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TDK Metro Terminals Railyard Expansion

Environmental Noise and Vibration Assessment

Prepared for:

TDK Metro Terminals

2023-03-08

Prepared by:

BKL CONSULTANTS LTD.

File: 2228-22A-R2

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List of Abbreviations

Abbreviation/Acronym	Definition
%HA	Percentage of highly annoyed persons
ANSI	American National Standards Institute
BC	British Columbia
BKL	BKL Consultants Ltd.
dB	decibel
dBA	A-weighted decibel
EA	environmental assessment
EC	European Commission
Hz	hertz
km	kilometre
km/h	kilometres per hour
L_d	daytime (7 am to 7 pm) equivalent sound level
L_{den}	day-evening-night equivalent sound level
L_e	evening time (7 pm to 10 pm) equivalent sound level
L_{eq}	equivalent sound level
L_{LF}	low frequency sound level
L_n	nighttime (10 pm to 7 am) equivalent sound level
L_{Rden}	rated day-evening-night equivalent sound level
m	metre
MTPA	mega tonnes per annum
the Port	Vancouver Fraser Port Authority
the Project	TDK Metro Terminals Railyard Expansion
s	second
SWL	sound power level
VFPA	Vancouver Fraser Port Authority

Executive Summary

BKL Consultants Ltd. (BKL) has conducted an environmental noise and vibration assessment for the TDK Metro Terminals Railyard Expansion Project (the Project) in Delta, BC. The Project involves developing an import and export distribution hub with an annual throughput of approximately 150,000 TEU. The proposed project will expand the site's existing container yard operation. The anticipated truck volume will increase from 65,000 gate transactions annually to an estimated 80,000 gate transactions annually upon project completion. The project is also estimated to handle 4,000 rail cars per year. The Project will be operating at full capacity by 2026.

Environmental Noise Assessment

BKL's environmental noise assessment aimed to

- evaluate existing noise conditions at potentially affected residential receivers within the community;
- develop a computer noise model to predict future community noise levels with the Project operating at full capacity;
- perform a noise impact assessment in compliance with the Port of Vancouver's *Project & Environmental Review Guidelines – Environmental Noise Assessment* (the PER Guideline).

BKL evaluated existing noise conditions by performing noise measurements at the site and in the community in Delta. The noise measurements captured various activities at the existing TDK site including truck movements, truck loading/unloading, train arrivals, processing, unloading and rail car movements.

BKL developed a Cadna/A computer noise model to assess Project noise levels using the measurement results, and information provided by TDK and Hatfield about expected sound sources and operating times of various activities.

The Project noise predictions were based on the following noise sources:

- 4000 rail cars per year;
- Rail unloading/loading between 7 am to 11 pm;
- On-site rail movements associated with the processing of rail cars (including rolling stock movements, and shunting events);
- On-site equipment such as mobile conveyors, mobile reach stackers, and container tippers; and
- 80,000 truck gate transactions per year (on-site truck movement).

The noise model accounts for the following factors:

- The specific operation times (times of day, total annual average daily operation time) of each noise source;

- A 12 dB impulsiveness penalty to noise from shunting activities; and
- A 5 dB low frequency noise penalty to noise from locomotives moving on the site.

Based on these assumptions, BKL predicts that

- annual average noise levels from the Project, with and without penalties, will be well below the existing community noise levels, such that the resulting total future annual average noise levels will be the same as the existing measured noise levels; and
- Project-related noise will not exceed any of the PER Guideline criteria.

Environmental Vibration Assessment

The port's PER Submission checklist also requests an assessment of how the Project will affect vibration levels experienced at the adjacent community.

While the PER does not specify how vibration should be assessed, the joint Railway Association of Canada (RAC) and Federation of Canadian Municipalities' (FCM) *Guidelines for New Development in Proximity to Railway Operations,* section AC.2.5 *Recommended Procedures for the Preparation of Vibration Impact Studies for New Residential or Other Sensitive Land Uses in Proximity to Railway Operations,* states that ground-borne vibration transmission should be evaluated for dwellings within 75 metres of the railway right-of-way.

Since the Project will be more than 700 metres away from the closest residential receivers, potential impacts from ground-borne vibration associated with the Project are expected to be insignificant, and no quantitative study has been performed.

Introduction

BKL Consultants Ltd. (BKL) has been retained by Hatfield Consultants (Hatfield) to provide an environmental noise and vibration impact assessment for the proposed TDK Metro Terminals Railyard Expansion (the Project) to be operated by TDK Metro Terminals Inc. (TDK).

The site, located at 480 Audley Blvd, Delta, BC V3M 5S4, is on Vancouver Fraser Port Authority (VFPA, the Port) land and therefore a noise assessment is required in support of the permit application.

Existing operations have been ongoing for many years and include the unloading/loading of materials by trucks. No noise complaints have reportedly been received from the community in the past five years.

Environmental Noise Assessment

The assessment methodology for the Project was developed by considering the requirements outlined in the Port's document, *Project & Environmental Review Guidelines – Environmental Noise Assessment* (PER Guideline) which was issued July 2015. The PER Guideline includes a noise screening procedure to determine whether an environmental noise assessment report is required for a Project. The completed screening worksheet, included in Appendix A, confirmed that a full noise assessment is required for this Project.

This report documents existing noise exposure levels at potentially affected residential receiver locations near the Project and the predicted noise climate following completion of the Project.

Relevant information regarding acoustics fundamentals and terminology is presented in Appendix B: Introduction to Sound and Environmental Noise Assessment.

Environmental Vibration Assessment

The port's PER Submission checklist also requests an assessment of how the Project will affect vibration levels experienced at the adjacent community.

While the PER does not specify how vibration should be assessed, the joint Railway Association of Canada (RAC) and Federation of Canadian Municipalities' (FCM) *Guidelines for New Development in Proximity to Railway Operations,* section AC.2.5 *Recommended Procedures for the Preparation of Vibration Impact Studies for New Residential or Other Sensitive Land Uses in Proximity to Railway Operations,* states that ground-borne vibration transmission should be evaluated for dwellings within 75 metres of the railway right-of-way.

Project Description

TDK is proposing to develop an import and export distribution hub with an annual throughput of approximately 150,000 TEU. The proposed project will expand the site's existing container yard operation. The anticipated truck volume will increase from 65,000 gate transactions annually to an estimated 80,000 gate transactions annually upon project completion.

The project location is within the blue box shown in in Figure 1 below.

Figure 1: Project Boundary

The proposed site layout consists of three components:

- Reconfiguration of the existing container yard: demolition of one (1) existing warehouse building at 480 Audley Blvd., reconfigured truck gate, three (3) new truck queuing lanes to accommodate up to thirteen (13) trucks within the site, but outside the gate.

- Grain transload operation. Commodity will arrive via rail in grain hoppers, mobile conveyors will slide under rail cars that will then dump grain directly onto belt to then be conveyed into a tipped container. Containers will be moved off site via truck.
- Trackwork: two (2) new rail siding tracks accessed via an SRY spur track. Each stacked track can accommodate 10 cars (for a total of 20).

Study Objectives

The objectives of the environmental noise study were to

- evaluate existing noise conditions at potentially affected representative residential receivers within the community;
- develop a computer noise model to predict future community noise levels with the Project operating at full capacity;
- perform a noise impact assessment in compliance with the PER Guideline.

The objective of the environmental vibration study was to evaluate whether vibration levels could change at any residential receivers as a result of the Project.

Construction noise assessment was not part of the current study. Construction noise management is addressed in the Project's Construction Environmental Management Plan.

Spatial Boundaries

The study area includes one residential receiver to the south of the Project site in Delta as there are no noise sensitive receivers within Annacis Island. This residence is considered to be representative of the noise sensitive receivers closest to the Project site. The study locations and future project noise sources on the project site are shown in Figure 2 below.

Figure 2: Future Project Noise Sources and Nearest Representative Residence

The Port's PER submission checklist also requests an assessment of how the Project will affect vibration levels experienced in the adjacent community. While the PER does not specify how vibration should be assessed, the joint Railway Association of Canada (RAC) and Federation of Canadian Municipalities' (FCM) *Guidelines for New Development in Proximity to Railway Operations,* section AC.2.5 *Recommended Procedures for the Preparation of Vibration Impact Studies for New Residential or Other Sensitive Land Uses in Proximity to Railway Operations,* states that ground-borne vibration transmission should be evaluated for dwellings within 75 metres of the railway right-of-way.

Temporal Boundaries

The intent of the study is to predict noise levels for two scenarios: the baseline (existing) scenario and the future scenario when the Project is operating at full capacity. It is expected that the Project may be utilized at or near full capacity at the opening year (2026) or as determined by market conditions which may delay operations of full capacity. A future year of 2026 has been used for the study as a basis for the modelling. Noise associated with construction activities is excluded from this assessment.

Inventory of Noise Sensitive Receivers

The noise-sensitive receivers near the site are all residential dwellings. Commercial building receivers have been excluded from the study. The closest noise-sensitive receivers (generally single-family

dwellings) are located to the south of the Project site in Delta. The chosen receiver, located at 9066 Collings Way, Delta is representative of other receivers in the study area, and is shown in Figure 2.

Inventory of Vibration Sensitive Receivers

The vibration-sensitive receivers near the site are all residential dwellings. Commercial building receivers have been excluded from the study, as BKL is not aware of any vibration sensitive commercial buildings near the project site. The main source of ground-borne vibration in communities next to Port facilities is train movements along the railway mainline tracks. The closest trackwork related to the proposed project is approximately 700 metres from the closest receivers. There is no change to the set-back distance between the receivers and the main railway line. Therefore, maximum vibration levels in the community are not expected to change with the Project.

Since the trackwork associated with the Project is more than 75 meters away from the nearest residences, no vibration sensitive receivers have been identified. Potential impacts from ground-borne vibration associated with the Project are expected to be insignificant, and no further analysis of vibration has been performed.

Assessment Criteria

This noise assessment has been conducted to comply with the Port's *Project & Environmental Review Guidelines – Environmental Noise Assessment* (VFPA 2015). It is understood that the Port's preference is to be consistent with Health Canada's *Guidance for Evaluating Human Health Impacts in Environmental Assessment: NOISE* (HC 2017).

Following the PER Guideline, the noise impact assessment approach is based on comparing baseline noise levels to future total noise levels. A no-project scenario was not carried out due to the short time frame between the current scenario and future full-capacity project scenario. The model predicts the yearly average Project noise levels and accounts for

- prominent tonal, impulsive and frequency characteristics of each noise source;
- how many days each activity occurs per year;
- the time of day each on-site activity occurs; and
- whether the activity occurs on weekends and/or weekdays.

Project noise levels have been added to existing noise levels at the representative receiver locations to predict the future total noise levels.

Noise has been quantified using the rated annual average day-evening-night sound level, or L_{Rden}. The rated annual average equivalent sound level is the recommended metric to predict the long-term annoyance response of a community (ANSI 2005). The predicted L_{Rden} includes adjustments for evening, night and weekend noise and any necessary adjustments for tonal or impulsive noise as recommended by the ANSI standard. The purpose of applying these adjustments is to reflect the fact that people are more disturbed by noise during evenings, nights and weekends, compared to weekday daytime hours. Similarly, people are more disturbed by impulsive (e.g., railcar shunting), tonal (e.g., backup alarms on mobile equipment, vehicle horns) and excessive low frequency (e.g., some shipboard generators, rail locomotive) noise sources, than they are by more neutral noise sources, like steady road traffic noise. The Guidelines also state that the Port will consider whether the Project L_{den} level exceeds 75 dBA.

In addition to the L_{Rden}, the change in the percentage of highly annoyed individuals (%HA) between the baseline and the Project year has been calculated. The Guidelines reference the %HA parameter, but do not provide criteria. Therefore, Health Canada guidance has been considered (HC 2017), which states that noise mitigation should be considered where the difference between the baseline %HA and the Project %HA exceeds 6.5%.

The Guidelines also address low frequency noise, specifically stating that the Port will consider whether the post-Project low-frequency continuous noise level, which is defined as the logarithmic sum of the 16, 31.5 and 63 Hz octave bands, exceeds 70 dB L_{LF}.

In summary, the Guidelines indicate that mitigation will be considered following review of the application if the predicted noise impact exceeds the criteria indicated below in Table 1.

Table 1: PER Assessment Guideline Noise Impact Thresholds Summary

Parameter	Value
Project noise, L_{den}	> 75 dBA
Increased community noise exposure in terms of increase in %HA	> 6.5% increase (Health Canada guideline)
Low frequency noise level, L_{LF}.	> 70 dB

Existing Environmental Conditions

Community Interaction

The Guidelines state "*the history of interaction between a tenant and the surrounding community concerning noise and other nuisance issues is useful in understanding the current level of acceptance*." VFPA confirmed that there have been no noise complaints from the community in the last five years, that can be directly attributed to TDK operations.

Baseline Noise Monitoring

Baseline noise measurements were carried out between Monday, October 31, and Wednesday, November 9, 2022. Baseline noise measurements at a single-family residence located at 9066 Collings Way in Delta, and on the rooftop of the existing TDK warehouse building, located at 480 Audley Blvd #10 in Delta.

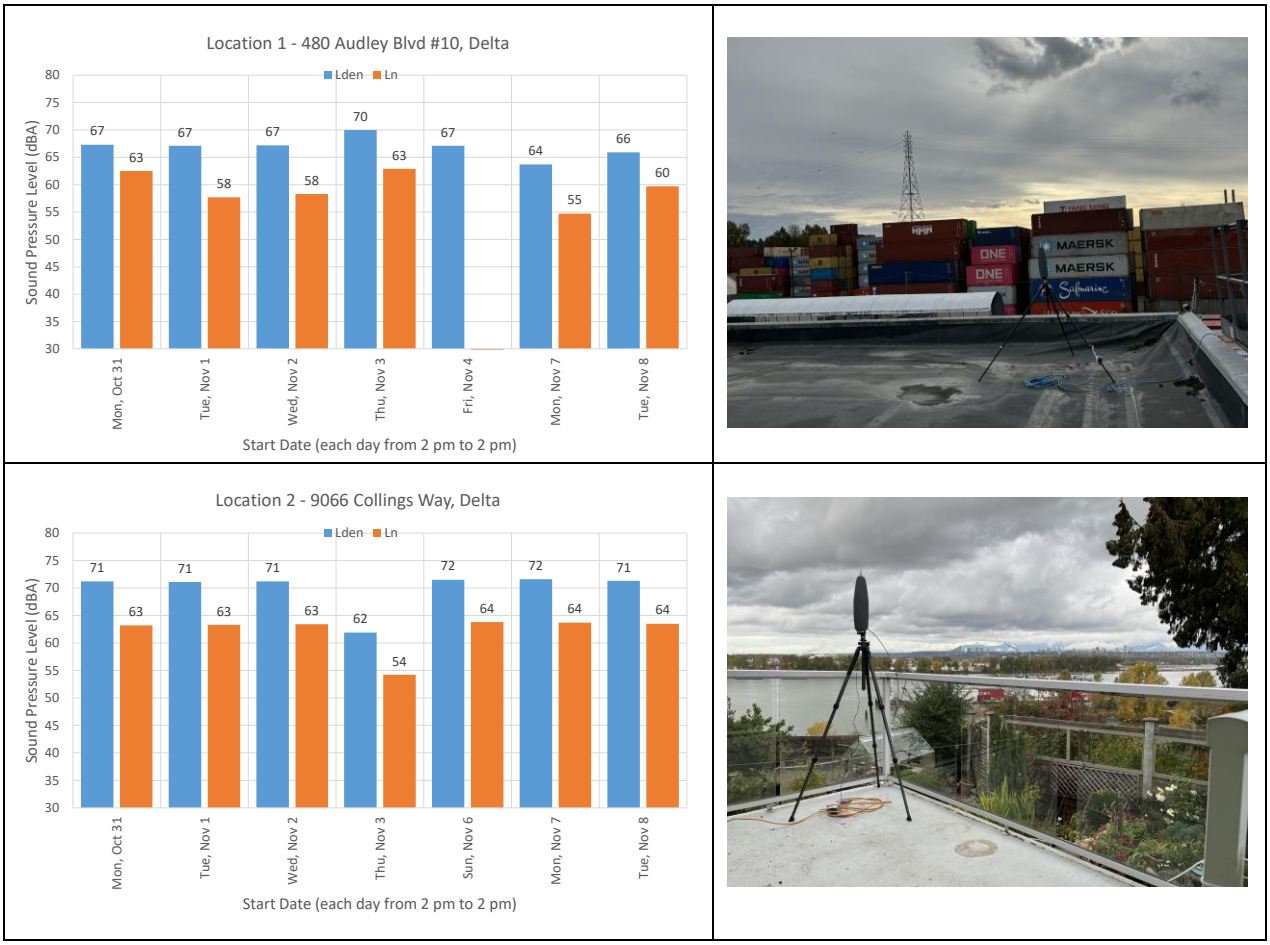
The location of the unattended sound level meter at the residence was selected to represent community locations with the highest potential to be impacted by Project noise. The monitoring location at the existing TDK warehouse building was selected to determine baseline noise levels from the existing facility affecting the nearest residence. Figure 3 shows the monitoring locations.

