Appendix O ROAD TRAFFIC NOISE AND VIBRATION ASSESSMENT

Road Traffic Noise and Vibration Impact Assessment

FINAL REPORT

Class Environmental Assessment and Preliminary Design Square One Drive (Rathburn Road West to Confederation Parkway), Mississauga, Ontario

Stantec

Prepared for:
The City of Mississauga
300 City Centre Drive
Mississauga, Ontario L5B 3C1

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File 165011005

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1	May 19, 2017	Draft submission for review	Stantec
2	June 23, 2017	Final Draft	Stantec
3	September 14, 2017	Final Draft, revised	Stantec
4	September 25, 2017	FINAL	Stantec

Sign-off Sheet

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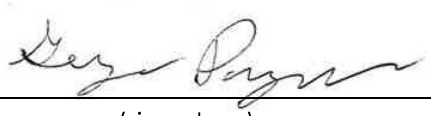
Prepared by 
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Executive Summary

On behalf of the City of Mississauga (the City), Stantec Consulting Ltd. (Stantec) completed an acoustical (noise and vibration) assessment of the preliminary design drawings completed as part of Class Environmental Assessment (EA) process for the extension of Square One Drive, from Rathburn Road West to Confederation Parkway. The analysis focused on the noise impact on the residential dwellings along Square One Drive due to changes resulting from the extension of Square One Drive.

This report summarizes the potential noise and vibration impacts due to the proposed road extension at the representative noise sensitive receptors and the underground parking structure at 330/350 Rathburn Road West. The need for noise and vibration mitigation was assessed based on the requirements of the City of Mississauga and Ontario Ministry of Transportation (MTO) guidelines.

The projected sound levels at the outdoor living areas (OLA) did not exceed the 60 dBA (Decibel, A-weighted) objective level at any of the identified receptors. Vibration due to the use of construction equipment is also predicted to be below the limits. It is recommended to consider vibration monitoring when construction occurs within 10 metres (m) of the car park of the adjacent condominium.

Abbreviations

dB	Decibel
dBA	Decibel, A-weighted
L_{eq}	Energy Equivalent Sound Level
m	metre
MES	most exposed side
MTO	Ministry of Transportation Ontario
NSA	noise sensitive area
OLA	Outdoor Living Area
POR	point(s) of reception
SPL	Sound Pressure Level
ZOI	zone of influence

Glossary

Acoustic Fence	A wall or a similar structure used as a noise control measure.
Administrative Feasibility of Noise Mitigation Measures	The ability to locate and maintain the noise mitigation on lands within public ownership (i.e., provincial, or municipal right-of-way).
Airborne Sound	Sound that reaches the point of interest by propagation through air.
Attenuation	The reduction of sound pressure achieved by various means (e.g., barrier, intermediate ground surface, intervening houses and/or trees).
A-Weighting	The weighting network used to account for changes in level sensitivity as a function of frequency. The A-weighting network de-emphasizes the low (i.e., below 1 kHz) frequencies, and emphasizes the frequencies between 1 kHz and 6.3 kHz, in an effort to simulate the relative response of the human ear. See also frequency weighting.
Barrier	An obstacle on the propagation path of sound (between a source and a receiver composed of a berm, wall or fence (or combination of those) that is free of gaps within or below of its extent and of sufficient mass to prevent significant transmission of sound through it.
Capital Road Projects	Road construction projects on regional roads (e.g. road expansion or improvement).
Daytime	Defined as the hours from 07:00h to 23:00h.
Decibel	A logarithmic measure of any measured physical quantity and commonly used in the measurement of sound. The decibel (dB) provides the possibility of representing a large span of signal levels in a simple manner. The difference between the sound pressure for silenced versus a loud sound is a factor of 1:1,000,000 or more and the same in Decibel is 0-130 dB, therefore it is less cumbersome to use a small range of equivalent values. A tenfold increase in sound power is equal

	to +10 dB; a tenfold increase in sound amplitude is equal to +20 dB.
Decibel, A-weighted	A-weighted decibels (dBA). Most common units for expressing sound levels since they approximate the response of the human ear.
Energy Equivalent Sound Level (Leq)	An energy-equivalent sound level (Leq) over a specified period of time that would have the same sound energy as the actual (i.e., unsteady) time varying sound over the same period of time. It represents the average sound pressure encountered for a period. The period is often added as a suffix to the label (i.e., Leq(16) for the 16-hour equivalent sound level). An Leq value expressed in dBA is a good, single-value descriptor to use as a measure of road traffic impact.
Mitigation	Measures taken to reduce, eliminate, or control impacts on the environment.
Night-time	Defined as the hours from 23:00h to 07:00h in Ontario
Noise	Any unwanted sound. "Noise" and "sound" are used interchangeably in this document.
Noise Barrier	Same as barrier or sound barrier. A wall, berm, a combination of a wall and a berm or a similar structure used as a noise control measure.
Noise level	Same as sound level.
Sound	A wave motion in air, water, or other media. It is the rapid oscillatory compression changes in a medium that propagate to distant points. It is characterized by changes in density, pressure, motion, and temperature as well as other physical properties. Not all rapid changes in the medium are due to sound (e.g., wind distortion on a microphone diaphragm).
Sound Level	Generally, sound level refers to the weighted sound pressure level obtained by frequency weighting, usually A- weighted, and expressed in decibels
Sound Pressure	The root-mean-square of the instantaneous sound pressures during a specified time interval in a stated frequency band.

Sound Pressure Level	Logarithmic ratio of the root mean square sound pressure to the sound pressure at the threshold of human hearing (i.e., 20 micropascals).
Technical Feasibility of Noise Mitigation Measures	A review of the constructability of the noise mitigation (i.e. design of wall, topography, achieve a 6 dB reduction, ability to provide a continuous barrier, etc.).

1.0 INTRODUCTION

Stantec Consulting Ltd. (Stantec) was retained by the City of Mississauga (the City) to conduct a Noise and Vibration Impact Assessment for the extension of Square One Drive Extension (Procurement: FA. 49. 464-15), herein referred to as "the Project", located in Mississauga, Ontario. The study is based on the preliminary design drawings completed to date for the extension of Square One Drive from Confederation Parkway to Rathburn Road West (provided in Appendix C). The analysis focused on the noise and vibration impact on the noise sensitive areas along the extension of Square One Drive, as well as the associated intersections and approaches.

The Project is being carried out in accordance with the "Municipal Class Environmental Assessment" documented by the Municipal Engineers Association (October 2000, as amended in 2007 and 2011). The purpose of this study is to assess the potential acoustical effects of the Project at identified Noise Sensitive Areas (NSAs) near the Project. This assessment compares the future sound level effect of the Project with and without the proposed extension to determine the incremental change in acoustical environment. In addition, it also evaluates the vibration effects at the underground parking structure at 330/350 Rathburn Road West due to construction and operation of the Project.

This study assesses the potential acoustical effects at the representative points of reception (POR) in accordance with the City of Mississauga Policy 09-03-03, 'Noise Attenuation Barriers on Major Roadways' (April 2011).

1.1 STUDY AREA

Square One Drive is a minor collector road under the jurisdiction of the City. Square One Drive extends approximately 300 m from Rathburn Road West to Confederation Parkway.

The project construction limit is Square One Drive from Confederation Parkway to Rathburn Road West including the intersection of Rathburn Road West and Square One Drive, as well as the intersection of Square One Drive and Confederation Parkway.

The Study Area is predominantly residential land uses with existing dwellings adjacent to Rathburn Road West and Confederation Parkway (a Zoning map is included in Appendix A). The Study Area extends 300 metres (m) from the location of the proposed improvements, and is shown in Figure 1-1. The Study Area was selected to extend a distance such that noise sensitive receptors outside of the Study Area are not likely to experience a change in sound level due to Project. The majority of the land in the study area is zoned as residential lands with a condominium building located near the proposed extension (to the north of extension). The underground parking structure at 330/350 Rathburn Road West spans up to the right-of-way of the Project to the south, to Confederation Parkway to the west, and to Rathburn Road West to the north.

1.2 PROJECT OVERVIEW

The existing portion of Square One Drive to the east of Confederation Parkway has two travelled lanes (one in each direction). The proposed extension from Rathburn Road West to Confederation Parkway is also planned to have two travel lanes with street parking and a sidewalk on the south side, and a multi-use trail on the north side. The planned intersection at Rathburn Road West to Square One Drive will be in the form of a two-lane roundabout with an approximate diameter of 46 m while, the intersection of Confederation Parkway to Square One Drive would be a signal-controlled intersection.

This report focuses on the noise and vibration impact on receptors, from the travel lane traffic, due to the construction and operation of the extension of Square One Drive from Rathburn Road West to Confederation Parkway.

Stantec

Legend

Study Area

0 150 300 metres

1:7,500 (At original document size of 11x17)

Notes

1. Coordinate System: NAD 1983 UTM Zone 17N
2. Base features produced under license with the Ontario Ministry of Natural Resources and Forestry © Queen's Printer for Ontario, 2017.
3. Orthoimagery © First Base Solutions, 2016. Imagery Date, 2014.

Project Location
City of Mississauga

165011005 REVA
Prepared by BCC on 2017-10-25

Client/Project
CITY OF MISSISSAUGA
SQUARE ONE DRIVE EXTENSION CLASS EA
ROAD TRAFFIC – NOISE AND VIBRATION IMPACT

Figure No.
1-1

Title
Area Map Showing the Study Area

2.0 GUIDELINES

2.1 ENVIRONMENTAL NOISE – ROAD OPERATION

Noise is recognized as a contaminant in the *Environmental Protection Act*, as unmitigated noise can have effects on human activities. Environmental noise assessment for road extension projects is typically assessed based on 16-hour daytime equivalent sound levels. The term "sound level" refers to the equivalent continuous sound pressure level (LEQ) expressed in A-weighted decibels having the same total sound energy as a time-varying sound pressure level over a specified time period (e.g. 16 hours). It is also worth noting that, although environmental noise is reported in A-weighted decibels (dBA), the difference between two A-weighted values is reported in decibels (dB).

Although elimination or control of the source of noise is usually a primary objective, there are general limits as to what is practically and technically feasible. Since the main practical noise mitigation measure under a road extension project is the use of noise barriers (as alterations to existing residential building envelopes is not considered practically feasible), the road traffic noise assessment is limited to assessing sound levels at outdoor living areas (OLAs) at grade during the daytime period only (07:00 to 23:00 hours).

The following sections describe the applicable noise guidelines and criteria used in the road traffic noise assessment.

2.1.1 Ministry of Transportation Ontario (MTO)

The MTO document 'Environmental Guide for Noise', (October 2006, updated July 2008), is used to assess the potential noise impact due to freeway improvement projects.

The MTO document requires noise assessment be conducted at a POR of the noise sensitive area (NSA) at the most exposed side (POR, most exposed side). If the change in the sound level due to the proposed improvement above the future ambient sound level is 5 dB or less and the projected sound level with the proposed roadway improvements is less than 65 dBA, then no mitigation effort is required.

