Town of Shelburne,
County of Dufferin, and
Ministry of Transportation

Final Report

Shelburne East Area Transportation Study

Town of Shelburne

Project No. T11-576

June 2012

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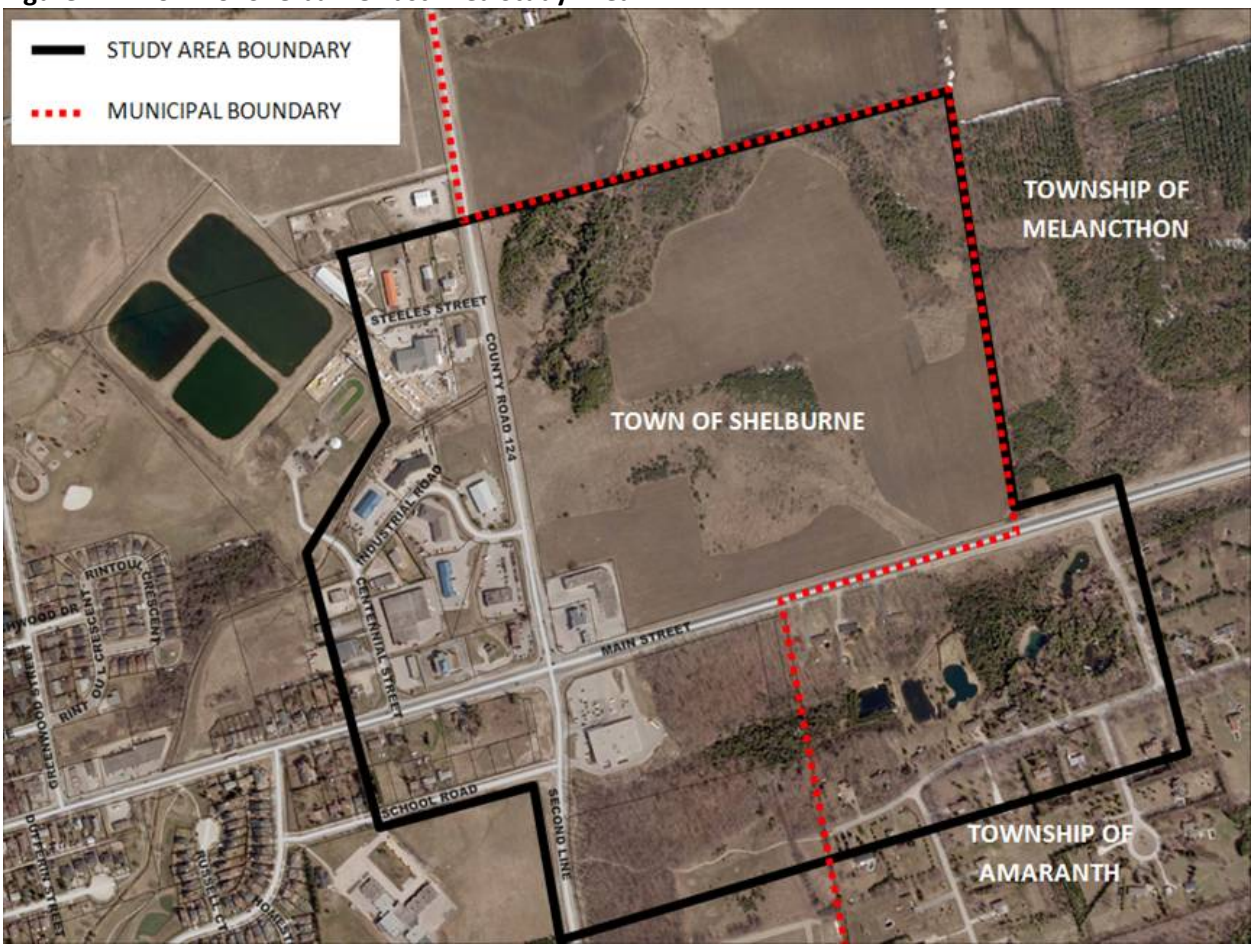
A. Executive Summary

A1. Background

The Town of Shelburne, jointly with the County of Dufferin and Ministry of Transportation, has developed a pragmatic, long-term plan to guide the development of the eastern portion of the Town's transportation system to meet the needs of existing residents and business owners, as well as accommodate planned growth. The study area is located at the boundary of the Town of Shelburne, and partly extends into the Township of Amaranth as shown in **Figure A-1**. Land uses in the study area are characterized by highway commercial, industrial, residential and open space uses. West of County Road 124, there is an increased presence of urban development and street network grid approaching the central business district of Shelburne.

Figure A-1: Town of Shelburne East Area Study Area



A2. Objectives

This study provides a practical assessment of the transportation system to resolve existing and anticipated future mobility needs and issues confronting the Town, including access management on the Provincial highway system and connectivity with adjacent municipalities. The key objectives of the Shelburne East Area Transportation Study are as follows:

- Develop an overall transportation strategic plan that addresses the short, medium and long-term transportation needs of the Town, County and MTO roads within the study area.
- Assess existing and anticipated impacts of planned developments within the study area and neighbouring municipalities on the transportation network.
- Develop and assess alternative solutions to address the anticipated deficiencies and needs of the transportation network necessary to maintain or improve the functionality, mobility and safety of the road network.
- Identify a transportation network solution that supports the Town's Official Plan, Provincial Policy Statement 2005 and the Provincial Growth Plan for the Greater Golden Horseshoe 2006.
- Develop a Highway Access Management Plan (HAMP), to manage numerous public and private residential and commercial accesses onto provincial highways or in the vicinity of the provincial highways to facilitate safe and efficient access. The HAMP will determine:
  - An appropriate location for a new public road onto Highway 10/89 east of County Road 124; and appropriate locations for internal public road access connections and/or commercial access connections from this new public road onto Highway 10/89.
  - An appropriate location for a new public road onto County Road 124 north of the Highway 10/89; and appropriate locations for internal public road access connections and/or commercial access connections from this new public road onto County Road 124.
  - An appropriate strategy for managing existing commercial uses and access connections in the vicinity of the Highway 10/89 and County Road 124 intersection as well as along the Highway 10/89, County Road 124 and County Road 11-Second Line corridors within the study area.
- Address walking/cycling as a safe and viable mode of transportation consistent with the Town's Draft Official Plan Amendment No.34 (Places to Grow Conformity Amendment) and Active Transportation Plan.

A3. Growth and Development

The traffic forecasts for the (2017, 2022, 2027 and 2032) study time horizons are based on the combination of continuing traffic growth due to new developments outside of the study area and traffic from proposed and planned developments within the study area or the immediate vicinity. Accordingly, the forecasts incorporate the following:

- Traffic growth of 3% per annum on Highway 10/89 from 2012 to 2022.
- Traffic growth of 2% per annum on County Road 124/11 from 2012 to 2022.
- Overall traffic growth of 1% per annum from 2022 to 2032.
- Background development traffic of planned and proposed developments that consist of residential, commercial and employment uses.

B. Highway Access Management

According to the MTO's Highway Access Management Guideline (Final Draft – January 2008):

> "*A Highway Access Management Plan (HAMP) is a comprehensive "master plan" that should be used to manage access to all or part of a provincial highway corrido*r"

A HAMP details requirements for permitting access connections along the highway and intersecting public roads. The purpose of a HAMP is:

- to act as an "access management master plan" that co-ordinates highway access management and adjacent road/land development on a strategic rather than reactive basis
- to provide the opportunity to reduce future potential conflicts between provincial highway access management objectives (policies/standards) and municipal land use objectives (road/land development plans), so that both objectives are efficiently achieved
- to provide MTO, municipalities and stakeholders with an orderly technical process to evaluate, and hopefully resolve, situations where development plans appear to be unable to comply with access management policies/standards.

Overall, a HAMP aims to achieve the optimum balance between transportation and planning objectives and preservation of the current and future function of the highway.

In the Shelburne East Area, a number of proposed developments have been identified (see **Section 3** of report), which will necessitate land accesses via the Provincial highway system, namely Highway 10/89. However, the constraints of the existing road network will limit the ability to apply the MTO's standards for intersection spacing. The MTO's desirable and minimum value for intersection spacing is 1600 m and 800 m, respectively for arterials. Given these values, any proposed road connection to Highway 10/89 in the study area will fall below the minimum requirement.

In addition to the above, MTO's Functional Intersection Area extends both upstream and downstream from a Highway 10/89 intersection. MTO's desirable offset spacing for new public roads from a highway intersection is 400 m. Given this value, proposed road connections from a Highway 10/89 intersection in the study area will fall below the desirable requirement.

As an alternative to the application of the desirable and minimum standards, a HAMP has been recommended to address and balance the needs for land accesses and the need to maintain traffic operation on the Provincial highway system. The HAMP will recognize the following principles:

- Land use development planning alternatives which avoid or minimize the need for direct highway access, through the provision of:
  - adequate internal road system
  - access points away from the highway
  - innovative design approaches, where appropriate

The following section reviews the alternative configurations of the proposed access locations and their implications on the existing intersections. Mitigation measures for the overall network will be developed with the recommended access management plan.

B1. Alternative Highway Access Management Concepts

A long list of alternative concepts was developed according to the basic framework outlined in the Terms of Reference:

- A new north public road onto Highway 10/89, east of the Highway 10/89 / County Road 124 intersection.
- A new south public road onto Highway 10/89, east of the Highway 10/89 / County Road 124 intersection.
- A new public road onto County Road 124, north of the Highway 10/89 / County Road 124 intersection.

The alternative HAMP concepts were evaluated qualitatively as part of an initial screening process. Potentially feasible alternatives are then carried forward for detailed analysis and evaluation.

C. Evaluation of Alternative Options

The following criteria are used to evaluate each alternative access management concept identified for further analysis.

Table C-1: Evaluation Criteria

Criteria	Evaluation
Intersection Operations	▪ Volume to capacity ratios and level of service analysis based on the 2032 traffic forecasts
HAMP Requirements	▪ Available intersection spacing ▪ Number of accesses
Storage Requirements	▪ Required left turn lane storage (based on queue analysis) and storage availability ▪ Queuing impact to existing driveways
Land Use Impacts	▪ Impacts to existing and proposed land uses ▪ Effects on existing driveway entrances
Active Transportation	▪ Pedestrian crossing opportunity ▪ Sidewalk / trail connectivity
Financial Considerations	▪ Potential viability
Overall Evaluation	▪ Evaluation based on above criteria
Mitigation Measures	▪ Geometric improvements ▪ Signal timing improvements ▪ Turn restrictions/prohibitions
Recommendation	▪ Recommended / Not Recommended to support planned growth

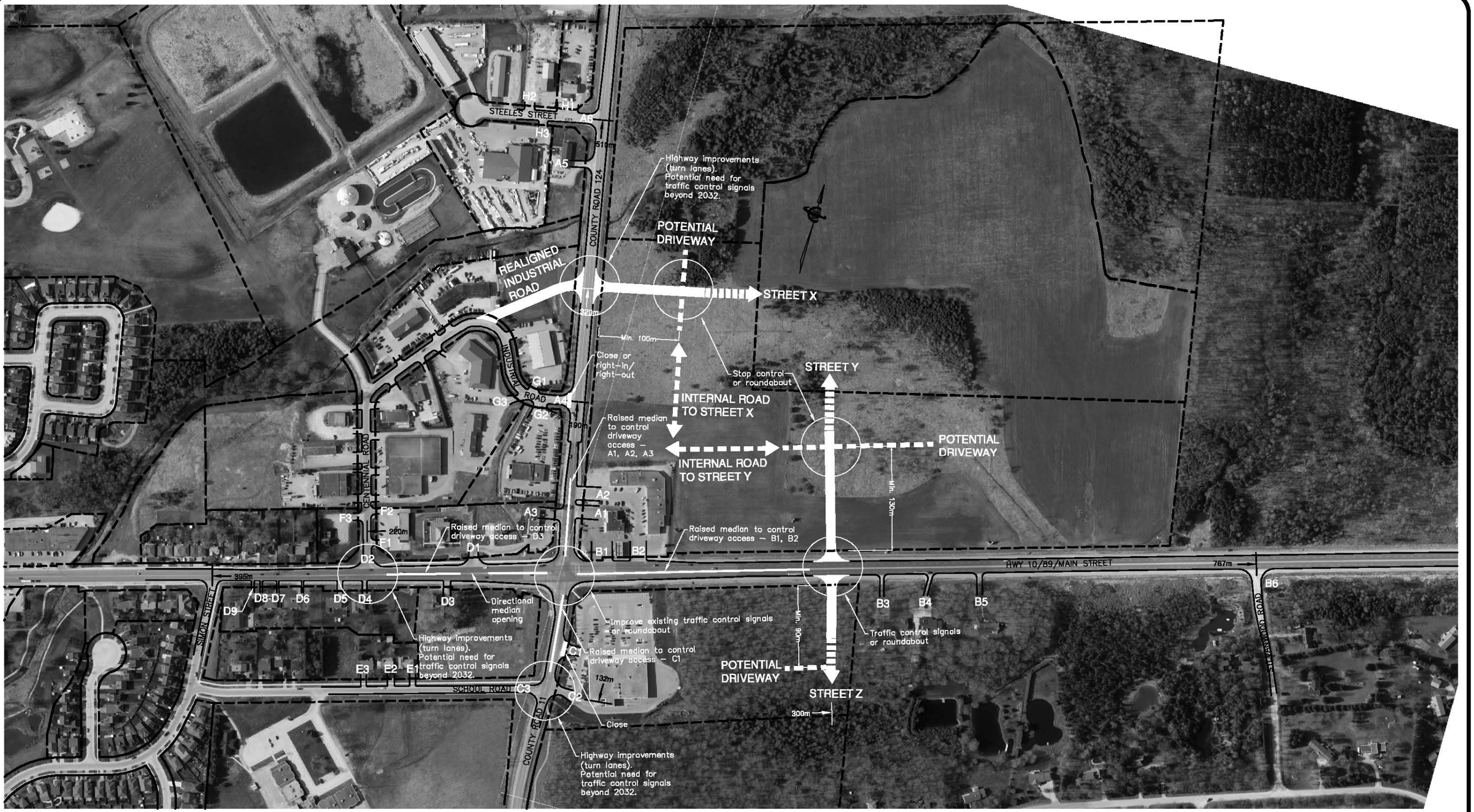
D. Preferred Option

Based on the evaluation, the preferred option for Shelburne East is shown in **Figure D-1** and is summarized as follows:

- A new north public road (Street Y) and a new south public road (Street Z) onto Highway 10/89 located 300 m east of the Highway 10/89 / County Road 124 intersection.
- A new public road (Street X) onto County Road 124, 320 m north of the Highway 10/89 / County Road 124 intersection; opposite realigned Industrial Road.
- Reduction in posted speed on Highway 10/89 between County Road 124 and Street Y from 70 km/h to 50 km/h. With the proposed future development, the role and function of Highway 10/89 in Shelburne East will change.
- Former Industrial Road closed or limited to right-in/right-out at County Road 124.
- Potential need for an eastbound left turn lane at Highway 10/89 and Centennial Road.
- Raised median along Highway 10/89 from County Road 124 to Street Y-Street Z (see **Section D3**).
- Raised median along Highway 10/89 from County Road 124 to Centennial Road (see **Section D3**). Consider directional median opening for Driveway D1.
- Raised median along County Road 124 north from Highway 10/89 to north of Driveway A2 or north of existing Industrial Road if right-in/right-out (see **Section D3**).
- Raised median along Second Line south from Highway 10/89 to School Road (see **Section D3**).
- Access to Street X shall be offset from County Road 124 a minimum of 100 m for signal option or 60 m for roundabout option (see **Section 6.5** of report)
- Access to Street Y shall be offset from Highway 10/89 a minimum of 130 m for signal option or 60 m for roundabout option (see **Section 6.5** of report)
- Access to Street Z shall be offset from Highway 10/89 a minimum of 90 m for signal option or 60 m for roundabout option (see **Section 6.5** of report)

The HAMP concept is based on an overall alternative that would minimize the number of new access points to be introduced on Highway 10/89, County Road 124 and Second Line – while also maintaining adequate connections for future developments. Analyses have shown the concept to be operationally feasible based on alternative traffic controls, namely signals or roundabouts, at the proposed access points of the new public roads. With that said, MTO will only support traffic signal controls where warranted and not solely based on capacity constraints. Major points to note regarding the plan are summarized following **Figure D-1**.

The merits for implementing traffic control signals and associated highway improvements (i.e. turning lanes) or roundabouts will be subject to Environmental Assessment studies in the future. In the meantime, the Town should plan for a process to protect property to accommodate the above noted intersection improvements should traffic signals or roundabouts be recommended through the Environmental Assessment process.



COLE ENGINEERING
70 VALLEYWOOD DRIVE, MARKHAM, ON L3R 4T5
T:416.987.6161 / 905.940.6161 F:905.940.2064

NOTES:

1. Feasibility of highway improvements (turn lanes), traffic control signals and/or roundabouts are subject to Environmental Assessment Study.
2. County Road 124/11 is assumed to be widened to 4 lanes.
3. Minimum distances shown from Highway 10/89 to potential driveways at Streets Y and Z are for traffic control signals, and may be reduced for roundabout option.
4. Minimum distance shown from County Road 124 to potential driveway at Street X is for traffic control signals, and may be reduced for roundabout option.

RECOMMENDED SCENARIO

SHELBURNE EAST AREA TRANSPORTATION STUDY
TOWN OF SHELBURNE, COUNTY OF DUFFERIN,
MINISTRY OF TRANSPORTATION OF ONTARIO

DATE:	JUNE 2012	PROJECT No.:	T11-576
SCALE:	1:4000	FIGURE No.:	D1

D1. Preferred Option Summary

Preferred Option with Traffic Signals

- Highway 10/89 / Centennial Road
  - Potential need for traffic control signal beyond 2032
  - New eastbound left turn lane
  - New southbound left turn lane
- Highway 10/89 / County Road 124
  - Existing traffic control signal
  - New northbound right turn lane
  - Extend existing southbound left turn lane to accommodate increased storage requirements
  - Extend existing eastbound right turn lane
- Highway 10/89 / Street Y-Street Z
  - New traffic control signal (warranted)
  - Eastbound and westbound left turn lanes
  - Eastbound and westbound right turn lanes
  - Northbound and southbound left turn lanes
- County Road 124 / Street X-Realigned Industrial Road
  - Potential need for traffic control signal beyond 2032
  - Northbound and southbound left turn lanes
  - Eastbound and westbound left turn lanes
- Second Line / School Road-Loblaw Access
  - Potential need for traffic control signal beyond 2032
- Widening of Highway 10/89 to accommodate turn lanes in accordance to MTO standards, based on a design speed of 80 km/h (posted speed of 60 km/h).
- Widening of County Road 124 and Second Line from two to four lanes through the study area.
- Access to Street X shall be offset from County Road 124 a minimum of 60 m (see **Section 6.5** of report)
- Access to Street Y shall be offset from Highway 10/89 a minimum of 60 m (see **Section 6.5** of report)
- Access to Street Z shall be offset from Highway 10/89 a minimum of 60 m (see **Section 6.5** of report)

The reduction in posted speed to 60 km/h for Highway 10/89 between Country Road 124 and Street Y-Street Z is consistent with the TAC Canadian Guidelines for Establishing Posted Speed Limits (December 2009) for the future road function and geometrics.

Preferred Option with Roundabouts

- Highway 10/89 / Centennial Road
  - Potential need for roundabout beyond 2032
- Highway 10/89 / County Road 124
  - Replace existing traffic control signal with roundabout
- Highway 10/89 / Street Y-Street Z (300 m east of the Highway 10/89 / County Road 124 intersection)
  - New roundabout
- County Road 124 / Street X-Realigned Industrial Road (320 m north of the Highway 10/89 / County Road 124 intersection)
  - Potential need for roundabout beyond 2032

- County Road 124 / Industrial Road
  - Closed or Right-in/right-out
- Second Line / School Road-Loblaw Access
  - Potential need for roundabout beyond 2032
- Access to Street X shall be offset from County Road 124 a minimum of 60 m (see **Section 6.5** of report)
- Access to Street Y shall be offset from Highway 10/89 a minimum of 60 m (see **Section 6.5** of report)
- Access to Street Z shall be offset from Highway 10/89 a minimum of 60 m (see **Section 6.5** of report)

D2. Property Impacts

Industrial Road Realignment
The required lands for the realignment of Industrial Road are in a flood plain and unlikely to have development opportunities for the Town to acquire lands through the development process in the near future. The Town should protect for the realignment through the Official Plan process.

Traffic Control Signals
MTO will only support traffic control signals where they are warranted and not solely based on capacity constraints.

Additional property at the intersections will be required for traffic control signals. The degree of impact will depend on the associated highway improvements (i.e. turning lanes), which would have to be determined through detailed feasibility studies. The following summarizes the traffic control signal locations and the properties that may be impacted (depending on the footprint size):

- Highway 10/89 / Centennial Road (properties on the northwest and northeast quadrants and along the south side of Highway 10/89)
- Highway 10/89 / County Road 124/11 (Wrigglesworth plaza, No Frills plaza, First Ave site)
- Highway 10/89 / Street Z-Street Y (Shelburne Market Village (Blackwood), Loblaw site)
- County Road 124 / Street X-Industrial Road (Shelburne Market Village (Blackwood))
- Second Line / School Road-Loblaw Access (No Frills plaza, First Ave site , Y Corp site)

The merits for implementing traffic control signals and associated highway improvements (i.e. turning lanes) will be subject to Environmental Assessment studies in the future. In the meantime, the Town should plan for a process to protect property to accommodate the above noted intersection improvements should traffic signals be recommended through the Environmental Assessment process.

Roundabouts
MTO will only support roundabouts where they are justified and feasible, and not solely based on capacity constraints.

As shown in **Figure D-2**, additional property at the intersections will be required for roundabouts. The degree of impact will depend on the footprint size of the roundabout, which would have to be determined through detailed feasibility studies. The following summarizes the roundabout locations and the properties that may or may not be impacted (depending on the footprint size):

- Highway 10/89 / Centennial Road (Residential property, properties on the northwest and northeast quadrants)
- Highway 10/89 / County Road 124/11 (Wrigglesworth plaza, No Frills plaza, First Ave site, Y Corp site)
- Highway 10/89 / Street Z-Street Y (Shelburne Market Village (Blackwood), Loblaw site)
- County Road 124 / Street X-Industrial Road (Shelburne Market Village (Blackwood))
- County Road 124 / School Road (No Frills, First Ave site, Y Corp site)

In general, the recommended roundabout size is for the smallest diameter that will accommodate truck movements. The merits for implementing roundabouts will be subject to Environmental Assessment studies in the future. In the meantime, the Town should plan for a process to protect property to accommodate the above noted intersection improvements should roundabouts be recommended through the Environmental Assessment process.

County Road 124 and Second Line – Widening from Two to Four Lanes

As indicated, based upon the assumed growth rates and development traffic, the estimated total future traffic volumes will necessitate widening on County Road 124 and Second Line from two to four lanes, if the preferred option with traffic control signals is implemented.

Properties along both roads may be impacted based upon this widening. The merits for implementing the widening will be subject to Environmental Assessment studies in the future. In the meantime, the County and the Town should plan for a process to protect property to accommodate the widening should it be recommended through the Environmental Assessment process.

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T:416.987.6161 / 905.940.6161 F:905.940.2064

NOTES:

1. Only inscribed diameter of roundabout shown. (45–55m for double–lane roundabout, 35–40m for single–lane roundabout.)

ROUNDABOUT FOOTPRINT

SHELBURNE EAST AREA TRANSPORTATION STUDY
TOWN OF SHELBURNE, COUNTY OF DUFFERIN,
MINISTRY OF TRANSPORTATION OF ONTARIO

DATE:	APRIL 30, 2012	PROJECT No.:	T11-576
SCALE:	1:4000	FIGURE No.:	D-2

D3. Impacted Driveways near Highway 10/89 / County Road 124

The following driveways are in close proximity to the Highway 10/89 / County Road 124-Second Line intersection where future operations (traffic queuing from the signalized intersection) will impede left turns from the driveways and affect drivers' ability to negotiate the movement:

- Wrigglesworth plaza – Driveways A1, A2, B1 and B2
- Commercial plaza northwest of Highway 10/89 / County Road 124 – Driveway A3
- No Frills plaza – Driveway C1
- Office / Plaza – Driveway D1
- First Avenue Group site – Driveway D3

Wrigglesworth Plaza

In the ultimate condition, a raised median is recommended along County Road 124 (north) and Highway 10/89 (east) to restrict Driveways A1, A2, B1 and B2 to right-in/right-out only. Access for Wrigglesworth plaza shall be provided via internal access connection to Street Y and Street X. It is therefore recommended that an easement be established through the Site Plan approval process for the Shelburne Market Village (Blackwood) site.

Commercial plaza northwest of Highway 10/89 / County Road 124

A raised median is recommended along County Road 124 (north) to limit Driveway A3 to right-in/right-out only. This will impact traffic destined north on County Road 124. Outbound traffic from Driveway A3 will need to utilize Centennial Road-Industrial Road to access northbound County Road 124.

A directional median opening (left-in/right-in/right-out) may be allowed at Driveway D1 (to existing office building) to avoid circuitous movements, in particular, for traffic coming from central Shelburne. The 95th percentile queue of the eastbound through movement is 85 m, and the link distance from the stop bar at County Road 124 to Driveway D1 is approximately 80m. Should the site west of the Insurance Office be redeveloped; an easement to Centennial Road should be investigated at which time the directional median opening should be closed and Driveway D1 limited to right-in/right-out only.

Should there be any new developments or redevelopments that will require access on Highway 10/89, between County Road 124 and Centennial Road, it is recommended that the new access(es) be limited to right-in/right-out only.

No Frills plaza / Loblaw site

Driveway C1 is recommended to be closed to traffic given that there are alternative accesses for the No Frills site via Driveway C2 on Second Line and the new public road, Street Z on Highway 10/89. The Ministry would also consider an additional right-in/right-out on Highway 10/89 as an alternative when Driveway C1 is closed.

Lands southwest of Highway 10/89 / Second Line

Driveway D3 is recommended to be right-in/right-out only on Highway 10/89. No driveways are recommended on Second Line between Highway 10/89 and School Road. Any future access to the First Ave site or Y Corp site should be provided via right-in / right-out on Highway 10/89 and on School Road.

Industrial Road
With Industrial Road realigned, the former Industrial Road is recommended to be closed and/or restricted to right-in/right-out only at County Road 124. The existing auto dealership and industrial uses west of County Road 124 will gain access to County Road 124 via the realigned Industrial Road.

D4. Interim Staging Recommendations

The preferred road concept plan developed outlines the ultimate road network requirements in Shelburne East area. Interim road improvements must consider the ultimate road network requirements. Overall, the following road improvements have been assumed to support the anticipated development within Shelburne East:

Shelburne Market Village (Blackwood), Employment Lands north of Shelburne Market Village (Blackwood) (2017)
Development of this site will necessitate: ▪ A new north public road (Street Y) onto Highway 10/89, 300 m east of the Highway 10/89 / County Road 124 intersection. ▪ A new public road (Street X) onto County Road 124, 320 m north of the Highway 10/89 / County Road 124 intersection. ▪ Traffic control signal or roundabout at Highway 10/89 / Street Y and County Road 124 / Street X and related intersection improvements. ▪ Highway 10/89 / Street Y should be constructed to allow for future south leg connection in the No Frills plaza /Loblaw site should development not occur at the same time in the southeast quadrant. ▪ County Road 124 / Street X should be constructed to allow for the realigned Industrial Road. Timing of the realignment will be subject to land availability. ▪ Raised median on Highway 10/89 (east) from County Road 124 to Street Y. ▪ Internal access connection from Wigglesworth plaza to Street X and Street Y.
No Frills Plaza / Loblaw Site (2022)
Development for this site will necessitate: ▪ A new south public road (Street Z) onto Highway 10/89, 300 m east of the Highway 10/89 / County Road 124 intersection and opposite Street X. ▪ With the new access onto Highway 10/89, the existing driveway C1 on Second Line is recommended to be closed. A right-in / right-out access to Highway 10/89 is an option with the closure of driveway C1.

The analyses confirmed that the above improvements are required in parallel with the development. The road improvements may be triggered earlier should the developments be advanced ahead of the projected timeline.
The analysis of the interim scenarios also indicated that:

a) Under the 2017 horizon, there will be no improvements required in addition to those triggered by the developments in the northeast quadrant (Shelburne Village Market (Blackwood)/Employment lands). *It has been noted that road improvements related to Shelburne Market Village (Blackwood) and employment lands north of Shelburne Market Village (Blackwood) should occur in parallel to the actual timeline of the development, which may be before or after 2017*.

b) Under the 2022 horizon, Highway 10/89 / Centennial Road and Second Line / School Road will experience capacity constraints. Traffic control signals or roundabouts need to be considered as improvements. MTO will only support traffic control signals where they are warranted.

   A left turn lane at Highway 10/89 / Centennial Road will need to be considered (without traffic control signals).

   Certain movements at Highway 10/89 / County Road 124 will approach capacity.

   In the same horizon, Industrial Road is assumed to be realigned opposite Street X. This may occur at a later time depending on the land availability.

c) Under the 2027 horizon, intersection improvements will be required at Highway 10/89 / County Road 124-Second Line. This will include turn lane improvements (northbound right turn and southbound left turn) widening of County Road 124 through the Highway 10/89 intersection due to capacity constraints. Alternatively, a roundabout may be considered.

d) Under 2032 conditions, it is recommended that County Road 124 and Second Line be widened to four lanes due to accommodate forecasted traffic volumes. However, should the roundabout option be preferred, the need for four-lane cross-sections could be deferred.

The study to date indicates that traffic control signals and intersection improvements (turning lanes) and/or roundabouts are operationally feasible. An Environmental Assessment study is recommended to be carried out to fully assess the feasibility of any associated traffic control improvement in order to determine the preferred option.

E. Active Transportation

Pedestrian Network

The future road network should provide connections to the following missing links in the pedestrian network:

- Pedestrian connection on the south side of Highway 10/89 between Simon Street and Second Line.
- Pedestrian connection on the west side of Second Line between Highway 10/89 and School Road.
- Pedestrian connection on the east side of Second Line between Highway 10/89 and the existing trail.

Sidewalk connections should also be continuous along Highway 10/89 easterly from County Road 124-Second Line and along County Road 124 northerly from Highway 10/89. Future Streets X, Y and Z should also have provisions for sidewalks along both sides.

Sidewalks should be paved through driveways consistent to the current practice on Highway 10/89.

Cycling Network

According to MTO's Bikeways Planning and Design Guidelines (1996), bicycles will "continue to be prohibited as deemed necessary for safety reasons, from specific controlled access highways". The Ministry is currently updating the Bikeways Planning and Design Guidelines, which will provide further directives of cycling facilities within Provincial roads.

Opportunities for alternative cycling routes along existing and new local roads and/or off-road routes should be identified and the provision of bicycle parking or other facilities that promote cycling, and

other forms of active transportation should be explored through the review of development applications within the study area and as a component of future planning initiatives.

F. Connecting Link

It is recommended that Town consider an extension of the current connecting link designation easterly from Simon Street to the new Highway 10/89 and Street Y-Street Z intersection. The Town would need to approach MTO regarding its ability and desire to transfer this section of Highway 10/89 to the Town and designate as a connecting link.

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1. Introduction

1.1. Background and Purpose

The Town of Shelburne, jointly with the County of Dufferin and Ministry of Transportation, is developing a pragmatic, long-term plan to guide the development of the eastern portion of the Town's transportation system to meet the needs of existing residents and planned growth.

This study provides a practical assessment of the transportation system to resolve existing and anticipated future mobility needs and issues confronting the Town, including access management on the Provincial highway system and connectivity with adjacent municipalities.

Recent and planned growth in the Town continues to add capacity pressure to the road network and operational deficiencies occur during peak periods. Further growth, as per the Town's Draft OP Amendment 34, extends beyond the current built boundary. Additionally, the recreational nature of the surrounding areas results in peak tourist demands consisting of longer-distance trips that need to be accommodated on the Provincial and County roads. With increasing traffic on the Highway 10/89 and County roads, local streets experience higher delays, especially for minor street and private driveway approaches.

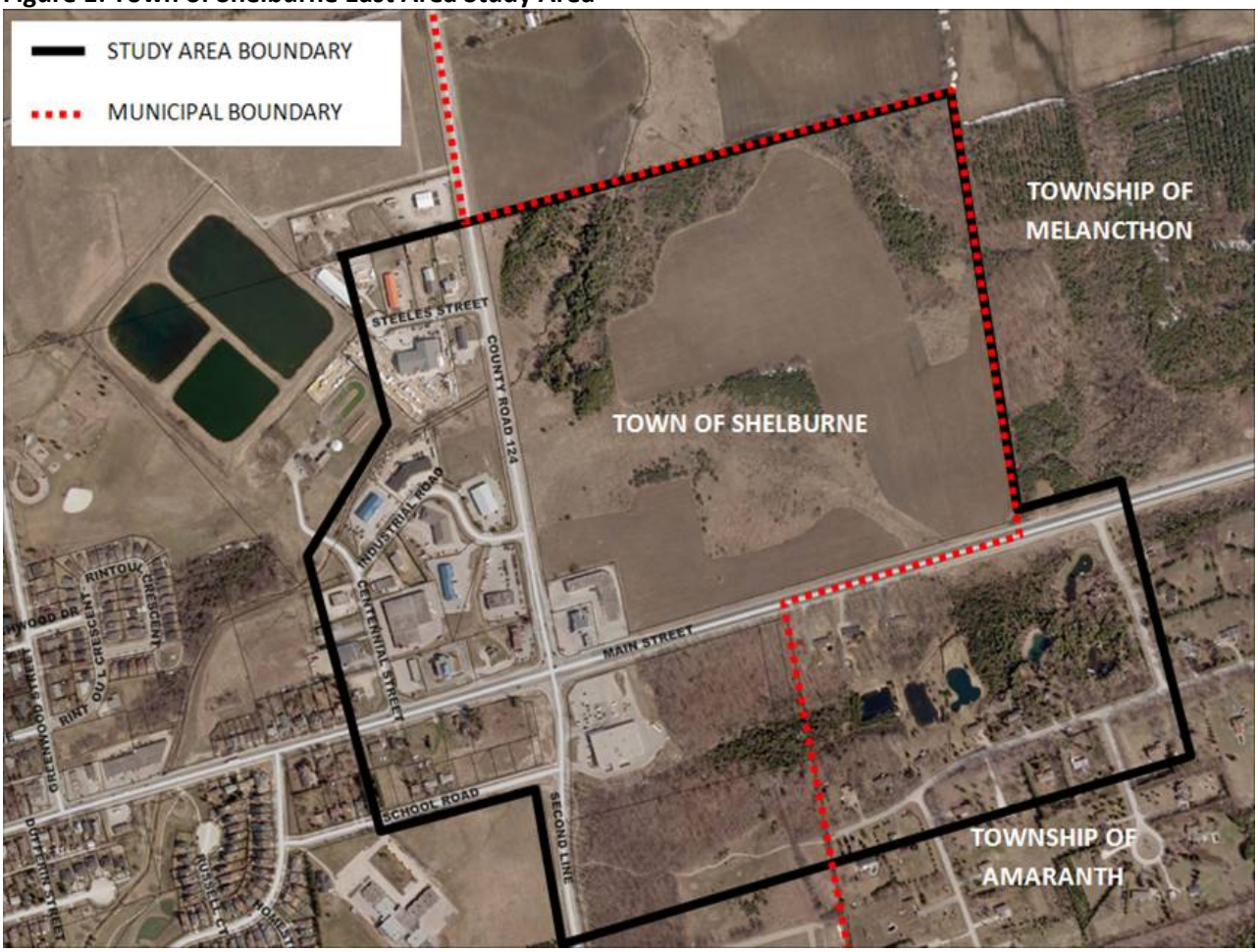
The following are the key objectives of the Shelburne East Area Transportation Study:

- Develop an overall transportation strategic plan that addresses the short, medium and long-term transportation needs of the Town, County and MTO roads within the Study Area.
- Assess existing and anticipated impacts of planned developments within the Study Area and neighbouring municipalities on the transportation network.
- Develop and assess alternative solutions to address the anticipated deficiencies and needs of the transportation network necessary to maintain or improve the functionality, mobility and safety of the road network.
- Identify a transportation network solution that supports the Town's Official Plan, Provincial Policy Statement 2005 and the Provincial Growth Plan for the Greater Golden Horseshoe 2006.
- Develop a Highway Access Management Plan (HAMP), to manage public and private accesses onto provincial highways or in the vicinity of the provincial highways to facilitate safe and efficient access. The HAMP will determine:
  - An appropriate location for a new public road onto Highway 10/89 east of County Road 124; and appropriate locations for internal public road access connections and/or commercial access connections from this new public road onto Highway 10/89.
  - An appropriate location for a new public road onto County Road 124 north of the Highway 10/89; and appropriate locations for internal public road access connections and/or commercial access connections from this new public road onto County Road 124.
  - An appropriate strategy for managing existing commercial uses and access connections in the vicinity of the Highway 10/89 and County Road 124 intersection as well as along the Highway 10/89, County Road 124 and Second Line corridors within the Study Area.
- Address the needs of pedestrians and cyclists as a safe and viable mode of transportation consistent with the Town's Draft Official Plan Amendment No.34 (Places to Grow Conformity Amendment) and Active Transportation Plan.
- This report documents the 90% interim findings of the Shelburne East Area Transportation Study to date.

1.2. Study Area

The study area is located at the boundary of the Town of Shelburne, and partly extends into the Township of Amaranth as shown in **Figure 1**. Land uses in the study area are characterized by highway commercial, industrial, residential and open space uses. West of County Road 124, there is an increased presence of urban development and street network grid approaching the central business district of Shelburne.

Figure 1: Town of Shelburne East Area Study Area

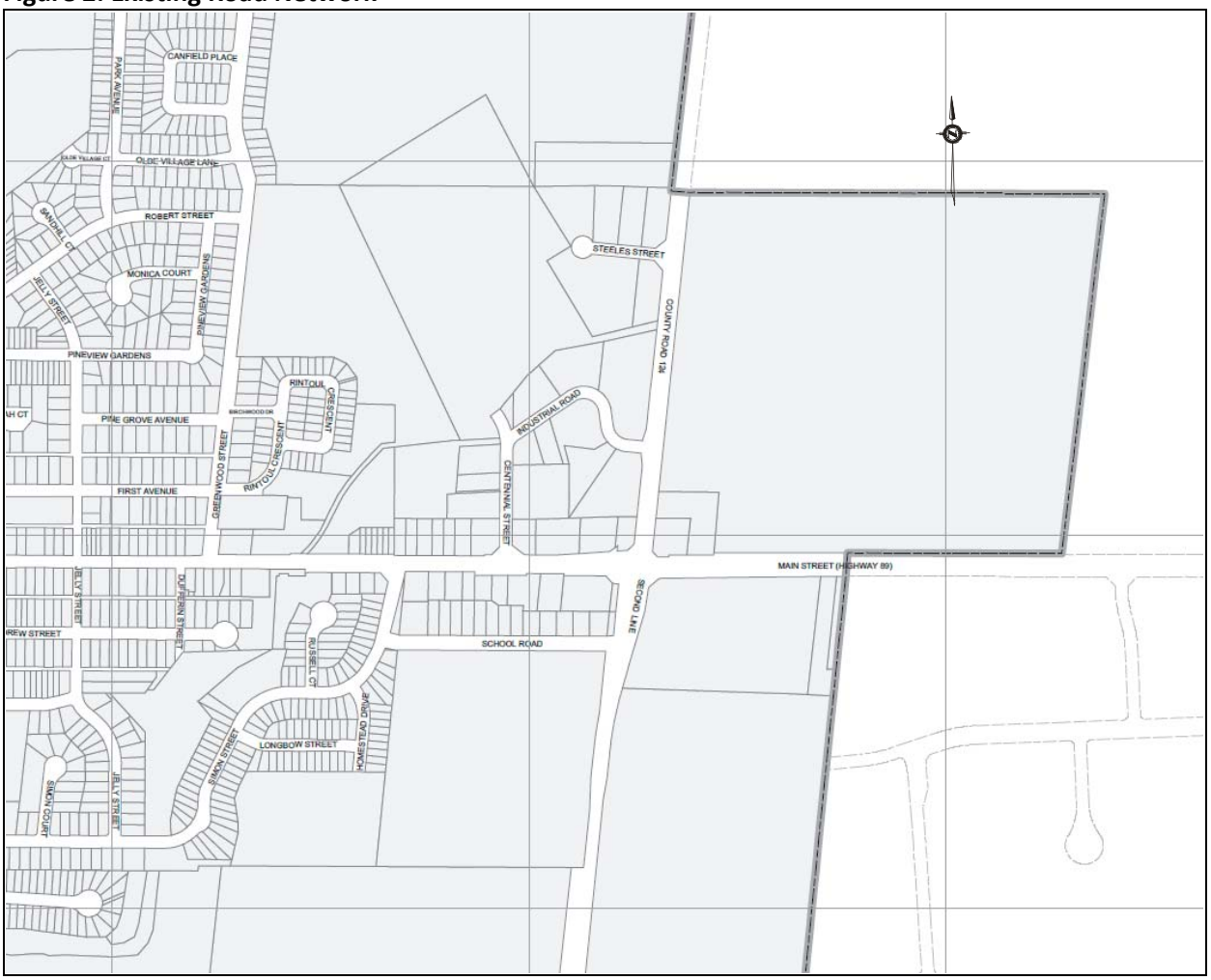


2. Existing Conditions

2.1. Road Network

The overall road network for the study and surrounding areas is shown in **Figure 2**. The primary thoroughfares within the study area are Highway 10/89 and County Road 124-Second Line which carries both local and inter-regional traffic.

Figure 2: Existing Road Network



Source: Town of Shelburne Street Map, 2007

Highway 10/89, also known as Main Street within the Town of Shelburne, is classified as an Arterial highway under the Ministry's Functional Classification System. Highway 10/89 is also classified as a Class III Special Controlled Access Highway from the Highway 10/89 / Country Road 124 intersection to the east limit of the study area. With the controlled access highway designation, access controls are in place to accommodate both high-speed and high-volume traffic to provide for the mobility of people and goods, while providing limited opportunities for new entrances to abutting land.

West of the County Road 124 intersection, Highway 10/89 has a four-lane urban cross-section to Greenwood Street. To the east, Highway 10/89 has a four-lane rural cross-section. County Road 124 and

Second Line are both two-lane rural roads. The posted speed limit transitions between urban and rural areas on Highway 10/89 and County Road 124. The Highway 10/89 / County Road 124 intersection is the only signalized intersection within the study area. Further details of the road network within the study area are provided in **Table 1**.

Table 1: Description of Existing Road Network

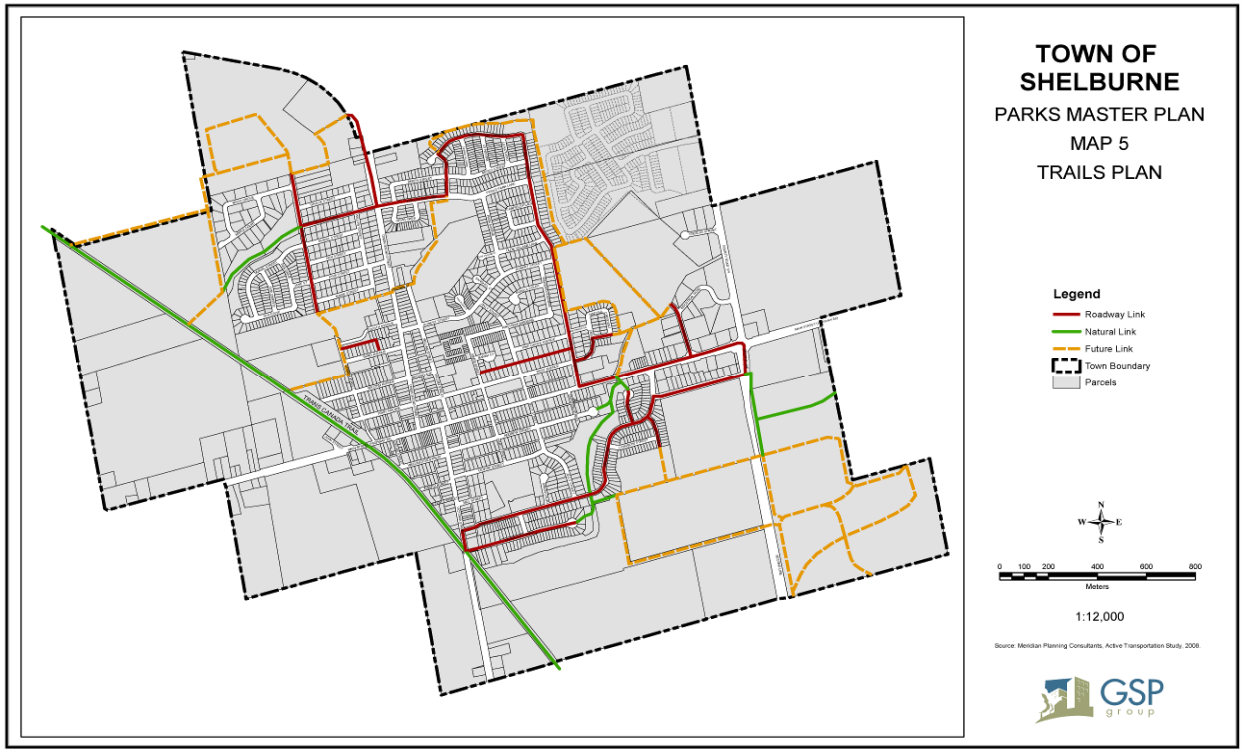
Road	Lanes	Posted Speed, km/h	Classification	*Jurisdiction*
Highway 10/89 (Main Street)				
West of Simon Street	4	50	Connecting Link	*Town of Shelburne*
Simon Street to County Road 124	4	50	Arterial (King's Highway)	*Ministry of Transportation*
County Road 124 to West of Sylvanwood Road	4	70	Arterial (Controlled Access)	*Ministry of Transportation*
Easterly from west of Sylvanwood Road	4	80	Arterial (Controlled Access)	*Ministry of Transportation*
County Road 124				
North of Industrial Road	2	60	Arterial	*County of Dufferin*
Industrial Road to Highway 10/89	2	50	Arterial	*County of Dufferin*
Second Line				
Highway 10/89 to School Road	2	50	Arterial	*County of Dufferin*
South of School Road	2	60	Arterial	*County of Dufferin*
Centennial Road	2	50	Local	*Town of Shelburne*
Industrial Road	2	50	Local	*Town of Shelburne*
Sylvanwood Road	2	40	Local	*Township of Amaranth*
School Road	*2*	*40*	*Local*	*Town of Shelburne*

2.2. Active Transportation Network

The active transportation network is primarily based on recreational opportunities and utilizes the trail and park system within the Town of Shelburne. Facilities are both on and off-road and support physical activity as well as connections to local destinations and points of interest. The existing park/trail inventory and planned future trail system in the Town of Shelburne are shown in **Figure 3**.

Through the Active Transportation Plan, the Town of Shelburne also promotes walking and cycling to achieve broader community goals. Recommendations included active living year round for all ages; building on the Shelburne Trail Network; promoting awareness through community projects; and, implementing the Active Transportation Plan.

Figure 3: Town of Shelburne Trail System



Source: Shelburne Park Master Plan

2.3. Existing (2011 Baseline) Conditions

2.3.1. Traffic Volumes

Highway 10/89 and County Road 124-Second Line are carrying average daily volumes of 17,900 vehicles and 5,300 vehicles, respectively. Heavy vehicles represent about 13-15% of the total traffic volume. Peak direction of travel is identified as eastbound in the AM peak period and westbound in the PM peak period. The study link volumes are summarized in **Table 2**.

Table 2: Study Link Volumes

Road	Class.	Average Daily Volumes	Truck %
Highway 10/89 (Main Street)	Arterial	17,900	13%
County Road 124 – Second Line	Arterial	5,300	15%

Source: County file 12401-C, MTO Traffic Operations Study – Highways 10 and 89 in the Town of Shelburne and Vicinity

Furthermore, the 2011 baseline traffic volumes for the weekday morning and afternoon peak hours are illustrated in **Figure 4**. Intersection turning volumes have been developed based on automatic traffic recorders (ATR) and turning movement counts from MTO and the County of Dufferin. For side street intersections, turning movements were estimated based on the existing traffic patterns on Highway 10/89 and County Road 124. It is however noted that total side street volumes are low and as such, the split of turning movement volumes at these locations are not critical to the operations analysis.

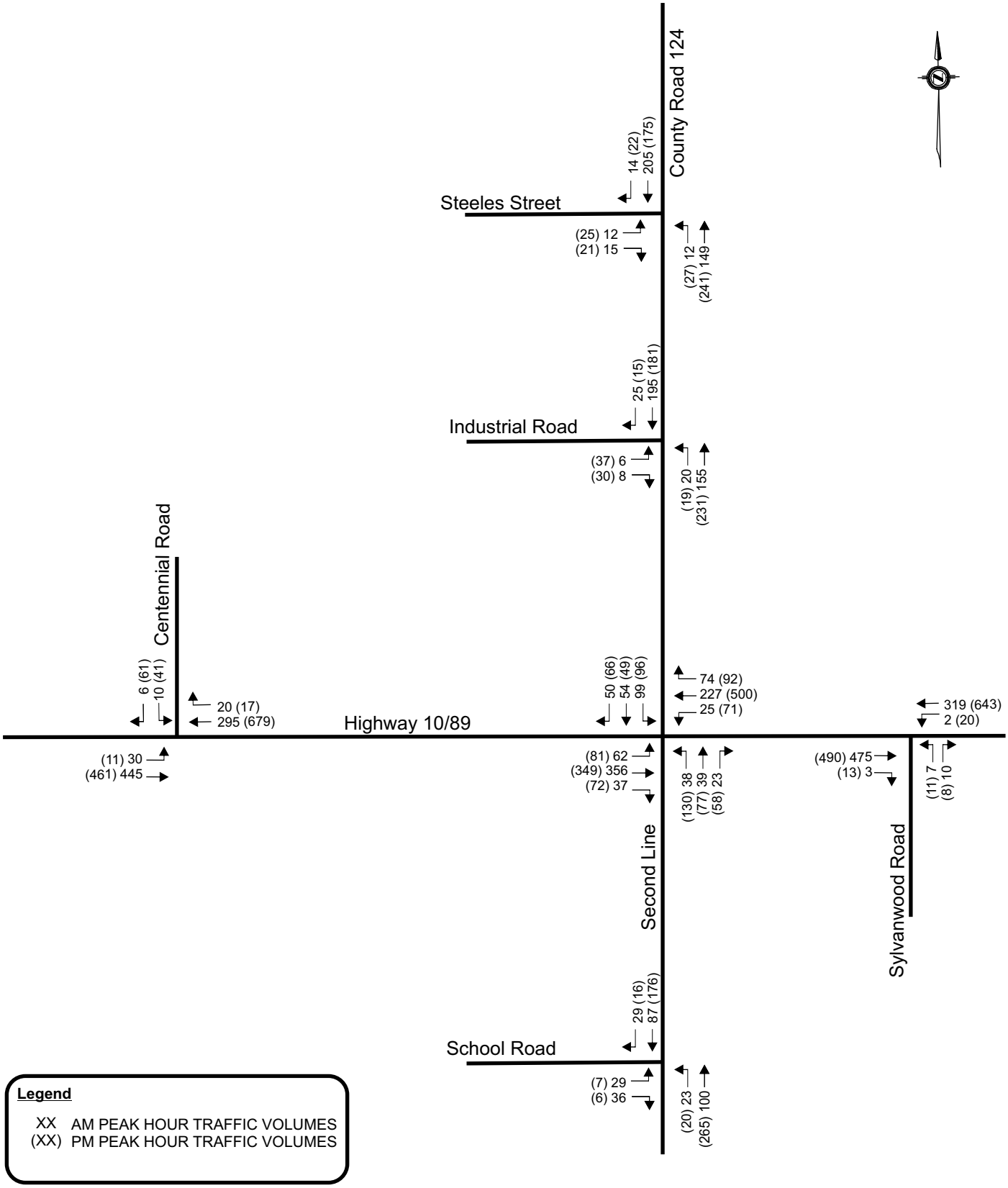


Figure 4
Traffic Volumes - 2011 Baseline Conditions

2.3.2. Intersection Operations – Existing Conditions

Operational analysis for the study intersections are assessed for the weekday morning and afternoon peak hours, under the 2011 baseline conditions. The capacity and level of service results are summarized in **Table 3** and the Synchro output sheets are attached in (**Appendix A**). Under existing conditions, the results indicate that all study intersections are operating with residual capacity and acceptable level of service.

Table 3: Intersection Operations – 2011 Baseline Condition

Intersection	Weekday AM Peak Hour		Weekday PM Peak Hour	
	v/c	LOS	v/c	LOS
Highway 10/89 (Main Street) / Centennial Road				
Eastbound Left-Through	0.03	A	0.01	A
Eastbound Through	0.19	A	0.20	A
Westbound Through	0.13	A	0.29	A
Westbound Through-Right	0.08	A	0.16	A
Southbound Left-Right	0.04	B	0.25	C
Highway 10/89 (Main Street) / County Road 124-Second Line				
Overall	0.25	B	0.25	B
Eastbound Left	0.29	B	0.25	B
Eastbound Through	0.54	C	0.24	B
Eastbound Right	0.03	B	0.05	B
Westbound Left	0.14	B	0.21	B
Westbound Through	0.36	B	0.34	B
Westbound Right	0.06	B	0.07	B
Northbound Left	0.06	A	0.27	B
Northbound Through-Right	0.06	A	0.16	B
Southbound Left	0.15	A	0.24	B
Southbound Through	0.05	A	0.07	B
Southbound Right	0.04	A	0.05	B
Highway 10/89 (Main Street) / Sylvanwood Road				
Eastbound Through	0.20	A	0.21	A
Eastbound Through-Right	0.10	A	0.11	A
Westbound Left-Through	0.01	A	0.02	A
Westbound Through	0.14	A	0.27	A
Northbound Left-Right	0.03	B	0.06	C
County Road 124 / Steeles Street				
Eastbound Left-Right	0.05	B	0.09	B
Northbound Left-Through	0.01	A	0.02	A
Southbound Through-Right	0.14	A	0.13	A
County Road 124 / Industrial Road				
Eastbound Left-Right	0.02	B	0.12	B
Northbound Left-Through	0.02	A	0.02	A
Southbound Through-Right	0.14	A	0.13	A
Second Line / School Road				
Eastbound Left-Right	0.09	B	0.02	B
Northbound Left-Through	0.02	A	0.02	A
Southbound Through-Right	0.07	A	0.12	A

2.3.3. Seasonal Variations

Highway 10/89 is a popular route for tourist and recreation travel year round. Traffic pattern on this section of Highway 10/89 is classified as Intermediate Recreation (IR) (MTO's traffic volume information). While recreational traffic utilize Highway 10/89 year round, the peak demands are in the summer, particularly Friday evenings and Sunday evenings. According to a report prepared for MTO (*Traffic Operations Study – Highways 10 and 89 in The Town of Shelburne and Vicinity: Traffic Operations Report Assignment: 3006-E-0047, May 2008*), there is a noticeable increase in traffic volumes during the summer months attributable to Shelburne serving as a gateway to recreational areas and facilities to the north and west. This study collected summer and fall traffic volumes over a one week period. Summer weekend traffic was found to be 7% higher than summer weekday volumes and fall weekend volumes were 5% higher than fall weekday volumes. Based on historic traffic data from the *Provincial Highways Traffic Volumes 1988-2008*, summer volumes are approximately 20% higher than annual average volumes.

The traffic operations analysis reported in the above Section 2.3.2 indicates that there is sufficient residual capacity to accommodate typical higher seasonal volumes. However, during the peak summer demands, congestion and delays are experienced for several hours each weekend. While it may be ideal to be able to accommodate traffic demands in all situations, it is not pragmatic nor financially feasible to design a transportation system that accommodates the peak of the peak with free-flow conditions. The analysis of the future conditions will be cognizant of the seasonal variation in traffic demand experience in the Town of Shelburne.

2.3.4. Walkability Audit

Walkability is defined as the level of integration of pedestrian facilities and municipal infrastructure, based on design elements and characteristics of the road environment, that influence the ease in which pedestrians can move through the network, conveniently, enjoyably and safely. The overall walkability of the Shelburne East study area was assessed based on a pre-developed walkability checklist.

A walkability checklist is a tool used to assess how pedestrian-friendly a neighbourhood is. It is a subjective assessment of walkability that is intended to generate discussion about how neighbourhoods can become more pedestrian-friendly as opposed to a measure of the pedestrian safety within the neighbourhood. For each category (sidewalks, crossings, traffic, safety, and ambience), points are awarded based on the perceived walkability. This checklist is used to conduct a walkability audit for this study and is attached in **Appendix B**.

For Shelburne East, the overall pedestrian environment within the study area changes from urban to rural. Within the urban section (west of County Road 124), sidewalks are provided on at least one side of the road. However, the following are noted from the walkability review:

- Missing pedestrian connection on the south side of Highway 10/89 between Simon Street and Second Line
- Missing pedestrian connection on the east and west sides of Second Line between School Road and Highway 10/89
- Small (narrow) separation of sidewalk from vehicular traffic on the north side of Highway 10/89
- Crosswalk markings are faded at the Highway 10/89 -County Road 124 intersection

2.3.5. Winter-related Issues

Issues have been noted though field observations and discussions with the project team related to winter traffic conditions:

- County Road 124 is subject to severe winter conditions, such as blowing snow, resulting in the closure of the road north of the Town. A warning sign is installed on County Road 124 just north of Highway 10/89 to provide advanced driver information and indicate when the road is closed.
- Snowmobile traffic is permitted on shoulders, and trail on County Road 124 – snowmobiles often access the service station on the northeast corner of Highway 10/89 and County Road 124 for fuel. The Motorized Snow Vehicles Act contains regulation provisions, which permits council of an upper-tier and council of a local municipality to pass by-laws that regulate, govern or prohibit the operation of snow motorized vehicles.

2.4. Road and Access Spacing

Along Highway 10/89 and County Road 124-Second Line, there are a number of existing private driveways to/from commercial and residential properties. These driveways generally allow for full movement access. Similarly, side roads connecting to Highway 10/89, County Road 124 and Second Line are provided with full movement access to the corridors. The spacing of each driveway and intersecting side street is summarized in **Table 4** and illustrated in **Figure 5.**

2.5. Planned Road Improvements

There are no road improvements planned in the study area with the exception of the scheduled resurfacing of Highway 10/89 in 2012. The road resurfacing (with no capacity improvements) extends from the east limit of the Connecting Link (at Simon Street) easterly to 0.65 km east of the Highway 10 / Highway 89 intersection (Primrose, Dufferin County); and on Highway 10, 0.5 km south of the Highway 10 / Highway 89 intersection.

Table 4: Existing Road and Access Spacing

		Distance from Highway 10/89 and County Road 124 Intersection	Entrance or Roadway Width
County Road 124 (north leg)			
East Side	A1. Plaza	65 m	15 m
	A2. Plaza	90 m	15 m
West Side	A3. Plaza	65 m	12 m
	A4. Industrial Road	192 m	10 m
	A5. Commercial	457 m	7.5 m
	A6. Steeles Street	510 m	11 m
Highway 10/89 (east leg)			
North Side	B1. Plaza	40 m	23 m
	B2. Plaza	85 m	18 m
South Side	B3. House	357 m	6 m
	B4. House	410 m	6 m
	B5. House	461 m	9 m
	B6. Sylvanwood Road	767 m	12 m
Second Line (south leg)			
East Side	C1. Plaza	85 m	10 m
	C2. Plaza	134 m	9 m
West Side	C3. School Road	135 m	8 m
Highway 10/89 (west leg)			
North Side	D1. Office/Plaza	105 m	10 m
	D2. Centennial Road	222 m	8.5 m
South Side	D3. House	130 m	8.0 m
	D4. House	222 m	5.0 m
	D5. House	250 m	6 m
	D6. House	290 m	2 m
	D7. House	320 m	2.5 m
	D8. House	338 m	2.5 m
	D9. House	350 m	3 m
School Road			
North Side	E1. House	148 m	6.6 m
	E2. House	174 m	7.7 m
	E3. House	202 m	6.0 m
Centennial Road			
East Side	F1. Commercial	33 m	5.5 m
	F2. Commercial	65 m	6 m
West Side	F3. Commercial	68 m	7 m
Industrial Road			
North Side	G1. Industrial/Commercial	52 m	10 m
South Side	G2. Auto Dealership	45 m	15 m
	G3. Industrial/Commercial	55 m	7 m
Steeles Street			
North Side	H1. Commercial	40 m	24 m
	H2. Commercial	82 m	11 m
South Side	H3. Commercial	66 m	10 m

COLE ENGINEERING

70 VALLEYWOOD DRIVE, MARKHAM, ON L3R 4T5
T:416.987.6161 / 905.940.6161 F:905.940.2064

EXISTING DRIVEWAY LOCATIONS

SHELBURNE EAST AREA TRANSPORTATION STUDY
TOWN OF SHELBURNE, COUNTY OF DUFFERIN,
MINISTRY OF TRANSPORTATION OF ONTARIO

DATE:	DECEMBER 14, 2011	PROJECT No.:	T11-576
SCALE:	1:4000	FIGURE No.:	5

3. Future Traffic Forecast

3.1. Growth Rate and Background Developments Assumptions

The traffic forecasts for the 2017, 2022, 2027 and 2032 time horizons are based on the combination of continuing traffic growth due to new developments outside of the study area and traffic from proposed and planned developments within the study area or the immediate vicinity. Accordingly, the forecasts incorporate the following:

- Traffic growth of 3% per annum on Highway 10/89 from 2012 to 2022
- Traffic growth of 2% per annum on County Road 124/ Second Line from 2012 to 2022
- Overall traffic growth of 1% per annum from 2022 to 2032
- Background development traffic of planned and proposed developments

Overall, the proposed and planned developments within Shelburne are summarized in **Table 5** and illustrated in **Figure 6**.

Table 5: Background Developments Summary

Future Residential
1. Greenbrook Village (previously known as Northridge Estates), located north of the study area with access to County Road 124, is a draft approved plan of subdivision for 321 single detached residential units. It is anticipated that this subdivision will take 6-7 years to build out (to 2018). Future development blocks could accommodate up to 70 townhouse units.
2. Vandyk – Shelburne North residential development, located in northwest Shelburne, is a proposed plan of subdivision consisting of a total of 355 residential units. Phase 1 is draft approved for 160 single detached units and Phase 2 is proposed for an additional 74 single detached units and 121 townhouse units. It is anticipated that this subdivision could be completed within 8 to 10 years (to 2020-2022).
3. Stone Ridge Condominiums is a proposed 40-unit townhouse condominium development located on the north side of Main Street West, to the west of Gordon Street. If approved, this development could be constructed within the next 5 years (to 2017).
4. There are approximately 22 vacant residential lots within existing plans of subdivision and existing lots of record which could accommodate the construction of single unit dwellings over the next 5 to 10 years depending on uptake in these locations.
5. There is 1.1ha of vacant residential land on the north side of Main Street East on the east side of the Besley Drain, which could accommodate approximately 48 residential units depending on housing types and density of development. Preliminary investigations are being undertaken by the owner for the potential development of this site; however, no timeframe has been established for approvals or construction.
6. There is 6.5ha of vacant residential land including two parcels located west of the former rail corridor, north of Main Street West, which could accommodate approximately 150 residential units depending on the housing types and density of development. There is no formal development proposal for this site at this time and therefore the timing of potential construction is unknown.

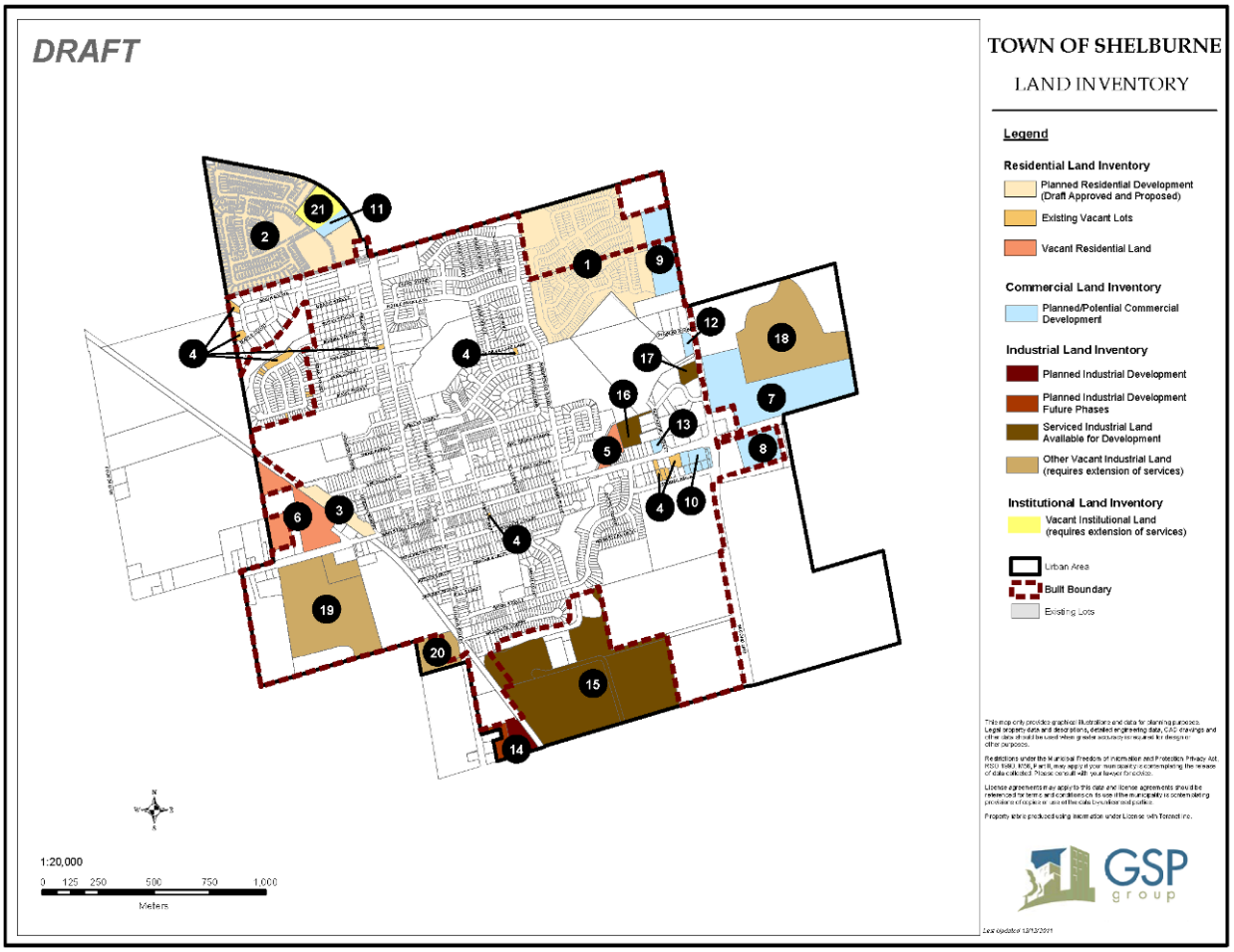
Table 5 continued

Future Commercial
7. Shelburne Market Village (Blackwood) is a proposed commercial development located at the northeast quadrant of the Highway 10/89 and County Road 124 intersection. The total gross floor area proposed for Phase 1 is 11,212 m^2. Phase 2 would add approximately 4,337 m^2 of commercial floor space. It is anticipated that Phase 1 of this commercial development could be constructed over the next 5 years with a longer time horizon of 8 to 10 years for full build out of the commercial portion of the site including Phase 2.
8. The east side of the No Frills (Loblaw) site, located at the southeast quadrant of the Highway 10/89 and County Road 124 intersection, could accommodate approximately 4,400 m^2 of additional commercial floor space based on the remaining vacant land area. No formal proposals have been submitted to the Town for the development of the easterly portion of this site, and therefore the timing for potential construction is unknown at this time.
9. The Greenbrook Village subdivision includes 2 commercial blocks having a total area of 3.3 ha which accommodate approximately 8,573 m^2 of commercial floor space. No formal proposals have been submitted or timeframes established for the development of the commercial blocks.
10. Shelburne Plaza (First Avenue Group), is a proposed commercial development located at the southwest quadrant of the Highway 10/89 and County Road 124/ Second Line intersection. The site is approximately 2ha in area and could accommodate approximately 2,000 m^2 of commercial floor space. Adjoining this property to the south are 4 lots known as 2, 4, 6 and 8 School Road (Y Corp) having a land area of 0.5ha which could accommodate approximately 1,000 m^2 of commercial floor space. It is anticipated that a timeframe for development of these adjoining commercial sites would be established following the resolution of access issues associated with the Highway 10/89, Second Line and School Road frontages.
11. The Vandyk – Shelburne North Phase 1 subdivision includes one commercial block fronting Highway 10 North which could accommodate up to 2,000 m^2 of commercial floor space. No formal proposals have been submitted to the Town and no timeframe has been established for development of the commercial block.
12. An expansion of the existing Fines Home Hardware/Building Centre was proposed in 2009; however, the details of the proposal have not been received by the Town and no timeframe has been provided for finalization of approvals and potential construction of the addition.
13. A traffic study has been submitted to the Town and MTO for a proposed drive-through restaurant at 664 Main Street East (north-west corner of Highway 10/89 at Centennial Road); however no formal development proposal has been submitted to the Town and no timeframe has been established for approvals and potential construction.