The meters used meet the Type 1 specifications in ANSI S1.4 (ANSI 1983). The instruments were field-calibrated before and after the monitoring periods using a Brüel & Kjær Type 4230 Calibrator with a difference of less than 1 dBA recorded.

At least 7-days of measurement data was collected throughout the measurement period. Any noise data influenced by external factors, such as adverse weather conditions, was excluded from our assessment.

A summary of the measurement results is provided in Figure 4 and Table 2. L_{den} and L_n values for start and end dates for each monitoring site do not include the full 24 hour and 9 hour monitoring periods respectively. A detailed description of the monitoring site and time history graphs of the noise levels and maximum noise histograms are contained in Appendix C: Baseline Noise Measurement Results.

Figure 3: Monitoring Locations



Note: Noise data collected after 9 pm on November 4, 2022 at 480 Audley Blvd was discarded due to adverse weather condition. Therefore, there is no *Ln* value shown in the graph for November 4, 2022 at 480 Audley Blvd.

Figure 4: Monitoring Locations and Measured Daily Noise Levels (dBA)

Monitoring Location	Average Rated Level L_{Rden} (dBA)	Average Daytime Level L_d (dBA)	Average Evening Level L_e (dBA)	Average Nighttime Level L_n (dBA)
480 Audley Blvd #10, Delta	68	66	64	59
9066 Collings Way, Delta	71	68	64	64

Table 2: Noise Measurement Summary

A cursory review of the noise data at the two locations does not indicate any significant tonal, impulse, or strong low-frequency noise content; therefore, no additional penalties were added to assess the rated day-evening-night equivalent noise level.

Based on information provided by TDK Metro Terminals, the operations on-site between October 31 and November 9, 2022 are representative of the annual average operational patterns for the site. Table 6 summarizes the activities that occurred during the monitoring periods.

Noise Modelling Methodology

In order to compare future and baseline noise levels, both metrics need to be normalized to an annual average level while incorporating adjustment factors as described in the Guidelines. Therefore, a 3-D computer model was developed to calculate an annual average noise level for the future Project noise sources at all three assessment locations. The future total noise level was calculated by adding the Project noise source levels to the measured baseline noise levels. The acoustical model implements the internationally recommended ISO 9613-2 (1996) standard for predicting exterior sound propagation. Details of the noise modelling methodology are shown in Appendix D: Noise Modelling Methodology and Details.

Noise Sources

The noise model includes noise sources shown in Figure 2 associated with the Project such as

- shunting events associated with the movement of the rail car strings at the rail unloading railyard;
- rolling stock noise associated with the movement of the rail cars strings at the unloading railyard;
- rail unloading/loading between 7 am to 11 pm;
- on-site equipment such as mobile conveyors, mobile reach stackers, and container tippers; and
- noise associated with on-site truck movement

The model includes the following operational assumptions:

- Railcars are brought onto the site by locomotive, then split into two sets of 10 car segments for product offloading between 11 pm and 7 am.
- Railcars are unloaded using on-site equipment such as mobile reach stackers, mobile conveyors, and container tippers which are estimated to run for approximately 12 minutes per car from 7 am to 11 pm.
- There are 4000 rail cars estimated to be processed per year, and 20 rail cars per train.
- Container yard trucks are estimated to be approximately 90% of the 80,000 gate transactions for the proposed project.
- Trucks will operate in the container yard between 7 am to 11 pm.

Further details on the modelled noise sources including sound power levels are summarized in Appendix D: Noise Modelling Methodology and Details.

Sound Level Adjustments

The required 5 dB evening time and 10 dB nighttime adjustments have been applied in the model to all noise that occurs during evening hours (7 pm to 10 pm) and nighttime hours (10 pm to 7 am), respectively.

In addition to the time period adjustments, noise source levels were adjusted to reflect the character of the noise source, specifically tonal, low frequency or impulsiveness characteristics.

Within the unloading railyard, the shunting events have a +12 dB highly impulsive penalty. A 5 dB low frequency noise penalty was applied to moving rail cars into and out of the unloading railyard.

No other noise sources on the site were considered to have special characteristics, therefore no other penalties have been applied to the model.

Time scale adjustments were applied based on operational hours for each activity/equipment, and then normalized to an annual average. Based on information provided by TDK, rail unloading and shipping operations would occur between 7 am and 11 pm and rail movement into and out of the railyard would occur between 11 pm and 7 am.

Limitations

For sound calculated using the ISO 9613 standard, the indicated accuracy is ± 3 dBA for source-to-receiver distances of up to 1,000 metres. Distances from the Project site to the included receivers are less than 1,000 metres.

Predicted Noise Levels and Noise Impact Assessment

Prediction of Project Noise

Based on the assumptions and noise source inputs provided, the predicted annual average rated noise levels for the modelled receivers at the representative residence located at 9066 Collings Way, Delta, 'Residence in Delta' from Project related noise sources is shown in Table 3.

Table 3: Predicted Annual Average Noise Levels from Project Noise Sources

Receiver	Predicted Annual Average Project Noise Levels		
	L_{Rden} (dBA)	L_n (dBA)	L_{LF} (dB)
Residence in Delta	44	36	51

The nighttime maximum predicted noise level (L_{AFMax}) from intermittent project events such as rail loading and unloading, and container yard operations (until 11 pm) is 50 dBA or less at the receiver.

Prediction of Future Total Noise Levels

The total future annual average noise level at each site is the logarithmic sum of the existing noise level and the noise contributed by the Project. The calculation result is shown in Table 4.

Table 4: Calculated Total Future Noise Levels

Receiver	Measured Baseline Noise Level [A]			Predicted Project Noise Level [B]			Future Total Noise Level [A] + [B]		
	L_{Rden}	L_n	L_{LF}	L_{Rden}	L_n	L_{LF}	L_{Rden}	L_n	L_{LF}
9066 Collings Way, Delta	71	64	72	44	36	51	71	64	72

The predicted annual average noise levels from the Project are more than 10 dB below the measured noise levels for each site; therefore, the resulting total future annual average noise levels are predicted to be the same as the existing measured noise levels.

Similarly, nighttime maximum noise levels from intermittent noise events are not expected to be additive with existing maximum noise levels.

Noise Impact Assessment

The predictions show that the Project noise will not measurably increase annual average noise levels at the nearest residences above existing levels. Consequently, the increase in community annoyance due to noise, represented by the %HA metric, is 0% for this Project. The predicted future total L_{Rden} level shown in Table 4 is below the criteria thresholds established in Table 1, and the future total L_{LF} level including the project-related noise sources remained the same as the existing L_{LF} noise level as shown in Table 4.

As the predicted noise levels indicate no increase in noise levels due the Project, and are below the level that require an investigation of noise mitigation, noise mitigation is not required for the Project.

Conclusion

The proposed project involves developing an import and export distribution hub with an annual throughput of approximately 150,000 TEU. The proposed project will expand the site's existing container yard operation. The anticipated truck volume will increase from 65,000 gate transactions annually to an estimated 80,000 gate transactions per year upon project completion. The project is also estimated to handle 4,000 rail cars per year.

The key changes to the noise and vibration emissions associated with the Project are due to an increase in the number of truck gate transactions, and the new rail unloading yard.

Environmental Noise Assessment

Based on these assumptions, BKL predicts that

- annual average noise levels from the Project, with and without penalties, will be well below the existing community noise levels, such that the resulting total future annual average noise levels will be the same as the existing measured noise levels; and
- Project-related noise will not exceed any of the PER Guideline criteria.

Environmental Vibration Assessment

Given that the Project is more than 700 metres away from the closest residential receivers, potential impacts from ground-borne vibration associated with the Project are expected to be insignificant.

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Glossary

%HA - A descriptor for noise annoyance in a population derived from a dose-response relationship between the percentage of a population expressing high annoyance to long-term noise and the corresponding A-weighted day night sound level (L_{dn})

A-weighting – A standardized filter used to alter the sensitivity of a sound level meter with respect to frequency so that the instrument is less sensitive at low and high frequencies where the human ear is less sensitive. Also written as dBA.

Ambient/existing level – The pre-project noise or vibration level.

C-weighting – C-weighting provides a more discriminating measure of the low frequency sound pressures than provided by A-weighting. Unlike A-weighting, C-weighting retains its sensitivity to sounds between 100 and 1000 Hz. Also written as dBC.

Cumulative sound – The summation of individual sounds into a single total value related to the effect over time.

Day-evening-night equivalent sound level (L_{den}) – The sound exposure level for a 24-hour day calculated by logarithmically adding the sound exposure level obtained during the daytime (L_d) (7:00 am to 7:00 pm) (or 5 times the sound exposure for Saturdays and Sundays) to 5 times the sound exposure level obtained during the evening (L_e) (7:00 pm to 10:00 pm) and to 10 times the sound exposure level obtained during the nighttime (L_n) (10:00 pm to 7:00 am) to account for greater human sensitivity to weekend daytime, evening, and nighttime noise.

Decibel – The standard unit of measurement for sound pressure and sound power levels. It is the unit of level that denotes the ratio between two quantities that are proportional to pressure or power. The decibel is 10 times the logarithm of this ratio. Also written as dB.

Equivalent sound level – The steady level that would contain the same amount of energy as the actual time-varying level. Although it represents the average sound energy throughout a period of time, it is strongly influenced by the loudest events because they contain the majority of the sound energy.

Frequency – The number of times that a periodically occurring quantity repeats itself in one second.

Frequency spectrum – The distribution of frequency components of a noise or vibration signal.

Hertz – The unit of acoustic or vibration frequency representing the number of cycles per second.

Impulsive sound – non-continuous sound characterized by brief bursts of sound pressure. The duration of a single burst of sound is usually less than one second.

Intermittent sound – non-continuous or transient noise or vibration that occurs at regular or irregular time intervals with each occurrence lasting more than about five seconds.

Intervening terrain – The terrain in between the noise/vibration source and a sensitive receiver.

Low frequency sound level (L_{LF})– The equivalent sound level that is the sum of the 16, 31.5 and 63 Hz octave bands, with no frequency weighting.

Maximum sound level – The highest exponential time-averaged sound level, in decibels, that occurs during a stated time period, using a "slow" or "fast" time constant (see time constant).

Metric – Measurement parameter or descriptor.

Noise – Noise is unwanted sound, which carries no useful information and tends to interfere with the ability to receive and interpret useful sound.

Noise sensitive human receivers – A place occupied by humans with a high sensitivity to noise. These include residences, hospitals, schools, hotels, etc.

Octave bands – A standardized set of bands making up a frequency spectrum. The centre frequency of each octave band is twice that of the lower band frequency. The bands are centred at standardized frequencies.

Rated day-evening-night equivalent sound level (L_{Rden}) – The L_{den} with a 5 dB correction added for tonal noise (e.g., alarm noise), a 12 dB adjustment for highly impulsive noise (e.g., rail shunting), a 5 dB adjustment for regular impulsive noise (e.g., banging sounds) and a variable adjustment for low frequency noise.

Receiver/receptor – A stationary far-field position at which noise or vibration levels are specified.

Root mean square – The square root of the mean-square value of an oscillating waveform, where the mean-square value is obtained by squaring the value of amplitudes at each instant of time and then averaging these values over the sample time.

Single event noise – Results from the occurrence of a singular intermittent or impulsive noise event such as from a train whistling, a railcar shunting or a vehicular pass-by. Single event noise is commonly described by the SEL and the fast A-weighted sound pressure level.

Sound – The fluctuating motion of air or other elastic medium that can produce the sensation of sound when incident upon the ear.

Sound exposure level – Defined as the constant sound level that has the same amount of energy in one second as the original noise event. Abbreviated as SEL.

Time constant (slow, fast) – Used to describe the exponential time weighting of a signal. The standardised time periods are 1 second for slow and 0.125 seconds for fast exponential weightings.

Tonal sound – Sound characterized by a single frequency component or multiple distinct frequency components that are perceptually distinct from the total sound.

Total Noise – Results from a combination of multiple noise sources at multiple spatial locations and is typically described by a 24-hour equivalent sound level.

Appendix A: PER Noise Assessment Worksheet

APPENDIX I – NOISE ASSESSMENT SCREENING WORKSHEET

This worksheet should be employed by one or more informed individuals representing the applicant in order to establish the potential to create noise impacts within surrounding areas. This screening procedure is opinion-based and largely qualitative in nature and involves completing a series of questions.

1. Complete this worksheet scoring each of the ten items.
2. Transfer the ten questionnaire scores into the Weighted Project Screening Scorecard provided as Appendix II – Noise Assessment Project Score.
3. Follow procedure in Appendix II

Question 1 – New Activity, Replacement or Expansion	1
Will the project involve only the replacement of existing equipment or activities or the expansion of a pre-existing facility or activity, or will it involve significant new noise sources or activities?	
• Replacement of Existing Equipment or Activities	Score 1 point
• Expansion of Existing Equipment or Activities	Score 3 points
• New Equipment or Activities	Score 5 points

Question 2 – Noise Levels Expected on Project Site	1
Based on experience with similar operations at the current location or elsewhere, or on your best judgment, do you expect that noise levels within the project site will be:	
• Very Low	Score 1 point
• Low	Score 2 points
• Moderate	Score 3 points
• High	Score 4 points
• Very High	Score 5 points

Question 3 - Presence of Undesirable Characteristics	0
Will any of the key activities/sources create ongoing noise which: (1). is clearly tonal (hums, whirs, whines), (2). is impulsive or has very rapid onset (bumps, bangs, material handling impacts, rail car shunting, compressed air release etc.), or (3). contains strong low-frequency content (e.g. large diesel engines, large fans or air compressors).	
• No	Score 0 points
• Yes, noise will contain one such characteristic	Score 3 points
• Yes, noise will contain two or three such characteristics	Score 5 points

Question 4 – Presence of High-Energy Impulsive Noise	0
Will any activities create ongoing noise which could be classified as “High-energy Impulsive”? Examples of such sources are limited in the port context but could include the industrial use of explosives or explosive circuit breakers.	
• No	Score 0 points
• Yes	Score 5 points

Question 5 – Hours/Days of Operation	3
Will the normal operating schedule be:	
• Day Shift only (5 days/week)	Score 1 point
• Day Shift only (7 days per week)	Score 2 points
• Day & Evening Shifts (5 days/week)	Score 2 points
• Day & Evening Shifts (7 days/week)	Score 3 points
• 24-hours per day (5 days /week)	Score 4 points
• 24-hours per day (7 days per week)	Score 5 points

Question 6 – Proximity to Noise-Sensitive Areas	3
How far is the nearest noise-sensitive land use (residences, schools, hospitals, passive parks etc.) from the property line of the project site?	
• More than 1,000 m	Score 0 points
• 500 to 1,000 m	Score 1 point
• 250 to 500 m	Score 2 points
• 125 to 250 m	Score 3 points
• 60 to 125 m	Score 4 points
• less than 60 m	Score 5 points