If the change in the future sound level at the POR with improvement (i.e. future Project sound level) and without improvement (i.e. future ambient) is greater than or equal to 5 dB, or the projected overall sound levels with the proposed improvements is greater than or equal to 65 dBA, feasibility of noise control measures within the road right-of-way should be investigated to meet the sound level requirements at the OLAs. The investigation shall consider its technical, economical and administrative feasibility (refer to glossary for definitions) of reducing sound level at the OLA of the receptor.

2.1.2 City of Mississauga Noise Attenuation Barriers on Major Roadways Policy

The City of Mississauga Policy 09-03-03, 'Noise Attenuation Barriers on Major Roadways' (April 2011) identifies responsibilities for construction and maintenance of noise attenuation barriers.

The City requires that a noise assessment be conducted at the OLA if the residential area is adjacent to municipal highways, arterial and major collector roads. It provides the following criteria for installation of noise barriers:

- The noise level must be greater than 60 dBA (Leq daytime). (Leq means "equivalent sound level" and daytime means 7:00 a.m. to 11:00 p.m. Leq daytime means daytime average.)
- The residential area must be adjacent to arterial and major collector roads, as designated in the Official Plan. Retrofit or replacements will not be considered adjacent to freeways or railway tracks, as they are not under the jurisdiction of the City of Mississauga.
- Barriers must be installed on a complete block to ensure their effectiveness.

2.1.3 Region of Peel Noise Guideline and City of Mississauga Noise By-Law

The Region of Peel noise guideline "General guidelines for the preparation of acoustical reports in the Region of Peel" is meant for land use planning where noise sensitive developments are planned near roadways.

The City of Mississauga by-law 360-79 and its amendments prohibit construction in quiet zone without the use of an effective exhaust or intake muffling device in good working order and in constant operation.

2.1.4 Summary

Based on the above discussion, the City of Mississauga's Policy 09-03-03 was applied as Square One Drive is under jurisdiction of the City as well as the City's criteria is more stringent than the MTO's 65 dBA Objective limit. Road operation is not a source of vibration and therefore is not considered in this report.

2.2 ROAD CONSTRUCTION

2.2.1 Construction Noise

The MTO or MOECC does not stipulate overall sound level limits for construction activities in the same way that limits are stipulated for noise sources during facility operation. Instead, the MOECC publication, Construction Equipment, Model Municipal Noise Control By-Law (NPC-115) (MOE 1978a) (NPC-115) sets sound emission standards for various types of construction equipment according to their power rating and date of manufacture. This publication does not set receptor based sound level limits, due to the temporary nature of construction activities, but rather sets limits for noise generated by each individual piece of equipment.

Table 2-1 illustrates maximum noise emission levels which should be adhered to for typical construction equipment per NPC-115.

Table 2-1: NPC-115 Noise Emission Limits for Construction Equipment

Type of Equipment	Maximum Sound Level (dBA)
Excavation equipment, bulldozers, loaders, backhoes or other equipment *	83 (for Power Rating less than 75 kW)
	85 (for Power Rating 75 kW and greater)
Pneumatic Pavement Breakers **	85
Portable Air Compressors **	70

* Maximum Sound Level (dBA), as determined using Publication NPC-103 – Procedures, Section 6
** Maximum Sound Level (dBA), as measured using Publication NPC-103 – Procedures, Section 7

In addition, NPC-115 emphasizes the importance of good maintenance of construction equipment; considerate use of construction equipment over the night-time periods, holidays and weekends; and emphasizes the use of administrative controls. This is also consistent with City of Mississauga requirements. The City of Mississauga by law 360-79 and its amendments prohibits construction in quiet zone without the use of an effective exhaust or intake muffling device in good working order and in constant operation.

In summary, both MOECC's NPC-115 and City of Mississauga's by-law were applied.

2.2.2 Construction Vibration

The construction vibration is quantified using peak particle velocity (PPV) and is typically assessed against structural damage criteria. There is no provincially or municipally established guidance or regulations for the assessment of Project construction vibration. The City of Toronto published By-law No.514-2008 (City of Toronto 2008) which limits vibration emissions of a project during construction as shown in Table 2-2. This by-law establishes quantitative vibration limits for construction activities; these limits have been used as guidance for this Project. Furthermore, By-law No. 514 (City of Toronto 2008) also requires the establishment of a Zone of Influence (ZOI) to identify an area of land within or adjacent to a construction site that potentially may be affected. For the purposes of Zone of Vibration influence, By-law No. 514 (City of Toronto 2008) considers a vibration level of 5 mm/s (PPV). The ZOI is the area of land within or adjacent to a construction site that potentially may be affected by vibrations emanating from a construction activity where the PPV measured at the POR is equal to or greater than 5 mm/sec at any frequency (considered as criteria boundary).

Table 2-2: Construction Vibration Limits (City of Toronto 2008)

Frequency of Vibration [Hz]	Vibration Peak Particle Velocity [mm/s]
Less than 4	8
4 to 10	15
More than 10	25

3.0 NOISE AND VIBRATION ASSESSMENT METHODOLOGY

3.1 NOISE DUE TO ROAD OPERATION

3.1.1 Road Traffic Data

Road traffic data for Square One Drive, Rathburn Road West, and Confederation Parkway were obtained from design team via a memo dated April 26, 2017.

The traffic data is summarized in Table 3-1.

Table 3-1: Road Traffic Data for Square One Drive, Rathburn Road West and Confederation Parkway

Road	Annual Average Daily Traffic (AADT)		Posted Speed Limit (km/h)[2]	% Truck[3]	Day/Night Split
	Existing (Before Construction) 2017[1]	Mature State of Development 2031[1]			
Square One Drive (Rathburn to Confederation)	n/a	4,500	50	5	90/10
Rathburn Road (Confederation to Elora, west leg)	17,300	23,000	50	5	90/10
Confederation Parkway (Rathburn to Prince of Wales)	32,800	43,550	50	4	90/10

[1] Average of road segments
[2] Square One Drive extension assumed speed limit of 50 km/h based upon surrounding roads and nearby school
[3] Medium / Heavy truck split of 55/45 was used in the assessment

3.1.2 Noise Prediction and Assessment Methods

Road traffic sound levels were assessed using STAMSON V5.04. STAMSON is a computerized implementation of the road and rail traffic noise prediction methods described in ORNAMENT (Ontario Road Noise Analysis Method for Environment and Transportation) and STEAM (Sound from Trains Environmental Analysis Method). STAMSON is an approved noise prediction methodology of the MOECC.

Based on the traffic data provided, daytime sound levels were calculated at the OLAs near the Square One Drive extension. The sample calculations are provided in Appendix B. OLAs were selected for nearby residential dwellings to the northwest of Rathburn Road West. The OLA locations were selected in the rear yard in accordance with the guideline requirements. No at-grade OLAs were located for the nearby condominium complexes.

If the calculated daytime level at the OLAs was above the guideline requirement of 60 dBA, the use of noise attenuation barriers need to be explored. It should be noted that there is an existing concrete acoustical fence along the north side of Rathburn Road West and were included in the model.

Representative receptors were identified as outlined in Section 3.1.3. Using the traffic data provided in Table 3-1, an energy equivalent sound level over a 16-hour period, L_{eq} (16), were calculated at outdoor living areas (OLAs) within the Study Area. The source-receiver distances were obtained from design drawings and scaled area map. Design drawings are included in Appendix C.

3.1.3 Locations of Outdoor Living Area

Four (4) receptor locations representing the OLAs were selected from the existing residential dwellings near the Square One Drive extension. The OLA locations were modeled as 1.5 m above grade, 3 m from the building façade and aligned with the midpoint of the applicable façade.

Table 3-2 summarizes the municipal addresses of the receptors considered in the assessment and Figure 3-1 shows the locations of the receptors.

Table 3-2: Receptor Locations

Receptor ID[1]	Municipal Address	UTM Coordinates (17N, NAD83)	
		Easting (m)	Northing (m)
R01	4356 Elora Drive	608753	4827073
R02	4353 Elora Drive	608744	4826998
R03	4217 Via Russo Court	608742	4826980
R04	4193 Schneider Court	608737	4826868

1 Refer to Figure 3-1 for location

Other residences with similar setback and orientation to the noise source are expected to receive similar sound exposure and noise impacts. Therefore, the selected locations were considered representative of several dwellings with similar setbacks.

Redevelopment of Zonta Meadows Park is planned to include relocated parking area and tennis courts that will be effected by the extension. There will also be an urban space within the park on the east side of the roundabout intersection where Square One Drive meets Rathburn Road West.

As mentioned, road operation is not a known source of vibration and therefore is not considered in this report.

3.2 ROAD CONSTRUCTION

3.2.1 Construction Noise

The construction noise would be considered qualitatively in conjunction with MOECC's publication NPC-115 and City of Mississauga by-law.

It is expected that construction phase will occur over several months. Construction equipment will include sources such as bulldozers, excavators, large and medium sized trucks, and hydraulic shovels. A complete list of expected construction equipment (stationary and mobile) considered for this project is not available, however it is anticipated above noted typical equipment units will be used.

3.2.2 Construction Vibration

For the construction and operation vibration assessment, the United States Federal Transit Administration (FTA) general method of calculation was used. This assessment method provides a conservative estimate of the potential maximum vibration level at a known distance from the nearest vibration source. For the vibration, it was conservatively assumed that the Project construction activities would occur anywhere within the road right-of-way.

The construction equipment discussed in Table 2-1 with a potential for causing vibration could operate anywhere within the construction area. The construction area is assumed to be the area within the right-of-way of the expanded Square One Drive. In order to predict the maximum vibration effects due to construction, the equipment was conservatively assumed to be operating along the right-of-way. Using the typical construction equipment, the extent of vibration influence (also referred to as the vibration ZOI) was estimated.

For the vibration assessment during operation, the vibration levels were estimated considering the heavy truck travelling along the closest lane to the foundation of the underground parking structure at 330/350 Rathburn Road West.

Stantec

Legend

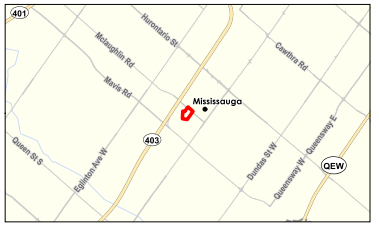
- Study Area
- Point of Reception

0 40 80 metres

1:2,000 (At original document size of 11x17)

Notes

1. Coordinate System: NAD 1983 UTM Zone 17N
2. Base features produced under license with the Ontario Ministry of Natural Resources and Forestry © Queen's Printer for Ontario, 2017.
3. Orthoimagery © First Base Solutions, 2016. Imagery Date, 2014.



Project Location
City of Mississauga

165011005 REVA
Prepared by BCC on 2017-10-25

Client/Project
CITY OF MISSISSAUGA
SQUARE ONE DRIVE EXTENSION CLASS EA
ROAD TRAFFIC – NOISE AND VIBRATION IMPACT

Figure No.
3-1

Title
Study Area Showing Receptor Locations

4.0 RESULTS AND DISCUSSION

4.1 NOISE DUE TO ROAD OPERATION

4.1.1 Results

Table 4-1 summarizes the predicted sound levels at the mature state of the development (2031), with and without the extension, at the representative receptor locations.