Table 5 continued

Future Industrial
14. A site plan was approved in 2011 for a 14-unit industrial mall building having a total floor area of approximately 3,720 m^2 to be constructed north-east of the corner of Victoria Street and 30th Sideroad/Second Line. Construction could occur as early as 2012. 15. The Shelburne Industrial Park, located along the north side of 30th Sideroad/Second Line, provides 28ha of vacant, serviced industrial land that is readily available for development. This land area could accommodate approximately 55,220 m^2 of industrial floor space over the next 10 to 20 years depending on uptake of the industrial land base. 16. There is 1.2ha of vacant industrial land located west of Centennial Road, north of Main Street East/Highway 10/89 which could accommodate approximately 2,487 m^2 of industrial floor space. The Town is not aware of any active development proposals for this site and therefore no timeframe has been established for potential construction. 17. There is 0.6ha of vacant industrial land located at 730 Industrial Road that could accommodate approximately 1,200 m^2 of industrial floor space; however, no formal development proposals have been received by the Town for this site and no timeframe has been established for construction. 18. The northerly portion of the Shelburne Market Village (Blackwood) property located in the north-east quadrant of Highway 10/89 and County Road 124 is designated for employment land uses in the Town's Official Plan and could accommodate approximately 22,206 m^2 of industrial floor area based on typical site coverage. The timing of servicing and development of the industrial portion of this site has not been established. 19. There is 16.4ha of vacant land south of Main Street West (Highway 10/89) and west of the former railway corridor designated for employment land uses in the Town's Official Plan which could accommodate 26,211 m^2 of industrial floor area. The timing of servicing and development of this vacant industrial site has not been established. 20. There are two properties located on the west side of Victoria Street, at the west end of Franklyn Street, totalling 2.1ha designated for employment land uses in the Town's Official Plan. This land area could accommodate approximately 3,439 m2 of industrial floor space; however, the timing of servicing and development of this vacant industrial site has not been established.
Future Institutional
21. There is one property located on the west side of Highway 10 at the northerly limit of Shelburne that is designated for institutional development in the Town's Official Plan. Depending on the type and density of development, the property could accommodate approximately 3,200 m^2 of institutional floor space. No formal proposals or timeframe for development have been established for this site.

Figure 6: Location of Background Developments



Source: Official Plan Background Work

Background developments identified to be within or in the vicinity of the study area are summarized in **Table 6**. The development timeline and phasing have been projected based on estimates provided by GSP Group, which take into consideration of the planning status, and the potential magnitude of developments for the specific locations.

Other background developments beyond the immediate vicinity of the study area are assumed in the stated growth rates.

Table 6: Town of Shelburne – Future Background Development and Phasing

Ref. #	Site	2017	2022	2027	2032
1.	Greenbrook Village (Residential)	90% (full build-out 2018)	100%	100%	100%
2.	Vandyk-Shelburne North	25%	50%	100%	100%
5.	Main Street East, west of Centennial Road	50%	100%	100%	100%
7.	Shelburne Market Village (Blackwood)	90%	100%	100%	100%
8.	Loblaw (No Frills) Site	0%	100%	100%	100%
9.	Greenbrook Village (Commercial)	0%	50%	100%	100%
10.	Shelburne Plaza (First Avenue Group)	50%	100%	100%	100%
11.	Vandyk-Shelburne North (Commercial)	0%	50%	100%	100%
13.	664 Main Street East (TDL Group), NW corner of Main Street and Centennial Road	100%	100%	100%	100%
14..	14-Unit Industrial Mall Building	100%	100%	100%	100%
15.	Shelburne Industrial Park	25%	50% (full build-out over 10-20 years)	75%	100%
16.	Industrial Lands - Centennial Road	0%	25%	50%	100%
18.	Employment Lands, north of Shelburne Market Village (Blackwood)	0%	25%	50%	100%

Note. Based on information prepared by GSP Group Inc.

3.2. Trip Generation and Distribution

The trip generation summary and distribution for the background developments as identified in **Table 5** are summarized in **Appendix C**.

4. Highway Access Management

According to the MTO's Highway Access Management Guideline (Final Draft – January 2008):

> "*A Highway Access Management Plan (HAMP) is a comprehensive "master plan" that should be used to manage access to all or part of a provincial highway corrido*r"

A HAMP details requirements for permitting access connections along the highway and intersecting public roads. The purpose of a HAMP is:

- to act as an "access management master plan" that co-ordinates highway access management and adjacent road/land development on a strategic rather than reactive basis
- to provide the opportunity to reduce future potential conflicts between provincial highway access management objectives (policies/standards) and municipal land use objectives (road/land development plans), so that both objectives are efficiently achieved
- to provide MTO, municipalities and stakeholders with an orderly technical process to evaluate, and hopefully resolve, situations where development plans appear to be unable to comply with access management policies/standards.

Overall, a HAMP aims to achieve the optimum balance between transportation and planning objectives and preservation of the current and future function of the highway.

In the Shelburne East Area, a number of developments have been identified (in **Section 3.1**), which will necessitate land accesses via the Provincial highway system, namely Highway 10/89. However, the constraints of the existing road network will limit the ability to apply the MTO's standards for intersection spacing. The MTO's desirable and minimum value for intersection spacing is 1600 m and 800 m, respectively for arterials. Given these values, any proposed road connection to Highway 10/89 in the study area will fall below the minimum requirement.

In addition to the above, MTO's Functional Intersection Area extends both upstream and downstream from a Highway 10/89 intersection. MTO's desirable offset spacing for new public roads from a highway intersection is 400 m. Given this value, proposed road connections from a Highway 10/89 intersection in the study area will fall below the desirable requirement.

As an alternative to the application of the desirable and minimum standards, a HAMP has been recommended to address and balance the needs for land accesses and the need to maintain traffic operation on the Provincial highway system. The HAMP will recognize the following principles:

- Land use development planning alternatives which avoid or minimize the need for direct highway access, through the provision of:
  - adequate internal road system
  - access points away from the highway
  - innovative design approaches, where appropriate

The following section reviews the alternative configurations of the proposed access locations and their implications on the existing intersections. Mitigation measures for the overall network will be developed with the recommended access management plan.

5. 2032 Full Build-out Scenario

The 2032 Scenario represents the 20-year horizon for when planned and proposed developments, as discussed in the previous section, will be fully built out. The traffic forecast for 2032 represents the ultimate condition for this study and the base scenario to evaluate alternative concepts for highway access management.

5.1. Assumptions for Developing HAMP

5.1.1. Link Capacity Consideration

Based upon the growth rate assumptions and anticipated background development traffic as outlined in **Section 3.1**, it is estimated that the existing link volumes within the Shelburne East study area will more than double by 2032. The volume comparisons are shown in **Table 7**.

Table 7: Future Link Volumes

Road	Existing Weekday Peak Hour Volumes		Future Weekday Peak Hour Volumes	
	AM Peak Hour	PM Peak Hour	AM Peak Hour	PM Peak Hour
Highway 10/89 (Main Street)	830	1,200	1,990	2,750
County Road 124	400	480	1,140	1,400
Second Line	230	480	930	1,460

The anticipated volume increase will necessitate widening on County Road 124-Second Line from two to four lanes. According to the Traffic and Capacity section of MTO's Geometric Design Standards for Ontario Highways manual, the calculated service flow (SF) for County Road 124-Second Line is as follows:

SF_D 1,150 vph (both directions) for LOS D
SF_E 1,800 vph (both directions) for LOS E

The forecasted 1,400 – 1,460 vph flow rate on County Road 124-Second Line indicate that the 2-lane arterial will operate at LOS E. With seasonal and weekend traffic, County Road 124-Second Line will likely reach or exceed capacity of the road by 2032. As a result, for the development of HAMP, County Road 124 and Second Line are assumed to be 4-lane roads in the analysis.

5.1.2. Roundabout Assumption

This study considers stop controls, traffic signals and roundabouts as potential intersection options for alternative road networks. For roundabout considerations, 2-lane roundabouts are generally assumed for this study as Highway 10/89 is already a 4-lane road with two lanes per direction. Similarly, widening is likely required on County Road 124-Second Line to a 4-lane road (as discussed in the previous section). Further discussions of roundabouts are provided in subsequent sections.

According to the MTO Highway Design Bulletin 2011-004, the inscribed diameter of a double-lane roundabout should range from 45 to 55 metres. This parameter is used to assess the potential property implication when evaluating traffic control options.

5.2. Alternative Highway Access Management Concepts (2032 Full Build-out Scenario)

Under the 2032 Full Build-out Scenario, a long list of alternative HAMP concepts was developed according to the basic framework outlined in the Terms of Reference:

- A new north public road onto Highway 10/89, east of the Highway 10/89 / County Road 124 intersection
- A new south public road onto Highway 10/89, east of the Highway 10/89 / County Road 124 intersection
- A new public road onto County Road 124, north of the Highway 10/89 / County Road 124 intersection

Table 8 to **Table 11** further describe the long list of alternative HAMP concepts, which have been divided into sub-sections as follows:

- West – Highway 10/89, west from County Road 124-Second Line
- East – Highway 10/89, east from County Road 124-Second Line
- North – County Road 124, north from Highway 10/89
- South – Second Line, south from Highway 10/89

The alternative HAMP concepts are evaluated qualitatively as part of an initial screening process. Potentially feasible alternatives are then carried forward for detail analysis and evaluation.

Table 8: West – Highway 10/89/Main Street, West of Second Line

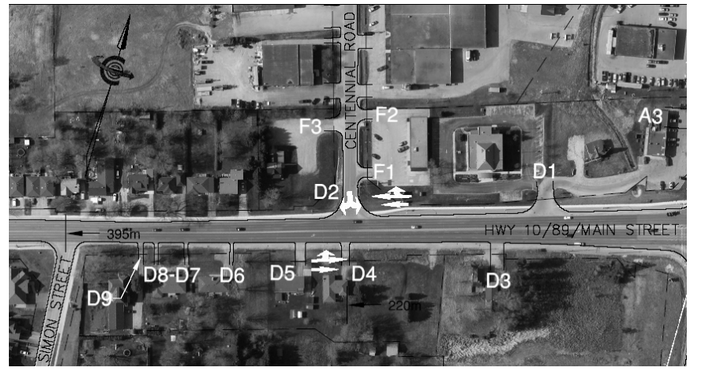
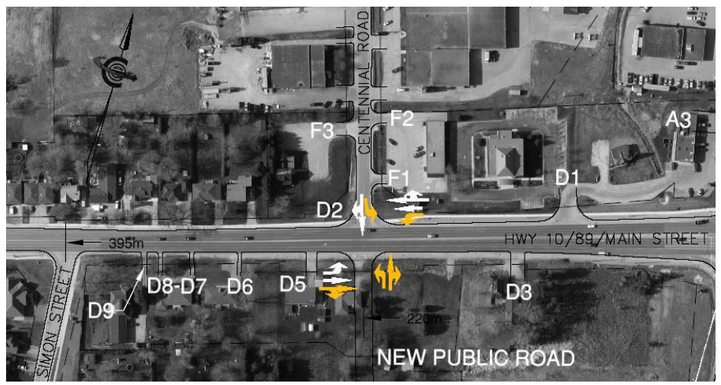
ALT.	ACCESS LOCATION	TRAFFIC CONTROL / DESIGN OPTIONS	DESCRIPTION / PRELIMINARY SCREENING	SKETCH
1	Centennial Road/Hwy 10/89 – Existing access configuration	a. Unsignalized b. Signalized with 1 eastbound through-left and 1 eastbound through c. Signalized with 1 eastbound left and 2 eastbound through d. Roundabout	▪ Existing access, need to consider different traffic control options in the future scenarios. ▪ Spacing between Simon Street and Centennial Road and between Centennial Road and County Road 124 needs to be assessed to confirm if it is sufficient to accommodate the storage requirements. ▪ **Carried forward for detailed evaluation.**	 
2	New public road opposite Centennial (220 m from CR 124) connecting to School Road	a. Unsignalized b. Signalized c. Roundabout	▪ Would require acquisition of private property south of Highway 10/89. ▪ Would introduce new traffic to School Road near school access. ▪ Public road at this location is not in the Town's Official Plan. ▪ Queue storage on Highway 10/89 for back-to-back left turns between County Road 124 and Centennial Road may be an issue. ▪ Roundabout likely not feasible due to property constraints. ▪ **Not carried forward.**	

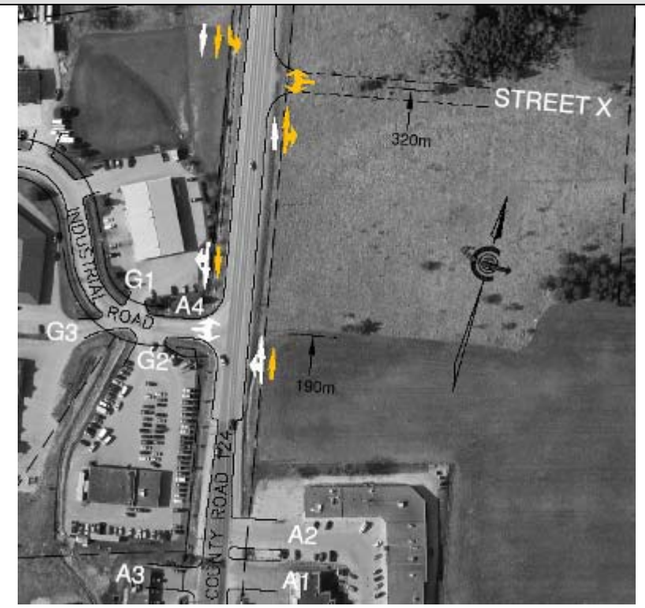
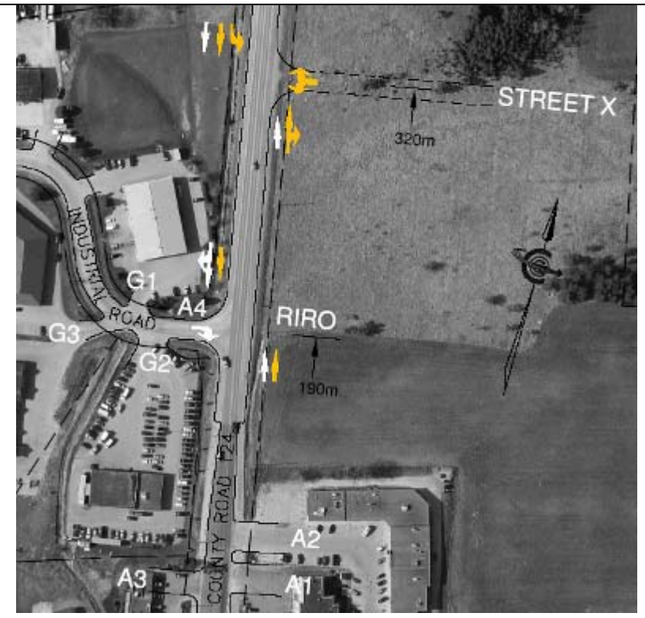
Table 9: East – Highway 10/89/Main Street, East of Second Line

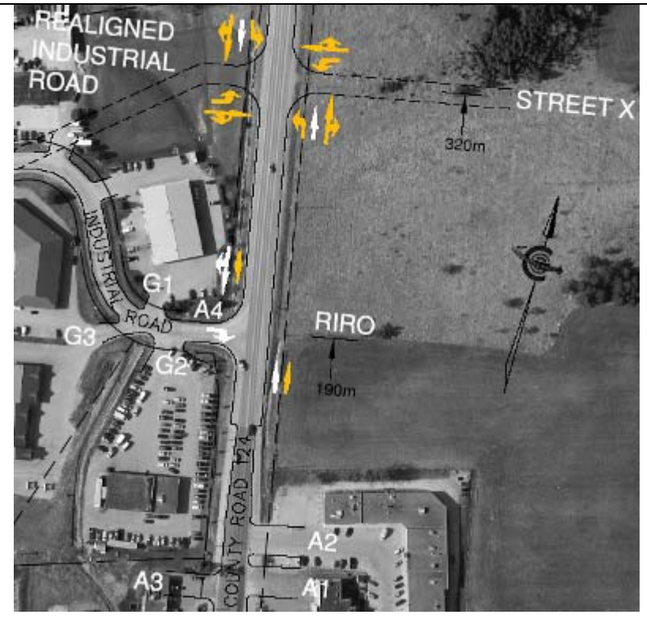
	ACCESS CONFIGURATION	TRAFFIC CONTROL / DESIGN OPTIONS	DESCRIPTION / PRELIMINARY SCREENING	SKETCH
1	New public road (Street Y) 590+ m east, full moves New public road (Street Z) – 300 m east, full moves	a. Unsignalized (Street Y, Street Z) b. Signalized (Street Y, Street Z) c. Roundabout	▪ Off-set T intersections. ▪ Potential issue: closely spaced intersections (290 m spacing between Street Y and Street Z, 177 m spacing between Street Y and Sylvanwood Road). Spacing between intersections needs to be assessed to confirm if it is sufficient to accommodate the storage requirements ▪ **Carried forward for detailed evaluation**.	
2	New public road (Street Y) 450 m east, full moves New public road (Street Z) – 300 m east, full moves	a) Unsignalized b) Signalized c) Roundabout	▪ Off-set T intersections. ▪ Closely spaced intersection between Street Y and Street Z. 150 m spacing between Street Y and Street Z is insufficient to accommodate standard design for back-to-back left turns. ▪ **Alternative not carried forward.**	

	ACCESS CONFIGURATION	TRAFFIC CONTROL / DESIGN OPTIONS	DESCRIPTION / PRELIMINARY SCREENING	SKETCH
3	New public road (Street Y) 590+ m east, full moves New public road (Street Z) – 300 m east, RIRO	a. Unsignalized (Street Y) b. Signalized (Street Y) c. Roundabout	▪ Off-set T intersections. ▪ Potential issue: closely spaced intersection between Street Y and Sylvanwood Road. Spacing between intersections needs to be assessed to confirm if it is sufficient to accommodate the storage requirement. ▪ Limiting Loblaw access (Street Z) to RIRO will likely cause congestion at Highway 10/89/CR 124 intersection and accesses on Second Line (additional 20-60 WBL at CR 124, additional 45-120 SBL at Loblaw driveways on Second Line). ▪ **Carried forward for detailed evaluation**.	
4	New public road (Street Y) 450 m east, full moves New public road (Street Z) – 300 m east, RIRO	a. Unsignalized (Street Y) b. Signalized (Street Y) c. Roundabout	▪ Off-set T intersections. ▪ Public road (Street Y) approximately opposite a private residential driveway (B5). There will be access issues related to private residential driveways on the south side. ▪ Limiting Loblaw access to RIRO adds to congestion at Highway 10/89/County Road 124 intersection and accesses on Second Line (additional 20-60 WBL at County Road 124, additional 45-120 SBL at Loblaw driveways on Second Line). ▪ **Carried forward for detailed evaluation.**	

	ACCESS CONFIGURATION	TRAFFIC CONTROL / DESIGN OPTIONS	DESCRIPTION / PRELIMINARY SCREENING	SKETCH
5	New public road (Street Y) mid-block 400 m east, full moves New public road (Street Z) – RIRO	a. Unsignalized (Street Y) b. Signalized (Street Y) c. Roundabout	▪ Public road (Street Y) approximately opposite a private residential driveway (B4) ▪ Operationally similar to Alternative 4 above. There will be access issues related to private residential driveways on the south side. ▪ Limiting Loblaw access to RIRO adds to congestion at Highway 10/89/County Road 124 intersection and accesses on Second Line (additional 20-60 WBL at County Road 124, additional 45-120 SBL at Loblaw driveways on Second Line). ▪ **Carried forward for detailed evaluation.**	
6	New public road (Street Y) 300m east opposite Loblaw (Street Z), full moves	a. Unsignalized (Street Y – Street Z) b. Signalized (Street Y – Street Z) c. Roundabout	▪ Consolidated access point for Street Y and Street Z ▪ Potential issue: closely spaced intersections (300 m spacing between County Road 124 and Street Y/Street Z). Spacing between intersections needs to be assessed to confirm if it is sufficient to accommodate the storage requirements ▪ **Carried forward for detailed evaluation.**	

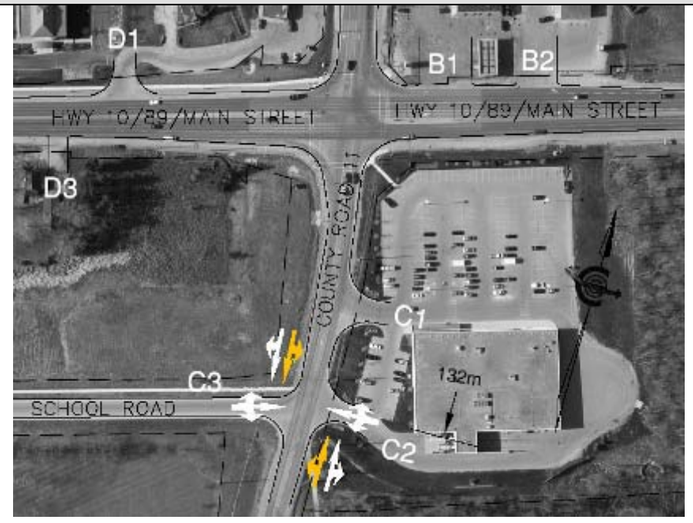
Table 10: North – County Road 124, North of Highway 10/89/Main Street

ALT.	ACCESS CONFIGURATION	TRAFFIC CONTROL / DESIGN OPTIONS	DESCRIPTION / PRELIMINARY SCREENING	SKETCH
1	New public road (Street X) 320m north, full moves Industrial Road remains as is	a. Unsignalized Industrial Road, Street X b. Unsignalized Industrial Road, Signalized Street X c. Roundabout	▪ Off-set T intersections. ▪ Potential issue: closely spaced intersections (190 m spacing between Highway 10/89 and Industrial Road, 130 m spacing between Street X and Industrial Road, 190 m spacing between Street X and Steeles Street). Spacing between intersections needs to be assessed to confirm if it is sufficient to accommodate the storage requirements ▪ **Carried forward for detailed evaluation.** Note: County Road 124 is assumed to be four lanes based on review of link capacity (See **Section 5.1.1**)	
2	New public road (Street X) 320m north, full moves Industrial restricted to RIRO	a. Unsignalized Industrial Road, Street X b. Unsignalized Industrial Road, Signalized Street X c. Roundabout	▪ Off-set T intersections. ▪ Potential issue: closely spaced intersections (190 m spacing between Highway 10/89 and Industrial Road, 130 m spacing between Street X and Industrial Road, 190 m spacing between Street X and Steeles Street). Spacing between intersections needs to be assessed to confirm if it is sufficient to accommodate the storage requirements ▪ **Carried forward for detailed evaluation.** Note: County Road 124 is assumed to be four lanes based on review of link capacity (See **Section 5.1.1**)	

ALT.	ACCESS CONFIGURATION	TRAFFIC CONTROL / DESIGN OPTIONS	DESCRIPTION / PRELIMINARY SCREENING	SKETCH
3	New public road (Street X) 320m north, full moves Industrial realigned opposite Street X. Old Industrial Road intersection closed	a. Unsignalized b. Signalized c. Roundabout	▪ Consolidated access for Street X and Industrial Road. ▪ Potential issue: closely spaced intersections (320 m spacing between Street X and Highway 10/89, 190 m spacing between Street X and Steeles Street). Spacing between intersections needs to be assessed to confirm if it is sufficient to accommodate the storage requirements ▪ **Carried forward for detailed evaluation.** Note: County Road 124 is assumed to be four lanes based on review of link capacity (See **Section 5.1.1**)	
4	New public road (Street X) 320m north, full moves Industrial realigned opposite Street X Old Industrial road intersection – RIRO	a. Unsignalized Industrial Road RIRO, Street X b. Unsignalized Industrial Road RIRO, Signalized Street X c. Roundabout	▪ Potential issue: closely spaced intersections (320 m spacing between Street X and Highway 10/89, 190 m spacing between Street X and Steeles Street). Spacing between intersections needs to be assessed to confirm if it is sufficient to accommodate the storage requirements ▪ **Carried forward for detailed evaluation.** Note: County Road 124 is assumed to be four lanes based on review of link capacity (See **Section 5.1.1**)	

ALT.	ACCESS CONFIGURATION	TRAFFIC CONTROL / DESIGN OPTIONS	DESCRIPTION / PRELIMINARY SCREENING	SKETCH
5	New public road (Street X) 190 m north, opposite existing Industrial Road, full moves	a. Unsignalized b. Signalized c. Roundabout	▪ Consolidated access for Street X and Industrial Road. ▪ Potential issue: closely spaced intersections (190 m spacing between Street X and Highway 10/89, 320 m spacing between Street X and Steeles Street). Spacing between intersections needs to be assessed to confirm if it is sufficient to accommodate the storage requirements ▪ **Carried forward for detailed evaluation.** Note: County Road 124 is assumed to be four lanes based on review of link capacity (See **Section 5.1.1**)	

Table 11: South – Second Line – South of Highway 10/89/Main Street

ALT.	ACCESS CONFIGURATION	TRAFFIC CONTROL / DESIGN OPTIONS	DESCRIPTION / PRELIMINARY SCREENING	SKETCH
1	School Road/Second Line, full moves	a. Unsignalized b. Signalized c. Roundabout	▪ Existing access, need to consider different traffic control options in the future scenarios. ▪ 190m spacing between School Road and Highway 10/89 needs to be assessed to confirm if it is sufficient to accommodate the storage requirements. ▪ **Carried forward for detailed evaluation.** Note: County Road 124 is assumed to be four lanes based on review of link capacity (See **Section 5.1.1**)	

5.3. Evaluation of Alternative Concepts

The following criteria are used to evaluate each alternative access management concept illustrated in the previous section (see **Table 8** to **Table 11**).

Table 12: Evaluation Criteria

Criteria	Evaluations
Intersection Operations	▪ Volume to capacity ratios and level of service analysis based on the 2032 traffic forecasts
HAMP Requirements	▪ Available intersection spacing ▪ Number of accesses
Storage Requirements	▪ Required left turn lane storage (based on queue analysis) and storage availability ▪ Queuing impact to existing driveways
Land Use Impacts	▪ Impacts to existing and proposed land uses ▪ Effects on existing driveway entrances
Active Transportation	▪ Pedestrian crossing opportunity ▪ Sidewalk / trail connectivity
Financial Considerations	▪ Potential viability
Overall Evaluation	▪ Evaluation based on above criteria
Mitigation Measures	▪ Geometric improvements ▪ Signal timing improvements ▪ Turn restrictions/prohibitions
Recommendation	▪ Recommended / Not Recommended to support planned growth

Evaluation of the alternative access management concepts are summarized as follows:

- West – Highway 10/89, west from County Road 124-Second Line (**Table 13**)
- East – Highway 10/89, east from County Road 124-Second Line (**Table 14**)
- North – County Road 124, north from Highway 10/89 (**Table 15**)
- South – Second Line, south from Highway 10/89 (**Table 16**)

The summary of detailed analysis is shown in **Appendix D**. For the detailed analysis, Synchro 7 is used to assess signalized and unsignalized intersection operations. Arcady 7 is used for roundabout analysis. Queue analysis for signalized and unsignalized intersections is based on the 95th percentile queue in Synchro, and for roundabouts, Arcady 7 is used.

The signal warrant analysis is based on projected volume warrant analysis (Justification 7) in the *Ontario Traffic Manual Book 12*.

Table 13: West – Highway 10/89 (West of County Road 124-Second Line) Evaluation of Alternatives

Highway 10/89 (West of County Road 124)	**Alternative 1**
Concept Configuration	Existing public road configuration; no new public road accesses.
Traffic Control	Traffic control options at the Centennial Road / Highway 10/89 intersection include: a. Unsignalized b. Signalized c. Roundabout
Evaluation	
Intersection Operations	The Centennial Road / Highway 10/89 intersection is forecasted to have capacity constraints (v/c > 1.0) and long delays (LOS F) if it remains an unsignalized intersection. With a signal, no capacity constraints are noted. A traffic signal is not warranted at the Centennial Road / Highway 10/89 intersection based on the projected volume warrant analysis. However, given the capacity constraints, a signal or roundabout is needed to address minor street capacity beyond the 20 year horizon. A left turn lane at Highway 10/89 / Centennial Road will need to be considered (without traffic control signals) within the 20 year horizon.
HAMP Requirements	No additional full movement access/road is proposed.
Storage Requirement	Based on a 70 km/h design speed (50 km/h posted speed), there is insufficient distance on Highway 10/89 between: ▪ Simon Street and Centennial Road to accommodate the eastbound left turn demand at Centennial Road. The eastbound left turn lane would require 175 m (20 m storage + 40 m parallel + 115 m taper). See Table 18 for summary. However, spacing between Simon Street and Centennial Road is only 20 m deficient and a left turn lane can be likely accommodated.
Land Use Impact	Eastbound through queues extending from the Highway 10/89 / Second Line intersection can reach Driveway D1. Eastbound queues extending from the Highway 10/89 / Centennial Road intersection can block Driveways D5-D6. Under signal control, traffic signal and intersection improvements (turn lanes) will require property acquisition on the south side,. Under roundabout control, a roundabout footprint will require property acquisition on the north and south sides of the intersection.
Active Transportation	Signalization at Highway 10/89 / Centennial Road can provide controlled pedestrian crossing opportunities. The sidewalk on the south side of Highway 10/89 needs to be extended from Simon Street to Second Line to provide network continuity on the south side.
Financial Consideration	▪ Cost for new left turn lane. ▪ Signal option: Costs for new traffic signal, road widening and intersection improvements (turn lanes). Cost of property acquisition. ▪ Roundabout option: Cost for roundabout. Cost of property acquisition.
Overall Evaluation	▪ Need traffic control signal or roundabout at the Centennial Road / Highway 10/89 intersection beyond the 20 year horizon. ▪ There is insufficient storage capacity between Simon Street and Centennial Road, however, spacing is only 20 m deficient and a left turn lane can likely be accommodated. ▪ Property acquisition required for either a signal or a roundabout.
Mitigation Measures	Signalization or roundabout at the Centennial Road / Highway 10/89 intersection. If signalized, improvements should include widening of Highway 10/89 to provide for eastbound left/through/through lane movements. Extend sidewalk on the south side of Highway 10/89 from Simon Street to Second Line.
Recommendation	**Potential need for left turn lane.**

Table 14: East – Highway 10/89 (East of County Road 124-Second Line) Evaluation of Alternatives

Highway 10/89 (East of County Road 124)	**Alternative 1**	
Concept Configuration	Two new intersections (offset T configuration): ▪ Street Z – new public road south of Highway 10/89 approximately 300 m east County Road 124 intersection ▪ Street Y – new public road north of Highway 10/89 approximately 590 m east of County Road 124 intersection (290 m east of Street Z) and 177m west of Sylvanwood Road.	
Concept Traffic Control	Street Z provides full movement access to commercial lands (Loblaws - Reference #7) in the southeast quadrant. Traffic control options considered include stop control, signal and roundabout. Street Y provides full movement access to commercial lands (Shelburne Market Village (Blackwood) - Reference #8) in the northeast quadrant. Traffic control options considered include stop control, signal and roundabout. Left turn and right turn auxiliary lanes provided on the eastbound and westbound approaches (for non-roundabout option).	
Evaluation		
Intersection Operations	Capacity constraints and delays are noted under stop control at both intersections. The northbound and southbound left turn movements from Street Z and Street Y operate at LOS F and experience excessive delays; the v/c ratios are also greater than 1.0. A traffic signal is not warranted at the Street Z nor Street Y intersections based on the projected volume warrant analysis. However, given the capacity constraints, signals or roundabouts are needed. With signal or roundabout control, the intersections operate with reserve capacity and acceptable level of service. Highway 10/89 / County Road 124 intersection is anticipated to operate with residual capacity. Outbound movements at the Sylvanwood Road / Highway 10/89 intersection are at LOS F.	
HAMP Requirements	For new public road/access connections, the desirable spacing is 1,600m (800 m minimum) from the centreline of the proposed crossing road to the centreline of the existing intersection. Accordingly: ▪ The distance from the centreline of the existing intersection to Street Z is less than desirable. ▪ The distance from the centreline of the existing intersection to Street Y is less than desirable, but almost 300m, further than Street Z.	
Storage Requirement	Based on a 90 km/h design speed (70 km/h posted speed), there is sufficient left-turn lane capacity on Highway 10/89 between County Road 124 and Street Z. [See Table A4] Based on a 90 km/h design speed (70 km/h posted speed), there is insufficient distance to accommodate the storage and deceleration lane requirements for standard left turn lanes between Street Z and Street Y. There would be sufficient distance to accommodate the storage and deceleration requirements if the posted speed is reduced to 50 km/h (70 km/h design speed). [See Table A4] Roundabout footprint will require property acquisition on the north and south sides but will reduce the widening requirements along Highway 10/89 as turn lanes are not needed with a roundabout.	
Land Use Impact	Under signal control, westbound queues from Street Z can potentially block residential driveway (B3) on the south side. Westbound queues extending from the Highway 10/89 / County Road 124 intersection can block Driveways B1 and B2. Traffic signals and intersection improvements (turn lanes) will potentially require property acquisition on the north and south sides at each intersection. Under roundabout control, the roundabout footprints will require property acquisition on the north and south sides of the intersections, but may reduce widening along Highway 10/89 as turn lanes are not required.	
Active Transportation	Controlled pedestrian crossings can be provided at the signalized intersections: Street Z and Street Y. Require provisions for sidewalks on the north and south sides on Highway 10/89.	
Financial Consideration	▪ Signal control: Costs for new traffic signals (x2), road widening and intersection improvements (turn lanes). Cost of property acquisition. ▪ Roundabout control: Costs for roundabouts. Cost of property acquisition.	
Overall Evaluation	▪ Maintain existing easement on the No Frills (Loblaw) site; maximize separation of offset public roads. Overall, two new access points ▪ Sufficient intersection capacity with signals or roundabouts. ▪ Sufficient storage capacity for standard left turn lanes if the design speed is reduced from 90 km/h to 70 km/h. ▪ Property acquisition required for either traffic signals or roundabouts.	
Mitigation Measures	Need to limit B1 and B2 to right-in/right-out only and provide alternate access for existing plaza via new public road Street Y.	
Recommendation	**Not Recommended**	

Table 14 continued

Highway 10/89 (East of County Road 124)	**Alternative 3**	
Concept Configuration	Two new intersections (offset T configuration): ▪ Street Z – New public road south of Highway 10/89 approximately 300 m east of County Road 124 intersection, RIRO only. ▪ Street Y – New public road north of Highway 10/89 approximately 590 m east of the Highway 10/89 (300m east of Street Z) and 177m west of Sylvanwood Road.	
Concept Traffic Control	Street Z provides right-in/right-out access to commercial lands (Loblaws - Reference #7) in the southeast quadrant. Street Y provides full movement access to commercial lands (Shelburne Market Village (Blackwood) - Reference #8) in the northeast quadrant. Traffic control options considered include stop control, signal and roundabout. Left turn and right turn lanes are provided on the eastbound and westbound approaches (for non-roundabout option).	
Evaluation		
Intersection Operations	Capacity constraints and delays are noted under stop control. The southbound left turn movement from Street Y operates at LOS F and experiences excessive delays; the v/c ratio is also greater than 1.0. A traffic signal is not warranted at the Street Y intersection based on the projected volume warrant analysis. However given the capacity constraints, signal or roundabout is needed. With signal or roundabout control, the intersection is anticipated to operate with reserve capacity and acceptable level of service. The Highway 10/89 / County Road 124 intersection is anticipated to exceed capacity as a result of added westbound left turns (unless dual westbound left turn lanes are implemented). Outbound movements at the Sylvanwood Road / Highway 10/89 intersection are at LOS F.	
HAMP Requirements	For new public road/access connections, the desirable spacing is 1,600m (800 m minimum) from the centreline of the proposed crossing road to the centreline of the existing intersection. Accordingly: ▪ The distance from the centreline of the existing intersection to Street Z is less than desirable. ▪ The distance from the centreline of the existing intersection to Street Y is less than desirable, but almost 300m, further than Street Z.	
Storage Requirement	Signal control: Based on a 90 km/h design speed (70 km/h posted speed), there is sufficient left-turn capacity on Highway 10/89 between County Road 124 and Street Y. [See Table A4] Roundabout control: Turn lanes are not needed with a roundabout.	
Land Use Impact	Under signal control, westbound queues extending from the Highway 10/89 / County Road 124 intersection can block Driveways B1 and B2. Traffic signal and intersection improvements (turn lanes) will require property acquisition on the north and south side. Under roundabout control, a roundabout footprint will require property acquisition on the north and south sides of the intersection, but may reduce widening along Highway 10/89 as turn lanes are not required.	
Active Transportation	Controlled pedestrian crossings can be provided at the signalized intersection at Street Y. Require provisions for sidewalks on the north and south sides on Highway 10/89.	
Financial Consideration	▪ Signal control: Costs for new traffic signal, road widening and intersection improvements (turn lanes). Cost of property acquisition. ▪ Roundabout control: Costs for roundabout. Cost of property acquisition.	
Overall Evaluation	▪ Maintain existing easement on the No Frills (Loblaw) site; maximize separation of offset public roads. Overall, two new access points ▪ Right-in /right-out at Street Z will lead to capacity issues at Highway 10/89 / County Road 124 unless dual westbound left turn lanes or roundabout are implemented. ▪ Sufficient storage capacity on Highway 10/89 ▪ Property acquisition required for either traffic signal or roundabout.	
Mitigation Measures	Need to limit B1 and B2 to right-in/right-out only and provide internal access for existing plaza via new public road Street Y. Under signal control scenario, dual westbound left turn lanes at Highway 10/89 / County Road 124 are needed.	
Recommendation	**Not Recommended**	

Table 14 continued

Highway 10/89 (East of County Road 124)	**Alternative 4**	
Concept Configuration	Two new intersections (offset T configuration): ▪ Street Z – New public road south of Highway 10/89 approximately 300 m east of County Road 124 intersection, RIRO only. ▪ Street Y – New public road north of Highway 10/89 approximately 450 m east of County Road 124 (150 m east of Street Z) and 317 m west of Sylvanwood Road.	
Concept Traffic Control	Street Z provides right-in/right-out access to commercial lands (Loblaws - Reference #7) in the southeast quadrant. Street Y provides full movement access to commercial lands (Shelburne Market Village (Blackwood) - Reference #8) in the northeast quadrant. Traffic control options considered include stop control, signal and roundabout. Left turn and right turn lanes are provided on the eastbound and westbound approaches (for non-roundabout option).	
Evaluation		
Intersection Operations	Capacity constraints and delays are noted under stop control. The southbound left turn movement from Street Y operates at LOS F and experiences excessive delays; the v/c ratio is also greater than 1.0. A traffic signal is not warranted at the Street Y intersection based on the projected volume warrant analysis. However given the capacity constraints, signal or roundabout are needed. With signal or roundabout control, the intersection is anticipated to operate with reserve capacity and acceptable level of service. The Highway 10/89 / County Road 124 intersection is anticipated to exceed capacity as a result of added westbound left turns (unless dual westbound left turn lanes are implemented). Outbound movements at the Sylvanwood Road / Highway 10/89 intersection are at LOS F.	
HAMP Requirements	For new public road/access connections, the desirable spacing is 1,600m (800 m minimum) from the centreline of the proposed crossing road to the centreline of the existing intersection. Accordingly: ▪ The distance from the centreline of the existing intersection to Street Z is less than desirable. ▪ The distance from the centreline of the existing intersection to Street Y is less than desirable.	
Storage Requirement	Signal control: Based on a 90 km/h design speed (70 km/h posted speed), there is sufficient distance to accommodate standard left turn lane requirements on Highway 10/89 between County Road 124 and Street Y. [See Table A4] Roundabout control: Turn lanes are not needed with a roundabout.	
Land Use Impact	Under signal control, westbound queues extending from the Highway 10/89 / County Road 124 intersection can block Driveways B1 and B2. Street Y is approximately opposite a private residential driveway, access issues related to residential driveway on the south side will need to be addressed. Traffic signal and intersection improvements (turn lanes) will require property acquisition on the north and south side. Under roundabout control, a roundabout footprint will require property acquisition on the north and south sides of the intersection, but may reduce widening along Highway 10/89 as turn lanes are not required.	
Active Transportation	Controlled pedestrian crossings can be provided at the signalized intersection at Street Y. Require provisions for sidewalks on the north and south sides on Highway 10/89.	
Financial Consideration	▪ Signal control: Costs for new traffic signal, road widening and intersection improvements (turn lanes). Cost of property acquisition. ▪ Roundabout control: Costs for roundabout. Cost of property acquisition.	
Overall Evaluation	▪ Maintain existing easement in the No Frills (Loblaw) site. Overall, two new access points ▪ Right-in /right-out at Street Z will lead to capacity issues at Highway 10/89 / County Road 124 unless dual westbound left turn lanes or roundabout are implemented. ▪ Sufficient storage capacity on Highway 10/89 ▪ Property acquisition required for either traffic signal or roundabout.	
Mitigation Measures	Need to limit B1 and B2 to right-in/right-out only and provide internal access for existing plaza via new public road Street Y. Under signal control scenario, dual westbound left turn lanes at Highway 10/89 / County Road 124 are needed.	
Recommendation	**Not Recommended**	

Table 14 continued

Highway 10/89 (East of County Road 124)	**Alternative 5**	
Concept Configuration	Two new intersections (offset T configuration): ▪ Street Z – New public road south of Highway 10/89 approximately 300 m east of County Road 124 intersection, RIRO only. ▪ Street Y – New public road north of Highway 10/89 approximately 400 m east of the Highway 10/89 (100 m east of STREET Z) and 367 m west of Sylvanwood Road.	
Concept Traffic Control	Street Z provides right-in/right-out access to commercial lands (Loblaws - Reference #7) in the southeast quadrant. Street Y provides full movement access to commercial lands (Shelburne Market Village (Blackwood) - Reference #8) in the northeast quadrant. Traffic control options considered include stop control, signal and roundabout. Left turn and right turn lanes are provided on the eastbound and westbound approaches (for non-roundabout option).	
Evaluation		
Intersection Operations	Capacity constraints and delays are noted under stop control. The southbound left turn movement from Street Y operates at LOS F and experiences excessive delays; the v/c ratio is also greater than 1.0. A traffic signal is not warranted at the Street Y intersection based on the projected volume warrant analysis. However given the capacity constraints, signal or roundabout are needed. With signal or roundabout control, the intersection is anticipated to operate with reserve capacity and acceptable level of service. The Highway 10/89 / County Road 124 intersection exceeds capacity as a result of added westbound left turns (unless dual westbound left turn lanes are implemented). Outbound movements at the Sylvanwood Road / Highway 10/89 intersection are at LOS F.	
HAMP Requirements	For new public road/access connections, the desirable spacing is 1,600m (800 m minimum) from the centreline of the proposed crossing road to the centreline of the existing intersection. Accordingly: ▪ The distance from the centreline of the existing intersection to Street Z is less than desirable. ▪ The distance from the centreline of the existing intersection to Street Y is less than desirable.	
Storage Requirement	Signal control: Based on a 90 km/h design speed (70 km/h posted speed), there is sufficient distance to accommodate standard left turn lane requirements on Highway 10/89 between County Road 124 and Street Z. [See Table A4] Roundabout control: Turn lanes are not needed with a roundabout.	
Land Use Impact	Under signal control, westbound queues extending from the Highway 10/89 / County Road 124 intersection can block Driveways B1 and B2. Street Y is approximately opposite a private residential driveway, access issues related to residential driveway on the south side will need to be addressed. Traffic signal and intersection improvements (turn lanes) will require property acquisition on the north and south side. Under roundabout control, a roundabout footprint will require property acquisition on the north and south sides of the intersection, but may reduce widening along Highway 10/89 as turn lanes are not required.	
Active Transportation	Controlled pedestrian crossings can be provided at the signalized intersection at Street Y. Require provisions for sidewalks on the north and south sides on Highway 10/89.	
Financial Consideration	▪ Signal control: Cost for new traffic signal, road widening and intersection improvements (turn lanes). Cost of property acquisition. ▪ Roundabout control: Cost for roundabout. Cost of property acquisition.	
Overall Evaluation	▪ Maintain existing easement in the No Frills (Loblaw) site. Overall, two new access points ▪ Right-in /right-out at Street Z will lead to capacity issues at Highway 10/89 / County Road 124 unless dual westbound left turn lanes or roundabout are implemented. ▪ Sufficient storage capacity on Highway 10/89 ▪ Property acquisition required for either traffic signal or roundabout.	
Mitigation Measures	Need to limit B1 and B2 to right-in/right-out only and provide internal access for existing plaza via new public road Street Y. Under signal control scenario, dual westbound left turn lanes at Highway 10/89 / County Road 124 are needed.	
Recommendation	**Not Recommended**	

Table 14 continued

Highway 10/89 (East of County Road 124)	**Alternative 6**
Concept Configuration	One new intersection: ▪ Street Y-Street Z – Approximately 300m east of the Highway 10/89 / County Road 124 intersection.
Concept Traffic Control	New intersection provides access to commercial lands in the northeast and southeast quadrants. Traffic control options considered include stop control, signal and roundabout. Left turn and right turn lanes are provided on the eastbound and westbound approaches (for non-roundabout option).
Evaluation	
Intersection Operations	A traffic signal is warranted at the Street Y-Street-Street Z intersection. With signal or roundabout, the intersection operates with reserve capacity and acceptable level of service. Outbound movements at the Sylvanwood Road / Highway 10/89 intersection operate at LOS F.
HAMP Requirements	For new public road/access connections, the desirable spacing is 1,600m (800 m minimum) from the centreline of the proposed crossing road to the centreline of the existing intersection. Accordingly: ▪ The distance from the centreline of the existing intersection to Street Y-Street Z is less than desirable.
Storage Requirement	Signal control: Based on an 90 km/h design speed (70 km/h posted speed), there is insufficient storage capacity on Highway 10/89 between County Road 124 and Street Y-Street Z. Sufficient storage may be provided if: ▪ Design speed is reduced to 70 km/h (50 km/h posted speed) *[In the analysis of the refined final concept, sufficient storage can be provided with an 80 km/h design speed.]* ▪ Centre left turn lane is provided (however this is not suitable for operating speeds in excess of 70 km/h) See Table A4 for details. Roundabout control: Turn lanes are not needed with a roundabout.
Land Use Impact	Under signal control, westbound queues extending from the Highway 10/89 / County Road 124 intersection can block Driveways B1 and B2. Traffic signal and intersection improvements (turn lanes) will require property acquisition on the north and south side. Under roundabout control, a roundabout footprint will require property acquisition on the north and south sides, but may reduce widening along Highway 10/89 as turn lanes are not required.
Active Transportation	Controlled pedestrian crossings can be provided at the signalized intersection at Street Y–Street Z. Require provisions for sidewalks on the north and south sides on Highway 10/89.
Financial Consideration	▪ Signal control: Costs for new traffic signal, road widening and intersection improvements (turn lanes). Cost of property acquisition. ▪ Roundabout control: Cost for roundabout. Cost of property acquisition.
Overall Evaluation	▪ Maintain existing easement in the No Frills (Loblaw) site; minimum number of access points. ▪ Sufficient intersection capacity with signal or roundabout ▪ Property acquisition required for either traffic signal or roundabout.
Mitigation Measures	Need to limit B1 and B2 to right-in/right-out only and provide internal access for existing plaza via new public road Street Y.
Recommendation	**Recommended**

Table 15: North - County Road 124 (North of Highway 10/89) Evaluation of Alternatives

Highway 10/89 (East of County Road 124)	**Alternative 1**
Concept Configuration	One new public road: Street X – Approximately 320m north of Highway 10/89; 130m north of Industrial Road and 190m south of Steeles Street.
Concept Traffic Control	Street X provides full movement access to employment lands (Reference #18) and commercial lands (Reference #7) in the northeast quadrant. Traffic control options considered include stop control, signal and roundabout. Southbound left turn lane is provided at the new intersection (for non-roundabout option).
Evaluation	
Intersection Operations	Under stop control, westbound movements from Street X operate at LOS F and experience excessive delays. Industrial Road also experiences capacity constraints and excessive delays. A traffic signal is not warranted at the Street X intersection based on the projected volume warrant analysis. However, given the capacity constraints, signal or roundabout is needed. With traffic signal or roundabout at Street X, the intersection operates with reserve capacity and acceptable level of service.
HAMP Requirements	For new public road/access connections, the desirable spacing is 400 m from the centreline of the proposed crossing road to the centreline of the existing intersection of Highway 10/89. Accordingly: ▪ The distance from the centreline of the existing intersection to Street X is less than desirable.
Storage Requirement	Signal control: Based on a 80 km/h design speed (60 km/h posted speed), there is sufficient storage capacity on sections of County Road 124 between: ▪ Highway 10/89 and Street X ▪ Industrial Road and Street X ▪ Street X and Steeles Street There is insufficient distance to accommodate back-to-back left turn lanes on County Road 124 between Highway 10/89 and Industrial Road. Roundabout control: Turn lanes are not needed with a roundabout.
Land Use Impact	Under signal control, southbound left turn queues (95th percentile) extending from Highway 10/89 / Second Line intersection can block Driveways A1 and A3. Traffic signal and intersection improvements (turn lanes) will require property acquisition on the east and west side. Under roundabout control, a roundabout footprint will require property acquisition on the east and west sides but may reduce the widening requirements (2 to 4 through lanes) along County Road 124
Active Transportation	Controlled pedestrian crossings can be provided at the signalized intersections. Require provisions for sidewalks on the east and west sides on County Road 124.
Financial Consideration	▪ Signal control: Costs for new traffic signal, road widening and intersection improvements (turn lanes). Cost of property acquisition. ▪ Roundabout control: Cost for roundabout. Cost of property acquisition.
Overall Evaluation	▪ Sufficient intersection capacity with signal or roundabout at the new intersection. ▪ Property acquisition required for either traffic signal or roundabout. ▪ Industrial Road will experience capacity and delay issues as unsignalized intersection, but would be too close to Highway 10/89 and Street X intersections for additional traffic signal, if warranted. ▪ Four closely spaced intersections
Mitigation Measures	Need to limit A1 and A3 to right-in/right-out only and provide internal access for existing plaza via new public road Street X or Street Y.
Recommendation	**Not recommended due to closely spaced intersections.**

Table 15 continued

Highway 10/89 (East of County Road 124)	**Alternative 2**
Concept Configuration	One new public road: Street X – Approximately 320m north of Highway 10/89; 130m north of Industrial Road and 190m south of Steeles Street. Restrict Industrial Road to RIRO only.
Concept Traffic Control	Street X provides full movement access to employment lands (Reference #18) and commercial lands (Reference #7) in the northeast quadrant. Traffic control options considered include stop control, signal and roundabout. Southbound left turn lane is provided at the new intersection (for non-roundabout option).
Evaluation	
Intersection Operations	Under stop control, westbound movements from Street X operate at LOS F and experience excessive delays. Industrial Road also experiences capacity constraints and excessive delays. A traffic signal is not warranted at the Street X intersection based on the projected volume warrant analysis. However, given the capacity constraints, signal or roundabout is needed. With traffic signal or roundabout at Street X, the intersection operates with reserve capacity and acceptable level of service. RIRO at industrial Road results in increased capacity constraints at Highway 10/89 / County Road 124.
HAMP Requirements	For new public road/access connections, the desirable spacing is 400 m from the centreline of the proposed crossing road to the centreline of the existing intersection of Highway 10/89. Accordingly: ▪ The distance from the centreline of the existing intersection to Street X is less than desirable.
Storage Requirement	Signal control: Based on a 80 km/h design speed (60 km/h posted speed), there is sufficient storage capacity on sections of County Road 124 between: ▪ Highway 10/89 and Street X ▪ Street X and Steeles Street Roundabout control: Turn lanes are not needed with a roundabout.
Land Use Impact	Under signal control, southbound left turn queues (95th percentile) extending from Highway 10/89 / Second Line intersection may block Driveways A1 and A3. Traffic signal and intersection improvements (turn lanes) will require property acquisition on the east and west side. Under roundabout control, a roundabout footprint will require property acquisition on the east and west sides but may reduce the widening requirements (2 to 4 through lanes) along County Road 124.
Active Transportation	Controlled pedestrian crossings can be provided at the signalized intersections. Require provisions for sidewalks on the east and west sides on County Road 124.
Financial Consideration	▪ Signal control: Costs for new traffic signal, road widening and intersection improvements (turn lanes). Cost of property acquisition. ▪ Roundabout control: Costs for roundabout. Cost of property acquisition.
Overall Evaluation	▪ Sufficient intersection capacity with signal or roundabout at the new intersection. ▪ Property acquisition required for either traffic signal or roundabout ▪ Restricting Industrial Road to RIRO will limit number of closely spaced full movement intersections but will increase capacity constraints at Highway 10/89/Second Line.
Mitigation Measures	Need to limit A1 and A3 to right-in/right-out only and provide internal access for existing plaza via new public road Street X or Street Y.
Recommendation	**Consider in the interim (See Alternative 3).**

Table 15 continued

Highway 10/89 (East of County Road 124)	**Alternative 3**
Concept Configuration	One new public road: Street X – Approximately 320 m north of Highway 10/89; opposite realigned Industrial Road and 190m south of Steeles Street. Close old Industrial Road intersection.
Concept Traffic Control	Street X provides full movement access to employment lands (Reference #18) and commercial lands (Reference #7) in the northeast quadrant. Traffic control options considered include stop control, signal and roundabout. Northbound and southbound left turn lanes are provided at the new intersection (for non-roundabout option).
Evaluation	
Intersection Operations	Under stop control, westbound movements from Street X operate at LOS F and experience excessive delays. Industrial Road also experiences capacity constraints and excessive delays. A traffic signal is not warranted at the Street X intersection based on the projected volume warrant analysis. However, given the capacity constraints, signal or roundabout is needed. With traffic signal or roundabout at Street X, the intersection operates with reserve capacity and acceptable level of service.
HAMP Requirements	For new public road/access connections, the desirable spacing is 400 m from the centreline of the proposed crossing road to the centreline of the existing intersection of Highway 10/89. Accordingly: ▪ The distance from the centreline of the existing intersection to Street X is less than desirable.
Storage Requirement	Signal control: Based on a 80 km/h design speed (60 km/h posted speed), there is sufficient storage capacity on sections of County Road 124 between: ▪ Highway 10/89 and Street X/Realigned Industrial Road ▪ Street X/Realigned Industrial Road and Steeles Street Roundabout control: Turn lanes are not needed with a roundabout.
Land Use Impact	Under signal control, southbound left turn queues (95th percentile) extending from Highway 10/89 / Second Line intersection may block Driveways A1 and A3. Traffic signal and intersection improvements (turn lanes) will require property acquisition on the east and west side. Under roundabout control, a roundabout footprint will require property acquisition on the east and west sides but may reduce the widening requirements (2 to 4 through lanes) along County Road 124
Active Transportation	Controlled pedestrian crossings can be provided at the signalized intersections. Require provisions for sidewalks on the east and west sides on County Road 124.
Financial Consideration	▪ Signal control: Costs for new traffic signal, road widening and intersection improvements (turn lanes). Cost of property acquisition. ▪ Roundabout control: Costs for roundabout. Cost of property acquisition. ▪ Both options: Cost of property acquisition for realigning Industrial Road.
Overall Evaluation	▪ Sufficient capacity at the new intersection with signal or roundabout ▪ Property acquisition required for either traffic signal or roundabout. ▪ Minimize number of access points by consolidating public roads: realigning Industrial Road opposite Street X ▪ Maximize intersection spacing from Highway 10/89 intersection ▪ Property impacts of Industrial Road realignment
Mitigation Measures	Need to limit A1 and A3 to right-in/right-out only and provide internal access for existing plaza via new public road Street X or Street Y.
Recommendation	**Recommended**

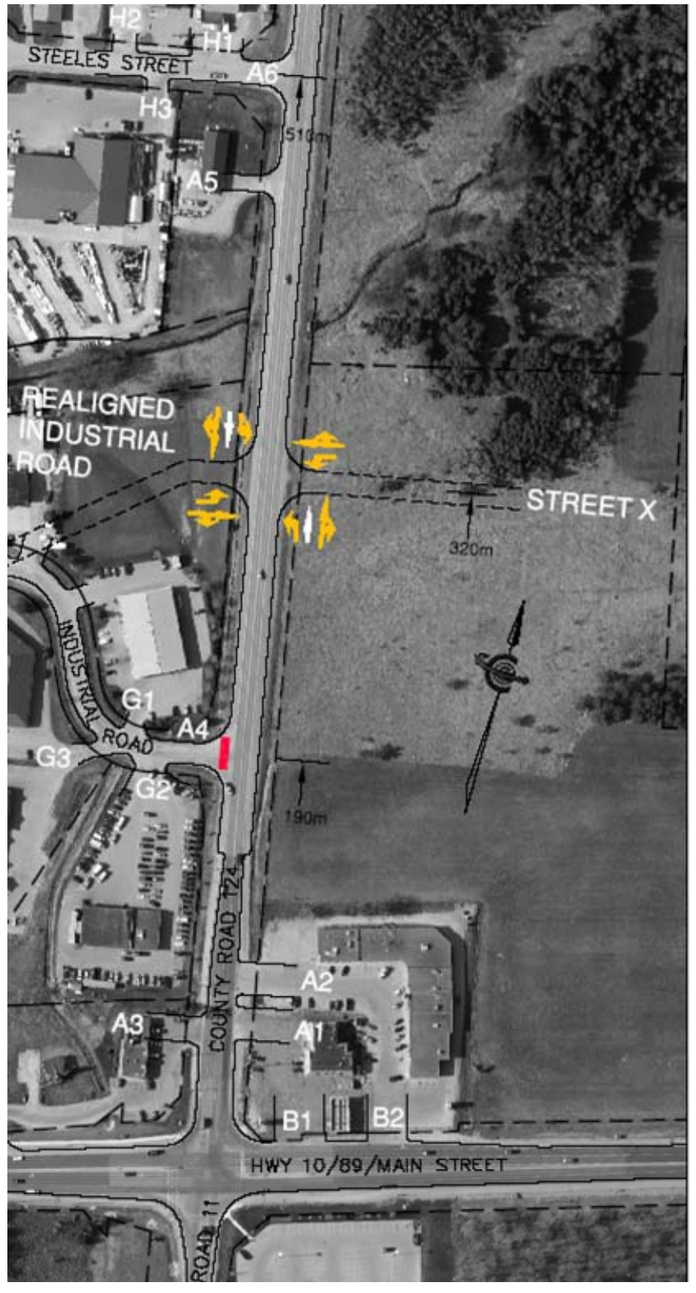


Table 15 continued

Highway 10/89 (East of County Road 124)	**Alternative 4**
Concept Configuration	One new public road: Street X – Approximately 320 m north of Highway 10/89; opposite realigned Industrial Road and 190m south of Steeles Street. Restrict Old Industrial Road to RIRO.
Concept Traffic Control	Street X provides full movement access to employment lands (Reference #18) and commercial lands (Reference #7) in the northeast quadrant. Traffic control options considered include stop control, signal and roundabout. Northbound and southbound left turn lanes are provided at the new intersection (for non-roundabout option).
Evaluation	
Intersection Operations	Under stop control, westbound movements from Street X operate at LOS F and experience excessive delays. Industrial Road also experience capacity constraints and excessive delays. A traffic signal is not warranted at the Street X intersection base on the projected volume warrant analysis. However, given the capacity constraints, signas or roundabout is needed. With traffic signal or roundabout at Street X, the intersection operates with reserve capacity and acceptable level of service.
HAMP Requirements	For new public road/access connections, the desirable spacing is 400 m from the centreline of the proposed crossing road to the centreline of the existing intersection. Accordingly: ▪ The distance from the centreline of the existing intersection to Street X is less than desirable.
Storage Requirement	Signal control: Based on a 80 km/h design speed (60 km/h posted speed), there is sufficient storage capacity on sections of County Road 124 between: ▪ Highway 10/89 and Street X/realigned Industrial Road ▪ Street X/Realigned Industrial Road and Steeles Street Roundabout control: Turn lanes are not needed with a roundabout.
Land Use Impact	Under signal control, southbound left turn queues (95th percentile) extending from Highway 10/89 / Second Line intersection may block Driveways A1 and A3. Traffic signal and intersection improvements (turn lanes) will require property acquisition on the east and west side. Under roundabout control, a roundabout footprint will require property acquisition on the east and west sides but may reduce the widening requirements (2 to 4 through lanes) along County Road 124
Active Transportation	Controlled pedestrian crossings can be provided at the signalized intersections. Require provisions for sidewalks on the east and west sides on County Road 124.
Financial Consideration	▪ Signal control: Costs for new traffic signal, road widening and intersection improvements (turn lanes). Cost of property acquisition. ▪ Roundabout control: Cost for roundabout. Cost of property acquisition ▪ Both options: Cost of property acquisition for realigning Industrial Road.
Overall Evaluation	▪ Sufficient capacity at the new intersection with signal or roundabout ▪ Property acquisition required for either traffic signal or roundabout. ▪ Reduced number of full movement access points by consolidating public roads: realigning Industrial Road opposite Street X. ▪ Old Industrial Road remains as RIRO ▪ Maximize intersection spacing from Highway 10/89 intersection ▪ Property impacts of Industrial Road realignment
Mitigation Measures	Need to limit A1 and A3 to right-in/right-out only and provide internal access for existing plaza via new public road Street X or Street Y.
Recommendation	**Recommended**

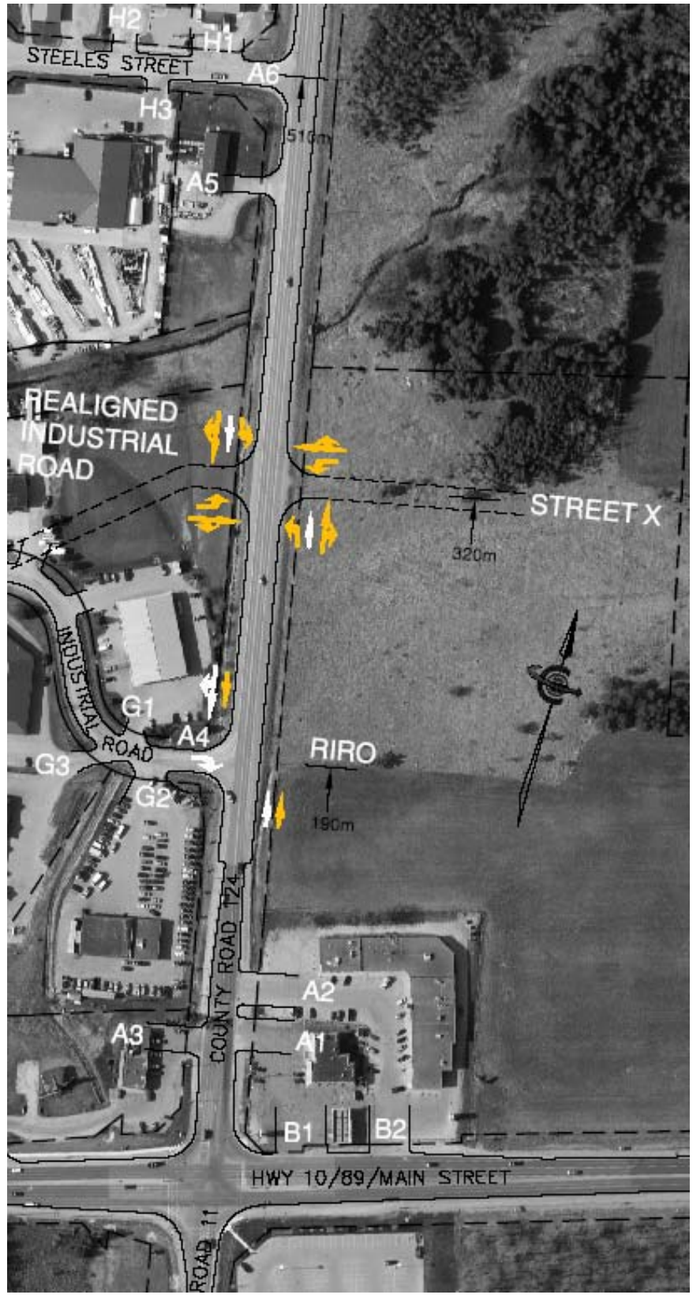


Table 15 continued

Highway 10/89 (East of County Road 124)	**Alternative 5**
Concept Configuration	One new public road: Street X – Approximately 190m north of Highway 10/89 / Second Line intersection, opposite Industrial Road and 320m south of Steeles Street
Concept Traffic Control	Street X provides full movement access to employment lands (Reference #18) and commercial lands (Reference #7) in the northeast quadrant. Traffic control options considered include stop control, signal and roundabout. Northbound and southbound left turn lanes are provided at the new intersection (for non-roundabout option)..
Evaluation	
Intersection Operations	Under stop control, westbound movements from Street X operate at LOS F and experience excessive delays. Industrial Road also experiences capacity constraints and excessive delays. A traffic signal is not warranted at the Street X-Indusstrial Road intersection base on the projected volume warrant analysis. However, given the capacity constraints, signal or roundabout is needed. With traffic signal or roundabout at Street X-Industrial Road, the intersection operates with reserve capacity and acceptable level of service.
HAMP Requirements	For new public road/access connections, the desirable spacing is 400 m from the centreline of the proposed crossing road to the centreline of the existing intersection of Highway 10/89. Accordingly: ▪ The distance from the centreline of the existing intersection to Street X is less than desirable.
Storage Requirement	Signal control: There is insufficient storage capacity on section of County Road 124 between Highway 10/89 and Industrial Road to accommodate back-to-back left turn lanes. Roundabout control: Turn lanes are not needed with a roundabout.
Land Use Impact	Under signal control, southbound left turn queues (95th percentile) extending from Highway 10/89 / Second Line intersection may block Driveways A1 and A3. Traffic signal and intersection improvements (turn lanes) will require property acquisition on the east and west side. Under roundabout control, a roundabout footprint will require property acquisition on the east and west sides but may reduce the widening requirements (2 to 4 through lanes) along County Road 124
Active Transportation	Controlled pedestrian crossings can be provided at the signalized intersection. Require provisions for sidewalks on the east and west sides on County Road 124.
Financial Consideration	▪ Signal control: Costs for new traffic signal, road widening and intersection improvements (turn lanes). Cost of property acquisition. ▪ Roundabout control: Costs for roundabout. Cost of property acquisition.
Overall Evaluation	▪ Sufficient capacity at the new intersection with signal or roundabout ▪ Insufficient storage capacity to accommodate back-to-back left turn lanes. between Highway 10/89 and Industrial Road
Mitigation Measures	Limit A1 and A3 to right-in/right-out only and provide internal access for existing plaza via new public road Street X or Street Y.
Recommendation	**Not recommended due to closely spaced intersections on County Road 124.**

