Geotechnical Engineering

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Mineral Resource Impact Assessment

Proposed Residential Development
The Meadows - Phase 4
Greenbank Road - Ottawa

Prepared For

Tamarack (Nepean) Corporation

July 19, 2018

Report PG4242-3

Paterson Group Inc.
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The Base Mapping Co. Ltd. - Operation and Rehabilitation Plan - Costello Pit - Project No. C 419-90 - Page 2 of 2 - Revision 2 dated May 17, 1999

Appendix 2

Paterson Report PG3786-1 - Noise Attenuation Study - Dated July 19-2018.

IBI Group - Environmental Noise Impact Assessment Report - The Meadows in Half Moon Bay - Phase 4 - Report No. 12054-5.22 dated December 2018

IBI Group - Transportation Impact Assessment Report - The Meadows Phase 5 - Report No. 115637-3.0 dated April 5, 2018

1.0 Introduction

Paterson Group (Paterson) was commissioned by Tamarack (Nepean) Corporation to conduct a mineral resource impact assessment for Phase 4 of the proposed residential development at the aforementioned site and is required by Section 3.74 of the City of Ottawa Official Plan.

The objective of the current assessment was to evaluate the potential for land use impacts relating to land use compatibility between the proposed residential development and the adjacent mineral aggregate resource currently in operation.

Based on Section 2.5 of the Provincial Policy Statement 2014, mineral aggregate resources shall be protected from long term use and, where provincial information is available, deposits of mineral aggregate resources shall be identified.

2.0 Proposed Development

It is understood that the Phase 4 of the proposed residential development will consist of townhouses, residential dwellings with attached garages, associated driveways, local roadways and landscaping areas.It is further understood that the proposed development will be serviced by future municipal water, sanitary and storm services.

3.0 Location and Surface Conditions

The subject site is bordered to the north and west by treed areas followed by Cambrian Road and Borrisokane Road, respectively. The site is bordered to the east and south by the remaining phases of the proposed residential development and to the southwest by a mineral resource extraction operation owned by George W. Drummond Limited.

One section of the west portion of Phase 4 has been cleared and is possibly being used as a snow dump area. Various fill piles, as well as scattered construction debris are located within this section of the site.

4.0 Adjacent Sand and Gravel Pit

4.1 Status, Type and Location of Pit Operation

The sand and gravel pit, also known as the Costello Pit, to the south of the subject site is located at 3713 Borrisokane Road and is owned by George W. Drummond Limited. Details of the pit is provided below and attached to the current report. A series of historical aerial photographs have been attached to the present letter to provide an extraction history of the aggregate resource.

Costello Pit (George W. Drummond Limited)

The legal description of the pit is CON 3RF PT LOT 9 RP 5R-6254; PART 2 LESS RP 5R-13374 PTS; 9 & 10 RD WIDENING, PIN 045920035.

The site consists of approximately 79.5 acres with a frontage of approximately 310 m along Borrisokane Road. Based on the Ministry of Natural Resources and Forestry database, the following information has been provided for the pit:

- ❏ Site ID: 4074
- ❏ Approval Type: Class A Licence
- ❏ Operation Type: Pit
- ❏ Max. Annual Tonnage: 350,000
- ❏ Licenced Area: 22.3 ha
- ❏ Location Name: n/a

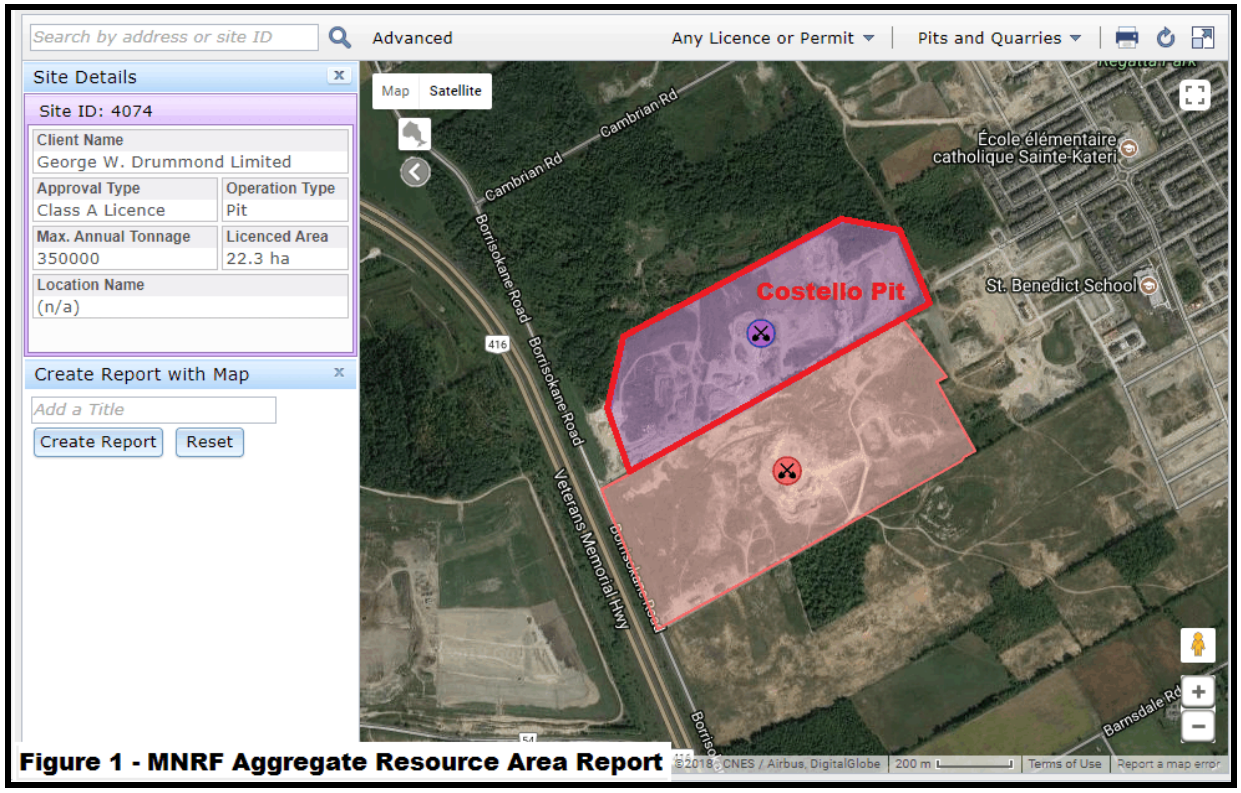

Figure 1 - MNRF Aggregate Resource Area Report

4.2 City of Ottawa Official Plan

The subject site is designated General Rural Area on Schedule A - 'Rural Policy Plan' of the City's Official Plan. The properties north and east of the subject site are designated as General Urban Area and to the west as General Rural Area on Schedule A of the Official Plan. The property south of the subject site is designated Sand and Gravel Resource Area on Schedule A of the Official Plan. It should be noted that an Urban Expansion Study Area has also been designated to the south of the subject site. See Figure 1 below for the extract of the City's Official Plan - Schedule A.

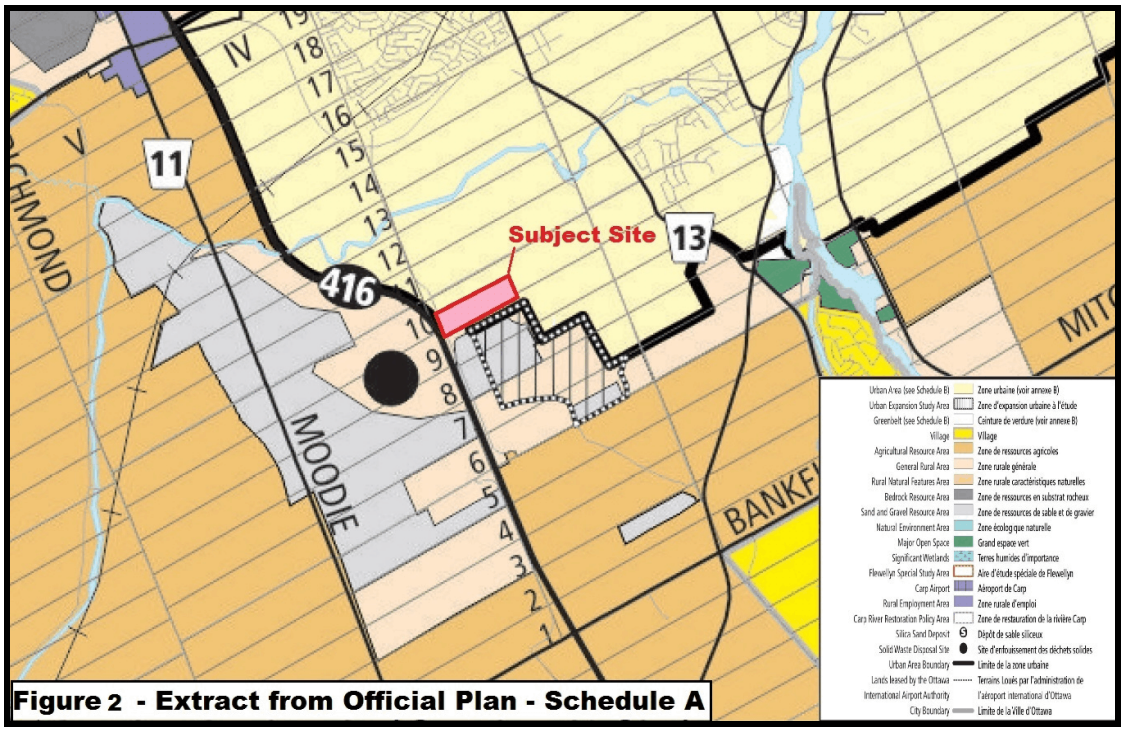

Figure 2 - Extract from Official Plan - Schedule A

Given the subject sites proximity to a designated Sand and Gravel Resource Area on Schedule A of the City's Official Plan, the proposed residential development is required to adhere to restrictions outlined in Policies 10, 11, 12 and 13 of Section 3.7.4 of the City's Official Plan - Development Restriction on Adjacent Lands listed below.

***Policy 10**:*
Limited types of new development may be approved within 500 metres of a Bedrock Resource Area or within 300 metres of a Sand and Gravel Resource Area, provided such development does not conflict with future mineral aggregate extraction.

Policy 11:
Where there is an existing licensed pit or quarry, development may be approved within the area of potential impact, referenced in policy 10, where an impact assessment study is completed and demonstrates that the mineral aggregate operation, including future expansion in depth or extent, will not be affected by the development.

***Policy 12**:*
The Ministry of Natural Resources will be consulted in review of studies necessary.

***Policy 13**:*
Where the City approves the development of land in accordance with policies above, the City may impose conditions to ensure the development provides adequate buffering and/or separation between the new proposed use and the mineral aggregate area/operation.

4.3 Provincial Standards - Aggregate Resources of Ontario

The existing sand and gravel pit south of the subject site is currently being developed as an open pit. For the purpose of this report, it is understood that the future development of the sand and gravel pit will be on the basis of a licence for a pit to extract resources to an elevation below the water table (Category 1 Licence - Class "A" pit below water).

Based on the Operational Standards Section of the Aggregate Resources of Ontario: Provincial Standards, Version 1.0, excavation setbacks are required for all licenced mineral aggregate operations. Excavation setbacks are defined in **Section 5.10** of the Operational Standards for a Category 1 Licence as the following:

5.10.1 fifteen metres from the boundary of the site;
5.10.2 thirty metres from any part of the boundary of the site that abuts:
- ***5.10.2.1*** a highway,
- ***5.10.2.2*** land in use for residential purposes at the time the licence was issued, or
- ***5.10.2.3*** land restricted to residential use by a zoning by-law when the licence was issued; or

5.10.3 thirty metres from any body of water that is not the result of excavation below the water table; "

Based on Section 5.10 of the Operational Standards for a Category 1 Licence, a minimum setback of 15 m will be required from the property boundary of the pit operation along the south border of the proposed residential development. It is understood that the 15 m setback will be applied on the adjacent owner's land.

5.0 Compatibility and Mitigation Analysis

Based on recent discussions with the Owner of the Costello Pit, it is understood that the aggregate resource located at 3713 Borrisokane Road and adjacent to the south property boundary of the proposed residential development is currently in operation and is expected to continue for 5 to 7 years.

5.1 Noise

A Phase 1 Environmental Noise Impact Assessment, Report 12054-5.2.2 dated December 2017, was prepared for this project by IBI Group and is located in Appendix 2. However, the aforementioned report is considered a Phase 1 report and does not further analyse any stationary noise sources or discuss the impacts it may have on the proposed residential development.

Costello Pit, an aggregate resource pit (sand and gravel) is identified along the southwest corner of Phases 4 of the proposed residential development and is identified as a stationary noise source. With respect to the Environmental Noise Control Guidelines issued by the City of Ottawa in January 2016, the stationary noise source is to be analysed up to 300 m from the source.

The general analysis of a stationary noise source is outlined in the City of Ottawa document Environmental Noise Control Guidelines. Therefore, the analysis for stationary noise is divided into both the daytime and nighttime limits. It is assumed that the aggregate resource pit will not be operational in the evening, so the analysis should focus on the daytime limits.

The analysis is also divided into reception points on the pane of window (for an analysis of the interior noise) and the outdoor living areas. It is assumed that if the stationary noise exceeds the limitations at the pane of window, that the building materials will be used in order to ensure adequate soundproofing of the proposed units.

The critical analysis will be for the outdoor living area. Results indicate that the maximum noise level for the development will be 53.3 dBA at the closest unit, with the sound levels dissipating as the distance between the source and the receiver increases. For the units with Block 65 Jackdaw Avenue, a Warning Clause type E will be required. The remainder of the units have minimal exceedances are considered unnoticeable.

5.2 Traffic

It is understood that the current truck route for the operation at the Costello Pit is Borrisokane Road and will continue utilizing the road for future operations, while Phase 4 of the proposed residential development will be accessed primarily from Grand Canal Street and the proposed Greenbank Road realignment. It should be noted that the proposed development is not anticipating to have any frontage along Borrisokane Road. As such, the additional traffic generated by the proposed development will not preclude or hinder future pit operations, nor will truck traffic generated by the pit operation interfere with the proposed development. Therefore, no potential compatibility impacts are anticipated between the proposed residential development and the current and future operation of the Costello Pit.

A transportation Impact Assessment was prepared by IBI Group in April 2018 for the proposed residential development. Refer to IBI Group Report 115637-3.0 - Transportation Impact Assessment (TIA) Report in Appendix 2 for additional details regarding the traffic assessment of the proposed development.

5.3 Dust

Under Section 3.1, 3.2 and 3.3 of the Operational Standards of the Aggregate Resources of Ontario: Provincial Standards, Version 1.0, all pit operations are responsible for maintaining dust emissions. Based on recent discussions with the Owner of the Costello Pit, dust control on the haul roads and processing areas at the operation is done regularly using water as a suppressant. Additional dust mitigation measures for the current and future operations of the sand and gravel pit will not be required. It is anticipated the proposed residential development will require water or other approved dust suppressants during the construction stages of the development.

5.4 Vibration

It is understood that current and future operations for the sand and gravel pit will not require blasting for excavation purpose. As a result, sources of vibration from the operation are limited to hauling and excavation equipment only, and have minimal impact on the proposed residential development. Similarly, blasting will not be required for excavation purposes during the construction stages of the proposed residential development, as such, sources of vibrations will be limited to oversized vehicles and construction equipment. Therefore, additional vibration mitigation measures will not be required for the sand and gravel pit or the proposed residential development as the potential impact of vibrations will be minimal.

5.5 Groundwater

It is understood that the subject site will be connected to municipal water and sewer services and will not adversely impact the groundwater levels of the current and future operations of the sand and gravel pit. Based on recent discussions with the Owner of the sand and gravel pit, excavation work below the groundwater table was completed in select areas of the deposit and may continue in the future. Based on the Operation Plan of the Costello Pit attached to the current report, it is undertstood that the long-term groundwater level is expected to be at a geodetic elevation of approximately 95 m. The owner noted that excavation methods below the groundwater table at the sand and gravel pit consists of dredging techniques. Due to dredging techniques implemented at the sand and gravel pit, the operation will not adversely impact the groundwater levels within the proposed residential development.

6.0 Conclusions

Based on the technical studies relating to noise and traffic by others, as well as Paterson's review of the subject site, the proposed residential development will not negatively impact the current and future operation of the aggregate resource pit. Similarly, the operation of the aggregate resource pit will not negatively impact the proposed residential development.

It is expected that the operation of the aggregate resource pit will continue to adhere to the Aggregate Resources of Ontario Provincial Standards, Version 1, as well as the adjacent property owners.

7.0 Statement of Limitations

The recommendations provided in this report are in accordance with our present understanding of the project.

The present report applies only to the project described in this document. Use of this report for purposes other than those described herein or by person(s) other than Tamarack (Nepean) Corporation, or their agent(s) is not authorized without review by Paterson Group for the applicability of our recommendations to the altered use of the report.

Paterson Group Inc.

Stephanie A. Boisvenue, P.Eng.

David J. Gilbert, P.Eng.

Report Distribution:

- ❑ Tamarack (Nepean) Corporation (3 copies)
- ❑ Paterson Group (1 copy)

APPENDIX 1

DRAWING PG4242-3 - Existing Conditions

Historical Aerial Photographs

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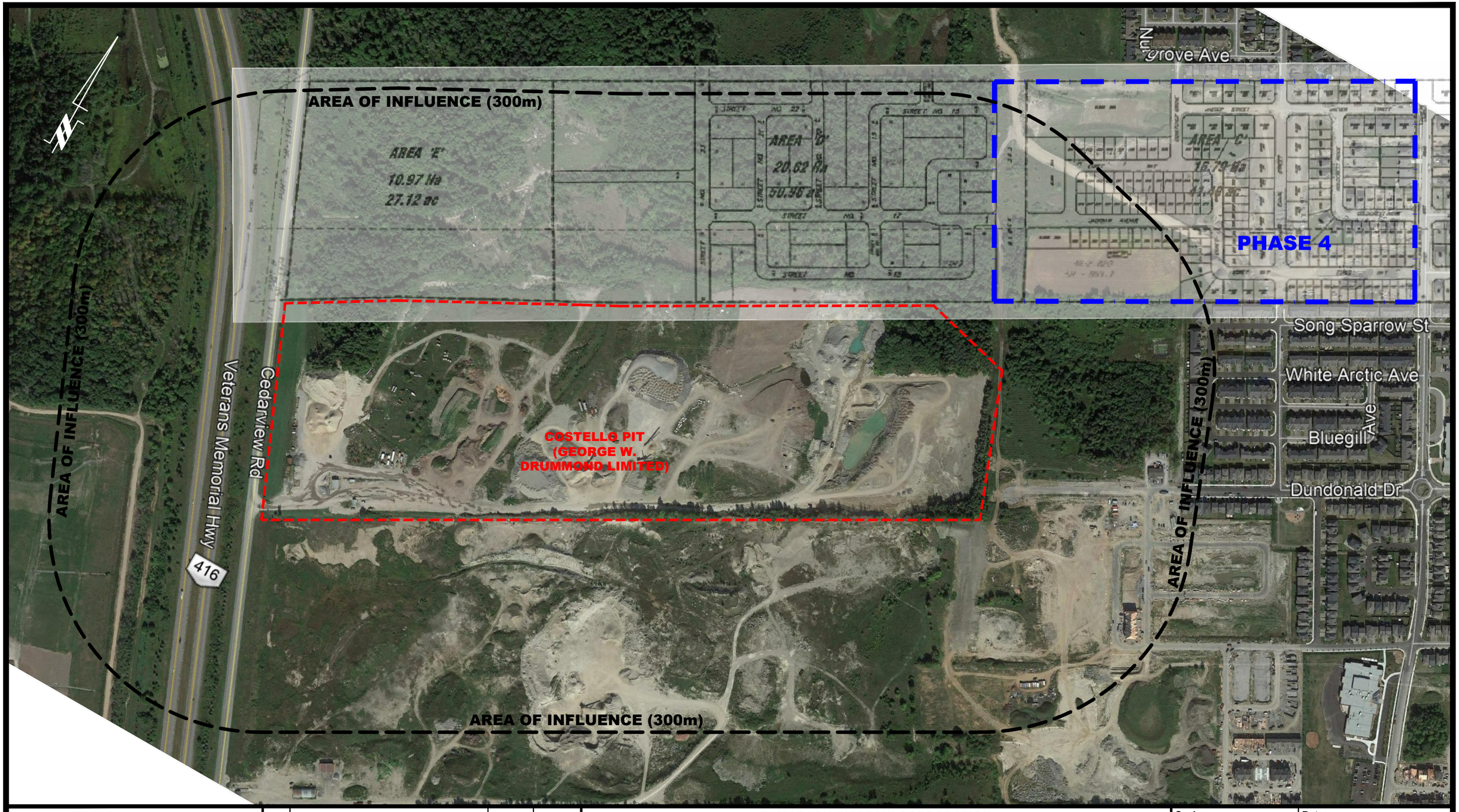
The Base Mapping Co. Ltd. - Operation and Rehabilitation Plan - Costello Pit - Project No. C 419-90 - Page 2 of 2 - Revision 2 dated May 17, 1999



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NO.	REVISIONS	DATE	INITIAL
0			

TAMARACK (NEPEAN) CORPORATION
MINERAL RESOURCE IMPACT ASSESSMENT
PROPOSED RESIDENTIAL DEVELOPMENT - PHASE 4
THE MEADOWS - BORRISOKANE ROAD
OTTAWA, ONTARIO

Title:

EXISTING CONDITIONS

Scale: 1:4000	Date: 02/2018
Drawn by: RCG	Report No.: PG4242-REP-3
Checked by: NZ	Dwg. No.: PG4242-3
Approved by: DJG	Revision No.: 0

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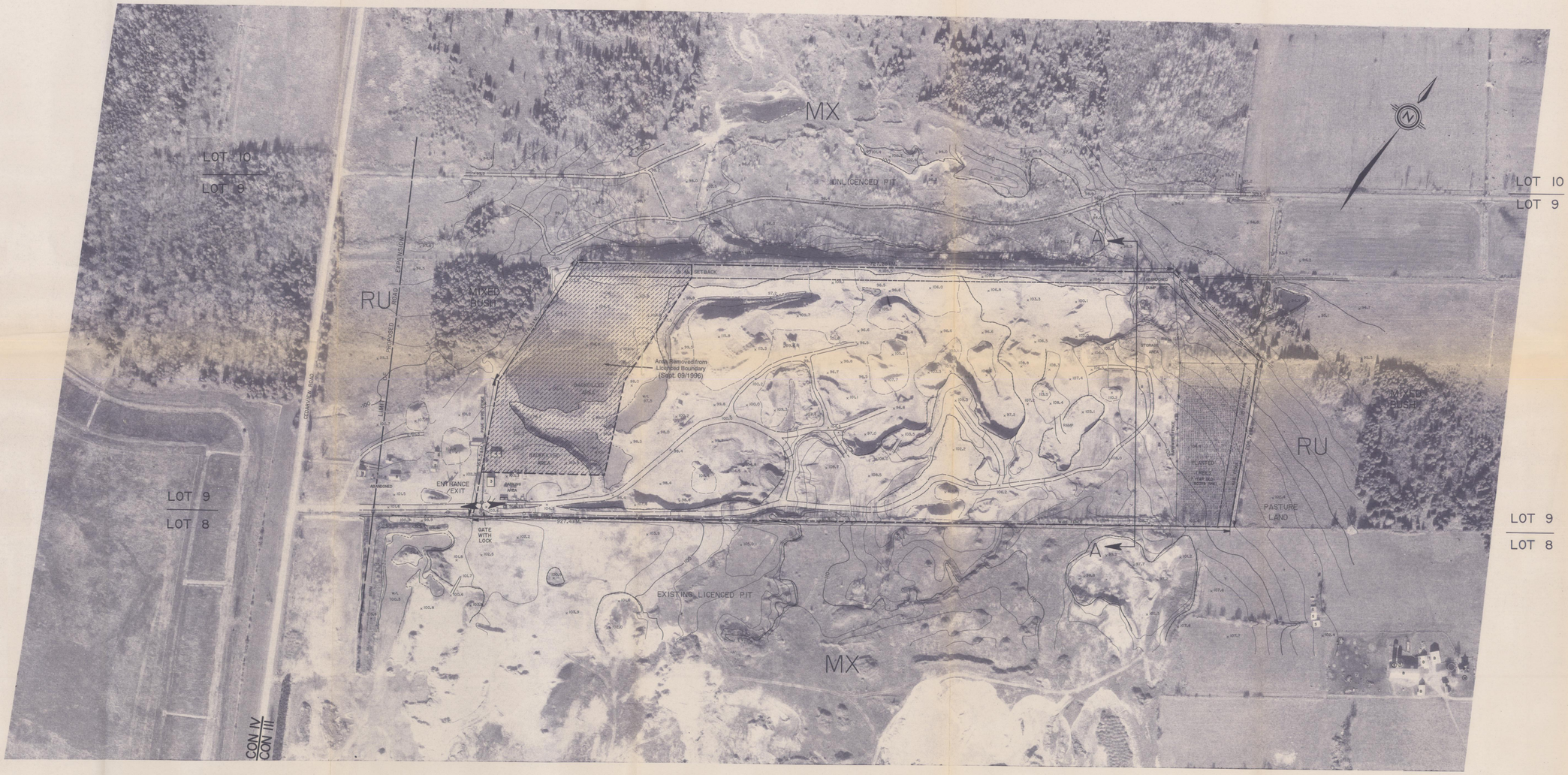
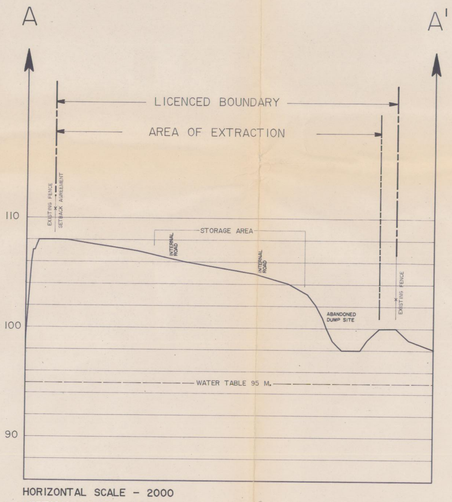




HORIZONTAL SCALE - 2000
VERTICAL SCALE - 200

EXISTING FEATURES

Property licenced for pit operation as designated under the authority of the Aggregate Resources Act 1989.

A pit area presently exists on the majority of the licenced area. Natural drainage of the property is by seepage into the soil and surface drainage to the east.

A weigh scale, garage, office and barn all present on the site near the entrance/exit to the pit.

Fencing is not required along the north boundary. Fencing and setback is not required along the south boundary as there exists a boundary agreement between Brazeau and George W. Drummond Ltd., owners of the two properties in concern.

There is no setback along the west boundary as the adjacent property is owned by George Drummond.

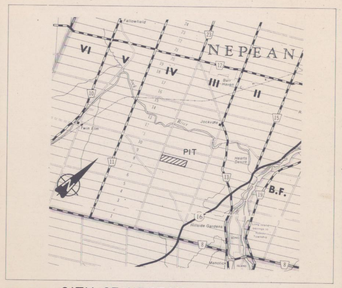
A tree plantation of 7 year old Scots pine exists on the licenced property located at the east end. This area has been leased out by Drummond until 2002.

INDEX OF SITE BUILDINGS

	Classification	Area (m²)
1.	Weigh Scale Office	12.8
2.	Office Trailer	25.0
3.	Storage Garage	109.6
4.	Barn	98.6

M.O.E. Well Water Data 1991 (in metres)

Con.	Lot	Well No.	Elevation Ft.	Water Found	Static Water Level
III	8	15-6040	97m	20.4	6.4



KEY MAP CITY OF NEPEAN

EXISTING FEATURES

NOTES

	Revision Values as of Sept. 09/1996
1. LICENCED AREA 27.5 ± HECTARES.	23.5 ± ha
2. AREA OF OPERATION 25.8 ± HECTARES.	22.3 ± ha
3. EXISTING DISTURBED AREA 22 ± HECTARES.	20.5± ha

4. THIS SITE PLAN IS PREPARED FOR SUBMISSION TO THE MINISTRY OF NATURAL RESOURCES IN CONJUNCTION WITH AN APPLICATION FOR A CLASS 'A' LICENCE UNDER THE AGGREGATE RESOURCES ACT & REGULATIONS.
5. THIS PLAN WAS PREPARED USING PHOTOGRAMMETRIC METHODS FROM AERIAL PHOTOGRAPHS.
6. LOT, CONCESSION AND BOUNDARY LINES ON THIS PLAN ARE APPROXIMATE.
7. THIS IS NOT A LEGAL SURVEY DRAWING IN ACCORDANCE WITH THE PROVINCE OF ONTARIO SURVEYORS ACT 1987.

OFFICE COPY

COSTELLO PIT

ARA No. 4074

PART OF LOT 9, CONCESSION III
CITY OF NEPEAN

GEORGE W. DRUMMOND LIMITED
30 RIDEAU HEIGHTS DRIVE
NEPEAN, ONTARIO K2E 7A6

LEGEND

- BOUNDARY OF AREA TO BE LICENCED
- LIMIT OF EXTRACTION (SETBACK LINE)
- ENTRANCE AND OR EXIT
- PIT/QUARRY FACE EXISTING/PROPOSED
- STOCKPILE: EXISTING/PROPOSED
- DIRECTION OF OPERATION AND PHASE
- WELL
- STANDING WATER
- TEST HOLE
- BUILDING: S-SILO, H-HOUSE, G-GARAGE B-BARN, S-SHED.
- FENCE/GATE
- ROAD: PAVED, UNPAVED
- RAILWAY
- POLE: HYDRO/TELEPHONE
- HYDRO TOWER
- LAKE/POND
- WATERCOURSE: DOUBLE, SINGLE, FLOW ARROW
- BRIDGE, CULVERT
- MARSH
- EXISTING CONTOURS
- PROPOSED CONTOURS
- SPOT ELEVATION
- BUSH: DECIDUOUS/CONIFEROUS
- EXISTING BERM
- PROPOSED BERM
- CROSS SECTION
- Area Removed from Licenced Boundary

PHOTO SCALE	ROLL No.	EXPOSURE No.	LINE No.	PHOTO DATE
1:15000	90066	37-39	1	NOV. 1990

MAP SCALE	CONTOUR INTERVAL	DATE OF SITE PLAN
1:2000	1 METRE	DEC. 1990

0 50 100 150 metres

AMENDMENTS	DATE
Modified licenced boundary and corresponding calculations and notes.	Sept. 09, 1996

SITE PLANS APPROVED BY MINISTRY OF NATURAL RESOURCES
SIGNATURE
DATE Sept 17/96

PAGE 1 of 2 | CONTRACT C 419 - 90

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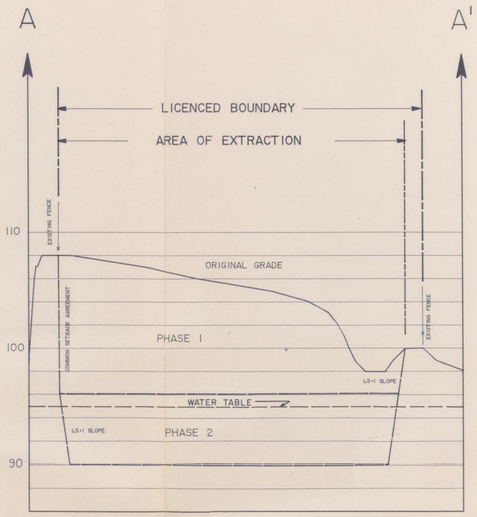
THE BASE MAPPING CO. LTD.
UNIT 37 - 81 AURIGA DRIVE, NEPEAN, ONTARIO K2E 7Y3
(613) 723-8100 FAX: (613) 723-8569

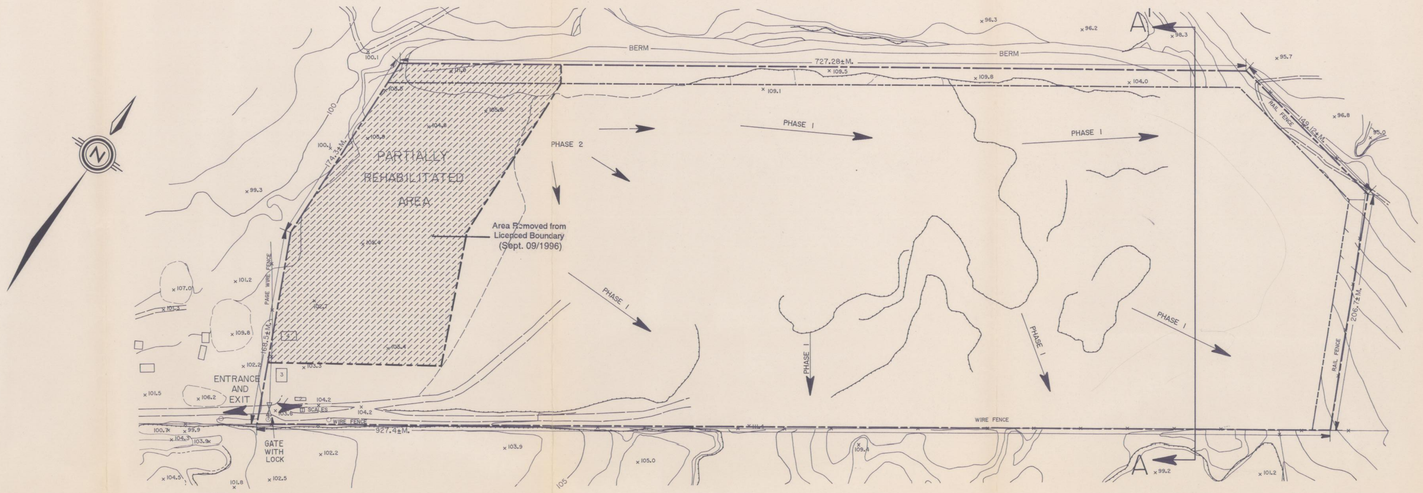
SEP 10 1996

OPERATION PLAN



HORIZONTAL SCALE - 2000

VERTICAL SCALE - 200



GENERAL

The pit will operate in accordance with the Aggregate Resources Act 1989.

Fencing and setback is not required along the south limits of the pit as agreed upon by Marcel Irazeau (pit owner to the south of Drummond) and George W. Drummond Ltd. Fencing is also not required for the north boundary. Various locations, where fences need not be established, have been agreed upon by the Ministry of Natural Resources.

The entrance/exit to the pit has a gate with a lock on it.

The entrance/exit to the pit is from Cedarview Road.

There exists no limitations to the types or location of excavation equipment which may operate on the site. All machinery is equipped with noise and dust suppressors.

Information pertaining to water wells is indicated on the Existing Features Plan.

Product stockpiles are stored within the confines of the limit of extraction.

Recycling of asphalt is permitted within the extraction limits. Area for recycling will be kept 10 metres from any open water.

The tree plantation area lease, upon its expiry date, will be subject to mining activity. Operation of this area will fall into regular mining phases as described within the Operation notes.

OPERATION

The licenced pit hectarage will be mined in two phases of operation. Phase 1 above water table, Phase 2 below water table.

Phase 1 mining is active, operating to a depth of approximately 95 metres as indicated on the Operation Plan. Direction of operation moves from the west towards the east.

Phase 2 mining will follow the Phase 1 mining pattern beginning from the westerly limits of the licenced property and proceeding in a easterly direction, as indicated on the Operation Plan.

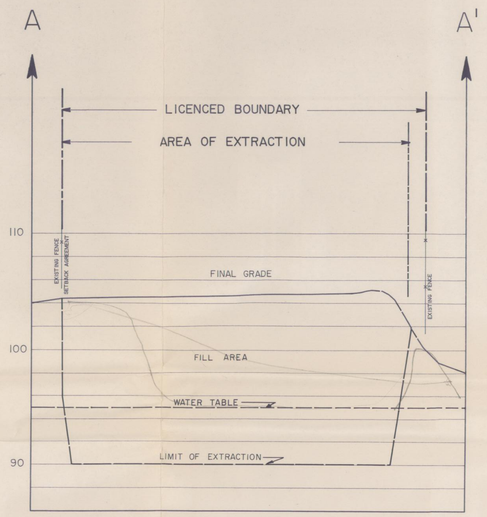
Phase 2 will begin mining operation upon completion of Phase 1. Mining will be below the water table. Extraction of the material will be by dragline methods. No pumping or letting of water will be needed. Final operation depth will be approximately 90 metres.

Amendment – April 29/99

Import topsoil to process for resale.

To allow Phases 1 & 2 to operate concurrently and simultaneous in various locations due to the differently quality of material throughout the site and also the high concentration of clay ridges.

PROGRESSIVE REHABILITATION AND FINAL REHABILITATION PLAN



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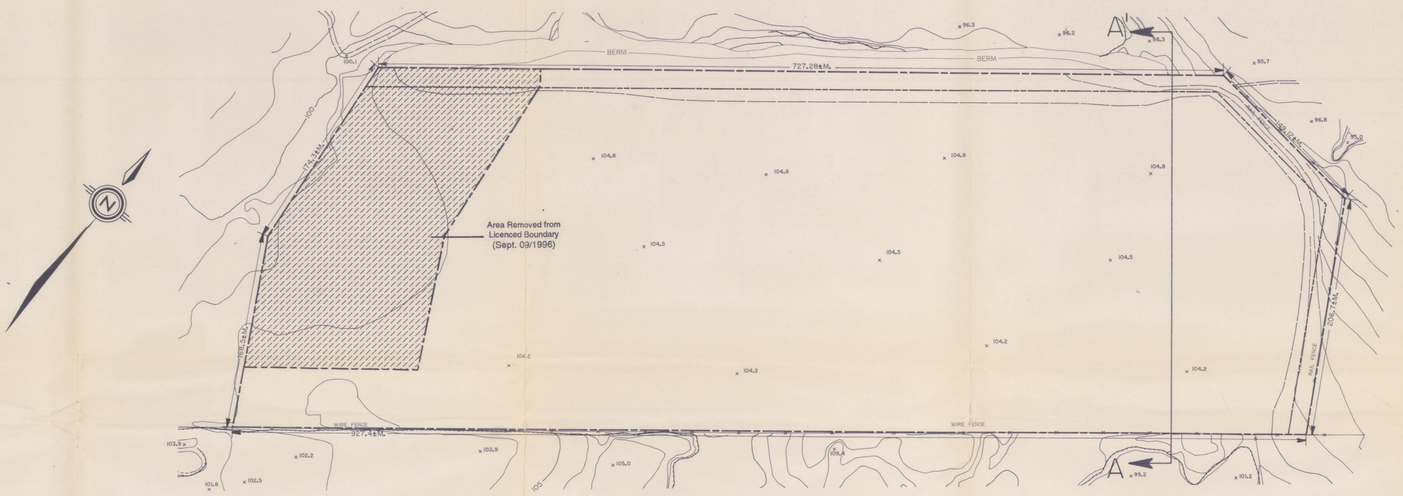


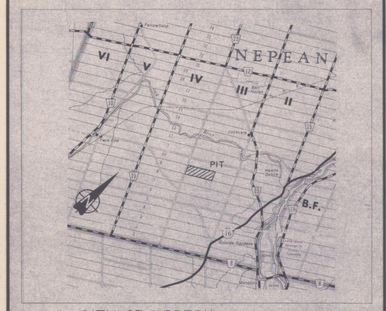
REHABILITATION

Maximum hectarage to be rehabilitated is approximately 22.3 hectares. Progressive rehabilitation will be carried out on the site. In the general this would be carried out by filling from a westerly to easterly direction.

