

PRELIMINARY ENVIRONMENTAL NOISE REPORT

PROPOSED MIXED-USE DEVELOPMENT
WATERSAND PHASE 2
SOUTH PLAN
CITY OF BARRIE



PREPARED FOR
Watersand Construction Ltd.

July 13, 2022
File: 15-121-02

TABLE OF CONTENTS

	SUMMARY	1
1.0	INTRODUCTION	2
2.0	NOISE SOURCES	4
2.1	Transportation Sources	4
2.2	Stationary Sources – Noise	4
3.0	ENVIRONMENTAL NOISE CRITERIA.....	5
3.1	Transportation Sources (Noise).....	5
3.1.1	Indoors.....	5
3.1.2	Outdoors	6
3.2	Stationary Sources	6
3.3	City of Barrie Noise Control By-law.....	7
4.0	NOISE IMPACT ASSESSMENT	8
4.1	Road Traffic.....	8
4.2	Stationary Sources.....	8
5.0	NOISE ABATEMENT MEASURES	9
5.1	Transportation Sources	9
5.1.1	Indoors.....	
5.1.2	Outdoors	10
5.2	Stationary Sources.....	11
6.0	CONCLUSIONS.....	12
7.0	REFERENCES	13

LIST OF TABLES

TABLE 1	SUMMARY OF ROAD TRAFFIC DATA	14
TABLE 2	SUMMARY OF PREDICTED SOUND LEVELS OUTDOORS DUE TO ROAD TRAFFIC.....	15
TABLE 3	SUMMARY OF MINIMUM NOISE ABATEMENT MEASURES	16

LIST OF FIGURES

FIGURE 1	KEY PLAN
FIGURE 2	SITE PLAN SHOWING NOISE ABATEMENT MEASURES

LIST OF APPENDICES

APPENDIX A	CORRESPONDENCE REGARDING ROAD TRAFFIC DATA	A-1
APPENDIX B	ENVIRONMENTAL NOISE CRITERIA.....	B-1
APPENDIX C	SAMPLE CALCULATIONS OF PREDICTED SOUND.....	C-1
APPENDIX D	SAMPLE CALCULATION OF ARCHITECTURAL COMPONENT SELECTION	D-1
APPENDIX E	SAMPLE SOUND BARRIER ANALYSIS	E-1

SUMMARY

The proposed mixed-use development is located on the south side of McKay Road West, between Regional Road 27 and Veterans Drive, in the City of Barrie. The proposed development is subject to road traffic noise from McKay Road West and new internal roads. Additionally, potential noise from future school block and recreational developments has been evaluated.

The environmental noise guidelines of the City of Barrie, County of Simcoe and the Ministry of the Environment, Conservation and Parks (MOE) set out sound level limits for both indoor and outdoor space. Sound levels due to the adjacent roads were determined using ORNAMENT, the noise prediction model of the MOE for road traffic.

Using the road traffic data provided by the City of Barrie and JD Northcote Engineering Inc., the sound levels for various locations in the residential development were determined.

It was found that with appropriate mitigative measures, all residential lots and blocks (units) in the development will meet the noise guidelines.

Lots and blocks (units) in the vicinity of McKay Road West require either central air conditioning or forced air heating systems sized to accommodate central air conditioning at a later date if noise becomes a concern. Table 3 and Figure 2 show the central air conditioning requirements.

Lot 1 flanking McKay Road West, requires an acoustic fence 2.4 m in height to achieve a mitigated rear yard sound level of 59 dBA. In order to achieve a mitigated rear yard sound level of 55 dBA a 3.5m high acoustic barrier would be required. Table 3 and Figure 2 show the acoustic barrier requirements.

Where minor excesses exist or mitigation is required, future occupants will be advised through the use of warning clauses.

Based on the preliminary analysis, upgraded windows may be required for Lot 1 flanking McKay Road West. For all other lots and blocks (units) window, exterior door and exterior wall construction that comply with standard construction practices are satisfactory in all cases. See Section 5.1.1 for details.

Purchasers/tenants will be advised through a warning clause that the dwelling unit is in proximity to a future community centre, whose activities may at times be audible. See text and Figure 2 for details.

1.0 INTRODUCTION

Jade Acoustics Inc. was retained to prepare a Preliminary Environmental Noise Report to investigate the potential impact of noise on the proposed development to the satisfaction of the City of Barrie and County of Simcoe.

This report has been prepared in support of the Draft Plan Approval for the proposed Phase 2 South Plan mixed-use development.

The proposed site is identified as:

Plan: 51R-24826
Part of the north half of Lot 3,
All of the north half of Lots 4 and
Part of Lot 5
Concession 9
(Geographic Township of Innisfil)
City of Barrie
County of Simcoe

The proposed development is bounded by McKay Road West to the north, future residential and new internal road to the east, existing agricultural lands to the south and open space to the west.

The proposed development is comprised of detached and townhouse dwellings; stormwater management pond part block; a recreational centre block; a school block; a buffer block; valley lands; and new internal roads.

The analysis is based on the following:

- Site visit conducted by Jade Acoustics Inc. staff on April 27, 2022;
- Preliminary draft plan prepared by KLM Planning Partners Inc., dated January 23, 2019, received April 30, 2020;
- Phase 2 south lotting concept site plan prepared by KLM Planning Partners Inc., dated April 22, 2020, received April 8, 2022;
- Traffic data provided by the City of Barrie on May 14, 2020, re-confirmed on April 12, 2022; and

- Draft Traffic Impact Study prepared by JD Northcote Engineering Inc., dated June 30, 2022, received June 30, 2022.

The proposed development is shown in Figure 2.

2.0 NOISE SOURCES

2.1 Transportation Sources

The major transportation noise source of potential impact on the proposed development is the road traffic on McKay Road West, and new internal roads.

Ultimate road traffic data was calculated based on turning movement count data provided in the Draft Traffic Impact Study prepared by JD Northcote Engineering Inc. noted in Section 1.0. The ultimate overall forecasted truck percentages on McKay Road West were provided by the City of Barrie. The information provided by the City of Barrie was originally provided in May 14, 2020 and re-confirmed to be valid on April 12, 2022.

The new internal roads were considered in the analysis. Based on forecasted traffic volumes from the turning movement count data provided by the above noted traffic impact study, the new internal roads are predicted to be acoustically insignificant and were not analyzed further. Please note that the traffic data of new internal road “Street 1” was not included in the analysis due to the information was not available at the time of preparation of this report. This new internal road will be considered at the time of the Detailed Environmental Noise Report.

The road traffic information is summarized in Table 1 and correspondence regarding road traffic volumes is included in Appendix A.

The site is not affected by rail or air traffic.

2.2 Stationary Sources

Existing residential/storage uses located north of McKay Road West and northwest of proposed development. Based on observations at the time of the site visit by Jade Acoustics staff, these uses are not expected to be acoustically significant at the subject site and were not considered further. Additionally, based on the Official Plan of the City of Barrie, these lands are expected to be future mixed-use developments; however, no detailed information regarding the future mixed-use developments is available at the time of preparation of this report. Further assessment of these potential noise sources should be conducted at the time of the detailed report to confirm no changes to this conclusion.

A future elementary school and future recreational centre are proposed on Blocks 213 and 214 of the subject site, respectively. Detailed information regarding noise sources associated with the proposed school and recreational centre are not available at this stage of the project. Once the specific information is determined and the site plan is available, a detailed noise analysis

should be prepared by the proponent of the school/recreational centre to ensure that the applicable guidelines are met at the proposed Phase 2 south plan mixed-use development.

3.0 ENVIRONMENTAL NOISE CRITERIA

The environmental noise criteria used for residential developments in the City of Barrie, the County of Simcoe and the MOE environmental noise criteria are contained in Appendix B and summarized below.

The most recent environmental noise guidelines (NPC-300) of the Ontario Ministry of the Environment, Conservation and Parks (MOE) titled “Environmental Noise Guideline Stationary and Transportation Sources – Approval and Planning, Publication NPC-300”, dated August, 2013, released October 21, 2013 (updated final version # 22) were used for the analysis. A brief summary of the NPC-300 guidelines is given in Appendix B. The guidelines are also summarized below.

3.1 Transportation Sources (Noise)

3.1.1 Indoors

If the nighttime (11:00 p.m. to 7:00 a.m.) sound level in terms of Leq at the exterior face of a bedroom or living/dining room window is greater than 60 dBA and/or if the daytime (7:00 a.m. to 11:00 p.m.) sound level in terms of Leq at the exterior face of a bedroom or living/dining room window is greater than 65 dBA, means must be provided so that windows can be kept closed for noise control purposes and central air conditioning is required. For nighttime sound levels (LeqNight) greater than 50 dBA to less than or equal to 60 dBA on the exterior face of a bedroom or living/dining room window or daytime sound levels (LeqDay) greater than 55 dBA to less than or equal to 65 dBA on the exterior face of a bedroom or living/dining room window, there need only be the provision for adding central air conditioning by the occupant at a later date. This typically involves a ducted heating system sized to accommodate the addition of central air conditioning by the occupant at a later date. A warning clause advising the occupant of the potential interference with some activities is also required.

In all cases, air cooled condenser units must not exceed an AHRI sound rating of 7.6 bels. The air cooled condenser units must be sited in accordance with the zoning by-laws with respect to setbacks as well as location.