Question 7 – Presence of Noise Shielding or Reflection	0
Will buildings, structures and/or landforms partially or totally screen (that is, interrupt the line of sight and direct hearing) project noise sources from nearby noise receptors? Here consideration should be given to the relative elevations of the noise sources, the noise receivers (ground and upper floors) and the intervening buildings and/or landforms. Noise shielding effects are maximized when intervening buildings and/or landforms are higher and wider than both the noise source area and the noise receiver area. Alternatively, the project may involve construction of a building or other structure that, while not necessarily a significant source of noise itself, reflects noise from other sources towards adjacent noise-sensitive areas. This other noise may originate from project operations or from sources not related to the project, such as other port operations or transportation facilities related sources.	
• Substantial, continuous noise shielding	Score 0 points
• Substantial, but not total, screening	Score 1 point
• Intermittent shielding, e.g., row of smaller, non-adjoining buildings	Score 2 points
• Scattered shielding by objects, machinery, stockpiles	Score 3 points
• No shielding potential	Score 4 points
• No noise shielding and will reflect noise towards sensitive areas	Score 5 points

Question 8 – Baseline Noise Environment	1
How would you rate the baseline (pre-project) noise environment within the noise sensitive area nearest the project site?	
• Very noisy (near busy highway, busy port, airport, heavy industry)	Score 1 point
• Noisy (near busy arterial road, light industrial area, urban core)	Score 2 points
• Moderately noise (near collector road, suburban residential)	Score 3 points
• Quiet (suburban residential away from collector roads)	Score 4 points
• Very Quiet (rural residential, well away from industry or main roads)	Score 5 points

Question 9 – Population Potentially Exposed to Project Noise	4
Approximately how many residences or other noise sensitive land uses are located within 500 m of the project site's property line?	
• 5 or less	Score 1 point
• 5 to 15	Score 2 points
• 16 to 40	Score 3 points
• 41 to 100	Score 4 points
• more than 100	Score 5 points

Question 10 – Level of Community Concern about Noise	2
What level of concern (e.g., complaint history) currently exists among residents/users of adjacent noise sensitive lands regarding noise emissions from PMV lands in general and your project site in particular?	
• No history of concern or complaints	Score 1 point
• Minor concerns have been expressed	Score 2 points
• Unknown	Score 3 points
• Moderate level of concern, some complaints	Score 4 points
• High level of concern/organized complaints	Score 5 points

APPENDIX II – NOISE ASSESSMENT PROJECT SCORE

This worksheet should be used together with the questionnaire in Appendix I – Noise Assessment Screening Worksheet. For each of the ten questions, this worksheet applies a weighting factor that is reflective of the relative importance of that attribute in forecasting noise impact potential. The overall noise impact potential of the project is determined by tallying the weighted values of all response scores to obtain a Total Weighted Project Score as follows:

1. Complete the questionnaire as provided in Appendix I – Noise Assessment Screening Worksheet, scoring each of the ten items.
2. Transfer the ten questionnaire scores into the Weighted Project Screening Scorecard provided below.
3. Apply the Importance Weighting factor (multiplying the weighting factor by the questionnaire score) and determine a Weighted Score for each item.
4. Tally the Weighted Scores and determine the Total Weighted Project Score
5. Submit a completed project score worksheet as part of the PER project permit application

No.	Attribute of Project or Project Setting	Questionnaire Score (Appendix I)	Importance Weighting	Weighted Score
1	New Activity, Replacement or Expansion	3	1.2	3.6
2	Noise Levels Expected on Project Site	3	1.8	5.4
3	Presence of Undesirable Characteristics	5	1.6	8
4	Presence of High Energy Impulsiveness Noise	0	1.6	0
5	Hours/Days of Operation	2	1.2	2.4
6	Proximity to Noise Sensitive Areas	1	1.6	1.6
7	Presence of Noise Shielding or Reflection	4	1.8	7.2
8	Baseline Noise Environment	2	1.6	3.2
9	Population Potentially Exposed to Project Noise	1	1.0	1
10	Level of Community Concern About Noise	1	1.2	1.2
			Total Weighted Project Score :	33.6

Appendix B: Introduction to Sound and Environmental Noise Assessment

General Noise Theory

The two principal components used to characterize sound are loudness (magnitude) and pitch (frequency). The basic unit for measuring magnitude is the decibel (dB), which represents a logarithmic ratio of the pressure fluctuations in air relative to a reference pressure. The basic unit for measuring pitch is the number of cycles per second, or hertz (Hz). Bass tones are low frequency and treble tones are high frequency. Audible sound occurs over a wide frequency range, from approximately 20 Hz to 20,000 Hz, but the human ear is less sensitive to low and very high frequency sounds than to sounds in the mid frequency range (500 to 4,000 Hz). A-weighting networks are commonly employed in sound level meters to simulate the frequency response of human hearing, and A-weighted sound levels are often designated dBA rather than dB.

If a continuous sound has an abrupt change in level of 3 dB it will generally be noticed, while the same change in level over an extended period of time will probably go unnoticed. A change of 6 dB is clearly noticeable subjectively and an increase of 10 dB is generally perceived as being twice as loud.

Basic Sound Metrics

While the decibel or A-weighted decibel is the basic unit used for noise measurement, other indices are also used to describe environmental noise. The equivalent sound level, abbreviated L_{eq}, is commonly used to indicate the average sound level over a period of time. The L_{eq} represents the steady level of sound that would contain the same amount of sound energy as the actual time-varying sound level. Although the L_{eq} is an average, it is strongly influenced by the loudest events occurring during the time period because these events contain most of the sound energy. Another common metric used is the L_{90}, which represents the sound level exceeded for 90 per cent of a time interval and is typically referred to as the background noise level.

The L_{eq} can be measured over any period of time using an integrating sound level meter. Some common time periods used are 24 hours, noted as the L_{eq24}, daytime hours (7 am to 7 pm), noted as the L_d, evening hours (7 pm to 11 pm), notes as the L_e, and night time hours (11 pm to 7 am), noted as the L_n. As the impact of noise on people is judged differently during the daytime, evening and nighttime, 24-hour noise metrics have been developed to reflect this.

The day-evening-night equivalent sound level (L_{den}) is one metric commonly used to represent community noise levels outside of the United States. It is derived from the L_d, L_e and L_n with a 5 dB penalty applied to the L_e, a 10 dB penalty applied to the L_n and a 5 dB penalty applied to the weekend L_d to account for increased sensitivity to evening, nighttime and weekend noise. In the United States, the day-night equivalent sound level (L_{dn}) is commonly used to represent community noise levels. It is derived from the L_d and L_n (i.e., eliminating the evening time period) with a 10 dB penalty applied to the L_n. ANSI Standard S12.9-2007 Part 5 *Sound Level Descriptors for Determination of Compatible Land*

Use states that although the L_{dn} and the L_{den} are not equal, their difference is typically insignificant for the purposes of studying annoyance.

ANSI S12.9-2005/Part 4 (2005) also recommends that adjustments be applied for certain sound characteristics to better predict long-term annoyance in the community. Relevant adjustments include a 5 dB adjustment for tonal noise (e.g., alarm noise), a 12 dB adjustment for highly impulsive noise (e.g., rail shunting), a 5 dB adjustment for regular impulsive noise (e.g., banging sounds) and a variable adjustment for low frequency noise (based on the received values in low frequency octave bands and the difference between the C-weighted and A-weighted sound pressure levels). With these factors taken into account, the day-evening-night level is referred to as the rated day-evening-night level, or L_{Rden}.

Appendix C: Baseline Noise Measurement Results

Baseline Noise Monitoring (480 Audley Blvd)

Project ID:	2228-22A	Address:	480 Audley Blvd #10, Delta, BC
Start Date:	October 31, 2022	Instrument:	01dB DUO
Start Time:	14:00	Serial No:	10204
Duration:	7 Days	Measured by:	AB/KC

Location Description

The microphone was located 8.7 m above the ground on the rooftop of the warehouse. The microphone position is 60 m to the north of the existing container yard.

Ambient Noise Description

The dominant noise source was traffic noise from the trucks and occasionally mobile equipment noise from daily operations.

Environmental Conditions

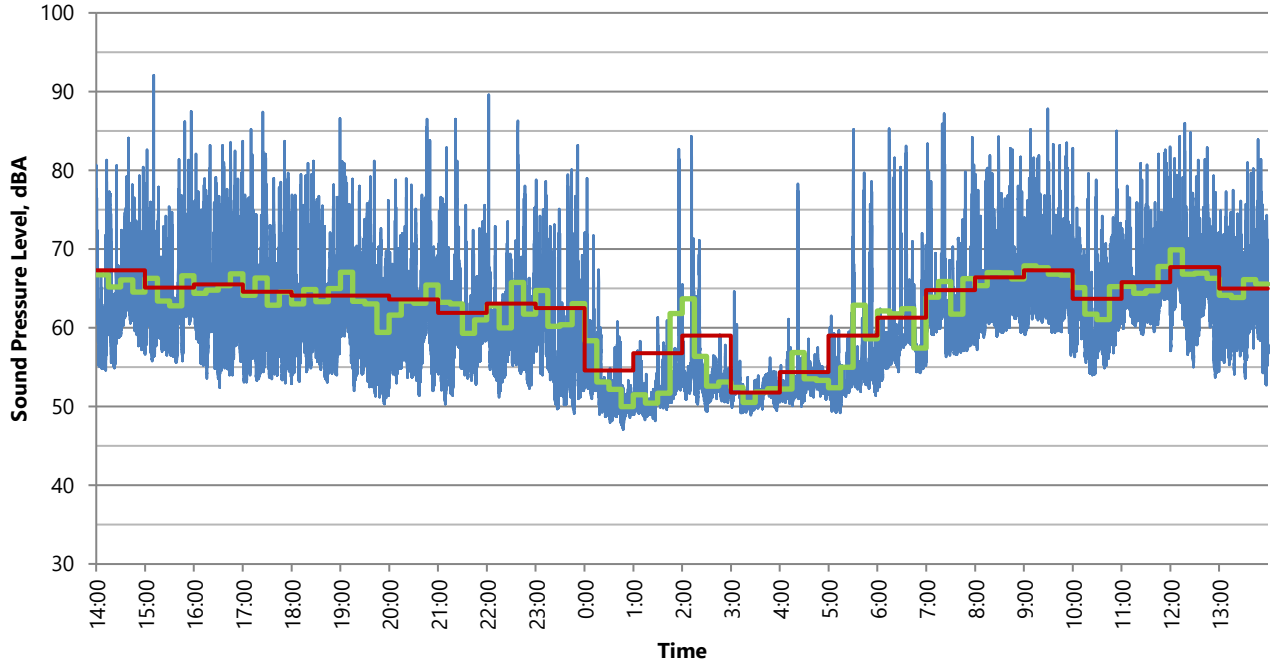
The weather was mainly partly cloudy on October 31 - November 2, 5, and 8-9, 2022; and rainy on November 3-4, and 6, 2022.

Purpose of Monitoring Location

This monitoring location is representative of the current environmental noise condition from daily operations of the existing container yard and warehouse.

Baseline Noise Monitoring (480 Audley Blvd)

The graph below shows the measured, and calculated time histories beginning on October 31, 2022

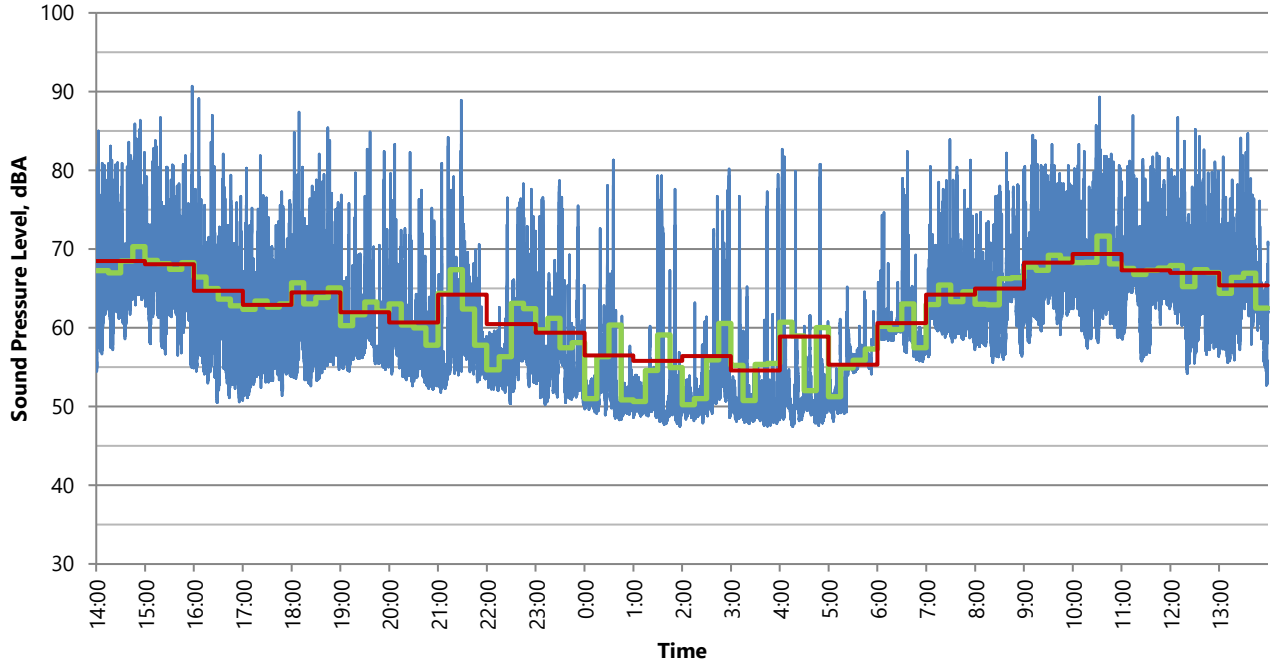


Hourly Interval Report starting at October 31, 2022
All Sound Pressure Levels presented in dBA

Date	Time	Duration	L_{eq}	L_{max}	L_{min}	L_1	L_5	L_{10}	L_{50}	L_{90}	L_{99}
Total	-	24:00:00	64	92	47	74	69	66	59	52	49
Oct 31	14:00:00	1:00:00	67	97	54	78	72	68	62	57	55
Oct 31	15:00:00	1:00:00	65	99	55	73	68	66	62	57	56
Oct 31	16:00:00	1:00:00	66	87	52	76	70	68	62	56	54
Oct 31	17:00:00	1:00:00	65	90	52	76	69	66	58	55	53
Oct 31	18:00:00	1:00:00	64	91	52	75	69	67	60	55	54
Oct 31	19:00:00	1:00:00	64	88	50	74	70	68	59	53	51
Oct 31	20:00:00	1:00:00	64	90	51	72	68	66	60	55	53
Oct 31	21:00:00	1:00:00	62	90	50	71	66	64	58	54	52
Oct 31	22:00:00	1:00:00	63	96	51	71	66	63	58	54	52
Oct 31	23:00:00	1:00:00	63	87	49	73	68	66	57	52	50
Nov 1	0:00:00	1:00:00	55	84	47	65	58	56	51	49	48
Nov 1	1:00:00	1:00:00	57	83	48	60	56	54	51	49	49
Nov 1	2:00:00	1:00:00	59	85	49	67	59	57	53	51	50
Nov 1	3:00:00	1:00:00	52	69	48	55	54	53	51	50	49
Nov 1	4:00:00	1:00:00	54	79	50	56	55	54	52	51	51
Nov 1	5:00:00	1:00:00	59	88	49	70	60	56	53	51	50
Nov 1	6:00:00	1:00:00	61	88	52	71	62	60	57	55	53
Nov 1	7:00:00	1:00:00	65	92	56	74	68	66	61	58	57
Nov 1	8:00:00	1:00:00	66	88	57	75	71	69	64	60	59
Nov 1	9:00:00	1:00:00	67	94	56	76	72	70	64	61	58
Nov 1	10:00:00	1:00:00	64	89	53	71	68	67	61	56	54
Nov 1	11:00:00	1:00:00	66	88	59	74	69	68	64	61	60
Nov 1	12:00:00	1:00:00	68	89	53	77	73	70	64	59	55
Nov 1	13:00:00	1:00:00	65	88	52	75	69	67	62	57	54

