

Environmental Noise Feasibility Study

55 Port Street East

Proposed Residential Development

City of Mississauga

March 6, 2018
Project 117-0597

Prepared for

FRAM Group

Prepared by



Ryan Trinh, B.A.Sc., EIT

Reviewed by



Guangsheng (Sam) Du, M.Sc., P.Eng.

VALCOUSTICS

Canada Ltd.

Revision History

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City of Mississauga

EXECUTIVE SUMMARY

Valcoustics Canada Ltd. (VCL) was retained to prepare an Environmental Noise Feasibility Study in support the Official Plan Amendment and Re-zoning application to the City of Mississauga. The development will consist of one 10-storey condominium building with one underground parking level.

The significant sources of transportation noise in the vicinity are road traffic on Lakeshore Road West, St Lawrence Drive, as well as rail traffic on the Canadian National Railway (CN/GO) Oakville Subdivision. The significant sources of stationary noise are to the east, associated with the mechanical equipment at the existing residential developments.

The sound levels on site have been determined and compared with the applicable Ministry of the Environment and Climate Change (MOE) and Region of Peel noise guideline limits to determine the need for noise mitigation.

To meet the applicable transportation noise source guideline limits:

- All dwelling units require mandatory central air conditioning.
- Upgraded exterior walls with a Sound Transmission Class (STC) rating of 54 and exterior windows with STC ratings as high as 34 could be required.
- Exterior wall and window STC requirements should be checked once building plans are finalized. This is typically required by the City at the time of building permit application.

1.0 INTRODUCTION

VCL was retained to prepare an Environmental Noise Feasibility Study to support the Re-zoning application to the City of Mississauga. The potential sound levels and noise mitigation measures needed for the proposed development to comply with the MOE and the Region of Peel noise guideline requirements are outlined herein.

1.1 SITE LOCATION AND SURROUNDING AREA

The site is located at the southeast corner of the intersection of Port Street East and Helene Street South in the City of Mississauga.

The site is bounded by:

- Port Street East, with existing mid-rise and high-rise residential development beyond, to the north;
- an existing 6-storey residential building, with Saint Lawrence Drive beyond, to the east;
- an existing park (St Lawrence Park), with Lake Ontario beyond, to the south; and
- Helene Street South, with the Port Credit Harbour Marina beyond, to the west.

A Key Plan is included as Figure 1.

This report is based on the architectural drawing set, prepared by Giannone Petricone Associates, dated September 29, 2017. The Site Plan is shown as Figure 2.

1.2 THE PROPOSED DEVELOPMENT

The proposed development consists of one 10-storey residential building with a maximum height of 33.0 m. Units on all floors will have private balconies. There are no common outdoor amenity spaces provided for the development. There will be one level of underground parking.

2.0 NOISE SOURCES

2.1 TRANSPORTATION NOISE SOURCES

The transportation noise sources with potential to impact the proposed development are road traffic on Lakeshore Road West and St Lawrence Drive, as well as rail traffic on the CN Oakville Subdivision rail line.

Tables 1A and 1B summarize the traffic data used in the assessment. Appendix A contains the correspondence regarding the road and rail traffic data.

2.1.1 Road Traffic

Ultimate road traffic data for Lakeshore Road West, and St Lawrence Drive were obtained from the City of Mississauga.

Traffic volumes on the other surrounding roadways are anticipated to be minor and no significant noise impact on the subject site is expected. Thus, these other surrounding roadways have not been considered further in this assessment.

2.1.2 Rail Traffic

Rail traffic data, applicable for the year 2017, for CN Oakville Subdivision was directly obtained from CN.

Future GO train forecasts in the vicinity of the site were taken from a noise study on the same rail corridor.

Since the beginning of 2016, Metrolinx has made significant revisions to its forecasts. The most significant changes from a noise perspective are:

Service is being intensified along all Metrolinx corridors as part of its Regional Express Rail service.

It is anticipated that GO services on the CN Oakville Subdivision will be comprised by a mix of diesel and electric trains within (at least) a 10-year time horizon.

Metrolinx has not yet made final decisions regarding the electric train technology to be used. In the interim, for the purposes of environmental noise studies, Metrolinx is recommending that the noise level and spectrum of a diesel train be used to model the impact from the electric trains. However, it is likely that this is conservative, since the reference sound levels for electric trains are not expected to be as high as for diesel trains. As the information on the specific train technology to be used has not yet been finalized and the reference sound level data for the electric trains has not been verified, the use of this modelling method should not be considered precedent setting for other sites in the vicinity.

The rail traffic volumes were escalated to the year 2028 using a growth rate of 2.5%, compounded annually. This growth rate is recommended by MOE and rail authorities in preparing environmental noise studies.

2.2 STATIONARY NOISE SOURCES

The Port Credit GO station is located more than 500 m to the northwest of the subject site. Due to distance separation and the presence of existing mid-rise and high-rise residential development between the subject site and GO station, noise from the GO station is not expected to have a significant noise impact at the subject site. Thus, the GO station was not considered further in this assessment.

During a site visit on December 20, 2017, noise from the stationary sources in the vicinity of the site was not audible at the subject site.

