Item No. 9.1.3

PO Box 1749
Halifax, Nova Scotia
B3J 3A5 Canada

M E M O R A N D U M

TO: Chair and Members of North West Planning Advisory Committee

FROM: Tyson Simms, Planner II

DATE: June 24, 2016

SUBJECT: **Case 20224: Application from WSP, on behalf of Kent Building Supplies Limited, to re-designate and rezone property located at 900/902 Sackville Drive from the Urban Residential Designation and R-2 (Two Unit Dwelling) Zone to the DB (Downsview-Beaver Bank) Designation and LS (Large Scale Commercial) Zone to accommodate a new driveway access and parking lot expansion**

Background: WSP Canada Incorporated, on behalf of Kent Building Supplies Limited, has submitted a request to amend the Sackville Municipal Planning Strategy (MPS), Sackville Drive Secondary Planning Strategy (SPS) and associated Land Use By-laws to permit the expansion of the Kent Building Supplies store at 900 & 902 Sackville Drive.

Location: 874, 900 & 902 Sackville Drive, Middle Sackville. The subject properties are located near the intersection of Sackville Drive and Beaver Bank Road.

Existing Use: 900 & 902 Sackville Drive is developed with a two-unit residential dwelling. 874 Sackville Drive is developed as a Kent Building Supplies Outlet.

Designation: 900 & 902 Sackville Drive is designated Urban Residential under the Sackville MPS. 874 Sackville Drive is designated Downsview-Beaver Bank under the Sackville Drive SPS.

Zoning: 900 & 902 Sackville Drive is zoned R-2 (Two Unit Dwelling) under the Sackville Land Use By-law (LUB). 874 Sackville Drive is zoned LS (Large Scale Commercial) under the Sackville Drive LUB.

MPS Policy: This application is to bring 900 & 902 Sackville Drive into the Sackville Drive Plan Area. As such, the designation and zoning of the subject property will be changed. 874 Sackville Drive is currently developed with a building supply outlet. This land use and associated outdoor storage of building materials has been enabled under a development agreement. Policy I-14 of the Sackville Drive allows Council to consider

any proposed major and/or minor amendment to the existing development agreement. A request to discharge the existing development agreement may also be considered by Council.

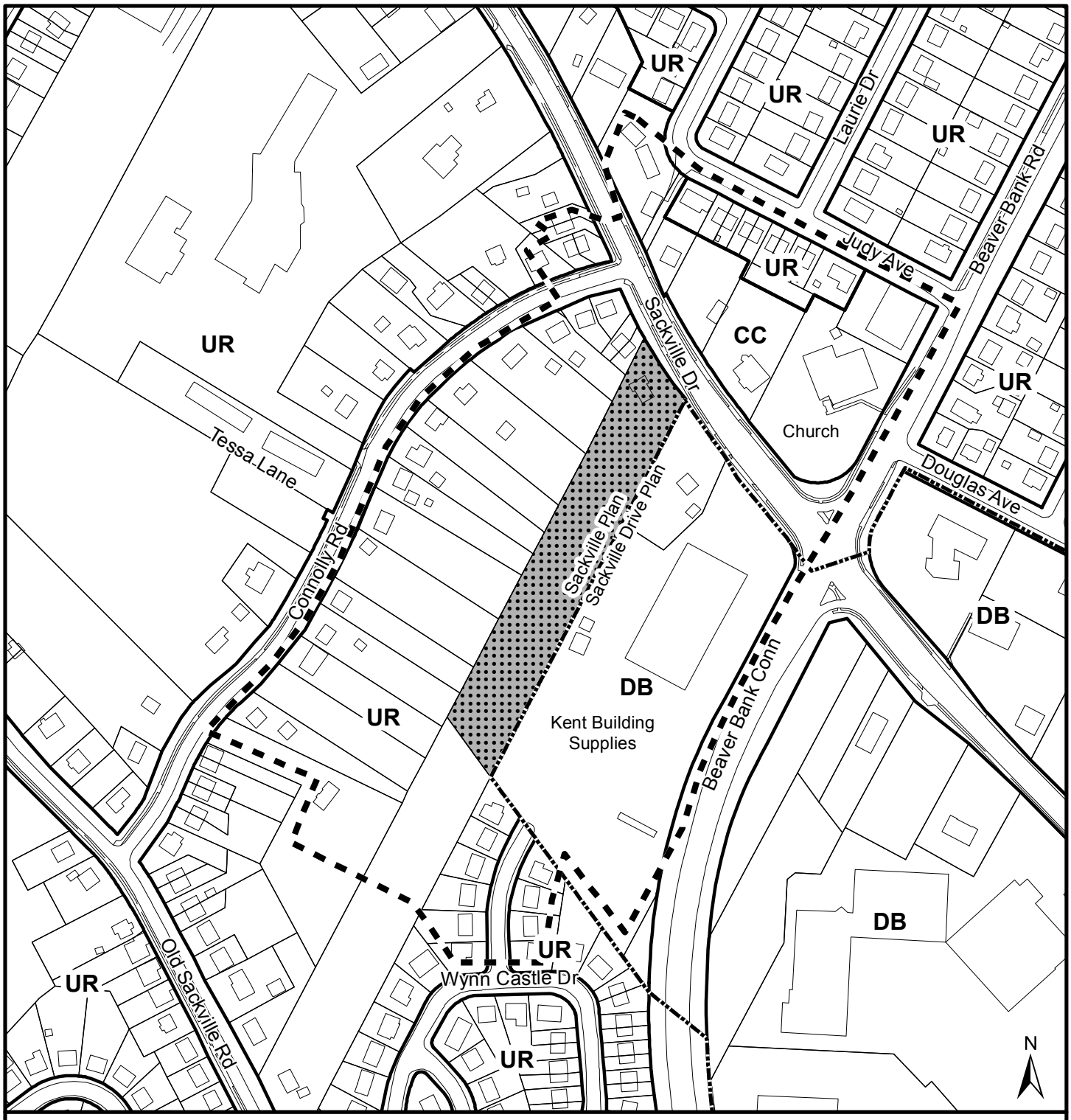
Proposal: The applicant has outlined their intention for the subject properties in a letter (Attachment A). As proposed, 900 & 902 Sackville Drive will be re-designated and rezoned to allow for an expansion of the existing Kent Building Supplies Outlet located at 874 Sackville Drive. As indicated in the Application Letter (Attachment A) and Concept Plan (Attachment B), the existing two-unit residential dwelling located at 900 & 902 Sackville Drive will be demolished and replaced with parking in support of the building supply outlet. 900 & 902 will also serve as the new primary entrance/exit for the building supply outlet. The existing driveway entrance/exit at 874 Sackville Drive is proposed to be changed to a right out only exit.

Input Sought from North West Planning Advisory Committee:

Feedback is sought from NWPAC relative to the subject application. NWPAC's recommendation will be included in the staff report to North West Community Council.

Attachments:

Map 1	Generalized Future Land Use Map
Map 2	Zoning Map
Attachment A	Application Letter
Attachment B	Concept Plan
Attachment C	Excerpt from the Sackville Drive Secondary Planning Strategy
Attachment D	Traffic Impact Study



Map 1 - Generalized Future Land Use

900 & 902 Sackville Drive,
Lower Sackville

HALIFAX

Subject Property

Plan Area Boundary

Sackville
Plan Area

Designation

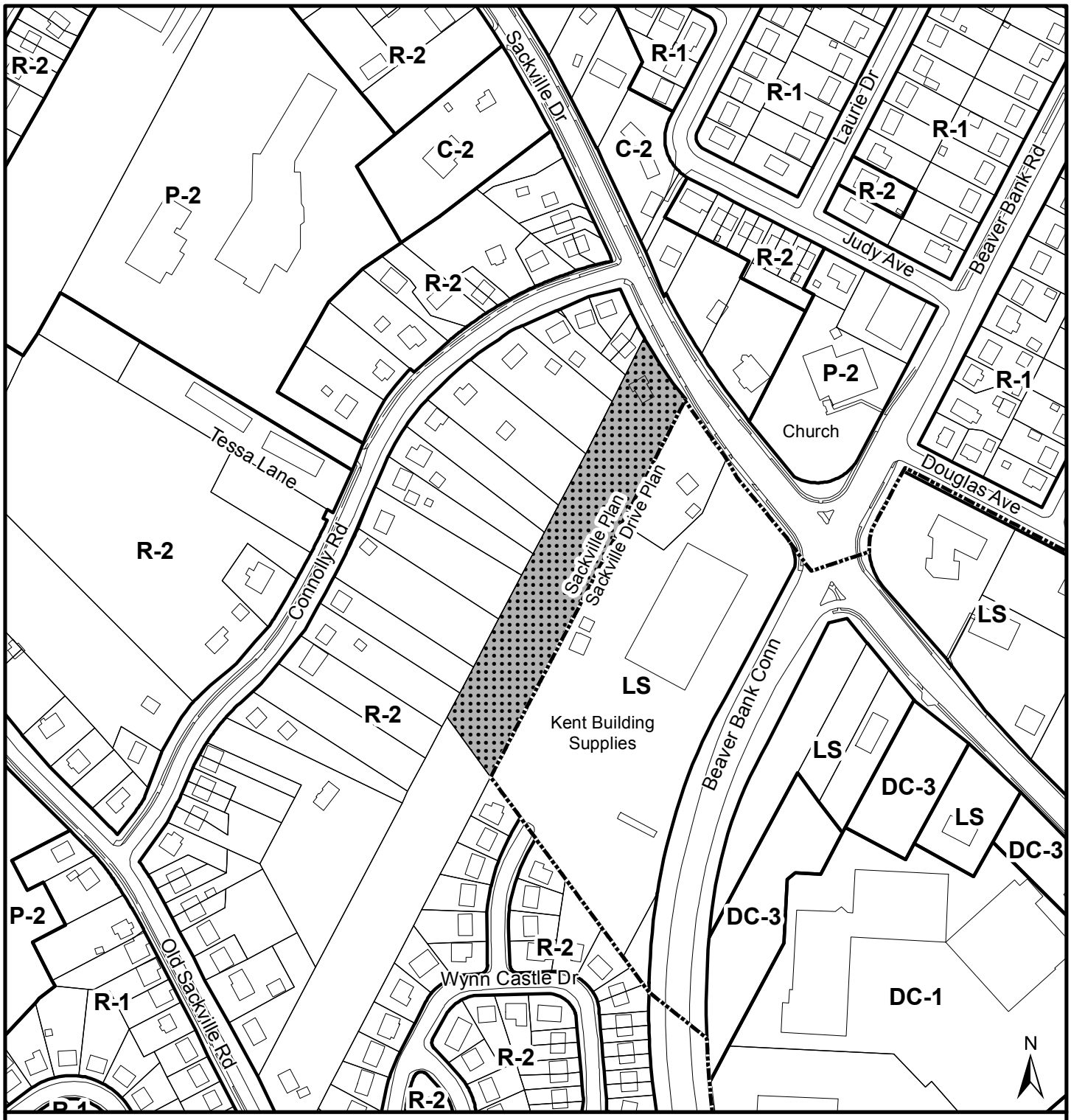
Sackville	UR	Urban Residential
	CC	Community Commercial
Sackville Drive	DB	Downview/Beaver Bank

0 20 40 60 80 100 120 m

This map is an unofficial reproduction of a portion of the Generalized Future Land Use Map for the plan area indicated.

The accuracy of any representation on this plan is not guaranteed.