Baseline Noise Monitoring (480 Audley Blvd)

The graph below shows the measured, and calculated time histories beginning on November 01, 2022

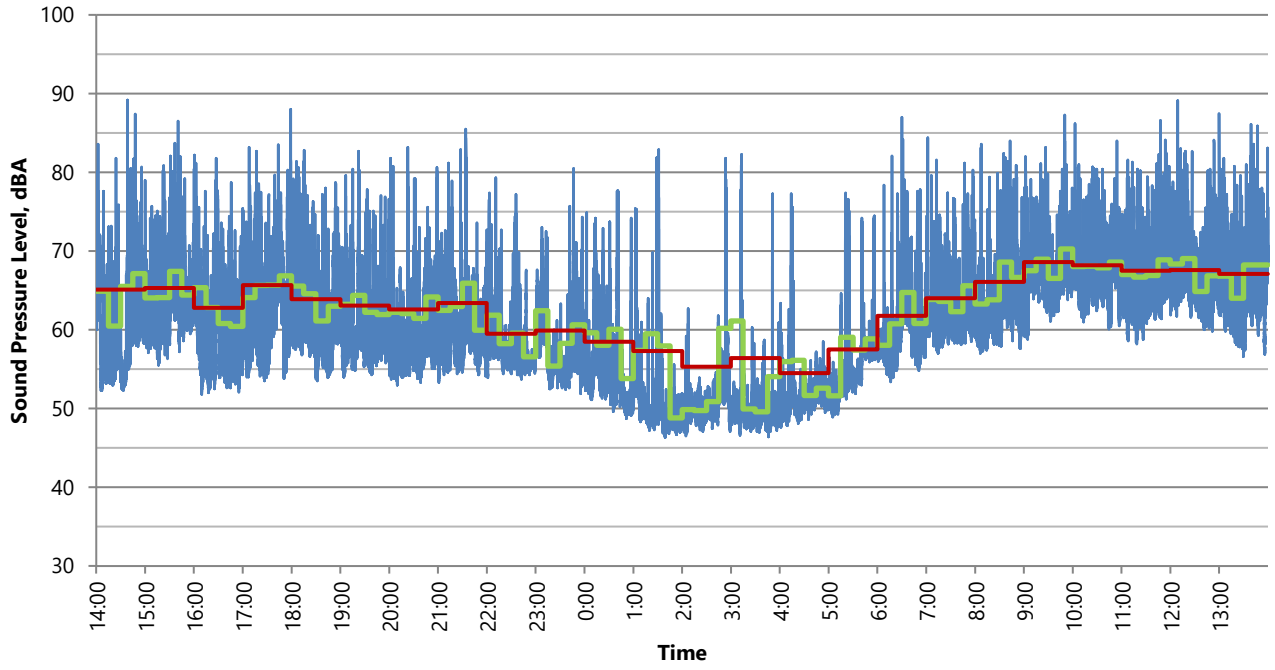


Hourly Interval Report starting at November 1, 2022
All Sound Pressure Levels presented in dBA

Date	Time	Duration	L_{eq}	L_{max}	L_{min}	L_1	L_5	L_{10}	L_{50}	L_{90}	L_{99}
Total	-	24:00:00	64	91	48	75	69	67	59	50	49
Nov 1	14:00:00	1:00:00	69	90	54	79	73	70	66	61	57
Nov 1	15:00:00	1:00:00	68	94	54	78	72	70	65	60	56
Nov 1	16:00:00	1:00:00	65	91	50	75	69	67	60	54	51
Nov 1	17:00:00	1:00:00	63	87	50	73	68	65	59	54	52
Nov 1	18:00:00	1:00:00	65	92	52	74	69	66	60	55	54
Nov 1	19:00:00	1:00:00	62	90	54	71	66	63	57	56	55
Nov 1	20:00:00	1:00:00	61	88	52	70	65	62	57	54	53
Nov 1	21:00:00	1:00:00	64	89	51	74	67	64	57	54	53
Nov 1	22:00:00	1:00:00	61	82	50	71	66	64	55	53	52
Nov 1	23:00:00	1:00:00	59	83	49	69	64	62	54	52	51
Nov 2	0:00:00	1:00:00	57	83	48	64	57	54	51	49	49
Nov 2	1:00:00	1:00:00	56	81	47	67	53	52	50	49	48
Nov 2	2:00:00	1:00:00	56	83	47	69	56	54	51	49	49
Nov 2	3:00:00	1:00:00	55	82	47	62	54	52	49	48	48
Nov 2	4:00:00	1:00:00	59	83	47	72	56	54	50	49	48
Nov 2	5:00:00	1:00:00	55	70	48	60	58	58	55	50	49
Nov 2	6:00:00	1:00:00	61	90	55	65	62	61	59	57	56
Nov 2	7:00:00	1:00:00	64	89	56	73	68	66	62	59	57
Nov 2	8:00:00	1:00:00	65	86	55	75	69	67	62	58	56
Nov 2	9:00:00	1:00:00	68	90	58	78	73	71	66	62	59
Nov 2	10:00:00	1:00:00	69	92	57	80	75	72	66	61	58
Nov 2	11:00:00	1:00:00	67	90	55	76	71	69	65	59	57
Nov 2	12:00:00	1:00:00	67	92	54	77	71	69	64	59	56
Nov 2	13:00:00	1:00:00	65	92	52	74	69	67	63	58	54

Baseline Noise Monitoring (480 Audley Blvd)

The graph below shows the measured, and calculated time histories beginning on November 02, 2022



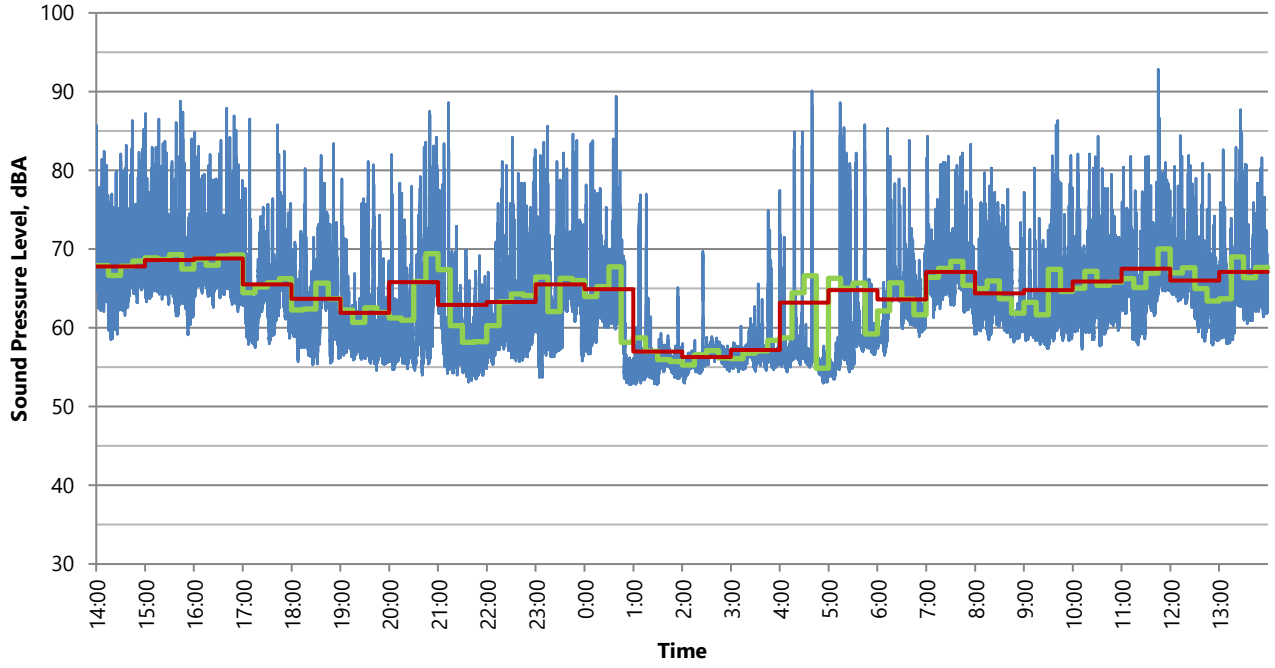
1 second measured L_{eq}
15 minute calculated L_{eq}
1 hour measured L_{eq}

Hourly Interval Report starting at November 2, 2022
All Sound Pressure Levels presented in dBA

Date	Time	Duration	L_{eq}	L_{max}	L_{min}	L_1	L_5	L_{10}	L_{50}	L_{90}	L_{99}
Total	-	24:00:00	64	89	46	74	69	67	59	50	48
Nov 2	14:00:00	1:00:00	65	93	52	76	70	67	59	54	53
Nov 2	15:00:00	1:00:00	65	92	55	74	69	67	63	59	57
Nov 2	16:00:00	1:00:00	63	88	51	72	68	66	58	54	53
Nov 2	17:00:00	1:00:00	66	90	53	76	70	68	62	56	54
Nov 2	18:00:00	1:00:00	64	90	53	75	68	66	60	56	54
Nov 2	19:00:00	1:00:00	63	84	54	74	67	65	59	56	55
Nov 2	20:00:00	1:00:00	63	84	53	75	66	63	58	55	54
Nov 2	21:00:00	1:00:00	63	86	53	72	66	65	59	56	54
Nov 2	22:00:00	1:00:00	60	84	53	69	63	61	57	55	54
Nov 2	23:00:00	1:00:00	60	88	51	69	65	63	56	54	53
Nov 3	0:00:00	1:00:00	59	82	48	69	63	60	53	51	49
Nov 3	1:00:00	1:00:00	57	85	46	67	55	53	49	48	47
Nov 3	2:00:00	1:00:00	55	83	46	58	55	53	50	48	47
Nov 3	3:00:00	1:00:00	56	83	46	59	52	51	49	48	47
Nov 3	4:00:00	1:00:00	55	79	47	62	54	53	51	49	48
Nov 3	5:00:00	1:00:00	58	81	48	68	59	58	54	51	50
Nov 3	6:00:00	1:00:00	62	93	53	72	63	62	58	55	54
Nov 3	7:00:00	1:00:00	64	89	57	73	68	66	61	59	58
Nov 3	8:00:00	1:00:00	66	89	57	76	71	69	62	59	58
Nov 3	9:00:00	1:00:00	69	91	58	77	73	71	66	63	60
Nov 3	10:00:00	1:00:00	68	91	60	76	72	70	66	63	61
Nov 3	11:00:00	1:00:00	68	91	58	77	71	69	65	62	60
Nov 3	12:00:00	1:00:00	68	93	59	77	71	69	65	62	60
Nov 3	13:00:00	1:00:00	67	91	56	77	71	69	64	59	58

Baseline Noise Monitoring (480 Audley Blvd)

The graph below shows the measured, and calculated time histories beginning on November 03, 2022

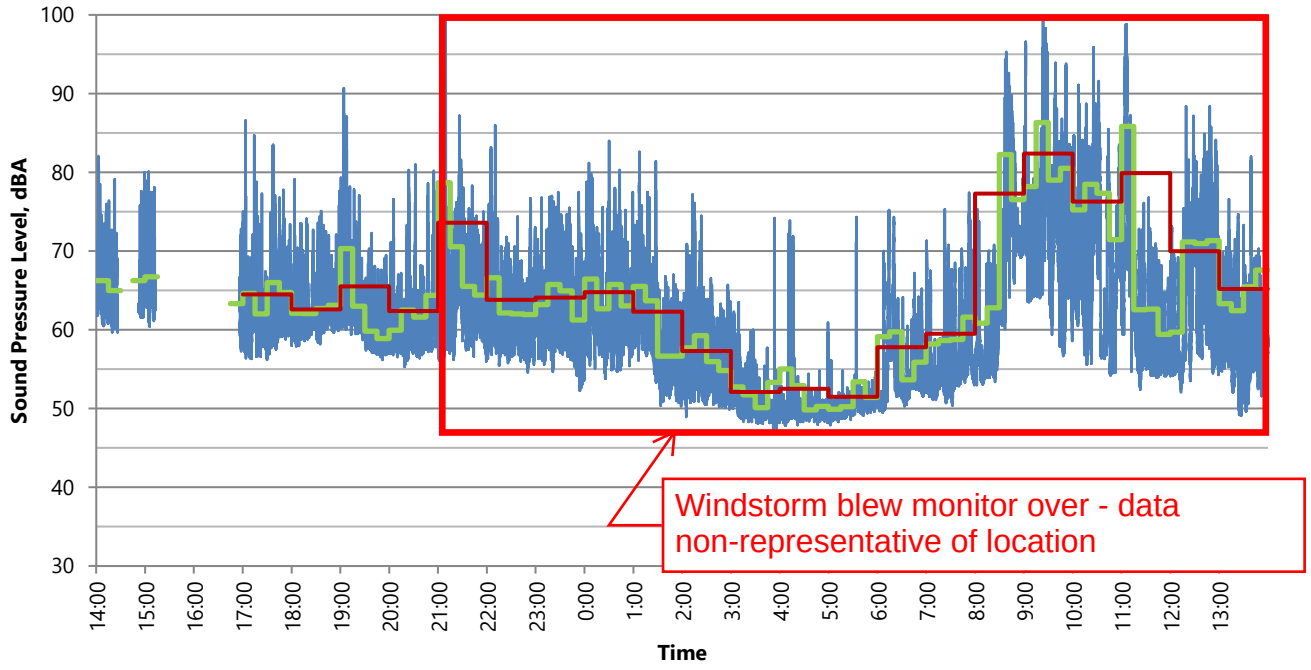


Hourly Interval Report starting at November 3, 2022
All Sound Pressure Levels presented in dBA

Date	Time	Duration	L_{eq}	L_{max}	L_{min}	L_1	L_5	L_{10}	L_{50}	L_{90}	L_{99}
Total	-	24:00:00	65	93	53	74	69	68	61	56	54
Nov 3	14:00:00	1:00:00	68	91	58	77	71	69	66	63	60
Nov 3	15:00:00	1:00:00	69	92	59	78	72	70	66	64	61
Nov 3	16:00:00	1:00:00	69	91	62	77	72	70	67	65	63
Nov 3	17:00:00	1:00:00	66	92	57	73	69	68	63	60	58
Nov 3	18:00:00	1:00:00	64	86	55	71	68	66	61	57	56
Nov 3	19:00:00	1:00:00	62	84	54	72	67	63	58	56	56
Nov 3	20:00:00	1:00:00	66	89	54	79	69	66	58	56	55
Nov 3	21:00:00	1:00:00	63	90	53	71	66	64	57	55	54
Nov 3	22:00:00	1:00:00	63	86	55	74	67	64	59	57	56
Nov 3	23:00:00	1:00:00	66	89	53	75	69	67	63	58	55
Nov 4	0:00:00	1:00:00	65	93	52	74	69	67	61	54	53
Nov 4	1:00:00	1:00:00	57	79	52	64	57	57	55	54	53
Nov 4	2:00:00	1:00:00	56	72	53	59	58	57	56	55	54
Nov 4	3:00:00	1:00:00	57	78	54	64	58	58	56	55	55
Nov 4	4:00:00	1:00:00	63	92	53	73	59	58	56	54	53
Nov 4	5:00:00	1:00:00	65	91	53	78	64	60	57	55	54
Nov 4	6:00:00	1:00:00	64	91	56	69	66	65	62	59	57
Nov 4	7:00:00	1:00:00	67	91	59	75	70	69	65	63	60
Nov 4	8:00:00	1:00:00	64	84	58	73	70	67	62	59	59
Nov 4	9:00:00	1:00:00	65	90	57	73	69	67	61	59	58
Nov 4	10:00:00	1:00:00	66	89	57	74	70	68	64	60	58
Nov 4	11:00:00	1:00:00	68	99	57	76	71	69	65	61	59
Nov 4	12:00:00	1:00:00	66	88	57	74	70	68	64	60	58
Nov 4	13:00:00	1:00:00	67	91	57	75	71	69	64	60	58