Table 4-1: OLA Noise Level Predictions

Receptor ID	Projected Sound Level L_{eq} 16-hr (dBA)		Change in Projected Sound Levels (Db) [A-B]	With extension exceeds 60 dBA? (Yes or No)
	With extension 2031 [Column A]	Without extension 2031 [Column A]		
R01	57	56	1	No
R02	56	56	0	No
R03	57	56	1	No
R04	56	56	0	No

The projected sound levels at the mature state of development do not exceed the 60 dBA objective level at any of the receptor locations. Thus, additional mitigation was not investigated.

4.2 ROAD CONSTRUCTION

4.2.1 Construction Noise

Standard measures for mitigating noise emissions shall be implemented for construction. These measures will include, but will not be limited to:

- Standard noise mitigation measures (e.g., muffler systems) to be installed on construction equipment and equipment will be properly maintained.
- Construction equipment to be turned off when not in use (i.e., a no idling policy).
- In addition, if construction is planned during evening, weekends, and statutory holidays a by-law exemption shall be considered during detail engineering stage.

4.2.2 Construction Vibration

Vibration of typical construction equipment was predicted at 30 m, 20 m and 10 m from construction. The predictions using typical construction equipment indicate that when construction occurs at distance more than 10 m from the underground parking structure at

330/350 Rathburn Road West, the vibration levels are below the 5 mm/s cautionary limit. Therefore, it is recommended that when construction occurs within 10 m of the underground parking structure, vibration monitoring should be conducted to verify that the vibration does not exceed the limits provided in Table 2-2.

Table 4-2: Typical Construction Limits and Predicted Peak Particle Velocity

Name of construction equipment	PPV-Vibration Level (mm/sec) at 30 metres	PPV-Vibration Level (mm/sec) at 20 metres	PPV-Vibration Level (mm/sec) at 10 metres
Excavators	0.38	1.08	2.40
Dozers	0.38	1.08	2.40
Graders	0.38	1.08	2.40
Loaders	0.38	1.08	2.40
Backhoe	0.38	1.08	2.40
Dump Truck (On Road)	0.32	0.92	2.05
Dump Truck (Off Road)	0.32	0.92	2.05
Compactors	0.13	0.36	0.81
Rollers	0.90	2.54	5.67
Scrapers	0.38	1.08	2.40

5.0 CONCLUSION AND CLOSURE

Stantec was retained by the City of Mississauga to prepare a Road Traffic Noise and Vibration Assessment for the Square One Drive Extension Class EA in the City of Mississauga. Based on the information available at the time of this report, Stantec's assessment predicted that the proposed improvements will result in a change in future sound levels of 1 dB or less at each identified receptor. No future sound levels were predicted to exceed the objective level of 60 dBA. Thus, the feasibility of noise mitigation measures was not investigated.

Construction vibration with typical construction equipment was predicted to be below the vibration limit when construction occurs at distances greater than 10 m. This should be reviewed when the construction equipment list is finalized. In addition, it is recommended to conduct construction vibration monitoring for construction activities within 10 m of the underground parking structure at 330/350 Rathburn Road West, Mississauga, to verify that the construction vibration does not exceed the levels discussed in this report.

6.0 REFERENCES

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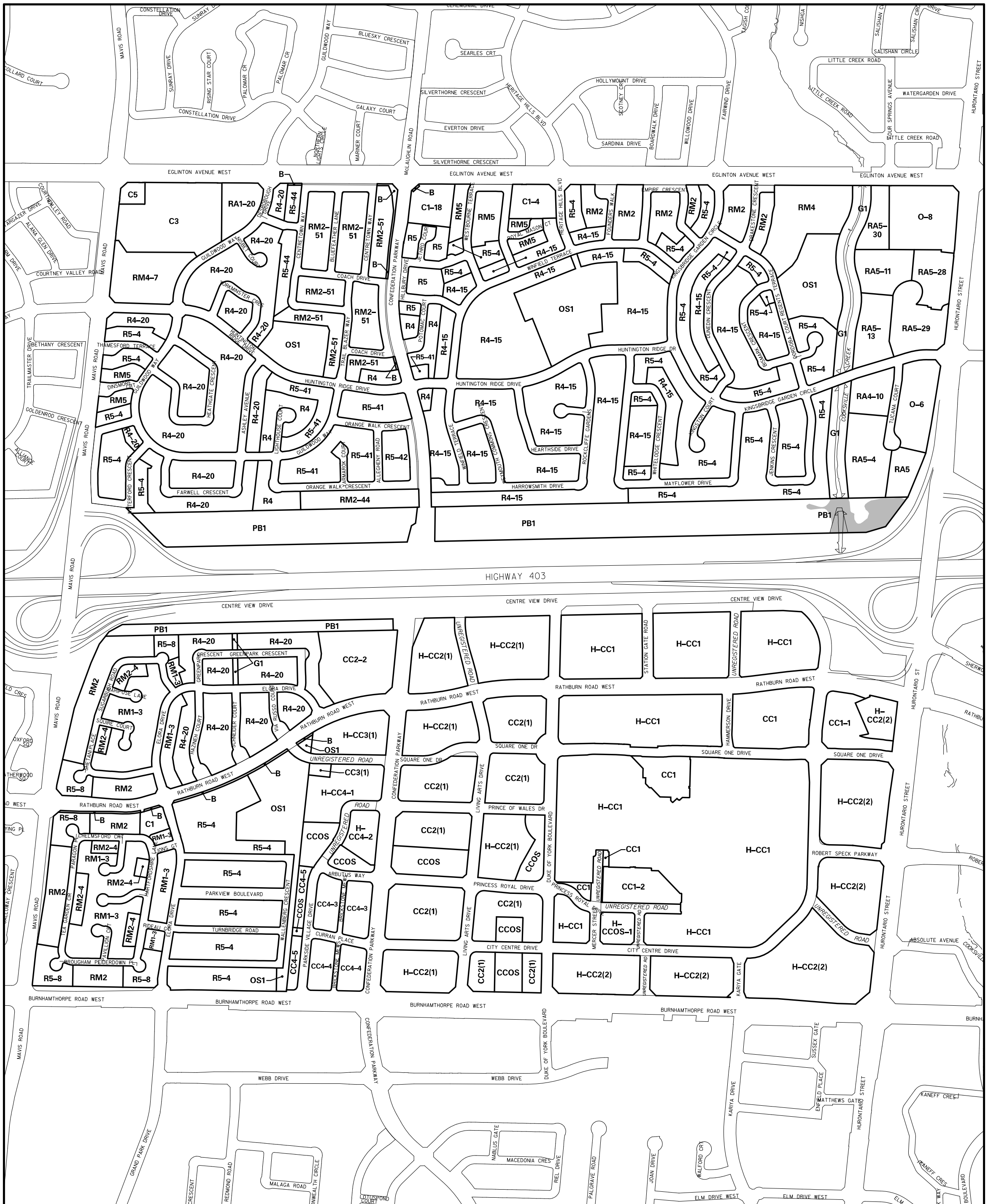
Appendix A ZONING MAPS

37W

37E



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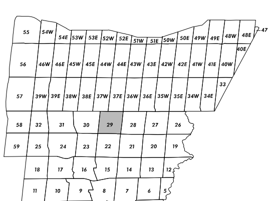


Zoning
Map 29

Schedule "B" To By–law No. 0225–2007

Greenlands Overlay

Zoning Notation Example:
R4–12 = R4–Exception 12

0 100 200
METRES

MISSISSAUGA

Revised: 2016 December 31

Produced by Transportation and Works Department, Geomatics Section

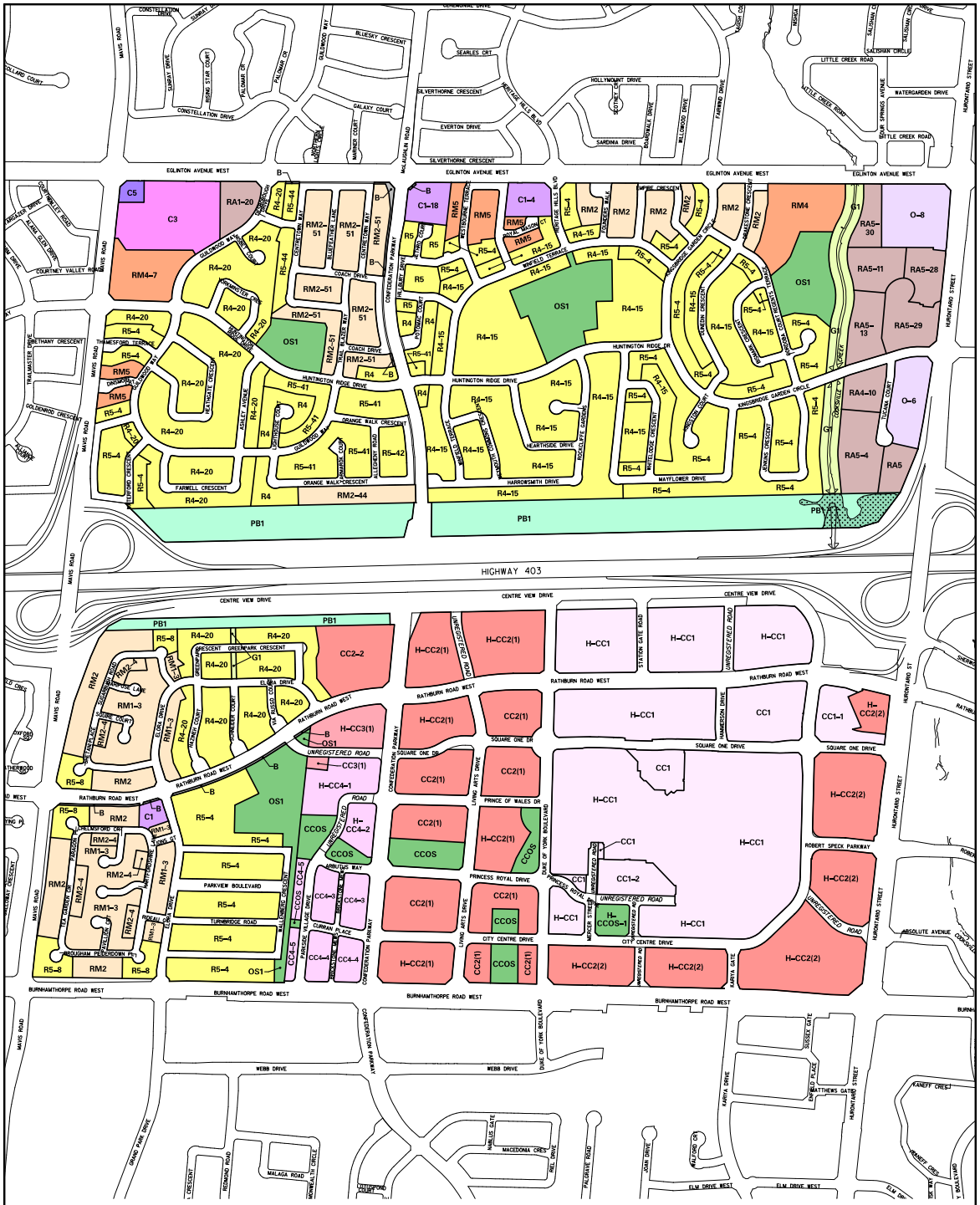
Technical Revisions: 2016 October 31

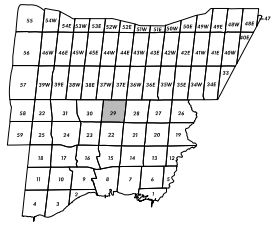
37W

37E

30

28





MISSISSAUGA

0 100 200
METRES

Greenlands Overlay

Zoning Notation Example:
R4–12 = R4–Exception 12

Zoning
Map 29

Schedule "B" To
By–law No. 0225–2007

Revised: 2016 December 31

Appendix B SAMPLE STAMSON CACULATIONS

STAMSON 5.0 NORMAL REPORT Date: 26-09-2017 15:16:50
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: r01wext.te Time Period: Day/Night 16/8 hours
Description: R01 with Square One Drive Extension