The pit will be backfilled with acceptable inert material. The final site elevation will be approximately 104 metres, sloping slightly to the south, as indicated on the Rehabilitation Plan. The sloped surface will then be sewn with a grass legume mixture.

Adequate soil would be spread on the site to facilitate an adequate growth for grass legume mixture.

The site can then be adequately utilized for building development or pasture.



KEY MAP CITY OF NEPEAN

OPERATION & REHAB. PLAN

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2. AREA OF OPERATION 25.9± HECTARES.	22.3 ± ha
3. EXISTING DISTURBED AREA 16.4± HECTARES.	16.4 ± ha

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AMENDMENTS	DATE
Modified licenced boundary and corresponding, calculations and notes.	Sept. 09, 1996
See amendment dated April 29/99	May 17/99

SITE PLANS APPROVED BY MINISTRY OF NATURAL RESOURCES.

SIGNATURE DATE

PAGE 2 of 2 | CONTRACT C 419 - 90

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THE BASE MAPPING CO. LTD.

SEP 7 0 1999

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APPENDIX 2

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patersongroup

Environmental Noise Control Study

Proposed Development
The Meadows - Phase 4 - Ottawa

Prepared For

Tamarack (Nepean) Corporation

July 19, 2018

Report: PG3786-1

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Appendices

1.0 Introduction

Paterson Group (Paterson) was commissioned by Tamarack (Nepean) Corporation to conduct an environmental noise control study for the proposed development to be located at The Meadows Phase 4, in the City of Ottawa.

The objective of the current study is to:

- Determine the primary noise sources impacting the site and compare the projected sound levels to guidelines set out by the Ministry of Environment and Climate Change (MOECC) and the City of Ottawa.

The following report has been prepared specifically and solely for the aforementioned project which is described herein. It contains our findings and includes acoustical recommendations pertaining to the design and construction of the subject development as they are understood at the time of writing this report.

This study has been conducted according to City of Ottawa document - Engineering Noise Control Guidelines (ENCG), dated January 2016, and the Ontario Ministry of the Environment Guideline NPC-300.

2.0 Background

It is understood that the proposed development will consist of single houses, townhouses and stacked townhouse units. The stacked townhouse units will not have any outdoor living areas associated with it, but the single houses and townhouses will. Proposes roadways and landscaped areas are also anticipated. An Environmental Noise Impact Assessment - The Meadows In Half Moon Bay - Phase 4 - 3680 Greenbank Road was completed by IBI Group under Report Project: 12054-5.2.2 in December 2017. This report is an analysis of the surface transportation noise for this phase of the development. Therefore, this report is soley for the stationary noise source identified as the Costello Pit.

3.0 Methodology and Noise Assessment Criteria

Stationary Noise

Stationary noise sources include sources or facilities that are fixed or mobile and can cause a combination of sound and vibration levels emitted beyond the property line. These sources may include commercial air conditioner units, generators and fans. Facilities that may contribute to stationary noise may include car washes, snow disposal sites, transit stations and manufacturing facilities. In this situation, the stationary noise source consists of an existing mineral aggregate pit.

The impact of stationary noise sources are directly related to the location of the subject site within the urban environment. The proposed development can be classified as Class 2 by provincial guidelines and outlined in the ENGC, meaning "a suburban areas of the City outside of the busy core where the urban hum is evident but within the urban boundary."

Table 4 - Guidelines for Stationary Noise - Class 2

Time of Day	Outdoor Point of Reception	Pane of Window
7:00-19:00	50	50
19:00-23:00	45	50
23:00-7:00	-	45

❏ Standards taken from Table 3.2a; Guidelines for Stationary Noise - Steady and Varying Sound

If the sound level limits are exceeded the following Warning Clause may be referenced:

Table 3 - Warning Clauses for Sound Level Exceedances

Warning Clause	Description
Warning Clause Type E	"Purchasers/tenants are advised that due to the proximity of the adjacent industry (facility) (utility), noise from the industry (facility) (utility) may at times be audible."

❏ Clauses taken from section C8 Warning Clauses; Environmental Noise Guidelines - NPC-300

4.0 Analysis

The stationary noise source consisting of the Constello Pit was identified within the 300 m radius from the proposed development. Upon conversation with the owner of the existing Costello Pit, two facts were identified. The first fact states that all mineral extraction within the western portion of the pit has been completed. A line indicating this portion of the pit is noted on the Initial Model figure included in Appendix 1. This is significant as it increases the worst case distance between the existing equipment and the proposed development. The other fact is that the Costello Pit will be terminating the mineral extraction over the entire pit within the next 5-7 years. Therefore, this stationary noise source is considered temporary and all analysis and recommendations made with respect to this stationary noise source can be removed from all deeds of sale once the pit is closed.

The existing pit is the only stationary noise source located within the proximity of the proposed development. The analysis was completed with specialized noise software: Predictor-Lima Version 11.21. Five (5) reception points were selected within the 300 m proximity radius for our analysis. The reception points were selected at both a 1.5 m and 4.5 m elevations, so that both pane of glass and outdoor living areas could be interpolated. The results of these reception points are included in Appendix 1.

5.0 Discussion

The maximum value at the reception points at Block 65 Jackdaw Avenue with a daytime value of 53.3 dBA. This exceeds the predetermined limit by 3 dBA. for the southenmost units within the 300 m radius.

The values indicate that Reception Points 1, 2 and 5 exceed the 50 dBA limits. The maximum value of 53.3 dBA was located at Block 65 Jackdaw Avenue. With this limited exceedance, combined with the knowledge that the stationary noise source is temporary in nature and should be eliminated within the next 7 years, it is proposed that a Warning Clause Type E should be applied to the deeds of sale for these units.

The remainder of the units exceeded the 50 dBA limit by up to 1 dBA, which is considered unnoticeable in the City of Ottawa documentation. Therefore, no warning clauses are recommended for the remainder of the units.

6.0 Conclusion

Due to the existing Costello Pit, the stationary noise will be marginally greater than the 50 dBA the MOECC prescribes. However, based on the analysis, only Block 65 Jackdaw Avenue will require a Warning Clause Type E on the deed of sale. The remainder of the exceedances are considered minor.

As it is understood that the Costello Pit will cease all mineral extraction within the next 7 years, this warning clause is considered temporary and is only applicable while the Costello Pit is within operation.

7.0 Statement of Limitations

The recommendations made in this report are in accordance with our present understanding of the project. Our recommendations should be reviewed when the project drawings and specifications are complete.

The present report applies only to the project described in this document. Use of this report for purposes other than those described herein or by person(s) other than the Tamarack (Nepean) Corporation or their agent(s) is not authorized without review by this firm for the applicability of our recommendations to the altered use of the report.

Paterson Group Inc.

Stephanie A. Boisvenue, P.Eng.

Report Distribution:

- ❑ Tamarack (Nepean) Corporation (3 copies)
- ❑ Paterson Group (1 copy)

APPENDIX 1

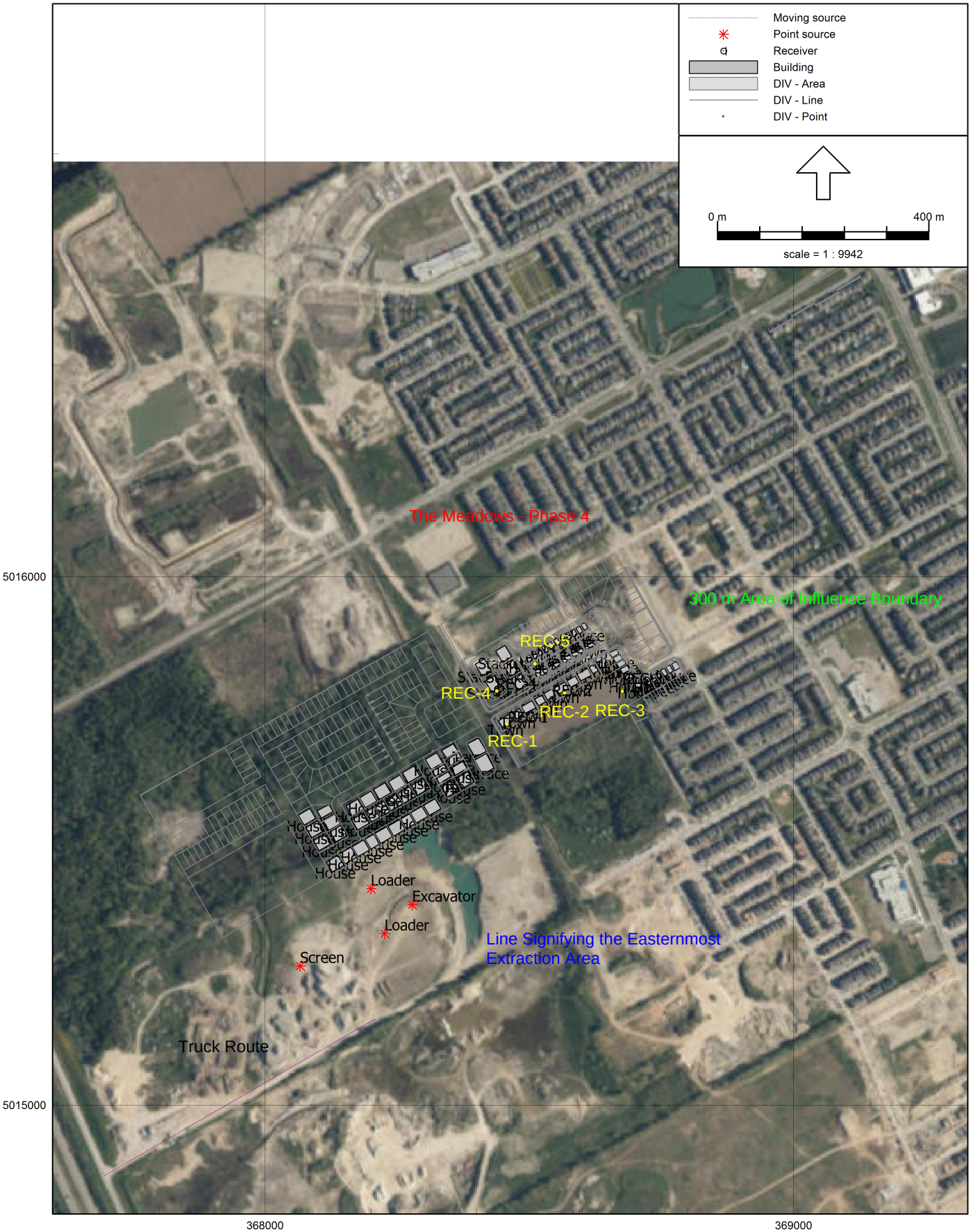
FIGURE 1 - INITIAL MODEL

TABLE OF RESULTS

initial model

19 Jul 2018, 16:51

Paterson Group



Industrial noise - LimA - ISO 9613.1/2, [version of Drummond Pit - Copy of initial model] , Predictor V11.21

Report: Table of Results
Model: Copy of initial model
LAeq: total results for receivers
Group: (main group)
Group Reduction: No

Name Receiver	Description	Height	Day	Night	Lden
REC-1_A	Rear Yard - Townhouse	1.50	53.2	53.2	59.6
REC-1_B	Rear Yard - Townhouse	4.50	53.0	53.0	59.4
REC-2_A	Townhouse	1.50	51.6	51.6	58.0
REC-2_B	Townhouse	4.50	51.4	51.4	57.8
REC-3_A	House	1.50	50.1	50.1	56.5
REC-3_B	House	4.50	49.9	49.9	56.3
REC-4_A	Stacked	1.50	48.6	48.6	55.0
REC-4_B	Stacked	4.50	48.6	48.6	55.0
REC-5_A	Reception Point	1.50	51.0	51.0	57.4
REC-5_B	Reception Point	4.50	50.8	50.8	57.2

All shown dB values are A-weighted

REPORT
Project: 12054-5.2.2

Environmental Noise Impact Assessment
The Meadows in Half Moon Bay
Phase 4 - 3640 Greenbank Road

Prepared for Tamarack (Nepean) Corporation
by IBI Group

Updated December 2017

Table of Contents

List of Tables

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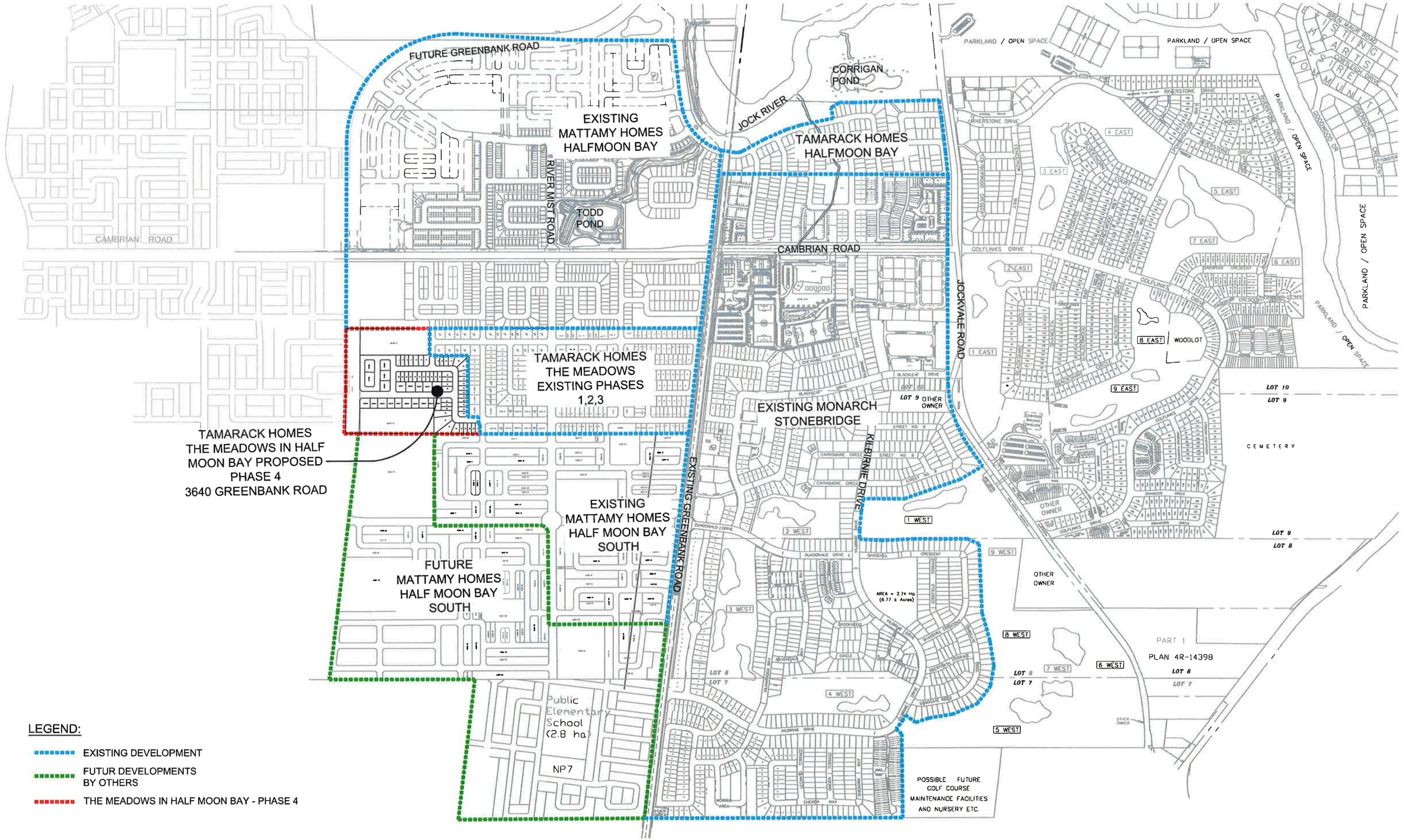
Appendix

Noise Plans

1 INTRODUCTION

On behalf of our client, a study has been prepared to determine the impact of the roadway traffic on the residential lands of Phase 4 of the Meadows in Half Moon Bay subdivision, located in the former City of Nepean. This report deals with the expected noise levels in the development and any required noise control measures.

The area of the study consists of the residential single family and townhouse units located on Egret Way and Jackdaw Avenue all located west of Grand Canal Street in the Barrhaven South Community. Back to back “Gallery Towns” are located on Street 3 east of future Greenbank Road. A location plan of the development is provided on **Figure 1**.



LEGEND:

- EXISTING DEVELOPMENT
- FUTUR DEVELOPMENTS BY OTHERS
- THE MEADOWS IN HALF MOON BAY - PHASE 4

J: \12054_SouthMBarr\5.9 Drawings\59civil\current\Phase 4\FIGURE1 - LOCATION PLAN.dwg Sheet Set: ####

IBI

Scale

N.T.S.

Project Title

TAMARACK (NEPEAN) CORPORATION
THE MEADOWS IN HALF MOON BAY
BARRHAVEN SOUTH

Drawing Title

LOCATION PLAN

Sheet No.

REV. 1

FIGURE 1

2 BACKGROUND

2.1 Noise Sources

The study area is primarily subject to road noise along future Greenbank Road. Aircraft noise from the Ottawa International Airport and rail noise is not a factor as the airport and rail lines are not in close proximity to the study area.

2.2 Sound Level Limits for Road Traffic

Sound level criteria for road traffic is taken from the City of Ottawa Environmental Noise Control Guidelines and from the Ministry of the Environment Environmental Noise Guideline Publication NPC-300. Noise levels are expressed in the form Leq (T) which refers to a weighted level of a steady sound carrying the same total energy in the time period T (in hours) as the observed fluctuation sound.

2.2.1 Indoor Sound Level Criterion

Similar to outdoor noise levels, the recommended indoor sound level criteria from Table 2.2b of the guidelines are:

- Bedrooms – 23:00 to 07:00 – 40 dBA Leq (8)
- Other areas – 07:00 to 23:00 – 45 dBA Leq (16)

The sound levels are based on the windows and doors to an indoor space being closed.

For the purpose of assessing indoor sound levels, the outdoor sound levels are observed at the plane of the living room window at 1.5 meters above the ground for daytime noise and at the plane of the bedroom window 4.5 meters above the ground for nighttime noise as per the guidelines.

As per NPC-300 C7.1.3 when the outdoor sound levels are less than or equal to 65 dBA at the living room window and/or less than or equal to 60 dBA at the bedroom level then the building must be compliant with the Ontario Building Code. Should the outdoor sound levels exceed this criteria then the building component (walls, windows etc.) must be designed to achieve indoor sound level criteria.

As per NPC-300 C7.1.2.1 and C7.1.2.2 when the outdoor noise levels at the living room are greater than 55 dBA and less than or equal to 65 dBA and/or greater than 50 dBA and less than or equal to 60 dBA at the bedroom window then a warning clause is required and forced air heating with provision for central air conditioning is required. Should the outdoor sound levels exceed the criteria central air conditioning is mandatory and a warning clause is required.

2.2.2 Outdoor Sound Level Criterion

As per Table 2.2a of the guidelines the sound level criterion for the outdoor living area (OLA) for the daytime period between 07:00 and 23:00 hours is 55 dBA Leq (16). Sound levels for the OLA are calculated 3 meters from the building face at the center of the unit or within the center of the OLA at a height of 1.5 meters above the ground.

If the Leq sound level is less than or equal to the above criteria then no further action is required by the developer. If the sound level exceeds the criteria by less than 5 dBA then the developer may either provide a warning clause to prospective purchasers or install physical attenuation. For sound levels greater than 5 dBA above the criteria, control measures are required to reduce the noise levels as close to 55 dBA as technically, economically and administratively possible. Should the sound levels with the barrier in place exceed 55 dBA a warning clause is also required.

3 ROADWAY NOISE

3.1 Traffic Volume Data

The major source of noise external to the development is the traffic moving along future Greenbank Road. River Mist Road is the nearest collector road to Phase 4 but it is located approximately 100 meters away with several rows of housing between so it will not contribute traffic noise to Phase 4.

Future Greenbank Road will be a four lane divided arterial roadway. Traffic volumes are taken from Appendix B of the Guidelines for a 4-Lane Arterial-Divided (4-UAD). Table 3.1 summarizes the traffic and road data used in this report.

TABLE 3.1
TRAFFIC AND ROAD DATA SUMMARY

	FUTURE GREENBANK ROAD
Annual Average Daily Traffic (AADT)	35,000
Posted Speed Limit (per/hr)	60
% Medium Trucks	7%
% Heavy Trucks	5%
% Daytime Traffic	92%
Road Gradient	1.5% max

3.2 Calculation Method

Roadway noise was calculated using the STAMSON 5.03 computer program from the Ontario Ministry of the Environment.

Numerous locations are used to calculate the sound levels for the outdoor recreational area and at the building face to determine indoor sound levels. Unattenuated daytime and nighttime noise levels at the building face (for determining indoor sound levels) and unattenuated daytime noise levels at the outdoor recreational area for each of the locations are shown in Tables 3.2 and 3.3, respectively. Parameters used for calculating the noise levels, the perpendicular distance from source to receiver and the roadway segment angles, are also included in the tables. For the future divided roadway the noise levels are calculated separately for the northbound and southbound lanes combined.

TABLE 3.2
Unattenuated Noise Levels at Building Face

LOCATION BLOCK/LOT	ROADWAY	DISTANCE SOURCE TO RECEIVER (M) NB	DISTANCE SOURCE TO RECEIVER (M) SB	LEFT ANGLE	RIGHT ANGLE	NOISE (DBA) DAYTIME	NOISE (DBA) NIGHTTIME
65 Unit 1	Greenbank	15.0	39.0	-90	90	70.02	62.64
65 Unit 2	Greenbank	19.25	43.25	0	90	65.41	58.12
65 Unit 3	Greenbank	25.25	49.25	0	90	63.68	56.51
62 Unit 2	Greenbank	96.75	120.75	-90	0	55.04	48.36
62 Unit 3	Greenbank	102.75	126.75	-90	0	54.65	47.98
69 NW Unit	Greenbank	28.25	52.25	-80	90	65.92	58.77
69 NE Unit	Greenbank	37.25	61.25	0	90	61.22	54.19
69 SE Unit	Greenbank	37.25	61.25	-45	0	59.36	52.22
70 SE Unit	Greenbank	37.25	61.25	-60	0	60.35	53.24
70 SW Unit	Greenbank	28.25	52.25	-70	90	65.78	58.62
68 NW Unit	Greenbank	73.75	97.75	-5	90	57.15	50.37
68 NE Unit	Greenbank	82.75	106.75	0	90	56.08	49.34
67 NW Unit	Greenbank	73.75	97.75	-10	0	54.36	47.67
				40	90		
67 SW Unit	Greenbank	73.75	97.75	-45	-25	53.38	46.71
				60	90		
66 SW Unit	Greenbank	73.75	97.75	-25	20	55.75	48.91
				70	90		
66 SE Unit	Greenbank	82.75	106.75	-25	0	51.88	45.00
LOT 1	Greenbank	117.25	141.25	-10	90	54.39	47.76

As indicated in Table 3.2 the recommended sound levels are exceeded for the majority of the locations.

TABLE 3.3
Unattenuated Daytime Noise Levels at OLA

LOCATION BLOCK/LOT	ROADWAY	DISTANCE SOURCE TO RECEIVER (M) NB	DISTANCE SOURCE TO RECEIVER (M) SB	LEFT ANGLE	RIGHT ANGLE	NOISE (DBA) DAYTIME
65 Unit 1	Greenbank	16.25	40.25	-90	90	69.50
65 Unit 2	Greenbank	22.25	46.25	-90	20	65.65
65 Unit 3	Greenbank	28.25	52.25	-90	15	63.88
65 Unit 4	Greenbank	34.25	58.25	-90	10	62.37
64 Unit 1	Greenbank	43.75	67.75	-90	5	60.52
64 Unit 2	Greenbank	49.75	73.75	-90	5	59.70
62 Unit 2	Greenbank	100.25	124.25	-90	3	55.00
62 Unit 3	Greenbank	106.25	130.25	-90	3	54.62
Lot 1	Greenbank	112.25	146.25	-10	90	54.47

As indicated in Table 3.3 the recommended sound levels are exceeded for the majority of the locations.

4 ABATEMENT MEASURES

4.1 Indoor Sound Levels

For units directly facing or flanking Future Greenbank Road the daytime sound level at the building face exceeds 65 dBA daytime requiring mandatory central air conditioning, a review of the building components and a type 'D' warning clause. Building components can be reviewed using the Sound Transmission Class (STC) method developed by the National Research Council of Canada. In this method, using the architectural plans, the required STC rating is determined for windows, walls and doors for each room exposed to noise based on the area of floor, windows, walls and doors. For all other units where the daytime noise level is less than 65 dBA but exceeds 55 dBA alternative means of ventilation is required as well as a type 'C' warning clause in the Agreement of Purchase and Sale. Alternative means of ventilation usually consist of a forced air heating system with ducts sized for future installation of central air conditioning.

4.2 Outdoor Recreational Area

At Block 65 Jackdaw Avenue the outdoor living areas flank Future Greenbank Road resulting in daytime noise levels in excess of 60 dBA requiring physical attenuation. Due to the short distance between the unit and the Greenbank Road right-of-way, a noise barrier is the only practical option to attenuate the traffic noise. A 2.5 meter high noise barrier on top of the berm is proposed along the Greenbank Road right-of-way and the rear of the two adjacent units. A 2.2 meter high barrier was not considered as this would increase the height of the berm which would have the base of the berm extend further. With the barrier in place, the noise levels is reduced below 60 dBA but remain about 55 dBA requiring a type 'B' warning clause. It is impractical to reduce the noise levels below 55 dBA as it would require a noise barrier and berm in excess of four metres in height. Results of noise barrier analysis are summarized in Table 4.1

TABLE 4.1
ATTENUATED DAYTIME NOISE LEVELS AT OLA

LOCATION	ROADWAY	DISTANCE – BARRIER TO RECEIVER (M)	BARRIER ANGLES			DAYTIME NOISE LEVEL (dBA)
			LEFT	RIGHT	HEIGHT	
65 Unit 1	Greenbank	7.0	-90	70	2.5	59.99
65 Unit 2	Greenbank	13.0	-90	20	2.5	55.02
65 Unit 3	Greenbank	19.0	-60	15	2.5	56.98
65 Unit 4	Greenbank	25.0	-30	10	2.5	59.45
64 Unit 1	Greenbank	34.5	-15	5	2.5	59.18
64 Unit 2	Greenbank	40.5	-10	5	2.5	58.74

Townhouse Blocks 62 to 64 on Jackdaw Avenue backing onto the school block are partially exposed to noise from Future Greenbank Road resulting in noise levels above 55 dBA but below 60 dBA. As this noise is below the 60 dBA limit it is recommended to use a type 'A' warning clause in lieu of a noise barrier as the future school building will provide some screening of the traffic noise. There are no other locations in Phase 4 where the daytime noise at the outdoor living areas exceed 55 dBA. For the back to back townhouses Blocks 68 to 70, there are no outdoor living areas.

5 SUMMARY OF ATTENUATION MEASURES

5.1 Warning Clauses

A clause regarding noise must appear on the Agreement of Purchase and Sale on the title of the lots and townhouse units indicated on the noise plan drawing No. 12054-Noise 4 and listed below.

Type 'A'	Jackdaw Avenue	– Block 62, Units 1 & 2
		– Block 63, All Units
		– Block 64, Units 2 & 3
Type 'B'	Jackdaw Avenue	– Block 64, Unit 1
		– Block 65, All Units
Type 'C'	Jackdaw Avenue	– Block 62, Units 1 & 2
		– Block 63, All Units
		– Block 64, All Units
		– Block 65, Units 3 & 4
	Street No. 3	– Block 66, All West Units
	Labrador Crescent	– Block 68, All West Units, NE end Unit
		– Block 69, NE & SE end Units
		– Block 70, NE & SE end Units
Type 'D'	Jackdaw Avenue	– Block 65, Units 1 & 2
		– Block 69, All West Units
		– Block 70, All West Units

The following warning clauses are taken from Section C8.1 of NPC-300 of the guidelines.

Type A	"Purchasers/tenants are advised that sound levels due to increasing Future Greenbank Road traffic may occasionally interfere with some activities of the dwelling occupants as the sound levels exceed the sound level limits of the Municipality and the Ministry of the Environment."
Type B	"Purchasers/tenants are advised that despite the inclusion of noise control features in the development and within the building units, sound levels due to increasing Future Greenbank Road traffic may on occasions interfere with some activities of the dwelling occupants as the sound levels exceed the sound level limits of the Municipality and the Ministry of the Environment."
Type C	"This dwelling unit has been designed with the provision for adding central air conditioning at the occupant's discretion. Installation of central air conditioning by the occupant in low and medium density developments will allow windows and exterior doors to remain closed, thereby ensuring that the indoor sound levels are within the sound level limits of the Municipality and the Ministry of the Environment."
Type D	"This dwelling unit has been supplied with a central air conditioning system which will allow windows and exterior doors to remain closed, thereby ensuring that the indoor sound levels are within the sound level limits of the Municipality and the Ministry of the Environment."

5.2 Ventilation Requirements and Building Components

All lots and townhouse units requiring a type 'C' warning clause listed in Section 5.1 require a forced air heating system sized to accommodate a central air conditioning system. All units requiring a type 'D' warning clause require mandatory central air conditioning and an acoustical review of building components.

5.3 Noise Barrier

A noise barrier constructed to current City of Ottawa and MOE standards is required at the location shown on the noise plan.

Prepared by:

Lance Erion, P. Eng.

Appendix

STAMSON 5.0 COMPREHENSIVE REPORT Date: 11-10-2017 17:10:52
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: b65u1in.te Time Period: Day/Night 16/8 hours
Description: Block 65 Unit 1 indoor

Road data, segment # 1: Greenbank NB (day/night)

Car traffic volume	: 14168/1232	veh/TimePeriod *
Medium truck volume	: 1127/98	veh/TimePeriod *
Heavy truck volume	: 805/70	veh/TimePeriod *
Posted speed limit	: 60 km/h	
Road gradient	: 2 %	
Road pavement	: 1 (Typical asphalt or concrete)	

* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT)	: 17500
Percentage of Annual Growth	: 0.00
Number of Years of Growth	: 0.00
Medium Truck % of Total Volume	: 7.00
Heavy Truck % of Total Volume	: 5.00
Day (16 hrs) % of Total Volume	: 92.00

Data for Segment # 1: Greenbank NB (day/night)

Angle1 Angle2	: -90.00 deg	90.00 deg
Wood depth	: 0	(No woods.)
No of house rows	: 0 / 0	
Surface	: 1	(Absorptive ground surface)
Receiver source distance	: 15.00 / 15.00	m
Receiver height	: 1.50 / 4.50	m
Topography	: 1	(Flat/gentle slope; no barrier)
Reference angle	: 0.00	

Road data, segment # 2: Greenbank SB (day/night)

Car traffic volume	: 14168/1232	veh/TimePeriod *
Medium truck volume	: 1127/98	veh/TimePeriod *
Heavy truck volume	: 805/70	veh/TimePeriod *
Posted speed limit	: 60 km/h	
Road gradient	: 2 %	
Road pavement	: 1 (Typical asphalt or concrete)	

* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT)	: 17500
Percentage of Annual Growth	: 0.00
Number of Years of Growth	: 0.00
Medium Truck % of Total Volume	: 7.00
Heavy Truck % of Total Volume	: 5.00
Day (16 hrs) % of Total Volume	: 92.00

Data for Segment # 2: Greenbank SB (day/night)

Angle1 Angle2	: -90.00 deg	90.00 deg
Wood depth	: 0	(No woods.)
No of house rows	: 0 / 0	
Surface	: 1	(Absorptive ground surface)
Receiver source distance	: 39.00 / 39.00	m

Receiver height : 1.50 / 4.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

Segment # 1: Greenbank NB (day)

Source height = 1.50 m

ROAD (0.00 + 69.21 + 0.00) = 69.21 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.66	70.67	0.00	0.00	-1.46	0.00	0.00	0.00	69.21

Segment Leq : 69.21 dBA

Segment # 2: Greenbank SB (day)

Source height = 1.50 m

ROAD (0.00 + 62.32 + 0.00) = 62.32 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.66	70.67	0.00	-6.89	-1.46	0.00	0.00	0.00	62.32

Segment Leq : 62.32 dBA

Total Leq All Segments: 70.02 dBA

Segment # 1: Greenbank NB (night)

Source height = 1.50 m

ROAD (0.00 + 61.77 + 0.00) = 61.77 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.57	63.07	0.00	0.00	-1.30	0.00	0.00	0.00	61.77

Segment Leq : 61.77 dBA

Segment # 2: Greenbank SB (night)

Source height = 1.50 m

ROAD (0.00 + 55.25 + 0.00) = 55.25 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.57	63.07	0.00	-6.52	-1.30	0.00	0.00	0.00	55.25

Segment Leq : 55.25 dBA
Total Leq All Segments: 62.64 dBA
TOTAL Leq FROM ALL SOURCES (DAY): 70.02
(NIGHT): 62.64

STAMSON 5.0 COMPREHENSIVE REPORT Date: 11-10-2017 17:11:19
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: b65u2in.te Time Period: Day/Night 16/8 hours
Description: Block 65 Unit 2 indoor

Road data, segment # 1: Greenbank NB (day/night)

Car traffic volume	: 14168/1232	veh/TimePeriod *
Medium truck volume	: 1127/98	veh/TimePeriod *
Heavy truck volume	: 805/70	veh/TimePeriod *
Posted speed limit	: 60	km/h
Road gradient	: 2	%
Road pavement	: 1	(Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT)	:	17500
Percentage of Annual Growth	:	0.00
Number of Years of Growth	:	0.00
Medium Truck % of Total Volume	:	7.00
Heavy Truck % of Total Volume	:	5.00
Day (16 hrs) % of Total Volume	:	92.00

Data for Segment # 1: Greenbank NB (day/night)

Angle1 Angle2	: 0.00 deg	90.00 deg
Wood depth	: 0	(No woods.)
No of house rows	: 0 / 0	
Surface	: 1	(Absorptive ground surface)
Receiver source distance	: 19.25 / 19.25	m
Receiver height	: 1.50 / 4.50	m
Topography	: 1	(Flat/gentle slope; no barrier)
Reference angle	: 0.00	

Road data, segment # 2: Greenbank SB (day/night)

Car traffic volume	: 14168/1232	veh/TimePeriod *
Medium truck volume	: 1127/98	veh/TimePeriod *
Heavy truck volume	: 805/70	veh/TimePeriod *
Posted speed limit	: 60	km/h
Road gradient	: 2	%
Road pavement	: 1	(Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT)	:	17500
Percentage of Annual Growth	:	0.00
Number of Years of Growth	:	0.00
Medium Truck % of Total Volume	:	7.00
Heavy Truck % of Total Volume	:	5.00
Day (16 hrs) % of Total Volume	:	92.00

Data for Segment # 2: Greenbank SB (day/night)

Angle1 Angle2	: 0.00 deg	90.00 deg
Wood depth	: 0	(No woods.)
No of house rows	: 0 / 0	
Surface	: 1	(Absorptive ground surface)
Receiver source distance	: 43.25 / 43.25	m

Receiver height : 1.50 / 4.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

Segment # 1: Greenbank NB (day)

Source height = 1.50 m

ROAD (0.00 + 64.40 + 0.00) = 64.40 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
0	90	0.66	70.67	0.00	-1.80	-4.47	0.00	0.00	0.00	64.40

Segment Leq : 64.40 dBA

Segment # 2: Greenbank SB (day)

Source height = 1.50 m

ROAD (0.00 + 58.56 + 0.00) = 58.56 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
0	90	0.66	70.67	0.00	-7.63	-4.47	0.00	0.00	0.00	58.56

Segment Leq : 58.56 dBA

Total Leq All Segments: 65.41 dBA

Segment # 1: Greenbank NB (night)

Source height = 1.50 m

ROAD (0.00 + 57.05 + 0.00) = 57.05 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
0	90	0.57	63.07	0.00	-1.70	-4.31	0.00	0.00	0.00	57.05

Segment Leq : 57.05 dBA

Segment # 2: Greenbank SB (night)

Source height = 1.50 m

ROAD (0.00 + 51.53 + 0.00) = 51.53 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
0	90	0.57	63.07	0.00	-7.22	-4.31	0.00	0.00	0.00	51.53

Segment Leq : 51.53 dBA
Total Leq All Segments: 58.12 dBA
TOTAL Leq FROM ALL SOURCES (DAY): 65.41
(NIGHT): 58.12

STAMSON 5.0 COMPREHENSIVE REPORT Date: 11-10-2017 17:11:59
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: b65u3in.te Time Period: Day/Night 16/8 hours
Description: Block 65 Unit 3 indoor

Road data, segment # 1: Greenbank NB (day/night)

Car traffic volume	: 14168/1232	veh/TimePeriod *
Medium truck volume	: 1127/98	veh/TimePeriod *
Heavy truck volume	: 805/70	veh/TimePeriod *
Posted speed limit	: 60	km/h
Road gradient	: 2	%
Road pavement	: 1	(Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT)	:	17500
Percentage of Annual Growth	:	0.00
Number of Years of Growth	:	0.00
Medium Truck % of Total Volume	:	7.00
Heavy Truck % of Total Volume	:	5.00
Day (16 hrs) % of Total Volume	:	92.00

Data for Segment # 1: Greenbank NB (day/night)

Angle1 Angle2	:	0.00 deg	90.00 deg
Wood depth	:	0	(No woods.)
No of house rows	:	0 / 0	
Surface	:	1	(Absorptive ground surface)
Receiver source distance	:	25.25 / 25.25	m
Receiver height	:	1.50 / 4.50	m
Topography	:	1	(Flat/gentle slope; no barrier)
Reference angle	:	0.00	

Road data, segment # 2: Greenbank SB (day/night)

Car traffic volume	: 14168/1232	veh/TimePeriod *
Medium truck volume	: 1127/98	veh/TimePeriod *
Heavy truck volume	: 805/70	veh/TimePeriod *
Posted speed limit	: 60	km/h
Road gradient	: 2	%
Road pavement	: 1	(Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT)	:	17500
Percentage of Annual Growth	:	0.00
Number of Years of Growth	:	0.00
Medium Truck % of Total Volume	:	7.00
Heavy Truck % of Total Volume	:	5.00
Day (16 hrs) % of Total Volume	:	92.00