As required by the MOE, indoor noise criteria for road traffic noise is 40 dBA (Leq8hour) for the bedrooms during nighttime hours, 45 dBA (Leq8hour) for living/dining rooms during nighttime hours and 45 dBA (Leq16hour) for the living/dining rooms and bedrooms during daytime hours.

These criteria are used to determine the architectural requirements.

3.1.2 Outdoors

For the outdoor amenity areas (Outdoor Living Area – OLA), a design goal of 55 dBA for the daytime period between 7:00 a.m. to 11:00 p.m. is used for road traffic. In some cases an excess not exceeding 5 dBA is considered acceptable. Where the unmitigated sound levels during the day exceed 55 dBA (Leq16hour, daytime) but are equal to or less than 60 Dba (Leq16hour, daytime), a warning clause is required and mitigation should be considered. Where the unmitigated sound levels exceed 60 dBA, mitigation measures and a warning clause are required.

The definition of outdoor amenity area as defined by the MOE is given below.

"Outdoor Living Area (OLA)

(applies to impact assessments of transportation sources) means that part of a noise sensitive land use that is:

- intended and designed for the quiet enjoyment of the outdoor environment; and
- readily accessible from the building.

The OLA includes:

- backyards, front yards, gardens, terraces or patios;
- balconies and elevated terraces (e.g. rooftops), with a minimum depth of 4 metres, that are not enclosed, provided they are the only outdoor living area (OLA) for the occupant; or
- common outdoor living areas (OLAs) associated with high-rise multi-unit buildings."

For both the indoor and outdoor conditions where the acoustical criteria are exceeded, warning clauses must be placed in offers of purchase and sale, lease agreements, and included in the condominium agreement.

3.2 Stationary Sources

MOE Noise Guidelines

The guidelines of the Ontario Ministry of the Environment, Conservation and Parks (MOE) for stationary sources are to be used for commercial/industrial facilities.

The MOE document NPC-300 titled “Environmental Noise Guideline Stationary and Transportation Sources – Approval and Planning” has been used in this assessment.

The MOE also has vibration guidelines with respect to stationary sources, NPC-207. These guidelines require that the peak vibration velocities not exceed 0.3 mm/s at the point of reception during the day or night.

The MOE recognizes the need for back-up beepers/alarms as safety devices and as such does not have any guidelines or criteria to address these sources.

It should be noted that the MOE guidelines do not require that the source be inaudible, but rather that specific sound level limits be achieved.

With respect to stationary sources of noise in urban areas, the MOE guidelines require that the sound level due to the stationary source at the building façade and outdoor amenity spaces not exceed the sound level due to road traffic and in certain situations due to rail traffic in any hour of source operation, subject to specific exclusions. Tables C-5, C-6, C-7 and C-8 of NPC-300 included in Appendix B provided the exclusion limit values of one-hour equivalent sound level (Leq,dBA) and impulsive sound level (L_{LM},dBAI).

In general, if the criteria for a stationary source of noise are exceeded, the MOE recommends that control be implemented at the source rather than at the receiver. Alternatively, if the receiver is set back from the source or if a physical barrier is constructed so that the criteria can be met at the receiver, no additional mitigative measures are required. Treatment of the receptor building by the use of suitable wall and window construction and central air conditioning to keep windows closed is not an acceptable solution to the MOE in Class 1 and 2 areas (urban). In addition, a warning clause in offers of purchase and sale and/or lease agreement noting the proximity of dwellings to such a source should be considered.

3.3 City of Barrie Noise Control By-law

The City of Barrie has By-law No. 2006-140 (as amended) which regulates noise likely to disturb the inhabitants of the City of Barrie. It provides mainly qualitative information with some quantitative information with respect to noise sources. Prohibitions by time and place are included in the by-law.

4.0 NOISE IMPACT ASSESSMENT

4.1 Road Traffic

For road traffic noise, the sound levels in terms of Leq, the energy equivalent continuous sound levels for both day (16 hours) and night (8 hours), were predicted using ORNAMENT, the MOE Traffic Noise Prediction Model for road traffic.

The topography between the source and the receiver has been taken into account. Shielding provided by the proposed buildings has also been accounted for in the analysis.

Where applicable, the sound levels were calculated using an absorption coefficient of 0.33 to account for the reduced absorption of the ground. This absorption coefficient is often used where there is a combination of acoustically reflective and absorptive areas of ground.

Table 2 provides a summary of predicted sound levels due to road traffic at selected locations without any mitigative measures. Appendix C gives sample calculations.

For Lot 1, flanking McKay Road West, the daytime and nighttime unmitigated sound levels are predicted to be 68 dBA and 61 dBA, respectively at the side wall. The unmitigated sound level in the rear yard is predicted to be 65 dBA.

Where the sound level limits are expected to be exceeded, mitigative measures and warning clauses are required.

4.2 Stationary Sources

As mentioned in Section 2.2, any potential noise sources regarding the residential/outdoor storage uses are not expected to be acoustically significant at the subject site and were not considered further. Further assessment of these potential noise sources should be conducted at the time of the detailed report to confirm no changes to this conclusion.

Future school and recreational centre are proposed within the proposed development. Detailed information regarding noise sources associated with the proposed school and recreational centre are not available at this stage of the project. Once the specific information is determined and the site plan is available, a detailed noise analysis should be prepared by the proponent of the school/recreational centre to ensure that the applicable guidelines are met at the proposed Phase 2 south plan mixed-use development.

5.0 NOISE ABATEMENT REQUIREMENTS

The noise mitigation requirements for both the indoor and outdoor locations are detailed below. Table 3 and Figure 2 provide a summary of the acoustical mitigative requirements for the residential units in this development.

5.1 Transportation Sources

5.1.1 Indoors

As required, indoor sound level criteria for road traffic can be achieved in all cases by using appropriate architectural elements for external walls, windows, exterior doors, and roof construction. The indoor limit for road traffic noise is 40 dBA for the bedrooms during nighttime hours and 45 dBA for the living/dining rooms during daytime and nighttime hours, as well as for bedrooms during daytime hours. These criteria have been used in this analysis. The characteristic spectrum for road traffic has been accounted for in the determination of the architectural components. Appendix D contains a sample calculation of the architectural component selection.

In determining the architectural requirements, it is assumed that the bedroom located on the second floor will be the worst case room receptor because the day/night traffic split results in more than 5 dBA difference between the predicted daytime and nighttime sound levels. This difference is more than the difference between the MOE indoor criteria for road traffic for daytime and nighttime hours; therefore, the bedroom with calculated daytime sound level was used for the analysis. For the dwellings that are flanking the roadways, the exterior walls would be 55% of the associated floor area; the windows would be 25% of the associated floor area.

The worst case location is Lot 1, flanking McKay Road West having a corner bedroom. Based on the analysis, windows need to be up to STC 29 and exterior walls need to be up to STC 37. An STC rating of 29 for windows and exterior doors may necessitate an upgrade above standard construction practices; an STC rating of 37 for exterior walls is typically satisfied by using construction which complies with the minimum structural and safety requirements of standard construction

Once the architectural plans have been finalized, the requirements should be revisited to ensure compliance with the applicable indoor sound level limits.

An STC 54 rating for the roof, normally met by most residential roof constructions with ventilated attic space, would be acoustically acceptable.

Where the sound level from road traffic is greater than 60 dBA (at night) at the outside face of a living room or bedroom window or greater than 65 dBA (during the day) on the outside face of a living room or bedroom window, the indoor noise criteria would not be met with open windows and provisions must be made to permit the windows to remain closed. The MOE requires central air conditioning and a warning clause. Lot 1, flanking McKay Road West, require mandatory air conditioning and warning clauses.

Where the sound level limit is exceeded by 1 dB to 10 dB (i.e. LeqNight greater than 50 dBA to less than or equal to 60 dBA and LeqDay greater than 55 dBA to less than or equal to 65 dBA), the provision for adding central air conditioning by the occupants and a warning clause is required. Lots 2 to 10 require the provision for adding central air conditioning and warning clauses.

The outdoor air conditioning condensing units must also meet the applicable sound level limits (AHRI sound rating of 7.6 bels) and be sited in accordance with the City of Barrie's zoning by-laws.

Warning clauses will also be required to be placed in offers of purchase and sale, lease agreements and included in the subdivision development agreement for all relevant lots/blocks (units) to make future occupants aware of the potential noise situation.

5.1.2 Outdoors

The outdoor amenity area is required to be exposed to sound levels of no more than 55 dBA during the day. A 5 dB increase is considered acceptable in certain situations. Typically, if the sound level is above 55 dBA, some form of mitigation and a warning clause are needed.

Sound barrier requirements are given in Table 3 and discussed below.

For Lot 1 flanking McKay Road West, a rear yard daytime predicted sound level of less than 55 dBA is predicted to be achieved with the installation of a 3.5m high acoustic barrier along the side and rear property lines. This would require the installation of a buffer block along McKay Road. The installation of a 2.4 m high acoustic fence along the side and rear property line would achieve a predicted mitigated rear yard sound level of less than 59 dBA. The acoustic barrier is to return to the side wall of the dwelling and would also need to extend along the rear property line of Lot 2.