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

Car traffic volume : 3848/428 veh/TimePeriod *
Medium truck volume : 111/12 veh/TimePeriod *
Heavy truck volume : 91/10 veh/TimePeriod *
Posted speed limit : 50 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): 4500
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 2.75
Heavy Truck % of Total Volume : 2.25
Day (16 hrs) % of Total Volume : 90.00

Data for Segment # 1: SquareOneDr (day/night)

Angle1 Angle2 : 0.00 deg 45.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 2 (Reflective ground surface)
Receiver source distance : 140.00 / 140.00 m
Receiver height : 1.50 / 4.50 m
Topography : 2 (Flat/gentle slope; with barrier)
Barrier angle1 : 0.00 deg Angle2 : 45.00 deg
Barrier height : 2.20 m
Barrier receiver distance : 15.00 / 15.00 m
Source elevation : 0.00 m
Receiver elevation : 0.00 m
Barrier elevation : 0.00 m
Reference angle : 0.00

♀
Road data, segment # 2: Rathburn Rd (day/night)

Car traffic volume : 19665/2185 veh/TimePeriod *
Medium truck volume : 569/63 veh/TimePeriod *
Heavy truck volume : 466/52 veh/TimePeriod *
Posted speed limit : 50 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): 23000
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 2.75
Heavy Truck % of Total Volume : 2.25
Day (16 hrs) % of Total Volume : 90.00

Data for Segment # 2: Rathburn Rd (day/night)

```
Angle1   Angle2           : -90.00 deg   45.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      1       (Absorptive ground surface)
Receiver source distance  :  36.00 / 36.00  m
Receiver height           :   1.50 / 4.50   m
Topography                :      2       (Flat/gentle slope; with barrier)
Barrier angle1            : -90.00 deg   Angle2 : 45.00 deg
Barrier height            :   2.20 m
Barrier receiver distance :  15.00 / 15.00  m
Source elevation          :   0.00 m
Receiver elevation        :   0.00 m
Barrier elevation         :   0.00 m
Reference angle           :   0.00

♀
Road data, segment # 3: Confed Pkwy (day/night)
-----------------------------------------------
Car traffic volume  : 37627/4181  veh/TimePeriod  *
Medium truck volume :   862/96    veh/TimePeriod  *
Heavy truck volume  :   706/78    veh/TimePeriod  *
Posted speed limit  :    50 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):  43550
    Percentage of Annual Growth        :   0.00
    Number of Years of Growth          :   0.00
    Medium Truck % of Total Volume     :   2.20
    Heavy Truck  % of Total Volume     :   1.80
    Day (16 hrs) % of Total Volume     :  90.00

Data for Segment # 3: Confed Pkwy (day/night)
---------------------------------------------
Angle1   Angle2           : -90.00 deg   45.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      2       (Reflective ground surface)
Receiver source distance  : 169.00 / 169.00 m
Receiver height           :   1.50 / 4.50   m
Topography                :      2       (Flat/gentle slope; with barrier)
Barrier angle1            : -90.00 deg   Angle2 : 45.00 deg
Barrier height            :   2.20 m
Barrier receiver distance :  15.00 / 15.00  m
Source elevation          :   0.00 m
Receiver elevation        :   0.00 m
Barrier elevation         :   0.00 m
Reference angle           :   0.00

♀
Results segment # 1: SquareOneDr (day)
--------------------------------------

Source height = 1.22 m

Barrier height for grazing incidence
------------------------------------
Source      ! Receiver    ! Barrier     ! Elevation of
Height  (m) ! Height  (m) ! Height  (m) ! Barrier Top  (m)
------------+-------------+-------------+--------------
       1.22 !        1.50 !        1.47 !         1.47
```

ROAD (0.00 + 39.46 + 0.00) = 39.46 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
0	45	0.00	61.06	0.00	-9.70	-6.02	0.00	0.00	-5.88	39.46

Segment Leq : 39.46 dBA

♀
Results segment # 2: Rathburn Rd (day)

Source height = 1.22 m

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
1.22	1.50	1.39	1.39

ROAD (0.00 + 53.92 + 0.00) = 53.92 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	45	0.54	68.15	0.00	-5.84	-2.13	0.00	0.00	-6.26	53.92

Segment Leq : 53.92 dBA

♀
Results segment # 3: Confed Pkwy (day)

Source height = 1.16 m

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
1.16	1.50	1.47	1.47

ROAD (0.00 + 52.83 + 0.00) = 52.83 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	45	0.00	70.29	0.00	-10.52	-1.25	0.00	0.00	-5.69	52.83

Segment Leq : 52.83 dBA

Total Leq All Segments: 56.51 dBA

♀
Barrier table for segment # 1: SquareOneDr (day)

Barrier Height	Elev of Barr Top	Road dBA	Tot Leq dBA
3.70	3.70	35.00	35.00
4.20	4.20	33.55	33.55
4.70	4.70	32.23	32.23

5.20	5.20	31.06	31.06
5.70	5.70	30.01	30.01
6.20	6.20	29.07	29.07
6.70	6.70	28.23	28.23
7.20	7.20	27.46	27.46
7.70	7.70	26.76	26.76
8.20	8.20	26.11	26.11

Barrier table for segment # 2: Rathburn Rd (day)

Barrier Height	Elev of Barr Top	Road dBA	Tot Leq dBA
3.70	3.70	50.06	50.06
4.20	4.20	49.01	49.01
4.70	4.70	48.11	48.11
5.20	5.20	47.33	47.33
5.70	5.70	46.65	46.65
6.20	6.20	46.04	46.04
6.70	6.70	45.51	45.51
7.20	7.20	45.13	45.13
7.70	7.70	44.88	44.88
8.20	8.20	44.72	44.72

Barrier table for segment # 3: Confed Pkwy (day)

Barrier Height	Elev of Barr Top	Road dBA	Tot Leq dBA
3.70	3.70	49.40	49.40
4.20	4.20	48.29	48.29
4.70	4.70	47.29	47.29
5.20	5.20	46.38	46.38
5.70	5.70	45.57	45.57
6.20	6.20	44.83	44.83
6.70	6.70	44.15	44.15
7.20	7.20	43.53	43.53
7.70	7.70	42.95	42.95
8.20	8.20	42.41	42.41

♀
Results segment # 1: SquareOneDr (night)

Source height = 1.22 m

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
1.22	4.50	4.15	4.15

ROAD (0.00 + 38.77 + 0.00) = 38.77 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
0	45	0.00	54.49	0.00	-9.70	-6.02	0.00	0.00	0.00	38.77*
0	45	0.00	54.49	0.00	-9.70	-6.02	0.00	0.00	0.00	38.77

* Bright Zone !

Segment Leq : 38.77 dBA

♀
Results segment # 2: Rathburn Rd (night)

Source height = 1.23 m

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
1.23	4.50	3.14	3.14

ROAD (0.00 + 53.44 + 0.00) = 53.44 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	45	0.45	61.63	0.00	-5.50	-2.01	0.00	0.00	-2.56	51.55*
-90	45	0.58	61.63	0.00	-6.00	-2.19	0.00	0.00	0.00	53.44

* Bright Zone !

Segment Leq : 53.44 dBA

♀
Results segment # 3: Confed Pkwy (night)

Source height = 1.16 m

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
1.16	4.50	4.20	4.20

ROAD (0.00 + 51.98 + 0.00) = 51.98 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	45	0.00	63.75	0.00	-10.52	-1.25	0.00	0.00	-0.40	51.58*
-90	45	0.00	63.75	0.00	-10.52	-1.25	0.00	0.00	0.00	51.98

* Bright Zone !

Segment Leq : 51.98 dBA

Total Leq All Segments: 55.87 dBA

♀
Barrier table for segment # 1: SquareOneDr (night)

Barrier Height	Elev of Barr Top	Road dBA	Tot Leq dBA
3.70	3.70	38.77	38.77
4.20	4.20	33.76	33.76
4.70	4.70	33.25	33.25

5.20	5.20	32.07	32.07
5.70	5.70	30.55	30.55
6.20	6.20	28.97	28.97
6.70	6.70	27.47	27.47
7.20	7.20	26.10	26.10
7.70	7.70	24.88	24.88
8.20	8.20	23.78	23.78

Barrier table for segment # 2: Rathburn Rd (night)

Barrier Height	Elev of Barr Top	Road dBA	Tot Leq dBA
3.70	3.70	48.95	48.95
4.20	4.20	47.80	47.80
4.70	4.70	46.45	46.45
5.20	5.20	45.17	45.17
5.70	5.70	44.05	44.05
6.20	6.20	43.09	43.09
6.70	6.70	42.26	42.26
7.20	7.20	41.54	41.54
7.70	7.70	40.91	40.91
8.20	8.20	40.35	40.35

Barrier table for segment # 3: Confed Pkwy (night)

Barrier Height	Elev of Barr Top	Road dBA	Tot Leq dBA
3.70	3.70	51.98	51.98
4.20	4.20	51.98	51.98
4.70	4.70	46.65	46.65
5.20	5.20	45.77	45.77
5.70	5.70	44.61	44.61
6.20	6.20	43.40	43.40
6.70	6.70	42.25	42.25
7.20	7.20	41.19	41.19
7.70	7.70	40.24	40.24
8.20	8.20	39.38	39.38

♀

TOTAL Leq FROM ALL SOURCES (DAY): 56.51
(NIGHT): 55.87

♀
♀

STAMSON 5.0 NORMAL REPORT Date: 26-09-2017 15:21:03
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: r02wo.te Time Period: Day/Night 16/8 hours
Description: R02 without Square One Drive Extension

Road data, segment # 1: Rathburn Rd (day/night)

Car traffic volume : 19665/2185 veh/TimePeriod *
Medium truck volume : 569/63 veh/TimePeriod *
Heavy truck volume : 466/52 veh/TimePeriod *
Posted speed limit : 50 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): 23000
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 2.75
Heavy Truck % of Total Volume : 2.25
Day (16 hrs) % of Total Volume : 90.00

Data for Segment # 1: Rathburn Rd (day/night)