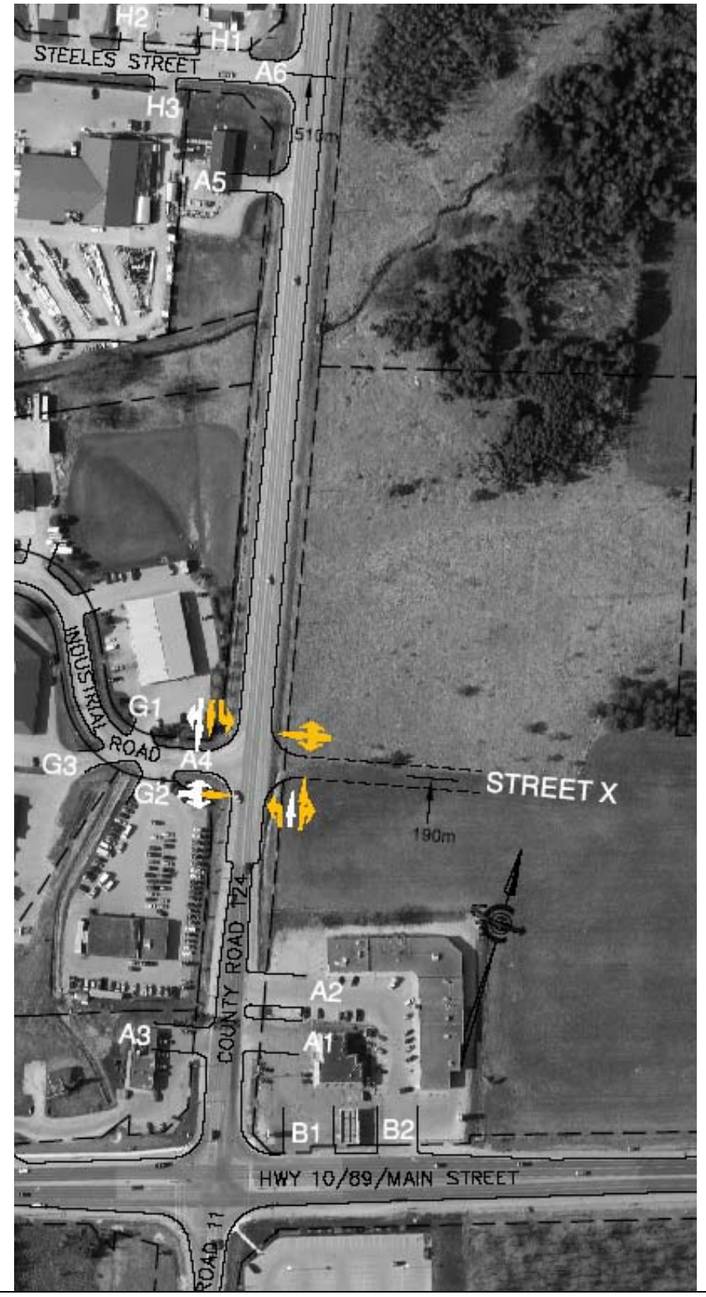
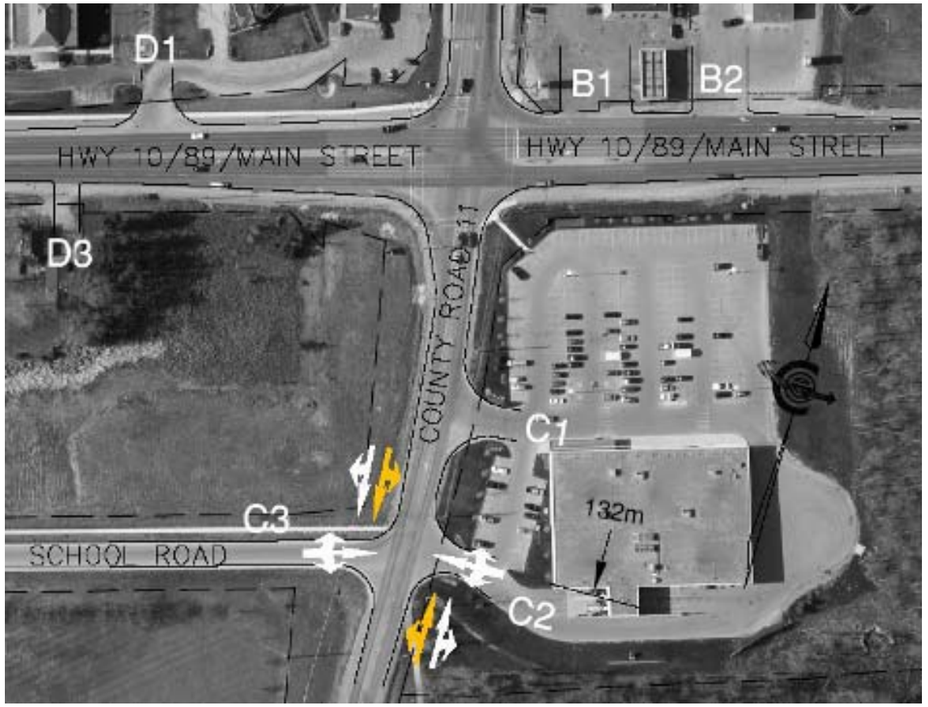


Table 16: South – Second Line (South of Highway 10/89) Evaluation of Alternatives

Second Line	**Alternative 1**
Concept Configuration	Existing public road configuration; no new full movement accesses.
Traffic Control	Traffic control options considered include stop control, signal or roundabout.
Evaluation	
Intersection Operations	Under stop control, eastbound movement from School Road operates at LOS F and experience excessive delays and capacity constraint. A traffic signal is not warranted at the School Road intersection based on the projected volume warrant. However, given the capacity constraints, a signal or roundabout is needed. With signal or roundabout, the School Road/Second Line intersection operates with reserve capacity.
HAMP Requirements	N/A – Existing Road
Storage Requirement	Signal control: Based on a 70 km/h design speed (50 km/h posted speed), there is insufficient link distance on Second Line between: ▪ Highway 10/89 and School Road/Loblaw access to accommodate back-to-back left turn lanes. Roundabout control: Turn lanes are not needed with a roundabout.
Land Use Impacts	Under signal control, northbound left turn queues (95th percentile) extending from Highway 10/89 / Second Line intersection will block Driveway C1. Traffic signal and intersection improvements (turn lanes) will require property acquisition on the east and west sides. Under roundabout control, a roundabout footprint will require property acquisition on the east and west sides but may reduce the widening requirements along Second Line (2 to 4 through lanes).
Active Transportation	Controlled pedestrian crossings can be provided at a signalized intersection of School Road. However, in the absence of traffic control signal, crossing of Second Line should be encouraged at the Highway 10/89 / Second Line intersection. Require provisions for sidewalks on the east and west sides of Second Line from Highway 10/89 to School Road and existing trail system.
Financial Consideration	▪ Signal control: Costs for new traffic signal, road widening and intersection improvements (turn lanes). Cost of property acquisition. ▪ Roundabout control: Cost for roundabout. Cost of property acquisition.
Overall Evaluation	▪ Insufficient storage capacity to accommodate back-to-back left turn lanes. between Highway 10/89 and School Road/Loblaw access ▪ Traffic signal or roundabout may be required at School Road to mitigate capacity constraints. ▪ The proximity of School Road to Highway 10/89, will preclude any new access between the existing intersections.
Mitigation Requirements	Consider closing access to driveway C1 and provide replacement access (RIRO only) on Highway 10/89.
Recommendation	**Consider roundabout alternative vs. traffic signal should capacity constraints need to be mitigated.**



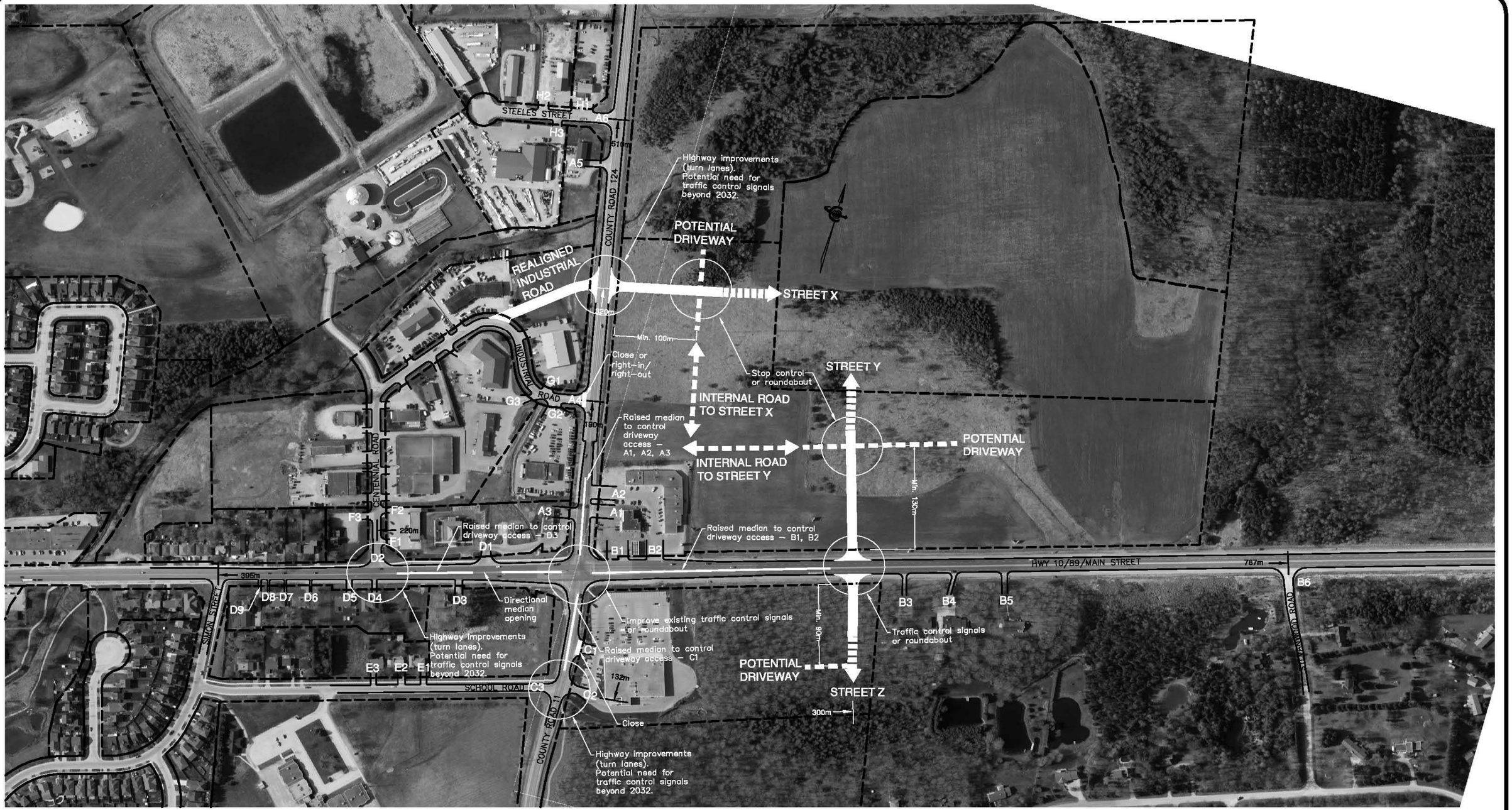
6. Preferred Option

The preferred HAMP concept for Shelburne East is shown in **Figure 7** and is summarized as follows:

- A new north public road (Street Y) and a new south public road (Street Z) onto Highway 10/89 located 300 m east of the Highway 10/89 / County Road 124 intersection.
- A new public road (Street X) onto County Road 124, 320 m north of the Highway 10/89 / County Road 124 intersection; opposite realigned Industrial Road.
- Reduction in posted speed on Highway 10/89 between County Road 124 and Street Y from 70 km/h to 50 km/h. With the proposed future development, the role and function of Highway 10/89 in Shelburne East will change.
- Former Industrial Road closed or limited to right-in/right-out at County Road 124.
- Potential need for an eastbound left turn lane at Highway 10/89 and Centennial Road.
- Raised median along Highway 10/89 from County Road 124 to Street Y-Street Z (see **Section 6.4**).
- Raised median along Highway 10/89 from County Road 124 to Centennial Road (see **Section 6.4**). Consider directional median opening for Driveway D1.
- Raised median along County Road 124 north from Highway 10/89 to north of Driveway A2 or north of existing Industrial Road if right-in/right-out (see **Section 6.4**).
- Raised median along Second Line south from Highway 10/89 to School Road (see **Section 6.4**).
- Access to Street X shall be offset from County Road 124 a minimum of 100 m for signal option or 60 m for roundabout option (see **Section 6.5**)
- Access to Street Y shall be offset from Highway 10/89 a minimum of 130 m for signal option or 60 m for roundabout option (see **Section 6.5**)
- Access to Street Z shall be offset from Highway 10/89 a minimum of 90 m for signal option or 60 m for roundabout option (see **Section 6.5**)

The HAMP concept is based on an overall alternative that would minimize the number of new access points to be introduced on Highway 10/89, County Road 124 and Second Line – while also maintaining adequate connections for future developments. Analyses have shown the concept to be operationally feasible based on alternative traffic controls, namely signals or roundabouts, at the proposed access points of the new public roads. With that said, MTO will only support traffic signal controls where warranted and not solely based on capacity constraints. The following sections further discuss the preferred concept and design considerations:

- **Section 6.1** and **Section 6.2** further discuss the network operations with traffic control signals and roundabouts, respectively.
- **Section 6.3** to **Section 6.5** provide discussion on impacts to property, impacted driveways, access connection to new public roads, and active transportation.
- **Section 6.6** provides discussion on staging requirements for interim scenarios.



COLE ENGINEERING
70 VALLEYWOOD DRIVE, MARKHAM, ON L3R 4T5
T:416.987.8161 / 905.940.8161 F:905.940.2064

NOTES:

1. Feasibility of highway improvements (turn lanes), traffic control signals and/or roundabouts are subject to Environmental Assessment Study.
2. County Road 124/11 is assumed to be widened to 4 lanes.
3. Minimum distances shown from Highway 10/89 to potential driveways at Streets Y and Z are for traffic control signals, and may be reduced for roundabout option.
4. Minimum distance shown from County Road 124 to potential driveway at Street X is for traffic control signals, and may be reduced for roundabout option.

RECOMMENDED SCENARIO

SHELBURNE EAST AREA TRANSPORTATION STUDY
TOWN OF SHELBURNE, COUNTY OF DUFFERIN,
MINISTRY OF TRANSPORTATION OF ONTARIO

DATE:	APRIL 30, 2012	PROJECT No.:	T11-576
SCALE:	1:4000	FIGURE No.:	7

6.1. Preferred Option with Traffic Signals

In the option where traffic control signals are implemented to mitigate capacity constraints, the following road network is recommended for 2032:

- Highway 10/89 / Centennial Road
  - Potential need for traffic control signal
  - New eastbound left turn lane
  - New southbound left turn lane
- Highway 10/89 / County Road 124
  - Existing traffic control signal
  - New northbound right turn lane
  - Extend existing southbound left turn lane to accommodate increased storage requirements
  - Extend existing eastbound right turn lane
- Highway 10/89 / Street Y-Street Z
  - New traffic control signal (warranted)
  - Eastbound and westbound left turn lanes
  - Eastbound and westbound right turn lanes
  - Northbound and southbound left turn lanes
- County Road 124 / Street X-Realigned Industrial Road
  - Potential need for traffic control signal
  - Northbound and southbound left turn lanes
  - Eastbound and westbound left turn lanes
- Second Line / School Road-Loblaw Access
  - Potential need for traffic control signal
- Widening of Highway 10/89 to accommodate turn lanes in accordance to MTO standards, based on a design speed of 80 km/h (posted speed of 60 km/h) between County Road 124 and Street Y-Street Z.
- Widening of County Road 124 and Second Line from two to four lanes through the study area.
- Access to Street X shall be offset from County Road 124 a minimum of 100 m (see **Section 6.5**)
- Access to Street Y shall be offset from Highway 10/89 a minimum of 130 m (see **Section 6.5**)
- Access to Street Z shall be offset from Highway 10/89 a minimum of 90 m (see **Section 6.5**)

The reduction in posted speed to 60 km/h for Highway 10/89 between Country Road 124 and Street Y-Street Z is consistent with the TAC Canadian Guidelines for Establishing Posted Speed Limits (December 2009) for the future road function and geometrics.

The resulting intersection operations are summarized in **Table 17** and arterial levels of service are summarized in **Table 18**. The Synchro outputs for the preferred alternative are in Appendix E.

Table 17: Intersection Operations – 2032 Condition (Preferred Option with Traffic Signals)

	Weekday AM Peak Hour			Weekday PM Peak Hour		
	v/c	LOS	Queue (m)	v/c	LOS	Queue (m)
Highway 10/89 / Centennial Road						
Overall	0.42	B		0.63	B	
Eastbound Left	0.07	A	5	0.23	A	10
Eastbound Through	0.69	B	60	0.55	A	60
Westbound Through-Right	0.51	B	40	0.79	B	105
Southbound Left	0.10	B	15	0.26	C	30
Southbound Right	0.03	B	10	0.23	C	25
Highway 10/89 / County Road 124-Second Line						
Overall	0.82	C		0.83	C	
Eastbound Left	0.59	C	40	0.88	D	45
Eastbound Through	0.85	D	85	0.75	C	80
Eastbound Right	0.10	C	15	0.14	B	15
Westbound Left	0.70	C	35	0.79	C	45
Westbound Through	0.35	B	35	0.92	D	125
Westbound Right	0.17	B	15	0.22	B	20
Northbound Left	0.40	C	35	0.83	D	65
Northbound Through	0.14	B	20	0.43	C	40
Northbound Right[2]	0.09	B	10	0.25	C	25
Southbound Left	0.82	D	95	0.91	E	65
Southbound Through	0.19	B	25	0.37	C	30
Southbound Right	0.07	B	10	0.11	C	15
Highway 10/89 / Street Y – Street Z						
Overall	0.45	B		0.82	C	
Eastbound Left	0.31	B	15	0.75	C	25
Eastbound Through	0.68	B	65	0.59	B	70
Eastbound Right	0.03	A	5	0.07	A	10
Westbound Left	0.30	B	15	0.62	C	40
Westbound Through	0.53	B	45	0.87	C	115
Westbound Right	0.06	A	10	0.16	B	20
Northbound Left	0.08	B	15	0.36	C	30
Northbound Through-Right	0.03	B	<5	0.13	C	20
Southbound Left	0.10	B	15	0.62	C	55
Southbound Through-Right	0.02	B	<5	0.25	C	25
Highway 10/89 (Main Street) / Sylvanwood Road						
Eastbound Through	0.46	-	-	0.54	-	-
Eastbound Through-Right	0.23	-	-	0.28	-	-
Westbound Left-Through	0.01	A	<5	0.07	A	<5
Westbound Through	0.37	-	-	0.62	-	-
Northbound Left-Right	0.16	D	5	0.54	**F**	20
County Road 124 / Steeles Street						
Eastbound Left-Right	0.17	C	5	0.28	C	10
Northbound Left	0.03	A	<5	0.05	A	<5
Northbound Through	0.18	-	-	0.34	-	-
Southbound Through	0.29	-	-	0.23	-	-
Southbound Right	0.16	-	-	0.13	-	-

Note. Queue length is based on Synchro 95th percentile queue results.

Table 17 Continued

	Weekday AM Peak Hour			Weekday PM Peak Hour		
	v/c	LOS	Queue (m)	v/c	LOS	Queue (m)
County Road 124/Realigned Industrial Road-Street X						
Overall	0.28	A		0.42	B	
Eastbound Left	0.12	C	10	0.34	C	20
Eastbound Through-Right	0.01	C	<5	0.03	C	<5
Westbound Left	0.28	C	10	0.60	C	35
Westbound Through-Right	0.01	C	<5	0.08	C	<5
Northbound Left	0.09	A	5	0.07	A	10
Northbound Through-Right	0.21	A	15	0.37	A	45
Southbound Left	0.08	A	5	0.24	A	15
Southbound Through-Right	0.28	A	25	0.25	A	30
Second Line / School Road						
Overall	0.49	B		0.51	B	
Eastbound Left-Through-Right	0.73	C	45	0.65	C	35
Westbound Left-Through-Right	0.05	B	10	0.30	C	25
Northbound Left-Through	0.33	A	30	0.47	A	55
Northbound Through-Right	0.33	A	30	0.47	A	55
Southbound Left-Through	0.36	A	35	0.45	A	40
Southbound Through-Right	0.36	A	35	0.45	A	40

Note. Queue length is based on Synchro 95th percentile queue results.

Table 18: Arterial Level of Service (Preferred Option with Traffic Signals)

Periods	Weekday AM Peak Hour		Weekday PM Peak Hour	
Highway 10/89	Eastbound	Westbound	Eastbound	Westbound
Level of Service	E	C	D	D
County Road 124-Second Line	Northbound	Southbound	Northbound	Southbound
Level of Service	D	D	E	D

The results of the operation analyses indicate reserve capacity and acceptable level of service for the study intersections in general. Some movements at the Highway 10/89 / Second Line intersection will approach capacity. However, the results are consistent to operations of an intersection under urban conditions.

The intersection spacing requirements to accommodate left turn lanes are also assessed for the preferred concept.

Table 19 to **Table 23** summarize the left turn lane requirements based on the queue analysis in Synchro and available spacing. In general, the left turn lanes can be accommodated within the preferred road network for 2032, with the exception of Second Line between Highway 10/89 and School Road. The distance between Highway 10/89 and School Road is 100 m and is insufficient to accommodate a standard left turn lane. It is also noted that the distance between Centennial Road and Simon Street cannot accommodate a standard eastbound left turn lane. However, given the number of driveways, a centre left turn lane may be considered between Centennial Road and Simon Street.

Table 19: West – Highway 10/89/Main Street – Left Turn Storage Requirement

	EB at County Road 124			Total	Available
Design Speed	EBL Storage	Parallel	Taper		
70 km/h	45 m	40 m	115 m	**200**[1] m	**200 m**

Table 20: East – Highway 10/89/Main Street – Left Turn Storage Requirement

	WB at County Road 124			EB at Street Z – Street Y		**Total**	**Available**
Design Speed	WBL Storage	Parallel	Taper	Parallel	EBL Storage		
90 km/h	45 m	60 m	145 m	60 m	25 m	**335 m**	**300 m**
80 km/h	45 m	50 m	130 m	50 m	25 m	**300 m**	**300 m**
70 km/h	45 m	40 m	115 m	40 m	25 m	**265 m**	**300 m**

Table 21: North – County Road 124 – Left Turn Storage Requirement

	SB at Highway 10/89			NB at Industrial Rd		**Total**	**Available**
Design Speed	SBL Storage	Parallel	Taper	Parallel	NBL Storage		
80 km/h	95 m	50 m	135 m	50 m	15 m	**335 m**	**320 m**
70 km/h	95 m	40 m	120 m	40 m	15 m	**300 m**	**320 m**

Table 22: South – Second Line – Left Turn Storage Requirement

	NB at Highway 10/89			SB at School Road		**Total**	**Available**
Design Speed	NBL Storage	Parallel	Taper	Parallel	SBL Storage		
80 km/h	65 m	50 m	130 m	50 m	10 m	**305 m**	**100 m**
70 km/h	65 m	40 m	115 m	40 m	10 m	**270 m**	**100 m**

Table 23: West – Highway 10/89/Centennial Road – Left Turn Storage Requirement

	EB at Centennial Road			Total	Available
Design Speed	EBL Storage	Parallel	Taper		
70 km/h	20 m	40 m	115 m	**175** m	**155 m**

Traffic signals and associated intersection improvements (i.e. turn lanes) will require property acquisitions. The merits for implementing traffic signals and associated intersection improvements will be subject to either MTO's "Class Environmental Assessment for Provincial Transportation Facilities" and/or the Municipal Class Environmental Assessment process.

In the meantime, the Town should plan for a process to protect property to accommodate the above noted intersection improvements should traffic signals be recommended through the Environmental Assessment process.

6.2. Preferred Option with Roundabout Control

In the option where roundabouts are implemented to mitigate capacity constraints, the following intersections are recommended for roundabout implementation by 2032:

- Highway 10/89 / Centennial Road (potentially)
- Highway 10/89 / County Road 124-Second Line
- Highway 10/89 / Street Y-Street Z (new intersection)
- County Road 124 / Street X-Realigned Industrial Road (new intersection) (potentially)
- County Road 124 / School Road-Loblaw Access (potentially)

With roundabouts at the study intersections, the recommended spacing of future site access driveways on the new public roads are:

- Access to Street X shall be offset from County Road 124 a minimum of 60 m (see **Section 6.5**)
- Access to Street Y shall be offset from Highway 10/89 a minimum of 60 m (see **Section 6.5**)
- Access to Street Z shall be offset from Highway 10/89 a minimum of 60 m (see **Section 6.5**)

Table 24 summarizes the traffic operations of the above noted intersections assuming double lane roundabouts. The analyses indicated sufficient capacity and acceptable level of service.

Table 24: Roundabout Operations – 2032 Condition

	Weekday AM Peak Hour			Weekday PM Peak Hour		
	v/c	LOS	Queue (m)	v/c	LOS	Queue (m)
Highway 10/89 / County Road 124-Centennial Road						
Arm 1: Highway 10/89 (East)	0.23	A	<5	0.58	A	8
Arm 2: Centennial Road	0.03	A	<5	0.14	A	<5
Arm 3: Highway 10/89 (West)	0.34	A	<5	0.41	A	<5
Highway 10/89 / County Road 124-Second Line						
Arm 1: Highway 10/89 (East)	0.34	A	<5	0.72	A	16
Arm 2: County Road 124	0.30	A	<5	0.43	A	5
Arm 3: Highway 10/89 (West)	0.46	A	5	0.51	A	6
Arm 4: Second Line	0.23	A	<5	0.47	A	5
Highway 10/89 / Street Y-Street Z						
Arm 1: Highway 10/89 (East)	0.34	A	<5	0.64	A	11
Arm 2: Street Y	0.03	A	<5	0.29	A	<5
Arm 3: Highway 10/89 (West)	0.38	A	<5	0.49	A	6
Arm 4: Street Z	0.04	A	<5	0.14	A	<5
County Road 124 / Realigned Industrial Road-Street X						
Arm 1: Street X	0.02	A	<5	0.12	A	<5
Arm 2: County Road 124 (North)	0.26	A	<5	0.21	A	<5
Arm 3: Industrial Road	0.01	A	<5	0.05	A	<5
Arm 4: County Road 124 (South)	0.19	A	<5	0.30	A	<5
Second Line / School Road						
Arm 1: Private driveway C2	0.00	A	<5	0.00	A	<5
Arm 2: Second Line (North)	0.19	A	<5	0.24	A	<5
Arm 3: School Road	0.09	A	<5	0.06	A	<5
Arm 4: Second Line (South)	0.11	A	<5	0.27	A	<5

Note. Street Y / Internal Driveway and Street X / Internal Driveway were not analyzed.

In comparison to traffic signal controls, roundabouts offer benefits of reducing queues between intersections and eliminating turn lane requirements on the approaches. For instance, a roundabout at Highway 10/89 / County Road 124-Second Line can address the noted spacing constraint on Second Line between Highway 10/89 and the School Road-Loblaw access to accommodate a standard left turn lane.

A number of private driveways along Highway 10/89 and County Road 124, namely Driveways A1, A2, B1 and B2 (the Wrigglesworth plaza), Driveway D3 (the First Ave property), Driveway A3 (commercial plaza northwest of Highway 10/89 / County Road 124) will be limited to right-in/right-out movements. Roundabouts provide opportunities for traffic to change direction of travel without travelling in a longer, circuitous route.

Roundabouts can also serve aesthetic benefits, providing a gateway feature for community enhancement.

While widening requirements will be reduced between intersections, roundabouts will require additional property at the intersection in comparison to traffic signal control. As shown in **Figure 8**, the footprint of inscribed diameter for double lane roundabouts range in size from 45 m to 55 m. With truck traffic within the study area, the size of the roundabouts would likely be in the higher range, to accommodate larger-size heavy vehicles.

For Street X and Street Y, roundabouts could also be considered for traffic control at the driveway accesses. The inscribed diameter of a single-lane roundabout range in size from 35 m to 40 m.

The merits for implementing roundabouts will be subject to either MTO's "Class Environmental Assessment for Provincial Transportation Facilities" and/or the Municipal Class Environmental Assessment process.

In the meantime, the Town should plan for a process to protect property to accommodate the above noted intersection improvements should roundabouts be recommended through the Environmental Assessment process.

COLE ENGINEERING
70 VALLEYWOOD DRIVE, MARKHAM, ON L3R 4T5
T:416.987.6161 / 905.940.6161 F:905.940.2064

NOTES:

1. Only inscribed diameter of roundabout shown. (45–55m for double–lane roundabout, 35–40m for single–lane roundabout.)

ROUNDABOUT FOOTPRINT

SHELBURNE EAST AREA TRANSPORTATION STUDY
TOWN OF SHELBURNE, COUNTY OF DUFFERIN,
MINISTRY OF TRANSPORTATION OF ONTARIO

DATE:	APRIL 30, 2012	PROJECT No.:	T11-576
SCALE:	1:4000	FIGURE No.:	8

6.3. Property Impacts

Industrial Road Realignment
The required lands for the realignment of Industrial Road are in a flood plain and unlikely to have development opportunities for the town to acquire lands through the development process in the near future. The town should protect for the realignment through the Official Plan process.

Traffic Control Signals
MTO will only support traffic control signals where they are warranted and not solely based on capacity constraints.

Additional property at the intersections will be required for traffic control signals. The degree of impact will depend on the associated highway improvements (i.e. turning lanes), which would have to be determined through detailed feasibility studies. The following summarizes the traffic control signal locations and the properties that may be impacted (depending on the footprint size):

- Highway 10/89 / Centennial Road (properties on the northwest and northeast quadrants and along the south side of Highway 10/89)
- Highway 10/89 / Second Line (Wrigglesworth plaza, No Frills plaza, First Ave site)
- Highway 10/89 / Street Z-Street Y (Shelburne Market Village (Blackwood), Loblaw site)
- County Road 124 / Street X-Industrial Road (Shelburne Market Village (Blackwood))
- Second Line / School Road-Loblaw Access (No Frills plaza, First Ave site , Y Corp site)

The merits for implementing traffic control signals and associated highway improvements (i.e. turning lanes) will be subject to Environmental Assessment studies in the future. In the meantime, the Town should plan for a process to protect property to accommodate the above noted intersection improvements should traffic signals be recommended through the Environmental Assessment process.

Roundabouts
MTO will only support roundabouts where they are justified and feasible, and not solely based on capacity constraints.

As shown in **Figure 8**, additional property at the intersections will be required for roundabouts. The degree of impact will depend on the footprint size of the roundabout, which would have to be determined through detailed feasibility studies. The following summarizes the roundabout locations and the properties that may or may not be impacted (depending on the footprint size):

- Highway 10/89 / Centennial Road (Residential property, properties on the northwest and northeast quadrants)
- Highway 10/89 / Second Line (Wrigglesworth plaza, No Frills plaza, First Ave site, Y Corp site)
- Highway 10/89 / Street Z-Street Y (Shelburne Market Village (Blackwood), Loblaw site)
- County Road 124 / Street X-Industrial Road (Shelburne Market Village (Blackwood))
- County Road 124 / School Road (No Frills, First Ave site, Y Corp site)

In general, the recommended roundabout size is for the smallest diameter that will accommodate truck movements. The merits for implementing roundabouts will be subject to Environmental Assessment studies in the future. In the meantime, the Town should plan for a process to protect property to

accommodate the above noted intersection improvements should roundabouts be recommended through the Environmental Assessment process.

County Road 124 and Second Line – Widening from Two to Four Lanes
As indicated, based upon the assumed growth rates and development traffic, the estimated total future traffic volumes will necessitate widening on County Road 124 and Second Line from two to four lanes, if the preferred option with traffic control signals is implemented.

Properties along both roads may be impacted based upon this widening. The merits for implementing the widening will be subject to Environmental Assessment studies in the future. In the meantime, the County and the Town should plan for a process to protect property to accommodate the widening should it be recommended through the Environmental Assessment process.

6.4. Impacted Driveways near Highway 10/89 / County Road 124

The following driveways are in close proximity to the Highway 10/89 / County Road 124-Second Line intersection where future operations (traffic queuing from the signalized intersection) will impede left turns from the driveways and affect drivers' ability to negotiate the movement:

- Wrigglesworth plaza – Driveways A1, A2, B1 and B2
- Commercial plaza northwest of Highway 10/89 / County Road 124 – Driveway A3
- No Frills plaza – Driveway C1
- Office / Plaza – Driveway D1
- First Avenue Group site – Driveway D3

Wrigglesworth Plaza
In the ultimate condition, a raised median is recommended along County Road 124 (north) and Highway 10/89 (east) to restrict Driveways A1, A2, B1 and B2 to right-in/right-out only. Access for Wrigglesworth plaza shall be provided via internal access connection to Street Y and Street X. It is therefore recommended that an easement be established through the Site Plan approval process for the Shelburne Market Village (Blackwood) site.

Commercial plaza northwest of Highway 10/89 / County Road 124
A raised median is recommended along County Road 124 (north) to limit Driveway A3 to right-in/right-out only. This will impact traffic destined north on County Road 124. Outbound traffic from Driveway A3 will need to utilize Centennial Road-Industrial Road to access northbound County Road 124.

A directional median opening (left-in/right-in/right-out) may be allowed at Driveway D1 (to existing office building) to avoid circuitous movements, in particular, for traffic coming from central Shelburne. The 95th percentile queue of the eastbound through movement is 85 m, and the link distance from the stop bar at County Road 124 to Driveway D1 is approximately 80m. Should the site west of the Insurance Office be redeveloped; an easement to Centennial Road should be investigated at which time the directional median opening should be closed and Driveway D1 limited to right-in/right-out only.

Should there be any new developments or redevelopments that will require access on Highway 10/89, between County Road 124 and Centennial Road, it is recommended that the new access(es) be limited to right-in/right-out only.

No Frills plaza / Loblaw site
Driveway C1 is recommended to be closed to traffic given that there are alternative accesses for the No Frills site via Driveway C2 on Second Line and the new public road, Street Z on Highway 10/89. The Ministry would also consider an additional right-in/right-out on Highway 10/89 as an alternative when Driveway C1 is closed.

Lands southwest of Highway 10/89 / Second Line
Driveway D3 is recommended to be right-in/right-out only on Highway 10/89. No driveways are recommended on Second Line between Highway 10/89 and School Road. Any future access to the First Ave site or Y Corp site should be provided via right-in / right-out on Highway 10/89 and on School Road.

Industrial Road
With Industrial Road realigned, the former Industrial Road is recommended to be closed and/or restricted to right-in/right-out only at County Road 124. The existing auto dealership and industrial uses west of County Road 124 will gain access to County Road 124 via the realigned Industrial Road.

6.5. Access Connections to New Public Roads

According to MTO's Highway Access Management Guideline, the desirable offset of public road and commercial access (medium/high volume traffic generators) from a principal arterial is 400 m. Given these values, any proposed access connection on Street X, Street Y and Street Z will fall below the minimum requirement. As an alternative to the application of the minimum standards, the recommended offsets for commercial driveways are assessed below.

Street X
Street X and Street Y are public roads that will provide access to Shelburne Market Village (Blackwood) and the employment lands north of Shelburne Market Village (Blackwood). Future employment uses will require access to Street X and Street Y. If a traffic signal is implemented at County Road 124 / Street X, the recommended minimum spacing of a driveway on Street X is 100 m from County Road 124, which is based on the following:

- The westbound left turn storage of 25 m governed by the 95th percentile queue at County Road 124
- The eastbound left turn storage of 15 m governed by the 95th percentile queue at the driveway
- Taper length of 60 m (according to TAC, for a design speed of 50 km/h – 60 km/h, the required bay taper length is 30 m based on a 10:1 "taper to lane width" ratio; however the taper is increased to 60 m to accommodate the deceleration of vehicles).

If roundabout is implemented at County Road 124 / Street X, the recommended minimum spacing of a driveway on Street X is 60 m from County Road 124, which is based on the following;

- 40 km/h design speed for roundabouts (from entry to exit)
- Stopping sight distance for 50 km/h design speed on Street X.

Street Y
Similarly, driveway access to Street Y will have to be maintained at a distance that accommodates anticipated queues extending from Highway 10/89. If a traffic signal is implemented at Highway 10/89 / Street Y-Street Z, the recommended minimum spacing of a driveway on Street Y is 130 m from Highway 10/89, which is based on the following:

- The southbound left turn storage of 55 m governed by the 95th percentile queue at Highway 10/89
- The northbound left turn storage of 15 m governed by the 95th percentile queue at the driveway

- Taper length of 60 m (according to TAC, for a design speed of 50 km/h – 60 km/h, the required bay taper length is 30 m based on a 10:1 "taper to lane width" ratio; however the taper is increased to 60 m to accommodate the deceleration of vehicles).

If roundabout is implemented at Highway 10/89 / Street Y-Street Z, the recommended minimum spacing of a driveway on Street Y is 60 m from Highway 10/89, which is based on the following;
- 40 km/h design speed for roundabouts (from entry to exit)
- Stopping sight distance for 50 km/h design speed on Street Y.

Street Z

Street Z will provide access to the No Frills plaza/Loblaw site. If a traffic signal is implemented at Highway 10/89 / Street Y-Street Z, the recommended minimum spacing of a driveway on Street Z is 90 m from Highway 10/89, which is based on the following:
- The northbound left turn storage of 30 m governed by the 95th percentile queue at Highway 10/89
- Taper length of 60 m (according to TAC, for a design speed of 50 km/h – 60 km/h, the required bay taper length is 30 m based on a 10:1 "taper to lane width" ratio; however the taper is increased to 60 m to accommodate the deceleration of vehicles).

If roundabout is implemented at Highway 10/89 / Street Y-Street Z, the recommended minimum spacing of a driveway on Street Z is 60 m from Highway 10/89, which is based on the following;
- 40 km/h design speed for roundabouts (from entry to exit)
- Stopping sight distance for 50 km/h design speed on Street Z.

6.6. Analysis of Interim Horizons and Staging Recommendations

Traffic operations in the interim 2017, 2022 and 2027 horizons are assessed to determine potential staging requirements for road improvements. The interim horizons reflect the projected development timeline as summarized in **Section 3.1 Table 5**.

Overall, the following road improvements have been assumed to support the anticipated development within Shelburne East:

Shelburne Market Village (Blackwood), Employment Lands north of Shelburne Market Village (Blackwood) (2017)

Development of this site will necessitate:
- A new north public road (Street Y) onto Highway 10/89, 300 m east of the Highway 10/89 / County Road 124 intersection.
- A new public road (Street X) onto County Road 124, 320 m north of the Highway 10/89 / County Road 124 intersection.
- Traffic control signal or roundabout at Highway 10/89 / Street Y and County Road 124 / Street X and related intersection improvements.
- Highway 10/89 / Street Y should be constructed to allow for future south leg connection in the No Frills plaza /Loblaw site should development not occur at the same time in the southeast quadrant.
- County Road 124 / Street X should be constructed to allow for the realigned Industrial Road. Timing of the realignment will be subject to land availability.
- Raised median on Highway 10/89 (east) from County Road 124 to Street Y.
- Internal access connection from Wigglesworth plaza to Street X and Street Y.

No Frills Plaza / Loblaw Site (2022)

Development for this site will necessitate:

- A new south public road (Street Z) onto Highway 10/89, 300 m east of the Highway 10/89 / County Road 124 intersection and opposite Street X.
- With the new access onto Highway 10/89, the existing driveway C1 on Second Line is recommended to be closed. A right-in / right-out access to Highway 10/89 is an option with the closure of driveway C1.

The analyses confirmed that the above improvements are required in parallel with the development. The road improvements may be triggered earlier should the developments be advanced ahead of the projected timeline.

The analysis of the interim scenarios also indicated that:

a) Under the 2017 horizon, there will be no improvements required in addition to those triggered by the developments in the northeast quadrant (Shelburne Village Market (Blackwood)/Employment lands). *It has been noted that road improvements related to Shelburne Market Village (Blackwood) and employment lands north of Shelburne Market Village (Blackwood) should occur in parallel to the actual timeline of the development, which may be before or after 2017*.

b) Under the 2022 horizon, Highway 10/89 / Centennial Road and Second Line / School Road will experience capacity constraints. Traffic control signals or roundabouts need to be considered as improvements. MTO will only support traffic control signals where they are warranted.

   A left turn lane at Highway 10/89 / Centennial Road will need to be considered (without traffic control signals).

   Certain movements at Highway 10/89 / County Road 124 will approach capacity.

   In the same horizon, Industrial Road is assumed to be realigned opposite Street X. This may occur at a later time depending on the land availability.

c) Under the 2027 horizon, intersection improvements will be required at Highway 10/89 / County Road 124-Second Line. This will include turn lane improvements (northbound right turn and southbound left turn) widening of County Road 124 through the Highway 10/89 intersection due to capacity constraints. Alternatively, a roundabout may be considered.

d) Under 2032 conditions, it is recommended that County Road 124 and Second Line be widened to four lanes due to accommodate forecasted traffic volumes. However, should the roundabout option be preferred, the need for four-lane cross-sections could be deferred.

The Synchro files for the interim year analysis are provided in **Appendix F**.

The preferred road concept plan developed for 2032 outlines the ultimate road network requirements in Shelburne East Area. Interim road improvements must consider the ultimate road network requirements.

The study to date indicates that traffic control signals and intersection improvements (turning lanes) and/or roundabouts are operationally feasible. An Environmental Assessment study is recommended to

be carried out to fully assess the feasibility of any associated traffic control improvement in order to determine the preferred option.

6.7. Active Transportation

Pedestrian Network

The future road network should provide connections to the following missing links in the pedestrian network:

- Pedestrian connection on the south side of Highway 10/89 between Simon Street and Second Line.
- Pedestrian connection on the west side of Second Line between Highway 10/89 and School Road.
- Pedestrian connection on the east side of Second Line between Highway 10/89 and the existing trail.

Sidewalk connections should also be continuous along Highway 10/89 easterly from County Road 124-Second Line and along County Road 124 northerly from Highway 10/89. Future Streets X, Y and Z should also have provisions for sidewalks along both sides.

Sidewalks should be paved through driveways consistent to the current practice on Highway 10/89.

Cycling Network

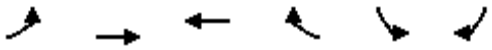
According to MTO's Bikeways Planning and Design Guidelines (1996), bicycles will "continue to be prohibited as deemed necessary for safety reasons, from specific controlled access highways". The Ministry is currently updating the Bikeways Planning and Design Guidelines, which will provide further directives of cycling facilities within Provincial roads.

Opportunities for alternative cycling routes along existing and new local roads and/or off-road routes should be identified and the provision of bicycle parking or other facilities that promote cycling, and other forms of active transportation should be explored through the review of development applications within the study area and as a component of future planning initiatives.

6.8. Connecting Link

It is recommended that Town consider an extension of the current connecting link designation easterly from Simon Street to the new Highway 10/89 and Street Y-Street Z intersection. The Town would need to approach MTO regarding its ability and desire to transfer this section of Highway 10/89 to the Town and designate as a connecting link.

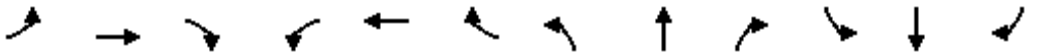
APPENDIX A
EXISTING CONDITION LOS ANALYSIS



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	30	445	295	20	10	6
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	33	484	321	22	11	7
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (m)			230			
pX, platoon unblocked						
vC, conflicting volume	342				639	171
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	342				639	171
tC, single (s)	4.2				7.4	7.5
tC, 2 stage (s)						
tF (s)	2.2				3.8	3.6
p0 queue free %	97				97	99
cM capacity (veh/h)	1192				345	767

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	SB 1
Volume Total	194	322	214	129	17
Volume Left	33	0	0	0	11
Volume Right	0	0	0	22	7
cSH	1192	1700	1700	1700	434
Volume to Capacity	0.03	0.19	0.13	0.08	0.04
Queue Length 95th (m)	0.6	0.0	0.0	0.0	0.9
Control Delay (s)	1.6	0.0	0.0	0.0	13.6
Lane LOS	A				B
Approach Delay (s)	0.6		0.0		13.6
Approach LOS					B

Intersection Summary			
Average Delay	0.6		
Intersection Capacity Utilization	35.3%	ICU Level of Service	A
Analysis Period (min)	15		



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	62	356	37	25	227	74	38	39	23	99	54	50
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	4.0	4.0		4.0	4.0	4.0
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	1.00		1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.94		1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1690	3349	1432	1630	3174	1328	1448	1581		1601	1795	1484
Flt Permitted	0.60	1.00	1.00	0.52	1.00	1.00	0.72	1.00		0.71	1.00	1.00
Satd. Flow (perm)	1065	3349	1432	897	3174	1328	1096	1581		1202	1795	1484
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	67	387	40	27	247	80	41	42	25	108	59	54
RTOR Reduction (vph)	0	0	31	0	0	63	0	10	0	0	0	21
Lane Group Flow (vph)	67	387	9	27	247	17	41	57	0	108	59	33
Heavy Vehicles (%)	8%	9%	14%	12%	15%	23%	26%	8%	26%	14%	7%	10%
Turn Type	Perm		Perm	Perm		Perm	Perm			Perm		Perm
Protected Phases		4			8			2			6	
Permitted Phases	4		4	8		8	2			6		6
Actuated Green, G (s)	12.4	12.4	12.4	12.4	12.4	12.4	35.1	35.1		35.1	35.1	35.1
Effective Green, g (s)	12.4	12.4	12.4	12.4	12.4	12.4	35.1	35.1		35.1	35.1	35.1
Actuated g/C Ratio	0.22	0.22	0.22	0.22	0.22	0.22	0.61	0.61		0.61	0.61	0.61
Clearance Time (s)	6.0	6.0	6.0	6.0	6.0	6.0	4.0	4.0		4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	230	722	309	193	684	286	669	965		734	1096	906
v/s Ratio Prot		c0.12			0.08			0.04			0.03	
v/s Ratio Perm	0.06		0.01	0.03		0.01	0.04			c0.09		0.02
v/c Ratio	0.29	0.54	0.03	0.14	0.36	0.06	0.06	0.06		0.15	0.05	0.04
Uniform Delay, d1	18.9	20.0	17.8	18.2	19.2	17.9	4.5	4.5		4.8	4.5	4.5
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	0.7	0.8	0.0	0.3	0.3	0.1	0.2	0.1		0.4	0.1	0.1
Delay (s)	19.6	20.8	17.8	18.6	19.5	18.0	4.7	4.6		5.2	4.6	4.5
Level of Service	B	C	B	B	B	B	A	A		A	A	A
Approach Delay (s)		20.4			19.1			4.7			4.9	
Approach LOS		C			B			A			A	

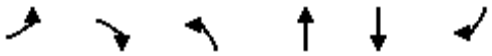
Intersection Summary			
HCM Average Control Delay	15.6	HCM Level of Service	B
HCM Volume to Capacity ratio	0.25		
Actuated Cycle Length (s)	57.5	Sum of lost time (s)	10.0
Intersection Capacity Utilization	38.7%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (veh/h)	475	3	2	319	7	10
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	516	3	2	347	8	11
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume			520		696	260
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			520		696	260
tC, single (s)			4.1		6.8	6.9
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		98	99
cM capacity (veh/h)			1057		380	745

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1
Volume Total	344	175	118	231	18
Volume Left	0	0	2	0	8
Volume Right	0	3	0	0	11
cSH	1700	1700	1057	1700	534
Volume to Capacity	0.20	0.10	0.00	0.14	0.03
Queue Length 95th (m)	0.0	0.0	0.0	0.0	0.8
Control Delay (s)	0.0	0.0	0.2	0.0	12.0
Lane LOS			A		B
Approach Delay (s)	0.0		0.1		12.0
Approach LOS					B

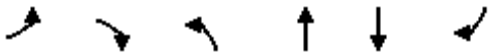
Intersection Summary			
Average Delay	0.3		
Intersection Capacity Utilization	23.2%	ICU Level of Service	A
Analysis Period (min)	15		



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	12	15	12	149	205	14
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	13	16	13	162	223	15
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	418	230	238			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	418	230	238			
tC, single (s)	6.9	6.7	4.3			
tC, 2 stage (s)						
tF (s)	3.9	3.7	2.4			
p0 queue free %	97	98	99			
cM capacity (veh/h)	507	707	1210			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	29	175	238
Volume Left	13	13	0
Volume Right	16	0	15
cSH	602	1210	1700
Volume to Capacity	0.05	0.01	0.14
Queue Length 95th (m)	1.2	0.2	0.0
Control Delay (s)	11.3	0.7	0.0
Lane LOS	B	A	
Approach Delay (s)	11.3	0.7	0.0
Approach LOS	B		

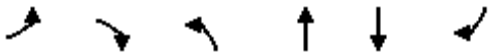
Intersection Summary			
Average Delay	1.0		
Intersection Capacity Utilization	27.7%	ICU Level of Service	A
Analysis Period (min)	15		



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	6	8	20	155	195	25
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	7	9	22	168	212	27
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (m)				201		
pX, platoon unblocked						
vC, conflicting volume	438	226	239			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	438	226	239			
tC, single (s)	6.6	6.4	4.6			
tC, 2 stage (s)						
tF (s)	3.6	3.4	2.7			
p0 queue free %	99	99	98			
cM capacity (veh/h)	542	783	1091			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	15	190	239
Volume Left	7	22	0
Volume Right	9	0	27
cSH	657	1091	1700
Volume to Capacity	0.02	0.02	0.14
Queue Length 95th (m)	0.5	0.5	0.0
Control Delay (s)	10.6	1.1	0.0
Lane LOS	B	A	
Approach Delay (s)	10.6	1.1	0.0
Approach LOS	B		

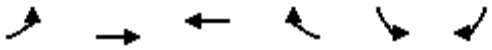
Intersection Summary			
Average Delay		0.8	
Intersection Capacity Utilization		34.4%	ICU Level of Service A
Analysis Period (min)		15	



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	29	36	23	100	87	29
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	32	39	25	109	95	32
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (m)					132	
pX, platoon unblocked						
vC, conflicting volume	269	110	126			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	269	110	126			
tC, single (s)	6.7	6.5	4.3			
tC, 2 stage (s)						
tF (s)	3.7	3.5	2.4			
p0 queue free %	95	96	98			
cM capacity (veh/h)	659	882	1356			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	71	134	126
Volume Left	32	25	0
Volume Right	39	0	32
cSH	766	1356	1700
Volume to Capacity	0.09	0.02	0.07
Queue Length 95th (m)	2.3	0.4	0.0
Control Delay (s)	10.2	1.6	0.0
Lane LOS	B	A	
Approach Delay (s)	10.2	1.6	0.0
Approach LOS	B		

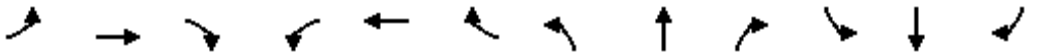
Intersection Summary			
Average Delay	2.8		
Intersection Capacity Utilization	23.7%	ICU Level of Service	A
Analysis Period (min)	15		



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	11	461	679	17	41	61
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	12	501	738	18	45	66
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (m)			230			
pX, platoon unblocked	0.90				0.90	0.90
vC, conflicting volume	757				1022	378
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	506				801	86
tC, single (s)	4.4				7.2	7.3
tC, 2 stage (s)						
tF (s)	2.3				3.7	3.5
p0 queue free %	99				83	92
cM capacity (veh/h)	883				258	816

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	SB 1
Volume Total	179	334	492	264	111
Volume Left	12	0	0	0	45
Volume Right	0	0	0	18	66
cSH	883	1700	1700	1700	437
Volume to Capacity	0.01	0.20	0.29	0.16	0.25
Queue Length 95th (m)	0.3	0.0	0.0	0.0	7.6
Control Delay (s)	0.7	0.0	0.0	0.0	16.0
Lane LOS	A				C
Approach Delay (s)	0.3		0.0		16.0
Approach LOS					C

Intersection Summary			
Average Delay	1.4		
Intersection Capacity Utilization	33.3%	ICU Level of Service	A
Analysis Period (min)	15		



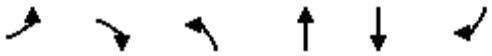
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	81	349	72	71	500	92	130	77	58	96	49	66
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0	6.0	6.0	6.0	6.0	6.0	4.0	4.0		4.0	4.0	4.0
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	1.00		1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.94		1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1738	3349	1570	1460	3411	1471	1690	1745		1534	1779	1498
Flt Permitted	0.42	1.00	1.00	0.53	1.00	1.00	0.72	1.00		0.66	1.00	1.00
Satd. Flow (perm)	775	3349	1570	810	3411	1471	1285	1745		1065	1779	1498
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	88	379	78	77	543	100	141	84	63	104	53	72
RTOR Reduction (vph)	0	0	42	0	0	54	0	33	0	0	0	42
Lane Group Flow (vph)	88	379	36	77	543	46	141	114	0	104	53	30
Heavy Vehicles (%)	5%	9%	4%	25%	7%	11%	8%	3%	3%	19%	8%	9%
Turn Type	Perm		Perm	Perm		Perm	Perm			Perm		Perm
Protected Phases		4			8			2			6	
Permitted Phases	4		4	8		8	2			6		6
Actuated Green, G (s)	37.0	37.0	37.0	37.0	37.0	37.0	33.0	33.0		33.0	33.0	33.0
Effective Green, g (s)	37.0	37.0	37.0	37.0	37.0	37.0	33.0	33.0		33.0	33.0	33.0
Actuated g/C Ratio	0.46	0.46	0.46	0.46	0.46	0.46	0.41	0.41		0.41	0.41	0.41
Clearance Time (s)	6.0	6.0	6.0	6.0	6.0	6.0	4.0	4.0		4.0	4.0	4.0
Lane Grp Cap (vph)	358	1549	726	375	1578	680	530	720		439	734	618
v/s Ratio Prot		0.11			c0.16			0.07			0.03	
v/s Ratio Perm	0.11		0.02	0.10		0.03	c0.11			0.10		0.02
v/c Ratio	0.25	0.24	0.05	0.21	0.34	0.07	0.27	0.16		0.24	0.07	0.05
Uniform Delay, d1	13.0	13.0	11.8	12.8	13.7	11.9	15.5	14.8		15.3	14.2	14.1
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	1.6	0.4	0.1	1.2	0.6	0.2	1.2	0.5		1.3	0.2	0.1
Delay (s)	14.7	13.4	12.0	14.0	14.3	12.1	16.7	15.2		16.6	14.4	14.2
Level of Service	B	B	B	B	B	B	B	B		B	B	B
Approach Delay (s)		13.4			14.0			16.0			15.3	
Approach LOS		B			B			B			B	

Intersection Summary			
HCM Average Control Delay	14.3	HCM Level of Service	B
HCM Volume to Capacity ratio	0.31		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	47.9%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (veh/h)	490	13	20	643	11	8
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	533	14	22	699	12	9
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume			547		933	273
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			547		933	273
tC, single (s)			4.1		6.8	6.9
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			98		95	99
cM capacity (veh/h)			1033		263	730

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1
Volume Total	355	192	255	466	21
Volume Left	0	0	22	0	12
Volume Right	0	14	0	0	9
cSH	1700	1700	1033	1700	360
Volume to Capacity	0.21	0.11	0.02	0.27	0.06
Queue Length 95th (m)	0.0	0.0	0.5	0.0	1.4
Control Delay (s)	0.0	0.0	0.9	0.0	15.6
Lane LOS			A		C
Approach Delay (s)	0.0		0.3		15.6
Approach LOS					C

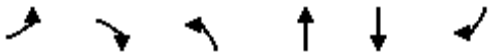
Intersection Summary			
Average Delay	0.4		
Intersection Capacity Utilization	42.2%	ICU Level of Service	A
Analysis Period (min)	15		



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	25	21	27	241	175	22
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	27	23	29	262	190	24
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	523	202	214			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	523	202	214			
tC, single (s)	6.7	6.5	4.2			
tC, 2 stage (s)						
tF (s)	3.8	3.6	2.3			
p0 queue free %	94	97	98			
cM capacity (veh/h)	455	768	1299			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	50	291	214
Volume Left	27	29	0
Volume Right	23	0	24
cSH	559	1299	1700
Volume to Capacity	0.09	0.02	0.13
Queue Length 95th (m)	2.2	0.5	0.0
Control Delay (s)	12.1	1.0	0.0
Lane LOS	B	A	
Approach Delay (s)	12.1	1.0	0.0
Approach LOS	B		

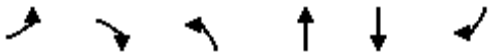
Intersection Summary			
Average Delay	1.6		
Intersection Capacity Utilization	38.1%	ICU Level of Service	A
Analysis Period (min)	15		



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	37	30	19	231	181	15
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	40	33	21	251	197	16
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (m)				201		
pX, platoon unblocked						
vC, conflicting volume	497	205	213			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	497	205	213			
tC, single (s)	6.6	6.4	4.5			
tC, 2 stage (s)						
tF (s)	3.6	3.4	2.6			
p0 queue free %	92	96	98			
cM capacity (veh/h)	499	802	1144			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	73	272	213
Volume Left	40	21	0
Volume Right	33	0	16
cSH	600	1144	1700
Volume to Capacity	0.12	0.02	0.13
Queue Length 95th (m)	3.1	0.4	0.0
Control Delay (s)	11.8	0.8	0.0
Lane LOS	B	A	
Approach Delay (s)	11.8	0.8	0.0
Approach LOS	B		

Intersection Summary			
Average Delay	1.9		
Intersection Capacity Utilization	37.5%	ICU Level of Service	A
Analysis Period (min)	15		



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	7	6	20	265	176	16
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	8	7	22	288	191	17
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (m)					134	
pX, platoon unblocked						
vC, conflicting volume	532	200	209			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	532	200	209			
tC, single (s)	6.5	6.3	4.1			
tC, 2 stage (s)						
tF (s)	3.6	3.4	2.2			
p0 queue free %	98	99	98			
cM capacity (veh/h)	493	831	1350			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	14	310	209
Volume Left	8	22	0
Volume Right	7	0	17
cSH	607	1350	1700
Volume to Capacity	0.02	0.02	0.12
Queue Length 95th (m)	0.5	0.4	0.0
Control Delay (s)	11.1	0.7	0.0
Lane LOS	B	A	
Approach Delay (s)	11.1	0.7	0.0
Approach LOS	B		

Intersection Summary			
Average Delay	0.7		
Intersection Capacity Utilization	38.6%	ICU Level of Service	A
Analysis Period (min)	15		

APPENDIX B
Walkability Review

Walkability Checklist for Community Planning

A walkability checklist is a tool for the assessment of how pedestrian-friendly a neighbourhood is. It is noted that this is a subjective assessment of walkability that is intended to generate discussion about how neighbourhoods can become more pedestrian

The following is a breakdown of the number of points is awarded for each of the categories (sidewalks, crossings, traffic, safety, and ambience) to gauge the perceived walkability in a neighbourhood. The overall score per category provides the specific neneighbourhood with an indication of major areas of improvement for a neighbourhood's walkability.