The location and height of the required acoustic barrier is shown on Figure 2. A sample calculation of the sound barrier analysis is enclosed as Appendix E.

The final sound barrier configurations will be determined once detailed grading plans are available.

Generally, if a sound barrier is to be used, the sound barrier may be a fence, made of any one or a combination of various materials, berm, or a berm/fence combination. The sound barrier should be of continuous construction, with no gaps and should have a minimum surface density of 20 kg/m² or more. Appropriate treatment of the sound barrier at all discontinuities and points of termination would be required to ensure that the sound barrier is effective. This would involve extending the sound barrier to the front property line; returning to the side wall of the house or extending the sound barrier for a minimum of three times the distance between the side wall and the sound barrier, past the rear wall of the house. An acoustic gate of 20 kg/m² is very heavy. Therefore, if a gate is required, provided that it is of continuous construction with no gaps between the boards, it may have a surface density of between 10 kg/m² and 20 kg/m². In addition, any gaps at the bottom of the gate should be kept to a minimal height.

Gaps at the bottom of the acoustic fence are discouraged. If drainage gaps are necessary, special design techniques to create interrupted line of sight under the acoustic fence are required.

Where an excess will remain or where mitigation is required, a warning clause should be placed in offers of purchase and sale or lease agreements and the development agreement.

6.0 CONCLUSIONS

With the incorporation of the items discussed (see Table 3, Notes to Table 3 and Figure 2), the sound levels will be within the appropriate environmental noise criteria. In accordance with City and Ministry implementation guidelines, where mitigation is required, future occupants will be advised through the use of warning clauses.

A detailed environmental noise report will need to be prepared once a final site plan and grading plan are available to ensure the applicable environmental noise criteria are achieved.

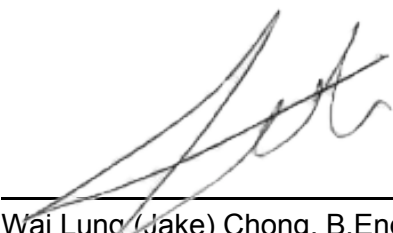
Prior to issuance of building permits, the acoustical requirements should be reviewed by a qualified acoustical engineer to ensure compliance with the applicable guidelines.

Prior to issuance of occupancy permits, a qualified acoustical engineer shall confirm that the acoustical requirements are in compliance with the noise report.

Once information becomes available for the proposed school and recreational centre blocks within the site, a noise report should be completed by a qualified acoustical engineer to ensure that the sound level limits will be achieved.

Respectfully submitted,

JADE ACOUSTICS INC.

Per: 
Wai Lung (Jake) Chong, B.Eng., E.I.T.

Per: 
Chris B Kellar, P.Eng.



JC/CK/jg
J:\Reports\15-121-02 Jul 13-22 Watersand Phase 2 South Plan (PENR).doc

7.0 REFERENCES

1. “Model Municipal Noise Control By-Law” Final Report, by the Ontario Ministry of the Environment, August, 1978.
2. “ORNAMENT – Ontario Road Noise Analysis Method for Environment and Transportation”, Ontario Ministry of the Environment, October, 1989.
3. “Building Practice Note No. 56: Controlling Sound Transmission into Buildings”, by J.D. Quirt, Division of Building Research, National Research Council of Canada, September, 1985.
4. “Environmental Noise Guideline Stationary and Transportation Sources – Approval and Planning”, Ontario Ministry of the Environment and Climate Change, Publication NPC-300, August, 2013 (updated final version # 22).
5. “Impulse Vibration in Residential Buildings”, Ontario Ministry of the Environment Publication NPC-207 (Draft), November, 1983.
6. City of Barrie Noise Control By-law Number 2006-140, June 12, 2006.
7. City of Barrie Comprehensive Zoning By-law Number 2009-141, August 10, 2009.

TABLE 1

PROPOSED MIXED-USE DEVELOPMENT

WATERSAND PHASE 2

SOUTH PLAN

CITY OF BARRIE

SUMMARY OF ROAD TRAFFIC DATA

Road	McKay Road West	Street “2”	“IIP Street F”
Ultimate AADT*	22,780**	1,120**	3,060**
Speed (km/hr)	80	40***	40***
Medium Trucks (%)	1.5	1	1
Heavy Trucks (%)	1.5	1	1
Day/Night Split (%)	90/10***	90/10***	90/10***

* Ultimate AADT: Average Annual Daily Traffic (2031).

** Calculated based on traffic data provided to Jade Acoustics Inc.

*** Assumed.

TABLE 2
PROPOSED MIXED-USE DEVELOPMENT
WATERSAND PHASE 2
SOUTH PLAN
CITY OF BARRIE

SUMMARY OF PREDICTED SOUND LEVELS
OUTDOORS DUE TO ROAD TRAFFIC

Lot	Location*	Source	Distance (m)	Leq (dBA)	
				Day	Night
Lot 1	Side Wall	McKay Road West	22	68	61
	Rear Yard	McKay Road West	26	65	--

* Rear yard location taken 3 m from rear wall and 1.5 m above grade. Wall location taken at 4.5 m above grade for the second floor.

TABLE 3

PROPOSED MIXED-USE DEVELOPMENT

WATERSAND PHASE 2

SOUTH PLAN

CITY OF BARRIE

SUMMARY OF MINIMUM NOISE ABATEMENT MEASURES

Lots and Blocks (Units)	Air Conditioning⁽¹⁾	Exterior Wall ^{(2)*}	Window STC Rating ^{(3)*}	Acoustic Barrier⁽⁴⁾	Warning Clause⁽⁵⁾
Lot 1	Mandatory	STC 37	STC 29	2.4 m**	A, B, D, E
Lot 2	Provision for Adding	Standard	Standard	2.4 m**	A, C, D, E
Lots 3 to 10	Provision for Adding	Standard	Standard	No	A, C, E
Lots 11 to 19, 181 and 182, 186 to 191, and Blocks 183 to 185 (all units).	No Acoustical Requirements				E
All other Lots and Blocks (units)	No Acoustical Requirements				

* Based on preliminary calculations. See Section 5.1.1 for details.

** 2.4 m high acoustic fence. See Section 5.1.2 and Figure 2 for details.

See Notes to Table 3 on following pages and Figure 2 for details.

NOTES TO TABLE 3

1. Means must be provided to allow windows to remain closed for noise control purposes. For all air cooled condenser units, the AHRI sound rating must not exceed 7.6 bels. The air cooled condenser units shall be placed in a noise insensitive location which complies with municipal by-laws.

Provision for adding central air conditioning would involve a ducted heating system sized to accommodate the addition of central air conditioning by the occupant at a later date. The air cooled condenser unit AHRI sound rating must not exceed 7.6 bels and should be placed in a noise insensitive location which complies with municipal by-laws.

2. STC – Sound Transmission Class Rating (Reference ASTM-E413). Values shown are based on preliminary calculations using standard assumptions. See text for details.
3. STC – Sound Transmission Class Rating (Reference ASTM-E413). Values shown are based on preliminary calculations using standard assumptions. See text for details. A sliding glass walkout door should be considered as a window and be included in the percentage of glazing.
4. Sound barriers must be of solid construction with no gaps and have a minimum surface density of 20kg/m^2 . Earthen berms, solid walls/fences of adequate density or combinations of berms and walls/fences may be used. An acoustic gate with a density of less than 20kg/m^2 will be acceptable provided the minimum surface density is greater than 10kg/m^2 .
5. Suggested warning clauses to be included in the subdivision agreement and to be included in offers of purchase and sale or lease agreements on designated lots and blocks (units):

A. "Purchasers/tenants are advised that despite the inclusion of noise control features in this development area and within the building units, noise due to increasing road traffic may continue to be of concern, occasionally interfering with some activities of the dwelling occupants as the noise level may exceed the noise criteria of the Municipality and the Ministry of the Environment, Conservation and Parks. I the purchaser hereby agree to place this clause in all subsequent offers of purchase and sale when I sell the property."

B. "Purchasers/tenants are advised that this dwelling unit was fitted with a forced air heating system including a central air conditioning system in order to permit closing of windows for noise control. (Note: locate air cooled condenser unit in a noise insensitive area and ensure the unit has an AHRI sound rating not exceeding 7.6 bels.)

C. "Purchasers/tenants are advised that this dwelling unit was fitted with a forced air heating system and the ducting, etc. sized to accommodate central air conditioning unit. Air conditioning can be installed at the owners' option and costs. (Note: locate air cooled condenser unit in a noise insensitive area and ensure the unit has an AHRI sound rating not exceeding 7.6 bels)."

D. "Purchasers/tenants are advised that the acoustical berm and/or barrier as installed shall be maintained, repaired or replaced by the owner. Any maintenance, repair or replacement shall be with the same material, to the same standards, and have the same colour and appearance as the original."

E. "Purchasers/tenants are advised that the dwelling unit is in proximity to a future recreational facility, whose activities may at times be audible."

