Epping to Thornleigh Third Track

Noise and Vibration Compliance Assessment

Sydney Trains

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Basis of Report

This report has been prepared by SLR Consulting Australia (SLR) with all reasonable skill, care and diligence, and taking account of the timescale and resources allocated to it by agreement with Sydney Trains (the Client). Information reported herein is based on the interpretation of data collected, which has been accepted in good faith as being accurate and valid.

This report is for the exclusive use of the Client. No warranties or guarantees are expressed or should be inferred by any third parties. This report may not be relied upon by other parties without written consent from SLR.

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Executive Summary

The Epping to Thornleigh Third Track Project (ETTT) involved the construction of six kilometres of new and upgraded track within the rail corridor between Epping and Thornleigh Stations on the western side of the existing tracks.

The Project is subject to Conditions of Approval (CoA) which include requirements for noise and vibration monitoring and assessment to determine compliance with the noise and vibration objectives in the CoA and to verify the noise predictions and mitigations referenced in the Epping to Thornleigh Third Track Operational Noise and Vibration Review (ONVR, 2014) and the addendum to the ONVR (June 2016).

This report details the compliance of the ETTT Project to the noise and vibration CoA at 5 years from the commencement of operations. The assessment of compliance was conducted in accordance with the requirements of Condition F2 of the CoA and was based on the following methodology and conclusions.

- SLR reviewed the noise model inputs for the current railway operations to confirm if the assumptions adopted in the ONVR remain valid. It was concluded that recalibration of the noise and vibration model was not required as inputs were consistent with the assumptions in the ONVR.
- SLR monitored railway noise at 19 locations and vibration at 3 locations along the ETTT corridor in 2023 to quantify noise and vibration emissions associated with railway operations 5 years from the opening of the ETTT Project.
- Monitored noise levels were compared to the noise predictions for the current operation of the ETTT Project. Current noise levels were found to be below the ONVR noise predictions for year 2026 operations at all monitoring locations. Therefore, the ONVR noise model was deemed appropriate for the determination of potential noise mitigation requirements.
- Noise levels at all receptors achieved the objectives of the IGANRIP and did not trigger the investigation of further mitigation measures.
- Noise emissions from the fixed facilities at Cheltenham Station and Pennant Hills Station were monitored in February 2024 and complied with the objectives of the NSW Industrial Noise Policy. Accordingly, compliance with Condition C2 has been achieved.
- Monitored vibration levels complied with the relevant vibration criteria and measures to mitigate ground vibration were not required. Therefore, compliance with Condition C3 has been achieved.
- Complaints received relating to operational rail noise and vibration impacts have been reviewed and are detailed in **Section 10.0** of this report.
- A range of rail noise initiatives have been implemented as part of the ETTT project and the broader management of rail noise on the network. Based the initiatives outlined in **Section 9.0** of this report, compliance of Condition F3 is achieved.
- This assessment has determined that the relevant CoA has been met by the ETTT Project at 5 years from the commencement of operation. On this basis, no further mitigation is required to mitigate noise and vibration impacts from current operations.

The requirement for further noise and vibration mitigation will be reviewed at 10 years from the commencement of operations, as part of the future compliance assessments required by the CoA.

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1.0 Introduction

SLR Consulting Australia Pty Ltd (SLR) has been engaged by Sydney Trains to undertake the 5 year noise and vibration compliance assessment in accordance with Conditions of Approval (CoA) F2.

> *The Proponent shall undertake noise and vibration compliance monitoring and assessments to confirm the predictions of the noise assessment and mitigations referred to in the ONVR (conditions C4). The noise and vibration compliance assessment shall be developed in consultation with the EPA and be undertaken at twelve months, 5 years and 10 years of the commencement of operation of the SSI, or as otherwise agreed by the Director-General.*

The purpose of the noise and vibration compliance assessment is to assess the noise and vibration produced by rail and stationary sources and the adequacy of noise mitigation measures to demonstrate compliance with the predictions in the Operational Noise and Vibration Review (ONVR).

1.1 Noise and Vibration Monitoring and Compliance Assessment

The Conditions relating to operational noise and vibration are contained in the CoA *Schedule C – Environmental Performance* and in *Schedule F – Operational Environmental Management*. The relevant conditions for the compliance monitoring and assessment for noise and vibration are reproduced below in **Table 1**.

Table 1 Conditions of Approval for Operational Noise and Vibration for the ETTT Project

Condition	Condition Requirements	Where Addressed
C1	Rail line components of the SSI shall be designed and operated with the objective of not exceeding the airborne and ground-borne noise trigger levels at existing development, at each stage of the SSI, as presented in IGANRIP or RING, whichever is the most conservative. For the purpose of this condition, existing development includes all development that at the date of this approval, has been carried out in the vicinity of the rail corridor and any such development approved prior to the determination of this SSI, but only to the extent that the location of the development is known.	**Section 5.0**
C2	Stationary facilities (including stations) shall be designed and operated with the objective of meeting operational noise levels derived from the NSW Industrial Noise Policy (NSW Government, 2000).	**Section 6.0**
C3	The SSI shall be designed and operated with the objective of not exceeding the vibration goals for human exposure for existing sensitive receptors, as presented in Assessing Vibration: a Technical Guideline (Department of Conservation and Climate Change, 2006).	**Section 7.0**
F2	The Proponent shall undertake noise and vibration compliance monitoring and assessments to confirm the predictions of the noise assessment and mitigations referred to in the ONVR (condition C4). The noise and vibration compliance assessment shall be developed in consultation with the EPA and be undertaken at twelve months, 5 years and 10 years of the commencement of operation of the SSI, or as otherwise agreed by the Director-General.	

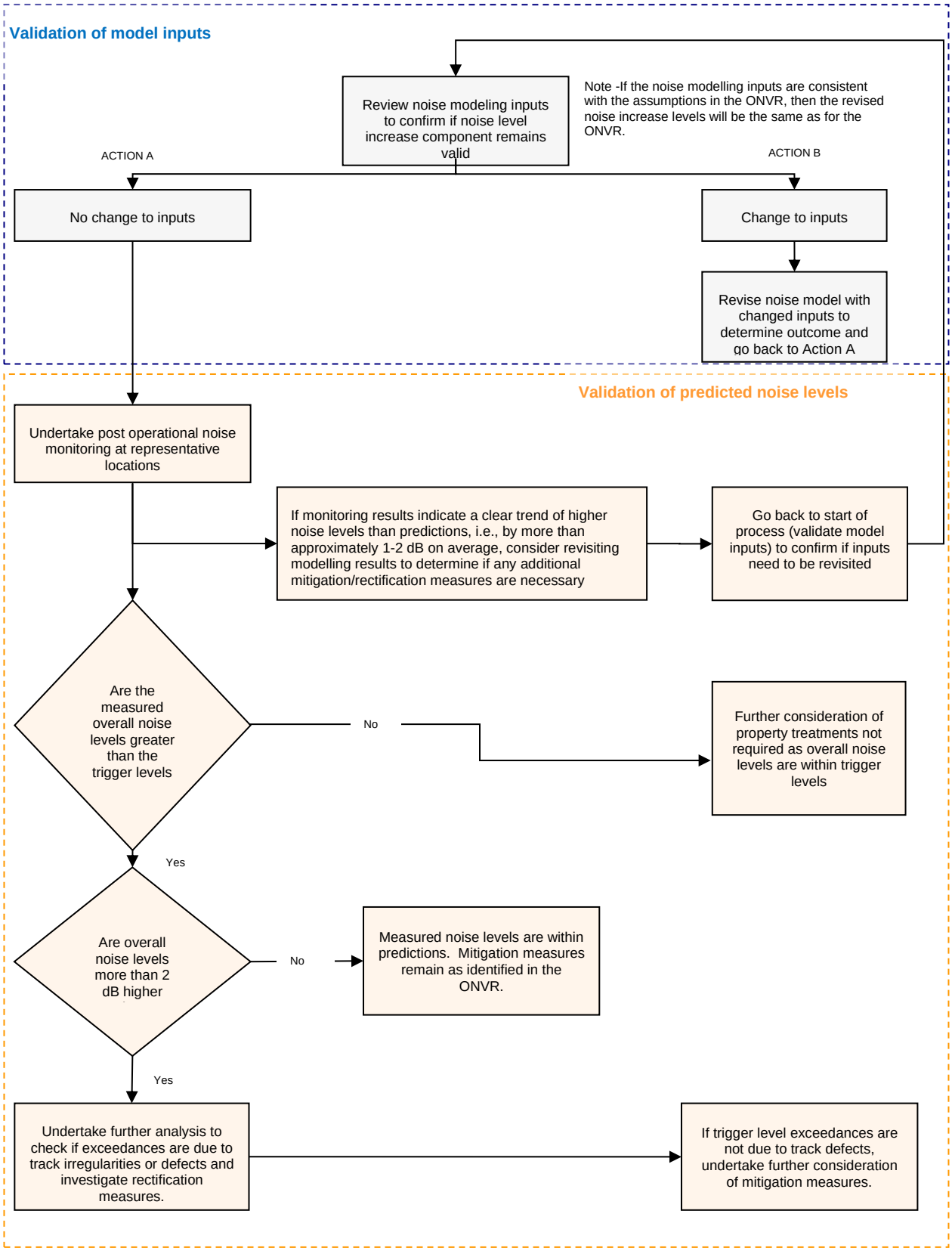
Condition	Condition Requirements	Where Addressed
	The assessment shall include, but not necessary be limited to:	
	a. Noise and vibration monitoring and compliance assessment, to assess compliance with conditions C1 to C3 of the approval and the ONVR;	**Section 4.2.2**
	b. An assessment methodology and the outcomes of the Source Noise Monitoring Plan and other relevant Rail Noise Initiatives developed and implemented for the SSI (condition F3);	**Section 9.0**
	c. Details of any complaints received relating to operational noise and vibration impacts;	**Section 10.0**
	d. An assessment of the performance and effectiveness of the applied noise and vibration mitigation measures;	**Section 8.0**
	e. Any required recalibration of the noise and vibration model, including consideration of freight train movements should the average number of night time trains exceed the projected value used for the noise mitigation design of the ONVR; and	**Section 3.0**
	f. Identification, if required, of further noise and vibration mitigation measures to meet the requirements of C1 to C3 of the approval and objectives identified in the ONVR.	**Section 8.0**
	An Operational Noise and Vibration Compliance Assessment Report providing the results of the assessment shall be submitted to the Director-General and the EPA within 60 days of its completion and made publicly available. If the assessment indicates an exceedance of the noise and vibration objectives and predictions identified in the ONVR, the Proponent shall implement further feasible and reasonable measures to mitigate these exceedances in consultation with affected property owners (where required).	
F3	The Proponent shall ensure that the rail corridor associated with the SSI is considered in the development of initiatives to manage existing noise across the rail network. Where feasible and reasonable, initiatives that would address broader rail noise should be implemented as they relate to the SSI corridor. The implementation of these initiatives shall be reported in the Operational Noise and Vibration Compliance and Monitoring Assessment Report (condition F2).	**Section 9.0**

1.2 ONVR Compliance Methodology

The ONVR provides a methodology for the post operational noise and vibration monitoring and the assessment of compliance to the CoA. Consistent with the requirements of CoA F2, the process includes the validation of noise prediction modelling, measurement of noise and vibration levels during operation and verification of any further mitigation measures required to meet the requirements and objectives of the CoA.

The key stages of the compliance methodology are outlined below with a flowchart of the post operational noise process detailed in **Figure 1**.

Figure 1 Noise Testing and Validation Process (Source: ETTT ONVR)



2.0 ETTT Project Noise and Vibration Criteria

The CoA set the noise and vibration requirements for the operation of the ETTT Project. A detailed review of the applicable noise and vibration trigger levels, objectives and criteria was undertaken in the ONVR.

The assessment criteria adopted by the ONVR are reproduced in this section and have been applied for the assessment of noise and vibration level against the requirements of the CoA.

Specific acoustic terminology is used within this report. An explanation of common acoustic terms is included provided in **Appendix A**.

2.1 Noise from Operation of the Rail Line

Condition C1 of the CoA requires the ETTT Project to be designed and operated with the objective of noise not exceeding the airborne noise trigger levels as presented in the *Interim Guideline for the Assessment of Noise from Rail Infrastructure Projects* (IGANRIP) or the *Rail Infrastructure Noise Guideline* (RING), whichever is the most conservative.

The ONVR determined that whilst the noise trigger levels for a redevelopment project were the same within the IGANRIP and RING, the IGANRIP was the more conservative guideline as it requires the assessment of the increase in noise due to the project including growth in rail traffic over time, as well as any immediate increase due to the physical construction of the project. The RING methodology specifically excludes natural growth in traffic and includes only growth in traffic facilitated by the project.

The application of the IGANRIP as the more conservative guideline was verified in the ONVR through comparison of the receptor locations triggered for consideration of mitigation under the IGANRIP and RING (refer Section 5.8 of the ONVR).

The IGANRIP trigger levels for residential receive locations for a heavy rail redevelopment project are provided in **Table 2** and for other noise sensitive receptor locations in **Table 3**.

Table 2 Heavy Rail Redevelopment Noise Trigger Levels for Residential Land Uses

Type of Development	Residential Noise Trigger Levels, dBA		Commentary
	Daytime	Night-time	
	7.00 am to 10.00 pm	10.00 pm to 7.00 am	
Redevelopment of an existing rail line	Development increases existing rail noise levels, AND Resulting rail noise levels exceed:		These numbers represent level of noise that trigger the need for an assessment of potential noise mitigation measures to reduce noise levels from a rail infrastructure project. An increase in existing rail noise is taken to be an increase of 2.0 dB or more in the L_{Aeq} or an increase of 3.0 dB or more in the L_{Amax}.
	65 $L_{Aeq(15hour)}$ 85 L_{Amax}	60 $L_{Aeq(9hour)}$ 85 L_{Amax}	

Note: LAmax refer to the maximum noise levels not exceeded for 95% of rail pass-by events.