Data for Segment # 2: Greenbank SB (day/night)

Angle1 Angle2	:	0.00 deg	90.00 deg
Wood depth	:	0	(No woods.)
No of house rows	:	0 / 0	
Surface	:	1	(Absorptive ground surface)
Receiver source distance	:	49.25 / 49.25	m

Receiver height : 1.50 / 4.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

Segment # 1: Greenbank NB (day)

Source height = 1.50 m

ROAD (0.00 + 62.44 + 0.00) = 62.44 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
0	90	0.66	70.67	0.00	-3.75	-4.47	0.00	0.00	0.00	62.44

Segment Leq : 62.44 dBA

Segment # 2: Greenbank SB (day)

Source height = 1.50 m

ROAD (0.00 + 57.63 + 0.00) = 57.63 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
0	90	0.66	70.67	0.00	-8.57	-4.47	0.00	0.00	0.00	57.63

Segment Leq : 57.63 dBA

Total Leq All Segments: 63.68 dBA

Segment # 1: Greenbank NB (night)

Source height = 1.50 m

ROAD (0.00 + 55.20 + 0.00) = 55.20 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
0	90	0.57	63.07	0.00	-3.55	-4.31	0.00	0.00	0.00	55.20

Segment Leq : 55.20 dBA

Segment # 2: Greenbank SB (night)

Source height = 1.50 m

ROAD (0.00 + 50.65 + 0.00) = 50.65 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
0	90	0.57	63.07	0.00	-8.11	-4.31	0.00	0.00	0.00	50.65

Segment Leq : 50.65 dBA
Total Leq All Segments: 56.51 dBA
TOTAL Leq FROM ALL SOURCES (DAY): 63.68
(NIGHT): 56.51

STAMSON 5.0 NORMAL REPORT Date: 12-10-2017 09:32:37
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: b62u1in.te Time Period: Day/Night 16/8 hours
Description: Block 62 Unit 2 indoor

Road data, segment # 1: Greenbank NB (day/night)

Car traffic volume	: 14168/1232	veh/TimePeriod *
Medium truck volume	: 1127/98	veh/TimePeriod *
Heavy truck volume	: 805/70	veh/TimePeriod *
Posted speed limit	: 60	km/h
Road gradient	: 2	%
Road pavement	: 1	(Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT)	: 17500
Percentage of Annual Growth	: 0.00
Number of Years of Growth	: 0.00
Medium Truck % of Total Volume	: 7.00
Heavy Truck % of Total Volume	: 5.00
Day (16 hrs) % of Total Volume	: 92.00

Data for Segment # 1: Greenbank NB (day/night)

Angle1 Angle2	: -90.00 deg	0.00 deg
Wood depth	: 0	(No woods.)
No of house rows	: 0 / 0	
Surface	: 1	(Absorptive ground surface)
Receiver source distance	: 96.75 / 96.75	m
Receiver height	: 1.50 / 4.50	m
Topography	: 1	(Flat/gentle slope; no barrier)
Reference angle	: 0.00	

Road data, segment # 2: Greenbank SB (day/night)

Car traffic volume	: 14168/1232	veh/TimePeriod *
Medium truck volume	: 1127/98	veh/TimePeriod *
Heavy truck volume	: 805/70	veh/TimePeriod *
Posted speed limit	: 60	km/h
Road gradient	: 2	%
Road pavement	: 1	(Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT)	: 17500
Percentage of Annual Growth	: 0.00
Number of Years of Growth	: 0.00
Medium Truck % of Total Volume	: 7.00
Heavy Truck % of Total Volume	: 5.00
Day (16 hrs) % of Total Volume	: 92.00

Data for Segment # 2: Greenbank SB (day/night)

Angle1 Angle2	: -90.00 deg	0.00 deg
Wood depth	: 0	(No woods.)
No of house rows	: 0 / 0	
Surface	: 1	(Absorptive ground surface)
Receiver source distance	: 120.75 / 120.75	m

Receiver height : 1.50 / 4.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

Results segment # 1: Greenbank NB (day)

Source height = 1.50 m

ROAD (0.00 + 52.76 + 0.00) = 52.76 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	0	0.66	70.67	0.00	-13.44	-4.47	0.00	0.00	0.00	52.76

Segment Leq : 52.76 dBA

Results segment # 2: Greenbank SB (day)

Source height = 1.50 m

ROAD (0.00 + 51.16 + 0.00) = 51.16 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	0	0.66	70.67	0.00	-15.04	-4.47	0.00	0.00	0.00	51.16

Segment Leq : 51.16 dBA

Total Leq All Segments: 55.04 dBA

Results segment # 1: Greenbank NB (night)

Source height = 1.50 m

ROAD (0.00 + 46.04 + 0.00) = 46.04 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	0	0.57	63.07	0.00	-12.71	-4.31	0.00	0.00	0.00	46.04

Segment Leq : 46.04 dBA

Results segment # 2: Greenbank SB (night)

Source height = 1.50 m

ROAD (0.00 + 44.53 + 0.00) = 44.53 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	0	0.57	63.07	0.00	-14.22	-4.31	0.00	0.00	0.00	44.53

Segment Leq : 44.53 dBA
Total Leq All Segments: 48.36 dBA
TOTAL Leq FROM ALL SOURCES (DAY): 55.04
(NIGHT): 48.36

```
STAMSON 5.0         NORMAL REPORT         Date: 12-10-2017 09:31:57
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: b62u3in.te            Time Period: Day/Night 16/8 hours
Description: Block 62 Unit 3 indoor

Road data, segment # 1: Greenbank NB (day/night)
----------------------------------------------
Car traffic volume  : 14168/1232  veh/TimePeriod  *
Medium truck volume :  1127/98    veh/TimePeriod  *
Heavy truck volume  :   805/70    veh/TimePeriod  *
Posted speed limit  :    60 km/h
Road gradient       :     2 %
Road pavement       :     1 (Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

    24 hr Traffic Volume (AADT or SADT):  17500
    Percentage of Annual Growth        :   0.00
    Number of Years of Growth          :   0.00
    Medium Truck % of Total Volume     :   7.00
    Heavy Truck  % of Total Volume     :   5.00
    Day (16 hrs) % of Total Volume     :  92.00

Data for Segment # 1: Greenbank NB (day/night)
----------------------------------------------
Angle1   Angle2           : -90.00 deg   0.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      1       (Absorptive ground surface)
Receiver source distance  : 102.75 / 102.75 m
Receiver height           :   1.50 / 4.50   m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00

Road data, segment # 2: Greenbank SB (day/night)
----------------------------------------------
Car traffic volume  : 14168/1232  veh/TimePeriod  *
Medium truck volume :  1127/98    veh/TimePeriod  *
Heavy truck volume  :   805/70    veh/TimePeriod  *
Posted speed limit  :    60 km/h
Road gradient       :     2 %
Road pavement       :     1 (Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

    24 hr Traffic Volume (AADT or SADT):  17500
    Percentage of Annual Growth        :   0.00
    Number of Years of Growth          :   0.00
    Medium Truck % of Total Volume     :   7.00
    Heavy Truck  % of Total Volume     :   5.00
    Day (16 hrs) % of Total Volume     :  92.00

Data for Segment # 2: Greenbank SB (day/night)
----------------------------------------------
Angle1   Angle2           : -90.00 deg   0.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      1       (Absorptive ground surface)
Receiver source distance  : 126.75 / 126.75 m
```

Receiver height : 1.50 / 4.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

Results segment # 1: Greenbank NB (day)

Source height = 1.50 m

ROAD (0.00 + 52.33 + 0.00) = 52.33 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	0	0.66	70.67	0.00	-13.87	-4.47	0.00	0.00	0.00	52.33

Segment Leq : 52.33 dBA

Results segment # 2: Greenbank SB (day)

Source height = 1.50 m

ROAD (0.00 + 50.81 + 0.00) = 50.81 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	0	0.66	70.67	0.00	-15.39	-4.47	0.00	0.00	0.00	50.81

Segment Leq : 50.81 dBA

Total Leq All Segments: 54.65 dBA

Results segment # 1: Greenbank NB (night)

Source height = 1.50 m

ROAD (0.00 + 45.63 + 0.00) = 45.63 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	0	0.57	63.07	0.00	-13.12	-4.31	0.00	0.00	0.00	45.63

Segment Leq : 45.63 dBA

Results segment # 2: Greenbank SB (night)

Source height = 1.50 m

ROAD (0.00 + 44.20 + 0.00) = 44.20 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	0	0.57	63.07	0.00	-14.55	-4.31	0.00	0.00	0.00	44.20

Segment Leq : 44.20 dBA
Total Leq All Segments: 47.98 dBA
TOTAL Leq FROM ALL SOURCES (DAY): 54.65
(NIGHT): 47.98

STAMSON 5.0 NORMAL REPORT Date: 12-10-2017 11:22:40
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: b69NEin.te Time Period: Day/Night 16/8 hours
Description: Block 69 North West Unit indoor

Road data, segment # 1: Greenbank NB (day/night)

Car traffic volume : 14168/1232 veh/TimePeriod *
Medium truck volume : 1127/98 veh/TimePeriod *
Heavy truck volume : 805/70 veh/TimePeriod *
Posted speed limit : 60 km/h
Road gradient : 2 %
Road pavement : 1 (Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT): 17500
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 7.00
Heavy Truck % of Total Volume : 5.00
Day (16 hrs) % of Total Volume : 92.00

Data for Segment # 1: Greenbank NB (day/night)

Angle1 Angle2 : -80.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 28.25 / 28.25 m
Receiver height : 1.50 / 4.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

Road data, segment # 2: Greenbank SB (day/night)

Car traffic volume : 14168/1232 veh/TimePeriod *
Medium truck volume : 1127/98 veh/TimePeriod *
Heavy truck volume : 805/70 veh/TimePeriod *
Posted speed limit : 60 km/h
Road gradient : 2 %
Road pavement : 1 (Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT): 17500
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 7.00
Heavy Truck % of Total Volume : 5.00
Day (16 hrs) % of Total Volume : 92.00

Data for Segment # 2: Greenbank SB (day/night)

Angle1 Angle2 : -80.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)

Receiver source distance : 52.25 / 52.25 m
Receiver height : 1.50 / 4.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

Results segment # 1: Greenbank NB (day)

Source height = 1.50 m

ROAD (0.00 + 64.58 + 0.00) = 64.58 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-80	90	0.66	70.67	0.00	-4.56	-1.52	0.00	0.00	0.00	64.58

Segment Leq : 64.58 dBA

Results segment # 2: Greenbank SB (day)

Source height = 1.50 m

ROAD (0.00 + 60.15 + 0.00) = 60.15 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-80	90	0.66	70.67	0.00	-9.00	-1.52	0.00	0.00	0.00	60.15

Segment Leq : 60.15 dBA

Total Leq All Segments: 65.92 dBA

Results segment # 1: Greenbank NB (night)

Source height = 1.50 m

ROAD (0.00 + 57.37 + 0.00) = 57.37 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-80	90	0.57	63.07	0.00	-4.32	-1.38	0.00	0.00	0.00	57.37

Segment Leq : 57.37 dBA

Results segment # 2: Greenbank SB (night)

Source height = 1.50 m

ROAD (0.00 + 53.18 + 0.00) = 53.18 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-80	90	0.57	63.07	0.00	-8.51	-1.38	0.00	0.00	0.00	53.18

Segment Leq : 53.18 dBA
Total Leq All Segments: 58.77 dBA
TOTAL Leq FROM ALL SOURCES (DAY): 65.92
(NIGHT): 58.77

STAMSON 5.0 NORMAL REPORT Date: 12-10-2017 11:29:29
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: b69nein.te Time Period: Day/Night 16/8 hours
Description: Block 69 South East Unit indoor

Road data, segment # 1: Greenbank NB (day/night)

Car traffic volume	: 14168/1232	veh/TimePeriod *
Medium truck volume	: 1127/98	veh/TimePeriod *
Heavy truck volume	: 805/70	veh/TimePeriod *
Posted speed limit	: 60	km/h
Road gradient	: 2	%
Road pavement	: 1	(Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT)	: 17500
Percentage of Annual Growth	: 0.00
Number of Years of Growth	: 0.00
Medium Truck % of Total Volume	: 7.00
Heavy Truck % of Total Volume	: 5.00
Day (16 hrs) % of Total Volume	: 92.00

Data for Segment # 1: Greenbank NB (day/night)

Angle1 Angle2	: -45.00 deg	0.00 deg
Wood depth	: 0	(No woods.)
No of house rows	: 0 / 0	
Surface	: 1	(Absorptive ground surface)
Receiver source distance	: 37.25 / 37.25	m
Receiver height	: 1.50 / 4.50	m
Topography	: 1	(Flat/gentle slope; no barrier)
Reference angle	: 0.00	

Road data, segment # 2: Greenbank SB (day/night)

Car traffic volume	: 14168/1232	veh/TimePeriod *
Medium truck volume	: 1127/98	veh/TimePeriod *
Heavy truck volume	: 805/70	veh/TimePeriod *
Posted speed limit	: 60	km/h
Road gradient	: 2	%
Road pavement	: 1	(Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT)	: 17500
Percentage of Annual Growth	: 0.00
Number of Years of Growth	: 0.00
Medium Truck % of Total Volume	: 7.00
Heavy Truck % of Total Volume	: 5.00
Day (16 hrs) % of Total Volume	: 92.00

Data for Segment # 2: Greenbank SB (day/night)

Angle1 Angle2	: -45.00 deg	0.00 deg
Wood depth	: 0	(No woods.)
No of house rows	: 0 / 0	
Surface	: 1	(Absorptive ground surface)
Receiver source distance	: 61.25 / 61.25	m

Receiver height : 1.50 / 4.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

Results segment # 1: Greenbank NB (day)

Source height = 1.50 m

ROAD (0.00 + 57.78 + 0.00) = 57.78 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-45	0	0.66	70.67	0.00	-6.56	-6.33	0.00	0.00	0.00	57.78

Segment Leq : 57.78 dBA

Results segment # 2: Greenbank SB (day)

Source height = 1.50 m

ROAD (0.00 + 54.20 + 0.00) = 54.20 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-45	0	0.66	70.67	0.00	-10.14	-6.33	0.00	0.00	0.00	54.20

Segment Leq : 54.20 dBA

Total Leq All Segments: 59.36 dBA

Results segment # 1: Greenbank NB (night)

Source height = 1.50 m

ROAD (0.00 + 50.58 + 0.00) = 50.58 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-45	0	0.57	63.07	0.00	-6.20	-6.29	0.00	0.00	0.00	50.58

Segment Leq : 50.58 dBA

Results segment # 2: Greenbank SB (night)

Source height = 1.50 m

ROAD (0.00 + 47.19 + 0.00) = 47.19 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-45	0	0.57	63.07	0.00	-9.59	-6.29	0.00	0.00	0.00	47.19

Segment Leq : 47.19 dBA
Total Leq All Segments: 52.22 dBA
TOTAL Leq FROM ALL SOURCES (DAY): 59.36
(NIGHT): 52.22

STAMSON 5.0 NORMAL REPORT Date: 12-10-2017 11:28:07
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: b69nein.te Time Period: Day/Night 16/8 hours
Description: Block 69 North East Unit indoor

Road data, segment # 1: Greenbank NB (day/night)

Car traffic volume	: 14168/1232	veh/TimePeriod *
Medium truck volume	: 1127/98	veh/TimePeriod *
Heavy truck volume	: 805/70	veh/TimePeriod *
Posted speed limit	: 60	km/h
Road gradient	: 2	%
Road pavement	: 1	(Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT)	:	17500
Percentage of Annual Growth	:	0.00
Number of Years of Growth	:	0.00
Medium Truck % of Total Volume	:	7.00
Heavy Truck % of Total Volume	:	5.00
Day (16 hrs) % of Total Volume	:	92.00

Data for Segment # 1: Greenbank NB (day/night)

Angle1 Angle2	:	0.00 deg	90.00 deg
Wood depth	:	0	(No woods.)
No of house rows	:	0 / 0	
Surface	:	1	(Absorptive ground surface)
Receiver source distance	:	37.25 / 37.25	m
Receiver height	:	1.50 / 4.50	m
Topography	:	1	(Flat/gentle slope; no barrier)
Reference angle	:	0.00	

Road data, segment # 2: Greenbank SB (day/night)

Car traffic volume	: 14168/1232	veh/TimePeriod *
Medium truck volume	: 1127/98	veh/TimePeriod *
Heavy truck volume	: 805/70	veh/TimePeriod *
Posted speed limit	: 60	km/h
Road gradient	: 2	%
Road pavement	: 1	(Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT)	:	17500
Percentage of Annual Growth	:	0.00
Number of Years of Growth	:	0.00
Medium Truck % of Total Volume	:	7.00
Heavy Truck % of Total Volume	:	5.00
Day (16 hrs) % of Total Volume	:	92.00

Data for Segment # 2: Greenbank SB (day/night)

Angle1 Angle2	:	0.00 deg	90.00 deg
Wood depth	:	0	(No woods.)
No of house rows	:	0 / 0	
Surface	:	1	(Absorptive ground surface)

Receiver source distance : 61.25 / 61.25 m
Receiver height : 1.50 / 4.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

Results segment # 1: Greenbank NB (day)

Source height = 1.50 m

ROAD (0.00 + 59.64 + 0.00) = 59.64 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
0	90	0.66	70.67	0.00	-6.56	-4.47	0.00	0.00	0.00	59.64

Segment Leq : 59.64 dBA

Results segment # 2: Greenbank SB (day)

Source height = 1.50 m

ROAD (0.00 + 56.06 + 0.00) = 56.06 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
0	90	0.66	70.67	0.00	-10.14	-4.47	0.00	0.00	0.00	56.06

Segment Leq : 56.06 dBA

Total Leq All Segments: 61.22 dBA

Results segment # 1: Greenbank NB (night)

Source height = 1.50 m

ROAD (0.00 + 52.55 + 0.00) = 52.55 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
0	90	0.57	63.07	0.00	-6.20	-4.31	0.00	0.00	0.00	52.55

Segment Leq : 52.55 dBA

Results segment # 2: Greenbank SB (night)

Source height = 1.50 m

ROAD (0.00 + 49.16 + 0.00) = 49.16 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
0	90	0.57	63.07	0.00	-9.59	-4.31	0.00	0.00	0.00	49.16

Segment Leq : 49.16 dBA
Total Leq All Segments: 54.19 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 61.22
(NIGHT): 54.19

STAMSON 5.0 NORMAL REPORT Date: 12-10-2017 11:31:36
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: b69nein.te Time Period: Day/Night 16/8 hours
Description: Block 70 South East Unit indoor

Road data, segment # 1: Greenbank NB (day/night)

Car traffic volume	: 14168/1232	veh/TimePeriod *
Medium truck volume	: 1127/98	veh/TimePeriod *
Heavy truck volume	: 805/70	veh/TimePeriod *
Posted speed limit	: 60	km/h
Road gradient	: 2	%
Road pavement	: 1	(Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT)	:	17500
Percentage of Annual Growth	:	0.00
Number of Years of Growth	:	0.00
Medium Truck % of Total Volume	:	7.00
Heavy Truck % of Total Volume	:	5.00
Day (16 hrs) % of Total Volume	:	92.00

Data for Segment # 1: Greenbank NB (day/night)

Angle1 Angle2	: -60.00 deg	0.00 deg
Wood depth	: 0	(No woods.)
No of house rows	: 0 / 0	
Surface	: 1	(Absorptive ground surface)
Receiver source distance	: 37.25 / 37.25	m
Receiver height	: 1.50 / 4.50	m
Topography	: 1	(Flat/gentle slope; no barrier)
Reference angle	: 0.00	

Road data, segment # 2: Greenbank SB (day/night)

Car traffic volume	: 14168/1232	veh/TimePeriod *
Medium truck volume	: 1127/98	veh/TimePeriod *
Heavy truck volume	: 805/70	veh/TimePeriod *
Posted speed limit	: 60	km/h
Road gradient	: 2	%
Road pavement	: 1	(Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT)	:	17500
Percentage of Annual Growth	:	0.00
Number of Years of Growth	:	0.00
Medium Truck % of Total Volume	:	7.00
Heavy Truck % of Total Volume	:	5.00
Day (16 hrs) % of Total Volume	:	92.00

Data for Segment # 2: Greenbank SB (day/night)

Angle1 Angle2	: -60.00 deg	0.00 deg
Wood depth	: 0	(No woods.)
No of house rows	: 0 / 0	
Surface	: 1	(Absorptive ground surface)

Receiver source distance : 61.25 / 61.25 m
Receiver height : 1.50 / 4.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

Results segment # 1: Greenbank NB (day)

Source height = 1.50 m

ROAD (0.00 + 58.77 + 0.00) = 58.77 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-60	0	0.66	70.67	0.00	-6.56	-5.33	0.00	0.00	0.00	58.77

Segment Leq : 58.77 dBA

Results segment # 2: Greenbank SB (day)

Source height = 1.50 m

ROAD (0.00 + 55.19 + 0.00) = 55.19 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-60	0	0.66	70.67	0.00	-10.14	-5.33	0.00	0.00	0.00	55.19

Segment Leq : 55.19 dBA

Total Leq All Segments: 60.35 dBA

Results segment # 1: Greenbank NB (night)

Source height = 1.50 m

ROAD (0.00 + 51.61 + 0.00) = 51.61 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-60	0	0.57	63.07	0.00	-6.20	-5.26	0.00	0.00	0.00	51.61

Segment Leq : 51.61 dBA

Results segment # 2: Greenbank SB (night)

Source height = 1.50 m

ROAD (0.00 + 48.21 + 0.00) = 48.21 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-60	0	0.57	63.07	0.00	-9.59	-5.26	0.00	0.00	0.00	48.21

Segment Leq : 48.21 dBA
Total Leq All Segments: 53.24 dBA
TOTAL Leq FROM ALL SOURCES (DAY): 60.35
(NIGHT): 53.24

STAMSON 5.0 NORMAL REPORT Date: 12-10-2017 11:25:04
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: b69NEin.te Time Period: Day/Night 16/8 hours
Description: Block 70 South West Unit indoor

Road data, segment # 1: Greenbank NB (day/night)

Car traffic volume	: 14168/1232	veh/TimePeriod *
Medium truck volume	: 1127/98	veh/TimePeriod *
Heavy truck volume	: 805/70	veh/TimePeriod *
Posted speed limit	: 60	km/h
Road gradient	: 2	%
Road pavement	: 1	(Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT)	:	17500
Percentage of Annual Growth	:	0.00
Number of Years of Growth	:	0.00
Medium Truck % of Total Volume	:	7.00
Heavy Truck % of Total Volume	:	5.00
Day (16 hrs) % of Total Volume	:	92.00

Data for Segment # 1: Greenbank NB (day/night)

Angle1 Angle2	: -70.00 deg	90.00 deg
Wood depth	: 0	(No woods.)
No of house rows	: 0 / 0	
Surface	: 1	(Absorptive ground surface)
Receiver source distance	: 28.25 / 28.25	m
Receiver height	: 1.50 / 4.50	m
Topography	: 1	(Flat/gentle slope; no barrier)
Reference angle	: 0.00	

Road data, segment # 2: Greenbank SB (day/night)

Car traffic volume	: 14168/1232	veh/TimePeriod *
Medium truck volume	: 1127/98	veh/TimePeriod *
Heavy truck volume	: 805/70	veh/TimePeriod *
Posted speed limit	: 60	km/h
Road gradient	: 2	%
Road pavement	: 1	(Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT)	:	17500
Percentage of Annual Growth	:	0.00
Number of Years of Growth	:	0.00
Medium Truck % of Total Volume	:	7.00
Heavy Truck % of Total Volume	:	5.00
Day (16 hrs) % of Total Volume	:	92.00

Data for Segment # 2: Greenbank SB (day/night)

Angle1 Angle2	: -70.00 deg	90.00 deg
Wood depth	: 0	(No woods.)
No of house rows	: 0 / 0	
Surface	: 1	(Absorptive ground surface)
Receiver source distance	: 52.25 / 52.25	m

Receiver height : 1.50 / 4.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

Results segment # 1: Greenbank NB (day)

Source height = 1.50 m

ROAD (0.00 + 64.44 + 0.00) = 64.44 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-70	90	0.66	70.67	0.00	-4.56	-1.66	0.00	0.00	0.00	64.44

Segment Leq : 64.44 dBA

Results segment # 2: Greenbank SB (day)

Source height = 1.50 m

ROAD (0.00 + 60.01 + 0.00) = 60.01 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-70	90	0.66	70.67	0.00	-9.00	-1.66	0.00	0.00	0.00	60.01

Segment Leq : 60.01 dBA
Total Leq All Segments: 65.78 dBAResults segment # 1: Greenbank NB (night)

Source height = 1.50 m

ROAD (0.00 + 57.22 + 0.00) = 57.22 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-70	90	0.57	63.07	0.00	-4.32	-1.54	0.00	0.00	0.00	57.22

Segment Leq : 57.22 dBA

Results segment # 2: Greenbank SB (night)

Source height = 1.50 m

ROAD (0.00 + 53.02 + 0.00) = 53.02 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-70	90	0.57	63.07	0.00	-8.51	-1.54	0.00	0.00	0.00	53.02

Segment Leq : 53.02 dBA
Total Leq All Segments: 58.62 dBA
TOTAL Leq FROM ALL SOURCES (DAY): 65.78
(NIGHT): 58.62

STAMSON 5.0 NORMAL REPORT Date: 12-10-2017 11:38:33
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: b68nwin.te Time Period: Day/Night 16/8 hours
Description: Block 68 North West Unit indoor

Road data, segment # 1: Greenbank NB (day/night)

Car traffic volume : 14168/1232 veh/TimePeriod *
Medium truck volume : 1127/98 veh/TimePeriod *
Heavy truck volume : 805/70 veh/TimePeriod *
Posted speed limit : 60 km/h
Road gradient : 2 %
Road pavement : 1 (Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT): 17500
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 7.00
Heavy Truck % of Total Volume : 5.00
Day (16 hrs) % of Total Volume : 92.00

Data for Segment # 1: Greenbank NB (day/night)

Angle1 Angle2 : -5.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 73.75 / 73.75 m
Receiver height : 1.50 / 4.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

Road data, segment # 2: Greenbank SB (day/night)

Car traffic volume : 14168/1232 veh/TimePeriod *
Medium truck volume : 1127/98 veh/TimePeriod *
Heavy truck volume : 805/70 veh/TimePeriod *
Posted speed limit : 60 km/h
Road gradient : 2 %
Road pavement : 1 (Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT): 17500
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 7.00
Heavy Truck % of Total Volume : 5.00
Day (16 hrs) % of Total Volume : 92.00

Data for Segment # 2: Greenbank SB (day/night)

Angle1 Angle2 : -5.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)

Receiver source distance : 97.75 / 97.75 m
Receiver height : 1.50 / 4.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

Results segment # 1: Greenbank NB (day)

Source height = 1.50 m

ROAD (0.00 + 55.04 + 0.00) = 55.04 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-5	90	0.66	70.67	0.00	-11.48	-4.14	0.00	0.00	0.00	55.04

Segment Leq : 55.04 dBA

Results segment # 2: Greenbank SB (day)

Source height = 1.50 m

ROAD (0.00 + 53.01 + 0.00) = 53.01 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-5	90	0.66	70.67	0.00	-13.51	-4.14	0.00	0.00	0.00	53.01

Segment Leq : 53.01 dBA

Total Leq All Segments: 57.15 dBA

Results segment # 1: Greenbank NB (night)

Source height = 1.50 m

ROAD (0.00 + 48.21 + 0.00) = 48.21 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-5	90	0.57	63.07	0.00	-10.86	-4.00	0.00	0.00	0.00	48.21

Segment Leq : 48.21 dBA

Results segment # 2: Greenbank SB (night)

Source height = 1.50 m

ROAD (0.00 + 46.29 + 0.00) = 46.29 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-5	90	0.57	63.07	0.00	-12.78	-4.00	0.00	0.00	0.00	46.29

Segment Leq : 46.29 dBA
Total Leq All Segments: 50.37 dBA
TOTAL Leq FROM ALL SOURCES (DAY): 57.15
(NIGHT): 50.37

STAMSON 5.0 NORMAL REPORT Date: 12-10-2017 11:41:38
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: b68nwin.te Time Period: Day/Night 16/8 hours
Description: Block 68 North East Unit indoor

Road data, segment # 1: Greenbank NB (day/night)

Car traffic volume	: 14168/1232	veh/TimePeriod *
Medium truck volume	: 1127/98	veh/TimePeriod *
Heavy truck volume	: 805/70	veh/TimePeriod *
Posted speed limit	: 60	km/h
Road gradient	: 2	%
Road pavement	: 1	(Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT)	:	17500
Percentage of Annual Growth	:	0.00
Number of Years of Growth	:	0.00
Medium Truck % of Total Volume	:	7.00
Heavy Truck % of Total Volume	:	5.00
Day (16 hrs) % of Total Volume	:	92.00

Data for Segment # 1: Greenbank NB (day/night)

Angle1 Angle2	:	0.00 deg	90.00 deg
Wood depth	:	0	(No woods.)
No of house rows	:	0 / 0	
Surface	:	1	(Absorptive ground surface)
Receiver source distance	:	82.75 / 82.75	m
Receiver height	:	1.50 / 4.50	m
Topography	:	1	(Flat/gentle slope; no barrier)
Reference angle	:	0.00	

Road data, segment # 2: Greenbank SB (day/night)

Car traffic volume	: 14168/1232	veh/TimePeriod *
Medium truck volume	: 1127/98	veh/TimePeriod *
Heavy truck volume	: 805/70	veh/TimePeriod *
Posted speed limit	: 60	km/h
Road gradient	: 2	%
Road pavement	: 1	(Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT)	:	17500
Percentage of Annual Growth	:	0.00
Number of Years of Growth	:	0.00
Medium Truck % of Total Volume	:	7.00
Heavy Truck % of Total Volume	:	5.00
Day (16 hrs) % of Total Volume	:	92.00

Data for Segment # 2: Greenbank SB (day/night)

Angle1 Angle2	:	0.00 deg	90.00 deg
Wood depth	:	0	(No woods.)
No of house rows	:	0 / 0	
Surface	:	1	(Absorptive ground surface)

Receiver source distance : 106.75 / 106.75 m
Receiver height : 1.50 / 4.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

Results segment # 1: Greenbank NB (day)

Source height = 1.50 m

ROAD (0.00 + 53.89 + 0.00) = 53.89 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
0	90	0.66	70.67	0.00	-12.31	-4.47	0.00	0.00	0.00	53.89

Segment Leq : 53.89 dBA

Results segment # 2: Greenbank SB (day)

Source height = 1.50 m

ROAD (0.00 + 52.05 + 0.00) = 52.05 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
0	90	0.66	70.67	0.00	-14.15	-4.47	0.00	0.00	0.00	52.05

Segment Leq : 52.05 dBA

Total Leq All Segments: 56.08 dBA

Results segment # 1: Greenbank NB (night)

Source height = 1.50 m

ROAD (0.00 + 47.11 + 0.00) = 47.11 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
0	90	0.57	63.07	0.00	-11.65	-4.31	0.00	0.00	0.00	47.11

Segment Leq : 47.11 dBA

Results segment # 2: Greenbank SB (night)

Source height = 1.50 m

ROAD (0.00 + 45.37 + 0.00) = 45.37 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
0	90	0.57	63.07	0.00	-13.38	-4.31	0.00	0.00	0.00	45.37

Segment Leq : 45.37 dBA
Total Leq All Segments: 49.34 dBA
TOTAL Leq FROM ALL SOURCES (DAY): 56.08
(NIGHT): 49.34

STAMSON 5.0 NORMAL REPORT Date: 01-12-2017 13:00:41
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: b67nwin.te Time Period: Day/Night 16/8 hours
Description: Block 67 north west end unit indoor

Road data, segment # 1: Greenbank NB (day/night)

Car traffic volume	: 14168/1232	veh/TimePeriod *
Medium truck volume	: 1127/98	veh/TimePeriod *
Heavy truck volume	: 805/70	veh/TimePeriod *
Posted speed limit	: 60	km/h
Road gradient	: 2	%
Road pavement	: 1	(Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT)	:	17500
Percentage of Annual Growth	:	0.00
Number of Years of Growth	:	0.00
Medium Truck % of Total Volume	:	7.00
Heavy Truck % of Total Volume	:	5.00
Day (16 hrs) % of Total Volume	:	92.00

Data for Segment # 1: Greenbank NB (day/night)

Angle1 Angle2	: -10.00 deg	0.00 deg
Wood depth	: 0	(No woods.)
No of house rows	: 0 / 0	
Surface	: 1	(Absorptive ground surface)
Receiver source distance	: 73.75 / 73.75	m
Receiver height	: 1.50 / 4.50	m
Topography	: 1	(Flat/gentle slope; no barrier)
Reference angle	: 0.00	

Road data, segment # 2: Greenbank SB (day/night)

Car traffic volume	: 14168/1232	veh/TimePeriod *
Medium truck volume	: 1127/98	veh/TimePeriod *
Heavy truck volume	: 805/70	veh/TimePeriod *
Posted speed limit	: 60	km/h
Road gradient	: 2	%
Road pavement	: 1	(Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT)	:	17500
Percentage of Annual Growth	:	0.00
Number of Years of Growth	:	0.00
Medium Truck % of Total Volume	:	7.00
Heavy Truck % of Total Volume	:	5.00
Day (16 hrs) % of Total Volume	:	92.00

```
Data for Segment # 2: Greenbank SB (day/night)
------------------------------------------------
Angle1   Angle2           : -10.00 deg    0.00 deg
Wood depth                :      0        (No woods.)
No of house rows          :      0 / 0
Surface                   :      1        (Absorptive ground surface)
Receiver source distance  :  97.75 / 97.75  m
Receiver height           :   1.50 / 4.50   m
Topography                :      1        (Flat/gentle slope; no barrier)
Reference angle           :   0.00


Road data, segment # 3: Greenbank NB (day/night)
------------------------------------------------
Car traffic volume  : 14168/1232  veh/TimePeriod  *
Medium truck volume :  1127/98    veh/TimePeriod  *
Heavy truck volume  :   805/70    veh/TimePeriod  *
Posted speed limit  :    60 km/h
Road gradient       :     2 %
Road pavement       :     1 (Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

    24 hr Traffic Volume (AADT or SADT):  17500
    Percentage of Annual Growth        :   0.00
    Number of Years of Growth          :   0.00
    Medium Truck % of Total Volume     :   7.00
    Heavy Truck  % of Total Volume     :   5.00
    Day (16 hrs) % of Total Volume     :  92.00

Data for Segment # 3: Greenbank NB (day/night)
------------------------------------------------
Angle1   Angle2           :  40.00 deg   90.00 deg
Wood depth                :      0        (No woods.)
No of house rows          :      0 / 0
Surface                   :      1        (Absorptive ground surface)
Receiver source distance  :  73.75 / 73.75  m
Receiver height           :   1.50 / 4.50   m
Topography                :      1        (Flat/gentle slope; no barrier)
Reference angle           :   0.00


Road data, segment # 4: Greenbank SB (day/night)
------------------------------------------------
Car traffic volume  : 14168/1232  veh/TimePeriod  *
Medium truck volume :  1127/98    veh/TimePeriod  *
Heavy truck volume  :   805/70    veh/TimePeriod  *
Posted speed limit  :    60 km/h
Road gradient       :     2 %
Road pavement       :     1 (Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

    24 hr Traffic Volume (AADT or SADT):  17500
```

```
    Percentage of Annual Growth          :    0.00
    Number of Years of Growth            :    0.00
    Medium Truck % of Total Volume       :    7.00
    Heavy Truck  % of Total Volume       :    5.00
    Day (16 hrs) % of Total Volume       :   92.00

Data for Segment # 4: Greenbank SB (day/night)
-----------------------------------------------
Angle1   Angle2           :  40.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      1       (Absorptive ground surface)
Receiver source distance  :  97.75 / 97.75  m
Receiver height           :   1.50 / 4.50   m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00


Results segment # 1: Greenbank NB (day)
---------------------------------------

Source height = 1.50 m

ROAD (0.00 + 46.62 + 0.00) = 46.62 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -10      0   0.66  70.67   0.00 -11.48 -12.57   0.00   0.00   0.00  46.62
-------------------------------------------------------------------------------

Segment Leq : 46.62 dBA


Results segment # 2: Greenbank SB (day)
---------------------------------------

Source height = 1.50 m

ROAD (0.00 + 44.59 + 0.00) = 44.59 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -10      0   0.66  70.67   0.00 -13.51 -12.57   0.00   0.00   0.00  44.59
-------------------------------------------------------------------------------

Segment Leq : 44.59 dBA
```

Results segment # 3: Greenbank NB (day)

Source height = 1.50 m

ROAD (0.00 + 50.86 + 0.00) = 50.86 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
40	90	0.66	70.67	0.00	-11.48	-8.32	0.00	0.00	0.00	50.86

Segment Leq : 50.86 dBA

Results segment # 4: Greenbank SB (day)

Source height = 1.50 m

ROAD (0.00 + 48.83 + 0.00) = 48.83 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
40	90	0.66	70.67	0.00	-13.51	-8.32	0.00	0.00	0.00	48.83

Segment Leq : 48.83 dBA

Total Leq All Segments: 54.36 dBA

Results segment # 1: Greenbank NB (night)

Source height = 1.50 m

ROAD (0.00 + 39.64 + 0.00) = 39.64 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-10	0	0.57	63.07	0.00	-10.86	-12.57	0.00	0.00	0.00	39.64

Segment Leq : 39.64 dBA

Results segment # 2: Greenbank SB (night)

Source height = 1.50 m

ROAD (0.00 + 37.72 + 0.00) = 37.72 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-10	0	0.57	63.07	0.00	-12.78	-12.57	0.00	0.00	0.00	37.72

Segment Leq : 37.72 dBA

Results segment # 3: Greenbank NB (night)

Source height = 1.50 m

ROAD (0.00 + 44.21 + 0.00) = 44.21 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
40	90	0.57	63.07	0.00	-10.86	-8.00	0.00	0.00	0.00	44.21

Segment Leq : 44.21 dBA

Results segment # 4: Greenbank SB (night)

Source height = 1.50 m

ROAD (0.00 + 42.29 + 0.00) = 42.29 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
40	90	0.57	63.07	0.00	-12.78	-8.00	0.00	0.00	0.00	42.29

Segment Leq : 42.29 dBA

Total Leq All Segments: 47.67 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 54.36
(NIGHT): 47.67

STAMSON 5.0 NORMAL REPORT Date: 01-12-2017 13:08:15
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: b67swin.te Time Period: Day/Night 16/8 hours
Description: Block 67 south west end unit indoor