Angle1 Angle2 : -45.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 30.00 / 30.00 m
Receiver height : 1.50 / 4.50 m
Topography : 2 (Flat/gentle slope; with barrier)
Barrier angle1 : -45.00 deg Angle2 : 90.00 deg
Barrier height : 2.20 m
Barrier receiver distance : 11.00 / 11.00 m
Source elevation : 0.00 m
Receiver elevation : 0.00 m
Barrier elevation : 0.00 m
Reference angle : 0.00

♀
Road data, segment # 2: Confed Pkwy (day/night)

Car traffic volume : 37627/4181 veh/TimePeriod *
Medium truck volume : 862/96 veh/TimePeriod *
Heavy truck volume : 706/78 veh/TimePeriod *
Posted speed limit : 50 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): 43550
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 2.20
Heavy Truck % of Total Volume : 1.80
Day (16 hrs) % of Total Volume : 90.00

Data for Segment # 2: Confed Pkwy (day/night)

```
Angle1   Angle2           :   0.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      2       (Reflective ground surface)
Receiver source distance  : 230.00 / 230.00 m
Receiver height           :   1.50 / 4.50   m
Topography                :      2       (Flat/gentle slope; with barrier)
Barrier angle1            :   0.00 deg   Angle2 : 90.00 deg
Barrier height            :   2.20 m
Barrier receiver distance :  11.00 / 11.00  m
Source elevation          :   0.00 m
Receiver elevation        :   0.00 m
Barrier elevation         :   0.00 m
Reference angle           :   0.00
```

♀

Results segment # 1: Rathburn Rd (day)

Source height = 1.22 m

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
1.22	1.50	1.40	1.40

ROAD (0.00 + 54.91 + 0.00) = 54.91 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-45	90	0.54	68.15	0.00	-4.62	-2.13	0.00	0.00	-6.49	54.91

Segment Leq : 54.91 dBA

♀

Results segment # 2: Confed Pkwy (day)

Source height = 1.16 m

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
1.16	1.50	1.48	1.48

ROAD (0.00 + 49.68 + 0.00) = 49.68 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
0	90	0.00	70.29	0.00	-11.86	-3.01	0.00	0.00	-5.75	49.68

Segment Leq : 49.68 dBA

Total Leq All Segments: 56.05 dBA

♀

Barrier table for segment # 1: Rathburn Rd (day)

Barrier Height	Elev of Barr Top	Road dBA	Tot Leq dBA
3.70	3.70	50.55	50.55
4.20	4.20	49.44	49.44
4.70	4.70	48.49	48.49
5.20	5.20	47.67	47.67
5.70	5.70	46.95	46.95
6.20	6.20	46.32	46.32
6.70	6.70	45.88	45.88
7.20	7.20	45.59	45.59
7.70	7.70	45.40	45.40
8.20	8.20	45.27	45.27

Barrier table for segment # 2: Confed Pkwy (day)

Barrier Height	Elev of Barr Top	Road dBA	Tot Leq dBA
3.70	3.70	46.17	46.17
4.20	4.20	45.10	45.10
4.70	4.70	44.14	44.14
5.20	5.20	43.28	43.28
5.70	5.70	42.51	42.51
6.20	6.20	41.81	41.81
6.70	6.70	41.17	41.17
7.20	7.20	40.58	40.58
7.70	7.70	40.04	40.04
8.20	8.20	39.61	39.61

♀
Results segment # 1: Rathburn Rd (night)

Source height = 1.23 m

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
1.23	4.50	3.30	3.30

ROAD (0.00 + 54.69 + 0.00) = 54.69 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-45	90	0.45	61.63	0.00	-4.35	-2.01	0.00	0.00	-0.77	54.49*
-45	90	0.58	61.63	0.00	-4.75	-2.19	0.00	0.00	0.00	54.69

* Bright Zone !

Segment Leq : 54.69 dBA

♀
Results segment # 2: Confed Pkwy (night)

Source height = 1.16 m

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
1.16	4.50	4.34	4.34

ROAD (0.00 + 48.88 + 0.00) = 48.88 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
0	90	0.00	63.75	0.00	-11.86	-3.01	0.00	0.00	-0.40	48.49*
0	90	0.00	63.75	0.00	-11.86	-3.01	0.00	0.00	0.00	48.88

* Bright Zone !

Segment Leq : 48.88 dBA

Total Leq All Segments: 55.70 dBA

♀
Barrier table for segment # 1: Rathburn Rd (night)

Barrier Height	Elev of Barr Top	Road dBA	Tot Leq dBA
3.70	3.70	50.25	50.25
4.20	4.20	49.01	49.01
4.70	4.70	47.47	47.47
5.20	5.20	46.01	46.01
5.70	5.70	44.74	44.74
6.20	6.20	43.67	43.67
6.70	6.70	42.75	42.75
7.20	7.20	41.96	41.96
7.70	7.70	41.26	41.26
8.20	8.20	40.65	40.65

Barrier table for segment # 2: Confed Pkwy (night)

Barrier Height	Elev of Barr Top	Road dBA	Tot Leq dBA
3.70	3.70	48.88	48.88
4.20	4.20	48.88	48.88
4.70	4.70	43.68	43.68
5.20	5.20	42.84	42.84
5.70	5.70	41.68	41.68
6.20	6.20	40.45	40.45
6.70	6.70	39.30	39.30
7.20	7.20	38.26	38.26
7.70	7.70	37.33	37.33
8.20	8.20	36.49	36.49

♀

TOTAL Leq FROM ALL SOURCES (DAY): 56.05
(NIGHT): 55.70
♀
♀

STAMSON 5.0 NORMAL REPORT Date: 26-09-2017 15:21:52
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: r03wext.te Time Period: Day/Night 16/8 hours
Description: R03 with Square One Drive Extension

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

Car traffic volume : 3848/428 veh/TimePeriod *
Medium truck volume : 111/12 veh/TimePeriod *
Heavy truck volume : 91/10 veh/TimePeriod *
Posted speed limit : 50 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): 4500
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 2.75
Heavy Truck % of Total Volume : 2.25
Day (16 hrs) % of Total Volume : 90.00

Data for Segment # 1: SquareOneDr (day/night)

Angle1 Angle2 : 0.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 2 (Reflective ground surface)
Receiver source distance : 52.00 / 52.00 m
Receiver height : 1.50 / 4.50 m
Topography : 2 (Flat/gentle slope; with barrier)
Barrier angle1 : 0.00 deg Angle2 : 90.00 deg
Barrier height : 2.20 m
Barrier receiver distance : 13.00 / 13.00 m
Source elevation : 0.00 m
Receiver elevation : 0.00 m
Barrier elevation : 0.00 m
Reference angle : 0.00

♀
Road data, segment # 2: Rathburn Rd (day/night)

Car traffic volume : 19665/2185 veh/TimePeriod *
Medium truck volume : 569/63 veh/TimePeriod *
Heavy truck volume : 466/52 veh/TimePeriod *
Posted speed limit : 50 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): 23000
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 2.75
Heavy Truck % of Total Volume : 2.25
Day (16 hrs) % of Total Volume : 90.00

Data for Segment # 2: Rathburn Rd (day/night)

```
Angle1   Angle2           : -90.00 deg   45.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      1       (Absorptive ground surface)
Receiver source distance  :  30.00 / 30.00  m
Receiver height           :   1.50 / 4.50   m
Topography                :      2       (Flat/gentle slope; with barrier)
Barrier angle1            : -90.00 deg   Angle2 : 45.00 deg
Barrier height            :   2.20 m
Barrier receiver distance :  13.00 / 13.00  m
Source elevation          :   0.00 m
Receiver elevation        :   0.00 m
Barrier elevation         :   0.00 m
Reference angle           :   0.00

♀
Road data, segment # 3: Confed Pkwy (day/night)
-----------------------------------------------
Car traffic volume  : 37627/4181  veh/TimePeriod  *
Medium truck volume :   862/96    veh/TimePeriod  *
Heavy truck volume  :   706/78    veh/TimePeriod  *
Posted speed limit  :    50 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):  43550
    Percentage of Annual Growth        :   0.00
    Number of Years of Growth          :   0.00
    Medium Truck % of Total Volume     :   2.20
    Heavy Truck  % of Total Volume     :   1.80
    Day (16 hrs) % of Total Volume     :  90.00

Data for Segment # 3: Confed Pkwy (day/night)
---------------------------------------------
Angle1   Angle2           :   0.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      2       (Reflective ground surface)
Receiver source distance  : 246.00 / 246.00 m
Receiver height           :   1.50 / 4.50   m
Topography                :      2       (Flat/gentle slope; with barrier)
Barrier angle1            :   0.00 deg   Angle2 : 90.00 deg
Barrier height            :   2.20 m
Barrier receiver distance :  13.00 / 13.00  m
Source elevation          :   0.00 m
Receiver elevation        :   0.00 m
Barrier elevation         :   0.00 m
Reference angle           :   0.00

♀
Results segment # 1: SquareOneDr (day)
--------------------------------------

Source height = 1.22 m

Barrier height for grazing incidence
------------------------------------
Source      ! Receiver    ! Barrier     ! Elevation of
Height  (m) ! Height  (m) ! Height  (m) ! Barrier Top  (m)
------------+-------------+-------------+--------------
       1.22 !        1.50 !        1.43 !         1.43
```

ROAD (0.00 + 46.74 + 0.00) = 46.74 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
0	90	0.00	61.06	0.00	-5.40	-3.01	0.00	0.00	-5.91	46.74

Segment Leq : 46.74 dBA

♀
Results segment # 2: Rathburn Rd (day)

Source height = 1.22 m

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
1.22	1.50	1.38	1.38

ROAD (0.00 + 54.92 + 0.00) = 54.92 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	45	0.54	68.15	0.00	-4.62	-2.13	0.00	0.00	-6.47	54.92

Segment Leq : 54.92 dBA

♀
Results segment # 3: Confed Pkwy (day)

Source height = 1.16 m

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
1.16	1.50	1.48	1.48

ROAD (0.00 + 49.48 + 0.00) = 49.48 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
0	90	0.00	70.29	0.00	-12.15	-3.01	0.00	0.00	-5.65	49.48

Segment Leq : 49.48 dBA

Total Leq All Segments: 56.50 dBA

♀
Barrier table for segment # 1: SquareOneDr (day)

Barrier Height	Elev of Barr Top	Road dBA	Tot Leq dBA
3.70	3.70	43.08	43.08
4.20	4.20	42.00	42.00
4.70	4.70	41.03	41.03

5.20	5.20	40.16	40.16
5.70	5.70	39.38	39.38
6.20	6.20	38.67	38.67
6.70	6.70	38.02	38.02
7.20	7.20	37.42	37.42
7.70	7.70	36.92	36.92
8.20	8.20	36.51	36.51

Barrier table for segment # 2: Rathburn Rd (day)

Barrier Height	Elev of Barr Top	Road dBA	Tot Leq dBA
3.70	3.70	50.67	50.67
4.20	4.20	49.57	49.57
4.70	4.70	48.63	48.63
5.20	5.20	47.81	47.81
5.70	5.70	47.10	47.10
6.20	6.20	46.47	46.47
6.70	6.70	45.99	45.99
7.20	7.20	45.68	45.68
7.70	7.70	45.48	45.48
8.20	8.20	45.34	45.34

Barrier table for segment # 3: Confed Pkwy (day)

Barrier Height	Elev of Barr Top	Road dBA	Tot Leq dBA
3.70	3.70	46.27	46.27
4.20	4.20	45.24	45.24
4.70	4.70	44.30	44.30
5.20	5.20	43.46	43.46
5.70	5.70	42.70	42.70
6.20	6.20	42.00	42.00
6.70	6.70	41.37	41.37
7.20	7.20	40.78	40.78
7.70	7.70	40.24	40.24
8.20	8.20	39.74	39.74

♀
Results segment # 1: SquareOneDr (night)

Source height = 1.22 m

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
1.22	4.50	3.68	3.68

ROAD (0.00 + 46.08 + 0.00) = 46.08 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
0	90	0.00	54.49	0.00	-5.40	-3.01	0.00	0.00	-0.84	45.24*
0	90	0.00	54.49	0.00	-5.40	-3.01	0.00	0.00	0.00	46.08

* Bright Zone !