Never 0 points
Rarely 1 point
Sometimes 2 points
Most of the time 3 points
All the time 4 points

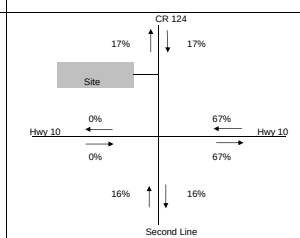
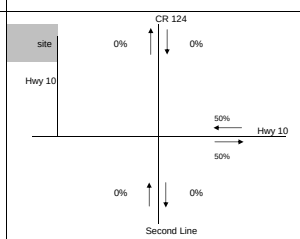
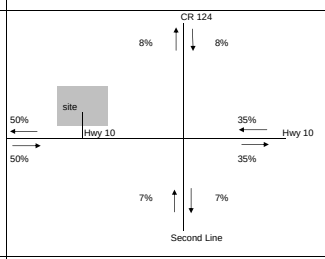
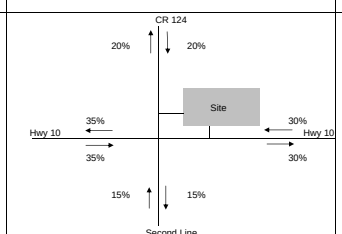
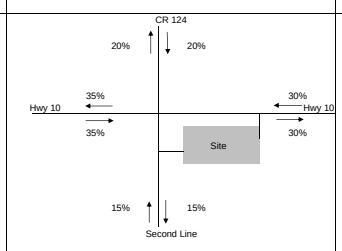
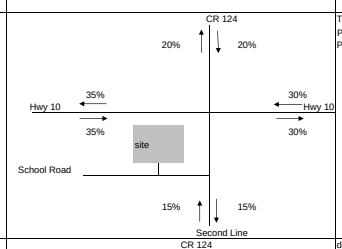
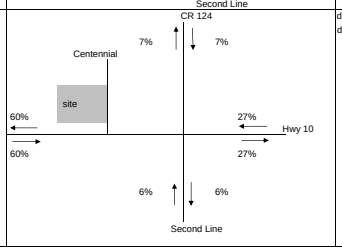
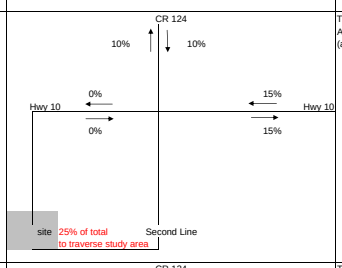
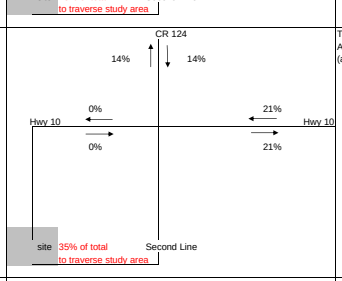
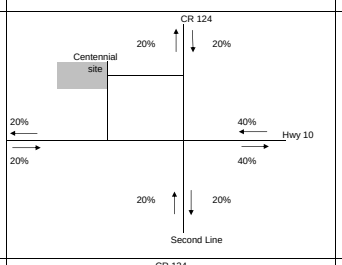
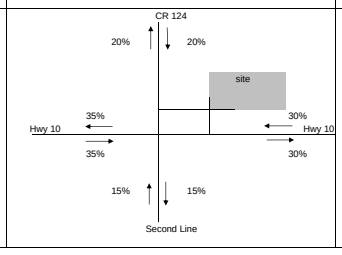
Date: December 12, 2011 12:30 PM
Weather: Sunny with some snow accoumulation

		Score	Comment
Sidewalks, Stairs, Ramps, and Winter Safety			
1	Are facilities accessible to all pedestrians?	2	Along the urban section of Highway 10/89 (Main Street), there is sidewalk on the north side that terminates at County Road 124 while the sidewalk on the south side terminates at Simon Street - thus there is no sidewalk along the south side from Simon Street to County Road 124, which provides crossing to the No Frills site. County Road 124 from School Road to Main Street does not have any sidewalks.
2	Are there sidewalks all along the route? (Are sidewalks continuous, with no missing segments?)	2	Along the urban section of Main Street, there is sidewalk on the north side that terminates at County Road 124 while the sidewalk on the south side terminates at Simon Street - thus there is no sidewalk on the south side from Simon Street to County Road 124. There is no sidewalk along the rurual sections of County Road 124, Highway 10/89 (Main Street) or County Road 11
3	Are there sidewalks on both sides of the street?	1	Sidewalk is generally on one side only (where they exist), namely Simon Street, School Road.
4	Are sidewalks smooth, wide and even, with no cracks or holes?	3	Yes, at locations where there are sidewalks
5	Are sidewalks level?	4	Yes, at locations where there are sidewalks
6	Is there enough space to walk on the sidewalk?	4	Yes, at locations where there are sidewalks
7	Are sidewalks free of obstructions (poles, signs, bushes, dumpsters, trash, parked bicycles, etc.)?	4	Yes, at locations where there are sidewalks
8	Are sidewalks separated from traffic by a parkway?	2	The sidewalk on the north side of Main Street has very small separation from traffic.
9	Are the edges of stairs and ramps marked with a contrasting color?	N/A	
10	Do stairs and ramps feel safe to use (not too steep, no cracks or breaks)?	N/A	
11	Do stairs and ramps have railings on both sides?	N/A	
12	Are stairs safe to use in wet weather (not slippery)?	N/A	
13	Are sidewalks safe to use in winter (clear, well salted or sanded)?		
14	Are there grit boxes in the neighbourhood?	N/A	None found
Crossings			
1	Do pedestrians confident about crossing the road?	N/A	There was no pedestrian activity observed at the time of visit.
2	Are there safe places to cross every 100 metres?	2	It is noted that pedestrians from School Road intending to cross County Road 124 to get to the No Frills site would have to cross at the Main Street-County Road 124 intersection (where it is signalized). However, there is currently no sidewalk connection on County Road from School Road to Main Street. Currently, there is not a significant number of pedestrian generators and demands.
3	Do curbs have ramps at sidewalks and crosswalks?	4	Yes, at Main Street/County Road 124-County Road 11 where there are crosswalk
4	Can you clearly see traffic before crossing the street? (Nothing blocks your view, for example parked cars, trees, or signs)	4	
5	On wide roads, is there an island or median in the middle of the road to wait for the next light?	3	
6	Can you use an underpass or overpass to cross very busy streets?	N/A	
7	Is there a crosswalk where you need one (you don't have to walk all the way to a corner to get across the street)?	2	It is noted that pedestrians from School Road intending to cross County Road 124 to get to the No Frills site would have to cross at the Main Street-County Road 124 intersection (where it is signalized). However, there is currently no sidewalk connection on County Road from School Road to Main Street. Currently, there is not a significant number of pedestrian generators and demands.
8	Do drivers give pedestrians the right of way at crosswalks and at stop signs and stop lights?	4	
9	Can you get across the street before the light changes?	4	
10	Does the traffic light change soon after you push the crosswalk button?	3	
11	Can you cross the street in time and within the crosswalk lines even if there are many people crossing at the same time?	N/A	
12	At unsignalized crossings, do you have to wait long for a gap in traffic? Do you have time to cross safely?	N/A	

Traffic			
1	What is the level of interaction between vehicles and pedestrians?	2	There is limited pedestrian activity observed.
2	Is there sufficient space between the sidewalk and the street?	3	The sidewalk on the north side of Main Street has very small separation from traffic.
3	In crossing areas, is your view of traffic free of obstructions (parked cars, trees, signs)?	3	
4	Is traffic light enough to make walking pleasant (not too many large trucks, exhaust fumes and noise)?	3	There are lots of truck traffic along County Road 124 and Highway 10/89 (east of County Road 124). However it is reasonably light within the urban areas.
5	Is the speed limit suitable for this neighbourhood?	4	Reasonable within the urban areas.
6	Do drivers obey the speed limit and other traffic laws?	N/A	
7	Do drivers yield when appropriate?	4	Yes
8	Does road design (for example speed bumps and extended curbs at corners) help slow down traffic?	3	
9	Are drivers careful (they watch out for pedestrians at driveways, crosswalks and parking lots)?	N/A	
10	Are drivers careful not to splash walkers when there are puddles on the streets?	N/A	
11	Are cyclists careful around pedestrians? Do they dismount when approaching pedestrians or do they drive slowly, use their bells and leave plenty of room between their bike and the walkers?	N/A	
12	Do the parking lots you walk through have sidewalks and/or crosswalks?	4	No Frills site only.
Personal Safety			
1	Do pedestrian feel safe in their environment?	3	
2	Are you able to cross at crosswalks or where you can see and be seen by drivers?	3	Yes, at the Main Street-County Road intersection. It is noted though that the crosswalk pavement markings are fading. The pavement marking should clearly delineate the pedestrian paths.
3	Are you able to cross with the light?	3	
4	Is the street well lit at night?	N/A	
5	Do you feel safe walking at night?	N/A	
6	Are there lots of other people around?	2	There was no pedestrian activity within the study area. However, this may be different closer to the Town centre or during warmer seasons.
7	Are there people who scare you or make you uncomfortable?	N/A	
8	Are there houses and stores where you could go in case of trouble?	3	
9	Are there phones you could use to call for help?	1	
10	Is your route free of suspicious people, vandalism, crime and disturbing graffiti?	4	
11	Are there police, security guards, or a park or pathway patrol on your walking route?	N/A	
12	Are dogs properly controlled by their owners?	N/A	
Walking Experience			
1	Ambience: pleasant and supportive routes for walkers?	2	
2	Does the route have natural elements such as water, gardens, green space, birds, flowers, trees or wildlife to look at?	2	
3	Is it well lit?	N/A	Streetlight exists along the pedestrian paths.
4	Is it clean (no litter or trash including houses and businesses)?	4	
5	Is there a lot of air pollution due to automobile exhaust?	3	
6	Are there interesting things to see such as statues, fountains, interesting old buildings or beautiful architecture?	2	
7	Are there other people out walking?	2	
8	Are there shady places with benches that can give you a comfortable place to sit and take a rest?	2	
9	Are there public washrooms that you can use easily and safely?	1	
10	Are there trees, building awnings and bus shelters that give protection from sun, rain and wind?	1	
11	Can you access public transit nearby, so that you can take a bus home if you get tired, for example?	1	
12	Can you get a drink at a water fountain?	1	
13	Is the overall walking environment pleasant?	2	The environment within the study area changes from urban to rural. Within the urban section (west of County Road 124), there are generally crosswalks provided at least on one side of the road. However, the following are noted: - Missing pedestrian connection on the south side of Main Street between Simon Street and County Road 11 - Missing pedestrian connection on the wesd side of County Road 11 between School Road and Main Street - Small separation of sidewalk from traffic on the north side of Main Street - Crosswalk markings are faded at the Main Street-County Road 124 intersection

APPENDIX C
BACKGROUND DEVELOPMENT
TRIP GENERATION AND DISTRIBUTION

Shelburne East Area Transportation Study
Background Developments - Trip Generation and Distribution

	Site	Description	LU Code	Trip Generation	AM In	AM Out	AM Total	PM In	PM Out	PM Total	Trip Distribution (through SEA study area)	AM In	AM Out	PM In	PM Out	Trip Distribution Diagrams	Remark
1	Greenbrook Village	321 single family homes 70 townhomes 92,300 sf commercial	TIS	new trips passby (retail component) Total trips	137 79 216	240 79 319	377 158 535	220 70 290	125 70 195	345 140 485	E via Hwy 10/89 Main St W via Hwy 10/89 Main St N via CR 124 S via Second Line	67% 0% 17% 16% 100%	67% 0% 17% 16% 100%	67% 0% 17% 16% 100%	67% 0% 17% 16% 100%		Total trip generation for Greenbrook Village site is 785 in AM and 716 in PM. However, not all site trips will use CR 124 for access. The site also has access to Owen Sound Street (Hwy 10) via Fiddle Park Lane. Trip generation and distribution from traffic study
2	Vandyk-Shelburn North	234 single family homes 121 townhomes 9,260 sf commercial	TIS	new trips	23	57	80	70	47	117	E via Hwy 10/89 Main St W via Hwy 10/89 Main St N via CR 124 S via CR 11	50% 0% 0% 0% 50%	50% 0% 0% 0% 50%	50% 0% 0% 0% 50%	50% 0% 0% 0% 50%		Total trip generation for Shelburn North site is 267 in AM and 385 in PM. Assumed that 50% of Shelburne North site trips that were assigned to Owen Sound St south of Fiddle Park Lane would continue through SEA study area Trip generation and distribution from traffic study.
5	Main St, W of Centennial	48 residential units	210 (eq'n)	new trips (LU 210)	11	32	43	34	20	54	E via Hwy 10/89 Main St W via Hwy 10/89 Main St N via CR 124 S via CR 11	35% 50% 8% 7% 100%	35% 50% 8% 7% 100%	35% 50% 8% 7% 100%	35% 50% 8% 7% 100%		
7	Shelburne Market Village	167,368 sf commercial	820 *eq'n)	new trips passby (retail component) Total trips	127 0 127	82 0 82	209 0 209	327 113 440	345 113 458	672 226 898	E via Hwy 10/89 Main St W via Hwy 10/89 Main St N via CR 124 S via CR 11	30% 35% 20% 15% 100%	30% 35% 20% 15% 100%	30% 35% 20% 15% 100%	30% 35% 20% 15% 100%		
8	Loblaws	90,498 sf commercial gas station (12 pumps) (includes 30 ksf of existing dev)	820 (eq'n) 944 (eq'n)	new trips pass-by (retail+gas station) Total trips	118 40 158	84 40 124	202 80 282	240 137 377	247 137 384	487 274 761	E via Hwy 10/89 Main St W via Hwy 10/89 Main St N via CR 124 S via CR 11	30% 35% 20% 15% 100%	30% 35% 20% 15% 100%	30% 35% 20% 15% 100%	30% 35% 20% 15% 100%		
10	Shelburne Plaza (First Av	11,300 sf commercial	TIS	new trips pass-by Total trips	112 36 148	104 36 140	216 72 288	40 80 120	45 80 125	85 160 245	E via Hwy 10/89 Main St W via Hwy 10/89 Main St N via CR 124 S via CR 11	30% 35% 20% 15% 100%	30% 35% 20% 15% 100%	30% 35% 20% 15% 100%	30% 35% 20% 15% 100%		Trip generation for gross trips based on traffic study. Pass-by of 25% in AM (less than traffic study) Pass-by of 65% in PM (less than traffic study)
13	Tim Hortons	Coffee shop and drive-through	TIS	new trips pass-by Total trips	66 134 200	66 134 200	132 268 400	51 49 100	51 49 100	102 98 200	E via Hwy 10/89 Main St W via Hwy 10/89 Main St N via CR 124 S via CR 11	27% 60% 7% 6% 100%	27% 60% 7% 6% 100%	40% 38% 15% 7% 100%	40% 38% 15% 7% 100%		distribution at Hwy 10/Centennial based on traffic study distribution at Hwy 10/CR124 based on existing patternsn
14	Industrial Mall	40,000 sf industrial	130 (eq'n)	new trips (25% of total)	11	2	13	4	15	19	E via Hwy 10/89 Main St W via Hwy 10/89 Main St N via CR 124 S via CR 11	15% 0% 10% 0% 25%	15% 0% 10% 0% 25%	15% 0% 10% 0% 25%	15% 0% 10% 0% 25%		Total trip generation is 51 in AM and 73 in PM. Assumed that 25% of site trips would traverse SEA study area. (access also on Victoria Street)
15	Shelburne Industrial Park	594,000 sf industrial	130 (eq'n)	new trips (35% of total)	117	26	143	37	138	175	E via Hwy 10/89 Main St W via Hwy 10/89 Main St N via CR 124 S via CR 11	21% 0% 14% 0% 35%	21% 0% 14% 0% 35%	21% 0% 14% 0% 35%	21% 0% 14% 0% 35%		Total trip generation is 407 in AM and 500 in PM. Assumed that 35% of site trips would traverse SEA study area. (access also on Victoria Street)
16	Industrial/Centennial	27,000 sf industrial	130 (eq'n)	new trips	30	7	37	13	50	63	E via Hwy 10/89 Main St W via Hwy 10/89 Main St N via CR 124 S via CR 11	40% 20% 20% 20% 100%	40% 20% 20% 20% 100%	40% 20% 20% 20% 100%	40% 20% 20% 20% 100%		
18	Employment lands (Blackwood site)	239,000 sf industrial	130 (eq'n)	new trips	166	36	202	47	179	226	E via Hwy 10/89 Main St W via Hwy 10/89 Main St N via CR 124 S via CR 11	30% 35% 20% 15% 100%	30% 35% 20% 15% 100%	30% 35% 20% 15% 100%	30% 35% 20% 15% 100%		

APPENDIX D
PRELIMINARY ANALYSIS OF ALTERNATIVES

D1 – Synchro Summary

D2 – Signal Warrant Analysis

D3 – Roundabout (Arcady) Analysis

APPENDIX D1
SYNCHRO SUMMARY

Table A1: West – Highway 10/89/Main Street Intersection Operations – Evaluation Summary

	Weekday AM Peak Hour									Weekday PM Peak Hour								
	Alternative 1a Unsignalized at Centennial 1 EBLT, 1 EBT			Alternative 1b Signalized at Centennial 1 EBLT, 1 EBT			Alternative 1c Signalized at Centennial EBL, 2 EBT			Alternative 1a Unsignalized at Centennial 1 EBLT, 1 EBT			Alternative 1b Signalized at Centennial 1 EBLT, 1 EBT			Alternative 1c Signalized at Centennial EBL, 2 EBT		
	v/c	LOS	Queue	v/c	LOS	Queue	v/c	LOS	Queue	v/c	LOS	Queue	v/c	LOS	Queue	v/c	LOS	Queue
Highway 10/89 / Centennial Road																		
Overall				0.76	B		0.56	B					0.82	C		0.79	B	
Eastbound Left	-	-	-	-	-	-	0.66	C	35	-	-	-	-	-	-	0.67	C	30
Eastbound Left-Through	0.16	A	5	0.87	C	90	-	-	-	0.14	A	5	0.89	C	110	-	-	-
Eastbound Through	0.36	A	5	-	-	-	0.68	B	65	0.42	A	5	-	-	-	0.55	B	60
Westbound Through	0.24	A	-	-	-	-	-	-	-	0.60	A	-	-	-	-	-	-	-
Westbound Through-Right	0.18	A	-	0.43	B	40	0.57	B	50	0.35	A	-	0.84	B	125	0.82	B	120
Southbound Left-Right	**1.93**	**F**	**170**	0.58	C	60	0.44	B	50	**4.94**	**F**	**>>170**	0.70	C	75	0.72	D	80
Highway 10/89 / County Road 124-Second Line																		
Overall	0.74	C	-	0.74	C	-	0.74	C	-	0.86	D		0.86	D		0.86	D	
Eastbound Left	0.59	C	40	0.59	C	40	0.59	C	40	0.90	E	45	0.90	E	45	0.90	E	45
Eastbound Through	0.84	D	90	0.84	D	90	0.84	D	90	0.81	C	85	0.81	C	85	0.81	C	85
Eastbound Right	0.10	C	15	0.10	C	15	0.10	C	15	0.15	C	15	0.15	C	15	0.15	C	15
Westbound Left	0.82	D	45	0.82	D	45	0.82	D	45	0.84	D	50	0.84	D	50	0.84	D	50
Westbound Through	0.37	B	40	0.37	B	40	0.37	B	40	0.97	D	130	0.97	D	130	0.97	D	130
Westbound Right	0.17	B	15	0.17	B	15	0.17	B	15	0.22	B	20	0.22	B	20	0.22	B	20
Northbound Left	0.38	C	35	0.38	C	35	0.38	C	35	0.80	C	60	0.80	C	60	0.80	C	60
Northbound Through	0.13	B	16	0.13	B	16	0.13	B	16	0.41	C	35	0.41	C	35	0.41	C	35
Northbound Right[2]	0.09	B	10	0.09	B	10	0.09	B	10	0.22	C	25	0.22	C	25	0.22	C	25
Southbound Left	0.76	C	95	0.76	C	95	0.76	C	95	0.91	E	60	0.91	E	60	0.91	E	60
Southbound Through	0.17	B	25	0.17	B	25	0.17	B	25	0.37	C	30	0.37	C	30	0.37	C	30
Southbound Right	0.07	B	10	0.07	B	10	0.07	B	10	0.11	C	15	0.11	C	15	0.11	C	15

[1] queue shown in meters
[2] northbound right turn is required

Table A2: West – Highway 10/89/Main Street – Left Turn Storage Requirement

		EB at County Road 124			Total
	Design Speed	EBL Storage	Parallel	Taper	
Between County Road 124 and Centennial Road	70 km/h	45 m	40 m	115 m	**200**[1] m
Between Centennial Road and Simon Street	70 km/h	40 m	40 m	115 m	**195** m

[1] The full left turn lane would extend to Centennial Road.

Remarks
See electronic files for Synchro Assessment

Signals will not be warranted at Highway 10/89 / Centennial Road according to the OTM Book 12 Signal Justification 7, however, there will be capacity issues at this intersection as a stop control.

Table A3: East – Highway 10/89/Main Street Intersection Operations – Evaluation Summary

	Weekday AM Peak Hour																	
	Alternative 1a Street Y (590m+) Unsignalized Street Z – Unsignalized			Alternative 1b Street Y (590m+) Signalized Street Z – Signalized			Alternative 3a Street Y (590m+)Unsignalized Street Z – RIRO			Alternative 3b Street Y (590m+) Signalized Street Z – RIRO			Alternative 4a Street Y (450m) Unsignalized Street Z – RIRO			Alternative 4b Street Y (450m) Signalized Street Z – RIRO		
	v/c	LOS	Queue	v/c	LOS	Queue	v/c	LOS	Queue	v/c	LOS	Queue	v/c	LOS	Queue	v/c	LOS	Queue
Highway 10/89 / County Road 124-Second Line																		
Overall	0.74	C	-	0.74	C	-	0.86	C		0.86	C		0.86	C		0.86	C	
Eastbound Left	0.59	C	40	0.59	C	40	0.57	C	40	0.57	C	40	0.57	C	40	0.57	C	40
Eastbound Through	0.84	D	90	0.84	D	90	0.84	D	90	0.84	D	90	0.84	D	90	0.84	D	90
Eastbound Right	0.10	C	15	0.10	C	15	0.10	C	15	0.10	C	15	0.10	C	15	0.10	C	15
Westbound Left	0.82	D	45	0.82	D	45	**1.07**	**F**	70	**1.07**	**F**	70	**1.07**	**F**	70	**1.07**	**F**	70
Westbound Through	0.37	B	40	0.37	B	40	0.35	B	40	0.35	B	40	0.35	B	40	0.35	B	40
Westbound Right	0.17	B	15	0.17	B	15	0.17	B	15	0.17	B	15	0.17	B	15	0.17	B	15
Northbound Left	0.38	C	35	0.38	C	35	0.46	C	40	0.46	C	40	0.46	C	40	0.46	C	40
Northbound Through	0.13	B	16	0.13	B	16	0.13	B	20	0.13	B	20	0.13	B	20	0.13	B	20
Northbound Right[2]	0.09	B	10	0.09	B	10	0.09	B	10	0.09	B	10	0.09	B	10	0.09	B	10
Southbound Left	0.76	C	95	0.76	C	95	0.76	C	100	0.76	C	100	0.76	C	100	0.76	C	100
Southbound Through	0.17	B	25	0.17	B	25	0.17	B	25	0.17	B	25	0.17	B	25	0.17	B	25
Southbound Right	0.07	B	10	0.07	B	10	0.07	B	10	0.07	B	10	0.07	B	10	0.07	B	10
Highway 10/89 / Street Z																		
Overall	-	-	-	0.48	B		-	-	-	-	-	-	-	-	-	-	-	-
Eastbound Through	0.35	-	-	0.72	B	75	0.35	A	-	0.35	A	-	0.35	A	-	0.35	A	-
Eastbound Right	0.03	-	-	0.04	A	5	0.03	A	<5	0.03	A	<5	0.03	A	<5	0.03	A	<5
Westbound Left	0.08	B	5	0.35	B	15	-	-	-	-	-	-	-	-	-	-	-	-
Westbound Through	0.25	-	-	0.54	B	50	0.27	A	-	0.27	A	-	0.27	A	-	0.27	A	-
Northbound Left	0.45	E	20	0.07	B	15	-	-	-	-	-	-	-	-	-	-	-	-
Northbound Right	0.45	E	20	0.03	B	10	0.06	A	<5	0.06	A	<5	0.06	A	<5	0.06	A	<5
Highway 10/89 / Street Y																		
Overall	-	-	-	0.47	B		-	-	-	0.47	B		-	-	-	0.47	B	
Eastbound Left	0.13	B	5	0.35	B	15	0.13	B	5	0.35	B	15	0.13	B	5	0.35	B	15
Eastbound Through	0.34	-	-	0.71	B	70	0.34	-	-	0.71	B	70	0.34	-	-	0.71	B	70
Westbound Through	0.26	-	-	0.57	B	50	0.26	-	-	0.57	B	50	0.26	-	-	0.57	B	50
Westbound Right	0.06	-	-	0.07	A	10	0.06	-	-	0.07	A	10	0.06	-	-	0.07	A	10
Southbound Left	0.59	**F**	25	0.08	B	15	0.59	**F**	25	0.08	B	15	0.59	**F**	25	0.08	B	15
Southbound Right	0.59	**F**	25	0.02	B	10	0.59	**F**	25	0.02	B	10	0.59	**F**	25	0.02	B	10
Highway 10/89 (Main Street) / Sylvanwood Road																		
Eastbound Through	0.47	-	-	0.47	-	-	0.47	-	-	0.47	-	-	0.47	-	-	0.47	-	-
Eastbound Through-Right	0.24	-	-	0.24	-	-	0.24	-	-	0.24	-	-	0.24	-	-	0.24	-	-
Westbound Left-Through	0.01	A	5	0.01	A	5	0.01	A	5	0.01	A	5	0.01	A	5	0.01	A	5
Westbound Through	0.38	-	-	0.38	-	-	0.38	-	-	0.38	-	-	0.38	-	-	0.38	-	-
Northbound Left-Right	0.16	D	30	0.16	D	30	0.16	D	30	0.16	D	30	0.16	D	30	0.16	D	30

[1] queue shown in meters
[2] northbound right turn is required

Table A3 Continued

	Weekday AM Peak Hour											
	Alternative 5a Street Y (400m) Unsignalized Street Z – RIRO			Alternative 5b Street Y (400m) Signalized Street Z – RIRO			Alternative 6a Street Y /Street Y (300m) Unsignalized			Alternative 6b Street Y /Street Y (300m) Signalized		
	v/c	LOS	Queue	v/c	LOS	Queue	v/c	LOS	Queue	v/c	LOS	Queue
Highway 10/89 / County Road 124-Second Line												
Overall	0.86	C		0.86	C		0.74	C	-	0.74	C	-
Eastbound Left	0.57	C	40	0.57	C	40	0.59	C	40	0.59	C	40
Eastbound Through	0.84	D	90	0.84	D	90	0.84	D	90	0.84	D	90
Eastbound Right	0.10	C	15	0.10	C	15	0.10	C	15	0.10	C	15
Westbound Left	**1.07**	**F**	70	**1.07**	**F**	70	0.82	D	45	0.82	D	45
Westbound Through	0.35	B	40	0.35	B	40	0.37	B	40	0.37	B	40
Westbound Right	0.17	B	15	0.17	B	15	0.17	B	15	0.17	B	15
Northbound Left	0.46	C	40	0.46	C	40	0.38	C	35	0.38	C	35
Northbound Through	0.13	B	20	0.13	B	20	0.13	B	16	0.13	B	16
Northbound Right[2]	0.09	B	10	0.09	B	10	0.09	B	10	0.09	B	10
Southbound Left	0.76	C	100	0.76	C	100	0.76	C	95	0.76	C	95
Southbound Through	0.17	B	25	0.17	B	25	0.17	B	25	0.17	B	25
Southbound Right	0.07	B	10	0.07	B	10	0.07	B	10	0.07	B	10
Highway 10/89 / Street Z												
Overall	-	-	-	-	-	-	-	-	-	-	-	-
Eastbound Through	0.35	A	-	0.35	A	-	-	-	-	-	-	-
Eastbound Right	0.03	A	<5	0.03	A	<5	-	-	-	-	-	-
Westbound Left	-	-	-	-	-	-	-	-	-	-	-	-
Westbound Through	0.27	A	-	0.27	A	-	-	-	-	-	-	-
Northbound Left	-	-	-	-	-	-	-	-	-	-	-	-
Northbound Right	0.06	A	<5	0.06	A	<5	-	-	-	-	-	-
Highway 10/89 / Street Y												
Overall	-	-	-	0.47	B		-	-	-	-	-	-
Eastbound Left	0.13	B	5	0.35	B	15	-	-	-	-	-	-
Eastbound Through	0.34	-	-	0.71	B	70	-	-	-	-	-	-
Westbound Through	0.26	-	-	0.57	B	50	-	-	-	-	-	-
Westbound Right	0.06	-	-	0.07	A	10	-	-	-	-	-	-
Southbound Left	0.59	**F**	25	0.08	B	15	-	-	-	-	-	-
Southbound Right	0.59	**F**	25	0.02	B	10	-	-	-	-	-	-
Highway 10/89 / Street Z – Street Y												
Overall	-	-	-	-	-	-	-	-	-	0.46	B	
Eastbound Left	-	-	-	-	-	-	0.12	B	15	0.31	B	15
Eastbound Through	-	-	-	-	-	-	0.32	-	-	0.69	B	65
Eastbound Right	-	-	-	-	-	-	0.03	-	-	0.03	A	5
Westbound Left	-	-	-	-	-	-	0.08	B	120	0.31	B	15
Westbound Through	-	-	-	-	-	-	0.24	-	-	0.54	B	45
Westbound Right	-	-	-	-	-	-	0.06	-	-	0.06	A	10
Northbound Left	-	-	-	-	-	-	0.83	F	120	0.09	B	15
Northbound Through-Right	-	-	-	-	-	-	0.83	F	120	0.03	B	<5
Southbound Left	-	-	-	-	-	-	0.74	F	105	0.10	B	15
Southbound Through-Right	-	-	-	-	-	-	0.74	F	105	0.02	B	<5
Highway 10/89 (Main Street) / Sylvanwood Road												
Eastbound Through	0.47	-	-	0.47	-	-	0.47	-	-	0.47	-	-
Eastbound Through-Right	0.24	-	-	0.24	-	-	0.24	-	-	0.24	-	-
Westbound Left-Through	0.01	A	5	0.01	A	5	0.01	A	5	0.01	A	5
Westbound Through	0.38	-	-	0.38	-	-	0.38	-	-	0.38	-	-
Northbound Left-Right	0.16	D	30	0.16	D	30	0.16	D	30	0.16	D	30

[1] queue shown in meters
[2] northbound right turn is required

Table A3 Continued

	Weekday PM Peak Hour																	
	Alternative 1a Street Y (590m+) Unsignalized Street Z – Unsignalized			Alternative 1b Street Y (590m+) Signalized Street Z – Signalized			Alternative 3a Street Y (590m+)Unsignalized Street Z – RIRO			Alternative 3b Street Y (590m+) Signalized Street Z – RIRO			Alternative 4a Street Y (450m) Unsignalized Street Z – RIRO			Alternative 4b Street Y (450m) Signalized Street Z – RIRO		
	v/c	LOS	Queue	v/c	LOS	Queue	v/c	LOS	Queue	v/c	LOS	Queue	v/c	LOS	Queue	v/c	LOS	Queue
Highway 10/89 / County Road 124-Second Line																		
Overall	0.86	D		0.86	D		**1.23**	D		**1.23**	D		**1.23**	D		**1.23**	D	
Eastbound Left	0.90	E	45	0.90	E	45	0.89	E	45	0.89	E	45	0.89	E	45	0.89	E	45
Eastbound Through	0.81	C	85	0.81	C	85	0.82	C	85	0.82	C	85	0.82	C	85	0.82	C	85
Eastbound Right	0.15	C	15	0.15	C	15	0.15	C	15	0.15	C	15	0.15	C	15	0.15	C	15
Westbound Left	0.84	D	50	0.84	D	50	**1.43**	**F**	105	**1.43**	**F**	105	**1.43**	**F**	105	**1.43**	**F**	105
Westbound Through	0.97	D	130	0.97	D	130	0.89	C	110	0.89	C	110	0.89	C	110	0.89	C	110
Westbound Right	0.22	B	20	0.22	B	20	0.21	B	20	0.21	B	20	0.21	B	20	0.21	B	20
Northbound Left	0.80	C	60	0.80	C	60	**1.06**	**F**	120	**1.06**	**F**	120	**1.06**	**F**	120	**1.06**	**F**	120
Northbound Through	0.41	C	35	0.41	C	35	0.42	C	40	0.42	C	40	0.42	C	40	0.42	C	40
Northbound Right[2]	0.22	C	25	0.22	C	25	0.22	C	25	0.22	C	25	0.22	C	25	0.22	C	25
Southbound Left	0.91	E	60	0.91	E	60	0.91	E	60	0.91	E	60	0.91	E	60	0.91	E	60
Southbound Through	0.37	C	30	0.37	C	30	0.37	C	30	0.37	C	30	0.37	C	30	0.37	C	30
Southbound Right	0.11	C	15	0.11	C	15	0.11	C	15	0.11	C	15	0.11	C	15	0.11	C	15
Highway 10/89 / Street Z																		
Overall	-	-	-	0.64	B		-	-	-	-	-	-	-	-	-	-	-	-
Eastbound Through	0.36	-	-	0.61	A	65	0.36	A	-	0.36	A	-	0.36	A	-	0.36	A	-
Eastbound Right	0.06	-	-	0.06	A	5	0.06	A	<5	0.06	A	<5	0.06	A	<5	0.06	A	<5
Westbound Left	0.23	B	5	0.66	B	45	-	-	-	-	-	-	-	-	-	-	-	-
Westbound Through	0.45	-	-	0.77	B	95	0.49	A	-	0.49	A	-	0.49	A	-	0.49	A	-
Northbound Left	4.30	**F**	20	0.29	C	30	-	-	-	-	-	-	-	-	-	-	-	-
Northbound Right	4.30	**F**	20	0.16	C	20	0.16	A	<5	0.16	A	<5	0.16	A	<5	0.16	A	<5
Highway 10/89 / Street Y																		
Overall	-	-	-	0.82	B		-	-	-	0.82	B		-	-	-	0.82	B	
Eastbound Left	0.38	C	15	0.64	B	30	0.38	C	15	0.64	B	30	0.38	C	15	0.64	B	30
Eastbound Through	0.35	-	-	0.58	A	70	0.35	-	-	0.58	A	70	0.35	-	-	0.58	A	70
Westbound Through	0.43	-	-	0.88	C	130	0.43	-	-	0.88	C	130	0.43	-	-	0.88	C	130
Westbound Right	0.10	-	-	0.16	B	15	0.10	-	-	0.16	B	15	0.10	-	-	0.16	B	15
Southbound Left	12.38	**F**	>100	0.58	C	55	12.38	**F**	>100	0.58	C	55	12.38	**F**	>100	0.58	C	55
Southbound Right	12.38	**F**	>100	0.24	C	25	12.38	**F**	>100	0.24	C	25	12.38	**F**	>100	0.24	C	25
Highway 10/89 (Main Street) / Sylvanwood Road																		
Eastbound Through	0.55	-	-	0.55	-	-	0.55	-	-	0.55	-	-	0.55	-	-	0.55	-	-
Eastbound Through-Right	0.29	-	-	0.29	-	-	0.29	-	-	0.29	-	-	0.29	-	-	0.29	-	-
Westbound Left-Through	0.07	A	<5	0.07	A	<5	0.07	A	<5	0.07	A	<5	0.07	A	<5	0.07	A	<5
Westbound Through	0.63	-	-	0.63	-	-	0.63	-	-	0.63	-	-	0.63	-	-	0.63	-	-
Northbound Left-Right	0.57	**F**	20	0.57	**F**	20	0.57	**F**	20	0.57	**F**	20	0.57	**F**	20	0.57	**F**	20

[1] queue shown in meters
[2] northbound right turn is required

Table A3 Continued

	Weekday PM Peak Hour											
	Alternative 5a Street Y (400m) Unsignalized Street Z – RIRO			Alternative 5b Street Y (400m) Signalized Street Z – RIRO			Alternative 6a Street Y /Street Y (300m) Unsignalized			Alternative 6b Street Y /Street Y (300m) Signalized		
	v/c	LOS	Queue	v/c	LOS	Queue	v/c	LOS	Queue	v/c	LOS	Queue
Highway 10/89 / County Road 124-Second Line												
Overall	**1.23**	D		**1.23**	D		0.86	D		0.86	D	
Eastbound Left	0.89	E	45	0.89	E	45	0.90	E	45	0.90	E	45
Eastbound Through	0.82	C	85	0.82	C	85	0.81	C	85	0.81	C	85
Eastbound Right	0.15	C	15	0.15	C	15	0.15	C	15	0.15	C	15
Westbound Left	**1.43**	**F**	105	**1.43**	**F**	105	0.84	D	50	0.84	D	50
Westbound Through	0.89	C	110	0.89	C	110	0.97	D	130	0.97	D	130
Westbound Right	0.21	B	20	0.21	B	20	0.22	B	20	0.22	B	20
Northbound Left	**1.06**	**F**	120	**1.06**	**F**	120	0.80	C	60	0.80	C	60
Northbound Through	0.42	C	40	0.42	C	40	0.41	C	35	0.41	C	35
Northbound Right[2]	0.22	C	25	0.22	C	25	0.22	C	25	0.22	C	25
Southbound Left	0.91	E	60	0.91	E	60	0.91	E	60	0.91	E	60
Southbound Through	0.37	C	30	0.37	C	30	0.37	C	30	0.37	C	30
Southbound Right	0.11	C	15	0.11	C	15	0.11	C	15	0.11	C	15
Highway 10/89 / Street Z												
Overall	-	-	-	-	-	-	-	-	-	-	-	-
Eastbound Through	0.36	A	-	0.36	A	-	-	-	-	-	-	-
Eastbound Right	0.06	A	<5	0.06	A	<5	-	-	-	-	-	-
Westbound Left	-	-	-	-	-	-	-	-	-	-	-	-
Westbound Through	0.49	A	-	0.49	A	-	-	-	-	-	-	-
Northbound Left	-	-	-	-	-	-	-	-	-	-	-	-
Northbound Right	0.16	A	<5	0.16	A	<5	-	-	-	-	-	-
Highway 10/89 / Street Y												
Overall	-	-	-	0.82	B		-	-	-	-	-	-
Eastbound Left	0.38	C	15	0.64	B	30	-	-	-	-	-	-
Eastbound Through	0.35	-	-	0.58	A	70	-	-	-	-	-	-
Westbound Through	0.43	-	-	0.88	C	130	-	-	-	-	-	-
Westbound Right	0.10	-	-	0.16	B	15	-	-	-	-	-	-
Southbound Left	12.38	**F**	>100	0.58	C	55	-	-	-	-	-	-
Southbound Right	12.38	**F**	>100	0.24	C	25	-	-	-	-	-	-
Highway 10/89 / Street Z – Street Y												
Overall	-	-	-	-	-	-	-	-	-	0.78	B	
Eastbound Left	-	-	-	-	-	-	0.32	C	15	0.77	C	25
Eastbound Through	-	-	-	-	-	-	0.32	A	-	0.57	B	70
Eastbound Right	-	-	-	-	-	-	0.06	A	-	0.07	A	10
Westbound Left	-	-	-	-	-	-	0.21	B	10	0.59	B	40
Westbound Through	-	-	-	-	-	-	0.39	A	-	0.85	C	120
Westbound Right	-	-	-	-	-	-	0.10	A	-	0.11	B	10
Northbound Left	-	-	-	-	-	-	**26.21**	F	>>100	0.40	C	30
Northbound Through-Right	-	-	-	-	-	-	**26.21**	F	>>100	0.13	C	20
Southbound Left	-	-	-	-	-	-	**32.14**	F	>>100	0.64	C	55
Southbound Through-Right	-	-	-	-	-	-	**32.14**	F	>>100	0.27	C	30
Highway 10/89 (Main Street) / Sylvanwood Road												
Eastbound Through	0.55	-	-	0.55	-	-	0.55	-	-	0.55	-	-
Eastbound Through-Right	0.29	-	-	0.29	-	-	0.29	-	-	0.29	-	-
Westbound Left-Through	0.07	A	<5	0.07	A	<5	0.07	A	<5	0.07	A	<5
Westbound Through	0.63	-	-	0.63	-	-	0.63	-	-	0.63	-	-
Northbound Left-Right	0.57	**F**	20	0.57	**F**	20	0.57	**F**	20	0.57	**F**	20

[1] queue shown in meters
[2] northbound right turn is required

Table A4: East – Highway 10/89/Main Street – Left Turn Storage Requirement

(Alternative 1)

	WB at County Road 124			Total	Available
Design Speed	WBL Storage	Parallel	Taper		
90 km/h	50 m	60 m	145 m	**265 m**	**300 m**
80 km/h	50 m	50 m	130 m	**240 m**	**300 m**
70 km/h	50 m	40 m	115 m	**215 m**	**300 m**

(Alternatives 3, 4,5)

	WB at County Road 124			Total	Available
Design Speed	WBL Storage	Parallel	Taper		
90 km/h	100 m	60 m	145 m	**305 m**	**590 m**
80 km/h	100 m	50 m	130 m	**290 m**	**590 m**
70 km/h	100 m	40 m	115 m	**265 m**	**590 m**

(Alternatives 1, 3)

	EB at Street Y			Total	Available
Design Speed	Taper	Parallel	Storage		
90 km/h	145 m	60 m	30 m	**235 m**	**~190 m**
80 km/h	130 m	50 m	30 m	**210 m**	**~190 m**
70 km/h	115 m	40 m	30 m	**185 m**	**~190 m**

(Alternative 4)

	EB at Street Y			Total	Available
Design Speed	Taper	Parallel	Storage		
90 km/h	145 m	60 m	30 m	**235 m**	**~150 m**
80 km/h	130 m	50 m	30 m	**210 m**	**~150 m**
70 km/h	115 m	40 m	30 m	**185 m**	**~150 m**

(Alternative 6b)

	WB at County Road 124			EB at Municipal Rd – Public Rd to Loblaw		Total	Available
Design Speed	WBL Storage	Parallel	Taper	Parallel	EBL Storage		
90 km/h	60	60	145	60	25	**350**	**300**
80 km/h	60	50	130	50	25	**315**	**300**
70 km/h	60	40	115	40	25	**280**	**300**

Remarks

Signals will not be warranted at Highway 10/89 / Street Y (T-Intersection) and at Highway 10/89 / Street Z (T-Intersection) according to the OTM Book 12 Signal Justification 7, however, there will be capacity issues at this intersection as a stop control.

Signals will be warranted at Highway 10/89 / Street Y- Street Z (4-Legged Intersection) according to the OTM Book 12 Signal Justification 7.

Table A5 North –County Road 124 Intersection Operations – Evaluation Summary

	Weekday AM Peak Hour																	
	Alternative 1a Street X (320m) Unsignalized Industrial Road Unsignalized			Alternative 1b Street X (320m) Signalized Industrial Road – Unsignalized			Alternative 2a Street X (320m) Unsignalized Industrial Road RIRO			Alternative 2b Street X (320m) Signalized Industrial Road RIRO			Alternative 3a Street X / Industrial Rd (320m) Unsignalized Old Industrial Rd Closed			Alternative 3b Street X / Industrial Rd (320m) Signalized Old Industrial Rd Closed		
	v/c	LOS	Queue	v/c	LOS	Queue	v/c	LOS	Queue	v/c	LOS	Queue	v/c	LOS	Queue	v/c	LOS	Queue
County Road 124 / Steeles Street																		
Eastbound Left-Right	0.17	C	<5	0.17	C	<5	0.17	C	<5	0.17	C	<5	0.17	C	<5	0.17	C	<5
Northbound Left	0.03	A	<5	0.03	A	<5	0.03	A	<5	0.03	A	<5	0.03	A	<5	0.03	A	<5
Northbound Through	0.18	-	-	0.18	-	-	0.18	-	-	0.18	-	-	0.18	-	-	0.18	-	-
Southbound Through	0.29	-	-	0.29	-	-	0.29	-	-	0.29	-	-	0.29	-	-	0.29	-	-
Southbound Right	0.16	-	-	0.16	-	-	0.16	-	-	0.16	-	-	0.16	-	-	0.16	-	-
County Road 124 / Street X																		
Overall	-	-	-	0.25	A		-	-	-	0.25	A		-	-	-	-	-	-
Westbound Left	0.15	C	20	0.28	D	10	0.15	C	20	0.28	D	10	-	-	-	-	-	-
Westbound Right	0.15	C	C	0.01	D	10	0.15	C	C	0.01	D	10	-	-	-	-	-	-
Northbound Through	0.18	-	-	0.19	C	15	0.18	-	-	0.19	C	15	-	-	-	-	-	-
Northbound Right	0.13	-	-	0.19	A	15	0.13	-	-	0.19	A	15	-	-	-	-	-	-
Southbound Left	0.05	A	10	0.08	A	5	0.05	A	10	0.08	A	5	-	-	-	-	-	-
Southbound Through	0.21	-	-	0.25	A	20	0.21	-	-	0.25	A	20	-	-	-	-	-	-
County Road 124 / Industrial Road																		
Overall	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Eastbound Left	0.08	C	<5	0.08	C	<5	-	-	-	-	-	-	-	-	-	-	-	-
Eastbound Right	0.08	C	<5	0.08	C	<5	0.02	B	<5	0.02	B	<5	-	-	-	-	-	-
Northbound Left	0.05	A	<5	0.05	A	<5	-	-	-	-	-	-	-	-	-	-	-	-
Northbound Through	0.20	-	-	0.20	-	-	0.16	-	-	0.16	-	-	-	-	-	-	-	-
Southbound Through	0.27	-	-	0.27	-	-	0.27	-	-	0.27	-	-	-	-	-	-	-	-
Southbound Right	0.16	-	-	0.16	-	-	0.16	-	-	0.16	-	-	-	-	-	-	-	-
County Road 124 / Industrial Road / Street X																		
Overall	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.29	A	
Eastbound Left	-	-	-	-	-	-	-	-	-	-	-	-	0.11	C	<5	0.13	C	10
Eastbound Through	-	-	-	-	-	-	-	-	-	-	-	-	0.11	C	<5	0.01	C	<5
Eastbound Right	-	-	-	-	-	-	-	-	-	-	-	-	0.11	C	<5	0.01	C	<5
Westbound Left	-	-	-	-	-	-	-	-	-	-	-	-	0.19	C	10	0.28	C	10
Westbound Through	-	-	-	-	-	-	-	-	-	-	-	-	0.19	C	10	0.01	C	<5
Westbound Right	-	-	-	-	-	-	-	-	-	-	-	-	0.19	C	10	0.01	C	<5
Northbound Left	-	-	-	-	-	-	-	-	-	-	-	-	0.05	B	<5	0.09	A	<5
Northbound Through	-	-	-	-	-	-	-	-	-	-	-	-	0.18	A	-	0.21	A	15
Northbound Right	-	-	-	-	-	-	-	-	-	-	-	-	0.13	A	-	0.21	A	15
Southbound Left	-	-	-	-	-	-	-	-	-	-	-	-	0.05	A	<5	0.08	A	5
Southbound Through	-	-	-	-	-	-	-	-	-	-	-	-	0.26	A	-	0.29	A	25
Southbound Right	-	-	-	-	-	-	-	-	-	-	-	-	0.16	A	-	0.29	A	25
Highway 10/89 / County Road 124-Second Line																		
Overall	0.74	C	-	0.74	C	-	0.74	C	-	0.74	C	-	0.74	C	-	0.74	C	-
Eastbound Left	0.59	C	40	0.59	C	40	0.66	C	50	0.66	C	50	0.59	C	40	0.59	C	40
Eastbound Through	0.84	D	90	0.84	D	90	0.84	D	90	0.84	D	90	0.84	D	90	0.84	D	90
Eastbound Right	0.10	C	15	0.10	C	15	0.10	C	15	0.10	C	15	0.10	C	15	0.10	C	15
Westbound Left	0.82	D	45	0.82	D	45	0.82	D	45	0.82	D	45	0.82	D	45	0.82	D	45
Westbound Through	0.37	B	40	0.37	B	40	0.39	B	45	0.39	B	45	0.37	B	40	0.37	B	40
Westbound Right	0.17	B	15	0.17	B	15	0.16	B	15	0.16	B	15	0.17	B	15	0.17	B	15
Northbound Left	0.38	C	35	0.38	C	35	0.41	C	35	0.41	C	35	0.38	C	35	0.38	C	35
Northbound Through	0.13	B	16	0.13	B	16	0.12	B	15	0.12	B	15	0.13	B	16	0.13	B	16
Northbound Right[2]	0.09	B	10	0.09	B	10	0.09	B	10	0.09	B	10	0.09	B	10	0.09	B	10
Southbound Left	0.76	C	95	0.76	C	95	0.75	C	95	0.75	C	95	0.76	C	95	0.76	C	95
Southbound Through	0.17	B	25	0.17	B	25	0.17	B	25	0.17	B	25	0.17	B	25	0.17	B	25
Southbound Right	0.07	B	10	0.07	B	10	0.07	B	10	0.07	B	10	0.07	B	10	0.07	B	10

[1] queue shown in meters
[2] northbound right turn is required

Table A5 Continued

	Weekday AM Peak Hour											
	Alternative 4a Street X / Industrial Rd (320m) Unsignalized Old Industrial Rd RIRO			Alternative 4b Street X / Industrial Rd (320m) Signalized Old Industrial Rd RIRO			Alternative 5a Street X / Industrial Rd (190m) Unsignalized			Alternative 5b Street X / Industrial Rd (190m) Signalized		
	v/c	LOS	Queue	v/c	LOS	Queue	v/c	LOS	Queue	v/c	LOS	Queue
County Road 124 / Steeles Street												
Eastbound Left-Right	0.17	C	<5	0.17	C	<5	0.17	C	<5	0.17	C	<5
Northbound Left	0.03	A	<5	0.03	A	<5	0.03	A	<5	0.03	A	<5
Northbound Through	0.18	-	-	0.18	-	-	0.18	-	-	0.18	-	-
Southbound Through	0.29	-	-	0.29	-	-	0.29	-	-	0.29	-	-
Southbound Right	0.16	-	-	0.16	-	-	0.16	-	-	0.16	-	-
County Road 124 / Industrial Road / Street X												
Overall	-	-	-	0.28	A		-	-	-	0.29	A	
Eastbound Left	0.09	D	<5	0.13	C	10	0.11	C	<5	0.13	C	10
Eastbound Through	0.09	B	<5	0.01	C	<5	0.11	C	<5	0.01	C	<5
Eastbound Right	0.02	B	<5	0.01	C	<5	0.11	C	<5	0.01	C	<5
Westbound Left	0.16	D	5	0.28	C	10	0.19	C	10	0.28	C	10
Westbound Through	0.03	B	<5	0.01	C	<5	0.19	C	10	0.01	C	<5
Westbound Right	0.03	B	<5	0.01	C	<5	0.19	C	10	0.01	C	<5
Northbound Left	0.05	B	<5	0.09	A	<5	0.05	B	<5	0.09	A	<5
Northbound Through	0.18	A	-	0.21	A	15	0.18	A	-	0.21	A	15
Northbound Right	0.13	A	-	0.21	A	15	0.13	A	-	0.21	A	15
Southbound Left	0.05	A	<5	0.08	A	5	0.05	A	<5	0.08	A	5
Southbound Through	0.26	A	-	0.28	A	25	0.26	A	-	0.29	A	25
Southbound Right	0.15	A	-	0.28	A	25	0.16	A	-	0.29	A	25
County Road 124 / Old Industrial Road												
Overall	-		-	-		-	-	-	-	-	-	-
Eastbound Left	-	-	-	-	-	-	-	-	-	-	-	-
Eastbound Right	0.01	B	<5	0.01	B	<5	-	-	-	-	-	-
Northbound Left	-	-	-	-	-	-	-	-	-	-	-	-
Northbound Through	0.16	A	-	0.16	A	-	-	-	-	-	-	-
Southbound Through	0.27	A	-	0.27	A	-	-	-	-	-	-	-
Southbound Right	0.14	A	-	0.14	A	-	-	-	-	-	-	-
Highway 10/89 / County Road 124-Second Line												
Overall	0.74	C	-	0.74	C	-	0.74	C	-	0.74	C	-
Eastbound Left	0.59	C	40	0.59	C	40	0.59	C	40	0.59	C	40
Eastbound Through	0.84	D	90	0.84	D	90	0.84	D	90	0.84	D	90
Eastbound Right	0.10	C	15	0.10	C	15	0.10	C	15	0.10	C	15
Westbound Left	0.82	D	45	0.82	D	45	0.82	D	45	0.82	D	45
Westbound Through	0.37	B	40	0.37	B	40	0.37	B	40	0.37	B	40
Westbound Right	0.17	B	15	0.17	B	15	0.17	B	15	0.17	B	15
Northbound Left	0.38	C	35	0.38	C	35	0.38	C	35	0.38	C	35
Northbound Through	0.13	B	16	0.13	B	16	0.13	B	16	0.13	B	16
Northbound Right[2]	0.09	B	10	0.09	B	10	0.09	B	10	0.09	B	10
Southbound Left	0.76	C	95	0.76	C	95	0.76	C	95	0.76	C	95
Southbound Through	0.17	B	25	0.17	B	25	0.17	B	25	0.17	B	25
Southbound Right	0.07	B	10	0.07	B	10	0.07	B	10	0.07	B	10

[1] queue shown in meters
[2] northbound right turn is required

Table A5 Continued

	Weekday PM Peak Hour																	
	Alternative 1a Street X (320m) Unsignalized Industrial Road Unsignalized			Alternative 1b Street X (320m) Signalized Industrial Road – Unsignalized			Alternative 2a Street X (320m) Unsignalized Industrial Road RIRO			Alternative 2b Street X (320m) Signalized Industrial Road RIRO			Alternative 3a Street X / Industrial Rd (320m) Unsignalized Old Industrial Rd Closed			Alternative 3b Street X / Industrial Rd (320m) Signalized Old Industrial Rd Closed		
	v/c	LOS	Queue	v/c	LOS	Queue	v/c	LOS	Queue	v/c	LOS	Queue	v/c	LOS	Queue	v/c	LOS	Queue
County Road 124 / Steeles Street																		
Eastbound Left-Right	0.32	D	10	0.28	C	10	0.36	D	15	0.32	D	10	0.32	D	10	0.28	C	10
Northbound Left	0.05	D	<5	0.05	A	<5	0.05	D	<5	0.05	D	<5	0.05	D	<5	0.05	A	<5
Northbound Through	0.34	-	-	0.34	-	-	0.34	-	-	0.34	-	-	0.34	-	-	0.34	-	-
Southbound Through	0.23	-	-	0.23	-	-	0.23	-	-	0.23	-	-	0.23	-	-	0.23	-	-
Southbound Right	0.14	-	-	0.14	-	-	0.14	-	-	0.14	-	-	0.14	-	-	0.14	-	-
County Road 124 / Street X																		
Overall	-	-	-	0.40	A		-	-	-	0.40	A		-	-	-	-	-	-
Westbound Left	1.31	F	115	0.53	C	35	1.31	F	115	0.53	C	35	-	-	-	-	-	-
Westbound Right	1.31	F	115	0.08	C	15	1.31	F	115	0.08	C	15	-	-	-	-	-	-
Northbound Through	0.31	-	-	0.37	A	40	0.31	-	-	0.37	A	40	-	-	-	-	-	-
Northbound Right	0.22	-	-	0.37	A	40	0.22	-	-	0.37	A	40	-	-	-	-	-	-
Southbound Left	0.13	B	5	0.25	A	15	0.13	B	5	0.25	A	15	-	-	-	-	-	-
Southbound Through	0.15	-	-	0.21	A	25	0.15	-	-	0.21	A	25	-	-	-	-	-	-
County Road 124 / Industrial Road																		
Overall	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Eastbound Left	0.47	D	20	0.40	C	15	-	-	-	-	-	-	-	-	-	-	-	-
Eastbound Right	0.47	D	20	0.40	C	15	0.08	B	<5	0.07	B	<5	-	-	-	-	-	-
Northbound Left	0.04	A	<5	0.04	A	<5	-	-	-	-	-	-	-	-	-	-	-	-
Northbound Through	0.32	-	-	0.32	-	-	0.26	-	-	0.26	-	-	-	-	-	-	-	-
Southbound Through	0.25	-	-	0.25	-	-	0.25	-	-	0.25	-	-	-	-	-	-	-	-
Southbound Right	0.14	-	-	0.14	-	-	0.14	-	-	0.14	-	-	-	-	-	-	-	-
County Road 124 / Industrial Road / Street X																		
Overall	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.42	B	
Eastbound Left	-	-	-	-	-	-	-	-	-	-	-	-	0.98	**F**	50	0.36	C	20
Eastbound Through	-	-	-	-	-	-	-	-	-	-	-	-	0.98	**F**	50	0.03	C	<5
Eastbound Right	-	-	-	-	-	-	-	-	-	-	-	-	0.98	**F**	50	0.03	C	<5
Westbound Left	-	-	-	-	-	-	-	-	-	-	-	-	**1.79**	**F**	155	0.60	C	35
Westbound Through	-	-	-	-	-	-	-	-	-	-	-	-	**1.79**	**F**	155	0.08	C	<5
Westbound Right	-	-	-	-	-	-	-	-	-	-	-	-	**1.79**	**F**	155	0.08	C	<5
Northbound Left	-	-	-	-	-	-	-	-	-	-	-	-	0.04	A	<5	0.08	A	<5
Northbound Through	-	-	-	-	-	-	-	-	-	-	-	-	0.28	A	<5	0.37	A	45
Northbound Right	-	-	-	-	-	-	-	-	-	-	-	-	0.21	A	<5	0.37	A	45
Southbound Left	-	-	-	-	-	-	-	-	-	-	-	-	0.12	B	<5	0.24	A	15
Southbound Through	-	-	-	-	-	-	-	-	-	-	-	-	0.19	A	<5	0.25	A	30
Southbound Right	-	-	-	-	-	-	-	-	-	-	-	-	0.11	A	<5	0.25	A	30
Highway 10/89 / County Road 124-Second Line																		
Overall	0.86	D		0.86	D		**1.42**	D	-	**1.42**	D	-	0.86	D		0.86	D	
Eastbound Left	0.90	E	45	0.90	E	45	**1.45**	**F**	105	**1.45**	**F**	105	0.90	E	45	0.90	E	45
Eastbound Through	0.81	C	85	0.81	C	85	0.53	B	70	0.53	B	70	0.81	C	85	0.81	C	85
Eastbound Right	0.15	C	15	0.15	C	15	0.16	B	15	0.16	B	15	0.15	C	15	0.15	C	15
Westbound Left	0.84	D	50	0.84	D	50	0.68	C	30	0.68	C	30	0.84	D	50	0.84	D	50
Westbound Through	0.97	D	130	0.97	D	130	0.66	B	90	0.66	B	90	0.97	D	130	0.97	D	130
Westbound Right	0.22	B	20	0.22	B	20	0.28	B	20	0.28	B	20	0.22	B	20	0.22	B	20
Northbound Left	0.80	C	60	0.80	C	60	**1.28**	**F**	125	**1.28**	**F**	125	0.80	C	60	0.80	C	60
Northbound Through	0.41	C	35	0.41	C	35	0.35	C	35	0.35	C	35	0.41	C	35	0.41	C	35
Northbound Right[2]	0.22	C	25	0.22	C	25	0.29	C	30	0.29	C	30	0.22	C	25	0.22	C	25
Southbound Left	0.91	E	60	0.91	E	60	**1.00**	**F**	100	**1.00**	**F**	100	0.91	E	60	0.91	E	60
Southbound Through	0.37	C	30	0.37	C	30	0.26	C	30	0.26	C	30	0.37	C	30	0.37	C	30
Southbound Right	0.11	C	15	0.11	C	15	0.29	C	30	0.29	C	30	0.11	C	15	0.11	C	15

[1] queue shown in meters
[2] northbound right turn is required

Table A5 Continued

	Weekday PM Peak Hour											
	Alternative 4a Street X / Industrial Rd (320m) Unsignalized Old Industrial Rd RIRO			Alternative 4b Street X / Industrial Rd (320m) Signalized Old Industrial Rd RIRO			Alternative 5a Street X / Industrial Rd (190m) Unsignalized			Alternative 5b Street X / Industrial Rd (190m) Signalized		
	v/c	LOS	Queue	v/c	LOS	Queue	v/c	LOS	Queue	v/c	LOS	Queue
County Road 124 / Steeles Street												
Eastbound Left-Right	0.36	D	15	0.32	D	10	0.32	D	10	0.32	D	10
Northbound Left	0.05	D	<5	0.05	D	<5	0.05	D	<5	0.05	D	<5
Northbound Through	0.34	-	-	0.34	-	-	0.34	-	-	0.34	-	-
Southbound Through	0.23	-	-	0.23	-	-	0.23	-	-	0.23	-	-
Southbound Right	0.14	-	-	0.14	-	-	0.14	-	-	0.14	-	-
County Road 124 / Industrial Road / Street X												
Overall	-	-	-	0.44	B		-	-	-	0.42	B	
Eastbound Left	0.97	**F**	50	0.36	C	20	0.85	**F**	45	0.36	C	20
Eastbound Through	0.97	**F**	50	0.03	C	<5	0.85	**F**	45	0.03	C	<5
Eastbound Right	0.97	**F**	50	0.03	C	<5	0.85	**F**	45	0.03	C	<5
Westbound Left	**1.75**	**F**	155	0.60	C	35	**1.60**	**F**	140	0.60	C	35
Westbound Through	**1.75**	**F**	155	0.08	C	<5	**1.60**	**F**	140	0.08	C	<5
Westbound Right	**1.75**	**F**	155	0.08	C	<5	**1.60**	**F**	140	0.08	C	<5
Northbound Left	0.04	A	<5	0.08	A	<5	0.04	A	<5	0.08	A	<5
Northbound Through	0.28	A	<5	0.37	A	45	0.28	A	<5	0.37	A	45
Northbound Right	0.21	A	<5	0.37	A	45	0.21	A	<5	0.37	A	45
Southbound Left	0.12	B	<5	0.24	A	15	0.11	B	<5	0.24	A	15
Southbound Through	0.19	A	<5	0.25	A	30	0.19	A	<5	0.25	A	30
Southbound Right	0.11	A	<5	0.25	A	30	0.11	A	<5	0.25	A	30
County Road 124 / Old Industrial Road												
Overall	-	-	-	-	-	-	-	-	-	-	-	-
Eastbound Left	-	-	-	-	-	-	-	-	-	-	-	-
Eastbound Right	0.01	B	<5	0.01	B	<5	-	-	-	-	-	-
Northbound Left	-	-	-	-	-	-	-	-	-	-	-	-
Northbound Through	0.25	-	-	0.25	-	-	-	-	-	-	-	-
Southbound Through	0.26	-	-	0.26	-	-	-	-	-	-	-	-
Southbound Right	0.14	-	-	0.14	-	-	-	-	-	-	-	-
Highway 10/89 / County Road 124-Second Line												
Overall	**1.16**	C	-	**1.16**	C	-	0.86	D		0.86	D	
Eastbound Left	1.18	**F**	75	1.18	**F**	75	0.90	E	45	0.90	E	45
Eastbound Through	0.58	C	75	0.58	C	75	0.81	C	85	0.81	C	85
Eastbound Right	0.16	B	15	0.16	B	15	0.15	C	15	0.15	C	15
Westbound Left	0.75	C	35	0.75	C	35	0.84	D	50	0.84	D	50
Westbound Through	0.69	B	95	0.69	B	95	0.97	D	130	0.97	D	130
Westbound Right	0.29	B	20	0.29	B	20	0.22	B	20	0.22	B	20
Northbound Left	1.11	**F**	115	1.11	**F**	115	0.80	C	60	0.80	C	60
Northbound Through	0.32	C	35	0.32	C	35	0.41	C	35	0.41	C	35
Northbound Right[2]	0.30	C	30	0.30	C	30	0.22	C	25	0.22	C	25
Southbound Left	0.90	E	90	0.90	E	90	0.91	E	60	0.91	E	60
Southbound Through	0.23	C	25	0.23	C	25	0.37	C	30	0.37	C	30
Southbound Right	0.27	C	30	0.27	C	30	0.11	C	15	0.11	C	15

[1] queue shown in meters
[2] northbound right turn is required

Table A6: County Road 124 (North of Highway 10/89) – Requirements for Left Turn Lane

(Alternative 1, 4 & 5)

	SB at Highway 10/89			NB at Industrial Rd		**Total**	**Available**
Design Speed	SBL Storage	Parallel	Taper	Parallel	NBL Storage		
80 km/h	95 m	50 m	135 m	50 m	15 m	**335 m**	**<190 m**
70 km/h	95 m	40 m	120 m	40 m	15 m	**300 m**	**<190 m**

Remarks

Signals will not be warranted at County Road / Street X (T-Intersection) and at County Road 124 / Street X-Industrial Road (4-legged Intersection) according to the OTM Book 12 Signal Justification 7, however, there will be capacity issues at this intersection as a stop control.

Table A7: South – County Road 11 – Evaluation Summary

	Weekday AM Peak Hour						Weekday PM Peak Hour					
	Alternative 1a Unsignalized at School Road			Alternative 1b Signalized at School Road			Alternative 1a Unsignalized at School Road			Alternative 1b Signalized at School Road		
	v/c	LOS	Queue	v/c	LOS	Queue	v/c	LOS	Queue	v/c	LOS	Queue
Highway 10/89 / County Road 124-Second Line												
Overall	0.74	C	-	0.74	C	-	0.86	D		0.86	D	
Eastbound Left	0.59	C	40	0.59	C	40	0.90	E	45	0.90	E	45
Eastbound Through	0.84	D	90	0.84	D	90	0.81	C	85	0.81	C	85
Eastbound Right	0.10	C	15	0.10	C	15	0.15	C	15	0.15	C	15
Westbound Left	0.82	D	45	0.82	D	45	0.84	D	50	0.84	D	50
Westbound Through	0.37	B	40	0.37	B	40	0.97	D	130	0.97	D	130
Westbound Right	0.17	B	15	0.17	B	15	0.22	B	20	0.22	B	20
Northbound Left	0.38	C	35	0.38	C	35	0.80	C	60	0.80	C	60
Northbound Through	0.13	B	16	0.13	B	16	0.41	C	35	0.41	C	35
Northbound Right[2]	0.09	B	10	0.09	B	10	0.22	C	25	0.22	C	25
Southbound Left	0.76	C	95	0.76	C	95	0.91	E	60	0.91	E	60
Southbound Through	0.17	B	25	0.17	B	25	0.37	C	30	0.37	C	30
Southbound Right	0.07	B	10	0.07	B	10	0.11	C	15	0.11	C	15
County Road 11 / School Road												
Overall				0.43	B							
Eastbound Left	0.79	E	50	0.71	C	40	0.77	F	40	0.61	D	35
Eastbound Through	0.79	E	50	0.71	C	40	0.77	F	40	0.61	D	35
Eastbound Right	0.79	E	50	0.71	C	40	0.77	F	40	0.61	D	35
Westbound Left	0.01	C	<5	0.01	B	<5	0.04	D	<5	0.03	C	5
Westbound Through	0.01	C	<5	0.01	B	<5	0.04	D	<5	0.03	C	5
Westbound Right	0.01	C	<5	0.01	B	<5	0.04	D	<5	0.03	C	5
Northbound Left	0.07	A	<5	0.24	A	20	0.05	A	<5	0.36	A	35
Northbound Through	0.09	A	<5	0.24	A	20	0.22	A	<5	0.36	A	35
Northbound Right	0.09	A	<5	0.24	A	20	0.22	A	<5	0.36	A	35
Southbound Left	0.01	A	<5	0.29	A	25	0.01	A	<5	0.29	A	25
Southbound Through	0.22	A	<5	0.29	A	25	0.22	A	<5	0.29	A	25
Southbound Right	0.22	A	<5	0.29	A	25	0.22	A	>5	0.29	A	25

[1] queue shown in meters
[2] northbound right turn is required

Table A8: South – County Road 11 – Left Turn Lane Storage Requirements

	NB at Highway 10/89			SB at School Road		Total
Design Speed	NBL Storage	Parallel	Taper	Parallel	SBL Storage	
80 km/h	60 m	50 m	130 m	50 m	10 m	**300 m**
70 km/h	60 m	40 m	115 m	40 m	10 m	**290 m**

APPENDIX D2
WARRANT ANALYSIS

Signal Warrant Calculation

Cole Engineering

Major Street: Highway 10/89

Minor Street: Centennial Road

Comment Future (2032) Total

Number of Approaches: 1 [ ] 2 [X]

Tee Intersection Configuration: Yes [X] No [ ]

Flow Condition: Free Flow (Rural) [ ] Restricted Flow (Urban) [X]

VOLUME	AM	PM	FACTOR *
1A - All	1,917	2,806	n/a	1,181
1B - MiNor	268	282	25%	138
2A - Major	1,649	2,524	25%	1,043
2B - Crossing	148	136	25%	36

* This factor relates average of the "peak eight hours" to the average of the "am and pm peak hours"

OVERALL WARRANT

150% Satisfied:	Yes [ ]	No [X]	Warrant for new intersection with forecast traffic
120% Satisfied:	Yes [ ]	No [X]	Warrant for existing intersection with forecast traffic
100% Satisfied:	Yes [ ]	No [X]	Warrant for existing intersection with existing traffic *
COMBO 80% Satisfied:	Yes [ ]	No [X]	Warrant for existing intersection with existing traffic
80% Satisfied:	Yes [ ]	No [X]	

* Consider full underground provisions if 100% for forecast traffic

WARRANT 1 - MINIMUM VEHICULAR VOLUME

APPROACH LANES	1		2 OR MORE		AVERAGE HOUR PERIOD
FLOW CONDITION	FREE FLOW	REST. FLOW	FREE FLOW	REST. FLOW X	
ALL APPROACHES	480	720	600	900	1181
	% FULFILLED				131%
APPROACH LANES	1		2 OR MORE		AVERAGE HOUR PERIOD
FLOW CONDITION	FREE FLOW	REST. FLOW	FREE FLOW	REST. FLOW X	
MINOR STREET APPROACHES	180	255	180	255	138
	% FULFILLED				54%

150% Satisfied:	Yes [ ]	No [X]
120% Satisfied:	Yes [ ]	No [X]
100% Satisfied:	Yes [ ]	No [X]
80% Satisfied:	Yes [ ]	No [X]

WARRANT 2 - DELAY TO CROSS TRAFFIC

APPROACH LANES	1		2 OR MORE		AVERAGE HOUR PERIOD
FLOW CONDITION	FREE FLOW	REST. FLOW	FREE FLOW	REST. FLOW X	
MAJOR STREET APPROACHES	480	720	600	900	1043
	% FULFILLED				116%
APPROACH LANES	1		2 OR MORE		AVERAGE HOUR PERIOD
FLOW CONDITION	FREE FLOW	REST. FLOW	FREE FLOW	REST. FLOW X	
TRAFFIC CROSSING MAJOR STREET	50	75	50	75	36
	% FULFILLED				47%

150% Satisfied:	Yes [ ]	No [X]
120% Satisfied:	Yes [ ]	No [X]
100% Satisfied:	Yes [ ]	No [X]
80% Satisfied:	Yes [ ]	No [X]

1A - MINIMUM VEHICULAR VOLUME: Total vehicle volume on all approaches for average day

1B - MINIMUM VEHICULAR VOLUME: Total vehicle volume on miNor streets

2A - DELAY TO CROSS TRAFFIC: Total vehicle volume on major street for average day

2B - DELAY TO CROSS TRAFFIC: Total vehicle and pedestrian volume crossing major street; comprising: (1) lefts from both miNor streets, (2) heaviest through from miNor street, (3) 50% of heavier left turn from major street when following criteria met: (a) left turn volume >120 and (b) left turn volume plus opposing volume > 720, (4) pedestrians crossing the major street.

Signal Warrant Calculation

Cole Engineering

Major Street: Highway 10/89

Minor Street: Street Z

Comment Future (2032) Total

Number of Approaches: 1 [ ] 2 [X]

Tee Intersection Configuration: Yes [X] No [ ]

Flow Condition: Free Flow (Rural) [X]
Restricted Flow (Urban) [ ]

VOLUME	AM	PM	FACTOR *	
1A - All	2,059	2,973	n/a	1,258
1B - MiNor	83	225	25%	77
2A - Major	1,976	2,748	25%	1,181
2B - Crossi	34	174	25%	26

* This factor relates average of the "peak eight hours" to the average of the "am and pm peak hours"

OVERALL WARRANT

150% Satisfied:	Yes [ ]	No [X]	Warrant for new intersection with forecast traffic
120% Satisfied:	Yes [ ]	No [X]	Warrant for existing intersection with forecast traffic
100% Satisfied:	Yes [ ]	No [X]	Warrant for existing intersection with existing traffic *
COMBO 80% Satisfied:	Yes [ ]	No [X]	Warrant for existing intersection with existing traffic
80% Satisfied:	Yes [ ]	No [X]	

* Consider full underground provisions if 100% for forecast traffi

WARRANT 1 - MINIMUM VEHICULAR VOLUME

APPROACH LANES	1		2 OR MORE		AVERAGE HOUR PERIOD
FLOW CONDITION	FREE FLOW	REST. FLOW	FREE FLOW X	REST. FLOW	
ALL APPROACHES	480	720	600	900	1258
	% FULFILLED				210%
APPROACH LANES	1		2 OR MORE		AVERAGE HOUR PERIOD
FLOW CONDITION	FREE FLOW	REST. FLOW	FREE FLOW X	REST. FLOW	
MINOR STREET APPROACHES	180	255	180	255	77
	% FULFILLED				43%

150% Satisfied:	Yes [ ]	No [X]
120% Satisfied:	Yes [ ]	No [X]
100% Satisfied:	Yes [ ]	No [X]
80% Satisfied:	Yes [ ]	No [X]

WARRANT 2 - DELAY TO CROSS TRAFFIC

APPROACH LANES	1		2 OR MORE		AVERAGE HOUR PERIOD
FLOW CONDITION	FREE FLOW	REST. FLOW	FREE FLOW X	REST. FLOW	
MAJOR STREET APPROACHES	480	720	600	900	1181
	% FULFILLED				197%
APPROACH LANES	1		2 OR MORE		AVERAGE HOUR PERIOD
FLOW CONDITION	FREE FLOW	REST. FLOW	FREE FLOW X	REST. FLOW	
TRAFFIC CROSSING MAJOR STREET	50	75	50	75	26
	% FULFILLED				52%

150% Satisfied:	Yes [ ]	No [X]
120% Satisfied:	Yes [ ]	No [X]
100% Satisfied:	Yes [ ]	No [X]
80% Satisfied:	Yes [ ]	No [X]

1A - MINIMUM VEHICULAR VOLUME: Total vehicle volume on all approaches for average day

1B - MINIMUM VEHICULAR VOLUME: Total vehicle volume on miNor streets

2A - DELAY TO CROSS TRAFFIC: Total vehicle volume on major street for average day

2B - DELAY TO CROSS TRAFFIC: Total vehicle and pedestrian volume crossing major street; comprising: (1) lefts from both miNor streets, (2) heaviest through from miNor street, (3) 50% of heavier left turn from major street when following criteria met: (a) left turn volume >120 and (b) left turn volume plus opposing volume > 720, (4) pedestrians crossing the major street.