6. Conventional ventilated attic roof construction meeting typical construction techniques is satisfactory in all cases.



N.T.S

**Proposed Mixed-Use Development
Watersand – Phase 2 South
City of Barrie**

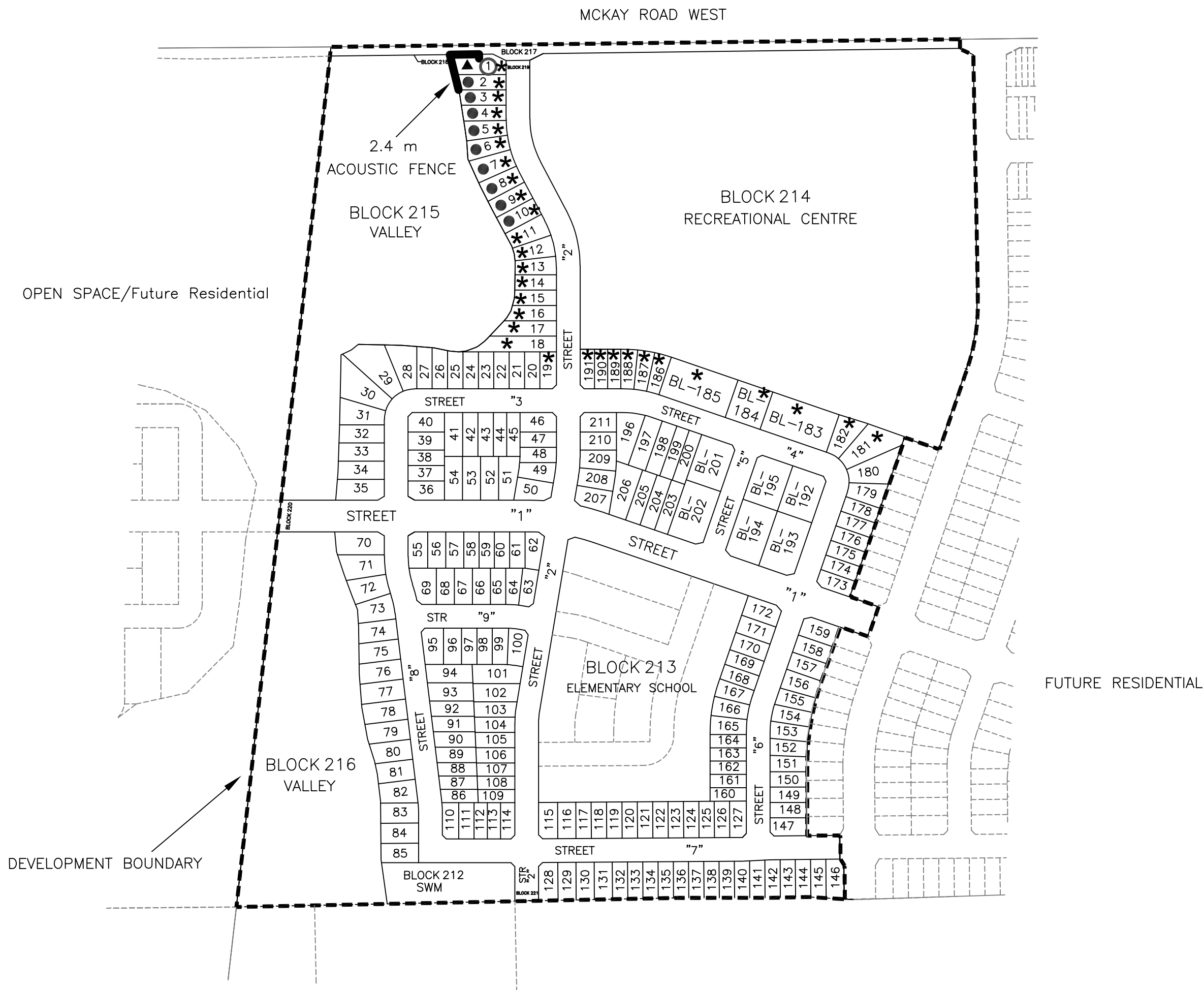
Date: July 2022

File: 15-121-02

KEY PLAN

FIGURE 1





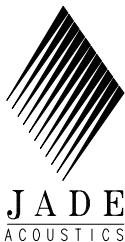
Legend:

- Analyzed Locations
- ▲ Mandatory Central Air Conditioning and Warning Clause (See text, Table 3 and Notes to Table 3 for details)
- Provision for Adding Central Air Conditioning and Warning Clause (See text, Table 3 and Notes to Table 3 for details)
- * Warning Clause E (See Table 3 and Notes to Table 3 for details)

N.T.S.

Proposed Mixed-Use Development
Watersand - Phase 2 South
City of Barrie

Date: July 2022 Our File: 15-121-02



JADE
ACOUSTICS

SITE PLAN SHOWING
NOISE ABATEMENT
MEASURES

FIGURE 2

APPENDIX A

CORRESPONDENCE REGARDING ROAD TRAFFIC DATA

Jake Chong

From: Maitham Dinani <maitham.dinani@jdengineering.ca>
Sent: June 30, 2022 2:37 PM
To: Michael Bechbach; John Northcote
Cc: Jacob Davis; Dalila Giusti; Alexa-Rae Valente; Paolo Sacilotto
Subject: RE: Watersand Phase 2 North/South - Request for Information (JAI Job #15-121-02 and -03)
Attachments: Draft Report (17122) - Watersand Ph 2 S - TIS (06 30 22).pdf

Hi Mike,

We do not have the traffic volumes for Phase 2 N ready. We will forward them as soon as they become available.

As requested, see attached our draft TIS for Phase 2 S.

Regards,

Maitham Dinani, P.Eng.

JD Engineering

Phone: (416) 727 3767



From: Michael Bechbach <michael@jadeacoustics.com>
Sent: Wednesday, June 29, 2022 2:17 PM
To: Maitham Dinani <maitham.dinani@jdengineering.ca>; John Northcote <john.northcote@jdengineering.ca>
Cc: Jacob Davis <jacob@jadeacoustics.com>; Dalila Giusti <dalila@jadeacoustics.com>; Alexa-Rae Valente <avalente@dgggroup.ca>; Paolo Sacilotto <PSacilotto@DGGroup.ca>
Subject: RE: Watersand Phase 2 North/South - Request for Information (JAI Job #15-121-02 and -03)

Hi Maitham,

Thank you for the figure.

Can you also please provide the information for the Phase 2 North development?

Additionally, as it has been some time since our original request for the TMC information, if the overall TIS for either or both developments are prepared, please provide in full for overall context.

Thank you.

Regards,

Mike Bechbach, P.Eng.

Figure 10 – Proposed Development Traffic Assignment – LI Permitted

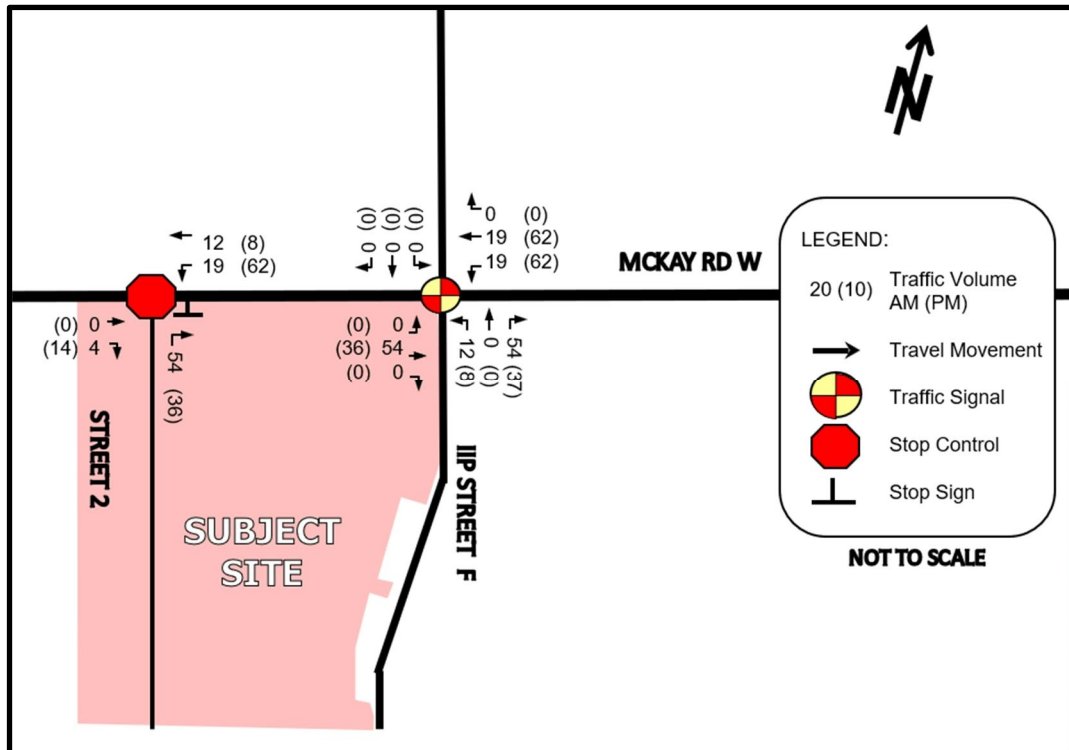
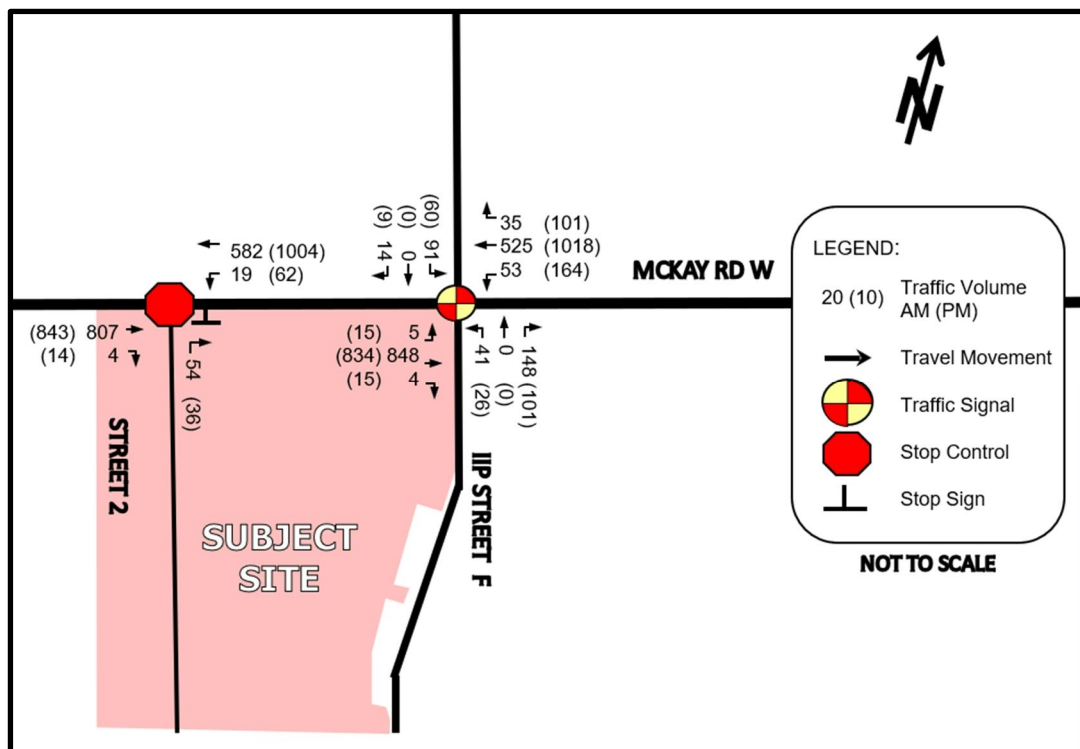