10 December 2015 | Case 20224 | T:\work\planning\Casemaps\SACK\20224\ (HK)



Map 2 - Zoning and Notification

900 & 902 Sackville Drive,
Lower Sackville

HALIFAX

Subject Property

Plan Area Boundary

Sackville
Plan Area

	Zone	
Sackville	R-1	Single Unit Dwelling
	R-2	Two Unit Dwelling
	C-2	Community Commercial
	P-2	Community Facility
Sackville Drive	LS	Large Scale Commercial
	DC-1	Downsview Complex -1
	DC-2	Downsview Complex -2

0 20 40 60 80 100 120 m

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The accuracy of any representation on this plan is not guaranteed.

131-20629-00

October 15, 2015

Ms. Thea Langille
Planning Applications
Halifax Regional Municipality
40 Alderney Drive, 2nd Floor
Dartmouth, NS, B2Y 2N5
langilt@halifax.ca

Re: Planning Application – 874 & 900 Sackville Drive, Lower Sackville, NS (PID 40093742 and PID 40093106)

Dear Ms. Langille,

We are writing on behalf of our client, Kent Building Supplies Ltd. (Kent), with respect to modifications to their Lower Sackville store (PID 40093742), including utilizing the adjacent property (PID 40093106) to accommodate a new driveway access and parking lot expansion.

Through this planning application, we are seeking approval for a plan area boundary amendment to the *Sackville Drive Secondary Planning Strategy (SPS)* to encompass PID 40093106 (900/902 Sackville Drive) and to rezone the encompassed section from residential to commercial as discussed during the pre-application process. This will permit the utilization of the adjacent property for the changes identified above.

Full-application Supporting Material

In order to assist with the application process, the following supporting materials are enclosed:

- Completed Planning Application Form
- Application Fee $1,100 + $1,500 Advertising Deposit
- Concept Plan with restriping Concept Sketch (10 copies)
- Traffic Impact Study dated November 2013 (4 copies)
- Traffic Impact Study Addendum Letter (October 8, 2015) (4 copies)
- Servicing Schematic (6 copies)
- Legal description of the site
- Written consent of registered owner
- Electronic copy of all above material (USB)

Background

It is our understanding that PID 40093742 (874 Sackville Drive) is designated DB-1 (Downsview-Beaver Bank) under the *Sackville Drive SPS* and zoned LS (Large Scale Commercial) under the *Sackville Drive Land Use By-Law (LUB)*. Further, it is our understanding that PID 40093106 (900/902 Sackville Drive) is designated Urban Residential (UR) under the *Sackville Municipal Planning Strategy (MPS)* and zoned R-2 (Two Unit Dwelling) under *Sackville's LUB*. Currently, there is an Agreement of Land Use dated October 18th, 2000 attached to PID 4009372 and relates to the existing lumber yard and storage sheds on the site.

Currently, the subject planning area is regulated under two separate planning strategies; Sackville MPS (900/902 Sackville Drive) and Sackville Drive SPS (874 Sackville Drive). Our intension with this application is to shift the boundary of the Sackville Drive SPS in a north-west direction to encompass the site in its entirety by including 900/902 Sackville Drive. The boundary shift would result in rendering the existing development subject to the provisions of the underlying LS (Large Scale) commercial zone regulated under the Sackville Drive SPS. This change would ultimately permit the building and parking lot expansion that Kent wishes to pursue in order to better serve their employees, customers, and surrounding community as a whole.

Development Proposal and Site Analysis

The existing Kent Building Supplies has operated at its current location for 24 years. In order to better serve their customers, and to enhance site safety, Kent is looking to redesign the site to enlarge the building, improve site access, and improve the parking lot layout. As shown on the attached Concept Plan, Kent proposes to undertake a 14,573 sq. ft. expansion of the south-west side of the existing store as well as to create additional parking and a new driveway access on the north-west side of the site. The proposed expansion would create a total commercial floor area of 54,263 sq. ft. and would require a minimum of 218 parking stalls.

Parking

In the *Sackville Drive LUB*, parking lots are encouraged to be located at the rear and side of buildings *(23(3))*. Currently the parking lot design does not support the intent of the LUB as it is located in front of the store. It is our understanding that the existing parking lot is undersized as it currently accommodates 104 stalls and does not adequately support store operations. The existing 39,360 sq. ft. Kent store requires a minimum of 159 stalls under the LUB. As shown in the Concept Plan, the development proposal includes a total of 247 parking stalls, (29 stalls above the required minimum), to the western side of the building.

Access

The access point currently serving the site is located close to the major intersection of Sackville Drive and the Beaver Bank Connector. In order to provide for efficient on-site vehicular circulation and to reduce turning movement conflict, a new access is proposed at the north-west portion of the site on PID 40093106. The new access point would accommodate full turning movement, while the existing access point would accommodate right-turn in and right-turn out movement only.

As part of the site redesign, a new proposed building entrance will be located to the west and face the newly expanded parking lot. This additional entrance will enable better on-site pedestrian movement. Further, this entrance will reduce pedestrian and vehicle conflicts by connecting into the existing Sackville Drive sidewalk network and directing pedestrian traffic to the new walkway running along the western side of the building. An entrance fronting onto Sackville Drive will also be provided through the Garden Centre which is consistent with the Architectural requirements of the *Sackville Drive LUB (11(3)).*

Sackville Drive SPS Policies

It is our understanding that the proposed re-development of the Kent site is aligned with the goals of the *Sackville Drive SPS*. In this respect, Policy 5.2.1 states:

> *Within the Downsview-Beaver Bank district, Sackville's only shopping centre and most of big box retail uses such as Kent Home Building … can be found. … large-format stores are integral to the viability of Sackville Drive, and Sackville overall. These stores have broad market appeal drawing on both local and non-local consumer markets, which tend to spill over into the smaller retail uses, benefiting the entire street.*
>
> *The long term viability of the large-format stores depends significantly on grouping the uses together, and ensuring they are within proximity to the regional transportation system in areas of high visibility and high traffic counts. Therefore, given the amount of vacant, highly visible, serviced commercial land near the interchange, the existing cluster of big box uses in this area, and the growing demand for new big box development, the creation of a "large-format power centre" shall be encouraged in this area of Sackville.*

By expanding development on the site, the proposed development reinforces the existing cluster of big box development, which is encouraged by the Sackville Drive SPS.

Furthermore, the proposal is aligned with the goals and objectives of the SPS. The objectives include (4.3 (a) (b) (c)):

> *(a) Improving Traffic Efficiency:*
> - *Provide easy access and egress to/from all businesses*
> - *Reduce conflicts between pedestrians and motor vehicles*
>
> *(b) Improve the Pedestrian Opportunities on the Street*
> - *Make businesses more accessible to pedestrians*
> - *Create convenient and accessible pedestrian linkages to the street*
>
> *c) Stimulate Retail & Residential Growth*
> - *Streamline development application processing time*
> - *Create a focus for retail and residential activity on the street*

- *Make Sackville Drive safe for all consumers (drivers and pedestrians)*
- *Improve traffic flow and circulation (access and egress)*

Traffic Impact Study

A Traffic Impact Study (2013) was undertaken in relation to the above-noted development proposal. The TIS concluded that the low number of trips generated by the proposed development does not have any noticeable impact to the level of performance of the Sackville Drive/Beaver Bank Road intersection. The TIS recommended that the site entrance be relocated approximately 90 meters west of the existing site entrance on Sackville Drive to improve performance and safety for westbound Sackville Drive traffic. An attached addendum to the TIS also supports the redesign of the existing driveway to allow for right-turn in and right-turn out movement. These changes are expected to have no significant impacts to the site or the street network Study Area and therefore keep all recommendations and conclusion from the original 2013 Traffic Impact Study valid.

The development proposal, as shown in the attached Concept Plan, reflects the recommendation to relocate the site entrance to the north-west. For further information with respect to Traffic, please see the attached Traffic Impact Study.

Comments Provided by HRM through the Pre-Application Process

Comments provided by HRM have been considered and have either been addressed in this application or have been identified as comments to be addressed in future permit requests. Such provisions include:

The Garden Centre located at the front of the building, facing Sackville Drive, does not comply with the requirement for a defined entrance on Sackville Drive.

- This comment has been noted and an articulated entry way will be addressed in the future building permit application for the site.

Architectural treatments are required for the portion of the building facing Sackville Drive and Beaver Bank Road.

- It has been acknowledged that architectural treatments on the façade facing Sackville Drive and Beaver Bank Road are needed and they will be addressed in the elevations provided with the future building permit application for the site.

Can the proposed right out only driveway (made from the existing access point to the site) be narrower to discourage vehicles from entering the site illegally?

- Since the pre-application, changes have been made to the concept plan to accommodate for right-turn in access as well as for right-turn out exit. Appropriate design features will be included for these changes including an elevated curbed island and surface markings which are meant to discourage any illegal entry or exit for the site.

Can the delivery/loading area be augmented to allow for trucks to enter and exit from the proposed new full access driveway?

- This has been acknowledged, however, in order for trucks to use this proposed new driveway for exiting purposes, it would require the customer parking area to serve as an access route to reach the final site exit point. This is deemed to be unsafe for customer vehicles as well as on-site pedestrians who are utilizing the store's parking lot area. Additionally, the current built form of the building will not permit trucks from entering the parking lot area as the space between the building and the property line near the Garden Centre will not accommodate the required turning radii for trucks. It is therefore recommended that trucks should use the right-out drive way located towards the south of the site.

The TIS recommendation to re-stripe the centre lane on Sackville Drive back to the intersection cannot be accommodated due to lane alignment/continuity requirements.

- This point has been acknowledged. Please see the attached Concept Plan which shows the proposed restriping markup for new left turn lane. This lane will enhance the overall safety for site access and is expected to reduce the frequency of vehicle collisions that current exist at the Beaverbank Connector/ Sackville Drive intersection.

The future revised plan should include proper storage arrangement for all commodities according to the fire protection system for which was designed as well as any applicable requirements as outlined in the NFCC.

- The surveying schematic notes that the building fire department connection will be located within 45m of a new hydrant located at the new front entry of the retail store.

The existing private hydrant and the building's Fire Department Connection will become situated at the rear of the building following proposed expansion. Time for firefighters to connect to the FDC will be greatly reduced if the location for these systems were changed and in keeping with the required standards.

- The location for the private hydrant and the building's FDC will be addressed based on the Nova Scotia Building Code Regulations at the detailed design level for the planned site changes.

Engineers are to confirm that the laterals are sized appropriately at 874 Sackville Drive to service both the existing building and the expansion.

- The laterals on 874 Sackville Drive are sized appropriately for the existing building as well as for the intended expansion. This has been shown on the attached servicing schematics.

Adequate signage must be put in place to indicate the direction of travel into and out of the driveways. Additional signage is to be placed should employee parking be separated from customer parking.

- Adequate and appropriate signage will be used upon entering and exiting the premises as well as within the expanded parking lot. These details will be included in future development permit applications.

Recommend that landscaping be kept below 3' and trees limbed up to at least 6' so as not to infringe on sightlines.

- Adequate and appropriate landscaping will be provided so as not to impede on visibility and sightlines. These details will be included in future development permit applications.

Good quality white lights should be in provided in the parking lot and exterior of the building to provide site users and CCTV equipment (if in place) adequate visibility after hours.

- Adequate and appropriate lighting will be provided to ensure visibility after hours. These details will be included in future development permit applications.