Road data, segment # 1: Greenbank NB (day/night)

Car traffic volume	: 14168/1232	veh/TimePeriod *
Medium truck volume	: 1127/98	veh/TimePeriod *
Heavy truck volume	: 805/70	veh/TimePeriod *
Posted speed limit	: 60	km/h
Road gradient	: 2	%
Road pavement	: 1	(Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT)	:	17500
Percentage of Annual Growth	:	0.00
Number of Years of Growth	:	0.00
Medium Truck % of Total Volume	:	7.00
Heavy Truck % of Total Volume	:	5.00
Day (16 hrs) % of Total Volume	:	92.00

Data for Segment # 1: Greenbank NB (day/night)

Angle1 Angle2	: -45.00 deg	-25.00 deg
Wood depth	: 0	(No woods.)
No of house rows	: 0 / 0	
Surface	: 1	(Absorptive ground surface)
Receiver source distance	: 73.75 / 73.75	m
Receiver height	: 1.50 / 4.50	m
Topography	: 1	(Flat/gentle slope; no barrier)
Reference angle	: 0.00	

Road data, segment # 2: Greenbank SB (day/night)

Car traffic volume	: 14168/1232	veh/TimePeriod *
Medium truck volume	: 1127/98	veh/TimePeriod *
Heavy truck volume	: 805/70	veh/TimePeriod *
Posted speed limit	: 60	km/h
Road gradient	: 2	%
Road pavement	: 1	(Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT)	:	17500
Percentage of Annual Growth	:	0.00
Number of Years of Growth	:	0.00
Medium Truck % of Total Volume	:	7.00
Heavy Truck % of Total Volume	:	5.00
Day (16 hrs) % of Total Volume	:	92.00

Data for Segment # 2: Greenbank SB (day/night)

Angle1 Angle2	: -45.00 deg	-25.00 deg
Wood depth	: 0	(No woods.)
No of house rows	: 0 / 0	
Surface	: 1	(Absorptive ground surface)
Receiver source distance	: 97.75 / 97.75	m
Receiver height	: 1.50 / 4.50	m
Topography	: 1	(Flat/gentle slope; no barrier)
Reference angle	: 0.00	

Road data, segment # 3: Greenbank NB (day/night)

Car traffic volume	: 14168/1232	veh/TimePeriod *
Medium truck volume	: 1127/98	veh/TimePeriod *
Heavy truck volume	: 805/70	veh/TimePeriod *
Posted speed limit	: 60	km/h
Road gradient	: 2	%
Road pavement	: 1	(Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT)	:	17500
Percentage of Annual Growth	:	0.00
Number of Years of Growth	:	0.00
Medium Truck % of Total Volume	:	7.00
Heavy Truck % of Total Volume	:	5.00
Day (16 hrs) % of Total Volume	:	92.00

Data for Segment # 3: Greenbank NB (day/night)

Angle1 Angle2	: 60.00 deg	90.00 deg
Wood depth	: 0	(No woods.)
No of house rows	: 0 / 0	
Surface	: 1	(Absorptive ground surface)
Receiver source distance	: 73.75 / 73.75	m
Receiver height	: 1.50 / 4.50	m
Topography	: 1	(Flat/gentle slope; no barrier)
Reference angle	: 0.00	

Road data, segment # 4: Greenbank SB (day/night)

Car traffic volume	: 14168/1232	veh/TimePeriod *
Medium truck volume	: 1127/98	veh/TimePeriod *
Heavy truck volume	: 805/70	veh/TimePeriod *
Posted speed limit	: 60	km/h
Road gradient	: 2	%
Road pavement	: 1	(Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT)	:	17500
Percentage of Annual Growth	:	0.00
Number of Years of Growth	:	0.00
Medium Truck % of Total Volume	:	7.00
Heavy Truck % of Total Volume	:	5.00
Day (16 hrs) % of Total Volume	:	92.00

Data for Segment # 4: Greenbank SB (day/night)

Angle1 Angle2	:	60.00 deg	90.00 deg
Wood depth	:	0	(No woods.)
No of house rows	:	0 / 0	
Surface	:	1	(Absorptive ground surface)
Receiver source distance	:	97.75 / 97.75	m
Receiver height	:	1.50 / 4.50	m
Topography	:	1	(Flat/gentle slope; no barrier)
Reference angle	:	0.00	

Results segment # 1: Greenbank NB (day)

Source height = 1.50 m

ROAD (0.00 + 49.05 + 0.00) = 49.05 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-45	-25	0.66	70.67	0.00	-11.48	-10.13	0.00	0.00	0.00	49.05

Segment Leq : 49.05 dBA

Results segment # 2: Greenbank SB (day)

Source height = 1.50 m

ROAD (0.00 + 47.02 + 0.00) = 47.02 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-45	-25	0.66	70.67	0.00	-13.51	-10.13	0.00	0.00	0.00	47.02

Segment Leq : 47.02 dBA

Results segment # 3: Greenbank NB (day)

Source height = 1.50 m

ROAD (0.00 + 47.29 + 0.00) = 47.29 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
60	90	0.66	70.67	0.00	-11.48	-11.90	0.00	0.00	0.00	47.29

Segment Leq : 47.29 dBA

Results segment # 4: Greenbank SB (day)

Source height = 1.50 m

ROAD (0.00 + 45.26 + 0.00) = 45.26 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
60	90	0.66	70.67	0.00	-13.51	-11.90	0.00	0.00	0.00	45.26

Segment Leq : 45.26 dBA

Total Leq All Segments: 53.38 dBA

Results segment # 1: Greenbank NB (night)

Source height = 1.50 m

ROAD (0.00 + 42.16 + 0.00) = 42.16 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-45	-25	0.57	63.07	0.00	-10.86	-10.05	0.00	0.00	0.00	42.16

Segment Leq : 42.16 dBA

Results segment # 2: Greenbank SB (night)

Source height = 1.50 m

ROAD (0.00 + 40.24 + 0.00) = 40.24 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-45	-25	0.57	63.07	0.00	-12.78	-10.05	0.00	0.00	0.00	40.24

Segment Leq : 40.24 dBA

Results segment # 3: Greenbank NB (night)

Source height = 1.50 m

ROAD (0.00 + 40.82 + 0.00) = 40.82 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
60	90	0.57	63.07	0.00	-10.86	-11.39	0.00	0.00	0.00	40.82

Segment Leq : 40.82 dBA

Results segment # 4: Greenbank SB (night)

Source height = 1.50 m

ROAD (0.00 + 38.90 + 0.00) = 38.90 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
60	90	0.57	63.07	0.00	-12.78	-11.39	0.00	0.00	0.00	38.90

Segment Leq : 38.90 dBA

Total Leq All Segments: 46.71 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 53.38
(NIGHT): 46.71

STAMSON 5.0 NORMAL REPORT Date: 01-12-2017 11:54:27
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: b66sein.te Time Period: Day/Night 16/8 hours
Description: Block 66 south east endu unit indoor

Road data, segment # 1: Greenbank NB (day/night)

Car traffic volume	: 14168/1232	veh/TimePeriod *
Medium truck volume	: 1127/98	veh/TimePeriod *
Heavy truck volume	: 805/70	veh/TimePeriod *
Posted speed limit	: 60	km/h
Road gradient	: 2	%
Road pavement	: 1	(Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT)	:	17500
Percentage of Annual Growth	:	0.00
Number of Years of Growth	:	0.00
Medium Truck % of Total Volume	:	7.00
Heavy Truck % of Total Volume	:	5.00
Day (16 hrs) % of Total Volume	:	92.00

Data for Segment # 1: Greenbank NB (day/night)

Angle1 Angle2	: -25.00 deg	0.00 deg
Wood depth	: 0	(No woods.)
No of house rows	: 0 / 0	
Surface	: 1	(Absorptive ground surface)
Receiver source distance	: 82.75 / 82.75	m
Receiver height	: 1.50 / 4.50	m
Topography	: 1	(Flat/gentle slope; no barrier)
Reference angle	: 0.00	

Road data, segment # 2: Greenbank SB (day/night)

Car traffic volume	: 14168/1232	veh/TimePeriod *
Medium truck volume	: 1127/98	veh/TimePeriod *
Heavy truck volume	: 805/70	veh/TimePeriod *
Posted speed limit	: 60	km/h
Road gradient	: 2	%
Road pavement	: 1	(Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT)	:	17500
Percentage of Annual Growth	:	0.00
Number of Years of Growth	:	0.00
Medium Truck % of Total Volume	:	7.00
Heavy Truck % of Total Volume	:	5.00
Day (16 hrs) % of Total Volume	:	92.00

Data for Segment # 2: Greenbank SB (day/night)

Angle1 Angle2	: -25.00 deg	0.00 deg
Wood depth	: 0	(No woods.)
No of house rows	: 0 / 0	
Surface	: 1	(Absorptive ground surface)
Receiver source distance	: 106.75 / 106.75 m	
Receiver height	: 1.50 / 4.50	m
Topography	: 1	(Flat/gentle slope; no barrier)
Reference angle	: 0.00	

Results segment # 1: Greenbank NB (day)

Source height = 1.50 m

ROAD (0.00 + 49.69 + 0.00) = 49.69 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-25	0	0.66	70.67	0.00	-12.31	-8.67	0.00	0.00	0.00	49.69

Segment Leq : 49.69 dBA

Results segment # 2: Greenbank SB (day)

Source height = 1.50 m

ROAD (0.00 + 47.85 + 0.00) = 47.85 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-25	0	0.66	70.67	0.00	-14.15	-8.67	0.00	0.00	0.00	47.85

Segment Leq : 47.85 dBA

Total Leq All Segments: 51.88 dBA

Results segment # 1: Greenbank NB (night)

Source height = 1.50 m

ROAD (0.00 + 42.77 + 0.00) = 42.77 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-25	0	0.57	63.07	0.00	-11.65	-8.65	0.00	0.00	0.00	42.77

Segment Leq : 42.77 dBA

Results segment # 2: Greenbank SB (night)

Source height = 1.50 m

ROAD (0.00 + 41.03 + 0.00) = 41.03 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-25	0	0.57	63.07	0.00	-13.38	-8.65	0.00	0.00	0.00	41.03

Segment Leq : 41.03 dBA

Total Leq All Segments: 45.00 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 51.88
(NIGHT): 45.00

STAMSON 5.0 NORMAL REPORT Date: 01-12-2017 12:43:46
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: b68swin.te Time Period: Day/Night 16/8 hours
Description: Block 66 south west end unit indoor

Road data, segment # 1: Greenbank NB (day/night)

Car traffic volume	: 14168/1232	veh/TimePeriod *
Medium truck volume	: 1127/98	veh/TimePeriod *
Heavy truck volume	: 805/70	veh/TimePeriod *
Posted speed limit	: 60	km/h
Road gradient	: 2	%
Road pavement	: 1	(Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT)	:	17500
Percentage of Annual Growth	:	0.00
Number of Years of Growth	:	0.00
Medium Truck % of Total Volume	:	7.00
Heavy Truck % of Total Volume	:	5.00
Day (16 hrs) % of Total Volume	:	92.00

Data for Segment # 1: Greenbank NB (day/night)

Angle1 Angle2	: -25.00 deg	20.00 deg
Wood depth	: 0	(No woods.)
No of house rows	: 0 / 0	
Surface	: 1	(Absorptive ground surface)
Receiver source distance	: 73.75 / 73.75	m
Receiver height	: 1.50 / 4.50	m
Topography	: 1	(Flat/gentle slope; no barrier)
Reference angle	: 0.00	

Road data, segment # 2: Greenbank SB (day/night)

Car traffic volume	: 14168/1232	veh/TimePeriod *
Medium truck volume	: 1127/98	veh/TimePeriod *
Heavy truck volume	: 805/70	veh/TimePeriod *
Posted speed limit	: 60	km/h
Road gradient	: 2	%
Road pavement	: 1	(Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT)	:	17500
Percentage of Annual Growth	:	0.00
Number of Years of Growth	:	0.00
Medium Truck % of Total Volume	:	7.00
Heavy Truck % of Total Volume	:	5.00
Day (16 hrs) % of Total Volume	:	92.00

```
Data for Segment # 2: Greenbank SB (day/night)
--------------------------------------------
Angle1   Angle2           : -25.00 deg   20.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      1       (Absorptive ground surface)
Receiver source distance  :  97.75 / 97.75  m
Receiver height           :   1.50 / 4.50   m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00


Road data, segment # 3: Greenbank NB (day/night)
-----------------------------------------------
Car traffic volume  : 14168/1232  veh/TimePeriod  *
Medium truck volume :  1127/98    veh/TimePeriod  *
Heavy truck volume  :   805/70    veh/TimePeriod  *
Posted speed limit  :    60 km/h
Road gradient       :     2 %
Road pavement       :     1 (Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

    24 hr Traffic Volume (AADT or SADT):  17500
    Percentage of Annual Growth        :   0.00
    Number of Years of Growth          :   0.00
    Medium Truck % of Total Volume     :   7.00
    Heavy Truck  % of Total Volume     :   5.00
    Day (16 hrs) % of Total Volume     :  92.00

Data for Segment # 3: Greenbank NB (day/night)
--------------------------------------------
Angle1   Angle2           :  70.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      1       (Absorptive ground surface)
Receiver source distance  :  73.75 / 73.75  m
Receiver height           :   1.50 / 4.50   m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00


Road data, segment # 4: Greenbank SB (day/night)
-----------------------------------------------
Car traffic volume  : 14168/1232  veh/TimePeriod  *
Medium truck volume :  1127/98    veh/TimePeriod  *
Heavy truck volume  :   805/70    veh/TimePeriod  *
Posted speed limit  :    60 km/h
Road gradient       :     2 %
Road pavement       :     1 (Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:
```

```
    24 hr Traffic Volume (AADT or SADT):  17500
    Percentage of Annual Growth        :   0.00
    Number of Years of Growth          :   0.00
    Medium Truck % of Total Volume     :   7.00
    Heavy Truck  % of Total Volume     :   5.00
    Day (16 hrs) % of Total Volume     :  92.00

Data for Segment # 4: Greenbank SB (day/night)
-----------------------------------------------
Angle1   Angle2           :  70.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      1       (Absorptive ground surface)
Receiver source distance  :  97.75 / 97.75  m
Receiver height           :   1.50 / 4.50   m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00


Results segment # 1: Greenbank NB (day)
---------------------------------------

Source height = 1.50 m

ROAD (0.00 + 53.09 + 0.00) = 53.09 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -25     20   0.66  70.67   0.00 -11.48  -6.10   0.00   0.00   0.00  53.09
-------------------------------------------------------------------------------

Segment Leq : 53.09 dBA


Results segment # 2: Greenbank SB (day)
---------------------------------------

Source height = 1.50 m

ROAD (0.00 + 51.06 + 0.00) = 51.06 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -25     20   0.66  70.67   0.00 -13.51  -6.10   0.00   0.00   0.00  51.06
-------------------------------------------------------------------------------

Segment Leq : 51.06 dBA
```

Results segment # 3: Greenbank NB (day)

Source height = 1.50 m

ROAD (0.00 + 44.40 + 0.00) = 44.40 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
70	90	0.66	70.67	0.00	-11.48	-14.79	0.00	0.00	0.00	44.40

Segment Leq : 44.40 dBA

Results segment # 4: Greenbank SB (day)

Source height = 1.50 m

ROAD (0.00 + 42.37 + 0.00) = 42.37 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
70	90	0.66	70.67	0.00	-13.51	-14.79	0.00	0.00	0.00	42.37

Segment Leq : 42.37 dBA

Total Leq All Segments: 55.75 dBA

Results segment # 1: Greenbank NB (night)

Source height = 1.50 m

ROAD (0.00 + 46.12 + 0.00) = 46.12 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-25	20	0.57	63.07	0.00	-10.86	-6.09	0.00	0.00	0.00	46.12

Segment Leq : 46.12 dBA

Results segment # 2: Greenbank SB (night)

Source height = 1.50 m

ROAD (0.00 + 44.20 + 0.00) = 44.20 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-25	20	0.57	63.07	0.00	-12.78	-6.09	0.00	0.00	0.00	44.20

Segment Leq : 44.20 dBA

Results segment # 3: Greenbank NB (night)

Source height = 1.50 m

ROAD (0.00 + 38.08 + 0.00) = 38.08 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
70	90	0.57	63.07	0.00	-10.86	-14.13	0.00	0.00	0.00	38.08

Segment Leq : 38.08 dBA

Results segment # 4: Greenbank SB (night)

Source height = 1.50 m

ROAD (0.00 + 36.16 + 0.00) = 36.16 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
70	90	0.57	63.07	0.00	-12.78	-14.13	0.00	0.00	0.00	36.16

Segment Leq : 36.16 dBA

Total Leq All Segments: 48.91 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 55.75
(NIGHT): 48.91

STAMSON 5.0 NORMAL REPORT Date: 12-10-2017 11:57:19
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: lot1in.te Time Period: Day/Night 16/8 hours
Description: Lot 1 indoor

Road data, segment # 1: Greenbank NB (day/night)

Car traffic volume	: 14168/1232	veh/TimePeriod *
Medium truck volume	: 1127/98	veh/TimePeriod *
Heavy truck volume	: 805/70	veh/TimePeriod *
Posted speed limit	: 60	km/h
Road gradient	: 2	%
Road pavement	: 1	(Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT)	:	17500
Percentage of Annual Growth	:	0.00
Number of Years of Growth	:	0.00
Medium Truck % of Total Volume	:	7.00
Heavy Truck % of Total Volume	:	5.00
Day (16 hrs) % of Total Volume	:	92.00

Data for Segment # 1: Greenbank NB (day/night)

Angle1 Angle2	: -10.00 deg	90.00 deg
Wood depth	: 0	(No woods.)
No of house rows	: 0 / 0	
Surface	: 1	(Absorptive ground surface)
Receiver source distance	: 117.25 / 117.25	m
Receiver height	: 1.50 / 4.50	m
Topography	: 1	(Flat/gentle slope; no barrier)
Reference angle	: 0.00	

Road data, segment # 2: Greenbank SB (day/night)

Car traffic volume	: 14168/1232	veh/TimePeriod *
Medium truck volume	: 1127/98	veh/TimePeriod *
Heavy truck volume	: 805/70	veh/TimePeriod *
Posted speed limit	: 60	km/h
Road gradient	: 2	%
Road pavement	: 1	(Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT)	:	17500
Percentage of Annual Growth	:	0.00
Number of Years of Growth	:	0.00
Medium Truck % of Total Volume	:	7.00
Heavy Truck % of Total Volume	:	5.00
Day (16 hrs) % of Total Volume	:	92.00

Data for Segment # 2: Greenbank SB (day/night)

Angle1 Angle2	: -10.00 deg	90.00 deg
Wood depth	: 0	(No woods.)
No of house rows	: 0 / 0	
Surface	: 1	(Absorptive ground surface)

Receiver source distance : 141.25 / 141.25 m
Receiver height : 1.50 / 4.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

Results segment # 1: Greenbank NB (day)

Source height = 1.50 m

ROAD (0.00 + 52.00 + 0.00) = 52.00 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-10	90	0.66	70.67	0.00	-14.82	-3.84	0.00	0.00	0.00	52.00

Segment Leq : 52.00 dBA

Results segment # 2: Greenbank SB (day)

Source height = 1.50 m

ROAD (0.00 + 50.66 + 0.00) = 50.66 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-10	90	0.66	70.67	0.00	-16.17	-3.84	0.00	0.00	0.00	50.66

Segment Leq : 50.66 dBA

Total Leq All Segments: 54.39 dBA

Results segment # 1: Greenbank NB (night)

Source height = 1.50 m

ROAD (0.00 + 45.34 + 0.00) = 45.34 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-10	90	0.57	63.07	0.00	-14.02	-3.71	0.00	0.00	0.00	45.34

Segment Leq : 45.34 dBA

Results segment # 2: Greenbank SB (night)

Source height = 1.50 m

ROAD (0.00 + 44.07 + 0.00) = 44.07 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-10	90	0.57	63.07	0.00	-15.29	-3.71	0.00	0.00	0.00	44.07

Segment Leq : 44.07 dBA
Total Leq All Segments: 47.76 dBA
TOTAL Leq FROM ALL SOURCES (DAY): 54.39
(NIGHT): 47.76

STAMSON 5.0 NORMAL REPORT Date: 01-12-2017 11:03:18
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: b65u1ola.te Time Period: Day/Night 16/8 hours
Description: Block 65 unit 1 OLA

Road data, segment # 1: Greenbank NB (day/night)

Car traffic volume	: 14168/1232	veh/TimePeriod	*
Medium truck volume	: 1127/98	veh/TimePeriod	*
Heavy truck volume	: 805/70	veh/TimePeriod	*
Posted speed limit	: 60 km/h		
Road gradient	: 2 %		
Road pavement	: 1 (Typical asphalt or concrete)		

* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT)	:	17500
Percentage of Annual Growth	:	0.00
Number of Years of Growth	:	0.00
Medium Truck % of Total Volume	:	7.00
Heavy Truck % of Total Volume	:	5.00
Day (16 hrs) % of Total Volume	:	92.00

Data for Segment # 1: Greenbank NB (day/night)

Angle1 Angle2	: -90.00 deg	90.00 deg	
Wood depth	: 0	(No woods.)	
No of house rows	: 0 / 0		
Surface	: 1	(Absorptive ground surface)	
Receiver source distance	: 16.25 / 16.25	m	
Receiver height	: 1.50 / 4.50	m	
Topography	: 1	(Flat/gentle slope; no barrier)	
Reference angle	: 0.00		

Road data, segment # 2: Greenbank SB (day/night)

Car traffic volume	: 14168/1232	veh/TimePeriod	*
Medium truck volume	: 1127/98	veh/TimePeriod	*
Heavy truck volume	: 805/70	veh/TimePeriod	*
Posted speed limit	: 60 km/h		
Road gradient	: 2 %		
Road pavement	: 1 (Typical asphalt or concrete)		

* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT)	:	17500
Percentage of Annual Growth	:	0.00
Number of Years of Growth	:	0.00
Medium Truck % of Total Volume	:	7.00
Heavy Truck % of Total Volume	:	5.00
Day (16 hrs) % of Total Volume	:	92.00

Data for Segment # 2: Greenbank SB (day/night)

Angle1 Angle2	: -90.00 deg	90.00 deg
Wood depth	: 0	(No woods.)
No of house rows	: 0 / 0	
Surface	: 1	(Absorptive ground surface)
Receiver source distance	: 40.25 / 40.25	m
Receiver height	: 1.50 / 4.50	m
Topography	: 1	(Flat/gentle slope; no barrier)
Reference angle	: 0.00	

Results segment # 1: Greenbank NB (day)

Source height = 1.50 m

ROAD (0.00 + 68.63 + 0.00) = 68.63 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.66	70.67	0.00	-0.58	-1.46	0.00	0.00	0.00	68.63

Segment Leq : 68.63 dBA

Results segment # 2: Greenbank SB (day)

Source height = 1.50 m

ROAD (0.00 + 62.09 + 0.00) = 62.09 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.66	70.67	0.00	-7.12	-1.46	0.00	0.00	0.00	62.09

Segment Leq : 62.09 dBA

Total Leq All Segments: 69.50 dBA

Results segment # 1: Greenbank NB (night)

Source height = 1.50 m

ROAD (0.00 + 61.22 + 0.00) = 61.22 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.57	63.07	0.00	-0.55	-1.30	0.00	0.00	0.00	61.22

Segment Leq : 61.22 dBA

Results segment # 2: Greenbank SB (night)

Source height = 1.50 m

ROAD (0.00 + 55.04 + 0.00) = 55.04 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.57	63.07	0.00	-6.73	-1.30	0.00	0.00	0.00	55.04

Segment Leq : 55.04 dBA

Total Leq All Segments: 62.16 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 69.50
(NIGHT): 62.16

STAMSON 5.0 NORMAL REPORT Date: 11-10-2017 15:36:09
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: b65u2bar.te Time Period: Day/Night 16/8 hours
Description: Block 65 Unit 2 OLA

Road data, segment # 1: Greenbank NB (day/night)

Car traffic volume	: 14168/1232	veh/TimePeriod *
Medium truck volume	: 1127/98	veh/TimePeriod *
Heavy truck volume	: 805/70	veh/TimePeriod *
Posted speed limit	: 60	km/h
Road gradient	: 2	%
Road pavement	: 1	(Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT)	:	17500
Percentage of Annual Growth	:	0.00
Number of Years of Growth	:	0.00
Medium Truck % of Total Volume	:	7.00
Heavy Truck % of Total Volume	:	5.00
Day (16 hrs) % of Total Volume	:	92.00

Data for Segment # 1: Greenbank NB (day/night)

Angle1 Angle2	: -90.00 deg	20.00 deg
Wood depth	: 0	(No woods.)
No of house rows	: 0 / 0	
Surface	: 1	(Absorptive ground surface)
Receiver source distance	: 22.25 / 22.25	m
Receiver height	: 1.50 / 4.50	m
Topography	: 1	(Flat/gentle slope; no barrier)
Reference angle	: 0.00	

Road data, segment # 2: Greenbank SB (day/night)

Car traffic volume	: 14168/1232	veh/TimePeriod *
Medium truck volume	: 1127/98	veh/TimePeriod *
Heavy truck volume	: 805/70	veh/TimePeriod *
Posted speed limit	: 60	km/h
Road gradient	: 2	%
Road pavement	: 1	(Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT)	:	17500
Percentage of Annual Growth	:	0.00
Number of Years of Growth	:	0.00
Medium Truck % of Total Volume	:	7.00
Heavy Truck % of Total Volume	:	5.00
Day (16 hrs) % of Total Volume	:	92.00

Data for Segment # 2: Greenbank SB (day/night)

Angle1 Angle2	: -90.00 deg	20.00 deg
Wood depth	: 0	(No woods.)
No of house rows	: 0 / 0	
Surface	: 1	(Absorptive ground surface)

Receiver source distance : 46.25 / 46.25 m
Receiver height : 1.50 / 4.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

Results segment # 1: Greenbank NB (day)

Source height = 1.50 m

ROAD (0.00 + 64.52 + 0.00) = 64.52 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	20	0.66	70.67	0.00	-2.84	-3.31	0.00	0.00	0.00	64.52

Segment Leq : 64.52 dBA

Results segment # 2: Greenbank SB (day)

Source height = 1.50 m

ROAD (0.00 + 59.24 + 0.00) = 59.24 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	20	0.66	70.67	0.00	-8.12	-3.31	0.00	0.00	0.00	59.24

Segment Leq : 59.24 dBA

Total Leq All Segments: 65.65 dBA

Results segment # 1: Greenbank NB (night)

Source height = 1.50 m

ROAD (0.00 + 57.19 + 0.00) = 57.19 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	20	0.57	63.07	0.00	-2.69	-3.19	0.00	0.00	0.00	57.19

Segment Leq : 57.19 dBA

Results segment # 2: Greenbank SB (night)

Source height = 1.50 m

ROAD (0.00 + 52.21 + 0.00) = 52.21 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	20	0.57	63.07	0.00	-7.68	-3.19	0.00	0.00	0.00	52.21

Segment Leq : 52.21 dBA
Total Leq All Segments: 58.39 dBA
TOTAL Leq FROM ALL SOURCES (DAY): 65.65
(NIGHT): 58.39

STAMSON 5.0 COMPREHENSIVE REPORT Date: 11-10-2017 15:43:40
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: b65u3bar.te Time Period: Day/Night 16/8 hours
Description: Block 65 Unit 3 OLA

Road data, segment # 1: Greenbank NB (day/night)

Car traffic volume	: 14168/1232	veh/TimePeriod *
Medium truck volume	: 1127/98	veh/TimePeriod *
Heavy truck volume	: 805/70	veh/TimePeriod *
Posted speed limit	: 60	km/h
Road gradient	: 2	%
Road pavement	: 1	(Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT)	:	17500
Percentage of Annual Growth	:	0.00
Number of Years of Growth	:	0.00
Medium Truck % of Total Volume	:	7.00
Heavy Truck % of Total Volume	:	5.00
Day (16 hrs) % of Total Volume	:	92.00

Data for Segment # 1: Greenbank NB (day/night)

Angle1 Angle2	: -90.00 deg	15.00 deg
Wood depth	: 0	(No woods.)
No of house rows	: 0 / 0	
Surface	: 1	(Absorptive ground surface)
Receiver source distance	: 28.25 / 28.25	m
Receiver height	: 1.50 / 4.50	m
Topography	: 1	(Flat/gentle slope; no barrier)
Reference angle	: 0.00	

Road data, segment # 2: Greenbank SB (day/night)

Car traffic volume	: 14168/1232	veh/TimePeriod *
Medium truck volume	: 1127/98	veh/TimePeriod *
Heavy truck volume	: 805/70	veh/TimePeriod *
Posted speed limit	: 60	km/h
Road gradient	: 2	%
Road pavement	: 1	(Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT)	:	17500
Percentage of Annual Growth	:	0.00
Number of Years of Growth	:	0.00
Medium Truck % of Total Volume	:	7.00
Heavy Truck % of Total Volume	:	5.00
Day (16 hrs) % of Total Volume	:	92.00

Data for Segment # 2: Greenbank SB (day/night)

Angle1 Angle2	: -90.00 deg	15.00 deg
Wood depth	: 0	(No woods.)
No of house rows	: 0 / 0	
Surface	: 1	(Absorptive ground surface)
Receiver source distance	: 52.25 / 52.25	m

Receiver height : 1.50 / 4.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

Segment # 1: Greenbank NB (day)

Source height = 1.50 m

ROAD (0.00 + 62.54 + 0.00) = 62.54 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	15	0.66	70.67	0.00	-4.56	-3.56	0.00	0.00	0.00	62.54

Segment Leq : 62.54 dBA

Segment # 2: Greenbank SB (day)

Source height = 1.50 m

ROAD (0.00 + 58.11 + 0.00) = 58.11 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	15	0.66	70.67	0.00	-9.00	-3.56	0.00	0.00	0.00	58.11

Segment Leq : 58.11 dBA

Total Leq All Segments: 63.88 dBA

Segment # 1: Greenbank NB (night)

Source height = 1.50 m

ROAD (0.00 + 55.32 + 0.00) = 55.32 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	15	0.57	63.07	0.00	-4.32	-3.44	0.00	0.00	0.00	55.32

Segment Leq : 55.32 dBA

Segment # 2: Greenbank SB (night)

Source height = 1.50 m

ROAD (0.00 + 51.12 + 0.00) = 51.12 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	15	0.57	63.07	0.00	-8.51	-3.44	0.00	0.00	0.00	51.12

Segment Leq : 51.12 dBA
Total Leq All Segments: 56.72 dBA
TOTAL Leq FROM ALL SOURCES (DAY): 63.88
(NIGHT): 56.72

STAMSON 5.0 COMPREHENSIVE REPORT Date: 11-10-2017 15:47:49
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: b65u4bar.te Time Period: Day/Night 16/8 hours
Description: Block 65 Unit 4 OLA

Road data, segment # 1: Greenbank NB (day/night)

Car traffic volume	: 14168/1232	veh/TimePeriod *
Medium truck volume	: 1127/98	veh/TimePeriod *
Heavy truck volume	: 805/70	veh/TimePeriod *
Posted speed limit	: 60	km/h
Road gradient	: 2	%
Road pavement	: 1	(Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT)	:	17500
Percentage of Annual Growth	:	0.00
Number of Years of Growth	:	0.00
Medium Truck % of Total Volume	:	7.00
Heavy Truck % of Total Volume	:	5.00
Day (16 hrs) % of Total Volume	:	92.00

Data for Segment # 1: Greenbank NB (day/night)

Angle1 Angle2	: -90.00 deg	10.00 deg
Wood depth	: 0	(No woods.)
No of house rows	: 0 / 0	
Surface	: 1	(Absorptive ground surface)
Receiver source distance	: 34.25 / 34.25	m
Receiver height	: 1.50 / 4.50	m
Topography	: 1	(Flat/gentle slope; no barrier)
Reference angle	: 0.00	

Road data, segment # 2: Greenbank SB (day/night)

Car traffic volume	: 14168/1232	veh/TimePeriod *
Medium truck volume	: 1127/98	veh/TimePeriod *
Heavy truck volume	: 805/70	veh/TimePeriod *
Posted speed limit	: 60	km/h
Road gradient	: 2	%
Road pavement	: 1	(Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT)	:	17500
Percentage of Annual Growth	:	0.00
Number of Years of Growth	:	0.00
Medium Truck % of Total Volume	:	7.00
Heavy Truck % of Total Volume	:	5.00
Day (16 hrs) % of Total Volume	:	92.00

Data for Segment # 2: Greenbank SB (day/night)

Angle1 Angle2	: -90.00 deg	10.00 deg
Wood depth	: 0	(No woods.)
No of house rows	: 0 / 0	
Surface	: 1	(Absorptive ground surface)
Receiver source distance	: 58.25 / 58.25	m

Receiver height : 1.50 / 4.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

Segment # 1: Greenbank NB (day)

Source height = 1.50 m

ROAD (0.00 + 60.87 + 0.00) = 60.87 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	10	0.66	70.67	0.00	-5.95	-3.84	0.00	0.00	0.00	60.87

Segment Leq : 60.87 dBA

Segment # 2: Greenbank SB (day)

Source height = 1.50 m

ROAD (0.00 + 57.04 + 0.00) = 57.04 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	10	0.66	70.67	0.00	-9.78	-3.84	0.00	0.00	0.00	57.04

Segment Leq : 57.04 dBA

Total Leq All Segments: 62.37 dBA

Segment # 1: Greenbank NB (night)

Source height = 1.50 m

ROAD (0.00 + 53.73 + 0.00) = 53.73 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	10	0.57	63.07	0.00	-5.63	-3.71	0.00	0.00	0.00	53.73

Segment Leq : 53.73 dBA

Segment # 2: Greenbank SB (night)

Source height = 1.50 m

ROAD (0.00 + 50.11 + 0.00) = 50.11 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	10	0.57	63.07	0.00	-9.25	-3.71	0.00	0.00	0.00	50.11

Segment Leq : 50.11 dBA
Total Leq All Segments: 55.30 dBA
TOTAL Leq FROM ALL SOURCES (DAY): 62.37
(NIGHT): 55.30

STAMSON 5.0 COMPREHENSIVE REPORT Date: 11-10-2017 16:28:12
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: b64u1bar.te Time Period: Day/Night 16/8 hours
Description: Block 64 Unit 1 OLA

Road data, segment # 1: Greenbank NB (day/night)

Car traffic volume	: 14168/1232	veh/TimePeriod *
Medium truck volume	: 1127/98	veh/TimePeriod *
Heavy truck volume	: 805/70	veh/TimePeriod *
Posted speed limit	: 60	km/h
Road gradient	: 2	%
Road pavement	: 1	(Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT)	:	17500
Percentage of Annual Growth	:	0.00
Number of Years of Growth	:	0.00
Medium Truck % of Total Volume	:	7.00
Heavy Truck % of Total Volume	:	5.00
Day (16 hrs) % of Total Volume	:	92.00

Data for Segment # 1: Greenbank NB (day/night)

Angle1 Angle2	: -90.00 deg	5.00 deg
Wood depth	: 0	(No woods.)
No of house rows	: 0 / 0	
Surface	: 1	(Absorptive ground surface)
Receiver source distance	: 43.75 / 43.75	m
Receiver height	: 1.50 / 4.50	m
Topography	: 1	(Flat/gentle slope; no barrier)
Reference angle	: 0.00	

Road data, segment # 2: Greenbank SB (day/night)

Car traffic volume	: 14168/1232	veh/TimePeriod *
Medium truck volume	: 1127/98	veh/TimePeriod *
Heavy truck volume	: 805/70	veh/TimePeriod *
Posted speed limit	: 60	km/h
Road gradient	: 2	%
Road pavement	: 1	(Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT)	:	17500
Percentage of Annual Growth	:	0.00
Number of Years of Growth	:	0.00
Medium Truck % of Total Volume	:	7.00
Heavy Truck % of Total Volume	:	5.00
Day (16 hrs) % of Total Volume	:	92.00

Data for Segment # 2: Greenbank SB (day/night)

Angle1 Angle2	: -90.00 deg	5.00 deg
Wood depth	: 0	(No woods.)
No of house rows	: 0 / 0	
Surface	: 1	(Absorptive ground surface)
Receiver source distance	: 67.75 / 67.75	m

```
Receiver height          :   1.50 / 4.50   m
Topography               :      1       (Flat/gentle slope; no barrier)
Reference angle          :   0.00

Segment # 1: Greenbank NB (day)
-------------------------------

Source height = 1.50 m

ROAD (0.00 + 58.81 + 0.00) = 58.81 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -90      5   0.66  70.67   0.00  -7.72  -4.14   0.00   0.00   0.00  58.81
-------------------------------------------------------------------------------

Segment Leq : 58.81 dBA

Segment # 2: Greenbank SB (day)
-------------------------------

Source height = 1.50 m

ROAD (0.00 + 55.65 + 0.00) = 55.65 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -90      5   0.66  70.67   0.00 -10.87  -4.14   0.00   0.00   0.00  55.65
-------------------------------------------------------------------------------

Segment Leq : 55.65 dBA

Total Leq All Segments: 60.52 dBA

Segment # 1: Greenbank NB (night)
---------------------------------

Source height = 1.50 m

ROAD (0.00 + 51.77 + 0.00) = 51.77 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -90      5   0.57  63.07   0.00  -7.30  -4.00   0.00   0.00   0.00  51.77
-------------------------------------------------------------------------------

Segment Leq : 51.77 dBA

Segment # 2: Greenbank SB (night)
---------------------------------

Source height = 1.50 m

ROAD (0.00 + 48.79 + 0.00) = 48.79 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -90      5   0.57  63.07   0.00 -10.28  -4.00   0.00   0.00   0.00  48.79
-------------------------------------------------------------------------------

Segment Leq : 48.79 dBA
Total Leq All Segments: 53.54 dBA
TOTAL Leq FROM ALL SOURCES (DAY): 60.52
                           (NIGHT): 53.54
```

STAMSON 5.0 COMPREHENSIVE REPORT Date: 11-10-2017 16:39:45
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: b64u2bar.te Time Period: Day/Night 16/8 hours
Description: Block 64 Unit 2 OLA

Road data, segment # 1: Greenbank NB (day/night)

Car traffic volume	: 14168/1232	veh/TimePeriod *
Medium truck volume	: 1127/98	veh/TimePeriod *
Heavy truck volume	: 805/70	veh/TimePeriod *
Posted speed limit	: 60	km/h
Road gradient	: 2	%
Road pavement	: 1	(Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT)	:	17500
Percentage of Annual Growth	:	0.00
Number of Years of Growth	:	0.00
Medium Truck % of Total Volume	:	7.00
Heavy Truck % of Total Volume	:	5.00
Day (16 hrs) % of Total Volume	:	92.00

Data for Segment # 1: Greenbank NB (day/night)