Figure 11 – Total (2041) Traffic Volumes – LI Permitted



6.0 SUPPLEMENTAL ANALYSIS – LOCAL ROADS AND COMMERCIAL ACCESSES LEFT-IN

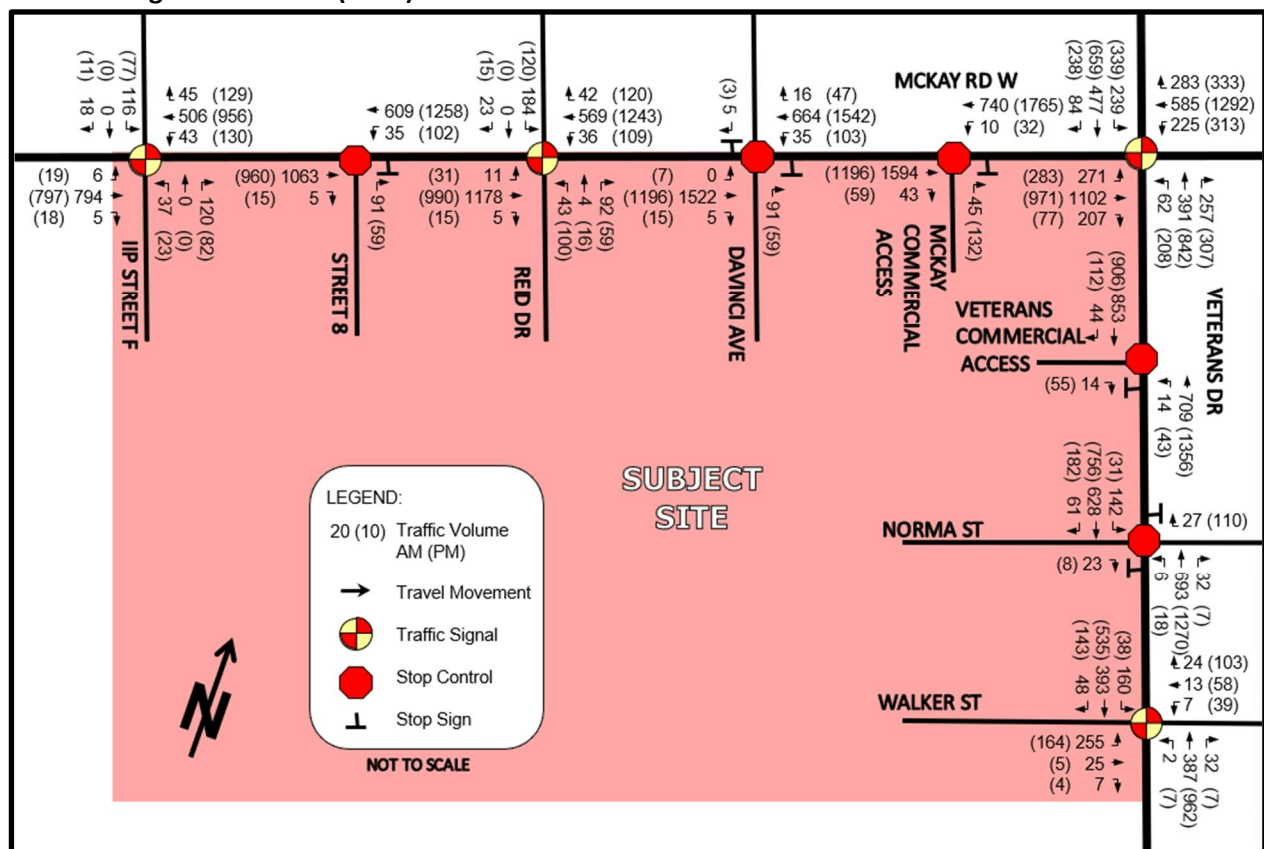
The City has requested all local roads and future commercial accesses from McKay Road West and Veteran's Drive to be limited to right-in-right-out accesses. This supplemental analysis has been provided to assess the impact of permitting left-in [LI] movements to the commercial accesses from McKay Road West and Veteran's Drive in addition to LI movements being permitted from McKay Road West and Veteran's Drive onto local roads Street 8, DaVinci Drive and Norma Street. The intent is to improve access into the Commercial Block while minimizing the impact on the local roads in the Watersand Development.

6.1 TOTAL (2041) TRAFFIC VOLUMES – LIs PERMITTED

The overall traffic assignment calculated in Table 9 in Section 4.2 will remain unchanged with the LI movements permitted at the commercial access and local roads; however, the distribution of traffic entering at each access location changes.

Using the traffic distribution patterns outlined in Table 9 in Section 4.2, the site traffic assignment for the subject site was recalculated for the AM and PM peak hour with LI movements permitted at the commercial accesses and local roads. **Figure 14** illustrates the revised traffic assignment.

Figure 14 – Total (2041) Traffic Volumes – Commercial and Local Road LI Permitted



Jake Chong

From: Justin MacDonald <Justin.MacDonald@barrie.ca>
Sent: April 12, 2022 9:19 PM
To: Michael Bechbach
Cc: Jake Chong
Subject: RE: Watersand Traffic Data Request (Jade File: 15-121-02 & 15-121-03)

Hi Mike,

The below information is still applicable.

For item #10, typically we would have the 24hr break down for classification for arterial roadways within the built up area of the City. However, the study area is green field development within a rural setting and these studies have not yet been completed as they would not accurately reflect the anticipated growth for the area.

I am happy to discuss further if you have recommendations for the 24hr break down.

Justin MacDonald, C.E.T., PTP
Project Delivery – Transportation Planning, Development Services
The City of Barrie
Mobile 705-734-8020
Please consider the environment before printing this email.

From: Michael Bechbach <michael@jadeacoustics.com>
Sent: Thursday, April 7, 2022 2:09 PM
To: Justin MacDonald <Justin.MacDonald@barrie.ca>
Cc: Jake Chong <jake@jadeacoustics.com>
Subject: RE: Watersand Traffic Data Request (Jade File: 15-121-02 & 15-121-03)

Hi Justin,

I hope this email finds you well.

Please see the below request for road traffic information and your associated response from a couple of years ago.

I kindly request your confirmation of the data at this time, should it remain valid. If the data is no longer valid for use in our noise report, please provide updated information accordingly.

For ease of reference, I have attached satellite imagery showing the relevant areas of interest for the respective roadways.

In clarification to item #10 in the below lists, while you have provided an overall daily volume, we are looking for detailed hourly ATR counts that can typically include vehicle classification information (but may not). If available, please provide from pre-2020 as to avoid any potential impact of the COVID-19 pandemic.

Thank you in advance, Justin. Please let me know if you have any questions on the request.

Regards,

Mike Bechbach, P.Eng.