2.3 ENVIRONMENTAL NOISE GUIDELINES – TRANSPORTATION NOISE SOURCES

2.3.1 MOE Publication NPC-300

The applicable noise guidelines for new residential development are those in MOE Publication NPC-300, “Environmental Noise Guideline, Stationary and Transportation Sources – Approval and Planning”.

The environmental noise guidelines of the MOE, as provided in Publication NPC-300, are discussed briefly below and summarized in Appendix B.

2.3.1.1 Architectural Elements

In the daytime (0700 to 2300), the indoor criterion for road noise is $L_{eq\ Day}$ (16-hour energy equivalent sound level (0700-2300 hours) of 45 dBA for sensitive spaces such as living/dining rooms, dens and bedrooms. At night, the indoor criterion for road noise is $L_{eq\ Night}$ (8-hour energy equivalent sound level (2300-0700 hours) of 45 dBA for sensitive spaces such as living/dining rooms and dens and 40 dBA for bedrooms. The indoor criteria for rail noise are 5 dBA more stringent than those for the road; that is 40 dBA for living/dining rooms, dens and bedrooms during the daytime and nighttime periods except for bedrooms where the nighttime indoor criterion is 35 dBA.

2.3.1.2 Ventilation

In accordance with the MOE noise guideline for road traffic sources, if the daytime sound level, $L_{eq\ Day}$, at the exterior face of a noise sensitive 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 daytime sound levels between 56 dBA and 65 dBA inclusive, there need only be the provision for adding air conditioning at a later date. A warning clause advising the occupant of the potential interference with some activities is also required. At nighttime, air conditioning would be required when the sound level exceeds 60 dBA ($L_{eq\ Night}$) at a noise sensitive window (provision for adding air conditioning is required when greater than 50 dBA).

In addition, the MOE requires brick veneer exterior wall construction (or masonry equivalent construction) for the first row of dwellings within 100 m of the rail line, when the $L_{eq\ 24\ hr}$ is greater than 60 dBA.

2.3.1.3 Outdoors

For outdoor amenity areas (“Outdoor Living Areas” – OLA’s), the guideline is $L_{eq\ Day}$ of 55 dBA, with an excess not exceeding 5 dBA considered acceptable if it is technically not practicable to achieve the 55 dBA objective, providing warning clauses are registered on title. Note, a balcony is not considered an OLA, unless it is the only OLA for the occupant and it is:

- at least 4 m in depth; and
- unenclosed.

2.4 REGION OF PEEL GUIDELINES

The Region of Peel guidelines are essentially the same as the MOE guidelines except that the nighttime level for triggering the air conditioning requirement is 1 dBA more stringent (i.e., lower) than the levels specified by the MOE – i.e., mandatory air conditioning for nighttime sound levels of 60 dBA or greater, and the provision for adding air conditioning for levels between 51 to 59 dBA inclusive.

2.4.1 Federation of Canadian Municipalities/Railway Association of Canada

The standard mitigation requirements of the Federation of Canadian Municipalities and the Railway Association of Canada (FCM/RAC) suggest a dwelling setback of 30 m for a residential development adjacent to a principal main line, if in combination with a safety berm at least 2.5 m

above the property line grade (at a 2.5:1 slope). A 5.5 m high sound barrier is also suggested (e.g., 3.0 m high acoustic fence atop a 2.5 m high safety berm). Due to the distance setback of the site and intervening development, the safety berm and acoustic fence would not be expected as a requirement.

Warning clauses specific to the railway for all dwellings within 300 m of the right-of-way are recommended.

Aside from “standard” requirements regarding the setback of dwellings and safety berm/sound barrier configuration, the sound level design objectives of FCM/RAC are similar to those of the MOE.

2.5 TRANSPORTATION NOISE IMPACT ASSESSMENT

2.5.1 Analysis Method

Using the road and rail traffic data in Table 1A and 1B, the sound levels, in terms of $L_{eq\ Day}$ and $L_{eq\ Night}$, were determined using STAMSON V5.04 – ORNAMENT, the computerized traffic noise prediction model of the MOE.

For the daytime and nighttime sound level calculations, the outdoor plane of window receptors were taken at the 10th floor, the worst-case locations. To be conservative, screening from neighbouring developments was not included in the analysis.

Terraces and balconies are currently shown to be less than 4.0 m in depth. Thus, these private terraces and balconies would not be considered OLA's as per the MOE definitions.

Table 2 summarizes the unmitigated daytime and nighttime sound level predictions. Appendix C contains a sample calculation.

2.5.2 Predicted Sound Levels

The highest unmitigated daytime/nighttime sound levels of 67 dBA / 62 dBA are predicted to occur at the north facade of the building, in the direction of the rail line.

Table 2 summarizes the unmitigated daytime and nighttime sound level predictions.

2.6 NOISE CONTROL MEASURES – TRANSPORTATION SOURCES

The noise control measures can generally be classified into two categories which are interrelated, but which can be treated separately for the most part:

- (a) Architectural elements to achieve acceptable indoor noise guidelines for transportation sources; and
- (b) Design features to protect the OLAs.

Noise abatement requirements are summarized in Table 3.