Table 3 Rail Redevelopment Noise Trigger Levels for Other Sensitive Land Uses

Sensitive Land Use	Noise Trigger Levels, dBA (when in use) Redevelopment of Existing Rail Line
Development increases existing rail noise levels by 2.0 dB or more in LAeq, AND resulting rail noise levels exceed:	
Schools, educational institutions – internal	45 $L_{Aeq(1hour)}$
Places of worship – internal	45 $L_{Aeq(1hour)}$
Hospitals – internal	35 $L_{Aeq(1hour)}$
Hospitals – external	60 $L_{Aeq(1hour)}$
Open space – passive use (eg parkland, bush reserves)	65 $L_{Aeq(15hour)}$
Open space – active use (eg sports field, golf course)	65 $L_{Aeq(24hour)}$

2.2 Ground-borne Noise

Ground-borne noise in buildings adjacent to railway lines is most common in railway tunnel situations where there is an absence of airborne noise to mask the ground-borne noise emissions. The ETTT Project does not include sections of underground railway, for this reason the effect of ground-borne noise will not be significant for the ETTT Project. Consistent with the ONVR, further assessment is not warranted.

2.3 Noise from Fixed Facilities

The ETTT Project included upgrades to Cheltenham Station and Pennant Hills Station. In accordance with CoA C2, the stations are to be designed and operated with the objective of meeting operational noise levels derived from the NSW Industrial Noise Policy (INP).

The ONVR assessed noise levels from the station upgrades and defined the INP noise criteria for station operations in **Table 4**.

Table 4 Summary of Operational Noise Criteria for Station Upgrades

Receptor Type	Assessment Period	Operational Noise Criteria, dBA		
		Intrusiveness $L_{Aeq(15minute)}$	Amenity $L_{Aeq(Period)}$	Sleep Disturbance $L_{A1(1minute)}$
Residential (South of Pennant Hills Station)	Daytime	48	55	n/a
	Evening	47	45	n/a
	Night-time	43	43	53
Residential (North of Pennant Hills Station)	Daytime	53	55	n/a
	Evening	51	51	n/a
	Night-time	44	49	54
Residential (North of Cheltenham Station)	Daytime	48	55	n/a
	Evening	46	45	n/a
	Night-time	36	40	46

Receptor Type	Assessment Period	Operational Noise Criteria, dBA		
		Intrusiveness $L_{Aeq(15minute)}$	Amenity $L_{Aeq(Period)}$	Sleep Disturbance $L_{A1(1minute)}$
Commercial	When in use	n/a	65	n/a
Educational	When in use	n/a	45	n/a
Active Recreation Area	When in use	n/a	55	n/a

Note: External noise level based on internal levels specified in the INP plus 10 dB (assuming open windows).

2.4 Ground Vibration

CoA C3 requires the ETTT Project to be operated with the objective of not exceeding the vibration goals for human exposure for existing sensitive receptors, as presented in *Assessing Vibration: a Technical Guideline* (AVATG) from the Department of Conservation and Climate Change (now the Environmental Protection Authority).

The guideline applies the Vibration Dose Value (VDV) parameter to assess vibration levels. The VDV is a measure of the total vibration exposure during the daytime and night-time period. It is a cumulative measure and indicates the combined effect of all train passby events within the daytime or night-time periods. The acceptable VDV criteria are provided in **Table 5**.

Table 5 Acceptable Vibration Dose Values for Intermittent Vibration ($m/s^{1.75}$)

Location	Daytime (7.00 am-10.00 pm)		Night-time (10.00 pm-7.00 am)	
	Preferred Value	Maximum Value	Preferred Value	Maximum Value
Residence	0.2	0.4	0.13	0.26
Offices, schools, educational institutions & places of worship	0.4	0.8	0.4	0.8

3.0 Review of Noise Modelling Inputs

In accordance with CoA condition F2.e, a review of the noise modelling inputs adopted in the ONVR has been conducted to determine if any recalibration of the noise and vibration model is required.

3.1 Freight Rail Operations

The daily freight train operations recorded by the Transport for NSW (TfNSW) Source Noise Monitoring station, adjacent to Sutherland Road at Beecroft, were analysed for September to November 2023. The daytime (7.00 am to 10.00 pm) and night-time (10.00 pm to 7.00 am) freight train operations for this period are summarised in **Table 6**. The current daytime and night-time freight movements are significantly less than the train movements applied in the ONVR, with the current peak freight movements more comparable, while still below the average forecast train movements in the ONVR.

The noise predictions in the ONVR for the daytime correlate well with current daytime freight movements. The night-time noise predictions in the ONVR are conservative for current rail operations and deemed valid for the assessment of noise levels and determination of noise mitigation. The train numbers used for this assessment are the baseline forecasts, i.e. the safety factor on train numbers included in the ONVR assessment as a precaution is not included.

Table 6 Freight Train Numbers from the Source Noise Monitoring Site

Source	Freight Train Numbers per Period (total for both tracks)	
	Daytime (7.00 am-10.00 pm)	Night-time (10.00 pm-7.00 am)
ONVR 2026 Daily Freight Forecast Average	23	21
ONVR 2026 Daily Freight Forecast Peak	34	35
Source Noise Monitoring Station September 2023	9 (average) 13 (peak)	9 (average) 15 (peak)
Source Noise Monitoring Station October 2023	9 (average) 17 (peak)	9 (average) 16 (peak)
Source Noise Monitoring Station November 2023	10 (average) 17 (peak)	9 (average) 15 (peak)

3.2 Passenger Rail Operations

Daily passenger train numbers, electric passenger fleet mix and the number of express and stopping services were provided by Sydney Trains for current rail operations and are shown in **Table 7** and **Table 8**. For reference, the assumptions applied in the '2026 Build' scenario in the ONVR is shown in brackets.

Table 7 Daily Train Operations

Scenario	Train Type	Trains per Weekday Period			
		Daytime (7.00 am-10.00 pm)		Night-time (10.00 pm-7.00 am)	
		Up	Down	Up	Down
2026 Build	Electric Passenger	105 (109)	106 (111)	33 (28)	32 (30)
	Diesel Passenger	3 (5)	4 (5)	1 (0)	0 (0)
	Freight capacity	10 (11)	7 (14)	4 (13)	9 (10)

Table 8 Electric Passenger ETTT Fleet Mix, Express and Stopping Services

Train Type	Fleet Mix	Express	Stopping
Double deck suburban (C/K/S/L/R sets)	0% (1%)	- (0%)	- (100%)
A/M/T/H sets	80% (81%)	28% (37%)	72% (67%)
V-Set (Intercity)/New Intercity Fleet	20% (18%)	100% (100%)	0% (0%)

Current daytime operations are lower than those adopted in the ONVR noise model, and as a result, noise predictions in the ONVR are conservative for current daytime rail operations. In the night-time period an additional seven passenger trains are expected as part of current rail operations. This 12% increase would have a negligible effect (approximately 0.5 dB increase) on the night-time predicted levels. Furthermore, as outlined in **Section 3.1**, under current operations, freight volumes are significantly less than the train movements applied in the ONVR. Consequently, the train movements applied in the ONVR are greater than current volumes and as such, are deemed valid for the assessment of noise levels and determination of noise mitigation, and no updates to the noise model are required.

3.3 Train Idling for the ETTT Project

Monitoring undertaken as part of the twelve-month compliance assessment process conducted in 2017 identified that on average, seven freight trains a week idle during the night-time at the northernmost signal in the project area. The ONVR assumed that freight trains would not idle at this location during the night-time period. Monitoring undertaken as part of this compliance assessment identified that freight trains continue to idle at this location during the night-time period, with 4 trains identified during the monitoring period, consistent with the noise levels observed during the 2017 assessment. As a result, the ONVR noise model was updated to include idling trains in the night-time period. A review of the noise prediction model confirmed that whilst idling trains at Thornleigh would influence the noise environment at nearby receptors for the duration of an idling events, the relatively low number of idling events were not sufficient to influence the 15-hour daytime and 9-hour night-time LAeq and LAmax noise levels. Based on the observed number of idling trains in the night-time period, the outcome of the 2017 compliance assessment remains valid, and no further updates to the noise model are required.

A review of the modelling inputs adopted in the ONVR has been undertaken and no changes to the ONVR noise model are required.

4.0 Noise And Vibration Monitoring Methodology

Noise and vibration levels from the ETTT Project were monitored between October 2023 and February 2024. The noise and vibration monitoring locations and monitoring methodologies are detailed below.

4.1 Noise and Vibration Monitoring Locations

The operational noise monitoring has been undertaken near to the potentially most-affected noise sensitive receptors, including 18 noise monitoring locations and three vibration monitoring locations consistent with those selected in the 2017 compliance assessment, as detailed in **Table 9**. Figures showing the monitoring locations are shown in **Appendix B.**

Table 9 Noise and Vibration Monitoring Locations

ID	Address	Details
N1	8 Cambridge Street, Epping	Representative location for noise sensitive receptors in Cambridge Street.
N2	36 Cambridge Street, Epping	Representative location for noise sensitive receptors in Edensor Street and Cambridge Street.
N3	23 Derby Street, Epping	Representative location for noise sensitive receptors in Derby Street.
V4	25 Old Beecroft Road, Cheltenham	Vibration monitored at a location representative of the highest predicted vibration levels in the ONVR.
N5	104 The Crescent, Cheltenham	Representative location for noise sensitive receptors on The Crescent and Old Beecroft Road.
N6	86 The Crescent, Cheltenham	Representative location for noise sensitive receptors on The Crescent.
N7	32 The Crescent, Cheltenham	Representative location for noise sensitive receptors on The Crescent, north of Cheltenham Road.

ID	Address	Details
NV8	Cheltenham Scout Hall	Representative location for noise sensitive receptors on The Crescent and Beecroft Road. Vibration monitored at a location representative of the highest predicted vibration levels in the ONVR.
N9	92 Sutherland Road, Beecroft	Representative of noise sensitive receptors on Sutherland Road adjacent to tight-radius track curve.
N10	126 Sutherland Road, Beecroft	Representative of noise sensitive receptors on Sutherland Road and Wongala Crescent, adjacent to tight-radius track curve.
N11	71 Wongala Crescent, Beecroft	Representative of noise sensitive receptors on Wongala Crescent adjacent to tight-radius track curve and Noise Barrier 2.
N12	83 Wongala Crescent, Pennant Hills	Representative of noise sensitive receptors on Wongala Crescent and Sherwood Close, adjacent to tight-radius track curve and Noise Barrier 2.
N13	3 Wongala Crescent, Pennant Hills	Representative of noise sensitive receptors on Wongala Crescent and Boundary Road, adjacent to tight-radius track curve.
N14	27 Azalea Grove, Pennant Hills	Representative of noise sensitive receptors adjacent to Azalea Grove.
V15	21 Binomea Place, Pennant Hills	Vibration monitored at a location representative of the highest predicted vibration levels in the ONVR.
N16	56 Yarrara Road, Pennant Hills	Representative of locations on Yarrara Road where modelling in the ONVR for 2026 identified potential triggers.
N17	1 Stevens Street, Pennant Hills	Representative of noise sensitive receptors on Stevens Street where modelling in the ONVR for 2026 identified potential triggers.
N18	Cheltenham Station, Cheltenham	Monitoring of noise from the station (fixed facility)
N19	Pennant Hills Station, Pennant Hills	Monitoring of noise from the station (fixed facility)
N20	14 Yarrara Road, Pennant Hills	Location of idling freight trains
N21	Thornleigh Seventh-day Adventist Church	Location of idling freight trains

4.2 Noise Monitoring Methodology

The noise monitoring methodology for this study is outlined in the following sections and has been undertaken in general accordance with Australian Standard AS2377-2002: *Acoustics – methods for the measurement of rail bound vehicle noise*, as recommended by the RING. Meteorological conditions were constantly monitored during the measurement period and measurements were stopped if they did not meet the requirements of AS 2377—2002.

The microphones of the sound level meters and noise loggers were deployed at a height of 1.5 m ± 0.2m above ground level. All measurements were in the free-field environment with no façade reflections.

All noise and vibration measurements were undertaken by a suitably qualified acoustic engineer to observe the train passby events and report measurement observations. The

measurements commenced as the train noise rose significantly above the background level and were stopped as the train noise approached the background level.

In the event that noise from other sources significantly affected the measurement results, the measurement was discarded. Detailed descriptions of any extraneous noise were recorded for all measurements, even if it did not control the measurement result.

For each measurement, detailed descriptions of the passby noise characteristics were recorded to fully define any noise features relevant to the track, and train, that potentially influenced the measured noise level. Details of the train operational state recorded during the measurement included:

- Time of the train passby/ noise event.
- Rolling stock (train) type.
- Number of cars on passenger trains and the number of wagons and locomotives on freight trains.
- Direction of travel (i.e. up or down line).
- The time taken for the train to pass a known point was recorded to estimate train speed as a function of the train length and time.
- Observed noise characteristics and any discernible noise source and/or defects that influenced the measurements.

A summary of rail passbys observed at each location during the noise monitoring is detailed in **Appendix C**.

4.2.1 Representative Sample of Train Passby Events

All noise measurements were conducted during low wind conditions (<5m/s) and no precipitation in accordance with AS2377-2002. The noise monitoring at each location was typically undertaken over a 3-hour period to ensure a minimum of 20 train passby events were satisfactorily monitored. The monitoring period was extended when required to ensure that at least one freight train passby event in both the Up and Down direction was monitored at each location. This approach ensured that a representative sample of noise measurements was undertaken as per the RING.

4.2.2 Analysis of Monitored Noise Levels

The sound level meters and noise loggers monitored L_{Aeq} and L_{Amax} noise levels consistent with the requirements of the RING and AS2377-2002. Monitoring of the L_{Aeq} and L_{Amax} metrics enabled direct comparison of the monitored noise levels to the assessment criteria.

Referencing the L_{Aeq} calculation methodology provided in the RING, the monitored noise levels for each train type were applied to calculate the overall L_{Aeq} daytime, L_{Aeq} night-time and L_{Amax} noise levels at each monitoring location. The L_{Amax} noise levels were derived as the 95th percentile from the L_{Amax} noise measurements for all train passbys at a location.

The methodology applied the derived sound exposure level (L_{AE}) for the individual passenger and freight trains to calculate daily noise levels based on the number of trains in each assessment period (daily rail operations).

4.3 Vibration Monitoring Methodology

Vibration levels were monitored at three representative sensitive receptor locations adjacent to the rail corridor. The vibration measurements were undertaken using a PCB 393A03 IEPE accelerometer connected to a 2-channel B&K 2270 sound level meter, or a Rion DA-40 digital

data recorder. Prior to measurements, accelerometer levels were checked using a MEGGITT REF2500 handheld vibration shaker to confirm correct functioning of the accelerometers and data acquisition system.

