HGC ENGINEERING

Howe Gastmeier Chapnik Limited
2000 Argentia Road, Plaza One, Suite 203
Mississauga, Ontario, Canada L5N 1P7
t: 905.826.4044

Noise Feasibility Study
Proposed Long Term Care Facility
Sudbury, Ontario

Prepared for:

Time Stone Corp.
1730 Regent Street
Sudbury, ON P3R 3Z8

Prepared by:

Mandy Chan, PEng

February 11, 2019

HGC Project No. 01801000

Table of Contents

1 INTRODUCTION AND SUMMARY

HGC Engineering was retained by Time Stone Corp. to conduct a noise study for their proposed long term care facility to be located south of Bancroft Drive and Dorsett Drive and north of the CP rail line, in the City of Greater Sudbury, Ontario. The study is required by the municipality and the Canadian Pacific Railway (CP) as part of their planning and approvals process.

Rail traffic on the CP Cartier Subdivision and road traffic on Bancroft Drive are the primary noise sources impacting this site. Rail and road traffic data was used to predict future traffic sound levels at various lots in the proposed residential development. The predicted sound levels were compared to the guidelines of the Ministry of Environment, Conservation and Parks (MECP) and CP Rail.

The sound level predictions indicate that the future traffic sound levels will exceed MECP guidelines at all the building facades with exposure to the CP railway line. All dwelling units with direct exposure to the CP rail line will require an alternative means of ventilation which enables the windows and exterior doors to remain closed. In addition, upgraded building constructions, such as brick exterior wall construction and upgraded glazing constructions, are required for these dwelling units. The MECP guidelines recommend that noise warning clauses be used to inform future owners of the traffic noise impacts and sound level excesses. A detailed noise study is required when detailed floor plans and building elevations are available.

A preliminary investigation of the potential noise impact from the rooftop mechanical equipment of the proposed building at the future residences was also conducted. The analysis is based on preliminary information obtained from a similar long term care facility. The results indicate that the potential noise from the rooftop mechanical equipment can be within the applicable noise guideline limits of the MECP at existing and future neighbouring residences. A detailed noise study should be conducted when equipment specifications are available to confirm that the sound level limits will be met at the adjacent residences and provide any additional recommendations which may be required.

In summary, with suitable controls integrated into the building plans, it is concluded that this proposed development is feasible from the perspective of noise impact. Details of the assessment leading to this conclusion are provided herein.

2 SITE DESCRIPTION AND NOISE SOURCES

Figure 1 shows a key plan illustrating the location of the proposed site. The site is located south of Bancroft Drive and Dorsett Drive and north of the CP rail line, in the City of Greater Sudbury, Ontario. The proposed development consists of one 3-storey long term care facility and is part of the Scenic View Subdivision as shown on Figure 2. A site plan prepared by MontgomerySisam dated November 9, 2018 is shown in Figure 3.

The area is considered to be Class II (semi-urban) in terms of its acoustical environment. The CP rail line and Bancroft Avenue are the dominant noise sources. The subject site is elevated above the CP railway by approximately 10 m. There are no sources of stationary noise within 500 m of the subject site.

3 NOISE LEVEL CRITERIA

3.1 Road and Rail Traffic Noise

Guidelines for acceptable levels of road and rail traffic noise impacting residential developments are given in the MECP publication NPC-300, "Environmental Noise Guideline Stationary and Transportation Sources – Approval and Planning", Part C release date October 21, 2013, and are listed in Table 1 below. The values in Table 1 are energy equivalent (average) sound levels [LEQ] in units of A-weighted decibels [dBA].

Table 1: MECP Road and Rail Traffic Noise Criteria (dBA)

Area	Daytime L_{EQ} (16 hour) Road/Rail	Nighttime L_{EQ}(8 hour) Road/Rail
Outdoor Living Area	55 dBA	--
Living/Dining Room	45 dBA / 40 dBA	--
Bedroom	--	40 dBA / 35 dBA

Daytime refers to the period between 07:00 and 23:00, while nighttime refers to the period between 23:00 and 07:00. The term "Outdoor Living Area" (OLA) is used in reference to an outdoor patio,

backyard, terrace, or other area where passive recreation is expected to occur, provided that is has a minimum depth of 4 m, and is outside the exterior building façade and unenclosed.

The MECP guidelines allow the daytime sound levels in an Outdoor Living Area to be exceeded by up to 5 dBA, without mitigation, if warning clauses are placed in the purchase and lease/rental agreements to the property. Where OLA sound levels exceed 60 dBA, physical mitigation is recommended to reduce the OLA sound level to below 60 dBA and as close to 55 dBA as technically, economically and administratively feasible.

Indoor guidelines are 5 dBA more stringent for rail noise than for road noise, to account for the low frequency (rumbling) character of locomotive sound, and its greater potential to transmit through exterior wall/window assemblies.

A central air conditioning system as an alternative means of ventilation to open windows is required for dwellings where nighttime sound levels outside bedroom and/or living/dining windows exceed 60 dBA or where daytime sound levels exceed 65 dBA. Forced-air ventilation with ducts sized to accommodate the future installation of air conditioning is required when nighttime sound levels at bedroom windows and/or living/dining windows are in the range of 51 to 60 dBA or when daytime sound levels are in the range of 56 to 65 dBA.

Warning clauses to notify future residents of possible excesses are also required when nighttime sound levels exceed 50 dBA at the plane of the and/or living/dining windows and daytime sound levels exceed 55 dBA in the outdoor living area due to road and rail traffic.

Building components such as walls, windows and doors must be designed to achieve indoor sound level criteria when the plane of windows nighttime sound level is greater than 60 dBA or the daytime sound level is greater than 65 dBA due to road traffic noise, or when the nighttime sound level is greater than 55 dBA or greater than 60 dBA during the daytime due to rail traffic noise. The use of warning clauses to notify future residents of possible excesses is also required.

MECP guidelines recommend exterior walls built with a masonry veneer or its acoustical equivalent from foundation to rafters as a minimum construction for any dwellings with a 24 hour L_{EQ} that is greater than 60 dBA, and which are within 100 m of the right of way of the railway.

CP Rail policies further stipulate that masonry construction or an equivalent construction is required for the first row of dwellings facing the railway right of way. Appendix A provides the CP principal mainline requirements for residential developments adjacent to a railway right of way.

4 TRAFFIC NOISE PREDICTIONS

4.1 Road Traffic

Traffic data for Bancroft Drive was obtained from the Traffic Impact Study prepared for the subdivision in the form of Peak Hour Traffic volumes, and is provided in Appendix B. Commercial vehicle percentages of 4.0% was assumed and split into 2.5% heavy trucks and 1.5% medium trucks for the analysis. A 90/10 day/night volume split was applied to the volume. A posted speed limit of 60 km/h was used. Traffic volumes were conservatively assumed to grow at a rate of 2.5% per year to the year of 2029. The resulting future traffic volumes are listed in Table 2.

Table 2: 2029 Projected Road Traffic Data

Road Name		Cars	Medium Trucks	Heavy Trucks	Total
Bancroft Drive	Daytime	5 482	86	143	5 711
	Nighttime	609	10	16	635
	Total	**6 091**	**95**	**159**	**6 345**

4.2 Rail Traffic

Rail traffic data for typical operations of the CP Cartier Subdivision was obtained from CP personnel and is provided in Appendix B. This data was projected to the year 2029 using a growth rate of 2.5%. The Cartier Subdivision is used for way freight operations and is a continuously welded principal mainline with two tracks. The maximum permissible train speed in the area of the site is 72 km/h (45 mph) for freight trains. This maximum speed, as well as the maximum number of cars and locomotives per train was used in the traffic noise analysis to yield a worst cast estimate of train noise. Table 3 summarises the rail traffic data used in the analysis.