Signal Warrant Calculation

Cole Engineering

Major Street: Highway 10/89

Minor Street: Street Y

Comment Future (2032) Total

Number of Approaches: 1 [ ] 2 [X]

Tee Intersection Configuration: Yes [X] No [ ]

Flow Condition: Free Flow (Rural) [X]
Restricted Flow (Urban) [ ]

VOLUME	AM	PM	FACTOR *	
1A - All	2,109	3,114	n/a	1,306
1B - MiNor	71	391	25%	116
2A - Major	2,038	2,723	25%	1,190
2B - Crossi	38	268	25%	38

* This factor relates average of the "peak eight hours" to the average of the "am and pm peak hours"

OVERALL WARRANT

150% Satisfied:	Yes [ ]	No [X]	Warrant for new intersection with forecast traffic
120% Satisfied:	Yes [ ]	No [X]	Warrant for existing intersection with forecast traffic
100% Satisfied:	Yes [ ]	No [X]	Warrant for existing intersection with existing traffic *
COMBO 80% Satisfied:	Yes [ ]	No [X]	Warrant for existing intersection with existing traffic
80% Satisfied:	Yes [ ]	No [X]	

* Consider full underground provisions if 100% for forecast traffi

WARRANT 1 - MINIMUM VEHICULAR VOLUME

APPROACH LANES	1		2 OR MORE		AVERAGE HOUR PERIOD
FLOW CONDITION	FREE FLOW	REST. FLOW	FREE FLOW X	REST. FLOW	
ALL APPROACHES	480	720	600	900	1306
	% FULFILLED				218%
APPROACH LANES	1		2 OR MORE		AVERAGE HOUR PERIOD
FLOW CONDITION	FREE FLOW	REST. FLOW	FREE FLOW X	REST. FLOW	
MINOR STREET APPROACHES	180	255	180	255	116
	% FULFILLED				64%

150% Satisfied:	Yes [ ]	No [X]
120% Satisfied:	Yes [ ]	No [X]
100% Satisfied:	Yes [ ]	No [X]
80% Satisfied:	Yes [ ]	No [X]

WARRANT 2 - DELAY TO CROSS TRAFFIC

APPROACH LANES	1		2 OR MORE		AVERAGE HOUR PERIOD
FLOW CONDITION	FREE FLOW	REST. FLOW	FREE FLOW X	REST. FLOW	
MAJOR STREET APPROACHES	480	720	600	900	1190
	% FULFILLED				198%
APPROACH LANES	1		2 OR MORE		AVERAGE HOUR PERIOD
FLOW CONDITION	FREE FLOW	REST. FLOW	FREE FLOW X	REST. FLOW	
TRAFFIC CROSSING MAJOR STREET	50	75	50	75	38
	% FULFILLED				77%

150% Satisfied:	Yes [ ]	No [X]
120% Satisfied:	Yes [ ]	No [X]
100% Satisfied:	Yes [ ]	No [X]
80% Satisfied:	Yes [ ]	No [X]

1A - MINIMUM VEHICULAR VOLUME: Total vehicle volume on all approaches for average day

1B - MINIMUM VEHICULAR VOLUME: Total vehicle volume on miNor streets

2A - DELAY TO CROSS TRAFFIC: Total vehicle volume on major street for average day

2B - DELAY TO CROSS TRAFFIC: Total vehicle and pedestrian volume crossing major street; comprising: (1) lefts from both miNor streets, (2) heaviest through from miNor street, (3) 50% of heavier left turn from major street when following criteria met: (a) left turn volume >120 and (b) left turn volume plus opposing volume > 720, (4) pedestrians crossing the major street.

Signal Warrant Calculation

Cole Engineering

Major Street: Highway 10/89

Minor Street: StreetZ / StreetY

Comment Future (2032) Total

Number of Approaches: 1 [ ] 2 [X]

Tee Intersection Configuration: Yes [ ] No [X]

Flow Condition: Free Flow (Rural) [X]
Restricted Flow (Urban) [ ]

VOLUME	AM	PM	FACTOR *	
1A - All	2,193	3,332	n/a	1,381
1B - MiNor	154	616	25%	193
2A - Major	2,039	2,716	25%	1,189
2B - Crossi	72	380	25%	57

* This factor relates average of the "peak eight hours" to the average of the "am and pm peak hours"

OVERALL WARRANT

150% Satisfied:	Yes [X]	No [ ]	Warrant for new intersection with forecast traffic
120% Satisfied:	Yes [X]	No [ ]	Warrant for existing intersection with forecast traffic
100% Satisfied:	Yes [X]	No [ ]	Warrant for existing intersection with existing traffic *
COMBO 80% Satisfied:	Yes [X]	No [ ]	Warrant for existing intersection with existing traffic
80% Satisfied:	Yes [X]	No [ ]	

* Consider full underground provisions if 100% for forecast traffi

WARRANT 1 - MINIMUM VEHICULAR VOLUME

APPROACH LANES	1		2 OR MORE		AVERAGE HOUR PERIOD
FLOW CONDITION	FREE FLOW	REST. FLOW	FREE FLOW X	REST. FLOW	
ALL APPROACHES	480	720	600	900	1381
	% FULFILLED				230%
APPROACH LANES	1		2 OR MORE		AVERAGE HOUR PERIOD
FLOW CONDITION	FREE FLOW	REST. FLOW	FREE FLOW X	REST. FLOW	
MINOR STREET APPROACHES	120	170	120	170	193
	% FULFILLED				160%

150% Satisfied:	Yes [X]	No [ ]
120% Satisfied:	Yes [X]	No [ ]
100% Satisfied:	Yes [X]	No [ ]
80% Satisfied:	Yes [X]	No [ ]

WARRANT 2 - DELAY TO CROSS TRAFFIC

APPROACH LANES	1		2 OR MORE		AVERAGE HOUR PERIOD
FLOW CONDITION	FREE FLOW	REST. FLOW	FREE FLOW X	REST. FLOW	
MAJOR STREET APPROACHES	480	720	600	900	1189
	% FULFILLED				198%
APPROACH LANES	1		2 OR MORE		AVERAGE HOUR PERIOD
FLOW CONDITION	FREE FLOW	REST. FLOW	FREE FLOW X	REST. FLOW	
TRAFFIC CROSSING MAJOR STREET	50	75	50	75	57
	% FULFILLED				113%

150% Satisfied:	Yes [ ]	No [X]
120% Satisfied:	Yes [ ]	No [X]
100% Satisfied:	Yes [X]	No [ ]
80% Satisfied:	Yes [X]	No [ ]

1A - MINIMUM VEHICULAR VOLUME: Total vehicle volume on all approaches for average day

1B - MINIMUM VEHICULAR VOLUME: Total vehicle volume on miNor streets

2A - DELAY TO CROSS TRAFFIC: Total vehicle volume on major street for average day

2B - DELAY TO CROSS TRAFFIC: Total vehicle and pedestrian volume crossing major street; comprising: (1) lefts from both miNor streets, (2) heaviest through from miNor street, (3) 50% of heavier left turn from major street when following criteria met: (a) left turn volume >120 and (b) left turn volume plus opposing volume > 720, (4) pedestrians crossing the major street.

Signal Warrant Calculation

Cole Engineering

Major Street: County Road 124

Minor Street: Street X

Comment Future (2032) Total

Number of Approaches: 1 [ ] 2 [X]

Tee Intersection Configuration: Yes [X] No [ ]

Flow Condition: Free Flow (Rural) [ ]
Restricted Flow (Urban) [X]

VOLUME	AM	PM	FACTOR *	
1A - All	1,234	1,640	n/a	719
1B - MiNor	47	248	25%	74
2A - Major	1,187	1,392	25%	645
2B - Crossi	11	69	25%	10

* This factor relates average of the "peak eight hours" to the average of the "am and pm peak hours"

OVERALL WARRANT

150% Satisfied:	Yes [ ]	No [X]	Warrant for new intersection with forecast traffic
120% Satisfied:	Yes [ ]	No [X]	Warrant for existing intersection with forecast traffic
100% Satisfied:	Yes [ ]	No [X]	Warrant for existing intersection with existing traffic *
COMBO 80% Satisfied:	Yes [ ]	No [X]	Warrant for existing intersection with existing traffic
80% Satisfied:	Yes [ ]	No [X]	

* Consider full underground provisions if 100% for forecast traffi

WARRANT 1 - MINIMUM VEHICULAR VOLUME

APPROACH LANES	1		2 OR MORE		AVERAGE HOUR PERIOD
FLOW CONDITION	FREE FLOW	REST. FLOW	FREE FLOW	REST. FLOW X	
ALL APPROACHES	480	720	600	900	719
	% FULFILLED				80%
APPROACH LANES	1		2 OR MORE		AVERAGE HOUR PERIOD
FLOW CONDITION	FREE FLOW	REST. FLOW	FREE FLOW	REST. FLOW X	
MINOR STREET APPROACHES	180	255	180	255	74
	% FULFILLED				29%

150% Satisfied:	Yes [ ]	No [X]
120% Satisfied:	Yes [ ]	No [X]
100% Satisfied:	Yes [ ]	No [X]
80% Satisfied:	Yes [ ]	No [X]

WARRANT 2 - DELAY TO CROSS TRAFFIC

APPROACH LANES	1		2 OR MORE		AVERAGE HOUR PERIOD
FLOW CONDITION	FREE FLOW	REST. FLOW	FREE FLOW	REST. FLOW X	
MAJOR STREET APPROACHES	480	720	600	900	645
	% FULFILLED				72%
APPROACH LANES	1		2 OR MORE		AVERAGE HOUR PERIOD
FLOW CONDITION	FREE FLOW	REST. FLOW	FREE FLOW	REST. FLOW X	
TRAFFIC CROSSING MAJOR STREET	50	75	50	75	10
	% FULFILLED				13%

150% Satisfied:	Yes [ ]	No [X]
120% Satisfied:	Yes [ ]	No [X]
100% Satisfied:	Yes [ ]	No [X]
80% Satisfied:	Yes [ ]	No [X]

1A - MINIMUM VEHICULAR VOLUME: Total vehicle volume on all approaches for average day

1B - MINIMUM VEHICULAR VOLUME: Total vehicle volume on miNor streets

2A - DELAY TO CROSS TRAFFIC: Total vehicle volume on major street for average day

2B - DELAY TO CROSS TRAFFIC: Total vehicle and pedestrian volume crossing major street; comprising: (1) lefts from both miNor streets, (2) heaviest through from miNor street, (3) 50% of heavier left turn from major street when following criteria met: (a) left turn volume >120 and (b) left turn volume plus opposing volume > 720, (4) pedestrians crossing the major street.

Signal Warrant Calculation

Cole Engineering

Major Street: County Road 124

Minor Street: Industrial Road

Comment Future (2032) Total

Number of Approaches: 1 [ ] 2 [X]

Tee Intersection Configuration: Yes [X] No [ ]

Flow Condition: Free Flow (Rural) [ ]
Restricted Flow (Urban) [X]

VOLUME	AM	PM	FACTOR *	
1A - All	1,205	1,511	n/a	679
1B - MiNor	23	114	25%	34
2A - Major	1,182	1,397	25%	645
2B - Crossi	11	69	25%	10

* This factor relates average of the "peak eight hours" to the average of the "am and pm peak hours"

OVERALL WARRANT

150% Satisfied:	Yes [ ]	No [X]	Warrant for new intersection with forecast traffic
120% Satisfied:	Yes [ ]	No [X]	Warrant for existing intersection with forecast traffic
100% Satisfied:	Yes [ ]	No [X]	Warrant for existing intersection with existing traffic *
COMBO 80% Satisfied:	Yes [ ]	No [X]	Warrant for existing intersection with existing traffic
80% Satisfied:	Yes [ ]	No [X]	

* Consider full underground provisions if 100% for forecast traffi

WARRANT 1 - MINIMUM VEHICULAR VOLUME

APPROACH LANES	1		2 OR MORE		AVERAGE HOUR PERIOD
FLOW CONDITION	FREE FLOW	REST. FLOW	FREE FLOW	REST. FLOW X	
ALL APPROACHES	480	720	600	900	679
	% FULFILLED				75%
APPROACH LANES	1		2 OR MORE		AVERAGE HOUR PERIOD
FLOW CONDITION	FREE FLOW	REST. FLOW	FREE FLOW	REST. FLOW X	
MINOR STREET APPROACHES	180	255	180	255	34
	% FULFILLED				13%

150% Satisfied:	Yes [ ]	No [X]
120% Satisfied:	Yes [ ]	No [X]
100% Satisfied:	Yes [ ]	No [X]
80% Satisfied:	Yes [ ]	No [X]

WARRANT 2 - DELAY TO CROSS TRAFFIC

APPROACH LANES	1		2 OR MORE		AVERAGE HOUR PERIOD
FLOW CONDITION	FREE FLOW	REST. FLOW	FREE FLOW	REST. FLOW X	
MAJOR STREET APPROACHES	480	720	600	900	645
	% FULFILLED				72%
APPROACH LANES	1		2 OR MORE		AVERAGE HOUR PERIOD
FLOW CONDITION	FREE FLOW	REST. FLOW	FREE FLOW	REST. FLOW X	
TRAFFIC CROSSING MAJOR STREET	50	75	50	75	10
	% FULFILLED				13%

150% Satisfied:	Yes [ ]	No [X]
120% Satisfied:	Yes [ ]	No [X]
100% Satisfied:	Yes [ ]	No [X]
80% Satisfied:	Yes [ ]	No [X]

1A - MINIMUM VEHICULAR VOLUME: Total vehicle volume on all approaches for average day

1B - MINIMUM VEHICULAR VOLUME: Total vehicle volume on miNor streets

2A - DELAY TO CROSS TRAFFIC: Total vehicle volume on major street for average day

2B - DELAY TO CROSS TRAFFIC: Total vehicle and pedestrian volume crossing major street; comprising: (1) lefts from both miNor streets, (2) heaviest through from miNor street, (3) 50% of heavier left turn from major street when following criteria met: (a) left turn volume >120 and (b) left turn volume plus opposing volume > 720, (4) pedestrians crossing the major street.

Signal Warrant Calculation

Cole Engineering

Major Street: County Road 124

Minor Street: Industrial Road / Street X

Comment Future (2032) Total

Number of Approaches: 1 [ ] 2 [X]

Tee Intersection Configuration: Yes [ ] No [X]

Flow Condition: Free Flow (Rural) [ ]
Restricted Flow (Urban) [X]

VOLUME	AM	PM	FACTOR *	
1A - All	1,276	1,713	n/a	747
1B - MiNor	70	362	25%	108
2A - Major	1,206	1,351	25%	639
2B - Crossi	37	204	25%	30

* This factor relates average of the "peak eight hours" to the average of the "am and pm peak hours"

OVERALL WARRANT

150% Satisfied:	Yes [ ]	No [X]	Warrant for new intersection with forecast traffic
120% Satisfied:	Yes [ ]	No [X]	Warrant for existing intersection with forecast traffic
100% Satisfied:	Yes [ ]	No [X]	Warrant for existing intersection with existing traffic *
COMBO 80% Satisfied:	Yes [ ]	No [X]	Warrant for existing intersection with existing traffic
80% Satisfied:	Yes [ ]	No [X]	

* Consider full underground provisions if 100% for forecast traffi

WARRANT 1 - MINIMUM VEHICULAR VOLUME

APPROACH LANES	1		2 OR MORE		AVERAGE HOUR PERIOD
FLOW CONDITION	FREE FLOW	REST. FLOW	FREE FLOW	REST. FLOW X	
ALL APPROACHES	480	720	600	900	747
	% FULFILLED				83%
APPROACH LANES	1		2 OR MORE		AVERAGE HOUR PERIOD
FLOW CONDITION	FREE FLOW	REST. FLOW	FREE FLOW	REST. FLOW X	
MINOR STREET APPROACHES	120	170	120	170	108
	% FULFILLED				64%

150% Satisfied:	Yes [ ]	No [X]
120% Satisfied:	Yes [ ]	No [X]
100% Satisfied:	Yes [ ]	No [X]
80% Satisfied:	Yes [ ]	No [X]

WARRANT 2 - DELAY TO CROSS TRAFFIC

APPROACH LANES	1		2 OR MORE		AVERAGE HOUR PERIOD
FLOW CONDITION	FREE FLOW	REST. FLOW	FREE FLOW	REST. FLOW X	
MAJOR STREET APPROACHES	480	720	600	900	639
	% FULFILLED				71%
APPROACH LANES	1		2 OR MORE		AVERAGE HOUR PERIOD
FLOW CONDITION	FREE FLOW	REST. FLOW	FREE FLOW	REST. FLOW X	
TRAFFIC CROSSING MAJOR STREET	50	75	50	75	30
	% FULFILLED				40%

150% Satisfied:	Yes [ ]	No [X]
120% Satisfied:	Yes [ ]	No [X]
100% Satisfied:	Yes [ ]	No [X]
80% Satisfied:	Yes [ ]	No [X]

1A - MINIMUM VEHICULAR VOLUME: Total vehicle volume on all approaches for average day

1B - MINIMUM VEHICULAR VOLUME: Total vehicle volume on miNor streets

2A - DELAY TO CROSS TRAFFIC: Total vehicle volume on major street for average day

2B - DELAY TO CROSS TRAFFIC: Total vehicle and pedestrian volume crossing major street; comprising: (1) lefts from both miNor streets, (2) heaviest through from miNor street, (3) 50% of heavier left turn from major street when following criteria met: (a) left turn volume >120 and (b) left turn volume plus opposing volume > 720, (4) pedestrians crossing the major street.

Signal Warrant Calculation

Cole Engineering

Major Street: County Road 11

Minor Street: School Road

Comment Future (2032) Total

Number of Approaches: 1 [ ] 2 [X]

Tee Intersection Configuration: Yes [ ] No [X]

Flow Condition: Free Flow (Rural) [ ]
Restricted Flow (Urban) [X]

VOLUME	AM	PM	FACTOR *	
1A - All	1,082	1,473	n/a	639
1B - MiNor	239	151	25%	98
2A - Major	843	1,322	25%	541
2B - Crossi	164	123	25%	36

* This factor relates average of the "peak eight hours" to the average of the "am and pm peak hours"

OVERALL WARRANT

150% Satisfied:	Yes [ ]	No [X]	Warrant for new intersection with forecast traffic
120% Satisfied:	Yes [ ]	No [X]	Warrant for existing intersection with forecast traffic
100% Satisfied:	Yes [ ]	No [X]	Warrant for existing intersection with existing traffic *
COMBO 80% Satisfied:	Yes [ ]	No [X]	Warrant for existing intersection with existing traffic
80% Satisfied:	Yes [ ]	No [X]	

* Consider full underground provisions if 100% for forecast traffi

WARRANT 1 - MINIMUM VEHICULAR VOLUME

APPROACH LANES	1		2 OR MORE		AVERAGE HOUR PERIOD
FLOW CONDITION	FREE FLOW	REST. FLOW	FREE FLOW	REST. FLOW X	
ALL APPROACHES	480	720	600	900	639
	% FULFILLED				71%
APPROACH LANES	1		2 OR MORE		AVERAGE HOUR PERIOD
FLOW CONDITION	FREE FLOW	REST. FLOW	FREE FLOW	REST. FLOW X	
MINOR STREET APPROACHES	120	170	120	170	98
	% FULFILLED				57%

150% Satisfied:	Yes [ ]	No [X]
120% Satisfied:	Yes [ ]	No [X]
100% Satisfied:	Yes [ ]	No [X]
80% Satisfied:	Yes [ ]	No [X]

WARRANT 2 - DELAY TO CROSS TRAFFIC

APPROACH LANES	1		2 OR MORE		AVERAGE HOUR PERIOD
FLOW CONDITION	FREE FLOW	REST. FLOW	FREE FLOW	REST. FLOW X	
MAJOR STREET APPROACHES	480	720	600	900	541
	% FULFILLED				60%
APPROACH LANES	1		2 OR MORE		AVERAGE HOUR PERIOD
FLOW CONDITION	FREE FLOW	REST. FLOW	FREE FLOW	REST. FLOW X	
TRAFFIC CROSSING MAJOR STREET	50	75	50	75	36
	% FULFILLED				48%

150% Satisfied:	Yes [ ]	No [X]
120% Satisfied:	Yes [ ]	No [X]
100% Satisfied:	Yes [ ]	No [X]
80% Satisfied:	Yes [ ]	No [X]

1A - MINIMUM VEHICULAR VOLUME: Total vehicle volume on all approaches for average day

1B - MINIMUM VEHICULAR VOLUME: Total vehicle volume on miNor streets

2A - DELAY TO CROSS TRAFFIC: Total vehicle volume on major street for average day

2B - DELAY TO CROSS TRAFFIC: Total vehicle and pedestrian volume crossing major street; comprising: (1) lefts from both miNor streets, (2) heaviest through from miNor street, (3) 50% of heavier left turn from major street when following criteria met: (a) left turn volume >120 and (b) left turn volume plus opposing volume > 720, (4) pedestrians crossing the major street.

APPENDIX D3
ROUNDABOUT (ARCADY) ANALYSIS

ARCADY 7

Version: 7.1.1.245 [9th June 2011]

For sales and distribution information, program advice and maintenance, contact TRL:
Tel: +44 (0)1344 770758 E-mail: software@trl.co.uk Web: http://www.trlsoftware.co.uk

File: C:\Users\hlo\Documents\References\shelburne\Centennial Road and Highway 10_89.arc7
Report generation date: 20/06/2012 3:08:35 PM

Summary of roundabout performance

	AM Peak Hour				PM Peak Hour			
	Queue (PCU)	Delay (min)	RFC	LOS	Queue (PCU)	Delay (min)	RFC	LOS
	(Default Analysis Set) - 2032 Full Build Out							
Arm 1	0.35	0.03	0.23	A	1.45	0.05	0.58	A
Arm 2	0.05	0.03	0.03	A	0.19	0.05	0.14	A
Arm 3	0.56	0.04	0.34	A	0.76	0.04	0.41	A

Values shown are the maximum values over all time segments. Delay is the maximum value of average delay per arriving vehicle.

2032 Full Build Out - PM Peak Hour runs from 08:00:00 to 09:30:00
2032 Full Build Out - AM Peak Hour runs from 08:00:00 to 09:30:00

File summary

File Description

Title	2032 Full Build Out Analysis
Location	Centennial Road and Highway 10/89
Site Number	
Date	27/02/2012
Version	
Status	(new file)
Identifier	
Client	
Jobnumber	
Enumerator	CEG
Description	

Analysis Options

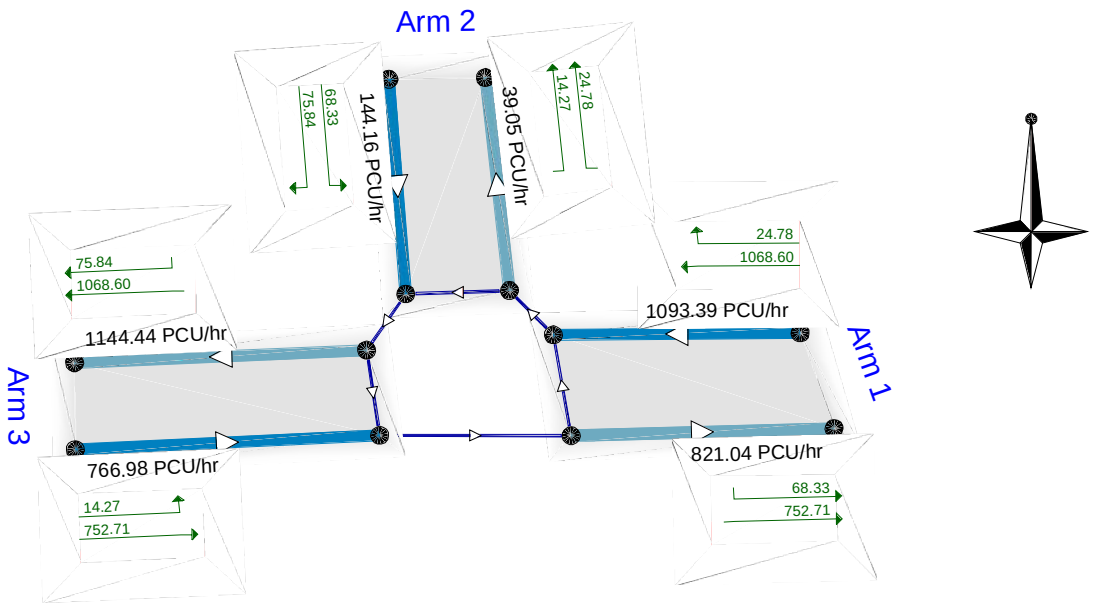
RFC Threshold	Vehicle Length (m)	Do Queue Variations
0.85	5.75	

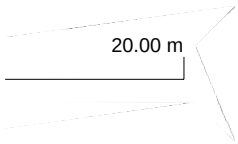
Sorting and Display

Show Arm Names	Arm Grouping	Sorting Direction	Sorting Type	Data Matrix Style	Time Style
	Order	Ascending	Numerical	By Destination	Absolute Time

Units

Distance Units	Speed Units	Traffic Units Input	Traffic Units Results	Flow Units	Average Delay Units	Total Delay Units	Rate Of Delay Units
m	kph	PCU	PCU	perHour	min	-Min	perMin





Turn Boxes - Entry Flow - PCU/hr
Entry Arm (Text A) - Entry Flow - PCU/hr
Exit Arm (Text B) - Exit Flow - PCU/hr

2032 Full Build Out Analysis
Current Time Segment: (8:00 AM-8:15 AM)
Analysis Set A1 - (Default Analysis Set), Demand Set D1 - 2032 Full Build Out, PM Peak Hour
Diagram produced using ARCADY 7 Diagram

The junction diagram reflects the last run of ARCADY.

A1 - (Default Analysis Set) - D1 - 2032 Full Build Out, PM Peak Hour

Data Errors and Warnings

No errors or warnings

Analysis Set Details

Name	Description	Include In Report	Use Specific Demand Set	Demand Set	Locked	Network Flow Scaling Factor (%)	Network Capacity Scaling Factor (%)	Reason For Scaling Factors
(Default Analysis Set)		Yes		(D1)		100.000	100.000	

Demand Set Details

Name	Scenario Name	Time Period Name	Description	Locked	Run Automatically	Use Relationship	Relationship	Start Time (HH:mm)	Finish Time (HH:mm)	Time Period Length (min)	Time Segment Length (min)	Traffic Profile Type
2032 Full Build Out, PM Peak Hour	2032 Full Build Out	PM Peak Hour			Yes			08:00	09:30	90	15	ONE HOUR

Roundabout Network

Roundabout Type(s)

ID	Name	Arm Order	Roundabout Type	Grade Separated	Large Roundabout	Do Geometric Delay
1	(untitled)	1,2,3	Standard			

Roundabout Network Options

Driving Side	Lighting	Road Surface	In London
Right	Normal/unknown	((Mini-roundabouts only))	

Arms

Arms

ID	Name	Description
1	Highway 10/89 East	
2	Centennial Road	
3	Highway 10/89 West	

Capacity Options

Arm	Minimum Capacity (PCU/hr)	Maximum Capacity (PCU/hr)	Assume Flat Start Profile	Initial Queue (PCU)
1	0.00	99999.00		0.00
2	0.00	99999.00		0.00
3	0.00	99999.00		0.00

Standard Geometry

Arm	V - Approach road half-width (m)	E - Entry width (m)	l' - Effective flare length (m)	R - Entry radius (m)	D - Inscribed circle diameter (m)	PHI - Conflict (entry) angle (deg)	Exit Only
1	7.00	12.00	10.00	70.00	50.00	30.00	
2	7.00	12.00	10.00	70.00	50.00	30.00	
3	7.00	12.00	10.00	70.00	50.00	30.00	

Pedestrian Crossings

Arm	Crossing Type
1	None
2	None
3	None

Arm Slope/ Intercept and Capacity

Slope and Intercept used in model

Arm	Enter Directly	Slope	Intercept (PCU/hr)	Final Slope	Final Intercept (PCU/hr)
1		((calculated))	((calculated))	0.826	2798.128
2		((calculated))	((calculated))	0.826	2798.128
3		((calculated))	((calculated))	0.826	2798.128

The slope and intercept shown above include any corrections and adjustments.

Traffic Flows

Demand Set Data Options

Default Vehicle Mix	Vehicle Mix Varies Over Time	Vehicle Mix Varies Over Turn	Vehicle Mix Varies Over Entry	Vehicle Mix Source	PCU Factor for a HV (PCU)	Default Turning Proportions	Estimate from entry/exit counts	Turning Proportions Vary Over Time	Turning Proportions Vary Over Turn	Turning Proportions Vary Over Entry
		Yes	Yes	HV Percentages	2.00				Yes	Yes

Entry Flows

General Flows Data

Arm	Profile Type	Use Turning Counts	Average Demand Flow (PCU/hr)	Flow Scaling Factor (%)	PHF
1	ONE HOUR		1456.00	100.000	N/A
2	ONE HOUR		192.00	100.000	N/A
3	ONE HOUR		1021.00	100.000	N/A

Direct/Resultant Flows

Direct Flows Data

Time Segment	Arm	Direct Demand Entry Flow (PCU/hr)	DirectDemandEntryFlowInPCU (PCU/hr)	Direct Demand Exit Flow (PCU/hr)	Direct Demand Pedestrian Flow (Ped/hr)
1	1	1096.15	1096.15	N/A	N/A
1	2	144.55	144.55	N/A	N/A
1	3	768.66	768.66	N/A	N/A
2	1	1308.91	1308.91	N/A	N/A
2	2	172.60	172.60	N/A	N/A
2	3	917.86	917.86	N/A	N/A
3	1	1603.09	1603.09	N/A	N/A
3	2	211.40	211.40	N/A	N/A
3	3	1124.14	1124.14	N/A	N/A
4	1	1603.09	1603.09	N/A	N/A
4	2	211.40	211.40	N/A	N/A
4	3	1124.14	1124.14	N/A	N/A
5	1	1308.91	1308.91	N/A	N/A
5	2	172.60	172.60	N/A	N/A
5	3	917.86	917.86	N/A	N/A
6	1	1096.15	1096.15	N/A	N/A
6	2	144.55	144.55	N/A	N/A
6	3	768.66	768.66	N/A	N/A

Turning Proportions

Turning Counts or Proportions (PCU/hr) - Roundabout 1 (for whole period)

		To		
		1	2	3
From	1	0.000	33.000	1423.000
	2	91.000	0.000	101.000
	3	1002.000	19.000	0.000

Turning Proportions (PCU) - Roundabout 1 (for whole period)

		To		
		1	2	3
From	1	0.00	0.02	0.98
	2	0.47	0.00	0.53
	3	0.98	0.02	0.00

Vehicle Mix

Average PCU Per Vehicle - Roundabout 1 (for whole period)

		To		
		1	2	3
From	1	1.000	1.130	1.070
	2	1.180	1.000	1.180
	3	1.080	1.130	1.000

Heavy Vehicle Percentages - Roundabout 1 (for whole period)

		To		
		1	2	3
From	1	0.000	13.000	7.000
	2	18.000	0.000	18.000
	3	8.000	13.000	0.000

ARCADY 7

Version: 7.1.1.245 [9th June 2011]

For sales and distribution information, program advice and maintenance, contact TRL:
Tel: +44 (0)1344 770758 E-mail: software@trl.co.uk Web: http://www.trlsoftware.co.uk

File: C:\Users\hlo\Documents\References\shelburne\Main Street and County Road 124.arc7
Report generation date: 20/06/2012 3:11:38 PM

Summary of roundabout performance

	AM Peak Hour				PM Peak			
	Queue (PCU)	Delay (min)	RFC	LOS	Queue (PCU)	Delay (min)	RFC	LOS
	(Default Analysis Set) - 2032 Full Build Out							
Arm 1	0.60	0.04	0.34	A	2.80	0.10	0.72	A
Arm 2	0.48	0.04	0.30	A	0.84	0.07	0.43	A
Arm 3	0.92	0.05	0.46	A	1.10	0.05	0.51	A
Arm 4	0.35	0.05	0.23	A	0.94	0.06	0.47	A

Values shown are the maximum values over all time segments. Delay is the maximum value of average delay per arriving vehicle.

2032 Full Build Out - AM Peak Hour runs from 08:00:00 to 09:30:00
2032 Full Build Out - PM Peak runs from 08:00:00 to 09:30:00

File summary

File Description

Title	2032 Full Build Out Analysis
Location	Highway 10/89 (Main) / County Road 124
Site Number	
Date	15/01/2012
Version	
Status	(new file)
Identifier	
Client	
Jobnumber	
Enumerator	CEG
Description	

Analysis Options

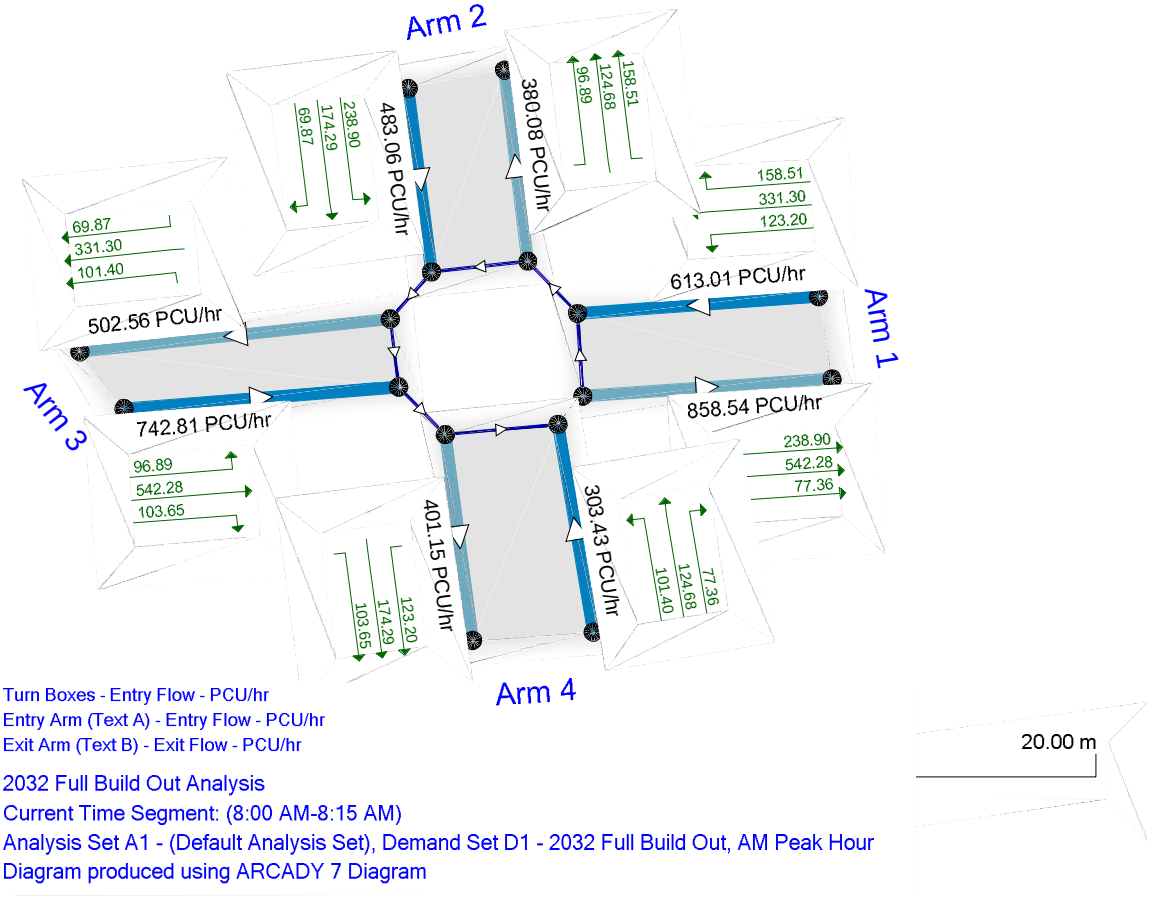
RFC Threshold	Vehicle Length (m)	Do Queue Variations
0.85	5.75	

Sorting and Display

Show Arm Names	Arm Grouping	Sorting Direction	Sorting Type	Data Matrix Style	Time Style
	Order	Ascending	Numerical	By Destination	Absolute Time

Units

Distance Units	Speed Units	Traffic Units Input	Traffic Units Results	Flow Units	Average Delay Units	Total Delay Units	Rate Of Delay Units
m	kph	PCU	PCU	perHour	min	-Min	perMin



The junction diagram reflects the last run of ARCADY.

A1 - (Default Analysis Set) - D1 - 2032 Full Build Out, AM Peak Hour

Data Errors and Warnings

No errors or warnings

Analysis Set Details

Name	Description	Include In Report	Use Specific Demand Set	Demand Set	Locked	Network Flow Scaling Factor (%)	Network Capacity Scaling Factor (%)	Reason For Scaling Factors
(Default Analysis Set)		Yes		(D1)		100.000	100.000	

Demand Set Details

Name	Scenario Name	Time Period Name	Description	Locked	Run Automatically	Use Relationship	Relationship	Start Time (HH:mm)	Finish Time (HH:mm)	Time Period Length (min)	Time Segment Length (min)	Traffic Profile Type
2032 Full Build Out, AM Peak Hour	2032 Full Build Out	AM Peak Hour			Yes			08:00	09:30	90	15	ONE HOUR

Roundabout Network

Roundabout Type(s)

ID	Name	Arm Order	Roundabout Type	Grade Separated	Large Roundabout	Do Geometric Delay
1	(untitled)	1,2,3,4	Standard			

Roundabout Network Options

Driving Side	Lighting	Road Surface	In London
Right	Normal/unknown	((Mini-roundabouts only))	

Arms

Arms

ID	Name	Description
1	Highway 10/89 (East Leg)	
2	County Road 124 North Leg	
3	Highway 10/89 (Main Street)	
4	County Road 11	

Capacity Options

Arm	Minimum Capacity (PCU/hr)	Maximum Capacity (PCU/hr)	Assume Flat Start Profile	Initial Queue (PCU)
1	0.00	99999.00		0.00
2	0.00	99999.00		0.00
3	0.00	99999.00		0.00
4	0.00	99999.00		0.00

Standard Geometry

Arm	V - Approach road half-width (m)	E - Entry width (m)	l' - Effective flare length (m)	R - Entry radius (m)	D - Inscribed circle diameter (m)	PHI - Conflict (entry) angle (deg)	Exit Only
1	7.00	12.00	20.00	70.00	50.00	30.00	
2	7.00	12.00	20.00	70.00	50.00	30.00	
3	7.00	12.00	20.00	70.00	50.00	30.00	
4	7.00	12.00	20.00	70.00	50.00	30.00	

Pedestrian Crossings

Arm	Crossing Type
1	None
2	None
3	None
4	None

Arm Slope/ Intercept and Capacity

Slope and Intercept used in model

Arm	Enter Directly	Slope	Intercept (PCU/hr)	Final Slope	Final Intercept (PCU/hr)
1		((calculated))	((calculated))	0.877	3066.148
2		((calculated))	((calculated))	0.877	3066.148
3		((calculated))	((calculated))	0.877	3066.148
4		((calculated))	((calculated))	0.877	3066.148

The slope and intercept shown above include any corrections and adjustments.

Traffic Flows

Demand Set Data Options

Default Vehicle Mix	Vehicle Mix Varies Over Time	Vehicle Mix Varies Over Turn	Vehicle Mix Varies Over Entry	Vehicle Mix Source	PCU Factor for a HV (PCU)	Default Turning Proportions	Estimate from entry/exit counts	Turning Proportions Vary Over Time	Turning Proportions Vary Over Turn	Turning Proportions Vary Over Entry
		Yes	Yes	HV Percentages	2.00				Yes	Yes

Entry Flows

General Flows Data

Arm	Profile Type	Use Turning Counts	Average Demand Flow (PCU/hr)	Flow Scaling Factor (%)	PHF
1	ONE HOUR		816.00	100.000	N/A
2	ONE HOUR		643.00	100.000	N/A
3	ONE HOUR		989.00	100.000	N/A
4	ONE HOUR		404.00	100.000	N/A

Direct/Resultant Flows

Direct Flows Data

Time Segment	Arm	Direct Demand Entry Flow (PCU/hr)	DirectDemandEntryFlowInPCU (PCU/hr)	Direct Demand Exit Flow (PCU/hr)	Direct Demand Pedestrian Flow (Ped/hr)
1	1	614.33	614.33	N/A	N/A
1	2	484.08	484.08	N/A	N/A
1	3	744.57	744.57	N/A	N/A
1	4	304.15	304.15	N/A	N/A
2	1	733.57	733.57	N/A	N/A
2	2	578.04	578.04	N/A	N/A
2	3	889.09	889.09	N/A	N/A
2	4	363.19	363.19	N/A	N/A
3	1	898.43	898.43	N/A	N/A
3	2	707.96	707.96	N/A	N/A
3	3	1088.91	1088.91	N/A	N/A
3	4	444.81	444.81	N/A	N/A
4	1	898.43	898.43	N/A	N/A
4	2	707.96	707.96	N/A	N/A
4	3	1088.91	1088.91	N/A	N/A
4	4	444.81	444.81	N/A	N/A
5	1	733.57	733.57	N/A	N/A
5	2	578.04	578.04	N/A	N/A
5	3	889.09	889.09	N/A	N/A
5	4	363.19	363.19	N/A	N/A
6	1	614.33	614.33	N/A	N/A
6	2	484.08	484.08	N/A	N/A
6	3	744.57	744.57	N/A	N/A
6	4	304.15	304.15	N/A	N/A

Turning Proportions

Turning Counts or Proportions (PCU/hr) - Roundabout 1 (for whole period)

		To			
		1	2	3	4
From	1	0.000	211.000	441.000	164.000
	2	318.000	0.000	93.000	232.000
	3	722.000	129.000	0.000	138.000
	4	103.000	166.000	135.000	0.000

Turning Proportions (PCU) - Roundabout 1 (for whole period)

		To			
		1	2	3	4
From	1	0.00	0.26	0.54	0.20
	2	0.49	0.00	0.14	0.36
	3	0.73	0.13	0.00	0.14
	4	0.25	0.41	0.33	0.00

Vehicle Mix

Average PCU Per Vehicle - Roundabout 1 (for whole period)

		To			
		1	2	3	4
From	1	1.000	1.230	1.150	1.120
	2	1.140	1.000	1.100	1.070
	3	1.090	1.080	1.000	1.140
	4	1.260	1.080	1.260	1.000

Heavy Vehicle Percentages - Roundabout 1 (for whole period)

		To			
		1	2	3	4
From	1	0.000	23.000	15.000	12.000
	2	14.000	0.000	10.000	7.000
	3	9.000	8.000	0.000	14.000
	4	26.000	8.000	26.000	0.000

ARCADY 7

Version: 7.1.1.245 [9th June 2011]

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File: C:\Users\hlo\Documents\References\shelburne\Street Z and Highway 10.arc7
Report generation date: 20/06/2012 3:13:38 PM

Summary of roundabout performance

	AM Peak Hour				PM Peak			
	Queue (PCU)	Delay (min)	RFC	LOS	Queue (PCU)	Delay (min)	RFC	LOS
	(Default Analysis Set) - 2032 Full Build Out							
Arm 1	0.50	0.03	0.30	A	1.43	0.05	0.57	A
Arm 2	0.79	0.04	0.42	A	0.91	0.04	0.45	A
Arm 3	0.05	0.03	0.05	A	0.14	0.03	0.12	A

Values shown are the maximum values over all time segments. Delay is the maximum value of average delay per arriving vehicle.

2032 Full Build Out - AM Peak Hour runs from 08:00:00 to 09:30:00
2032 Full Build Out - PM Peak runs from 08:00:00 to 09:30:00

File summary

File Description

Title	2032 Full Build Out Analysis
Location	Highway 10/89 and Street Z
Site Number	
Date	15/01/2012
Version	
Status	(new file)
Identifier	
Client	
Jobnumber	
Enumerator	CEG
Description	

Analysis Options

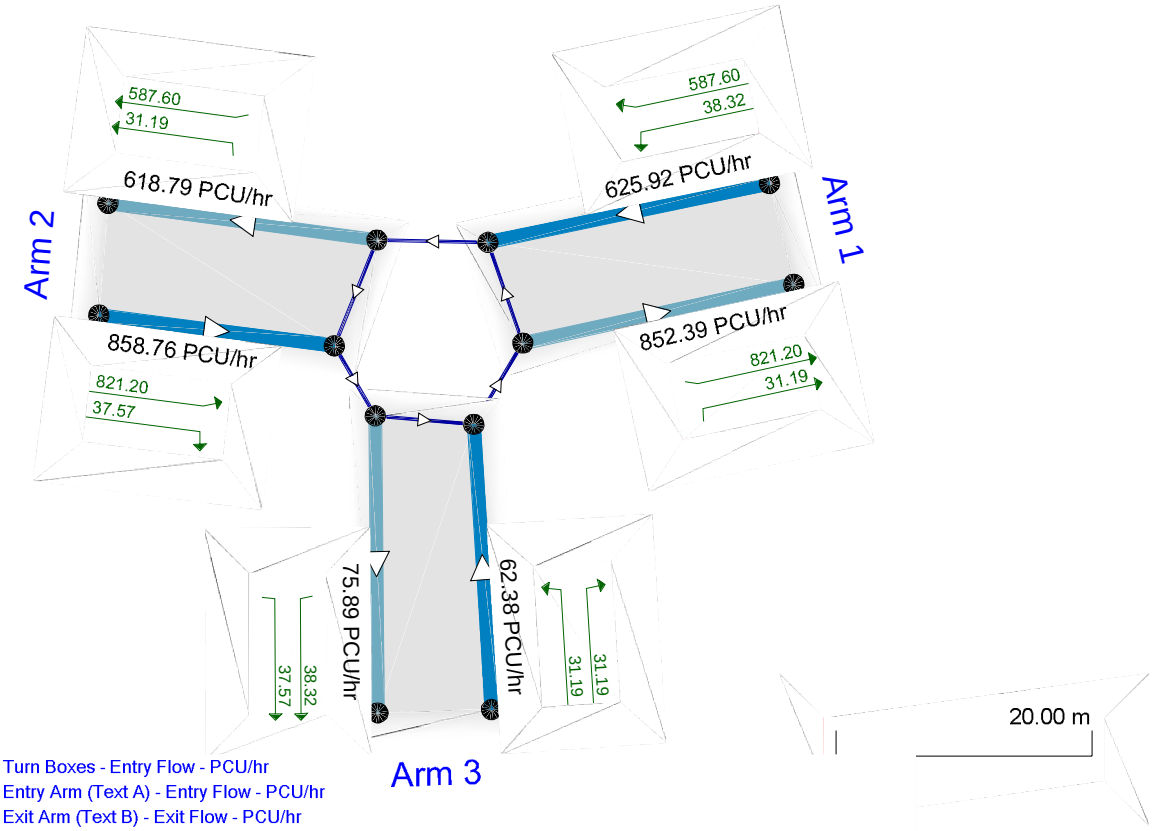
RFC Threshold	Vehicle Length (m)	Do Queue Variations
0.85	5.75	

Sorting and Display

Show Arm Names	Arm Grouping	Sorting Direction	Sorting Type	Data Matrix Style	Time Style
	Order	Ascending	Numerical	By Destination	Absolute Time

Units

Distance Units	Speed Units	Traffic Units Input	Traffic Units Results	Flow Units	Average Delay Units	Total Delay Units	Rate Of Delay Units
m	kph	PCU	PCU	perHour	min	-Min	perMin



The junction diagram reflects the last run of ARCADY.

A1 - (Default Analysis Set) - D1 - 2032 Full Build Out, AM Peak Hour

Data Errors and Warnings

No errors or warnings

Analysis Set Details

Name	Description	Include In Report	Use Specific Demand Set	Demand Set	Locked	Network Flow Scaling Factor (%)	Network Capacity Scaling Factor (%)	Reason For Scaling Factors
(Default Analysis Set)		Yes		(D1)		100.000	100.000	

Demand Set Details

Name	Scenario Name	Time Period Name	Description	Locked	Run Automatically	Use Relationship	Relationship	Start Time (HH:mm)	Finish Time (HH:mm)	Time Period Length (min)	Time Segment Length (min)	Traffic Profile Type
2032 Full Build Out, AM Peak Hour	2032 Full Build Out	AM Peak Hour			Yes			08:00	09:30	90	15	ONE HOUR

Roundabout Network

Roundabout Type(s)

ID	Name	Arm Order	Roundabout Type	Grade Separated	Large Roundabout	Do Geometric Delay
1	(untitled)	1,2,3	Standard			

Roundabout Network Options

Driving Side	Lighting	Road Surface	In London
Right	Normal/unknown	((Mini-roundabouts only))	

Arms

Arms

ID	Name	Description
1	Highway 10/89 East Leg	
2	Street Z	
3	Highway 10/89 East Leg	

Capacity Options

Arm	Minimum Capacity (PCU/hr)	Maximum Capacity (PCU/hr)	Assume Flat Start Profile	Initial Queue (PCU)
1	0.00	99999.00		0.00
2	0.00	99999.00		0.00
3	0.00	99999.00		0.00

Standard Geometry

Arm	V - Approach road half-width (m)	E - Entry width (m)	l' - Effective flare length (m)	R - Entry radius (m)	D - Inscribed circle diameter (m)	PHI - Conflict (entry) angle (deg)	Exit Only
1	7.00	12.00	20.00	70.00	50.00	30.00	
2	7.00	12.00	20.00	70.00	50.00	30.00	
3	7.00	12.00	20.00	70.00	50.00	30.00	

Pedestrian Crossings

Arm	Crossing Type
1	None
2	None
3	None

Arm Slope/ Intercept and Capacity

Slope and Intercept used in model

Arm	Enter Directly	Slope	Intercept (PCU/hr)	Final Slope	Final Intercept (PCU/hr)
1		((calculated))	((calculated))	0.877	3066.148
2		((calculated))	((calculated))	0.877	3066.148
3		((calculated))	((calculated))	0.877	3066.148

The slope and intercept shown above include any corrections and adjustments.

.

Traffic Flows

Demand Set Data Options

Default Vehicle Mix	Vehicle Mix Varies Over Time	Vehicle Mix Varies Over Turn	Vehicle Mix Varies Over Entry	Vehicle Mix Source	PCU Factor for a HV (PCU)	Default Turning Proportions	Estimate from entry/exit counts	Turning Proportions Vary Over Time	Turning Proportions Vary Over Turn	Turning Proportions Vary Over Entry
		Yes	Yes	HV Percentages	2.00				Yes	Yes

Entry Flows

General Flows Data

Arm	Profile Type	Use Turning Counts	Average Demand Flow (PCU/hr)	Flow Scaling Factor (%)	PHF
1	ONE HOUR		833.00	100.000	N/A
2	ONE HOUR		1143.00	100.000	N/A
3	ONE HOUR		83.00	100.000	N/A

Direct/Resultant Flows

Direct Flows Data

Time Segment	Arm	Direct Demand Entry Flow (PCU/hr)	DirectDemandEntryFlowInPCU (PCU/hr)	Direct Demand Exit Flow (PCU/hr)	Direct Demand Pedestrian Flow (Ped/hr)
1	1	627.13	627.13	N/A	N/A
1	2	860.51	860.51	N/A	N/A
1	3	62.49	62.49	N/A	N/A
2	1	748.85	748.85	N/A	N/A
2	2	1027.53	1027.53	N/A	N/A
2	3	74.62	74.62	N/A	N/A
3	1	917.15	917.15	N/A	N/A
3	2	1258.47	1258.47	N/A	N/A
3	3	91.38	91.38	N/A	N/A
4	1	917.15	917.15	N/A	N/A
4	2	1258.47	1258.47	N/A	N/A
4	3	91.38	91.38	N/A	N/A
5	1	748.85	748.85	N/A	N/A
5	2	1027.53	1027.53	N/A	N/A
5	3	74.62	74.62	N/A	N/A
6	1	627.13	627.13	N/A	N/A
6	2	860.51	860.51	N/A	N/A
6	3	62.49	62.49	N/A	N/A

Turning Proportions

Turning Counts or Proportions (PCU/hr) - Roundabout 1 (for whole period)

		To		
		1	2	3
From	1	0.000	782.000	51.000
	2	1093.000	0.000	50.000
	3	49.000	49.000	0.000

Turning Proportions (PCU) - Roundabout 1 (for whole period)

		To		
		1	2	3
From	1	0.00	0.94	0.06
	2	0.96	0.00	0.04
	3	0.50	0.50	0.00

Vehicle Mix

Average PCU Per Vehicle - Roundabout 1 (for whole period)

		To		
		1	2	3
From	1	1.000	1.170	1.000
	2	1.110	1.000	1.000
	3	1.000	1.000	1.000

Heavy Vehicle Percentages - Roundabout 1 (for whole period)

		To		
		1	2	3
From	1	0.000	17.000	0.000
	2	11.000	0.000	0.000
	3	0.000	0.000	0.000

ARCADY 7

Version: 7.1.1.245 [9th June 2011]

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File: C:\Users\hlo\Documents\References\shelburne\Street Y and Highway 10.arc7
Report generation date: 20/06/2012 3:15:13 PM

Summary of roundabout performance

	AM Peak Hour				PM Peak Hour			
	Queue (PCU)	Delay (min)	RFC	LOS	Queue (PCU)	Delay (min)	RFC	LOS
	(Default Analysis Set) - 2032 Full Build Out							
Arm 1	0.56	0.04	0.33	A	1.71	0.06	0.61	A
Arm 2	0.04	0.03	0.03	A	0.39	0.05	0.27	A
Arm 3	0.78	0.04	0.41	A	1.18	0.05	0.52	A

Values shown are the maximum values over all time segments. Delay is the maximum value of average delay per arriving vehicle.

2032 Full Build Out - PM Peak Hour runs from 08:00:00 to 09:30:00
2032 Full Build Out - AM Peak Hour runs from 08:00:00 to 09:30:00

File summary

File Description

Title	2032 Full Build Out Analysis
Location	Street Y and Highway 10/89
Site Number	
Date	27/02/2012
Version	
Status	(new file)
Identifier	
Client	
Jobnumber	
Enumerator	CEG
Description	

Analysis Options

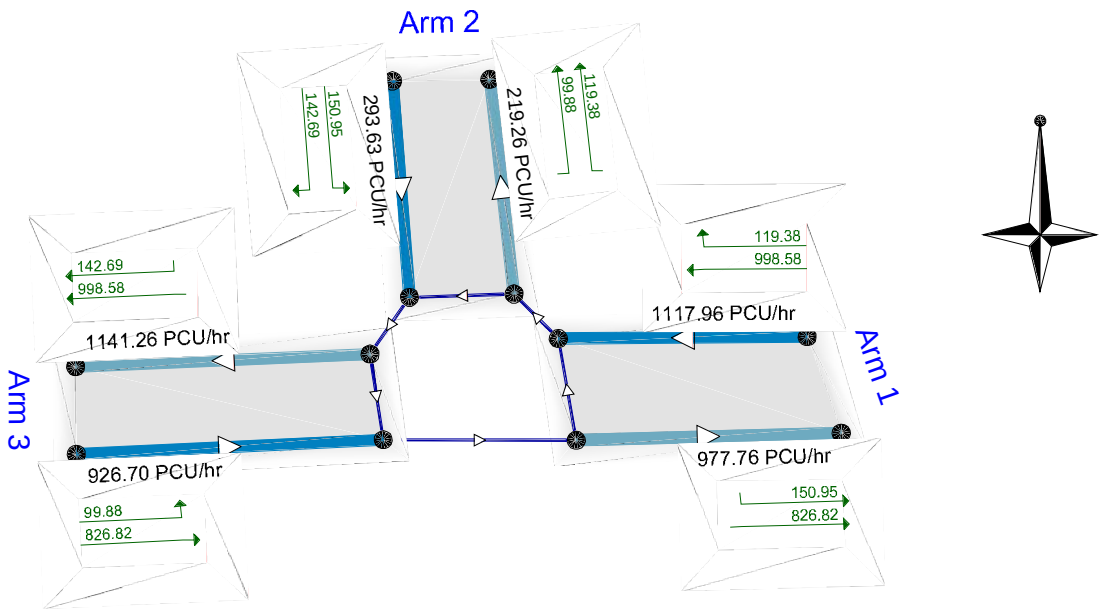
RFC Threshold	Vehicle Length (m)	Do Queue Variations
0.85	5.75	

Sorting and Display

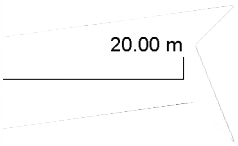
Show Arm Names	Arm Grouping	Sorting Direction	Sorting Type	Data Matrix Style	Time Style
	Order	Ascending	Numerical	By Destination	Absolute Time

Units

Distance Units	Speed Units	Traffic Units Input	Traffic Units Results	Flow Units	Average Delay Units	Total Delay Units	Rate Of Delay Units
m	kph	PCU	PCU	perHour	min	-Min	perMin



Turn Boxes - Entry Flow - PCU/hr
Entry Arm (Text A) - Entry Flow - PCU/hr
Exit Arm (Text B) - Exit Flow - PCU/hr



2032 Full Build Out Analysis
Current Time Segment: (8:00 AM-8:15 AM)
Analysis Set A1 - (Default Analysis Set), Demand Set D1 - 2032 Full Build Out, PM Peak Hour
Diagram produced using ARCADY 7 Diagram

The junction diagram reflects the last run of ARCADY.

A1 - (Default Analysis Set) - D1 - 2032 Full Build Out, PM Peak Hour

Data Errors and Warnings

No errors or warnings

Analysis Set Details

Name	Description	Include In Report	Use Specific Demand Set	Demand Set	Locked	Network Flow Scaling Factor (%)	Network Capacity Scaling Factor (%)	Reason For Scaling Factors
(Default Analysis Set)		Yes		(D1)		100.000	100.000	

Demand Set Details

Name	Scenario Name	Time Period Name	Description	Locked	Run Automatically	Use Relationship	Relationship	Start Time (HH:mm)	Finish Time (HH:mm)	Time Period Length (min)	Time Segment Length (min)	Traffic Profile Type
2032 Full Build Out, PM Peak Hour	2032 Full Build Out	PM Peak Hour			Yes			08:00	09:30	90	15	ONE HOUR

Roundabout Network

Roundabout Type(s)

ID	Name	Arm Order	Roundabout Type	Grade Separated	Large Roundabout	Do Geometric Delay
1	(untitled)	1,2,3	Standard			

Roundabout Network Options

Driving Side	Lighting	Road Surface	In London
Right	Normal/unknown	((Mini-roundabouts only))	

Arms

Arms

ID	Name	Description
1	Highway 10/89 East	
2	Street Z	
3	Highway 10/89 West	

Capacity Options

Arm	Minimum Capacity (PCU/hr)	Maximum Capacity (PCU/hr)	Assume Flat Start Profile	Initial Queue (PCU)
1	0.00	99999.00		0.00
2	0.00	99999.00		0.00
3	0.00	99999.00		0.00

Standard Geometry

Arm	V - Approach road half-width (m)	E - Entry width (m)	l' - Effective flare length (m)	R - Entry radius (m)	D - Inscribed circle diameter (m)	PHI - Conflict (entry) angle (deg)	Exit Only
1	7.00	12.00	10.00	70.00	50.00	30.00	
2	7.00	12.00	10.00	70.00	50.00	30.00	
3	7.00	12.00	10.00	70.00	50.00	30.00	

Pedestrian Crossings

Arm	Crossing Type
1	None
2	None
3	None

Arm Slope/ Intercept and Capacity

Slope and Intercept used in model

Arm	Enter Directly	Slope	Intercept (PCU/hr)	Final Slope	Final Intercept (PCU/hr)
1		((calculated))	((calculated))	0.826	2798.128
2		((calculated))	((calculated))	0.826	2798.128
3		((calculated))	((calculated))	0.826	2798.128

The slope and intercept shown above include any corrections and adjustments.

Traffic Flows

Demand Set Data Options

Default Vehicle Mix	Vehicle Mix Varies Over Time	Vehicle Mix Varies Over Turn	Vehicle Mix Varies Over Entry	Vehicle Mix Source	PCU Factor for a HV (PCU)	Default Turning Proportions	Estimate from entry/exit counts	Turning Proportions Vary Over Time	Turning Proportions Vary Over Turn	Turning Proportions Vary Over Entry
		Yes	Yes	HV Percentages	2.00				Yes	Yes

Entry Flows

General Flows Data

Arm	Profile Type	Use Turning Counts	Average Demand Flow (PCU/hr)	Flow Scaling Factor (%)	PHF
1	ONE HOUR		1489.00	100.000	N/A
2	ONE HOUR		391.00	100.000	N/A
3	ONE HOUR		1234.00	100.000	N/A

Direct/Resultant Flows

Direct Flows Data

Time Segment	Arm	Direct Demand Entry Flow (PCU/hr)	DirectDemandEntryFlowInPCU (PCU/hr)	Direct Demand Exit Flow (PCU/hr)	Direct Demand Pedestrian Flow (Ped/hr)
1	1	1121.00	1121.00	N/A	N/A
1	2	294.37	294.37	N/A	N/A
1	3	929.02	929.02	N/A	N/A
2	1	1338.58	1338.58	N/A	N/A
2	2	351.50	351.50	N/A	N/A
2	3	1109.34	1109.34	N/A	N/A
3	1	1639.42	1639.42	N/A	N/A
3	2	430.50	430.50	N/A	N/A
3	3	1358.66	1358.66	N/A	N/A
4	1	1639.42	1639.42	N/A	N/A
4	2	430.50	430.50	N/A	N/A
4	3	1358.66	1358.66	N/A	N/A
5	1	1338.58	1338.58	N/A	N/A
5	2	351.50	351.50	N/A	N/A
5	3	1109.34	1109.34	N/A	N/A
6	1	1121.00	1121.00	N/A	N/A
6	2	294.37	294.37	N/A	N/A
6	3	929.02	929.02	N/A	N/A

Turning Proportions

Turning Counts or Proportions (PCU/hr) - Roundabout 1 (for whole period)

		To		
		1	2	3
From	1	0.000	159.000	1330.000
	2	201.000	0.000	190.000
	3	1101.000	133.000	0.000

Turning Proportions (PCU) - Roundabout 1 (for whole period)

		To		
		1	2	3
From	1	0.00	0.11	0.89
	2	0.51	0.00	0.49
	3	0.89	0.11	0.00

Vehicle Mix

Average PCU Per Vehicle - Roundabout 1 (for whole period)

		To		
		1	2	3
From	1	1.000	1.050	1.090
	2	1.050	1.000	1.050
	3	1.100	1.050	1.000

Heavy Vehicle Percentages - Roundabout 1 (for whole period)

		To		
		1	2	3
From	1	0.000	5.000	9.000
	2	5.000	0.000	5.000
	3	10.000	5.000	0.000

ARCADY 7

Version: 7.1.1.245 [9th June 2011]

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File: C:\Users\hlo\Documents\References\shelburne\Street Y_Street Z and Highway 10.arc7
Report generation date: 20/06/2012 3:16:26 PM

Summary of roundabout performance

	AM Peak Hour				PM Peak Hour			
	Queue (PCU)	Delay (min)	RFC	LOS	Queue (PCU)	Delay (min)	RFC	LOS
	(Default Analysis Set) - 2032 Full Build Out							
Arm 1	0.60	0.04	0.34	A	1.92	0.07	0.64	A
Arm 2	0.04	0.03	0.03	A	0.42	0.06	0.29	A
Arm 3	0.68	0.04	0.38	A	1.02	0.05	0.49	A
Arm 4	0.04	0.03	0.04	A	0.16	0.04	0.14	A

Values shown are the maximum values over all time segments. Delay is the maximum value of average delay per arriving vehicle.

2032 Full Build Out - PM Peak Hour runs from 08:00:00 to 09:30:00
2032 Full Build Out - AM Peak Hour runs from 08:00:00 to 09:30:00

File summary

File Description

Title	2032 Full Build Out Analysis
Location	Street Y_Street Z and Highway 10/89
Site Number	
Date	12/01/2012
Version	
Status	(new file)
Identifier	
Client	
Jobnumber	
Enumerator	CEG
Description	

Analysis Options

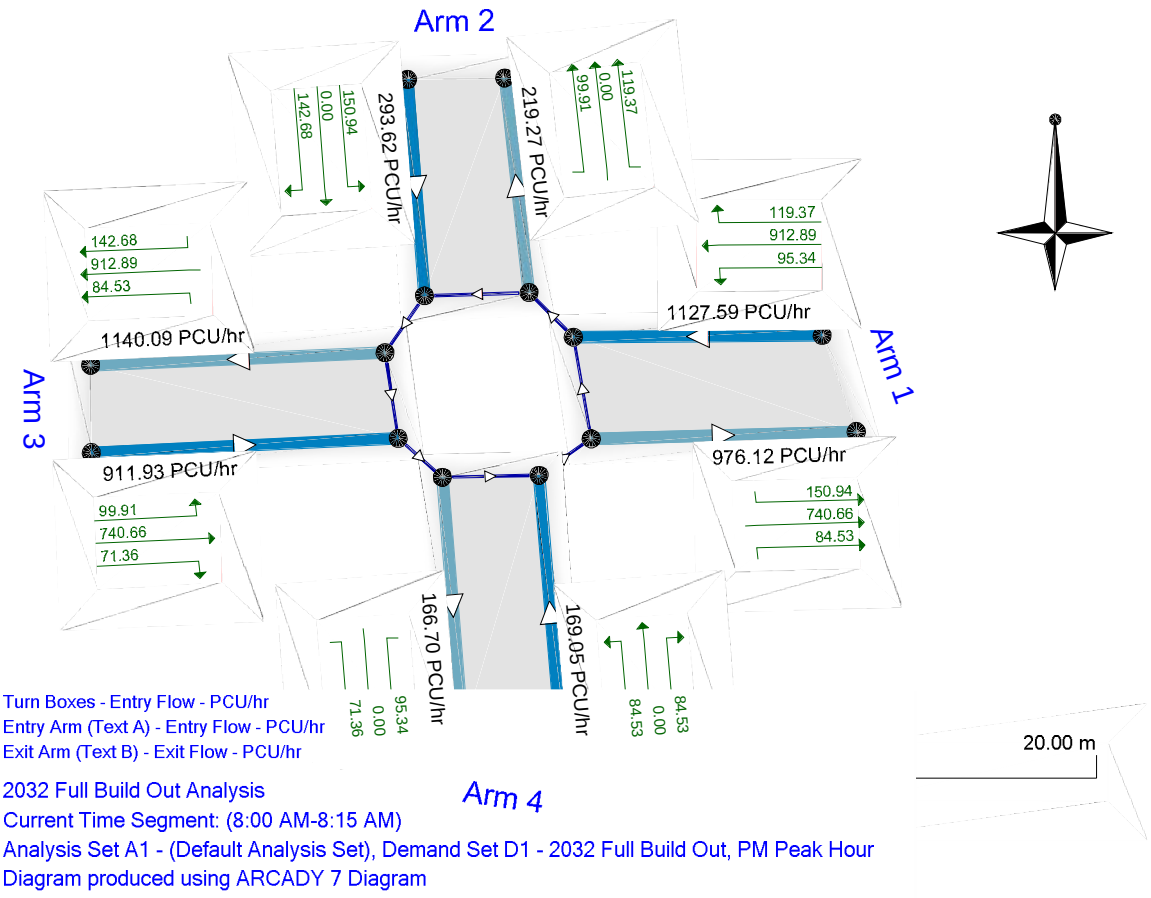
RFC Threshold	Vehicle Length (m)	Do Queue Variations
0.85	5.75	

Sorting and Display

Show Arm Names	Arm Grouping	Sorting Direction	Sorting Type	Data Matrix Style	Time Style
	Order	Ascending	Numerical	By Destination	Absolute Time

Units

Distance Units	Speed Units	Traffic Units Input	Traffic Units Results	Flow Units	Average Delay Units	Total Delay Units	Rate Of Delay Units
m	kph	PCU	PCU	perHour	min	-Min	perMin



The junction diagram reflects the last run of ARCADY.