Conclusion

It is our opinion that the proposed re-development of the Kent Site is within the intent of the policies contained in the *Sackville Drive Secondary Planning Strategy.* Further, the re-development provides a strategic opportunity to improve existing site challenges – particularly with respect to parking and access. The requested amendment to shift the Sackville Drive SPS boundary to fully encompass the Kent's site would ultimately support their intent to better serve the community and its customers through adequate parking facilities and overall safer on- and off-site vehicular circulation.

We look forward to starting the planning process and trust our application submission is satisfactory.

Should you require further information, please do not hesitate to contact the undersigned directly.

Kind regards,

WSP Canada Inc.

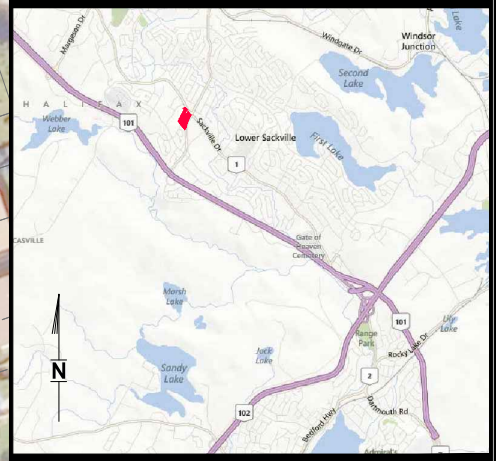
Original Signed

Christina Townsend, MCIP, LPP
Urban Planner
902 835 9955

Cc: Rick Davis, Kent Building Supplies

Attachment B: Concept Plan

KEY PLAN



LEGEND

- Site Boundary
- Adjacent Property Boundary
- Proposed Property Boundary

SITE SUMMARY:

- Land Area - 10.44 Acres
- Existing Zone - LS (Large Scale Commercial)
  R-2 (Two Unit Dwelling)

	BUILDING AREA	PARKING		
		REQUIRED	PROVIDED	RATIO
KENT	39,690 SF	159	---	---
EXPANSION	14,573 SF	59	---	---
Total	54,263 SF	218	247	4.6

NOTES:

- Property lines approximate only. Site subject to survey.
- Site subject to planning approvals
- 1 class A bicycle room or cage required

SOURCES:

- Adjacent Property lines from Provincial Mapping
- Topographic features from GENIVAR survey plan '131-20629-528.dwg'
- Bing Aerial Imagery

Designer: KWATTERS
Planner: CTOWNSEND

VERSION 1.2

CONCEPT PLAN
874 SACKVILLE DRIVE
LOWER SACKVILLE, NOVA SCOTIA

OCTOBER 07, 2015 131-20629100_V12

SCALE 24 16 8 0 40 m — 1 : 1,500

NORTH

WSP
1 SPECTACLE LAKE DRIVE
DARTMOUTH, NOVA SCOTIA CANADA, B3B 1X7
PHONE: 902 835-9955 - FAX: 902 835-1645 - WWW.WSPGROUP.COM

Attachment C
Excerpt from the Sackville Drive Secondary Planning Strategy

5.2 The Downsview-Beaver Bank Designation

The Downsview-Beaver Bank Designation refers to all public and private lands located between the Beaver Bank Connector and Riverside Drive including Walker Avenue and Old Sackville Road. The proximity to the regional transportation system and diversity of land uses, provides both unique opportunities and challenges. Based on these opportunities and constraints, the following policy objectives have been identified for the Downsview-Beaver Bank Designation:

Policy DB-1

A Downsview-Beaver Bank Designation shall be established as shown on Schedule 'A' - Generalized Future Land Use, that shall:

(a) encourage the creation of a visually attractive and viable retail power centre in Sackville;

(b) discourage new high density residential uses, other than within the Downsview Complex Zones and with the exception of a mixed use multiple unit development at 8 Walker Avenue and 732 Old Sackville Road as permitted by Development Agreement due to its proximity to the Halifax Transit Sackville Terminal (RC-Jul 21/15;E-Sep 12/15);

(c) discourage small scale retail and commercial uses within the Large Scale Commercial Zone;

(d) encourage the restoration of the Downsview Shopping Centre and Plaza to re-instill it as an important and viable community commercial centre;

(e) improve vehicular movement;

(f) create a recognizable entry into Sackville Drive;

(g) improve the visible and physical connection to the Little Sackville River; and

(h) improve the quality and image of the streetscape.

5.2.1 Develop a Large Format Retail Power Centre

Within the Downsview-Beaver Bank district, Sackville's only shopping centre and most of big box retail uses such as Kent Home Building, WalMart, Sobeys, Super Store, Blockbuster, and Canadian Tire can be found. In general terms, these stores are large-format stores that typically range in size from 20,000 to more than 80,000 square feet. The definition of "big" is relative, however, and must be related to the product category in question. For instance, a large format supermarket/grocery sector would normally be in the 50,000 to 100,000 square foot range. For warehouse operations, such as Kent or Home Depot, a large format store would normally contain 100,000 square feet. In contrast, for book retailers, 25,000 to 50,000 square feet would qualify as a big-box operation. For other specialty retail categories, for example, eye glasses, a 5,000 square-foot store would qualify as a large format store. The key point is that "large format" stores are several times the size of traditional outlets in their category.

Although conventional wisdom dictates that "large-format" commercialism creates a lose-lose outcome to the community in that such uses tend to "squeeze" out the small retail market, this is not always the case. In fact, large-format stores are integral to the viability of Sackville Drive, and Sackville overall. These stores have broad market appeal drawing on both local and non-local consumer markets, which tend to spillover into the smaller retail uses, benefiting the entire street.

The long term viability of the large-format stores depends significantly on grouping the uses together, and ensuring they are within proximity to the regional transportation system in areas of high visibility and high traffic counts. Therefore, given the amount of vacant, highly visible, serviced commercial land near the interchange, the existing cluster of big box uses in this area, and the growing demand for new big box development, the creation of a "largeformat power centre" shall be encouraged in this area of Sackville.

Policy I-14

Notwithstanding the foregoing policies, any proposed major and minor amendment to a development agreement approved before May 7, 2002, shall be considered by Council. In considering amendments Council shall have regard to the following matters:

(a) the proposal furthers the intent of the streetscape guidelines established within the Land Use By-law relating to signage, architecture, landscaping, parking and driveway entrances;

(b) that the proposal is not premature or inappropriate by reason of:
- (i) the financial capability of the Municipality to absorb any costs relating to the development;
- (ii) the adequacy of sewer and water services;
- (iii) the adequacy or proximity of school, recreation and other community facilities;
- (iv) the adequacy of road networks leading or next to, or within the development; and
- (v) the potential for damage to or for destruction of designated historic buildings and sites.

(c) that controls are placed on the proposed development to reduce conflict with any adjacent or nearby land uses by reason of:
- (i) type of use;
- (ii) height, bulk and lot coverage of any proposed building;
- (iii) traffic generation, access to and egress from the site, and parking;
- (iv) open storage;
- (v) maintenance; and
- (vi) any other relevant matter of planning concern.

Ref. No. 131-20629

October 8, 2015

Ms. Thea Langille
Major Projects Planner
HRM Community Development
PO Box 1749
HALIFAX NS B3J 3A5

RE: Addendum - Traffic Impact Study, Proposed Kent Building Supplies Expansion Sackville Drive, Lower Sackville, NS

Dear Ms. Langille:

Kent Building Supplies are planning for the redevelopment of the existing commercial site at 874 Sackville Drive. This is an addendum to the Traffic Impact Study[1] prepared by WSP (then GENIVAR) in November 2013 for the proposed development. The Addendum has been prepared to consider a proposed change to the access configuration that will permit vehicles to enter the site at the south site driveway (right turns only), which was previously proposed to accommodate exiting vehicles only. The driveway will be modified from 'right-out' to 'right-in / right-out'.

Proposed Development- The proposed development, which includes addition of 14,773 sq. ft. of commercial floor space to the existing 39,690 sq. ft. Kent Building Supplies store, remains as proposed in the *2013 Traffic Impact Study*.

Proposed Access Changes- An updated site plan showing the proposed access configuration is shown in Figure 1. The north site driveway remains full access as originally proposed. The south driveway – previously a 'right-out' exit – has been modified to permit southbound right turning traffic to enter the site. The proposed change will be expected to shift some of the southbound traffic entering the site from the north driveway to the south driveway; however, will have no effect on traffic entering the site from the south or exiting the site in either direction.

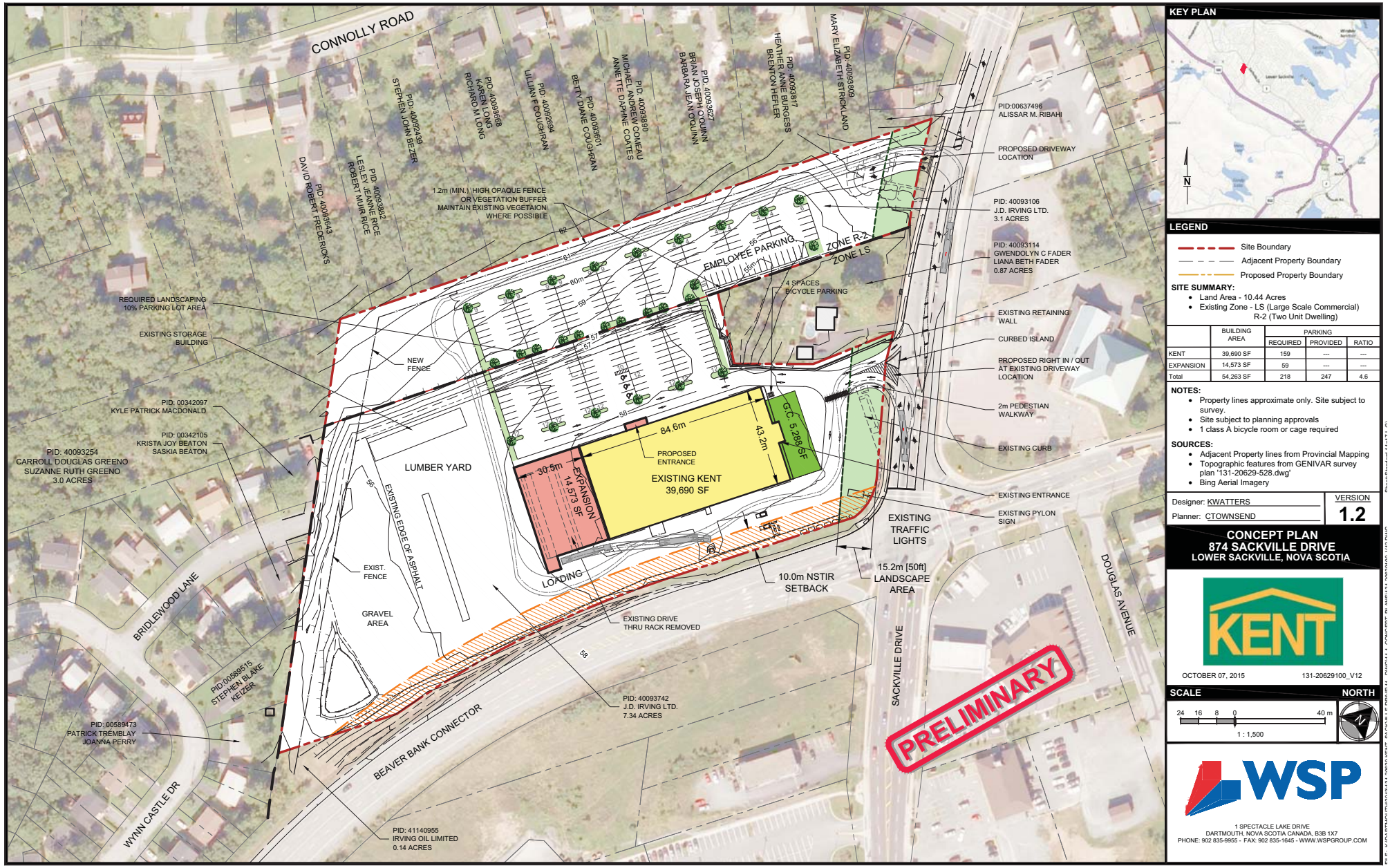
Conclusions and Recommendations –

1. The access revisions proposed for planned expansion of the Kent Building Supplies location at 874 Sackville Drive are not expected to result in any significant impacts to the site or street network in the Study Area. As a result, the recommendations and conclusions provided in the *2013 Traffic Impact Study* remain valid.