2.6.1 Architectural Requirements

2.6.1.1 Method

The indoor sound level limits can be achieved by using appropriate construction for exterior walls, windows and doors. In determining the worst-case architectural requirements for the residential suites, exterior wall and window areas were assumed to be 20% and 80%, respectively, of the associated floor area on the facades exposed directly or at an angle to the road and rail traffic noise sources for both living/dining areas and sleeping quarters.

2.6.1.2 Exterior Wall Construction

The sound levels at the exterior of the building are such that upgraded exterior wall construction is required. The exterior walls should be designed to achieve an STC rating of 54. It is anticipated that this building will be constructed using a window-wall system. As such there may only be spandrel and vision glass sections, as opposed to traditional wall sections. Where spandrel sections are used to cover the concrete shear walls, the performance would be expected to meet the STC 54 requirement. At other locations where a steel stud gypsum board wall back up is needed, an example construction that could meet the STC requirement would be spandrel panel; 13 mm air space; 92 mm steel stud; 89 mm acoustic insulation; two layers of 16 mm Type X gypsum wall board.

2.6.1.3 Window Construction

With exterior wall construction meeting the minimum rating of STC 54, window construction meeting up to STC 34 is adequate to meet the indoor sound level criteria of the MOE noise guidelines.

Note, the window assessment is based on assumptions and should be updated/confirmed once building floor plans and elevations are finalized at more detailed design stages.

Further note, the STC ratings for windows apply to the window assembly as a whole and not just the glazing. The window supplier should provide laboratory STC data indicating that the intended window units can meet the required STC ratings.

2.6.2 Ventilation Requirements

Based on the predicted daytime and nighttime sound levels, all residential suites within the development require mandatory air conditioning to allow windows to remain closed for noise control purposes.

2.7 WARNING CLAUSES

Warning clauses are a tool to inform prospective owners/occupants of potential annoyance due to existing noise sources. Where the sound level guidelines are exceeded, warning clauses should be registered on title or included in the development agreement that is registered on title. The warning clauses should also be included in agreements of Offers of Purchase and Sale and/or lease/rental agreements.

2.8 STATIONARY NOISE IMPACT ASSESSMENT

Preliminary information was made available for the neighbouring residential building at 65 Port Street East. At the time this study, detailed sound data was not available for some of the rooftop equipment expected to have a noise impact potential. It is recommended that a detailed assessment of the neighbouring development be considered at a later stage of the application process once the mechanical equipment information is available.

3.0 CONCLUSIONS

With the incorporation of the recommended design measures, it is expected the applicable MOE noise guidelines can be met and a suitable acoustical environment provided for the occupants. The project is considered feasible acoustically.

The approvals and administrative procedures are available to ensure that the noise requirements are implemented.

4.0 REFERENCES

1. PC STAMSON 5.04, "Computer Program for Road Traffic Noise Assessment", Ontario Ministry of the Environment.
2. Building Practice Note No. 56: "Controlling Sound Transmission into Buildings", by J. D. Quirt, Division of Building Research, National Council of Canada, September 1985.
3. MOE Publication NPC-300, "Stationary and Transportation Sources – Approval and Planning" Ontario Ministry of the Environment, August 2013.

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TABLE 1A
ROAD TRAFFIC DATA

Roadway	Ultimate AADT ⁽¹⁾	% Trucks ⁽¹⁾		Day/Night Split (%)	Speed Limit (kph)
		Medium	Heavy		
Lakeshore Road W	51 093	1.35	1.65	90/10	50
St Lawrence Dr	4 000	1.35	1.65	90/10	50

Note:

(1) AADT – Annual Average Daily Traffic. Data obtained from the City of Mississauga..

TABLE 1B
RAILTRAFFIC DATA
CN/GO OAKVILLE SUBDIVISION

Source of Rail Traffic	Period	Train Type	# of Trains ⁽¹⁾	Max # of Cars/Train	Max # of Locos/Train	Maximum Speed (kph)
CN Year 2017 ⁽²⁾	Daytime (0700–2300)	VIA Passenger	14 (17.9)	10	2	137
	Nighttime (2300–0700)		0	–	–	–
GO ⁽³⁾ minimum 10-year Forecast	Daytime (0700–2300)	GO Commuter	192	12	1	137
	Nighttime (2300–0700)		46			

Notes:

- (1) The data shown in brackets is projected to the year 2028 with a 2.5% growth rate, compounded annually.
- (2) Obtained directly from CN.
- (3) Obtained directly from Metrolinx. Both electric and diesel trains have been modelled as diesel trains.

TABLE 2
PREDICTED TRANSPORTATION SOUND LEVELS

Location	Source	Distance (m)⁽¹⁾	L_{eq} Day (dBA)	L_{eq} Night (dBA)
Northeast Unit - Level 10 East Façade	Lakeshore Rd W	142	57	51
	St Lawrence Dr	145	48	42
	CN/GO Oakville	540	62	58
	Total	—	64	59
Northeast Unit - Level 10 North Façade	Lakeshore Rd W	142	60	54
	St Lawrence Dr	145	45	39
	CN/GO Oakville	540	66	61
	Total	—	67	62

Note:

(1) Distances as measured from centreline of transportation corridor

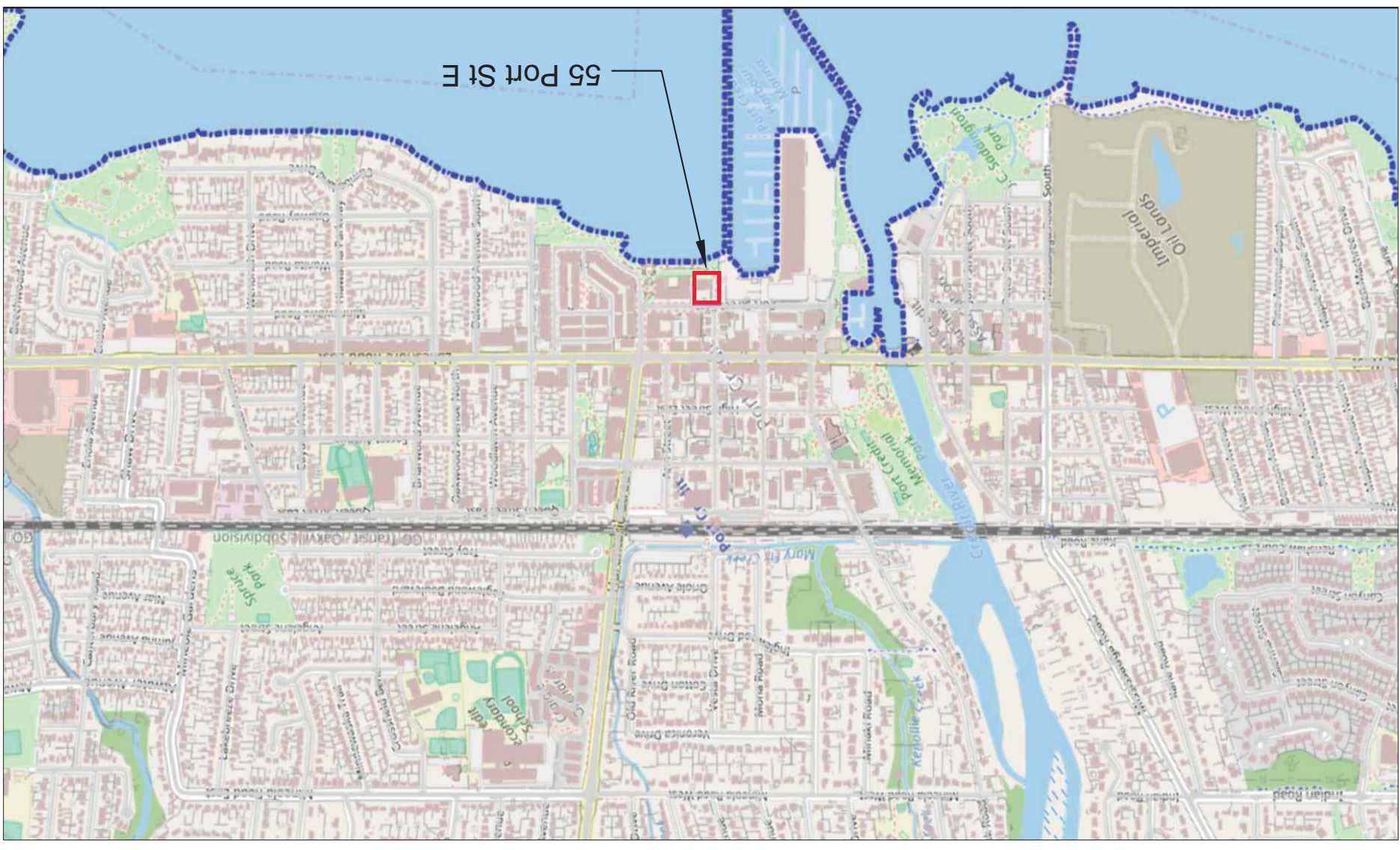
TABLE 3

NOISE ABATEMENT REQUIREMENTS⁽¹⁾

Building	Air Conditioning⁽²⁾	Exterior Wall⁽³⁾	Exterior Window⁽⁴⁾	Sound Barrier	Warning Clauses⁽⁵⁾
All Residential Units	Mandatory	STC 54	Up to STC 34	None	A + B + C

Notes:

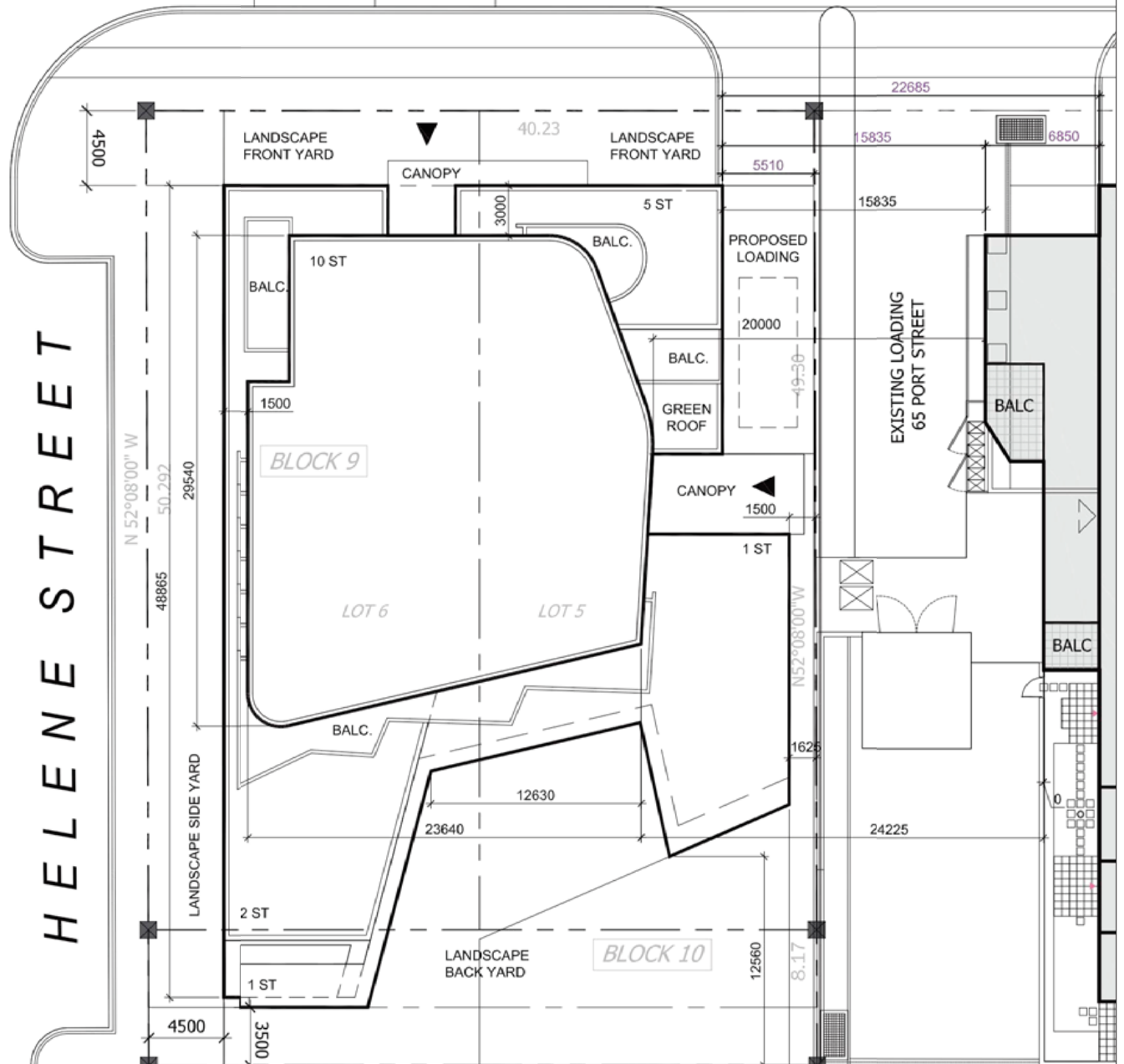
1. Minimum required noise control measures are the minimum measures needed to comply with the MOE noise guidelines. Recommended upgrades – measures have been recommended where deemed appropriate to better facilitate land use compatibility. These measures are not required under the MOE noise guidelines and are recommendations only.
2. Central air conditioning allows windows to remain closed for noise control purposes. Provision for adding air conditioning typically takes the form of a ducted ventilation system sized to accommodate the addition of central air conditioning by the occupant.
3. STC – Sound Transmission Class Rating (Reference ASTM E-413).
4. A sliding glass walkout door should be considered as a window and be included in the percentage of glazing. Window and exterior wall requirements were based on standard assumptions and should be reviewed once building (floor) plans are finalized. The window STC rating applies to the entire window assembly and not just the glazing. The window supplier should provide acoustical laboratory test data (following a recognized test standard) for the intended windows indicated the STC ratings can be met.
5. Standard example warning clauses to be registered on title and be included in Offers of Purchase and Sale and Leases on designated units:
 - A. "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 road traffic may occasionally interfere with some activities of the dwelling occupants as the sound level may exceed the noise guidelines of the Municipality and the Ministry of the Environment."
 - B. "This dwelling unit has been supplied with a central air conditioning system which will allow windows and exterior doors to remain closed, thereby ensuring that the indoor sound levels are within the sound level limits of the Municipality and the Ministry of the Environment."
 - C. "Purchasers/tenants are advised that due to the proximity to the existing neighbouring residential developments, noise from the mechanical equipment at the developments may at times be audible."
6. Conventional roof construction meeting Ontario Building Code requirements is satisfactory in all cases.
7. All exterior doors shall be fully weatherstripped





PORT STREET

HELENE STREET



Scale: N.T.S

	Title Site Plan	Date 2018-02-21	Figure 2
	Project Name 55 Port Street East	Project No. 117-0597	

APPENDIX A

TRAFFIC DATA

Date: 11-Jan-18

NOISE REPORT FOR PROPOSED DEVELOPMENT

REQUESTED BY:

Name: Ryan Trinh

Company: Valaccoustics



PREPARED BY:

Name: J. Hunter

Tel#: (905) 615-3200

Location: Lakeshore Road W, west of Hurontario Street

Look Up ID#: 384

ON SITE TRAFFIC DATA

Specific	Street Names			
	LAKESHORE RD W	ST LAWERENCE DR		
AADT:	51093	4000		
# of Lanes:	4	2		
% Trucks:	3%	2%		
Medium/Heavy Trucks Ratio:	45/55	45/55		
Day/Night Traffic Split:	90/10	90/10		
Posted Speed Limit:	50	50		
Gradient of Road:	<2%	<2%		
Ultimate R O W:	26m			

Comments:

ULTIMATE TRAFFIC ONLY

Note: For local roads 4,000 AADT and 2% trucks was assumed

Empty text boxes for additional comments.