Baseline Noise Monitoring (480 Audley Blvd)

The graph below shows the measured, and calculated time histories beginning on November 04, 2022



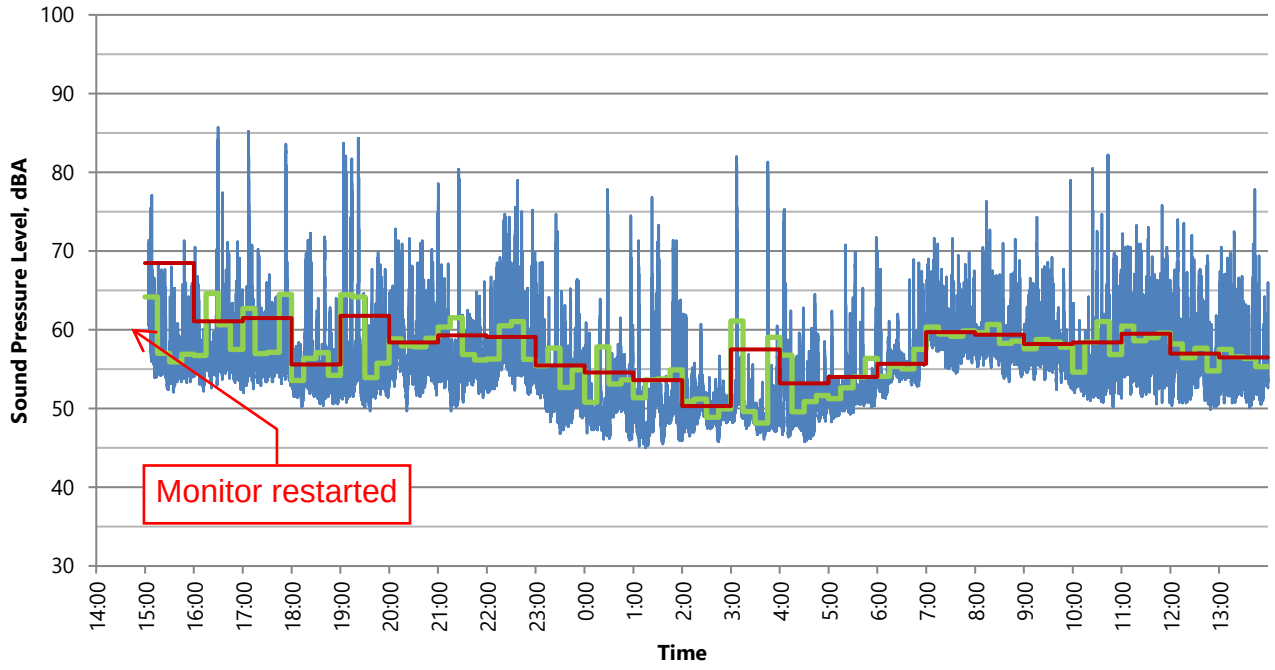
Hourly Interval Report starting at November 4, 2022
All Sound Pressure Levels presented in dBA

1 second measured L_{eq}
15 minute calculated L_{eq}
1 hour measured L_{eq}

Date	Time	Duration	L_{eq}	L_{max}	L_{min}	L_1	L_5	L_{10}	L_{50}	L_{90}	L_{99}
Total	-	24:00:00	73	108	47	86	74	70	60	51	49
Nov 4	14:00:00	1:00:00	-	-	-	-	-	-	-	-	-
Nov 4	15:00:00	1:00:00	-	-	-	-	-	-	-	-	-
Nov 4	16:00:00	1:00:00	-	-	-	-	-	-	-	-	-
Nov 4	17:00:00	1:00:00	65	90	55	73	68	66	61	58	57
Nov 4	18:00:00	1:00:00	63	84	57	70	66	64	61	60	59
Nov 4	19:00:00	1:00:00	66	91	56	72	66	64	60	58	57
Nov 4	20:00:00	1:00:00	62	83	55	73	66	64	59	58	56
Nov 4	21:00:00	1:00:00	74	116	55	77	73	70	62	58	57
Nov 4	22:00:00	1:00:00	64	88	54	73	68	66	61	58	56
Nov 4	23:00:00	1:00:00	64	83	52	74	70	67	61	56	53
Nov 5	0:00:00	1:00:00	65	88	53	75	69	67	61	57	55
Nov 5	1:00:00	1:00:00	62	87	50	73	66	65	58	53	51
Nov 5	2:00:00	1:00:00	57	79	49	68	61	59	54	52	50
Nov 5	3:00:00	1:00:00	52	76	47	57	54	53	50	49	48
Nov 5	4:00:00	1:00:00	53	75	47	62	52	51	50	49	48
Nov 5	5:00:00	1:00:00	52	76	48	54	52	52	50	49	49
Nov 5	6:00:00	1:00:00	58	78	49	69	62	59	53	51	50
Nov 5	7:00:00	1:00:00	60	81	50	70	66	63	54	52	51
Nov 5	8:00:00	1:00:00	77	103	52	89	86	81	66	55	54
Nov 5	9:00:00	1:00:00	82	101	56	94	91	86	70	64	57
Nov 5	10:00:00	1:00:00	76	98	54	87	83	80	68	57	55
Nov 5	11:00:00	1:00:00	80	101	52	95	85	75	60	55	54
Nov 5	12:00:00	1:00:00	70	92	52	80	76	74	62	55	53
Nov 5	13:00:00	1:00:00	65	91	48	76	69	68	59	52	50

Baseline Noise Monitoring (480 Audley Blvd)

The graph below shows the measured, and calculated time histories beginning on November 07, 2022

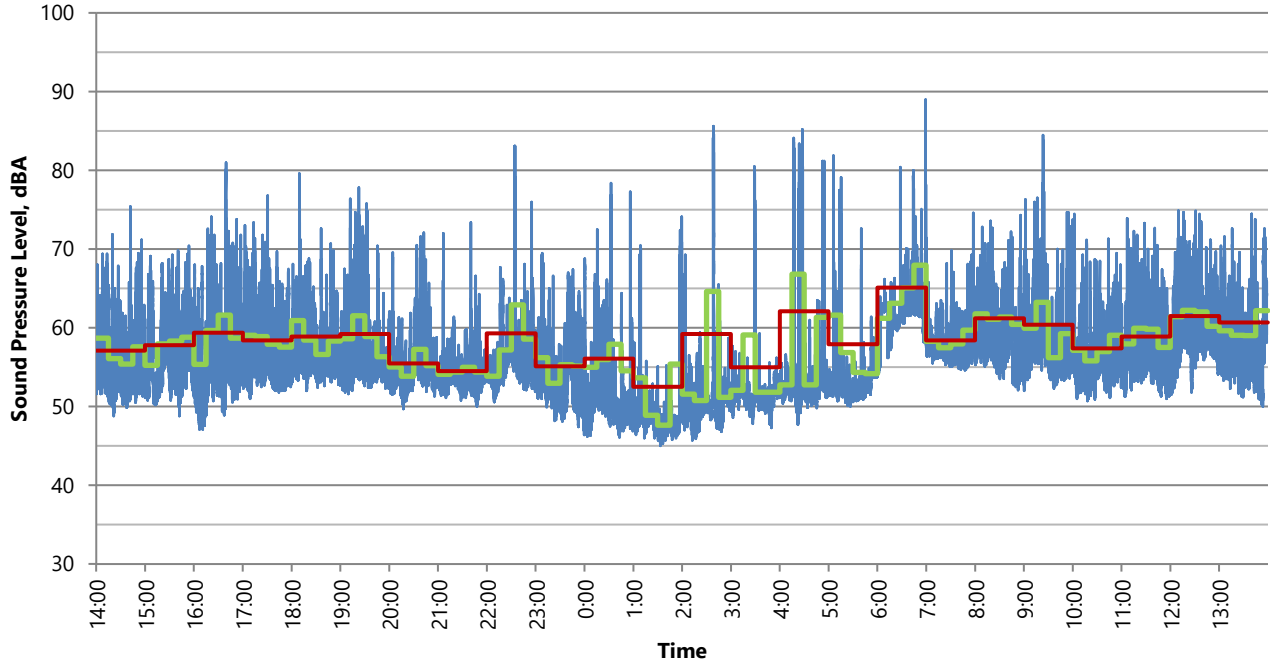


Hourly Interval Report starting at November 7, 2022
All Sound Pressure Levels presented in dBA

Date	Time	Duration	L_{eq}	L_{max}	L_{min}	L_1	L_5	L_{10}	L_{50}	L_{90}	L_{99}
Total	-	24:00:00	58	86	45	67	61	59	55	49	47
Nov 7	14:00:00	1:00:00	-	-	-	-	-	-	-	-	-
Nov 7	15:00:00	1:00:00	69	88	51	84	69	64	56	54	53
Nov 7	16:00:00	1:00:00	61	88	51	68	61	59	56	54	53
Nov 7	17:00:00	1:00:00	62	86	51	70	61	59	56	54	53
Nov 7	18:00:00	1:00:00	56	76	49	64	58	56	54	52	51
Nov 7	19:00:00	1:00:00	62	87	49	76	58	57	54	52	51
Nov 7	20:00:00	1:00:00	58	78	49	66	63	61	56	53	52
Nov 7	21:00:00	1:00:00	59	83	49	68	60	59	56	53	51
Nov 7	22:00:00	1:00:00	59	81	51	70	62	60	56	54	52
Nov 7	23:00:00	1:00:00	56	76	46	66	59	56	52	49	48
Nov 8	0:00:00	1:00:00	55	79	45	61	56	54	50	48	47
Nov 8	1:00:00	1:00:00	54	79	44	67	54	52	49	46	46
Nov 8	2:00:00	1:00:00	50	66	45	58	53	52	49	48	46
Nov 8	3:00:00	1:00:00	58	83	45	63	54	52	49	48	47
Nov 8	4:00:00	1:00:00	53	77	45	63	56	53	49	47	46
Nov 8	5:00:00	1:00:00	54	78	48	66	56	53	51	50	49
Nov 8	6:00:00	1:00:00	56	72	51	62	59	57	55	53	52
Nov 8	7:00:00	1:00:00	60	76	54	66	62	61	59	57	55
Nov 8	8:00:00	1:00:00	59	82	53	66	62	61	58	56	54
Nov 8	9:00:00	1:00:00	58	83	52	65	61	60	57	55	53
Nov 8	10:00:00	1:00:00	58	87	50	67	59	57	54	52	51
Nov 8	11:00:00	1:00:00	60	83	50	69	64	62	57	53	52
Nov 8	12:00:00	1:00:00	57	76	49	66	61	59	54	51	51
Nov 8	13:00:00	1:00:00	57	81	50	66	61	59	54	52	51

Baseline Noise Monitoring (480 Audley Blvd)

The graph below shows the measured, and calculated time histories beginning on November 08, 2022



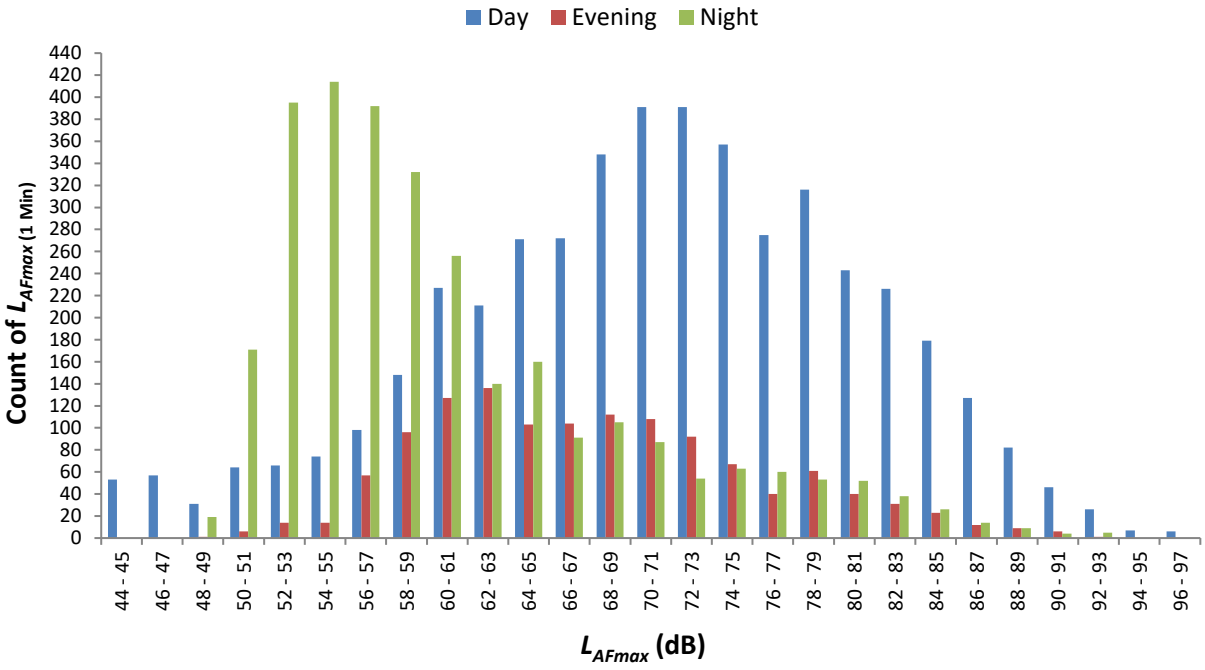
Hourly Interval Report starting at November 8, 2022
All Sound Pressure Levels presented in dBA

1 second measured L_{eq}
15 minute calculated L_{eq}
1 hour measured L_{eq}

Date	Time	Duration	L_{eq}	L_{max}	L_{min}	L_1	L_5	L_{10}	L_{50}	L_{90}	L_{99}
Total	-	24:00:00	59	89	45	69	63	61	55	50	47
Nov 8	14:00:00	1:00:00	57	79	48	66	62	60	54	51	50
Nov 8	15:00:00	1:00:00	58	74	48	67	63	61	55	52	50
Nov 8	16:00:00	1:00:00	59	82	47	69	64	61	55	50	48
Nov 8	17:00:00	1:00:00	58	82	51	68	63	61	55	53	52
Nov 8	18:00:00	1:00:00	59	80	51	68	63	60	56	54	53
Nov 8	19:00:00	1:00:00	59	80	51	71	64	61	55	53	52
Nov 8	20:00:00	1:00:00	56	76	49	62	58	57	54	52	51
Nov 8	21:00:00	1:00:00	55	77	49	59	57	56	54	52	51
Nov 8	22:00:00	1:00:00	59	84	49	67	60	58	55	53	52
Nov 8	23:00:00	1:00:00	55	72	46	64	60	58	52	50	48
Nov 9	0:00:00	1:00:00	56	79	45	66	61	57	50	48	47
Nov 9	1:00:00	1:00:00	53	76	44	67	51	50	48	47	46
Nov 9	2:00:00	1:00:00	59	87	45	68	55	53	50	48	47
Nov 9	3:00:00	1:00:00	55	82	47	56	54	53	51	50	49
Nov 9	4:00:00	1:00:00	62	86	47	77	56	55	52	51	49
Nov 9	5:00:00	1:00:00	58	83	49	70	56	55	53	51	51
Nov 9	6:00:00	1:00:00	65	89	54	75	66	64	62	58	55
Nov 9	7:00:00	1:00:00	58	77	54	65	61	60	57	56	55
Nov 9	8:00:00	1:00:00	61	78	51	70	66	64	59	54	53
Nov 9	9:00:00	1:00:00	60	87	51	68	63	61	57	54	53
Nov 9	10:00:00	1:00:00	57	79	50	65	62	60	55	52	51
Nov 9	11:00:00	1:00:00	59	78	50	67	63	62	57	53	52
Nov 9	12:00:00	1:00:00	62	80	51	71	67	64	59	55	52
Nov 9	13:00:00	1:00:00	61	91	49	70	66	64	57	53	51

TDK Metro Terminals Rail Yard Expansion Project - Maximum Sound Level Histogram
480 Audley Blvd

Histogram of 1 minute L_{AFmax} values from October 31st-November 5th and November 7th-November 9th, 2022



L_{AFmax} (dB)	Count of 1 minute values		
	Day	Evening	Night
44 - 45	53	0	0
46 - 47	57	0	0
48 - 49	31	1	19
50 - 51	64	6	171
52 - 53	66	14	395
54 - 55	74	14	414
56 - 57	98	57	392
58 - 59	148	96	332
60 - 61	227	127	256
62 - 63	211	136	140
64 - 65	271	103	160
66 - 67	272	104	91
68 - 69	348	112	105
70 - 71	391	108	87
72 - 73	391	92	54
74 - 75	357	67	63
76 - 77	275	40	60
78 - 79	316	61	53
80 - 81	243	40	52
82 - 83	226	31	38
84 - 85	179	23	26
86 - 87	127	12	14
88 - 89	82	9	9
90 - 91	46	6	4
92 - 93	26	1	5
94 - 95	7	0	0
96 - 97	6	0	0

Baseline Noise Monitoring (9066 Collings Way)

Project ID:	2228-22A	Address:	9066 Collings Way, Delta, BC
Start Date:	October 31, 2022	Instrument:	01dB DUO
Start Time:	15:00	Serial No:	12788
Duration:	7 Days	Measured by:	AB/KC

Location Description

The microphone was located 4.3 m above the ground on a balcony of a single house. The north façade of the house is 2.6 m away from the microphone. The microphone position is 37 m from the EB South Fraser Perimeter Road (SFPR) centreline; and 730 m away from the existing container yard.