Segment Leq : 46.08 dBA

♀
Results segment # 2: Rathburn Rd (night)

Source height = 1.23 m

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
1.23	4.50	3.08	3.08

ROAD (0.00 + 54.69 + 0.00) = 54.69 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	45	0.45	61.63	0.00	-4.35	-2.01	0.00	0.00	-2.41	52.85*
-90	45	0.58	61.63	0.00	-4.75	-2.19	0.00	0.00	0.00	54.69

* Bright Zone !

Segment Leq : 54.69 dBA

♀
Results segment # 3: Confed Pkwy (night)

Source height = 1.16 m

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
1.16	4.50	4.32	4.32

ROAD (0.00 + 48.59 + 0.00) = 48.59 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
0	90	0.00	63.75	0.00	-12.15	-3.01	0.00	0.00	-0.48	48.11*
0	90	0.00	63.75	0.00	-12.15	-3.01	0.00	0.00	0.00	48.59

* Bright Zone !

Segment Leq : 48.59 dBA

Total Leq All Segments: 56.10 dBA

♀
Barrier table for segment # 1: SquareOneDr (night)

Barrier Height	Elev of Barr Top	Road dBA	Tot Leq dBA
3.70	3.70	41.08	41.08
4.20	4.20	40.64	40.64
4.70	4.70	39.60	39.60

5.20	5.20	38.34	38.34
5.70	5.70	37.10	37.10
6.20	6.20	35.95	35.95
6.70	6.70	34.92	34.92
7.20	7.20	34.00	34.00
7.70	7.70	33.17	33.17
8.20	8.20	32.42	32.42

Barrier table for segment # 2: Rathburn Rd (night)

Barrier Height	Elev of Barr Top	Road dBA	Tot Leq dBA
3.70	3.70	49.78	49.78
4.20	4.20	48.39	48.39
4.70	4.70	46.90	46.90
5.20	5.20	45.55	45.55
5.70	5.70	44.38	44.38
6.20	6.20	43.38	43.38
6.70	6.70	42.53	42.53
7.20	7.20	41.79	41.79
7.70	7.70	41.13	41.13
8.20	8.20	40.55	40.55

Barrier table for segment # 3: Confed Pkwy (night)

Barrier Height	Elev of Barr Top	Road dBA	Tot Leq dBA
3.70	3.70	48.59	48.59
4.20	4.20	48.59	48.59
4.70	4.70	43.40	43.40
5.20	5.20	42.66	42.66
5.70	5.70	41.60	41.60
6.20	6.20	40.47	40.47
6.70	6.70	39.38	39.38
7.20	7.20	38.38	38.38
7.70	7.70	37.48	37.48
8.20	8.20	36.66	36.66

♀

TOTAL Leq FROM ALL SOURCES (DAY): 56.50
(NIGHT): 56.10

♀
♀

STAMSON 5.0 NORMAL REPORT Date: 26-09-2017 15:23:57
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: r04wo.te Time Period: Day/Night 16/8 hours
Description: R04 without Square One Drive Extension

Road data, segment # 1: Rathburn Rd (day/night)

Car traffic volume : 19665/2185 veh/TimePeriod *
Medium truck volume : 569/63 veh/TimePeriod *
Heavy truck volume : 466/52 veh/TimePeriod *
Posted speed limit : 50 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): 23000
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 2.75
Heavy Truck % of Total Volume : 2.25
Day (16 hrs) % of Total Volume : 90.00

Data for Segment # 1: Rathburn Rd (day/night)

Angle1 Angle2 : -90.00 deg 45.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 28.00 / 28.00 m
Receiver height : 1.50 / 4.50 m
Topography : 2 (Flat/gentle slope; with barrier)
Barrier angle1 : -90.00 deg Angle2 : 45.00 deg
Barrier height : 2.20 m
Barrier receiver distance : 13.00 / 13.00 m
Source elevation : 0.00 m
Receiver elevation : 0.00 m
Barrier elevation : 0.00 m
Reference angle : 0.00

♀
Road data, segment # 2: Confed Pkwy (day/night)

Car traffic volume : 37627/4181 veh/TimePeriod *
Medium truck volume : 862/96 veh/TimePeriod *
Heavy truck volume : 706/78 veh/TimePeriod *
Posted speed limit : 50 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): 43550
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 2.20
Heavy Truck % of Total Volume : 1.80
Day (16 hrs) % of Total Volume : 90.00

Data for Segment # 2: Confed Pkwy (day/night)

```
Angle1   Angle2           :   0.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      2       (Reflective ground surface)
Receiver source distance  : 331.00 / 331.00 m
Receiver height           :   1.50 / 4.50   m
Topography                :      2       (Flat/gentle slope; with barrier)
Barrier angle1            :   0.00 deg   Angle2 : 90.00 deg
Barrier height            :   2.20 m
Barrier receiver distance :  13.00 / 13.00  m
Source elevation          :   0.00 m
Receiver elevation        :   0.00 m
Barrier elevation         :   0.00 m
Reference angle           :   0.00
```

♀

Results segment # 1: Rathburn Rd (day)

Source height = 1.22 m

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
1.22	1.50	1.37	1.37

ROAD (0.00 + 55.28 + 0.00) = 55.28 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	45	0.54	68.15	0.00	-4.16	-2.13	0.00	0.00	-6.57	55.28

Segment Leq : 55.28 dBA

♀

Results segment # 2: Confed Pkwy (day)

Source height = 1.16 m

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
1.16	1.50	1.49	1.49

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
0	90	0.00	70.29	0.00	-13.44	-3.01	0.00	0.00	-5.63	48.21

Segment Leq : 48.21 dBA

Total Leq All Segments: 56.06 dBA

♀

Barrier table for segment # 1: Rathburn Rd (day)

Barrier Height	Elev of Barr Top	Road dBA	Tot Leq dBA
3.70	3.70	50.91	50.91
4.20	4.20	49.79	49.79
4.70	4.70	48.84	48.84
5.20	5.20	48.02	48.02
5.70	5.70	47.29	47.29
6.20	6.20	46.65	46.65
6.70	6.70	46.22	46.22
7.20	7.20	45.93	45.93
7.70	7.70	45.73	45.73
8.20	8.20	45.60	45.60

Barrier table for segment # 2: Confed Pkwy (day)

Barrier Height	Elev of Barr Top	Road dBA	Tot Leq dBA
3.70	3.70	45.02	45.02
4.20	4.20	44.00	44.00
4.70	4.70	43.07	43.07
5.20	5.20	42.22	42.22
5.70	5.70	41.46	41.46
6.20	6.20	40.77	40.77
6.70	6.70	40.13	40.13
7.20	7.20	39.55	39.55
7.70	7.70	39.01	39.01
8.20	8.20	38.51	38.51

♀
Results segment # 1: Rathburn Rd (night)

Source height = 1.23 m

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
1.23	4.50	2.98	2.98

ROAD (0.00 + 55.16 + 0.00) = 55.16 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	45	0.45	61.63	0.00	-3.92	-2.01	0.00	0.00	-2.97	52.72*
-90	45	0.58	61.63	0.00	-4.28	-2.19	0.00	0.00	0.00	55.16

* Bright Zone !

Segment Leq : 55.16 dBA

♀
Results segment # 2: Confed Pkwy (night)

Source height = 1.16 m

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
1.16	4.50	4.37	4.37

ROAD (0.00 + 47.30 + 0.00) = 47.30 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
0	90	0.00	63.75	0.00	-13.44	-3.01	0.00	0.00	-0.46	46.84*
0	90	0.00	63.75	0.00	-13.44	-3.01	0.00	0.00	0.00	47.30

* Bright Zone !

Segment Leq : 47.30 dBA

Total Leq All Segments: 55.82 dBA

♀
Barrier table for segment # 1: Rathburn Rd (night)

Barrier Height	Elev of Barr Top	Road dBA	Tot Leq dBA
3.70	3.70	49.85	49.85
4.20	4.20	48.35	48.35
4.70	4.70	46.83	46.83
5.20	5.20	45.49	45.49
5.70	5.70	44.34	44.34
6.20	6.20	43.36	43.36
6.70	6.70	42.52	42.52
7.20	7.20	41.79	41.79
7.70	7.70	41.13	41.13
8.20	8.20	40.65	40.65

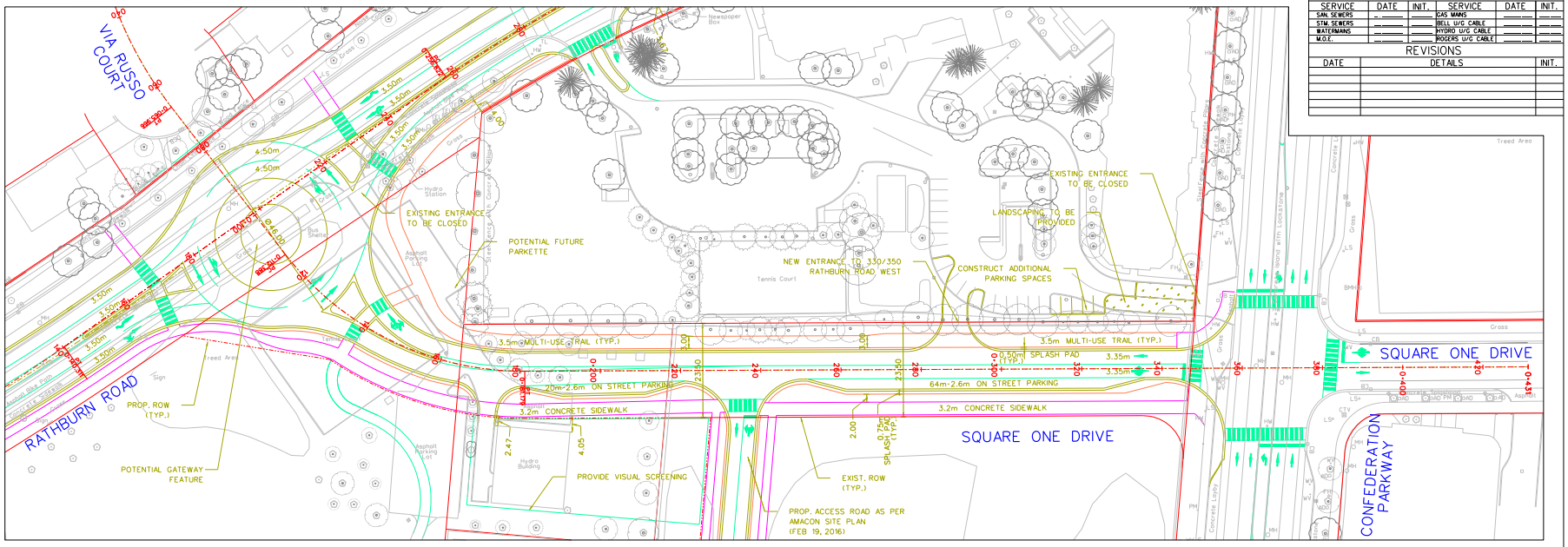
Barrier table for segment # 2: Confed Pkwy (night)

