

Transportation Impact Assessment (TIA)

Cowan's Grove Commercial Plaza (4791 Bank Street)

TIA REPORT



Prepared for Urbandale Group of Companies
by IBI Group

July 2018



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July 17, 2018

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Dear Mr. Yousfani:

**RE: URBANDALE GROUP– COWAN'S GROVE COMMERCIAL PLAZA 4791 BANK STREET
TIA STEP 4 SUBMISSION**

The enclosed submission for Cowan's Grove Commercial Plaza (4791 Bank Street) in the City of Ottawa includes three (3) hardcopies of the Transportation Impact Assessment (TIA), as well as a USB stick containing an electronic copy of the TIA report, appendices and the Synchro files. The following TIA represents Steps 1 – 4, as defined in the City TIA Guidelines. The report has addressed/ incorporated the required technical comments received over the course of the submission process. We have also enclosed these comments with for your reference in Appendix A.

If you have any questions regarding the contents of this submission, please do not hesitate to contact the undersigned at 613-225-1311 ext. 64073.

Sincerely,

Austin Shih, M.A.Sc, P.Eng.
Project Engineer



TIA Plan Reports - Certification

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

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

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

CERTIFICATION

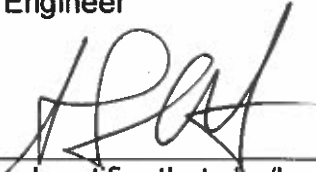
1. I have reviewed and have a sound understanding of the objectives, needs and requirements of the City of Ottawa's Official Plan, Transportation Master Plan and the Transportation Impact Assessment (2017) Guidelines;
2. I have a sound knowledge of industry standard practice with respect to the preparation of transportation impact assessment reports, including multi modal level of service review;
3. I have substantial experience (more than 5 years) in undertaking and delivering transportation impact studies (analysis, reporting and geometric design) with strong background knowledge in transportation planning, engineering or traffic operations; and
4. I am either a licensed¹ or registered¹ professional in good standing, whose field of expertise [check ☒ appropriate field(s)] is either transportation engineering ☐ or transportation planning ☐.

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

Dated at Ottawa this 17th day of July, 2018.
(City)

Name: Austin Shih, M.A.Sc., P.Eng.

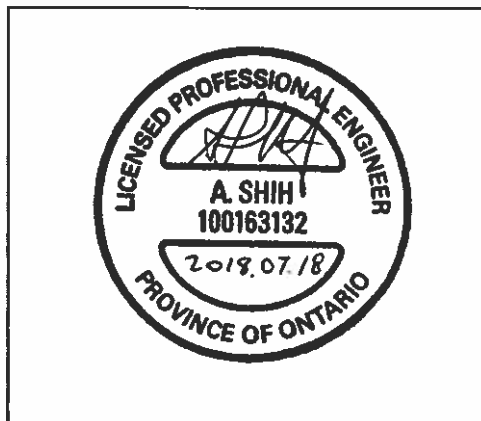
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Signature of Individual certifier that she/he meets the above four criteria

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Stamp





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EXECUTIVE SUMMARY

IBI Group (IBI) was retained by Urbandale Group of Companies to complete a Transportation Impact Assessment (TIA) in support of the Cowan's Grove Commercial Plaza in the City of Ottawa. This subject property is approximately 5 acres in size, and is generally bounded to the east of Bank Street and to the north of the proposed Shuttleworth Drive.

Urbandale Group of Companies intends to develop approximately 5 commercial units at 4791 Bank Street. The proposed development was assumed to be completed in one phase.

The general methodology used in this study was based on the City of Ottawa Transportation Impact Assessment Guidelines (2017). The first 3 steps of the TIA process have been followed and approved by the City. This report represents Step 4 and the Final Submission.

Currently there is a Road Modification Approval (RMA) design to add an east leg (Shuttleworth Drive) to Findlay Creek Centre Access and Bank Street intersection by 2019. The addition of Shuttleworth Drive will allow for the accommodation of future traffic volumes generated by the proposed development and surrounding adjacent developments.

The key conclusions from the TIA Analysis Report are as follows:

- The study area transportation network is expected to accommodate site generated traffic volumes through to the 2025 horizon year.
- There is no requirement for an RMA.
- There is no requirement for a monitoring plan.

The overall conclusion of this TIA is that the traffic generated by the Cowan's Grove Commercial Plaza can be accommodated on the adjacent transportation network with the appropriate actions and modifications in place. The owner shall be responsible for constructing all required access intersections and internal transportation facilities as dictated by the proposed site plan.

The key findings and recommendations from this TIA are as follows:

Cowan's Grove Commercial Plaza (4791 Bank Street) Characteristics

- The proposed development will include five (5) commercial retail buildings with 153 parking surface spaces, which includes accessible spaces.
- The proposed development will provide sidewalks to facilitate access between buildings. No dedicated cycling facilities have been proposed within the horizon years of the proposed development, however the Bank Street Widening ultimate design (2031) intends to implement 2.0 m bike lanes along both the north and south legs of Bank Street and Findlay Creek Centre Access/ Shuttleworth Drive intersection.
- The proposed development is expected to be constructed and fully built out by 2020.

Existing Conditions Analysis

- The study area included the following existing intersections:
 - Bank Street and Findlay Creek Access.
- A review of the reported collisions data showed no discernable patterns.



- There are two existing transit service routes operating within the study area: Route 93 Leirim/ Greenboro and Route 294 Findlay Creek/ Hurdman. The 93 provides daily service; the 294 operates only on weekdays.
- Bank Street is currently the only existing boundary street providing direct frontage to the proposed development. The section of Bank Street fronting the subject property currently has a paved shoulder and no formal cycling or pedestrian facilities.
- The existing study area intersection was shown to operate within City standards in 2018. These results coincided with previous traffic studies completed in the study area.

Future Background Traffic Demand

- Two future analysis horizons were established based on the expected development phases: 2020 and 2025.
- As a conservative approach, a linear growth rate of 2.0% per annum was applied to existing traffic volumes at Bank Street and Findlay Creek Centre to account for regional growth in this traffic study up to the 2020 horizon year. Future travel demand in 2025 was based on the Leirim MTS, which accounted for all adjacent developments separately and applied a 1.0% growth rate for traffic outside of the Leirim Community. The background growth rate was only applied to through movements on Bank Street, since side street traffic in the Leirim Community was accounted for separately.
- All adjacent developments were accounted for separately in this analysis.

Cowan's Grove Commercial Plaza (4791 Bank Street) Generated Traffic Volumes

- Development generated traffic volumes were derived using Institute of Transportation Engineers (ITE) Trip Generation Rates and converted to person trips according to the TIA Guidelines. The City Origin Destination (OD) Survey mode share for the South Gloucester/ Leirim Zone was applied to determine the trips by mode.
- Peak hour development generated traffic volumes were developed using a local blended commercial trip generation rate from the Leirim MTS to better represent local traffic behavior. A local traffic count was conducted on Tuesday, January 21, 2014 at the Findlay Creek Commercial Centre to develop average commercial vehicle trip generation rates. The City Origin Destination (OD) Survey mode share for the South Gloucester/ Leirim Zone was applied to determine the trips by mode.
- The proposed development is expected to generate the following peak hour trips at each future horizon:
 - 2020 & 2025 - New Auto Trips: 43 morning peak hour trips; 81 afternoon peak hour trips
Transit: 18 morning peak hour trips; 33 afternoon peak hour trips

Future Intersection Analysis

- Bank Street and Findlay Creek Centre Access/ Shuttleworth Drive:
The Bank Street and Findlay Creek Centre Access intersection is presently operating below its theoretical capacity.



Intersection capacity analysis indicated that the Bank Street and Findlay Creek Centre Access/ Shuttleworth Drive intersection would operate within City standards through to the 2025 total traffic condition with the proposed intersection modification in the RMA's interim design.

Auxiliary storage lane lengths proposed in the detailed design were found to be sufficient to accommodate travel demand through to the 2025 total traffic condition, and no further modifications to the design were required.

- Proposed Accesses/ Egresses
 - For a commercial development with 100-199 parking spaces, the proposed private approach must be at least 45 metres from the nearest intersecting street line and 45 metres from any other approach.
 - The nearest private approaches to the intersection of Bank Street/ Shuttleworth Drive, Access #1 and Access #3, are spaced more than 45 m from the street line. Although these accesses are spaced less than 45 m from any other approach, when factoring in the low traffic volume projected for Shuttleworth Drive and how traffic will be alleviated by the right-in/ right-out access, City standards are met.

Geometric Analysis Results

- Shuttleworth Drive was proposed to intersect with Bank Street across from Findlay Creek Centre Access with no significant horizontal or vertical alignment constraints. Sight distance and corner clearances are not expected to be a concern. All geometric design requirements were being reviewed and confirmed as part of the detailed design for the upgrade of the Bank Street and Findlay Creek Centre Access intersection.

Summary of Recommendations

A summary of all recommended actions/ modifications has been provided in **Table ES-1**.



TABLE ES-1 – Summary of Recommended Actions/ Modifications

HORIZON	RECOMMENDED ACTIONS/ MODIFICATIONS
Existing (2018)	Bank Street and Findlay Creek Centre Access <ul style="list-style-type: none"> Meets City operational guidelines
Future (2020) Background – No Site Generated Traffic	Bank Street and Findlay Creek Centre Access <ul style="list-style-type: none"> Meets City operational guidelines
Future (2025) Background– No Site Generated Traffic	<p>Assume all actions and modifications from the Existing (2018) traffic conditions remain.</p> Bank Street and Findlay Creek Centre Access/ Shuttleworth Drive <ul style="list-style-type: none"> Construct east leg of intersection (Shuttleworth Drive) – Urbandale Group <ul style="list-style-type: none"> Construct 40m westbound left-turn storage lane Construct 120m southbound left-turn storage lane
Future (2020) Total – With Site Generated Traffic	<p>Assume all actions and modifications from the Existing (2018) traffic conditions remain.</p> Bank Street and Findlay Creek Centre Access/ Shuttleworth Drive <ul style="list-style-type: none"> Construct east leg of intersection (Shuttleworth Drive) – Urbandale Group <ul style="list-style-type: none"> Construct 40m westbound left-turn storage lane Construct 120m southbound left-turn storage lane Access Intersections #1 to #4 off of Shuttleworth Drive <ul style="list-style-type: none"> Stop-controlled access intersections – Urbandale Group <ul style="list-style-type: none"> Construct shared-through turning lanes on all approaches Access Intersection #5 off of Bank Street <ul style="list-style-type: none"> Stop-controlled access intersection – Urbandale Group <ul style="list-style-type: none"> Construct right-in/right-out access intersection with shared through-turning lanes on all approaches
Future (2025) Total – With Site Generated Traffic	<p>Assume all actions and modifications from the Future (2020) Total traffic conditions remain.</p> Bank Street and Findlay Creek Centre Access <ul style="list-style-type: none"> Meets City operational guidelines



1 Introduction

The Screening, Scoping, Forecasting and Analysis Report has been prepared on behalf of Urbandale Group of Companies in support of the Cowan's Grove Plaza site plan application. The format of the Screening, Scoping, Forecasting and Analysis was based on the City of Ottawa's 2017 Transportation Impact Assessment (TIA) Guidelines.

Responses to the City's comments received for the submission of the Screening and Scoping are provided in **Appendix A**.

2 Screening and Scoping

The purpose of the Screening and Scoping is to identify "the range of analyses required to understand how well the development proposal aligns with City of Ottawa policies and objectives and if the transportation network requires modification to offset development impacts." ¹

Section 2 is the initial stage of the TIA. The Screening Form (Section 2.1) establishes the need to complete the study. The remainder of Section 2 focuses on the Scoping, which involves establishing the existing/ planned conditions of the study, key parameters and a review of possible exemptions.

2.1 Screening Form

STEP 1 - City of Ottawa 2017 TIA Guidelines Screening Form

1. Description of Proposed Development

Municipal Address	Cowan's Grove Plaza – part of 4791 Bank Street
Description of Location	Leitrim Community – east of Bank Street across Findlay Creek Commercial Centre
Land Use Classification	Commercial Retail
Development Size (units)	-
Development Size (m ²)	3,253
Number of Accesses and Locations	1x RIRO off Bank Street, north of proposed E/W Collector Rd 2x minor accesses off E/W Collector Road, east of Bank St
Phase of Development	Single Phase
Buildout Year	2020

2. Trip Generation Trigger

Land Use Type	Minimum Development Size
Single-family homes	40 units
Townhomes or apartments	90 units
Office	3,500 m ²

¹ Ottawa Transportation Impact Assessment Guidelines (2017), p.19



Industrial	5,000 m ²	
Fast-food restaurant or coffee shop	100 m ²	
Destination retail	1,000 m ²	✓
Gas station or convenience market	75 m ²	

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

Based on the results above, the Trip Generation Trigger was satisfied.

3. Location Triggers

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

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

Based on the results above, the Location Trigger was satisfied.

4. Safety Triggers

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

Based on the results above, Safety Trigger was satisfied.



5. Summary

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

2.2 Description of Proposed Development

2.2.1 Site Location

The proposed Cowan's Grove Commercial Plaza, part of the lands municipally known as 4791 Bank Street, is located opposite of the existing Findlay Creek Centre within Cowan's Grove Subdivision in the Leitrim Community, south Ottawa. The subject site is approximately 5 acres in size. The subject development abuts Bank Street to the west, and undeveloped lands to the north, south and east.

The site location is shown in **Exhibit 1**.

2.2.2 Land Use

The proposed draft plan for the subject site is shown in **Exhibit 2**. The land is currently undeveloped, and is zoned as an Urban Expansion Area within the Official Plan Amendment (OPA) 9B. The proposed development will contain commercial retail land uses, as summarized in **Table 1**.

For the purpose of this study, full occupancy of the proposed development was assumed in a single phase by 2020. The assumed buildout is highly dependent on market forces and it is possible that full occupancy won't be achieved by the buildout horizon year of 2020.

TABLE 1 – Land Use Statistics

LAND USE		SIZE (m ²)
Commercial Retail	Building A	880
	Building B	990
	Building C	328
	Building D	659
	Building E	396
	Total	3253



PROPOSED
DEVELOPMENT

BANK STREET

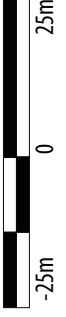
F1417 CREEK CENTRE





Cowan's Grove Commercial Plaza
Transportation Impact Assessment

EXHIBIT 1
Site Location

PROJECT No.: 116871
DATE: June 2018
SCALE:





 BUILDING
 LANDSCAPE AREA



2.2.3 Site Layout

The proposed single-phased development consists of five (5) retail buildings with 153 parking surface spaces, which includes accessible spaces. The proposed development will provide sidewalks to facilitate access between buildings. Shuttleworth Drive, a proposed east-west collector road will bisect the subject development, extending from Bank Street (across Findlay Creek Centre Access) in the west through the proposed Cowan's Grove subdivision to the east. Two minor accesses are proposed off of Shuttleworth Drive to service the north and south portions of the site. A right-in/right-out access is proposed approximately 70 m to the north of the existing Findlay Creek Centre Access and Bank Street intersection.

The proposed development will include a drive-through facility for Building C, as seen in **Exhibit 2**. Urbandale Group of Companies has confirmed that Building C will be a Bank when the site is fully developed. Based on the City of Ottawa's Parking, Queuing and Loading Provisions, Section 112, Drive-through facilities for banks or bank machines must contain a minimum of three (3) queuing spaces leading up to the bank machine, and one (1) queuing space after the bank machine. As noted in **Exhibit 2**, the proposed development meets both queuing requirements outlined by the City.

2.2.4 Transit, Pedestrian and Cycling Facilities

Transit may be routed through the subject development via Shuttleworth Drive, as discussed in Section 2.4.1.2. Sidewalks will be provided to facilitate access between, local amenities, the area network and the Cowan's Grove Subdivision. The proposed development does not include any cycling facilities.

2.3 Existing Conditions

2.3.1 Existing Road Network

2.3.1.1 Roadways

Bank Street is an arterial road under the jurisdiction of the City of Ottawa that extends from Wellington Street in Ottawa's Central Business District (CBD) in the north to Ottawa City limits in the south, where it turns into Highway 31. Within the vicinity of the subject site, Bank Street has a two-lane cross-section, a posted speed limit of 70 km/h in the northbound direction, 80 km/h in the southbound direction and a ROW protection of 44.5 m; Bank Street is divided north of Findlay Creek Centre Access and undivided south of Findlay Creek Centre Access.

2.3.1.2 Study Area Intersections

All trips generated by the proposed development are expected to use the proposed Shuttleworth Drive, therefore the following was the only intersection included in the study area:

- Bank Street and Findlay Creek Centre Access

The Bank Street and Findlay Creek Centre Access is a signalized intersection with an eastbound left and right turn lane configuration from Findlay Creek Centre Access. On Bank Street there is a southbound right turn lane and a northbound left turn lane into Findlay Creek Centre Access, a single northbound and southbound through lane.

Currently there is a Road Modification Approval (RMA) design to add an east leg (Shuttleworth Drive) to Findlay Creek Centre Access and Bank Street intersection. The proposed intersection will have a westbound through-right lane that will allow for both access to Bank Street and Findlay Creek Centre Access, and an eastbound through lane allowing vehicle passage from Findlay Creek Centre Access and Bank Street into the Cowan's Grove Commercial Plaza and Cowan's Grove subdivision. There is a proposed southbound left-turn lane and northbound right-turn lane on Bank Street. Concrete sidewalks will be constructed on the corners of the Shuttleworth Drive and Bank Street intersection that connect to the paved shoulders on both sides of Shuttleworth Drive.

2.3.1.3 Traffic Management Measures

There are currently no existing traffic management or traffic calming measures on any of the boundary roads located within the study area.

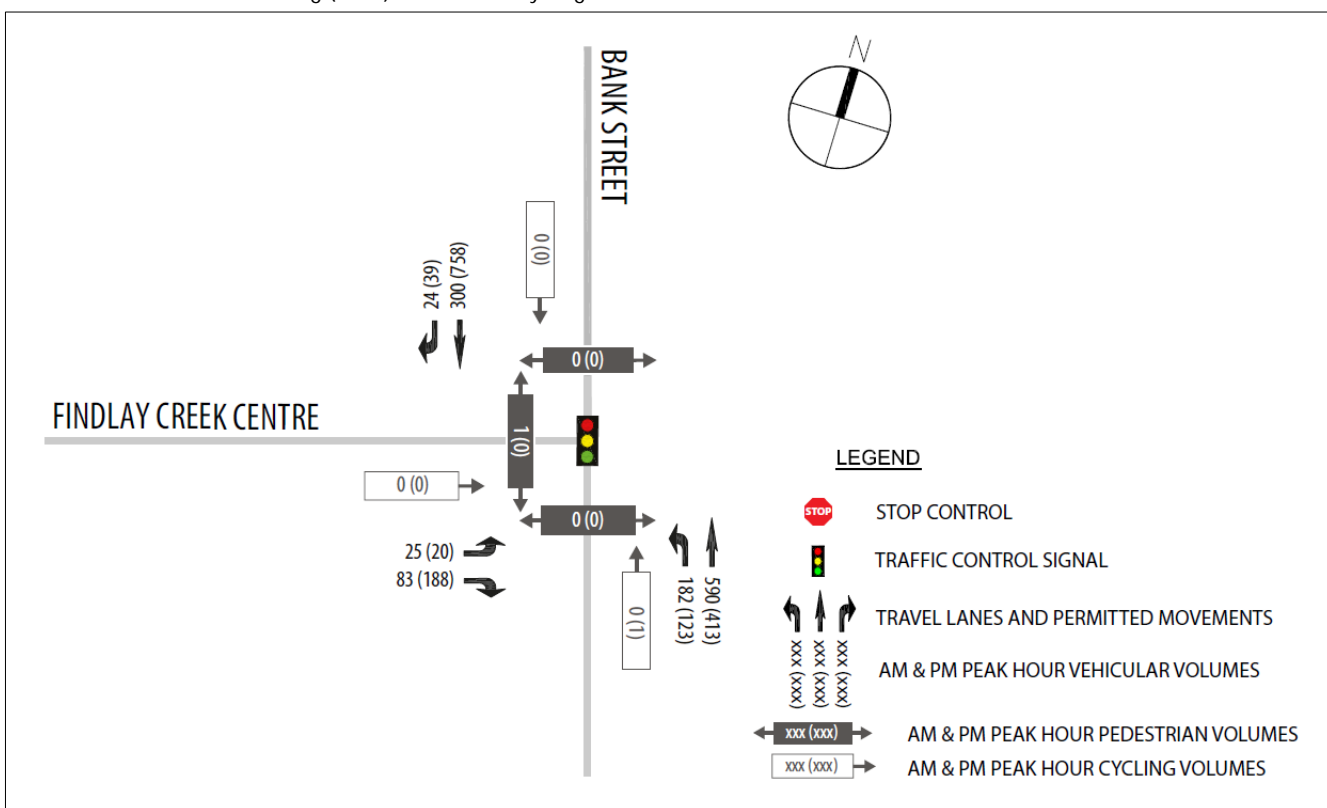
2.3.1.4 Existing Traffic Volumes

Weekday morning and afternoon peak hour turning movement counts were obtained from the City of Ottawa at the following study area intersection:

- Bank Street and Findlay Creek Centre Access (Wednesday, May 27, 2015)

The existing (2018) peak hour traffic volumes for Bank Street and Findlay Creek Centre Access are shown in **Exhibit 3**. Traffic count data is provided in **Appendix B**.

EXHIBIT 3 – Existing (2018) Pedestrian, Cycling and Vehicular Volumes





2.3.2 Existing Bicycle and Pedestrian Facilities

Bank Street currently has a southbound onstreet bike lane and paved shoulder in the northbound direction. A sidewalk is provided on the west side of Bank Street adjacent to the Findlay Creek Centre and there are no sidewalks along the east side of Bank Street.

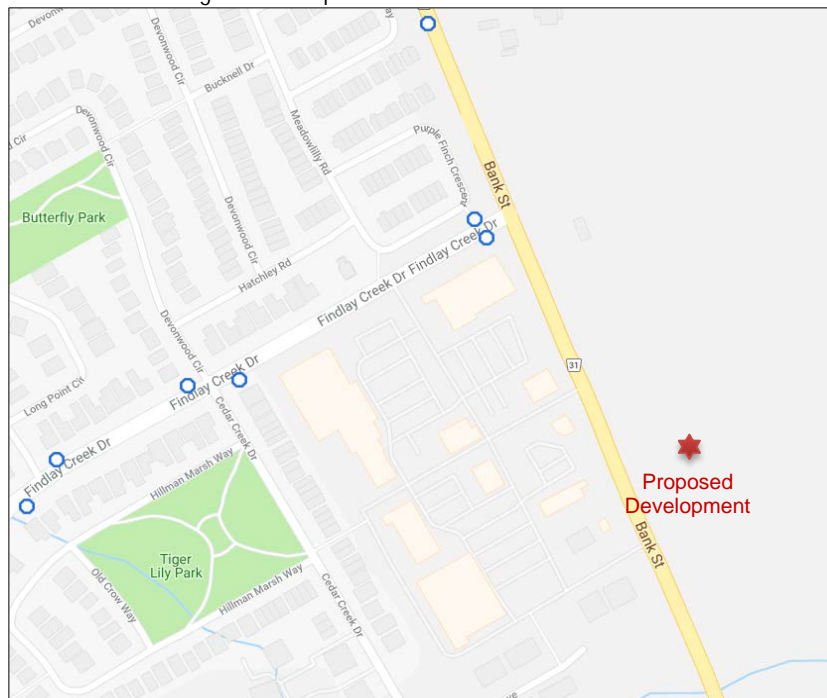
2.3.3 Existing Transit Facilities and Service

There are two OC Transpo routes in the area:

- **Route 93** Leirtrim/ Greenboro is a regular/all-day service route with 20 minute headways during afternoon peak hours and 30 minute headways during off-peak hours. The bus service is provided from Greenboro Station to Leirtrim Station via South Keys Station, Bridge Path Drive, Queensdale Avenue, Conroy Road, Bank Street, and Kelly Farm Drive. Points of interest along this route include South Keys Shopping Centre, Fred G. Barrett Arena and Gloucester South Community Centre.
- **Route 294** Findlay Creek/ Hurdman is a regular service route that operates during the weekday AM and PM peak periods, with 30 minute headways. The AM peak period bus service is provided from Findlay Creek to Hurdman station via Kelly Farm Drive, Findlay Creek Drive, Bank Street, Lester Road, Bridge Path Drive, Hunt Club Road and the Transitway. Service is provided in the reverse direction during the PM peak. Points of interest along this route include South Keys Shopping Centre, Billings Bridge Shopping Centre and Riverside Hospital.

Exhibit 4 shows the existing transit stops in the study area. Transit data is provided in **Appendix C**.

EXHIBIT 4 – Existing Transit Stops



2.3.4 Collision Analysis

A review of historical collision data has been provided. The City requires a safety review if there are more than 6 collisions for any one movement or of a discernible pattern, over a five year period have occurred. **Table 2** summarizes all reported collisions between January 1, 2012 and January 1, 2017.

TABLE 2 – Reported Collisions within Study Area

LOCATION	TOTAL # OF REPORTED COLLISIONS OF ANY ONE MOVEMENT OR OF A DISCERNABLE PATTERN
Bank Street at Findlay Creek Centre Access	2
Bank Street between Findlay Creek Drive and Blais Road	5

Based on **Table 2**, there are no discernable patterns present in the collision data. A copy of the City collision records is available in **Appendix D**.

2.4 Planned Conditions

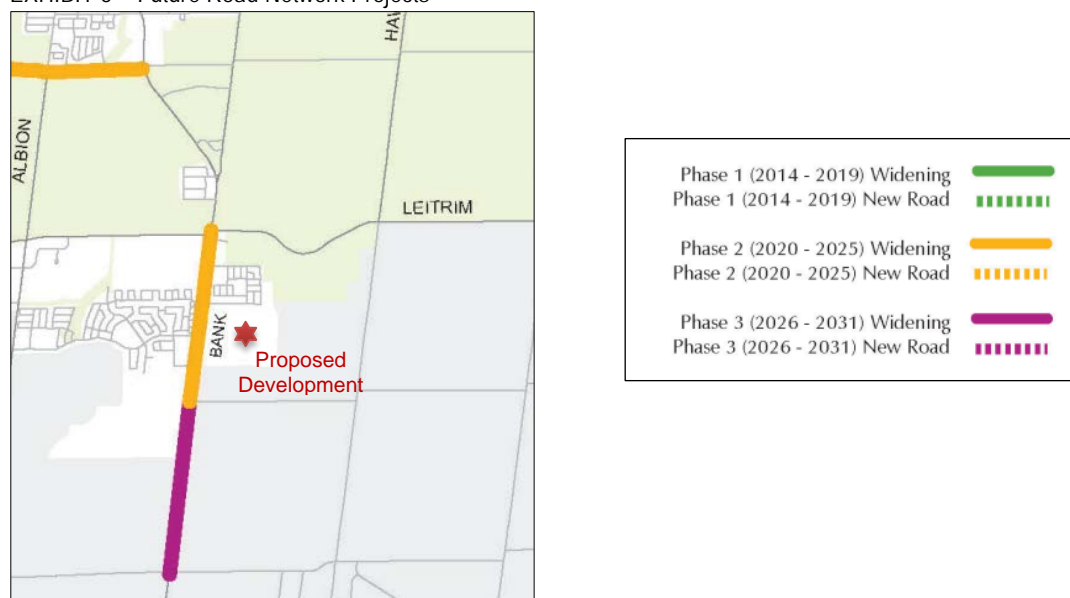
2.4.1 Changes to the Study Area Transportation Network

2.4.1.1 Future Road Network Projects (TMP)

The City of Ottawa 2013 Transportation Master Plan (TMP) has established a Road Network Concept Plan for Ottawa which includes future road infrastructure projects that will be required to support the City's growth projections and travel behaviour targets by 2031.

The TMP has also identified an Affordable Road Network, as shown in Exhibit 5, which is made up of a subset of the projects in the Network Concept Plan that can be realistically constructed by 2031, given restrictions to the availability of funds that are expected during this period.