Angle1 Angle2	: -90.00 deg	5.00 deg
Wood depth	: 0	(No woods.)
No of house rows	: 0 / 0	
Surface	: 1	(Absorptive ground surface)
Receiver source distance	: 49.75 / 49.75	m
Receiver height	: 1.50 / 4.50	m
Topography	: 1	(Flat/gentle slope; no barrier)
Reference angle	: 0.00	

Road data, segment # 2: Greenbank SB (day/night)

Car traffic volume	: 14168/1232	veh/TimePeriod *
Medium truck volume	: 1127/98	veh/TimePeriod *
Heavy truck volume	: 805/70	veh/TimePeriod *
Posted speed limit	: 60	km/h
Road gradient	: 2	%
Road pavement	: 1	(Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT)	:	17500
Percentage of Annual Growth	:	0.00
Number of Years of Growth	:	0.00
Medium Truck % of Total Volume	:	7.00
Heavy Truck % of Total Volume	:	5.00
Day (16 hrs) % of Total Volume	:	92.00

Data for Segment # 2: Greenbank SB (day/night)

Angle1 Angle2	: -90.00 deg	5.00 deg
Wood depth	: 0	(No woods.)
No of house rows	: 0 / 0	
Surface	: 1	(Absorptive ground surface)

Receiver source distance : 73.75 / 73.75 m
Receiver height : 1.50 / 4.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

Segment # 1: Greenbank NB (day)

Source height = 1.50 m

ROAD (0.00 + 57.88 + 0.00) = 57.88 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	5	0.66	70.67	0.00	-8.64	-4.14	0.00	0.00	0.00	57.88

Segment Leq : 57.88 dBA

Segment # 2: Greenbank SB (day)

Source height = 1.50 m

ROAD (0.00 + 55.04 + 0.00) = 55.04 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	5	0.66	70.67	0.00	-11.48	-4.14	0.00	0.00	0.00	55.04

Segment Leq : 55.04 dBA

Total Leq All Segments: 59.70 dBA

Segment # 1: Greenbank NB (night)

Source height = 1.50 m

ROAD (0.00 + 50.89 + 0.00) = 50.89 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	5	0.57	63.07	0.00	-8.18	-4.00	0.00	0.00	0.00	50.89

Segment Leq : 50.89 dBA

Segment # 2: Greenbank SB (night)

Source height = 1.50 m

ROAD (0.00 + 48.21 + 0.00) = 48.21 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	5	0.57	63.07	0.00	-10.86	-4.00	0.00	0.00	0.00	48.21

Segment Leq : 48.21 dBA
Total Leq All Segments: 52.76 dBA
TOTAL Leq FROM ALL SOURCES (DAY): 59.70
(NIGHT): 52.76

STAMSON 5.0 COMPREHENSIVE REPORT Date: 11-10-2017 16:47:02
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: b62u2ola.te Time Period: Day/Night 16/8 hours
Description: Block 62 Unit 2 OLA

Road data, segment # 1: Greenbank NB (day/night)

Car traffic volume	: 14168/1232	veh/TimePeriod *
Medium truck volume	: 1127/98	veh/TimePeriod *
Heavy truck volume	: 805/70	veh/TimePeriod *
Posted speed limit	: 60	km/h
Road gradient	: 2	%
Road pavement	: 1	(Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT)	:	17500
Percentage of Annual Growth	:	0.00
Number of Years of Growth	:	0.00
Medium Truck % of Total Volume	:	7.00
Heavy Truck % of Total Volume	:	5.00
Day (16 hrs) % of Total Volume	:	92.00

Data for Segment # 1: Greenbank NB (day/night)

Angle1 Angle2	: -90.00 deg	3.00 deg
Wood depth	: 0	(No woods.)
No of house rows	: 0 / 0	
Surface	: 1	(Absorptive ground surface)
Receiver source distance	: 100.25 / 100.25	m
Receiver height	: 1.50 / 4.50	m
Topography	: 1	(Flat/gentle slope; no barrier)
Reference angle	: 0.00	

Road data, segment # 2: Greenbank SB (day/night)

Car traffic volume	: 14168/1232	veh/TimePeriod *
Medium truck volume	: 1127/98	veh/TimePeriod *
Heavy truck volume	: 805/70	veh/TimePeriod *
Posted speed limit	: 60	km/h
Road gradient	: 2	%
Road pavement	: 1	(Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT)	:	17500
Percentage of Annual Growth	:	0.00
Number of Years of Growth	:	0.00
Medium Truck % of Total Volume	:	7.00
Heavy Truck % of Total Volume	:	5.00
Day (16 hrs) % of Total Volume	:	92.00

Data for Segment # 2: Greenbank SB (day/night)

Angle1 Angle2	: -90.00 deg	3.00 deg
Wood depth	: 0	(No woods.)
No of house rows	: 0 / 0	
Surface	: 1	(Absorptive ground surface)
Receiver source distance	: 124.25 / 124.25	m

Receiver height : 1.50 / 4.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

Segment # 1: Greenbank NB (day)

Source height = 1.50 m

ROAD (0.00 + 52.70 + 0.00) = 52.70 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	3	0.66	70.67	0.00	-13.69	-4.27	0.00	0.00	0.00	52.70

Segment Leq : 52.70 dBA

Segment # 2: Greenbank SB (day)

Source height = 1.50 m

ROAD (0.00 + 51.15 + 0.00) = 51.15 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	3	0.66	70.67	0.00	-15.24	-4.27	0.00	0.00	0.00	51.15

Segment Leq : 51.15 dBA

Total Leq All Segments: 55.00 dBA

Segment # 1: Greenbank NB (night)

Source height = 1.50 m

ROAD (0.00 + 45.99 + 0.00) = 45.99 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	3	0.57	63.07	0.00	-12.95	-4.12	0.00	0.00	0.00	45.99

Segment Leq : 45.99 dBA

Segment # 2: Greenbank SB (night)

Source height = 1.50 m

ROAD (0.00 + 44.53 + 0.00) = 44.53 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	3	0.57	63.07	0.00	-14.42	-4.12	0.00	0.00	0.00	44.53

Segment Leq : 44.53 dBA
Total Leq All Segments: 48.33 dBA
TOTAL Leq FROM ALL SOURCES (DAY): 55.00
(NIGHT): 48.33

STAMSON 5.0 COMPREHENSIVE REPORT Date: 11-10-2017 16:46:28
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: b62u3ola.te Time Period: Day/Night 16/8 hours
Description: Block 62 Unit 3 OLA

Road data, segment # 1: Greenbank NB (day/night)

Car traffic volume	: 14168/1232	veh/TimePeriod *
Medium truck volume	: 1127/98	veh/TimePeriod *
Heavy truck volume	: 805/70	veh/TimePeriod *
Posted speed limit	: 60	km/h
Road gradient	: 2	%
Road pavement	: 1	(Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT)	:	17500
Percentage of Annual Growth	:	0.00
Number of Years of Growth	:	0.00
Medium Truck % of Total Volume	:	7.00
Heavy Truck % of Total Volume	:	5.00
Day (16 hrs) % of Total Volume	:	92.00

Data for Segment # 1: Greenbank NB (day/night)

Angle1 Angle2	: -90.00 deg	3.00 deg
Wood depth	: 0	(No woods.)
No of house rows	: 0 / 0	
Surface	: 1	(Absorptive ground surface)
Receiver source distance	: 106.25 / 106.25	m
Receiver height	: 1.50 / 4.50	m
Topography	: 1	(Flat/gentle slope; no barrier)
Reference angle	: 0.00	

Road data, segment # 2: Greenbank SB (day/night)

Car traffic volume	: 14168/1232	veh/TimePeriod *
Medium truck volume	: 1127/98	veh/TimePeriod *
Heavy truck volume	: 805/70	veh/TimePeriod *
Posted speed limit	: 60	km/h
Road gradient	: 2	%
Road pavement	: 1	(Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT)	:	17500
Percentage of Annual Growth	:	0.00
Number of Years of Growth	:	0.00
Medium Truck % of Total Volume	:	7.00
Heavy Truck % of Total Volume	:	5.00
Day (16 hrs) % of Total Volume	:	92.00

Data for Segment # 2: Greenbank SB (day/night)

Angle1 Angle2	: -90.00 deg	3.00 deg
Wood depth	: 0	(No woods.)
No of house rows	: 0 / 0	
Surface	: 1	(Absorptive ground surface)
Receiver source distance	: 130.25 / 130.25	m

Receiver height : 1.50 / 4.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

Segment # 1: Greenbank NB (day)

Source height = 1.50 m

ROAD (0.00 + 52.28 + 0.00) = 52.28 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	3	0.66	70.67	0.00	-14.11	-4.27	0.00	0.00	0.00	52.28

Segment Leq : 52.28 dBA

Segment # 2: Greenbank SB (day)

Source height = 1.50 m

ROAD (0.00 + 50.81 + 0.00) = 50.81 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	3	0.66	70.67	0.00	-15.58	-4.27	0.00	0.00	0.00	50.81

Segment Leq : 50.81 dBA

Total Leq All Segments: 54.62 dBA

Segment # 1: Greenbank NB (night)

Source height = 1.50 m

ROAD (0.00 + 45.60 + 0.00) = 45.60 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	3	0.57	63.07	0.00	-13.35	-4.12	0.00	0.00	0.00	45.60

Segment Leq : 45.60 dBA

Segment # 2: Greenbank SB (night)

Source height = 1.50 m

ROAD (0.00 + 44.21 + 0.00) = 44.21 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	3	0.57	63.07	0.00	-14.74	-4.12	0.00	0.00	0.00	44.21

Segment Leq : 44.21 dBA
Total Leq All Segments: 47.97 dBA
TOTAL Leq FROM ALL SOURCES (DAY): 54.62
(NIGHT): 47.97

STAMSON 5.0 COMPREHENSIVE REPORT Date: 11-10-2017 16:48:13
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: lot1ola.te Time Period: Day/Night 16/8 hours
Description: Lot 1 OLA

Road data, segment # 1: Greenbank NB (day/night)

Car traffic volume	: 14168/1232	veh/TimePeriod *
Medium truck volume	: 1127/98	veh/TimePeriod *
Heavy truck volume	: 805/70	veh/TimePeriod *
Posted speed limit	: 60	km/h
Road gradient	: 2	%
Road pavement	: 1	(Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT)	:	17500
Percentage of Annual Growth	:	0.00
Number of Years of Growth	:	0.00
Medium Truck % of Total Volume	:	7.00
Heavy Truck % of Total Volume	:	5.00
Day (16 hrs) % of Total Volume	:	92.00

Data for Segment # 1: Greenbank NB (day/night)

Angle1 Angle2	: -10.00 deg	90.00 deg
Wood depth	: 0	(No woods.)
No of house rows	: 0 / 0	
Surface	: 1	(Absorptive ground surface)
Receiver source distance	: 112.25 / 112.25	m
Receiver height	: 1.50 / 4.50	m
Topography	: 1	(Flat/gentle slope; no barrier)
Reference angle	: 0.00	

Road data, segment # 2: Greenbank SB (day/night)

Car traffic volume	: 14168/1232	veh/TimePeriod *
Medium truck volume	: 1127/98	veh/TimePeriod *
Heavy truck volume	: 805/70	veh/TimePeriod *
Posted speed limit	: 60	km/h
Road gradient	: 2	%
Road pavement	: 1	(Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT)	:	17500
Percentage of Annual Growth	:	0.00
Number of Years of Growth	:	0.00
Medium Truck % of Total Volume	:	7.00
Heavy Truck % of Total Volume	:	5.00
Day (16 hrs) % of Total Volume	:	92.00

Data for Segment # 2: Greenbank SB (day/night)

Angle1 Angle2	: -10.00 deg	90.00 deg
Wood depth	: 0	(No woods.)
No of house rows	: 0 / 0	
Surface	: 1	(Absorptive ground surface)
Receiver source distance	: 146.25 / 146.25	m

Receiver height : 1.50 / 4.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

Segment # 1: Greenbank NB (day)

Source height = 1.50 m

ROAD (0.00 + 52.31 + 0.00) = 52.31 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-10	90	0.66	70.67	0.00	-14.51	-3.84	0.00	0.00	0.00	52.31

Segment Leq : 52.31 dBA

Segment # 2: Greenbank SB (day)

Source height = 1.50 m

ROAD (0.00 + 50.41 + 0.00) = 50.41 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-10	90	0.66	70.67	0.00	-16.42	-3.84	0.00	0.00	0.00	50.41

Segment Leq : 50.41 dBA

Total Leq All Segments: 54.47 dBA

Segment # 1: Greenbank NB (night)

Source height = 1.50 m

ROAD (0.00 + 45.64 + 0.00) = 45.64 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-10	90	0.57	63.07	0.00	-13.72	-3.71	0.00	0.00	0.00	45.64

Segment Leq : 45.64 dBA

Segment # 2: Greenbank SB (night)

Source height = 1.50 m

ROAD (0.00 + 43.83 + 0.00) = 43.83 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-10	90	0.57	63.07	0.00	-15.53	-3.71	0.00	0.00	0.00	43.83

Segment Leq : 43.83 dBA
Total Leq All Segments: 47.84 dBA
TOTAL Leq FROM ALL SOURCES (DAY): 54.47
(NIGHT): 47.84

STAMSON 5.0 NORMAL REPORT Date: 01-12-2017 10:43:06
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: b65u1bar.te Time Period: Day/Night 16/8 hours
Description: Block 65 unit 1 OLA with barrier

Road data, segment # 1: Greenbank NB (day/night)

Car traffic volume	: 14168/1232	veh/TimePeriod *
Medium truck volume	: 1127/98	veh/TimePeriod *
Heavy truck volume	: 805/70	veh/TimePeriod *
Posted speed limit	: 60	km/h
Road gradient	: 2	%
Road pavement	: 1	(Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT)	:	17500
Percentage of Annual Growth	:	0.00
Number of Years of Growth	:	0.00
Medium Truck % of Total Volume	:	7.00
Heavy Truck % of Total Volume	:	5.00
Day (16 hrs) % of Total Volume	:	92.00

Data for Segment # 1: Greenbank NB (day/night)

Angle1 Angle2	: -90.00 deg	90.00 deg
Wood depth	: 0	(No woods.)
No of house rows	: 0 / 0	
Surface	: 1	(Absorptive ground surface)
Receiver source distance	: 16.25 / 16.25	m
Receiver height	: 1.50 / 4.50	m
Topography	: 2	(Flat/gentle slope; with barrier)
Barrier angle1	: -90.00 deg	Angle2 : 70.00 deg
Barrier height	: 2.50	m
Barrier receiver distance	: 7.00 / 7.00	m
Source elevation	: 95.45	m
Receiver elevation	: 95.65	m
Barrier elevation	: 96.65	m
Reference angle	: 0.00	

Road data, segment # 2: Greenbank SB (day/night)

Car traffic volume	: 14168/1232	veh/TimePeriod *
Medium truck volume	: 1127/98	veh/TimePeriod *
Heavy truck volume	: 805/70	veh/TimePeriod *
Posted speed limit	: 60	km/h
Road gradient	: 2	%
Road pavement	: 1	(Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

```
    24 hr Traffic Volume (AADT or SADT):  17500
    Percentage of Annual Growth        :   0.00
    Number of Years of Growth          :   0.00
    Medium Truck % of Total Volume     :   7.00
    Heavy Truck  % of Total Volume     :   5.00
    Day (16 hrs) % of Total Volume     :  92.00

Data for Segment # 2: Greenbank SB (day/night)
-----------------------------------------------
Angle1   Angle2           : -90.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      1       (Absorptive ground surface)
Receiver source distance  :  40.25 / 40.25  m
Receiver height           :   1.50 / 4.50   m
Topography                :      2       (Flat/gentle slope; with barrier)
Barrier angle1            : -90.00 deg   Angle2 : 70.00 deg
Barrier height            :   2.50 m
Barrier receiver distance :   7.00 / 7.00   m
Source elevation          :  95.45 m
Receiver elevation        :  95.65 m
Barrier elevation         :  96.65 m
Reference angle           :   0.00


Results segment # 1: Greenbank NB (day)
---------------------------------------

Source height = 1.50 m

Barrier height for grazing incidence
------------------------------------
Source      ! Receiver    ! Barrier     ! Elevation of
Height  (m) ! Height  (m) ! Height  (m) ! Barrier Top  (m)
------------+-------------+-------------+--------------
       1.50 !        1.50 !        0.41 !        97.06

ROAD (0.00 + 56.35 + 55.30) = 58.87 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -90     70   0.51  70.67   0.00  -0.52  -1.45   0.00   0.00 -12.35  56.35
-------------------------------------------------------------------------------
    70     90   0.66  70.67   0.00  -0.58 -14.79   0.00   0.00   0.00  55.30
-------------------------------------------------------------------------------

Segment Leq : 58.87 dBA
```

Results segment # 2: Greenbank SB (day)

Source height = 1.50 m

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
1.50	1.50	0.46	97.11

ROAD (0.00 + 51.77 + 48.76) = 53.54 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	70	0.51	70.67	0.00	-6.47	-1.45	0.00	0.00	-10.97	51.77
70	90	0.66	70.67	0.00	-7.12	-14.79	0.00	0.00	0.00	48.76

Segment Leq : 53.54 dBA

Total Leq All Segments: 59.99 dBA

Results segment # 1: Greenbank NB (night)

Source height = 1.50 m

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
1.50	4.50	2.12	98.77

ROAD (0.00 + 55.68 + 48.39) = 56.42 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	70	0.42	63.07	0.00	-0.49	-1.31	0.00	0.00	-5.59	55.68
70	90	0.57	63.07	0.00	-0.55	-14.13	0.00	0.00	0.00	48.39

Segment Leq : 56.42 dBA

Results segment # 2: Greenbank SB (night)

Source height = 1.50 m

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
1.50	4.50	2.94	99.59

ROAD (0.00 + 54.80 + 42.21) = 55.04 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	70	0.42	63.07	0.00	-6.09	-1.31	0.00	0.00	-4.34	51.34*
-90	70	0.57	63.07	0.00	-6.73	-1.54	0.00	0.00	0.00	54.80
70	90	0.57	63.07	0.00	-6.73	-14.13	0.00	0.00	0.00	42.21

* Bright Zone !

Segment Leq : 55.04 dBA

Total Leq All Segments: 58.79 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 59.99
(NIGHT): 58.79

STAMSON 5.0 NORMAL REPORT Date: 01-12-2017 10:46:58
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: b65u2bar.te Time Period: Day/Night 16/8 hours
Description: Block 65 unit 2 OLA with barrier

Road data, segment # 1: Greenbank NB (day/night)

Car traffic volume	: 14168/1232	veh/TimePeriod *
Medium truck volume	: 1127/98	veh/TimePeriod *
Heavy truck volume	: 805/70	veh/TimePeriod *
Posted speed limit	: 60	km/h
Road gradient	: 2	%
Road pavement	: 1	(Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT)	:	17500
Percentage of Annual Growth	:	0.00
Number of Years of Growth	:	0.00
Medium Truck % of Total Volume	:	7.00
Heavy Truck % of Total Volume	:	5.00
Day (16 hrs) % of Total Volume	:	92.00

Data for Segment # 1: Greenbank NB (day/night)

Angle1 Angle2	: -90.00 deg	20.00 deg
Wood depth	: 0	(No woods.)
No of house rows	: 0 / 0	
Surface	: 1	(Absorptive ground surface)
Receiver source distance	: 22.25 / 22.25	m
Receiver height	: 1.50 / 4.50	m
Topography	: 2	(Flat/gentle slope; with barrier)
Barrier angle1	: -90.00 deg	Angle2 : 20.00 deg
Barrier height	: 2.70	m
Barrier receiver distance	: 13.00 / 13.00	m
Source elevation	: 95.45	m
Receiver elevation	: 95.65	m
Barrier elevation	: 96.65	m
Reference angle	: 0.00	

Road data, segment # 2: Greenbank SB (day/night)

Car traffic volume	: 14168/1232	veh/TimePeriod *
Medium truck volume	: 1127/98	veh/TimePeriod *
Heavy truck volume	: 805/70	veh/TimePeriod *
Posted speed limit	: 60	km/h
Road gradient	: 2	%
Road pavement	: 1	(Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

```
    24 hr Traffic Volume (AADT or SADT):  17500
    Percentage of Annual Growth        :   0.00
    Number of Years of Growth          :   0.00
    Medium Truck % of Total Volume     :   7.00
    Heavy Truck  % of Total Volume     :   5.00
    Day (16 hrs) % of Total Volume     :  92.00

Data for Segment # 2: Greenbank SB (day/night)
------------------------------------------
Angle1   Angle2           : -90.00 deg   20.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      1       (Absorptive ground surface)
Receiver source distance  :  46.25 / 46.25  m
Receiver height           :   1.50 / 4.50   m
Topography                :      2       (Flat/gentle slope; with barrier)
Barrier angle1            : -90.00 deg   Angle2 : 20.00 deg
Barrier height            :   2.70 m
Barrier receiver distance :  13.00 / 13.00  m
Source elevation          :  95.45 m
Receiver elevation        :  95.65 m
Barrier elevation         :  96.65 m
Reference angle           :   0.00

Results segment # 1: Greenbank NB (day)
---------------------------------------

Source height = 1.50 m

Barrier height for grazing incidence
------------------------------------
Source      ! Receiver    ! Barrier     ! Elevation of
Height  (m) ! Height  (m) ! Height  (m) ! Barrier Top  (m)
------------+-------------+-------------+--------------
       1.50 !        1.50 !        0.38 !        97.03

ROAD (0.00 + 53.26 + 0.00) = 53.26 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
   -90     20   0.50  70.67   0.00  -2.57  -3.08   0.00   0.00 -11.76  53.26
-------------------------------------------------------------------------

Segment Leq : 53.26 dBA
```

Results segment # 2: Greenbank SB (day)

Source height = 1.50 m

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
1.50	1.50	0.44	97.09

ROAD (0.00 + 50.25 + 0.00) = 50.25 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	20	0.50	70.67	0.00	-7.33	-3.08	0.00	0.00	-10.01	50.25

Segment Leq : 50.25 dBA

Total Leq All Segments: 55.02 dBA

Results segment # 1: Greenbank NB (night)

Source height = 1.50 m

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
1.50	4.50	1.63	98.28

ROAD (0.00 + 50.03 + 0.00) = 50.03 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	20	0.41	63.07	0.00	-2.41	-2.95	0.00	0.00	-7.68	50.03

Segment Leq : 50.03 dBA

Results segment # 2: Greenbank SB (night)

Source height = 1.50 m

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
1.50	4.50	2.60	99.25

ROAD (0.00 + 48.22 + 0.00) = 48.22 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	20	0.41	63.07	0.00	-6.89	-2.95	0.00	0.00	-5.02	48.22

Segment Leq : 48.22 dBA

Total Leq All Segments: 52.23 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 55.02
(NIGHT): 52.23

STAMSON 5.0 NORMAL REPORT Date: 01-12-2017 11:01:04
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: b65u3bar.te Time Period: Day/Night 16/8 hours
Description: Block 65 unit 3 OLA with barrier

Road data, segment # 1: Greenbank NB (day/night)

Car traffic volume	: 14168/1232	veh/TimePeriod *
Medium truck volume	: 1127/98	veh/TimePeriod *
Heavy truck volume	: 805/70	veh/TimePeriod *
Posted speed limit	: 60	km/h
Road gradient	: 2	%
Road pavement	: 1	(Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT)	:	17500
Percentage of Annual Growth	:	0.00
Number of Years of Growth	:	0.00
Medium Truck % of Total Volume	:	7.00
Heavy Truck % of Total Volume	:	5.00
Day (16 hrs) % of Total Volume	:	92.00

Data for Segment # 1: Greenbank NB (day/night)

Angle1 Angle2	: -90.00 deg	15.00 deg
Wood depth	: 0	(No woods.)
No of house rows	: 0 / 0	
Surface	: 1	(Absorptive ground surface)
Receiver source distance	: 28.25 / 28.25	m
Receiver height	: 1.50 / 4.50	m
Topography	: 2	(Flat/gentle slope; with barrier)
Barrier angle1	: -60.00 deg	Angle2 : 15.00 deg
Barrier height	: 2.70	m
Barrier receiver distance	: 19.00 / 19.00	m
Source elevation	: 95.45	m
Receiver elevation	: 95.65	m
Barrier elevation	: 96.65	m
Reference angle	: 0.00	

Road data, segment # 2: Greenbank SB (day/night)

Car traffic volume	: 14168/1232	veh/TimePeriod *
Medium truck volume	: 1127/98	veh/TimePeriod *
Heavy truck volume	: 805/70	veh/TimePeriod *
Posted speed limit	: 60	km/h
Road gradient	: 2	%
Road pavement	: 1	(Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

```
    24 hr Traffic Volume (AADT or SADT):  17500
    Percentage of Annual Growth        :   0.00
    Number of Years of Growth          :   0.00
    Medium Truck % of Total Volume     :   7.00
    Heavy Truck  % of Total Volume     :   5.00
    Day (16 hrs) % of Total Volume     :  92.00

Data for Segment # 2: Greenbank SB (day/night)
-----------------------------------------------
Angle1   Angle2           : -90.00 deg   15.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      1       (Absorptive ground surface)
Receiver source distance  :  52.25 / 52.25  m
Receiver height           :   1.50 / 4.50   m
Topography                :      2       (Flat/gentle slope; with barrier)
Barrier angle1            : -60.00 deg   Angle2 : 15.00 deg
Barrier height            :   2.70 m
Barrier receiver distance :  19.00 / 19.00  m
Source elevation          :  95.45 m
Receiver elevation        :  95.65 m
Barrier elevation         :  96.65 m
Reference angle           :   0.00


Results segment # 1: Greenbank NB (day)
---------------------------------------

Source height = 1.50 m

Barrier height for grazing incidence
------------------------------------
Source      ! Receiver    ! Barrier     ! Elevation of
Height  (m) ! Height  (m) ! Height  (m) ! Barrier Top  (m)
------------+-------------+-------------+--------------
       1.50 !        1.50 !        0.36 !        97.01

ROAD (54.21 + 49.10 + 0.00) = 55.37 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -90    -60   0.66  70.67   0.00  -4.56 -11.90   0.00   0.00   0.00  54.21
-------------------------------------------------------------------------------
   -60     15   0.50  70.67   0.00  -4.12  -4.15   0.00   0.00 -13.30  49.10
-------------------------------------------------------------------------------

Segment Leq : 55.37 dBA
```

Results segment # 2: Greenbank SB (day)

Source height = 1.50 m

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
1.50	1.50	0.43	97.08

ROAD (49.77 + 47.78 + 0.00) = 51.90 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	-60	0.66	70.67	0.00	-9.00	-11.90	0.00	0.00	0.00	49.77
-60	15	0.50	70.67	0.00	-8.12	-4.15	0.00	0.00	-10.61	47.78

Segment Leq : 51.90 dBA

Total Leq All Segments: 56.98 dBA

Results segment # 1: Greenbank NB (night)

Source height = 1.50 m

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
1.50	4.50	1.34	97.99

ROAD (47.36 + 45.78 + 0.00) = 49.65 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	-60	0.57	63.07	0.00	-4.32	-11.39	0.00	0.00	0.00	47.36
-60	15	0.41	63.07	0.00	-3.87	-4.09	0.00	0.00	-9.32	45.78

Segment Leq : 49.65 dBA

Results segment # 2: Greenbank SB (night)

Source height = 1.50 m

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
1.50	4.50	2.33	98.98

ROAD (43.17 + 46.10 + 0.00) = 47.89 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	-60	0.57	63.07	0.00	-8.51	-11.39	0.00	0.00	0.00	43.17
-60	15	0.41	63.07	0.00	-7.63	-4.09	0.00	0.00	-5.24	46.10

Segment Leq : 47.89 dBA

Total Leq All Segments: 51.87 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 56.98
(NIGHT): 51.87

STAMSON 5.0 NORMAL REPORT Date: 01-12-2017 11:08:26
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: b65u4bar.te Time Period: Day/Night 16/8 hours
Description: Block 65 unit 4 OLA with barrier

Road data, segment # 1: Greenbank NB (day/night)

Car traffic volume	: 14168/1232	veh/TimePeriod *
Medium truck volume	: 1127/98	veh/TimePeriod *
Heavy truck volume	: 805/70	veh/TimePeriod *
Posted speed limit	: 60	km/h
Road gradient	: 2	%
Road pavement	: 1	(Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT)	:	17500
Percentage of Annual Growth	:	0.00
Number of Years of Growth	:	0.00
Medium Truck % of Total Volume	:	7.00
Heavy Truck % of Total Volume	:	5.00
Day (16 hrs) % of Total Volume	:	92.00

Data for Segment # 1: Greenbank NB (day/night)

Angle1 Angle2	: -90.00 deg	10.00 deg
Wood depth	: 0	(No woods.)
No of house rows	: 0 / 0	
Surface	: 1	(Absorptive ground surface)
Receiver source distance	: 34.25 / 34.25	m
Receiver height	: 1.50 / 4.50	m
Topography	: 2	(Flat/gentle slope; with barrier)
Barrier angle1	: -30.00 deg	Angle2 : 10.00 deg
Barrier height	: 2.70	m
Barrier receiver distance	: 25.00 / 25.00	m
Source elevation	: 95.45	m
Receiver elevation	: 95.65	m
Barrier elevation	: 96.65	m
Reference angle	: 0.00	

Road data, segment # 2: Greenbank SB (day/night)

Car traffic volume	: 14168/1232	veh/TimePeriod *
Medium truck volume	: 1127/98	veh/TimePeriod *
Heavy truck volume	: 805/70	veh/TimePeriod *
Posted speed limit	: 60	km/h
Road gradient	: 2	%
Road pavement	: 1	(Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

```
    24 hr Traffic Volume (AADT or SADT):  17500
    Percentage of Annual Growth        :   0.00
    Number of Years of Growth          :   0.00
    Medium Truck % of Total Volume     :   7.00
    Heavy Truck  % of Total Volume     :   5.00
    Day (16 hrs) % of Total Volume     :  92.00

Data for Segment # 2: Greenbank SB (day/night)
-----------------------------------------------
Angle1   Angle2           : -90.00 deg   10.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      1       (Absorptive ground surface)
Receiver source distance  :  58.25 / 58.25  m
Receiver height           :   1.50 / 4.50   m
Topography                :      2       (Flat/gentle slope; with barrier)
Barrier angle1            : -30.00 deg   Angle2 : 10.00 deg
Barrier height            :   2.70 m
Barrier receiver distance :  25.00 / 25.00  m
Source elevation          :  95.45 m
Receiver elevation        :  95.65 m
Barrier elevation         :  96.65 m
Reference angle           :   0.00


Results segment # 1: Greenbank NB (day)
---------------------------------------

Source height = 1.50 m

Barrier height for grazing incidence
------------------------------------
Source      ! Receiver    ! Barrier     ! Elevation of
Height  (m) ! Height  (m) ! Height  (m) ! Barrier Top  (m)
------------+-------------+-------------+--------------
       1.50 !        1.50 !        0.35 !        97.00

ROAD (57.63 + 45.08 + 0.00) = 57.87 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -90    -30   0.66  70.67   0.00  -5.95  -7.08   0.00   0.00   0.00  57.63
-------------------------------------------------------------------------------
   -30     10   0.50  70.67   0.00  -5.37  -6.61   0.00   0.00 -13.61  45.08
-------------------------------------------------------------------------------

Segment Leq : 57.87 dBA
```

Results segment # 2: Greenbank SB (day)

Source height = 1.50 m

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
1.50	1.50	0.41	97.06

ROAD (53.80 + 44.66 + 0.00) = 54.30 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	-30	0.66	70.67	0.00	-9.78	-7.08	0.00	0.00	0.00	53.80
-30	10	0.50	70.67	0.00	-8.83	-6.61	0.00	0.00	-10.57	44.66

Segment Leq : 54.30 dBA

Total Leq All Segments: 59.45 dBA

Results segment # 1: Greenbank NB (night)

Source height = 1.50 m

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
1.50	4.50	1.16	97.81

ROAD (50.62 + 41.09 + 0.00) = 51.08 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	-30	0.57	63.07	0.00	-5.63	-6.82	0.00	0.00	0.00	50.62
-30	10	0.41	63.07	0.00	-5.05	-6.60	0.00	0.00	-10.33	41.09

Segment Leq : 51.08 dBA

Results segment # 2: Greenbank SB (night)

Source height = 1.50 m

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
1.50	4.50	2.12	98.77

ROAD (47.00 + 42.61 + 0.00) = 48.35 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	-30	0.57	63.07	0.00	-9.25	-6.82	0.00	0.00	0.00	47.00
-30	10	0.41	63.07	0.00	-8.30	-6.60	0.00	0.00	-5.56	42.61

Segment Leq : 48.35 dBA

Total Leq All Segments: 52.94 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 59.45
(NIGHT): 52.94

STAMSON 5.0 NORMAL REPORT Date: 01-12-2017 11:12:08
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: b64u1bar.te Time Period: Day/Night 16/8 hours
Description: Block 64 unit 1 OLA with barrier

Road data, segment # 1: Greenbank NB (day/night)

Car traffic volume	: 14168/1232	veh/TimePeriod *
Medium truck volume	: 1127/98	veh/TimePeriod *
Heavy truck volume	: 805/70	veh/TimePeriod *
Posted speed limit	: 60	km/h
Road gradient	: 2	%
Road pavement	: 1	(Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT)	:	17500
Percentage of Annual Growth	:	0.00
Number of Years of Growth	:	0.00
Medium Truck % of Total Volume	:	7.00
Heavy Truck % of Total Volume	:	5.00
Day (16 hrs) % of Total Volume	:	92.00

Data for Segment # 1: Greenbank NB (day/night)

Angle1 Angle2	: -90.00 deg	5.00 deg
Wood depth	: 0	(No woods.)
No of house rows	: 0 / 0	
Surface	: 1	(Absorptive ground surface)
Receiver source distance	: 43.75 / 43.75	m
Receiver height	: 1.50 / 4.50	m
Topography	: 2	(Flat/gentle slope; with barrier)
Barrier angle1	: -15.00 deg	Angle2 : 5.00 deg
Barrier height	: 2.70	m
Barrier receiver distance	: 34.50 / 34.50	m
Source elevation	: 95.45	m
Receiver elevation	: 95.65	m
Barrier elevation	: 96.65	m
Reference angle	: 0.00	

Road data, segment # 2: Greenbank SB (day/night)

Car traffic volume	: 14168/1232	veh/TimePeriod *
Medium truck volume	: 1127/98	veh/TimePeriod *
Heavy truck volume	: 805/70	veh/TimePeriod *
Posted speed limit	: 60	km/h
Road gradient	: 2	%
Road pavement	: 1	(Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

```
    24 hr Traffic Volume (AADT or SADT):  17500
    Percentage of Annual Growth        :   0.00
    Number of Years of Growth          :   0.00
    Medium Truck % of Total Volume     :   7.00
    Heavy Truck  % of Total Volume     :   5.00
    Day (16 hrs) % of Total Volume     :  92.00

Data for Segment # 2: Greenbank SB (day/night)
-----------------------------------------------
Angle1   Angle2           : -90.00 deg   5.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      1       (Absorptive ground surface)
Receiver source distance  :  67.75 / 67.75  m
Receiver height           :   1.50 / 4.50   m
Topography                :      2       (Flat/gentle slope; with barrier)
Barrier angle1            : -15.00 deg   Angle2 : 5.00 deg
Barrier height            :   2.70 m
Barrier receiver distance :  34.50 / 34.50  m
Source elevation          :  95.45 m
Receiver elevation        :  95.65 m
Barrier elevation         :  96.65 m
Reference angle           :   0.00


Results segment # 1: Greenbank NB (day)
---------------------------------------

Source height = 1.50 m

Barrier height for grazing incidence
------------------------------------
Source      ! Receiver    ! Barrier     ! Elevation of
Height  (m) ! Height  (m) ! Height  (m) ! Barrier Top  (m)
------------+-------------+-------------+--------------
       1.50 !        1.50 !        0.34 !        96.99

ROAD (57.34 + 40.69 + 0.00) = 57.43 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -90    -15   0.66  70.67   0.00  -7.72  -5.61   0.00   0.00   0.00  57.34
-------------------------------------------------------------------------------
   -15      5   0.50  70.67   0.00  -6.96  -9.56   0.00   0.00 -13.45  40.69
-------------------------------------------------------------------------------

Segment Leq : 57.43 dBA
```

Results segment # 2: Greenbank SB (day)

Source height = 1.50 m

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
1.50	1.50	0.40	97.05

ROAD (54.19 + 41.16 + 0.00) = 54.40 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	-15	0.66	70.67	0.00	-10.87	-5.61	0.00	0.00	0.00	54.19
-15	5	0.50	70.67	0.00	-9.81	-9.56	0.00	0.00	-10.13	41.16

Segment Leq : 54.40 dBA

Total Leq All Segments: 59.18 dBA

Results segment # 1: Greenbank NB (night)

Source height = 1.50 m

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
1.50	4.50	0.97	97.62

ROAD (50.36 + 35.99 + 0.00) = 50.51 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	-15	0.57	63.07	0.00	-7.30	-5.41	0.00	0.00	0.00	50.36
-15	5	0.41	63.07	0.00	-6.55	-9.56	0.00	0.00	-10.98	35.99

Segment Leq : 50.51 dBA

Results segment # 2: Greenbank SB (night)

Source height = 1.50 m

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
1.50	4.50	1.87	98.52

ROAD (47.38 + 38.30 + 0.00) = 47.88 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	-15	0.57	63.07	0.00	-10.28	-5.41	0.00	0.00	0.00	47.38
-15	5	0.41	63.07	0.00	-9.22	-9.56	0.00	0.00	-5.99	38.30

Segment Leq : 47.88 dBA

Total Leq All Segments: 52.40 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 59.18
(NIGHT): 52.40

STAMSON 5.0 NORMAL REPORT Date: 01-12-2017 11:13:11
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: b64u2bar.te Time Period: Day/Night 16/8 hours
Description: Block 64 unit 2 OLA with barrier

Road data, segment # 1: Greenbank NB (day/night)

Car traffic volume	: 14168/1232	veh/TimePeriod *
Medium truck volume	: 1127/98	veh/TimePeriod *
Heavy truck volume	: 805/70	veh/TimePeriod *
Posted speed limit	: 60	km/h
Road gradient	: 2	%
Road pavement	: 1	(Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT)	:	17500
Percentage of Annual Growth	:	0.00
Number of Years of Growth	:	0.00
Medium Truck % of Total Volume	:	7.00
Heavy Truck % of Total Volume	:	5.00
Day (16 hrs) % of Total Volume	:	92.00

Data for Segment # 1: Greenbank NB (day/night)

Angle1 Angle2	: -90.00 deg	5.00 deg
Wood depth	: 0	(No woods.)
No of house rows	: 0 / 0	
Surface	: 1	(Absorptive ground surface)
Receiver source distance	: 49.75 / 49.75	m
Receiver height	: 1.50 / 4.50	m
Topography	: 2	(Flat/gentle slope; with barrier)
Barrier angle1	: -10.00 deg	Angle2 : 5.00 deg
Barrier height	: 2.70	m
Barrier receiver distance	: 40.50 / 40.50	m
Source elevation	: 95.45	m
Receiver elevation	: 95.65	m
Barrier elevation	: 96.65	m
Reference angle	: 0.00	

Road data, segment # 2: Greenbank SB (day/night)

Car traffic volume	: 14168/1232	veh/TimePeriod *
Medium truck volume	: 1127/98	veh/TimePeriod *
Heavy truck volume	: 805/70	veh/TimePeriod *
Posted speed limit	: 60	km/h
Road gradient	: 2	%
Road pavement	: 1	(Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

```
    24 hr Traffic Volume (AADT or SADT):  17500
    Percentage of Annual Growth        :   0.00
    Number of Years of Growth          :   0.00
    Medium Truck % of Total Volume     :   7.00
    Heavy Truck  % of Total Volume     :   5.00
    Day (16 hrs) % of Total Volume     :  92.00

Data for Segment # 2: Greenbank SB (day/night)
-----------------------------------------------
Angle1   Angle2           : -90.00 deg   5.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      1       (Absorptive ground surface)
Receiver source distance  :  73.75 / 73.75  m
Receiver height           :   1.50 / 4.50   m
Topography                :      2       (Flat/gentle slope; with barrier)
Barrier angle1            : -10.00 deg   Angle2 : 5.00 deg
Barrier height            :   2.70 m
Barrier receiver distance :  40.50 / 40.50  m
Source elevation          :  95.45 m
Receiver elevation        :  95.65 m
Barrier elevation         :  96.65 m
Reference angle           :   0.00


Results segment # 1: Greenbank NB (day)
---------------------------------------

Source height = 1.50 m

Barrier height for grazing incidence
------------------------------------
Source      ! Receiver    ! Barrier     ! Elevation of
Height  (m) ! Height  (m) ! Height  (m) ! Barrier Top  (m)
------------+-------------+-------------+--------------
       1.50 !        1.50 !        0.33 !        96.98

ROAD (56.82 + 38.71 + 0.00) = 56.89 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -90    -10   0.66  70.67   0.00  -8.64  -5.20   0.00   0.00   0.00  56.82
-------------------------------------------------------------------------------
   -10      5   0.50  70.67   0.00  -7.80 -10.80   0.00   0.00 -13.35  38.71
-------------------------------------------------------------------------------

Segment Leq : 56.89 dBA
```

Results segment # 2: Greenbank SB (day)

Source height = 1.50 m

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
1.50	1.50	0.39	97.04

ROAD (53.99 + 39.58 + 0.00) = 54.14 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	-10	0.66	70.67	0.00	-11.48	-5.20	0.00	0.00	0.00	53.99
-10	5	0.50	70.67	0.00	-10.36	-10.80	0.00	0.00	-9.93	39.58

Segment Leq : 54.14 dBA

Total Leq All Segments: 58.74 dBA

Results segment # 1: Greenbank NB (night)

Source height = 1.50 m

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
1.50	4.50	0.89	97.54

ROAD (49.88 + 33.72 + 0.00) = 49.98 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	-10	0.57	63.07	0.00	-8.18	-5.02	0.00	0.00	0.00	49.88
-10	5	0.41	63.07	0.00	-7.33	-10.80	0.00	0.00	-11.22	33.72

Segment Leq : 49.98 dBA

Results segment # 2: Greenbank SB (night)

Source height = 1.50 m

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
1.50	4.50	1.74	98.39

ROAD (47.19 + 36.33 + 0.00) = 47.53 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	-10	0.57	63.07	0.00	-10.86	-5.02	0.00	0.00	0.00	47.19
-10	5	0.41	63.07	0.00	-9.74	-10.80	0.00	0.00	-6.20	36.33

Segment Leq : 47.53 dBA

Total Leq All Segments: 51.94 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 58.74
(NIGHT): 51.94

PARK (BY OTHERS)

APPROXIMATE LOCATION OF TERRACING 3:1 MAX TO EXISTING.