Dear Adam:

Re: Train Traffic Data – CN Oakville Subdivision near Stavebank Road in Mississauga, ON

The following is provided in response to Adam Simkin’s 2017/07/10 request for information regarding rail traffic in the vicinity of Stavebank Road in Mississauga at approximately Mile 13.11 on CN’s Oakville Subdivision.

Typical daily traffic volumes are recorded below. However, traffic volumes may fluctuate due to overall economic conditions, varying traffic demands, weather conditions, track maintenance programs, statutory holidays and traffic detours that when required may be heavy although temporary. For the purpose of noise and vibration reports, train volumes must be escalated by 2.5% per annum for a 10-year period.

Typical daily traffic volumes at this site location are as follows:

*Maximum train speed is given in Miles per Hour

	0700-2300			
Type of Train	Volumes	Max.Consist	Max. Speed	Max. Power
Freight	0	140	60	4
Way Freight	0	25	60	4
Passenger	14	10	85	2

	2300-0700			
Type of Train	Volumes	Max.Consist	Max. Speed	Max. Power
Freight	0	140	60	4
Way Freight	0	25	60	4
Passenger	0	10	85	2

The volumes recorded reflect westbound and eastbound freight and passenger operations on CN’s Oakville Subdivision.

Except where anti-whistling bylaws are in effect, engine-warning whistles and bells are normally sounded at all at-grade crossings. There is one at-grade crossing in the immediate vicinity of the study area at Mile 12.02 (Revus Ave). Anti-whistling bylaws are not in effect at this crossing. Please note that engine warning whistles may be sounded in cases of emergency, as a safety and or warning precaution at station locations and pedestrian crossings and occasionally for operating requirements.

With respect to equipment restrictions, the gross weight of the heaviest permissible car is 286,000 lbs.

The triple mainline track is considered to be continuously welded rail throughout the study area. The presence of 8 switches located at Mile 13.56, 13.63, 13.66, 13.74, 13.76, 13.82, 13.83, and 13.89 may exacerbate the noise and vibration caused by train movements.

The Canadian National Railway continues to be strongly opposed to locating developments near railway facilities and rights-of-way due to potential safety and environmental conflicts. Development adjacent to the Railway Right-of-Way is not appropriate without sound impact mitigation measures to reduce the incompatibility. For confirmation of the applicable rail noise, vibration and safety standards, Nadia El Dabee, Canadian National Railway Properties at 514-399-7627 should be contacted directly.

I trust the above information will satisfy your current request.

Sincerely,



Michael Vallins P.Eng
Manager of Public Works
public_works_gld@cn.ca

Seema Nagaraj

From: Brandon Gaffoor <Brandon.Gaffoor@metrolinx.com>
Sent: Wednesday, September 27, 2017 2:09 PM
To: Seema Nagaraj
Cc: Adam Snow
Subject: RE: Rail traffic data request (VCL File: 117-0010)

Hello Seema - Further to your requested dated June 21, 2017 (attached below), the subject site is 21 Park Street East in the City of Mississauga. The subject site is located within 300 metres of GO Transit's Lakeshore West rail corridor.

It's anticipated that GO Service along this corridor will be comprised of a mix of diesel and electric trains within (at least) a 10 year time horizon. The preliminary midterm weekday train volume forecast at this location, including both revenue and equipment trips is in the order of 238 trains (diesel: 45 day, 9 night; electric: 147 day, 37 night). Trains will be comprised of a single locomotive and up to 12 passenger cars.

The current maximum design speed of this corridor is 85 mph (137 km/h).

Anti-whistling by-law is in effect at the Stavebank Road grade crossing.

With respect to future electrified rail service, it should be noted that Metrolinx has not made a final decision regarding the electric train technology or technologies to be deployed. Similarly, we are only beginning to understand potential noise and vibration implications associated with electrification. We can, however, provide the following interim information which may be helpful:

1. At lower speeds, train noise is dominated by the powertrain. At higher speeds, train noise is dominated by the wheel- track interaction. Hence, at higher speeds, the noise level and spectrum of electric trains is expected to be very similar, if not identical, to those of equivalent diesel trains.
2. Along with electrification, Metrolinx will intensify service levels along all of its corridors to deliver the promised Regional Express Rail (RER) service. Everything else being equal, this will likely result in an overall increase in train noise emissions.

Given the above considerations, it would be prudent, for the purposes of acoustical analyses, to either use established model pre-sets for electrified trains or conservatively assume that the noise impacts associated with electrified and diesel trains are equivalent. We anticipate that additional information regarding specific operational parameters for electrified trains will become available in the near future.

Operational information is subject to change and may be influenced by, among other factors, service planning priorities, operational considerations, funding availability and passenger demand.

I trust that this information is useful. Please feel free to contact me should you have any additional questions.

Brandon Gaffoor, B.E.S.