EXHIBIT 5 – Future Road Network Projects



According to the TMP, Phase 2 of the Bank Street Widening will widen Bank Street from 2 lanes to 4 lanes from Leirtrim road to Blais Road/ Urban Boundary and Phase 3 will widen Bank Street from 2 lanes to 4 lanes further south to Rideau



Road. The Bank Street Widening aims to provide capacity for future travel and address pedestrian and cycling facilities. Accommodations for pedestrians will be in the form of sidewalks and for cyclists, a set of multi-use pathways within the Greenbelt and paved shoulder that will be separate from the travel lane by use of a rumble strip within the rural area.

The Bank Street Widening Class Environmental Assessment Study (Bank Street EA) triggered an update to the staging of recommended modifications in the TMP. These changes have been reflected in Table 3.

TABLE 3 – Staging of Recommended Modifications in the Bank Street EA

ROAD/ PHASING	PROJECT DETAILS
Phase 2: 2020–2025	
Bank Street	Widen Bank Street from 2 to 4 lanes from Leitrim Road to Findlay Creek Drive including widening Leitrim Road to 4-lanes through the intersection.
Phase 3: 2026–2031	
Bank Street	Widen Bank Street from Findlay Creek Drive to south of Blais Road/ the Urban Boundary from 2 to 4 lanes.
Beyond 2031	
Bank Street	Widen Bank Street from south of the Urban Boundary to Rideau Road from 2 to 4 lanes, including a two-way left turn lane within the rural area. Widen Bank Street to 6 lanes through the Leitrim Road intersection.

The 2014 Development Charge Bylaw identified funds would be available in 2020–2021 for the widening of Bank Street between Leitrim Road and south of Findlay Creek Drive. However, the City has since indicated that based on their latest budgetary forecast, these funds will not be available until 2025. Therefore, it will be assumed in this study that the City would not construct the Phase 2 modifications prior to 2025.

It should be noted that the detailed designs for the Bank Street Widening indicate changes to the widening limits for Phase 3 (Findlay Creek Drive changed to Findlay Creek Centre Access) from what was previously stated in the Bank Street EA. **Table 4** includes the updated Bank Street Widening Stages based on discussion with City staff.

TABLE 4 - Staging of Recommended Modifications Based on Discussion with City Staff

ROAD/ PHASING	PROJECT DETAILS
Phase 1: 2019	
Bank Street	<ul style="list-style-type: none"> Bank Street and Leitrim Road intersection upgrades will be targeted for completion based on the Leitrim MTS recommendation. Leitrim will be widened from 2 lanes to 4 lanes at the intersection, with double left-turn lanes. Bank Street will receive a dedicated right turn lane in the northbound direction and paved shoulders on both sides.
Phase 3: 2026–2031	
Bank Street	<ul style="list-style-type: none"> Widening Bank Street from 2 to 4 lanes from Leitrim Road to Findlay Creek Centre Access. Widening Bank Street from Findlay Creek Centre Access to south of Blais Road/ Urban Boundary from 2 to 4 lanes. Widen Bank Street to 6 lanes through the intersection of Bank Street and Leitrim Road.
Beyond 2031	
Bank Street	<ul style="list-style-type: none"> Widen Bank Street from south of the Urban Boundary to Rideau Road from 2 to 4 lanes, including a two-way left turn lane within the rural area. Widen Bank Street to 6 lanes through the Leitrim Road intersection.

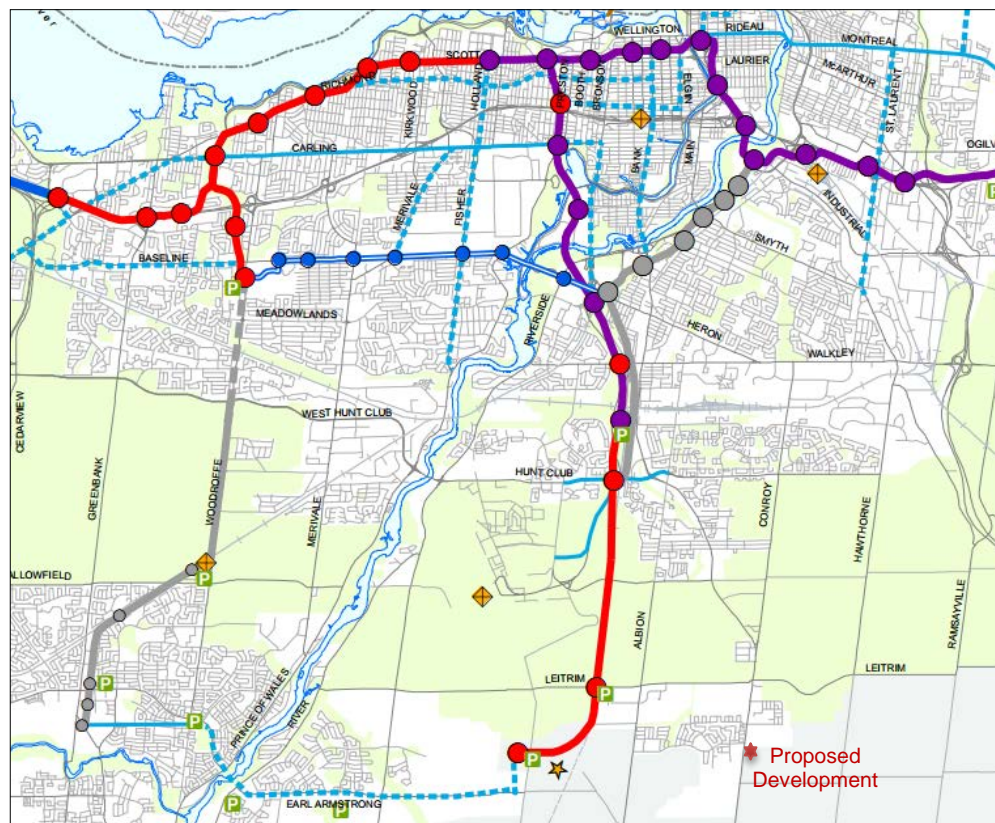
2.4.1.2 Future Transit Facilities and Services

As indicated in the TMP's 2031 Affordable Network there are no transit facilities proposed within the vicinity of the subject property. The 2017 Leitrim MTS, p. 65, shows future transit networks such as the O-Train North-South Light Rail Transit Corridor extending to Riverside South, but not in the vicinity of the proposed development.

It is expected that existing transit routes will be extended south along Bank Street to serve the Cowan's Grove development via Shuttleworth Drive, a collector road with a ROW protection of 24 m. A 24 m ROW protection is the typical minimum ROW required for OC Transpo transit service. The details of OC Transpo transit service will be developed with the OC Transpo approvals staff during the approvals process for the subject development.

Exhibit 6 shows the future transit network within the vicinity of the subject site.

EXHIBIT 6 – Future Transit Network



Park and Ride

Future Rail

Transit Priority Corridor (Isolated Measures)



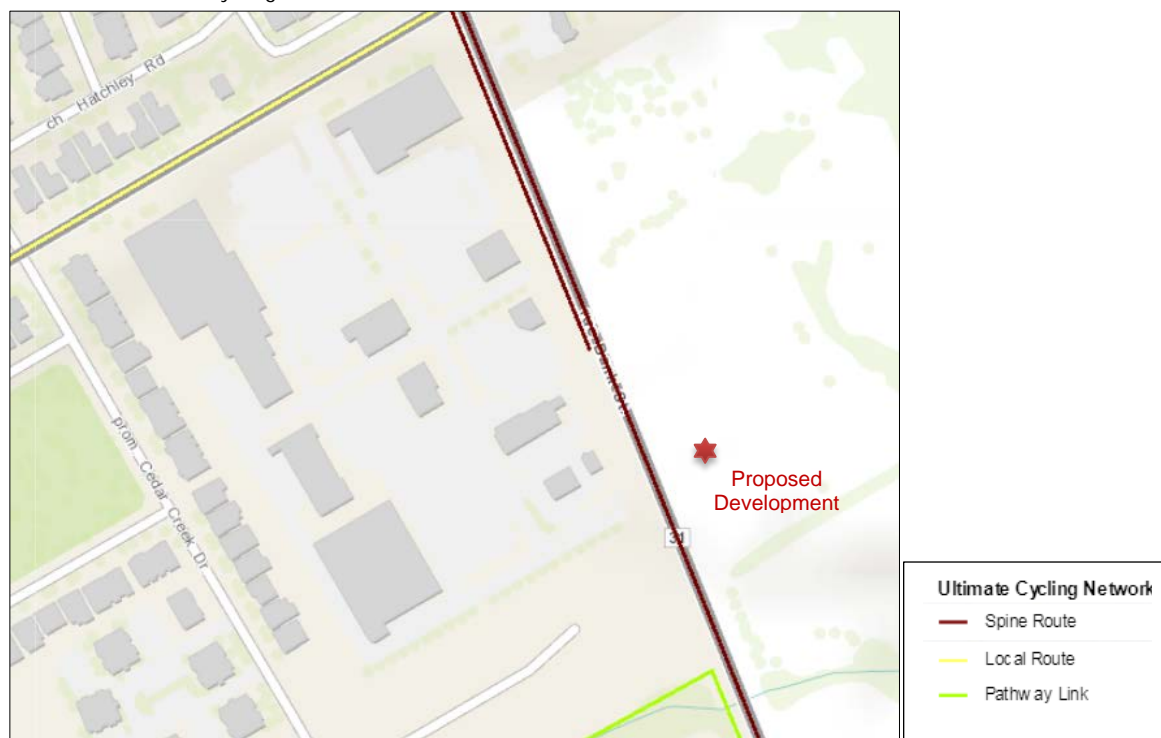
2.4.1.3 Future Cycling and Pedestrian Facilities

The Bank Street EA addresses cycling and pedestrian needs through the implementation of cycling and pedestrian facilities. Accommodations for pedestrians will be in the form of sidewalks. For cyclists a set of multi-use pathways within the Greenbelt and paved shoulders along Bank Street will be implemented.

According to GeoOttawa, Bank Street is designated as a Spine cycling route and Findlay Creek Drive is planned as a local route. An east-west Pathway Link is proposed in the Ultimate Cycling Network, crossing Bank Street approximately 200 m to the south of the subject property.

Exhibit 7 shows the future cycling connections within the vicinity of the subject site.

EXHIBIT 7 – Future Cycling Connections





2.4.2 Future Adjacent Developments

The City of Ottawa Transportation Impact Assessment (TIA) Guidelines specifies all significant developments within the study area which are likely to occur within the horizon years for the study must be identified and recognized in all TIA reports. Future adjacent developments included in the MTS for the 2025 planning horizon (Buildout plus 5 years) are shown in **Exhibit 8** and are described in **Table 5**.

TABLE 5 – Adjacent Developments and Dwelling Units

DEVELOPMENT NAME	LAND USE	EXPECTED BUILDOUT/ OCCUPANCY DATE
Remaining Findlay Creek	Residential	(No occupancy in 2018)
Remaining Lemay and Sundance	Residential	
Transport Canada	Residential	
Findlay Creek Stage 2 Phase 4C	Residential	
Remer and Idone	Residential	
	Commercial	
Barrett Lands	Residential	
Barrett Lands Extension	Commercial	
OPA 76 Area 9a and 9b	Residential	
	Commercial	



BARRETT LANDS

**BARRETT LANDS
EXTENSION**

**FINDLAY CREEK
STAGE 2 PHASE 4C**

**TRANSPORT CANADA
AND ADDITIONAL LANDS**

**REMER AND
IDONE LANDS**

**PROPOSED
DEVELOPMENT**

OPA AREAS 9A & 9B

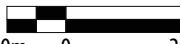
**ALL REMAINING LANDS
EITHER OCCUPIED OR
UNDER CONSTRUCTION**

URBAN BOUNDARY



Cowan's Grove Commercial Plaza
Transportation Impact Assessment

EXHIBIT 8
Proposed Adjacent Developments

PROJECT No. 116871
DATE: JUNE 2018
SCALE:  -100m 0 200m



2.4.3 Network Concept Screenline

A screenline is an imaginary line made up of a number of stations to count east/west or north/south travel within a particular area. Screenlines are typically located along geographical barriers such as rivers, rail lines or within the greenbelt. To be truly representative of the flow, there is a station at each intersecting road crossing the screenline.

The Bank Street EA considered project specific screenlines south of Leitrim Road and North of Rideau Road where Bank Street has a two-lane cross-section to better assess the need for widening. Conservative growth rates were applied along each roadway crossing the screenline. A 1.5% annual growth rate was applied along Bank Street to account for development within the Leitrim Community up to 2031, including the subject site.

2.5 Study Area

Based on the review of the nearest screenlines, transit routes and active transportation facilities, the proposed study area will be limited to the Bank Street and Findlay Creek Centre Access intersection.

It is expected that the traffic generated by the proposed development will have a marginal impact on the traffic volumes on the adjacent road network. Therefore, this TIA will consider a condensed study area and focus on site specific impacts, integration with boundary streets, a functional review of site access geometry and a review of parking/ loading requirements.

Multi-modal Level of Service (MMLOS) analysis will be conducted for the intersection described above in both the existing and future horizons, as defined in Section 2.7.

2.6 Time Periods

Although this is a retail development, Bank Street is a commuter route therefore traffic generated during the morning peak hour and afternoon peak hour is expected to result in the most significant impact to traffic operations on the adjacent network in terms of development-generated and background traffic. These two (2) analysis periods will be used for operational analysis in the TIA.

2.7 Horizon Years

Two (2) future horizons are proposed for analysis in the Transportation Impact Analysis (TIA) Report:

- Year 2020 – Opening Day; Full occupancy
- Year 2025 – Opening Day plus 5 years

2.8 Exemptions Review

The TIA Guidelines provide exemption considerations for elements of the Design Review and Network Impact components. **Table 6** identifies each element, and indicates whether or not it will be required in Step 4 – Analysis.



TABLE 6 – Exemptions Review

TIA MODULE	ELEMENT	EXEMPTION CONSIDERATIONS	REQUIRED
Design Review Component			
4.1 Development Design	4.1.2 Circulation and Access	<ul style="list-style-type: none"> Only required for site plans 	✓
	4.1.3 New Street Networks	<ul style="list-style-type: none"> Only required for plans of subdivision 	✗
4.2 Parking	4.2.1 Parking Supply	<ul style="list-style-type: none"> Only required for site plans 	✓
	4.2.2 Spillover Parking	<ul style="list-style-type: none"> Only required for site plans where parking supply is 15% below unconstrained demand 	✗
Network Impact Component			
4.5 Transportation Demand Management	All Elements	<ul style="list-style-type: none"> Not required for site plans expected to have fewer than 60 employees and/or students on location at any given time 	✓
4.6 Neighbourhood Traffic Management	4.6.1 Adjacent Neighbourhoods	<ul style="list-style-type: none"> Only required when the development relies on local or collector streets for access and total volumes exceed ATM capacity thresholds 	✓
4.8 Network Concept	n/a	<ul style="list-style-type: none"> Only required when proposed development generates more than 200 person-trips during the peak hour in excess of the equivalent volume permitted by established zoning 	✗

3 Forecasting

The purpose of the Forecasting section is to “generate the future transportation demand number required to analyze pre and post-development network performance to determine if a network modification is required to offset development impacts” (City of Ottawa TIA Guidelines, p. 27).

3.1 Development Generated Traffic

3.1.1 Trip Generation Methodology

Peak hour development generated traffic volumes were developed using a local blended commercial trip generation rate from the Leitrim MTS to better represent local traffic behavior. A local traffic count was conducted on Tuesday, January 21, 2014 at the Findlay Creek Commercial Centre to develop average commercial vehicle trip generation rates.

The City recommends that the vehicle-trip rates be converted to person-trips split based on representative mode share proportions. This conversion factor was based on the TRANS Committee: 2011 Origin-Destination (OD) Survey.

The OD Survey has mode share breakdowns for specific zones throughout the City; the South Gloucester/ Leitrim contained the subject site and was applied in this analysis. Local mode shares were based on the OD Survey.

Appendix E contains the trip generation survey results for Findlay Creek Centre Access.

3.1.2 Trip Generation Results

3.1.2.1 Vehicle Trip Generation

A traffic count was completed on Tuesday, January 21, 2014 at the intersection of Findlay Creek Centre Access, located directly across from the subject site, to develop local blended commercial trip generation rates for the Leitrim MTS. The local trip generation count should be considered conservative, as it included larger format retail stores that would likely attract more regional trips than the smaller format retail stores proposed within the subject site.

Local blended commercial trip generation rates developed in the Leitrim MTS were utilized to determine site-generated trips for the subject site. The results are summarized in **Table 7**.

TABLE 7 – Local Development Trip Generation Results

LAND USE	SIZE (sqft)	PERIOD	GENERATED TRIPS (VPH)		
			IN	OUT	TOTAL
Local Commercial (5 Buildings)	35,015	AM	62	45	107
		PM	98	106	204

VPH = vehicles per hour;
Formula Rate and Splits

AM: $T = 3.07 \times X$

IN: 58%; OUT: 42%

PM: $T = 5.83 \times X$

IN: 48%; OUT: 52%

3.1.2.2 Person Trip Generation

An appropriate person-trip conversion factor was determined to be 1.49 based on the PM Peak Auto Driver mode share percentage of 67% from the TRANS Committee: 2011 Origin-Destination (OD) Survey. By applying this factor to the vehicle-trips, the person-trips were calculated. The results after applying this factor have been summarized in **Table 8**.



TABLE 8 – Development Person Trip Generation Results

LAND USE	FACTOR	PERIOD	GENERATED TRIPS (PPH)		
			IN	OUT	TOTAL
Local Commercial (5 Buildings, 35,015 sqft)	1.49	AM	93	67	160
		PM	146	158	304

PPH = persons per hour

3.1.2.3 Mode Share Proportions

The total person trips generated by the proposed development were stratified by mode, based on mode share proportions in the 2011 Origin-Destination (OD) Survey for the South Gloucester/ Leitrim Traffic Assessment Zone (TAZ). The relevant extracts from the 2011 OD Survey has been provided in **Appendix F**.

No adjustments were made to any sustainable modes of transportation such as transit, walking or cycling for future planning horizons. This approach should be considered conservative. The existing and proposed mode share targets for the South Gloucester/ Leitrim TAZ for each of the analysis horizons are outlined in **Table 9**. Of the available data, the weekday PM Peak inbound direction (i.e. To District) was determined to be the most appropriate existing mode share reference as it coincides with the peak weekday demand of the proposed development.

TABLE 9 – Proposed Mode Shares for South Gloucester/ Leitrim (2011 OD Survey)

TRAVEL MODE	MODE SHARE
	PM
Auto Driver	67%
Transit	11%
Auto Passenger	15%
Cycling	0%
Walking	1%
Other	5%
Total	100%

3.1.2.4 Trip Reduction Factors

3.1.2.4.1 Deduction of Existing Development Trips

Not applicable.

3.1.2.4.2 Pass-By Traffic

Commercial pass-by trips are generated by a particular land use from auto trips that are already en-route to their ultimate destination. The Leitrim MTS assumed a pass-by proportion of 80%; however, this assumed full buildout of the entire Leitrim Community.

The ITE Trip Generation Manual: Volume 1 – Table 5.6, pass-by trips for the Shopping Centre land use were reported to be an average of 34%. Since the proposed development does not technically fall under the ITE Shopping Centre classification, and is significantly smaller in size than the shopping centres surveyed for pass-by data in the ITE manual, a 60% pass-by trip proportion was found to be more representative of the trip generation for the subject site prior to full buildout of the Leitrim Community.



3.1.2.4.3 Synergy/ Internalization

Synergy or internalization is applied to developments with two or more land uses to prevent double-counting trips that have multiple intermediate destinations within the same site. Synergy was embedded into the Findlay Creek Commercial Centre traffic count for both morning and afternoon peak hours and therefore does not need to be included as a reduction factor. Findlay Creek Commercial Centre is adjacent to the proposed development and is similar in characteristics, including multi-use commercial facilities and a drive-through.

3.1.2.5 Trip Generation by Mode

The mode shares in **Table 9** were applied to person trips results from **Table 8** to estimate the number of development generated trips by mode, as shown in **Table 10**.

TABLE 10 – Development Generated Traffic by Mode

TRAVEL MODE	PEAK PERIOD TRIPS BY MODE					
	AM			PM		
	IN	OUT	TOTAL	IN	OUT	TOTAL
Auto Driver	62	45	107	98	106	204
Pass-By Trips (60%)	32	32	64	61	61	122
New Auto Trips	30	13	43	37	45	81
Transit	10	7	18	16	17	33
Auto Passenger	14	10	24	22	24	46
Cycling	0	0	0	0	0	0
Walking	1	1	2	1	2	3
Other	5	3	8	7	8	15

The proposed development is expected to generate approximately 43 morning and 81 afternoon new peak hour vehicular trips at full buildout.

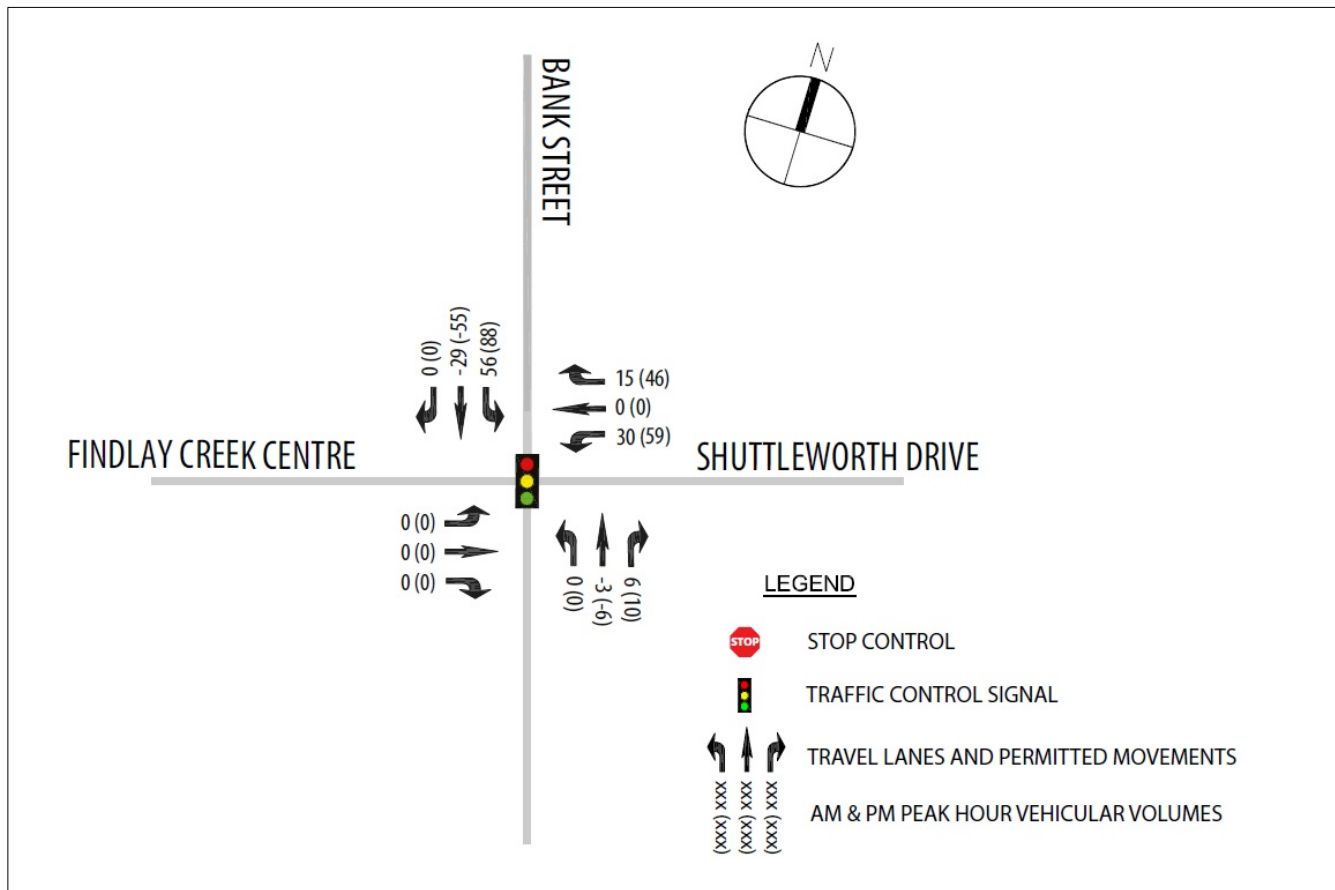
3.1.3 Trip Distribution and Assignment

Since the land use of the proposed development will be commercial, it is anticipated that the distribution of site-generated traffic will be consistent with existing commuter traffic flow. No traffic is expected to travel to/from the west and the east.

- 90% to/from the North
 - 90% via Bank Street
- 10% to/from the South
 - 10% via Bank Street

Site-generated traffic volumes are shown in **Exhibit 9**.

EXHIBIT 9 – Site Generated Traffic



3.2 Background Network Traffic

3.2.1 Changes to the Background Transportation Network

To properly assess future traffic conditions, the City requires that all anticipated changes to the transportation network over time, particularly road and transit route components, are accounted for through City planning documents. These changes would then be reflected in the future background demand volumes to develop an appropriate foundation for the TIA.

As noted in Section 2.4.1.1 and as directed by City staff, the Bank Street Widening from Leitrim Road to Findlay Creek Access was postponed until Phase 3 (2026 - 2031) of the TMP, which is beyond the ultimate planning horizon for this TIA. Therefore traffic impacts resulting from the Bank Street Widening will not be accounted for in this TIA.

3.2.2 General Background Growth Rates

As a conservative approach, a linear growth rate of 2.0% per annum was applied to existing traffic volumes at Bank Street and Findlay Creek Centre Access to account for regional growth in this traffic study up to the 2020 horizon year. Future travel demand in 2025 was based on the Leitrim MTS, which accounted for all adjacent developments separately and applied a 1.0% growth rate for traffic outside of the Leitrim Community. The background growth rate was only applied to through movements on Bank Street, since side street traffic in the Leitrim Community was accounted for separately.



3.2.3 Other Area Development

The City of Ottawa TIA Guidelines specifies all significant developments within the study area which are likely to occur within the horizon years must be identified and taken into consideration in all TIA reports. Since the traffic generated by these developments was not captured in the background traffic growth calculation, they must be added separately.

Section 2.4.2 lists eight (8) known developments expected to contribute traffic within the study area by 2025 based on the Leitrim MTS.

The adjacent developments have been summarized in **Table 11**.

TABLE 11 – Future Adjacent Developments

DEVELOPMENT NAME	TIA PREPARED BY	LAND USE	SIZE/ DWELLING UNITS (DU)	EXPECTED BUILDOUT/ OCCUPANCY DATE	RECOMMENDED ROAD MODIFICATIONS
Remaining Findlay Creek	IBI Group	Residential	152	(No occupancy in 2018)	Recommendations to account for future total traffic for 2019 include: a new access intersection to Shuttleworth Drive consisting of southbound and westbound left-turn lanes and appropriate storage lengths.
Remaining Lemay and Sundance		Residential	158		
Transport Canada		Residential	371		
Findlay Creek Stage 2 Phase 4C		Residential	425		
Remer and Idone		Residential	2310		
		Commercial	419		
Barrett Lands		Residential	1111		
Barrett Lands Extension		Commercial	266		
OPA 76 Area 9a and 9b		Residential	2249		
		Commercial	166		

3.3 Demand Rationalization

The following section summarizes any adjustments made to future travel demands in the study area to account for capacity limitations of the transportation network.

3.3.1 Description of Capacity Issues

Based on the Intersection Capacity Analysis done for the Leitrim MTS for the future 2025 horizon year, Bank Street and Findlay Creek Centre Access/ Shuttleworth Drive was expected to approach capacity, while continuing to operate within the City standards.

3.3.2 Adjustment to Development Generated Demands

The total person trips generated by the proposed development were stratified by mode, based on mode share proportions in the 2011 Origin-Destination (OD) Survey for the South Gloucester/ Leitrim Traffic Assessment Zone (TAZ). No adjustments were made to any sustainable modes of transportation such as transit, walking or cycling for future planning horizons.