Jade Acoustics Inc.
411 Confederation Parkway, Unit 19
Concord, Ontario
L4K 0A8
T: 905-660-2444
F: 905-660-4110
C: 647-628-6485
Email: michael@jadeacoustics.com
Website: www.jadeacoustics.com

From: Justin MacDonald [<mailto:Justin.MacDonald@barrie.ca>]
Sent: Thursday, May 14, 2020 11:24 AM
To: Kristofer Tassis <kris@jadeacoustics.com>
Cc: Michael Bechbache <michael@jadeacoustics.com>; Makarand Kaushik <makarand@jadeacoustics.com>; Dalila Giusti <dalila@jadeacoustics.com>
Subject: Re: Watersand Traffic Data Request (Jade File: 15-121-02 & 15-121-03)

Good morning,

As per your request:

If you need anything further information please let me know.

Essa Road

1. ultimate AADT (Average Annual Daily Traffic volume); - N/A
2. projected growth if available; 2% compounded yearly to a horizon year of 2041
3. number of lanes; - current cross section 2 lanes; Please refer to attached for future lane configuration attached.
4. percentage of trucks; 3%
5. ratio of medium trucks to heavy trucks; n/a
6. day/night traffic split; n/a
7. posted speed limit; 80km/h
8. gradient of the road; n/a
9. right-of-way width (R.O.W.) Please refer to attached for future lane configuration attached.
10. Existing 24 Hour by hour traffic counts (if available) - 6,000 vehicles per day
11. any other pertinent information.

Veterans

1. ultimate AADT (Average Annual Daily Traffic volume); N/A
2. projected growth if available; 4% compounded yearly to a horizon year of 2041
3. number of lanes; current 2 lanes - Please refer to attached for future lane configuration attached.
4. percentage of trucks; 3%
5. ratio of medium trucks to heavy trucks; n/a
6. day/night traffic split; n/a

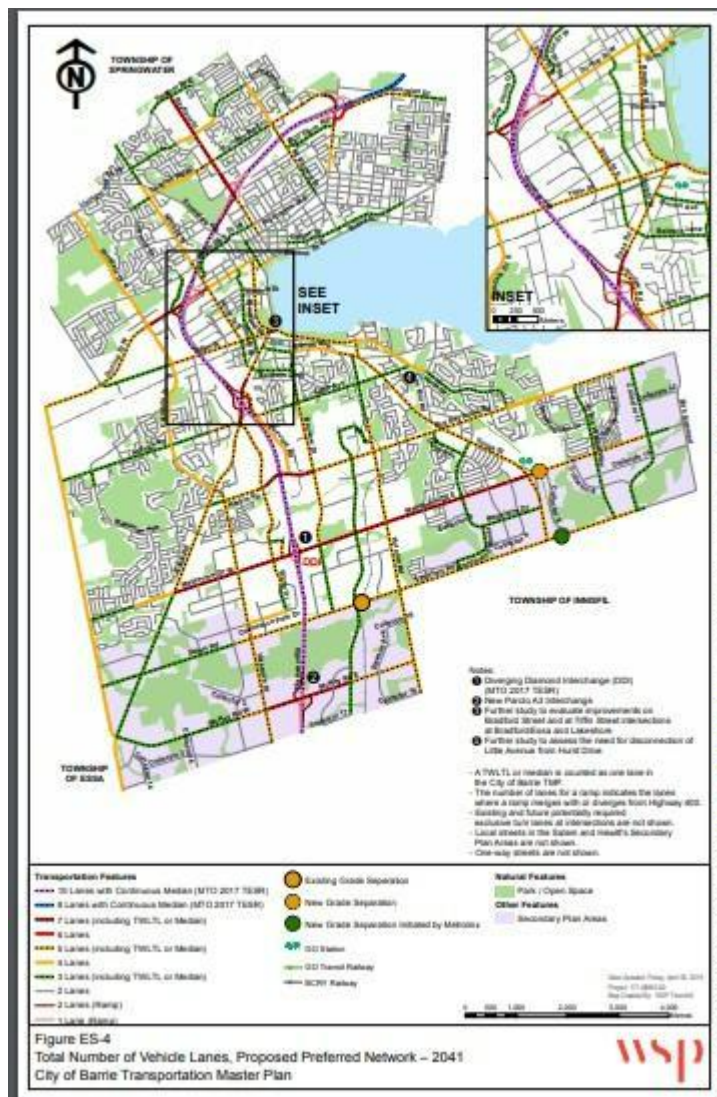
7. posted speed limit; 80km/h
8. gradient of the road;n/a
9. right-of-way width (R.O.W.) Please refer to attached for future lane configuration attached.
10. Existing 24 Hour by hour traffic counts (if available) - 9,000 vehicles per day
11. any other pertinent information.

Salem

1. ultimate AADT (Average Annual Daily Traffic volume); N/A
2. projected growth if available; 5% compounded yearly to a horizon year of 2041.
3. number of lanes; current 2 lanes - Please refer to attached for future lane configuration attached.
4. percentage of trucks; 3%
5. ratio of medium trucks to heavy trucks; n/a
6. day/night traffic split; n/a
7. posted speed limit; 80km/h
8. gradient of the road; n/a
9. right-of-way width (R.O.W.) - Please refer to attached future lane configuration attached.
10. Existing 24 Hour by hour traffic counts (if available) - 1,000 vehicles per day
11. any other pertinent information.

McKay

1. ultimate AADT (Average Annual Daily Traffic volume);N/A
2. projected growth if available; 5% growth rate
3. number of lanes; current 2 lanes - Please refer to the attached for future lane configuration
4. percentage of trucks; 3%
5. ratio of medium trucks to heavy trucks; n/a
6. day/night traffic split; n/a
7. posted speed limit; 80 km/h
8. gradient of the road; n/a
9. right-of-way width (R.O.W.) Please refer to the attached for future lane configuration
10. Existing 24 Hour by hour traffic counts (if available) - 2,000
11. any other pertinent information.



From: Kristofer Tassis <kris@jadeacoustics.com>

Sent: Thursday, April 30, 2020 3:00 PM

To: Justin MacDonald <Justin.MacDonald@barrie.ca>

Cc: Michael Bechbach <michael@jadeacoustics.com>; Makarand Kaushik <makarand@jadeacoustics.com>; Dalila Giusti <dalila@jadeacoustics.com>

Subject: re: Watersand Traffic Data Request (Jade File: 15-121-02 & 15-121-03)

Good Afternoon,

Jade Acoustics Inc. has been retained to prepare an Environmental Noise Report for a proposed residential development North of McKay Road, South of Salem Road, East of Essa Road, and West of Veterans Drive. As part of our analysis we require the below noted information for McKay Road, Veterans Drive, Essa Road, and Salem Road (if available).

Please see the attached map for additional clarification.

1. ultimate AADT (Average Annual Daily Traffic volume);

2. projected growth if available;
3. number of lanes;
4. percentage of trucks;
5. ratio of medium trucks to heavy trucks;
6. day/night traffic split;
7. posted speed limit;
8. gradient of the road;
9. right-of-way width (R.O.W.)
10. Existing 24 Hour by hour traffic counts (if available)
11. any other pertinent information.

Any information you could provide would be greatly appreciated.

Should you have any questions, please call.

Regards,

Kris Tassis, P.Eng.

Jade Acoustics Inc.

411 Confederation Parkway, Unit 19

Concord, Ontario

L4K 0A8

C: 416-460-2814

T: 905-660-2444

F: 905-660-4110

Email: kris@jadeacoustics.com

Website: www.jadeacoustics.com

APPENDIX B

ENVIRONMENTAL NOISE CRITERIA

ONTARIO MINISTRY OF THE ENVIRONMENT AND CLIMATE CHANGE (MOECC)

Reference: "Environmental Noise Guidelines Stationary and Transportation Sources – Approval and Planning", Publication NPC-300, August, 2013, released October 21, 2013 (updated final version # 22).

SOUND LEVEL CRITERIA FOR ROAD AND RAIL NOISE

TABLE C-1

Sound Level Limit for Outdoor Living Areas

Road and Rail

Time Period	L_{eq} (16) (dBA)
16 hr, 07:00 - 23:00	55

TABLE C-2

**Indoor Sound Level Limits
Road and Rail**

Type of Space	Time Period	L_{eq} (dBA)	
		Road	Rail
Living/dining, den areas of residences, hospitals, nursing homes, schools, daycare centres, etc.	07:00 – 23:00	45	40
Living/dining, den areas of residences, hospitals, nursing homes, etc. (except schools or daycare centres)	23:00 – 07:00	45	40
Sleeping quarters	07:00 – 23:00	45	40
	23:00 – 07:00	40	35

SOUND LEVEL CRITERIA FOR AIRCRAFT NOISE

TABLE C-3

Outdoor Aircraft Noise Limit

Time Period	NEF/NEP
24-hour	30

TABLE C-4

Indoor Aircraft Noise Limit (Applicable over 24-hour period)

Type of Space	Indoor NEF/NEP*
Living/dining/den areas of residences, hospitals, nursing/retirement homes, schools, daycare centres, etc.	5
Sleeping Quarters	0

* The indoor NEF/NEP values in Table C-4 are used to determine acoustical insulation requirements based on the NEF/NEP contour maps.