2. It is recommended that appropriate turn restriction signage be installed on Sackville Drive to prohibit access to vehicles from the south and on the site driveway approach to permit only right turn movements from the driveway.

[1] *Traffic Impact Study: Proposed Kent Building Supplies Expansion* (GENIVAR, 2013)

1 Spectacle Lake Drive, Dartmouth, Nova Scotia, Canada B3B 1X7
Telephone: 902-835-9955 ~ Fax: 902-835-1645 ~ www.wspgroup.com



KEY PLAN

LEGEND

- Site Boundary
- Adjacent Property Boundary
- Proposed Property Boundary

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874 SACKVILLE DRIVE
LOWER SACKVILLE, NOVA SCOTIA

OCTOBER 07, 2015 131-20629100_V12

SCALE 24 16 8 0 40 m
1 : 1,500

NORTH

WSP
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PHONE: 902 835-9955 - FAX: 902 835-1645 - WWW.WSPGROUP.COM

Figure 1: Site Plan

If you have any questions or comments, please contact me by email at mike.connors@wspgroup.com or by telephone at 835-9955.

Sincerely:

Original Signed

Mike Connors, P. Eng.
Traffic Engineer
WSP Canada Inc.

GENIVAR

Traffic Impact Study –

Proposed
Kent Building Supplies Expansion

Sackville Drive
Lower Sackville, NS

Presented To:
Kent Building Supplies

November 2013

Project No. 131-20629

www.genivar.com

Table of Contents

Prepared by:
Ken O'Brien, PEng
Greg O'Brien, PEng
Mike Connors, PEng

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1 Spectacle Lake Drive
DARTMOUTH NS B3B 1X7

Phone (902) 835-9955
Fax (902) 835-1645
Email greg.obrien@genivar.com

1.0 Introduction

Background

Kent Building Supplies propose redevelopment of the existing site at 874 Sackville Drive. The project (Figure 1) includes expansion of the existing building, changing the existing driveway to allow right-out movements only, and construction of a new full movement driveway on Sackville Drive approximately 90 metres west of the existing driveway. The project is expected to be completed during 2014.

GENIVAR Inc. has been retained to complete a Traffic Impact Study for the proposed development to satisfy the requirements of Halifax Regional Municipality.

A Traffic Impact Study Usually Considers Four Questions

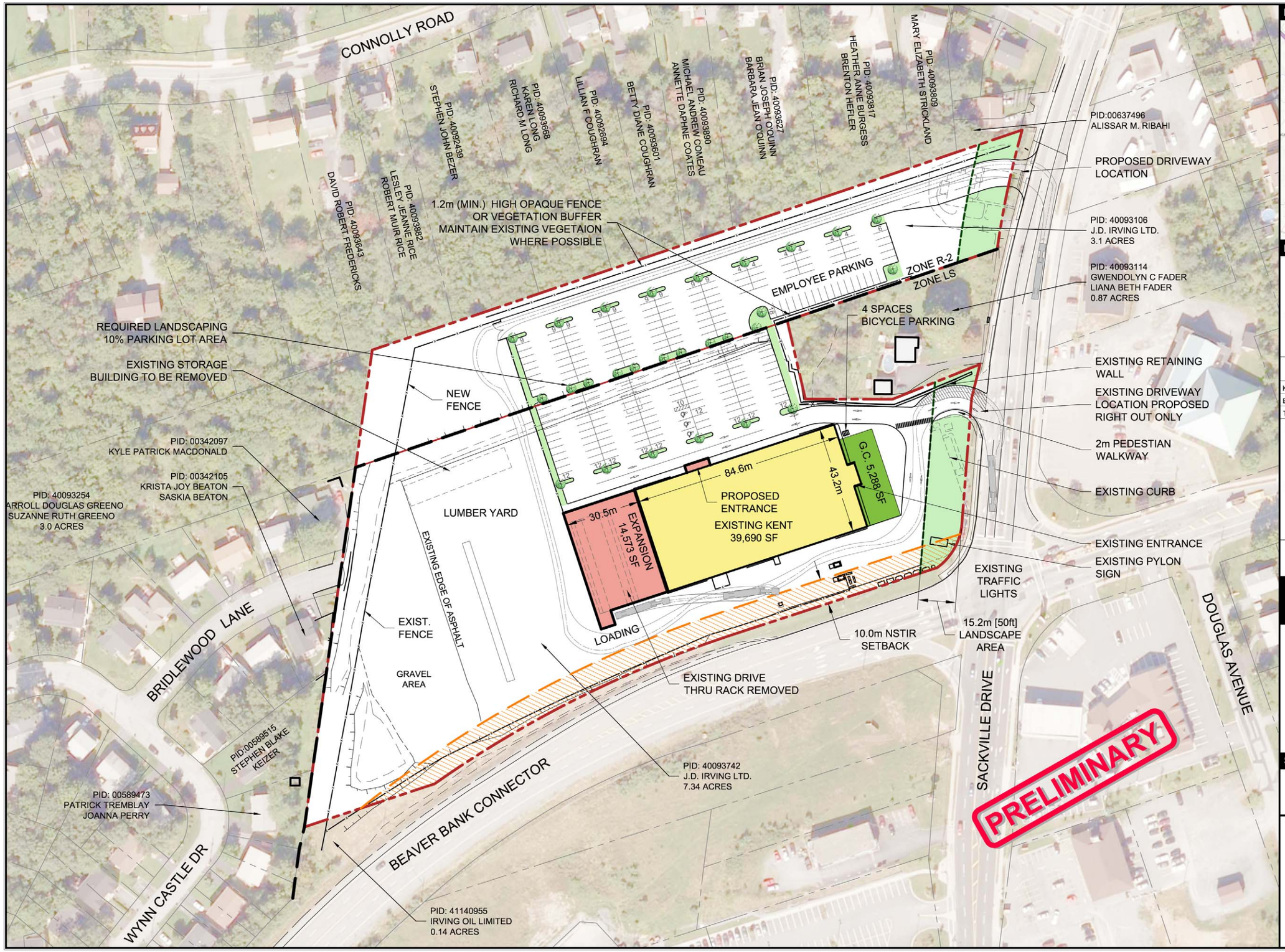
A Traffic Impact Study usually consists of determining answers for the following questions:

1. **What are the existing traffic situations** on the street adjacent to the study site?
2. **What traffic changes are expected** at Study Area intersections? How many vehicle trips will be generated by the proposed development during weekday peak hours? How will the traffic be distributed to Study Area streets and intersections?
3. **What traffic impacts will occur** on Study Area streets and intersections? How will level of service be affected?
4. **What road or intersection improvements are required** to mitigate project impacts on Study Area traffic movements?

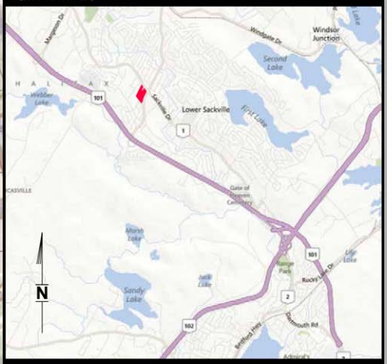
Study Objectives

The following are the objectives for completing a Traffic Impact Study for this development:

1. Obtain manual counts at the Kent Building Supply site driveway on Sackville Drive during AM and PM peak travel periods to assist in preparation of trip generation estimates for use in this Study.
2. Redistribute site driveway entering and exiting trips to the proposed right-out only and new full movement driveway on Sackville Drive.
3. Use available June 2012 AM and PM peak hour turning movement volumes at the Sackville Drive / Beaver Bank Road intersection.
4. Use an appropriate annual growth rate to project 2014 AM and PM peak hour background volumes at site driveways and the Sackville Drive / Beaver Bank Road intersection.
5. Use existing site generated trips from the newly acquired driveway count to estimate AM and PM peak hour trips for the proposed expansion to the existing building.
6. Distribute and assign site generated trips to site driveways and the Sackville Drive / Beaver Bank Road intersection and add them to projected 2014 background volumes to provide projected 2014 peak hour volumes at Study Area intersections.
7. Evaluate the performance of the Study Area intersections using Synchro 8.0.
8. Recommend improvements that may be needed to mitigate impacts of site generated traffic.



KEY PLAN



LEGEND

- Site Boundary
- Adjacent Property Boundary
- Proposed Property Boundary

SITE SUMMARY:

- Land Area - 10.44 Acres
- Existing Zone - LS (Large Scale Commercial)
  R-2 (Two Unit Dwelling)

	BUILDING AREA	PARKING		
		REQUIRED	PROVIDED	RATIO
KENT	39,690 SF	159	---	---
EXPANSION	14,573 SF	59	---	---
Total	54,263 SF	218	247	4.6

NOTES:

- Property lines approximate only. Site subject to survey.
- Site subject to planning approvals
- 1 class A bicycle room or cage required

SOURCES:

- Adjacent Property lines from Provincial Mapping
- Topographic features from GENIVAR survey plan '131-20629-528.dwg'
- Bing Aerial Imagery

Designer: KWATTERS
Planner: CTOWNSEND

VERSION 1.0

CONCEPT PLAN
874 SACKVILLE DRIVE
LOWER SACKVILLE, NOVA SCOTIA

KENT

AUGUST 30, 2013 131-20629100_V10

SCALE 1 : 1,500 (24 16 8 0 40 m) NORTH

GENIVAR
1 SPECTACLE LAKE DRIVE
DARTMOUTH, NOVA SCOTIA
CANADA, B3B 1X7
PHONE: 902 835-9955 ~ FAX: 902 835-1645
WWW.GENIVAR.COM

FILE: K:\DARTMOUTH\2013\131-20629 KENT_SACKVILLE DRIVE\11_ DWG\11.1_CONCEPT_PLANS\131-20629100_V10.DWG Sheet:Standard 11x17 L (2)

2.0 Descriptions of Proposed Development and Study Area

Description of Development and Site Accesses - The proposed development as illustrated in the concept plan (Figure 1) will include construction of a 14,573 square foot addition to the existing 39,690 square foot (SF) Building Supply Store.

Two driveways are proposed:
1. Reconstruct the existing full movement site driveway (Photos 1 and 2) on Sackville Drive 80 meters west of the Sackville Drive / Beaver Bank Road intersection as a right-out only exit driveway.
2. Construct a new full movement driveway near the western site boundary (Photos 3 and 4) approximately 90 meters west of the right-out driveway and 60 meters east of the Connelly Road intersection.

Visibility is good for Sackville Drive approaches to both driveway locations as illustrated in Photos 1 to 4.