Unweighted time domain data was recorded continuously with a sampling rate of 500 Hz on the Rion DA-40 and 48000 Hz with the B&K 2270 sound level meter (later down sampled to 750 Hz prior to data analysis), with anti-aliasing filters providing useable data up to approximately 200 Hz and 300 Hz, respectively. At each location, the accelerometer was magnetically mounted to a small stake which was driven into the earth such that the base of the accelerometer was flush with the surface of the earth. The stake was directly adjacent to the rail corridor to measure vibration from train passby events.

The monitored vibration levels were then post-processed to calculate Vibration Dose Values (VDVs) in accordance with the requirements of AVATG. The guideline is based on the British Standard BS 6472-1992, which fully describes the Vibration Dose Value and its respective calculation.

The VDV for the monitoring period were compared to the VDV assessment criteria from AVATG, as per CoA C3 (refer to **Table 1**).

5.0 Noise Model Verification

The Noise and Vibration Compliance assessment process outlined in **Figure 1** requires the monitored noise levels at representative locations to be compared to the predicted noise levels. If monitored noise levels identify a clear trend of being higher than the predicted noise levels, i.e. by more than approximately 1 dBA to 2 dBA on average, then the noise modelling should be reviewed to determine if any additional mitigation/rectification measures are necessary.

The noise levels monitored in 2023 have been compared to the noise prediction modelling for the ETTT Project for the year 2026, as this provides the closest comparison of predicted noise levels for the rail operations at the time of the 2023 noise monitoring.

As outlined in **Section 4.2.2**, the monitored L_{AE} and L_{Amax} noise levels were applied to calculate daytime and night-time L_{Aeq} noise levels and the 95th percentile L_{Amax} noise levels at each monitoring location. For reference, the highest L_{Amax} measurement for freight train passby noise has also been referenced, as it provides a measurement of discrete high noise events such a curve squeal or locomotive exhaust noise.

The noise prediction model for the ETTT Project in the year 2026 was utilised to predict free-field rail noise levels at each monitoring location to allow direct comparison between monitored noise levels and predicted noise levels.

The calculated noise levels are provided in **Table 10** along with the 2026 ONVR predicted noise levels.

Table 10 Verification of the ETTT Project Noise Model

Monitoring Location	Rail Noise Levels from 2023 Noise Monitoring, dBA				Predicted ETTT Noise Levels Year 2026, dBA			Noise Model Validation, dBA[1]			
	L_{Aeq} Day	L_{Aeq} Night	L_{Amax}, 95th %ile	L_{Amax} 100th %ile	L_{Aeq} Day	L_{Aeq} Night	L_{Amax}	L_{Aeq} Day	L_{Aeq} Night	L_{Amax}, 95th %ile	L_{Amax} 100th %ile
N1 - 8 Cambridge Street	57	58	81	91	64	64	86	-7	-6	-6	4
N2 - 36 Cambridge Street	56	56	78	81	63	64	85	-7	-8	-7	-4
N3 – 23 Derby Street	57	58	83	91	61	62	85	-4	-4	-3	6
N5 - 104 The Crescent	56	56	78	79	63	64	90	-7	-8	-12	-11
N6 - 86 The Crescent	60	61	84	85	62	63	89	-2	-2	-5	-4
N7 - 32 The Crescent	61	62	77	85	63	64	89	-2	-2	-12	-3
NV8 - Cheltenham Scout Hall	64	64	89	89	66	67	94	-2	-3	-4	-4
N9 - 92 Sutherland Road	65	65	90	95	68	69	95	-3	-4	-5	0
N10 - 126 Sutherland Road	60	59	79	90	65	66	91	-4	-6	-12	0
N11 - 71 Wongala Crescent	55	54	75	88	58	59	85	-4	-5	-9	3
N12 - 83 Wongala Crescent	56	57	73	84	59	60	84	-3	-3	-10	1
N13 - 3 Wongala Crescent	56	55	78	82	65	65	88	-9	-10	-10	-7
N14 - 27 Azalea Grove	45	46	73	74	52	53	79	-7	-7	-6	-5
N16 - 56 Yarrara Road	56	58	77	88	63	64	89	-8	-7	-13	-1
N17 - 1 Stevens Street	59	58	80	81	66	66	91	-6	-9	-10	-9
Arithmetic average difference between modelled and monitored rail noise levels								**-5**	**-5**	**-8**	**-2**

Note: A negative difference denotes monitored noise levels lower than predicted noise levels.

The ONVR noise model was validated against noise monitoring undertaken as part of this assessment. **Table 10** shows that the predicted noise levels are, on average, up to 5 dBA L_{Aeq} daytime and night-time, higher than the monitored noise levels. 95th percentile L_{Amax} noise levels are on average 8 dBA higher than the monitored noise levels.

A comparison of measured absolute L_{Amax} noise levels shows a greater correlation between the predicted ONVR noise levels, which are on average, 2 dBA higher than measure levels. These maximum noise levels are generally controlled by curving noise, particularly from freight trains.

Section 5 of the ONVR provides discussion on the sensitivity of the noise prediction modelling to key factors such as train speed, locomotive notch settings, the noise source emission levels, rail roughness and the application of correction factors for location specific noise characteristics, such as curve squeal.

Notwithstanding, the noise modelling is again showing a trend for over prediction compared to measured rail noise levels.

Overall, the 2023 monitored rail noise levels were found to be consistently lower than the predicted noise levels presented in the ONVR assessment. In accordance with the validation process the noise model is deemed appropriate for the forecast of noise mitigation and the noise model inputs do not need to be reviewed.

5.1 Compliance with IGANRIP

Rail noise levels calculated for daytime $L_{Aeq(15hour)}$, night-time $L_{Aeq(9hour)}$ and L_{Amax} noise levels were assessed against the IGANRIP trigger levels. The noise levels were found to comply with the day time $L_{Aeq(15hour)}$ 65 dB trigger level at all residential receptors. At receiver locations N6, N7 and N9 noise levels were above the $L_{Aeq(9hour)}$ night time 60 dBA trigger level, however as shown in the ONVR, the noise levels at these receivers have not increased by more than 2dB from the existing no build noise levels and are therefore compliant with the IGANRIP trigger levels. Similarly at N9 the L_{Amax} 95th percentile noise level was above the 85dBA level, but had not increased by 3dBA and is therefore compliant with the IGANRIP trigger levels.

Therefore, predicted noise levels at all representative receiver locations comply with the IGANRIP trigger levels outlined in **Table 2**.

6.0 Monitored Noise Levels From Fixed Facilities

Noise levels were monitored at Cheltenham Station and Pennant Hills Station during the evening period on 8 February 2024 to assess operational noise from the stations. The noise monitoring was conducted at nominated locations representative of the nearest sensitive receivers surrounding the stations.

At the time of the monitoring survey, the PA system was the only audible source of noise from both stations during the noise monitoring. During the noise monitoring period the majority of PA announcements were not clearly audible above the background noise level. PA announcements were observed to have a duration of up to 16 seconds.

Noise levels at the nearest sensitive receivers from PA announcements have been calculated for the most sensitive night-time period based on up to 10 PA announcements per 15-minute period and are summarised in **Table 11**.

Table 11 Summary of Station Noise Measurement Results

Receptor	Assessment Period	Criteria, dBA		Measured Noise Level (dBA)		Compliant
		$L_{Aeq(15min)}$	$L_{A1(1min)}$	$L_{Aeq(15min)}$	$L_{A1(1min)}$	
Residential (Pennant Hills Station)	Night-time	43	53	36	48	Yes
Residential (Cheltenham Station)	Night-time	36	46	35	46	Yes

The monitored and calculated noise from both Cheltenham station and Pennant Hills station have been assessed to comply with the daytime, evening and night-time intrusive and amenity criteria and sleep disturbance screening criteria outlined in **Table 4** at all nearby sensitive receptors.

7.0 Monitored Vibration Levels From Railway Operations

Ground vibration was monitored at three locations indicative of the locations where the ONVR identified the highest vibration levels may be experienced. At all three locations the VDV levels were negligible and well within the nominated vibration objectives from AVATG, referenced in CoA C3.

The monitored vibration levels at each location are presented in **Table 12**. It can be seen from the table that all vibration levels comply with the most stringent 0.13 $m/s^{1.75}$ night-time VDV objective from AVATG.

Table 12 Monitored Vibration Dose Values for the ETTT Project

Monitoring Location	Vibration Dose Values During Train Passby Events, $m/s^{1.75}$	
	Daytime (7.00 am-10.00 pm)	Night-time (10.00 pm-7.00 am)
NV4 - 25 Old Beecroft Road	0.032	0.028
NV8 - Cheltenham Scout Hall	0.016	0.019
NV15 - 21 Binomea Place	0.021	0.017

At all times the potential vibration from the ETTT Project has been assessed to comply with the vibration goals for human comfort from AVATG.

8.0 Noise and Vibration Mitigation Measures

Analysis of the monitored noise levels has demonstrated the constructed rail noise barriers have controlled rail noise levels in line with the predictions as part of the ONVR.

All properties eligible for property treatments have received treatments as part of the ETTT Project.

As a result, no further noise and vibration mitigation has been deemed necessary.

9.0 Rail Noise Initiatives

A range of rail noise initiatives have been implemented as part of the ETTT project and the broader management of rail noise on the network.

9.1 Noise Monitoring Station

A noise monitoring station has been installed in Beecroft to provide real time publicly accessible noise levels for passing freight movements. The data from the monitoring station has successfully allowed for noisier locomotives and wagons to be identified. The community has been able to monitor rail noise levels, identify individual freight movements and direct noise complaints to the private freight operators that are responsible.

9.2 Track Lubrication

Track lubricants have been installed and commissioned in accordance with TfNSW standard T-HR-TR-00111 ST Rail Lubrication. The ETTT area is the first section of track to be covered by a lubrication system that complies with this new standard.

TfNSW advised that the lubricators have continued to provide comprehensive coverage of the entire track section between Epping and Thornleigh. The lubricators are being maintained by Sydney Trains.

9.3 Freight Wagon Steering

The poor steering of freight wagons can be a key cause of wheel squeal. A new revision of TfNSW Standard RSU 400 Series - Minimum Operating Standards for Rolling Stock - Freight Vehicle Specific Requirements v2.0, was introduced on 1 January 2018. The new steering requirements have seen freight wagons progressively upgraded over the previous years and will continue to improve steering through curves and minimise the incidence of wheel squeal. In addition, as part of their regulation of railway activities, the EPA now requires freight rolling stock operators to fix the steering on their priority freight wagons to meet minimum standards and improve their performance.

9.4 Publication of the Locomotive Noise Report

A report on high noise locomotives has been prepared and published on the TfNSW website. The report details noise measurements of more than 600 trains recorded under a range of operational conditions at six locations across the network, including at Cheltenham. The report provides the public with information on the noise emissions from train movements on the network.

9.5 Freight Noise Attenuation Program

Similar to the acoustic treatments provided for the ETTT project, TfNSW launched the Freight Noise Attenuation Program (FNAP) in late 2015 as an initiative to assist in minimising the impact of freight noise. The FNAP is being progressively rolled out across the NSW Government managed rail network, with priority treatments given to areas experiencing the highest night time rail noise levels.

Whilst not specific to the ETTT, freight noise attenuation may be provided to neighbouring communities that are currently raising concerns about freight noise. Some areas adjacent to the ETTT project have already been assessed as eligible for the program and treatments will be provided in the coming years.

9.6 Strategic Noise Action Plan

TfNSW is implementing a range of at-source noise control programs under the Strategic Noise Action Plan to minimise the emission of rail noise. This includes partnerships with freight operators to fast-track the upgrade of freight wagon bogies to reduce wheel squeal.

10.0 ETTT Project Complaints Management System

TfNSW has received a total of 71 noise and vibration related complaints since May 2017 and September 2023. A review of the available complaint information identified the following breakdown of the nature of the noise complaints.

- 10 complaints were received in relation to disturbance from noise emissions from idling trains between Pennant Hills Station and Thornleigh Station. These complaints largely originated from the residential complex at 298-312 Pennant Hills Road, Thornleigh.
- 14 complaints were based on disturbance from discrete noise events from freight trains, such as train horns and bunching noise from freight wagons, particularly idling trains between Pennant Hills and Thornleigh.
- 34 complaints were received relating to wheel-squeal and general curving noise particularly from freight trains travelling through the tight radius curves through Beecroft.
- 12 complaints were based on noise events associated with track condition issues.
- Two complaints were received directly relating to vibration from trains, with one complaint relating to trains potentially causing property damage.

11.0 Compliance with the Conditions of Approval

11.1 Noise from Railway Operations on the ETTT Project (Condition C1)

The noise levels monitored during train passby events were observed to be below those predicted for 2026 operations as part of the ONVR. As no recalibration of the ONVR noise model was required, monitored noise levels demonstrate that the rail noise barriers constructed for the ETTT Project have provided effective control of noise from railway operations. Residual noise impacts have been addressed by at property treatments at the residences identified in the ONVR. Noise levels at all receptors achieved the objectives of the IGANRIP and did not trigger the investigation of further mitigation measures. Accordingly, the requirements of Condition C1 have been met by the ETTT Project.

11.2 Noise from Fixed Facilities (Condition C2)

The monitored noise levels at Cheltenham Station and Pennant Hills Station were applied to calculate noise from the station PA systems at the nearest sensitive receptors. Noise levels have been assessed to comply with the noise criteria derived from the INP. Accordingly, the requirements of Condition C2 have been met by the ETTT Project.

11.3 Vibration Levels from Railway Operations on the ETTT Project (Condition C3)

The vibration levels monitored during train passby events complied with the vibration goals for human exposure specified in AVATG referenced in CoA C3. The requirements of CoA C3 have been met by the ETTT Project.

11.4 Operational Noise and Vibration Compliance Monitoring and Assessment (Condition F2)

Condition F2 includes requirements for the management of operational noise and vibration from the ETTT Project.