Intern | Rail Corridor Management Office | Rail Corridor Infrastructure | GO Transit
METROLINX | 335 Judson Street | Toronto | Ontario | M8Z 1B2
T. 416.202.7294 M. 647.289.1958



APPENDIX B

ENVIRONMENTAL NOISE GUIDELINES

APPENDIX B ENVIRONMENTAL NOISE GUIDELINES

MINISTRY OF THE ENVIRONMENT AND CLIMATE CHANGE (MOE)

Reference: MOE Publication NPC-300, October 2013: *“Environmental Noise Guideline, Stationary and Transportation Source – Approval and Planning”*.

SPACE	SOURCE	TIME PERIOD	CRITERION
Living/dining, den areas of residences, hospitals, nursing homes, schools, daycare centres, etc.	Road	07:00 to 23:00	45 dBA
	Rail	07:00 to 23:00	40 dBA
	Aircraft	24-hour period	NEF/NEP 5
Living/dining, den areas of residences, hospitals, nursing homes, etc. (except schools or daycare centres)	Road	23:00 to 07:00	45 dBA
	Rail	23:00 to 07:00	40 dBA
	Aircraft	24-hour period	NEF/NEP 5
Sleeping quarters	Road	07:00 to 23:00	45 dBA
	Rail	07:00 to 23:00	40 dBA
	Aircraft	24-hour period	NEF/NEP 0
Sleeping quarters	Road	23:00 to 07:00	40 dBA
	Rail	23:00 to 07:00	35 dBA
	Aircraft	24-hour period	NEF/NEP 0
Outdoor Living Areas	Road and Rail	07:00 to 23:00	55 dBA
Outdoor Point of Reception	Aircraft	24-hour period	NEF/NEP 30 [#]
	Stationary Source		
	Class 1 Area	07:00 to 19:00 ⁽¹⁾	50 ⁺ dBA
	Class 2 Area	19:00 to 23:00 ⁽¹⁾	50 ⁺ dBA
	Class 3 Area	07:00 to 19:00 ⁽²⁾	50 ⁺ dBA
	Class 4 Area	19:00 to 23:00 ⁽²⁾	45 ⁺ dBA
		07:00 to 19:00 ⁽³⁾	45 ⁺ dBA
		19:00 to 23:00 ⁽³⁾	40 ⁺ dBA
	07:00 to 19:00 ⁽⁴⁾	55 ⁺ dBA	
	19:00 to 23:00 ⁽⁴⁾	55 ⁺ dBA	

.../cont'd

SPACE	SOURCE	TIME PERIOD	CRITERION
Plane of a Window of Noise Sensitive Spaces	Stationary Source Class 1 Area	07:00 to 19:00 ⁽¹⁾	50 ⁺ dBA
		19:00 to 23:00 ⁽¹⁾	50 ⁺ dBA
	Class 2 Area	23:00 to 07:00 ⁽¹⁾	45 ⁺ dBA
		07:00 to 19:00 ⁽²⁾	50 ⁺ dBA
	Class 3 Area	19:00 to 23:00 ⁽²⁾	50 ⁺ dBA
		23:00 to 07:00 ⁽²⁾	45 ⁺ dBA
	Class 4 Area	07:00 to 19:00 ⁽³⁾	45 ⁺ dBA
		19:00 to 23:00 ⁽³⁾	45 ⁺ dBA
		23:00 to 07:00 ⁽³⁾	40 ⁺ dBA
		07:00 to 19:00 ⁽⁴⁾	60 ⁺ dBA
		19:00 to 23:00 ⁽⁴⁾	60 ⁺ dBA
		23:00 to 07:00 ⁽⁴⁾	55 ⁺ dBA

- # may not apply to in-fill or re-development.
 * or the minimum hourly background sound exposure $L_{eq(1)}$, due to road traffic, if higher.
 (1) Class 1 Area: Urban.
 (2) Class 2 Area: Urban during day; rural-like evening and night.
 (3) Class 3 Area: Rural.
 (4) Class 4 Area: Subject to land use planning authority's approval.

Reference: MOE Publication ISBN 0-7729-2804-5, 1987: "Environmental Noise Assessment in Land-Use Planning".

EXCESS ABOVE RECOMMENDED SOUND LEVEL LIMITS (dBA)	CHANGE IN SUBJECTIVE LOUDNESS ABOVE	MAGNITUDE OF THE NOISE PROBLEM	NOISE CONTROL MEASURES (OR ACTION TO BE TAKEN)
No excess (<55 dBA)	—	No expected noise problem	None
1 to 5 inclusive (56 to 60 dBA)	Noticeably louder	Slight noise impact	If no physical measures are taken, then prospective purchasers or tenants should be made aware by suitable warning clauses.
6 to 10 inclusive (61 - 65 dBA)	Almost twice as loud	Definite noise impact	Recommended.
11 to 15 inclusive (66 - 70 dBA)	Almost three times as loud	Serious noise impact	Strongly Recommended.
16 and over (>70 dBA)	Almost four times as loud	Very serious noise impact	Strongly Recommended (may be mandatory).