Description of Sackville Drive- Sackville Drive is a collector street with curb, gutter and sidewalks on both sides. The street has three travel lanes adjacent to the site frontage with a designated eastbound left turn lane for Beaver Bank Road towards the east end of the site and a designated westbound left turn lane for Connelly Road just west of the site. The center lane on Sackville Drive becomes a two-way left turn lane west of the Connelly Road intersection. The span wire suspended TWO WAY LEFT TURN sign is visible in the center of Photo 1.

Photo 1 - Looking west on Sackville Drive towards the proposed new driveway from the existing Kent site driveway. Note the beginning of the eastbound left turn lane to the right of the photo and the westbound left turn lane at the top of the photo.

Photo 2 - Looking east on Sackville Drive from the existing Kent driveway towards the Beaver Bank Road intersection.

Photo 3 - Looking west on Sackville Drive from the proposed new full movement site driveway. The westbound left turn lane for Connelly Road is in the center of the photo.

Photo 4 - Looking east on Sackville Drive towards the existing Kent site driveway and Beaver Bank Road from the proposed new site driveway. The transition from eastbound to westbound left turn lanes is visible in the lower left of the photo.

Manual Turning Movement Counts

A manual turning movement count, obtained during AM and PM peak periods at the existing site driveway on Sackville Drive on Thursday, August 15, 2013, is tabulated in Table A-1, Appendix A. A turning movement count obtained by HRM Traffic & Right of Way section on Wednesday, June 6, 2012, is tabulated in Table A-2.

Estimation of 2014 Background Peak Hourly Volumes

An annual growth rate of 1.0% has been assumed to be appropriate for this section of Sackville Drive. The AM and PM peak hourly volumes at the two counted intersections (Tables A-1 and A-2) have been used to provide projected 2014 peak hour volumes for the Study Area intersections. Traffic volumes entering and exiting the Kent site have been redistributed to the proposed driveway configuration and projected 2014 AM and PM peak hourly volumes are illustrated diagrammatically on Figure A-1.

3.0 Trip Generation, Trip Distribution and Assignment

Trip Generation Calculations for the Expanded Building

The manual count obtained at the existing Kent site driveway on Thursday, August 15, 2013, (Table A-1, Appendix A) provided the following trip generation data for theexisting 39,690 square foot building:

- AM Peak Hour 65 vehicles entering and 51 vehicles exiting
- PM Peak Hour 66 vehicles entering and 81 vehicles exiting.

Based on the trip rates for the existing building, it is estimated (Table 1) that the 14,573 square foot expansion will generate the following additional trips:

- AM Peak Hour 24 vehicles entering and 19 vehicles exiting
- PM Peak Hour 24 vehicles entering and 30 vehicles exiting.

The redeveloped site is estimated to generate the following trips:

- AM Peak Hour 89 vehicles entering and 70 vehicles exiting
- PM Peak Hour 90 vehicles entering and 111vehicles exiting.

Table 1 - Trip Generation Estimates for the Proposed Redeveloped Site

Trip Generation Scenarios	Units [1]	Trips Generated [2]			
		AM Peak		PM Peak	
		In	Out	In	Out
Trips Generated by Existing Kent (Counted Thursday, August 15, 2012)	39.690 KGLA	65	51	66	81
Estimated Trips Generated by Expansion (Based on Trip Rates for Existing Store)	14.573 KGFA	24	19	24	30
Total Estimated Trips Generated by the Expanded Building	54.263 KGFA	89	70	90	111

NOTES: 1. KGFA is 'Gross Floor Area x 1000square feet'. These are the sizes of the existing building, proposed expansion, and total expanded building, respectively.
2. Trips generated are 'vehicles per hour' for AM and PM peak hours

Distribution and Assignment of Trips Generated by the Proposed Expansion

Trips generated by the proposed expansion have been distributed to the site driveways and Sackville Drive / Beaver Bank Road intersection in accordance with projected 2014 background traffic patterns. Assigned trips generated by the expansion are illustrated diagrammatically in Figure A-2, Appendix A.

Trips generated by the expansion have ben added to projected 2014 background volumes to provide projected 2014 AM and PM peak hourly volumes that include the estimated trips generated by the expansion which are illustrated diagrammatically in Figure A-3.

4.0 Intersection Performance Analysis

Intersection Level of Service Analysis

The level or quality of performance of an intersection in terms of traffic movement is determined by a level of service (LOS) analysis. LOS for intersections is defined in terms of delay, which is a measure of driver discomfort and frustration, fuel consumption, and increased travel time. LOS criteria (Table 2) are stated in terms of average control delay per vehicle which includes initial deceleration delay, queue move-up time, stopped delay, and final acceleration delay.

Table 2 - Level of Service (LOS) Criteria for Intersections

LOS	Signalized Intersections Control Delay (seconds per vehicle)	LOS Description
A	less than 10.0	Very low delay; most vehicles do not stop **(Excellent)**
B	between 10.0 and 20.0	Higher delay; more vehicles stop **(Very Good)**
C	between 20.0 and 35.0	Higher level of congestion; numberof vehicles stopping issignificant, although many still pass through intersection without stopping **(Good)**
D	between 35.0 and 55.0	Congestion becomes noticeable; vehicles must sometimes wait through more than one red light; many vehicles stop **(Satisfactory)**
E	between 55.0 and 80.0	Vehicles must often wait through more than one red light; considered by many agencies to be the limit of **acceptable** delay
F	greater than 80.0	This level is considered to be unacceptable to most drivers; occurs when arrival flow rates exceed the capacity of the intersection **(Unacceptable)**

Intersection Level of Service Analysis

Synchro 8.0 software has been used for performance evaluation of projected 2014 AM and PM peak hour volumes at the Sackville Drive / Beaver Bank Road intersection, both without and with addition of site trips that are estimated to be generated by the proposed expansion to the Kent building. Analysis sheets are included on Pages A-6 to A-9, Appendix A, and the results are summarized in Table 4.

The LOS analyses used existing signal phasing and timing for the projected 2014 background volumes and the AM peak hourly volumes that include trips from the expansion. However, the signal timing was adjusted for the PM peak with expansion scenario by shifting some time from the north/south left turn phases to the east-west phases to brings the v/c ratios back to more acceptable levels.

HRM Critical Limits for Intersection Performance Evaluation.

The HRM *Guidelines for Preparation of Transportation Impact Studies* indicates the following critical limits for intersection evaluation:

1. the v/c ratio of an intersection exceeds 0.85;
2. the v/c ratio of an individual though movement or shared through/ turning movement exceeds 0.85;
3. the v/c ratio of an exclusive turning movement exceeds 1.0;
4. an exclusive turning movement generates queues which exceedthe available turning lane storage space.

Summary Level of Service Analysis

Level of service (LOS) analyses for projected 2014 volumes at the Sackville Drive / Beaver Bank Road intersection indicate:

- Volume / capacity ratios are within HRM critical limits for AM peak hour analyses, both without and with added trips from the expansion of the building.
- The westbound through lane has a v/c ratio of 1.0 for the PM peak hour analysis without added site trips.
- After adjusting the signal timing to provide more time for the east/west movements, the v/c ratio for the westbound through lane has been improved slightly to 0.98 for volumes that included added site trips.
- The added site generated trips do not have any noticeable impact to the level of performance of the Sackville Drive / Beaver Bank Road intersection.

Table 4 - LOS for Sackville Drive / Beaver Bank Road Intersection

LOS Criteria	Control Delay (sec/veh), LOS, v/c Ratio, and 95% Queue (m) by Intersection Movement											Intersection LOS
	EB-L	EB-T	EB-R	WB-L	WB-T	WB-R	NB-L	NB-T	NB-R	SB-L	SB-TR	
AM Peak Hour - Projected 2014 Background Volumes - Existing Traffic Control (Page A-6)												
Delay	18.7	48.4	5.8	25.2	32.6	3.9	23.0	28.1	6.2	18.5	40.2	29.6
v/c	0.30	0.82	0.43	0.58	0.42	0.18	0.48	0.21	0.24	0.32	0.83	-
Queue	31.4	117.4	18.3	38.1	58.9	7.6	25.6	28.2	13.5	36.4	114.6	-
AM Peak Hour - Projected 2014 Volumes with Expanded Site - Existing Traffic Control (Page A-8)												
Delay	18.9	48.8	5.8	25.5	32.8	3.9	23.5	28.2	6.2	18.6	40.7	29.9
v/c	0.32	0.83	0.43	0.59	0.43	0.18	0.49	0.21	0.24	0.32	0.84	-
Queue	32.5	118.9	18.2	38.1	60.4	7.6	25.7	28.2	13.5	36.4	115.7	-
PM Peak Hour - Projected 2014 Background Volumes - Existing Traffic Control (Page A-7)												
Delay	87.0	43.9	5.2	26.0	75.1	13.5	53.2	43.1	10.0	28.9	50.6	45.0
v/c	0.98	0.74	0.30	0.55	1.00	0.56	0.89	0.65	0.31	0.53	0.83	-
Queue	95.5	157.8	16.7	40.3	255.8	58.5	122.7	94.8	22.1	41.6	76.5	-
PM Peak Hour - Projected 2014 Volumes with Site Expansion - Modified Signal Timing (Page A-9)												
Delay	78.1	40.4	4.6	23.2	70.6	12.3	67.0	46.9	10.8	32.5	52.5	45.6
v/c	0.95	0.70	0.29	0.52	0.98	0.55	0.95	0.68	0.32	0.57	0.85	-
Queue	94.5	151.2	15.8	37.1	247.9	54.2	143.4	98.3	23.0	44.9	77.2	-

5.0 Summary, Recommendations and Conclusions

Description of the Proposed Development

1. The project includes construction of a 14,573 square foot addition to the existing 39,690 square foot (SF) Kent Building Supplies Store at the corner of Sackville Drive and Beaver Bank Road. The project is expected to be completed during 2014.

Proposed Site Access

2. The proposed site access includes changing the existing driveway to allow right-out movements only, and construction of a new full movement driveway on Sackville Drive approximately 90 metres west of the existing driveway.

Description of Sackville Drive

3. Sackville Drive is a collector street with curb, gutter and sidewalks on both sides. The street has three travel lanes adjacent to the site frontage with a designated eastbound left turn lane for Beaver Bank Road towards the east end of the site and a designated westbound left turn lane for Connelly Road just west of the site. The center lane on Sackville Drive becomes a two-way left turn lane west of the Connelly Road intersection.

Existing Traffic Volumes

4. A manual turning movement count was obtained during AM and PM peak periods at the existing site driveway on Sackville Drive on Thursday, August 15, 2013. A turning movement count obtained by HRM Traffic & Right of Way section at the Sackville Drive / Beaver Bank Road intersection on Wednesday, June 6, 2012, has also been used in this Study.

Projected 2014 Background Volumes

5. Projected 2014 AM and PM peak hourly background volumes have been produced using the 2012 and 2013 manual counts with a 1.0% annual volume growth rate which is considered appropriate for this location. Existing traffic volumes entering and exiting the Kent site have been redistributed to the proposed driveway configuration.

Trip Generation Estimates for the Proposed Development

6. It is estimated that the 14,573 square foot expansion will generate the following additional trips:
   - AM Peak Hour 24 vehicles entering and 19 vehicles exiting
   - PM Peak Hour 24 vehicles entering and 30 vehicles exiting.

Summary Level of Service Analysis

7. Level of service (LOS) analyses for projected 2014 volumes at the Sackville Drive / Beaver Bank Road intersection indicate:
   - Volume / capacity ratios are within HRM critical limits for AM peak hour analyses, both without and with added trips from the expansion of the building.
   - The westbound through lane has a v/c ratio of 1.0 for the PM peak hour analysis without added site trips.
   - After adjusting the signal timing to provide more time for the east/west movements, the v/c ratio for the westbound through lane has been improved slightly to 0.98 for volumes that included added site trips.