Table 13 Statement of Compliance to CoA F2

Condition Requirements	Statement of Compliance
The Proponent shall undertake noise and vibration compliance monitoring and assessments to confirm the predictions of the noise assessment and mitigations referred to in the ONVR (C4). The noise and vibration compliance assessment shall be developed in consultation with the EPA and be undertaken at twelve months, 5 years and 10 years of the commencement of operation of the SSI, or as otherwise agreed by the Director-General. The assessment shall include, but not necessary be limited to:	
a. Noise and vibration monitoring and compliance assessment, to assess compliance with conditions C1 to C3 of the approval and the ONVR;	The noise and vibration levels at 5 years from the ETTT Project opening have been assessed to meet the requirements of conditions C1 to C3.
b. An assessment methodology and the outcomes of the Source Noise Monitoring Plan and other relevant Rail Noise Initiatives developed and implemented for the SSI (condition F3);	The rail noise initiatives, including the Source Noise Monitoring Plan, along with a summary of all operational rail noise and vibration related complaints are detailed in **Section 9.0**.
c. Details of any complaints received relating to operational noise and vibration impacts;	
d. An assessment of the performance and effectiveness of the applied noise and vibration mitigation measures;	The constructed rail noise barriers have controlled rail noise levels to achieve the IGANRIP noise trigger levels at all receptors for current operation
e. Any required recalibration of the noise and vibration model, including consideration of freight train movements should the average number of night-time trains exceed the projected value used for the noise mitigation design of the ONVR; and	Noise model inputs for the current railway operations were reviewed and recalibration of the noise and vibration model was not required as inputs were consistent with the assumptions in the ONVR
f. Identification, if required, of further noise and vibration mitigation measures to meet the requirements of C1 to C3 of the approval and objectives identified in the ONVR.	Noise levels at all receptors achieved the objectives of the IGANRIP. Further mitigation measures are not required.

11.5 Rail Noise Initiatives (Condition F3)

As outlined in **Section 9.0**, TfNSW has implemented a number of initiatives, specific to the ETTT project and the broader rail network to manage rail noise. Based on these initiatives, compliance of Condition F3 is considered to be achieved.

12.0 Conclusion

This operational noise and vibration compliance assessment was undertaken 5 years from the commencement of the ETTT Project. In accordance with the methodology outlined in the ONVR, current and forecast rail operations are consistent with those adopted in the ONVR. Subsequently, the predicted noise levels outlined in the ONVR are deemed appropriate for the determination of potential noise mitigation requirements.

The noise emissions from the upgraded Cheltenham Station and Pennant Hills Station have been assessed to meet the requirements of A C2. All monitored vibration levels complied with the vibration objectives and criteria specified in CoA C3.

TfNSW has implemented a number of initiatives, specific to the ETTT project and the broader rail network to manage rail noise in accordance with the requirements of CoA F3.

Based on the above, all requirements of CoA F2 are considered to have been met. It is concluded that no further noise or vibration mitigation is required for the ETTT Project based on the monitoring undertaken after 5 years of operation. The requirement for further noise and vibration mitigation will be periodically reviewed as part of the future compliance assessments required by the CoA.

Appendix A Acoustic Terminology

Epping to Thornleigh Third Track

Noise and Vibration Compliance Assessment

Sydney Trains

SLR Project No.: 610.30926.00001

8 March 2024

Sound Level or Noise Level

The terms 'sound' and 'noise' are almost interchangeable, except that 'noise' often refers to unwanted sound.

Sound (or noise) consists of minute fluctuations in atmospheric pressure. The human ear responds to changes in sound pressure over a very wide range with the loudest sound pressure to which the human ear can respond being ten million times greater than the softest. The decibel (abbreviated as dB) scale reduces this ratio to a more manageable size by the use of logarithms.

The symbols SPL, L or LP are commonly used to represent Sound Pressure Level. The symbol LA represents A-weighted Sound Pressure Level. The standard reference unit for Sound Pressure Levels expressed in decibels is 2×10^{-5} Pa.

'A' Weighted Sound Pressure Level

The overall level of a sound is usually expressed in terms of dBA, which is measured using a sound level meter with an 'A-weighting' filter. This is an electronic filter having a frequency response corresponding approximately to that of human hearing.

People's hearing is most sensitive to sounds at mid frequencies (500 Hz to 4,000 Hz), and less sensitive at lower and higher frequencies. Different sources having the same dBA level generally sound about equally loud.

A change of 1 dB or 2 dB in the level of a sound is difficult for most people to detect, whilst a 3 dB to 5 dB change corresponds to a small but noticeable change in loudness. A 10 dB change corresponds to an approximate doubling or halving in loudness. The table below lists examples of typical noise levels.

Sound Pressure Level (dBA)	Typical Source	Subjective Evaluation
130	Threshold of pain	Intolerable
120	Heavy rock concert	Extremely noisy
110	Grinding on steel	
100	Loud car horn at 3 m	Very noisy
90	Construction site with pneumatic hammering	
80	Kerbside of busy street	Loud
70	Loud radio or television	
60	Department store	Moderate to quiet
50	General Office	
40	Inside private office	Quiet to very quiet
30	Inside bedroom	
20	Recording studio	Almost silent

Other weightings (eg B, C and D) are less commonly used than A-weighting. Sound Levels measured without any weighting are referred to as 'linear', and the units are expressed as dB(lin) or dB.

Sound Power Level

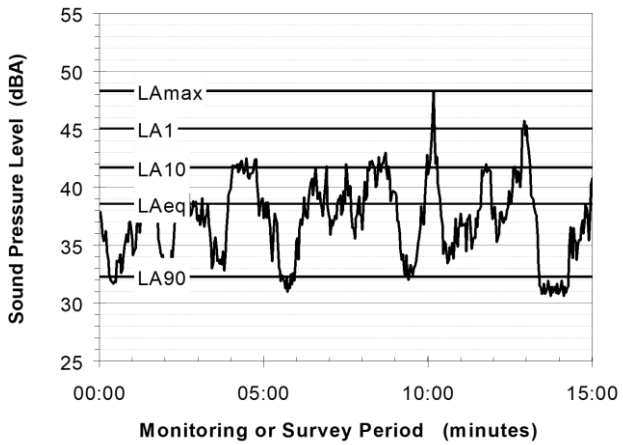
The Sound Power of a source is the rate at which it emits acoustic energy. As with Sound Pressure Levels, Sound Power Levels are expressed in decibel units (dB or dBA), but may be identified by the symbols SWL or LW, or by the reference unit 10^{-12} W.

The relationship between Sound Power and Sound Pressure is similar to the effect of an electric radiator, which is characterised by a power rating but has an effect on the surrounding environment that can be measured in terms of a different parameter, temperature.

Statistical Noise Levels

Sounds that vary in level over time, such as road traffic noise and most community noise, are commonly described in terms of the statistical exceedance levels L_{AN}, where L_{AN} is the A-weighted sound pressure level exceeded for N% of a given measurement period. For example, the L_{A1} is the noise level exceeded for 1% of the time, L_{A10} the noise exceeded for 10% of the time, and so on.

The following figure presents a hypothetical 15 minute noise survey, illustrating various common statistical indices of interest.



Of particular relevance, are:

L_{A1} The noise level exceeded for 1% of the 15 minute interval.

L_{A10} The noise level exceeded for 10% of the 15 minute interval. This is commonly referred to as the average maximum noise level.

L_{A90} The noise level exceeded for 90% of the sample period. This noise level is described as the average minimum background sound level (in the absence of the source under consideration), or simply the background level.

L_{Aeq} The A-weighted equivalent noise level (basically, the average noise level). It is defined as the steady sound level that contains the same amount of acoustical energy as the corresponding time-varying sound.

Frequency Analysis

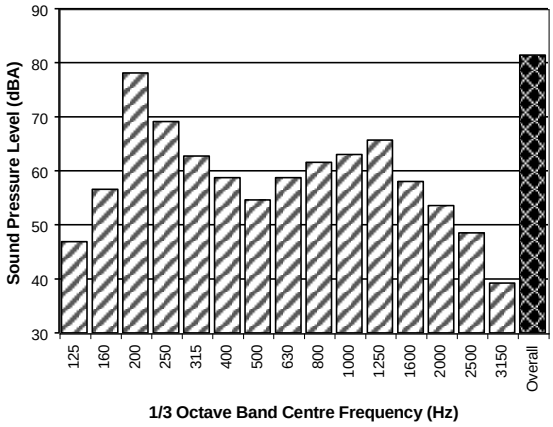
Frequency analysis is the process used to examine the tones (or frequency components) which make up the overall noise or vibration signal.

The units for frequency are Hertz (Hz), which represent the number of cycles per second.

Frequency analysis can be in:

- Octave bands (where the centre frequency and width of each band is double the previous band)
- 1/3 octave bands (three bands in each octave band)
- Narrow band (where the spectrum is divided into 400 or more bands of equal width)

The following figure shows a 1/3 octave band frequency analysis where the noise is dominated by the 200 Hz band. Note that the indicated level of each individual band is less than the overall level, which is the logarithmic sum of the bands.



Annoying Noise (Special Audible Characteristics)

A louder noise will generally be more annoying to nearby receivers than a quieter one. However, noise is often also found to be more annoying and result in larger impacts where the following characteristics are apparent:

- **Tonality** - tonal noise contains one or more prominent tones (ie differences in distinct frequency components between adjoining octave or 1/3 octave bands), and is normally regarded as more annoying than 'broad band' noise.
- **Impulsiveness** - an impulsive noise is characterised by one or more short sharp peaks in the time domain, such as occurs during hammering.
- **Intermittency** - intermittent noise varies in level with the change in level being clearly audible. An example would include mechanical plant cycling on and off.
- **Low Frequency Noise** - low frequency noise contains significant energy in the lower frequency bands, which are typically taken to be in the 10 to 160 Hz region.

Vibration

Vibration may be defined as cyclic or transient motion. This motion can be measured in terms of its displacement, velocity or acceleration. Most assessments of human response to vibration or the risk of damage to buildings use measurements of vibration velocity. These may be expressed in terms of 'peak' velocity or 'rms' velocity.

The former is the maximum instantaneous velocity, without any averaging, and is sometimes referred to as 'peak particle velocity', or PPV. The latter incorporates 'root mean squared' averaging over some defined time period.

Vibration measurements may be carried out in a single axis or alternatively as triaxial measurements (ie vertical, longitudinal and transverse).

The common units for velocity are millimetres per second (mm/s). As with noise, decibel units can also be used, in which case the reference level should always be stated. A vibration level V, expressed in mm/s can be converted to decibels by the formula 20 log (V/Vo), where Vo is the reference level (10^{-9} m/s). Care is required in this regard, as other reference levels may be used.

Human Perception of Vibration

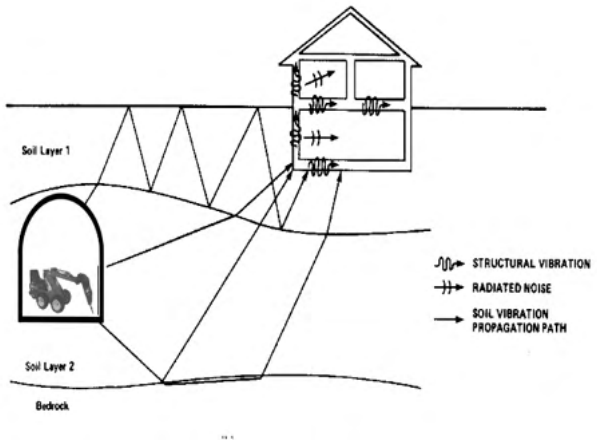
People are able to 'feel' vibration at levels lower than those required to cause even superficial damage to the most susceptible classes of building (even though they may not be disturbed by the motion). An individual's perception of motion or response to vibration depends very strongly on previous experience and expectations, and on other connotations associated with the perceived source of the vibration. For example, the vibration that a person responds to as 'normal' in a car, bus or train is considerably higher than what is perceived as 'normal' in a shop, office or dwelling.

Ground-borne Noise, Structure-borne Noise and Regenerated Noise

Noise that propagates through a structure as vibration and is radiated by vibrating wall and floor surfaces is termed 'structure-borne noise', 'ground-borne noise' or 'regenerated noise'. This noise originates as vibration and propagates between the source and receiver through the ground and/or building structural elements, rather than through the air.

Typical sources of ground-borne or structure-borne noise include tunnelling works, underground railways, excavation plant (eg rockbreakers), and building services plant (eg fans, compressors and generators).

The following figure presents an example of the various paths by which vibration and ground-borne noise may be transmitted between a source and receiver for construction activities occurring within a tunnel.



The term 'regenerated noise' is also used in other instances where energy is converted to noise away from the primary source. One example would be a fan blowing air through a discharge grill. The fan is the energy source and primary noise source. Additional noise may be created by the aerodynamic effect of the discharge grill in the airstream. This secondary noise is referred to as regenerated noise.