3.3.3 Adjustment to Background Network Demands

The development of background traffic for this TIA was based on traffic analysis completed for the Leitrim MTS, which was approved in March 2017. Based on the results of the MTS, no further adjustments were expected to be necessary to accommodate background traffic through to the 2025 horizon year.

3.4 Traffic Volume Summary

3.4.1 Future Background Traffic Volumes

The existing 2018 peak hour traffic volumes from the Scoping Report has been provided in **Exhibit 10**. The future background traffic volumes developed in Section 3: Background Network Traffic for the 2020 and 2025 horizons have been provided in **Exhibits 11 and 12**, respectively.

3.4.2 Future Total Traffic Volumes

The site generated peak hour traffic volumes from **Exhibit 9** were added to corresponding background traffic volumes to create background plus site generated or total peak hour traffic volumes for the 2020 and 2025 horizon years, as shown in **Exhibits 13 and 14**, respectively.

EXHIBIT 10 – Existing 2018 Auto, Cycling and Pedestrian AM & PM Peak Hour Traffic Volumes

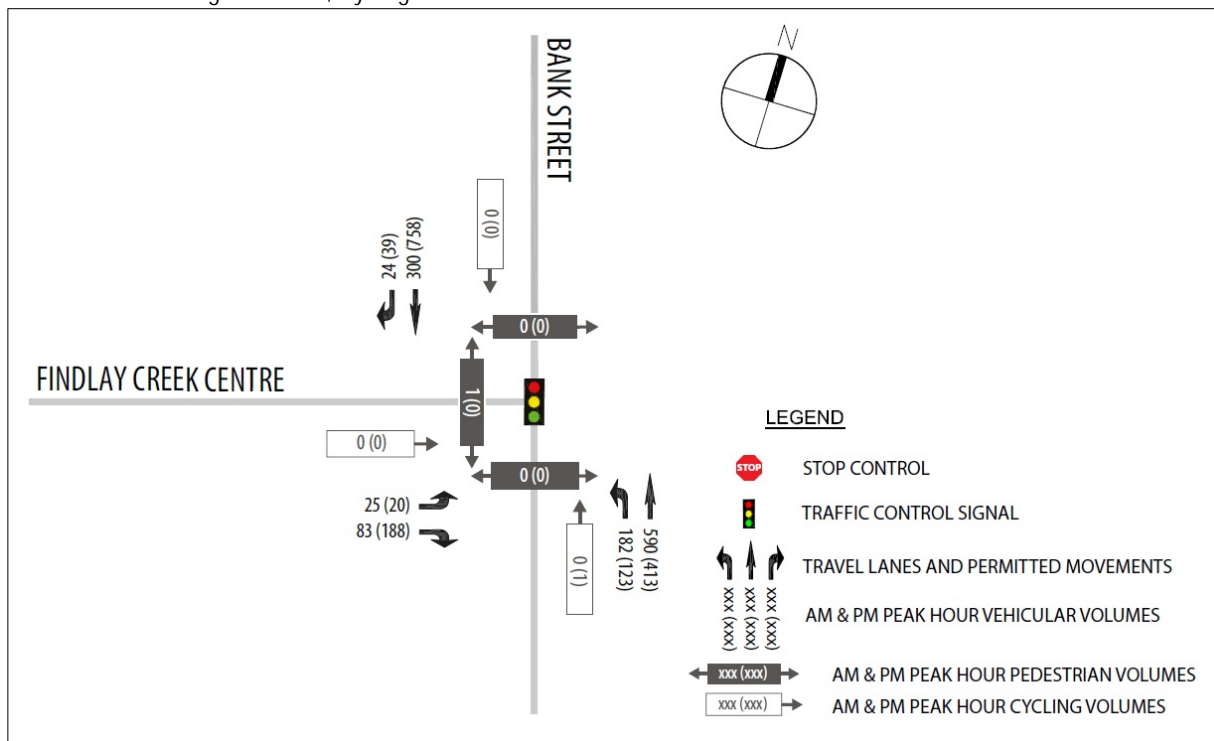


EXHIBIT 11 – 2020 Background AM & PM Peak Hour Traffic Volumes

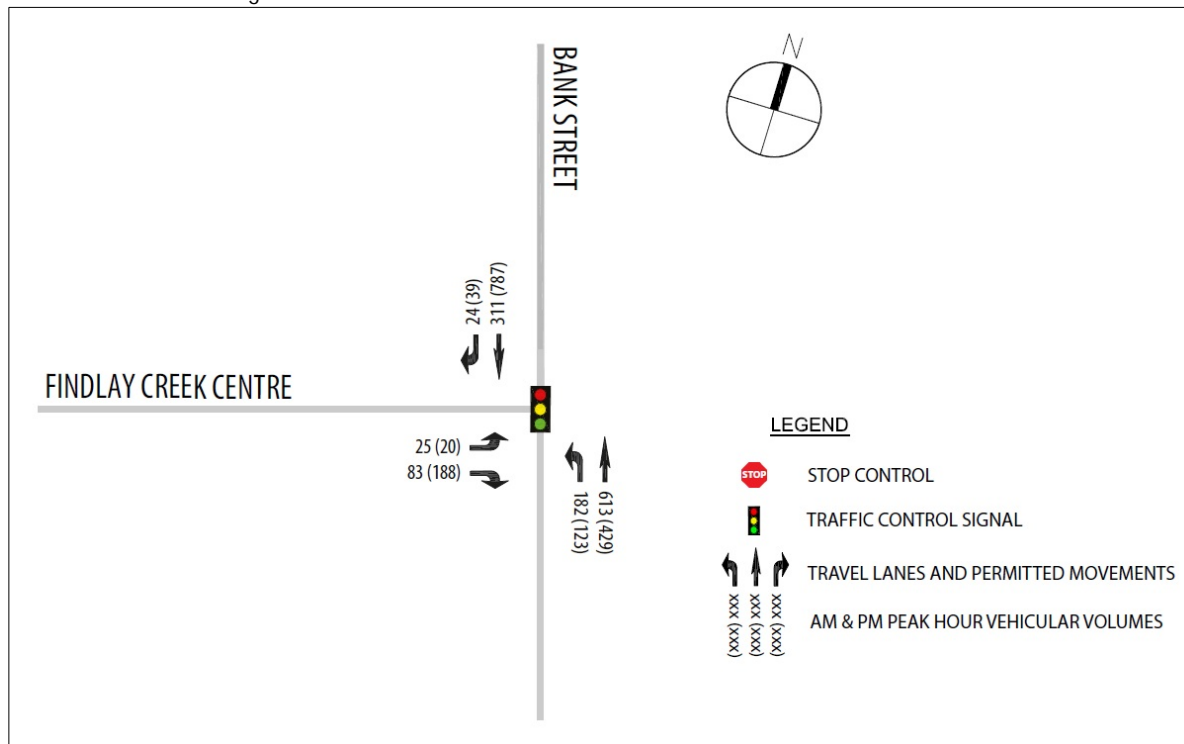


EXHIBIT 12 – 2025 Background AM & PM Peak Hour Traffic Volumes

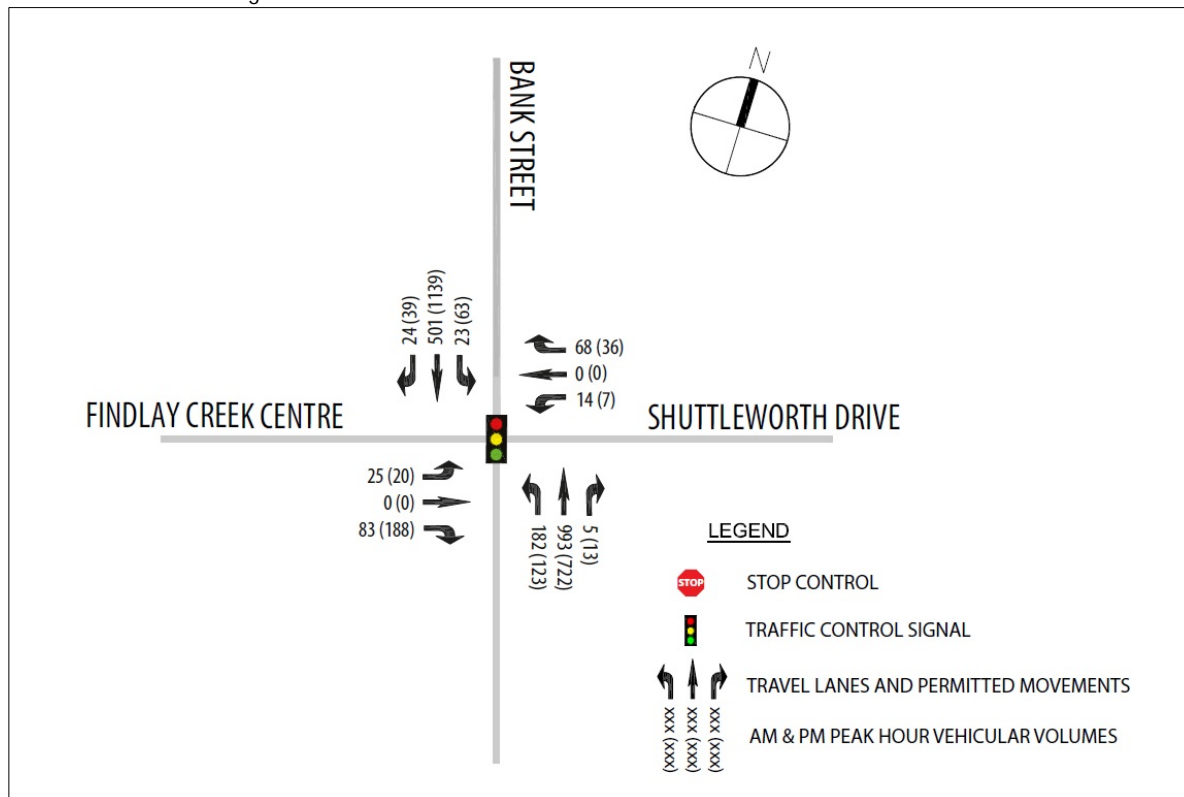




EXHIBIT 13 – 2020 Total AM & PM Peak Hour Traffic Volumes

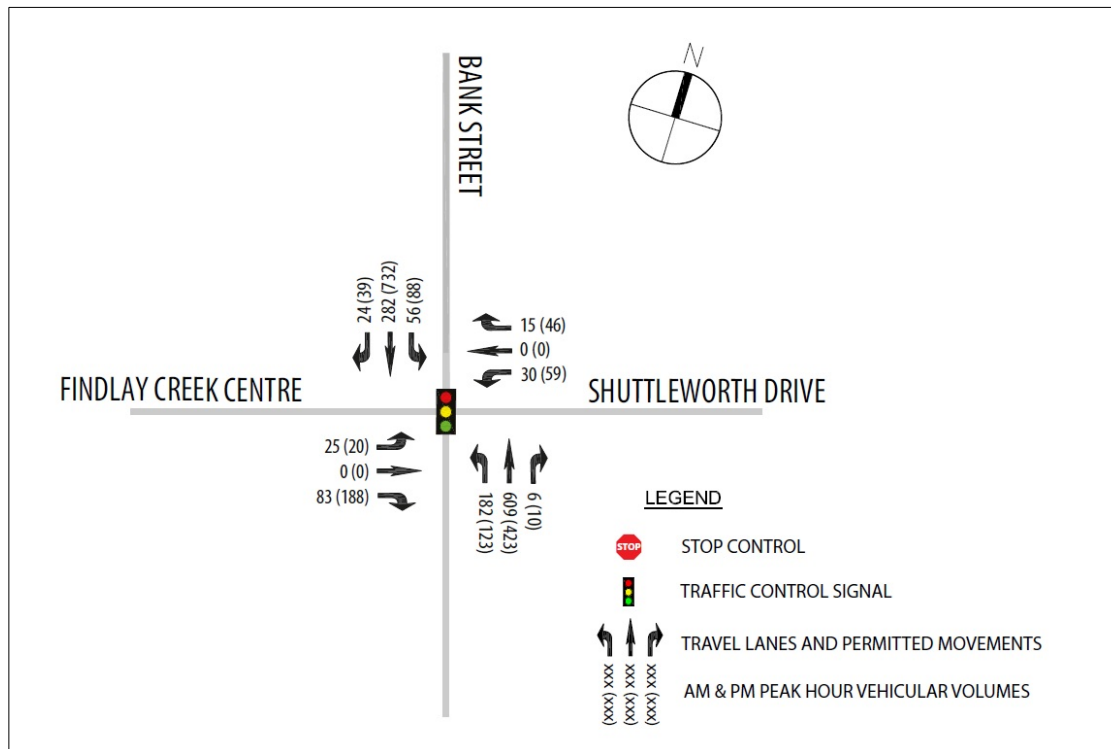
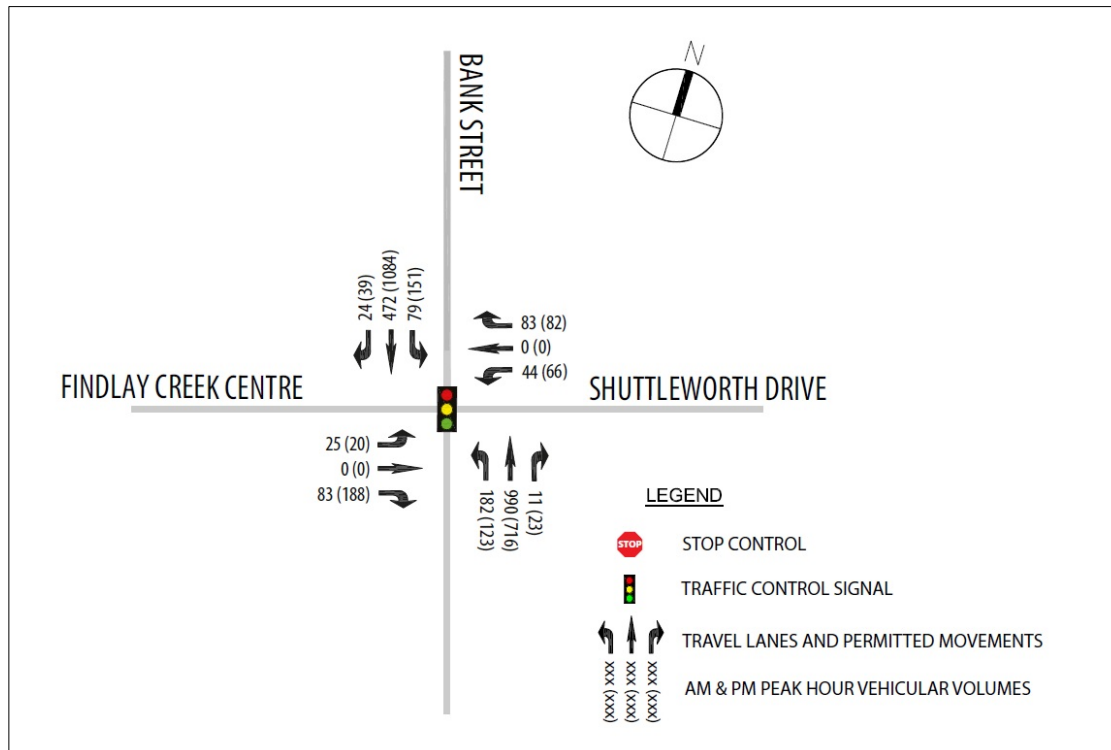


EXHIBIT 14 – 2025 Total AM & PM Peak Hour Traffic Volumes





4 Analysis

The purpose of the TIA Analysis component is to “assess the alignment between the transportation elements of the proposed development and the City of Ottawa’s city-building objectives and identify any opportunities to improve the alignment. It also evaluates the post-development performance of the planned transportation network based on the City’s established performance measures and targets and identifies potential mitigation measures to off-set development impacts.”²

4.1 Development Design

4.1.1 Design for Sustainable Modes

For consistency with the City of Ottawa’s Urban Design Guidelines and transportation policies, new developments shall provide safe and efficient access for all users while creating an environment that encourages walking, cycling and transit use.

The proposed development will have a 1.8 m concrete sidewalk to the north of Shuttleworth Drive which connects to the paved shoulder of Bank Street. A smaller side walk exists on the south corner of Bank Street and Shuttleworth Drive. The Sidewalks will allow for the idle time of pedestrians as they wait to cross the intersection, and the paved shoulder to the south of Bank Street will allow for easy access for cyclists to the subject site. Vehicular loading operations have been positioned entirely to the rear of the proposed development to minimize potential conflicts with pedestrians.

Currently transit services exist along Findlay Creek Drive and Bank Street, approximately 310 m north of the proposed development.

4.1.2 Circulation and Access

A geometric analysis of the proposed site plan was undertaken utilizing truck templates for the following two (2) design vehicles: Waste Collection and Fire Truck. The templates confirm the ability for each of these vehicles to enter the site from all proposed accesses off of Shuttleworth Drive, manoeuvre through the site and exit back onto the boundary streets. Access to the site by Fire Truck is expected to be rare while access by Waste Collection and Delivery Trucks will be infrequent and occur only a few times per week.

The analysis confirmed that the site layout and access configuration was sufficient to accommodate each of the design vehicles listed above, and that no off-site roadway modifications are required.

The heavy vehicle turning templates described above have been provided in **Appendix G**.

4.1.3 New Street Networks

Not applicable. As the proposed development is not a part of a plan of subdivision, this section was excluded.

4.2 Parking

4.2.1 Parking Supply

² Ottawa 2017 Transportation Impact Assessment (TIA) Guidelines, p. 35



Vehicular Parking

The proposed development will include a total of 153 surface parking spaces, exceeding the minimum Zoning By-law 2008-250 Consolidation parking requirement of 3.4 spaces per 100 m². As the proposed supply of on-site parking is greater than the By-law requirement, no further review of vehicular parking is required.

4.2.2 Spillover Parking

Not Applicable. As the proposed supply of on-site parking is greater than the requirement outlined in the Zoning By-law 2008-250 Consolidation, no further review of parking is required beyond what has been described above.

4.3 Boundary Streets

At the time of this study, there were no plans to construct any of the boundary streets within the study area as Complete Streets. Therefore, Segment Multi-modal Level of Service (MMLOS) analysis was undertaken, as specified in the TIA Guidelines, to identify gaps in the City's pedestrian and cycling network.

Segment multi-modal level of service (MMLOS) for the Existing (2018) condition was completed along the portion of Bank Street fronting the proposed development.

The results of the Segment Multi-modal Level of Service (MMLOS) for the Existing (2018) conditions are shown in **Table 12**, and 2020 and 2025 Total Traffic results are shown in **Table 13**. **Appendix H** provides all detailed Segment MMLOS results.

TABLE 12 – Segment MMLOS – Existing (2018) Results

SEGMENT	LEVEL OF SERVICE			
	2018			
	P	B	T	TK
Bank Street	D	E	D	B

TABLE 13 – Segment MMLOS – Total Traffic (2020 & 2025) Results

SEGMENT	LEVEL OF SERVICE			
	2020, 2025			
	P	B	T	TK
Bank Street	D	E	D	B
Shuttleworth Drive	C	E	D	B

4.4 Access Intersections

4.4.1 Location and Design of Access

The proposed site accesses, which are referred to as Access #1, Access #2, Access #3, Access #4 and Access #5 are in accordance with the City of Ottawa Private Approach By-law 2003-447. Key items from the By-law are referenced as follows:

- Width: The width of any two-way private approaches must be between 6.7 and 9.0 metres.
 - All accesses on the site were proposed as two-way private approaches, each with a width of 7.5m at the throat. ✓



- Distance from Intersecting Road: For a commercial development with 100-199 parking spaces, the proposed private approach must be at least 45 metres from the nearest intersecting street line and 45 metres from any other approach.
 - The nearest private approaches to the intersection of Bank Street/ Shuttleworth Drive, Access #1 and Access #3, are spaced more than 45 m from the street line. ✓
 - Although these accesses are spaced less than 45 m from any other approach, when factoring in the low traffic volume projected for Shuttleworth Drive and the alleviation of traffic by the right-in/ right-out access, City standards are met.
- Quantity and Spacing of Private Approaches: For sites with frontage between 46 and 150 metres, one (1) two-way and two (2) one-way private approaches are permitted or two two-way private approaches. Any two private approaches must be separated by at least 9.0m and can be reduced to 2.0 m in the case of two one-way driveways.
 - Accesses #1 through #4 will be provided along the approximate 90 m frontage of the proposed Shuttleworth Drive. Access #5 will be provided along the approximate 115 m frontage of Bank Street. ✓
 - The proposed private approaches are separated by more than 9 m. ✓
- Distance from Property Line: Private approaches must be at least 3.0 m from the abutting property line, however this requirement can be reduced to 0.3 m provided that the access is a safe distance from the access serving the adjacent property, sight lines are adequate and that it does not create a traffic hazard.
 - The proposed east private approaches, Access #2 and Access #4 have been set 3 m from the property line. ✓

4.4.2 Intersection Control

Proposed Access Intersections #1 to #4 off of Shuttleworth Drive

All of the proposed site accesses were recommended to operate as two-way, all-movement accesses. Due to the low traffic volumes projected for Shuttleworth Drive and proximity to Bank Street/ Shuttleworth, it was not necessary to implement any form of traffic control other than stop control for the accesses.

4.4.3 Intersection Design

Since the City's Multi-Modal Level of Service (MMLOS) evaluation is not applicable to unsignalized intersections, no analysis will be undertaken at these locations.

4.4.3.1 Curb Radii

The truck templates described previously in Section 4.1.2 confirmed that the proposed 7.5 metre access width and curb radii at both of the proposed access intersections are appropriately-sized to accommodate the turning requirements of the site's design vehicles.

4.4.3.2 Entrance Configuration

The detailed design of the site access driveways shall conform to the requirements of the City per Standard Detail Drawing SC7.1 – Curb Return at Private or Commercial Entrance, Unsignalized Intersection.



4.5 Transportation Demand Management (TDM)

The City of Ottawa is committed to implementing Transportation Demand Management (TDM) measures on a city-wide basis in an effort to reduce automobile dependence for residents of Ottawa, particularly during the weekday peak travel periods. TDM initiatives are aimed at encouraging individuals to use non-auto modes of travel during peak periods. The purpose of this module is to identify post-occupancy TDM program measures that complement the proposed design and infrastructure elements to reduce reliance on automobile transportation.

The site plan was anticipated to comply with the minimum requirements for Transportation Demand Management, as specified by the City. All minimum requirements will be reviewed and confirmed during the detailed design stage.

4.5.1 Context for TDM

Not Applicable.

4.5.2 Need and Opportunity

Not Applicable.

4.5.3 TDM Program

Not Applicable.

4.6 Neighbourhood Traffic Management

4.6.1 Adjacent Neighborhoods

The TIA Guidelines provide peak hour vehicular volume thresholds for local and collector roads that are located along significant access routes/ egress routes for the proposed development. The subject site relies on Shuttleworth Drive for access to the overall transportation network. To be conservative, it was assumed that 100% of development traffic utilized Shuttleworth Drive to access/ egress the subject site. Based on the size of the proposed retail development, two-way site-generated traffic for both the AM and PM peak periods was not expected to exceed 175 vehicles per hour in both directions, significantly less than the threshold of 300 vehicles per hour per lane (vphpl) for collector roads specified in the TIA Guidelines.

TABLE 14 – Roadway Classification Capacity

STREET	ROADWAY	CAPACITY (VPHPL)	PEAK PERIOD DEMAND	
			IN	OUT
Shuttleworth Drive	East of Bank Street	300	174	149

The results from **Table 14** show that the collector roadways in the vicinity of the proposed development are expected to accommodate future traffic. The overall impact of congestion is not expected to adversely impact the role or function of the roadway.

4.7 Transit

4.7.1 Route Capacity

The estimated future 2025 total transit passenger demand within the study area was provided in Section 3.1.2.4: Trip Generation by Mode. The results have been summarized in **Table 15**.



TABLE 15 – Development-Generated Transit Demand

PERIOD	PEAK PERIOD DEMAND	
	IN	OUT
AM	10	7
PM	16	17

As identified in **Table 15** above, the proposed development will have a marginal impact on the capacity of nearby transit routes. Additional capacity and service improvements via transit priority measures were not deemed necessary.

As the Cowan's Grove subdivision is built out to the east of the subject site, there will be opportunities for OC Transpo to provided transit service along Shuttleworth Drive to better serve this development.

4.7.2 Transit Priority

As indicated by the intersection capacity results, the impacts to the adjacent road network are expected to be marginal. Transit priority measures are therefore not triggered as a direct result of the proposed development.

4.8 Review of Network Concept

Not Applicable. The proposed development is expected to generate less than 200 new person trips during the weekday morning or afternoon peak hours. As indicated in Section 2.8 above (Table 4 – Exemptions Review), the impact of the development will be localized and minor, therefore there is no requirement to undertake a review of the Network Concept.

4.9 Intersection Design

The study area intersections were evaluated in the morning and afternoon peak hour traffic conditions at the following horizons:

- Existing Traffic (2018)
- Future (2020) Background Traffic
- Future (2025) Background Traffic
- Future (2020) Total Traffic
- Future (2025) Total Traffic

The following intersection was included in this analysis:

- Bank Street and Findlay Creek Centre Access/ Shuttleworth Drive

4.9.1 Intersection Control

4.9.1.1 Traffic Signal Warrant Analysis:

Not Applicable - The Bank Street and Findlay Creek Centre Access intersection is currently signalized, and is expected to operate through to the 2025 total traffic condition with

4.9.1.2 Roundabout Screening Tool Analysis

Not Applicable – IBI Group is currently undertaking the detailed design for the interim and ultimate buildout of this intersection with ongoing discussions with the City. Based on discussions with the City through the development of the detailed design, the intersection is to remain signalized, once the east leg (Shuttleworth Drive) is constructed.



4.9.2 Intersection Design

4.9.2.1 Intersection Analysis Criteria (Signalized Intersections)

In qualitative terms, the Level-of-Service (LOS) defines operational conditions within a traffic stream and their perception by motorists. A LOS definition generally describes these conditions in terms of such factors as delay, speed and travel time, freedom to manoeuvre, traffic interruptions, safety, comfort and convenience. LOS can also be related to the ratio of the volume to capacity (v/c) which is simply the relationship of the traffic volume (either measured or forecast) to the capability of the intersection or road section to accommodate a given traffic volume. This capability varies depending on the factors described above. LOS are given letter designations from A to F. LOS "A" represents the best operating conditions and LOS "E" represents the level at which the intersection or an approach to the intersection is carrying the maximum traffic volume that can, practicably, be accommodated. LOS F indicates that the intersection is operating beyond its theoretical capacity.

The City of Ottawa has developed criteria as part of the Transportation Impact Assessment Guidelines, which directly relate the volume to capacity (v/c) ratio of a signalized intersection to a LOS designation. These criteria are shown in **Table 16**.

TABLE 16 – LOS Criteria for Signalized Intersections

LOS	VOLUME TO CAPACITY RATIO (v/c)
A	0 to 0.60
B	0.61 to 0.70
C	0.71 to 0.80
D	0.81 to 0.90
E	0.91 to 1.00
F	> 1.00

The intersection capacity analysis technique provides an indication of the LOS for each movement at the intersection under consideration and for the intersection as a whole. The overall v/c ratio for an intersection is defined as the sum of equivalent volumes for all critical movements at the intersection divided by the sum of capacities for all critical movements.

4.9.2.2 Intersection Analysis Methodology

Using the established intersection capacity analysis criteria described above, the existing and future conditions were analyzed during the weekday peak hour traffic volumes derived in the previous sections of this report.

The worst/ critical observed LOS movement at each study area intersection was recorded; if the LOS was 'E' or lower, it was compared to the intersection LOS. If the intersection LOS was also indicated to be below City standards, potential roadway modifications or measures were considered and the intersection was re-evaluated. Any recommended modifications would be carried forward to the following horizon.

The following section presents the results of the intersection capacity analysis and roundabout capacity analysis. All tables summarize study area intersection LOS results during the morning and afternoon peak hour periods. The Synchro analysis output files have been provided in **Appendix I**.