Barrier Height	Elev of Barr Top	Road dBA	Tot Leq dBA
3.70	3.70	47.30	47.30
4.20	4.20	47.30	47.30
4.70	4.70	42.16	42.16
5.20	5.20	41.46	41.46
5.70	5.70	40.44	40.44
6.20	6.20	39.32	39.32
6.70	6.70	38.23	38.23
7.20	7.20	37.22	37.22
7.70	7.70	36.31	36.31
8.20	8.20	35.48	35.48

♀

TOTAL Leq FROM ALL SOURCES (DAY): 56.06
(NIGHT): 55.82
♀
♀

Appendix C DESIGN DRAWINGS

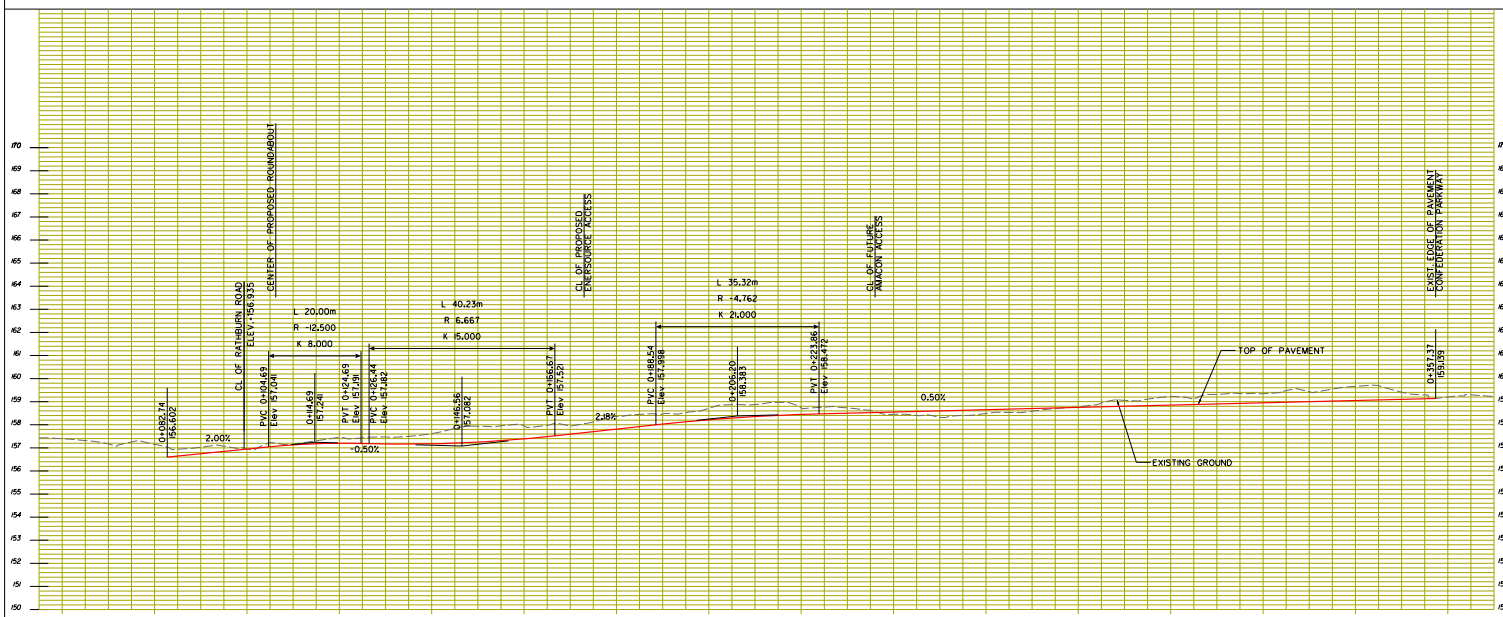


SERVICE DATA

SERVICE	DATE	INIT.	SERVICE	DATE	INIT.
SAN. SEWERS			GAS MAINS		
STM. SEWERS			BELL U/G CABLE		
WATERMAINS			HYDRO U/G CABLE		
M.O.E.			ROGERS U/G CABLE		

REVISIONS

DATE	DETAILS	INIT.



		156.947	157.201	157.176	157.390	157.811	158.217	158.449	158.552	158.652	158.752	158.852	158.952	159.052	FINAL RD. GR.
157.40	157.15	156.96	157.46	157.61	157.95	158.36	158.71	158.73	158.45	158.49	158.78	159.22	159.34	159.66	159.20 EXIST RD. GR.
0+060	0+080	0+100	0+120	0+140	0+160	0+180	0+200	0+220	0+240	0+260	0+280	0+300	0+320	0+340	0+360 CHAINAGE

DESIGN BY

C.E.T.

APPROVED BY

DEPARTMENTAL APPROVAL

SILVIO CESARIO P.ENG.

MISSISSAUGA

PRODUCED FOR - T&W, ENGINEERING AND WORKS

SQUARE ONE DRIVE EXTENSION CLASS EA

SQUARE ONE DRIVE PLAN AND PROFILE

STA 0+060 - STA 0+360

SCALE HOR. 1:500 VERT. 1:100

C.A.D.D. BY

DATE 2017/3/23

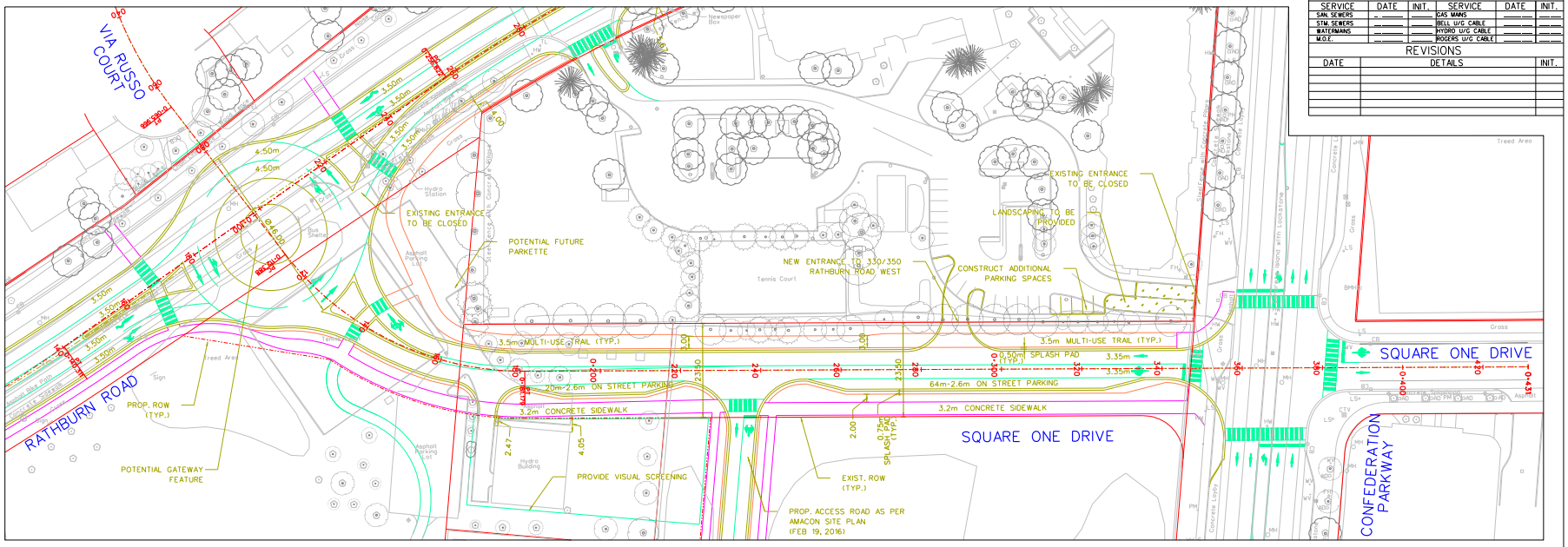
AREA

CHECKED BY

SHEET __ OF __

PROJECT No.

PLAN No.

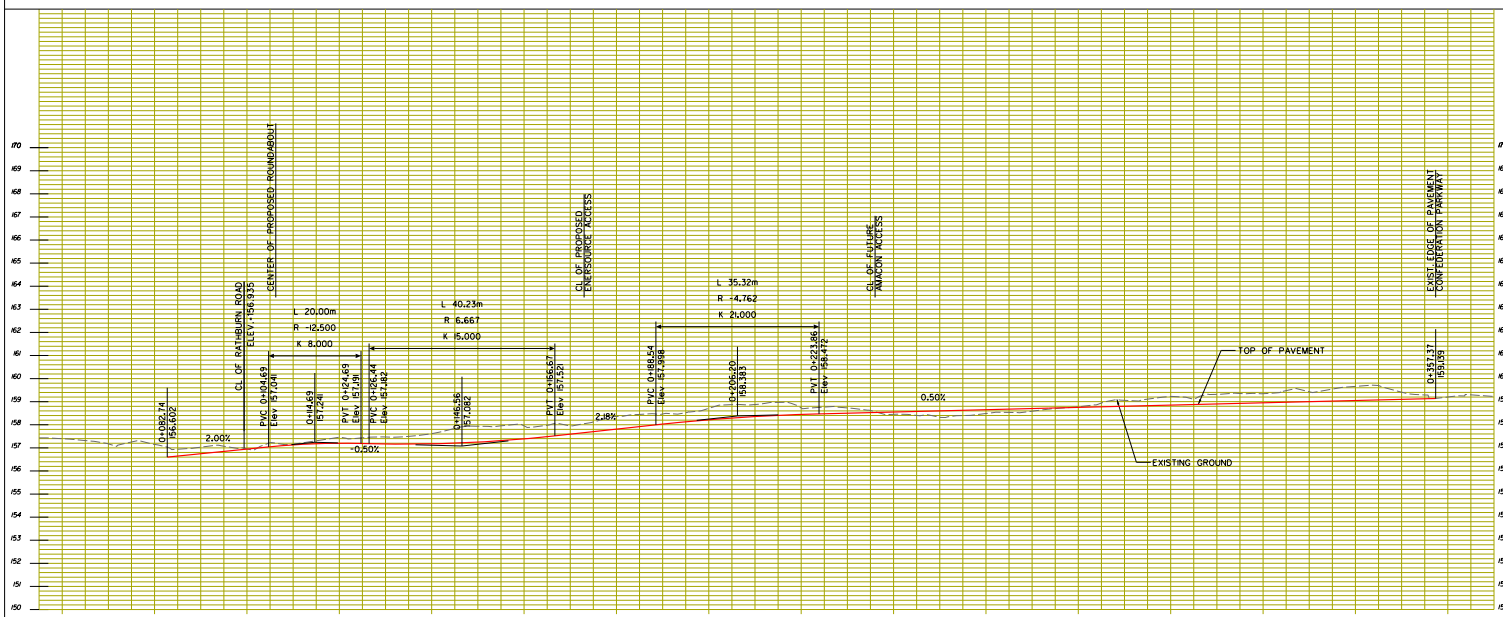


SERVICE DATA

SERVICE	DATE	INIT.	SERVICE	DATE	INIT.
SAN. SEWERS			GAS MAINS		
STM. SEWERS			BELL U/G CABLE		
WATERMAINS			HYDRO U/G CABLE		
M.O.E.			ROGERS U/G CABLE		

REVISIONS

DATE	DETAILS	INIT.