Appendix B Noise and Vibration Monitoring Locations

Epping to Thornleigh Third Track

Noise and Vibration Compliance Assessment

Sydney Trains

SLR Project No.: 610.30926.00001

8 March 2024

Scale: 1:5,000 at A4
Coordinate System: GDA 1994 MGA Zone 56

Date Drawn: 19-Feb-2024
Project Number: 610.030926

Data Source: NearMap Imagery December 2023

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SLR

NOISE AND VIBRATION MONITORING LOCATIONS

APPENDIX B

Scale: 1:5,000 at A4
Coordinate System: GDA 1994 MGA Zone 56

Date Drawn: 19-Feb-2024
Project Number: 610.030926

Data Source: NearMap Imagery December 2023

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NOISE AND VIBRATION MONITORING LOCATIONS

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NOISE AND VIBRATION MONITORING LOCATIONS

APPENDIX B

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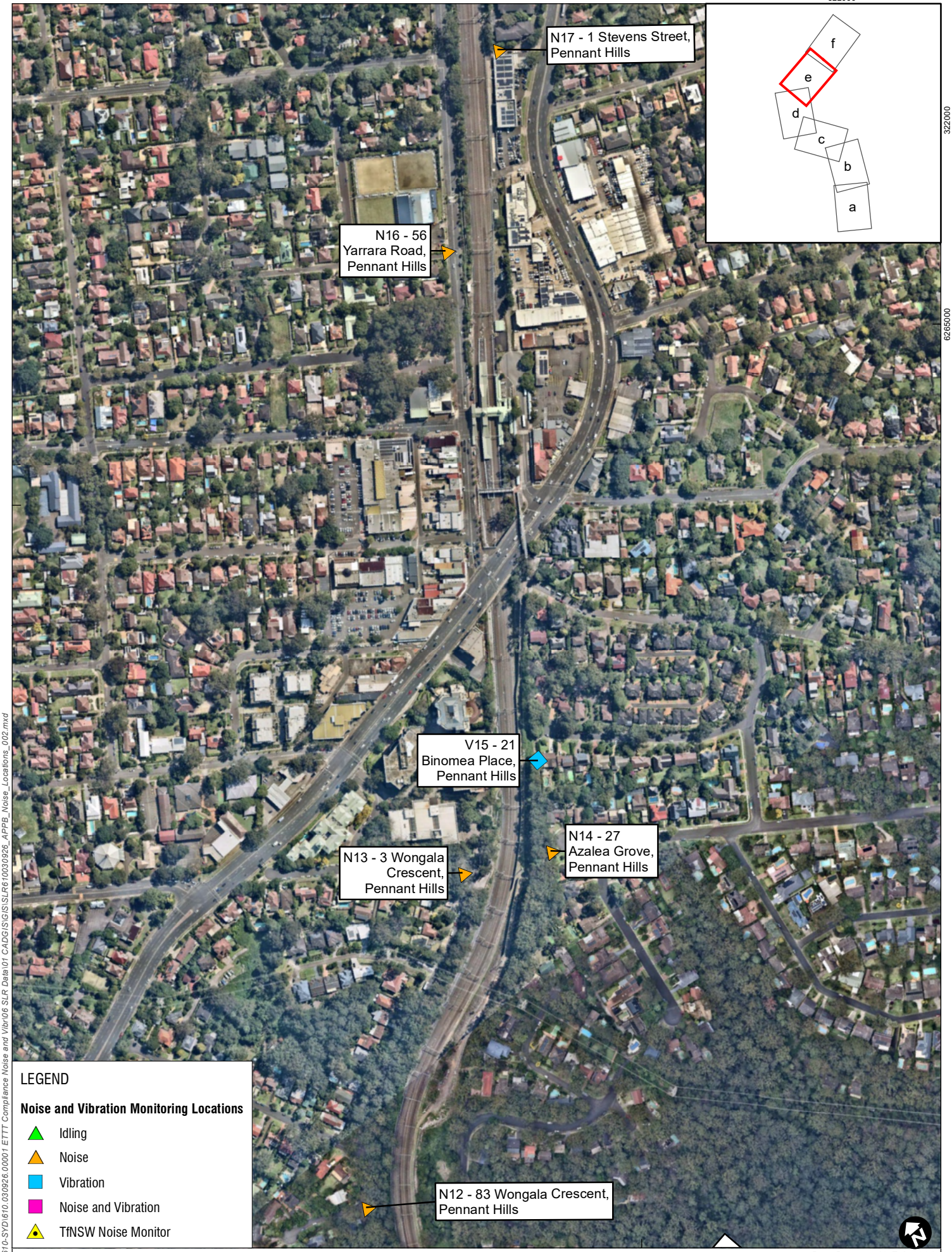
NOISE AND VIBRATION MONITORING LOCATIONS

APPENDIX B



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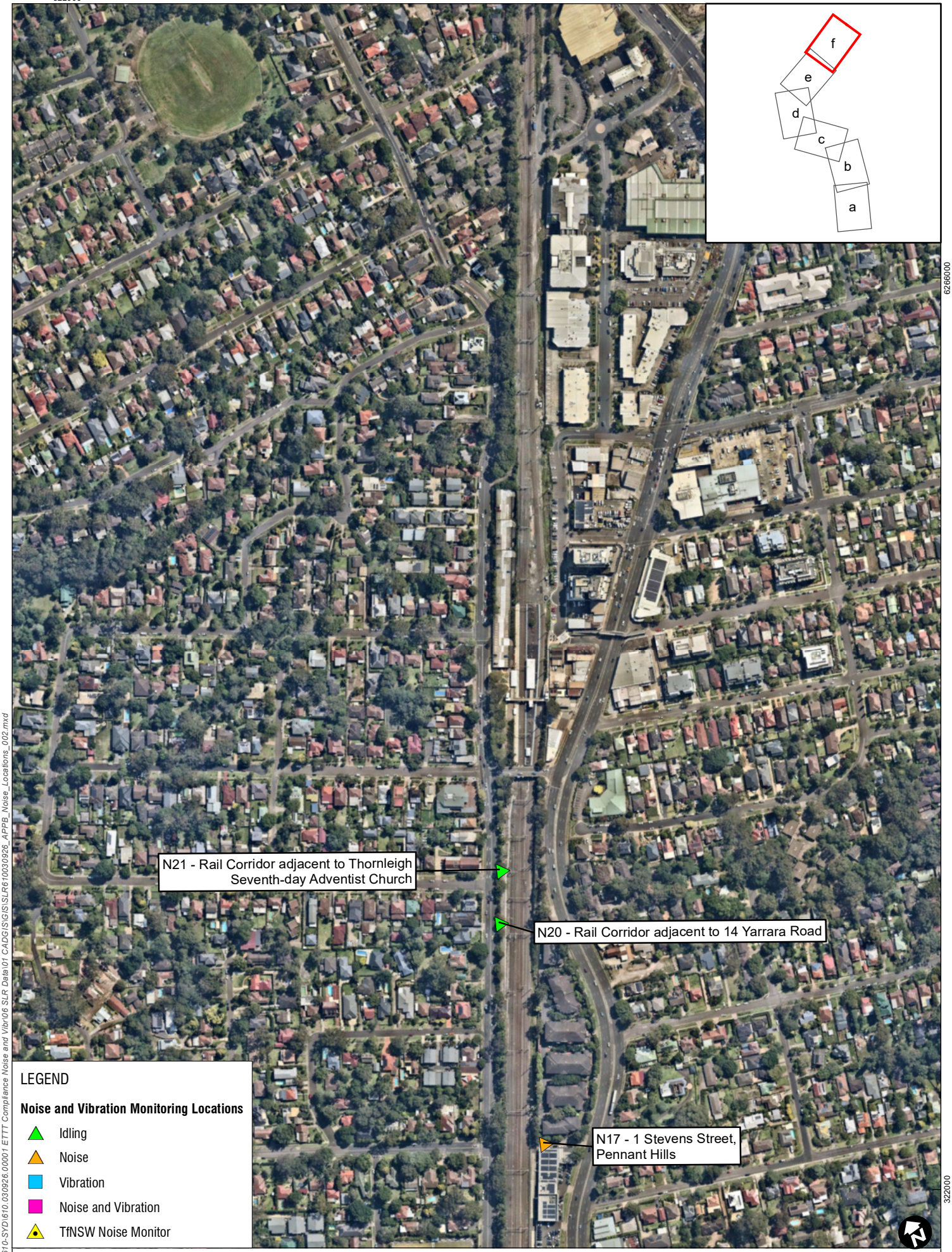
NOISE AND VIBRATION MONITORING LOCATIONS

APPENDIX B



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NOISE AND VIBRATION MONITORING LOCATIONS

APPENDIX B

Appendix C Attended Noise Monitoring Summary

Epping to Thornleigh Third Track

Noise and Vibration Compliance Assessment

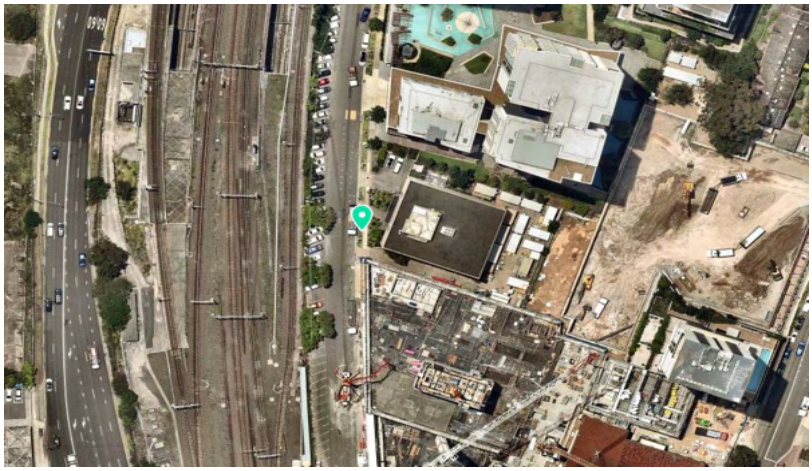
Sydney Trains

SLR Project No.: 610.30926.00001

8 March 2024

Project	**ETTT 5 Year Compliance Assessment**
Location ID	**N1**
Street	**16 Cambridge Street, Epping**
Date	**Monday, 18 December 2023**
Weather	**Clear, Gentle Winds, 25°C**
Measurement Height	**1.5m above ground level**
Measurement Location	**Free-field**
Monitoring Equipment	**Brüel & Kjær 2270**
Equipment Serial No.	**3029485**

Note: Measurements conducted approximately 34m from the closest track.



Event No.	Passby Time	Duration (s)	LAE	LAMax	Track	Class/ Type	No. Cars/Wagons	Notes On Ambient Noise
1	21:30:38	16	77 dBA	71 dBA	Up	Waratah	8	No influence from other noise sources
2	21:33:31	13	81 dBA	77 dBA	Up	Intercity	4	Curving noise present
3	21:36:49	22	76 dBA	66 dBA	Down	Waratah	8	No influence from other noise sources
4	21:40:14	20	73 dBA	68 dBA	Down	Intercity	8	Curving noise present
5	21:50:25	23	76 dBA	67 dBA	Down	Waratah	8	No influence from other noise sources
6	21:55:26	25	71 dBA	62 dBA	Up	Tangara	8	No influence from other noise sources
7	21:58:05	23	75 dBA	65 dBA	Up	Waratah	10	New Intercity Fleet
8	22:04:59	20	78 dBA	70 dBA	Down	Waratah	8	No influence from other noise sources
9	22:10:14	18	76 dBA	74 dBA	Up	Waratah	8	Curving noise present
10	22:13:20	19	70 dBA	61 dBA	Down	Oscar	4	No influence from other noise sources
11	22:13:41	15	74 dBA	68 dBA	Up	Intercity	4	Curving noise present
12	22:18:31	19	78 dBA	72 dBA	Up	Intercity	4	Curving noise present
13	22:22:01	20	76 dBA	67 dBA	Down	Waratah	8	No influence from other noise sources
14	22:39:31	21	75 dBA	65 dBA	Down	Waratah	8	No influence from other noise sources
15	22:46:19	10	77 dBA	74 dBA	Up	Oscar	4	Curving noise present
16	22:52:03	23	75 dBA	66 dBA	Down	Waratah	8	No influence from other noise sources
17	23:00:01	48	87 dBA	81 dBA	Up	Freight	28	Curving noise present. Defective wheel near end of train
18	23:08:13	18	76 dBA	66 dBA	Down	Tangara	8	Curving noise present
19	23:22:09	32	73 dBA	62 dBA	Down	Waratah	8	No influence from other noise sources
20	23:35:44	19	77 dBA	69 dBA	Down	Waratah	10	New Intercity Fleet
21	23:37:09	24	73 dBA	63 dBA	Down	Waratah	8	No influence from other noise sources
22	23:39:30	20	73 dBA	65 dBA	Up	Waratah	8	No influence from other noise sources
23	23:52:12	21	76 dBA	68 dBA	Down	Waratah	8	No influence from other noise sources
24	23:57:52	21	74 dBA	69 dBA	Up	Waratah	8	Curving noise present
25	00:01:37	19	74 dBA	65 dBA	Up	Waratah	8	No influence from other noise sources
26	00:04:23	22	75 dBA	65 dBA	Up	Waratah	10	New Intercity Fleet
27	00:12:22	22	72 dBA	62 dBA	Down	Tangara	8	Curving noise present
28	00:19:09	18	74 dBA	69 dBA	Up	Oscar	8	Curving noise present
29	00:22:07	20	77 dBA	67 dBA	Down	Waratah	8	No influence from other noise sources
30	00:37:31	34	72 dBA	61 dBA	Down	Waratah	8	No influence from other noise sources
31	02:57:21	68	94 dBA	91 dBA	Down	Freight	45	Heavy curving noise throughout
32	03:02:44	69	90 dBA	81 dBA	Down	Freight	53	Curving noise present throughout

Project	**ETTT 5 Year Compliance Assessment**
Location ID	**N2**
Street	**36 Cambridge Street, Epping**
Date	**Tuesday, 31 October 2023**
Weather	**Clear, Gusty wind at times, 30°C**
Measurement Height	**1.5m above ground level**
Measurement Location	**Free-field**
Monitoring Equipment	**Brüel & Kjær 2270**
Equipment Serial No.	**3029485**

Note: Measurements condected approximately 34m from the closest track.