4.9.2.3 Existing (2018) Traffic Results

The existing (2018) intersection capacity analysis was based on morning and afternoon peak hour traffic volumes. A summary of the results has been provided in **Table 17**.



TABLE 17 – Intersection Capacity Analysis: Existing (2018) Traffic

INTERSECTION	CONTROL	PEAK HOUR	V/C RATIO		LEVEL OF SERVICE	
			CRITICAL MOVEMENT	INTERSECTION	CRITICAL MOVEMENT	INTERSECTION
Bank Street & Findlay Creek Centre Access	Traffic Signals	AM	0.44 (NBT)	-	A (NBT)	-
		PM	0.62 (EBR)	-	B (EBR)	-

Notes: EB = eastbound; WB = westbound; NB = northbound; SB = southbound

4.9.2.4 2020 Background Traffic Results

The 2020 background traffic condition was based on morning and afternoon peak hour traffic volumes. A summary of the results has been provided in **Table 18**.

TABLE 18 – Intersection Capacity Analysis: Future (2020) Background Traffic

INTERSECTION	CONTROL	PEAK HOUR	V/C RATIO		LEVEL OF SERVICE	
			CRITICAL MOVEMENT	INTERSECTION	CRITICAL MOVEMENT	INTERSECTION
Bank Street & Findlay Creek Centre Access/ Shuttleworth Drive	Traffic Signals	AM	0.41 (NBT)	-	A (NBT)	-
		PM	0.59 (EBR)	-	A (EBR)	-

Notes: EB = eastbound; WB = westbound; NB = northbound; SB = southbound

4.9.2.5 2025 Background Traffic Results

The 2025 background traffic condition was based on morning and afternoon peak hour traffic volumes. A summary of the results has been provided in **Table 19**.

TABLE 19 – Intersection Capacity Analysis: Future (2025) Background Traffic

INTERSECTION	CONTROL	PEAK HOUR	V/C RATIO		LEVEL OF SERVICE	
			CRITICAL MOVEMENT	INTERSECTION	CRITICAL MOVEMENT	INTERSECTION
Bank Street & Findlay Creek Centre Access/ Shuttleworth Drive	Traffic Signals	AM	0.67 (NBT)	-	B (NBT)	-
		PM	0.70 (EBT)	-	B (EBT)	-

Notes: EB = eastbound; WB = westbound; NB = northbound; SB = southbound

Summary of Modifications:

- 1 - Bank Street & Findlay Creek Centre Access/ Shuttleworth Drive
 - a. Construct east leg (Shuttleworth Drive) with 40m WBL storage lane
 - b. Construct 120m SBL storage lane

4.9.2.6 2020 Total Traffic Results

The 2020 total traffic condition intersection capacity analysis for total background traffic was completed using morning and afternoon peak hour traffic volumes. A summary of the results has been provided in **Table 20**.



TABLE 20 – Intersection Capacity Analysis: 2020 Total Traffic

INTERSECTION	CONTROL	PEAK HOUR	V/C RATIO		LEVEL OF SERVICE	
			CRITICAL MOVEMENT	INTERSECTION	CRITICAL MOVEMENT	INTERSECTION
Bank Street & Findlay Creek Centre Access/ Shuttleworth Drive	Traffic Signals	AM	0.41 (NBT)	-	A (NBT)	-
		PM	0.79 (WBL)	-	C (WBL)	-

Notes: EB = eastbound; WB = westbound; NB = northbound; SB = southbound

Summary of Modifications:

- 1 - Bank Street & Findlay Creek Centre Access/ Shuttleworth Drive
 - a. Construct east leg (Shuttleworth Drive) with 40m WBL storage lane
 - b. Construct 120m SBL storage lane

4.9.2.7 2025 Total Traffic Results

The 2025 total traffic condition intersection capacity for total background traffic analysis was completed using morning and afternoon peak hour traffic volumes. All recommended modifications from the 2020 total traffic condition have been carried forward to this horizon. A summary of the results has been provided in **Table 21**.

TABLE 21 – Intersection Capacity Analysis: 2025 Total Traffic

INTERSECTION	CONTROL	PEAK HOUR	V/C RATIO		LEVEL OF SERVICE	
			CRITICAL MOVEMENT	INTERSECTION	CRITICAL MOVEMENT	INTERSECTION
Bank Street & Findlay Creek Centre Access/ Shuttleworth Drive	Traffic Signals	AM	0.67 (NBT)	-	B (NBT)	-
		PM	0.82 (SBT)	-	D (SBT)	-

Notes: EB = eastbound; WB = westbound; NB = northbound; SB = southbound

4.9.3 Intersection Design (MMLOS)

The Multi-modal level of service (MMLOS) Guidelines provide guidance on how to assess the various LOS for the different modes of transportation and what the specific target service levels for each mode should be given the location and context of the transportation project. This all-in-one evaluation tool will allow comparisons using similar performance metrics for each non-auto mode. The MMLOS procedure is only applied to signalized intersections, and the worst-performing approach at the intersection for any mode represents the overall intersection MMLOS for that mode.

The Intersection MMLOS results for the Existing (2018) condition are shown in **Table 22**, and the Intersection MMLOS results for the Future (2020 and 2025) Background and Total Traffic condition are shown in **Table 23**. Detailed MMLOS results are provided in **Appendix H**.

TABLE 22 – Intersection MMLOS – Existing Conditions (2018)

INTERSECTION	SCENARIO	LEVEL OF SERVICE			
		PLOS	BLOS	TLOS	TKLOS
Bank Street & Findlay Creek Centre Access/ Shuttleworth Drive	Existing (2018) Base	E	E	D	E

Notes: PLOS = Pedestrian LOS; BLOS = Bicycle LOS; TLOS = Transit LOS; TKLOS = Truck LOS



TABLE 23 – Intersection MMLOS – Future Background and Total Results

INTERSECTION	SCENARIO	LEVEL OF SERVICE							
		2020				2025			
		P	B	T	TK	P	B	T	TK
Bank Street & Findlay Creek Centre Access/ Shuttleworth Drive	Future BG	E	E	D	E	E	E	D	E
	Future BGSG	E	E	D	E	E	E	D	E

Notes:

LOS = Level of Service; P = Pedestrian LOS; B = Bicycle LOS; T = Transit LOS; TK = Truck LOS

Future BG = Future Background Traffic; Future BGSG = Future Background and Site-Generated Traffic

Summary of Modifications:

- 1 - Bank Street & Findlay Creek Centre Access/ Shuttleworth Drive
 - a. Construct east leg (Shuttleworth Drive) with 40m WBL storage lane
 - b. Construct 120m SBL storage lane

4.9.3.1 Intersection Pedestrian Level of Service (PLOS)

The PLOS at intersections is based on several factors including the number of traffic lanes that pedestrians must cross, corner radii, and whether the crossing allows for permissive or protective right or left turns, among others. The City of Ottawa target for PLOS is C.

The intersection of Bank Street & Findlay Creek Centre Access/ Shuttleworth Drive was tested in 2020 and 2025 in the background traffic condition and total traffic condition. All of these scenarios resulted in a PLOS of 'E'. This is due to the pedestrian walk-time meeting only the minimum requirement of 7.0 seconds.

According to the Bank Street Environmental Assessment (EA), the ultimate design for Bank Street will be a complete street, with sidewalks for pedestrians along Bank Street and the approach of Shuttleworth Drive. Therefore the PLOS of the intersection will improve significantly once the sidewalks are implemented.

4.9.3.2 Intersection Bicycle Level of Service (BLOS)

The BLOS at intersections is dependent on the number of lanes that the cyclist is required to cross to make a left-turn or on the presence of a dedicated right-turn lane on the approach, as well as the operating speed of each approach. The City target for BLOS is C.

The 2020 and 2025 background and total traffic conditions were tested with a signalized intersection, and all resulted in a BLOS of 'E', due to the high operating speeds along the existing Bank Street (i.e. 60 km/h or greater), as well as the number of lanes that cyclists must cross to make a left-turn when left-turn lanes are added to an approach.

The Bank Street Environmental Assessment (EA) recommends that the ultimate configuration of Bank Street include 2.0 m bike path when the four-lane cross-section of Bank Street is constructed. Therefore, the BLOS will improve significantly on the North and South approaches of the intersection, once this cycling infrastructure is implemented.

4.9.3.3 Intersection Transit Level of Service (TLOS)

Intersection TLOS is based on the average signal delay experienced by transit vehicles at each intersection. The City Target TLOS is C.

The 2020 and 2025 background and total traffic conditions were tested with a signalized intersection, and all resulted in a TLOS of 'D', which marginally exceeds the City's TLOS target value. This is due to the longer cycle length required to accommodate vehicular movement.



4.9.3.4 Intersection Truck Level of Service (TKLOS)

The TKLOS is based on the right-turn radii, as well as the number of receiving lanes for vehicles making a right-turn from the traffic lane being analyzed. The City of Ottawa target for TKLOS is D.

The intersection of Bank Street & Findlay Creek Centre Access/ Shuttleworth Drive was tested in 2020 and 2025 in the background traffic condition and total traffic condition. All of these scenarios resulted in a TKLOS of 'E', which is attributed to the tighter turning radii and single-receiving lanes. The ultimate configuration of Bank Street according to the Bank Street EA will add an additional receiving lane on Bank Street, thereby increasing the TKLOS.

4.10 Geometric Review

The following section reviews all geometric requirements for the study area intersections.

4.10.1 Sight Distance and Corner Clearances

Shuttleworth Drive was proposed to intersect with Bank Street across from Findlay Creek Centre Access with no significant horizontal or vertical alignment constraints. Sight distance and corner clearances are not expected to be a concern. All geometric design requirements were being reviewed and confirmed as part of the detailed design for the upgrade of the Bank Street and Findlay Creek Centre Access intersection.

4.10.2 Auxiliary Lane Analysis

Auxiliary turning lane lengths were evaluated for all intersections within the study area.

4.10.2.1 Auxiliary Left-Turn Lane Requirements (Unsignalized)

The MTO Geometric Design Standards for Ontario Highways left-turn warrant was applied to main-street approaches at all unsignalized intersection using the highest left-turn volumes from either the morning or afternoon peak hour.

The results of the auxiliary left-turn lane analysis are summarized below in **Table 24**. Relevant Extracts are provided in **Appendix J**.

TABLE 24 – Recommended Auxiliary Left-Turn Storage Lengths at Signalized Intersections

INTERSECTION	MOVEMENT	POSTED SPEED (KM/H)	DESIGN SPEED (KM/H)	LEFT-TURN VOLUME (VPH)	APPROACH VOLUME (VPH)	OPPOSING VOLUME (VPH)	LEFT-TURN STORAGE
Shuttleworth Drive/ Access Intersections	EB	50	60	98	174	106	-
	WB	50	60	106	149	98	-

Recommended storage lengths do not include deceleration lane and taper lengths. Units rounded to nearest 5m.

-Synchro extrapolated queue lengths at congested intersections. From Synchro 9 User Guide, "In practice, 95th percentile queue lengths will rarely be exceeded and the queues shown with the # footnote are acceptable in the design of storage bays."

Auxiliary left-turn lane analysis was completed under the 2025 total traffic condition for the four (4) proposed access intersections off of Shuttleworth Drive. Based on the worst case scenario, which assumed that 100% of site-generated vehicular traffic accessed/ egressed the subject site through a single access intersection off of Shuttleworth Drive, auxiliary left-turn lanes were not warranted.

4.10.2.2 Signalized Auxiliary Left-Turn Lane Requirements

A review of auxiliary left-turn lane storage requirements was completed at the intersection of Bank Street and Findlay Creek Centre Access/ Shuttleworth Drive. The review compared the projected 95th percentile queue lengths from Synchro operational results, and the City of Ottawa queue length calculation for the 2025 total traffic condition with the left-turn storage lengths proposed in the interim intersection redesign of Bank Street and Findlay Creek Centre Access/ Shuttleworth Drive.



The City queue length results were based on the following equation:

$$\text{Storage Length, } S = \frac{NL}{C} \times 1.5$$

Where:

N = number of vehicles per hour

L = Length occupied by a vehicle in the queue = 7 m

C = number of traffic signal cycles per hour (3600 seconds per hour/cycle length)

The results of the auxiliary left-turn lane analysis storage lengths are summarized below in Table 25.

TABLE 25 – Recommended Auxiliary Left-Turn Storage Lengths at Signalized Intersections

INTERSECTION	APPROACH	95TH %ILE QUEUE LENGTH (M)	CITY QUEUE LENGTH (M)	EXISTING STORAGE LENGTH (M)	INTERIM INTERSECTION REDESIGN (M)	RECOMMENDED ADDITIONAL STORAGE LENGTH (M)
Bank Street & Findlay Creek Centre Access/ Shuttleworth Drive	NB	#45	65	160	No Change	-
	SB	25	55	-	120 ¹	-
	EB	<10	<10	50	No Change	-
	WB	#30	25	-	40	-

Recommended storage lengths do not include deceleration lane and taper lengths. Units rounded to nearest 5m.

- Synchro extrapolated queue lengths at congested intersections. From Synchro 9 User Guide, "In practice, 95th percentile queue lengths will rarely be exceeded and the queues shown with the # footnote are acceptable in the design of storage bays."

¹ - The City requires a minimum 35m storage length for left-turn lanes along arterial roads. Recommended left-turn storage lengths were based on the 95th percentile queue lengths from Synchro, and did not consider parallel deceleration or taper length requirements from TAC. Left-turn lane requirements will be reviewed and confirmed during detailed design stage.

Left-turn storage bays utilized in the Bank Street and Findlay Creek Centre Access/ Shuttleworth Drive Interim Intersection Redesign were shown to be of sufficient length to accommodate projected queue lengths from the Synchro analysis and the City queue length calculations.

In compliance with TAC Section 9.1.2.3 of TAC, a southbound left-turn bay and a westbound left-turn bay were proposed in the interim intersection design to align with the existing northbound left-turn and the proposed eastbound left-turn lanes. Providing symmetry between corresponding approach and departure lanes will mitigate the risk of collisions between left-turning vehicles and opposing through vehicles.

4.10.2.3 Auxiliary Right-Turn Lane Requirements (Unsignalized)

There is currently no formal City or MTO warrant procedure governing the application of auxiliary right-turn lanes at unsignalized intersections. Referring to TAC standards, Section 9.14.2 suggests an auxiliary right-turn lane be considered "when volume of decelerating or accelerating vehicles compared with the through traffic volumes cause undue hazard."

Based on the above noted criteria, a northbound right-turn deceleration lane should be considered at Access #5, proposed as a right-in/ right-out access intersection off of Bank Street.

4.10.2.4 Signalized Auxiliary Right-Turn Lane Requirements

Section 9.14 of TAC suggests implementing a right-turn lane when more than 20% of vehicles on an approach are turning right, and generally when the peak hour demand exceeds 60 vehicles. The purpose of this guideline is to mitigate operational impacts to through-traffic, particularly on high-speed arterial roadways and may not be applicable in all circumstances such as private approaches (i.e. Findlay Creek Centre). Existing right-turn lane requirements were found to be sufficient to accommodate traffic through to the 2025 total traffic condition.



The results of the auxiliary right-turn lane analysis are summarized below in **Table 26**.

TABLE 26 – Recommended Auxiliary Right-Turn Storage Lengths at Signalized Intersections

INTERSECTION	APPROACH	RIGHT TURN VOLUME	APPROACH VEHICLES TURNING RIGHT (%)	95TH %ILE QUEUE LENGTH (M)	EXISTING STORAGE LENGTH (M)	INTERIM INTERSECTION REDESIGN (M)	RECOMMENDED ADDITIONAL STORAGE LENGTH (M)
Bank Street & Findlay Creek Centre Access/ Shuttleworth	EB	188	90%	15	50	Converted to shared EBT/ R	Private Approach – Not Applicable
	WB	55	45%	20	-	-	Not Warranted
	NB	23	3%	<10	-	-	Not Warranted
	SB	39	3%	30	60	60	Not Warranted

¹ Right-turn lanes requirements were not warranted in the MTS

² Recommended storage lengths do not include deceleration lane and taper lengths. Units rounded to nearest 5m.

Based on the results of **Table 26**, and confirmed through intersection capacity analyses, no modifications beyond the interim intersection design were required at the intersection of Bank Street and Findlay Creek Centre Access/ Shuttleworth Drive.

4.11 Summary of Improvements Indicated and Modification Options

4.11.1 Bank Street & Findlay Creek Centre Access/ Shuttleworth Drive

At the time of this study, IBI was undertaking the RMA for the interim design to upgrade the intersection of Bank Street and Findlay Creek Centre Access to include a fourth leg (Shuttleworth Drive), which includes exclusive southbound left-turn lane and westbound left-turn lane.

Intersection capacity analysis indicated that the Bank Street and Findlay Creek Centre Access/ Shuttleworth Drive intersection would operate within City standards through to the 2025 total traffic condition with the intersection upgrades proposed in the RMA's interim design.

Auxiliary storage lane lengths proposed in the detailed design were found to be sufficient to accommodate travel demand through to the 2025 total traffic condition, and no further modifications to the design were required.

4.11.2 Access Intersections

The proposed access intersections for the subject development off of Bank Street and Shuttleworth Drive were expected to operate within City operational standards with shared through-turning lanes on all approaches, and stop-controlled minor approaches through to the 2025 total traffic condition.

Traffic will be distributed between the five (5) proposed access intersections, thereby mitigating the effects of potential queuing or potential capacity restrictions.

The geometric assessment of the proposed access intersections did not trigger any auxiliary turning lanes to accommodate the 2025 total traffic condition. The existing shared lanes on all approaches were considered acceptable.

The access intersections all found to be in compliance with the Private Approach Bylaw, as shown in Section 4.4.1.

4.11.3 Summary of Recommendations

The key conclusions from the TIA Analysis Report are as follows:

- The study area transportation network is expected to accommodate site-generated traffic volumes through to the 2025 total traffic condition. Urbandale Homes shall be responsible for constructing all required access intersections and internal transportation facilities as dictated in the proposed site plan.



- There is no requirement for an RMA. At the time of preparing this TIA, IBI was completing the RMA to upgrade the intersection of Bank Street and Findlay Creek Centre Access to a 4-legged intersection. The proposed right-in/ right-out off of Bank Street was included in this RMA.
- There is no requirement for a monitoring plan.

A summary of all recommended actions/ modifications has been provided in **Table 27**.

TABLE 27 – Summary of Recommended Actions/ Modifications

HORIZON	RECOMMENDED ACTIONS/ MODIFICATIONS
Existing (2018)	Bank Street and Findlay Creek Centre Access <ul style="list-style-type: none"> • Meets City operational guidelines
Future (2020) Background – No Site Generated Traffic	Bank Street and Findlay Creek Centre Access <ul style="list-style-type: none"> • Meets City operational guidelines
Future (2025) Background– No Site Generated Traffic	<p>Assume all actions and modifications from the Existing (2018) traffic conditions remain.</p> Bank Street and Findlay Creek Centre Access/ Shuttleworth Drive <ul style="list-style-type: none"> • Construct east leg of intersection (Shuttleworth Drive) – Urbandale Group <ul style="list-style-type: none"> ➢ Construct 40m westbound left-turn storage lane ➢ Construct 120m southbound left-turn storage lane
Future (2020) Total – With Site Generated Traffic	<p>Assume all actions and modifications from the Existing (2018) traffic conditions remain.</p> Bank Street and Findlay Creek Centre Access/ Shuttleworth Drive <ul style="list-style-type: none"> • Construct east leg of intersection (Shuttleworth Drive) – Urbandale Group <ul style="list-style-type: none"> ➢ Construct 40m westbound left-turn storage lane ➢ Construct 120m southbound left-turn storage lane Access Intersections #1 to #4 off of Shuttleworth Drive <ul style="list-style-type: none"> • Stop-controlled access intersections – Urbandale Group <ul style="list-style-type: none"> ➢ Construct shared-through turning lanes on all approaches Access Intersection #5 off of Bank Street <ul style="list-style-type: none"> • Stop-controlled access intersection – Urbandale Group <ul style="list-style-type: none"> ➢ Construct right-in/right-out access intersection with shared through-turning lanes on all approaches
Future (2025) Total – With Site Generated Traffic	<p>Assume all actions and modifications from the Future (2020) Total traffic conditions remain.</p> Bank Street and Findlay Creek Centre Access <ul style="list-style-type: none"> • Meets City operational guidelines



Cowan's Grove Commercial Plaza 4791 Bank Street

Transportation Impact Assessment Report

Appendix A: City Comments and Responses

July 2018



Cowan's Grove Commercial Plaza – Screening & Scoping Comments

Responses to Asad Yousfani's comments sent via email on June 27, 2018 for the Screening and Scoping Report are indicated in red:

1) Exemptions Review - Neighbourhood Traffic Management (NTM) – 4.6.1 needs to be added in report because entrance (main) is being proposed on a local/ collector road.

Acknowledged. Shuttleworth Drive will be reviewed during Step 4 to ensure that it meets ATM capacity thresholds for collector roads.

2) Is Building C a drive-thru?

Building C is proposed as a drive-through bank. This TIA proposes to utilize a local trip generation rate based on traffic counts conducted at the Findlay Creek Centre Access during the AM and PM peak periods, which includes trips from a Tim Horton's drive-through. Therefore, the higher turn-over trips generated by a drive-through are already accounted for in the local trip rates.

As per the Zoning Bylaw 2008-250 Consolidation, Part 4 (Table 112), 3 queuing spaces are provided on the site plan leading to the bank machine, and one space is provided at the machine.

3) Provide sufficient vehicle stacking on site.

There are three (3) proposed access intersections meant to accommodate site-generated traffic, and mitigate the effects of potential stacking issues within the subject site.

Chapter 8 – Access from TAC indicates that a clear throat length of 8m should be used to accommodate a shopping centre that is less than 25,000m² in size for a private approach providing access to a collector road. The proposed retail shopping centre north of Shuttleworth Drive is approximately 10% of the 25,000m² threshold for retail developments that require 8m clear throat lengths.

All access intersections for the Cowan's Grove development propose throat lengths in excess of the TAC standards with the one exception being the proposed southbound access off of Shuttleworth Drive, (nearest to Bank Street) with a 7m clear throat length. Even though there is marginally less stacking distance proposed at this access than the TAC standard of 8m, this configuration still provides sufficient stacking distance to accommodate a standard TAC Large Car (1999) with a length of 5.6m.