Recommendations

8. The following infrastructure improvements are recommended:
   - Remark the approximately 150 meters section of the Sackville Drive center lane between the Beaver Bank Road intersection and the proposed new driveway to provide a westbound left turn lane for the new driveway.
   - Remove the spanwire suspended TWO WAY LEFT TURN sign that is now hanging over the designated westbound left t urn lane for Connelly Road.
   - Adjust the signal timing for the Beaver Bank Road traffic signals by shifting some time from the north/south left turn phases to the east-west phases to brings the v/c ratios back to more acceptable levels.

Conclusions

9. The following conclusions emanate from this Study:
   - The relocation of the site entrance approximately 90 meters west of the existing site entrance will improve performance and safety for Sackville Drive westbound traffic as vehicles turning left from Sackville Drive will no longer nee d to stop in a westbound through lane and attempt to cross three opposing eastbound lanes to enter the site.
   - The low number of added site generated trips will not have any noticeable impact to the level of performance of the Sackville Drive / Beaver Bank Road intersection.
   - While all analyses for this study have considere d the existing street network, completion of a road connection that HRM is currently designing and plans to construct wit hin the next few years from the Margeson Drive interchange south to Lucasville Road is anticipated to reduce through vol umes past the site which will improve the operation of the Sackville Drive / Beaver Bank Road intersection.

Appendix A

Turning Movement Counts

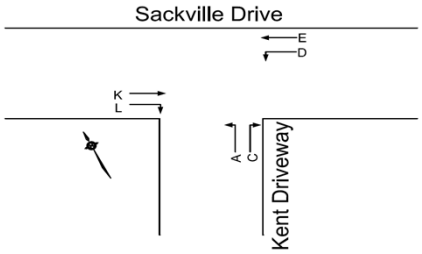
Traffic Volume Diagrams

Level of Service Analysis

Table A-1

Sackville Drive
@
Kent Building Supplies Driveway

Sackville, Nova Scotia
Thursday, August 15, 2013

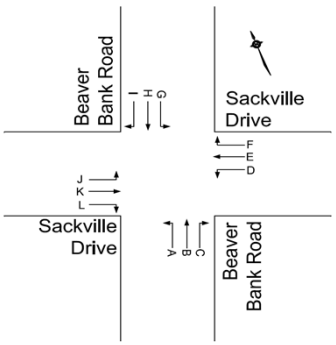


Time		Kent Driveway Northbound Approach		Sackville Drive Westbound Approach		Sackville Drive Eastbound Approach		Total Vehicles
		A	C	D	E	K	L	
07:00	07:15	5	12	65	9	182	16	289
07:15	07:30	3	6	7	71	187	5	279
07:30	07:45	2	8	8	93	202	9	322
07:45	08:00	5	9	9	79	139	7	248
08:00	08:15	3	11	7	72	151	6	250
08:15	08:30	3	10	14	92	197	5	321
08:30	08:45	0	12	9	55	117	4	197
08:45	09:00	1	7	3	83	118	4	216
AM Peak Hour		**13**	**38**	**38**	**336**	**689**	**27**	**1141**
15:45	16:00	5	17	12	189	133	5	361
16:00	16:15	5	10	10	187	149	6	367
16:15	16:30	6	14	7	208	155	5	395
16:30	16:45	5	17	14	385	262	9	692
16:45	17:00	7	19	17	371	267	5	686
17:00	17:15	8	17	9	279	163	5	481
17:15	17:30	0	8	7	211	177	0	403
17:30	17:45	3	12	3	24	23	3	68
PM Peak Hour		**20**	**61**	**47**	**1246**	**869**	**19**	**2262**

Table A-2

Sackville Drive
@
Beaver Bank Road

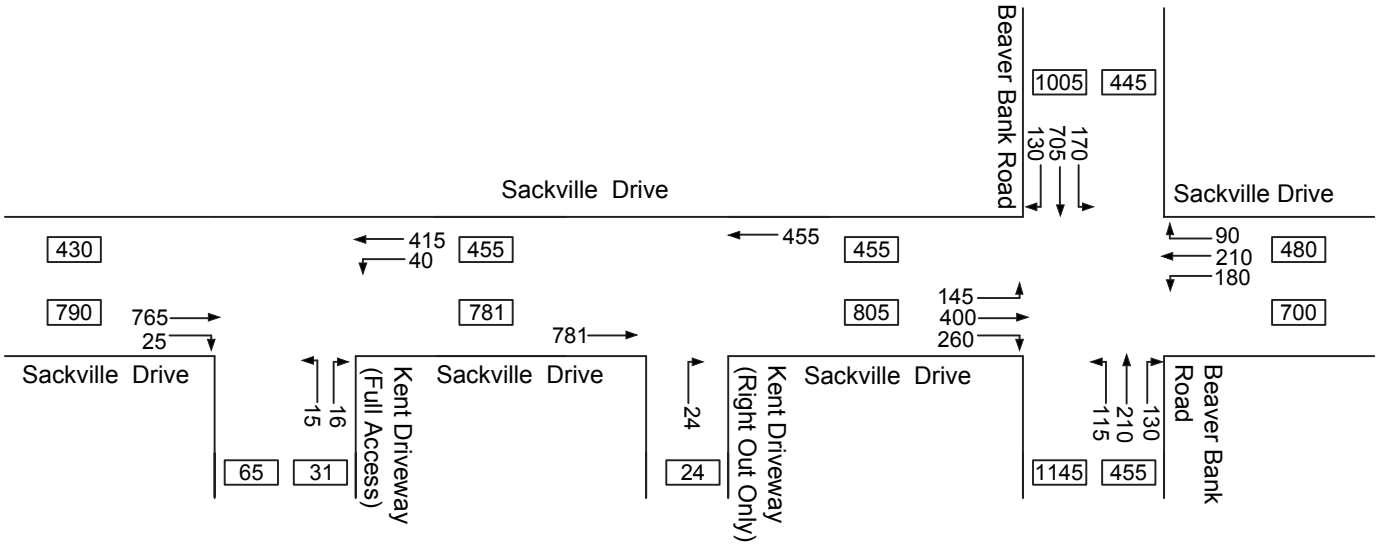
Sackville, Nova Scotia
Wednesday, June 6, 2012



Time		Beaver Bank Road Northbound Approach			Sackville Drive Westbound Approach			Beaver Bank Road Southbound Approach			Sackville Drive Eastbound Approach			Total Vehicle
		A	B	C	D	E	F	G	H	I	J	K	L	s
07:30	07:45	35	59	28	47	70	17	31	182	39	41	97	82	728
07:45	08:00	34	53	28	36	64	24	49	168	35	39	104	65	699
08:00	08:15	33	48	34	51	66	21	45	166	44	46	98	77	729
08:15	08:30	32	46	37	44	67	25	41	175	32	38	119	54	710
AM Peak Hour		**134**	**206**	**127**	**178**	**267**	**87**	**166**	**691**	**150**	**164**	**418**	**278**	**2866**
16:30	16:45	72	135	43	47	127	98	46	79	35	38	114	47	881
16:45	17:00	82	145	32	35	131	101	41	76	47	38	97	36	861
17:00	17:15	90	133	46	42	140	96	41	64	37	49	85	34	857
17:15	17:30	80	177	37	37	135	98	37	77	51	39	85	34	887
PM Peak Hour		**324**	**590**	**158**	**161**	**533**	**393**	**165**	**296**	**170**	**164**	**381**	**151**	**3486**

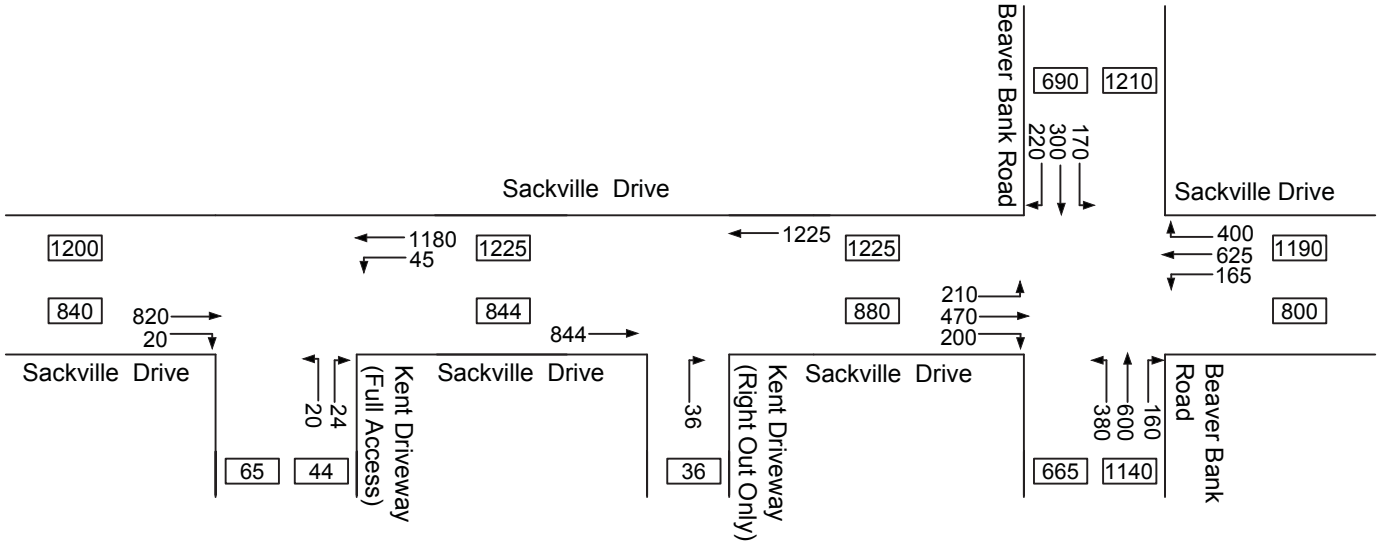
* Count provided by HRM Traffic & Right-of-Way Division