Event No.	Passby Time	Duration (s)	LAE	LAMax	Track	Class/ Type	No. Cars/Wagons	Notes On Ambient Noise
1	12:14:29	18	75 dBA	66 dBA	Up	Waratah	8	No influence from other noise sources
2	12:19:36	128	87 dBA	78 dBA	Up	Freight	53	No influence from other noise sources. 4 car OSCAR mid passby with no influence on measured level
3	12:23:44	22	75 dBA	66 dBA	Down	Waratah	10	New Intercity Fleet
4	12:30:15	20	74 dBA	66 dBA	Up	Waratah	8	No influence from other noise sources
5	12:33:23	22	79 dBA	70 dBA	Up	Intercity	8	No influence from other noise sources
6	12:38:40	26	73 dBA	64 dBA	Up	Tangara	8	No influence from other noise sources
7	12:41:38	23	78 dBA	70 dBA	Down	Intercity	8	Curving noise present throughout
8	12:46:37	21	71 dBA	61 dBA	Up	Waratah	8	No influence from other noise sources
9	12:51:18	46	89 dBA	78 dBA	Down	Freight	39	Curving noise present
10	12:54:26	59	86 dBA	78 dBA	Up	Freight	49	No influence from other noise sources
11	12:57:58	21	73 dBA	65 dBA	Up	Waratah	8	No influence from other noise sources
12	12:59:54	71	89 dBA	81 dBA	Down	Freight	47	Curving noise present throughout. Defective wheel in middle of train
13	13:02:43	23	75 dBA	67 dBA	Up	Waratah	8	No influence from other noise sources
14	13:06:02	17	75 dBA	65 dBA	Down	Waratah	8	No influence from other noise sources
15	13:08:31	18	74 dBA	66 dBA	Up	Tangara	8	No influence from other noise sources
16	13:22:26	20	74 dBA	65 dBA	Down	Tangara	8	No influence from other noise sources
17	13:23:58	11	82 dBA	77 dBA	Down	Oscar	4	Curving noise present
18	13:30:30	21	82 dBA	74 dBA	Up	Intercity	8	Defective wheels at the back of train
19	13:38:57	27	78 dBA	69 dBA	Up	Waratah	8	No influence from other noise sources
20	13:57:02	21	74 dBA	65 dBA	Down	Waratah	8	No influence from other noise sources
21	14:00:45	20	73 dBA	64 dBA	Up	Tangara	8	Curving noise present
22	14:04:22	18	72 dBA	63 dBA	Up	Oscar	8	Curving noise present
23	14:08:35	23	72 dBA	64 dBA	Down	Waratah	8	No influence from other noise sources
24	14:16:28	16	74 dBA	66 dBA	Down	Tangara	8	No influence from other noise sources
25	14:34:28	18	75 dBA	65 dBA	Up	Waratah	8	No influence from other noise sources
26	14:39:51	26	75 dBA	67 dBA	Down	Waratah	8	No influence from other noise sources
27	14:50:50	22	72 dBA	63 dBA	Down	Waratah	8	No influence from other noise sources
28	15:06:34	18	83 dBA	74 dBA	Down	XPT	7	Curving noise present throughout
29	15:08:04	18	81 dBA	74 dBA	Up	XPT	7	No influence from other noise sources

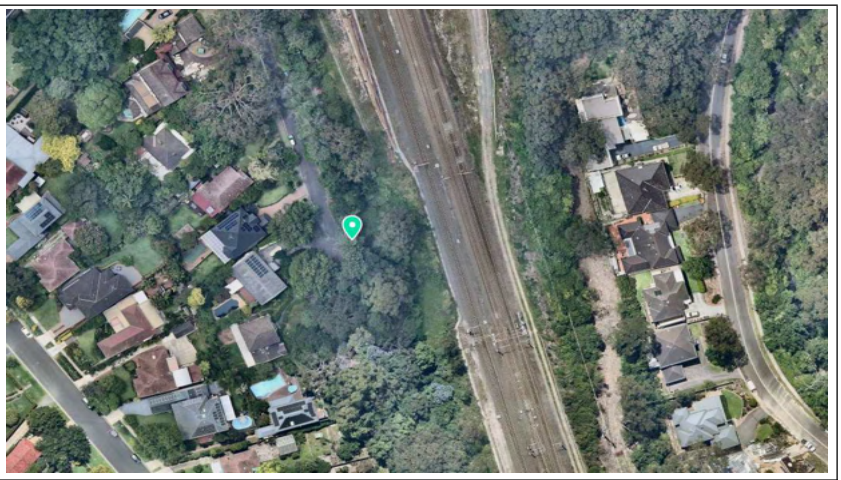
Project	**ETTT 5 Year Compliance Assessment**
Location ID	**N3**
Street	**23 Derby Street, Epping**
Date	**Thursday, 2 November 2023**
Weather	**Overcast, Calm, 28°C**
Measurement Height	**1.5m above ground level**
Measurement Location	**Free-field**
Monitoring Equipment	**Brüel & Kjær 2270**
Equipment Serial No.	**3029485**

Note: Measurements conducted approximately 46m from the closest track.

Event No.	Passby Time	Duration (s)	LAE	LAMax	Track	Class/ Type	No. Cars/Wagons	Notes On Ambient Noise
1	09:42:33	59	83 dBA	74 dBA	Up	Freight	40	Minor curving noise present
2	09:50:43	16	73 dBA	64 dBA	Up	Waratah	8	No influence from other noise sources
3	09:58:27	18	71 dBA	62 dBA	Down	Waratah	8	Minor curving noise present
4	09:59:15	16	75 dBA	68 dBA	Up	Waratah	8	Minor curving noise present. Wheel defect near end of train
5	10:01:28	26	70 dBA	60 dBA	Down	Tangara	8	Minor curving noise present
6	10:10:09	70	95 dBA	91 dBA	Up	Freight	53	Heavy curving noise present throughout. Down track Tangara mid passby, no influence on measured levels
7	10:13:48	17	67 dBA	57 dBA	Down	Oscar	8	No influence from other noise sources
8	10:14:34	14	75 dBA	70 dBA	Up	Tangara	8	No influence from other noise sources
9	10:21:06	17	71 dBA	62 dBA	Down	Waratah	8	Curving noise present
10	10:28:43	22	74 dBA	65 dBA	Up	Waratah	8	No influence from other noise sources
11	10:32:04	43	77 dBA	70 dBA	Up	Intercity	8	No influence from other noise sources
12	10:40:40	48	87 dBA	83 dBA	Up	Freight	33	Curving noise present fram locos
13	10:42:12	21	71 dBA	66 dBA	Down	Waratah	8	No influence from other noise sources
14	10:45:36	25	70 dBA	61 dBA	Down	Intercity	8	Curving noise present. Wheel defect at end of train
15	10:46:29	19	75 dBA	68 dBA	Up	Tangara	8	No influence from other noise sources
16	11:00:56	16	76 dBA	70 dBA	Up	Waratah	8	No influence from other noise sources
17	11:03:41	14	72 dBA	69 dBA	Up	Oscar	4	No influence from other noise sources
18	11:05:46	17	80 dBA	80 dBA	Down	Tangara	8	Curving noise present
19	11:10:12	18	70 dBA	61 dBA	Down	Waratah	8	Curving noise present
20	11:16:43	18	72 dBA	64 dBA	Up	Waratah	8	No influence from other noise sources
21	11:20:37	19	72 dBA	65 dBA	Down	Waratah	8	No influence from other noise sources
22	11:29:45	28	72 dBA	62 dBA	Up	Tangara	8	No influence from other noise sources
23	11:32:30	34	75 dBA	65 dBA	Up	Intercity	8	Curving noise present
24	11:35:30	23	71 dBA	62 dBA	Down	Waratah	8	Curving noise present
25	11:40:57	21	73 dBA	63 dBA	Down	Intercity	8	Curving noise present throughout
26	11:45:04	18	74 dBA	67 dBA	Up	Waratah	8	No influence from other noise sources
27	15:37:07	18	70 dBA	61 dBA	Down	Waratah	8	No influence from other noise sources
28	15:40:58	20	73 dBA	69 dBA	Down	Intercity	8	Curving noise present
29	11:59:18	14	78 dBA	70 dBA	Up	Waratah	8	Additional measurements on 7 December 2023. No influence from other noise sources
30	12:05:47	16	69 dBA	60 dBA	Down	Waratah	8	Additional measurements on 7 December 2023. No influence from other noise sources
31	12:06:23	14	70 dBA	62 dBA	Down	XPT	7	Additional measurements on 7 December 2023. Curving noise present from locos
32	12:08:10	111	92 dBA	85 dBA	Up	Freight	86	Additional measurements on 7 December 2023. Wheel defect mid train
33	12:29:21	16	78 dBA	69 dBA	Up	Waratah	8	Additional measurements on 7 December 2023. No influence from other noise sources
34	12:33:34	31	82 dBA	75 dBA	Up	Intercity	8	Additional measurements on 7 December 2023. Curving noise present
35	12:39:16	60	90 dBA	79 dBA	Up	Freight	58	Additional measurements on 7 December 2023. Heavy curving noise present throughout
36	12:40:55	24	73 dBA	63 dBA	Down	Intercity	8	Additional measurements on 7 December 2023. No influence from other noise sources
37	13:08:53	45	76 dBA	65 dBA	Down	Freight	54	Additional measurements on 7 December 2023. Curving noise present
38	13:11:04	12	67 dBA	60 dBA	Down	Oscar	4	Additional measurements on 7 December 2023. Curving noise present

Project	**ETTT 5 Year Compliance Assessment**
Location ID	**N5**
Street	**104 The Crescent, Cheltenham**
Date	**Tuesday, 2 November 2023**
Weather	**Overcast, Gentle Winds, 21°C**
Measurement Height	**1.5m above ground level**
Measurement Location	**Free-field**
Monitoring Equipment	**Brüel & Kjær 2250L**
Equipment Serial No.	**3004635**

Note: Measurements conducted approximately 30m from the closest track.



Event No.	Passby Time	Duration (s)	LAE	LAMax	Track	Class/ Type	No. Cars/Wagons	Notes On Ambient Noise
1	12:06:41	19	72 dBA	64 dBA	Down	Waratah	8	No influence from other noise sources. Impact noise over nearby turnouts
2	12:08:20	71	89 dBA	79 dBA	Up	Freight	58	No influence from other noise sources. Impact noise over nearby turnouts
3	12:11:46	17	68 dBA	61 dBA	Down	Oscar	4	No influence from other noise sources. Impact noise over nearby turnouts
4	12:21:43	18	74 dBA	66 dBA	Down	Tangara	8	No influence from other noise sources. Impact noise over nearby turnouts
5	12:22:32	61	89 dBA	77 dBA	Down	Freight	43	No influence from other noise sources
6	12:25:19	102	89 dBA	77 dBA	Up	Freight	81	No influence from other noise sources. Impact noise over nearby turnouts
7	12:32:03	15	75 dBA	67 dBA	Up	Waratah	8	No influence from other noise sources
8	13:37:17	18	72 dBA	65 dBA	Down	Waratah	8	No influence from other noise sources. Impact noise over nearby turnouts
9	13:40:07	99	90 dBA	78 dBA	Down	Freight	71	No influence from other noise sources
10	13:43:44	15	76 dBA	68 dBA	Up	Waratah	8	No influence from other noise sources. Impact noise over nearby turnouts
11	13:45:11	12	80 dBA	75 dBA	Down	Intercity	4	No influence from other noise sources. Impact noise over nearby turnouts
12	13:48:30	50	84 dBA	74 dBA	Up	Freight	33	No influence from other noise sources. 2 defective wheels near end of train
13	13:51:53	23	72 dBA	64 dBA	Down	Tangara	8	No influence from other noise sources. Impact noise over nearby turnouts
14	13:58:48	16	75 dBA	67 dBA	Up	Tangara	8	No influence from other noise sources. Impact noise over nearby turnouts
15	14:01:26	18	73 dBA	65 dBA	Up	Oscar	8	No influence from other noise sources. Impact noise over nearby turnouts
16	14:06:41	20	74 dBA	66 dBA	Down	Waratah	8	No influence from other noise sources. Impact noise over nearby turnouts
17	14:11:34	17	76 dBA	68 dBA	Down	Intercity	4	No influence from other noise sources. Impact noise over nearby turnouts
18	14:14:50	14	77 dBA	70 dBA	Up	Waratah	8	No influence from other noise sources. Impact noise over nearby turnouts
19	14:21:08	18	73 dBA	66 dBA	Down	Waratah	8	No influence from other noise sources. Impact noise over nearby turnouts
20	14:28:27	14	78 dBA	71 dBA	Up	Tangara	8	No influence from other noise sources
21	14:30:52	19	75 dBA	66 dBA	Up	Intercity	8	No influence from other noise sources
22	14:36:22	18	77 dBA	70 dBA	Down	Waratah	8	No influence from other noise sources. Impact noise over nearby turnouts
23	14:37:30	87	88 dBA	78 dBA	Up	Freight	77	No influence from other noise sources. Impact noise over nearby turnouts
24	14:41:37	20	75 dBA	66 dBA	Down	Intercity	8	No influence from other noise sources. Impact noise over nearby turnouts
25	14:44:43	15	74 dBA	66 dBA	Up	Waratah	8	No influence from other noise sources
26	14:58:57	14	75 dBA	67 dBA	Up	Waratah	8	No influence from other noise sources. Impact noise over nearby turnouts
27	15:02:08	27	72 dBA	60 dBA	Up	Oscar	8	No influence from other noise sources
28	15:06:51	18	74 dBA	68 dBA	Down	Tangara	8	No influence from other noise sources. Impact noise over nearby turnouts
29	15:09:21	19	82 dBA	73 dBA	Down	XPT	7	No influence from other noise sources

Project	**ETTT 5 Year Compliance Assessment**
Location ID	**N6**
Street	**86 The Crescent, Cheltenham**
Date	**Tuesday, 24 October 2023**
Weather	**Clear, Gentle Winds, 28°C**
Measurement Height	**1.5m above ground level**
Measurement Location	**Free-field**
Monitoring Equipment	**Brüel & Kjær 2270**
Equipment Serial No.	**3029485, 3008204**

Note the LAE Ref and LAMax Ref are referenced at 15m from the track

Event No.	Passby Time	Duration (s)	LAE	LAMax	Track	Class/ Type	No. Cars/Wagons	Notes On Ambient Noise
1	14:16:29	64	92 dBA	85 dBA	Up	Freight	33	No influence from other noise sources
2	14:22:43	13	72 dBA	65 dBA	Up	Waratah	8	No influence from other noise sources
3	14:24:45	15	73 dBA	67 dBA	Down	Waratah	8	Wheel defect mid train
4	14:28:48	24	71 dBA	62 dBA	Up	Tangara	8	No influence from other noise sources
5	14:33:05	15	75 dBA	68 dBA	Up	Intercity	8	No influence from other noise sources
6	14:38:26	15	73 dBA	65 dBA	Down	Waratah	8	Track condition influences noise levels
7	14:42:30	31	75 dBA	67 dBA	Down	Intercity	8	Track condition influences noise levels
8	14:43:27	17	71 dBA	64 dBA	Up	Waratah	8	No influence from other noise sources
9	14:51:46	14	74 dBA	67 dBA	Down	Waratah	8	Track condition influences noise levels
10	14:58:30	17	73 dBA	67 dBA	Up	Waratah	8	No influence from other noise sources
11	15:01:53	24	69 dBA	59 dBA	Up	Oscar	8	Track condition influences noise levels
12	15:06:20	16	86 dBA	78 dBA	Down	XPT	7	Track condition influences noise levels
13	15:07:25	17	72 dBA	64 dBA	Down	Tangara	8	No influence from other noise sources
14	15:12:31	15	73 dBA	65 dBA	Down	Oscar	8	No influence from other noise sources
15	15:13:51	15	71 dBA	64 dBA	Up	Waratah	8	No influence from other noise sources
16	15:16:33	23	76 dBA	68 dBA	Up	XPT	7	No influence from other noise sources
17	15:23:37	18	73 dBA	64 dBA	Down	Waratah	8	No influence from other noise sources
18	15:27:18	14	71 dBA	63 dBA	Up	Waratah	8	Track condition influences noise levels
19	15:30:16	20	76 dBA	69 dBA	Up	Intercity	8	No influence from other noise sources
20	15:38:27	15	74 dBA	66 dBA	Down	Waratah	8	No influence from other noise sources
21	15:42:13	20	76 dBA	71 dBA	Down	Intercity	8	No influence from other noise sources
22	15:42:44	15	72 dBA	66 dBA	Up	Tangara	8	No influence from other noise sources
23	15:51:57	15	74 dBA	66 dBA	Down	Waratah	8	No influence from other noise sources
24	15:57:40	18	68 dBA	60 dBA	Up	Waratah	8	No influence from other noise sources
25	16:00:37	14	74 dBA	72 dBA	Up	Oscar	8	No influence from other noise sources
26	16:02:06	14	81 dBA	73 dBA	Down	Oscar	8	Track condition influences noise levels
27	10:37:40	12	81 dBA	74 dBA	Down	Waratah	8	Additional measurements on 7 December 2023. Track condition influences noise levels
28	10:40:35	94	96 dBA	84 dBA	Down	Freight	85	Additional measurements on 7 December 2023. Track condition influences noise levels
29	10:43:44	16	83 dBA	75 dBA	Down	Intercity	8	Additional measurements on 7 December 2023. Track condition influences noise levels
30	10:44:27	15	77 dBA	69 dBA	Up	Tangara	8	Additional measurements on 7 December 2023. No influence from other noise sources
31	10:51:25	12	82 dBA	74 dBA	Down	Waratah	8	Additional measurements on 7 December 2023. Track condition influences noise levels
32	10:52:59	66	95 dBA	85 dBA	Down	Freight	51	Additional measurements on 7 December 2023. Wheel defects on 2 wagons

Project	**ETTT 5 Year Compliance Assessment**
Location ID	**N7**
Street	**32 The Crescent, Cheltenham**
Date	**Wednesday, 25 October 2023**
Weather	**Clear, Gentle Winds, 20°C**
Measurement Height	**1.5m above ground level**
Measurement Location	**Free-field**
Monitoring Equipment	**Brüel & Kjær 2270**
Equipment Serial No.	**3029485**

Note: Measurements conducted approximately 34m from the closest track.