Cowan's Grove Commercial Plaza 4791 Bank Street

Transportation Impact Assessment Report

Appendix B: Traffic Data

July 2018



Turning Movement Count - Full Study Peak Hour Diagram

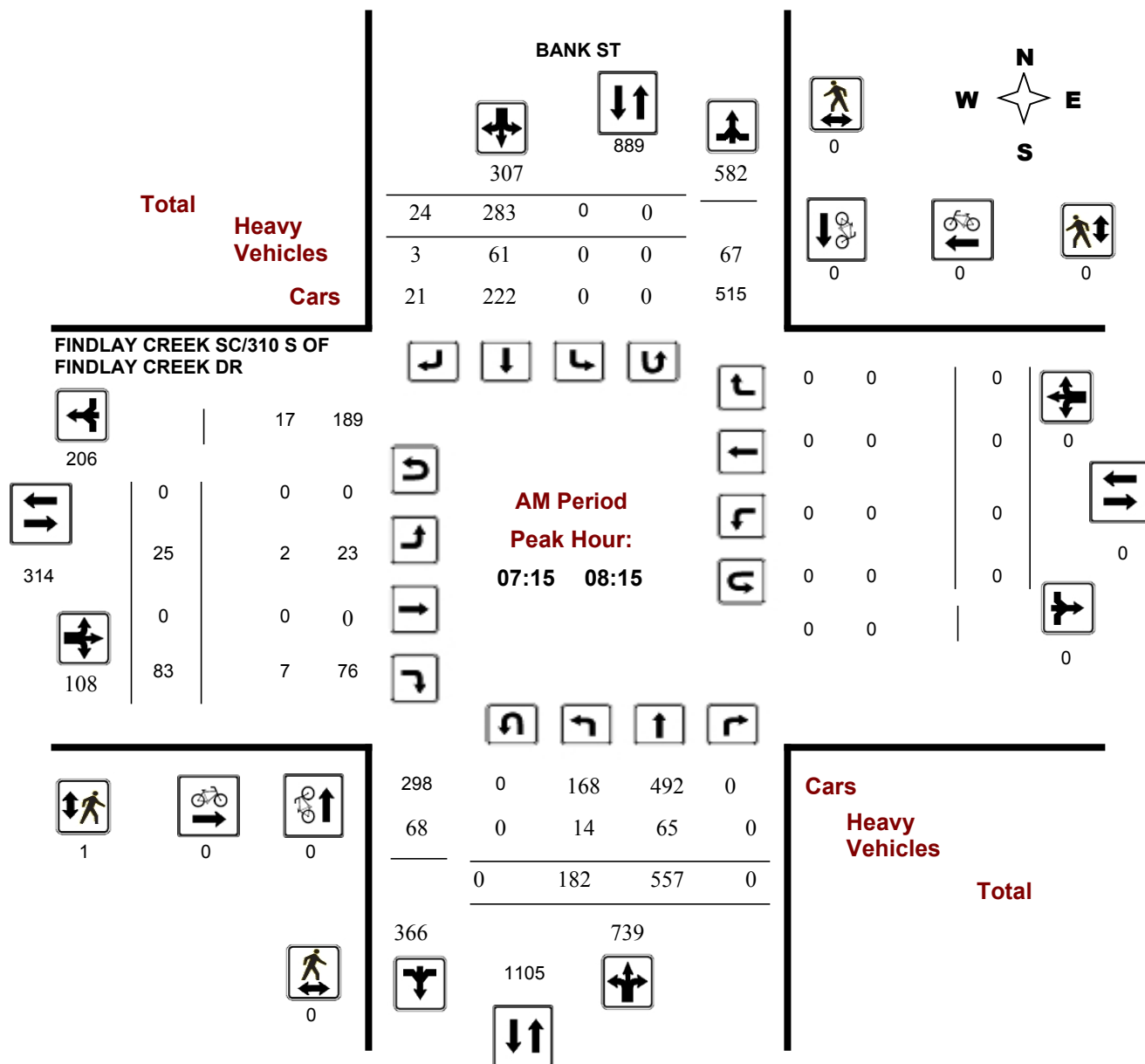
BANK ST @ FINDLAY CREEK SC/310 S OF FINDLAY CREEK DR

Survey Date: Wednesday, May 27, 2015

Start Time: 07:00

WO No: 34591

Device: Jamar Technologies, Inc



Turning Movement Count - Full Study Peak Hour Diagram

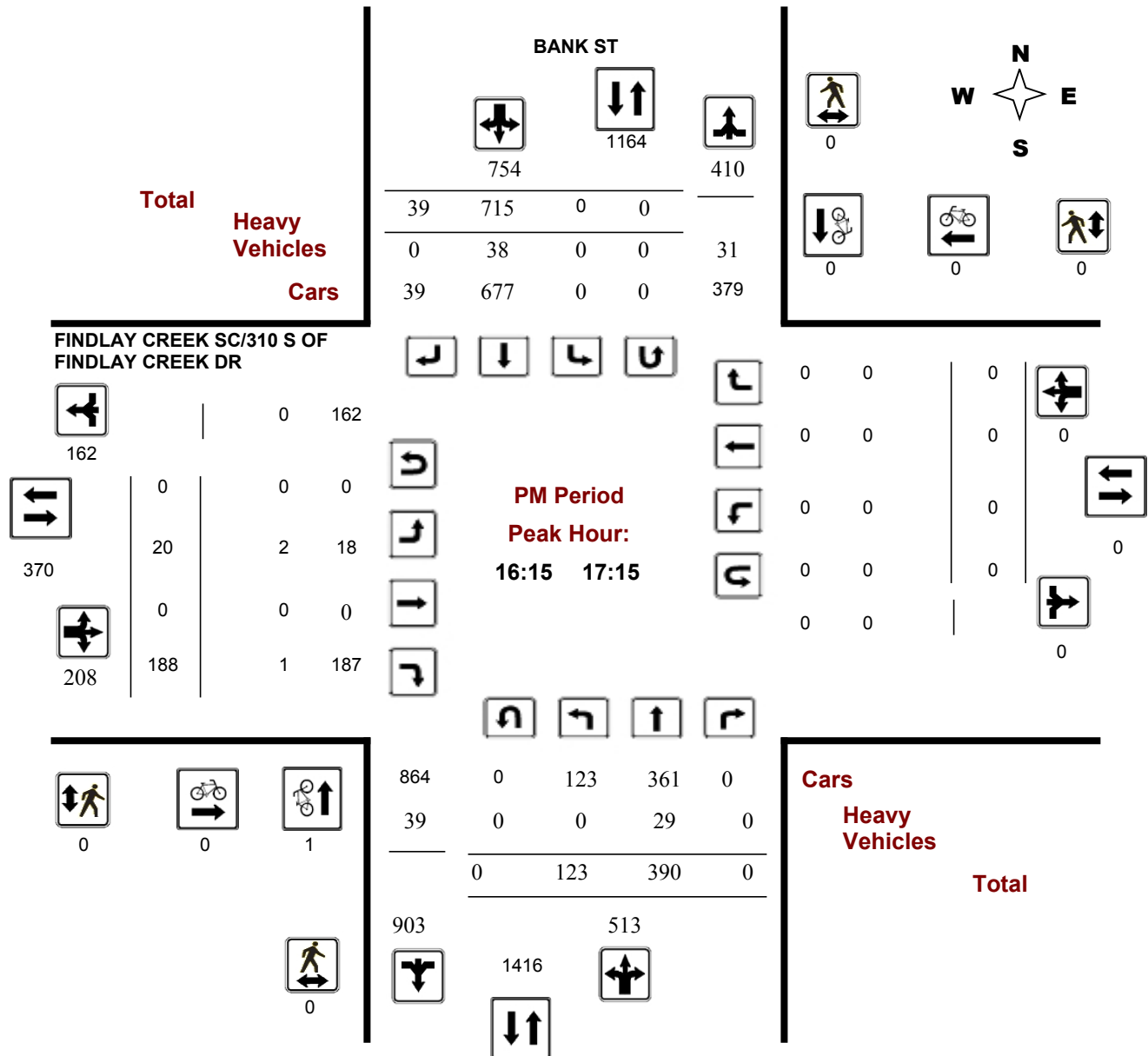
BANK ST @ FINDLAY CREEK SC/310 S OF FINDLAY CREEK DR

Survey Date: Wednesday, May 27, 2015

Start Time: 07:00

WO No: 34591

Device: Jamar Technologies, Inc





Cowan's Grove Commercial Plaza 4791 Bank Street

Transportation Impact Assessment Report

Appendix C: OC Transpo Maps

July 2018





93

GREENBORO BLOSSOM PARK

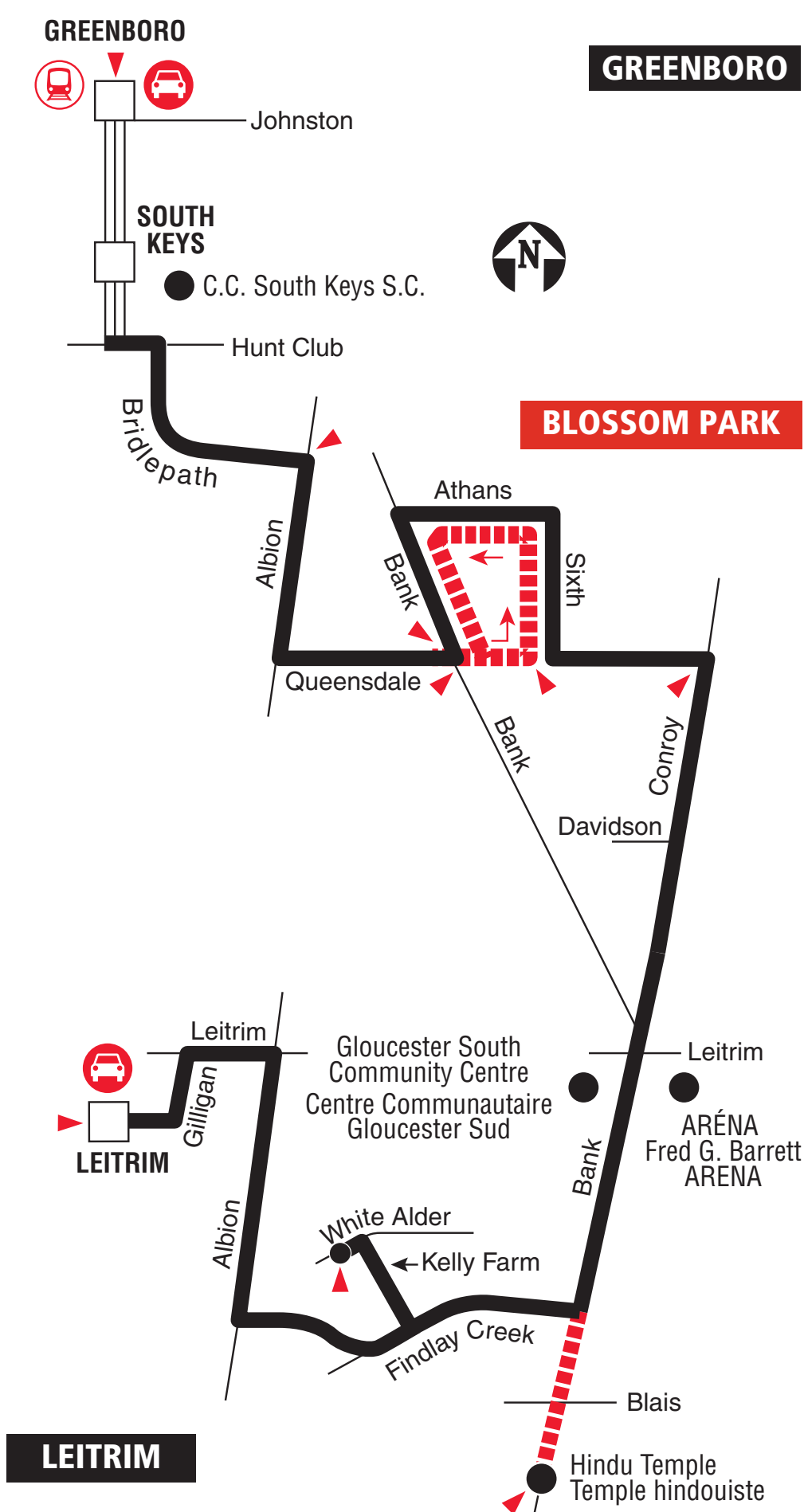
LEITRIM

Local

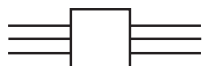
7 days a week / 7 jours par semaine

All day service

Service toute la journée



Legend • Légende



Transitway & Station



Some Sunday trips /
Quelques trajets le dimanche



Line 2 – O-Train Trillium Line
Ligne 2 - O-Train Ligne Trillium



Park & Ride / *Parc-o-Bus*



Timepoint / *Heures de passage*

2017.12



Schedule / Horaire.....613-560-1000

Text / Texto560560

plus your four digit bus stop number / plus votre numéro d'arrêt à quatre chiffres

Customer Relations

Service à la clientèle **613-842-3600**

Lost and Found / Objets perdus..... **613-563-4011**

Security / Sécurité **613-741-2478**

Effective December 24, 2017

En vigueur 24 décembre 2017



INFO 613-741-4390
octranspo.com

NEW / NOUVEAU

294

HURDMAN
FINDLAY CREEK

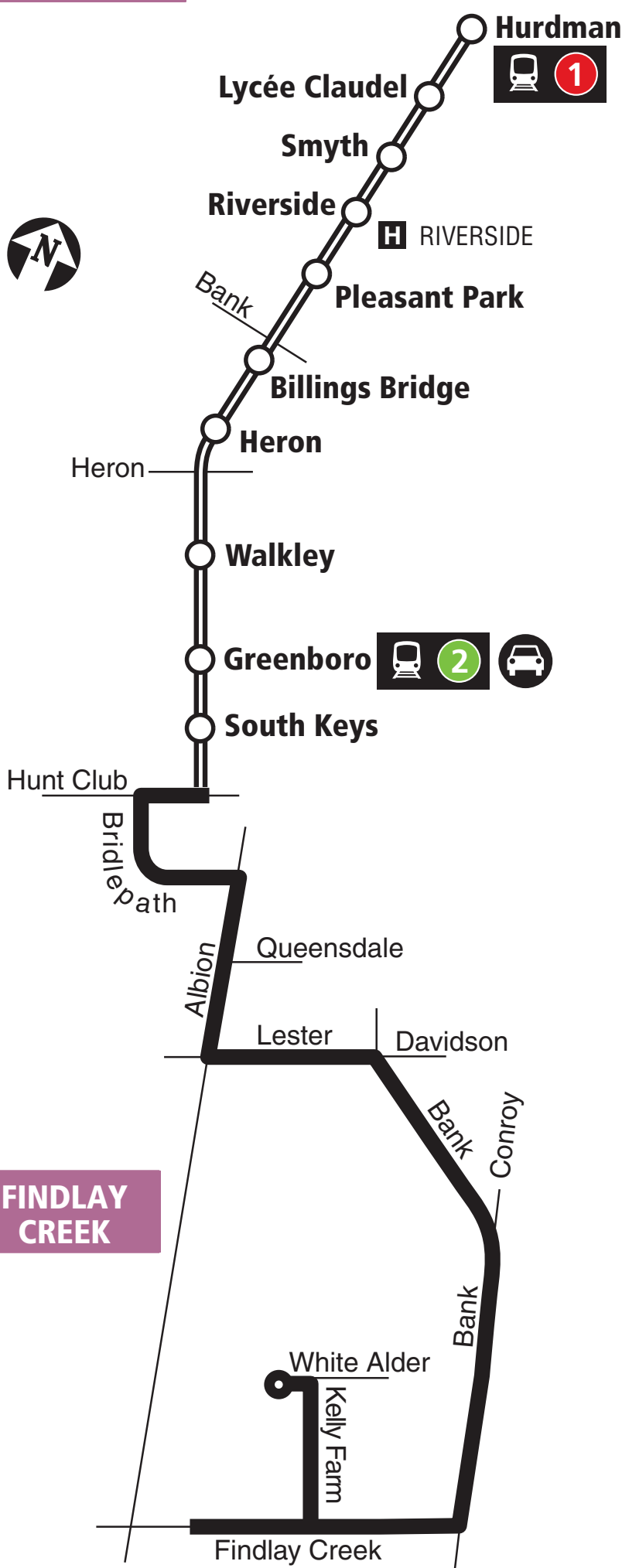
Connexion

Monday to Friday / Lundi au vendredi

Peak periods only

Périodes de pointe seulement

AM
↑
HURDMAN



Transitway & Station



Park & Ride / Parc-o-bus

2017.12



Schedule / Horaire.....613-560-1000

Text / Texto560560

plus your four digit bus stop number / plus votre numéro d'arrêt à quatre chiffres

Customer Relations

Service à la clientèle 613-842-3600

Lost and Found / Objets perdus..... 613-563-4011

Security / Sécurité 613-741-2478

Effective December 24, 2017

En vigueur 24 décembre 2017



INFO 613-741-4390
octranspo.com



Cowan's Grove Commercial Plaza 4791 Bank Street

Transportation Impact Assessment Report

Appendix D: Collision Data

June 2018





City Operations - Transportation Services

Collision Details Report - Public Version

From: January 1, 2012 **To:** December 31, 2018

Location: BANK ST @ FINDLAY CREEK SC/310 S OF FINDLAY CREEK DR

Traffic Control: Traffic signal

Total Collisions: 3

Date/Day/Time	Environment	Impact Type	Classification	Surface Cond'n	Veh. Dir	Vehicle Manoeuvre	Vehicle type	First Event	No. Ped
2016-Jul-05, Tue,06:35	Clear	Other	P.D. only	Dry	West	Reversing	Automobile, station wagon	Other motor vehicle	
					East	Turning left	Pick-up truck	Other motor vehicle	
2016-Nov-21, Mon,08:43	Snow	Rear end	Non-fatal injury	Wet	North	Slowing or stopping	Pick-up truck	Other motor vehicle	
					North	Stopped	Automobile, station wagon	Other motor vehicle	
2016-Nov-24, Thu,10:42	Snow	Angle	P.D. only	Loose snow	East	Turning right	Automobile, station wagon	Other motor vehicle	
					South	Stopped	Pick-up truck	Skidding/sliding	

Location: BANK ST btwn FINDLAY CREEK DR & BLAIS RD

Traffic Control: No control

Total Collisions: 10

Date/Day/Time	Environment	Impact Type	Classification	Surface Cond'n	Veh. Dir	Vehicle Manoeuvre	Vehicle type	First Event	No. Ped
2012-Jan-05, Thu,14:00	Clear	Rear end	P.D. only	Dry	North	Going ahead	Automobile, station wagon	Other motor vehicle	
					North	Slowing or stopping	Pick-up truck	Other motor vehicle	
2012-Jan-21, Sat,20:20	Clear	SMV other	Non-fatal injury	Dry	North	Turning right	Automobile, station wagon	Pole (utility, power)	

2012-Jun-30, Sat,04:04	Clear	SMV other	Non-fatal injury	Dry	North	Going ahead	Automobile, station wagon	Ran off road
2012-Sep-20, Thu,20:29	Clear	SMV other	P.D. only	Dry	North	Going ahead	Automobile, station wagon	Animal - wild
2013-Jan-28, Mon,18:31	Snow	Sideswipe	P.D. only	Loose snow	South	Overtaking	Automobile, station wagon	Skidding/sliding
					South	Going ahead	Pick-up truck	Other motor vehicle
2013-May-13, Mon,07:18	Clear	Rear end	P.D. only	Dry	North	Going ahead	Automobile, station wagon	Other motor vehicle
					North	Stopped	Pick-up truck	Other motor vehicle
2013-Dec-20, Fri,16:45	Snow	Approaching	P.D. only	Loose snow	North	Going ahead	Pick-up truck	Other motor vehicle
					South	Going ahead	Passenger van	Other motor vehicle
2015-Jan-14, Wed,08:46	Clear	Approaching	Non-fatal injury	Ice	South	Going ahead	Pick-up truck	Other motor vehicle
					North	Going ahead	Pick-up truck	Other motor vehicle
2016-Apr-18, Mon,19:31	Rain	SMV other	P.D. only	Wet	South	Going ahead	Automobile, station wagon	Animal - wild
2016-Sep-30, Fri,06:55	Clear	Rear end	P.D. only	Dry	North	Going ahead	Automobile, station wagon	Other motor vehicle
					North	Stopped	Automobile, station wagon	Other motor vehicle
					North	Stopped	Automobile, station wagon	Other motor vehicle
					North	Stopped	Pick-up truck	Other motor vehicle



Cowan's Grove Commercial Plaza 4791 Bank Street

Transportation Impact Assessment Report

Appendix E: Trip Generation Data

July 2018



FINDLAY CREEK CENTRE TRIP GENERATION SURVEY RESULTS

21-Jan-14

TIME	Signalized Int @ Bank ST	
	IN	OUT
0630-0645	23	17
0645-0700	37	10
0700-0715	25	11
0715-0730	21	17
0730-0745	23	7
0745-0800	22	17
0800-0815	30	15
0815-0830	34	20
TOTAL	215	114

TIME	RIRO @ Bank ST	
	IN	OUT
0630-0645	12	0
0645-0700	7	1
0700-0715	14	0
0715-0730	8	0
0730-0745	12	0
0745-0800	11	1
0800-0815	8	3
0815-0830	9	1
TOTAL	81	6

TIME	Findlay Creek Access		
	IN	OUT	
0630-0645	15	23	
0645-0700	23	41	
0700-0715	24	43	
0715-0730	26	41	439
0730-0745	21	28	440
0745-0800	30	27	429
0800-0815	29	38	435
0815-0830	40	39	465
TOTAL	208	280	

1600-1615	25	40
1615-1630	22	31
1630-1645	25	27
1645-1700	23	38
1700-1715	33	36
1715-1730	25	30
1730-1745	14	35
1745-1800	9	29
TOTAL	176	266

1600-1615	18	21
1615-1630	10	22
1630-1645	21	7
1645-1700	13	22
1700-1715	15	12
1715-1730	15	10
1730-1745	19	12
1745-1800	8	12
TOTAL	119	118

1600-1615	85	49	
1615-1630	47	71	
1630-1645	71	60	
1645-1700	67	62	877
1700-1715	65	66	866
1715-1730	72	60	875
1730-1745	61	77	882
1745-1800	60	50	825
TOTAL	528	495	

Site Uses	GFA
Canadian Tire	39,081
McDonalds	5,468
Gas Station	-
Day Care	3,120
Subway	1,690
Pet Store	1,375
Hair Salon	1,205
Cleaner	925
Dentist	1,830
Johnny Canucks	5,925
Tim Hortons	2,407
Restaurant	2,500
Shawarma	1,500
Optical	1,200
Unknown	1,500
Unknown	850
Unknown	1,505
Bulk Barn	5,010
LCBO	6,210
Freshco	32,532
Medical Centre	7,480
Shoppers	16,845
Scotiabank	4,972
CIBC	6,130
TOTAL	151,260

2-hr Site	IN	OUT		
AM	504	400		
PM	823	879		
	IN	OUT	TOTAL	RATE
AM Peak	269	196	465	3.07
PM Peak	422	460	882	5.83
AM Peak	58%	42%		
PM Peak	48%	52%		

658,395
23% FAR



Cowan's Grove Commercial Plaza 4791 Bank Street

Transportation Impact Assessment Report

Appendix F: 2011 OD Survey - South Gloucester/ Leirim

July 2018



South Gloucester / Leirim

Demographic Characteristics

Population	17,600	Actively Travelled	14,190
Employed Population	8,910	Number of Vehicles	11,080
Households	6,240	Area (km ²)	78.9

Occupation Status (age 5+)	Male	Female	Total
Full Time Employed	4,550	3,630	8,180
Part Time Employed	130	590	730
Student	2,160	2,130	4,290
Retiree	720	770	1,490
Unemployed	90	220	320
Homemaker	20	540	560
Other	80	120	200
Total:	7,750	8,010	15,760

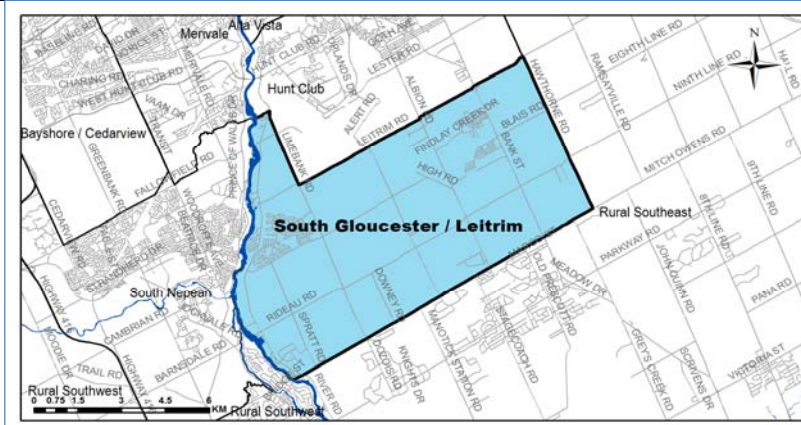
Traveller Characteristics	Male	Female	Total
Transit Pass Holders	790	1,070	1,850

Licensed Drivers	5,790	5,940	11,730
------------------	-------	-------	--------

Telecommuters	60	10	70
---------------	----	----	----

Trips made by residents	20,810	24,430	45,240
-------------------------	--------	--------	--------

Selected Indicators	
Daily Trips per Person (age 5+)	2.87
Vehicles per Person	0.63
Number of Persons per Household	2.82
Daily Trips per Household	7.25
Vehicles per Household	1.78
Workers per Household	1.43
Population Density (Pop/km2)	220

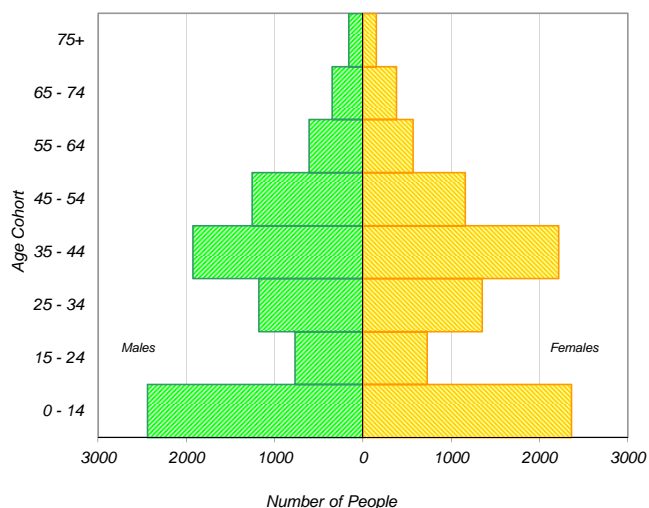


Household Size		
1 person	880	14%
2 persons	1,870	30%
3 persons	1,170	19%
4 persons	1,630	26%
5+ persons	690	11%
Total:	6,240	100%

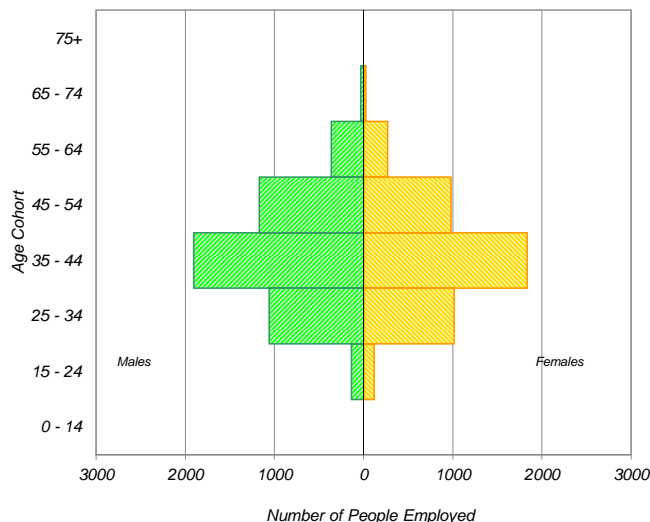
Households by Vehicle Availability		
0 vehicles	40	1%
1 vehicle	2,080	33%
2 vehicles	3,510	56%
3 vehicles	510	8%
4+ vehicles	100	2%
Total:	6,240	100%

Households by Dwelling Type		
Single-detached	3,300	53%
Semi-detached	770	12%
Townhouse	2,010	32%
Apartment/Condo	150	2%
Total:	6,240	100%

Population



Employed Population

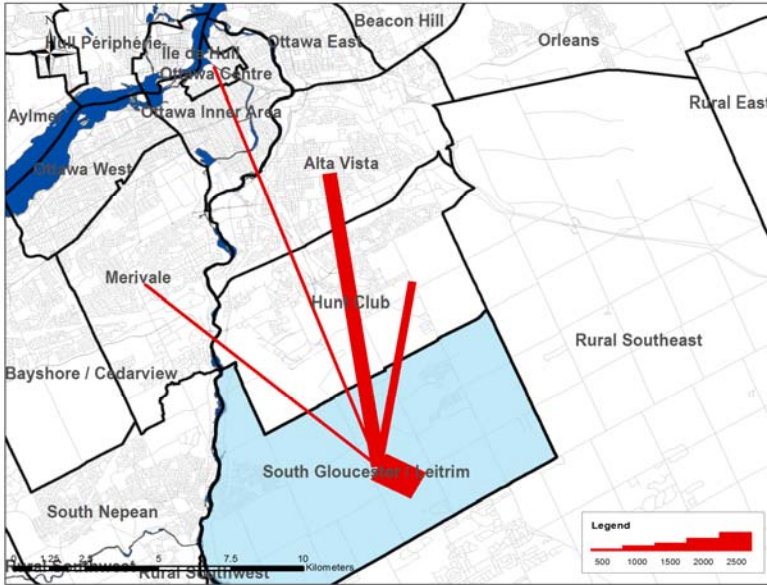


* In 2005 data was only collected for household members aged 11+ therefore these results cannot be compared to the 2011 data.