Ambient Noise Description

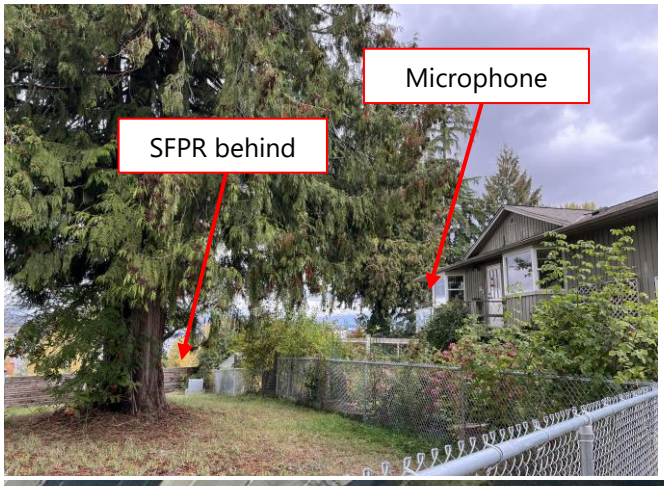
The dominant noise source was traffic noise from South Fraser Perimeter Road (SFPR).

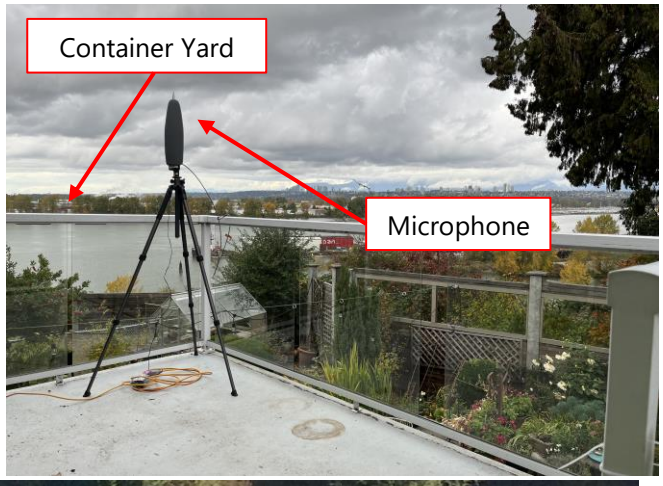
Environmental Conditions

The weather was mainly partly cloudy on October 31 - November 2, 5, and 8-9, 2022; and rainy on November 3-4, and 6, 2022.

Purpose of Monitoring Location

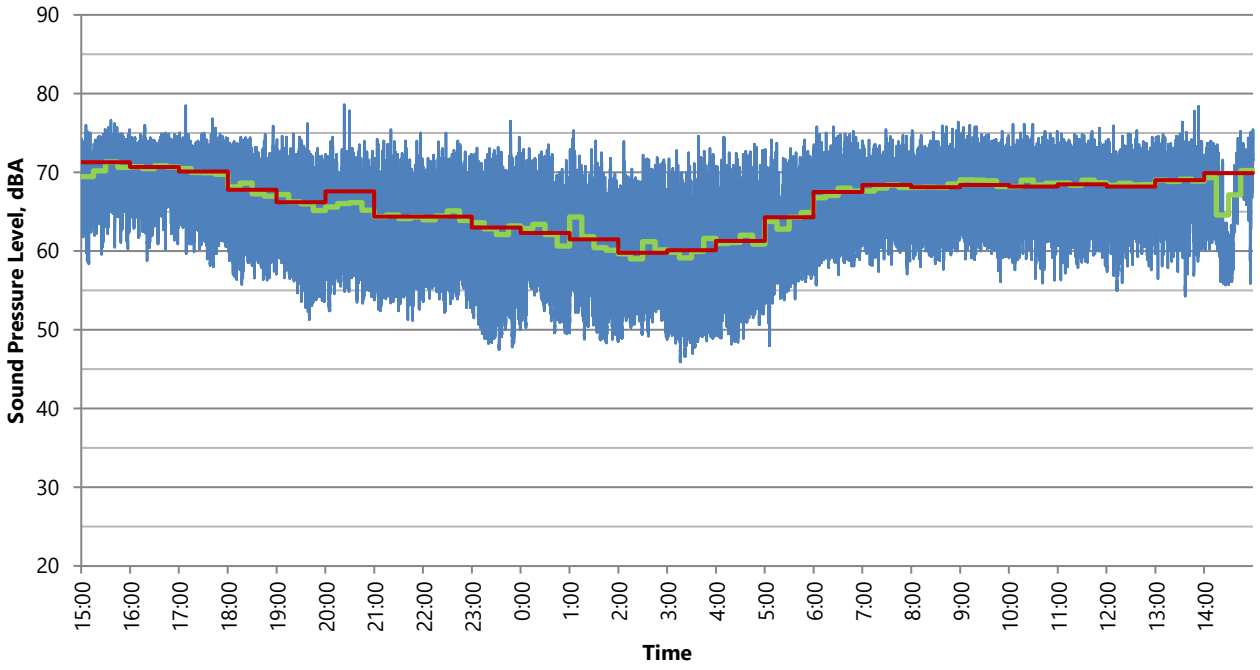
This monitoring location has a direct line of sight to the existing container yard on Annacis Island. It is representative of the nearest residenences to the Project site.





Baseline Noise Monitoring (9066 Collings Way)

The graph below shows the measured, and calculated time histories beginning on October 31, 2022

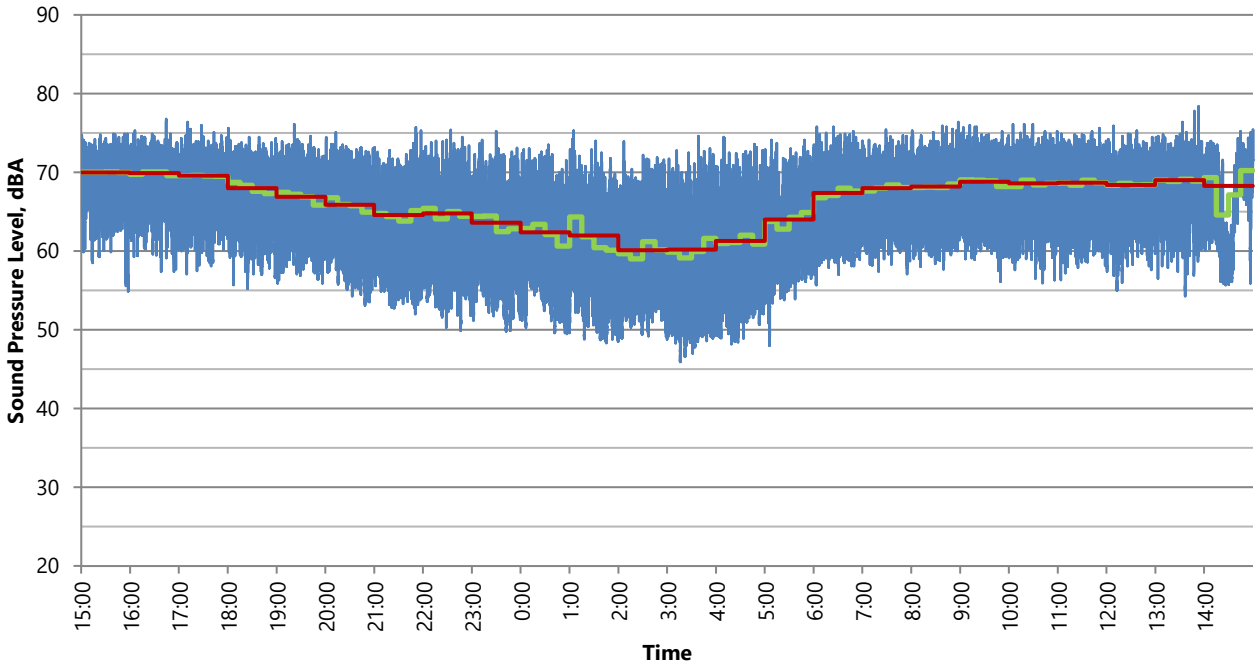


Hourly Interval Report starting at October 31, 2022
All Sound Pressure Levels presented in dBA

Date	Time	Duration	L_{eq}	L_{max}	L_{min}	L_1	L_5	L_{10}	L_{50}	L_{90}	L_{99}
Total	-	24:00:00	67	79	46	74	72	71	65	55	50
Oct 31	15:00:00	1:00:00	71	103	58	75	73	73	70	66	62
Oct 31	16:00:00	1:00:00	71	78	58	74	73	73	71	66	62
Oct 31	17:00:00	1:00:00	70	81	57	74	73	72	70	65	61
Oct 31	18:00:00	1:00:00	68	77	55	73	72	71	67	60	57
Oct 31	19:00:00	1:00:00	66	81	51	73	71	70	64	57	54
Oct 31	20:00:00	1:00:00	68	90	52	77	73	70	64	57	54
Oct 31	21:00:00	1:00:00	64	84	51	72	70	68	61	56	53
Oct 31	22:00:00	1:00:00	64	80	52	72	70	68	62	56	53
Oct 31	23:00:00	1:00:00	63	81	47	72	69	67	58	51	49
Nov 1	0:00:00	1:00:00	62	77	46	71	69	67	57	51	48
Nov 1	1:00:00	1:00:00	62	76	45	71	68	66	54	48	46
Nov 1	2:00:00	1:00:00	60	75	45	70	66	64	54	48	46
Nov 1	3:00:00	1:00:00	60	75	44	71	67	64	54	48	46
Nov 1	4:00:00	1:00:00	61	77	47	71	68	66	56	51	49
Nov 1	5:00:00	1:00:00	64	76	48	72	70	68	61	56	51
Nov 1	6:00:00	1:00:00	68	77	54	73	72	71	66	61	57
Nov 1	7:00:00	1:00:00	68	78	58	74	72	71	67	62	60
Nov 1	8:00:00	1:00:00	68	78	56	73	72	71	67	61	58
Nov 1	9:00:00	1:00:00	68	78	56	74	73	72	67	62	58
Nov 1	10:00:00	1:00:00	68	80	54	74	72	71	67	61	58
Nov 1	11:00:00	1:00:00	69	80	53	74	72	71	68	62	58
Nov 1	12:00:00	1:00:00	68	78	53	74	72	71	67	61	57
Nov 1	13:00:00	1:00:00	69	82	54	74	72	72	68	63	59
Nov 1	14:00:00	1:00:00	70	84	56	74	73	72	70	65	59

Baseline Noise Monitoring (9066 Collings Way)

The graph below shows the measured, and calculated time histories beginning on November 01, 2022

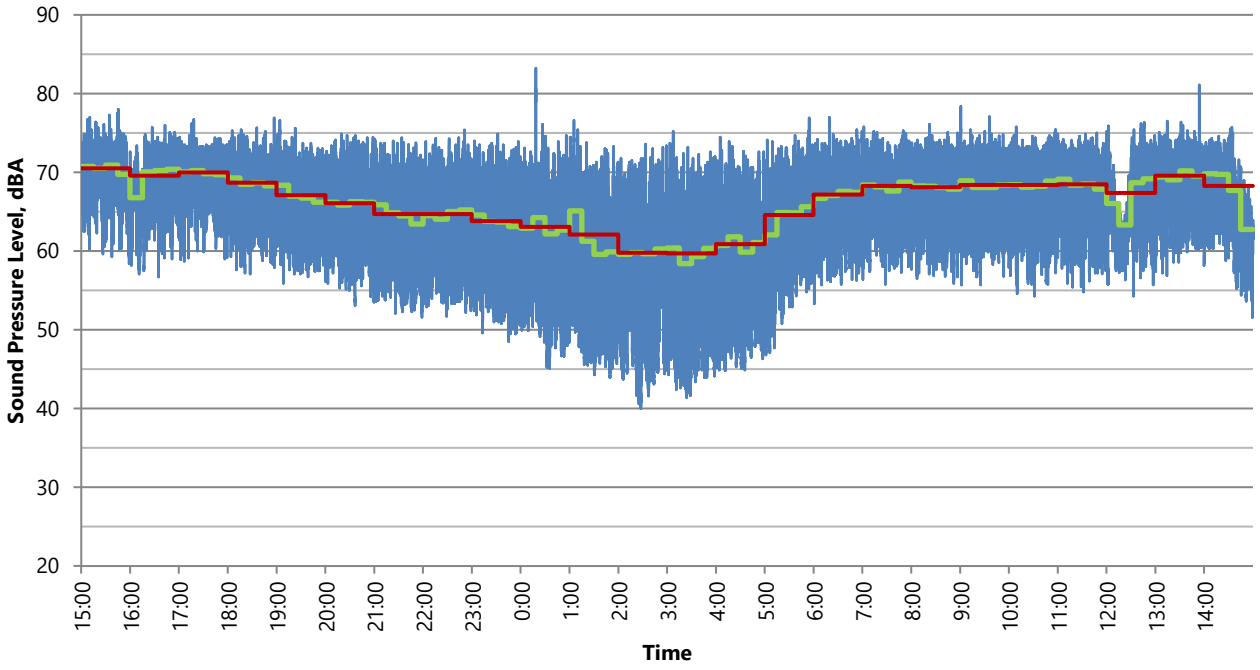


Hourly Interval Report starting at November 1, 2022
All Sound Pressure Levels presented in dBA