Event No.	Passby Time	Duration (s)	LAE	LAMax	Track	Class/ Type	No. Cars/Wagons	Notes On Ambient Noise
1	08:09:50	17	72 dBA	64 dBA	Down	Waratah	8	Track condition influencing noise levels
2	08:11:24	14	68 dBA	62 dBA	Up	Oscar	8	Track condition influencing noise levels
3	08:24:25	20	73 dBA	65 dBA	Down	Waratah	8	Track condition influencing noise levels. Wheel defect on second carriage
4	08:27:46	17	75 dBA	67 dBA	Up	Intercity	8	Track condition influencing noise levels
5	08:36:07	21	67 dBA	59 dBA	Up	Waratah	8	Track condition influencing noise levels
6	08:39:21	17	72 dBA	63 dBA	Down	Waratah	8	Track condition influencing noise levels
7	08:42:07	17	75 dBA	67 dBA	Up	Intercity	8	Track condition influencing noise levels. Wheel defect near front of train
8	08:42:53	21	75 dBA	68 dBA	Down	Intercity	8	Track condition influencing noise levels
9	08:51:03	19	69 dBA	61 dBA	Up	Waratah	8	Track condition influencing noise levels
10	08:53:58	18	71 dBA	62 dBA	Down	Waratah	8	Track condition influencing noise levels
11	08:57:00	16	69 dBA	61 dBA	Up	Waratah	8	Track condition influencing noise levels
12	08:58:57	16	72 dBA	65 dBA	Down	Waratah	8	Track condition influencing noise levels
13	09:00:08	21	70 dBA	61 dBA	Up	Intercity	8	Track condition influencing noise levels
14	09:08:16	17	72 dBA	66 dBA	Down	Waratah	8	Track condition influencing noise levels. Wheel defect near middle of train
15	09:12:10	20	68 dBA	66 dBA	Up	Waratah	8	Track condition influencing noise levels
16	09:12:27	13	71 dBA	63 dBA	Down	Oscar	8	Track condition influencing noise levels
17	09:14:47	17	74 dBA	66 dBA	Down	Tangara	8	Track condition influencing noise levels. Wheel defect near end of train
18	09:15:48	20	66 dBA	59 dBA	Up	Oscar	8	Track condition influencing noise levels
19	09:29:35	16	69 dBA	64 dBA	Up	Waratah	8	Track condition influencing noise levels
20	09:31:38	17	70 dBA	62 dBA	Down	Waratah	8	Track condition influencing noise levels
21	09:34:00	23	69 dBA	59 dBA	Up	Intercity	8	Track condition influencing noise levels
22	09:34:28	16	83 dBA	74 dBA	Down	Waratah	8	Track condition influencing noise levels
23	09:39:42	62	83 dBA	71 dBA	Up	Freight	41	Track condition influencing noise levels
24	09:44:44	14	72 dBA	70 dBA	Up	Waratah	8	Track condition influencing noise levels
25	09:47:06	17	86 dBA	77 dBA	Down	Intercity	8	Track condition influencing noise levels
26	09:47:26	17	73 dBA	64 dBA	Down	Tangara	8	Track condition influencing noise levels. Wheel defect and first and last carriage
27	09:58:21	16	86 dBA	78 dBA	Down	Xplorer	6	Track condition influencing noise levels
28	09:59:23	21	74 dBA	65 dBA	Down	Waratah	8	Track condition influencing noise levels. Wheel defect on first carriage
29	10:04:50	15	73 dBA	64 dBA	Down	Tangara	8	Track condition influencing noise levels. Wheel defect on last carriage
30	10:11:07	22	73 dBA	63 dBA	Down	Tangara	8	Track condition influencing noise levels
31	10:13:12	21	70 dBA	66 dBA	Up	Tangara	8	Track condition influencing noise levels
32	10:14:06	148	95 dBA	85 dBA	Down	Freight	89	Track condition influencing noise levels. Wheel screeching throught passby
33	10:17:13	16	72 dBA	64 dBA	Down	Oscar	8	Track condition influencing noise levels. Wheel defect near front of train

Project	**ETTT 5 Year Compliance Assessment**
Location ID	**NV8**
Street	**Cheltenham Scout Hall**
Date	**Thursday, 2 November 2024**
Weather	**Clear, Gentle Winds, 22°C**
Measurement Height	**1.5m above ground level**
Measurement Location	**Free-field**
Monitoring Equipment	**Brüel & Kjær 2270**
Equipment Serial No.	**3008204**

Note: Measurements conducted approximately 19m from the closest track.

Event No.	Passby Time	Duration (s)	LAE	LAMax	Track	Class/ Type	No. Cars/Wagons	Notes On Ambient Noise
1	12:56:09	17	79 dBA	73 dBA	Up	Waratah	8	No influence from other noise sources
2	12:57:38	18	79 dBA	71 dBA	Down	Waratah	8	No influence from other noise sources
3	13:00:11	12	74 dBA	68 dBA	Up	Oscar	4	Curving noise present
4	13:05:39	72	97 dBA	88 dBA	Up	Freight	58	No influence from other noise sources
5	13:08:48	17	79 dBA	72 dBA	Down	Waratah	8	No influence from other noise sources
6	13:29:20	15	83 dBA	76 dBA	Up	Waratah	8	Curving noise present throughout
7	13:32:29	34	83 dBA	78 dBA	Up	Intercity	8	Curving noise present throughout
8	13:39:41	17	80 dBA	73 dBA	Up	Waratah	8	Curving noise present
9	13:41:09	17	82 dBA	75 dBA	Down	Waratah	8	No influence from other noise sources
10	13:41:48	114	97 dBA	89 dBA	Down	Freight	71	Curving noise present throughout. Wheel defects on multiple wagons
11	13:45:56	41	98 dBA	89 dBA	Up	Freight	33	Curving noise present throughout. Intercity train near end of passby
12	13:54:03	16	81 dBA	73 dBA	Down	Tangara	8	No influence from other noise sources
13	13:56:18	15	80 dBA	73 dBA	Up	Tangara	8	No influence from other noise sources
14	13:59:32	20	86 dBA	80 dBA	Up	Oscar	8	Curving noise present throughout
15	14:08:57	15	81 dBA	74 dBA	Down	Waratah	8	Curving noise present
16	14:12:06	17	79 dBA	72 dBA	Up	Waratah	8	No influence from other noise sources
17	14:12:49	13	86 dBA	83 dBA	Down	Intercity	4	No influence from other noise sources
18	14:23:36	16	80 dBA	72 dBA	Down	Waratah	8	No influence from other noise sources
19	14:25:47	16	76 dBA	68 dBA	Up	Tangara	8	Curving noise present
20	14:29:06	24	86 dBA	85 dBA	Up	Intercity	8	Curving noise present
21	14:35:27	90	94 dBA	88 dBA	Up	Freight	77	Curving noise present throughout. Wheel defect near end of train
22	14:38:38	16	82 dBA	74 dBA	Down	Waratah	8	Wheel defect near end of train
23	14:41:33	16	83 dBA	77 dBA	Up	Waratah	8	Curving noise present throughout
24	14:42:45	18	83 dBA	73 dBA	Down	Intercity	8	No influence from other noise sources
25	14:56:17	17	84 dBA	78 dBA	Up	Waratah	8	No influence from other noise sources
26	14:59:19	16	80 dBA	73 dBA	Down	Waratah	8	Check Overlap
27	14:59:45	21	83 dBA	78 dBA	Up	Oscar	8	Curving noise present throughout. Wheel defect on front carriage
28	15:09:21	16	80 dBA	72 dBA	Down	Tangara	8	Wheel defect on front carriage
29	15:10:13	16	81 dBA	74 dBA	Up	Waratah	8	No influence from other noise sources
30	15:10:50	17	89 dBA	82 dBA	Down	XPT	7	Curving noise present

Project	**ETTT 5 Year Compliance Assessment**
Location ID	**N9**
Street	**92 Sunderland Road, Beecroft**
Date	**Wednesday, 1 November 2023**
Weather	**Clear, Light Winds, 20°C**
Measurement Height	**1.5m above ground level**
Measurement Location	**Free-field**
Monitoring Equipment	**Brüel & Kjær 2270**
Equipment Serial No.	**3029485**

Note: Measurements conducted approximately 38m from the closest track.

Event No.	Passby Time	Duration (s)	LAE	LAMax	Track	Class/ Type	No. Cars/Wagons	Notes On Ambient Noise
1	11:41:59	16	88 dBA	82 dBA	Up	Waratah	8	Curving noise present throughout
2	11:44:52	15	83 dBA	77 dBA	Down	Intercity	8	Curving noise present throughout
3	11:54:01	16	78 dBA	71 dBA	Down	Waratah	8	Curving noise present throughout
4	11:58:39	13	87 dBA	82 dBA	Up	Oscar	4	Curving noise present throughout
5	12:03:29	16	86 dBA	83 dBA	Up	Waratah	8	Curving noise present throughout
6	12:11:20	16	87 dBA	81 dBA	Up	Waratah	8	Curving noise present throughout
7	12:14:00	21	81 dBA	73 dBA	Down	XPT	7	Curving noise present
8	12:17:54	14	73 dBA	67 dBA	Down	Oscar	4	No influence from other noise sources
9	12:21:26	65	98 dBA	89 dBA	Up	Freight	58	Curving noise present throughout
10	12:26:24	19	80 dBA	73 dBA	Down	Waratah	8	Curving noise present throughout
11	12:28:06	15	88 dBA	81 dBA	Up	Intercity	8	Curving noise present throughout. Wheel defect near middle of train
12	12:32:54	16	84 dBA	80 dBA	Up	Waratah	8	Curving noise present throughout
13	12:40:59	21	85 dBA	77 dBA	Up	Waratah	8	Curving noise present throughout
14	12:42:54	15	85 dBA	86 dBA	Down	Intercity	8	Curving noise present throughout
15	12:46:44	164	97 dBA	87 dBA	Up	Freight	89	Curving noise present throughout. Wheel defects throughout passby
16	12:53:57	18	75 dBA	68 dBA	Down	Waratah	8	No influence from other noise sources
17	12:57:12	14	84 dBA	79 dBA	Up	Oscar	4	No influence from other noise sources
18	13:02:49	15	84 dBA	78 dBA	Up	Waratah	8	Curving noise present
19	13:08:56	23	75 dBA	66 dBA	Down	Waratah	8	No influence from other noise sources
20	13:22:58	15	90 dBA	84 dBA	Up	Waratah	8	Curving noise present throughout
21	13:24:51	17	76 dBA	71 dBA	Down	Tangara	8	No influence from other noise sources
22	13:28:15	68	99 dBA	91 dBA	Down	Freight	52	Curving noise present throughout. Intercity Up mid passby excluded.
23	13:33:10	15	85 dBA	80 dBA	Up	Waratah	8	Curving noise present
24	13:39:47	21	78 dBA	72 dBA	Down	Waratah	8	Curving noise present throughout
25	13:40:56	14	85 dBA	77 dBA	Up	Waratah	8	Track defect influencing noise level
26	13:43:07	10	79 dBA	75 dBA	Down	Intercity	4	Curving noise present throughout
27	13:52:47	102	99 dBA	95 dBA	Up	Freight	85	Curving noise present throughout
28	14:00:27	15	87 dBA	83 dBA	Up	Tangara	8	Curving noise present throughout
29	14:01:16	17	78 dBA	75 dBA	Down	Tangara	8	Curving noise present
30	14:03:31	23	92 dBA	88 dBA	Up	Oscar	8	Curving noise present throughout
31	14:05:30	142	97 dBA	93 dBA	Down	Freight	77	Curving noise present throughout. Wheel defect near end of train
32	14:11:05	17	85 dBA	79 dBA	Up	Waratah	8	Curving noise present
33	14:13:54	18	77 dBA	72 dBA	Down	Waratah	8	Curving noise present
34	14:17:06	11	82 dBA	79 dBA	Down	Intercity	4	Curving noise present throughout
35	14:26:07	17	84 dBA	78 dBA	Up	Tangara	8	Track defect influencing noise level
36	14:38:54	18	80 dBA	77 dBA	Down	Waratah	8	Curving noise present throughout
37	14:42:56	16	81 dBA	73 dBA	Down	Intercity	8	Curving noise present throughout

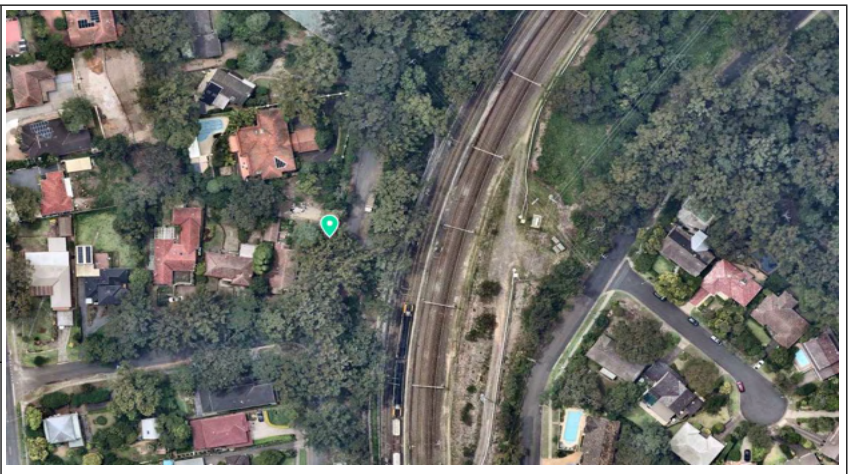
Project	**ETTT 5 Year Compliance Assessment**
Location ID	**N10**
Street	**126 Sutherland Road,Beecroft**
Date	**Wednesday, 1 November 2023**
Weather	**Clear, Light winds, 18°C**
Measurement Height	**1.5m above ground level**
Measurement Location	**Free-field**
Monitoring Equipment	**Brüel & Kjær 2270**
Equipment Serial No.	**3029485**

Note: Measurements conducted approximately 40m from the closest track.