A1 - (Default Analysis Set) - D1 - 2032 Full Build Out, PM Peak Hour

Data Errors and Warnings

No errors or warnings

Analysis Set Details

Name	Description	Include In Report	Use Specific Demand Set	Demand Set	Locked	Network Flow Scaling Factor (%)	Network Capacity Scaling Factor (%)	Reason For Scaling Factors
(Default Analysis Set)		Yes		(D1)		100.000	100.000	

Demand Set Details

Name	Scenario Name	Time Period Name	Description	Locked	Run Automatically	Use Relationship	Relationship	Start Time (HH:mm)	Finish Time (HH:mm)	Time Period Length (min)	Time Segment Length (min)	Traffic Profile Type
2032 Full Build Out, PM Peak Hour	2032 Full Build Out	PM Peak Hour			Yes			08:00	09:30	90	15	ONE HOUR

Roundabout Network

Roundabout Type(s)

ID	Name	Arm Order	Roundabout Type	Grade Separated	Large Roundabout	Do Geometric Delay
1	(untitled)	1,2,3,4	Standard			

Roundabout Network Options

Driving Side	Lighting	Road Surface	In London
Right	Normal/unknown	((Mini-roundabouts only))	

Arms

Arms

ID	Name	Description
1	Highway 10/89 East	
2	Street Y	
3	Highway 10/89 West	
4	Street Z	

Capacity Options

Arm	Minimum Capacity (PCU/hr)	Maximum Capacity (PCU/hr)	Assume Flat Start Profile	Initial Queue (PCU)
1	0.00	99999.00		0.00
2	0.00	99999.00		0.00
3	0.00	99999.00		0.00
4	0.00	99999.00		0.00

Standard Geometry

Arm	V - Approach road half-width (m)	E - Entry width (m)	l' - Effective flare length (m)	R - Entry radius (m)	D - Inscribed circle diameter (m)	PHI - Conflict (entry) angle (deg)	Exit Only
1	7.00	12.00	10.00	70.00	50.00	30.00	
2	7.00	12.00	10.00	70.00	50.00	30.00	
3	7.00	12.00	20.00	70.00	50.00	30.00	
4	7.00	12.00	20.00	70.00	50.00	30.00	

Pedestrian Crossings

Arm	Crossing Type
1	None
2	None
3	None
4	None

Arm Slope/ Intercept and Capacity

Slope and Intercept used in model

Arm	Enter Directly	Slope	Intercept (PCU/hr)	Final Slope	Final Intercept (PCU/hr)
1		((calculated))	((calculated))	0.826	2798.128
2		((calculated))	((calculated))	0.826	2798.128
3		((calculated))	((calculated))	0.877	3066.148
4		((calculated))	((calculated))	0.877	3066.148

The slope and intercept shown above include any corrections and adjustments.

Traffic Flows

Demand Set Data Options

Default Vehicle Mix	Vehicle Mix Varies Over Time	Vehicle Mix Varies Over Turn	Vehicle Mix Varies Over Entry	Vehicle Mix Source	PCU Factor for a HV (PCU)	Default Turning Proportions	Estimate from entry/exit counts	Turning Proportions Vary Over Time	Turning Proportions Vary Over Turn	Turning Proportions Vary Over Entry
		Yes	Yes	HV Percentages	2.00				Yes	Yes

Entry Flows

General Flows Data

Arm	Profile Type	Use Turning Counts	Average Demand Flow (PCU/hr)	Flow Scaling Factor (%)	PHF
1	ONE HOUR		1502.00	100.000	N/A
2	ONE HOUR		391.00	100.000	N/A
3	ONE HOUR		1214.00	100.000	N/A
4	ONE HOUR		225.00	100.000	N/A

Direct/Resultant Flows

Direct Flows Data

Time Segment	Arm	Direct Demand Entry Flow (PCU/hr)	DirectDemandEntryFlowInPCU (PCU/hr)	Direct Demand Exit Flow (PCU/hr)	Direct Demand Pedestrian Flow (Ped/hr)
1	1	1130.78	1130.78	N/A	N/A
1	2	294.37	294.37	N/A	N/A
1	3	913.96	913.96	N/A	N/A
1	4	169.39	169.39	N/A	N/A
2	1	1350.27	1350.27	N/A	N/A
2	2	351.50	351.50	N/A	N/A
2	3	1091.36	1091.36	N/A	N/A
2	4	202.27	202.27	N/A	N/A
3	1	1653.73	1653.73	N/A	N/A
3	2	430.50	430.50	N/A	N/A
3	3	1336.64	1336.64	N/A	N/A
3	4	247.73	247.73	N/A	N/A
4	1	1653.73	1653.73	N/A	N/A
4	2	430.50	430.50	N/A	N/A
4	3	1336.64	1336.64	N/A	N/A
4	4	247.73	247.73	N/A	N/A
5	1	1350.27	1350.27	N/A	N/A
5	2	351.50	351.50	N/A	N/A
5	3	1091.36	1091.36	N/A	N/A
5	4	202.27	202.27	N/A	N/A
6	1	1130.78	1130.78	N/A	N/A
6	2	294.37	294.37	N/A	N/A
6	3	913.96	913.96	N/A	N/A
6	4	169.39	169.39	N/A	N/A

Turning Proportions

Turning Counts or Proportions (PCU/hr) - Roundabout 1 (for whole period)

		To			
		1	2	3	4
From	1	0.000	159.000	1216.000	127.000
	2	201.000	0.000	190.000	0.000
	3	986.000	133.000	0.000	95.000
	4	115.000	0.000	115.000	0.000

Turning Proportions (PCU) - Roundabout 1 (for whole period)

		To			
		1	2	3	4
From	1	0.00	0.11	0.81	0.08
	2	0.51	0.00	0.49	0.00
	3	0.81	0.11	0.00	0.08
	4	0.50	0.00	0.50	0.00

Vehicle Mix

Average PCU Per Vehicle - Roundabout 1 (for whole period)

		To			
		1	2	3	4
From	1	1.000	1.020	1.090	1.000
	2	1.020	1.000	1.020	1.000
	3	1.100	1.020	1.000	1.000
	4	1.000	1.020	1.030	1.000

Heavy Vehicle Percentages - Roundabout 1 (for whole period)

		To			
		1	2	3	4
From	1	0.000	2.000	9.000	0.000
	2	2.000	0.000	2.000	0.000
	3	10.000	2.000	0.000	0.000
	4	0.000	2.000	3.000	0.000

ARCADY 7

Version: 7.1.1.245 [9th June 2011]

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File: C:\Users\hlo\Documents\References\shelburne\Street X and County Road 124.arc7
Report generation date: 20/06/2012 3:18:14 PM

Summary of roundabout performance

	AM Peak Hour				PM Peak			
	Queue (PCU)	Delay (min)	RFC	LOS	Queue (PCU)	Delay (min)	RFC	LOS
	(Default Analysis Set) - 2032 Full Build Out							
Arm 1	0.02	0.02	0.02	A	0.13	0.03	0.12	A
Arm 2	0.35	0.03	0.25	A	0.28	0.03	0.21	A
Arm 3	0.22	0.02	0.18	A	0.45	0.03	0.30	A

Values shown are the maximum values over all time segments. Delay is the maximum value of average delay per arriving vehicle.

2032 Full Build Out - AM Peak Hour runs from 08:00:00 to 09:30:00
2032 Full Build Out - PM Peak runs from 08:00:00 to 09:30:00

File summary

File Description

Title	2032 Full Build Out Analysis
Location	County Road / Street X
Site Number	
Date	15/01/2012
Version	
Status	(new file)
Identifier	
Client	
Jobnumber	
Enumerator	CEG\
Description	

Analysis Options

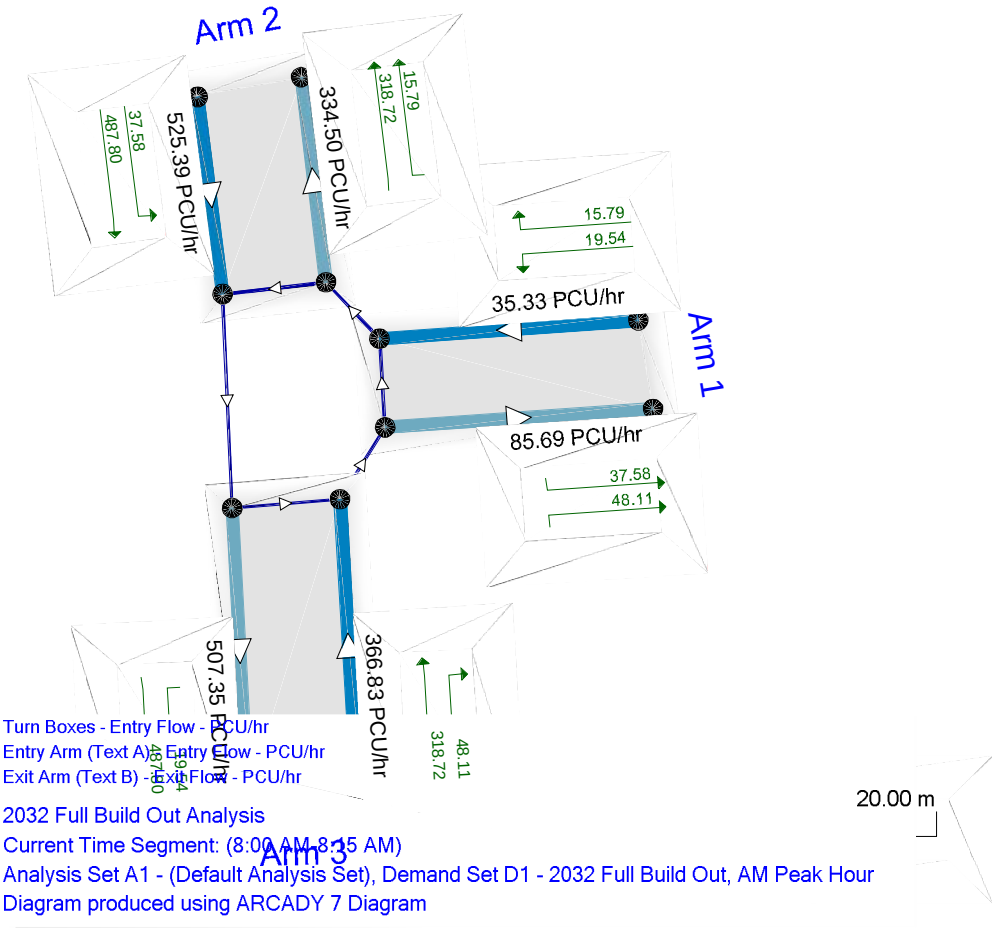
RFC Threshold	Vehicle Length (m)	Do Queue Variations
0.85	5.75	

Sorting and Display

Show Arm Names	Arm Grouping	Sorting Direction	Sorting Type	Data Matrix Style	Time Style
	Order	Ascending	Numerical	By Destination	Absolute Time

Units

Distance Units	Speed Units	Traffic Units Input	Traffic Units Results	Flow Units	Average Delay Units	Total Delay Units	Rate Of Delay Units
m	kph	PCU	PCU	perHour	min	-Min	perMin



The junction diagram reflects the last run of ARCADY.

A1 - (Default Analysis Set) - D1 - 2032 Full Build Out, AM Peak Hour

Data Errors and Warnings

No errors or warnings

Analysis Set Details

Name	Description	Include In Report	Use Specific Demand Set	Demand Set	Locked	Network Flow Scaling Factor (%)	Network Capacity Scaling Factor (%)	Reason For Scaling Factors
(Default Analysis Set)		Yes		(D1)		100.000	100.000	

Demand Set Details

Name	Scenario Name	Time Period Name	Description	Locked	Run Automatically	Use Relationship	Relationship	Start Time (HH:mm)	Finish Time (HH:mm)	Time Period Length (min)	Time Segment Length (min)	Traffic Profile Type
2032 Full Build Out, AM Peak Hour	2032 Full Build Out	AM Peak Hour			Yes			08:00	09:30	90	15	ONE HOUR

Roundabout Network

Roundabout Type(s)

ID	Name	Arm Order	Roundabout Type	Grade Separated	Large Roundabout	Do Geometric Delay
1	(untitled)	1,2,3	Standard			

Roundabout Network Options

Driving Side	Lighting	Road Surface	In London
Right	Normal/unknown	((Mini-roundabouts only))	

Arms

Arms

ID	Name	Description
1	Street X	
2	County Road 124 North Leg	
3	County Road 124	

Capacity Options

Arm	Minimum Capacity (PCU/hr)	Maximum Capacity (PCU/hr)	Assume Flat Start Profile	Initial Queue (PCU)
1	0.00	99999.00		0.00
2	0.00	99999.00		0.00
3	0.00	99999.00		0.00

Standard Geometry

Arm	V - Approach road half-width (m)	E - Entry width (m)	l' - Effective flare length (m)	R - Entry radius (m)	D - Inscribed circle diameter (m)	PHI - Conflict (entry) angle (deg)	Exit Only
1	7.00	12.00	20.00	70.00	50.00	30.00	
2	7.00	12.00	20.00	70.00	50.00	30.00	
3	7.00	12.00	20.00	70.00	50.00	30.00	

Pedestrian Crossings

Arm	Crossing Type
1	None
2	None
3	None

Arm Slope/ Intercept and Capacity

Slope and Intercept used in model

Arm	Enter Directly	Slope	Intercept (PCU/hr)	Final Slope	Final Intercept (PCU/hr)
1		((calculated))	((calculated))	0.877	3066.148
2		((calculated))	((calculated))	0.877	3066.148
3		((calculated))	((calculated))	0.877	3066.148

The slope and intercept shown above include any corrections and adjustments.

Traffic Flows

Demand Set Data Options

Default Vehicle Mix	Vehicle Mix Varies Over Time	Vehicle Mix Varies Over Turn	Vehicle Mix Varies Over Entry	Vehicle Mix Source	PCU Factor for a HV (PCU)	Default Turning Proportions	Estimate from entry/exit counts	Turning Proportions Vary Over Time	Turning Proportions Vary Over Turn	Turning Proportions Vary Over Entry
		Yes	Yes	HV Percentages	2.00				Yes	Yes

Entry Flows

General Flows Data

Arm	Profile Type	Use Turning Counts	Average Demand Flow (PCU/hr)	Flow Scaling Factor (%)	PHF
1	ONE HOUR		47.00	100.000	N/A
2	ONE HOUR		699.00	100.000	N/A
3	ONE HOUR		488.00	100.000	N/A

Direct/Resultant Flows

Direct Flows Data

Time Segment	Arm	Direct Demand Entry Flow (PCU/hr)	DirectDemandEntryFlowInPCU (PCU/hr)	Direct Demand Exit Flow (PCU/hr)	Direct Demand Pedestrian Flow (Ped/hr)
1	1	35.38	35.38	N/A	N/A
1	2	526.24	526.24	N/A	N/A
1	3	367.39	367.39	N/A	N/A
2	1	42.25	42.25	N/A	N/A
2	2	628.39	628.39	N/A	N/A
2	3	438.70	438.70	N/A	N/A
3	1	51.75	51.75	N/A	N/A
3	2	769.61	769.61	N/A	N/A
3	3	537.30	537.30	N/A	N/A
4	1	51.75	51.75	N/A	N/A
4	2	769.61	769.61	N/A	N/A
4	3	537.30	537.30	N/A	N/A
5	1	42.25	42.25	N/A	N/A
5	2	628.39	628.39	N/A	N/A
5	3	438.70	438.70	N/A	N/A
6	1	35.38	35.38	N/A	N/A
6	2	526.24	526.24	N/A	N/A
6	3	367.39	367.39	N/A	N/A

Turning Proportions

Turning Counts or Proportions (PCU/hr) - Roundabout 1 (for whole period)

		To		
		1	2	3
From	1	0.000	21.000	26.000
	2	50.000	0.000	649.000
	3	64.000	424.000	0.000

Turning Proportions (PCU) - Roundabout 1 (for whole period)

		To		
		1	2	3
From	1	0.00	0.45	0.55
	2	0.07	0.00	0.93
	3	0.13	0.87	0.00

Vehicle Mix

Average PCU Per Vehicle - Roundabout 1 (for whole period)

		To		
		1	2	3
From	1	1.000	1.030	1.030
	2	1.030	1.000	1.030
	3	1.030	1.030	1.000

Heavy Vehicle Percentages - Roundabout 1 (for whole period)

		To		
		1	**2**	**3**
From	**1**	0.000	3.000	3.000
	2	3.000	0.000	3.000
	3	3.000	3.000	0.000

ARCADY 7

Version: 7.1.1.245 [9th June 2011]

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File: C:\Users\hlo\Documents\References\shelburne\Street X_Industrial Rd and County Road 124.arc7
Report generation date: 20/06/2012 3:19:49 PM

Summary of roundabout performance

	AM Peak Hour				PM Peak			
	Queue (PCU)	Delay (min)	RFC	LOS	Queue (PCU)	Delay (min)	RFC	LOS
	(Default Analysis Set) - 2032 Full Build Out							
Arm 1	0.02	0.02	0.02	A	0.14	0.03	0.12	A
Arm 2	0.38	0.03	0.26	A	0.29	0.03	0.21	A
Arm 3	0.01	0.03	0.01	A	0.06	0.03	0.05	A
Arm 4	0.26	0.03	0.19	A	0.45	0.03	0.30	A

Values shown are the maximum values over all time segments. Delay is the maximum value of average delay per arriving vehicle.

2032 Full Build Out - AM Peak Hour runs from 08:00:00 to 09:30:00
2032 Full Build Out - PM Peak runs from 08:00:00 to 09:30:00

File summary

File Description

Title	2032 Full Build Out Analysis
Location	County Road / Street X-Industrial Road
Site Number	
Date	15/01/2012
Version	
Status	(new file)
Identifier	
Client	
Jobnumber	
Enumerator	CEG
Description	

Analysis Options

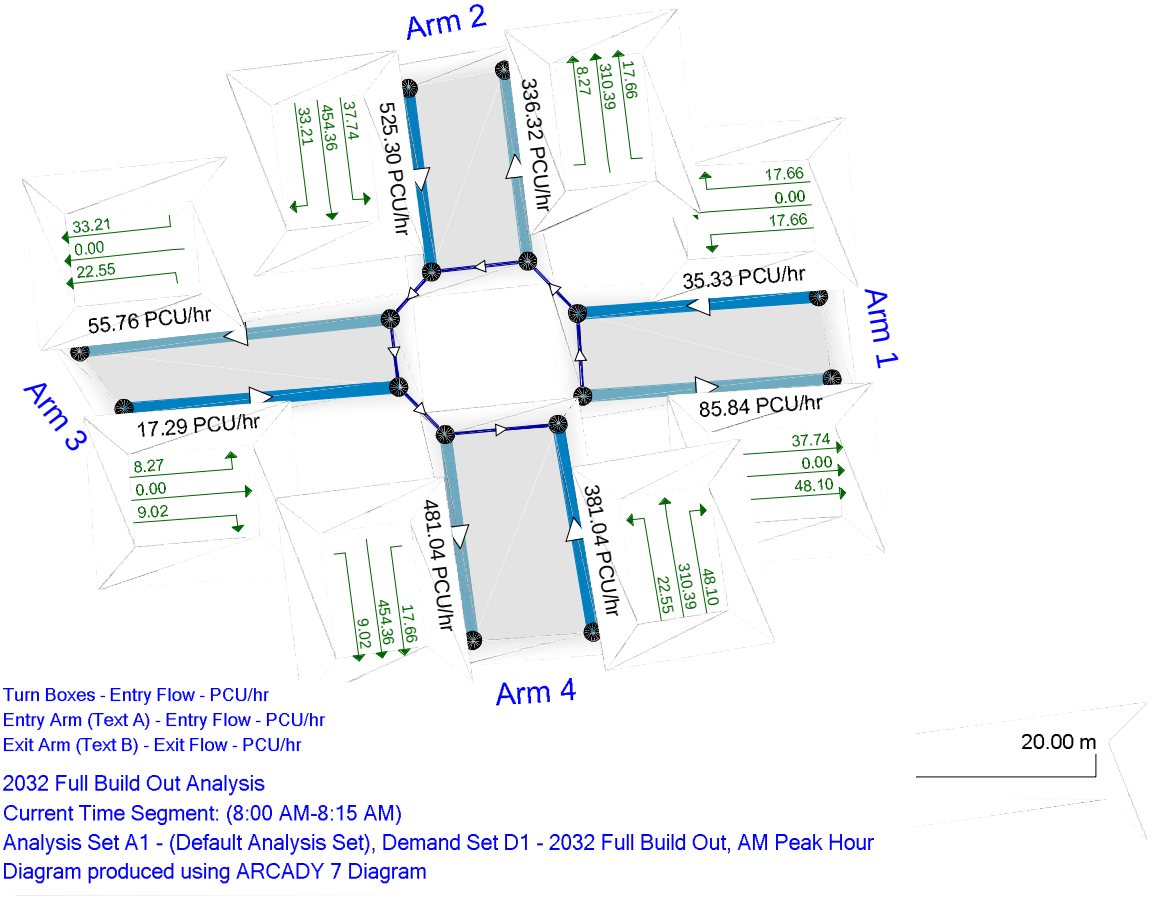
RFC Threshold	Vehicle Length (m)	Do Queue Variations
0.85	5.75	

Sorting and Display

Show Arm Names	Arm Grouping	Sorting Direction	Sorting Type	Data Matrix Style	Time Style
	Order	Ascending	Numerical	By Destination	Absolute Time

Units

Distance Units	Speed Units	Traffic Units Input	Traffic Units Results	Flow Units	Average Delay Units	Total Delay Units	Rate Of Delay Units
m	kph	PCU	PCU	perHour	min	-Min	perMin



The junction diagram reflects the last run of ARCADY.

A1 - (Default Analysis Set) - D1 - 2032 Full Build Out, AM Peak Hour

Data Errors and Warnings

No errors or warnings

Analysis Set Details

Name	Description	Include In Report	Use Specific Demand Set	Demand Set	Locked	Network Flow Scaling Factor (%)	Network Capacity Scaling Factor (%)	Reason For Scaling Factors
(Default Analysis Set)		Yes		(D1)		100.000	100.000	

Demand Set Details

Name	Scenario Name	Time Period Name	Description	Locked	Run Automatically	Use Relationship	Relationship	Start Time (HH:mm)	Finish Time (HH:mm)	Time Period Length (min)	Time Segment Length (min)	Traffic Profile Type
2032 Full Build Out, AM Peak Hour	2032 Full Build Out	AM Peak Hour			Yes			08:00	09:30	90	15	ONE HOUR

Roundabout Network

Roundabout Type(s)

ID	Name	Arm Order	Roundabout Type	Grade Separated	Large Roundabout	Do Geometric Delay
1	(untitled)	1,2,3,4	Standard			

Roundabout Network Options

Driving Side	Lighting	Road Surface	In London
Right	Normal/unknown	((Mini-roundabouts only))	

Arms

Arms

ID	Name	Description
1	Street X	
2	County Road 124 North Leg	
3	Industrial Road	
4	County Road 124	

Capacity Options

Arm	Minimum Capacity (PCU/hr)	Maximum Capacity (PCU/hr)	Assume Flat Start Profile	Initial Queue (PCU)
1	0.00	99999.00		0.00
2	0.00	99999.00		0.00
3	0.00	99999.00		0.00
4	0.00	99999.00		0.00

Standard Geometry

Arm	V - Approach road half-width (m)	E - Entry width (m)	l' - Effective flare length (m)	R - Entry radius (m)	D - Inscribed circle diameter (m)	PHI - Conflict (entry) angle (deg)	Exit Only
1	7.00	12.00	20.00	70.00	50.00	30.00	
2	7.00	12.00	20.00	70.00	50.00	30.00	
3	7.00	12.00	20.00	70.00	50.00	30.00	
4	7.00	12.00	20.00	70.00	50.00	30.00	

Pedestrian Crossings

Arm	Crossing Type
1	None
2	None
3	None
4	None

Arm Slope/ Intercept and Capacity

Slope and Intercept used in model

Arm	Enter Directly	Slope	Intercept (PCU/hr)	Final Slope	Final Intercept (PCU/hr)
1		((calculated))	((calculated))	0.877	3066.148
2		((calculated))	((calculated))	0.877	3066.148
3		((calculated))	((calculated))	0.877	3066.148
4		((calculated))	((calculated))	0.877	3066.148

The slope and intercept shown above include any corrections and adjustments.

Traffic Flows

Demand Set Data Options

Default Vehicle Mix	Vehicle Mix Varies Over Time	Vehicle Mix Varies Over Turn	Vehicle Mix Varies Over Entry	Vehicle Mix Source	PCU Factor for a HV (PCU)	Default Turning Proportions	Estimate from entry/exit counts	Turning Proportions Vary Over Time	Turning Proportions Vary Over Turn	Turning Proportions Vary Over Entry
		Yes	Yes	HV Percentages	2.00				Yes	Yes

Entry Flows

General Flows Data

Arm	Profile Type	Use Turning Counts	Average Demand Flow (PCU/hr)	Flow Scaling Factor (%)	PHF
1	ONE HOUR		47.00	100.000	N/A
2	ONE HOUR		699.00	100.000	N/A
3	ONE HOUR		23.00	100.000	N/A
4	ONE HOUR		507.00	100.000	N/A

Direct/Resultant Flows

Direct Flows Data

Time Segment	Arm	Direct Demand Entry Flow (PCU/hr)	DirectDemandEntryFlowInPCU (PCU/hr)	Direct Demand Exit Flow (PCU/hr)	Direct Demand Pedestrian Flow (Ped/hr)
1	1	35.38	35.38	N/A	N/A
1	2	526.24	526.24	N/A	N/A
1	3	17.32	17.32	N/A	N/A
1	4	381.70	381.70	N/A	N/A
2	1	42.25	42.25	N/A	N/A
2	2	628.39	628.39	N/A	N/A
2	3	20.68	20.68	N/A	N/A
2	4	455.78	455.78	N/A	N/A
3	1	51.75	51.75	N/A	N/A
3	2	769.61	769.61	N/A	N/A
3	3	25.32	25.32	N/A	N/A
3	4	558.22	558.22	N/A	N/A
4	1	51.75	51.75	N/A	N/A
4	2	769.61	769.61	N/A	N/A
4	3	25.32	25.32	N/A	N/A
4	4	558.22	558.22	N/A	N/A
5	1	42.25	42.25	N/A	N/A
5	2	628.39	628.39	N/A	N/A
5	3	20.68	20.68	N/A	N/A
5	4	455.78	455.78	N/A	N/A
6	1	35.38	35.38	N/A	N/A
6	2	526.24	526.24	N/A	N/A
6	3	17.32	17.32	N/A	N/A
6	4	381.70	381.70	N/A	N/A

Turning Proportions

Turning Counts or Proportions (PCU/hr) - Roundabout 1 (for whole period)

		To			
		1	2	3	4
From	1	0.000	26.000	0.000	26.000
	2	50.000	0.000	44.000	602.000
	3	0.000	11.000	0.000	12.000
	4	64.000	413.000	30.000	0.000

Turning Proportions (PCU) - Roundabout 1 (for whole period)

		To			
		1	2	3	4
From	1	0.00	0.50	0.00	0.50
	2	0.07	0.00	0.06	0.86
	3	0.00	0.48	0.00	0.52
	4	0.13	0.81	0.06	0.00

Vehicle Mix

Average PCU Per Vehicle - Roundabout 1 (for whole period)

		To			
		1	2	3	4
From	1	1.000	1.050	1.030	1.050
	2	1.030	1.000	1.500	1.110
	3	1.030	1.150	1.000	1.150
	4	1.030	1.140	1.500	1.000

Heavy Vehicle Percentages - Roundabout 1 (for whole period)

		To			
		1	2	3	4
From	1	0.000	5.000	3.000	5.000
	2	3.000	0.000	50.000	11.000
	3	3.000	15.000	0.000	15.000
	4	3.000	14.000	50.000	0.000

ARCADY 7

Version: 7.1.1.245 [9th June 2011]

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File: C:\Users\hlo\Documents\References\shelburne\School Road and County Road.arc7
Report generation date: 20/06/2012 3:21:07 PM

Summary of roundabout performance

	AM Peak Hour				PM Peak Hour			
	Queue (PCU)	Delay (min)	RFC	LOS	Queue (PCU)	Delay (min)	RFC	LOS
	(Default Analysis Set) - 2032 Full Build Out							
Arm 1	0.00	0.03	0.00	A	0.00	0.03	0.00	A
Arm 2	0.26	0.03	0.19	A	0.34	0.03	0.24	A
Arm 3	0.12	0.03	0.09	A	0.07	0.03	0.06	A
Arm 4	0.15	0.03	0.11	A	0.40	0.03	0.27	A

Values shown are the maximum values over all time segments. Delay is the maximum value of average delay per arriving vehicle.

2032 Full Build Out - PM Peak Hour runs from 08:00:00 to 09:30:00
2032 Full Build Out - AM Peak Hour runs from 08:00:00 to 09:30:00

File summary

File Description

Title	2032 Full Build Out Analysis
Location	School Road_and County Road 11
Site Number	
Date	12/01/2012
Version	
Status	(new file)
Identifier	
Client	
Jobnumber	
Enumerator	CEG
Description	

Analysis Options

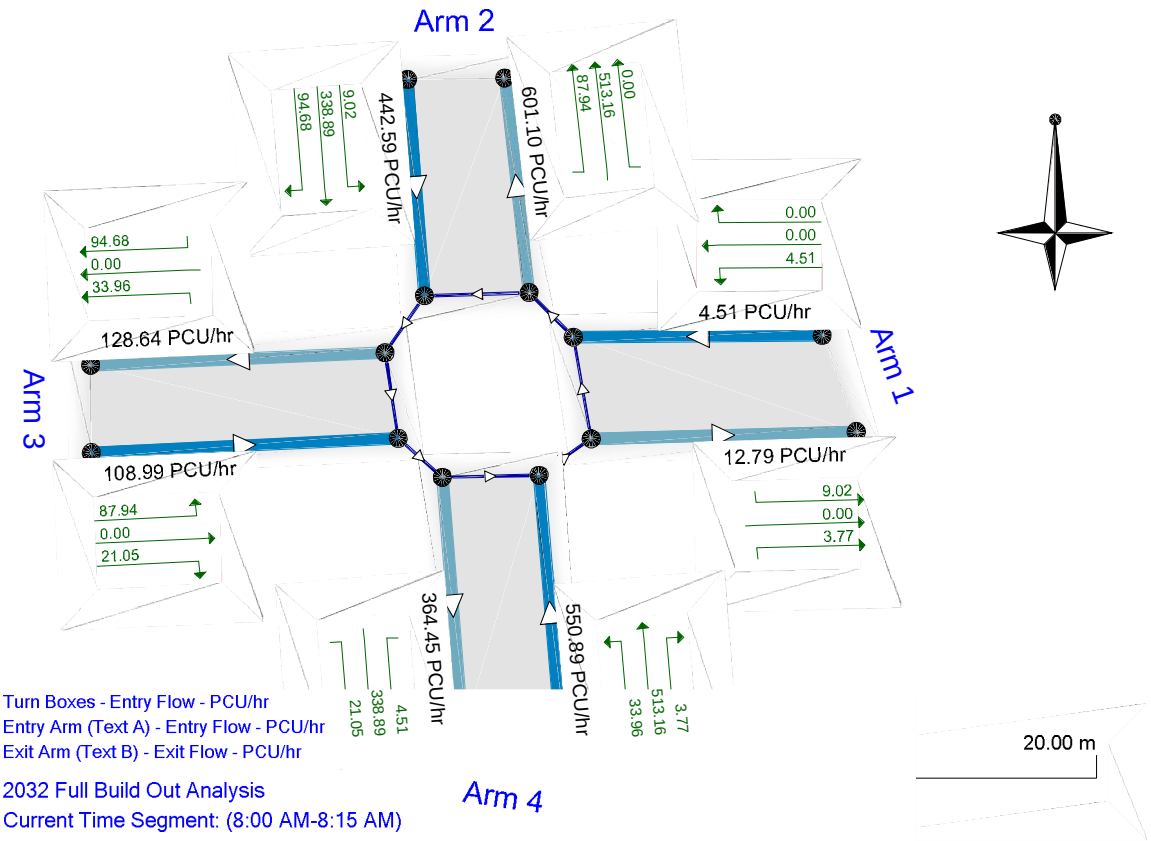
RFC Threshold	Vehicle Length (m)	Do Queue Variations
0.85	5.75	

Sorting and Display

Show Arm Names	Arm Grouping	Sorting Direction	Sorting Type	Data Matrix Style	Time Style
	Order	Ascending	Numerical	By Destination	Absolute Time

Units

Distance Units	Speed Units	Traffic Units Input	Traffic Units Results	Flow Units	Average Delay Units	Total Delay Units	Rate Of Delay Units
m	kph	PCU	PCU	perHour	min	-Min	perMin



The junction diagram reflects the last run of ARCADY.

A1 - (Default Analysis Set) - D1 - 2032 Full Build Out, PM Peak Hour

Data Errors and Warnings

No errors or warnings

Analysis Set Details

Name	Description	Include In Report	Use Specific Demand Set	Demand Set	Locked	Network Flow Scaling Factor (%)	Network Capacity Scaling Factor (%)	Reason For Scaling Factors
(Default Analysis Set)		Yes		(D1)		100.000	100.000	

Demand Set Details

Name	Scenario Name	Time Period Name	Description	Locked	Run Automatically	Use Relationship	Relationship	Start Time (HH:mm)	Finish Time (HH:mm)	Time Period Length (min)	Time Segment Length (min)	Traffic Profile Type
2032 Full Build Out, PM Peak Hour	2032 Full Build Out	PM Peak Hour			Yes			08:00	09:30	90	15	ONE HOUR

Roundabout Network

Roundabout Type(s)

ID	Name	Arm Order	Roundabout Type	Grade Separated	Large Roundabout	Do Geometric Delay
1	(untitled)	1,2,3,4	Standard			

Roundabout Network Options

Driving Side	Lighting	Road Surface	In London
Right	Normal/unknown	((Mini-roundabouts only))	

Arms

Arms

ID	Name	Description
1	Private Driveway (C2)	
2	County Road 11 North Leg	
3	School Road	
4	County Road 11	

Capacity Options

Arm	Minimum Capacity (PCU/hr)	Maximum Capacity (PCU/hr)	Assume Flat Start Profile	Initial Queue (PCU)
1	0.00	99999.00		0.00
2	0.00	99999.00		0.00
3	0.00	99999.00		0.00
4	0.00	99999.00		0.00

Standard Geometry

Arm	V - Approach road half-width (m)	E - Entry width (m)	l' - Effective flare length (m)	R - Entry radius (m)	D - Inscribed circle diameter (m)	PHI - Conflict (entry) angle (deg)	Exit Only
1	7.00	12.00	10.00	70.00	50.00	30.00	
2	7.00	12.00	10.00	70.00	50.00	30.00	
3	7.00	12.00	20.00	70.00	50.00	30.00	
4	7.00	12.00	20.00	70.00	50.00	30.00	

Pedestrian Crossings

Arm	Crossing Type
1	None
2	None
3	None
4	None

Arm Slope/ Intercept and Capacity

Slope and Intercept used in model

Arm	Enter Directly	Slope	Intercept (PCU/hr)	Final Slope	Final Intercept (PCU/hr)
1		((calculated))	((calculated))	0.826	2798.128
2		((calculated))	((calculated))	0.826	2798.128
3		((calculated))	((calculated))	0.877	3066.148
4		((calculated))	((calculated))	0.877	3066.148

The slope and intercept shown above include any corrections and adjustments.

Traffic Flows

Demand Set Data Options

Default Vehicle Mix	Vehicle Mix Varies Over Time	Vehicle Mix Varies Over Turn	Vehicle Mix Varies Over Entry	Vehicle Mix Source	PCU Factor for a HV (PCU)	Default Turning Proportions	Estimate from entry/exit counts	Turning Proportions Vary Over Time	Turning Proportions Vary Over Turn	Turning Proportions Vary Over Entry
		Yes	Yes	HV Percentages	2.00				Yes	Yes

Entry Flows

General Flows Data

Arm	Profile Type	Use Turning Counts	Average Demand Flow (PCU/hr)	Flow Scaling Factor (%)	PHF
1	ONE HOUR		6.00	100.000	N/A
2	ONE HOUR		589.00	100.000	N/A
3	ONE HOUR		145.00	100.000	N/A
4	ONE HOUR		733.00	100.000	N/A

Direct/Resultant Flows

Direct Flows Data

Time Segment	Arm	Direct Demand Entry Flow (PCU/hr)	DirectDemandEntryFlowInPCU (PCU/hr)	Direct Demand Exit Flow (PCU/hr)	Direct Demand Pedestrian Flow (Ped/hr)
1	1	4.52	4.52	N/A	N/A
1	2	443.43	443.43	N/A	N/A
1	3	109.16	109.16	N/A	N/A
1	4	551.84	551.84	N/A	N/A
2	1	5.39	5.39	N/A	N/A
2	2	529.50	529.50	N/A	N/A
2	3	130.35	130.35	N/A	N/A
2	4	658.95	658.95	N/A	N/A
3	1	6.61	6.61	N/A	N/A
3	2	648.50	648.50	N/A	N/A
3	3	159.65	159.65	N/A	N/A
3	4	807.05	807.05	N/A	N/A
4	1	6.61	6.61	N/A	N/A
4	2	648.50	648.50	N/A	N/A
4	3	159.65	159.65	N/A	N/A
4	4	807.05	807.05	N/A	N/A
5	1	5.39	5.39	N/A	N/A
5	2	529.50	529.50	N/A	N/A
5	3	130.35	130.35	N/A	N/A
5	4	658.95	658.95	N/A	N/A
6	1	4.52	4.52	N/A	N/A
6	2	443.43	443.43	N/A	N/A
6	3	109.16	109.16	N/A	N/A
6	4	551.84	551.84	N/A	N/A

Turning Proportions

Turning Counts or Proportions (PCU/hr) - Roundabout 1 (for whole period)

		To			
		1	2	3	4
From	1	0.000	0.000	0.000	6.000
	2	12.000	0.000	126.000	451.000
	3	0.000	117.000	0.000	28.000
	4	5.000	680.000	45.000	0.000

Turning Proportions (PCU) - Roundabout 1 (for whole period)

		To			
		1	2	3	4
From	1	0.00	0.00	0.00	1.00
	2	0.02	0.00	0.21	0.77
	3	0.00	0.81	0.00	0.19
	4	0.01	0.93	0.06	0.00

Vehicle Mix

Average PCU Per Vehicle - Roundabout 1 (for whole period)

		To			
		1	2	3	4
From	1	1.000	1.020	1.000	1.020
	2	1.000	1.000	1.040	1.130
	3	1.000	1.060	1.000	1.060
	4	1.000	1.050	1.040	1.000

Heavy Vehicle Percentages - Roundabout 1 (for whole period)

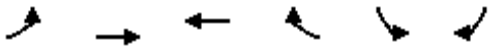
		To			
		1	2	3	4
From	1	0.000	2.000	0.000	2.000
	2	0.000	0.000	4.000	13.000
	3	0.000	6.000	0.000	6.000
	4	0.000	5.000	4.000	0.000

APPENDIX E
ANALYSIS OF PREFERRED ALTERNATIVE

E1 – Synchro Analysis

E2 – Roundabout (Arcady) Analysis

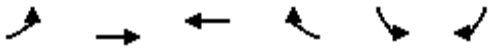
APPENDIX E1
SYNCHRO ANALYSIS



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (vph)	18	916	617	25	47	31
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0	6.0	6.0		6.0	6.0
Lane Util. Factor	1.00	0.95	0.95		1.00	1.00
Frt	1.00	1.00	0.99		1.00	0.85
Flt Protected	0.95	1.00	1.00		0.95	1.00
Satd. Flow (prot)	1738	3349	3140		1426	1276
Flt Permitted	0.35	1.00	1.00		0.95	1.00
Satd. Flow (perm)	636	3349	3140		1426	1276
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	20	996	671	27	51	34
RTOR Reduction (vph)	0	0	5	0	0	22
Lane Group Flow (vph)	20	996	693	0	51	12
Heavy Vehicles (%)	5%	9%	16%	5%	28%	28%
Turn Type	Perm					Perm
Protected Phases		4	8		6	
Permitted Phases	4					6
Actuated Green, G (s)	25.1	25.1	25.1		21.2	21.2
Effective Green, g (s)	25.1	25.1	25.1		21.2	21.2
Actuated g/C Ratio	0.43	0.43	0.43		0.36	0.36
Clearance Time (s)	6.0	6.0	6.0		6.0	6.0
Vehicle Extension (s)	3.0	3.0	3.0		3.0	3.0
Lane Grp Cap (vph)	274	1442	1352		519	464
v/s Ratio Prot		c0.30	0.22		c0.04	
v/s Ratio Perm	0.03					0.01
v/c Ratio	0.07	0.69	0.51		0.10	0.03
Uniform Delay, d1	9.8	13.5	12.1		12.2	11.9
Progression Factor	1.00	1.00	1.00		1.00	1.00
Incremental Delay, d2	0.1	1.4	0.3		0.4	0.1
Delay (s)	9.9	14.9	12.5		12.6	12.0
Level of Service	A	B	B		B	B
Approach Delay (s)		14.8	12.5		12.4	
Approach LOS		B	B		B	

Intersection Summary			
HCM Average Control Delay	13.8	HCM Level of Service	B
HCM Volume to Capacity ratio	0.42		
Actuated Cycle Length (s)	58.3	Sum of lost time (s)	12.0
Intersection Capacity Utilization	38.7%	ICU Level of Service	A
Analysis Period (min)	15		

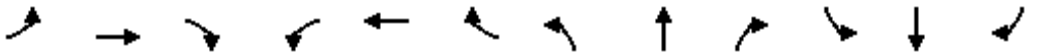
c Critical Lane Group



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (vph)	19	1002	1423	33	91	101
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0	6.0	6.0		6.0	6.0
Lane Util. Factor	1.00	0.95	0.95		1.00	1.00
Frt	1.00	1.00	1.00		1.00	0.85
Flt Protected	0.95	1.00	1.00		0.95	1.00
Satd. Flow (prot)	1615	3380	3395		1547	1384
Flt Permitted	0.09	1.00	1.00		0.95	1.00
Satd. Flow (perm)	158	3380	3395		1547	1384
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	21	1089	1547	36	99	110
RTOR Reduction (vph)	0	0	2	0	0	29
Lane Group Flow (vph)	21	1089	1581	0	99	81
Heavy Vehicles (%)	13%	8%	7%	13%	18%	18%
Turn Type	Perm					Perm
Protected Phases		4	8		6	
Permitted Phases	4					6
Actuated Green, G (s)	43.1	43.1	43.1		18.2	18.2
Effective Green, g (s)	43.1	43.1	43.1		18.2	18.2
Actuated g/C Ratio	0.59	0.59	0.59		0.25	0.25
Clearance Time (s)	6.0	6.0	6.0		6.0	6.0
Vehicle Extension (s)	3.0	3.0	3.0		3.0	3.0
Lane Grp Cap (vph)	93	1987	1996		384	344
v/s Ratio Prot		0.32	c0.47		c0.06	
v/s Ratio Perm	0.13					0.06
v/c Ratio	0.23	0.55	0.79		0.26	0.23
Uniform Delay, d1	7.2	9.2	11.6		22.1	22.0
Progression Factor	1.00	1.00	1.00		1.00	1.00
Incremental Delay, d2	1.2	0.3	2.2		1.6	1.6
Delay (s)	8.4	9.5	13.9		23.7	23.6
Level of Service	A	A	B		C	C
Approach Delay (s)		9.5	13.9		23.7	
Approach LOS		A	B		C	

Intersection Summary			
HCM Average Control Delay	12.9	HCM Level of Service	B
HCM Volume to Capacity ratio	0.63		
Actuated Cycle Length (s)	73.3	Sum of lost time (s)	12.0
Intersection Capacity Utilization	56.6%	ICU Level of Service	B
Analysis Period (min)	15		

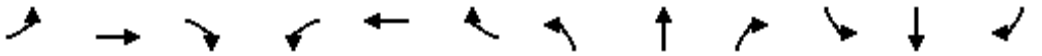
c Critical Lane Group



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	125	704	134	164	423	211	131	166	103	318	232	89
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	7.0	7.0	7.0	4.0	7.0	7.0	8.0	8.0	8.0	8.0	8.0	8.0
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1690	3349	1432	1630	3174	1328	1448	3380	1296	1601	3411	1484
Flt Permitted	0.49	1.00	1.00	0.17	1.00	1.00	0.60	1.00	1.00	0.64	1.00	1.00
Satd. Flow (perm)	867	3349	1432	283	3174	1328	908	3380	1296	1076	3411	1484
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	136	765	146	178	460	229	142	180	112	346	252	97
RTOR Reduction (vph)	0	0	107	0	0	133	0	0	68	0	0	59
Lane Group Flow (vph)	136	765	39	178	460	96	142	180	44	346	252	38
Heavy Vehicles (%)	8%	9%	14%	12%	15%	23%	26%	8%	26%	14%	7%	10%
Turn Type	Perm		Perm	pm+pt		Perm	Perm		Perm	Perm		Perm
Protected Phases		4		3	8			2			6	
Permitted Phases	4		4	8		8	2		2	6		6
Actuated Green, G (s)	21.2	21.2	21.2	33.1	33.1	33.1	31.0	31.0	31.0	31.0	31.0	31.0
Effective Green, g (s)	21.2	21.2	21.2	33.1	33.1	33.1	31.0	31.0	31.0	31.0	31.0	31.0
Actuated g/C Ratio	0.27	0.27	0.27	0.42	0.42	0.42	0.39	0.39	0.39	0.39	0.39	0.39
Clearance Time (s)	7.0	7.0	7.0	4.0	7.0	7.0	8.0	8.0	8.0	8.0	8.0	8.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	232	898	384	253	1328	556	356	1325	508	422	1337	582
v/s Ratio Prot		c0.23		c0.07	0.14			0.05			0.07	
v/s Ratio Perm	0.16		0.03	0.22		0.07	0.16		0.03	c0.32		0.03
v/c Ratio	0.59	0.85	0.10	0.70	0.35	0.17	0.40	0.14	0.09	0.82	0.19	0.07
Uniform Delay, d1	25.1	27.5	21.8	16.7	15.6	14.4	17.3	15.4	15.1	21.5	15.8	15.0
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	3.7	7.8	0.1	8.6	0.2	0.1	3.3	0.2	0.3	16.2	0.3	0.2
Delay (s)	28.9	35.3	21.9	25.2	15.8	14.6	20.6	15.7	15.5	37.7	16.1	15.2
Level of Service	C	D	C	C	B	B	C	B	B	D	B	B
Approach Delay (s)		32.6			17.4			17.2			26.7	
Approach LOS		C			B			B			C	

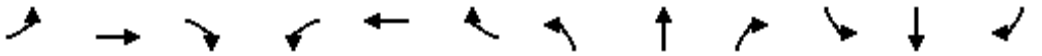
Intersection Summary			
HCM Average Control Delay	24.7	HCM Level of Service	C
HCM Volume to Capacity ratio	0.82		
Actuated Cycle Length (s)	79.1	Sum of lost time (s)	19.0
Intersection Capacity Utilization	73.3%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	161	725	207	182	1012	302	293	317	226	243	230	151
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	7.0	7.0	4.0	7.0	7.0	4.0	8.0	8.0	4.0	8.0	8.0
Lane Util. Factor	1.00	0.95	1.00	1.00	*0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1738	3349	1570	1460	3411	1471	1690	3544	1427	1534	3380	1498
Flt Permitted	0.16	1.00	1.00	0.20	1.00	1.00	0.53	1.00	1.00	0.54	1.00	1.00
Satd. Flow (perm)	293	3349	1570	301	3411	1471	944	3544	1427	879	3380	1498
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	175	788	225	198	1100	328	318	345	246	264	250	164
RTOR Reduction (vph)	0	0	155	0	0	213	0	0	166	0	0	131
Lane Group Flow (vph)	175	788	70	198	1100	115	318	345	80	264	250	33
Heavy Vehicles (%)	5%	9%	4%	25%	7%	11%	8%	3%	3%	19%	8%	9%
Parking (#/hr)									0			
Turn Type	pm+pt		Perm	pm+pt		Perm	pm+pt		Perm	pm+pt		Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4		4	8		8	2		2	6		6
Actuated Green, G (s)	30.0	25.0	25.0	36.0	28.0	28.0	26.0	18.0	18.0	22.0	16.0	16.0
Effective Green, g (s)	30.0	25.0	25.0	36.0	28.0	28.0	26.0	18.0	18.0	22.0	16.0	16.0
Actuated g/C Ratio	0.38	0.31	0.31	0.45	0.35	0.35	0.32	0.22	0.22	0.28	0.20	0.20
Clearance Time (s)	4.0	7.0	7.0	4.0	7.0	7.0	4.0	8.0	8.0	4.0	8.0	8.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	200	1047	491	251	1194	515	381	797	321	291	676	300
v/s Ratio Prot	0.05	0.24		c0.08	c0.32		c0.08	0.10		0.07	0.07	
v/s Ratio Perm	0.27		0.04	0.28		0.08	c0.19		0.06	0.18		0.02
v/c Ratio	0.88	0.75	0.14	0.79	0.92	0.22	0.83	0.43	0.25	0.91	0.37	0.11
Uniform Delay, d1	20.5	24.7	19.8	15.5	24.9	18.3	23.6	26.6	25.5	26.6	27.6	26.2
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	31.9	3.1	0.1	15.1	11.6	0.2	14.5	1.7	1.9	29.7	1.6	0.7
Delay (s)	52.4	27.8	19.9	30.6	36.5	18.6	38.2	28.3	27.3	56.3	29.2	26.9
Level of Service	D	C	B	C	D	B	D	C	C	E	C	C
Approach Delay (s)		29.9			32.2			31.5			39.2	
Approach LOS		C			C			C			D	

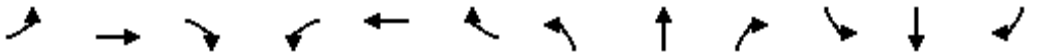
Intersection Summary			
HCM Average Control Delay	32.5	HCM Level of Service	C
HCM Volume to Capacity ratio	0.83		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	78.7%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	82	993	50	51	731	96	34	0	49	38	0	33
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	7.0	7.0	7.0	7.0	7.0	7.0	6.0	6.0		6.0	6.0	
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	1.00		1.00	1.00	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.85		1.00	0.85	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1789	3288	1633	1825	3120	1601	1825	1633		1789	1601	
Flt Permitted	0.32	1.00	1.00	0.20	1.00	1.00	0.73	1.00		0.72	1.00	
Satd. Flow (perm)	599	3288	1633	375	3120	1601	1409	1633		1361	1601	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	89	1079	54	55	795	104	37	0	53	41	0	36
RTOR Reduction (vph)	0	0	27	0	0	54	0	37	0	0	25	0
Lane Group Flow (vph)	89	1079	27	55	795	50	37	16	0	41	11	0
Heavy Vehicles (%)	2%	11%	0%	0%	17%	2%	0%	2%	0%	2%	2%	2%
Turn Type	Perm		Perm	Perm		Perm	Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4		4	8		8	2			6		
Actuated Green, G (s)	30.1	30.1	30.1	30.1	30.1	30.1	19.4	19.4		19.4	19.4	
Effective Green, g (s)	30.1	30.1	30.1	30.1	30.1	30.1	19.4	19.4		19.4	19.4	
Actuated g/C Ratio	0.48	0.48	0.48	0.48	0.48	0.48	0.31	0.31		0.31	0.31	
Clearance Time (s)	7.0	7.0	7.0	7.0	7.0	7.0	6.0	6.0		6.0	6.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	288	1584	786	181	1503	771	437	507		422	497	
v/s Ratio Prot		c0.33			0.25			0.01			0.01	
v/s Ratio Perm	0.15		0.02	0.15		0.03	0.03			c0.03		
v/c Ratio	0.31	0.68	0.03	0.30	0.53	0.06	0.08	0.03		0.10	0.02	
Uniform Delay, d1	9.9	12.5	8.5	9.8	11.3	8.7	15.3	15.0		15.3	15.0	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.6	1.2	0.0	1.0	0.3	0.0	0.4	0.1		0.5	0.1	
Delay (s)	10.5	13.7	8.6	10.8	11.6	8.7	15.6	15.1		15.8	15.0	
Level of Service	B	B	A	B	B	A	B	B		B	B	
Approach Delay (s)		13.3			11.2			15.3			15.4	
Approach LOS		B			B			B			B	

Intersection Summary			
HCM Average Control Delay	12.6	HCM Level of Service	B
HCM Volume to Capacity ratio	0.45		
Actuated Cycle Length (s)	62.5	Sum of lost time (s)	13.0
Intersection Capacity Utilization	56.2%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	133	966	95	127	1196	159	110	0	115	201	0	190
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	7.0	7.0	7.0	7.0	7.0	6.0	6.0		7.0	6.0	
Lane Util. Factor	1.00	0.95	1.00	1.00	*0.97	1.00	1.00	1.00		1.00	1.00	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.85		1.00	0.85	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1789	3318	1633	1825	3419	1601	1825	1633		1789	1601	
Flt Permitted	0.11	1.00	1.00	0.27	1.00	1.00	0.60	1.00		0.68	1.00	
Satd. Flow (perm)	203	3318	1633	516	3419	1601	1150	1633		1275	1601	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	145	1050	103	138	1300	173	120	0	125	218	0	207
RTOR Reduction (vph)	0	0	44	0	0	60	0	65	0	0	91	0
Lane Group Flow (vph)	145	1050	59	138	1300	113	120	60	0	218	116	0
Heavy Vehicles (%)	2%	10%	0%	0%	9%	2%	0%	2%	0%	2%	2%	2%
Turn Type	pm+pt		Perm	Perm		Perm	Perm			Perm		
Protected Phases	7	4			8			2			6	
Permitted Phases	4		4	8		8	2			6		
Actuated Green, G (s)	41.1	41.1	41.1	33.1	33.1	33.1	22.0	22.0		22.0	22.0	
Effective Green, g (s)	41.1	41.1	41.1	33.1	33.1	33.1	22.0	22.0		21.0	22.0	
Actuated g/C Ratio	0.54	0.54	0.54	0.43	0.43	0.43	0.29	0.29		0.28	0.29	
Clearance Time (s)	4.0	7.0	7.0	7.0	7.0	7.0	6.0	6.0		6.0	6.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	193	1792	882	224	1487	696	332	472		352	463	
v/s Ratio Prot	0.04	c0.32			c0.38			0.04			0.07	
v/s Ratio Perm	0.37		0.04	0.27		0.07	0.10			c0.17		
v/c Ratio	0.75	0.59	0.07	0.62	0.87	0.16	0.36	0.13		0.62	0.25	
Uniform Delay, d1	13.4	11.8	8.4	16.6	19.6	13.1	21.5	20.0		24.1	20.7	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2	15.1	0.5	0.0	5.0	6.0	0.1	3.0	0.6		8.0	1.3	
Delay (s)	28.5	12.3	8.4	21.6	25.6	13.2	24.5	20.5		32.0	22.0	
Level of Service	C	B	A	C	C	B	C	C		C	C	
Approach Delay (s)		13.8			23.9			22.5			27.1	
Approach LOS		B			C			C			C	

Intersection Summary			
HCM Average Control Delay	20.5	HCM Level of Service	C
HCM Volume to Capacity ratio	0.82		
Actuated Cycle Length (s)	76.1	Sum of lost time (s)	21.0
Intersection Capacity Utilization	78.5%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (veh/h)	1076	4	3	868	10	15
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	1170	4	3	943	11	16
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume			1174		1650	587
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			1174		1650	587
tC, single (s)			4.1		6.8	6.9
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			99		88	96
cM capacity (veh/h)			602		91	458

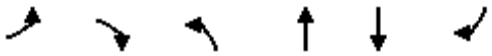
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1
Volume Total	780	394	318	629	27
Volume Left	0	0	3	0	11
Volume Right	0	4	0	0	16
cSH	1700	1700	602	1700	175
Volume to Capacity	0.46	0.23	0.01	0.37	0.16
Queue Length 95th (m)	0.0	0.0	0.1	0.0	4.1
Control Delay (s)	0.0	0.0	0.2	0.0	29.3
Lane LOS			A		D
Approach Delay (s)	0.0		0.1		29.3
Approach LOS					D

Intersection Summary			
Average Delay	0.4		
Intersection Capacity Utilization	39.9%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (veh/h)	1263	19	30	1453	16	12
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	1373	21	33	1579	17	13
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume			1393		2238	697
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			1393		2238	697
tC, single (s)			4.1		6.8	6.9
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			93		49	97
cM capacity (veh/h)			497		34	388

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1
Volume Total	915	478	559	1053	30
Volume Left	0	0	33	0	17
Volume Right	0	21	0	0	13
cSH	1700	1700	497	1700	56
Volume to Capacity	0.54	0.28	0.07	0.62	0.54
Queue Length 95th (m)	0.0	0.0	1.6	0.0	16.1
Control Delay (s)	0.0	0.0	1.9	0.0	126.9
Lane LOS			A		F
Approach Delay (s)	0.0		0.7		126.9
Approach LOS					F

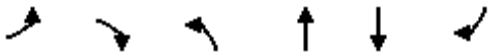
Intersection Summary			
Average Delay	1.6		
Intersection Capacity Utilization	71.6%	ICU Level of Service	C
Analysis Period (min)	15		



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	18	22	18	422	672	21
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	20	24	20	459	730	23
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (m)				181		
pX, platoon unblocked						
vC, conflicting volume	1010	377	753			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1010	377	753			
tC, single (s)	7.8	7.9	4.6			
tC, 2 stage (s)						
tF (s)	4.0	3.8	2.4			
p0 queue free %	88	95	97			
cM capacity (veh/h)	166	507	723			

Direction, Lane #	EB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	43	172	306	487	266
Volume Left	20	20	0	0	0
Volume Right	24	0	0	0	23
cSH	263	723	1700	1700	1700
Volume to Capacity	0.17	0.03	0.18	0.29	0.16
Queue Length 95th (m)	4.4	0.6	0.0	0.0	0.0
Control Delay (s)	21.4	1.4	0.0	0.0	0.0
Lane LOS	C	A			
Approach Delay (s)	21.4	0.5		0.0	
Approach LOS	C				

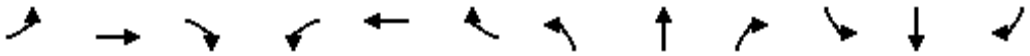
Intersection Summary			
Average Delay	0.9		
Intersection Capacity Utilization	34.9%	ICU Level of Service	A
Analysis Period (min)	15		



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	37	31	40	786	528	33
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	40	34	43	854	574	36
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (m)				181		
pX, platoon unblocked	0.94					
vC, conflicting volume	1106	305	610			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	977	305	610			
tC, single (s)	7.4	7.5	4.3			
tC, 2 stage (s)						
tF (s)	3.8	3.6	2.3			
p0 queue free %	78	94	95			
cM capacity (veh/h)	179	610	900			

Direction, Lane #	EB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	74	328	570	383	227
Volume Left	40	43	0	0	0
Volume Right	34	0	0	0	36
cSH	264	900	1700	1700	1700
Volume to Capacity	0.28	0.05	0.34	0.23	0.13
Queue Length 95th (m)	8.5	1.2	0.0	0.0	0.0
Control Delay (s)	23.8	1.7	0.0	0.0	0.0
Lane LOS	C	A			
Approach Delay (s)	23.8	0.6		0.0	
Approach LOS	C				

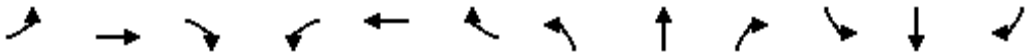
Intersection Summary			
Average Delay	1.5		
Intersection Capacity Utilization	52.5%	ICU Level of Service	A
Analysis Period (min)	15		



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	10	0	12	26	0	21	30	409	64	50	601	43
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0	6.0		6.0	6.0		6.0	6.0		6.0	6.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	0.95		1.00	0.95	
Frt	1.00	0.85		1.00	0.85		1.00	0.98		1.00	0.99	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1587	1420		1738	1555		1217	3190		1825	3180	
Flt Permitted	0.85	1.00		0.85	1.00		0.39	1.00		0.46	1.00	
Satd. Flow (perm)	1422	1420		1557	1555		494	3190		887	3180	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	11	0	13	28	0	23	33	445	70	54	653	47
RTOR Reduction (vph)	0	12	0	0	22	0	0	9	0	0	4	0
Lane Group Flow (vph)	11	1	0	28	1	0	33	506	0	54	696	0
Heavy Vehicles (%)	15%	0%	15%	5%	0%	5%	50%	14%	0%	0%	11%	50%
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	4.7	4.7		4.7	4.7		57.3	57.3		57.3	57.3	
Effective Green, g (s)	4.7	4.7		4.7	4.7		57.3	57.3		57.3	57.3	
Actuated g/C Ratio	0.06	0.06		0.06	0.06		0.77	0.77		0.77	0.77	
Clearance Time (s)	6.0	6.0		6.0	6.0		6.0	6.0		6.0	6.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	90	90		99	99		383	2470		687	2462	
v/s Ratio Prot		0.00			0.00			0.16			c0.22	
v/s Ratio Perm	0.01			c0.02			0.07			0.06		
v/c Ratio	0.12	0.01		0.28	0.01		0.09	0.21		0.08	0.28	
Uniform Delay, d1	32.7	32.5		33.0	32.5		2.0	2.2		2.0	2.4	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.6	0.0		1.6	0.1		0.4	0.2		0.2	0.3	
Delay (s)	33.3	32.5		34.6	32.5		2.5	2.4		2.2	2.7	
Level of Service	C	C		C	C		A	A		A	A	
Approach Delay (s)		32.9			33.7			2.4			2.7	
Approach LOS		C			C			A			A	

Intersection Summary			
HCM Average Control Delay	4.2	HCM Level of Service	A
HCM Volume to Capacity ratio	0.28		
Actuated Cycle Length (s)	74.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	44.4%	ICU Level of Service	A
Analysis Period (min)	15		

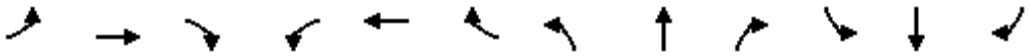
c Critical Lane Group



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	65	0	45	135	0	113	28	648	104	89	445	25
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0	6.0		6.0	6.0		6.0	6.0		6.0	6.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	0.95		1.00	0.95	
Frt	1.00	0.85		1.00	0.85		1.00	0.98		1.00	0.99	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1573	1408		1738	1555		1267	3371		1825	3159	
Flt Permitted	0.68	1.00		0.73	1.00		0.46	1.00		0.33	1.00	
Satd. Flow (perm)	1123	1408		1327	1555		619	3371		633	3159	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	71	0	49	147	0	123	30	704	113	97	484	27
RTOR Reduction (vph)	0	40	0	0	100	0	0	13	0	0	4	0
Lane Group Flow (vph)	71	9	0	147	23	0	30	804	0	97	507	0
Heavy Vehicles (%)	16%	0%	16%	5%	0%	5%	44%	7%	0%	0%	13%	44%
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	13.3	13.3		13.3	13.3		46.9	46.9		46.9	46.9	
Effective Green, g (s)	13.3	13.3		13.3	13.3		46.9	46.9		46.9	46.9	
Actuated g/C Ratio	0.18	0.18		0.18	0.18		0.65	0.65		0.65	0.65	
Clearance Time (s)	6.0	6.0		6.0	6.0		6.0	6.0		6.0	6.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	207	259		244	286		402	2190		411	2052	
v/s Ratio Prot		0.01			0.01			c0.24			0.16	
v/s Ratio Perm	0.06			c0.11			0.05			0.15		
v/c Ratio	0.34	0.03		0.60	0.08		0.07	0.37		0.24	0.25	
Uniform Delay, d1	25.6	24.2		27.0	24.4		4.7	5.8		5.2	5.3	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	1.0	0.1		4.2	0.1		0.4	0.5		1.3	0.3	
Delay (s)	26.6	24.2		31.2	24.5		5.0	6.3		6.6	5.6	
Level of Service	C	C		C	C		A	A		A	A	
Approach Delay (s)		25.7			28.1			6.3			5.7	
Approach LOS		C			C			A			A	

Intersection Summary			
HCM Average Control Delay	10.5	HCM Level of Service	B
HCM Volume to Capacity ratio	0.42		
Actuated Cycle Length (s)	72.2	Sum of lost time (s)	12.0
Intersection Capacity Utilization	55.3%	ICU Level of Service	B
Analysis Period (min)	15		

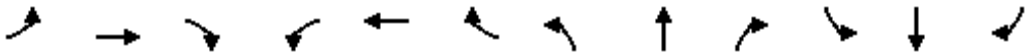
c Critical Lane Group



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	162	0	75	13	0	28	56	326	18	39	322	169
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	
Lane Util. Factor		1.00			1.00			0.95			0.95	
Frt		0.96			0.91			0.99			0.95	
Flt Protected		0.97			0.98			0.99			1.00	
Satd. Flow (prot)		1411			1683			3044			3079	
Flt Permitted		0.77			0.87			0.82			0.90	
Satd. Flow (perm)		1121			1488			2501			2771	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	176	0	82	14	0	30	61	354	20	42	350	184
RTOR Reduction (vph)	0	28	0	0	22	0	0	3	0	0	54	0
Lane Group Flow (vph)	0	230	0	0	22	0	0	432	0	0	522	0
Heavy Vehicles (%)	26%	0%	26%	2%	0%	2%	20%	19%	0%	0%	10%	20%
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		17.5			17.5			32.6			32.6	
Effective Green, g (s)		17.5			17.5			32.6			32.6	
Actuated g/C Ratio		0.28			0.28			0.52			0.52	
Clearance Time (s)		6.0			6.0			6.0			6.0	
Vehicle Extension (s)		3.0			3.0			3.0			3.0	
Lane Grp Cap (vph)		316			419			1313			1455	
v/s Ratio Prot												
v/s Ratio Perm		c0.21			0.02			0.17			c0.19	
v/c Ratio		0.73			0.05			0.33			0.36	
Uniform Delay, d1		20.1			16.3			8.5			8.6	
Progression Factor		1.00			1.00			1.00			1.00	
Incremental Delay, d2		8.1			0.1			0.7			0.7	
Delay (s)		28.3			16.3			9.1			9.3	
Level of Service		C			B			A			A	
Approach Delay (s)		28.3			16.3			9.1			9.3	
Approach LOS		C			B			A			A	

Intersection Summary			
HCM Average Control Delay	13.2	HCM Level of Service	B
HCM Volume to Capacity ratio	0.49		
Actuated Cycle Length (s)	62.1	Sum of lost time (s)	12.0
Intersection Capacity Utilization	61.9%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	117	0	28	58	0	101	48	730	57	99	394	126
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	
Lane Util. Factor		1.00			1.00			0.95			0.95	
Frt		0.97			0.91			0.99			0.97	
Flt Protected		0.96			0.98			1.00			0.99	
Satd. Flow (prot)		1697			1691			3444			3218	
Flt Permitted		0.65			0.85			0.88			0.69	
Satd. Flow (perm)		1154			1457			3030			2243	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	127	0	30	63	0	110	52	793	62	108	428	137
RTOR Reduction (vph)	0	12	0	0	89	0	0	5	0	0	23	0
Lane Group Flow (vph)	0	145	0	0	84	0	0	902	0	0	650	0
Heavy Vehicles (%)	6%	0%	6%	2%	0%	2%	4%	5%	0%	0%	13%	4%
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		13.9			13.9			45.9			45.9	
Effective Green, g (s)		13.9			13.9			45.9			45.9	
Actuated g/C Ratio		0.19			0.19			0.64			0.64	
Clearance Time (s)		6.0			6.0			6.0			6.0	
Vehicle Extension (s)		3.0			3.0			3.0			3.0	
Lane Grp Cap (vph)		223			282			1937			1434	
v/s Ratio Prot												
v/s Ratio Perm		c0.13			0.06			c0.30			0.29	
v/c Ratio		0.65			0.30			0.47			0.45	
Uniform Delay, d1		26.7			24.8			6.7			6.6	
Progression Factor		1.00			1.00			1.00			1.00	
Incremental Delay, d2		6.4			0.6			0.8			1.0	
Delay (s)		33.1			25.4			7.5			7.6	
Level of Service		C			C			A			A	
Approach Delay (s)		33.1			25.4			7.5			7.6	
Approach LOS		C			C			A			A	

Intersection Summary			
HCM Average Control Delay	11.2	HCM Level of Service	B
HCM Volume to Capacity ratio	0.51		
Actuated Cycle Length (s)	71.8	Sum of lost time (s)	12.0
Intersection Capacity Utilization	71.0%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

APPENDIX E2
ROUNDABOUT (ARCADY) ANALYSIS

ARCADY 7

Version: 7.1.1.245 [9th June 2011]

For sales and distribution information, program advice and maintenance, contact TRL:
Tel: +44 (0)1344 770758 E-mail: software@trl.co.uk Web: http://www.trlsoftware.co.uk

File: C:\Users\hlo\Documents\References\shelburne\Centennial Road and Highway 10_89.arc7
Report generation date: 20/06/2012 3:08:35 PM

Summary of roundabout performance

	AM Peak Hour				PM Peak Hour			
	Queue (PCU)	Delay (min)	RFC	LOS	Queue (PCU)	Delay (min)	RFC	LOS
	(Default Analysis Set) - 2032 Full Build Out							
Arm 1	0.35	0.03	0.23	A	1.45	0.05	0.58	A
Arm 2	0.05	0.03	0.03	A	0.19	0.05	0.14	A
Arm 3	0.56	0.04	0.34	A	0.76	0.04	0.41	A

Values shown are the maximum values over all time segments. Delay is the maximum value of average delay per arriving vehicle.