SOUND LEVEL CRITERIA FOR STATIONARY SOURCES

TABLE C-5

Exclusion Limit Values of One-Hour Equivalent Sound Level (L_{eq} , dBA) Outdoor Points of Reception

Time of Day	Class 1 Area	Class 2 Area	Class 3 Area	Class 4 Area
07:00 – 19:00	50	50	45	55
19:00 – 23:00	50	45	40	55

TABLE C-6

**Exclusion Limit Values of One-Hour Equivalent Sound Level (L_{eq} , dBA)
Plane of Window of Noise Sensitive Spaces**

Time of Day	Class 1 Area	Class 2 Area	Class 3 Area	Class 4 Area
07:00 – 19:00	50	50	45	60
19:00 – 23:00	50	50	40	60
23:00 – 07:00	45	45	40	55

TABLE C-7

**Exclusion Limit Values for Impulsive Sound Level (L_{LM} , dBA)
Outdoor Points of Reception**

Time of Day	Actual Number of Impulses in Period of One-Hour	Class 1 Area	Class 2 Area	Class 3 Area	Class 4 Area
07:00 – 23:00	9 or more	50	50	45	55
	7 to 8	55	55	50	60
	5 to 6	60	60	55	65
	4	65	65	60	70
	3	70	70	65	75
	2	75	75	70	80
	1	80	80	75	85

TABLE C-8

**Exclusion Limit Values of Impulsive Sound Level (L_{LM} , dBAI)
Plane of Window - Noise Sensitive Spaces (Day/Night)**

Actual Number of Impulses in Period of One-Hour	Class 1 Area (07:00-23:00)/ (23:00-07:00)	Class 2 Area (07:00-23:00)/ (23:00-07:00)	Class 3 Area (07:00-19:00)/ (19:00-07:00)	Class 4 Area (07:00-23:00)/ (23:00-07:00)
9 or more	50/45	50/45	45/40	60/55
7 to 8	55/50	55/50	50/45	65/60
5 to 6	60/55	60/55	55/50	70/65
4	65/60	65/60	60/55	75/70
3	70/65	70/65	65/60	80/75
2	75/70	75/70	70/65	85/80
1	80/75	80/75	75/70	90/85

SUPPLEMENTARY SOUND LEVEL LIMITS

Indoor limits for transportation sources applicable to noise sensitive land uses are specified in Table C-2 and Table C-4. Table C-9 and Table C-10 are expanded versions of Table C-2 and Table C-4, and present guidelines for acceptable indoor sound levels that are extended to land uses and developments which are not normally considered noise sensitive. The specified values are maximum sound levels and apply to the indicated indoor spaces with the windows and doors closed. The sound level limits in Table C-9 and Table C-10 are presented as information, for good-practice design objectives.

TABLE C-9

**Supplementary Indoor Sound Level Limits
Road and Rail**

Type of Space	Time Period	L _{eq} (Time Period) (dBA)	
		Road	Rail
General offices, reception areas, retail stores, etc.	16 hours between 07:00 – 23:00	50	45
Living/dining areas of residences, hospitals, schools, nursing/retirement homes, daycare centres, theatres, places of worship, libraries, individual or semi-private offices, conference rooms, reading rooms, etc.	16 hours between 07:00 – 23:00	45	40
Sleeping quarters of hotels/motels	8 hours between 23:00 – 07:00	45	40
Sleeping quarters of residences, hospitals, nursing/retirement homes, etc.	8 hours between 23:00 – 07:00	40	35

TABLE C-10

**Supplementary Indoor Aircraft Noise Limit
(Applicable over 24-hour period)**

Type of Space	Indoor NEF/NEP*
General offices, reception areas, retail stores, etc.	15
Individual or semi-private offices, conference rooms, etc.	10
Living/dining areas of residences, sleeping quarters of hotels/motels, theatres, libraries, schools, daycare centres, places of worship, etc.	5
Sleeping quarters of residences, hospitals, nursing/retirement homes, etc.	0

* The indoor NEF/NEP values in Table C-10 are not obtained from NEF/NEP contour maps. The values are representative of the indoor sound levels and are used as assessment criteria for the evaluation of acoustical insulation requirements.

APPENDIX C

SAMPLE CALCULATION OF PREDICTED SOUND LEVELS

APPENDIX C-1
SAMPLE CALCULATION OF PREDICTED SOUND LEVELS

FILE: 15-121-02
NAME: Watersand Phase 2 South Plan
REFERENCE DRAWINGS: Concept Site Plan
LOCATION: Lot 1, second storey, side wall

Noise Source:	McKay Road West
Time Period:	16 hr. (day)
Segment Angle:	-90 to 90
Distance (m):	21.50

CALCULATION OF SOUND LEVELS*

Reference Leq (dBA)*:	71.40
Distance Correction (dBA):	-2.47
Finite Element Correction (dBA):	-1.32
Allowance for Screening (dBA):	0.00
Allowance for Future Growth (dBA):	incl.

LeqDay (dBA):	67.61
Combined LeqDay (dBA)	67.61

* Leq determined using the computerized model of the Ministry of the Environment and Climate Change Noise Assessment Guidelines, STAMSON Version 5.04 (ORNAMENT). See attached printouts.

APPENDIX C-2

SAMPLE CALCULATION OF PREDICTED SOUND LEVELS

FILE: 15-121-02
 NAME: Watersand Phase 2 South Plan
 REFERENCE DRAWINGS: Concept Site Plan
 LOCATION: Lot 1, second storey, side wall

Noise Source:	McKay Road West
Time Period:	8 hr. (night)
Segment Angle:	-90 to 90
Distance (m):	21.50

CALCULATION OF SOUND LEVELS*

Reference Leq (dBA)*:	64.86
Distance Correction (dBA):	-2.47
Finite Element Correction (dBA):	-1.32
Allowance for Screening (dBA):	0.00
Allowance for Future Growth (dBA):	incl.

LeqNight (dBA):	61.06
Combined LeqNight (dBA)	61.06

* Leq determined using the computerized model of the Ministry of the Environment and Climate Change Noise Assessment Guidelines, STAMSON Version 5.04 (ORNAMENT). See attached printouts.

Filename: lot1br.te **Time Period:** Day/Night 16/8 hours
Description: Lot 1 Building requirement

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

```
-----
Car traffic volume : 19887/2210 veh/TimePeriod *
Medium truck volume : 308/34 veh/TimePeriod *
Heavy truck volume : 308/34 veh/TimePeriod *
Posted speed limit : 80 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): 22780
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 1.50
Heavy Truck % of Total Volume : 1.50
Day (16 hrs) % of Total Volume : 90.00
```

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

```
-----
Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 21.50 / 21.50 m
Receiver height : 4.50 / 4.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00
```

Results segment # 1: MCKAY (day)

Source height = 1.11 m

ROAD (0.00 + 67.61 + 0.00) = 67.61 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.58	71.40	0.00	-2.47	-1.32	0.00	0.00	0.00	67.61

Segment Leq : 67.61 dBA

Total Leq All Segments: 67.61 dBA

Results segment # 1: MCKAY (night)

Source height = 1.11 m

ROAD (0.00 + 61.06 + 0.00) = 61.06 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.58	64.86	0.00	-2.47	-1.32	0.00	0.00	0.00	61.06

Segment Leq : 61.06 dBA

Total Leq All Segments: 61.06 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 67.61
(NIGHT): 61.06

APPENDIX C-3

SAMPLE CALCULATION OF PREDICTED SOUND LEVEL

FILE: 15-121-02
 NAME: Watersand Phase 2 South Plan
 REFERENCE DRAWINGS: Concept Site Plan
 LOCATION: Lot 1, rear yard

Noise Source:	McKay Road West	McKay Road West
Time Period:	16 hr. (day)	16 hr. (day)
Segment Angle:	-90 to -43	-43 to 32
Distance (m):	26.35	26.35

CALCULATION OF SOUND LEVELS*

Reference Leq (dBA)*:	71.40	71.40
Distance Correction (dBA):	-3.25	-4.06
Finite Element Correction (dBA):	-7.42	-4.03
Allowance for Screening (dBA):	0.00	0.00
Allowance for Future Growth (dBA):	incl.	incl.
LeqDay (dBA):	60.73	63.32
Combined LeqDay (dBA)	65.23	

* Leq determined using the computerized model of the Ministry of the Environment and Climate Change Noise Assessment Guidelines, STAMSON Version 5.04 (ORNAMENT). See attached printouts.