Table 3: 2029 Projected Rail Traffic Data

Type of Train	Maximum Number of locomotives Day/Night	Maximum Number of cars Day/Night	Maximum Speed (km/h)	Current Volume Day/Night	Projected Daytime (07:00-23:00) trains	Projected Night-time (23:00-07:00) train
Freight	4	180	72	8/4	10	5

4.3 Traffic Noise Predictions

To assess the levels of rail traffic noise which will impact the site in the future, predictions were made using STAMSON version 5.04, a computer algorithm developed by the MECP. Sample STAMSON output is included in Appendix C. There are no at-grade crossings in the vicinity of the site and thus whistle noise is not included in the assessment.

Predictions of the traffic sound levels were made at various locations. The results of these predictions are summarized in Tables 4 and 5. Should the site plan be changed significantly, the acoustic requirements may be subject to modification.

Table 4: Predicted Daytime Traffic Sound Levels [dBA], Without Mitigation

Prediction Location	Description	Daytime ($L_{EQ-16hr}$)		
		Road	Rail	Overall
A	South Facade	<40	66	66
B	East Façade	<40	63	63
C	North Façade	41	51	51
D	West Facade	<40	59	59
E	Interior Courtyard	<40	<55	<55

Table 5: Predicted Nighttime Traffic Sound Levels [dBA], Without Mitigation

Prediction Location	Description	Nighttime (L_{EQ-8hr})		
		Road	Rail	Overall
A	South Facade	<40	64	64
B	East Façade	<40	63	63
C	North Façade	<40	<50	<50
D	West Facade	<40	58	58

4.4 Traffic Noise Recommendations

The sound level predictions indicate that the future traffic sound levels will exceed MECP guidelines at the building facades with exposure to the CP railway line. The following discussion outlines preliminary recommendations ventilation requirements, building façade constructions, and warning clauses to achieve the noise criteria stated in Table 1.

4.4.1 Outdoor Living Areas

The predicted sound levels in the interior courtyards are less than 55 dBA. There are no requirements for acoustic barriers.

A safety berm is typically required for residential dwellings adjacent to a principal mainline. Since the site is elevated, CP personnel should be contacted to clarity the requirements, if any.

4.4.2 Minimum Distance Setbacks

For noise control and safety reasons, the CP policies typically stipulate that the minimum required setback between a new dwelling and a principal mainline right of way is typically 30 meters. The nearest dwelling units in the proposed development will be located approximately 85 metres from the railway right-of-way meeting the CP requirement.

4.4.3 Indoor Living Areas

The predicted future daytime and/or nighttime sound levels at the plane of the windows at most of the building facades will be greater than 65 dBA during the day and/or 60 dBA respectively. Typically, MECP guidelines recommend that central air conditioning system should be implemented for all

dwelling units or ventilation provisions are required where windows are to remain closed in order to meet the applicable indoor sound level limits. The ventilation system also needs to provide proper temperature and humidity control.

Ventilation methods other than central air conditioning are acceptable for high and medium density residential developments, such as this, subject to the following conditions:

a) The noise produced by the proposed ventilation system in the space served does not exceed 40 dBA. In practice, this condition usually implies that window air conditioning units are not acceptable;

b) The ventilation system complies with all national, provincial and municipal standards and codes;

c) The ventilation system is designed by a heating and ventilation professional; and

d) The ventilation system enables the windows and exterior doors to remain closed.

It is understood that the residential units in the building will be provided with ventilation (fresh air and heating) such that windows can remain closed and that the corridors will be air conditioned. This will meet the MECP ventilation requirement provided the conditions listed above are also met.

The outdoor ventilation equipment should also be located, installed, and selected with an appropriate sound emission rating to comply with MECP guideline NPC-300, as applicable. A preliminary noise assessment was conducted and can be found in Section 5.0.

4.4.4 Building Facade Constructions

Future traffic sound levels at the facades of the closest dwelling units with exposure to the CP railway line will exceed 55 dBA at night. MECP guidelines recommend that the windows, walls and doors be designed so that the indoor sound levels comply with MECP noise criteria.

The building floor plans and elevations were not yet available for review by HGC Engineering at the time of this report, but preliminary calculations have been performed to determine the building envelope constructions likely to be required to maintain indoor sound levels within MECP guidelines. The calculation methods were developed by the National Research Council (NRC). They are based on the

predicted future sound levels at the building facades, and the area ratios of the facade components (walls, windows and doors) and the anticipated floor area of the adjacent room.

Exterior Wall Constructions

MECP and CP guidelines require brick exterior walls from foundations to rafters as a minimum construction for any dwellings that are in the first row of dwellings adjacent to and with exposure to a rail line. The facades requiring brick construction is shown on Figure 4.

Acoustical Requirements for Glazing

a) South Facade

Since the predicted sound levels at the south with direct exposure to the CP rail line exceed the MECP guidelines, upgraded glazing constructions will be required.

The minimum necessary specification for the building envelope is Acoustical Insulation Factor, AIF-31 for bedrooms and AIF-26 for living/dining/family rooms, based on the possibility of sound entering the buildings through windows, since the exterior wall is assumed to be brick. A well-sealed thermopane unit having a Sound Transmission Class (STC) rating of 31would provide sufficient noise insulation for the dwellings, as long as the window area to room floor area ratio does not exceed 25% for the bedrooms and 63% for living/dining/family rooms.

When detailed floor plans and building elevations are available, an acoustical consultant should revise the glazing constructions based on actual window to floor area ratios.

b) East & West Facades

The minimum necessary specification for the building envelope of the east and west facades is Acoustical Insulation Factor, AIF-30 for bedrooms and AIF-25 for living/dining/family rooms, based on the possibility of sound entering the buildings through windows, since the exterior wall is assumed to be brick. A well-sealed thermopane unit having a Sound Transmission Class (STC) rating of 30, that is, two 3 mm panes and a 13 mm inter-pane gap would provide sufficient noise insulation for the dwellings, as long as the window area to room floor area ratio does not exceed 25% for the bedrooms.

When detailed floor plans and building elevations are available, an acoustical consultant should revise the glazing constructions based on actual window to floor area ratios.

c) North Facade

Any double glazed window construction meeting the minimum requirements of the Ontario Building Code (OBC) will provide adequate sound insulation for the north facade.

4.4.5 Warning Clauses

The MECP guidelines recommend that the following warning clauses be included in the property agreements for the proposed long term care facility with anticipated traffic sound level excesses.

Suitable wording for future dwellings where the indoor sound level exceeds the criteria is given below.

Type A:

> Purchasers /tenants are advised that sound levels due to increasing road and rail traffic may occasionally interfere with some activities of the dwelling occupants as the sound levels exceed the Municipality's and the Ministry of the Environment's noise criteria.

Suggested wording for future dwellings for which physical mitigation has been provided is given below.

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 rail traffic may on occasion 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.

Suggested wording for future dwellings requiring forced air ventilation systems is given below.

Type C:

> This dwelling unit has been fitted with a forced air heating system and the ducting etc., was sized to accommodate central air conditioning. Installation of central air conditioning will allow windows and exterior doors to remain closed, thereby ensuring that the indoor sound levels are within the criteria of the Municipality and the Ministry of the Environment and Energy. (Note: The location and installation of the outdoor air conditioning device should be done so as to minimize the noise impacts and comply with criteria of MECP publication NPC-300, as applicable)

Suggested wording for proposed dwelling units requiring central air conditioning systems is given below.

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 Municipality's and the Ministry of Environment's noise criteria.

CP's standard warning clause which is required for all residential developments located within 300 m of their mainlines is given below.