2032 Full Build Out - PM Peak Hour runs from 08:00:00 to 09:30:00
2032 Full Build Out - AM Peak Hour runs from 08:00:00 to 09:30:00

File summary

File Description

Title	2032 Full Build Out Analysis
Location	Centennial Road and Highway 10/89
Site Number	
Date	27/02/2012
Version	
Status	(new file)
Identifier	
Client	
Jobnumber	
Enumerator	CEG
Description	

Analysis Options

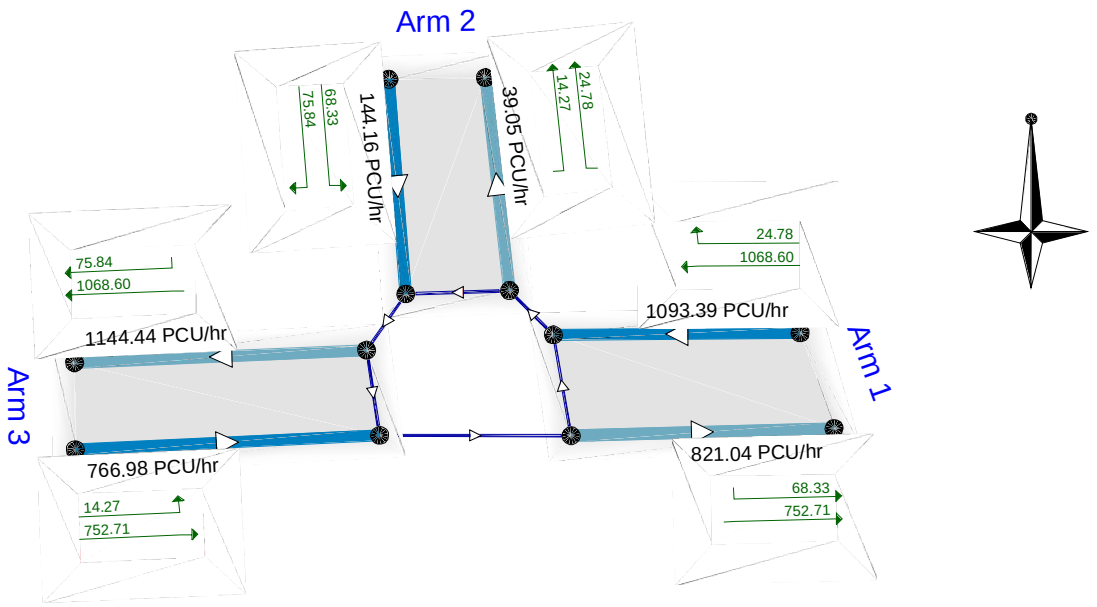
RFC Threshold	Vehicle Length (m)	Do Queue Variations
0.85	5.75	

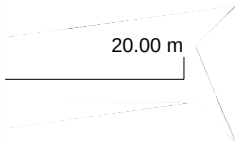
Sorting and Display

Show Arm Names	Arm Grouping	Sorting Direction	Sorting Type	Data Matrix Style	Time Style
	Order	Ascending	Numerical	By Destination	Absolute Time

Units

Distance Units	Speed Units	Traffic Units Input	Traffic Units Results	Flow Units	Average Delay Units	Total Delay Units	Rate Of Delay Units
m	kph	PCU	PCU	perHour	min	-Min	perMin





Turn Boxes - Entry Flow - PCU/hr
Entry Arm (Text A) - Entry Flow - PCU/hr
Exit Arm (Text B) - Exit Flow - PCU/hr

2032 Full Build Out Analysis
Current Time Segment: (8:00 AM-8:15 AM)
Analysis Set A1 - (Default Analysis Set), Demand Set D1 - 2032 Full Build Out, PM Peak Hour
Diagram produced using ARCADY 7 Diagram

The junction diagram reflects the last run of ARCADY.

A1 - (Default Analysis Set) - D1 - 2032 Full Build Out, PM Peak Hour

Data Errors and Warnings

No errors or warnings

Analysis Set Details

Name	Description	Include In Report	Use Specific Demand Set	Demand Set	Locked	Network Flow Scaling Factor (%)	Network Capacity Scaling Factor (%)	Reason For Scaling Factors
(Default Analysis Set)		Yes		(D1)		100.000	100.000	

Demand Set Details

Name	Scenario Name	Time Period Name	Description	Locked	Run Automatically	Use Relationship	Relationship	Start Time (HH:mm)	Finish Time (HH:mm)	Time Period Length (min)	Time Segment Length (min)	Traffic Profile Type
2032 Full Build Out, PM Peak Hour	2032 Full Build Out	PM Peak Hour			Yes			08:00	09:30	90	15	ONE HOUR

Roundabout Network

Roundabout Type(s)

ID	Name	Arm Order	Roundabout Type	Grade Separated	Large Roundabout	Do Geometric Delay
1	(untitled)	1,2,3	Standard			

Roundabout Network Options

Driving Side	Lighting	Road Surface	In London
Right	Normal/unknown	((Mini-roundabouts only))	

Arms

Arms

ID	Name	Description
1	Highway 10/89 East	
2	Centennial Road	
3	Highway 10/89 West	

Capacity Options

Arm	Minimum Capacity (PCU/hr)	Maximum Capacity (PCU/hr)	Assume Flat Start Profile	Initial Queue (PCU)
1	0.00	99999.00		0.00
2	0.00	99999.00		0.00
3	0.00	99999.00		0.00

Standard Geometry

Arm	V - Approach road half-width (m)	E - Entry width (m)	l' - Effective flare length (m)	R - Entry radius (m)	D - Inscribed circle diameter (m)	PHI - Conflict (entry) angle (deg)	Exit Only
1	7.00	12.00	10.00	70.00	50.00	30.00	
2	7.00	12.00	10.00	70.00	50.00	30.00	
3	7.00	12.00	10.00	70.00	50.00	30.00	

Pedestrian Crossings

Arm	Crossing Type
1	None
2	None
3	None

Arm Slope/ Intercept and Capacity

Slope and Intercept used in model

Arm	Enter Directly	Slope	Intercept (PCU/hr)	Final Slope	Final Intercept (PCU/hr)
1		((calculated))	((calculated))	0.826	2798.128
2		((calculated))	((calculated))	0.826	2798.128
3		((calculated))	((calculated))	0.826	2798.128

The slope and intercept shown above include any corrections and adjustments.

Traffic Flows

Demand Set Data Options

Default Vehicle Mix	Vehicle Mix Varies Over Time	Vehicle Mix Varies Over Turn	Vehicle Mix Varies Over Entry	Vehicle Mix Source	PCU Factor for a HV (PCU)	Default Turning Proportions	Estimate from entry/exit counts	Turning Proportions Vary Over Time	Turning Proportions Vary Over Turn	Turning Proportions Vary Over Entry
		Yes	Yes	HV Percentages	2.00				Yes	Yes

Entry Flows

General Flows Data

Arm	Profile Type	Use Turning Counts	Average Demand Flow (PCU/hr)	Flow Scaling Factor (%)	PHF
1	ONE HOUR		1456.00	100.000	N/A
2	ONE HOUR		192.00	100.000	N/A
3	ONE HOUR		1021.00	100.000	N/A

Direct/Resultant Flows

Direct Flows Data

Time Segment	Arm	Direct Demand Entry Flow (PCU/hr)	DirectDemandEntryFlowInPCU (PCU/hr)	Direct Demand Exit Flow (PCU/hr)	Direct Demand Pedestrian Flow (Ped/hr)
1	1	1096.15	1096.15	N/A	N/A
1	2	144.55	144.55	N/A	N/A
1	3	768.66	768.66	N/A	N/A
2	1	1308.91	1308.91	N/A	N/A
2	2	172.60	172.60	N/A	N/A
2	3	917.86	917.86	N/A	N/A
3	1	1603.09	1603.09	N/A	N/A
3	2	211.40	211.40	N/A	N/A
3	3	1124.14	1124.14	N/A	N/A
4	1	1603.09	1603.09	N/A	N/A
4	2	211.40	211.40	N/A	N/A
4	3	1124.14	1124.14	N/A	N/A
5	1	1308.91	1308.91	N/A	N/A
5	2	172.60	172.60	N/A	N/A
5	3	917.86	917.86	N/A	N/A
6	1	1096.15	1096.15	N/A	N/A
6	2	144.55	144.55	N/A	N/A
6	3	768.66	768.66	N/A	N/A

Turning Proportions

Turning Counts or Proportions (PCU/hr) - Roundabout 1 (for whole period)

		To		
		1	2	3
From	1	0.000	33.000	1423.000
	2	91.000	0.000	101.000
	3	1002.000	19.000	0.000

Turning Proportions (PCU) - Roundabout 1 (for whole period)

		To		
		1	2	3
From	1	0.00	0.02	0.98
	2	0.47	0.00	0.53
	3	0.98	0.02	0.00

Vehicle Mix

Average PCU Per Vehicle - Roundabout 1 (for whole period)

		To		
		1	2	3
From	1	1.000	1.130	1.070
	2	1.180	1.000	1.180
	3	1.080	1.130	1.000

Heavy Vehicle Percentages - Roundabout 1 (for whole period)

		To		
		1	2	3
From	1	0.000	13.000	7.000
	2	18.000	0.000	18.000
	3	8.000	13.000	0.000

ARCADY 7

Version: 7.1.1.245 [9th June 2011]

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File: C:\Users\hlo\Documents\References\shelburne\Main Street and County Road 124.arc7
Report generation date: 20/06/2012 3:11:38 PM

Summary of roundabout performance

	AM Peak Hour				PM Peak			
	Queue (PCU)	Delay (min)	RFC	LOS	Queue (PCU)	Delay (min)	RFC	LOS
	(Default Analysis Set) - 2032 Full Build Out							
Arm 1	0.60	0.04	0.34	A	2.80	0.10	0.72	A
Arm 2	0.48	0.04	0.30	A	0.84	0.07	0.43	A
Arm 3	0.92	0.05	0.46	A	1.10	0.05	0.51	A
Arm 4	0.35	0.05	0.23	A	0.94	0.06	0.47	A

Values shown are the maximum values over all time segments. Delay is the maximum value of average delay per arriving vehicle.

2032 Full Build Out - AM Peak Hour runs from 08:00:00 to 09:30:00
2032 Full Build Out - PM Peak runs from 08:00:00 to 09:30:00

File summary

File Description

Title	2032 Full Build Out Analysis
Location	Highway 10/89 (Main) / County Road 124
Site Number	
Date	15/01/2012
Version	
Status	(new file)
Identifier	
Client	
Jobnumber	
Enumerator	CEG
Description	

Analysis Options

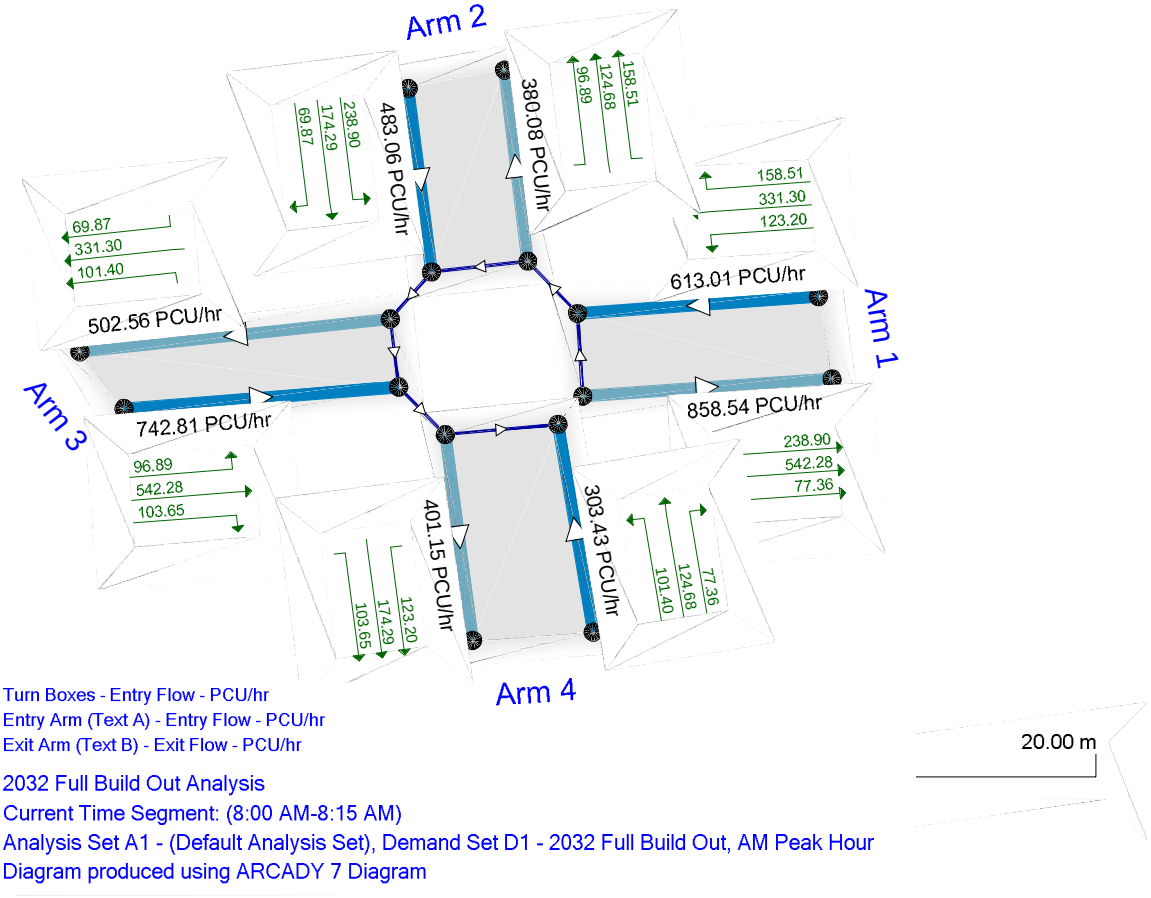
RFC Threshold	Vehicle Length (m)	Do Queue Variations
0.85	5.75	

Sorting and Display

Show Arm Names	Arm Grouping	Sorting Direction	Sorting Type	Data Matrix Style	Time Style
	Order	Ascending	Numerical	By Destination	Absolute Time

Units

Distance Units	Speed Units	Traffic Units Input	Traffic Units Results	Flow Units	Average Delay Units	Total Delay Units	Rate Of Delay Units
m	kph	PCU	PCU	perHour	min	-Min	perMin



The junction diagram reflects the last run of ARCADY.

A1 - (Default Analysis Set) - D1 - 2032 Full Build Out, AM Peak Hour

Data Errors and Warnings

No errors or warnings

Analysis Set Details

Name	Description	Include In Report	Use Specific Demand Set	Demand Set	Locked	Network Flow Scaling Factor (%)	Network Capacity Scaling Factor (%)	Reason For Scaling Factors
(Default Analysis Set)		Yes		(D1)		100.000	100.000	

Demand Set Details

Name	Scenario Name	Time Period Name	Description	Locked	Run Automatically	Use Relationship	Relationship	Start Time (HH:mm)	Finish Time (HH:mm)	Time Period Length (min)	Time Segment Length (min)	Traffic Profile Type
2032 Full Build Out, AM Peak Hour	2032 Full Build Out	AM Peak Hour			Yes			08:00	09:30	90	15	ONE HOUR

Roundabout Network

Roundabout Type(s)

ID	Name	Arm Order	Roundabout Type	Grade Separated	Large Roundabout	Do Geometric Delay
1	(untitled)	1,2,3,4	Standard			

Roundabout Network Options

Driving Side	Lighting	Road Surface	In London
Right	Normal/unknown	((Mini-roundabouts only))	

Arms

Arms

ID	Name	Description
1	Highway 10/89 (East Leg)	
2	County Road 124 North Leg	
3	Highway 10/89 (Main Street)	
4	County Road 11	

Capacity Options

Arm	Minimum Capacity (PCU/hr)	Maximum Capacity (PCU/hr)	Assume Flat Start Profile	Initial Queue (PCU)
1	0.00	99999.00		0.00
2	0.00	99999.00		0.00
3	0.00	99999.00		0.00
4	0.00	99999.00		0.00

Standard Geometry

Arm	V - Approach road half-width (m)	E - Entry width (m)	l' - Effective flare length (m)	R - Entry radius (m)	D - Inscribed circle diameter (m)	PHI - Conflict (entry) angle (deg)	Exit Only
1	7.00	12.00	20.00	70.00	50.00	30.00	
2	7.00	12.00	20.00	70.00	50.00	30.00	
3	7.00	12.00	20.00	70.00	50.00	30.00	
4	7.00	12.00	20.00	70.00	50.00	30.00	

Pedestrian Crossings

Arm	Crossing Type
1	None
2	None
3	None
4	None

Arm Slope/ Intercept and Capacity

Slope and Intercept used in model

Arm	Enter Directly	Slope	Intercept (PCU/hr)	Final Slope	Final Intercept (PCU/hr)
1		((calculated))	((calculated))	0.877	3066.148
2		((calculated))	((calculated))	0.877	3066.148
3		((calculated))	((calculated))	0.877	3066.148
4		((calculated))	((calculated))	0.877	3066.148

The slope and intercept shown above include any corrections and adjustments.

Traffic Flows

Demand Set Data Options

Default Vehicle Mix	Vehicle Mix Varies Over Time	Vehicle Mix Varies Over Turn	Vehicle Mix Varies Over Entry	Vehicle Mix Source	PCU Factor for a HV (PCU)	Default Turning Proportions	Estimate from entry/exit counts	Turning Proportions Vary Over Time	Turning Proportions Vary Over Turn	Turning Proportions Vary Over Entry
		Yes	Yes	HV Percentages	2.00				Yes	Yes

Entry Flows

General Flows Data

Arm	Profile Type	Use Turning Counts	Average Demand Flow (PCU/hr)	Flow Scaling Factor (%)	PHF
1	ONE HOUR		816.00	100.000	N/A
2	ONE HOUR		643.00	100.000	N/A
3	ONE HOUR		989.00	100.000	N/A
4	ONE HOUR		404.00	100.000	N/A

Direct/Resultant Flows

Direct Flows Data

Time Segment	Arm	Direct Demand Entry Flow (PCU/hr)	DirectDemandEntryFlowInPCU (PCU/hr)	Direct Demand Exit Flow (PCU/hr)	Direct Demand Pedestrian Flow (Ped/hr)
1	1	614.33	614.33	N/A	N/A
1	2	484.08	484.08	N/A	N/A
1	3	744.57	744.57	N/A	N/A
1	4	304.15	304.15	N/A	N/A
2	1	733.57	733.57	N/A	N/A
2	2	578.04	578.04	N/A	N/A
2	3	889.09	889.09	N/A	N/A
2	4	363.19	363.19	N/A	N/A
3	1	898.43	898.43	N/A	N/A
3	2	707.96	707.96	N/A	N/A
3	3	1088.91	1088.91	N/A	N/A
3	4	444.81	444.81	N/A	N/A
4	1	898.43	898.43	N/A	N/A
4	2	707.96	707.96	N/A	N/A
4	3	1088.91	1088.91	N/A	N/A
4	4	444.81	444.81	N/A	N/A
5	1	733.57	733.57	N/A	N/A
5	2	578.04	578.04	N/A	N/A
5	3	889.09	889.09	N/A	N/A
5	4	363.19	363.19	N/A	N/A
6	1	614.33	614.33	N/A	N/A
6	2	484.08	484.08	N/A	N/A
6	3	744.57	744.57	N/A	N/A
6	4	304.15	304.15	N/A	N/A

Turning Proportions

Turning Counts or Proportions (PCU/hr) - Roundabout 1 (for whole period)

		To			
		1	2	3	4
From	1	0.000	211.000	441.000	164.000
	2	318.000	0.000	93.000	232.000
	3	722.000	129.000	0.000	138.000
	4	103.000	166.000	135.000	0.000

Turning Proportions (PCU) - Roundabout 1 (for whole period)

		To			
		1	2	3	4
From	1	0.00	0.26	0.54	0.20
	2	0.49	0.00	0.14	0.36
	3	0.73	0.13	0.00	0.14
	4	0.25	0.41	0.33	0.00

Vehicle Mix

Average PCU Per Vehicle - Roundabout 1 (for whole period)

		To			
		1	2	3	4
From	1	1.000	1.230	1.150	1.120
	2	1.140	1.000	1.100	1.070
	3	1.090	1.080	1.000	1.140
	4	1.260	1.080	1.260	1.000

Heavy Vehicle Percentages - Roundabout 1 (for whole period)

		To			
		1	2	3	4
From	1	0.000	23.000	15.000	12.000
	2	14.000	0.000	10.000	7.000
	3	9.000	8.000	0.000	14.000
	4	26.000	8.000	26.000	0.000

ARCADY 7

Version: 7.1.1.245 [9th June 2011]

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File: C:\Users\hlo\Documents\References\shelburne\Street Y_Street Z and Highway 10.arc7
Report generation date: 20/06/2012 3:16:26 PM

Summary of roundabout performance

	AM Peak Hour				PM Peak Hour			
	Queue (PCU)	Delay (min)	RFC	LOS	Queue (PCU)	Delay (min)	RFC	LOS
	(Default Analysis Set) - 2032 Full Build Out							
Arm 1	0.60	0.04	0.34	A	1.92	0.07	0.64	A
Arm 2	0.04	0.03	0.03	A	0.42	0.06	0.29	A
Arm 3	0.68	0.04	0.38	A	1.02	0.05	0.49	A
Arm 4	0.04	0.03	0.04	A	0.16	0.04	0.14	A

Values shown are the maximum values over all time segments. Delay is the maximum value of average delay per arriving vehicle.

2032 Full Build Out - PM Peak Hour runs from 08:00:00 to 09:30:00
2032 Full Build Out - AM Peak Hour runs from 08:00:00 to 09:30:00

File summary

File Description

Title	2032 Full Build Out Analysis
Location	Street Y_Street Z and Highway 10/89
Site Number	
Date	12/01/2012
Version	
Status	(new file)
Identifier	
Client	
Jobnumber	
Enumerator	CEG
Description	

Analysis Options

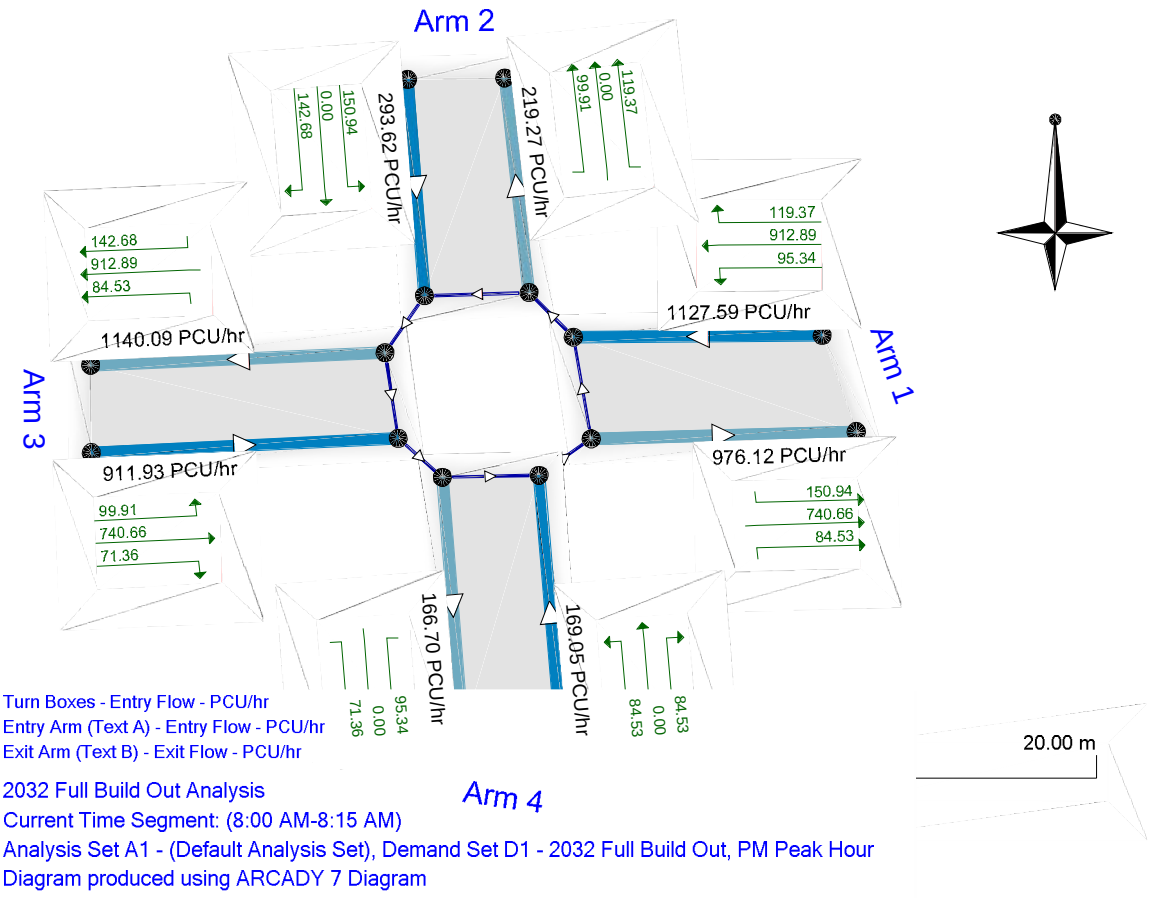
RFC Threshold	Vehicle Length (m)	Do Queue Variations
0.85	5.75	

Sorting and Display

Show Arm Names	Arm Grouping	Sorting Direction	Sorting Type	Data Matrix Style	Time Style
	Order	Ascending	Numerical	By Destination	Absolute Time

Units

Distance Units	Speed Units	Traffic Units Input	Traffic Units Results	Flow Units	Average Delay Units	Total Delay Units	Rate Of Delay Units
m	kph	PCU	PCU	perHour	min	-Min	perMin



The junction diagram reflects the last run of ARCADY.

A1 - (Default Analysis Set) - D1 - 2032 Full Build Out, PM Peak Hour

Data Errors and Warnings

No errors or warnings

Analysis Set Details

Name	Description	Include In Report	Use Specific Demand Set	Demand Set	Locked	Network Flow Scaling Factor (%)	Network Capacity Scaling Factor (%)	Reason For Scaling Factors
(Default Analysis Set)		Yes		(D1)		100.000	100.000	

Demand Set Details

Name	Scenario Name	Time Period Name	Description	Locked	Run Automatically	Use Relationship	Relationship	Start Time (HH:mm)	Finish Time (HH:mm)	Time Period Length (min)	Time Segment Length (min)	Traffic Profile Type
2032 Full Build Out, PM Peak Hour	2032 Full Build Out	PM Peak Hour			Yes			08:00	09:30	90	15	ONE HOUR

Roundabout Network

Roundabout Type(s)

ID	Name	Arm Order	Roundabout Type	Grade Separated	Large Roundabout	Do Geometric Delay
1	(untitled)	1,2,3,4	Standard			

Roundabout Network Options

Driving Side	Lighting	Road Surface	In London
Right	Normal/unknown	((Mini-roundabouts only))	

Arms

Arms

ID	Name	Description
1	Highway 10/89 East	
2	Street Y	
3	Highway 10/89 West	
4	Street Z	

Capacity Options

Arm	Minimum Capacity (PCU/hr)	Maximum Capacity (PCU/hr)	Assume Flat Start Profile	Initial Queue (PCU)
1	0.00	99999.00		0.00
2	0.00	99999.00		0.00
3	0.00	99999.00		0.00
4	0.00	99999.00		0.00

Standard Geometry

Arm	V - Approach road half-width (m)	E - Entry width (m)	l' - Effective flare length (m)	R - Entry radius (m)	D - Inscribed circle diameter (m)	PHI - Conflict (entry) angle (deg)	Exit Only
1	7.00	12.00	10.00	70.00	50.00	30.00	
2	7.00	12.00	10.00	70.00	50.00	30.00	
3	7.00	12.00	20.00	70.00	50.00	30.00	
4	7.00	12.00	20.00	70.00	50.00	30.00	

Pedestrian Crossings

Arm	Crossing Type
1	None
2	None
3	None
4	None

Arm Slope/ Intercept and Capacity

Slope and Intercept used in model

Arm	Enter Directly	Slope	Intercept (PCU/hr)	Final Slope	Final Intercept (PCU/hr)
1		((calculated))	((calculated))	0.826	2798.128
2		((calculated))	((calculated))	0.826	2798.128
3		((calculated))	((calculated))	0.877	3066.148
4		((calculated))	((calculated))	0.877	3066.148

The slope and intercept shown above include any corrections and adjustments.

Traffic Flows

Demand Set Data Options

Default Vehicle Mix	Vehicle Mix Varies Over Time	Vehicle Mix Varies Over Turn	Vehicle Mix Varies Over Entry	Vehicle Mix Source	PCU Factor for a HV (PCU)	Default Turning Proportions	Estimate from entry/exit counts	Turning Proportions Vary Over Time	Turning Proportions Vary Over Turn	Turning Proportions Vary Over Entry
		Yes	Yes	HV Percentages	2.00				Yes	Yes

Entry Flows

General Flows Data

Arm	Profile Type	Use Turning Counts	Average Demand Flow (PCU/hr)	Flow Scaling Factor (%)	PHF
1	ONE HOUR		1502.00	100.000	N/A
2	ONE HOUR		391.00	100.000	N/A
3	ONE HOUR		1214.00	100.000	N/A
4	ONE HOUR		225.00	100.000	N/A

Direct/Resultant Flows

Direct Flows Data

Time Segment	Arm	Direct Demand Entry Flow (PCU/hr)	DirectDemandEntryFlowInPCU (PCU/hr)	Direct Demand Exit Flow (PCU/hr)	Direct Demand Pedestrian Flow (Ped/hr)
1	1	1130.78	1130.78	N/A	N/A
1	2	294.37	294.37	N/A	N/A
1	3	913.96	913.96	N/A	N/A
1	4	169.39	169.39	N/A	N/A
2	1	1350.27	1350.27	N/A	N/A
2	2	351.50	351.50	N/A	N/A
2	3	1091.36	1091.36	N/A	N/A
2	4	202.27	202.27	N/A	N/A
3	1	1653.73	1653.73	N/A	N/A
3	2	430.50	430.50	N/A	N/A
3	3	1336.64	1336.64	N/A	N/A
3	4	247.73	247.73	N/A	N/A
4	1	1653.73	1653.73	N/A	N/A
4	2	430.50	430.50	N/A	N/A
4	3	1336.64	1336.64	N/A	N/A
4	4	247.73	247.73	N/A	N/A
5	1	1350.27	1350.27	N/A	N/A
5	2	351.50	351.50	N/A	N/A
5	3	1091.36	1091.36	N/A	N/A
5	4	202.27	202.27	N/A	N/A
6	1	1130.78	1130.78	N/A	N/A
6	2	294.37	294.37	N/A	N/A
6	3	913.96	913.96	N/A	N/A
6	4	169.39	169.39	N/A	N/A

Turning Proportions

Turning Counts or Proportions (PCU/hr) - Roundabout 1 (for whole period)

		To			
		1	2	3	4
From	1	0.000	159.000	1216.000	127.000
	2	201.000	0.000	190.000	0.000
	3	986.000	133.000	0.000	95.000
	4	115.000	0.000	115.000	0.000

Turning Proportions (PCU) - Roundabout 1 (for whole period)

		To			
		1	2	3	4
From	1	0.00	0.11	0.81	0.08
	2	0.51	0.00	0.49	0.00
	3	0.81	0.11	0.00	0.08
	4	0.50	0.00	0.50	0.00

Vehicle Mix

Average PCU Per Vehicle - Roundabout 1 (for whole period)

		To			
		1	2	3	4
From	1	1.000	1.020	1.090	1.000
	2	1.020	1.000	1.020	1.000
	3	1.100	1.020	1.000	1.000
	4	1.000	1.020	1.030	1.000

Heavy Vehicle Percentages - Roundabout 1 (for whole period)

		To			
		1	2	3	4
From	1	0.000	2.000	9.000	0.000
	2	2.000	0.000	2.000	0.000
	3	10.000	2.000	0.000	0.000
	4	0.000	2.000	3.000	0.000

ARCADY 7

Version: 7.1.1.245 [9th June 2011]

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File: C:\Users\hlo\Documents\References\shelburne\Street X_Industrial Rd and County Road 124.arc7
Report generation date: 20/06/2012 3:19:49 PM

Summary of roundabout performance

	AM Peak Hour				PM Peak			
	Queue (PCU)	Delay (min)	RFC	LOS	Queue (PCU)	Delay (min)	RFC	LOS
	(Default Analysis Set) - 2032 Full Build Out							
Arm 1	0.02	0.02	0.02	A	0.14	0.03	0.12	A
Arm 2	0.38	0.03	0.26	A	0.29	0.03	0.21	A
Arm 3	0.01	0.03	0.01	A	0.06	0.03	0.05	A
Arm 4	0.26	0.03	0.19	A	0.45	0.03	0.30	A

Values shown are the maximum values over all time segments. Delay is the maximum value of average delay per arriving vehicle.

2032 Full Build Out - AM Peak Hour runs from 08:00:00 to 09:30:00
2032 Full Build Out - PM Peak runs from 08:00:00 to 09:30:00

File summary

File Description

Title	2032 Full Build Out Analysis
Location	County Road / Street X-Industrial Road
Site Number	
Date	15/01/2012
Version	
Status	(new file)
Identifier	
Client	
Jobnumber	
Enumerator	CEG
Description	

Analysis Options

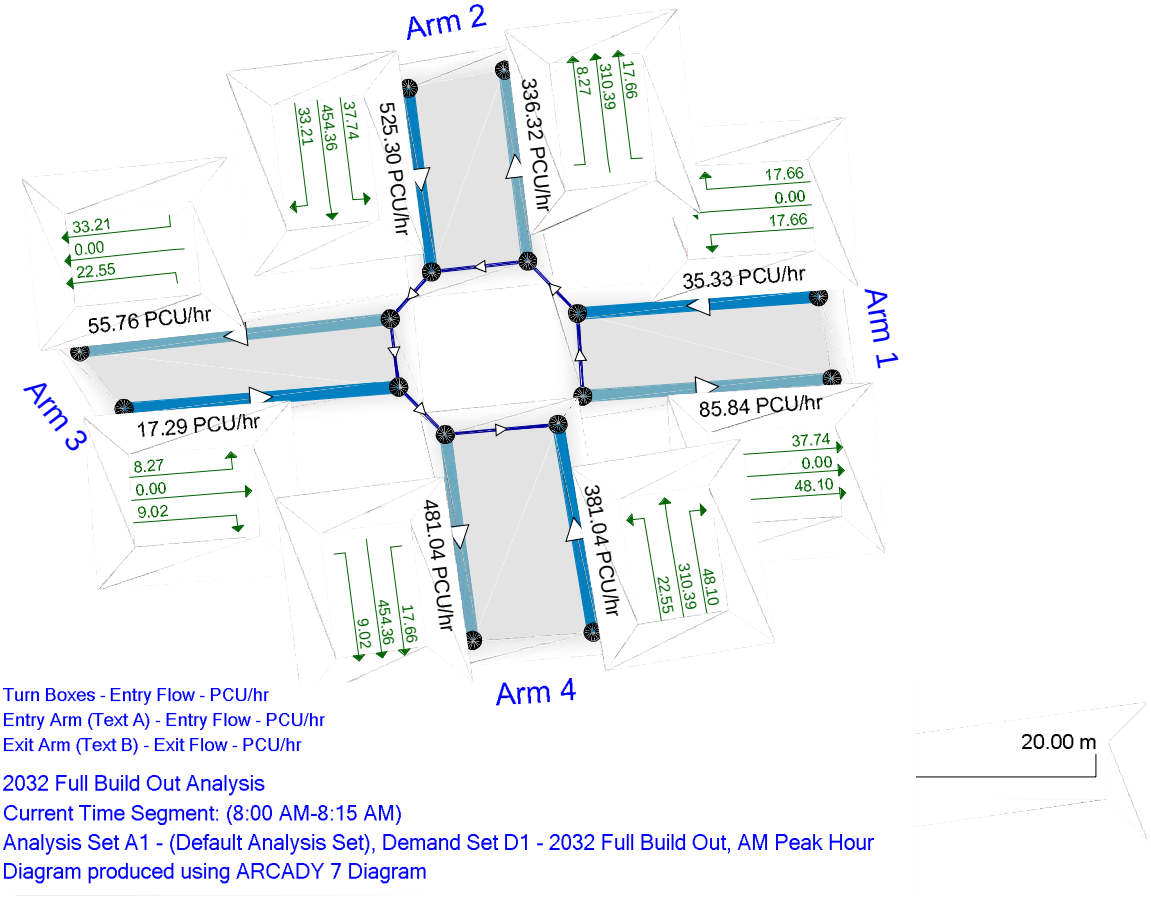
RFC Threshold	Vehicle Length (m)	Do Queue Variations
0.85	5.75	

Sorting and Display

Show Arm Names	Arm Grouping	Sorting Direction	Sorting Type	Data Matrix Style	Time Style
	Order	Ascending	Numerical	By Destination	Absolute Time

Units

Distance Units	Speed Units	Traffic Units Input	Traffic Units Results	Flow Units	Average Delay Units	Total Delay Units	Rate Of Delay Units
m	kph	PCU	PCU	perHour	min	-Min	perMin



The junction diagram reflects the last run of ARCADY.

A1 - (Default Analysis Set) - D1 - 2032 Full Build Out, AM Peak Hour

Data Errors and Warnings

No errors or warnings

Analysis Set Details

Name	Description	Include In Report	Use Specific Demand Set	Demand Set	Locked	Network Flow Scaling Factor (%)	Network Capacity Scaling Factor (%)	Reason For Scaling Factors
(Default Analysis Set)		Yes		(D1)		100.000	100.000	

Demand Set Details

Name	Scenario Name	Time Period Name	Description	Locked	Run Automatically	Use Relationship	Relationship	Start Time (HH:mm)	Finish Time (HH:mm)	Time Period Length (min)	Time Segment Length (min)	Traffic Profile Type
2032 Full Build Out, AM Peak Hour	2032 Full Build Out	AM Peak Hour			Yes			08:00	09:30	90	15	ONE HOUR

Roundabout Network

Roundabout Type(s)

ID	Name	Arm Order	Roundabout Type	Grade Separated	Large Roundabout	Do Geometric Delay
1	(untitled)	1,2,3,4	Standard			

Roundabout Network Options

Driving Side	Lighting	Road Surface	In London
Right	Normal/unknown	((Mini-roundabouts only))	

Arms

Arms

ID	Name	Description
1	Street X	
2	County Road 124 North Leg	
3	Industrial Road	
4	County Road 124	

Capacity Options

Arm	Minimum Capacity (PCU/hr)	Maximum Capacity (PCU/hr)	Assume Flat Start Profile	Initial Queue (PCU)
1	0.00	99999.00		0.00
2	0.00	99999.00		0.00
3	0.00	99999.00		0.00
4	0.00	99999.00		0.00

Standard Geometry

Arm	V - Approach road half-width (m)	E - Entry width (m)	l' - Effective flare length (m)	R - Entry radius (m)	D - Inscribed circle diameter (m)	PHI - Conflict (entry) angle (deg)	Exit Only
1	7.00	12.00	20.00	70.00	50.00	30.00	
2	7.00	12.00	20.00	70.00	50.00	30.00	
3	7.00	12.00	20.00	70.00	50.00	30.00	
4	7.00	12.00	20.00	70.00	50.00	30.00	

Pedestrian Crossings

Arm	Crossing Type
1	None
2	None
3	None
4	None

Arm Slope/ Intercept and Capacity

Slope and Intercept used in model

Arm	Enter Directly	Slope	Intercept (PCU/hr)	Final Slope	Final Intercept (PCU/hr)
1		((calculated))	((calculated))	0.877	3066.148
2		((calculated))	((calculated))	0.877	3066.148
3		((calculated))	((calculated))	0.877	3066.148
4		((calculated))	((calculated))	0.877	3066.148

The slope and intercept shown above include any corrections and adjustments.

Traffic Flows

Demand Set Data Options

Default Vehicle Mix	Vehicle Mix Varies Over Time	Vehicle Mix Varies Over Turn	Vehicle Mix Varies Over Entry	Vehicle Mix Source	PCU Factor for a HV (PCU)	Default Turning Proportions	Estimate from entry/exit counts	Turning Proportions Vary Over Time	Turning Proportions Vary Over Turn	Turning Proportions Vary Over Entry
		Yes	Yes	HV Percentages	2.00				Yes	Yes

Entry Flows

General Flows Data

Arm	Profile Type	Use Turning Counts	Average Demand Flow (PCU/hr)	Flow Scaling Factor (%)	PHF
1	ONE HOUR		47.00	100.000	N/A
2	ONE HOUR		699.00	100.000	N/A
3	ONE HOUR		23.00	100.000	N/A
4	ONE HOUR		507.00	100.000	N/A

Direct/Resultant Flows

Direct Flows Data

Time Segment	Arm	Direct Demand Entry Flow (PCU/hr)	DirectDemandEntryFlowInPCU (PCU/hr)	Direct Demand Exit Flow (PCU/hr)	Direct Demand Pedestrian Flow (Ped/hr)
1	1	35.38	35.38	N/A	N/A
1	2	526.24	526.24	N/A	N/A
1	3	17.32	17.32	N/A	N/A
1	4	381.70	381.70	N/A	N/A
2	1	42.25	42.25	N/A	N/A
2	2	628.39	628.39	N/A	N/A
2	3	20.68	20.68	N/A	N/A
2	4	455.78	455.78	N/A	N/A
3	1	51.75	51.75	N/A	N/A
3	2	769.61	769.61	N/A	N/A
3	3	25.32	25.32	N/A	N/A
3	4	558.22	558.22	N/A	N/A
4	1	51.75	51.75	N/A	N/A
4	2	769.61	769.61	N/A	N/A
4	3	25.32	25.32	N/A	N/A
4	4	558.22	558.22	N/A	N/A
5	1	42.25	42.25	N/A	N/A
5	2	628.39	628.39	N/A	N/A
5	3	20.68	20.68	N/A	N/A
5	4	455.78	455.78	N/A	N/A
6	1	35.38	35.38	N/A	N/A
6	2	526.24	526.24	N/A	N/A
6	3	17.32	17.32	N/A	N/A
6	4	381.70	381.70	N/A	N/A

Turning Proportions

Turning Counts or Proportions (PCU/hr) - Roundabout 1 (for whole period)

		To			
		1	2	3	4
From	1	0.000	26.000	0.000	26.000
	2	50.000	0.000	44.000	602.000
	3	0.000	11.000	0.000	12.000
	4	64.000	413.000	30.000	0.000

Turning Proportions (PCU) - Roundabout 1 (for whole period)

		To			
		1	2	3	4
From	1	0.00	0.50	0.00	0.50
	2	0.07	0.00	0.06	0.86
	3	0.00	0.48	0.00	0.52
	4	0.13	0.81	0.06	0.00

Vehicle Mix

Average PCU Per Vehicle - Roundabout 1 (for whole period)

		To			
		1	2	3	4
From	1	1.000	1.050	1.030	1.050
	2	1.030	1.000	1.500	1.110
	3	1.030	1.150	1.000	1.150
	4	1.030	1.140	1.500	1.000

Heavy Vehicle Percentages - Roundabout 1 (for whole period)

		To			
		1	2	3	4
From	1	0.000	5.000	3.000	5.000
	2	3.000	0.000	50.000	11.000
	3	3.000	15.000	0.000	15.000
	4	3.000	14.000	50.000	0.000

ARCADY 7

Version: 7.1.1.245 [9th June 2011]

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File: C:\Users\hlo\Documents\References\shelburne\School Road and County Road.arc7
Report generation date: 20/06/2012 3:21:07 PM

Summary of roundabout performance

	AM Peak Hour				PM Peak Hour			
	Queue (PCU)	Delay (min)	RFC	LOS	Queue (PCU)	Delay (min)	RFC	LOS
	(Default Analysis Set) - 2032 Full Build Out							
Arm 1	0.00	0.03	0.00	A	0.00	0.03	0.00	A
Arm 2	0.26	0.03	0.19	A	0.34	0.03	0.24	A
Arm 3	0.12	0.03	0.09	A	0.07	0.03	0.06	A
Arm 4	0.15	0.03	0.11	A	0.40	0.03	0.27	A

Values shown are the maximum values over all time segments. Delay is the maximum value of average delay per arriving vehicle.

2032 Full Build Out - PM Peak Hour runs from 08:00:00 to 09:30:00
2032 Full Build Out - AM Peak Hour runs from 08:00:00 to 09:30:00

File summary

File Description

Title	2032 Full Build Out Analysis
Location	School Road_and County Road 11
Site Number	
Date	12/01/2012
Version	
Status	(new file)
Identifier	
Client	
Jobnumber	
Enumerator	CEG
Description	

Analysis Options

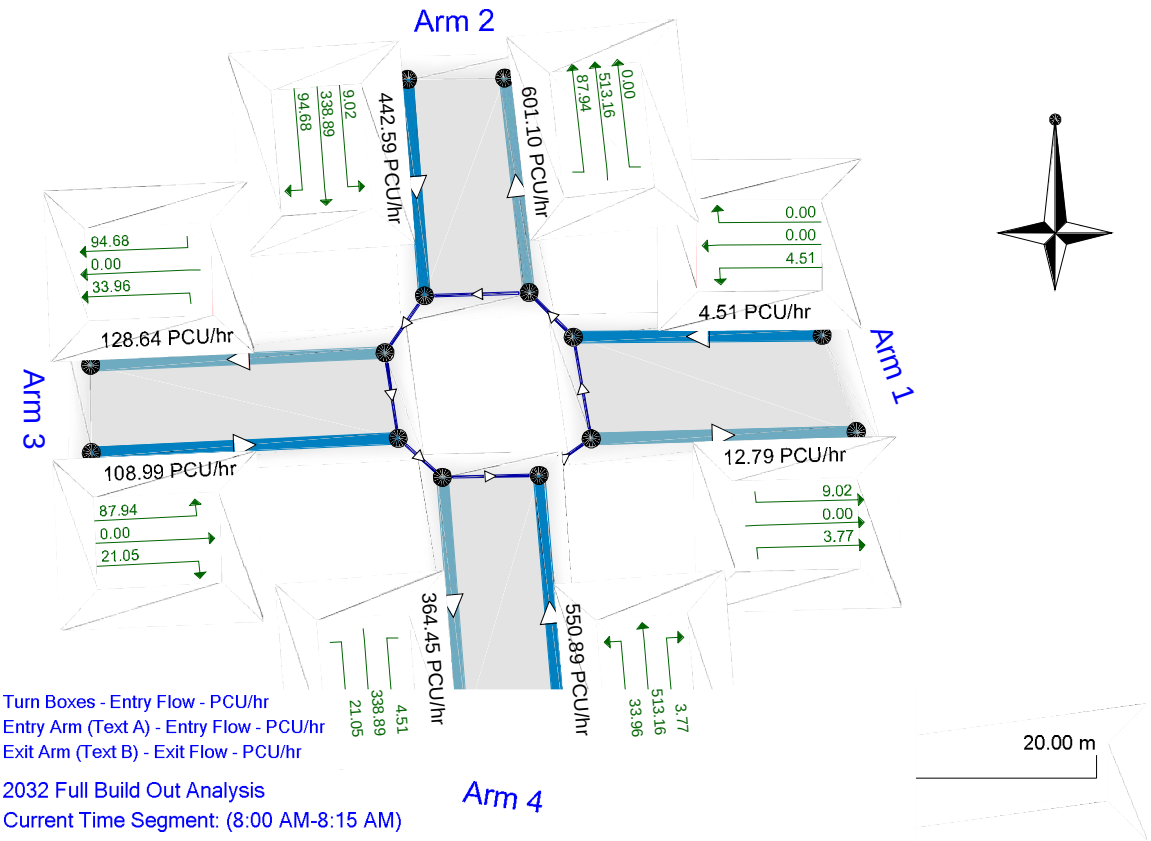
RFC Threshold	Vehicle Length (m)	Do Queue Variations
0.85	5.75	

Sorting and Display

Show Arm Names	Arm Grouping	Sorting Direction	Sorting Type	Data Matrix Style	Time Style
	Order	Ascending	Numerical	By Destination	Absolute Time

Units

Distance Units	Speed Units	Traffic Units Input	Traffic Units Results	Flow Units	Average Delay Units	Total Delay Units	Rate Of Delay Units
m	kph	PCU	PCU	perHour	min	-Min	perMin



The junction diagram reflects the last run of ARCADY.

A1 - (Default Analysis Set) - D1 - 2032 Full Build Out, PM Peak Hour

Data Errors and Warnings

No errors or warnings

Analysis Set Details

Name	Description	Include In Report	Use Specific Demand Set	Demand Set	Locked	Network Flow Scaling Factor (%)	Network Capacity Scaling Factor (%)	Reason For Scaling Factors
(Default Analysis Set)		Yes		(D1)		100.000	100.000	

Demand Set Details

Name	Scenario Name	Time Period Name	Description	Locked	Run Automatically	Use Relationship	Relationship	Start Time (HH:mm)	Finish Time (HH:mm)	Time Period Length (min)	Time Segment Length (min)	Traffic Profile Type
2032 Full Build Out, PM Peak Hour	2032 Full Build Out	PM Peak Hour			Yes			08:00	09:30	90	15	ONE HOUR

Roundabout Network

Roundabout Type(s)

ID	Name	Arm Order	Roundabout Type	Grade Separated	Large Roundabout	Do Geometric Delay
1	(untitled)	1,2,3,4	Standard			

Roundabout Network Options

Driving Side	Lighting	Road Surface	In London
Right	Normal/unknown	((Mini-roundabouts only))	

Arms

Arms

ID	Name	Description
1	Private Driveway (C2)	
2	County Road 11 North Leg	
3	School Road	
4	County Road 11	

Capacity Options

Arm	Minimum Capacity (PCU/hr)	Maximum Capacity (PCU/hr)	Assume Flat Start Profile	Initial Queue (PCU)
1	0.00	99999.00		0.00
2	0.00	99999.00		0.00
3	0.00	99999.00		0.00
4	0.00	99999.00		0.00

Standard Geometry

Arm	V - Approach road half-width (m)	E - Entry width (m)	l' - Effective flare length (m)	R - Entry radius (m)	D - Inscribed circle diameter (m)	PHI - Conflict (entry) angle (deg)	Exit Only
1	7.00	12.00	10.00	70.00	50.00	30.00	
2	7.00	12.00	10.00	70.00	50.00	30.00	
3	7.00	12.00	20.00	70.00	50.00	30.00	
4	7.00	12.00	20.00	70.00	50.00	30.00	

Pedestrian Crossings

Arm	Crossing Type
1	None
2	None
3	None
4	None

Arm Slope/ Intercept and Capacity

Slope and Intercept used in model

Arm	Enter Directly	Slope	Intercept (PCU/hr)	Final Slope	Final Intercept (PCU/hr)
1		((calculated))	((calculated))	0.826	2798.128
2		((calculated))	((calculated))	0.826	2798.128
3		((calculated))	((calculated))	0.877	3066.148
4		((calculated))	((calculated))	0.877	3066.148

The slope and intercept shown above include any corrections and adjustments.

Traffic Flows

Demand Set Data Options

Default Vehicle Mix	Vehicle Mix Varies Over Time	Vehicle Mix Varies Over Turn	Vehicle Mix Varies Over Entry	Vehicle Mix Source	PCU Factor for a HV (PCU)	Default Turning Proportions	Estimate from entry/exit counts	Turning Proportions Vary Over Time	Turning Proportions Vary Over Turn	Turning Proportions Vary Over Entry
		Yes	Yes	HV Percentages	2.00				Yes	Yes

Entry Flows

General Flows Data

Arm	Profile Type	Use Turning Counts	Average Demand Flow (PCU/hr)	Flow Scaling Factor (%)	PHF
1	ONE HOUR		6.00	100.000	N/A
2	ONE HOUR		589.00	100.000	N/A
3	ONE HOUR		145.00	100.000	N/A
4	ONE HOUR		733.00	100.000	N/A

Direct/Resultant Flows

Direct Flows Data

Time Segment	Arm	Direct Demand Entry Flow (PCU/hr)	DirectDemandEntryFlowInPCU (PCU/hr)	Direct Demand Exit Flow (PCU/hr)	Direct Demand Pedestrian Flow (Ped/hr)
1	1	4.52	4.52	N/A	N/A
1	2	443.43	443.43	N/A	N/A
1	3	109.16	109.16	N/A	N/A
1	4	551.84	551.84	N/A	N/A
2	1	5.39	5.39	N/A	N/A
2	2	529.50	529.50	N/A	N/A
2	3	130.35	130.35	N/A	N/A
2	4	658.95	658.95	N/A	N/A
3	1	6.61	6.61	N/A	N/A
3	2	648.50	648.50	N/A	N/A
3	3	159.65	159.65	N/A	N/A
3	4	807.05	807.05	N/A	N/A
4	1	6.61	6.61	N/A	N/A
4	2	648.50	648.50	N/A	N/A
4	3	159.65	159.65	N/A	N/A
4	4	807.05	807.05	N/A	N/A
5	1	5.39	5.39	N/A	N/A
5	2	529.50	529.50	N/A	N/A
5	3	130.35	130.35	N/A	N/A
5	4	658.95	658.95	N/A	N/A
6	1	4.52	4.52	N/A	N/A
6	2	443.43	443.43	N/A	N/A
6	3	109.16	109.16	N/A	N/A
6	4	551.84	551.84	N/A	N/A

Turning Proportions

Turning Counts or Proportions (PCU/hr) - Roundabout 1 (for whole period)

		To			
		1	2	3	4
From	1	0.000	0.000	0.000	6.000
	2	12.000	0.000	126.000	451.000
	3	0.000	117.000	0.000	28.000
	4	5.000	680.000	45.000	0.000

Turning Proportions (PCU) - Roundabout 1 (for whole period)

		To			
		1	2	3	4
From	1	0.00	0.00	0.00	1.00
	2	0.02	0.00	0.21	0.77
	3	0.00	0.81	0.00	0.19
	4	0.01	0.93	0.06	0.00

Vehicle Mix

Average PCU Per Vehicle - Roundabout 1 (for whole period)

		To			
		1	2	3	4
From	1	1.000	1.020	1.000	1.020
	2	1.000	1.000	1.040	1.130
	3	1.000	1.060	1.000	1.060
	4	1.000	1.050	1.040	1.000

Heavy Vehicle Percentages - Roundabout 1 (for whole period)

		To			
		1	2	3	4
From	1	0.000	2.000	0.000	2.000
	2	0.000	0.000	4.000	13.000
	3	0.000	6.000	0.000	6.000
	4	0.000	5.000	4.000	0.000

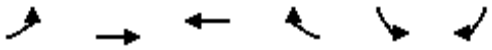
APPENDIX F
ANALYSIS OF INTERIM SCENARIOS

F1 – 2017 Interim Synchro Analysis

F2 – 2022 Interim Synchro Analysis

F3 – 2027 Interim Synchro Analysis

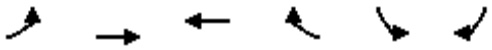
APPENDIX F1
2017 INTERIM SYNCHRO ANALYSIS



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	10	633	450	6	35	24
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	11	688	489	7	38	26
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (m)			230			
pX, platoon unblocked						
vC, conflicting volume	496				858	248
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	496				858	248
tC, single (s)	4.2				7.4	7.5
tC, 2 stage (s)						
tF (s)	2.2				3.8	3.6
p0 queue free %	99				85	96
cM capacity (veh/h)	1044				247	679

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	SB 1
Volume Total	240	459	326	170	64
Volume Left	11	0	0	0	38
Volume Right	0	0	0	7	26
cSH	1044	1700	1700	1700	334
Volume to Capacity	0.01	0.27	0.19	0.10	0.19
Queue Length 95th (m)	0.2	0.0	0.0	0.0	5.3
Control Delay (s)	0.5	0.0	0.0	0.0	18.3
Lane LOS	A				C
Approach Delay (s)	0.2		0.0		18.3
Approach LOS					C

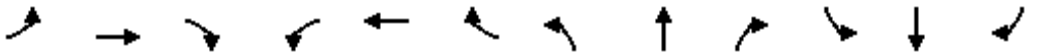
Intersection Summary			
Average Delay	1.0		
Intersection Capacity Utilization	34.7%	ICU Level of Service	A
Analysis Period (min)	15		



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	13	735	1021	20	49	73
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	14	799	1110	22	53	79
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (m)			230			
pX, platoon unblocked	0.83				0.83	0.83
vC, conflicting volume	1132				1548	566
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	759				1259	81
tC, single (s)	4.4				7.2	7.3
tC, 2 stage (s)						
tF (s)	2.3				3.7	3.5
p0 queue free %	98				54	90
cM capacity (veh/h)	650				116	762

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	SB 1
Volume Total	280	533	740	392	133
Volume Left	14	0	0	0	53
Volume Right	0	0	0	22	79
cSH	650	1700	1700	1700	235
Volume to Capacity	0.02	0.31	0.44	0.23	0.56
Queue Length 95th (m)	0.5	0.0	0.0	0.0	23.7
Control Delay (s)	0.8	0.0	0.0	0.0	38.4
Lane LOS	A				E
Approach Delay (s)	0.3		0.0		38.4
Approach LOS					E

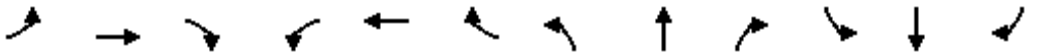
Intersection Summary			
Average Delay	2.6		
Intersection Capacity Utilization	43.4%	ICU Level of Service	A
Analysis Period (min)	15		



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	89	480	98	99	295	184	91	108	72	141	119	70
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	7.0	7.0	7.0	7.0	7.0	7.0	8.0	8.0		8.0	8.0	8.0
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	1.00		1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.94		1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1690	3349	1432	1630	3174	1328	1448	1568		1601	1795	1484
Flt Permitted	0.56	1.00	1.00	0.42	1.00	1.00	0.67	1.00		0.64	1.00	1.00
Satd. Flow (perm)	991	3349	1432	718	3174	1328	1028	1568		1070	1795	1484
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	97	522	107	108	321	200	99	117	78	153	129	76
RTOR Reduction (vph)	0	0	78	0	0	147	0	25	0	0	0	38
Lane Group Flow (vph)	97	522	29	108	321	53	99	170	0	153	129	38
Heavy Vehicles (%)	8%	9%	14%	12%	15%	23%	26%	8%	26%	14%	7%	10%
Turn Type	Perm		Perm	Perm		Perm	Perm			Perm		Perm
Protected Phases		4			8			2			6	
Permitted Phases	4		4	8		8	2			6		6
Actuated Green, G (s)	17.2	17.2	17.2	17.2	17.2	17.2	32.2	32.2		32.2	32.2	32.2
Effective Green, g (s)	17.2	17.2	17.2	17.2	17.2	17.2	32.2	32.2		32.2	32.2	32.2
Actuated g/C Ratio	0.27	0.27	0.27	0.27	0.27	0.27	0.50	0.50		0.50	0.50	0.50
Clearance Time (s)	7.0	7.0	7.0	7.0	7.0	7.0	8.0	8.0		8.0	8.0	8.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	265	894	382	192	848	355	514	784		535	898	742
v/s Ratio Prot		c0.16			0.10			0.11			0.07	
v/s Ratio Perm	0.10		0.02	0.15		0.04	0.10			c0.14		0.03
v/c Ratio	0.37	0.58	0.07	0.56	0.38	0.15	0.19	0.22		0.29	0.14	0.05
Uniform Delay, d1	19.2	20.5	17.6	20.4	19.2	18.0	8.9	9.0		9.4	8.7	8.3
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	0.9	1.0	0.1	3.7	0.3	0.2	0.8	0.6		1.3	0.3	0.1
Delay (s)	20.0	21.5	17.7	24.1	19.5	18.2	9.7	9.7		10.7	9.0	8.4
Level of Service	C	C	B	C	B	B	A	A		B	A	A
Approach Delay (s)		20.7			19.9			9.7			9.6	
Approach LOS		C			B			A			A	

Intersection Summary			
HCM Average Control Delay	16.9	HCM Level of Service	B
HCM Volume to Capacity ratio	0.39		
Actuated Cycle Length (s)	64.4	Sum of lost time (s)	15.0
Intersection Capacity Utilization	61.6%	ICU Level of Service	B
Analysis Period (min)	15		

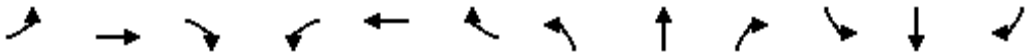
c Critical Lane Group



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	128	512	144	142	712	157	218	195	152	134	140	111
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	7.0	7.0	7.0	4.0	7.0	7.0	4.0	8.0		4.0	8.0	8.0
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	1.00		1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.93		1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1738	3349	1570	1460	3411	1471	1690	1743		1534	1779	1498
Flt Permitted	0.36	1.00	1.00	0.30	1.00	1.00	0.64	1.00		0.42	1.00	1.00
Satd. Flow (perm)	656	3349	1570	466	3411	1471	1132	1743		684	1779	1498
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	139	557	157	154	774	171	237	212	165	146	152	121
RTOR Reduction (vph)	0	0	113	0	0	107	0	31	0	0	0	82
Lane Group Flow (vph)	139	557	44	154	774	64	237	346	0	146	152	39
Heavy Vehicles (%)	5%	9%	4%	25%	7%	11%	8%	3%	3%	19%	8%	9%
Turn Type	Perm		Perm	pm+pt		Perm	pm+pt			pm+pt		Perm
Protected Phases		4		3	8		5	2		1	6	
Permitted Phases	4		4	8		8	2			6		6
Actuated Green, G (s)	22.9	22.9	22.9	30.9	30.9	30.9	33.2	27.2		31.2	26.2	26.2
Effective Green, g (s)	22.9	22.9	22.9	30.9	30.9	30.9	33.2	27.2		31.2	26.2	26.2
Actuated g/C Ratio	0.28	0.28	0.28	0.38	0.38	0.38	0.40	0.33		0.38	0.32	0.32
Clearance Time (s)	7.0	7.0	7.0	4.0	7.0	7.0	4.0	8.0		4.0	8.0	8.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	183	934	438	224	1284	554	499	577		312	568	478
v/s Ratio Prot		0.17		0.03	c0.23		c0.03	c0.20		0.03	0.09	
v/s Ratio Perm	0.21		0.03	c0.23		0.04	0.16			0.15		0.03
v/c Ratio	0.76	0.60	0.10	0.69	0.60	0.12	0.47	0.60		0.47	0.27	0.08
Uniform Delay, d1	27.1	25.6	22.0	21.1	20.6	16.7	17.2	22.9		17.9	20.8	19.5
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	16.5	1.0	0.1	8.5	0.8	0.1	0.7	4.6		1.1	1.2	0.3
Delay (s)	43.5	26.6	22.1	29.5	21.5	16.8	17.9	27.5		19.1	22.0	19.9
Level of Service	D	C	C	C	C	B	B	C		B	C	B
Approach Delay (s)		28.5			21.9			23.8			20.3	
Approach LOS		C			C			C			C	

Intersection Summary			
HCM Average Control Delay	24.0	HCM Level of Service	C
HCM Volume to Capacity ratio	0.56		
Actuated Cycle Length (s)	82.1	Sum of lost time (s)	11.0
Intersection Capacity Utilization	75.4%	ICU Level of Service	D
Analysis Period (min)	15		

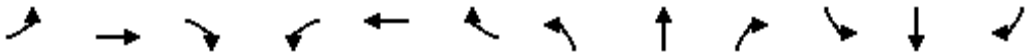
c Critical Lane Group



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	30	663	0	0	559	34	0	0	0	22	0	19
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	7.0	7.0			7.0	7.0				6.0	6.0	
Lane Util. Factor	1.00	0.95			0.95	1.00				1.00	1.00	
Frt	1.00	1.00			1.00	0.85				1.00	0.85	
Flt Protected	0.95	1.00			1.00	1.00				0.95	1.00	
Satd. Flow (prot)	1789	3288			3120	1601				1789	1601	
Flt Permitted	0.41	1.00			1.00	1.00				0.76	1.00	
Satd. Flow (perm)	769	3288			3120	1601				1426	1601	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	33	721	0	0	608	37	0	0	0	24	0	21
RTOR Reduction (vph)	0	0	0	0	0	24	0	0	0	0	12	0
Lane Group Flow (vph)	33	721	0	0	608	13	0	0	0	24	9	0
Heavy Vehicles (%)	2%	11%	0%	0%	17%	2%	0%	2%	0%	2%	2%	2%
Turn Type	Perm		Perm	Perm		Perm	Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4		4	8		8	2			6		
Actuated Green, G (s)	18.3	18.3			18.3	18.3				22.1	22.1	
Effective Green, g (s)	18.3	18.3			18.3	18.3				22.1	22.1	
Actuated g/C Ratio	0.34	0.34			0.34	0.34				0.41	0.41	
Clearance Time (s)	7.0	7.0			7.0	7.0				6.0	6.0	
Vehicle Extension (s)	3.0	3.0			3.0	3.0				3.0	3.0	
Lane Grp Cap (vph)	264	1127			1069	549				590	663	
v/s Ratio Prot		c0.22			0.19						0.01	
v/s Ratio Perm	0.04					0.01				c0.02		
v/c Ratio	0.12	0.64			0.57	0.02				0.04	0.01	
Uniform Delay, d1	12.1	14.8			14.3	11.6				9.3	9.2	
Progression Factor	1.00	1.00			1.00	1.00				1.00	1.00	
Incremental Delay, d2	0.2	1.2			0.7	0.0				0.1	0.0	
Delay (s)	12.3	16.0			15.0	11.6				9.5	9.3	
Level of Service	B	B			B	B				A	A	
Approach Delay (s)		15.8			14.8			0.0			9.4	
Approach LOS		B			B			A			A	

Intersection Summary			
HCM Average Control Delay	15.2	HCM Level of Service	B
HCM Volume to Capacity ratio	0.31		
Actuated Cycle Length (s)	53.4	Sum of lost time (s)	13.0
Intersection Capacity Utilization	39.1%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	111	687	0	0	874	133	0	0	0	127	0	127
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	7.0	7.0			7.0	7.0				6.0	6.0	
Lane Util. Factor	1.00	0.95			0.95	1.00				1.00	1.00	
Frt	1.00	1.00			1.00	0.85				1.00	0.85	
Flt Protected	0.95	1.00			1.00	1.00				0.95	1.00	
Satd. Flow (prot)	1789	3318			3349	1601				1789	1601	
Flt Permitted	0.24	1.00			1.00	1.00				0.76	1.00	
Satd. Flow (perm)	445	3318			3349	1601				1426	1601	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	121	747	0	0	950	145	0	0	0	138	0	138
RTOR Reduction (vph)	0	0	0	0	0	82	0	0	0	0	90	0
Lane Group Flow (vph)	121	747	0	0	950	63	0	0	0	138	48	0
Heavy Vehicles (%)	2%	10%	0%	0%	9%	2%	0%	2%	0%	2%	2%	2%
Turn Type	Perm		Perm	Perm		Perm	Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4		4	8		8	2			6		
Actuated Green, G (s)	25.1	25.1			25.1	25.1				19.3	19.3	
Effective Green, g (s)	25.1	25.1			25.1	25.1				19.3	19.3	
Actuated g/C Ratio	0.44	0.44			0.44	0.44				0.34	0.34	
Clearance Time (s)	7.0	7.0			7.0	7.0				6.0	6.0	
Vehicle Extension (s)	3.0	3.0			3.0	3.0				3.0	3.0	
Lane Grp Cap (vph)	195	1451			1464	700				479	538	
v/s Ratio Prot		0.23			c0.28						0.03	
v/s Ratio Perm	0.27					0.04				c0.10		
v/c Ratio	0.62	0.51			0.65	0.09				0.29	0.09	
Uniform Delay, d1	12.5	11.7			12.7	9.5				14.0	13.0	
Progression Factor	1.00	1.00			1.00	1.00				1.00	1.00	
Incremental Delay, d2	6.0	0.3			1.0	0.1				1.5	0.3	
Delay (s)	18.5	12.0			13.7	9.5				15.5	13.4	
Level of Service	B	B			B	A				B	B	
Approach Delay (s)		12.9			13.1			0.0			14.4	
Approach LOS		B			B			A			B	