		156.947	157.201	157.176	157.390	157.811	158.217	158.449	158.552	158.652	158.752	158.852	158.952	159.052	FINAL RD. GR.
157.40	157.15	156.96	157.46	157.61	157.95	158.36	158.71	158.73	158.45	158.49	158.78	159.22	159.34	159.66	159.20 EXIST RD. GR.
0+060	0+080	0+100	0+120	0+140	0+160	0+180	0+200	0+220	0+240	0+260	0+280	0+300	0+320	0+340	0+360 CHAINAGE

DESIGN BY

C.E.T.

APPROVED BY

DEPARTMENTAL APPROVAL

SILVIO CESARIO P.ENG.

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SQUARE ONE DRIVE PLAN AND PROFILE

STA 0+060 - STA 0+360

SCALE HOR. 1:500 VERT. 1:100

C.A.D.D. BY

DATE 2017/3/23

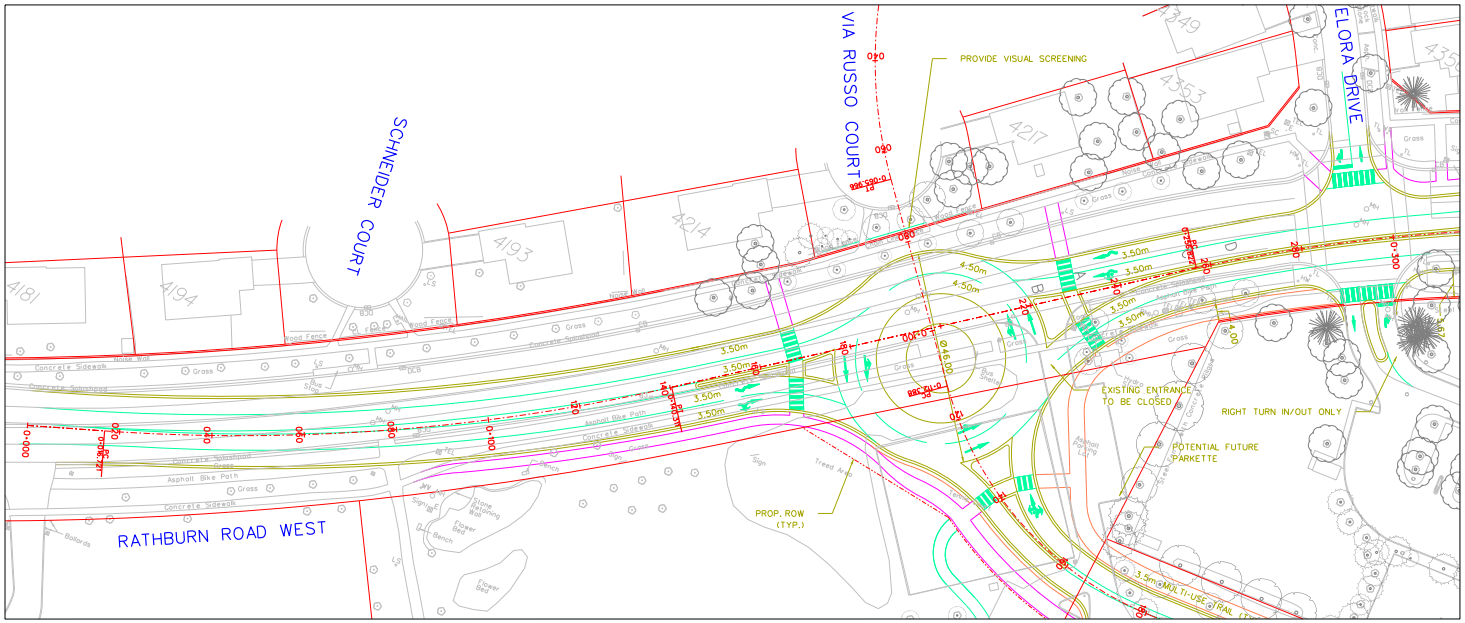
AREA

CHECKED BY

SHEET __ OF __

PROJECT No.

PLAN No.



SERVICE DATA

SERVICE	DATE	INIT.	SERVICE	DATE	INIT.
SAN. SEWERS			GAS MAINS		
STM. SEWERS			BELL U/G CABLE		
WATERMAINS			HYDRO U/G CABLE		
M.O.E.			ROGERS U/G CABLE		

REVISIONS

DATE	DETAILS	INIT.

157.721	157.252	156.817	156.508	156.330	156.283	156.367	156.513	156.658	156.804	156.949	157.095	157.240	157.386	157.532	157.707	FINAL RD. GR.
157.72	157.31	156.79	156.38	156.29	156.30	156.51	156.69	156.77	156.84	156.90	157.26	157.36	157.36	157.58	157.81	EXIST RD. GR.
0+000	0+020	0+040	0+060	0+080	0+100	0+120	0+140	0+160	0+180	0+200	0+220	0+240	0+260	0+280	0+300	CHAINAGE

DESIGN BY: C.E.T.

APPROVED BY:

DEPARTMENTAL APPROVAL: SILVIO CESARIO P.ENG.

MISSISSAUGA

PRODUCED FOR - T&W, ENGINEERING AND WORKS

SQUARE ONE DRIVE EXTENSION CLASS EA

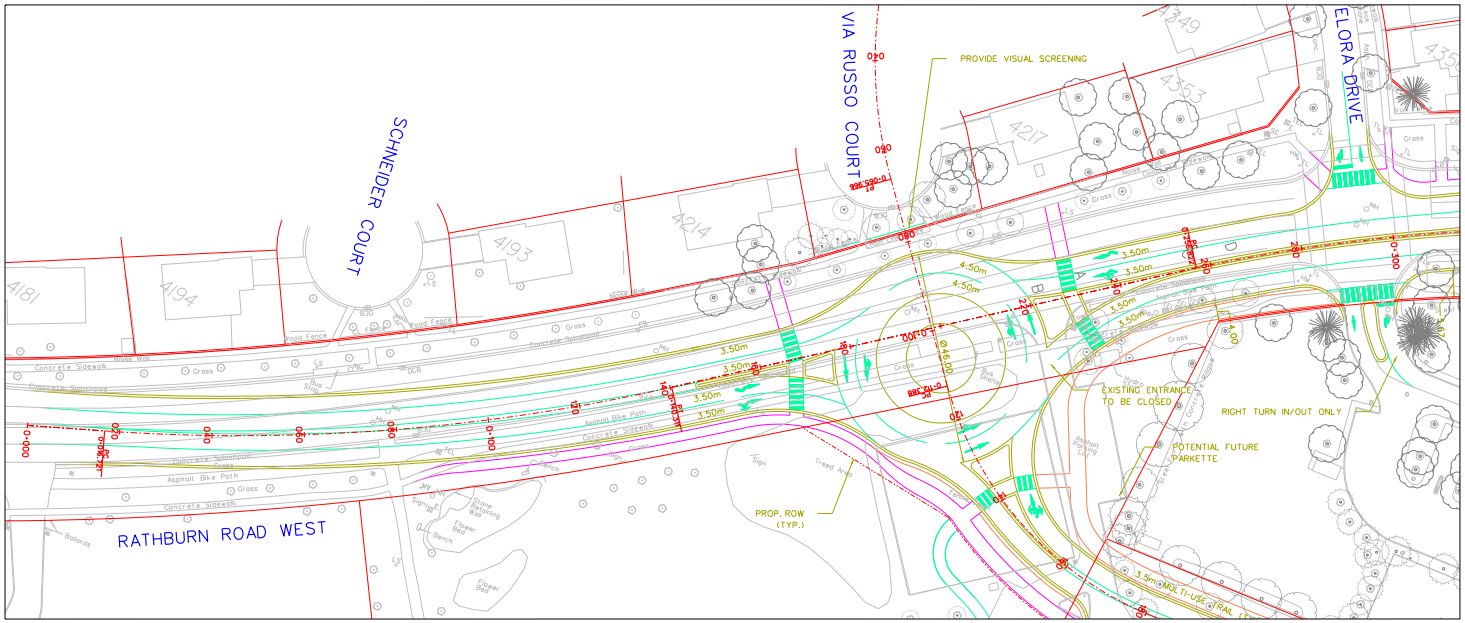
RATHBURN ROAD PLAN AND PROFILE

STA 0+000 - STA 0+320

SCALE HOR. 1:500 VERT. 1:100 | AREA | PROJECT No.

C.A.D.D. BY | CHECKED BY | PLAN No.

DATE 2017/3/23 | SHEET __ OF __



SERVICE DATA

SERVICE	DATE	INIT.	SERVICE	DATE	INIT.
SAN. SEWERS			GAS MAINS		
STM. SEWERS			BELL U/G CABLE		
WATERMAINS			HYDRO U/G CABLE		
M.O.E.			ROGERS U/G CABLE		

REVISIONS

DATE	DETAILS	INIT.

157.721	157.252	156.817	156.508	156.330	156.283	156.367	156.513	156.658	156.804	156.949	157.095	157.240	157.386	157.532	157.707	FINAL RD. GR.
157.72	157.31	156.79	156.38	156.29	156.30	156.51	156.69	156.77	156.84	156.90	157.26	157.36	157.36	157.58	157.81	EXIST RD. GR.
0+000	0+020	0+040	0+060	0+080	0+100	0+120	0+140	0+160	0+180	0+200	0+220	0+240	0+260	0+280	0+300	CHAINAGE

DESIGN BY: C.E.T.

APPROVED BY:

DEPARTMENTAL APPROVAL: SILVIO CESARIO P.ENG.

MISSISSAUGA

PRODUCED FOR - T&W, ENGINEERING AND WORKS

SQUARE ONE DRIVE EXTENSION CLASS EA

RATHBURN ROAD PLAN AND PROFILE

STA 0+000 - STA 0+320

SCALE HOR. 1:500 VERT. 1:100 | AREA | PROJECT No.

C.A.D.D. BY | CHECKED BY | PLAN No.

DATE 2017/3/23 | SHEET __ OF __