Type E:

> Warning: Canadian Pacific Railways Company or its assigns or successors in interest has or have a rights-of-way within 300 metres from the land subject hereof. There may be alteration to or expansions of the railway facilities on such rights-of-way in the future including the possibility that the railway or its assigns or successors as aforesaid may expand its operations, which expansion may affect the living environment of the residents in the vicinity, notwithstanding the inclusion of any noise and vibration attenuating measures in the design of the development and individual dwellings. CPR will not be responsible for any complaints or claims arising from use of such facilities and/or operations on, over or under the aforesaid rights-of-way.

These sample clauses are provided by the MECP as examples and can be modified by the Municipality as required.

4.5 Summary of Traffic Noise Control Recommendations

The following recommendations and Table 6 are provided in regard to noise mitigation for road and rail traffic noise for the proposed long term care facility.

1. A safety berm is typically required for residential dwellings adjacent to a principal mainline. Since the site is elevated, CP personnel should be contacted to clarity the requirements, if any.

2. An alternative means of ventilation to open windows is required.

3. Brick or masonry veneer exterior walls is required for the building.

4. Upgraded glazing constructions will be required for all dwelling units on the south, east and west facades with exposure to the railway.

5. A detailed noise study is required when detailed floor plans and building elevations are available to verify the brick exterior wall construction and to refine the glazing requirements.

6. Warning clauses should be included in the Property agreements to inform future owners about noise concerns from transportation sources in the area.

The reader is referred to the previous sections of the report where these recommendations are discussed in more detail.

Table 6: Summary of Noise Control Requirements

Facades	Acoustic Barrier	Ventilation Requirements	Type of Warning Clause	Exterior Wall	Glazing AIF Requirements
North	--	Alternative Means of Ventilation	A, D, E	--	OBC
East & West	--	Alternative Means of Ventilation	A, D, E	Brick (1)	LR/DR: AIF-25 BR: AIF-30
South	--	Alternative Means of Ventilation	A, D, E	Brick	LR/DR: AIF-26 BR: AIF-31

Notes:
-- no specific requirement
(1) Refer to Figure 4
* The location, installation and sound rating of the air conditioning condensers must be compliant with MECP Guideline NPC-300, as applicable.
LR/DR – Living Room/Dining Room
BR – Bedroom
OBC – Ontario Building Code Requirements

5 Preliminary Assessment of Stationary Noise Sources

A preliminary noise impact assessment at existing and future nearby residences due to the building ventilation equipment of the proposed building has been conducted.

5.1 Criteria for Stationary Sources of Sound

NPC-300 is the latest MECP Guideline specified for use in assessing Land Use Compatibility issues. The facade of a residence (i.e., outside the plane of a window to a noise sensitive interior space such as a bedroom or living room), or any associated usable outdoor area are considered to be sensitive points of reception. NPC-300 stipulates that the non-impulsive sound level limit in a Semi-Urban environment for a stationary noise source during daytime hours (07:00 to 23:00) is the greater of the minimum one-hour energy equivalent (average) background sound level (Leq_{1hr}), or the exclusionary minimum limit of 50 dBA. During nighttime hours (21:00 to 07:00), the exclusionary minimum limit is 45 dBA.

Existing and future residences to the west, north and south of the subject site (R1-R3) were considered the representative receptors in this assessment. R1 and R2 are future 2-storey homes and R3 is an existing 2-storey home. The second storey receptor height is 4.5 m. Receptor locations are shown on Figures 5 and 6. The exclusionary minimum limits of 50 dBA during the day and 45 dBA at night apply for all receptors.

5.2 Noise Assessment

Predictive noise modelling was used to assess the potential noise impact of rooftop equipment at the closest residential receptors. The noise prediction model was based on sound emission levels for rooftop equipment, assumed operational profiles (during the daytime and nighttime), and established engineering methods for the prediction of outdoor sound propagation. These methods include the effects of distance, air absorption, and acoustical screening by barrier obstacles.

Detailed mechanical rooftop plans are currently not available as the proposed development is still in the early stages of planning. Typical rooftop equipment was obtained from a similar facility. Sound emission data for typical rooftop equipment obtained from the manufacturer and HGC Engineering files for similar projects was used in the analysis and is provided in Appendix D.

The following information and assumptions were used in the analysis.

- The long term facility building was assumed to be 11 m height;
- Two condensing units, one air make-up units and two heat recovery exchange units on the rooftop, shown as green crosses on Figures 5 and 6;
- Rooftop units are assumed to be 1.4 m high;

In accordance with establishing the predictable worst-case conditions, the rooftop HVAC equipment was assumed to operate at 100% capacity during daytime and 50% during nighttime hours.

Commercial activities such as the occasional movement of customer vehicles on the property, the infrequent delivery of goods and garbage collection are not of themselves considered to be significant noise sources in the MECP guidelines.

The sound levels were used as input to a predictive computer model. The software used for this purpose (*Cadna-A version 2019*) is a computer implementation of ISO Standard 9613-2.2 "Acoustics - Attenuation of Sound During Propagation Outdoors." The ISO method accounts for reduction in sound level with distance due to geometrical spreading, air absorption, ground attenuation and acoustical shielding by intervening structures such as barriers. The calculations consider the acoustical effects of distance and shielding by the building. The unmitigated sound levels due to the rooftop mechanical equipment at the closest neighbouring residences are summarized in the following table. Sound level contours are shown in Figure 5.

Table 6: Predicted Sound Levels at Residential Receptors [dBA], Without Mitigation

Receptor	Criteria Day/ Night	Predicted Daytime – at Façade	Predicted Nighttime – at Façade
R1 (2-storey Future house to the west)	50 / 45	43	40
R2 (2-storey Future house to the south)	50 / 45	41	<40
R3 (2-storey Existing house to the North)	50 / 45	<40	<40

The results from the preliminary stationary source noise assessment indicate that noise from rooftop mechanical equipment can be within the MECP sound level limits at the nearby residences. A detailed noise study should be conducted when detailed roof plans and mechanical equipment selections are available to confirm that the MECP limits will be met at the neighbouring residences and provide any

additional recommendations which may be required.

6 RECOMMENDATIONS FOR IMPLEMENTATION

To ensure that the noise control recommendations outlined above are fully implemented, it is recommended that:

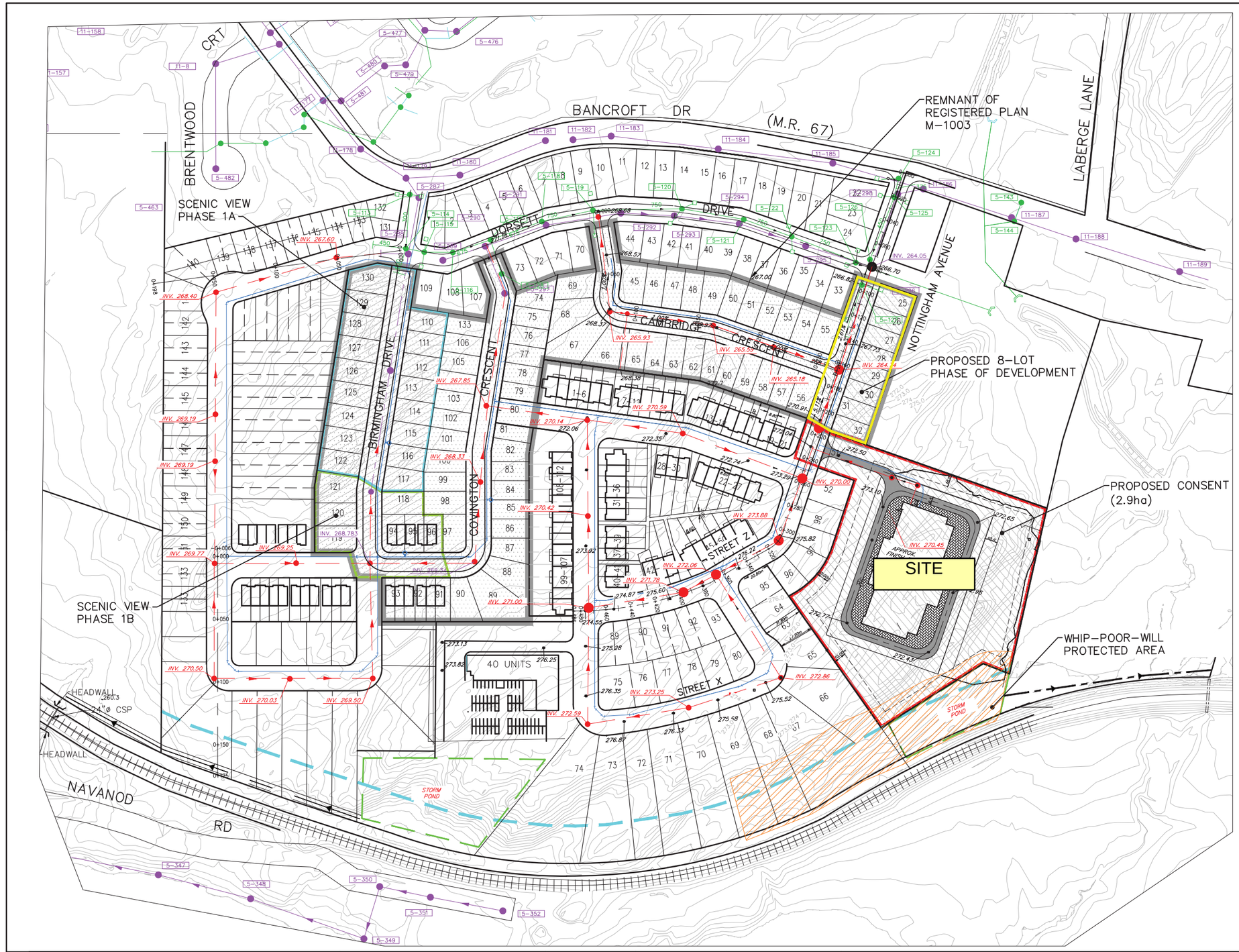
1) When detailed rooftop equipment models and locations are known, a detailed noise study should be conducted by a Professional Engineer qualified to perform acoustical engineering services in the Province of Ontario to confirm that sound emitted by the building mechanical systems will not exceed the MECP limits at neighbouring noise sensitive receptors and provide any additional recommendations which may be required in that regard.

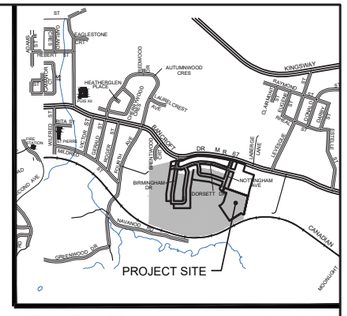
2) When architectural plans are available for the facades with exposure to the CP railway, an acoustical consultant should review the drawings to determine appropriate glazing constructions and to verify the inclusion of brick exterior wall constructions.

3) Prior to the issuance of building permits for this development, the Municipality's building inspector or a Professional Engineer qualified to perform acoustical engineering services in the Province of Ontario should certify that the noise control measures have been properly incorporated.

4) Prior to assumption of the subdivision, the Municipality's building inspector or a Professional Engineer qualified to perform acoustical engineering services in the Province of Ontario should certify that the noise control measures have been properly installed and constructed.

Figure 1: Aerial Photo





KEY PLAN 1:20,000

LEGEND

- PROPOSED C/L ROAD ELEVATION
- PROPOSED SANITARY SEWER AND INVERTS
- STORM WATER MANAGEMENT POND
- PROPOSED WATERMAIN
- PROPERTY BOUNDARY
- PROPOSED SWALE
- EXISTING SANITARY SEWER
- NOISE REDUCTION BERM
- PROPOSED STORM SEWER AND INVERTS

REVISIONS		
DATE	DETAILS	BY

CAUTION

- ALL UTILITIES ARE NOT NECESSARILY SHOWN ON THIS DRAWING.
- WHERE UTILITIES ARE SHOWN, LOCATIONS ARE NOT GUARANTEED
- LOCATION & SIZE OF ALL UTILITIES MUST BE VERIFIED IN THE FIELD.

DATE:	2018-10-18
DRAWN:	KM
DESIGNED:	KM
CHECKED:	
ENGINEER:	