Travel Patterns

Top Five Destinations of Trips from South Gloucester / Leirtrim

AM Peak Period



Summary of Trips to and from South Gloucester / Leirtrim

AM Peak Period (6:30 - 8:59)

Districts	Destinations of Trips From		Origins of Trips To	
	District	% Total	District	% Total
Ottawa Centre	930	9%	0	0%
Ottawa Inner Area	530	5%	250	4%
Ottawa East	240	2%	40	1%
Beacon Hill	240	2%	30	0%
Alta Vista	1,970	18%	160	2%
Hunt Club	1,100	10%	870	13%
Merivale	770	7%	340	5%
Ottawa West	290	3%	0	0%
Bayshore / Cedarview	170	2%	70	1%
Orléans	50	0%	170	3%
Rural East	0	0%	10	0%
Rural Southeast	210	2%	570	8%
South Gloucester / Leirtrim	3,680	34%	3,680	55%
South Nepean	310	3%	100	1%
Rural Southwest	120	1%	220	3%
Kanata / Stittsville	140	1%	60	1%
Rural West	40	0%	60	1%
Île de Hull	90	1%	0	0%
Hull Périphérie	10	0%	20	0%
Plateau	0	0%	20	0%
Aylmer	0	0%	0	0%
Rural Northwest	20	0%	10	0%
Pointe Gatineau	10	0%	30	0%
Gatineau Est	0	0%	0	0%
Rural Northeast	20	0%	0	0%
Buckingham / Masson-Angers	0	0%	20	0%
Ontario Sub-Total:	10,790	99%	6,630	99%
Québec Sub-Total:	150	1%	100	1%
Total:	10,940	100%	6,730	100%

Trips by Trip Purpose

24 Hours	From District		To District		Within District	
Work or related	6,300	29%	3,270	15%	700	6%
School	1,640	8%	840	4%	1,930	16%
Shopping	1,830	8%	720	3%	700	6%
Leisure	2,730	13%	1,990	9%	660	6%
Medical	440	2%	120	1%	120	1%
Pick-up / drive passenger	1,610	7%	970	4%	1,720	14%
Return Home	6,020	28%	13,110	60%	5,320	44%
Other	1,160	5%	680	3%	850	7%
Total:	21,730	100%	21,700	100%	12,000	100%

AM Peak (06:30 - 08:59)	From District		To District		Within District	
Work or related	4,650	64%	1,740	57%	420	11%
School	1,310	18%	810	27%	1,580	43%
Shopping	60	1%	40	1%	10	0%
Leisure	140	2%	50	2%	0	0%
Medical	80	1%	0	0%	0	0%
Pick-up / drive passenger	780	11%	180	6%	900	25%
Return Home	100	1%	120	4%	330	9%
Other	150	2%	110	4%	430	12%
Total:	7,270	100%	3,050	100%	3,670	100%

PM Peak (15:30 - 17:59)	From District		To District		Within District	
Work or related	140	3%	150	2%	40	1%
School	30	1%	0	0%	80	2%
Shopping	270	6%	170	2%	210	6%
Leisure	840	19%	420	6%	140	4%
Medical	50	1%	0	0%	30	1%
Pick-up / drive passenger	310	7%	360	5%	400	12%
Return Home	2,400	54%	5,990	82%	2,350	69%
Other	400	9%	200	3%	150	4%
Total:	4,440	100%	7,290	100%	3,400	100%

Peak Period (%)	Total:	% of 24 Hours	Within District (%)
24 Hours	55,430		22%
AM Peak Period	13,990	25%	26%
PM Peak Period	15,130	27%	22%

Trips by Primary Travel Mode

24 Hours	From District		To District		Within District	
Auto Driver	14,990	69%	14,970	69%	5,210	43%
Auto Passenger	3,870	18%	3,650	17%	3,120	26%
Transit	1,630	8%	1,740	8%	200	2%
Bicycle	90	0%	100	0%	20	0%
Walk	40	0%	40	0%	2,680	22%
Other	1,110	5%	1,200	6%	770	6%
Total:	21,730	100%	21,700	100%	12,000	100%

AM Peak (06:30 - 08:59)	From District		To District		Within District	
Auto Driver	4,640	64%	2,070	68%	1,540	42%
Auto Passenger	1,260	17%	210	7%	1,140	31%
Transit	860	12%	100	3%	60	2%
Bicycle	70	1%	20	1%	10	0%
Walk	20	0%	0	0%	620	17%
Other	420	6%	640	21%	300	8%
Total:	7,270	100%	3,040	100%	3,670	100%

PM Peak (15:30 - 17:59)	From District		To District		Within District	
Auto Driver	3,100	70%	4,920	67%	1,510	44%
Auto Passenger	1,020	23%	1,120	15%	860	25%
Transit	150	3%	790	11%	50	1%
Bicycle	20	0%	80	1%	0	0%
Walk	10	0%	0	0%	850	25%
Other	130	3%	390	5%	130	4%
Total:	4,430	100%	7,300	100%	3,400	100%

Avg Vehicle Occupancy	From District		To District		Within District	
24 Hours	1.26		1.24		1.60	
AM Peak Period	1.27		1.10		1.74	
PM Peak Period	1.33		1.23		1.57	

Transit Modal Split	From District		To District		Within District	
24 Hours	8%		9%		2%	
AM Peak Period	13%		4%		2%	
PM Peak Period	4%		12%		2%	



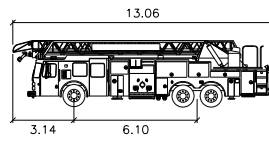
Cowan's Grove Commercial Plaza 4791 Bank Street

Transportation Impact Assessment Report

Appendix G: Turning Template Analysis

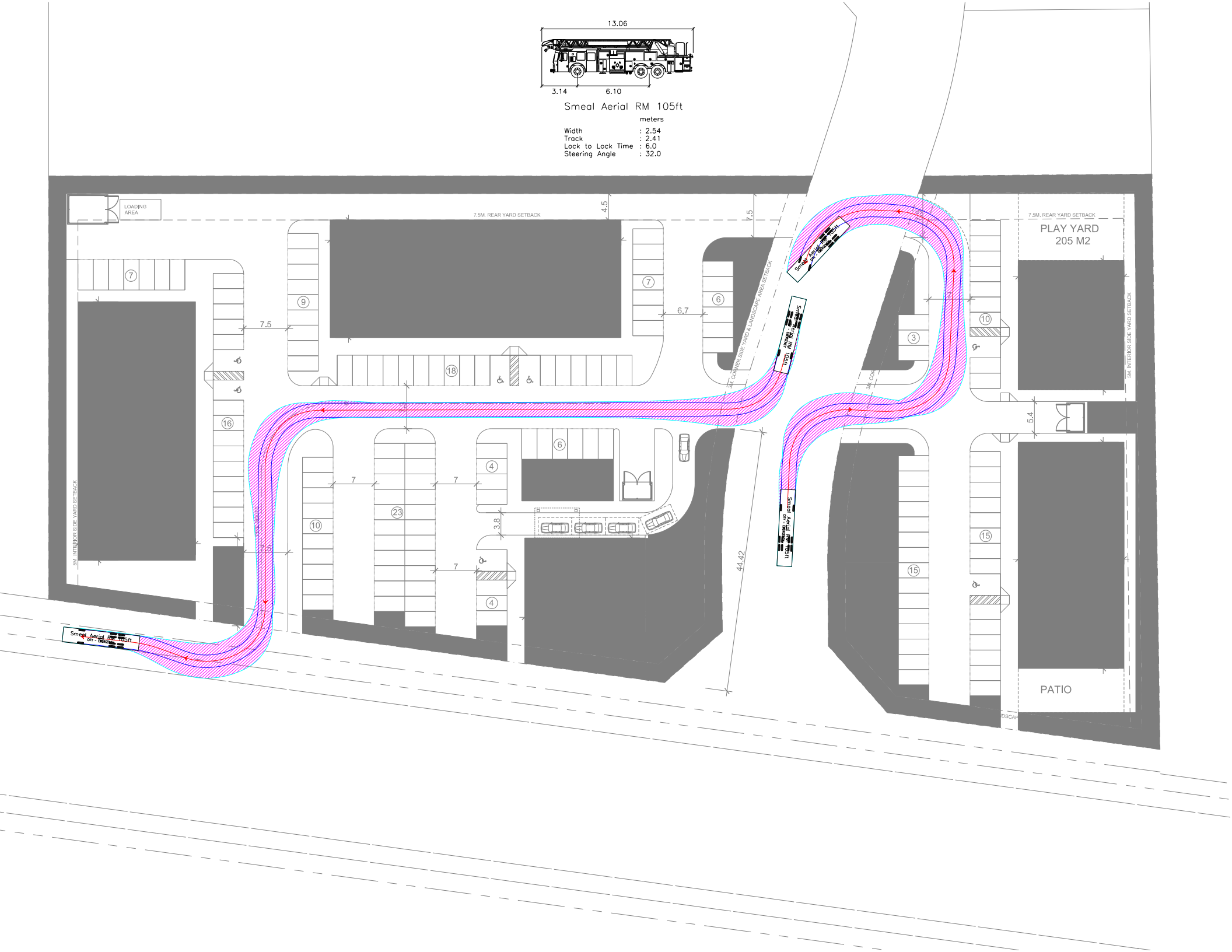
July 2018

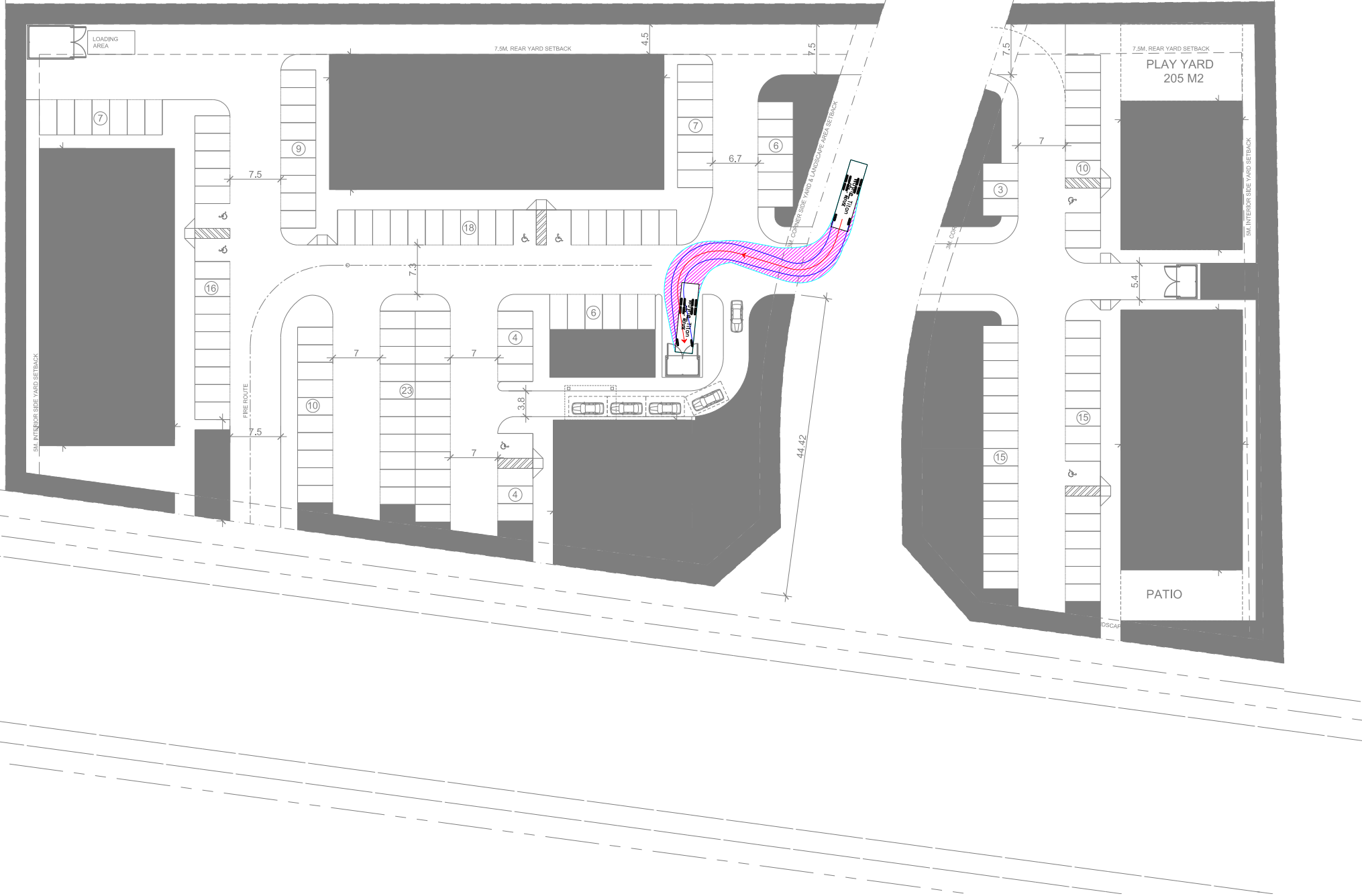


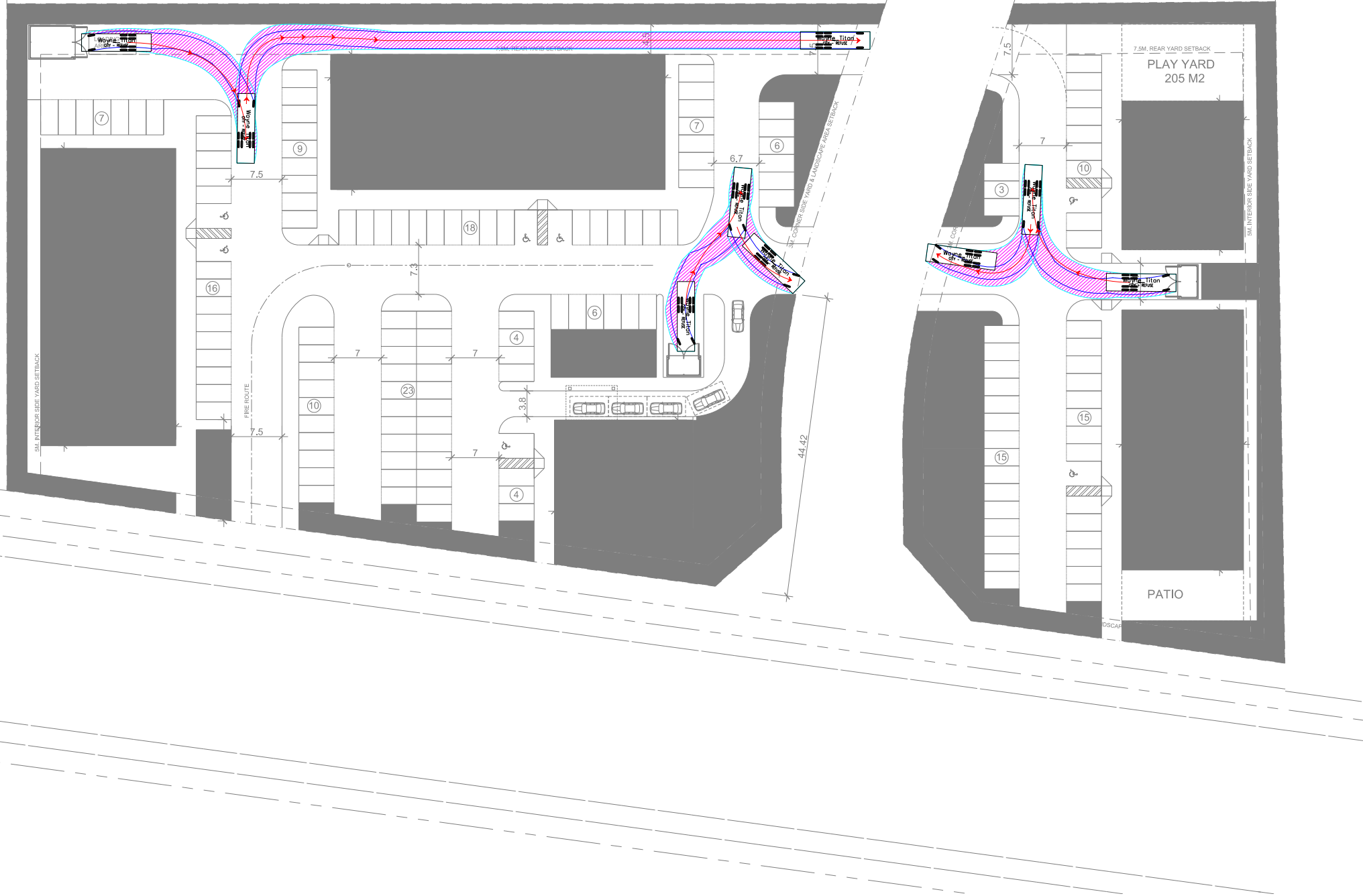
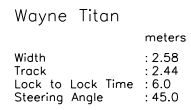


Smeal Aerial RM 105ft

	meters
Width	: 2.54
Track	: 2.41
Lock to Lock Time	: 6.0
Steering Angle	: 32.0









Cowan's Grove Commercial Plaza 4791 Bank Street

Transportation Impact Assessment Report

Appendix H: MMLOS

July 2018



Multi-Modal Level of Service

Cowan's Grove Commercial Centre (116871) Existing Conditions

Scenario: Existing Conditions - Bank Street/ Findlay Creek Centre Access

INTERSECTIONS		Findlay Creek Centre Access/ Bank Street			
		NORTH leg	SOUTH leg	EAST leg	WEST leg
Pedestrian	Lanes (do NOT include lanes protected by bulb-outs)	2	2		2
	Median	No Median	No Median		No Median
	Island Refuge				
	Conflicting Left Turns (from street to right)	No left turn/prohibited	Permissive		Permissive
	Conflicting Right Turns (from street to left)	Permissive or yield control	No right turn		Permissive or yield control
	RTOR? (from street to left)	RTOR allowed	RTOR prohibited		RTOR allowed
	Ped Leading Interval? (on cross street)	No	No		No
	Corner Radius	> 5m to 10m	> 5m to 10m		> 5m to 10m
	Right Turn Channel	No right turn channel	No right turn channel		No right turn channel
	Crosswalk Type	Standard transverse markings	Standard transverse markings		Standard transverse markings
	LOS (PETS)	94 A	94 A	#N/A	86 B
	Cycle Length (sec)	110	110		110
Cyclist	Pedestrian Walk Time (solid white symbol) (sec)	7	7		7
	LOS (Delay,seconds)	49.3 E	49.3 E	#DIV/0!	49.3 E
	Overall Level of Service	E			
	Type of Bikeway	Bike Lanes/Cycle Track	Bike Lanes/Cycle Track		Mixed Traffic
	Turning Speed (based on corner radius & angle)				
	Right Turn Storage Length	> 50m	> 50m		
	Dual Right Turn?	No	No		No
	Shared Through-Right?	Yes	No		Yes
	Bike Box?	No	No		No
	Number of Lanes Crossed for Left Turns	1 Lane Crossed	1 Lane Crossed		No Lanes Crossed
	Operating Speed on Approach	≥ 60km/h	≥ 60km/h		≤ 40km/h
	Dual Left Turn Lanes?	No	No		No
Transit	Average Signal Delay	≤10 sec	≤10 sec		≤30 sec
	Level of Service	B	B		D
		D			
Truck	Turning Radius (Right Turn)	10 to 15m			10 to 15m
	Number of Receiving Lanes	1			1
		E			E
Auto		E			
	Level of Service	A (AM) / B (PM)			

SEGMENTS		Findlay Creek Centre Access/ Bank Street	Section		
			1	2	3
Pedestrian	Sidewalk Width		2.0 or more		
	Boulevard Width		> 2		
	AADT		> 3000		
	On-Street Parking		No		
	Operating Speed		61 km/h or more		
	Level of Service		D		
Cyclist			D		
	Type of Bikeway		Bike Lanes Not Adjacent Parking Lane		
	Number of Travel Lanes (per direction)		1 Travel Lane Per Direction		
	Raised Median?		Yes		
	Bike Lane Width		≥1.8 m wide bike lane		
	Operating Speed		≥ 70 km/h		
	Bike Lane Blockages (Commercial Areas)		Rare		
	Median Refuge		Median Refuge (≥1.8m wide)		
	Number of Travel Lanes on Sidestreet		2 Lanes Crossed		
Transit	Sidestreet Operating Speed		≤ 40 km/h		
	Level of Service		E		
			D		
Truck	Facility Type		Mixed Traffic		
	Friction		Limited parking/driveway friction		
	Level of Service		D		
			B		
Truck	Curb Lane Width		>3.7		
	Number of Travel Lanes		2		
			B		
Auto			B		
	Level of Service		B		

Multi-Modal Level of Service

Cowan's Grove Commercial Centre (116871) Future Background 2025

Scenario: Existing Conditions - Bank Street/ Shuttleworth Drive

INTERSECTIONS		Bank Street/ Shuttleworth Drive			
		NORTH leg	SOUTH leg	EAST leg	WEST leg
Pedestrian	Lanes (do NOT include lanes protected by bulb-outs)	2	2	2	2
	Median	No Median	No Median	No Median	No Median
	Island Refuge				
	Conflicting Left Turns (from street to right)	Permissive	Permissive	Permissive	Permissive
	Conflicting Right Turns (from street to left)	Permissive or yield control	Permissive or yield control	Permissive or yield control	Permissive or yield control
	RTOR? (from street to left)	RTOR allowed	RTOR allowed	RTOR allowed	RTOR allowed
	Ped Leading Interval? (on cross street)	No	No	No	No
	Corner Radius	> 10m to 15m	> 10m to 15m	> 10m to 15m	> 10m to 15m
	Right Turn Channel	No right turn channel	No right turn channel	No right turn channel	No right turn channel
	Crosswalk Type	Standard transverse markings	Standard transverse markings	Standard transverse markings	Standard transverse markings
	LOS (PETS)	85 B	85 B	85 B	85 B
	Cycle Length (sec)	110	110	110	110
	Pedestrian Walk Time (solid white symbol) (sec)	7	7	7	7
	LOS (Delay,seconds)	49.3 E	49.3 E	49.3 E	49.3 E
	Overall Level of Service	E			
Cyclist	Type of Bikeway	Bike Lanes/Cycle Track	Bike Lanes/Cycle Track	Mixed Traffic	Mixed Traffic
	Turning Speed (based on corner radius & angle)				
	Right Turn Storage Length	> 50m	≤ 50m	≤ 50m	≤ 50m
	Dual Right Turn?	No	No	No	No
	Shared Through-Right?	No	Yes	Yes	Yes
	Bike Box?	No	No	No	No
	Number of Lanes Crossed for Left Turns	1 Lane Crossed	1 Lane Crossed	1 Lane Crossed	1 Lane Crossed
	Operating Speed on Approach	≥ 60km/h	≥ 60km/h	50km/h	≤ 40km/h
	Dual Left Turn Lanes?	No	No	No	No
	Level of Service	E	E	C	B
Transit	Average Signal Delay	≤10 sec	≤10 sec	≤10 sec	≤30 sec
	Level of Service	B	B	B	D
Truck	Turning Radius (Right Turn)	10 to 15m	10 to 15m	10 to 15m	10 to 15m
	Number of Receiving Lanes	1	1	1	1
		E	E	E	E
		E			
Auto	Level of Service	F (AM) / F (PM)			

SEGMENTS		Bank Street/ Shuttleworth Drive	Section		
			1	2	3
Pedestrian	Sidewalk Width		2.0 or more	1.8	
	Boulevard Width		> 2	> 2	
	AADT		> 3000	> 3000	
	On-Street Parking		No	No	
	Operating Speed		61 km/h or more	31 to 50 km/h	
	Level of Service		D	C	D
Cyclist	Type of Bikeway		Bike Lanes Not Adjacent Parking Lane		
	Number of Travel Lanes (per direction)		1 Travel Lane Per Direction		
	Raised Median?		No		
	Bike Lane Width		≥1.8 m wide bike lane		
	Operating Speed		≥ 70 km/h		
	Bike Lane Blockages (Commercial Areas)		Rare		
	Median Refuge		No Median Refuge		
	Number of Travel Lanes on Sidestreet		2 Lanes Crossed		
	Sidestreet Operating Speed		≤ 40 km/h		
	Level of Service		E		
Transit	Facility Type		Mixed Traffic		
	Friction		Limited parking/driveway friction		
Truck	Level of Service		D		
	Curb Lane Width		≤3.5	>3.7	
	Number of Travel Lanes		2	2	
			C	B	
			C		

Multi-Modal Level of Service

Cowan's Grove Commercial Centre (116871) Future Background 2020

Scenario: Existing Conditions - Bank Street/ Findlay Creek Centre Access

INTERSECTIONS		Findlay Creek Centre Access/ Bank Street			
		NORTH leg	SOUTH leg	EAST leg	WEST leg
Pedestrian	Lanes (do NOT include lanes protected by bulb-outs)	2	2		2
	Median	No Median	No Median		No Median
	Island Refuge				
	Conflicting Left Turns (from street to right)	No left turn/prohibited	Permissive		Permissive
	Conflicting Right Turns (from street to left)	Permissive or yield control	No right turn		Permissive or yield control
	RTOR? (from street to left)	RTOR allowed	RTOR prohibited		RTOR allowed
	Ped Leading Interval? (on cross street)	No	No		No
	Corner Radius	> 5m to 10m	> 5m to 10m		> 5m to 10m
	Right Turn Channel	No right turn channel	No right turn channel		No right turn channel
	Crosswalk Type	Standard transverse markings	Standard transverse markings		Standard transverse markings
	LOS (PETS)	94 A	94 A	#N/A	86 B
	Cycle Length (sec)	110	110		110
Cyclist	Pedestrian Walk Time (solid white symbol) (sec)	7	7		7
	LOS (Delay,seconds)	49.3 E	49.3 E	#DIV/0!	49.3 E
	Overall Level of Service	E			
	Type of Bikeway	Bike Lanes/Cycle Track	Bike Lanes/Cycle Track		Mixed Traffic
	Turning Speed (based on corner radius & angle)				
	Right Turn Storage Length	> 50m	> 50m		
	Dual Right Turn?	No	No		No
	Shared Through-Right?	Yes	No		Yes
	Bike Box?	No	No		No
	Number of Lanes Crossed for Left Turns	1 Lane Crossed	1 Lane Crossed		No Lanes Crossed
	Operating Speed on Approach	≥ 60km/h	≥ 60km/h		≤ 40km/h
	Dual Left Turn Lanes?	No	No		No
Transit	Average Signal Delay	≤10 sec	≤10 sec		≤30 sec
	Level of Service	B	B		D
		D			
Truck	Turning Radius (Right Turn)	10 to 15m			10 to 15m
	Number of Receiving Lanes	1			1
		E			E
Auto		E			
	Level of Service	A (AM) / A (PM)			

SEGMENTS		Findlay Creek Centre Access/ Bank Street	Section		
			1	2	3
Pedestrian	Sidewalk Width		2.0 or more		
	Boulevard Width		> 2		
	AADT		> 3000		
	On-Street Parking		No		
	Operating Speed		61 km/h or more		
	Level of Service		D		
Cyclist			D		
	Type of Bikeway		Bike Lanes Not Adjacent Parking Lane		
	Number of Travel Lanes (per direction)		1 Travel Lane Per Direction		
	Raised Median?		Yes		
	Bike Lane Width		≥1.8 m wide bike lane		
	Operating Speed		≥ 70 km/h		
	Bike Lane Blockages (Commercial Areas)		Rare		
	Median Refuge		Median Refuge (≥1.8m wide)		
	Number of Travel Lanes on Sidestreet		2 Lanes Crossed		
Transit	Sidestreet Operating Speed		≤ 40 km/h		
	Level of Service		E		
			D		
Truck	Facility Type		Mixed Traffic		
	Friction		Limited parking/driveway friction		
	Level of Service		D		
	Curb Lane Width		>3.7		
	Number of Travel Lanes		2		
			B		
			B		

Multi-Modal Level of Service

Cowan's Grove Commercial Centre (116871) Future Total 2025

Scenario: Existing Conditions - Bank Street/ Shuttleworth Drive

INTERSECTIONS		Bank Street/ Shuttleworth Drive			
		NORTH leg	SOUTH leg	EAST leg	WEST leg
Pedestrian	Lanes (do NOT include lanes protected by bulb-outs)	2	2	2	2
	Median	No Median	No Median	No Median	No Median
	Island Refuge				
	Conflicting Left Turns (from street to right)	Permissive	Permissive	Permissive	Permissive
	Conflicting Right Turns (from street to left)	Permissive or yield control	Permissive or yield control	Permissive or yield control	Permissive or yield control
	RTOR? (from street to left)	RTOR allowed	RTOR allowed	RTOR allowed	RTOR allowed
	Ped Leading Interval? (on cross street)	No	No	No	No
	Corner Radius	> 10m to 15m	> 10m to 15m	> 10m to 15m	> 10m to 15m
	Right Turn Channel	No right turn channel	No right turn channel	No right turn channel	No right turn channel
	Crosswalk Type	Standard transverse markings	Standard transverse markings	Standard transverse markings	Standard transverse markings
	LOS (PETS)	85 B	85 B	85 B	85 B
	Cycle Length (sec)	110	110	110	110
	Pedestrian Walk Time (solid white symbol) (sec)	7	7	7	7
	LOS (Delay,seconds)	49.3 E	49.3 E	49.3 E	49.3 E
	Overall Level of Service	E			
Cyclist	Type of Bikeway	Bike Lanes/Cycle Track	Bike Lanes/Cycle Track	Mixed Traffic	Mixed Traffic
	Turning Speed (based on corner radius & angle)				
	Right Turn Storage Length	> 50m	≤ 50m	≤ 50m	≤ 50m
	Dual Right Turn?	No	No	No	No
	Shared Through-Right?	No	Yes	Yes	Yes
	Bike Box?	No	No	No	No
	Number of Lanes Crossed for Left Turns	1 Lane Crossed	1 Lane Crossed	1 Lane Crossed	1 Lane Crossed
	Operating Speed on Approach	≥ 60km/h	≥ 60km/h	50km/h	≤ 40km/h
	Dual Left Turn Lanes?	No	No	No	No
	Level of Service	E	E	C	B
Transit	Average Signal Delay	≤10 sec	≤10 sec	≤30 sec	≤30 sec
	Level of Service	B	B	D	D
Truck	Turning Radius (Right Turn)	10 to 15m	10 to 15m	10 to 15m	10 to 15m
	Number of Receiving Lanes	1	1	1	1
		E	E	E	E
		E			
Auto	Level of Service	F (AM) / F (PM)			

SEGMENTS		Bank Street/ Shuttleworth Drive	Section		
			1	2	3
Pedestrian	Sidewalk Width		2.0 or more	1.8	
	Boulevard Width		> 2	> 2	
	AADT		> 3000	> 3000	
	On-Street Parking		No	No	
	Operating Speed		61 km/h or more	31 to 50 km/h	
	Level of Service		D	C	D
Cyclist	Type of Bikeway		Bike Lanes Not Adjacent Parking Lane		
	Number of Travel Lanes (per direction)		1 Travel Lane Per Direction		
	Raised Median?		No		
	Bike Lane Width		≥1.8 m wide bike lane		
	Operating Speed		≥ 70 km/h		
	Bike Lane Blockages (Commercial Areas)		Rare		
	Median Refuge		No Median Refuge		
	Number of Travel Lanes on Sidestreet		2 Lanes Crossed		
	Sidestreet Operating Speed		≤ 40 km/h		
	Level of Service		E		
Transit	Facility Type		Mixed Traffic		
	Friction		Limited parking/driveway friction		
Truck	Level of Service		D		
	Curb Lane Width		≤3.5	>3.7	
	Number of Travel Lanes		2	2	
			C	B	
			C		