APPENDIX C

SAMPLE CALCULATION

STAMSON 5.04 NORMAL REPORT Date: 22-02-2018 12:06:33
 MINISTRY OF THE ENVIRONMENT AND CLIMATE CHANGE / NOISE ASSESSMENT

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

Description: Northeast Corner, North Facade

Rail data, segment # 1: CN Oakville (day/night)

Train Type	Trains	Speed (km/h)	# loc / Train	# Cars / Train	Eng type	Cont weld
* 1. Passenger	18.4/0.0	137.0	2.0	10.0	Diesel	Yes
* 2. GO Commuter	196.0/46.0	137.0	1.0	12.0	Diesel	Yes

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

Train No	Name	Unadj. Trains	Annual % Increase	Years of Growth
1.	Passenger	14.0/0.0	2.50	11.00
2.	GO Commuter	196.0/46.0	2.50	0.00

Data for Segment # 1: CN Oakville (day/night)

Angle1 Angle2 : -90.00 deg 90.00 deg
 Wood depth : 0 (No woods.)
 No of house rows : 0 / 1
 House density : 20 %
 Surface : 2 (Reflective ground surface)
 Receiver source distance : 500.00 / 500.00 m
 Receiver height : 30.00 / 30.00 m
 Topography : 1 (Flat/gentle slope; no barrier)
 No Whistle
 Reference angle : 0.00

Results segment # 1: CN Oakville (day)

LOCOMOTIVE (0.00 + 64.90 + 0.00) = 64.90 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.00	80.13	-15.23	0.00	0.00	0.00	0.00	64.90

WHEEL (0.00 + 57.60 + 0.00) = 57.60 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.00	72.83	-15.23	0.00	0.00	0.00	0.00	57.60

Segment Leq : 65.64 dBA
 Total Leq All Segments: 65.64 dBA

Results segment # 1: CN Oakville (night)

 LOCOMOTIVE (0.00 + 60.22 + 0.00) = 60.22 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.00	76.24	-15.23	0.00	0.00	-0.80	0.00	60.22

 WHEEL (0.00 + 53.16 + 0.00) = 53.16 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.00	69.18	-15.23	0.00	0.00	-0.80	0.00	53.16

Segment Leq : 61.00 dBA

Total Leq All Segments: 61.00 dBA

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

 Car traffic volume : 44604/4956 veh/TimePeriod *
 Medium truck volume : 621/69 veh/TimePeriod *
 Heavy truck volume : 759/84 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): 51093
 Percentage of Annual Growth : 0.00
 Number of Years of Growth : 0.00
 Medium Truck % of Total Volume : 1.35
 Heavy Truck % of Total Volume : 1.65
 Day (16 hrs) % of Total Volume : 90.00

Data for Segment # 1: Lakeshore W (day/night)

 Angle1 Angle2 : -90.00 deg 90.00 deg
 Wood depth : 0 (No woods.)
 No of house rows : 0 / 0
 Surface : 2 (Reflective ground surface)
 Receiver source distance : 142.00 / 142.00 m
 Receiver height : 30.00 / 30.00 m
 Topography : 1 (Flat/gentle slope; no barrier)
 Reference angle : 0.00

Road data, segment # 2: Lawrence Dr (day/night)

```

-----
Car traffic volume : 3528/392 veh/TimePeriod *
Medium truck volume : 32/4 veh/TimePeriod *
Heavy truck volume : 40/4 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): 4000
  Percentage of Annual Growth : 0.00
  Number of Years of Growth : 0.00
  Medium Truck % of Total Volume : 0.90
  Heavy Truck % of Total Volume : 1.10
  Day (16 hrs) % of Total Volume : 90.00
    
```

Data for Segment # 2: Lawrence Dr (day/night)

```

-----
Angle1 Angle2 : 0.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 2 (Reflective ground surface)
Receiver source distance : 145.00 / 145.00 m
Receiver height : 30.00 / 30.00 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00
    
```

Results segment # 1: Lakeshore W (day)

```

-----
Source height = 1.13 m
ROAD (0.00 + 60.35 + 0.00) = 60.35 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
-----
-90 90 0.00 70.11 0.00 -9.76 0.00 0.00 0.00 0.00 60.35
-----
    
```

Segment Leq : 60.35 dBA

Results segment # 2: Lawrence Dr (day)

```

-----
Source height = 1.03 m
ROAD (0.00 + 45.33 + 0.00) = 45.33 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
-----
0 90 0.00 58.19 0.00 -9.85 -3.01 0.00 0.00 0.00 45.33
-----
    
```

Segment Leq : 45.33 dBA

Total Leq All Segments: 60.48 dBA

Results segment # 1: Lakeshore W (night)

Source height = 1.13 m
ROAD (0.00 + 53.81 + 0.00) = 53.81 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq

-90 90 0.00 63.57 0.00 -9.76 0.00 0.00 0.00 0.00 53.81

Segment Leq : 53.81 dBA

Results segment # 2: Lawrence Dr (night)

Source height = 1.00 m
ROAD (0.00 + 38.67 + 0.00) = 38.67 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq

0 90 0.00 51.53 0.00 -9.85 -3.01 0.00 0.00 0.00 38.67

Segment Leq : 38.67 dBA

Total Leq All Segments: 53.94 dBA
TOTAL Leq FROM ALL SOURCES (DAY): 66.80
(NIGHT): 61.78