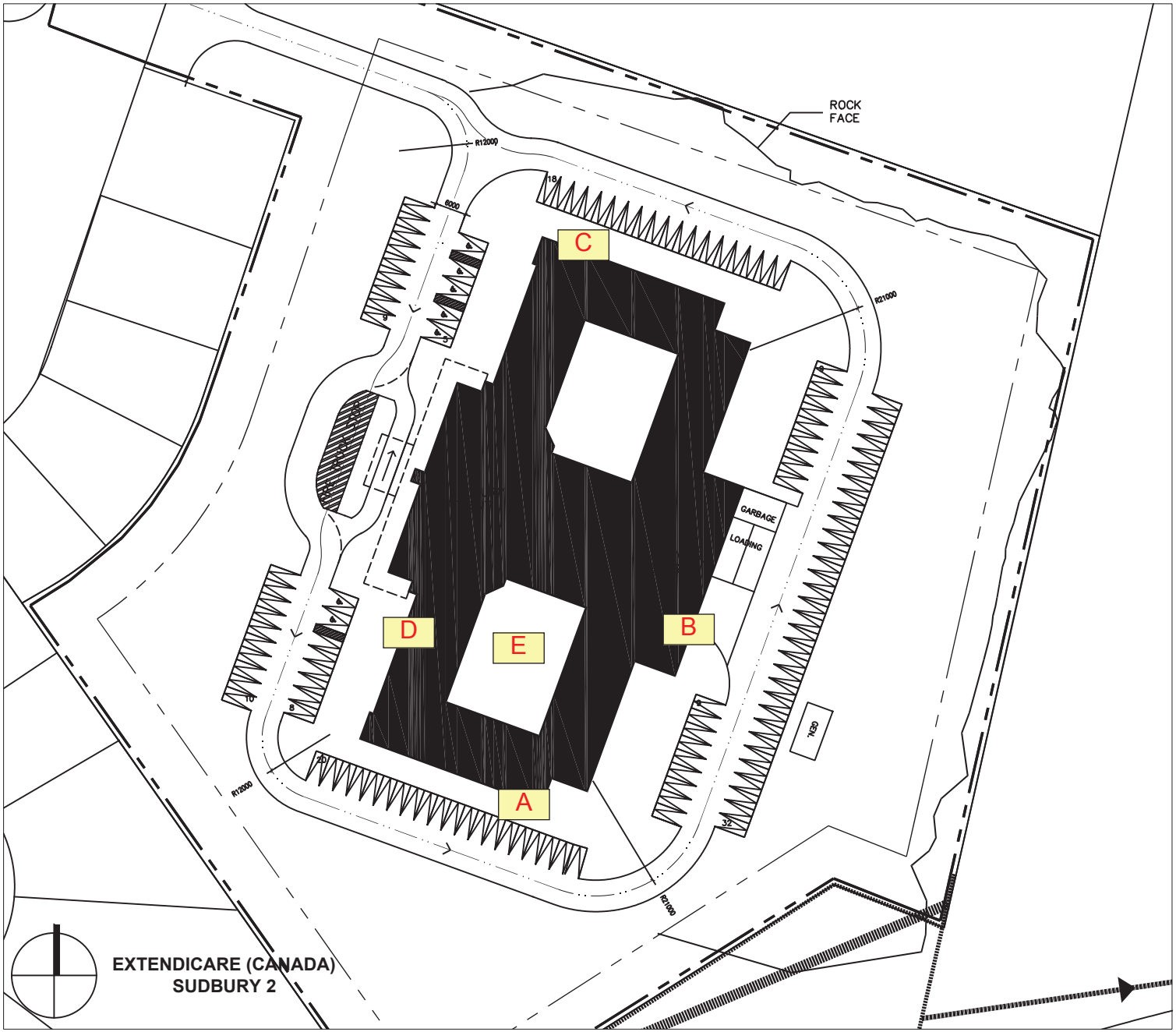
EXTENDICARE

arva R.V. Anderson Associates Limited
engineering • environment • infrastructure

ZULICH SCENIC VIEW
CONCEPTUAL PLAN
EXTENDICARE– SUDBURY

SCALE:	1:1500
CONTRACT NO.:	
CAD/FILE NUMBER:	112277
PAGE NO.:	2

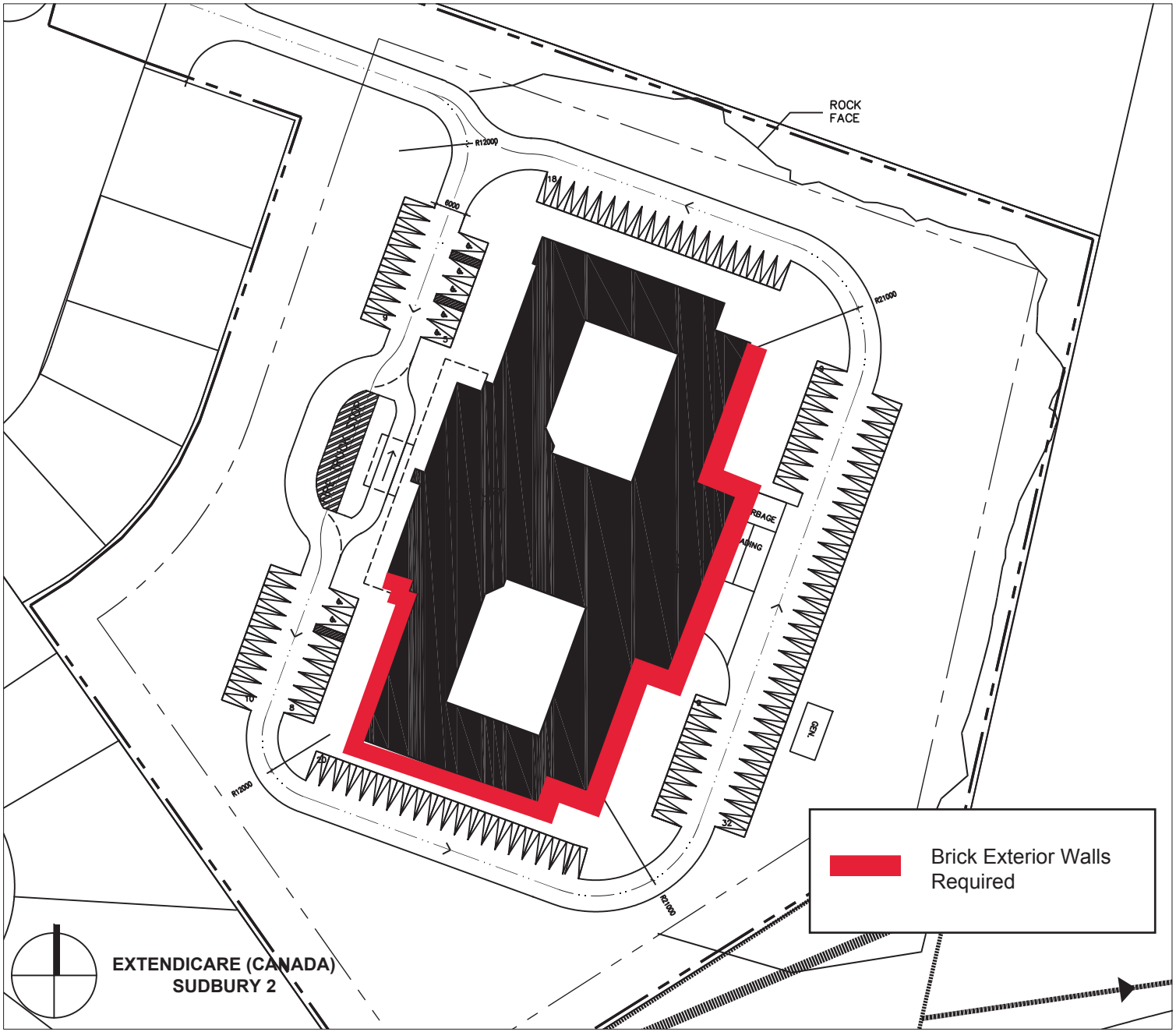
Figure 2: Overall Subdivision Plan



DETAILS OF PROPOSED DEVELOPMENT	
SETBACKS	
West Lot Line:	9m
South Lot Line:	9m
North Lot Line:	9m
East Lot Line:	9m
STATISTICS	
LOT AREA	28 630 sq.m
BUILDING COVERAGE	3 950 sq.m
# OF LTC RESIDENTS	192
PARKING	
PARKING (TOTAL)	120
BARRIER FREE PARKING	7
LOADING SPACES (9m x 3.6m)	2

EXTENDICARE – SUDBURY 2
OPTION 2
1: 750
SK – 2
MontgomerySisam
18.11.09

Figure 3: Site Plan Showing Prediction Locations



DETAILS OF PROPOSED DEVELOPMENT	
SETBACKS	
West Lot Line:	9m
South Lot Line:	9m
North Lot Line:	9m
East Lot Line:	9m
STATISTICS	
LOT AREA	28 630 sq.m
BUILDING COVERAGE	3 950 sq.m
# OF LTC RESIDENTS	192
PARKING	
PARKING (TOTAL)	120
BARRIER FREE PARKING	7
LOADING SPACES (9m x 3.6m)	2