Filename: lotlry.te Time Period: Day 16hours
Description: Lot 1 Rear yard

Road data, segment # 1: MCKAY (day)

Car traffic volume : 19887 veh/TimePeriod *
Medium truck volume : 308 veh/TimePeriod *
Heavy truck volume : 308 veh/TimePeriod *
Posted speed limit : 80 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): 22780
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 1.50
Heavy Truck % of Total Volume : 1.50
Day (16 hrs) % of Total Volume : 90.00

Data for Segment # 1: MCKAY (day)

Angle1 Angle2 : -90.00 deg -43.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 26.35 m
Receiver height : 1.50 m
Topography : 0 (Define your own alpha.)
Barrier angle1 : -90.00 deg Angle2 : -43.00 deg
Barrier height : 0.01 m
Barrier receiver distance : 9.00 m
Source elevation : 0.00 m
Receiver elevation : 0.50 m
Barrier elevation : 0.00 m
Alpha : 0.33
Reference angle : 0.00

Road data, segment # 2: MCKAY (day)

Car traffic volume : 19887 veh/TimePeriod *
Medium truck volume : 308 veh/TimePeriod *
Heavy truck volume : 308 veh/TimePeriod *
Posted speed limit : 80 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): 22780
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 1.50
Heavy Truck % of Total Volume : 1.50
Day (16 hrs) % of Total Volume : 90.00

Data for Segment # 2: MCKAY (day)

```

-----
Angle1   Angle2           : -43.00 deg   32.00 deg
Wood depth      :           0           (No woods.)
No of house rows :           0
Surface         :           1           (Absorptive ground surface)
Receiver source distance : 26.35 m
Receiver height  :           1.50 m
Topography      :           2           (Flat/gentle slope; with barrier)
Barrier angle1   : -43.00 deg   Angle2 : 32.00 deg
Barrier height   :           0.01 m
Barrier receiver distance : 9.00 m
Source elevation :           0.00 m
Receiver elevation :           0.50 m
Barrier elevation :           0.00 m
Reference angle  :           0.00
  
```

Results segment # 1: MCKAY (day)

Source height = 1.11 m

Barrier height for grazing incidence

```

-----
Source      ! Receiver      ! Barrier      ! Elevation of
Height (m) ! Height (m) ! Height (m) ! Barrier Top (m)
-----+-----+-----+-----
          1.11 !          1.50 !          1.70 !          1.70
  
```

ROAD (0.00 + 60.73 + 0.00) = 60.73 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	-43	0.33	71.40	0.00	-3.25	-7.42	0.00	0.00	-0.72	60.01*
-90	-43	0.33	71.40	0.00	-3.25	-7.42	0.00	0.00	0.00	60.73

* Bright Zone !

Segment Leq : 60.73 dBA

Results segment # 2: MCKAY (day)

Source height = 1.11 m

Barrier height for grazing incidence

```

-----
Source      ! Receiver      ! Barrier      ! Elevation of
Height (m) ! Height (m) ! Height (m) ! Barrier Top (m)
-----+-----+-----+-----
          1.11 !          1.50 !          1.70 !          1.70
  
```

ROAD (0.00 + 63.32 + 0.00) = 63.32 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-43	32	0.66	71.40	0.00	-4.06	-4.03	0.00	0.00	0.00	63.32*
-43	32	0.66	71.40	0.00	-4.06	-4.03	0.00	0.00	0.00	63.32

* Bright Zone !

Segment Leq : 63.32 dBA

Total Leq All Segments: 65.23 dBA

APPENDIX D

SAMPLE CALCULATION OF ARCHITECTURAL COMPONENT SELECTION

APPENDIX D-1

SAMPLE CALCULATION OF ARCHITECTURAL COMPONENT SELECTION*

FILE: 15-121-02

NAME: Watersand Phase 2 South Plan

REFERENCE DRAWINGS: Concept Site Plan

LOCATION: Lot 1, second storey corner bedroom (daytime)

ROAD

Wall area as a percentage of floor area:	Side:	55%
	Front:	55%

Window area as a percentage of floor area:	Side:	25%
	Front:	25%

Number of components: 4

Outdoor Leq:	Side:	68 (+3 for reflections) = 71 dBA
	Front:	65 (+3 for reflections) = 68 dBA

Indoor Leq: 45

Noise Reduction (dBA):	Side:	26
	Front:	23

Noise Spectrum:	Mixed Road Traffic	Angle Correction: 0
-----------------	--------------------	---------------------

Absorption:	Medium
-------------	--------

APPROPRIATE ELEMENTS

		Configuration	STC Rating
Wall	Side	Standard	STC 37
	Front	Standard	STC 34
Window	Side	Standard	STC 29
	Front	Standard	STC 26

* Based upon "Controlling Sound Transmission into Buildings", Building Practice Note 56 by National Research Council of Canada, September, 1985.

APPENDIX E

SAMPLE CALCULATION OF SOUND BARRIER ANALYSIS

Filename: lotlry.te Time Period: Day 16hours
Description: Lot 1 Rear yard

Road data, segment # 1: MCKAY (day)

Car traffic volume : 19887 veh/TimePeriod *
Medium truck volume : 308 veh/TimePeriod *
Heavy truck volume : 308 veh/TimePeriod *
Posted speed limit : 80 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): 22780
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 1.50
Heavy Truck % of Total Volume : 1.50
Day (16 hrs) % of Total Volume : 90.00

Data for Segment # 1: MCKAY (day)

Angle1 Angle2 : -90.00 deg -43.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 26.35 m
Receiver height : 1.50 m
Topography : 0 (Define your own alpha.)
Barrier angle1 : -90.00 deg Angle2 : -43.00 deg
Barrier height : 0.01 m
Barrier receiver distance : 9.00 m
Source elevation : 0.00 m
Receiver elevation : 0.50 m
Barrier elevation : 0.00 m
Alpha : 0.33
Reference angle : 0.00

Road data, segment # 2: MCKAY (day)

Car traffic volume : 19887 veh/TimePeriod *
Medium truck volume : 308 veh/TimePeriod *
Heavy truck volume : 308 veh/TimePeriod *
Posted speed limit : 80 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): 22780
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 1.50
Heavy Truck % of Total Volume : 1.50
Day (16 hrs) % of Total Volume : 90.00

Data for Segment # 2: MCKAY (day)

```

-----
Angle1   Angle2           : -43.00 deg   32.00 deg
Wood depth           :      0           (No woods.)
No of house rows     :      0
Surface              :      1           (Absorptive ground surface)
Receiver source distance : 26.35 m
Receiver height       :      1.50 m
Topography           :      2           (Flat/gentle slope; with barrier)
Barrier angle1        : -43.00 deg   Angle2 : 32.00 deg
Barrier height        :      0.01 m
Barrier receiver distance : 9.00 m
Source elevation      :      0.00 m
Receiver elevation    :      0.50 m
Barrier elevation     :      0.00 m
Reference angle       :      0.00
  
```

Results segment # 1: MCKAY (day)

Source height = 1.11 m

Barrier height for grazing incidence

```

-----
Source      ! Receiver    ! Barrier      ! Elevation of
Height (m) ! Height (m) ! Height (m) ! Barrier Top (m)
-----+-----+-----+-----
          1.11 !          1.50 !          1.70 !          1.70
  
```

ROAD (0.00 + 60.73 + 0.00) = 60.73 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	-43	0.33	71.40	0.00	-3.25	-7.42	0.00	0.00	-0.72	60.01*
-90	-43	0.33	71.40	0.00	-3.25	-7.42	0.00	0.00	0.00	60.73

* Bright Zone !

Segment Leq : 60.73 dBA

Results segment # 2: MCKAY (day)

Source height = 1.11 m

Barrier height for grazing incidence

```

-----
Source      ! Receiver    ! Barrier      ! Elevation of
Height (m) ! Height (m) ! Height (m) ! Barrier Top (m)
-----+-----+-----+-----
          1.11 !          1.50 !          1.70 !          1.70
  
```

ROAD (0.00 + 63.32 + 0.00) = 63.32 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-43	32	0.66	71.40	0.00	-4.06	-4.03	0.00	0.00	0.00	63.32*
-43	32	0.66	71.40	0.00	-4.06	-4.03	0.00	0.00	0.00	63.32

* Bright Zone !

Segment Leq : 63.32 dBA

Total Leq All Segments: 65.23 dBA

Barrier table for segment # 1: MCKAY (day)

Barrier Height	Elev of Barr Top	Road dBA	Tot Leq dBA
!	!	!	!
-----	-----	-----	-----
1.80	1.80	55.71	55.71
1.90	1.90	55.66	55.66
2.00	2.00	55.57	55.57
2.10	2.10	55.46	55.46
2.20	2.20	55.31	55.31
2.30	2.30	55.15	55.15
2.40	2.40	54.96	54.96
2.50	2.50	54.76	54.76
2.60	2.60	54.54	54.54
2.70	2.70	54.31	54.31
2.80	2.80	54.07	54.07
2.90	2.90	53.83	53.83
3.00	3.00	53.59	53.59
3.10	3.10	53.34	53.34
3.20	3.20	53.10	53.10
3.30	3.30	52.85	52.85
3.40	3.40	52.61	52.61
3.50	3.50	52.37	52.37
3.60	3.60	52.14	52.14
3.70	3.70	51.91	51.91

Barrier table for segment # 2: MCKAY (day)

Barrier Height	Elev of Barr Top	Road dBA	Tot Leq dBA
!	!	!	!
-----	-----	-----	-----
1.80	1.80	58.54	58.54
1.90	1.90	58.43	58.43
2.00	2.00	58.24	58.24
2.10	2.10	57.99	57.99
2.20	2.20	57.68	57.68
2.30	2.30	57.32	57.32
2.40	2.40	56.92	56.92
2.50	2.50	56.49	56.49
2.60	2.60	56.04	56.04
2.70	2.70	55.57	55.57
2.80	2.80	55.11	55.11
2.90	2.90	54.64	54.64
3.00	3.00	54.17	54.17
3.10	3.10	53.72	53.72
3.20	3.20	53.27	53.27
3.30	3.30	52.83	52.83
3.40	3.40	52.40	52.40
3.50	3.50	51.99	51.99
3.60	3.60	51.60	51.60
3.70	3.70	51.21	51.21

Combined Leq (Day) with a 2.4 m high acoustic barrier = 59.06 dBA