Date	Time	Duration	L_{eq}	L_{max}	L_{min}	L_1	L_5	L_{10}	L_{50}	L_{90}	L_{99}
Total	-	24:00:00	67	78	46	73	72	71	65	55	50
Nov 1	15:00:00	1:00:00	70	76	54	74	73	72	70	66	59
Nov 1	16:00:00	1:00:00	70	78	57	74	73	72	70	65	60
Nov 1	17:00:00	1:00:00	70	78	56	74	72	72	69	64	60
Nov 1	18:00:00	1:00:00	68	77	55	73	72	71	67	61	58
Nov 1	19:00:00	1:00:00	67	77	55	73	71	70	66	60	57
Nov 1	20:00:00	1:00:00	66	77	53	73	71	70	64	58	55
Nov 1	21:00:00	1:00:00	65	77	52	72	70	69	61	56	53
Nov 1	22:00:00	1:00:00	65	76	50	72	70	69	62	55	52
Nov 1	23:00:00	1:00:00	64	76	49	72	69	68	60	54	51
Nov 2	0:00:00	1:00:00	62	75	49	71	68	67	58	53	50
Nov 2	1:00:00	1:00:00	62	77	48	71	68	67	57	50	49
Nov 2	2:00:00	1:00:00	60	75	48	70	67	64	56	51	49
Nov 2	3:00:00	1:00:00	60	76	45	70	67	65	54	50	47
Nov 2	4:00:00	1:00:00	61	77	48	71	68	66	56	51	49
Nov 2	5:00:00	1:00:00	64	75	48	72	70	68	61	56	52
Nov 2	6:00:00	1:00:00	67	77	55	73	72	71	66	60	58
Nov 2	7:00:00	1:00:00	68	76	57	73	72	71	67	62	59
Nov 2	8:00:00	1:00:00	68	78	57	74	72	71	67	62	59
Nov 2	9:00:00	1:00:00	69	77	56	74	73	72	68	62	60
Nov 2	10:00:00	1:00:00	69	77	55	74	73	72	68	62	58
Nov 2	11:00:00	1:00:00	69	78	56	74	72	72	68	62	59
Nov 2	12:00:00	1:00:00	68	77	54	73	72	71	68	62	58
Nov 2	13:00:00	1:00:00	69	81	54	74	72	72	68	63	59
Nov 2	14:00:00	1:00:00	68	76	55	73	72	71	68	59	57

Baseline Noise Monitoring (9066 Collings Way)

The graph below shows the measured, and calculated time histories beginning on November 02, 2022

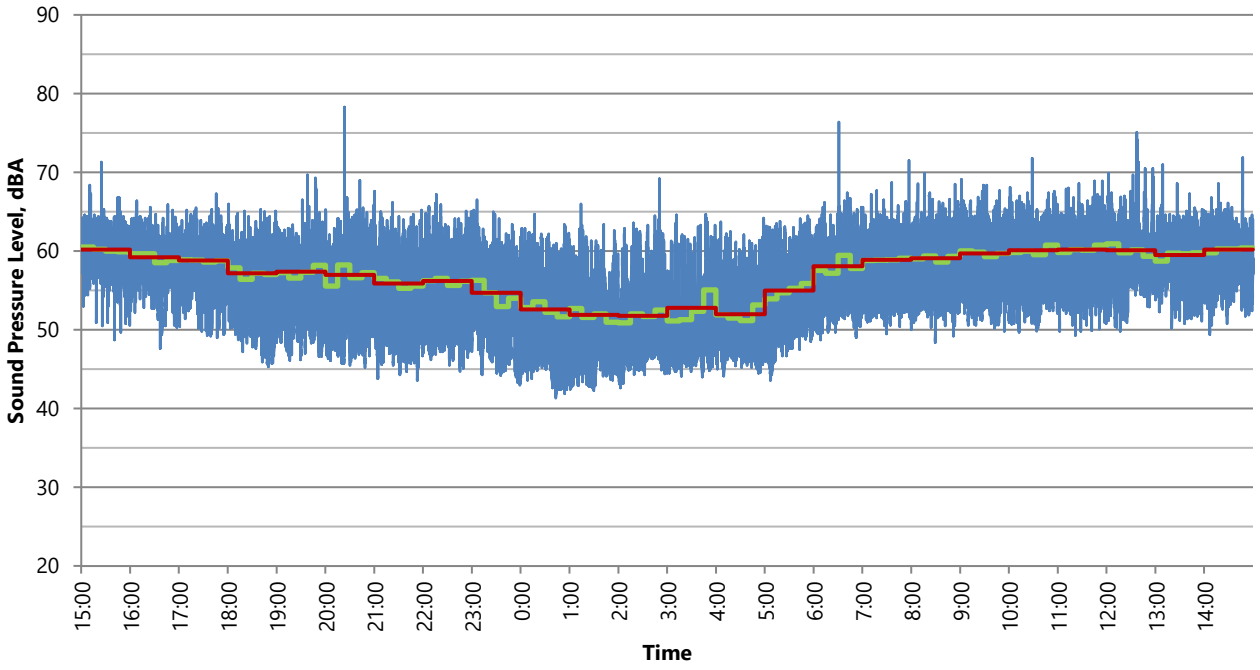


Hourly Interval Report starting at November 2, 2022
All Sound Pressure Levels presented in dBA

Date	Time	Duration	L_{eq}	L_{max}	L_{min}	L_1	L_5	L_{10}	L_{50}	L_{90}	L_{99}
Total	-	24:00:00	67	83	40	74	72	71	65	54	45
Nov 2	15:00:00	1:00:00	71	79	58	75	73	73	70	65	61
Nov 2	16:00:00	1:00:00	70	78	56	74	73	72	69	63	59
Nov 2	17:00:00	1:00:00	70	77	58	73	73	72	70	66	60
Nov 2	18:00:00	1:00:00	69	80	57	73	72	71	68	63	59
Nov 2	19:00:00	1:00:00	67	78	56	73	71	70	66	60	58
Nov 2	20:00:00	1:00:00	66	76	53	73	71	70	64	58	55
Nov 2	21:00:00	1:00:00	65	76	51	73	70	69	62	55	53
Nov 2	22:00:00	1:00:00	65	76	51	72	70	69	62	55	53
Nov 2	23:00:00	1:00:00	64	77	48	72	70	68	60	53	50
Nov 3	0:00:00	1:00:00	63	85	45	72	69	67	58	50	46
Nov 3	1:00:00	1:00:00	62	79	43	72	69	67	54	47	45
Nov 3	2:00:00	1:00:00	60	77	39	70	67	65	53	45	41
Nov 3	3:00:00	1:00:00	60	77	41	71	67	64	52	45	42
Nov 3	4:00:00	1:00:00	61	76	44	71	68	65	55	48	46
Nov 3	5:00:00	1:00:00	65	78	46	72	70	69	61	55	49
Nov 3	6:00:00	1:00:00	67	79	53	74	72	71	66	60	57
Nov 3	7:00:00	1:00:00	68	77	55	73	72	71	67	62	58
Nov 3	8:00:00	1:00:00	68	78	55	74	72	71	67	61	58
Nov 3	9:00:00	1:00:00	68	80	55	74	72	71	67	62	58
Nov 3	10:00:00	1:00:00	68	77	54	74	72	72	67	61	57
Nov 3	11:00:00	1:00:00	69	77	54	73	72	71	68	62	58
Nov 3	12:00:00	1:00:00	67	81	54	74	72	71	65	60	57
Nov 3	13:00:00	1:00:00	70	83	56	74	73	72	69	64	60
Nov 3	14:00:00	1:00:00	68	77	51	74	72	72	67	60	56

Baseline Noise Monitoring (9066 Collings Way)

The graph below shows the measured, and calculated time histories beginning on November 03, 2022

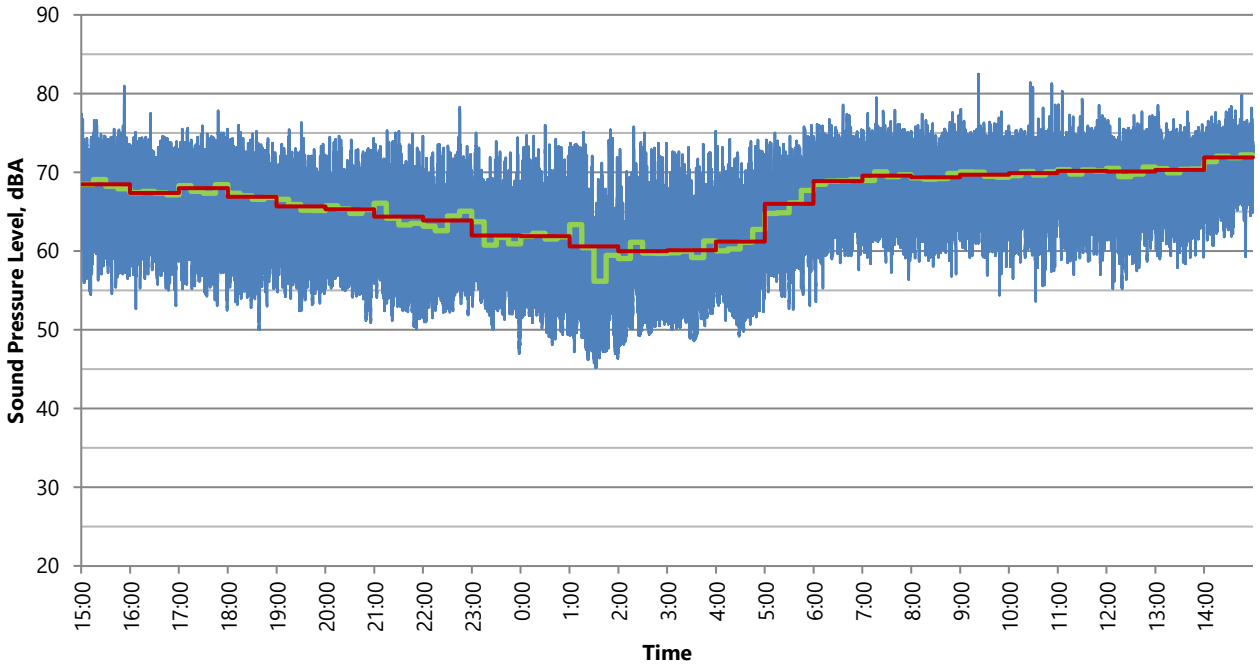


Hourly Interval Report starting at November 3, 2022
All Sound Pressure Levels presented in dBA

Date	Time	Duration	L_{eq}	L_{max}	L_{min}	L_1	L_5	L_{10}	L_{50}	L_{90}	L_{99}
Total	-	24:00:00	58	78	41	65	63	61	56	47	44
Nov 3	15:00:00	1:00:00	60	72	48	64	63	62	60	57	52
Nov 3	16:00:00	1:00:00	59	70	47	64	62	61	59	56	52
Nov 3	17:00:00	1:00:00	59	69	49	64	62	61	58	55	51
Nov 3	18:00:00	1:00:00	57	68	45	64	61	60	56	51	47
Nov 3	19:00:00	1:00:00	57	72	45	65	62	61	56	50	47
Nov 3	20:00:00	1:00:00	57	80	45	64	62	61	54	48	46
Nov 3	21:00:00	1:00:00	56	69	43	64	61	60	53	47	45
Nov 3	22:00:00	1:00:00	56	69	44	64	62	60	53	48	46
Nov 3	23:00:00	1:00:00	55	71	42	62	60	59	52	46	44
Nov 4	0:00:00	1:00:00	53	66	41	61	59	57	49	44	42
Nov 4	1:00:00	1:00:00	52	67	41	61	58	56	48	44	43
Nov 4	2:00:00	1:00:00	52	72	42	62	58	55	48	45	43
Nov 4	3:00:00	1:00:00	53	66	43	63	60	56	48	46	45
Nov 4	4:00:00	1:00:00	52	66	44	61	58	55	49	46	45
Nov 4	5:00:00	1:00:00	55	66	43	63	60	59	53	48	45
Nov 4	6:00:00	1:00:00	58	77	48	65	62	61	56	52	50
Nov 4	7:00:00	1:00:00	59	75	49	65	63	62	58	53	51
Nov 4	8:00:00	1:00:00	59	71	48	65	63	62	58	53	51
Nov 4	9:00:00	1:00:00	60	72	49	65	64	63	59	54	51
Nov 4	10:00:00	1:00:00	60	75	49	66	64	63	59	54	51
Nov 4	11:00:00	1:00:00	60	72	49	66	64	63	59	54	51
Nov 4	12:00:00	1:00:00	60	76	49	68	64	63	59	55	52
Nov 4	13:00:00	1:00:00	60	73	49	64	63	62	59	55	52
Nov 4	14:00:00	1:00:00	60	73	49	65	63	62	60	56	52

Baseline Noise Monitoring (9066 Collings Way)

The graph below shows the measured, and calculated time histories beginning on November 06, 2022

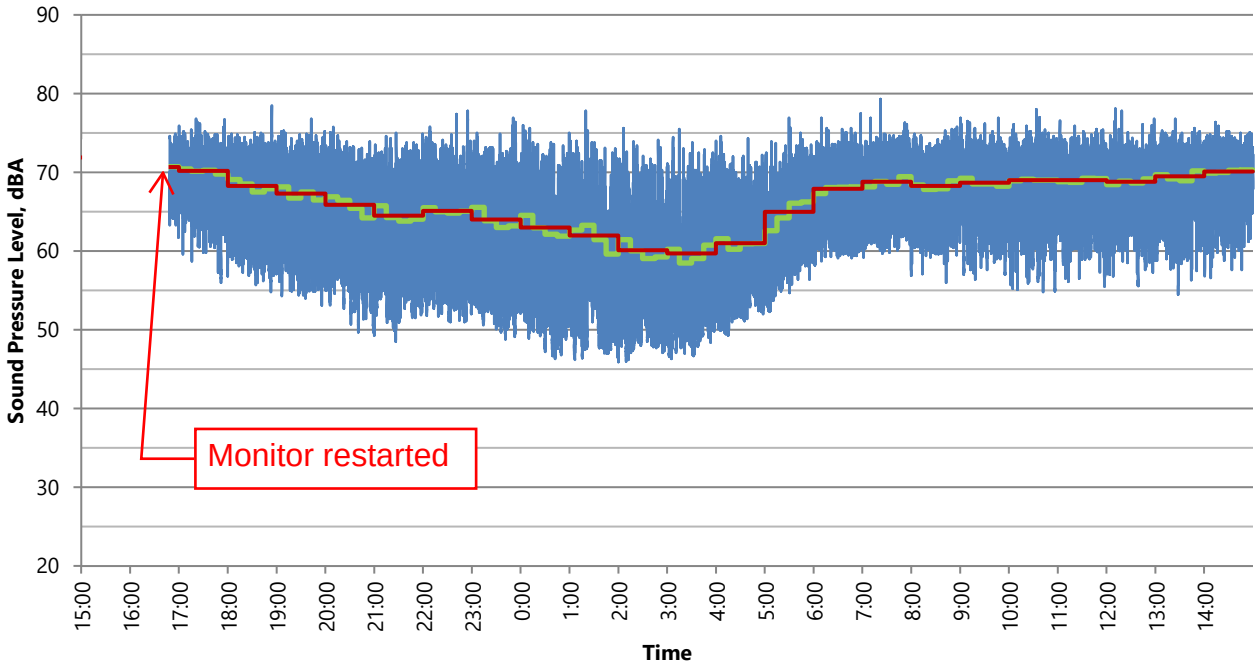


Hourly Interval Report starting at November 6, 2022
All Sound Pressure Levels presented in dBA

Date	Time	Duration	L_{eq}	L_{max}	L_{min}	L_1	L_5	L_{10}	L_{50}	L_{90}	L_{99}
Total	-	24:00:00	68	83	45	75	73	72	65	54	49
Nov 6	15:00:00	1:00:00	69	82	54	75	73	72	67	60	57
Nov 6	16:00:00	1:00:00	67	78	52	74	72	71	66	60	56
Nov 6	17:00:00	1:00:00	68	78	52	74	72	71	67	60	55
Nov 6	18:00:00	1:00:00	67	77	49	73	71	70	66	58	54
Nov 6	19:00:00	1:00:00	66	78	52	72	70	69	64	57	54
Nov 6	20:00:00	1:00:00	65	77	50	73	70	69	63	56	52
Nov 6	21:00:00	1:00:00	64	78	50	72	70	69	61	54	52
Nov 6	22:00:00	1:00:00	64	79	50	72	70	68	60	54	52
Nov 6	23:00:00	1:00:00	62	75	47	72	68	66	57	53	48
Nov 7	0:00:00	1:00:00	62	74	49	72	68	66	57	52	49
Nov 7	1:00:00	1:00:00	61	74	46	72	68	65	52	48	46
Nov 7	2:00:00	1:00:00	60	74	49	71	67	64	53	50	49
Nov 7	3:00:00	1:00:00	60	73	49	71	67	64	55	51	49
Nov 7	4:00:00	1:00:00	61	73	50	71	68	65	57	53	51
Nov 7	5:00:00	1:00:00	66	75	53	74	71	70	63	58	55
Nov 7	6:00:00	1:00:00	69	77	54	75	73	72	67	62	59
Nov 7	7:00:00	1:00:00	70	78	57	75	74	73	68	63	59
Nov 7	8:00:00	1:00:00	69	77	57	75	73	72	68	62	59
Nov 7	9:00:00	1:00:00	70	80	55	75	74	73	69	63	60
Nov 7	10:00:00	1:00:00	70	81	54	75	74	73	69	63	58
Nov 7	11:00:00	1:00:00	70	78	58	76	74	73	69	63	60
Nov 7	12:00:00	1:00:00	70	77	56	75	74	73	69	63	58
Nov 7	13:00:00	1:00:00	70	77	58	75	74	73	70	64	60
Nov 7	14:00:00	1:00:00	72	78	60	76	75	74	71	67	63