EXTENDICARE – SUDBURY 2
OPTION 2
1: 750
SK –
MontgomerySisam
18.11.09

Figure 4: Site Plan Showing Brick Facade Requirements

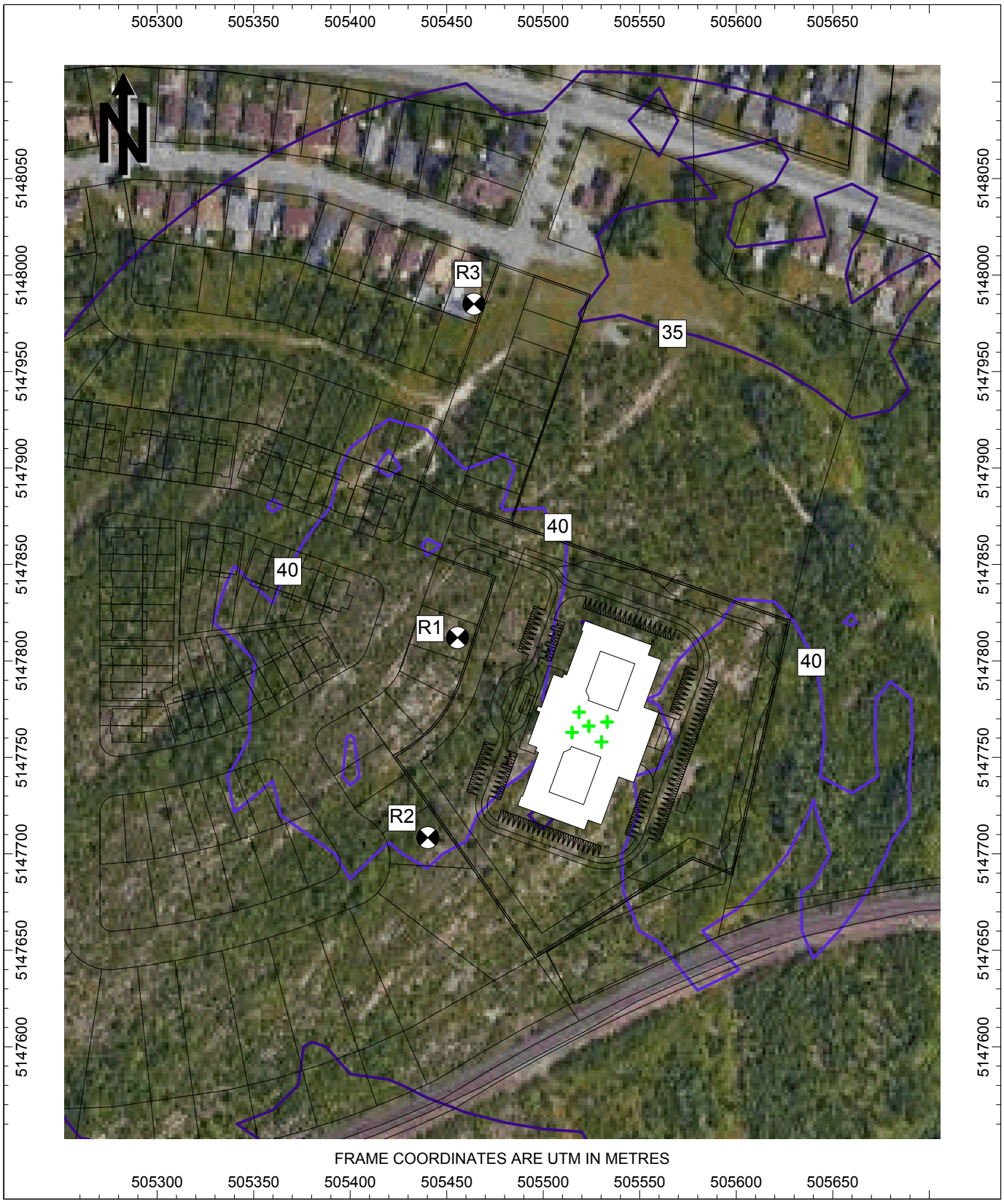


Figure 5: Predicted Daytime Sound Level Contours, 4.5m Receptor Height, Leq1hr [dBA]

APPENDIX A

CPR Requirements

CANADIAN PACIFIC RAILWAY

PRINCIPAL MAIN LINE REQUIREMENTS

1. Berm, or combination berm and noise attenuation fence, having extensions or returns at the ends, to be erected on adjoining property, parallel to the railway right-of-way with construction according to the following:

   a) Minimum total height 5.5 metres above top-of-rail;
   b) Berm minimum height 2.5 metres and side slopes not steeper than 2.5 to 1.
   c) Fence, or wall, to be constructed without openings and of a durable material weighing not less than 20 kg. per square metre (4 lb/sq.ft.) of surface area.

   No part of the berm/noise barrier is to be constructed on railway property.

   A clause should be inserted in all offers of purchase and sale or lease, and be registered on title or included in the lease for each dwelling affected by any noise and vibration attenuation measures, advising that any berm, fencing, or vibration isolation features implemented are not to be tampered with or altered, and further that the owner shall have the sole responsibility for and shall maintain these features.

   Dwellings must be constructed such that the interior noise levels meet the criteria of the appropriate Ministry. A noise study should be carried out by a professional noise consultant to determine what impact, if any, railway noise would have on residents of proposed subdivisions and to recommend mitigation measures, if required. The Railway may consider other measures recommended by the study.

2. Setback of dwellings from the railway right-of-way to be a minimum of 30 metres. While no dwelling should be closer to the right-of-way than the specified setback, an unoccupied building, such as a garage, may be built closer. The 2.5 metre high earth berm adjacent to the right-of-way must be provided in all instances.

3. Ground vibration transmission to be estimated through site tests. If in excess of the acceptable levels, all dwellings within 75 metres of the nearest track should be protected. The measures employed may be:

   a) Support the building on rubber pads between the foundation and the occupied structure so that the maximum vertical natural frequency of the structure on the pads is 12 Hz;
   b) Insulate the building from the vibration originating at the railway tracks by an intervening discontinuity or by installing adequate insulation outside the building, protected from the compaction that would reduce its effectiveness so that vibration in the building became unacceptable; or
   c) Other suitable measures that will retain their effectiveness over time.

4. A clause should be inserted in all offers of purchase and sale or lease and in the title deed or lease of each dwelling within 300m of the railway right-of-way, warning prospective purchasers or tenants of the existence of the Railway's operating right-of-way; the possibility of alterations including the possibility that the Railway may expand its operations, which expansion may affect the living environment of the residents notwithstanding the inclusion of noise and vibration attenuating measures in the design of the subdivision and individual units, and that the Railway will not be responsible for complaints or claims arising from the use of its facilities and/or operations.

5. Any proposed alterations to the existing drainage pattern affecting railway property must receive prior concurrence from the Railway, and be substantiated by a drainage report to be reviewed by the Railway.

6. A 1.83 metre high chain link security fence be constructed and maintained along the common property line of the Railway and the development by the developer at his expense, and the developer is made aware of the necessity of including a covenant running with the lands, in all deeds, obliging the purchasers of the land to maintain the fence in a satisfactory condition at their expense.

7. Any proposed utilities under or over railway property to serve the development must be approved prior to their installation and be covered by the Railway's standard agreement.

APPENDIX B

Road and Rail Traffic Information

800 - 1290 Central Parkway West
Mississauga, Ontario
Canada L5C 4R3

T 905 803 3429
E josie_tomei@cpr.ca

January 14, 2019

Via email: machan@hgcengineering.com

Mandy Chan
HGC Engineering
2000 Argentia Road
Plaza One, Suite 203
Mississauga, Ontario L5N 1P7

Dear Sir/Madam:

Re: Rail Traffic Volumes, CP Mileage 75.0, Cartier Subdivision, Dorsett Drive, Sudbury

This is in reference to your request for rail traffic data in the vicinity of Dorsett Drive in the Greater Sudbury Region. The study area is located at mile 75.0 of our Cartier Subdivision, which is classified as a Principal Main Line line.

The information requested is as follows:

1. Number of freight trains between 0700 & 2300: 8
   Number of freight trains between 2300 & 0700: 4

2. Maximum cars per train freight: 180

3. Number of locomotives per train: 2 (4 max.)

4. Maximum permissible train speed: 45 mph

5. There are no grade crossings in the study area, however, the whistle may be sounded if deemed necessary by the train crew for safety reasons at any time.

6. There are 2 mainline tracks with continuously welded rail.

The information provided is based on recent rail traffic. Variations of the above may exist on a day-to-day basis. Specific measurements may also vary significantly depending on customer needs.