A
AM Peak Hour



NOT TO SCALE

B
PM Peak Hour



NOT TO SCALE

GENIVAR

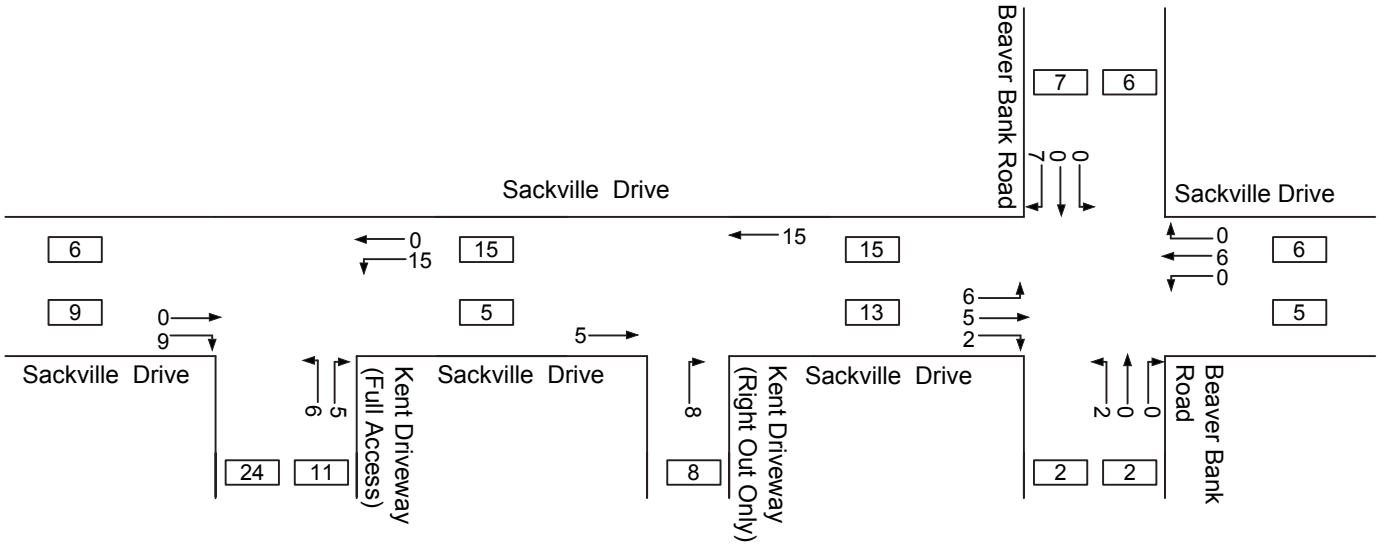
Traffic Impact Study - Proposed Commercial Development
Trunk 1 (Sackville Drive, Lower Sackville, NS)

Figure A-1

2014 Weekday AM and PM Peak Hour
Background Traffic (Revised Driveway Configuration)

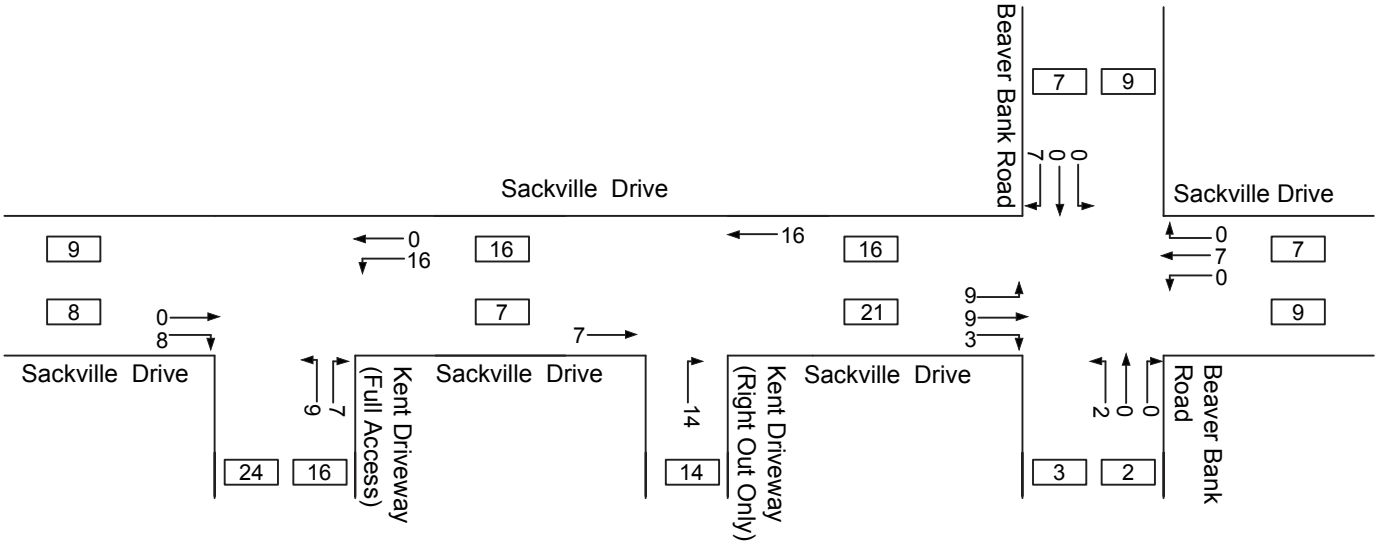
October 2013

A
AM Peak Hour



NOT TO SCALE

B
PM Peak Hour

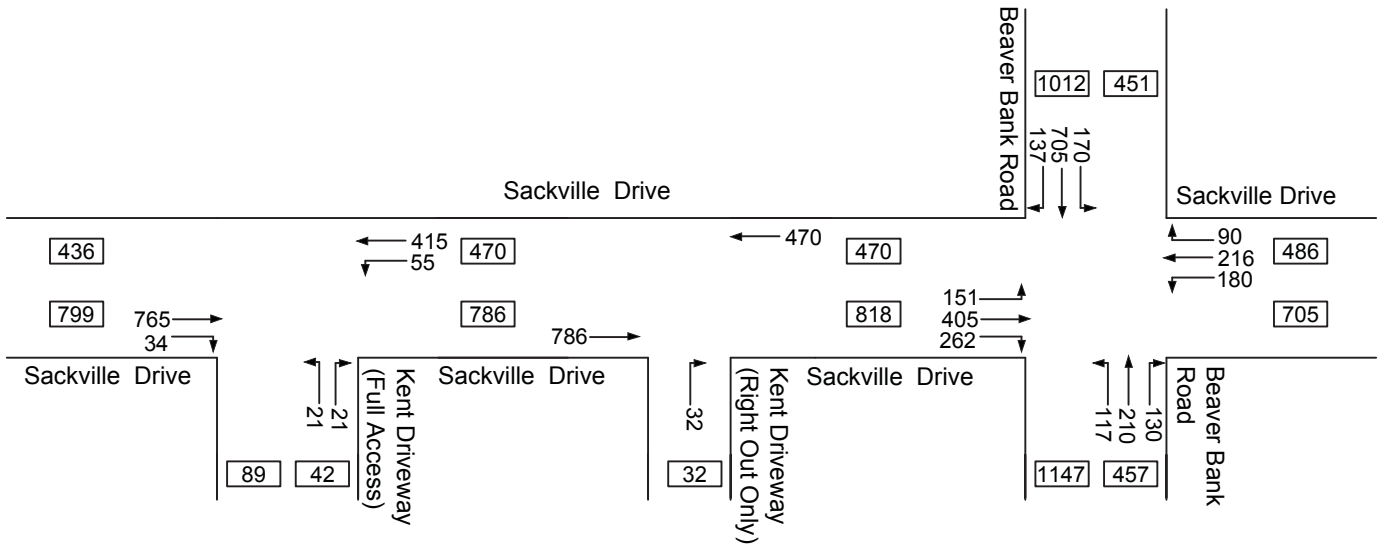


NOT TO SCALE

GENIVAR	Traffic Impact Study - Proposed Commercial Development Trunk 1 (Sackville Drive, Lower Sackville, NS)	Figure A-2
	Estimated Additional Site Generated Trips	October 2013

A

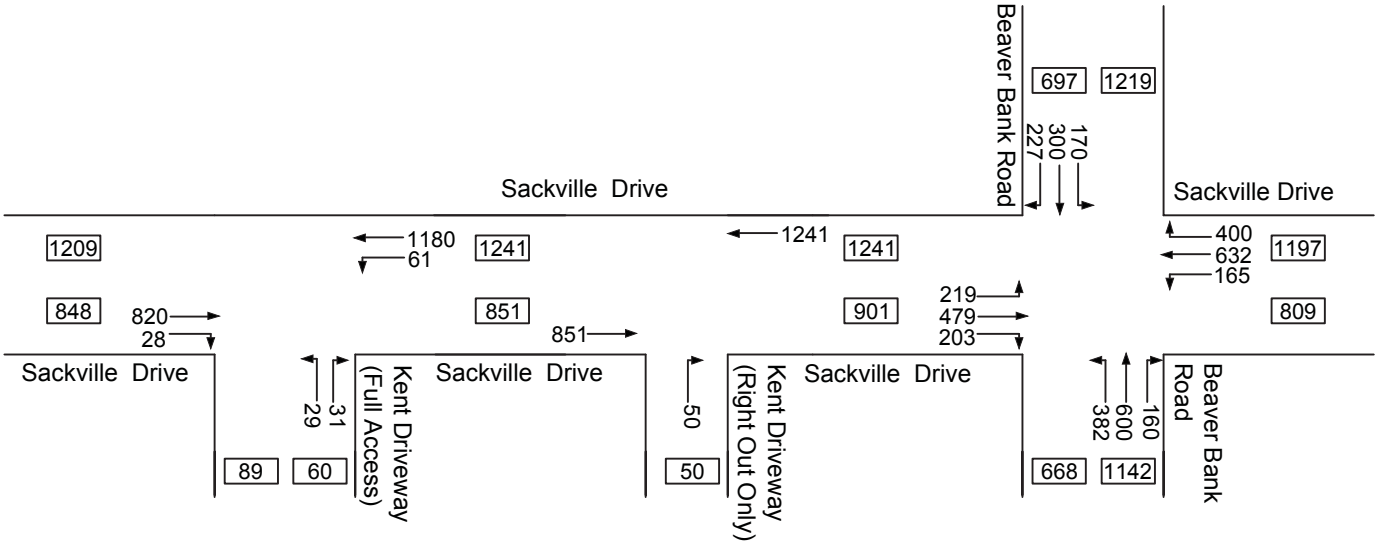
AM Peak Hour



NOT TO SCALE

B

PM Peak Hour



NOT TO SCALE

GENIVAR

Traffic Impact Study - Proposed Commercial Development
Trunk 1 (Sackville Drive, Lower Sackville, NS)

Figure A-3

2014 Weekday AM and PM Peak Hour
Background Traffic (Revised Driveway Configuration)
with Added Site Generated Trips

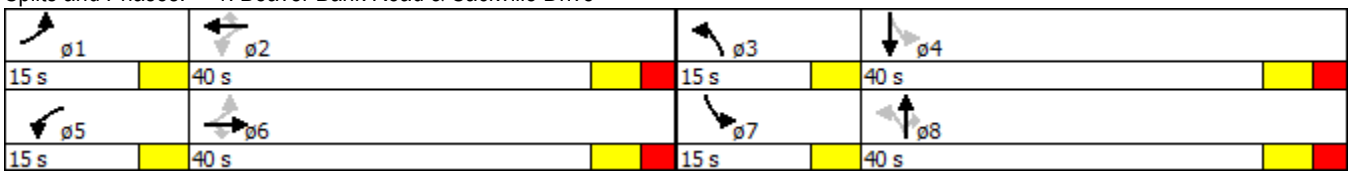
October 2013

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	145	400	260	180	210	90	115	210	130	170	705	130
Satd. Flow (prot)	1789	1883	1601	1789	1883	1601	1789	3579	1601	1789	3496	0
Flt Permitted	0.572			0.226			0.144			0.595		
Satd. Flow (perm)	1077	1883	1601	426	1883	1601	271	3579	1601	1121	3496	0
Satd. Flow (RTOR)			274			119			137		20	
Lane Group Flow (vph)	153	421	274	189	221	95	121	221	137	179	879	0
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	
Protected Phases	1	6		5	2		3	8		7	4	
Permitted Phases	6		6	2		2	8		8	4		
Total Split (s)	15.0	40.0	40.0	15.0	40.0	40.0	15.0	40.0	40.0	15.0	40.0	
Total Lost Time (s)	4.0	7.0	7.0	4.0	7.0	7.0	4.0	7.0	7.0	4.0	7.0	
Act Effct Green (s)	39.8	27.0	27.0	41.3	27.7	27.7	41.0	28.7	28.7	42.8	29.6	
Actuated g/C Ratio	0.40	0.27	0.27	0.42	0.28	0.28	0.41	0.29	0.29	0.43	0.30	
v/c Ratio	0.30	0.82	0.43	0.58	0.42	0.18	0.48	0.21	0.24	0.32	0.83	
Control Delay	18.7	48.4	5.8	25.2	32.6	3.9	23.0	28.1	6.2	18.5	40.2	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Delay	18.7	48.4	5.8	25.2	32.6	3.9	23.0	28.1	6.2	18.5	40.2	
LOS	B	D	A	C	C	A	C	C	A	B	D	
Approach Delay		29.3			24.4			20.6			36.5	
Approach LOS		C			C			C			D	
Queue Length 50th (m)	18.2	79.6	0.0	23.0	36.7	0.0	13.7	17.7	0.0	21.0	84.5	
Queue Length 95th (m)	31.4	117.4	18.3	38.1	58.9	7.6	25.6	28.2	13.5	36.4	114.6	
Internal Link Dist (m)		341.2			466.2			635.6			321.9	
Turn Bay Length (m)	85.0		85.0	75.0			65.0		50.0	50.0		
Base Capacity (vph)	530	641	726	336	641	624	290	1220	636	573	1204	
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	
Reduced v/c Ratio	0.29	0.66	0.38	0.56	0.34	0.15	0.42	0.18	0.22	0.31	0.73	