DOWITCHER GROVE

VOIE BRAMBLING WA

RUE GRAND CANAL STREET

FUTURE GREENBANK ROAD

STREET 3

EGRET WAY

JACKDAW AVENUE

BLOCK 69

BLOCK 68

BLOCK 67

BLOCK 66

BLOCK 70

BLOCK 51

BLOCK 52

BLOCK 53

BLOCK 54

BLOCK 55

BLOCK 65

BLOCK 64

BLOCK 63

BLOCK 62

BLOCK 61

BLOCK 60

BLOCK 59

BLOCK 58

BLOCK 57

BLOCK 56

BLOCK 72

SCHOOL (BY OTHERS)

BUSH

TERRACING 3:1 TO BACK OF FUTURE SIDEWALK

2.5m

1.7m

2.5m HIGH NOISE BARRIER

T/W=95.68 B/W=94.45

T/W=95.78 B/W=94.71

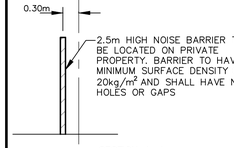
T/W=95.75 B/W=94.97

T/W=95.65 B/W=95.23

T/W=95.78 B/W=95.49

LEGEND:

- 2.5m HIGH NOISE BARRIER
- A — NOISE WARNING CLAUSE
- RECEIVER LOCATIONS FOR INDOOR NOISE ASSESSMENT
- RECEIVER LOCATIONS FOR OUTDOOR NOISE ASSESSMENT



SECTION A–A

No.	REVISIONS	By	Date
14			
13			
12			
11			
10			
9			
8			
7			
6			
5			
4			
3			
2	REVISED PER CITY COMMENTS	TRB	17:12:04
1	ISSUED TO THE CITY - PH4	TRB	17:10:12

IBI GROUP
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ibigroup.com

Project Title

THE MEADOWS IN HALF MOON BAY

PHASE 4

LICENSED PROFESSIONAL ENGINEER
M. ERION
13379508
2017/12/04
PROVINCE OF ONTARIO

Drawing Title

NOISE PLAN

Scale 1 : 500

Design	Date
TRB	JUNE 2017
Drawn	Checked
CMC	TRB
Project No.	Drawing No.
12054	N-4

D07-16-09-0037 P4

15776

The Meadows Phase 5

TRANSPORTATION IMPACT ASSESSMENT (TIA) REPORT

Prepared for Tamarack Homes
by IBI Group

March 2018

Document Control Page

CLIENT:	Tamarack Homes
PROJECT NAME:	The Meadows Phase 5 TIA
REPORT TITLE:	TIA Report
IBI REFERENCE:	115637
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ORIGINATOR:	Ben Pascolo-Neveu, E.I.T.
REVIEWER:	Austin Shih, M.A.Sc, P.Eng.
AUTHORIZATION:	Justin Date, P.Eng.
CIRCULATION LIST:	Rosanna Baggs, C.E.T.
HISTORY:	1.0. Screening and Scoping Report to City of Ottawa – March 2018 2.0. Screening, Scoping & Forecasting to City of Ottawa – March 2018 3.0. TIA Report – March 2018

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LIST OF APPENDICES

1 Introduction

The Screening and Scoping has been prepared on behalf of Tamarack Homes in support of the Meadows Phase 5 (Meadows Ph5) draft plan of subdivision application. The format of the Screening and Scoping was based on the City of Ottawa's 2017 Transportation Impact Assessment (TIA) Guidelines. 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]

2 Screening and Scoping

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	Tamarack Homes - The Meadows Phase 5 – TIA Screening Letter
Description of Location	Barrhaven South Subject site is located east of the future realigned Greenbank Road, south of Cambrian Road and is bounded by undeveloped lands to the north, south and west
Land Use Classification	Residential
Development Size (units)	221 units (Townhomes/ Semi-detached Residential) 125 units (Single Family Homes)
Development Size (ha)	19 ha
Number of Accesses and Locations	There are two (2) accesses/ egresses proposed for this development: (1) Street 23 – connects with residential development to the north (2) Street 17 – connects with residential development to the east and to the future realigned Greenbank Road. The future re-aligned Greenbank Road will eventually be a boundary street on the east side of the development; however, the realignment is not expected to be complete until after the study horizon years considered in this traffic study
Phase of Development	Single Phase
Buildout Year	2022 (full buildout) 2027 (full buildout + 5 years)

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

2. Trip Generation Trigger

Considering the Development's Land Use type and Size (as filled out in the previous section), please refer to the Trip Generation Trigger checks below.

Land Use Type	Minimum Development Size
Single-family homes	40 units ✓
Townhomes or apartments	90 units ✓
Office	3,500 m^2
Industrial	5,000 m^2
Fast-food restaurant or coffee shop	100 m^2
Destination retail	1,000 m^2
Gas station or convenience market	75 m^2

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

If the proposed development size is greater than the sizes identified above, therefore the Trip Generation Trigger is satisfied.

3. Location Triggers

	Yes	No
Does the development propose a new driveway to a boundary street that is designated as part of the City's Transit Priority, Rapid Transit or Spine Bicycle Networks?		✓
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).*

If any of the above questions were answered with 'Yes,' the Location Trigger is satisfied.

4. Safety Triggers

	Yes	No
Are posted speed limits on a boundary street are 80 km/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?		✓

If any of the above questions were answered with 'Yes,' the Safety Trigger is satisfied.

5. Summary

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

Overall, the subject development has been found to satisfy one of the triggers for a Transportation Impact Assessment (TIA).

2.2 Description of Proposed Development

2.2.1 Site Location

The proposed Meadows Phase 5, part of the lands municipally known as 3640 Greenbank Road, is shown in Exhibit 1. The portion of these lands that is proposed to be developed is approximately 19 hectares in total. The land abuts the proposed future alignment of Greenbank Road to the east, and is bounded by undeveloped lands to the north, south and west. Cambrian Road is located approximately 200m north of the subject property.

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 mostly for development reserve zone, with a small section designated as mineral aggregate reserve zone. The proposed development will contain a mix of low and medium density residential land uses, as summarized in Table 1.

For the purposes of this study, full occupancy of the proposed development was assumed by the 2022 horizon year. However, the assumed buildout horizon year is highly dependent on market forces. It is possible full occupancy won't be achieved by the buildout horizon year.

TABLE 1 – Land Use Statistics

LAND USE	SIZE (# OF UNITS)
Townhome/ Semi-Detached Residential	221 units
Single Family Homes	125 units

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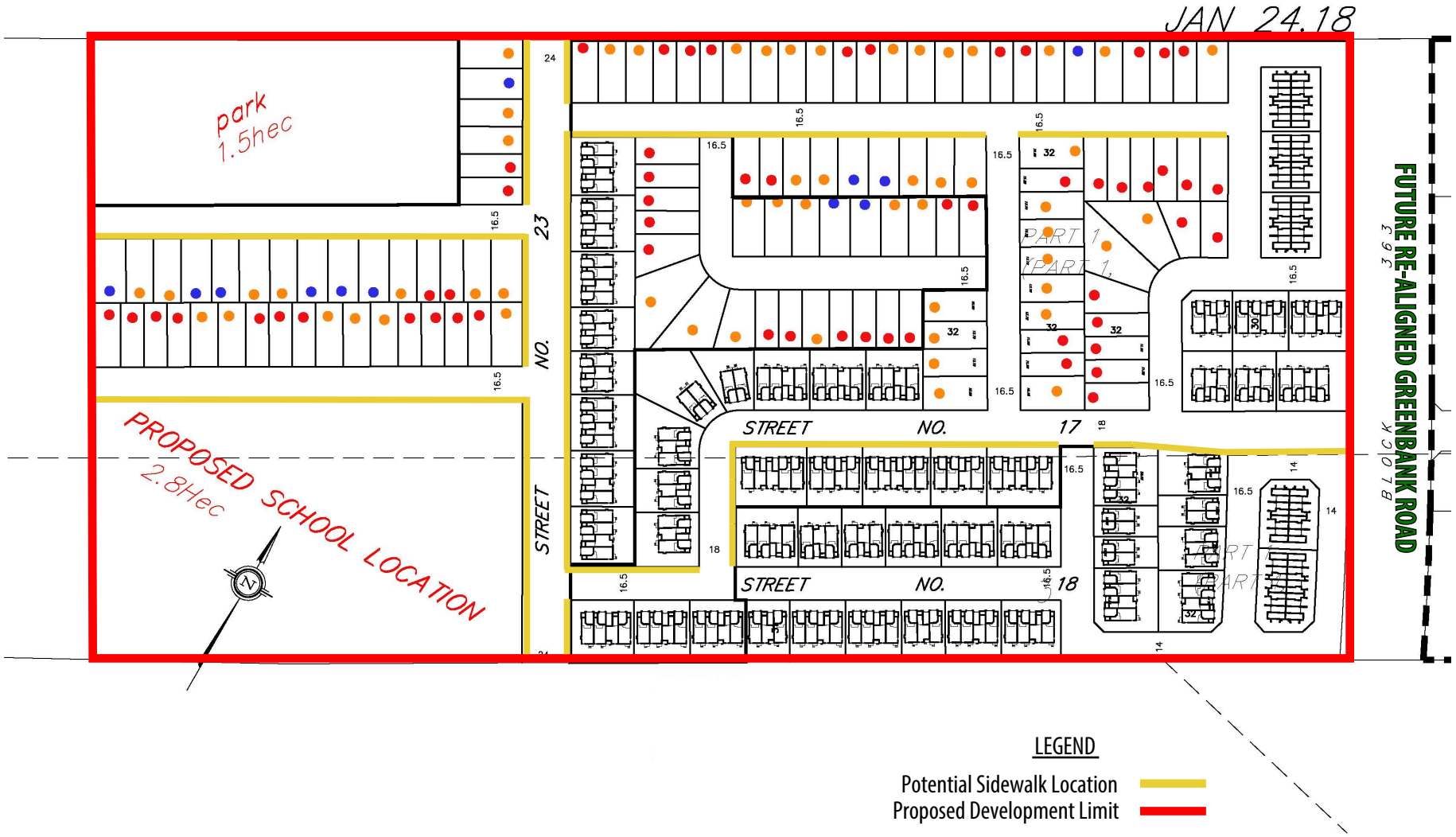
The Meadows Phase 5
Transportation Impact Assessment

Exhibit 1
Site Location

PROJECT No. 115637
DATE: MARCH 2018
SCALE: -50m 0 100m



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The Meadows Phase 5
Transportation Impact Assessment

Exhibit 2
Proposed Development

PROJECT No. 115637
DATE: MARCH 2018
SCALE: -50m 0 100m

2.2.3 Site Layout

According to the plan of subdivision, the proposed development is expected to connect to the Meadows Phase 4 subdivision to the east via Street 17. Street 17 is proposed as an east-west local road with an 18m right-of-way, crossing the realigned Greenbank Road and terminating at Street 23 to the west. Street 23 is proposed as a north-south collector road with a 24m right-of-way (ROW) that will connect to Cambrian Road via the proposed Half Moon Bay West development access intersection to the north. Street 23 is approximately 300m in length, and will terminate at the southern edge of the development.

The remaining roads proposed within the development were proposed to have a 16.5m right-of-way (ROW) width for double-loaded streets, and 14m right-of-way (ROW) width for single-loaded streets.

2.2.4 Transit, Pedestrian and Cycling Facilities

The proposed development does not include any transit or cycling facilities. Sidewalks will be provided on select sections, as noted in Exhibit 2, to provide access to local amenities and adjacent developments.

2.3 Existing Conditions

2.3.1 Existing Road Network

2.3.1.1 Roadways

Cambrian Road is designated as an arterial road with a with a ROW width of 37.5 m that extends east-west from Longfields Drive (formerly Jockvale Road) to Borrisokane Road. Between Borrisokane Road and Seeley's Bay Street, Cambrian Road is a two-lane rural arterial road with a posted speed limit of 70km/h. East of Seeley's Bay Street, Cambrian Road transitions to a two-lane urban arterial road with a posted speed limit of 50km/h.

Borrisokane Road is a two-lane rural arterial road with a posted speed limit of 80km/h, and gravel shoulders along both sides of the roadway within the vicinity of the subject site.

2.3.1.2 Study Area Intersections

The following existing intersection will be evaluated in this report:

- Cambrian Road and Borrisokane Road

The Cambrian Road and Borrisokane Road intersection is stop-controlled on the westbound approach along Cambrian Road, and free-flow along Borrisokane Road in the northbound and southbound directions.

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.

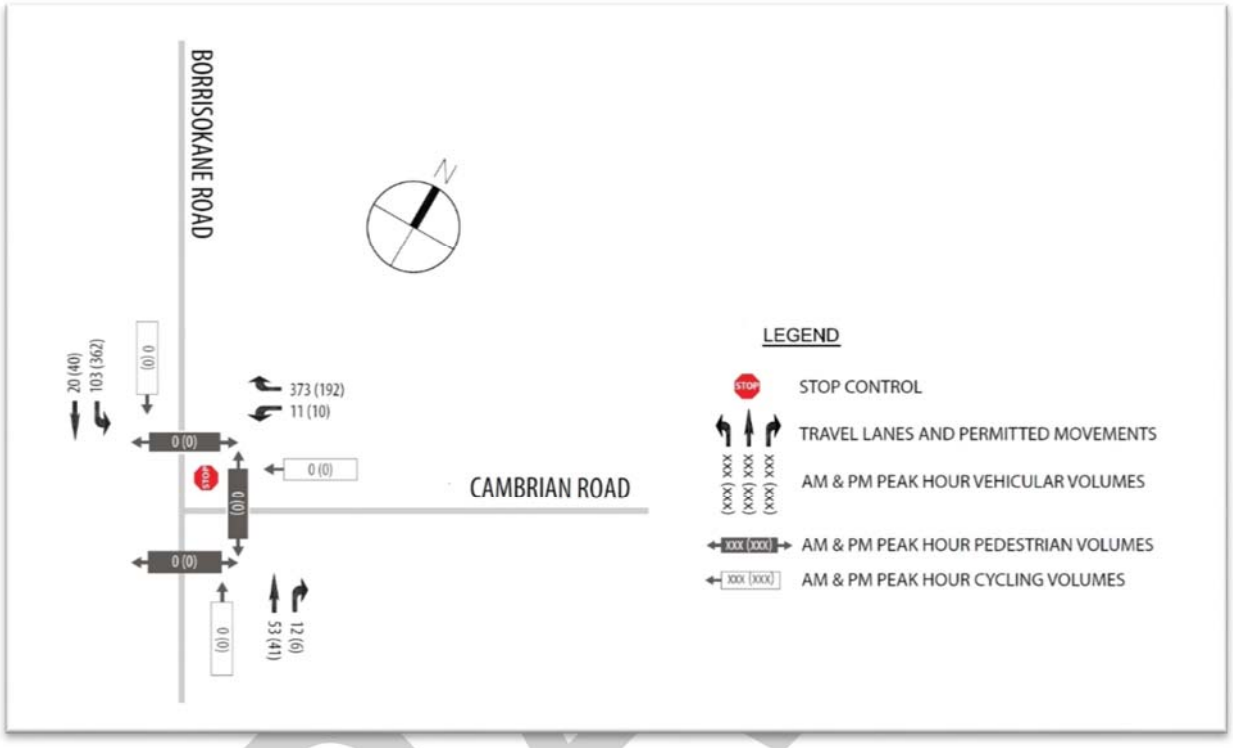
2.3.1.4 Existing Traffic Volumes

Weekday morning and afternoon peak hour turning movement counts were obtained from the City of Ottawa at the following study area intersections. Where City data was not available, IBI Group completed the necessary traffic counts.

- Cambrian Road and Borrisokane Road (IBI Group – February 2018)

The existing (2018) peak hour traffic volumes are shown in Exhibit 3. Traffic count data is provided in Appendix A.

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



2.3.2 Existing Bicycle and Pedestrian Facilities

East of Seeley's Bay Street, formal urban sidewalks are located on both sides of Cambrian Road. West of Seeley's Bay Street, Cambrian Road transitions to a two-lane rural road with gravel shoulders, and no formal pedestrian facilities.

No dedicated cycling facilities exist within the vicinity of the subject site.

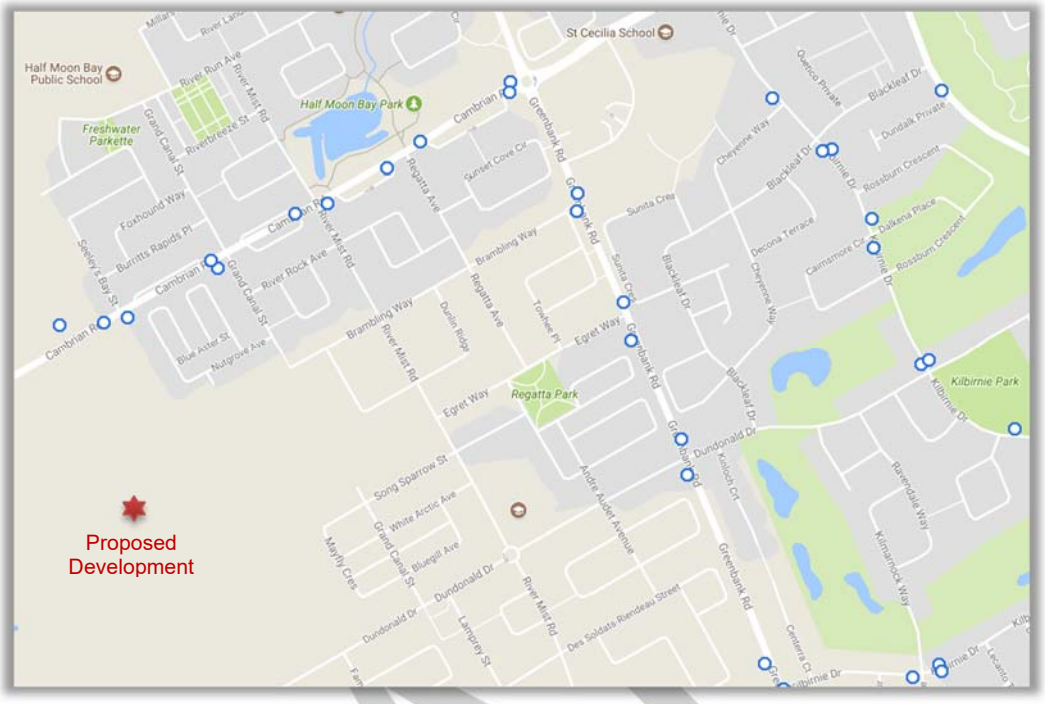
2.3.3 Existing Transit Facilities and Service

There is currently one OC Transpo service route that run through the study area.

- Route #177 is a regular/all-day service route with headways ranging from 15 to 30 minutes in the peak and off-peak hours. It operates between Barrhaven Centre and a loop just east of the study area on Cambrian Road. On weekends, transit service typically operates at 30-minute headways.

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

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 at least six 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, 2011 and January 1, 2016.

TABLE 2 – Reported Collisions within Study Area

LOCATION	# OF REPORTED COLLISIONS
Cambrian Road and River Mist Road	1
Cambrian Road and Grand Canal Street	2
Cambrian Road, between Greenbank Road and Borrisokane Road	5
Cambrian Road, between Grand Canal Street and Seeley's Bay Street	1
Cambrian Road, between Grand Canal Street and Borrisokane Road	1

Upon review of all collision records, there were no discernible collision patterns noted. A copy of the City collision records is available in Appendix C.

2.4 Planned Conditions

2.4.1 Changes to the Study Area Transportation Network

2.4.1.1 Future Road Network Projects (TMP)

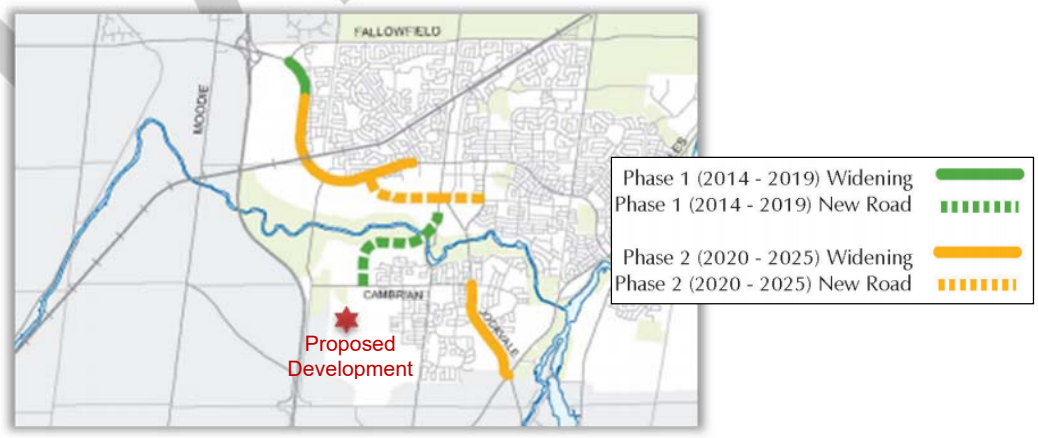
The 2013 Transportation Master Plan (TMP) outlines future road network modifications required in the 2031 'Affordable Road Network,' as shown in Exhibit 5. The following projects were noted that may have an impact on study area traffic:

- Greenbank Road realignment – New 4-lane road between Cambrian Road and Jockvale Road (Phase 1: 2014-2019). The anticipated completion date has been pushed to 2021-2022, as indicated by City staff.
- Jockvale Road (now Longfields Drive) widening – Widen from two to four lanes between Cambrian Road and Prince of Wales Drive (Phase 2: 2020-2025). At the time of this study, the project was not anticipated prior to Phase 3 (2026-2031).
- Chapman Mills Drive extension – New 4-lane road between Strandherd Drive and Longfields Drive (Phase 2: 2020-2025), currently projected by 2024.
- Strandherd Drive widening – Widen from two to four lanes between Fallowfield Drive and Maravista Drive (Phase 1: 2014-2019) and widen from two to four lanes between Maravista Drive and Jockvale Road (Phase 2: 2020-2025).

Phase 1 of the Strandherd Drive widening, between Fallowfield Drive and Maravista Drive has been completed. The Development Charges Amendment Background Study: Transit and Roads and Related Services (March 24, 2017) identified funds set aside for the Greenbank Road realignment to be constructed between 2017 and 2019, and the Jockvale Road widening between 2024 and 2025, Strandherd Drive Phase 2 widening between 2020 and 2022, and Chapman Mills Drive extension between 2019 and 2020.

As noted above, the Greenbank Road re-alignment was slated for completion in Phase 1 (2014-2019) of the Transportation Master Plan (TMP); however, as indicated in Addendum No. 1 of the Community Transportation Study (CTS) for Half Moon Bay West completed in November 2017 (see Section 2.4.2), the realignment was assumed not to be in place through to the ultimate planning horizon in 2029, as directed by City staff. This was meant to reflect the worst case scenario for traffic analysis purposes. At the time of this study, the Half Moon Bay West Addendum No. 1 CTS was pending approval, following resubmission to address minor comments.

EXHIBIT 5 – Future Road Network Projects



2.4.1.2 Future Road Network Projects (Cambrian Road EA)

The Cambrian Road Widening Environmental Assessment (EA) was completed by Stantec in 2014, and proposes an ultimate four-lane cross-section along Cambrian Road from the future re-aligned Greenbank Road to Longfields Drive. Although this EA is not shown in the TMP's affordable network, it has been approved by Transportation Committee and City Council. Please refer to Appendix D for the Cambrian Road Widening EA Recommended 4-lane Functional Design.

The Barrhaven South Community Design Plan (CDP) outlined potential road widenings and rapid transit expansions in the study area. The CDP also highlighted a potential future interchange where Cambrian Road currently dead-ends at Highway 416. A map of the planned and potential transportation network and transit network changes as shown in the CDP are shown below in Exhibit 6.

EXHIBIT 6 – Barrhaven South Community Design Plan – Road Network

2.4.1.3 Future Transit Facilities and Services

The 2013 TMP outlines future rapid transit and transit priority (RTTP) network. The nearest project noted in the 'Affordable RTTP Network' was the Chapman Mills/ Strandherd / Earl Armstrong Transit Signal Priority and Queue Jump Lanes at select intersections between Barrhaven Centre Station to Bowesville Station. This project was not expected to impact study area traffic.

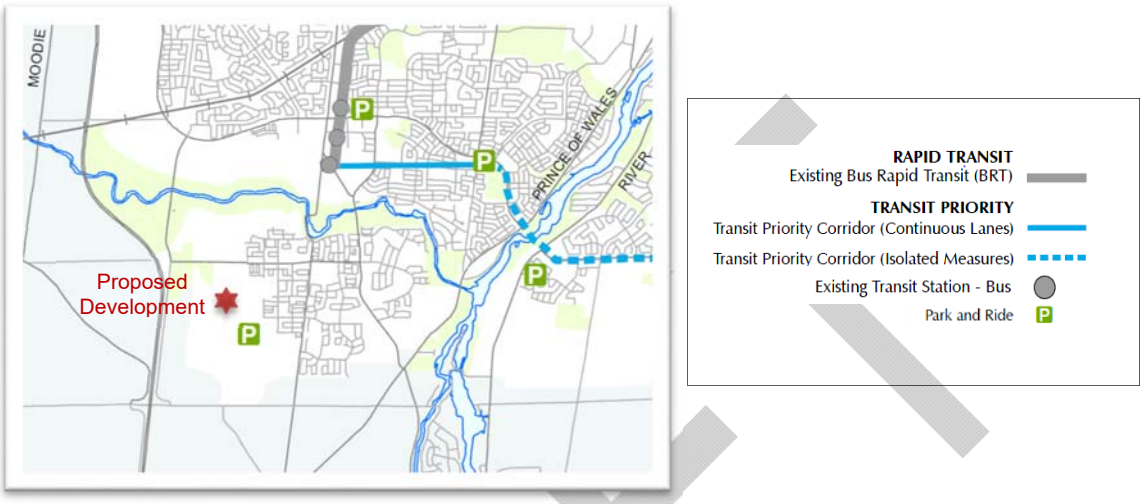
The following projects were noted in the '2031 Network Concept' that may have an impact on study area traffic:

- South Transitway Extension: At-Grade BRT corridor following the re-aligned Greenbank Road extension between Barrhaven Town Centre and Cambrian Road, with the possibility of a future extension to Barnsdale Road
- South Transitway: At-Grade BRT corridor between the Southwest Transitway and Riverside South Town Centre

Exhibit 7 shows the transit infrastructure projects in the vicinity of the study area that are part of the affordable plan.

In addition to the above-noted regional transit facilities outlined in the TMP, typical cross-sections presented in the Cambrian Road Environmental Assessment (EA) from 2014 demonstrates that this corridor will be able to accommodate mixed-use transit, as shown in Appendix D.

EXHIBIT 7 – Future 'Affordable RTTP Network Projects'



2.4.1.4 Future Cycling and Pedestrian Facilities

The Transportation Master Plan (TMP) designates Cambrian Road as "Local Route".

The Ottawa Cycling Plan (2013), a long term strategic plan to strengthen and support cycling in the City, does not note any future modifications to the area cycling network based on the 'Affordable Cycling Network Plan' recommendations. Exhibit 8 below shows the future cycling network in the vicinity of the proposed development.

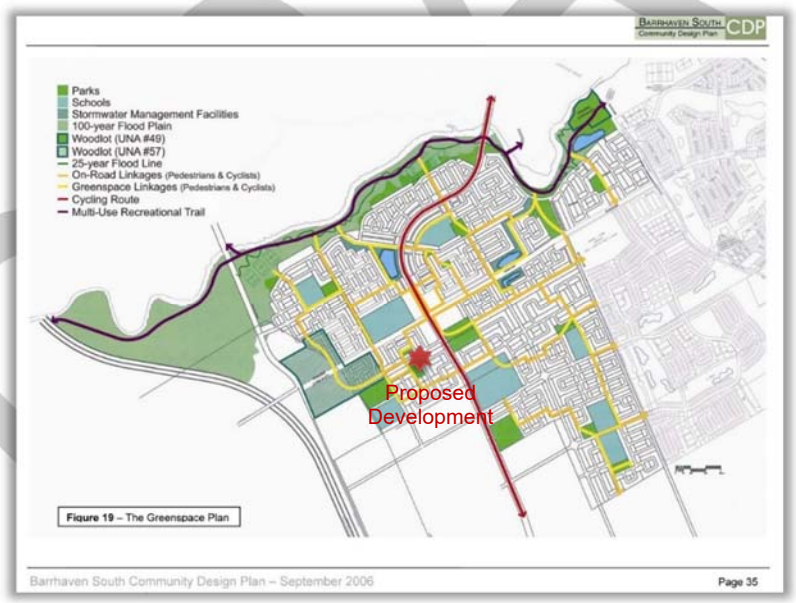
The Ottawa Pedestrian Plan (2013) does not propose any future modifications to the pedestrian network within the study area.

The Cambrian Road Environmental Assessment (EA) was completed in 2014, after the latest TMP update in 2013. This Environmental Assessment (EA) proposes a typical cross-section that features enhanced cycling and pedestrian facilities, as compared to the existing cross-section. Sharrows and dedicated cycling lanes will be utilized along the corridor to promote the use of active transportation methods, especially for inter-zonal commuting. In addition, 2.0m sidewalks separated by grassed boulevards and a multi-use pathway (MUP) is proposed on the south side of the roadway. Please refer to the Typical Cross-section in Appendix D.

EXHIBIT 8 – Future Cycling Connections

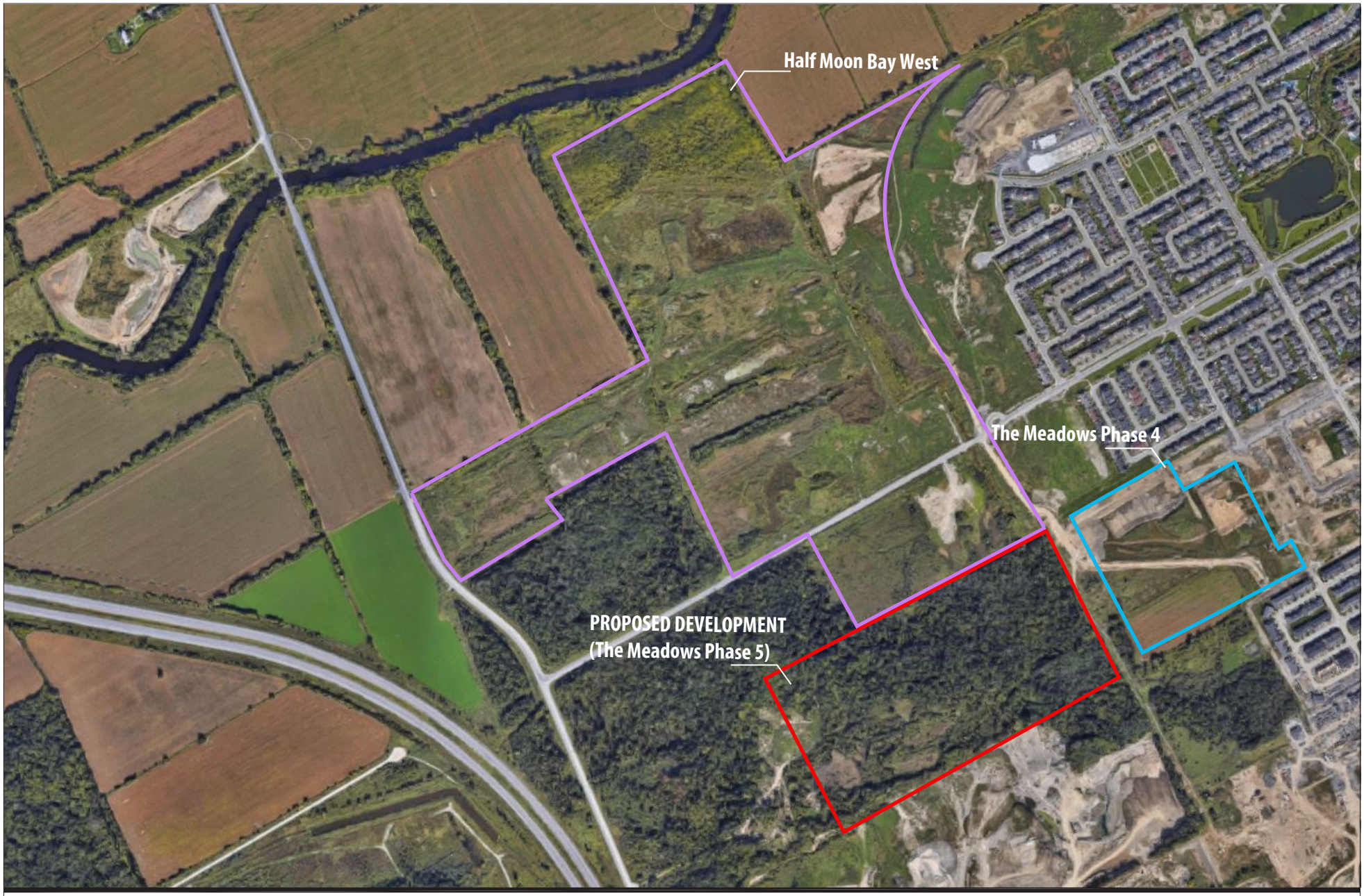
The Barrhaven South Community Design Plan (CDP) shows Cambrian Road immediately east and west of the proposed Greenbank Road re-alignment will provide "On-Road Linkages" for pedestrians and cyclists. The planned cycling and pedestrian network from the CDP are shown below in Exhibit 9.

EXHIBIT 9 – Riverside South Community Design Plan – Cycling and Pedestrian Network



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 year must be identified and recognized 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. Developments adjacent to the study area are shown in Exhibit 10.



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The Meadows Phase 5
Transportation Impact Assessment

Exhibit 10
Future Adjacent Developments

PROJECT No. 115637
DATE: MARCH 2018
SCALE:

-100m 0 100m

Table 3 outlines future adjacent developments to the study area. The development of Half Moon Bay West was proposed immediately to the north of the subject site, and The Meadows Phase 4 was proposed to the east of the subject site, according to TIA reports prepared for these developments. As confirmed via Google Maps aerial imagery at the time of writing this TIA, no portions of either site have been builtout.

TABLE 3 – Developments Adjacent to Subject Development

DEVELOPMENT NAME	TIA PREPARED BY	SIZE/ NUMBER OF UNITS	EXPECTED BUILDOUT/ OCCUPANCY DATE	RECOMMENDED ROAD MODIFICATIONS
Half Moon Bay West (Mattamy Homes)	Stantec Consulting	518 singles 427 townhome units 5.3 acres of commercial land 109 townhome units 360 townhomes/back-to-back homes	2024 (no occupancy in 2018)	Auxiliary lanes were recommended at the following locations: Cambrian Road and Mattamy Site Access • Implement traffic signals • 70m SBL storage lane • 40m EBL storage lane • WBR turn lane
The Meadows Phase 4 (Tamarack Homes)	IBI Group	50 singles 136 units townhomes/ Semi-detached	2019 (no occupancy in 2018)	No recommended modifications to intersections on roadways within study area.