Baseline Noise Monitoring (9066 Collings Way)

The graph below shows the measured, and calculated time histories beginning on November 07, 2022



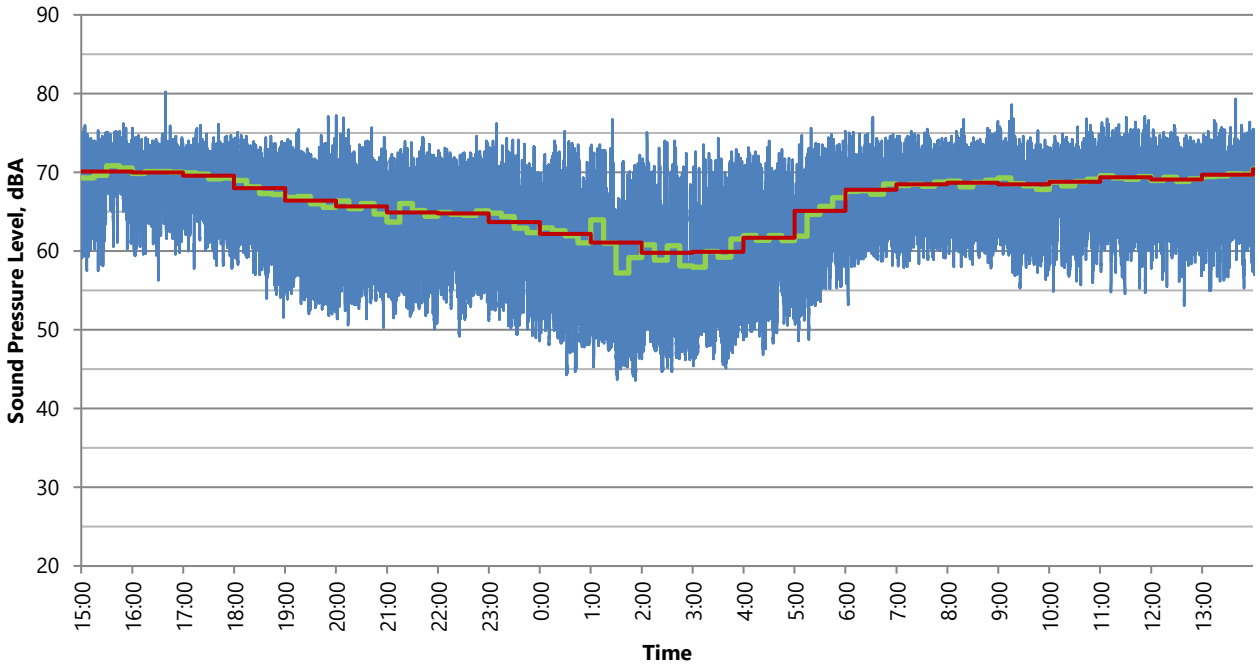
Hourly Interval Report starting at November 7, 2022
All Sound Pressure Levels presented in dBA

1 second measured L_{eq}
15 minute calculated L_{eq}
1 hour measured L_{eq}

Date	Time	Duration	L_{eq}	L_{max}	L_{min}	L_1	L_5	L_{10}	L_{50}	L_{90}	L_{99}
Total	-	22:00:00	67	79	46	74	72	71	65	53	48
Nov 7	15:00:00	1:00:00	-	-	-	-	-	-	-	-	-
Nov 7	16:00:00	1:00:00	-	-	-	-	-	-	-	-	-
Nov 7	17:00:00	1:00:00	70	79	55	74	73	72	70	65	60
Nov 7	18:00:00	1:00:00	68	80	54	74	72	71	67	60	57
Nov 7	19:00:00	1:00:00	67	78	53	74	72	71	65	58	55
Nov 7	20:00:00	1:00:00	66	76	49	73	71	70	64	56	51
Nov 7	21:00:00	1:00:00	65	77	48	73	70	69	61	54	51
Nov 7	22:00:00	1:00:00	65	80	51	73	71	69	61	54	52
Nov 7	23:00:00	1:00:00	64	78	48	73	70	68	60	53	50
Nov 8	0:00:00	1:00:00	63	78	46	73	70	67	57	50	47
Nov 8	1:00:00	1:00:00	62	80	46	72	69	67	55	48	47
Nov 8	2:00:00	1:00:00	60	77	45	71	67	64	53	49	47
Nov 8	3:00:00	1:00:00	60	76	46	71	67	63	53	49	47
Nov 8	4:00:00	1:00:00	61	76	49	71	67	65	56	52	50
Nov 8	5:00:00	1:00:00	65	78	52	72	70	69	62	57	53
Nov 8	6:00:00	1:00:00	68	79	58	74	72	71	67	61	59
Nov 8	7:00:00	1:00:00	69	80	56	74	73	72	68	63	61
Nov 8	8:00:00	1:00:00	68	78	55	74	72	71	67	62	59
Nov 8	9:00:00	1:00:00	69	79	56	74	73	72	68	62	59
Nov 8	10:00:00	1:00:00	69	79	54	74	73	72	68	62	57
Nov 8	11:00:00	1:00:00	69	78	55	74	73	72	68	63	59
Nov 8	12:00:00	1:00:00	69	79	55	74	72	72	68	62	58
Nov 8	13:00:00	1:00:00	70	79	54	74	73	72	69	63	59
Nov 8	14:00:00	1:00:00	70	78	56	74	73	72	70	65	60

Baseline Noise Monitoring (9066 Collings Way)

The graph below shows the measured, and calculated time histories beginning on November 08, 2022



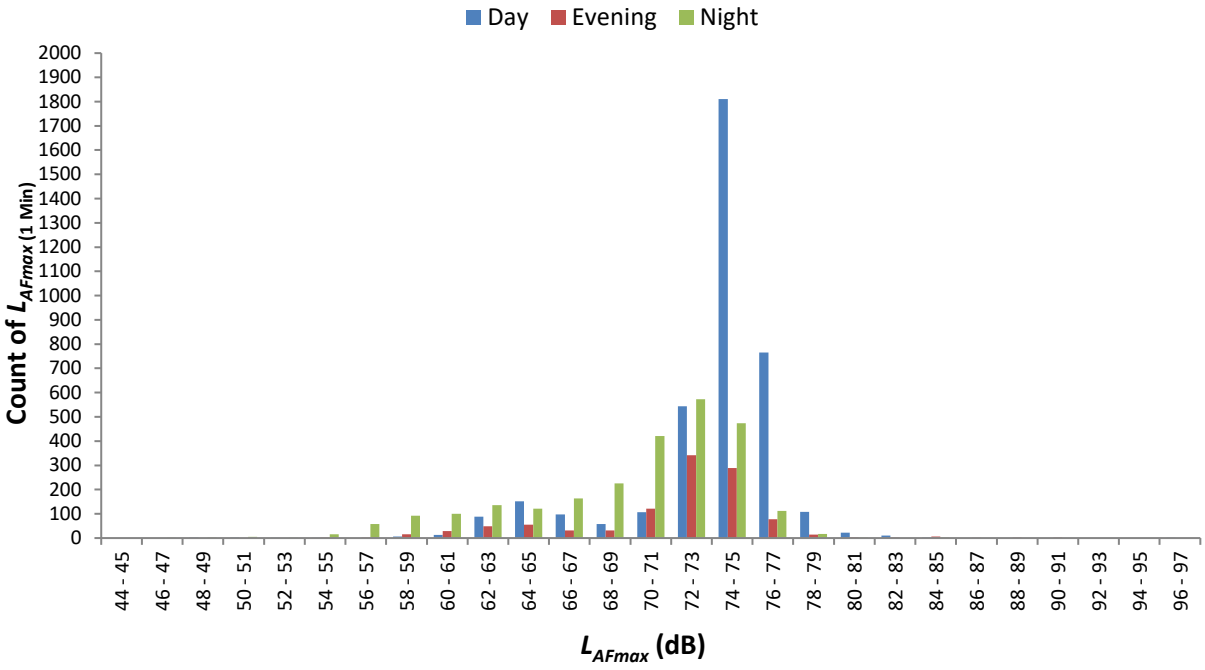
Hourly Interval Report starting at November 8, 2022
All Sound Pressure Levels presented in dBA

1 second measured L_{eq}
15 minute calculated L_{eq}
1 hour measured L_{eq}

Date	Time	Duration	L_{eq}	L_{max}	L_{min}	L_1	L_5	L_{10}	L_{50}	L_{90}	L_{99}
Total	-	23:00:00	67	80	44	74	72	71	66	53	47
Nov 8	15:00:00	1:00:00	70	78	57	74	73	72	70	65	60
Nov 8	16:00:00	1:00:00	70	81	56	74	73	72	70	66	61
Nov 8	17:00:00	1:00:00	70	78	57	74	72	72	69	65	60
Nov 8	18:00:00	1:00:00	68	77	51	73	72	71	67	60	56
Nov 8	19:00:00	1:00:00	66	79	51	73	71	70	65	57	53
Nov 8	20:00:00	1:00:00	66	81	50	73	71	69	63	56	53
Nov 8	21:00:00	1:00:00	65	76	50	72	70	69	62	55	52
Nov 8	22:00:00	1:00:00	65	76	49	72	70	69	62	55	52
Nov 8	23:00:00	1:00:00	64	78	48	72	70	68	59	53	50
Nov 9	0:00:00	1:00:00	62	76	44	72	68	67	57	50	45
Nov 9	1:00:00	1:00:00	61	80	43	71	68	66	53	46	44
Nov 9	2:00:00	1:00:00	60	77	44	71	67	64	53	48	46
Nov 9	3:00:00	1:00:00	60	76	44	71	67	64	53	48	46
Nov 9	4:00:00	1:00:00	62	75	46	71	68	66	57	52	48
Nov 9	5:00:00	1:00:00	65	77	48	73	71	69	62	56	51
Nov 9	6:00:00	1:00:00	68	78	53	74	72	71	66	61	59
Nov 9	7:00:00	1:00:00	69	78	57	74	72	72	68	62	59
Nov 9	8:00:00	1:00:00	69	78	57	74	73	72	68	62	60
Nov 9	9:00:00	1:00:00	69	81	55	74	72	72	68	61	58
Nov 9	10:00:00	1:00:00	69	79	54	74	72	72	68	62	58
Nov 9	11:00:00	1:00:00	69	78	54	75	73	72	69	63	58
Nov 9	12:00:00	1:00:00	69	77	52	74	73	72	68	63	58
Nov 9	13:00:00	1:00:00	70	81	55	75	73	72	69	63	58
Nov 9	14:00:00	1:00:00	-	-	-	-	-	-	-	-	-

TDK Metro Terminals Rail Yard Expansion Project - Maximum Sound Level Histogram
9066 Collings Way

Histogram of 1 minute L_{AFmax} values from October 31st-November 4th and November 6th-November 9th, 2022



	Count of 1 minute values		
L_{AFmax} (dB)	Day	Evening	Night
44 - 45	0	0	0
46 - 47	0	0	1
48 - 49	2	0	2
50 - 51	2	0	5
52 - 53	1	0	1
54 - 55	1	2	15
56 - 57	0	2	58
58 - 59	7	15	92
60 - 61	13	29	100
62 - 63	88	49	136
64 - 65	151	55	121
66 - 67	98	31	163
68 - 69	58	32	225
70 - 71	107	121	421
72 - 73	543	342	573
74 - 75	1810	289	474
76 - 77	765	78	112
78 - 79	108	14	17
80 - 81	22	4	2
82 - 83	11	2	0
84 - 85	2	6	2
86 - 87	0	1	0
88 - 89	0	2	0
90 - 91	0	2	0
92 - 93	0	0	0
94 - 95	0	0	0
96 - 97	1	0	0

Appendix D: Noise Modelling Methodology and Details

Acoustical Model

Noise levels at residential receiver locations have been predicted using the internationally recommended ISO 9613-2 (1996) standard, which is implemented in the outdoor sound propagation software Cadna/A version 2021. The *Good Practice Guide for Strategic Noise Mapping* (EC WG-AEN 2007) points out that this standard is recommended by the European Commission (EC) as current best practice to obtain accurate prediction results.

ISO 9613 describes a method for calculating the attenuation of sound during propagation outdoors in order to predict environmental noise levels at a distance from a variety of sources. It is the EC preferred standard for general industrial noise prediction. The method predicts the equivalent continuous A-weighted sound pressure level under meteorological conditions favourable for sound propagation. BKL used this method to predict noise propagation from the Project activities to the residential receivers.

Model calculations were performed in octave bands, considering ground cover, topography and shielding objects (see following sections). A temperature of 10°C and relative humidity of 80 per cent were used in the model settings to represent average weather conditions in Vancouver. A moderate temperature inversion was assumed to represent conditions favourable for sound propagation but not the absolute worst-case conditions.

Geometric Data

Topography

The ground is mainly flat at the terminal facility on Annacis Island. Terrain around the residential receiver is elevated approximately 30 metres above the facility's elevation and has a clear line of sight to Annacis Island.

The layout and dimensions of the Project terminal, its nearby facilities, and road and rail were taken from drawings provided by Hatfield. Residential building heights were estimated using field observations, and Google Earth.

Ground Surface

The acoustic properties of the ground surface can have a considerable effect on the propagation of noise. Flat non-porous surfaces, such as concrete, asphalt, buildings, calm water, etc., are highly reflective to noise, and according to ISO 9613-2 have a ground constant of G=0. Soft, porous surfaces, such as foliage, loam, soft grass, snow, etc., are highly absorptive to noise, and have a ground constant of G=1. The ISO standard does not use intermediate ground constants.

Highly reflective surfaces have been modelled in most areas as most of the surfaces near the site are considered to be acoustically hard, including nearby roadways and the water of the Fraser River.

Obstacles

The layout and dimensions of the Project's buildings and equipment were incorporated into the model based on Project drawings provided by TDK.

Noise Source Details

Table 5 below describes the sound power level and type of noise sources used in the model.

Table 5: Noise Source Data

Description	Model Source Type	SWL (dB) per Octave Band Frequency (Hz)									Total SWL
		31	63	125	250	500	1000	2000	4000	8000	dBA
Rail Loading/Unloading	Area	117	119	113	110	106	105	102	97	92	110
Rolling Stock	Line	110	106	98	96	93	91	90	86	81	97
Shunting	Line	107	103	100	97	97	94	92	87	77	99
Mobile Conveyer*	Point	93	94	96	97	97	97	100	103	103	108
Container Tipper*	Point	91	90	96	98	98	97	94	90	86	101

* Representative spectrum was adopted for modelling

The SWL in the model for 'Rolling Stock' and 'Shunting' were based on past source measurements that BKL did for similar projects. Other sources in the model were selected based on the closest match to the equipment provided in the design inputs, provided to us by TDK. To simplify modelling, the activities in the unloading railyard were consolidated into one track instead of two tracks. Details regarding the operations at the site are summarized in Table 6.

Table 6: Project Operations Summary

Information	Project
Terminal operating hours	7am – 11pm
Arrival/departure hours of train	11pm – 7am
Number of rail cars per year	4000
Number of rail cars per day	16 – 20
Maximum rail loading/unloading capacity	2 cars at the same time
Time taken for rail unloading per car	12 minutes
Number of total gate transactions per year	80,000