Multi-Modal Level of Service

Cowan's Grove Commercial Centre (116871) Future Total 2020

Scenario: Existing Conditions - Bank Street/ Shuttleworth Drive

INTERSECTIONS		Bank Street/ Shuttleworth Drive			
		NORTH leg	SOUTH leg	EAST leg	WEST leg
Pedestrian	Lanes (do NOT include lanes protected by bulb-outs)	2	2	2	2
	Median	No Median	No Median	No Median	No Median
	Island Refuge				
	Conflicting Left Turns (from street to right)	Permissive	Permissive	Permissive	Permissive
	Conflicting Right Turns (from street to left)	Permissive or yield control	Permissive or yield control	Permissive or yield control	Permissive or yield control
	RTOR? (from street to left)	RTOR allowed	RTOR allowed	RTOR allowed	RTOR allowed
	Ped Leading Interval? (on cross street)	No	No	No	No
	Corner Radius	> 10m to 15m	> 10m to 15m	> 10m to 15m	> 10m to 15m
	Right Turn Channel	No right turn channel	No right turn channel	No right turn channel	No right turn channel
	Crosswalk Type	Standard transverse markings	Standard transverse markings	Standard transverse markings	Standard transverse markings
	LOS (PETS)	85 B	85 B	85 B	85 B
	Cycle Length (sec)	110	110	110	110
	Pedestrian Walk Time (solid white symbol) (sec)	7	7	7	7
	LOS (Delay,seconds)	49.3 E	49.3 E	49.3 E	49.3 E
	Overall Level of Service	E			
Cyclist	Type of Bikeway	Bike Lanes/Cycle Track	Bike Lanes/Cycle Track	Mixed Traffic	Mixed Traffic
	Turning Speed (based on corner radius & angle)				
	Right Turn Storage Length	> 50m	≤ 50m	≤ 50m	≤ 50m
	Dual Right Turn?	No	No	No	No
	Shared Through-Right?	No	Yes	Yes	Yes
	Bike Box?	No	No	No	No
	Number of Lanes Crossed for Left Turns	1 Lane Crossed	1 Lane Crossed	1 Lane Crossed	1 Lane Crossed
	Operating Speed on Approach	≥ 60km/h	≥ 60km/h	50km/h	≤ 40km/h
	Dual Left Turn Lanes?	No	No	No	No
	Level of Service	E	E	C	B
Transit	Average Signal Delay	≤10 sec	≤10 sec	≤30 sec	≤20 sec
	Level of Service	B	B	D	C
Truck	Turning Radius (Right Turn)	10 to 15m	10 to 15m	10 to 15m	10 to 15m
	Number of Receiving Lanes	1	1	1	1
		E	E	E	E
		E			
Auto	Level of Service	F (AM) / F (PM)			

SEGMENTS		Bank Street/ Shuttleworth Drive	Section		
			1	2	3
Pedestrian	Sidewalk Width		2.0 or more	1.8	
	Boulevard Width		> 2	> 2	
	AADT		> 3000	> 3000	
	On-Street Parking		No	No	
	Operating Speed		61 km/h or more	31 to 50 km/h	
	Level of Service		D	C	D
Cyclist	Type of Bikeway		Bike Lanes Not Adjacent Parking Lane		
	Number of Travel Lanes (per direction)		1 Travel Lane Per Direction		
	Raised Median?		No		
	Bike Lane Width		≥1.8 m wide bike lane		
	Operating Speed		≥ 70 km/h		
	Bike Lane Blockages (Commercial Areas)		Rare		
	Median Refuge		No Median Refuge		
	Number of Travel Lanes on Sidestreet		2 Lanes Crossed		
	Sidestreet Operating Speed		≤ 40 km/h		
	Level of Service		E		
Transit	Facility Type		Mixed Traffic		
	Friction		Limited parking/driveway friction		
Truck	Level of Service		D		
	Curb Lane Width		≤3.5	>3.7	
	Number of Travel Lanes		2	2	
			C	B	
			C		















Cowan's Grove Commercial Plaza 4791 Bank Street

Transportation Impact Assessment Report

Appendix I: Synchro Output Files

July 2018



						
Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	25	83	182	590	300	24
Future Volume (vph)	25	83	182	590	300	24
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800
Storage Length (m)	50.0	0.0	160.0			60.0
Storage Lanes	1	1	1			1
Taper Length (m)	20.0		20.0			
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.850				0.850
Flt Protected	0.950		0.950			
Satd. Flow (prot)	1695	1517	1695	1784	1784	1517
Flt Permitted	0.950		0.560			
Satd. Flow (perm)	1695	1517	999	1784	1784	1517
Right Turn on Red		Yes				Yes
Satd. Flow (RTOR)		92				27
Link Speed (k/h)	50			70	70	
Link Distance (m)	948.5			691.3	737.3	
Travel Time (s)	68.3			35.6	37.9	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	28	92	202	656	333	27
Shared Lane Traffic (%)						
Lane Group Flow (vph)	28	92	202	656	333	27
Turn Type	Perm	Perm	Perm	NA	NA	Perm
Protected Phases				2	6	
Permitted Phases	4	4	2			6
Detector Phase	4	4	2	2	6	6
Switch Phase						
Minimum Initial (s)	10.0	10.0	10.0	10.0	10.0	10.0
Minimum Split (s)	28.3	28.3	30.4	30.4	30.4	30.4
Total Split (s)	35.0	35.0	75.0	75.0	75.0	75.0
Total Split (%)	31.8%	31.8%	68.2%	68.2%	68.2%	68.2%
Maximum Green (s)	28.7	28.7	68.6	68.6	68.6	68.6
Yellow Time (s)	3.3	3.3	4.6	4.6	4.6	4.6
All-Red Time (s)	3.0	3.0	1.8	1.8	1.8	1.8
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.3	6.3	6.4	6.4	6.4	6.4
Lead/Lag						
Lead-Lag Optimize?						
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	None	C-Min	C-Min	C-Min	C-Min
Walk Time (s)	7.0	7.0	7.0	7.0	7.0	7.0
Flash Dont Walk (s)	15.0	15.0	17.0	17.0	17.0	17.0
Pedestrian Calls (#/hr)	0	0	0	0	0	0
Act Effect Green (s)	10.1	10.1	91.7	91.7	91.7	91.7
Actuated g/C Ratio	0.09	0.09	0.83	0.83	0.83	0.83
v/c Ratio	0.18	0.41	0.24	0.44	0.22	0.02
Control Delay	49.0	15.7	3.5	4.4	3.0	1.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	49.0	15.7	3.5	4.4	3.0	1.0



Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
LOS	D	B	A	A	A	A
Approach Delay	23.4			4.2	2.9	
Approach LOS	C			A	A	
Queue Length 50th (m)	5.2	0.0	8.2	33.9	13.3	0.0
Queue Length 95th (m)	13.3	13.7	14.7	50.0	20.8	1.4
Internal Link Dist (m)	924.5			667.3	713.3	
Turn Bay Length (m)	50.0		160.0			60.0
Base Capacity (vph)	442	463	832	1487	1487	1269
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.06	0.20	0.24	0.44	0.22	0.02

Intersection Summary

Area Type: Other

Cycle Length: 110

Actuated Cycle Length: 110

Offset: 58 (53%), Referenced to phase 2:NBTL and 6:SBT, Start of Green

Natural Cycle: 60

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.44

Intersection Signal Delay: 5.6

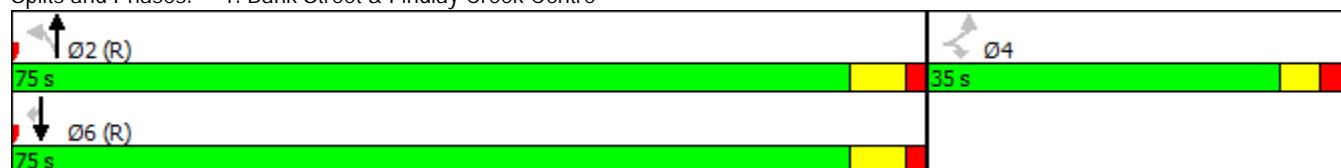
Intersection LOS: A













Intersection Capacity Utilization 51.7%

ICU Level of Service A

Analysis Period (min) 15

Splits and Phases: 1: Bank Street & Findlay Creek Centre



						
Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	20	188	123	413	758	39
Future Volume (vph)	20	188	123	413	758	39
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800
Storage Length (m)	50.0	0.0	160.0			60.0
Storage Lanes	1	1	1			1
Taper Length (m)	20.0		20.0			
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.850				0.850
Flt Protected	0.950		0.950			
Satd. Flow (prot)	1695	1517	1695	1784	1784	1517
Flt Permitted	0.950		0.292			
Satd. Flow (perm)	1695	1517	521	1784	1784	1517
Right Turn on Red		Yes				Yes
Satd. Flow (RTOR)		209				43
Link Speed (k/h)	50			70	70	
Link Distance (m)	948.5			691.3	737.3	
Travel Time (s)	68.3			35.6	37.9	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	22	209	137	459	842	43
Shared Lane Traffic (%)						
Lane Group Flow (vph)	22	209	137	459	842	43
Turn Type	Perm	Perm	Perm	NA	NA	Perm
Protected Phases				2	6	
Permitted Phases	4	4	2			6
Detector Phase	4	4	2	2	6	6
Switch Phase						
Minimum Initial (s)	10.0	10.0	10.0	10.0	10.0	10.0
Minimum Split (s)	28.3	28.3	30.4	30.4	30.4	30.4
Total Split (s)	30.0	30.0	80.0	80.0	80.0	80.0
Total Split (%)	27.3%	27.3%	72.7%	72.7%	72.7%	72.7%
Maximum Green (s)	23.7	23.7	73.6	73.6	73.6	73.6
Yellow Time (s)	3.3	3.3	4.6	4.6	4.6	4.6
All-Red Time (s)	3.0	3.0	1.8	1.8	1.8	1.8
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.3	6.3	6.4	6.4	6.4	6.4
Lead/Lag						
Lead-Lag Optimize?						
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	None	C-Min	C-Min	C-Min	C-Min
Walk Time (s)	7.0	7.0	7.0	7.0	7.0	7.0
Flash Dont Walk (s)	15.0	15.0	17.0	17.0	17.0	17.0
Pedestrian Calls (#/hr)	0	0	0	0	0	0
Act Effect Green (s)	10.8	10.8	86.5	86.5	86.5	86.5
Actuated g/C Ratio	0.10	0.10	0.79	0.79	0.79	0.79
v/c Ratio	0.13	0.62	0.33	0.33	0.60	0.04
Control Delay	46.4	14.9	6.2	4.2	7.2	1.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	46.4	14.9	6.2	4.2	7.2	1.0



Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
LOS	D	B	A	A	A	A
Approach Delay	17.9			4.7	6.9	
Approach LOS	B			A	A	
Queue Length 50th (m)	4.1	0.0	6.0	20.1	51.8	0.0
Queue Length 95th (m)	10.7	19.4	15.7	36.3	93.6	2.2
Internal Link Dist (m)	924.5			667.3	713.3	
Turn Bay Length (m)	50.0		160.0			60.0
Base Capacity (vph)	365	490	409	1401	1401	1201
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.06	0.43	0.33	0.33	0.60	0.04

Intersection Summary

Area Type: Other

Cycle Length: 110

Actuated Cycle Length: 110

Offset: 25 (23%), Referenced to phase 2:NBTL and 6:SBT, Start of Green

Natural Cycle: 80

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.62

Intersection Signal Delay: 7.6

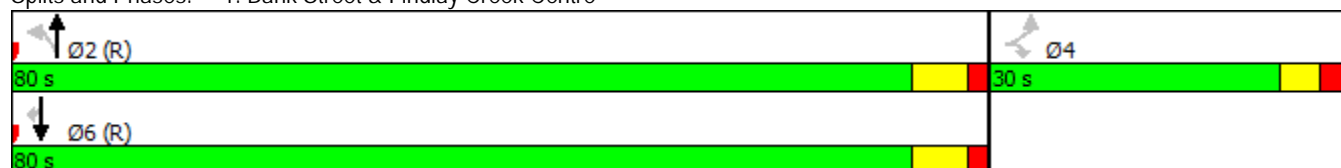
Intersection LOS: A













Intersection Capacity Utilization 74.7%







ICU Level of Service D

Analysis Period (min) 15

Splits and Phases: 1: Bank Street & Findlay Creek Centre



						
Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	25	83	182	613	311	24
Future Volume (vph)	25	83	182	613	311	24
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800
Storage Length (m)	50.0	0.0	160.0			60.0
Storage Lanes	1	1	1			1
Taper Length (m)	20.0		20.0			
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.850				0.850
Flt Protected	0.950		0.950			
Satd. Flow (prot)	1695	1517	1695	1784	1784	1517
Flt Permitted	0.950		0.571			
Satd. Flow (perm)	1695	1517	1019	1784	1784	1517
Right Turn on Red		Yes				Yes
Satd. Flow (RTOR)		83				24
Link Speed (k/h)	50			70	70	
Link Distance (m)	948.5			691.3	737.3	
Travel Time (s)	68.3			35.6	37.9	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	25	83	182	613	311	24
Shared Lane Traffic (%)						
Lane Group Flow (vph)	25	83	182	613	311	24
Turn Type	Perm	Perm	Perm	NA	NA	Perm
Protected Phases				2	6	
Permitted Phases	4	4	2			6
Detector Phase	4	4	2	2	6	6
Switch Phase						
Minimum Initial (s)	10.0	10.0	10.0	10.0	10.0	10.0
Minimum Split (s)	32.5	32.5	37.0	37.0	37.0	37.0
Total Split (s)	34.0	34.0	76.0	76.0	76.0	76.0
Total Split (%)	30.9%	30.9%	69.1%	69.1%	69.1%	69.1%
Maximum Green (s)	28.5	28.5	70.0	70.0	70.0	70.0
Yellow Time (s)	3.6	3.6	4.5	4.5	4.5	4.5
All-Red Time (s)	1.9	1.9	1.5	1.5	1.5	1.5
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.5	5.5	6.0	6.0	6.0	6.0
Lead/Lag						
Lead-Lag Optimize?						
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	None	C-Min	C-Min	C-Min	C-Min
Walk Time (s)	7.0	7.0	7.0	7.0	7.0	7.0
Flash Dont Walk (s)	20.0	20.0	24.0	24.0	24.0	24.0
Pedestrian Calls (#/hr)	0	0	0	0	0	0
Act Effect Green (s)	10.1	10.1	92.7	92.7	92.7	92.7
Actuated g/C Ratio	0.09	0.09	0.84	0.84	0.84	0.84
v/c Ratio	0.16	0.39	0.21	0.41	0.21	0.02
Control Delay	48.7	15.8	3.0	3.8	2.7	0.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	48.7	15.8	3.0	3.8	2.7	0.9

						
Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
LOS	D	B	A	A	A	A
Approach Delay	23.4			3.6	2.5	
Approach LOS	C			A	A	
Queue Length 50th (m)	4.6	0.0	6.7	28.2	11.3	0.0
Queue Length 95th (m)	12.3	13.2	11.9	41.4	17.6	1.3
Internal Link Dist (m)	924.5			667.3	713.3	
Turn Bay Length (m)	50.0		160.0			60.0
Base Capacity (vph)	439	454	858	1503	1503	1282
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.06	0.18	0.21	0.41	0.21	0.02

Intersection Summary

Area Type: Other

Cycle Length: 110

Actuated Cycle Length: 110

Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBT, Start of Green

Natural Cycle: 70

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.41

Intersection Signal Delay: 5.1



Intersection LOS: A













Intersection Capacity Utilization 52.0%

ICU Level of Service A

Analysis Period (min) 15

Splits and Phases: 1: Bank Street & Findlay Creek Centre

	
Ø2 (R)	Ø4
76 s	34 s
	
Ø6 (R)	
76 s	

						
Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	20	188	123	429	787	39
Future Volume (vph)	20	188	123	429	787	39
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800
Storage Length (m)	50.0	0.0	160.0			60.0
Storage Lanes	1	1	1			1
Taper Length (m)	20.0		20.0			
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.850				0.850
Flt Protected	0.950		0.950			
Satd. Flow (prot)	1695	1517	1695	1784	1784	1517
Flt Permitted	0.950		0.321			
Satd. Flow (perm)	1695	1517	573	1784	1784	1517
Right Turn on Red		Yes				Yes
Satd. Flow (RTOR)		188				39
Link Speed (k/h)	50			70	70	
Link Distance (m)	948.5			691.3	737.3	
Travel Time (s)	68.3			35.6	37.9	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	20	188	123	429	787	39
Shared Lane Traffic (%)						
Lane Group Flow (vph)	20	188	123	429	787	39
Turn Type	Perm	Perm	Perm	NA	NA	Perm
Protected Phases				2	6	
Permitted Phases	4	4	2			6
Detector Phase	4	4	2	2	6	6
Switch Phase						
Minimum Initial (s)	10.0	10.0	10.0	10.0	10.0	10.0
Minimum Split (s)	27.5	27.5	37.0	37.0	30.0	30.0
Total Split (s)	29.0	29.0	81.0	81.0	81.0	81.0
Total Split (%)	26.4%	26.4%	73.6%	73.6%	73.6%	73.6%
Maximum Green (s)	23.5	23.5	75.0	75.0	75.0	75.0
Yellow Time (s)	3.6	3.6	4.5	4.5	4.5	4.5
All-Red Time (s)	1.9	1.9	1.5	1.5	1.5	1.5
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.5	5.5	6.0	6.0	6.0	6.0
Lead/Lag						
Lead-Lag Optimize?						
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	None	C-Min	C-Min	C-Min	C-Min
Walk Time (s)	7.0	7.0	7.0	7.0	7.0	7.0
Flash Dont Walk (s)	15.0	15.0	20.0	20.0	17.0	17.0
Pedestrian Calls (#/hr)	0	0	0	0	0	0
Act Effect Green (s)	10.7	10.7	87.8	87.8	87.8	87.8
Actuated g/C Ratio	0.10	0.10	0.80	0.80	0.80	0.80
v/c Ratio	0.12	0.59	0.27	0.30	0.55	0.03
Control Delay	46.4	14.9	4.7	3.7	5.9	0.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	46.4	14.9	4.7	3.7	5.9	0.9



Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
LOS	D	B	A	A	A	A
Approach Delay	17.9			3.9	5.7	
Approach LOS	B			A	A	
Queue Length 50th (m)	3.7	0.0	4.7	17.1	42.5	0.0
Queue Length 95th (m)	10.2	18.3	11.9	30.7	75.3	1.9
Internal Link Dist (m)	924.5			667.3	713.3	
Turn Bay Length (m)	50.0		160.0			60.0
Base Capacity (vph)	362	471	457	1423	1423	1218
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.06	0.40	0.27	0.30	0.55	0.03

Intersection Summary

Area Type: Other

Cycle Length: 110

Actuated Cycle Length: 110

Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBT, Start of Green

Natural Cycle: 70

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.59

Intersection Signal Delay: 6.7

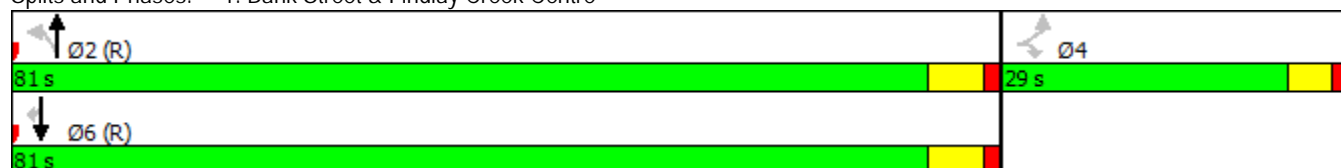
Intersection LOS: A






















Intersection Capacity Utilization 75.0%













ICU Level of Service D

Analysis Period (min) 15

Splits and Phases: 1: Bank Street & Findlay Creek Centre



												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	25	0	83	14	0	68	182	993	5	23	501	24
Future Volume (vph)	25	0	83	14	0	68	182	993	5	23	501	24
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Storage Length (m)	50.0		0.0	40.0		0.0	160.0		0.0	120.0		60.0
Storage Lanes	1		0	1		0	1		0	1		1
Taper Length (m)	20.0			20.0			20.0			20.0		
Lane Util. 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
Frt		0.850			0.850			0.999				0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1695	1517	0	1695	1517	0	1695	1783	0	1695	1784	1517
Flt Permitted	0.713			0.703			0.471			0.239		
Satd. Flow (perm)	1272	1517	0	1254	1517	0	840	1783	0	426	1784	1517
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		372			123							28
Link Speed (k/h)		50			50			70			70	
Link Distance (m)		948.5			965.3			691.3			737.3	
Travel Time (s)		68.3			69.5			35.6			37.9	
Peak Hour 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
Adj. Flow (vph)	25	0	83	14	0	68	182	993	5	23	501	24
Shared Lane Traffic (%)												
Lane Group Flow (vph)	25	83	0	14	68	0	182	998	0	23	501	24
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	Perm
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		6
Detector Phase	4	4		8	8		2	2		6	6	6
Switch Phase												
Minimum Initial (s)	10.0	10.0		10.0	10.0		10.0	10.0		10.0	10.0	10.0
Minimum Split (s)	37.8	37.8		37.8	37.8		37.0	37.0		37.0	37.0	37.0
Total Split (s)	37.8	37.8		37.8	37.8		72.2	72.2		72.2	72.2	72.2
Total Split (%)	34.4%	34.4%		34.4%	34.4%		65.6%	65.6%		65.6%	65.6%	65.6%
Maximum Green (s)	32.0	32.0		32.0	32.0		66.2	66.2		66.2	66.2	66.2
Yellow Time (s)	3.6	3.6		3.6	3.6		4.5	4.5		4.5	4.5	4.5
All-Red Time (s)	2.2	2.2		2.2	2.2		1.5	1.5		1.5	1.5	1.5
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	0.0
Total Lost Time (s)	5.8	5.8		5.8	5.8		6.0	6.0		6.0	6.0	6.0
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	3.0
Recall Mode	None	None		None	None		C-Min	C-Min		C-Min	C-Min	C-Min
Walk Time (s)	7.0	7.0		7.0	7.0		7.0	7.0		7.0	7.0	7.0
Flash Dont Walk (s)	25.0	25.0		25.0	25.0		24.0	24.0		24.0	24.0	24.0
Pedestrian Calls (#/hr)	0	0		0	0		0	0		0	0	0
Act Effect Green (s)	10.1	10.1		10.1	10.1		92.4	92.4		92.4	92.4	92.4
Actuated g/C Ratio	0.09	0.09		0.09	0.09		0.84	0.84		0.84	0.84	0.84
v/c Ratio	0.21	0.17		0.12	0.27		0.26	0.67		0.06	0.33	0.02
Control Delay	51.0	0.8		48.4	3.3		3.6	7.2		2.8	3.4	0.8
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	0.0
Total Delay	51.0	0.8		48.4	3.3		3.6	7.2		2.8	3.4	0.8

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
LOS	D	A		D	A		A	A		A	A	A
Approach Delay		12.4			11.0			6.6			3.2	
Approach LOS		B			B			A			A	
Queue Length 50th (m)	4.7	0.0		2.6	0.0		7.2	70.0		0.8	21.5	0.0
Queue Length 95th (m)	12.4	0.0		8.3	1.5		13.4	108.5		2.3	32.2	1.2
Internal Link Dist (m)		924.5			941.3			667.3			713.3	
Turn Bay Length (m)	50.0			40.0			160.0			120.0		60.0
Base Capacity (vph)	370	705		364	528		705	1498		357	1499	1278
Starvation Cap Reductn	0	0		0	0		0	0		0	0	0
Spillback Cap Reductn	0	0		0	0		0	0		0	0	0
Storage Cap Reductn	0	0		0	0		0	0		0	0	0
Reduced v/c Ratio	0.07	0.12		0.04	0.13		0.26	0.67		0.06	0.33	0.02

Intersection Summary

Area Type: Other

Cycle Length: 110

Actuated Cycle Length: 110

Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green

Natural Cycle: 90

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.67

Intersection Signal Delay: 6.2

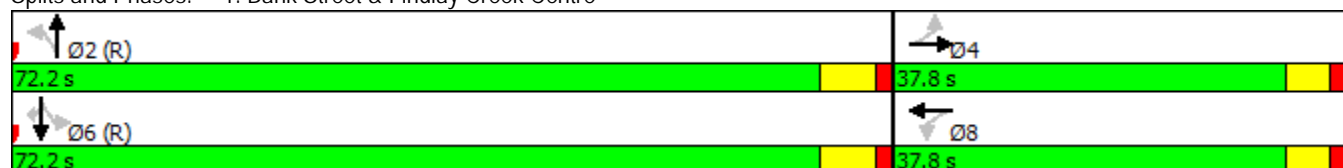
Intersection LOS: A






















Intersection Capacity Utilization 87.0%













ICU Level of Service E

Analysis Period (min) 15

Splits and Phases: 1: Bank Street & Findlay Creek Centre



												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	20	0	188	7	0	36	123	722	13	63	1139	39
Future Volume (vph)	20	0	188	7	0	36	123	722	13	63	1139	39
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Storage Length (m)	50.0		0.0	40.0		0.0	160.0		0.0	120.0		60.0
Storage Lanes	1		0	1		0	1		0	1		1
Taper Length (m)	20.0			20.0			20.0			20.0		
Lane Util. 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
Frt		0.850			0.850			0.997				0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1695	1517	0	1695	1517	0	1695	1779	0	1695	1784	1517
Flt Permitted	0.734			0.393			0.143			0.332		
Satd. Flow (perm)	1310	1517	0	701	1517	0	255	1779	0	592	1784	1517
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		88			228			1				28
Link Speed (k/h)		50			50			70				70
Link Distance (m)		948.5			965.3			691.3				737.3
Travel Time (s)		68.3			69.5			35.6				37.9
Peak Hour 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
Adj. Flow (vph)	20	0	188	7	0	36	123	722	13	63	1139	39
Shared Lane Traffic (%)												
Lane Group Flow (vph)	20	188	0	7	36	0	123	735	0	63	1139	39
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	Perm
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		6
Detector Phase	4	4		8	8		2	2		6	6	6
Switch Phase												
Minimum Initial (s)	10.0	10.0		10.0	10.0		10.0	10.0		10.0	10.0	10.0
Minimum Split (s)	37.8	37.8		37.8	37.8		37.0	37.0		37.0	37.0	37.0
Total Split (s)	37.8	37.8		37.8	37.8		72.2	72.2		72.2	72.2	72.2
Total Split (%)	34.4%	34.4%		34.4%	34.4%		65.6%	65.6%		65.6%	65.6%	65.6%
Maximum Green (s)	32.0	32.0		32.0	32.0		66.2	66.2		66.2	66.2	66.2
Yellow Time (s)	3.6	3.6		3.6	3.6		4.5	4.5		4.5	4.5	4.5
All-Red Time (s)	2.2	2.2		2.2	2.2		1.5	1.5		1.5	1.5	1.5
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	0.0
Total Lost Time (s)	5.8	5.8		5.8	5.8		6.0	6.0		6.0	6.0	6.0
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	3.0
Recall Mode	None	None		None	None		C-Min	C-Min		C-Min	C-Min	C-Min
Walk Time (s)	7.0	7.0		7.0	7.0		7.0	7.0		7.0	7.0	7.0
Flash Dont Walk (s)	25.0	25.0		25.0	25.0		24.0	24.0		24.0	24.0	24.0
Pedestrian Calls (#/hr)	0	0		0	0		0	0		0	0	0
Act Effect Green (s)	14.0	14.0		14.0	14.0		84.2	84.2		84.2	84.2	84.2
Actuated g/C Ratio	0.13	0.13		0.13	0.13		0.77	0.77		0.77	0.77	0.77
v/c Ratio	0.12	0.70		0.08	0.09		0.63	0.54		0.14	0.83	0.03
Control Delay	41.6	37.5		41.1	0.5		25.8	7.6		5.1	16.8	2.2
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	0.0
Total Delay	41.6	37.5		41.1	0.5		25.8	7.6		5.1	16.8	2.2