Intersection Summary

Cycle Length: 110
Actuated Cycle Length: 98.8
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.83
Intersection Signal Delay: 29.6 Intersection LOS: C
Intersection Capacity Utilization 79.4% ICU Level of Service D
Analysis Period (min) 15

Splits and Phases: 1: Beaver Bank Road & Sackville Drive



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	210	470	200	165	625	400	380	600	160	170	300	220
Satd. Flow (prot)	1789	1883	1601	1789	1883	1601	1789	3579	1601	1789	3350	0
Flt Permitted	0.091			0.236			0.164			0.411		
Satd. Flow (perm)	171	1883	1601	444	1883	1601	309	3579	1601	774	3350	0
Satd. Flow (RTOR)			211			291			142		124	
Lane Group Flow (vph)	221	495	211	174	658	421	400	632	168	179	548	0
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	
Protected Phases	1	6		5	2		3	8		7	4	
Permitted Phases	6		6	2		2	8		8	4		
Total Split (s)	15.0	50.0	50.0	15.0	50.0	50.0	35.0	40.0	40.0	25.0	30.0	
Total Lost Time (s)	4.0	7.0	7.0	4.0	7.0	7.0	4.0	7.0	7.0	4.0	7.0	
Act Effct Green (s)	58.1	44.0	44.0	56.4	43.2	43.2	53.7	33.5	33.5	36.5	20.4	
Actuated g/C Ratio	0.47	0.36	0.36	0.46	0.35	0.35	0.44	0.27	0.27	0.30	0.17	
v/c Ratio	0.98	0.74	0.30	0.55	1.00	0.56	0.89	0.65	0.31	0.53	0.83	
Control Delay	87.0	43.9	5.2	26.0	75.1	13.5	53.2	43.1	10.0	28.9	50.6	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Delay	87.0	43.9	5.2	26.0	75.1	13.5	53.2	43.1	10.0	28.9	50.6	
LOS	F	D	A	C	E	B	D	D	A	C	D	
Approach Delay		45.4			47.6			41.8			45.2	
Approach LOS		D			D			D			D	
Queue Length 50th (m)	~42.3	111.1	0.0	24.6	~177.4	24.2	75.9	70.8	4.7	26.4	54.5	
Queue Length 95th (m)	#95.5	157.8	16.7	40.3	#255.8	58.5	#122.7	94.8	22.1	41.6	76.5	
Internal Link Dist (m)		341.2			466.2			635.6			321.9	
Turn Bay Length (m)	85.0		85.0	75.0			65.0		50.0	50.0		
Base Capacity (vph)	225	673	708	327	661	751	509	1045	568	453	729	
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	
Reduced v/c Ratio	0.98	0.74	0.30	0.53	1.00	0.56	0.79	0.60	0.30	0.40	0.75	

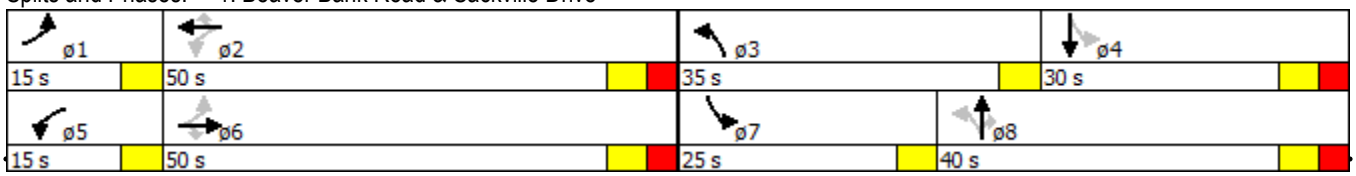
Intersection Summary

Cycle Length: 130
Actuated Cycle Length: 123
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 1.00
Intersection Signal Delay: 45.0 Intersection LOS: D
Intersection Capacity Utilization 99.3% ICU Level of Service F
Analysis Period (min) 15

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

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

Splits and Phases: 1: Beaver Bank Road & Sackville Drive

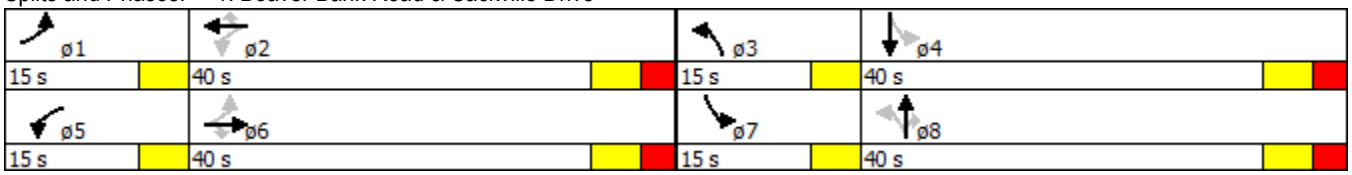


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	151	405	262	180	216	90	117	210	130	170	705	137
Satd. Flow (prot)	1789	1883	1601	1789	1883	1601	1789	3579	1601	1789	3493	0
Flt Permitted	0.560			0.222			0.139			0.597		
Satd. Flow (perm)	1055	1883	1601	418	1883	1601	262	3579	1601	1124	3493	0
Satd. Flow (RTOR)			276			119			137		21	
Lane Group Flow (vph)	159	426	276	189	227	95	123	221	137	179	886	0
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	
Protected Phases	1	6		5	2		3	8		7	4	
Permitted Phases	6		6	2		2	8		8	4		
Total Split (s)	15.0	40.0	40.0	15.0	40.0	40.0	15.0	40.0	40.0	15.0	40.0	
Total Lost Time (s)	4.0	7.0	7.0	4.0	7.0	7.0	4.0	7.0	7.0	4.0	7.0	
Act Effct Green (s)	40.2	27.3	27.3	41.5	27.9	27.9	41.2	28.9	28.9	42.9	29.7	
Actuated g/C Ratio	0.40	0.27	0.27	0.42	0.28	0.28	0.41	0.29	0.29	0.43	0.30	
v/c Ratio	0.32	0.83	0.43	0.59	0.43	0.18	0.49	0.21	0.24	0.32	0.84	
Control Delay	18.9	48.8	5.8	25.5	32.8	3.9	23.5	28.2	6.2	18.6	40.7	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Delay	18.9	48.8	5.8	25.5	32.8	3.9	23.5	28.2	6.2	18.6	40.7	
LOS	B	D	A	C	C	A	C	C	A	B	D	
Approach Delay		29.5			24.7			20.7			37.0	
Approach LOS		C			C			C			D	
Queue Length 50th (m)	19.0	80.9	0.0	23.1	37.9	0.0	14.1	17.9	0.0	21.2	86.3	
Queue Length 95th (m)	32.5	118.9	18.2	38.1	60.4	7.6	25.7	28.2	13.5	36.4	115.7	
Internal Link Dist (m)		341.2			466.2			635.6			321.9	
Turn Bay Length (m)	85.0		85.0	75.0			65.0		50.0	50.0		
Base Capacity (vph)	524	637	725	332	637	621	286	1212	633	573	1197	
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	
Reduced v/c Ratio	0.30	0.67	0.38	0.57	0.36	0.15	0.43	0.18	0.22	0.31	0.74	

Intersection Summary

Cycle Length: 110
Actuated Cycle Length: 99.3
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.84
Intersection Signal Delay: 29.9 Intersection LOS: C
Intersection Capacity Utilization 80.0% ICU Level of Service D
Analysis Period (min) 15

Splits and Phases: 1: Beaver Bank Road & Sackville Drive



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	219	479	203	165	632	400	382	600	160	170	300	227
Satd. Flow (prot)	1789	1883	1601	1789	1883	1601	1789	3579	1601	1789	3346	0
Flt Permitted	0.082			0.261			0.161			0.372		
Satd. Flow (perm)	154	1883	1601	492	1883	1601	303	3579	1601	701	3346	0
Satd. Flow (RTOR)			214			298			142		128	
Lane Group Flow (vph)	231	504	214	174	665	421	402	632	168	179	555	0
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	
Protected Phases	1	6		5	2		3	8		7	4	
Permitted Phases	6		6	2		2	8		8	4		
Total Split (s)	17.0	55.0	55.0	15.0	53.0	53.0	30.0	40.0	40.0	20.0	30.0	
Total Lost Time (s)	4.0	7.0	7.0	4.0	7.0	7.0	4.0	7.0	7.0	4.0	7.0	
Act Effct Green (s)	64.6	48.7	48.7	59.4	46.0	46.0	53.4	33.2	33.2	37.1	20.9	
Actuated g/C Ratio	0.51	0.38	0.38	0.47	0.36	0.36	0.42	0.26	0.26	0.29	0.16	
v/c Ratio	0.95	0.70	0.29	0.52	0.98	0.55	0.95	0.68	0.32	0.57	0.85	
Control Delay	78.1	40.4	4.6	23.2	70.6	12.3	67.0	46.9	10.8	32.5	52.5	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Delay	78.1	40.4	4.6	23.2	70.6	12.3	67.0	46.9	10.8	32.5	52.5	
LOS	E	D	A	C	E	B	E	D	B	C	D	
Approach Delay		41.5			44.6			48.6			47.6	
Approach LOS		D			D			D			D	
Queue Length 50th (m)	43.1	110.4	0.0	23.6	169.4	22.4	82.5	75.6	5.0	28.5	56.4	
Queue Length 95th (m)	#94.5	151.2	15.8	37.1	#247.9	54.2	#143.4	98.3	23.0	44.9	77.2	
Internal Link Dist (m)		341.2			466.2			635.6			321.9	
Turn Bay Length (m)	85.0		85.0	75.0			65.0		50.0	50.0		
Base Capacity (vph)	244	719	744	343	680	768	430	951	529	356	709	
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	
Reduced v/c Ratio	0.95	0.70	0.29	0.51	0.98	0.55	0.93	0.66	0.32	0.50	0.78	

Intersection Summary

Cycle Length: 130
Actuated Cycle Length: 127.5
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.98
Intersection Signal Delay: 45.6 Intersection LOS: D
Intersection Capacity Utilization 100.5% 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: Beaver Bank Road & Sackville Drive