2.4.3 Network Concept Screenline

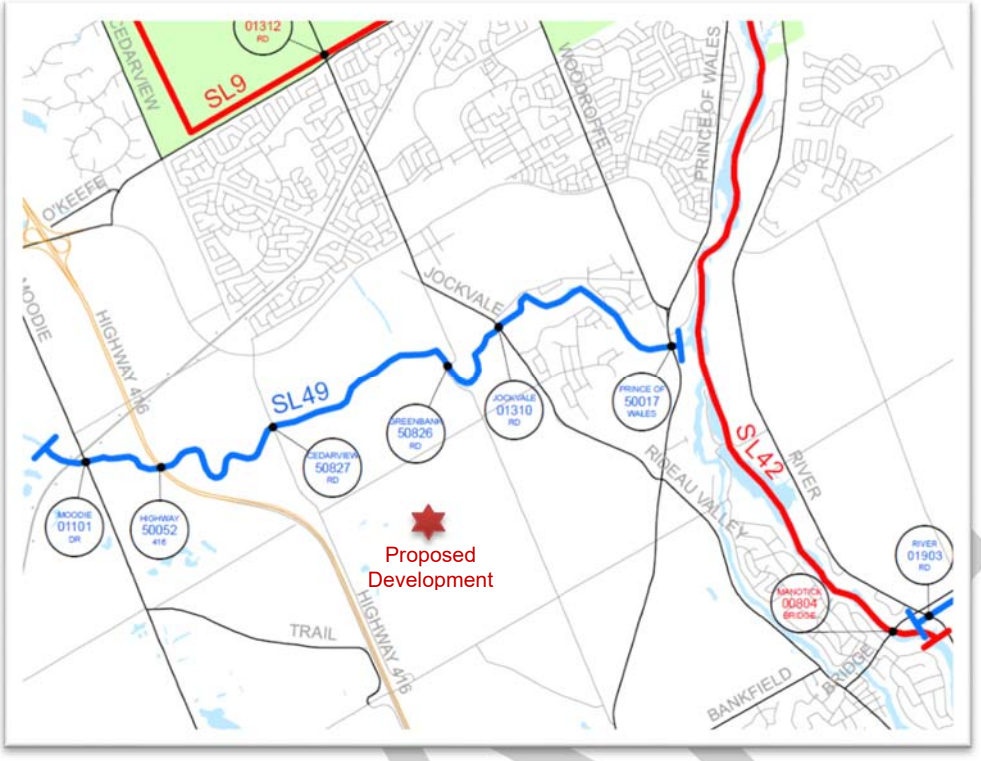
A screenline is an imaginary line made up of a number of stations to count east/west or north/south travel within a particular area. Screenlines are typically located along geographical barriers such as rivers, rail lines or within the greenbelt. To be truly representative of the flow, there is a station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

As specified in Module 4.8 of the 2017 TIA Guidelines, the latest Network Concept will be reviewed with to ensure that the nearest strategic planning screenlines adjacent to the development are considered in the screenline analysis.

- SL42 – Rideau River (Manotick) – This is the closest north/south screenline to the subject site, and it is located along the Rideau River from just south of Mitch Owens Road to just north of Leitrim Road. It has two (2) crossing points: the Vimy Memorial Bridge and the Manotick Bridge.
- SL49 – Jock River – This is the nearest east/west screenline to the subject site. It follows the Jock River from just west of Moodie Drive in the west to the Rideau River in the east. This screenline has six (6) crossing points over the Jock River, including: Moodie Drive, Highway 416, Cedarview Road (now called Borrisokane Road), Greenbank Road, Jockvale Road and Prince of Wales Drive.

SL42 and SL49 are shown in Exhibit 11, as determined from the City of Ottawa's Road Network Development Report (2013), a supporting document to the 2013 Transportation Master Plan (TMP).

EXHIBIT 11 – Nearest Screenlines



2.5 Study Area

Based on the review of the nearest screenlines, transit routes and active transportation facilities, the proposed study area will be defined by Cambrian Road to the north, Borrisokane Road to the west and undeveloped lands to the south and west.

The following existing intersection will be assessed as part of this TIA:

- Cambrian Road and Borrisokane Road

The following proposed intersection will be assessed as part of this TIA:

- Cambrian Road and Street 23/ Mattamy Site Access

Intersections along Cambrian Road east of Street 23 up to Greenbank Road were discussed and reviewed as part of the TIA prepared for the Meadows Phase 4, which is currently under review to address minor comments. As part of the Meadows Phase 4, the majority traffic was directed to River Mist Road and the existing Greenbank Road. Even with this conservative distribution, the River Mist Road and Cambrian Road intersection was shown to operate within City standards through to the ultimate 2024 planning horizon as stop-controlled intersection. Based on existing turning movement counts along Cambrian Road, the majority of traffic from the subject site is expected to utilize Street 23 and Borrisokane Road, as this a more direct route to Highway 416 for commuters, rather than navigating through internal streets within the Meadows Phase 4 development. Since very little traffic is expected to bleed east through the development, existing intersections to the east of Street 23 along Cambrian Road were not considered as part of the study area.

As previously discussed in Section 2.4.1.1, this TIA will consider the worst case scenario, and rely on existing infrastructure to service the subject development. In this scenario, it was assumed that the Greenbank Road realignment to Cambrian Road would not be completed within the study horizons, and the existing Greenbank Road alignment remains through to the ultimate planning horizon. This approach provided a better evaluation of potential bottlenecks in the adjacent road network.

An agreement will be in place between the Mattamy Homes and Tamarack Homes as part of the conditions of approval, stating that the construction of Street 23 will be built from the subject lands and connect to Cambrian Road prior to the completion and occupancy of residential units within the subject development. Street 23 will be required for servicing, as well to provide vehicular access to the subject site.

2.6 Time Periods

Since this is a residential development, traffic generated during the morning and afternoon peak hour are 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 2022 – Opening Day; Full occupancy
- Year 2027 – 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 4 identifies each element, and indicates whether or not it will be required in Step 4 – Analysis.

TABLE 4 – Exemptions Review

TIA MODULE	ELEMENT	EXEMPTION CONISDERATIONS	REQUIRED
Design Review Component			
4.1 Development Design	4.1.2 Circulation and Access	• Only required for site plans	✗
	4.1.3 New Street Networks	• Only required for plans of subdivision	✓
4.2 Parking	4.2.1 Parking Supply	• Only required for site plans	✗
	4.2.2 Spillover Parking	• Only required for site plans where parking supply is 15% below unconstrained demand	✗
Network Impact Component			
4.5 Transportation Demand Management	All Elements	• 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	• 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	• 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." [2]

3.1 Development Generated Traffic

3.1.1 Trip Generation Methodology

Peak hour development generated traffic volumes were developed using Institute of Transportation Engineers (ITE) Trip Generation Manual, 9th Edition, 2012. The Transportation Impact Assessment (TIA) Guidelines require ITE

[2] Ottawa 2017 Transportation Impact Assessment Guidelines, p. 27

vehicle-trip rates to be adjusted to better reflect local travel patterns. The ITE trip generation rates are based on data collected from traffic surveys conducted across North America, but mostly in suburban areas of the United States where the level of transit use is traditionally very low (estimates show that ITE rates average approximately 96% auto mode split). This statistic is not representative of the City of Ottawa that has a well-established transit system and pedestrian/ cycling network.

The City recommends the ITE vehicle-trip rates be converted to person-trips split based on representative mode share proportions. This conversion factor was based on a recommended average vehicle occupancy of 1.15 and a 10% non-auto mode share. The person-trips were then split based on representative mode share percentages to determine the number of vehicle, transit, pedestrian, cycling and other trip types.

Local mode shares were based on the TRANS Committee: 2011 Origin-Destination (OD) Survey completed for the City of Ottawa. The OD Survey has mode share breakdowns for specific zones throughout the City; the South Nepean Zone contained the subject site and was applied in this analysis.

3.1.2 Trip Generation Results

3.1.2.1 ITE Vehicle Trip Generation

The peak hour vehicular traffic volumes from The Meadows Phase 5 development were determined using peak hour trip generation rates from the ITE Manual. A summary of the vehicular trip generation results for the proposed development has been summarized in Table 5.

The relevant extracts from the ITE Manual have been provided in Appendix E.

TABLE 5 – ITE Development Trip Generation Results

LAND USE (ITE CODE)	SIZE (DU)	PERIOD	GENERATED TRIPS (VPH)		
			IN	OUT	TOTAL
Single Detached Housing (210)	125	AM	24	73	97
		PM	81	48	56
Townhouse (230)	221	AM	17	81	98
		PM	77	38	115

Notes: DU = Dwelling Units

vph = vehicles per hour; DU = Dwelling Units
Formula Rate and Splits for Single Detached Homes
AM T = 0.7(X) + 9.74 IN: 25%; OUT: 75%
PM T = e^(0.9*ln(X)+0.51) IN: 63%; OUT: 37%

vph = vehicles per hour; DU = Dwelling Units
Formula Rate and Splits for Townhomes
AM T = e^(0.80*ln(X) + 0.26) IN: 17%; OUT: 83%
PM T = e^(0.82*ln(X)+0.51) IN: 67%; OUT: 33%

3.1.2.2 Person Trip Generation

The ITE vehicle-trip to person-trip conversion factor of 1.28 based on an average vehicle occupancy of 1.15 and a default 10% non-auto mode share was applied to vehicle-trip results in Table 1. The results after applying this factor have been summarized in Table 6.

TABLE 6 – Development Person Trip Generation Results

LAND USE (ITE CODE)	FACTOR	PERIOD	GENERATED TRIPS (PPH)		
			IN	OUT	TOTAL
Single Detached Housing (210)	1.28	AM	24	73	97
		PM	80	47	127
Townhouse (230)		AM	16	81	97
		PM	76	37	113
Total		AM	40	154	194
		PM	156	84	240

Notes:
pph = persons per hour; DU = dwelling units

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 Nepean Traffic Assessment Zone (TAZ). The relevant extracts from the 2011 OD Survey has been provided in Appendix F.

No adjustments were made to active transportation modes such as walking or cycling for future planning horizons used for this traffic study. The existing and proposed mode share targets for the South Nepean TAZ for each of the analysis horizons are outlined in Table 7. Significant adjustments were made to the transit modal split to reduce it to from 27% to 10% in the AM peak hour, and from 24% to 10% in the PM peak hour. The difference was shifted over to the auto-drive mode. This approach should be considered conservative.

TABLE 7 – Proposed Mode Shares for South Nepean (2011 OD Survey)

TRAVEL MODE	2011 OD SURVEY MODE SHARE		ADJUSTED MODE SHARE	
	AM	PM	AM	PM
Auto Driver	61%	63%	78%	77%
Transit	27%	24%	10%	10%
Auto Passenger	8%	11%	No Change	
Cycling	0%	0%		
Walking	0%	0%		
Other	4%	2%		
Total	100%	100%	100%	100%

3.1.2.4 Trip Generation by Mode

The mode share target in Table 7 were applied to person trips results from Table 6 to estimate the number of development generated trips by mode, as shown in Table 8.

TABLE 8 – Development Generated Traffic by Mode

TRAVEL MODE	PEAK PERIOD TRIPS BY MODE					
	AM			PM		
	IN	OUT	TOTAL	IN	OUT	TOTAL
Auto Driver	41	153	194	156	84	240
Transit	5	20	25	20	11	31
Auto Passenger	4	16	20	22	12	34
Cycling	0	0	0	0	0	0
Walking	0	0	0	0	0	0
Other	2	8	10	4	2	6

The proposed development is expected to generate approximately 194 morning and 240 afternoon peak hour vehicular trips at full buildout.

3.1.3 Trip Distribution and Assignment

A regional trip distribution was applied to the site generated traffic within the study area. The expected travel routes to and from the study area were as follows:

- East on Cambrian Road
- North and South on Borrisokane Road

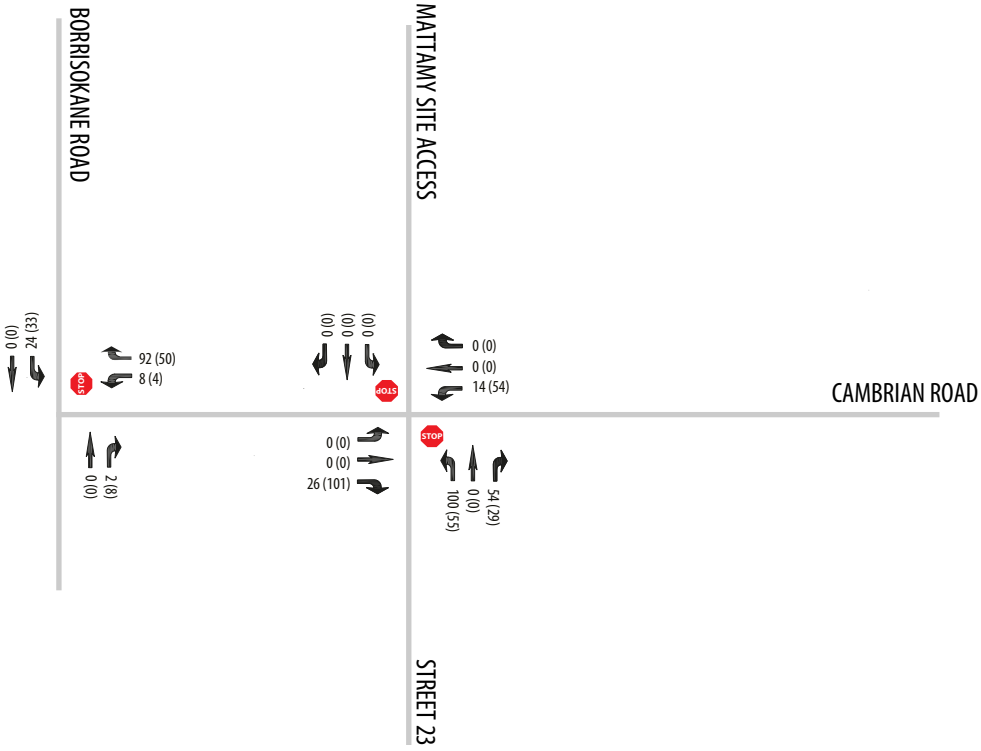
It should be noted that since Cambrian Road terminates to the west at Borrisokane Road, any traffic heading west on Cambrian Road is captured in the north or south directions along Borrisokane Road. The estimated trip distributions were based on assumptions made in approved traffic studies completed within the study area.

A summary of trip distribution proportions applied to site generated trips is shown in Table 9.

TABLE 9 – Trip Distribution by Direction

LOCATION	TRIP DISTRIBUTION	
	IN	OUT
East on Cambrian Road	35%	35%
North on existing Borrisokane Road	60%	60%
South on existing Borrisokane Road	5%	5%

The intersection level trip distribution was based on existing turning movement counts. The resulting development generated morning and afternoon peak hour traffic volumes has been provided in Exhibit 12.



LEGEND

- STOP CONTROL
- TRAFFIC CONTROL SIGNAL
- TRAVEL LANES AND PERMITTED MOVEMENTS
- AM & PM PEAK HOUR VEHICULAR VOLUMES

xxx (xxx) xxx (xxx) xxx (xxx)

IBI

The Meadows Phase 5
Transportation Impact Assessment

EXHIBIT 12
Site Generated AM & PM
Peak Hour Traffic Volumes

PROJECT No.: 115637
DATE: MARCH 2018
SCALE: NTS

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. These changes would then be reflected in the future background demand volumes to develop an appropriate foundation for the TIA.

As noted in the Scoping, the impact of the Greenbank Road realignment was not accounted for in the following TIA. This approach was meant to represent the worst case scenario for the transportation network and provide a better evaluation of potential bottlenecks in the adjacent road network.

Recommended intersection modifications noted in the Half Moon Bay West Community Transportation Study (CTS): Addendum No. 1 dated November 2017, include adding traffic signals and auxiliary lanes at the intersections of Borrisokane Road and Cambrian Road, as well as at Street 23 and Cambrian Road. It is not anticipated that further modifications in addition to those recommended in the Half Moon Bay West CTS will be required to accommodate traffic generated from the subject development.

Existing transit service routes will need to be adjusted to increase transit coverage within the proposed development, however, as transit accessibility within 400m will be limited until the future Greenbank realignment south of Cambrian Road is completed.

3.2.2 General Background Growth Rates

The background growth rate is meant to represent regional growth, outside the study area, along the adjacent road network. Approved transportation impact assessments completed within the study area applied growth rates of 2% at the intersection of Borrisokane Road and Cambrian Road. For this study, a linear growth rate of 2% per annum to existing traffic volumes was applied to estimate future traffic volumes. This growth rate was applied to all movements for all study area intersections.

The above assumptions were considered conservative since other area developments have been captured separately in the TIA, as discussed in the following section.

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.

There are two (2) known developments expected to contribute traffic within the study area. These developments are currently in the development application approval process, and are both currently in the development review process. Construction has not begun on either development. Half Moon Bay West is located immediately to the north of the subject property, and the Meadows Phase 4 is located to the east of the subject property, on the other side of the future re-aligned Greenbank Road. The unit counts and characteristics for each development were based on traffic studies that supported the development application.

The adjacent developments have been summarized in Table 10, and their approximate locations in relation to subject site were shown in Exhibit 10.

TABLE 10 – Future Adjacent Developments

DEVELOPMENT NAME	TIA PREPARED BY	SIZE/ NUMBER OF UNITS	EXPECTED BUILDOUT/ OCCUPANCY DATE	RECOMMENDED ROAD MODIFICATIONS
Half Moon Bay West (Mattamy Homes)	Stantec Consulting	518 singles 427 townhome units 5.3 acres of commercial land 109 townhome units 360 townhomes/back-to-back homes	2024 (no occupancy in 2018)	Auxiliary lanes were recommended at the following locations: (1) Cambrian Road and Mattamy Site Access a. Implement traffic signals b. 70m SBL storage lane c. 40m EBL storage lane d. WBR turn lane
The Meadows Phase 4 (Tamarack Homes)	IBI Group	50 singles 136 units townhomes/ Semi-detached	2019 (no occupancy in 2018)	No recommended modifications to intersections on roadways within study area.

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

A review of previous TIAs in the area reveal no major capacity issues within the study area. The development generated traffic volumes were not expected to create significant capacity issues in the local network.

According to the Needs and Opportunities Report (2013), the both SL42 – River Road (Manotick) and SL49 – Jock River have sufficient capacity to accommodate future traffic demand, in even the Inbound 2031 Base Scenario, which does not include modifications from the City 2031 Network Concept.

The City planned realignment of Greenbank Road and the future widening of Longfields Drive is expected to create additional capacity in the road network to accommodate any deficiencies that may be triggered by future background or development generated traffic growth. As previously discussed, the realignment was assumed not to be completed in the future horizons, to represent the worst case scenario.

Therefore, there were no adjustments made to development generated or background network demand.

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 13. The future background traffic volumes developed in Section 3: Background Network Traffic for the 2022 and 2027 horizons have been provided in Exhibits 14 and 15, respectively.

3.4.2 Future Total Traffic Volumes

The site generated peak hour traffic volumes from Exhibit 12 were added to corresponding background traffic volumes to create background plus site generated or total peak hour traffic volumes for the 2022 and 2027 horizon years, as shown in Exhibits 16 and 17, respectively.

EXHIBIT 13 – Existing (2018) Auto, Cycling and Pedestrian AM & PM Peak Hour Traffic Volumes

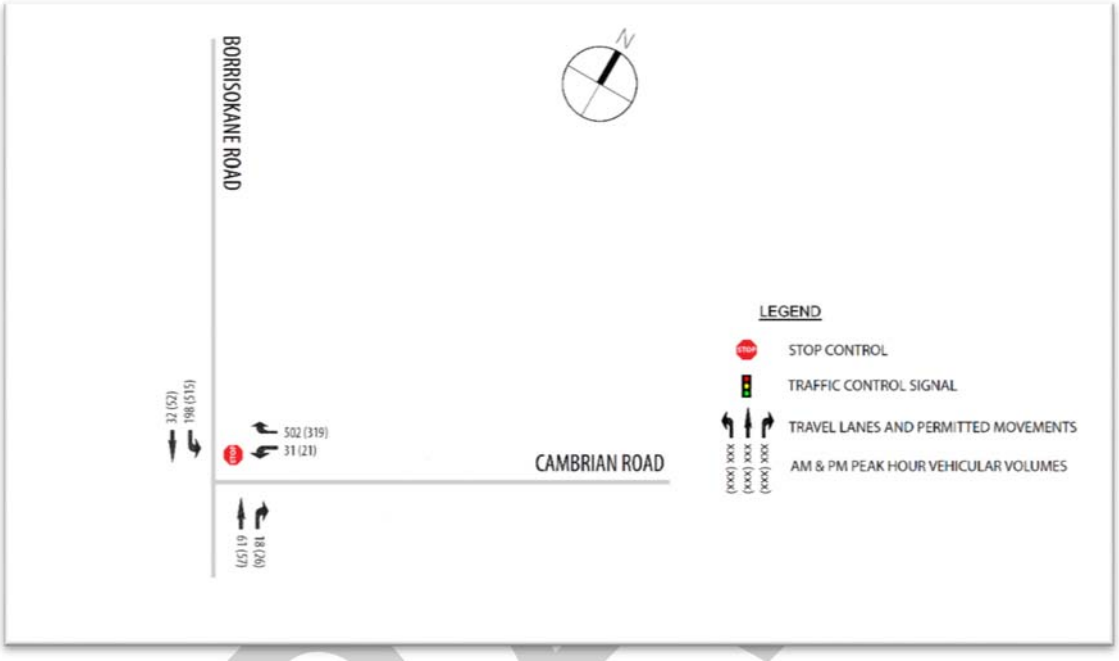
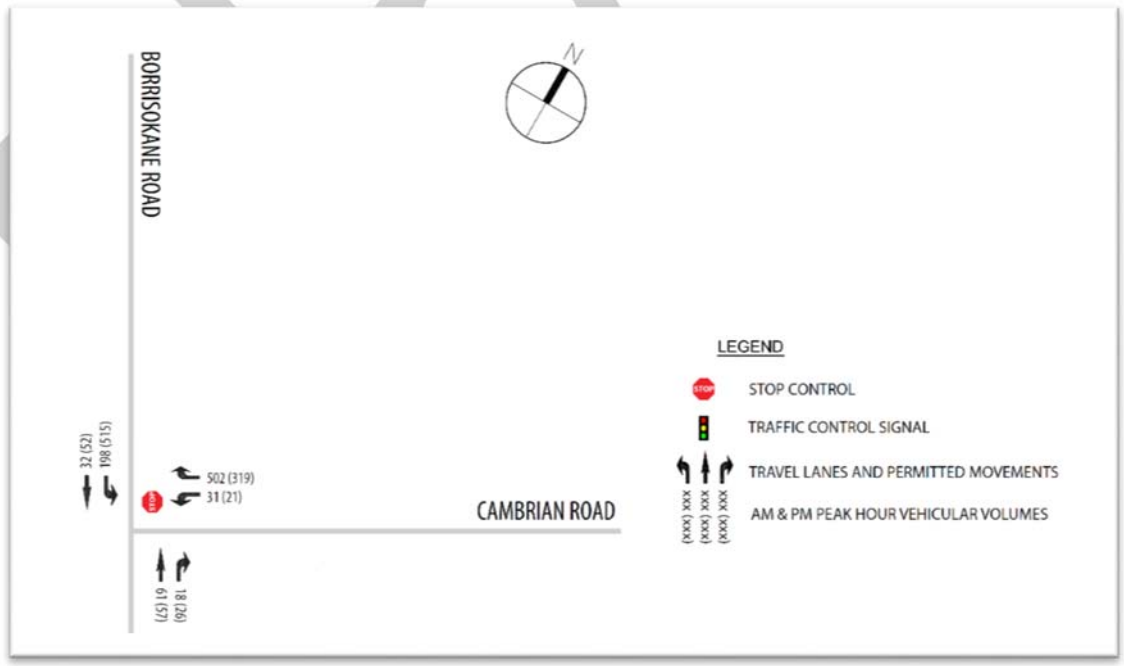
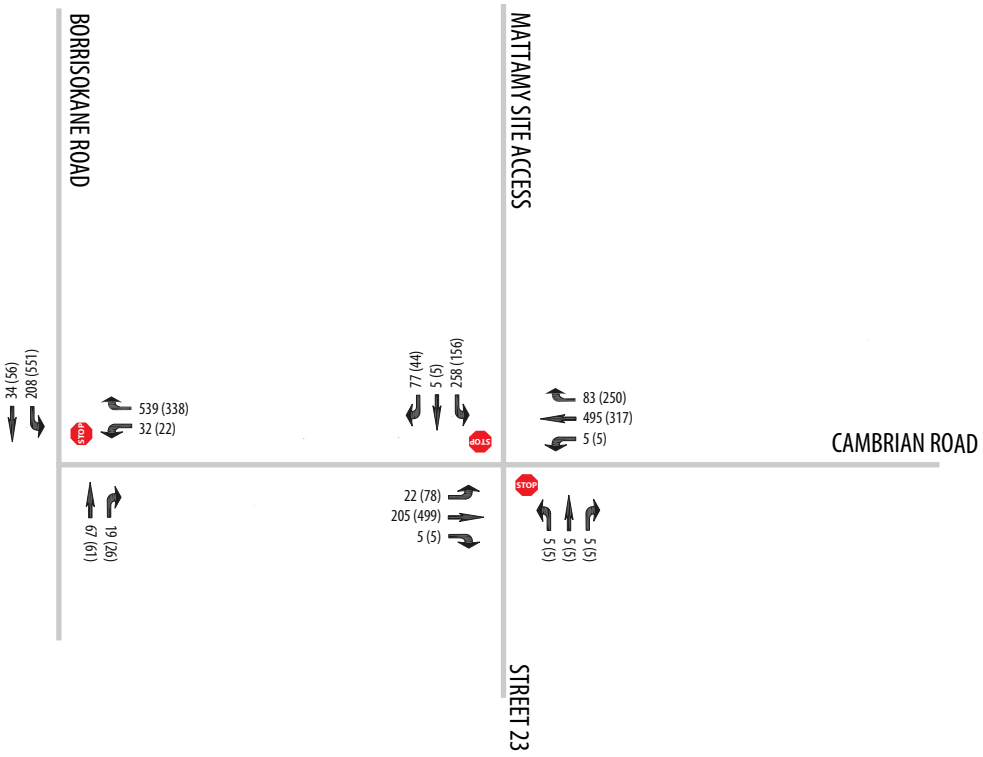


EXHIBIT 14 – Future (2022) Background AM & PM Peak Hour Traffic Volumes





LEGEND

STOP CONTROL

TRAFFIC CONTROL SIGNAL

TRAVEL LANES AND PERMITTED MOVEMENTS

AM & PM PEAK HOUR VEHICULAR VOLUMES

xxx (xxx) xxx (xxx) xxx (xxx)

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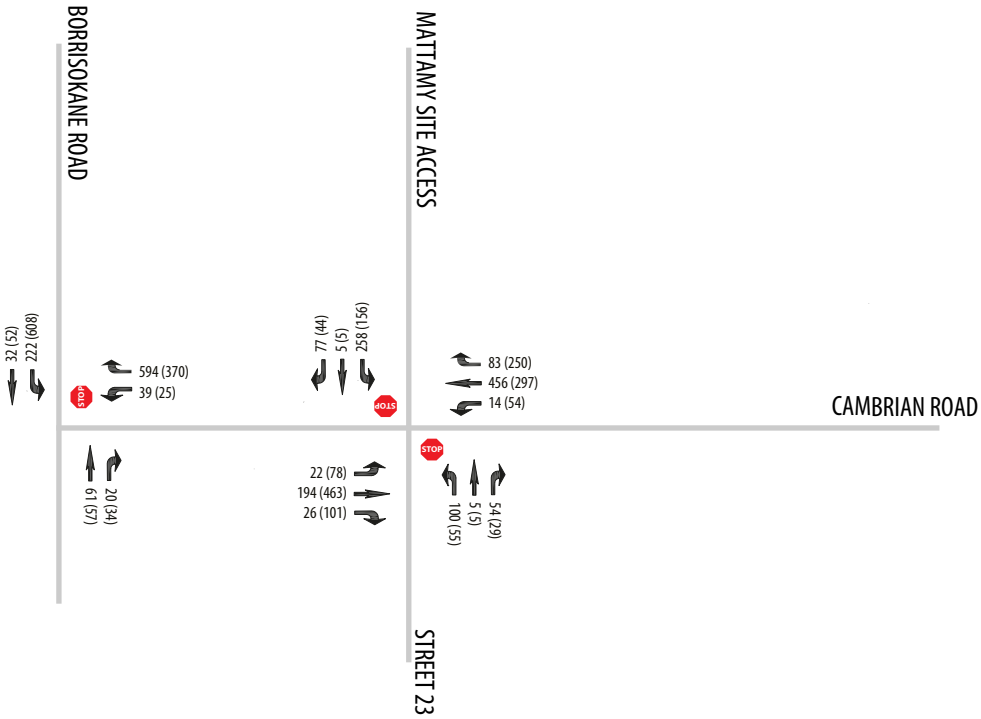
The Meadows Phase 5
Transportation Impact Assessment

EXHIBIT 15
Future (2027) Peak Hour
Background Traffic Volumes

PROJECT No.: 115637
DATE: MARCH 2018
SCALE: NTS



LEGEND

- STOP CONTROL
- TRAFFIC CONTROL SIGNAL
- TRAVEL LANES AND PERMITTED MOVEMENTS
- AM & PM PEAK HOUR VEHICULAR VOLUMES

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The Meadows Phase 5
Transportation Impact Assessment

EXHIBIT 16
Future (2022) Peak Hour Background and
Site Generated Traffic Volumes

PROJECT No.: 115637
DATE: MARCH 2018
SCALE: NTS

LEGEND

- STOP CONTROL
- TRAFFIC CONTROL SIGNAL
- TRAVEL LANES AND PERMITTED MOVEMENTS
- AM & PM PEAK HOUR VEHICULAR VOLUMES

xxx (xxx) xxx (xxx) xxx (xxx)

IBI

The Meadows Phase 5
Transportation Impact Assessment

EXHIBIT 17
Future (2027) Peak Hour Background and Site Generated Traffic Volumes

PROJECT No.: 115637
DATE: MARCH 2018
SCALE: NTS

4 Analysis

The purpose of the TIA Analysis 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 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." [3]

4.1 Development Design

4.1.1 Design for Sustainable Modes

The nearest bus stop to the Meadows Phase 5 development is located northeast of the subject site at Seeley's Bay Street and Cambrian Road, but it is beyond the 400m maximum walking distance to a transit stop as required by the City. Extending transit service west along Cambrian Road, south along the proposed Street 23 access and providing a turn-around area for buses at the southern edge of the subject site at Street 23, would put approximately 90% of residents within a 400m walking distance of a transit stop and approximately 100% of residents within a 500m walking distance of a transit stop. Proposed transit coverage is shown in Exhibit 18.

There are no cycling facilities planned within the proposed development. Sidewalks have been strategically placed to ensure adequate accessibility to the adjacent road network and local amenities, as shown in Exhibit 2.

4.1.2 Circulation and Access

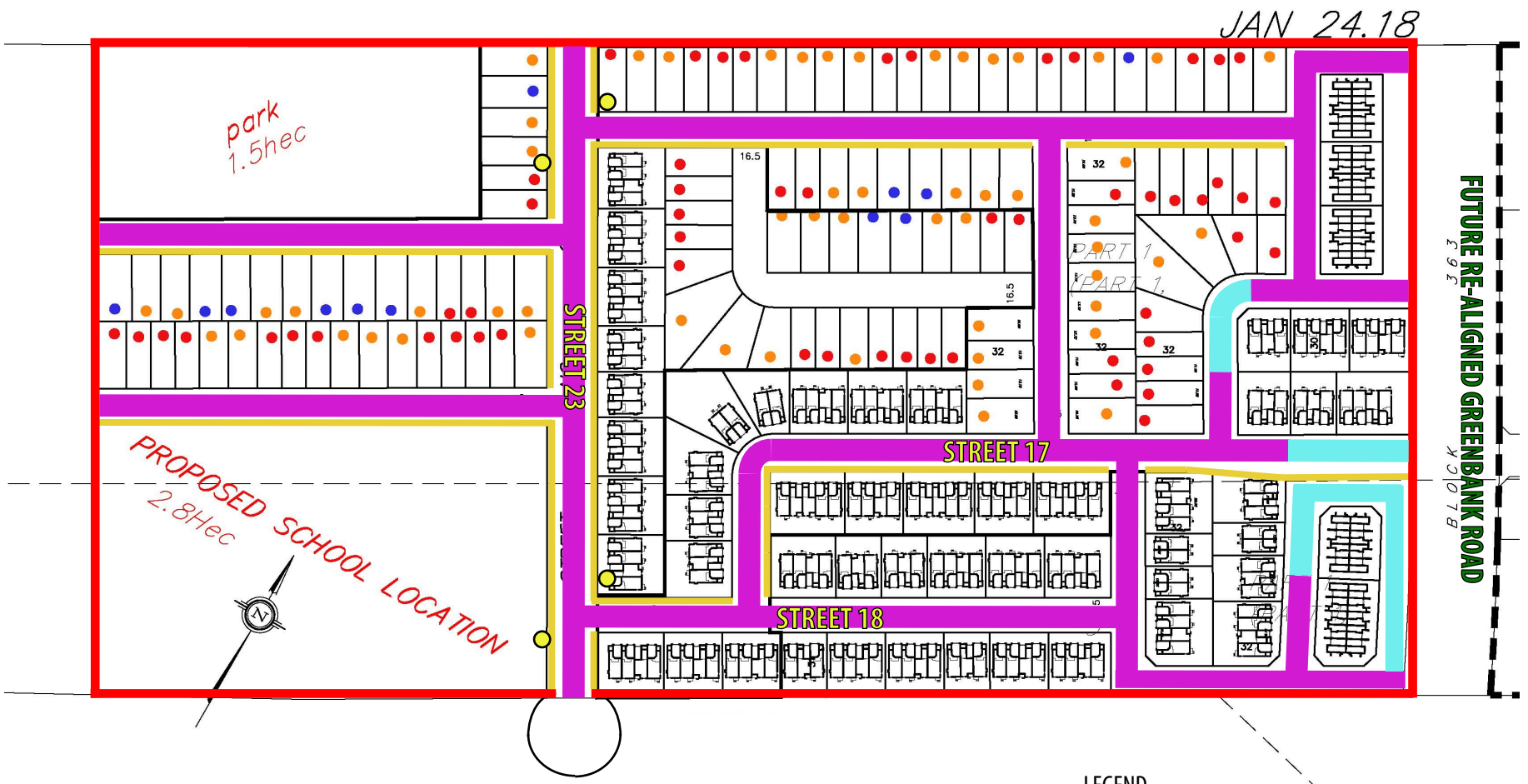
This element is only required for site plans. Therefore, it has been exempt from this TIA.

4.1.3 New Street Networks

According to the plan of subdivision, the proposed development is expected to connect to the Meadows Phase 4 subdivision to the east via Street 17. Street 17 is proposed as an east-west local road with an 18m right-of-way, crossing the realigned Greenbank Road and terminating at Street 23 to the west. Street 23 is proposed as a north-south collector road with a 24m right-of-way (ROW) that will connect to Cambrian Road via the proposed Half Moon Bay West development access intersection to the north. Street 23 is approximately 300m in length, and will terminate at the southern edge of the development.

The remaining roads proposed within the development were proposed to have a 16.5m right-of-way (ROW) width for double-loaded streets, and 14m right-of-way (ROW) width for single-loaded streets.

[3] Ottawa 2017 Transportation Impact Assessment (TIA) Guidelines, p. 35



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The Meadows Phase 5
Transportation Impact Assessment

Exhibit 18
Proposed Transit Coverage

PROJECT No. 115637
DATE: MARCH 2018
SCALE: -50m 0 100m

4.2 Parking

4.2.1 Parking Supply

The Parking Supply element is exempt from this TIA, as indicated in Section 2.8: Exemptions Review. This element is only required for site plan applications.

4.2.2 Spillover Parking

The Spillover Parking element is exempt from this TIA, as indicated in Section 2.8: Exemptions Review. This element is only required for site plan applications.

4.3 Boundary Streets

Cambrian Road is considered the only boundary street to the subject development, and it is classified as an arterial road, running east-west approximately 200m to the north of the subject development.

In the future, the re-aligned Greenbank Road will be extended south of Cambrian Road and run along the west property line. Future design elements along this frontage will be reviewed by the City during the Environmental Assessment of the future extension.

The results of the Segment Multi-Modal Level of Service (MMLOS) of Cambrian Road within the vicinity of the study area is provided in Table 11. Detailed results are provided in Appendix G. The Segment MMLOS is based on the geometry of the roadway and not traffic volumes. Therefore, only one result for each mode is provided for each mode.

TABLE 11 – Segment MMLOS – Future Background and Total Results

INTERSECTION	SCENARIO	LEVEL OF SERVICE			
		PLOS	BLOS	TLOS	TKLOS
Cambrian Road (300m east of Borrisokane Road to Existing Bus Turn-around)	Existing (2018)	F [1]	F [2]	D	B
	2022 BG & BGSG	F [1]	F [2]	D	B
	2027 BG & BGSG	B	F [2]	D	B

Notes: [1] No formal sidewalks; rural cross-section on Cambrian Road with gravel shoulders
[2] The Segment BLOS of 'F' along Cambrian Road is attributed to the higher operating speed (>= 60 km/h) for vehicular traffic

The Community Transportation Study (CTS) for Half Moon Bay West: Addendum 1 (November 2017) indicated that there would be sidewalks provided along the approximately 500m section of Cambrian Road fronting the Half Moon Bay West development. Therefore, by 2027, it was assumed in this study that sidewalks would be provided along Cambrian Road from 300m east of Borrisokane Road to just west of the existing bus turn-around.

4.4 Access Intersections

4.4.1 Location and Design of Access Intersections

The proposed vehicular accesses/ egresses for the subject site will be located to the north of the subject site via Street 23 and Cambrian Road.

Analysis is only shown for the Street 23 and Cambrian Road intersection, as the majority of traffic generated from the subject site is expected to access/ egress the site from the Street 23 access. This assumption, as a worst case scenario, was based on the majority of traffic heading west on Cambrian Road to Borrisokane Road, as indicated by

existing traffic counts conducted for intersections located to the east of the study area. Utilizing Street 23 provides a more direct route to access the Cambrian Road, compared with navigating through the local road network of Meadows Phase 4 and utilizing Grand Canal Street or River Mist Road to access Cambrian Road.