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
LOS	D	D		D	A		C	A		A	B	A
Approach Delay		37.9			7.1			10.2			15.8	
Approach LOS		D			A			B			B	
Queue Length 50th (m)	3.6	19.0		1.3	0.0		8.7	45.8		2.6	115.5	0.4
Queue Length 95th (m)	9.5	38.0		4.9	0.0		#47.1	92.2		8.1	#281.8	3.2
Internal Link Dist (m)		924.5			941.3			667.3			713.3	
Turn Bay Length (m)	50.0			40.0			160.0			120.0		60.0
Base Capacity (vph)	381	503		203	602		195	1362		453	1365	1167
Starvation Cap Reductn	0	0		0	0		0	0		0	0	0
Spillback Cap Reductn	0	0		0	0		0	0		0	0	0
Storage Cap Reductn	0	0		0	0		0	0		0	0	0
Reduced v/c Ratio	0.05	0.37		0.03	0.06		0.63	0.54		0.14	0.83	0.03

Intersection Summary

Area Type: Other

Cycle Length: 110

Actuated Cycle Length: 110

Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green

Natural Cycle: 150

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.83

Intersection Signal Delay: 15.5

Intersection LOS: B

Intersection Capacity Utilization 98.7%









ICU Level of Service F






















Analysis Period (min) 15













95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 1: Bank Street & Findlay Creek Centre/Shuttleworth Drive

							
Ø2 (R)		Ø6 (R)		Ø4		Ø8	
72.2 s		72.2 s		37.8 s		37.8 s	

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	25	0	83	30	0	15	182	609	6	56	282	24
Future Volume (vph)	25	0	83	30	0	15	182	609	6	56	282	24
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Storage Length (m)	50.0		0.0	40.0		0.0	160.0		0.0	120.0		60.0
Storage Lanes	1		0	1		0	1		0	1		1
Taper Length (m)	20.0			20.0			20.0			20.0		
Lane Util. 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
Frt		0.850			0.850			0.999				0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1695	1517	0	1695	1517	0	1695	1783	0	1695	1784	1517
Flt Permitted	0.748			0.703			0.587			0.410		
Satd. Flow (perm)	1335	1517	0	1254	1517	0	1047	1783	0	732	1784	1517
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		592			286			1				28
Link Speed (k/h)		50			50			70				70
Link Distance (m)		948.5			965.3			691.3				737.3
Travel Time (s)		68.3			69.5			35.6				37.9
Peak Hour 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
Adj. Flow (vph)	25	0	83	30	0	15	182	609	6	56	282	24
Shared Lane Traffic (%)												
Lane Group Flow (vph)	25	83	0	30	15	0	182	615	0	56	282	24
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	Perm
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		6
Detector Phase	4	4		8	8		2	2		6	6	6
Switch Phase												
Minimum Initial (s)	10.0	10.0		10.0	10.0		10.0	10.0		10.0	10.0	10.0
Minimum Split (s)	37.8	37.8		37.8	37.8		37.0	37.0		37.0	37.0	37.0
Total Split (s)	39.0	39.0		39.0	39.0		71.0	71.0		71.0	71.0	71.0
Total Split (%)	35.5%	35.5%		35.5%	35.5%		64.5%	64.5%		64.5%	64.5%	64.5%
Maximum Green (s)	33.2	33.2		33.2	33.2		65.0	65.0		65.0	65.0	65.0
Yellow Time (s)	3.6	3.6		3.6	3.6		4.5	4.5		4.5	4.5	4.5
All-Red Time (s)	2.2	2.2		2.2	2.2		1.5	1.5		1.5	1.5	1.5
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	0.0
Total Lost Time (s)	5.8	5.8		5.8	5.8		6.0	6.0		6.0	6.0	6.0
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	3.0
Recall Mode	None	None		None	None		C-Min	C-Min		C-Min	C-Min	C-Min
Walk Time (s)	7.0	7.0		7.0	7.0		7.0	7.0		7.0	7.0	7.0
Flash Dont Walk (s)	25.0	25.0		25.0	25.0		24.0	24.0		24.0	24.0	24.0
Pedestrian Calls (#/hr)	0	0		0	0		0	0		0	0	0
Act Effect Green (s)	10.3	10.3		10.3	10.3		92.3	92.3		92.3	92.3	92.3
Actuated g/C Ratio	0.09	0.09		0.09	0.09		0.84	0.84		0.84	0.84	0.84
v/c Ratio	0.20	0.12		0.26	0.04		0.21	0.41		0.09	0.19	0.02
Control Delay	50.0	0.4		51.9	0.2		3.2	4.0		2.9	2.7	0.8
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	0.0
Total Delay	50.0	0.4		51.9	0.2		3.2	4.0		2.9	2.7	0.8

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
LOS	D	A		D	A		A	A		A	A	A
Approach Delay		11.9			34.7			3.8			2.6	
Approach LOS		B			C			A			A	
Queue Length 50th (m)	4.7	0.0		5.6	0.0		6.8	28.8		1.9	10.3	0.0
Queue Length 95th (m)	12.3	0.0		14.2	0.0		12.8	45.0		4.5	17.1	1.2
Internal Link Dist (m)		924.5			941.3			667.3			713.3	
Turn Bay Length (m)	50.0			40.0			160.0			120.0		60.0
Base Capacity (vph)	402	871		378	657		878	1495		613	1496	1276
Starvation Cap Reductn	0	0		0	0		0	0		0	0	0
Spillback Cap Reductn	0	0		0	0		0	0		0	0	0
Storage Cap Reductn	0	0		0	0		0	0		0	0	0
Reduced v/c Ratio	0.06	0.10		0.08	0.02		0.21	0.41		0.09	0.19	0.02

Intersection Summary

Area Type: Other

Cycle Length: 110

Actuated Cycle Length: 110

Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green

Natural Cycle: 75

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.41

Intersection Signal Delay: 5.2

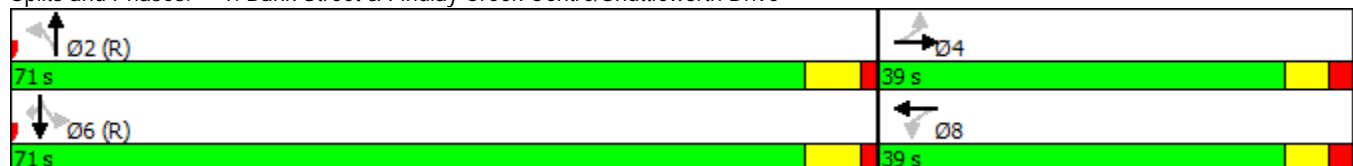
Intersection LOS: A






















Intersection Capacity Utilization 65.8%













ICU Level of Service C

Analysis Period (min) 15

Splits and Phases: 1: Bank Street & Findlay Creek Centre/Shuttleworth Drive



												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	20	0	188	59	0	46	123	423	10	88	732	39
Future Volume (vph)	20	0	188	59	0	46	123	423	10	88	732	39
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Storage Length (m)	50.0		0.0	40.0		0.0	160.0		0.0	120.0		60.0
Storage Lanes	1		0	1		0	1		0	1		1
Taper Length (m)	20.0			20.0			20.0			20.0		
Lane Util. 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
Frt		0.850			0.850			0.997				0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1695	1517	0	1695	1517	0	1695	1779	0	1695	1784	1517
Flt Permitted	0.727			0.516			0.320			0.499		
Satd. Flow (perm)	1297	1517	0	921	1517	0	571	1779	0	890	1784	1517
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		129			324			2				39
Link Speed (k/h)		50			50			70				70
Link Distance (m)		948.5			965.3			691.3				737.3
Travel Time (s)		68.3			69.5			35.6				37.9
Peak Hour 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
Adj. Flow (vph)	20	0	188	59	0	46	123	423	10	88	732	39
Shared Lane Traffic (%)												
Lane Group Flow (vph)	20	188	0	59	46	0	123	433	0	88	732	39
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	Perm
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		6
Detector Phase	4	4		8	8		2	2		6	6	6
Switch Phase												
Minimum Initial (s)	10.0	10.0		10.0	10.0		10.0	10.0		10.0	10.0	10.0
Minimum Split (s)	37.8	37.8		37.8	37.8		37.0	37.0		37.0	37.0	37.0
Total Split (s)	37.8	37.8		37.8	37.8		42.2	42.2		42.2	42.2	42.2
Total Split (%)	47.3%	47.3%		47.3%	47.3%		52.8%	52.8%		52.8%	52.8%	52.8%
Maximum Green (s)	32.0	32.0		32.0	32.0		36.2	36.2		36.2	36.2	36.2
Yellow Time (s)	3.6	3.6		3.6	3.6		4.5	4.5		4.5	4.5	4.5
All-Red Time (s)	2.2	2.2		2.2	2.2		1.5	1.5		1.5	1.5	1.5
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	0.0
Total Lost Time (s)	5.8	5.8		5.8	5.8		6.0	6.0		6.0	6.0	6.0
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	3.0
Recall Mode	None	None		None	None		C-Min	C-Min		C-Min	C-Min	C-Min
Walk Time (s)	7.0	7.0		7.0	7.0		7.0	7.0		7.0	7.0	7.0
Flash Dont Walk (s)	25.0	25.0		25.0	25.0		24.0	24.0		24.0	24.0	24.0
Pedestrian Calls (#/hr)	0	0		0	0		0	0		0	0	0
Act Effect Green (s)	11.4	11.4		11.4	11.4		56.8	56.8		56.8	56.8	56.8
Actuated g/C Ratio	0.14	0.14		0.14	0.14		0.71	0.71		0.71	0.71	0.71
v/c Ratio	0.11	0.57		0.45	0.09		0.30	0.34		0.14	0.58	0.04
Control Delay	30.0	18.8		42.1	0.4		7.2	5.6		4.9	8.4	1.7
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	0.0
Total Delay	30.0	18.8		42.1	0.4		7.2	5.6		4.9	8.4	1.7

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
LOS	C	B		D	A		A	A		A	A	A
Approach Delay		19.9			23.8			6.0			7.8	
Approach LOS		B			C			A			A	
Queue Length 50th (m)	2.5	7.7		7.8	0.0		4.8	17.5		3.0	38.2	0.0
Queue Length 95th (m)	7.4	23.1		17.2	0.0		15.0	37.2		9.0	80.7	2.5
Internal Link Dist (m)		924.5			941.3			667.3			713.3	
Turn Bay Length (m)	50.0			40.0			160.0			120.0		60.0
Base Capacity (vph)	518	684		368	801		405	1263		631	1265	1088
Starvation Cap Reductn	0	0		0	0		0	0		0	0	0
Spillback Cap Reductn	0	0		0	0		0	0		0	0	0
Storage Cap Reductn	0	0		0	0		0	0		0	0	0
Reduced v/c Ratio	0.04	0.27		0.16	0.06		0.30	0.34		0.14	0.58	0.04

Intersection Summary

Area Type: Other

Cycle Length: 80

Actuated Cycle Length: 80

Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green

Natural Cycle: 80

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.58

Intersection Signal Delay: 9.6

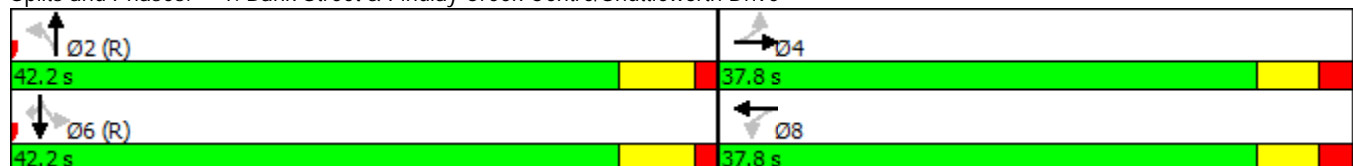
Intersection LOS: A






















Intersection Capacity Utilization 89.3%













ICU Level of Service E

Analysis Period (min) 15

Splits and Phases: 1: Bank Street & Findlay Creek Centre/Shuttleworth Drive



												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	25	0	83	44	0	83	182	990	11	79	472	24
Future Volume (vph)	25	0	83	44	0	83	182	990	11	79	472	24
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Storage Length (m)	50.0		0.0	40.0		0.0	160.0		0.0	120.0		60.0
Storage Lanes	1		0	1		0	1		0	1		1
Taper Length (m)	20.0			20.0			20.0			20.0		
Lane Util. 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
Frt		0.850			0.850			0.998				0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1695	1517	0	1695	1517	0	1695	1781	0	1695	1784	1517
Flt Permitted	0.703			0.703			0.485			0.234		
Satd. Flow (perm)	1254	1517	0	1254	1517	0	865	1781	0	418	1784	1517
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		396			124			1				28
Link Speed (k/h)		50			50			70				70
Link Distance (m)		948.5			965.3			691.3				737.3
Travel Time (s)		68.3			69.5			35.6				37.9
Peak Hour 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
Adj. Flow (vph)	25	0	83	44	0	83	182	990	11	79	472	24
Shared Lane Traffic (%)												
Lane Group Flow (vph)	25	83	0	44	83	0	182	1001	0	79	472	24
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	Perm
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		6
Detector Phase	4	4		8	8		2	2		6	6	6
Switch Phase												
Minimum Initial (s)	10.0	10.0		10.0	10.0		10.0	10.0		10.0	10.0	10.0
Minimum Split (s)	37.8	37.8		37.8	37.8		37.0	37.0		37.0	37.0	37.0
Total Split (s)	37.8	37.8		37.8	37.8		72.2	72.2		72.2	72.2	72.2
Total Split (%)	34.4%	34.4%		34.4%	34.4%		65.6%	65.6%		65.6%	65.6%	65.6%
Maximum Green (s)	32.0	32.0		32.0	32.0		66.2	66.2		66.2	66.2	66.2
Yellow Time (s)	3.6	3.6		3.6	3.6		4.5	4.5		4.5	4.5	4.5
All-Red Time (s)	2.2	2.2		2.2	2.2		1.5	1.5		1.5	1.5	1.5
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	0.0
Total Lost Time (s)	5.8	5.8		5.8	5.8		6.0	6.0		6.0	6.0	6.0
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	3.0
Recall Mode	None	None		None	None		C-Min	C-Min		C-Min	C-Min	C-Min
Walk Time (s)	7.0	7.0		7.0	7.0		7.0	7.0		7.0	7.0	7.0
Flash Dont Walk (s)	25.0	25.0		25.0	25.0		24.0	24.0		24.0	24.0	24.0
Pedestrian Calls (#/hr)	0	0		0	0		0	0		0	0	0
Act Effect Green (s)	10.9	10.9		10.9	10.9		91.7	91.7		91.7	91.7	91.7
Actuated g/C Ratio	0.10	0.10		0.10	0.10		0.83	0.83		0.83	0.83	0.83
v/c Ratio	0.20	0.16		0.35	0.32		0.25	0.67		0.23	0.32	0.02
Control Delay	49.0	0.7		54.2	5.9		3.9	7.9		4.8	3.6	1.0
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	0.0
Total Delay	49.0	0.7		54.2	5.9		3.9	7.9		4.8	3.6	1.0

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
LOS	D	A		D	A		A	A		A	A	A
Approach Delay		11.9			22.6			7.3			3.7	
Approach LOS		B			C			A			A	
Queue Length 50th (m)	4.7	0.0		8.3	0.0		7.1	70.3		3.0	19.8	0.0
Queue Length 95th (m)	12.1	0.0		18.1	5.0		15.4	127.8		8.5	34.7	1.4
Internal Link Dist (m)		924.5			941.3			667.3			713.3	
Turn Bay Length (m)	50.0			40.0			160.0			120.0		60.0
Base Capacity (vph)	364	722		364	529		720	1484		348	1486	1268
Starvation Cap Reductn	0	0		0	0		0	0		0	0	0
Spillback Cap Reductn	0	0		0	0		0	0		0	0	0
Storage Cap Reductn	0	0		0	0		0	0		0	0	0
Reduced v/c Ratio	0.07	0.11		0.12	0.16		0.25	0.67		0.23	0.32	0.02

Intersection Summary

Area Type: Other

Cycle Length: 110

Actuated Cycle Length: 110

Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green

Natural Cycle: 100

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.67

Intersection Signal Delay: 7.5

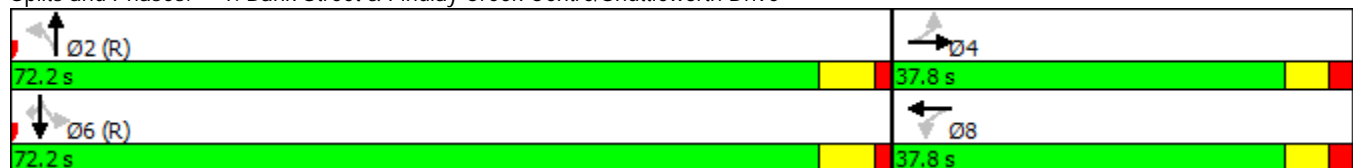
Intersection LOS: A

Intersection Capacity Utilization 88.1%

ICU Level of Service E






















Analysis Period (min) 15













Splits and Phases: 1: Bank Street & Findlay Creek Centre/Shuttleworth Drive



Lanes, Volumes, Timings
1: Bank Street & Findlay Creek Centre/Shuttleworth Drive

Future (2025) BGS
PM Peak Hour

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	20	0	188	66	0	82	123	716	23	151	1084	39
Future Volume (vph)	20	0	188	66	0	82	123	716	23	151	1084	39
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Storage Length (m)	50.0		0.0	40.0		0.0	160.0		0.0	120.0		60.0
Storage Lanes	1		0	1		0	1		0	1		1
Taper Length (m)	20.0			20.0			20.0			20.0		
Lane Util. 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
Frt		0.850			0.850			0.995				0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1695	1517	0	1695	1517	0	1695	1775	0	1695	1784	1517
Flt Permitted	0.704			0.438			0.157			0.324		
Satd. Flow (perm)	1256	1517	0	782	1517	0	280	1775	0	578	1784	1517
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		84			206			3				31
Link Speed (k/h)		50			50			70				70
Link Distance (m)		948.5			965.3			691.3				737.3
Travel Time (s)		68.3			69.5			35.6				37.9
Peak Hour 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
Adj. Flow (vph)	20	0	188	66	0	82	123	716	23	151	1084	39
Shared Lane Traffic (%)												
Lane Group Flow (vph)	20	188	0	66	82	0	123	739	0	151	1084	39
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	Perm
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		6
Detector Phase	4	4		8	8		2	2		6	6	6
Switch Phase												
Minimum Initial (s)	10.0	10.0		10.0	10.0		10.0	10.0		10.0	10.0	10.0
Minimum Split (s)	37.8	37.8		37.8	37.8		37.0	37.0		37.0	37.0	37.0
Total Split (s)	37.8	37.8		37.8	37.8		62.2	62.2		62.2	62.2	62.2
Total Split (%)	37.8%	37.8%		37.8%	37.8%		62.2%	62.2%		62.2%	62.2%	62.2%
Maximum Green (s)	32.0	32.0		32.0	32.0		56.2	56.2		56.2	56.2	56.2
Yellow Time (s)	3.6	3.6		3.6	3.6		4.5	4.5		4.5	4.5	4.5
All-Red Time (s)	2.2	2.2		2.2	2.2		1.5	1.5		1.5	1.5	1.5
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	0.0
Total Lost Time (s)	5.8	5.8		5.8	5.8		6.0	6.0		6.0	6.0	6.0
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	3.0
Recall Mode	None	None		None	None		C-Min	C-Min		C-Min	C-Min	C-Min
Walk Time (s)	7.0	7.0		7.0	7.0		7.0	7.0		7.0	7.0	7.0
Flash Dont Walk (s)	25.0	25.0		25.0	25.0		24.0	24.0		24.0	24.0	24.0
Pedestrian Calls (#/hr)	0	0		0	0		0	0		0	0	0
Act Effect Green (s)	13.6	13.6		13.6	13.6		74.6	74.6		74.6	74.6	74.6
Actuated g/C Ratio	0.14	0.14		0.14	0.14		0.75	0.75		0.75	0.75	0.75
v/c Ratio	0.12	0.67		0.62	0.21		0.59	0.56		0.35	0.82	0.03
Control Delay	37.1	34.1		64.4	1.3		22.3	8.2		8.0	16.1	2.1
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	0.0
Total Delay	37.1	34.1		64.4	1.3		22.3	8.2		8.0	16.1	2.1

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
LOS	D	C		E	A		C	A		A	B	A
Approach Delay		34.4			29.4			10.2			14.7	
Approach LOS		C			C			B			B	
Queue Length 50th (m)	3.2	17.7		11.4	0.0		7.9	45.2		7.3	99.0	0.3
Queue Length 95th (m)	8.8	35.7		22.6	0.0		#42.4	92.6		21.4	#246.4	3.1
Internal Link Dist (m)		924.5			941.3			667.3			713.3	
Turn Bay Length (m)	50.0			40.0			160.0			120.0		60.0
Base Capacity (vph)	401	542		250	625		208	1324		430	1330	1139
Starvation Cap Reductn	0	0		0	0		0	0		0	0	0
Spillback Cap Reductn	0	0		0	0		0	0		0	0	0
Storage Cap Reductn	0	0		0	0		0	0		0	0	0
Reduced v/c Ratio	0.05	0.35		0.26	0.13		0.59	0.56		0.35	0.82	0.03

Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green

Natural Cycle: 130

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.82

Intersection Signal Delay: 15.7

Intersection LOS: B

Intersection Capacity Utilization 108.8%









ICU Level of Service G

Analysis Period (min) 15

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 1: Bank Street & Findlay Creek Centre/Shuttleworth Drive

			
Ø2 (R)			Ø4
62.2 s			37.8 s
			
Ø6 (R)			Ø8
62.2 s			37.8 s



Cowan's Grove Commercial Plaza 4791 Bank Street

Transportation Impact Assessment Report

Appendix J: Technical Standards

July 2018



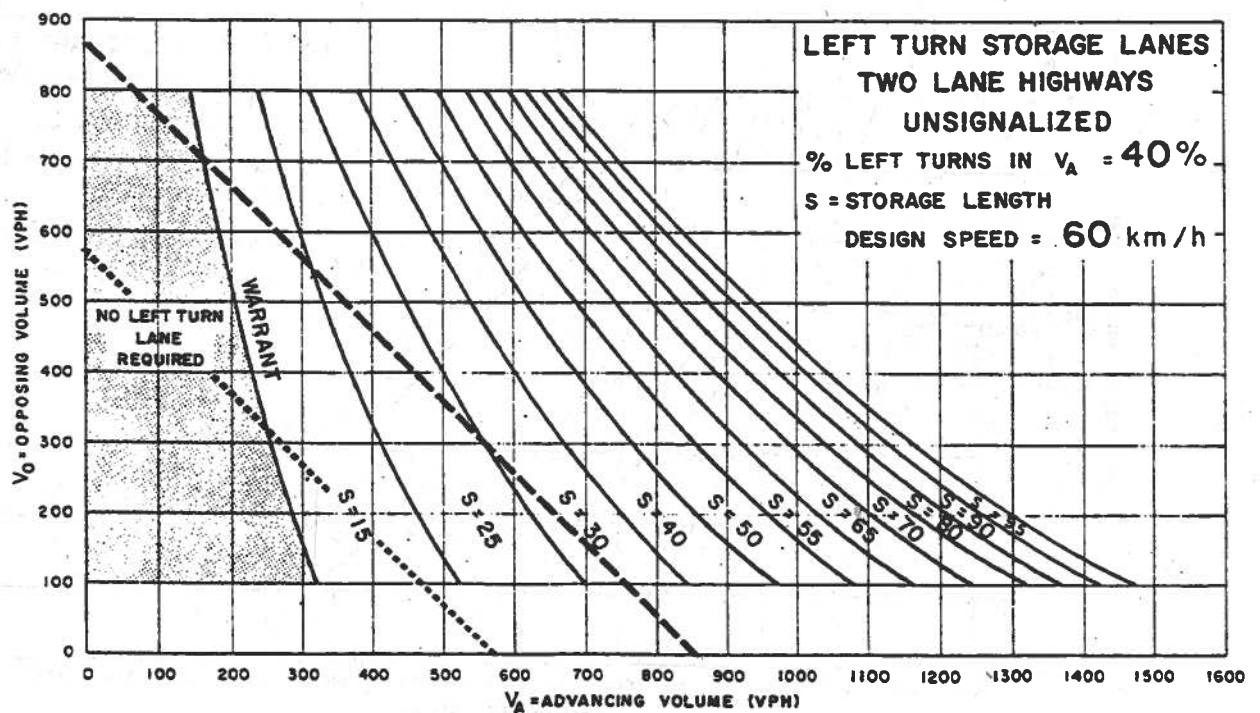
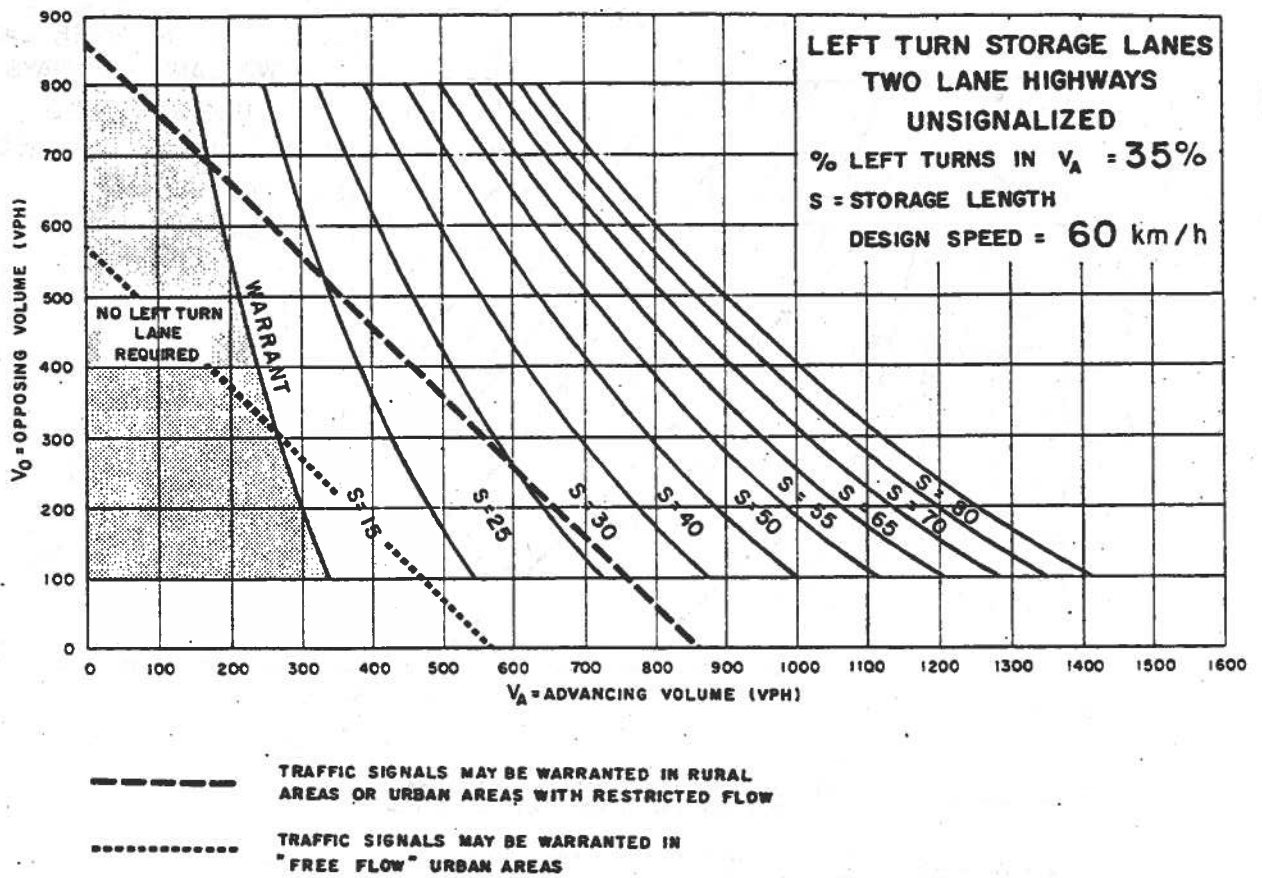


Figure EA-9