Yours truly,

Josie Tomei SR/WA
Specialist Real Estate Sales & Acquisitions – Ontario

Date: Wednesday September 19, 2012 **Conditions:** Cloudy

	west approach - Bancroft Dr						east approach - Bancroft Dr						south approach - Brentwood Crt						north approach - Shelbourne St					
	ALL VEHICLES			HEAVY VEHICLES			ALL VEHICLES			HEAVY VEHICLES			ALL VEHICLES			HEAVY VEHICLES			ALL VEHICLES			HEAVY VEHICLES		
Start Time	EBT	EBL	EBR	EBT	EBL	EBR	WBT	WBL	WBR	WBT	WBL	WBR	NBT	NBL	NBR	NBT	NBL	NBR	SBT	SBL	SBR	SBT	SBL	SBR
3:30:00 PM	38	7	0	2	1	0	24	1	1	2	0	0	0	1	0	0	0	0	0	2	7	0	1	1
3:45:00 PM	42	5	0	1	2	0	30	0	0	2	0	0	0	2	0	0	0	0	0	2	4	0	1	0
4:00:00 PM	33	4	5	2	0	0	45	0	3	4	0	0	0	2	0	0	0	0	0	2	9	0	0	1
4:15:00 PM	46	8	1	2	0	0	28	0	1	2	0	1	0	2	0	0	0	0	0	1	4	0	0	1
4:30:00 PM	60	12	4	2	0	0	43	1	0	1	0	0	0	0	0	0	0	0	0	2	8	0	0	2
4:45:00 PM	64	4	0	1	0	0	46	1	2	1	0	0	0	0	0	0	0	0	0	2	5	0	0	0
5:00:00 PM	67	8	3	0	0	0	33	0	1	1	0	0	0	0	0	0	0	0	0	0	10	0	0	0
5:15:00 PM	67	10	1	1	0	0	37	1	2	1	0	0	0	4	0	0	0	0	0	2	3	0	0	0
5:30:00 PM	52	5	2	1	0	0	43	0	0	0	0	0	0	1	0	0	0	0	0	2	3	0	0	0
5:45:00 PM	41	7	0	1	0	0	26	0	0	2	0	0	0	2	0	0	0	1	0	0	4	0	0	0
Peak Hour																								
4:30:00 PM	258	34	8	4	0	0	159	3	5	4	0	0	0	4	0	0	0	0	0	6	26	0	0	2
heavy %	2%	0%	0%				3%	0%	0%					0%	0%	0%			0%	0%	8%			

	west approach - Bancroft Dr					east approach - Bancroft Dr				south approach - Birmingham Dr			
	ALL VEHICLES		HEAVY VEHICLES			ALL VEHICLES		HEAVY VEHICLES		ALL VEHICLES		HEAVY VEHICLES	
Start Time	EBT	EBR	EBT	EBR		WBT	WBL	WBT	WBL	NBL	NBR	NBL	NBR
4:30:00 PM	58	4	2	0		44	0	1	0	0	0	0	0
4:45:00 PM	60	6	1	0		45	0	1	0	4	0	0	0
5:00:00 PM	63	5	0	0		31	0	1	0	3	0	0	0
5:15:00 PM	62	7	1	0		37	0	1	0	3	0	0	0
Peak Hour													
4:30:00 PM	243	22	4	0		157	0	4	0	10	0	0	0
heavy %	2%	0%				3%	0%			0%	0%		

Date: Thursday September 20, 2012 **Conditions:** Rainy

	west approach - Bancroft Dr						east approach - Bancroft Dr						south approach - Brentwood Crt						north approach - Shelbourne St					
	ALL VEHICLES			HEAVY VEHICLES			ALL VEHICLES			HEAVY VEHICLES			ALL VEHICLES			HEAVY VEHICLES			ALL VEHICLES			HEAVY VEHICLES		
Start Time	EBT	EBL	EBR	EBT	EBL	EBR	WBT	WBL	WBR	WBT	WBL	WBR	NBT	NBL	NBR	NBT	NBL	NBR	SBT	SBL	SBR	SBT	SBL	SBR
7:00:00 AM	20	3	0	2	1	0	27	0	0	1	0	0	0	1	0	0	0	0	0	2	4	0	0	0
7:15:00 AM	17	6	1	2	1	0	44	0	1	3	0	0	0	0	0	0	0	0	0	1	12	0	0	1
7:30:00 AM	28	2	0	4	0	0	47	0	1	4	0	0	0	2	1	0	0	0	0	1	3	0	1	1
7:45:00 AM	21	6	0	0	1	2	48	0	0	0	0	0	0	4	0	0	0	0	0	3	11	0	1	0
8:00:00 AM	26	2	1	2	0	0	35	0	0	1	0	0	0	2	0	0	0	0	0	1	7	0	0	0
8:15:00 AM	23	5	1	0	0	0	38	0	2	2	0	0	0	3	0	0	0	0	0	0	7	0	0	0
8:30:00 AM	26	4	0	2	0	0	45	0	3	1	0	1	0	2	0	0	0	0	1	1	16	0	0	1
8:45:00 AM	35	8	1	3	0	0	44	0	0	1	0	0	0	2	0	0	0	0	0	1	5	0	0	0
9:00:00 AM	21	4	0	3	0	0	29	0	2	0	0	1	0	1	0	0	0	0	0	0	3	0	0	0
9:15:00 AM	18	8	3	2	1	1	16	1	2	2	0	0	0	0	1	0	0	1	0	2	5	0	0	1
Peak Hour																								
8:00:00 AM	110	19	3	7	0	0	162	0	5	5	0	1	0	9	0	0	0	0	1	3	35	0	0	1
heavy %	6%	0%	0%				3%	0%	20%					0%	0%	0%			0%	0%	3%			

	west approach - Bancroft Dr					east approach - Bancroft Dr				south approach - Birmingham Dr			
	ALL VEHICLES		HEAVY VEHICLES			ALL VEHICLES		HEAVY VEHICLES		ALL VEHICLES		HEAVY VEHICLES	
Start Time	EBT	EBR	EBT	EBR		WBT	WBL	WBT	WBL	NBL	NBR	NBL	NBR
8:00:00 AM	27	0	2	0		30	0	1	0	5	0	0	0
8:15:00 AM	22	1	0	0		37	0	2	0	3	0	0	0
8:30:00 AM	27	0	2	0		44	0	2	0	4	0	0	0
8:45:00 AM	35	1	3	0		40	0	1	0	4	0	0	0
Peak Hour													
8:00:00 AM	111	2	7	0		151	0	6	0	16	0	0	0
heavy %	6%	0%				4%	0%			0%	0%		

APPENDIX C

Sample STAMSON 5.04 Output

```
STAMSON 5.0        NORMAL REPORT        Date: 11-02-2019 11:31:33
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: a.te                  Time Period: Day/Night 16/8 hours
Description: Predicted daytime & nighttime sound levels at the upper storey windows
at the south façade, Prediction Location [A]


Rail data, segment # 1: CP (day/night)
---------------------------------------
Train            ! Trains      ! Speed !# loc !# Cars! Eng  !Cont
Type             !             !(km/h) !/Train!/Train! type !weld
-----------------+-------------+-------+------+------+------+----
* 1.             !  10.2/5.1   !  72.0 !  4.0 !180.0 !Diesel! Yes

* The identified number of trains have been adjusted for
  future growth using the following parameters:

Train type:         ! Unadj. ! Annual % ! Years of !
 No  Name           ! Trains ! Increase !  Growth  !
--------------------+--------+----------+----------+
  1.                !   8.0/4.0   !    2.50  !   10.00  !

Data for Segment # 1: CP (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  :  87.00 / 87.00  m
Receiver height           :   7.50 / 7.50   m
Topography                :      4       (Elevated; with barrier)
No Whistle
Barrier angle1            : -45.00 deg   Angle2 : 90.00 deg
Barrier height            :   0.00 m
Elevation                 :   9.00 m
Barrier receiver distance :   5.00 / 5.00   m
Source elevation          : 263.00 m
Receiver elevation        : 272.00 m
Barrier elevation         : 270.00 m
Reference angle           :   0.00

Results segment # 1: CP (day)
-----------------------------

Barrier height for grazing incidence
------------------------------------
Source      ! Receiver    ! Barrier     ! Elevation of
Height  (m) ! Height  (m) ! Height  (m) ! Barrier Top  (m)
------------+-------------+-------------+--------------
       4.00 !        7.50 !        8.78 !       278.78
       0.50 !        7.50 !        8.58 !       278.58

LOCOMOTIVE (0.00 + 63.71 + 0.00) = 63.71 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
   -45     90   0.14  73.89  -8.66  -1.52   0.00   0.00  -0.01  63.70*
   -45     90   0.14  73.89  -8.66  -1.52   0.00   0.00   0.00  63.71
-------------------------------------------------------------------------

 * Bright Zone !

WHEEL (0.00 + 55.59 + 0.00) = 55.59 dBA
```