For the Meadows Phase 4 traffic study, the majority of traffic was directed to River Mist Road and was assumed to head towards the existing Greenbank Road, as a worst case scenario. The Cambrian Road and River Mist Road intersection was shown to operate with a v/c ratio of 0.81 and an LOS of 'D' in the 2024 total traffic condition with the existing four-way stop control, which could accommodate some traffic from the subject site, if it were to bleed through the proposed Meadows Phase 4 development. Meadows Phase 4 and Meadows Phase 5 developments have similar unit counts, and it is expected that if some traffic from Meadows Phase 4 bleeds west through Meadows Phase 5 and vice versa, the traffic volumes will likely balance out and have little or no effect on the operations of the access intersections.

4.4.2 Intersection Control

4.4.2.1 Traffic Signal Warrants

The use of traffic signals was investigated at the intersections of Cambrian Road and Borrisokane Road, as well as Cambrian Road and Street 23/ Mattamy Site Access. Traffic signal warrants specified in the Ontario Traffic Manual (OTM) Book 12 were completed for both intersections. The results of the analysis indicated that signalizing the intersection of Cambrian Road and Street 23/ Mattamy Site Access was warranted in the 2027 total traffic condition. Cambrian Road and Borrisokane Road did not trigger traffic signal warrants through to the 2027 total traffic condition.

The results of the traffic signal warrant analysis for the Street shown in Appendix H.

4.4.2.2 Roundabout Analysis

The Roundabout Screening Tool was used to determine the feasibility of a roundabout at the intersection of Cambrian Road and Street 23/ Mattamy Site Access, as this is proposed as a new City intersection, and traffic signals were warranted at this intersection in the 2027 traffic condition, as discussed in Section 4.4.2.1. There were no contra-indications to suggest that a roundabout would be 'problematic', and the suitability factors suggested that roundabout is technically feasible at this intersection. The results of the Roundabout Feasibility Screening Tool are provided in Appendix I.

A detailed roundabout capacity analysis was completed using SIDRA analysis software for a single-lane roundabout at the proposed intersection of Cambrian Road and Street 23/ Mattamy Site Access. The analysis results showed that the roundabout operated within City operational standards in the 2027 total traffic condition. SIDRA is an industry accepted program that uses similar delay-based methodology as the HCM 2010. Any movement with a v/c ratio greater than 1.0 triggers an LOS F for that movement. If the v/c ratio for any movement is equal to or less than 1.0, the delay criteria for unsignalized intersections, shown in Table 16, should be used.

4.4.3 Intersection Design

The Multi-Modal Level of Service (MMLOS) Guidelines provide guidance on how to assess various LOS for the different modes of transportation and specify target levels of service for each mode, given the location and context of the transportation project. This all-in-one evaluation tool allows for comparison 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. As indicated in Section 4.4.2.3,

the proposed Cambrian Road and Street 23/ Mattamy Site Access intersection is expected to require signals by the 2027 background and total traffic conditions; therefore, analysis was completed for 2027 background and total traffic condition scenarios only. MMLOS was only completed for the proposed Cambrian Road and Street 23/ Mattamy Site Access intersection in the 2027 background and total traffic conditions.

The detailed MMLOS results are provided in Appendix G, and Intersection MMLOS results are provided in Table 12.

TABLE 12 – Intersection MMLOS – Future BG & Future BGSG Results

INTERSECTION	SCENARIO	LEVEL OF SERVICE			
		2027			
		P	B	T	TK
Cambrian Road and Street 23/ Mattamy Site Access	Future BG	C	F	D	F
	Future BGSG	C	F	D	F

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
No Intersection MMLOS results were produced for Cambrian Road and Borrisokane Road, as this interseciton did not require signals for the 2021 Background or 2021 Background plus Site-generated planning horizons. MMLOS warrants only apply to signalized intersections.

4.4.3.1 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 proposed intersection of Cambrian Road and Street 23/ Mattamy Site Access was tested in the 2027 background and total traffic conditions. All of these scenarios met the City of Ottawa PLOS target of 'C'.

4.4.3.2 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 2027 background and total traffic conditions were tested with traffic signals, and all resulted in a BLOS of 'F', due to the high operating speeds along the Cambrian Road (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.

It should be noted that reducing the speed limit along Cambrian Road to 50km/h to match the urbanized section of the roadway to the east of Seeley's Bay Street will significantly improve the BLOS.

4.4.3.3 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 2027 total traffic conditions result in a TLOS of 'D', which marginally exceeds the City's TLOS target of 'C'. The deterioration of the TLOS in the 2027 total traffic condition can be attributed to the approach delay experienced by vehicles exiting the Mattamy Site Access to the north in the morning peak period. All other approaches at this intersection experienced delays resulting in a TLOS of 'C'.

4.4.3.4 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 Cambrian Road and Street 23/ Mattamy Site Access has a TKLOS of 'F', which is attributed to the tighter turning radii and single-receiving lanes. The main purpose of this intersection is to provide access for local, residential traffic to the Half Moon Bay West and Meadows Phase 5 developments.

4.5 Transportation Demand Management

The City of Ottawa is committed to implementing Transportation Demand Management (TDM) measures on a City-wide basis in an effort to reduce the automobile dependence of Ottawa residents, particularly during the weekday peak travel periods. TDM initiatives are aimed at encouraging individuals to use non-auto modes of travel during the peak periods.

Mode shares used to estimate future development traffic were based on the 2011 TRANS OD Survey for the Traffic Assessment Zone where the proposed development is located. The non-auto transportation mode shares were left constant in the future, which was a conservative assumption. There are no employment uses proposed onsite. However, the development will still conform to the City's TDM principles by providing direct connections to adjacent pedestrian, cycling and transit facilities where applicable.

4.6 Neighbourhood Traffic Management

4.6.1 Adjacent Neighbourhoods

The TIA Guidelines provide peak hour vehicular volume thresholds for local and collector roads that are located along significant access/ egress routes for the proposed development. For the subject site, Street 23 was proposed as the sole access for the subject development to connect directly with Cambrian Road to the north. To be conservative, it was assumed that 100% of development traffic utilized Street 23 to access/ egress the subject site. Street 17 provided a secondary site access/ egress location to the east; however, this is not a direct route to the arterial road network, and would force vehicles to navigate through the road network for the proposed Meadows Phase 4. As shown in Table 13, the proposed development is expected to generate less than 300 vehicles per hour per lane (vphpl) on Street 23, the threshold for a collector road.

The threshold of 120 vphpl for local roadways within the development is not expected to be exceeded, since traffic generated in the dominant direction by the entire development is expected to only marginally exceed the threshold for local roadways. Traffic utilizing the local roads to the east and west of Street 23, the collector road, will be further divided based on the resident's location within the subject development.

TABLE 13 – Road Classification Capacity

STREET	SEGMENT	CAPACITY (VPHPL)	PEAK HOUR DEMAND IN PEAK DIRECTION (VPHPL)	
			AM	PM
Street 23	South of Cambrian Road	300	154	155

Notes: vphpl = vehicles per hour per lane

The results from Table 13 show that the local 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.

4.6.2 Local Intersection Requirements

Local road intersections within the subject development are expected to be signalized (stop-controlled) on the side street movement. These requirements will be reviewed and confirmed at detailed design. All pavement marking and signage requirements are expected to follow City standards.

4.7 Transit

4.7.1 Route Capacity

The estimated future 2027 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 14.

TABLE 14 – Development-Generated Transit Demand

PERIOD	PEAK PERIOD DEMAND	
	IN	OUT
AM	5	20
PM	20	11

The proposed development will generate a marginal amount of transit demand. Additional capacity and service improvements via transit priority measures were not deemed necessary.

When the realigned Greenbank Road is extended south of Cambrian Road, there will be opportunities for OC-Transpo to provide improved transit coverage for this development.

4.8 Review of Network Concept

Section 2.4.3 outlined nearby screenlines to the subject site, SL 42 – Rideau River (Manotick); and SL49 – Jock River, shown in Exhibit 19. A summary of 2031 Base and 2031 Network Concept demand and capacity scenarios have been provided in Table 15. The results of the 2031 Network Concept reflect the increase in roadway capacity associated with planned capital projects noted in the Transportation Master Plan (TMP), as compared with the 2031 Base scenario.

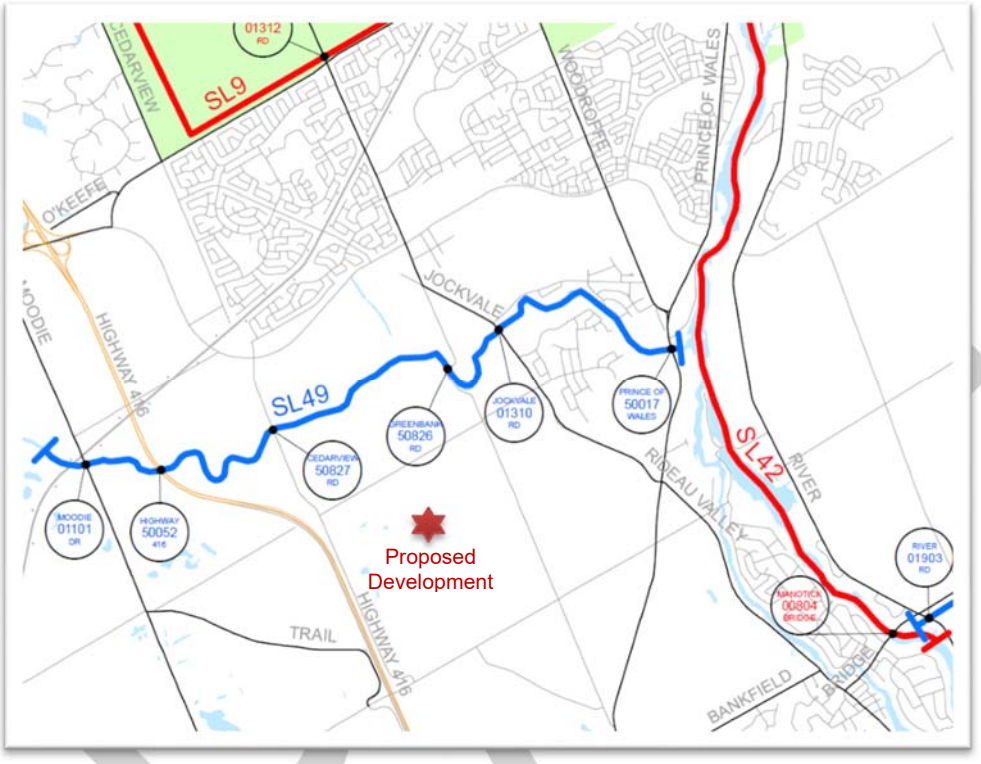
TABLE 15 – 2031 Development Generated Transit Demand

SCREENLINE	AM 2031 INBOUND (BASE)			AM 2031 INBOUND (NETWORK CONCEPT)		
	DEMAND	CAPACITY	V/C RATIO	DEMAND	CAPACITY	V/C RATIO
SL42 Rideau River (Manotick)	2,928	3,800	0.77	2,596	3,800	0.68
SL49 Jock River	6,405	10,200	0.63	6,642	13,200	0.50

Notes:
Table results from TMP – Final Report: Road Network Development Report

Proposed development traffic does not trigger any capacity deficiencies along nearby screenlines in either the 2031 Base Scenario or 2031 Network Concept. However, future road projects such as the widening of Cambrian Road, the realignment of Greenbank Road and widening of Strandherd Drive should be completed on schedule to reduce or spread traffic demand along nearby screenlines and help mitigate local traffic bottlenecks.

EXHIBIT 19 – Nearest Screenlines



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 (2022) Background Traffic
- Future (2027) Background Traffic
- Future (2022) Total Traffic
- Future (2027) Total Traffic

The following intersection was included in this analysis:

- Cambrian Road and Borrisokane Road

4.9.1 Base Road Network

There were no future roadway modifications noted in the Transportation Master Plan (TMP) "Affordable Network," DC Background Study or Capital Budget Forecasts within the study area.

Roundabouts were only considered at unsignalized intersections if shown to be operating below City standards. Further discussion on the geometric requirements for auxiliary turn lanes and storage lengths at proposed access intersections has been provided in Section 4.10.1: Auxiliary Lane Analysis.

4.9.2 Intersection Analysis Criteria

4.9.2.1 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 Unsignalized Intersections

The capacity of an unsignalized intersection can also be expressed in terms of the LOS it provides. For an un-signalized intersection, the Level of Service is defined in terms of the average movement delays at the intersection. This is defined as the total elapsed time from when a vehicle stops at the end of the queue until the vehicle departs from the stop line; this includes the time required for a vehicle to travel from the last-in-queue position to the first-in-queue position. The average delay for any particular minor movement at the un-signalized intersection is a function of the capacity of the approach and the degree of saturation.

The Highway Capacity Manual 2010 (HCM), prepared by the Transportation Research Board, includes the following Levels of Service criteria for un-signalized intersections, related to average movement delays at the intersection, as indicated in Table 17.

TABLE 17 – LOS Criteria for Unsignalized Intersections

LOS	DELAY (seconds)
A	<10
B	>10 and <15
C	>15 and <25
D	>25 and <35
E	>35 and <50
F	>50

The unsignalized intersection capacity analysis technique included in the HCM and used in the current study provides an indication of the Level of Service for each movement of the intersection under consideration. By this technique, the performance of the unsignalized intersection can be compared under varying traffic conditions, using the Level of Service concept in a qualitative sense. One unsignalized intersection can be compared with another unsignalized intersection using this concept. Level of Service 'E' represents the capacity of the movement under consideration and generally, in large urban areas, Level of Service 'D' is considered to represent an acceptable operating condition (Level of Service 'E' is considered an acceptable operating condition for planning purposes for intersections located within Ottawa's Urban Core— the downtown and its vicinity). Level of Service 'F' indicates that the movement is operating beyond its design capacity.

4.9.2.3 Roundabout Analysis

The Roundabout Feasibility Screening Tool was not completed for the intersection of Cambrian Road and Borrisokane Road, as this intersection does not satisfy any of the following conditions that require a roundabout to be considered:

(1) It is not a new City intersection
(2) Traffic signals are not warranted at this intersection through to the 2027 total traffic condition
(3) There were no capacity or safety problems are experienced through to the 2027 total traffic condition

The Roundabout Feasibility Screening Tool was completed for the proposed intersection of Cambrian Road and Street 23/ Mattamy Site Access, as discussed in Section 4.4.2.2.

4.9.3 Intersection Control

4.9.3.1 Traffic Signal Warrant Methodology

Traffic control signal warrants were completed for all unsignalized stop or yield controlled intersections. The warrant procedures for both existing and future conditions were based on the established methodology outlined in the Ontario Traffic Manual, Book 12, Ministry of Transportation Ontario (MTO), 2012.

Traffic signals are warranted at the intersection of

For future traffic conditions, an Average Hourly Volume (AHV) for each intersection approach is estimated using the following equation and applied to the warrant procedure:

$$\text{Average Hourly Volume} = \frac{\text{(AM Peak Hour Volume + PM Peak Hour Volume)}}{4}$$

4.9.3.2 Traffic Signal Warrants

The traffic signal warrant was not triggered in the 2027 total traffic condition at the Cambrian Road and Borrisokane Road intersection. Details of the traffic signal warrants analyses described above are included in Appendix H.

4.9.4 Intersection Design (Operations)

4.9.4.1 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 and SIDRA analysis output files have been provided in Appendix J.

4.9.4.2 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 18.

TABLE 18 – Intersection Capacity Analysis: Existing (2018) Traffic

INTERSECTION	CONTROL	PEAK HOUR	V/C RATIO		LEVEL OF SERVICE	
			CRITICAL MOVEMENT	INTERSECTION	CRITICAL MOVEMENT	INTERSECTION
Cambrian Road and Borrisokane Road	WB Stop	AM	0.44	-	B	-
		PM	0.26	-	B	-

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

4.9.4.3 2022 Background Traffic Results

The 2022 background 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 19.

TABLE 19 – Intersection Capacity Analysis: Future (2022) Background Traffic

INTERSECTION	CONTROL	PEAK HOUR	V/C RATIO		LEVEL OF SERVICE	
			CRITICAL MOVEMENT	INTERSECTION	CRITICAL MOVEMENT	INTERSECTION
Cambrian Road and Borrisokane Road	WB Stop	AM	0.44	-	B	-
		PM	0.27	-	B	-

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

4.9.4.4 2027 Background Traffic Results

The 2027 background traffic condition intersection capacity for total background traffic analysis was completed using morning and afternoon peak hour traffic volumes. All recommended modifications from the 2022 background traffic condition have been carried forward to this horizon. A summary of the results has been provided in Table 20.

TABLE 20 – Intersection Capacity Analysis: Future (2027) Background Traffic

INTERSECTION	CONTROL	PEAK HOUR	V/C RATIO		LEVEL OF SERVICE	
			CRITICAL MOVEMENT	INTERSECTION	CRITICAL MOVEMENT	INTERSECTION
Cambrian Road & Borrisokane Road	WB Stop	AM	0.62	-	C	-
		PM	0.52	-	C	-
Cambrian Road and Street 23/ Mattamy Site Access	NB/ SB Stop	AM	0.99	-	F	-
		PM	0.96	-	F	-
	Traffic Signals [a]	AM	0.78	-	C	-
		PM	0.64	-	B	-
	Roundabout [b]	AM	0.55	-	B	B
		PM	0.63	-	B	B

Notes: EB = eastbound; WB = westbound; NB = northbound; SB = southbound
Summary of Modifications:
1 - Cambrian Road and Street 23/ Mattamy Site Access intersection
  a. Traffic Signals
    i. Construct north leg (Mattamy Site Access) with 70m SBL storage lane
    ii. Construct south leg (Street 23) with 20m NBL storage lane
    iii. Construct 40m EBL storage lane
    iv. Construct 15m WBL storage lane and 10m WBR storage lane
  b. Single-lane roundabout
    i. Construct north and south legs of intersection with shared-turning lanes on all approaches

4.9.4.5 2022 Total Traffic Results

The 2022 total traffic condition intersection capacity analysis was completed using morning and afternoon peak hour traffic volumes. A summary of the results has been provided in Table 21.

TABLE 21 – Intersection Capacity Analysis: Future (2022) Total Traffic

INTERSECTION	CONTROL	PEAK HOUR	V/C RATIO		LEVEL OF SERVICE	
			CRITICAL MOVEMENT	INTERSECTION	CRITICAL MOVEMENT	INTERSECTION
Cambrian Road & Borrisokane Road	WB Stop	AM	0.69	-	C	-
		PM	0.63	-	C	-
Cambrian Road & Street 23	NB Stop [1]	AM	0.31	-	C	-
		PM	0.25	-	C	-

Notes: EB = eastbound; WB = westbound; NB = northbound; SB = southbound
Summary of Modifications:
1 - Cambrian Road and Street 23
  a. Construct NB stop-controlled access with shared-through turning lane
  b. Construct 15m WBL storage lane
  c. Construct provisional EBL left-turn lane to ensure symmetry between eastbound and westbound through lanes

4.9.4.6 2027 Total Traffic Results

The 2027 total traffic condition intersection capacity analysis was completed using morning and afternoon peak hour traffic volumes. All recommended modifications from the 2022 total traffic condition have been carried forward to this horizon. A summary of the results has been provided in Table 22.

TABLE 22 – Intersection Capacity Analysis: Future (2027) Total Traffic

INTERSECTION	CONTROL	PEAK HOUR	V/C RATIO		LEVEL OF SERVICE	
			CRITICAL MOVEMENT	INTERSECTION	CRITICAL MOVEMENT	INTERSECTION
Cambrian Road & Borrisokane Road	WB Stop	AM	0.74	-	C	-
		PM	0.71	-	C	-
Cambrian Road & Street 23/ Mattamy Site Access	NB/ SB Stop [a]	AM	1.16	-	F	-
		PM	1.41	-	F	-
	Traffic Signals [b]	AM	0.80	-	C	-
		PM	0.77	-	C	-
	Roundabout [c]	AM	0.61	-	C	B
		PM	0.77	-	C	C

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

1 - Cambrian Road and Street 23/ Mattamy Site Access intersection
  a. NB/ SB stop-controlled intersection
    i. Construct north leg (Mattamy Site Access) with shared through-turning lane
  b. Traffic Signals
    i. Construct north leg (Mattamy Site Access) with 70m SBL storage lane
    ii. Construct 40m EBL storage lane, 20m NBL storage and 10m WBR storage lane
  c. Single-lane roundabout
    i. Construct north leg of intersection (Mattamy Site Access)
    ii. Shared turning lanes on all approaches

4.9.5 Intersection Design (MMLOS)

The 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, as per the MMLOs Guidelines.

MMLOS was only completed for the proposed Cambrian Road and Street 23/ Mattamy Site Access intersection in the 2027 background and total traffic conditions. No MMLOS results were produced for Cambrian Road and Borrisokane Road, as this intersection did not require signals through to the 2027 total traffic condition.

The detailed MMLOS results are provided in Appendix G, and intersection MMLOS results are provided in Table 23.

TABLE 23 – Intersection MMLOS – Future BG & Future BGSG Results

INTERSECTION	SCENARIO	LEVEL OF SERVICE			
		2027			
		P	B	T	TK
Cambrian Road and Street 23/ Mattamy Site Access	Future BG	C	F	D	F
	Future BGSG	C	F	D	F

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
No Intersection MMLOS results were produced for Cambrian Road and Borrisokane Road, as this interseciton did not require signals for the 2021 Background or 2021 Background plus Site-generated planning horizons. MMLOS warrants only apply to signalized intersections.

4.9.5.1 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 proposed intersection of Cambrian Road and Street 23/ Mattamy Site Access was tested in the 2027 background and total traffic conditions. All of these scenarios met the City of Ottawa PLOS target of 'C'.

4.9.5.2 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 2027 background and total traffic conditions were tested with traffic signals, and all resulted in a BLOS of 'F', due to the high operating speeds along the Cambrian Road (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.

It should be noted that reducing the speed limit along Cambrian Road to 50km/h to match the urbanized section of the roadway to the east of Seeley's Bay Street will significantly improve the BLOS.

4.9.5.3 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 2027 total traffic conditions result in a TLOS of 'D', which marginally exceeds the City's TLOS target of 'C'. The deterioration of the TLOS in the 2027 total traffic condition can be attributed to the approach delay experienced by vehicles exiting the Mattamy Site Access to the north in the morning peak period. All other approaches at this intersection experienced a TLOS of 'C'.

4.9.5.4 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 Cambrian Road and Street 23/ Mattamy Site Access has a TKLOS of 'F', which is attributed to the tighter turning radii and single-receiving lanes. The main purpose of this intersection is to provide access for local, residential traffic to the Half Moon Bay West and Meadows Phase 5 developments.

4.10 Geometric Review

The following section reviews all geometric requirements for the study area intersections. All relevant excerpts from referenced technical standards have been provided in Appendix K.

4.10.1 Auxiliary Lane Analysis

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

4.10.1.1 Unsignalized Auxiliary Left-Turn Lane Requirements

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

Auxiliary left-turn lane analysis for the westbound approach was completed under 2022 total traffic conditions for the Cambrian Road/ Street 23 intersection. This intersection is expected to require traffic signals with the construction of the north leg for the Mattamy Site Access, as part of the Half Moon Bay West development in 2027. The requirement for traffic signals was determined based on the signal warrant triggers and Synchro operational results not meeting City standards in the 2027 total traffic condition.

The storage length requirements for the southbound approach of the Cambrian Road and Borrisokane Road intersection could not be properly assessed using the MTO left-turn warrant method, due to the high number of southbound left-turning vehicles in all planning horizons through to the 2027 total traffic condition. The proportion of left-turning vehicles from the southbound approach was approximately 90% of the traffic volume from this approach. Graphs provided for left-turn warrant analysis only allow for the assessment of left-turns up to 40% of the total approach volume, which yielded a storage length of 30m. To determine the southbound left-turn storage length required in the worst-case scenario, the Cambrian Road and Borrisokane Road intersection was tested as an all-way stop. This provided a very conservative queue length of 140m for the southbound left-turn. Therefore, it is reasonable to assume that the queue length should be a minimum of 30m as determined from the MTO left-turn warrant method and a maximum of 140m, as determined from Synchro results with an all-way stop.

Even though traffic signal warrants were not triggered at the Cambrian Road and Borrisokane Road intersection, and the Synchro results met City operational standards with the existing configuration and stop control through to the 2027 total traffic condition, traffic signals may be required at this intersection to resolve potential safety issues with the anticipated high volume of southbound left-turning vehicles. It should be noted that with traffic signals, the intersection of Cambrian Road and Borrisokane Road operated within City standards through under the 2027 total traffic condition with its existing configuration of shared-through lanes on all approaches.

The results have been summarized below in Table 24.

TABLE 24 – Auxiliary Left-Turn Lane Analysis at Unsignalized Intersections

INTERSECTION	MOVEMENT	POSTED SPEED (KM/H)	DESIGN SPEED (KM/H)	LEFT-TURN VOLUME (VPH)	APPROACH VOLUME (VPH)	OPPOSING VOLUME (VPH)	LEFT-TURN STORAGE (M)
Cambrian Road & Street 23	WBL	70	80	54	282	516	15
Borrisokane Road and Cambrian Road	SBL	80	90	644	700	96	120 [1]

Notes: WBL = westbound left-turn; SBL = southbound left-turn
[1] Storage length could not be properly assessed using MTO left-turn warrant method for two-lane highways. The storage length was determined by Synchro results and based on the CTS prepared for Half Moon Bay West.

In order to ensure symmetry of the eastbound and westbound through lanes at the Cambrian Road and Street 23 intersection, provisions for an eastbound left-turn lane are recommended to be constructed to oppose the proposed eastbound left-turn in the 2022 total traffic condition. Street 23 should be constructed with an 11m pavement width to ensure that there is sufficient width to accommodate a left-turn lane, if one is required in the future.

The recommended left-turn storage lanes should be reviewed and confirmed during detailed design.

4.10.1.2 Signalized Auxiliary Left-Turn Lane Requirements

A review of auxiliary left-turn lane storage requirements was completed at the intersection of Cambrian Road and Street 23/ Mattamy Site Access, the only intersection within the study area expected to require signalization in the 2027 total traffic condition. The review compared the projected 95th percentile queue lengths from Synchro operational results, and the City of Ottawa queue length calculation based on the following equation:

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

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)	RECOMMENDED ADDITIONAL STORAGE LENGTH (M)
Cambrian Road and Street 23/ Mattamy Site Access	NB	<10	20	-	20
	WB	10	15	-	15
Cambrian Road and Borrisokane Road	SB	#120	115	-	120

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."

The following auxiliary storage lanes were recommended at the intersection of Cambrian Road and Street 23/ Mattamy Site Access in the Half Moon Bay West Community Transportation Study (CTS) – Addendum No. 1:

- A 40m eastbound left-turn storage lane
- A 70m southbound left-turn storage lane

As previously recommended in Section 4.10.1.1, Street 23 should be constructed with an 11m pavement width to meet the current standards width for a collector road. This will ensure that there is sufficient roadway width to accommodate a northbound left-turn lane at the Cambrian and Street 23/ Mattamy Site Access. The results of this traffic study indicated that a 20m northbound left-turn lane was required in the 2027 background and total traffic conditions, as per the City queue length calculation.

A 15m westbound left-turn storage lane was able to accommodate traffic in the 2027 total traffic condition, according to the 95th percentile Synchro results and the City of Ottawa queue length calculation.

The recommended left-turn storage lengths should be reviewed and confirmed during detailed design.

4.10.1.3 Unsignalized Auxiliary Right-Turn Lane Requirements

At the time of this study, there were no right-turn lanes provided at the intersection of Borrisokane Road and Cambrian Road. 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 the volume of decelerating or accelerating vehicles compared with the through traffic volume causes undue hazard." Field observations did not note any undue hazard; auxiliary right-turn lanes were not recommended at the Borrisokane Road and Cambrian Road intersection.

4.10.1.4 Signalized Auxiliary Right-Turn Lane Requirements

A westbound right-turn lane is warranted at the intersection of Cambrian Road and Street 23/ Mattamy Site Access, according to Section 9.14 of TAC. It is recommended to implement 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 requirements for a westbound right-turn lane is triggered in the 2027 background and total traffic conditions. Also, a westbound right-turn was recommended in the Half Moon Bay West Community Transportation Study (CTS) – Addendum No. 1 at the intersection of Cambrian Road and Street 23/ Mattamy Site Access.

Even though the peak hour volume requirement of 60 vehicles was met on the southbound and eastbound approaches under the 2027 total traffic conditions, Synchro results indicated that right-turn lanes on the eastbound and southbound approaches were not necessary for the intersection to operate within City standards. The southbound approach was anticipated to have very few vehicles travelling southbound through, so it was assumed that right-turn lane may be able to remain as a shared through-right turning lane. The eastbound approach did not meet the requirement for 20% threshold of right-turning vehicles for the approach.

The results of the auxiliary right-turn lane analysis are summarized below in Table 26. Right-turn lane requirements should be reviewed and confirmed during detailed design.

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)	RECOMMENDED ADDITIONAL STORAGE LENGTH (M)
Cambrian Road and Street 23/ Mattamy Site Access	EB	101	15%	<10	-	Not warranted at this time [1]
	WB	250	40%	15	-	15 [1,2]
	NB	54	35%	<10	-	Not warranted at this time [1]
	SB	77	23%	<10	-9	Not warranted at this time [1]

INTERSECTION	APPROACH	RIGHT TURN VOLUME	APPROACH VEHICLES TURNING RIGHT (%)	95TH %ILE QUEUE LENGTH (M)	EXISTING STORAGE LENGTH (M)	RECOMMENDED ADDITIONAL STORAGE LENGTH (M)
Cambrian Road and Borrisokane Road	WB	250	93%	20	-	20

[1] Right-turn lanes requirements will be reviewed during detailed design stage
[2] Recommended storage lengths do not include deceleration lane and taper lengths. Units rounded to nearest 5m.

4.11 Summary of Improvements Indicated and Modification Options

4.11.1 Cambrian Road and Borrisokane Road

The Cambrian Road and Borrisokane Road intersection was shown to operate within City standards through to the 2027 total traffic condition with the existing lane configurations and stop-controlled westbound approach. The existing shared lanes on all approaches was considered acceptable.

4.11.2 Cambrian Road and Street 23/ Mattamy Site Access

Under the 2022 total traffic condition, the proposed intersection of Cambrian Road and Street 23 was proposed as an unsignalized T-intersection with a northbound stop-controlled approach. The intersection was shown to operate within City standards in the 2022 planning horizon with shared-through lanes on all approaches.

MTO left-turn lane requirements triggered a 15m westbound left-turn storage lane with the 2022 total traffic demand. According to TAC Section 9.1.2.3, provisions should also be provided for the construction of an eastbound left-turn lane to ensure symmetry between eastbound and westbound approach and departure lanes, which will mitigate the risk of potential collisions between left-turns and opposing through traffic, once the north leg of the intersection is constructed.

By 2027, the Mattamy Site Access was assumed to be constructed to provide access to the Half Moon Bay West development to the north of Cambrian Road. The intersection did not conform to City operational standards with northbound and southbound stop-controlled approaches, and signal warrants were triggered under 2027 total traffic conditions. Based on the results of the OTM signal warrants and the Roundabout Feasibility Screening Tool, it was recommended to either implement traffic signals or a single-lane roundabout at this intersection. Both are considered acceptable solutions to accommodate the traffic demand beyond the 2027 planning horizon.

Synchro results indicated that if the Cambrian Road and Street 23/ Mattamy Site Access intersection was signalized, a 15m westbound left-turn storage lane and 10m westbound right-turn storage lane would be sufficient to accommodate total traffic demand in 2027. According to the Community Transportation Study (CTS) for Half Moon Bay West – Addendum No. 1 (November 2017), a 70m southbound left-turn storage lane and a 40m eastbound left-turn storage lane were required at the intersection. In order to maintain the alignment of the northbound and southbound through lanes, a northbound left-turn with a storage length of 20m should be provided at the intersection to oppose the southbound left-turn lane.

Traffic analysis undertaken as part of this traffic study indicated that a single-lane roundabout would be able to operate within City standards with shared lanes on all approaches.

4.11.3 Summary of Conclusions and Recommendations

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

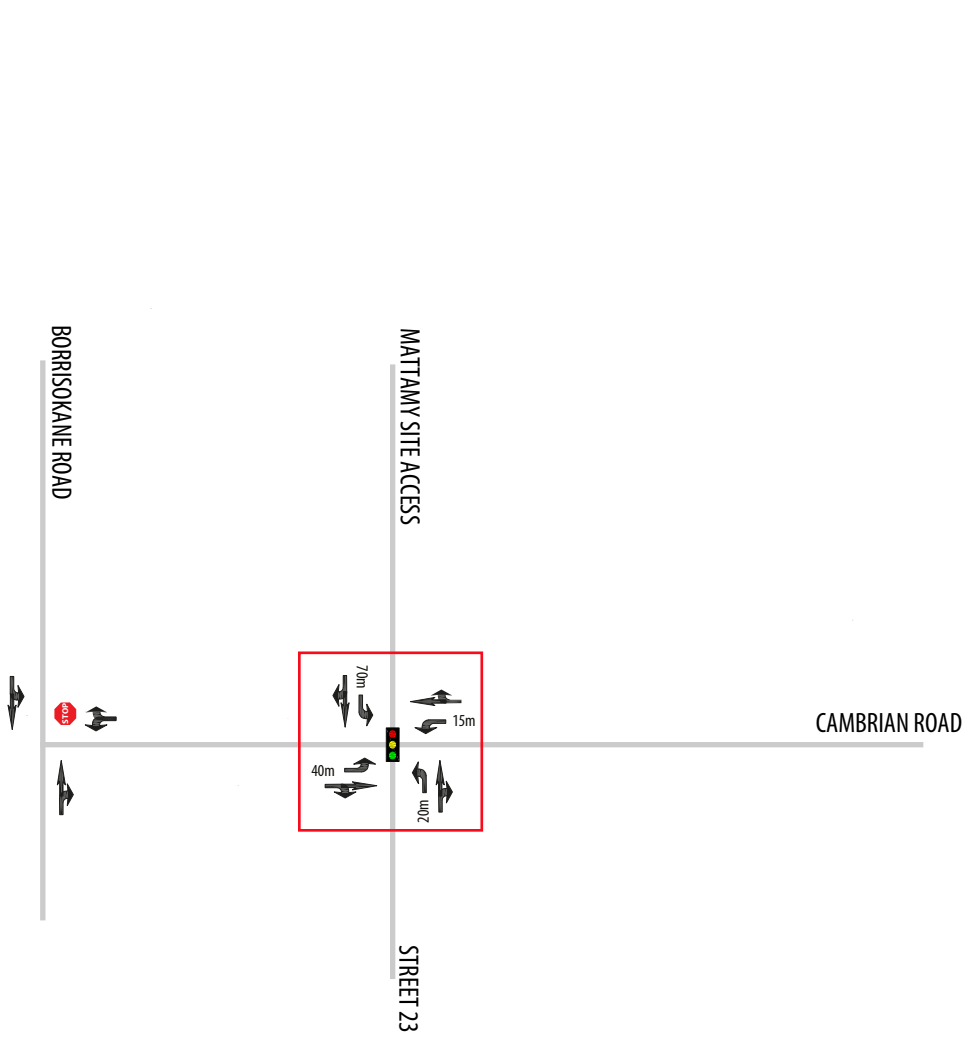
- The study area transportation network is expected to accommodate site generated traffic volumes through to the 2027 horizon year.
- There is a requirement for an RMA at the intersection of Cambrian Road and Street 23
- There is no requirement for a monitoring plan.

A summary of all recommendations has been provided in Table 27. The recommended design for all off-site roadway modifications in the 2027 total traffic condition has been provided in Exhibit 20.

TABLE 27 – Summary of Recommended Actions/ Modifications

HORIZON	RECOMMENDED ACTIONS/ MODIFICATIONS
Existing (2018)	Cambrian Road and Borrisokane Road • Meets City operational guidelines
Future (2022) Background – No Meadows Phase 5 Traffic	Assume all modifications from the Existing (2018) traffic conditions remain. No further recommendations. Cambrian Road and Borrisokane Road • Meets City operational guidelines
Future (2022) Total – With Meadows Phase 5 Traffic	Assume all modifications from the Existing (2018) traffic conditions remain. No further recommendations. Cambrian Road and Borrisokane Road • Meets City operational guidelines Cambrian Road and Street 23 • Tamarack - Construct unsignalized, 3-legged intersection • Construct south leg (Street 23) with shared lane • Northbound stop-controlled • Construct 15m westbound left-turn storage lane and provision for an eastbound left-turn lane
Future (2027) Background – No Meadows Phase 5 Traffic	Assume all modifications from the Future (2022) Background traffic conditions remain. Cambrian Road and Borrisokane Road • Meets City operational guidelines Cambrian Road and Street 23/ Mattamy Site Access • Traffic Signals ➢ Construct signalized, 4-legged intersection ➢ Mattamy - Construct north leg (Mattamy Site Access) with 70m southbound left-turn storage lane ➢ Tamarack - Construct south leg (Street 23) with 20m northbound left-turn storage lane ➢ Construct 40m eastbound left-turn storage lane ➢ Construct 15m westbound left-turn storage lane and 10m WBR turn storage lane OR • Single-lane roundabout ➢ Construct north leg (Mattamy Site Access) with shared through-turning lane ➢ Construct south leg (Street 23) with shared through-turning lane
Future (2027) Total – With Meadows Phase 5 Traffic	Assume all modifications from the Future (2022) Total traffic conditions remain. No further recommendations. Cambrian Road and Borrisokane Road • Meets City operational guidelines • Mattamy – Construct 120m left-turn storage lane Cambrian Road and Street 23/ Mattamy Site Access • Traffic Signals ➢ Mattamy Homes - Construct north leg (Mattamy Site Access) with 70m southbound left-turn storage lane ➢ Tamarack - Construct 20m northbound left-turn storage lane ➢ Mattamy - Construct 40m eastbound left-turn storage lane ➢ Tamarack - Construct 15m westbound right-turn storage lane OR • Single-lane roundabout ➢ Construct north leg (Mattamy Site Access) with shared through-turning lane

HORIZON	RECOMMENDED ACTIONS/ MODIFICATIONS
	➢ Construct south leg (Street 23) with shared through-turning lane



LEGEND

- STOP CONTROL
- TRAFFIC CONTROL SIGNAL
- TRAVEL LANES AND PERMITTED MOVEMENTS
- XXm AUXILIARY STORAGE LENGTHS (METRES) DOES NOT INCLUDE TAPER
- RECOMMENDED MODIFICATION

IBI

The Meadows Phase 5
Transportation Impact Assessment

EXHIBIT 20
Future (2027) Lane Configurations
and Intersection Control

PROJECT No.: 115637
DATE: MARCH 2018
SCALE: NTS