Intersection Summary			
HCM Average Control Delay	13.2	HCM Level of Service	B
HCM Volume to Capacity ratio	0.49		
Actuated Cycle Length (s)	57.4	Sum of lost time (s)	13.0
Intersection Capacity Utilization	54.8%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (veh/h)	681	4	2	585	8	12
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	740	4	2	636	9	13
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume			745		1065	372
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			745		1065	372
tC, single (s)			4.1		6.8	6.9
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		96	98
cM capacity (veh/h)			872		220	631

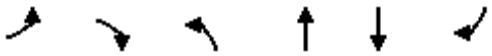
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1
Volume Total	493	251	214	424	22
Volume Left	0	0	2	0	9
Volume Right	0	4	0	0	13
cSH	1700	1700	872	1700	362
Volume to Capacity	0.29	0.15	0.00	0.25	0.06
Queue Length 95th (m)	0.0	0.0	0.1	0.0	1.5
Control Delay (s)	0.0	0.0	0.1	0.0	15.6
Lane LOS			A		C
Approach Delay (s)	0.0		0.0		15.6
Approach LOS					C

Intersection Summary			
Average Delay	0.3		
Intersection Capacity Utilization	29.0%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (veh/h)	798	16	24	994	13	10
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	867	17	26	1080	14	11
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume			885		1468	442
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			885		1468	442
tC, single (s)			4.1		6.8	6.9
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			97		88	98
cM capacity (veh/h)			773		117	568

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1
Volume Total	578	307	386	720	25
Volume Left	0	0	26	0	14
Volume Right	0	17	0	0	11
cSH	1700	1700	773	1700	178
Volume to Capacity	0.34	0.18	0.03	0.42	0.14
Queue Length 95th (m)	0.0	0.0	0.8	0.0	3.6
Control Delay (s)	0.0	0.0	1.1	0.0	28.5
Lane LOS			A		D
Approach Delay (s)	0.0		0.4		28.5
Approach LOS					D

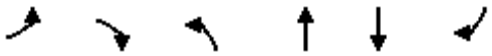
Intersection Summary			
Average Delay	0.6		
Intersection Capacity Utilization	54.7%	ICU Level of Service	A
Analysis Period (min)	15		



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	14	18	14	338	337	17
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	15	20	15	367	366	18
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	773	376	385			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	773	376	385			
tC, single (s)	6.9	6.7	4.3			
tC, 2 stage (s)						
tF (s)	3.9	3.7	2.4			
p0 queue free %	95	97	99			
cM capacity (veh/h)	305	580	1063			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	35	383	385
Volume Left	15	15	0
Volume Right	20	0	18
cSH	416	1063	1700
Volume to Capacity	0.08	0.01	0.23
Queue Length 95th (m)	2.1	0.3	0.0
Control Delay (s)	14.4	0.5	0.0
Lane LOS	B	A	
Approach Delay (s)	14.4	0.5	0.0
Approach LOS	B		

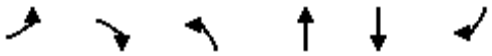
Intersection Summary			
Average Delay	0.9		
Intersection Capacity Utilization	39.1%	ICU Level of Service	A
Analysis Period (min)	15		



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	30	25	32	462	327	26
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	33	27	35	502	355	28
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	941	370	384			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	941	370	384			
tC, single (s)	6.7	6.5	4.2			
tC, 2 stage (s)						
tF (s)	3.8	3.6	2.3			
p0 queue free %	87	96	97			
cM capacity (veh/h)	250	614	1122			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	60	537	384
Volume Left	33	35	0
Volume Right	27	0	28
cSH	343	1122	1700
Volume to Capacity	0.17	0.03	0.23
Queue Length 95th (m)	4.7	0.7	0.0
Control Delay (s)	17.7	0.9	0.0
Lane LOS	C	A	
Approach Delay (s)	17.7	0.9	0.0
Approach LOS	C		

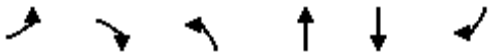
Intersection Summary			
Average Delay	1.6		
Intersection Capacity Utilization	58.2%	ICU Level of Service	B
Analysis Period (min)	15		



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	7	10	24	357	320	30
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	8	11	26	388	348	33
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (m)				174		
pX, platoon unblocked						
vC, conflicting volume	804	364	380			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	804	364	380			
tC, single (s)	6.6	6.4	4.6			
tC, 2 stage (s)						
tF (s)	3.6	3.4	2.7			
p0 queue free %	98	98	97			
cM capacity (veh/h)	326	653	958			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	18	414	380
Volume Left	8	26	0
Volume Right	11	0	33
cSH	462	958	1700
Volume to Capacity	0.04	0.03	0.22
Queue Length 95th (m)	0.9	0.6	0.0
Control Delay (s)	13.1	0.9	0.0
Lane LOS	B	A	
Approach Delay (s)	13.1	0.9	0.0
Approach LOS	B		

Intersection Summary			
Average Delay		0.7	
Intersection Capacity Utilization		48.5%	ICU Level of Service A
Analysis Period (min)		15	



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	44	36	23	458	315	18
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	48	39	25	498	342	20
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (m)				174		
pX, platoon unblocked	0.97					
vC, conflicting volume	900	352	362			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	881	352	362			
tC, single (s)	6.6	6.4	4.5			
tC, 2 stage (s)						
tF (s)	3.6	3.4	2.6			
p0 queue free %	83	94	97			
cM capacity (veh/h)	283	661	998			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	87	523	362
Volume Left	48	25	0
Volume Right	39	0	20
cSH	381	998	1700
Volume to Capacity	0.23	0.03	0.21
Queue Length 95th (m)	6.6	0.6	0.0
Control Delay (s)	17.2	0.7	0.0
Lane LOS	C	A	
Approach Delay (s)	17.2	0.7	0.0
Approach LOS	C		

Intersection Summary			
Average Delay	1.9		
Intersection Capacity Utilization	54.1%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	18	15	338	27	23	332
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	20	16	367	29	25	361
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (m)			352			
pX, platoon unblocked						
vC, conflicting volume	793	382			397	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	793	382			397	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	94	98			98	
cM capacity (veh/h)	350	665			1162	

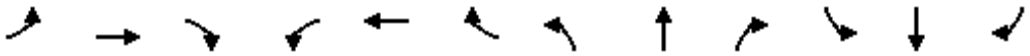
Direction, Lane #	WB 1	NB 1	SB 1	SB 2
Volume Total	36	397	25	361
Volume Left	20	0	25	0
Volume Right	16	29	0	0
cSH	446	1700	1162	1700
Volume to Capacity	0.08	0.23	0.02	0.21
Queue Length 95th (m)	2.0	0.0	0.5	0.0
Control Delay (s)	13.8	0.0	8.2	0.0
Lane LOS	B		A	
Approach Delay (s)	13.8	0.0	0.5	
Approach LOS	B			

Intersection Summary			
Average Delay	0.9		
Intersection Capacity Utilization	29.4%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	91	79	415	87	76	293
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	99	86	451	95	83	318
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (m)			352			
pX, platoon unblocked						
vC, conflicting volume	982	498			546	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	982	498			546	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	61	85			92	
cM capacity (veh/h)	254	572			1024	

Direction, Lane #	WB 1	NB 1	SB 1	SB 2
Volume Total	185	546	83	318
Volume Left	99	0	83	0
Volume Right	86	95	0	0
cSH	342	1700	1024	1700
Volume to Capacity	0.54	0.32	0.08	0.19
Queue Length 95th (m)	23.1	0.0	2.0	0.0
Control Delay (s)	27.2	0.0	8.8	0.0
Lane LOS	D		A	
Approach Delay (s)	27.2	0.0	1.8	
Approach LOS	D			

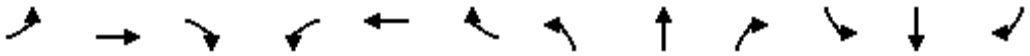
Intersection Summary			
Average Delay	5.1		
Intersection Capacity Utilization	51.2%	ICU Level of Service	A
Analysis Period (min)	15		



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	110	0	56	5	0	26	40	224	7	39	163	114
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	120	0	61	5	0	28	43	243	8	42	177	124
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (m)											132	
pX, platoon unblocked	0.99	0.99	0.99	0.99	0.99		0.99					
vC, conflicting volume	686	662	239	719	720	247	301			251		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	682	657	232	715	716	247	294			251		
tC, single (s)	7.4	6.5	6.5	7.1	6.5	6.2	4.3			4.1		
tC, 2 stage (s)												
tF (s)	3.7	4.0	3.5	3.5	4.0	3.3	2.4			2.2		
p0 queue free %	61	100	92	98	100	96	96			97		
cM capacity (veh/h)	303	359	747	300	332	791	1165			1326		

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	180	34	295	343
Volume Left	120	5	43	42
Volume Right	61	28	8	124
cSH	379	626	1165	1326
Volume to Capacity	0.48	0.05	0.04	0.03
Queue Length 95th (m)	18.8	1.3	0.9	0.8
Control Delay (s)	22.8	11.1	1.5	1.2
Lane LOS	C	B	A	A
Approach Delay (s)	22.8	11.1	1.5	1.2
Approach LOS	C	B		

Intersection Summary				
Average Delay	6.3			
Intersection Capacity Utilization	45.4%	ICU Level of Service	A	
Analysis Period (min)	15			

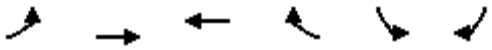


Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	62	0	16	14	0	82	33	421	14	77	279	70
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	67	0	17	15	0	89	36	458	15	84	303	76
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (m)											132	
pX, platoon unblocked	0.92	0.92	0.92	0.92	0.92		0.92					
vC, conflicting volume	1135	1053	341	1063	1084	465	379			473		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1101	1013	236	1023	1046	465	277			473		
tC, single (s)	7.2	6.5	6.3	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.6	4.0	3.4	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	49	100	98	91	100	85	97			92		
cM capacity (veh/h)	133	198	727	176	189	597	1168			1100		

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	85	104	509	463
Volume Left	67	15	36	84
Volume Right	17	89	15	76
cSH	160	443	1168	1100
Volume to Capacity	0.53	0.24	0.03	0.08
Queue Length 95th (m)	20.0	6.9	0.7	1.9
Control Delay (s)	50.3	15.6	0.9	2.2
Lane LOS	F	C	A	A
Approach Delay (s)	50.3	15.6	0.9	2.2
Approach LOS	F	C		

Intersection Summary				
Average Delay	6.4			
Intersection Capacity Utilization	61.0%	ICU Level of Service	B	
Analysis Period (min)	15			

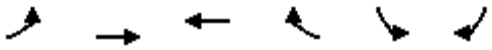
APPENDIX F2
2022 INTERIM SYNCHRO ANALYSIS



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (vph)	13	782	550	12	40	27
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.0	6.0		6.0	
Lane Util. Factor		0.95	0.95		1.00	
Frt		1.00	1.00		0.95	
Flt Protected		1.00	1.00		0.97	
Satd. Flow (prot)		3348	3143		1378	
Flt Permitted		0.94	1.00		0.97	
Satd. Flow (perm)		3152	3143		1378	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	14	850	598	13	43	29
RTOR Reduction (vph)	0	0	3	0	18	0
Lane Group Flow (vph)	0	864	608	0	54	0
Heavy Vehicles (%)	5%	9%	16%	5%	28%	28%
Turn Type	Perm					
Protected Phases		4	8		6	
Permitted Phases	4					
Actuated Green, G (s)		22.0	22.0		21.2	
Effective Green, g (s)		22.0	22.0		21.2	
Actuated g/C Ratio		0.40	0.40		0.38	
Clearance Time (s)		6.0	6.0		6.0	
Vehicle Extension (s)		3.0	3.0		3.0	
Lane Grp Cap (vph)		1256	1253		529	
v/s Ratio Prot			0.19		c0.04	
v/s Ratio Perm		c0.27				
v/c Ratio		0.69	0.49		0.10	
Uniform Delay, d1		13.8	12.4		10.9	
Progression Factor		1.00	1.00		1.00	
Incremental Delay, d2		1.6	0.3		0.4	
Delay (s)		15.3	12.7		11.3	
Level of Service		B	B		B	
Approach Delay (s)		15.3	12.7		11.3	
Approach LOS		B	B		B	

Intersection Summary			
HCM Average Control Delay	14.1	HCM Level of Service	B
HCM Volume to Capacity ratio	0.40		
Actuated Cycle Length (s)	55.2	Sum of lost time (s)	12.0
Intersection Capacity Utilization	44.7%	ICU Level of Service	A
Analysis Period (min)	15		

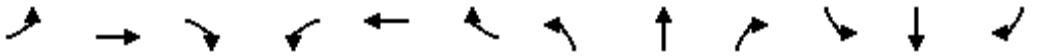
c Critical Lane Group



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (vph)	16	898	1241	25	64	86
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.0	6.0		6.0	
Lane Util. Factor		0.95	0.95		1.00	
Frt		1.00	1.00		0.92	
Flt Protected		1.00	1.00		0.98	
Satd. Flow (prot)		3374	3398		1471	
Flt Permitted		0.92	1.00		0.98	
Satd. Flow (perm)		3094	3398		1471	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	17	976	1349	27	70	93
RTOR Reduction (vph)	0	0	2	0	48	0
Lane Group Flow (vph)	0	993	1374	0	115	0
Heavy Vehicles (%)	13%	8%	7%	13%	18%	18%
Turn Type	Perm					
Protected Phases		4	8		6	
Permitted Phases	4					
Actuated Green, G (s)		36.3	36.3		17.3	
Effective Green, g (s)		36.3	36.3		17.3	
Actuated g/C Ratio		0.55	0.55		0.26	
Clearance Time (s)		6.0	6.0		6.0	
Vehicle Extension (s)		3.0	3.0		3.0	
Lane Grp Cap (vph)		1712	1880		388	
v/s Ratio Prot			c0.40		c0.08	
v/s Ratio Perm		0.32				
v/c Ratio		0.58	0.73		0.30	
Uniform Delay, d1		9.6	11.0		19.3	
Progression Factor		1.00	1.00		1.00	
Incremental Delay, d2		0.5	1.5		1.9	
Delay (s)		10.1	12.5		21.2	
Level of Service		B	B		C	
Approach Delay (s)		10.1	12.5		21.2	
Approach LOS		B	B		C	

Intersection Summary			
HCM Average Control Delay	12.1	HCM Level of Service	B
HCM Volume to Capacity ratio	0.59		
Actuated Cycle Length (s)	65.6	Sum of lost time (s)	12.0
Intersection Capacity Utilization	55.0%	ICU Level of Service	B
Analysis Period (min)	15		

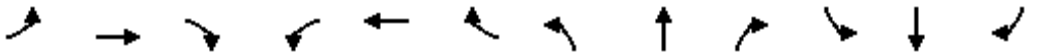
c Critical Lane Group



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	105	589	128	124	361	201	121	141	88	265	188	80
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	7.0	7.0	7.0	4.0	7.0	7.0	8.0	8.0		8.0	8.0	8.0
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	1.00		1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.94		1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1690	3349	1432	1630	3174	1328	1448	1575		1601	1795	1484
Flt Permitted	0.52	1.00	1.00	0.23	1.00	1.00	0.63	1.00		0.60	1.00	1.00
Satd. Flow (perm)	926	3349	1432	392	3174	1328	960	1575		1019	1795	1484
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	114	640	139	135	392	218	132	153	96	288	204	87
RTOR Reduction (vph)	0	0	104	0	0	141	0	27	0	0	0	48
Lane Group Flow (vph)	114	640	35	135	392	77	132	222	0	288	204	39
Heavy Vehicles (%)	8%	9%	14%	12%	15%	23%	26%	8%	26%	14%	7%	10%
Turn Type	Perm		Perm	pm+pt		Perm	Perm			Perm		Perm
Protected Phases		4		3	8			2			6	
Permitted Phases	4		4	8		8	2			6		6
Actuated Green, G (s)	19.5	19.5	19.5	27.4	27.4	27.4	35.2	35.2		35.2	35.2	35.2
Effective Green, g (s)	19.5	19.5	19.5	27.4	27.4	27.4	35.2	35.2		35.2	35.2	35.2
Actuated g/C Ratio	0.25	0.25	0.25	0.35	0.35	0.35	0.45	0.45		0.45	0.45	0.45
Clearance Time (s)	7.0	7.0	7.0	4.0	7.0	7.0	8.0	8.0		8.0	8.0	8.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	233	842	360	201	1121	469	435	714		462	814	673
v/s Ratio Prot		c0.19		c0.03	0.12			0.14			0.11	
v/s Ratio Perm	0.12		0.02	0.20		0.06	0.14			c0.28		0.03
v/c Ratio	0.49	0.76	0.10	0.67	0.35	0.16	0.30	0.31		0.62	0.25	0.06
Uniform Delay, d1	24.8	26.9	22.3	19.8	18.5	17.2	13.4	13.5		16.2	13.1	11.9
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	1.6	4.1	0.1	8.5	0.2	0.2	1.8	1.1		6.2	0.7	0.2
Delay (s)	26.4	31.0	22.4	28.3	18.7	17.4	15.2	14.6		22.4	13.8	12.1
Level of Service	C	C	C	C	B	B	B	B		C	B	B
Approach Delay (s)		29.0			20.1			14.8			17.8	
Approach LOS		C			C			B			B	

Intersection Summary			
HCM Average Control Delay	21.9	HCM Level of Service	C
HCM Volume to Capacity ratio	0.68		
Actuated Cycle Length (s)	77.6	Sum of lost time (s)	19.0
Intersection Capacity Utilization	73.1%	ICU Level of Service	D
Analysis Period (min)	15		

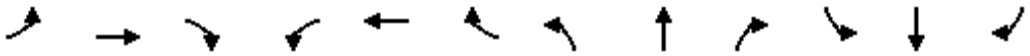
c Critical Lane Group



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	146	626	190	155	865	255	272	266	174	206	196	129
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	7.0	7.0	4.0	7.0	7.0	4.0	8.0		4.0	8.0	8.0
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	1.00		1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.94		1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1738	3349	1570	1460	3411	1471	1690	1755		1534	1779	1498
Flt Permitted	0.19	1.00	1.00	0.22	1.00	1.00	0.51	1.00		0.24	1.00	1.00
Satd. Flow (perm)	349	3349	1570	336	3411	1471	910	1755		390	1779	1498
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	159	680	207	168	940	277	296	289	189	224	213	140
RTOR Reduction (vph)	0	0	153	0	0	194	0	30	0	0	0	108
Lane Group Flow (vph)	159	680	54	168	940	83	296	448	0	224	213	32
Heavy Vehicles (%)	5%	9%	4%	25%	7%	11%	8%	3%	3%	19%	8%	9%
Turn Type	pm+pt		Perm	pm+pt		Perm	pm+pt			pm+pt		Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4		4	8		8	2			6		6
Actuated Green, G (s)	25.0	21.0	21.0	31.0	24.0	24.0	32.7	22.0		25.3	18.3	18.3
Effective Green, g (s)	25.0	21.0	21.0	31.0	24.0	24.0	32.7	22.0		25.3	18.3	18.3
Actuated g/C Ratio	0.31	0.26	0.26	0.39	0.30	0.30	0.41	0.28		0.32	0.23	0.23
Clearance Time (s)	4.0	7.0	7.0	4.0	7.0	7.0	4.0	8.0		4.0	8.0	8.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	179	879	412	229	1023	441	476	483		223	407	343
v/s Ratio Prot	0.04	0.20		c0.06	c0.28		c0.08	c0.26		c0.09	0.12	
v/s Ratio Perm	0.23		0.03	0.22		0.06	0.17			0.23		0.02
v/c Ratio	0.89	0.77	0.13	0.73	0.92	0.19	0.62	0.93		1.00	0.52	0.09
Uniform Delay, d1	24.8	27.3	22.5	17.9	27.1	20.8	17.1	28.2		25.1	27.0	24.3
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	37.1	4.3	0.1	11.5	12.7	0.2	2.5	26.5		61.4	4.8	0.5
Delay (s)	61.9	31.6	22.7	29.4	39.7	21.0	19.6	54.7		86.5	31.8	24.9
Level of Service	E	C	C	C	D	C	B	D		F	C	C
Approach Delay (s)		34.4			34.7			41.3			51.3	
Approach LOS		C			C			D			D	

Intersection Summary			
HCM Average Control Delay	38.5	HCM Level of Service	D
HCM Volume to Capacity ratio	0.86		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	87.2%	ICU Level of Service	E
Analysis Period (min)	15		

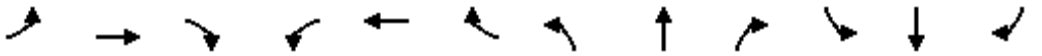
c Critical Lane Group



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	46	846	50	51	627	53	34	0	49	28	0	24
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	7.0	7.0	7.0	7.0	7.0	7.0	6.0	6.0		6.0	6.0	
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	1.00		1.00	1.00	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.85		1.00	0.85	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1789	3288	1633	1825	3120	1601	1825	1633		1789	1601	
Flt Permitted	0.37	1.00	1.00	0.24	1.00	1.00	0.74	1.00		0.72	1.00	
Satd. Flow (perm)	693	3288	1633	460	3120	1601	1422	1633		1361	1601	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	50	920	54	55	682	58	37	0	53	30	0	26
RTOR Reduction (vph)	0	0	31	0	0	34	0	34	0	0	17	0
Lane Group Flow (vph)	50	920	23	55	682	24	37	19	0	30	9	0
Heavy Vehicles (%)	2%	11%	0%	0%	17%	2%	0%	2%	0%	2%	2%	2%
Turn Type	Perm		Perm	Perm		Perm	Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4		4	8		8	2			6		
Actuated Green, G (s)	24.7	24.7	24.7	24.7	24.7	24.7	21.3	21.3		21.3	21.3	
Effective Green, g (s)	24.7	24.7	24.7	24.7	24.7	24.7	21.3	21.3		21.3	21.3	
Actuated g/C Ratio	0.42	0.42	0.42	0.42	0.42	0.42	0.36	0.36		0.36	0.36	
Clearance Time (s)	7.0	7.0	7.0	7.0	7.0	7.0	6.0	6.0		6.0	6.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	290	1377	684	193	1306	670	513	590		491	578	
v/s Ratio Prot		c0.28			0.22			0.01			0.01	
v/s Ratio Perm	0.07		0.01	0.12		0.02	c0.03			0.02		
v/c Ratio	0.17	0.67	0.03	0.28	0.52	0.04	0.07	0.03		0.06	0.02	
Uniform Delay, d1	10.7	13.8	10.1	11.3	12.8	10.1	12.4	12.2		12.3	12.1	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.3	1.2	0.0	0.8	0.4	0.0	0.3	0.1		0.2	0.1	
Delay (s)	11.0	15.1	10.1	12.1	13.1	10.1	12.6	12.3		12.6	12.2	
Level of Service	B	B	B	B	B	B	B	B		B	B	
Approach Delay (s)		14.6			12.9			12.4			12.4	
Approach LOS		B			B			B			B	

Intersection Summary			
HCM Average Control Delay	13.7	HCM Level of Service	B
HCM Volume to Capacity ratio	0.39		
Actuated Cycle Length (s)	59.0	Sum of lost time (s)	13.0
Intersection Capacity Utilization	51.9%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	123	788	95	127	1015	147	110	0	115	154	0	150
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	7.0	7.0	7.0	7.0	7.0	7.0	6.0	6.0		6.0	6.0	
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	1.00		1.00	1.00	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.85		1.00	0.85	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1789	3318	1633	1825	3349	1601	1825	1633		1789	1601	
Flt Permitted	0.19	1.00	1.00	0.29	1.00	1.00	0.65	1.00		0.68	1.00	
Satd. Flow (perm)	361	3318	1633	560	3349	1601	1256	1633		1275	1601	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	134	857	103	138	1103	160	120	0	125	167	0	163
RTOR Reduction (vph)	0	0	51	0	0	76	0	88	0	0	67	0
Lane Group Flow (vph)	134	857	52	138	1103	84	120	37	0	167	96	0
Heavy Vehicles (%)	2%	10%	0%	0%	9%	2%	0%	2%	0%	2%	2%	2%
Turn Type	Perm		Perm	Perm		Perm	Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4		4	8		8	2			6		
Actuated Green, G (s)	32.6	32.6	32.6	32.6	32.6	32.6	19.4	19.4		19.4	19.4	
Effective Green, g (s)	32.6	32.6	32.6	32.6	32.6	32.6	19.4	19.4		19.4	19.4	
Actuated g/C Ratio	0.50	0.50	0.50	0.50	0.50	0.50	0.30	0.30		0.30	0.30	
Clearance Time (s)	7.0	7.0	7.0	7.0	7.0	7.0	6.0	6.0		6.0	6.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	181	1664	819	281	1680	803	375	487		381	478	
v/s Ratio Prot		0.26			0.33			0.02			0.06	
v/s Ratio Perm	c0.37		0.03	0.25		0.05	0.10			c0.13		
v/c Ratio	0.74	0.52	0.06	0.49	0.66	0.10	0.32	0.08		0.44	0.20	
Uniform Delay, d1	12.8	10.9	8.3	10.7	12.0	8.5	17.7	16.4		18.4	17.0	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2	15.0	0.3	0.0	1.4	0.9	0.1	2.2	0.3		3.6	0.9	
Delay (s)	27.8	11.2	8.4	12.1	13.0	8.6	19.9	16.7		22.0	18.0	
Level of Service	C	B	A	B	B	A	B	B		C	B	
Approach Delay (s)		12.9			12.4			18.3			20.0	
Approach LOS		B			B			B			C	

Intersection Summary			
HCM Average Control Delay	13.9	HCM Level of Service	B
HCM Volume to Capacity ratio	0.63		
Actuated Cycle Length (s)	65.0	Sum of lost time (s)	13.0
Intersection Capacity Utilization	72.2%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (veh/h)	919	4	3	722	10	14
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	999	4	3	785	11	15
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume			1003		1400	502
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			1003		1400	502
tC, single (s)			4.1		6.8	6.9
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		92	97
cM capacity (veh/h)			698		133	520

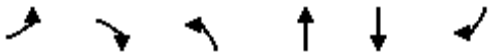
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1
Volume Total	666	337	265	523	26
Volume Left	0	0	3	0	11
Volume Right	0	4	0	0	15
cSH	1700	1700	698	1700	235
Volume to Capacity	0.39	0.20	0.00	0.31	0.11
Queue Length 95th (m)	0.0	0.0	0.1	0.0	2.8
Control Delay (s)	0.0	0.0	0.2	0.0	22.2
Lane LOS			A		C
Approach Delay (s)	0.0		0.1		22.2
Approach LOS					C

Intersection Summary			
Average Delay	0.3		
Intersection Capacity Utilization	35.5%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (veh/h)	1040	18	27	1262	15	11
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	1130	20	29	1372	16	12
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume			1150		1885	575
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			1150		1885	575
tC, single (s)			4.1		6.8	6.9
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			95		73	97
cM capacity (veh/h)			615		61	466

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1
Volume Total	754	396	487	914	28
Volume Left	0	0	29	0	16
Volume Right	0	20	0	0	12
cSH	1700	1700	615	1700	96
Volume to Capacity	0.44	0.23	0.05	0.54	0.29
Queue Length 95th (m)	0.0	0.0	1.1	0.0	8.4
Control Delay (s)	0.0	0.0	1.4	0.0	57.3
Lane LOS			A		F
Approach Delay (s)	0.0		0.5		57.3
Approach LOS					F

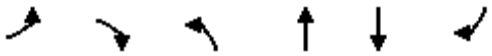
Intersection Summary			
Average Delay	0.9		
Intersection Capacity Utilization	64.2%	ICU Level of Service	C
Analysis Period (min)	15		



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	16	20	16	390	548	19
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	17	22	17	424	596	21
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (m)				181		
pX, platoon unblocked	0.97					
vC, conflicting volume	1065	606	616			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1050	606	616			
tC, single (s)	6.9	6.7	4.3			
tC, 2 stage (s)						
tF (s)	3.9	3.7	2.4			
p0 queue free %	91	95	98			
cM capacity (veh/h)	196	422	865			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	39	441	616
Volume Left	17	17	0
Volume Right	22	0	21
cSH	279	865	1700
Volume to Capacity	0.14	0.02	0.36
Queue Length 95th (m)	3.7	0.5	0.0
Control Delay (s)	20.0	0.6	0.0
Lane LOS	C	A	
Approach Delay (s)	20.0	0.6	0.0
Approach LOS	C		

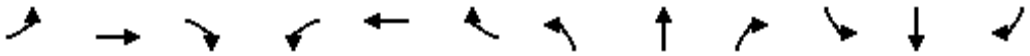
Intersection Summary			
Average Delay	1.0		
Intersection Capacity Utilization	43.5%	ICU Level of Service	A
Analysis Period (min)	15		



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	34	29	37	653	460	30
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	37	32	40	710	500	33
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (m)				181		
pX, platoon unblocked	0.82					
vC, conflicting volume	1307	516	533			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1263	516	533			
tC, single (s)	6.7	6.5	4.2			
tC, 2 stage (s)						
tF (s)	3.8	3.6	2.3			
p0 queue free %	71	94	96			
cM capacity (veh/h)	127	504	986			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	68	750	533
Volume Left	37	40	0
Volume Right	32	0	33
cSH	194	986	1700
Volume to Capacity	0.35	0.04	0.31
Queue Length 95th (m)	11.3	1.0	0.0
Control Delay (s)	33.3	1.1	0.0
Lane LOS	D	A	
Approach Delay (s)	33.3	1.1	0.0
Approach LOS	D		

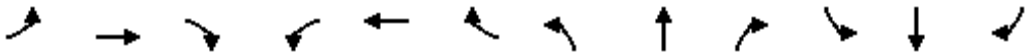
Intersection Summary			
Average Delay	2.3		
Intersection Capacity Utilization	74.9%	ICU Level of Service	D
Analysis Period (min)	15		



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	8	0	11	21	0	17	27	381	38	31	501	36
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0	6.0		6.0	6.0		6.0	6.0		6.0	6.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.85		1.00	0.85		1.00	0.99		1.00	0.99	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1587	1420		1738	1555		1217	1681		1825	1674	
Flt Permitted	0.89	1.00		0.89	1.00		0.43	1.00		0.50	1.00	
Satd. Flow (perm)	1485	1420		1626	1555		551	1681		962	1674	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	9	0	12	23	0	18	29	414	41	34	545	39
RTOR Reduction (vph)	0	11	0	0	17	0	0	3	0	0	2	0
Lane Group Flow (vph)	9	1	0	23	1	0	29	452	0	34	582	0
Heavy Vehicles (%)	15%	0%	15%	5%	0%	5%	50%	14%	0%	0%	11%	50%
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	4.5	4.5		4.5	4.5		61.9	61.9		61.9	61.9	
Effective Green, g (s)	4.5	4.5		4.5	4.5		61.9	61.9		61.9	61.9	
Actuated g/C Ratio	0.06	0.06		0.06	0.06		0.79	0.79		0.79	0.79	
Clearance Time (s)	6.0	6.0		6.0	6.0		6.0	6.0		6.0	6.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	85	82		93	89		435	1327		760	1322	
v/s Ratio Prot		0.00			0.00			0.27			c0.35	
v/s Ratio Perm	0.01			c0.01			0.05			0.04		
v/c Ratio	0.11	0.01		0.25	0.01		0.07	0.34		0.04	0.44	
Uniform Delay, d1	35.0	34.8		35.3	34.9		1.8	2.4		1.8	2.7	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.6	0.0		1.4	0.1		0.3	0.7		0.1	1.1	
Delay (s)	35.6	34.9		36.7	34.9		2.1	3.1		1.9	3.7	
Level of Service	D	C		D	C		A	A		A	A	
Approach Delay (s)		35.2			35.9			3.0			3.6	
Approach LOS		D			D			A			A	

Intersection Summary			
HCM Average Control Delay	5.1	HCM Level of Service	A
HCM Volume to Capacity ratio	0.43		
Actuated Cycle Length (s)	78.4	Sum of lost time (s)	12.0
Intersection Capacity Utilization	46.4%	ICU Level of Service	A
Analysis Period (min)	15		

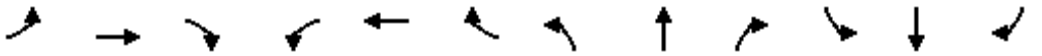
c Critical Lane Group



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	53	0	41	108	0	93	26	544	97	84	383	21
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0	6.0		6.0	6.0		6.0	6.0		6.0	6.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.85		1.00	0.85		1.00	0.98		1.00	0.99	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1573	1408		1738	1555		1267	1772		1825	1663	
Flt Permitted	0.69	1.00		0.73	1.00		0.49	1.00		0.33	1.00	
Satd. Flow (perm)	1146	1408		1331	1555		655	1772		636	1663	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	58	0	45	117	0	101	28	591	105	91	416	23
RTOR Reduction (vph)	0	38	0	0	85	0	0	7	0	0	2	0
Lane Group Flow (vph)	58	7	0	117	16	0	28	689	0	91	437	0
Heavy Vehicles (%)	16%	0%	16%	5%	0%	5%	44%	7%	0%	0%	13%	44%
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	12.0	12.0		12.0	12.0		52.9	52.9		52.9	52.9	
Effective Green, g (s)	12.0	12.0		12.0	12.0		52.9	52.9		52.9	52.9	
Actuated g/C Ratio	0.16	0.16		0.16	0.16		0.69	0.69		0.69	0.69	
Clearance Time (s)	6.0	6.0		6.0	6.0		6.0	6.0		6.0	6.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	179	220		208	243		451	1219		438	1144	
v/s Ratio Prot		0.00			0.01			c0.39			0.26	
v/s Ratio Perm	0.05			c0.09			0.04			0.14		
v/c Ratio	0.32	0.03		0.56	0.06		0.06	0.57		0.21	0.38	
Uniform Delay, d1	28.8	27.5		30.0	27.7		3.9	6.1		4.4	5.1	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	1.1	0.1		3.5	0.1		0.3	1.9		1.1	1.0	
Delay (s)	29.9	27.6		33.5	27.8		4.2	8.0		5.4	6.0	
Level of Service	C	C		C	C		A	A		A	A	
Approach Delay (s)		28.9			30.8			7.9			5.9	
Approach LOS		C			C			A			A	

Intersection Summary			
HCM Average Control Delay	11.8	HCM Level of Service	B
HCM Volume to Capacity ratio	0.57		
Actuated Cycle Length (s)	76.9	Sum of lost time (s)	12.0
Intersection Capacity Utilization	66.8%	ICU Level of Service	C
Analysis Period (min)	15		

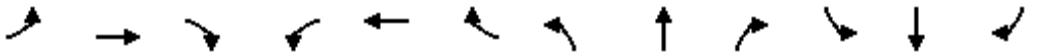
c Critical Lane Group



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	158	0	70	13	0	28	53	161	18	39	236	165
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	
Lane Util. Factor		1.00			1.00		1.00	1.00		1.00	1.00	
Frt		0.96			0.91		1.00	0.98		1.00	0.94	
Flt Protected		0.97			0.98		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1413			1683		1521	1616		1825	1580	
Flt Permitted		0.77			0.87		0.46	1.00		0.64	1.00	
Satd. Flow (perm)		1119			1493		736	1616		1220	1580	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	172	0	76	14	0	30	58	175	20	42	257	179
RTOR Reduction (vph)	0	23	0	0	22	0	0	4	0	0	26	0
Lane Group Flow (vph)	0	225	0	0	22	0	58	191	0	42	410	0
Heavy Vehicles (%)	26%	0%	26%	2%	0%	2%	20%	19%	0%	0%	10%	20%
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		18.9			18.9		39.9	39.9		39.9	39.9	
Effective Green, g (s)		18.9			18.9		39.9	39.9		39.9	39.9	
Actuated g/C Ratio		0.27			0.27		0.56	0.56		0.56	0.56	
Clearance Time (s)		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	
Lane Grp Cap (vph)		299			399		415	911		688	890	
v/s Ratio Prot								0.12			c0.26	
v/s Ratio Perm		c0.20			0.01		0.08			0.03		
v/c Ratio		0.75			0.06		0.14	0.21		0.06	0.46	
Uniform Delay, d1		23.8			19.3		7.3	7.6		7.0	9.1	
Progression Factor		1.00			1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		10.2			0.1		0.7	0.5		0.2	1.7	
Delay (s)		33.9			19.4		8.0	8.2		7.2	10.8	
Level of Service		C			B		A	A		A	B	
Approach Delay (s)		33.9			19.4			8.1			10.5	
Approach LOS		C			B			A			B	

Intersection Summary			
HCM Average Control Delay	16.0	HCM Level of Service	B
HCM Volume to Capacity ratio	0.55		
Actuated Cycle Length (s)	70.8	Sum of lost time (s)	12.0
Intersection Capacity Utilization	60.5%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

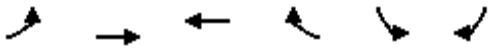


Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	117	0	27	58	0	101	45	494	57	99	318	124
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.0			6.0		6.0	6.0		6.0	6.0	
Lane Util. Factor		1.00			1.00		1.00	1.00		1.00	1.00	
Frt		0.97			0.91		1.00	0.98		1.00	0.96	
Flt Protected		0.96			0.98		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1698			1691		1755	1810		1825	1666	
Flt Permitted		0.65			0.85		0.45	1.00		0.37	1.00	
Satd. Flow (perm)		1147			1458		835	1810		716	1666	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	127	0	29	63	0	110	49	537	62	108	346	135
RTOR Reduction (vph)	0	11	0	0	89	0	0	4	0	0	14	0
Lane Group Flow (vph)	0	145	0	0	84	0	49	595	0	108	467	0
Heavy Vehicles (%)	6%	0%	6%	2%	0%	2%	4%	5%	0%	0%	13%	4%
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		14.1			14.1		46.9	46.9		46.9	46.9	
Effective Green, g (s)		14.1			14.1		46.9	46.9		46.9	46.9	
Actuated g/C Ratio		0.19			0.19		0.64	0.64		0.64	0.64	
Clearance Time (s)		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	
Lane Grp Cap (vph)		222			282		536	1163		460	1070	
v/s Ratio Prot								c0.33			0.28	
v/s Ratio Perm		c0.13			0.06		0.06			0.15		
v/c Ratio		0.65			0.30		0.09	0.51		0.23	0.44	
Uniform Delay, d1		27.2			25.2		5.0	6.9		5.5	6.5	
Progression Factor		1.00			1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		6.7			0.6		0.3	1.6		1.2	1.3	
Delay (s)		33.9			25.8		5.3	8.6		6.7	7.8	
Level of Service		C			C		A	A		A	A	
Approach Delay (s)		33.9			25.8			8.3			7.6	
Approach LOS		C			C			A			A	

Intersection Summary			
HCM Average Control Delay	12.5	HCM Level of Service	B
HCM Volume to Capacity ratio	0.54		
Actuated Cycle Length (s)	73.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	64.7%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

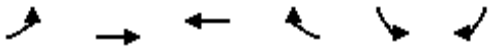
APPENDIX F3
2027 INTERIM SYNCHRO ANALYSIS



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (vph)	14	855	587	16	44	30
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.0	6.0		6.0	
Lane Util. Factor		0.95	0.95		1.00	
Frt		1.00	1.00		0.94	
Flt Protected		1.00	1.00		0.97	
Satd. Flow (prot)		3348	3142		1378	
Flt Permitted		0.94	1.00		0.97	
Satd. Flow (perm)		3150	3142		1378	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	15	929	638	17	48	33
RTOR Reduction (vph)	0	0	3	0	21	0
Lane Group Flow (vph)	0	944	652	0	60	0
Heavy Vehicles (%)	5%	9%	16%	5%	28%	28%
Turn Type	Perm					
Protected Phases		4	8		6	
Permitted Phases	4					
Actuated Green, G (s)		24.8	24.8		21.2	
Effective Green, g (s)		24.8	24.8		21.2	
Actuated g/C Ratio		0.43	0.43		0.37	
Clearance Time (s)		6.0	6.0		6.0	
Vehicle Extension (s)		3.0	3.0		3.0	
Lane Grp Cap (vph)		1347	1343		504	
v/s Ratio Prot			0.21		c0.04	
v/s Ratio Perm		c0.30				
v/c Ratio		0.70	0.49		0.12	
Uniform Delay, d1		13.6	12.0		12.2	
Progression Factor		1.00	1.00		1.00	
Incremental Delay, d2		1.7	0.3		0.5	
Delay (s)		15.2	12.3		12.7	
Level of Service		B	B		B	
Approach Delay (s)		15.2	12.3		12.7	
Approach LOS		B	B		B	

Intersection Summary			
HCM Average Control Delay	14.0	HCM Level of Service	B
HCM Volume to Capacity ratio	0.43		
Actuated Cycle Length (s)	58.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	47.8%	ICU Level of Service	A
Analysis Period (min)	15		

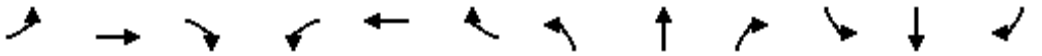
c Critical Lane Group



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (vph)	17	959	1341	28	73	92
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.0	6.0		6.0	
Lane Util. Factor		0.95	0.95		1.00	
Frt		1.00	1.00		0.92	
Flt Protected		1.00	1.00		0.98	
Satd. Flow (prot)		3374	3397		1473	
Flt Permitted		0.91	1.00		0.98	
Satd. Flow (perm)		3074	3397		1473	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	18	1042	1458	30	79	100
RTOR Reduction (vph)	0	0	2	0	36	0
Lane Group Flow (vph)	0	1060	1486	0	143	0
Heavy Vehicles (%)	13%	8%	7%	13%	18%	18%
Turn Type	Perm					
Protected Phases		4	8		6	
Permitted Phases	4					
Actuated Green, G (s)		40.5	40.5		18.3	
Effective Green, g (s)		40.5	40.5		18.3	
Actuated g/C Ratio		0.57	0.57		0.26	
Clearance Time (s)		6.0	6.0		6.0	
Vehicle Extension (s)		3.0	3.0		3.0	
Lane Grp Cap (vph)		1758	1943		381	
v/s Ratio Prot			c0.44		c0.10	
v/s Ratio Perm		0.34				
v/c Ratio		0.60	0.76		0.38	
Uniform Delay, d1		9.9	11.5		21.6	
Progression Factor		1.00	1.00		1.00	
Incremental Delay, d2		0.6	1.8		2.8	
Delay (s)		10.5	13.4		24.4	
Level of Service		B	B		C	
Approach Delay (s)		10.5	13.4		24.4	
Approach LOS		B	B		C	

Intersection Summary			
HCM Average Control Delay	13.0	HCM Level of Service	B
HCM Volume to Capacity ratio	0.64		
Actuated Cycle Length (s)	70.8	Sum of lost time (s)	12.0
Intersection Capacity Utilization	58.3%	ICU Level of Service	B
Analysis Period (min)	15		

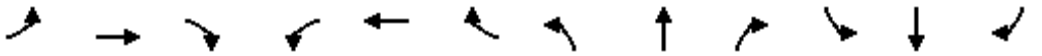
c Critical Lane Group



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	112	656	132	145	394	206	125	151	94	243	196	84
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	7.0	7.0	7.0	4.0	7.0	7.0	8.0	8.0	8.0	8.0	8.0	8.0
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1690	3349	1432	1630	3174	1328	1448	3380	1296	1601	3411	1484
Flt Permitted	0.50	1.00	1.00	0.19	1.00	1.00	0.62	1.00	1.00	0.65	1.00	1.00
Satd. Flow (perm)	894	3349	1432	332	3174	1328	943	3380	1296	1092	3411	1484
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	122	713	143	158	428	224	136	164	102	264	213	91
RTOR Reduction (vph)	0	0	105	0	0	131	0	0	62	0	0	55
Lane Group Flow (vph)	122	713	38	158	428	93	136	164	40	264	213	36
Heavy Vehicles (%)	8%	9%	14%	12%	15%	23%	26%	8%	26%	14%	7%	10%
Turn Type	Perm		Perm	pm+pt		Perm	Perm		Perm	Perm		Perm
Protected Phases		4		3	8			2			6	
Permitted Phases	4		4	8		8	2		2	6		6
Actuated Green, G (s)	20.9	20.9	20.9	32.7	32.7	32.7	31.0	31.0	31.0	31.0	31.0	31.0
Effective Green, g (s)	20.9	20.9	20.9	32.7	32.7	32.7	31.0	31.0	31.0	31.0	31.0	31.0
Actuated g/C Ratio	0.27	0.27	0.27	0.42	0.42	0.42	0.39	0.39	0.39	0.39	0.39	0.39
Clearance Time (s)	7.0	7.0	7.0	4.0	7.0	7.0	8.0	8.0	8.0	8.0	8.0	8.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	237	889	380	267	1319	552	371	1331	510	430	1344	585
v/s Ratio Prot		c0.21		c0.06	0.13			0.05			0.06	
v/s Ratio Perm	0.14		0.03	0.19		0.07	0.14		0.03	c0.24		0.02
v/c Ratio	0.51	0.80	0.10	0.59	0.32	0.17	0.37	0.12	0.08	0.61	0.16	0.06
Uniform Delay, d1	24.6	27.0	21.8	16.1	15.5	14.5	16.9	15.2	14.9	19.1	15.4	14.8
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	1.9	5.3	0.1	3.5	0.1	0.1	2.8	0.2	0.3	6.4	0.3	0.2
Delay (s)	26.5	32.2	21.9	19.6	15.7	14.6	19.7	15.4	15.2	25.5	15.7	15.0
Level of Service	C	C	C	B	B	B	B	B	B	C	B	B
Approach Delay (s)		30.0			16.2			16.8			20.1	
Approach LOS		C			B			B			C	

Intersection Summary			
HCM Average Control Delay	22.0	HCM Level of Service	C
HCM Volume to Capacity ratio	0.68		
Actuated Cycle Length (s)	78.7	Sum of lost time (s)	19.0
Intersection Capacity Utilization	66.3%	ICU Level of Service	C
Analysis Period (min)	15		

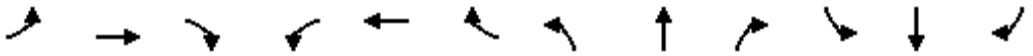
c Critical Lane Group



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	153	683	197	169	950	296	281	296	200	236	213	138
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	7.0	7.0	4.0	7.0	7.0	4.0	8.0	8.0	4.0	8.0	8.0
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1738	3349	1570	1460	3411	1471	1690	3544	1585	1534	3380	1498
Flt Permitted	0.16	1.00	1.00	0.21	1.00	1.00	0.61	1.00	1.00	0.56	1.00	1.00
Satd. Flow (perm)	298	3349	1570	330	3411	1471	1080	3544	1585	899	3380	1498
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	166	742	214	184	1033	322	305	322	217	257	232	150
RTOR Reduction (vph)	0	0	148	0	0	207	0	0	173	0	0	120
Lane Group Flow (vph)	166	742	66	184	1033	115	305	322	44	257	232	30
Heavy Vehicles (%)	5%	9%	4%	25%	7%	11%	8%	3%	3%	19%	8%	9%
Turn Type	pm+pt		Perm	pm+pt		Perm	pm+pt		Perm	pm+pt		Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4		4	8		8	2		2	6		6
Actuated Green, G (s)	29.6	24.6	24.6	37.0	28.3	28.3	23.0	16.0	16.0	23.0	16.0	16.0
Effective Green, g (s)	29.6	24.6	24.6	37.0	28.3	28.3	23.0	16.0	16.0	23.0	16.0	16.0
Actuated g/C Ratio	0.37	0.31	0.31	0.47	0.36	0.36	0.29	0.20	0.20	0.29	0.20	0.20
Clearance Time (s)	4.0	7.0	7.0	4.0	7.0	7.0	4.0	8.0	8.0	4.0	8.0	8.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	202	1039	487	278	1217	525	367	715	320	317	682	302
v/s Ratio Prot	0.05	0.22		c0.07	c0.30		c0.07	0.09		0.07	0.07	
v/s Ratio Perm	0.26		0.04	0.24		0.08	c0.17		0.03	0.16		0.02
v/c Ratio	0.82	0.71	0.14	0.66	0.85	0.22	0.83	0.45	0.14	0.81	0.34	0.10
Uniform Delay, d1	18.9	24.2	19.7	14.2	23.5	17.8	25.0	27.8	26.0	24.6	27.1	25.8
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	22.8	2.4	0.1	5.8	5.7	0.2	14.7	2.0	0.9	14.5	1.4	0.7
Delay (s)	41.7	26.6	19.8	20.0	29.2	18.0	39.8	29.8	26.9	39.1	28.5	26.4
Level of Service	D	C	B	C	C	B	D	C	C	D	C	C
Approach Delay (s)		27.5			25.8			32.7			32.3	
Approach LOS		C			C			C			C	

Intersection Summary			
HCM Average Control Delay	28.7	HCM Level of Service	C
HCM Volume to Capacity ratio	0.76		
Actuated Cycle Length (s)	79.3	Sum of lost time (s)	16.0
Intersection Capacity Utilization	75.4%	ICU Level of Service	D
Analysis Period (min)	15		

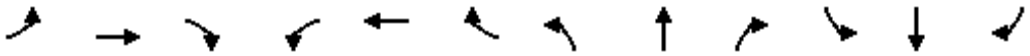
c Critical Lane Group



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	58	952	50	51	684	67	34	0	49	31	0	27
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	7.0	7.0	7.0	7.0	7.0	7.0	6.0	6.0		6.0	6.0	
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	1.00		1.00	1.00	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.85		1.00	0.85	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1789	3288	1633	1825	3120	1601	1825	1633		1789	1601	
Flt Permitted	0.34	1.00	1.00	0.21	1.00	1.00	0.74	1.00		0.72	1.00	
Satd. Flow (perm)	647	3288	1633	397	3120	1601	1418	1633		1361	1601	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	63	1035	54	55	743	73	37	0	53	34	0	29
RTOR Reduction (vph)	0	0	29	0	0	39	0	36	0	0	20	0
Lane Group Flow (vph)	63	1035	25	55	743	34	37	17	0	34	9	0
Heavy Vehicles (%)	2%	11%	0%	0%	17%	2%	0%	2%	0%	2%	2%	2%
Turn Type	Perm		Perm	Perm		Perm	Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4		4	8		8	2			6		
Actuated Green, G (s)	27.7	27.7	27.7	27.7	27.7	27.7	19.3	19.3		19.3	19.3	
Effective Green, g (s)	27.7	27.7	27.7	27.7	27.7	27.7	19.3	19.3		19.3	19.3	
Actuated g/C Ratio	0.46	0.46	0.46	0.46	0.46	0.46	0.32	0.32		0.32	0.32	
Clearance Time (s)	7.0	7.0	7.0	7.0	7.0	7.0	6.0	6.0		6.0	6.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	299	1518	754	183	1440	739	456	525		438	515	
v/s Ratio Prot		c0.31			0.24			0.01			0.01	
v/s Ratio Perm	0.10		0.02	0.14		0.02	c0.03			0.02		
v/c Ratio	0.21	0.68	0.03	0.30	0.52	0.05	0.08	0.03		0.08	0.02	
Uniform Delay, d1	9.6	12.7	8.8	10.1	11.4	8.9	14.2	13.9		14.2	13.9	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.4	1.3	0.0	0.9	0.3	0.0	0.3	0.1		0.3	0.1	
Delay (s)	10.0	14.0	8.8	11.0	11.7	8.9	14.5	14.1		14.5	13.9	
Level of Service	A	B	A	B	B	A	B	B		B	B	
Approach Delay (s)		13.5			11.4			14.3			14.2	
Approach LOS		B			B			B			B	

Intersection Summary			
HCM Average Control Delay	12.7	HCM Level of Service	B
HCM Volume to Capacity ratio	0.44		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	13.0
Intersection Capacity Utilization	54.9%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	126	898	95	127	1140	151	110	0	115	170	0	164
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	7.0	7.0	7.0	7.0	7.0	7.0	6.0	6.0		6.0	6.0	
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	1.00		1.00	1.00	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.85		1.00	0.85	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1789	3318	1633	1825	3349	1601	1825	1633		1789	1601	
Flt Permitted	0.16	1.00	1.00	0.25	1.00	1.00	0.64	1.00		0.68	1.00	
Satd. Flow (perm)	308	3318	1633	486	3349	1601	1239	1633		1275	1601	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	137	976	103	138	1239	164	120	0	125	185	0	178
RTOR Reduction (vph)	0	0	46	0	0	67	0	93	0	0	58	0
Lane Group Flow (vph)	137	976	57	138	1239	97	120	32	0	185	120	0
Heavy Vehicles (%)	2%	10%	0%	0%	9%	2%	0%	2%	0%	2%	2%	2%
Turn Type	Perm		Perm	Perm		Perm	Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4		4	8		8	2			6		
Actuated Green, G (s)	37.2	37.2	37.2	37.2	37.2	37.2	17.4	17.4		17.4	17.4	
Effective Green, g (s)	37.2	37.2	37.2	37.2	37.2	37.2	17.4	17.4		17.4	17.4	
Actuated g/C Ratio	0.55	0.55	0.55	0.55	0.55	0.55	0.26	0.26		0.26	0.26	
Clearance Time (s)	7.0	7.0	7.0	7.0	7.0	7.0	6.0	6.0		6.0	6.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	169	1826	899	267	1843	881	319	420		328	412	
v/s Ratio Prot		0.29			0.37			0.02			0.08	
v/s Ratio Perm	c0.45		0.03	0.28		0.06	0.10			c0.15		
v/c Ratio	0.81	0.53	0.06	0.52	0.67	0.11	0.38	0.08		0.56	0.29	
Uniform Delay, d1	12.3	9.7	7.1	9.6	10.8	7.3	20.6	19.0		21.8	20.2	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2	24.6	0.3	0.0	1.7	1.0	0.1	3.4	0.4		6.9	1.8	
Delay (s)	37.0	10.0	7.1	11.2	11.8	7.3	24.0	19.4		28.7	21.9	
Level of Service	D	A	A	B	B	A	C	B		C	C	
Approach Delay (s)		12.8			11.3			21.6			25.4	
Approach LOS		B			B			C			C	

Intersection Summary			
HCM Average Control Delay	14.1	HCM Level of Service	B
HCM Volume to Capacity ratio	0.73		
Actuated Cycle Length (s)	67.6	Sum of lost time (s)	13.0
Intersection Capacity Utilization	76.7%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (veh/h)	1028	4	3	792	10	14
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	1117	4	3	861	11	15
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume			1122		1557	561
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			1122		1557	561
tC, single (s)			4.1		6.8	6.9
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			99		90	97
cM capacity (veh/h)			630		105	476

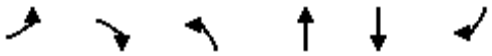
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1
Volume Total	745	377	290	574	26
Volume Left	0	0	3	0	11
Volume Right	0	4	0	0	15
cSH	1700	1700	630	1700	193
Volume to Capacity	0.44	0.22	0.01	0.34	0.14
Queue Length 95th (m)	0.0	0.0	0.1	0.0	3.5
Control Delay (s)	0.0	0.0	0.2	0.0	26.6
Lane LOS			A		D
Approach Delay (s)	0.0		0.1		26.6
Approach LOS					D

Intersection Summary			
Average Delay	0.4		
Intersection Capacity Utilization	38.5%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (veh/h)	1164	19	29	1389	16	11
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	1265	21	32	1510	17	12
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume			1286		2093	643
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			1286		2093	643
tC, single (s)			4.1		6.8	6.9
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			94		60	97
cM capacity (veh/h)			546		44	421

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1
Volume Total	843	442	535	1007	29
Volume Left	0	0	32	0	17
Volume Right	0	21	0	0	12
cSH	1700	1700	546	1700	69
Volume to Capacity	0.50	0.26	0.06	0.59	0.43
Queue Length 95th (m)	0.0	0.0	1.4	0.0	12.7
Control Delay (s)	0.0	0.0	1.6	0.0	92.2
Lane LOS			A		F
Approach Delay (s)	0.0		0.6		92.2
Approach LOS					F

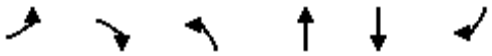
Intersection Summary			
Average Delay	1.3		
Intersection Capacity Utilization	69.1%	ICU Level of Service	C
Analysis Period (min)	15		



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	17	21	17	407	628	20
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	18	23	18	442	683	22
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (m)				181		
pX, platoon unblocked						
vC, conflicting volume	952	352	704			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	952	352	704			
tC, single (s)	7.8	7.9	4.6			
tC, 2 stage (s)						
tF (s)	4.0	3.8	2.4			
p0 queue free %	90	96	98			
cM capacity (veh/h)	183	528	757			

Direction, Lane #	EB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	41	166	295	455	249
Volume Left	18	18	0	0	0
Volume Right	23	0	0	0	22
cSH	287	757	1700	1700	1700
Volume to Capacity	0.14	0.02	0.17	0.27	0.15
Queue Length 95th (m)	3.8	0.6	0.0	0.0	0.0
Control Delay (s)	19.6	1.3	0.0	0.0	0.0
Lane LOS	C	A			
Approach Delay (s)	19.6	0.5		0.0	
Approach LOS	C				

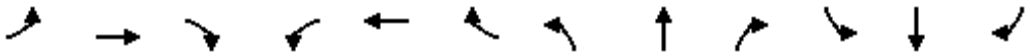
Intersection Summary			
Average Delay	0.9		
Intersection Capacity Utilization	33.7%	ICU Level of Service	A
Analysis Period (min)	15		



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	36	30	39	737	506	31
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	39	33	42	801	550	34
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (m)				181		
pX, platoon unblocked	0.95					
vC, conflicting volume	1052	292	584			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	952	292	584			
tC, single (s)	7.4	7.5	4.3			
tC, 2 stage (s)						
tF (s)	3.8	3.6	2.3			
p0 queue free %	79	95	95			
cM capacity (veh/h)	190	623	921			

Direction, Lane #	EB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	72	309	534	367	217
Volume Left	39	42	0	0	0
Volume Right	33	0	0	0	34
cSH	278	921	1700	1700	1700
Volume to Capacity	0.26	0.05	0.31	0.22	0.13
Queue Length 95th (m)	7.6	1.1	0.0	0.0	0.0
Control Delay (s)	22.4	1.7	0.0	0.0	0.0
Lane LOS	C	A			
Approach Delay (s)	22.4	0.6		0.0	
Approach LOS	C				

Intersection Summary			
Average Delay	1.4		
Intersection Capacity Utilization	50.3%	ICU Level of Service	A
Analysis Period (min)	15		



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	10	0	11	23	0	19	29	395	46	37	575	39
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0	6.0		6.0	6.0		6.0	6.0		6.0	6.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	0.95		1.00	0.95	
Frt	1.00	0.85		1.00	0.85		1.00	0.98		1.00	0.99	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1587	1420		1738	1555		1217	3193		1825	3187	
Flt Permitted	0.89	1.00		0.89	1.00		0.40	1.00		0.48	1.00	
Satd. Flow (perm)	1485	1420		1626	1555		510	3193		919	3187	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	11	0	12	25	0	21	32	429	50	40	625	42
RTOR Reduction (vph)	0	11	0	0	20	0	0	6	0	0	3	0
Lane Group Flow (vph)	11	1	0	25	1	0	32	473	0	40	664	0
Heavy Vehicles (%)	15%	0%	15%	5%	0%	5%	50%	14%	0%	0%	11%	50%
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	4.5	4.5		4.5	4.5		56.6	56.6		56.6	56.6	
Effective Green, g (s)	4.5	4.5		4.5	4.5		56.6	56.6		56.6	56.6	
Actuated g/C Ratio	0.06	0.06		0.06	0.06		0.77	0.77		0.77	0.77	
Clearance Time (s)	6.0	6.0		6.0	6.0		6.0	6.0		6.0	6.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	91	87		100	96		395	2472		712	2468	
v/s Ratio Prot		0.00			0.00			0.15			c0.21	
v/s Ratio Perm	0.01			c0.02			0.06			0.04		
v/c Ratio	0.12	0.01		0.25	0.01		0.08	0.19		0.06	0.27	
Uniform Delay, d1	32.4	32.2		32.7	32.2		2.0	2.2		1.9	2.4	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.6	0.0		1.3	0.1		0.4	0.2		0.2	0.3	
Delay (s)	33.0	32.2		34.0	32.3		2.4	2.4		2.1	2.6	
Level of Service	C	C		C	C		A	A		A	A	
Approach Delay (s)		32.6			33.2			2.4			2.6	
Approach LOS		C			C			A			A	

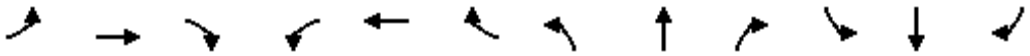
Intersection Summary			
HCM Average Control Delay	4.1	HCM Level of Service	A
HCM Volume to Capacity ratio	0.27		
Actuated Cycle Length (s)	73.1	Sum of lost time (s)	12.0
Intersection Capacity Utilization	43.4%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	58	0	43	117	0	100	27	618	100	86	427	22
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0	6.0		6.0	6.0		6.0	6.0		6.0	6.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	0.95		1.00	0.95	
Frt	1.00	0.85		1.00	0.85		1.00	0.98		1.00	0.99	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1573	1408		1738	1555		1267	3371		1825	3164	
Flt Permitted	0.69	1.00		0.73	1.00		0.47	1.00		0.35	1.00	
Satd. Flow (perm)	1137	1408		1329	1555		633	3371		668	3164	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	63	0	47	127	0	109	29	672	109	93	464	24
RTOR Reduction (vph)	0	39	0	0	91	0	0	12	0	0	3	0
Lane Group Flow (vph)	63	8	0	127	18	0	29	769	0	93	485	0
Heavy Vehicles (%)	16%	0%	16%	5%	0%	5%	44%	7%	0%	0%	13%	44%
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	11.8	11.8		11.8	11.8		45.9	45.9		45.9	45.9	
Effective Green, g (s)	11.8	11.8		11.8	11.8		45.9	45.9		45.9	45.9	
Actuated g/C Ratio	0.17	0.17		0.17	0.17		0.66	0.66		0.66	0.66	
Clearance Time (s)	6.0	6.0		6.0	6.0		6.0	6.0		6.0	6.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	192	238		225	263		417	2220		440	2084	
v/s Ratio Prot		0.01			0.01			c0.23			0.15	
v/s Ratio Perm	0.06			c0.10			0.05			0.14		
v/c Ratio	0.33	0.03		0.56	0.07		0.07	0.35		0.21	0.23	
Uniform Delay, d1	25.5	24.2		26.6	24.3		4.3	5.3		4.7	4.8	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	1.0	0.1		3.2	0.1		0.3	0.4		1.1	0.3	
Delay (s)	26.5	24.2		29.8	24.5		4.6	5.7		5.8	5.1	
Level of Service	C	C		C	C		A	A		A	A	
Approach Delay (s)		25.5			27.3			5.7			5.2	
Approach LOS		C			C			A			A	

Intersection Summary			
HCM Average Control Delay	9.7	HCM Level of Service	A
HCM Volume to Capacity ratio	0.39		
Actuated Cycle Length (s)	69.7	Sum of lost time (s)	12.0
Intersection Capacity Utilization	53.2%	ICU Level of Service	A
Analysis Period (min)	15		

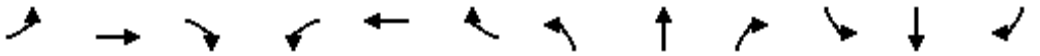
c Critical Lane Group



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	160	0	72	13	0	28	55	297	18	39	285	167
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	
Lane Util. Factor		1.00			1.00			0.95			0.95	
Frt		0.96			0.91			0.99			0.95	
Flt Protected		0.97			0.98			0.99			1.00	
Satd. Flow (prot)		1412			1683			3042			3063	
Flt Permitted		0.77			0.87			0.82			0.90	
Satd. Flow (perm)		1120			1488			2511			2757	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	174	0	78	14	0	30	60	323	20	42	310	182
RTOR Reduction (vph)	0	27	0	0	22	0	0	4	0	0	64	0
Lane Group Flow (vph)	0	225	0	0	22	0	0	399	0	0	470	0
Heavy Vehicles (%)	26%	0%	26%	2%	0%	2%	20%	19%	0%	0%	10%	20%
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		17.2			17.2			32.8			32.8	
Effective Green, g (s)		17.2			17.2			32.8			32.8	
Actuated g/C Ratio		0.28			0.28			0.53			0.53	
Clearance Time (s)		6.0			6.0			6.0			6.0	
Vehicle Extension (s)		3.0			3.0			3.0			3.0	
Lane Grp Cap (vph)		311			413			1328			1459	
v/s Ratio Prot												
v/s Ratio Perm		c0.20			0.02			0.16			c0.17	
v/c Ratio		0.72			0.05			0.30			0.32	
Uniform Delay, d1		20.2			16.4			8.2			8.3	
Progression Factor		1.00			1.00			1.00			1.00	
Incremental Delay, d2		8.0			0.1			0.6			0.6	
Delay (s)		28.3			16.5			8.8			8.9	
Level of Service		C			B			A			A	
Approach Delay (s)		28.3			16.5			8.8			8.9	
Approach LOS		C			B			A			A	

Intersection Summary			
HCM Average Control Delay	13.1	HCM Level of Service	B
HCM Volume to Capacity ratio	0.46		
Actuated Cycle Length (s)	62.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	59.7%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	117	0	28	58	0	101	47	673	57	99	355	125
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	
Lane Util. Factor		1.00			1.00			0.95			0.95	
Frt		0.97			0.91			0.99			0.97	
Flt Protected		0.96			0.98			1.00			0.99	
Satd. Flow (prot)		1697			1691			3442			3218	
Flt Permitted		0.65			0.85			0.88			0.70	
Satd. Flow (perm)		1154			1457			3037			2261	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	127	0	30	63	0	110	51	732	62	108	386	136
RTOR Reduction (vph)	0	12	0	0	89	0	0	6	0	0	25	0
Lane Group Flow (vph)	0	145	0	0	84	0	0	839	0	0	605	0
Heavy Vehicles (%)	6%	0%	6%	2%	0%	2%	4%	5%	0%	0%	13%	4%
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		13.9			13.9			45.9			45.9	
Effective Green, g (s)		13.9			13.9			45.9			45.9	
Actuated g/C Ratio		0.19			0.19			0.64			0.64	
Clearance Time (s)		6.0			6.0			6.0			6.0	
Vehicle Extension (s)		3.0			3.0			3.0			3.0	
Lane Grp Cap (vph)		223			282			1941			1445	
v/s Ratio Prot												
v/s Ratio Perm		c0.13			0.06			c0.28			0.27	
v/c Ratio		0.65			0.30			0.43			0.42	
Uniform Delay, d1		26.7			24.8			6.5			6.4	
Progression Factor		1.00			1.00			1.00			1.00	
Incremental Delay, d2		6.4			0.6			0.7			0.9	
Delay (s)		33.1			25.4			7.2			7.3	
Level of Service		C			C			A			A	
Approach Delay (s)		33.1			25.4			7.2			7.3	
Approach LOS		C			C			A			A	

Intersection Summary			
HCM Average Control Delay	11.2	HCM Level of Service	B
HCM Volume to Capacity ratio	0.48		
Actuated Cycle Length (s)	71.8	Sum of lost time (s)	12.0
Intersection Capacity Utilization	68.3%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group