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-45	90	0.24	66.76	-9.47	-1.70	0.00	0.00	-0.01	55.57*
-45	90	0.24	66.76	-9.47	-1.70	0.00	0.00	0.00	55.59

* Bright Zone !

Segment Leq : 64.33 dBA

Total Leq All Segments: 64.33 dBA

Results segment # 1: CP (night)

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
4.00	7.50	8.78	278.78
0.50	7.50	8.58	278.58

LOCOMOTIVE (0.00 + 63.71 + 0.00) = 63.71 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-45	90	0.14	73.89	-8.66	-1.52	0.00	0.00	-0.01	63.70*
-45	90	0.14	73.89	-8.66	-1.52	0.00	0.00	0.00	63.71

* Bright Zone !

WHEEL (0.00 + 55.59 + 0.00) = 55.59 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-45	90	0.24	66.76	-9.47	-1.70	0.00	0.00	-0.01	55.57*
-45	90	0.24	66.76	-9.47	-1.70	0.00	0.00	0.00	55.59

* Bright Zone !

Segment Leq : 64.33 dBA

Total Leq All Segments: 64.33 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 64.33
(NIGHT): 64.33

```
STAMSON 5.0        NORMAL REPORT        Date: 11-02-2019 11:32:14
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: b.te                  Time Period: Day/Night 16/8 hours
Description:


Rail data, segment # 1: CP (day/night)
-------------------------------------
Train            ! Trains      ! Speed !# loc !# Cars! Eng  !Cont
Type             !             !(km/h) !/Train!/Train! type !weld
-----------------+-------------+-------+------+------+------+----
* 1.             !  10.2/5.1   !  72.0 !  4.0 !180.0 !Diesel! Yes

* The identified number of trains have been adjusted for
  future growth using the following parameters:

Train type:         ! Unadj. ! Annual % ! Years of !
 No  Name           ! Trains ! Increase !  Growth  !
--------------------+--------+----------+----------+
  1.                !   8.0/4.0   !    2.50  !   10.00  !

Data for Segment # 1: CP (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  : 120.00 / 120.00 m
Receiver height           :   7.50 / 7.50   m
Topography                :      4       (Elevated; with barrier)
No Whistle
Barrier angle1            : -45.00 deg   Angle2 : 90.00 deg
Barrier height            :   0.00 m
Elevation                 :   9.00 m
Barrier receiver distance :  20.00 / 20.00  m
Source elevation          : 263.00 m
Receiver elevation        : 272.00 m
Barrier elevation         : 270.00 m
Reference angle           :   0.00

Results segment # 1: CP (day)
-----------------------------

Barrier height for grazing incidence
------------------------------------
Source      ! Receiver    ! Barrier     ! Elevation of
Height  (m) ! Height  (m) ! Height  (m) ! Barrier Top  (m)
------------+-------------+-------------+--------------
       4.00 !        7.50 !        7.42 !       277.42
       0.50 !        7.50 !        6.83 !       276.83

LOCOMOTIVE (0.00 + 62.12 + 0.00) = 62.12 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
   -45     90   0.14  73.89 -10.25  -1.52   0.00   0.00  -0.04  62.09*
   -45     90   0.14  73.89 -10.25  -1.52   0.00   0.00   0.00  62.12
-------------------------------------------------------------------------

 * Bright Zone !

WHEEL (0.00 + 53.85 + 0.00) = 53.85 dBA
```

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-45	90	0.24	66.76	-11.20	-1.70	0.00	0.00	-0.04	53.81*
-45	90	0.24	66.76	-11.20	-1.70	0.00	0.00	0.00	53.85

* Bright Zone !

Segment Leq : 62.72 dBA

Total Leq All Segments: 62.72 dBA

Results segment # 1: CP (night)

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
4.00	7.50	7.42	277.42
0.50	7.50	6.83	276.83

LOCOMOTIVE (0.00 + 62.12 + 0.00) = 62.12 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-45	90	0.14	73.89	-10.25	-1.52	0.00	0.00	-0.04	62.09*
-45	90	0.14	73.89	-10.25	-1.52	0.00	0.00	0.00	62.12

* Bright Zone !

WHEEL (0.00 + 53.85 + 0.00) = 53.85 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-45	90	0.24	66.76	-11.20	-1.70	0.00	0.00	-0.04	53.81*
-45	90	0.24	66.76	-11.20	-1.70	0.00	0.00	0.00	53.85

* Bright Zone !

Segment Leq : 62.72 dBA

Total Leq All Segments: 62.72 dBA

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

Car traffic volume	5482/609	veh/TimePeriod *
Medium truck volume	86/10	veh/TimePeriod *
Heavy truck volume	143/16	veh/TimePeriod *
Posted speed limit	50	km/h
Road gradient	0	%
Road pavement	1	(Typical asphalt or concrete)

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

24 hr Traffic Volume (AADT or SADT)	4170
Percentage of Annual Growth	2.50
Number of Years of Growth	17.00
Medium Truck % of Total Volume	1.50
Heavy Truck % of Total Volume	2.50
Day (16 hrs) % of Total Volume	90.00

```
Data for Segment # 1: Bancroft (day/night)
------------------------------------------
Angle1   Angle2           : -45.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      1 / 1
House density             :     50 %
Surface                   :      1       (Absorptive ground surface)
Receiver source distance  : 260.00 / 260.00 m
Receiver height           :   7.50 / 7.50   m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00

Results segment # 1: Bancroft (day)
-----------------------------------

Source height = 1.26 m

ROAD (0.00 + 37.80 + 0.00) = 37.80 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -45     90   0.58  62.02   0.00 -19.54  -2.19   0.00  -2.49   0.00  37.80
-------------------------------------------------------------------------------

Segment Leq : 37.80 dBA

Total Leq All Segments: 37.80 dBA

Results segment # 1: Bancroft (night)
-------------------------------------

Source height = 1.26 m

ROAD (0.00 + 31.30 + 0.00) = 31.30 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -45     90   0.58  55.52   0.00 -19.54  -2.19   0.00  -2.49   0.00  31.30
-------------------------------------------------------------------------------

Segment Leq : 31.30 dBA

Total Leq All Segments: 31.30 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 62.73
                           (NIGHT): 62.72
```

APPENDIX D

Assumed Rooftop Mechanical Equipment Information

Table D1 – Source Sound Power Levels [dB re 10^{-12} Watt] Used in acoustical Modelling

Source	Octave Band Centre Frequency [Hz]								
	63	125	250	500	1k	2k	4k	8k	A
Make-up Air Unit	91	92	89	86	86	84	81	79	91
15 Ton HVAC	--	92	88	87	83	78	72	67	88
Heat Recovery Exchange Unit	103	100	94	87	83	79	75	70	91