Event No.	Passby Time	Duration (s)	LAE	LAMax	Track	Class/ Type	No. Cars/Wagons	Notes On Ambient Noise
1	08:25:15	17	77 dBA	71 dBA	Up	Intercity	8	Curving noise present throughout
2	08:28:56	20	77 dBA	69 dBA	Down	Waratah	8	Curving noise present throughout
3	08:40:19	19	76 dBA	67 dBA	Up	Intercity	8	Curving noise present throughout
4	08:40:46	32	75 dBA	67 dBA	Down	Waratah	8	Curving noise present
5	08:48:17	39	73 dBA	67 dBA	Up	Waratah	8	Wheel defect mid train
6	09:01:58	20	76 dBA	67 dBA	Down	Waratah	8	Curving noise present throughout
7	09:08:33	18	72 dBA	64 dBA	Up	Waratah	8	Wheel defect mid train
8	09:11:47	19	78 dBA	70 dBA	Up	Oscar	8	Curving noise present throughout
9	09:15:25	18	74 dBA	66 dBA	Down	Oscar	8	Curving noise present throughout
10	09:27:06	107	75 dBA	66 dBA	Down	Waratah	8	Curving noise present
11	09:28:57	22	98 dBA	90 dBA	Up	Freight	62	Curving noise present throughout. Wheel defects throughout passby
12	09:33:01	19	70 dBA	61 dBA	Down	Waratah	8	No influence from other noise sources
13	09:40:08	18	75 dBA	67 dBA	Up	Waratah	8	No influence from other noise sources
14	09:43:27	22	78 dBA	70 dBA	Down	Intercity	8	Curving noise present throughout
15	09:54:49	19	74 dBA	64 dBA	Up	Waratah	8	Curving noise present throughout
16	09:59:43	17	76 dBA	68 dBA	Down	Waratah	8	Curving noise present throughout
17	10:00:31	14	76 dBA	69 dBA	Down	Xplorer	6	No influence from other noise sources
18	10:07:57	19	70 dBA	65 dBA	Up	Oscar	4	Curving noise present throughout
19	10:12:10	18	75 dBA	66 dBA	Down	Tangara	8	Wheel defects influencing noise levl
20	10:14:17	19	75 dBA	67 dBA	Up	Tangara	8	Curving noise present throughout
21	10:24:36	28	72 dBA	64 dBA	Up	Waratah	8	Curving noise present
22	10:29:20	18	80 dBA	70 dBA	Up	Intercity	8	Curving noise present throughout. Down Tangara but no influence on measured levels
23	10:40:08	115	73 dBA	65 dBA	Up	Tangara	8	No influence from other noise sources
24	10:46:29	22	93 dBA	81 dBA	Up	Freight	65	Curving noise present throughout
25	10:57:59	173	75 dBA	69 dBA	Up	Oscar	4	Curving noise present throughout
26	11:00:43	16	90 dBA	79 dBA	Down	Freight	82	Curving noise present throughout
27	11:09:16	23	73 dBA	65 dBA	Up	Waratah	8	No influence from other noise sources
28	11:11:55	22	75 dBA	66 dBA	Down	Waratah	8	Curving noise present

Project	**ETTT 5 Year Compliance Assessment**
Location ID	**N11**
Street	**71 Wongala Crescent, Beecroft**
Date	**Monday, 6 November 2023**
Weather	**Clear, Gentle Winds, 20°C**
Measurement Height	**1.5m above ground level**
Measurement Location	**Free-field**
Monitoring Equipment	**Brüel & Kjær 2270**
Equipment Serial No.	**3008204**

Note: Measurements conducted approximately 35m from the closest track.



Event No.	Passby Time	Duration (s)	LAE	LAMax	Track	Class/ Type	No. Cars/Wagons	Notes On Ambient Noise
1	09:54:08	14	68 dBA	59 dBA	Up	Waratah	8	No influence from other noise sources
2	09:57:38	17	73 dBA	64 dBA	Down	Waratah	8	Curving noise present past monitoring location
3	10:02:02	13	72 dBA	64 dBA	Down	Xplorer	8	Curving nosie present throughout
4	10:03:39	14	71 dBA	63 dBA	Down	Tangara	8	Curving nosie present throughout
5	10:09:29	15	67 dBA	58 dBA	Up	Tangara	8	No influence from other noise sources
6	10:14:53	99	95 dBA	88 dBA	Up	Freight	-	Heavy curving nosie present throughout. Length and speed unknown
7	10:21:00	173	82 dBA	67 dBA	Up	Freight	-	Curving nosie present throughout. Length and speed unknown
8	10:31:12	29	72 dBA	63 dBA	Up	Intercity	8	Curving nosie present throughout
9	10:35:18	105	83 dBA	72 dBA	Up	Freight	-	Curving nosie present throughout. Length and speed unknown
10	10:40:10	22	76 dBA	67 dBA	Down	Waratah	8	Curving nosie present throughout
11	10:41:06	23	68 dBA	58 dBA	Up	Tangara	8	Curving nosie present throughout
12	10:44:07	52	86 dBA	77 dBA	Down	Freight	-	No influence from other noise sources. Length and speed unknown
13	10:49:45	22	72 dBA	64 dBA	Down	Intercity	8	Wheel defects inlfuence noise levels
14	10:53:45	21	71 dBA	62 dBA	Up	Waratah	8	Curving nosie present throughout
15	11:08:57	24	71 dBA	64 dBA	Up	Waratah	8	Curving nosie present throughout
16	11:14:44	121	87 dBA	75 dBA	Up	Freight	-	Curving nosie present throughout. Length and speed unknown
17	11:17:24	22	68 dBA	59 dBA	Down	Oscar	4	Curving nosie present throughout
18	11:24:21	23	67 dBA	58 dBA	Up	Tangara	8	No influence from other noise sources
19	11:40:45	24	71 dBA	62 dBA	Up	Waratah	8	Curving nosie present throughout
20	11:41:27	26	75 dBA	65 dBA	Down	Waratah	8	Curving nosie present throughout
21	11:43:53	28	72 dBA	63 dBA	Down	Intercity	8	Curving nosie present throughout
22	11:53:40	22	71 dBA	61 dBA	Up	Waratah	8	Curving nosie present throughout
23	12:08:36	21	71 dBA	63 dBA	Up	Waratah	8	Curving nosie present throughout
24	12:12:49	28	78 dBA	69 dBA	Down	XPT	8	Curving nosie present throughout
25	12:18:06	23	72 dBA	64 dBA	Down	Oscar	4	Wheel defects inlfuence noise levels
26	12:24:16	22	72 dBA	64 dBA	Up	Waratah	8	Curving nosie present throughout
27	12:28:39	28	76 dBA	66 dBA	Up	Intercity	8	Curving nosie present throughout
28	12:31:21	23	74 dBA	65 dBA	Down	Waratah	8	Curving nosie present throughout

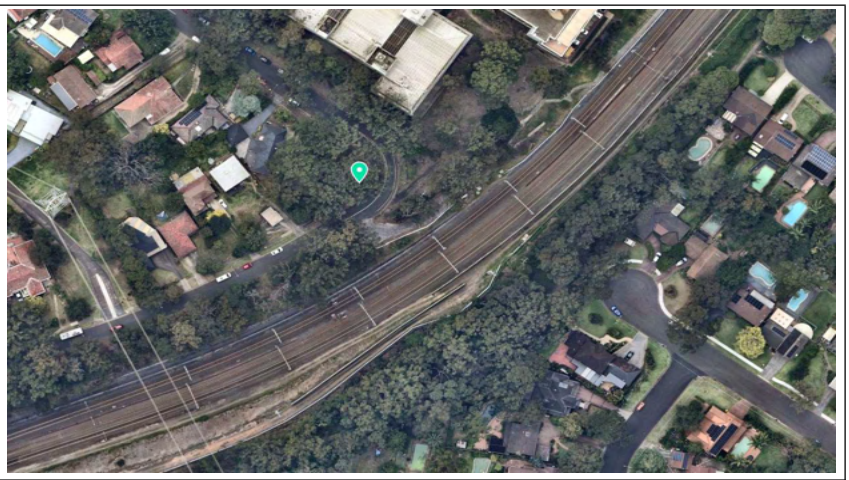
Project	**ETTT 5 Year Compliance Assessment**
Location ID	**N12**
Street	**83 Wongala Crescent, Beecroft**
Date	**Monday, 6 November 2023**
Weather	**Clear, Gentle Winds, 21°C**
Measurement Height	**1.5m above ground level**
Measurement Location	**Free-field**
Monitoring Equipment	**Brüel & Kjær 2270**
Equipment Serial No.	**3029485**

Note: Measurements conducted approximately 30m from the closest track.

Event No.	Passby Time	Duration (s)	LAE	LAMax	Track	Class/ Type	No. Cars/Wagons	Notes On Ambient Noise
1	13:10:30	19	72 dBA	63 dBA	Down	Waratah	8	Wheel defect influences noise levels
2	13:25:25	18	75 dBA	66 dBA	Down	Tangara	8	No influence from other noise sources
3	13:38:50	18	69 dBA	61 dBA	Up	Waratah	8	No influence from other noise sources
4	13:40:06	18	73 dBA	64 dBA	Down	Waratah	8	Wheel defect influences noise levels
5	13:43:31	15	71 dBA	64 dBA	Down	Intercity	4	Curving noise present throughout
6	13:53:21	20	70 dBA	61 dBA	Up	Waratah	8	No influence from other noise sources
7	14:08:44	17	71 dBA	62 dBA	Up	Waratah	8	Curving noise present throughout
8	14:14:58	19	73 dBA	65 dBA	Down	Waratah	8	No influence from other noise sources
9	14:17:19	29	74 dBA	64 dBA	Down	Intercity	8	No influence from other noise sources
10	14:22:46	21	69 dBA	61 dBA	Up	Tangara	8	Curving noise present throughout
11	14:25:53	19	76 dBA	67 dBA	Down	Waratah	8	Curving noise present throughout
12	14:27:31	27	69 dBA	60 dBA	Up	Intercity	8	Curving noise present throughout
13	14:38:18	20	69 dBA	63 dBA	Up	Waratah	8	Curving noise present throughout
14	14:40:34	25	76 dBA	67 dBA	Down	Waratah	8	Curving noise present throughout
15	14:45:05	21	77 dBA	69 dBA	Down	Intercity	8	Curving noise present throughout
16	14:52:30	20	69 dBA	61 dBA	Up	Waratah	8	Curving noise present throughout
17	14:56:02	23	75 dBA	67 dBA	Up	Oscar	8	Curving noise present throughout
18	14:57:34	19	71 dBA	62 dBA	Down	Waratah	8	Wheel defect influences noise levels
19	15:07:38	24	67 dBA	59 dBA	Up	Waratah	8	Curving noise present throughout
20	15:10:11	22	77 dBA	67 dBA	Down	XPT	7	No influence from other noise sources
21	15:11:05	27	77 dBA	66 dBA	Up	XPT	7	No influence from other noise sources
22	15:14:01	18	74 dBA	65 dBA	Down	Tangara	8	No influence from other noise sources
23	15:16:18	26	74 dBA	63 dBA	Down	Oscar	8	Curving noise present throughout
24	15:23:17	26	68 dBA	59 dBA	Up	Waratah	8	Curving noise present throughout
25	15:26:07	17	74 dBA	65 dBA	Down	Waratah	8	Curving noise present throughout
26	15:37:00	25	66 dBA	57 dBA	Up	Tangara	8	No influence from other noise sources
27	15:43:23	20	72 dBA	63 dBA	Down	Waratah	8	No influence from other noise sources
28	15:45:45	28	75 dBA	65 dBA	Down	Intercity	8	Curving noise present throughout
29	15:51:59	23	68 dBA	60 dBA	Up	Waratah	8	No influence from other noise sources
30	15:56:48	23	69 dBA	59 dBA	Up	Oscar	8	Curving noise present throughout
31	15:58:59	21	72 dBA	63 dBA	Down	Waratah	8	No influence from other noise sources
32	10:04:35	60	89 dBA	78 dBA	Up	Freight	-	Curving noise present throughout. Speed and length unknown
33	10:27:52	136	91 dBA	84 dBA	Down	Freight	-	Curving noise present. Wheel defect near end of train. Speed and length unknown

Project	**ETTT 5 Year Compliance Assessment**
Location ID	**N13**
Street	**3 Wongala Crescent, Pennant Hills**
Date	**Tuesday, 7 November 2023**
Weather	**Clear, Calm, 20°C**
Measurement Height	**1.5m above ground level**
Measurement Location	**Free-field**
Monitoring Equipment	**Brüel & Kjær 2270**
Equipment Serial No.	**3008204**

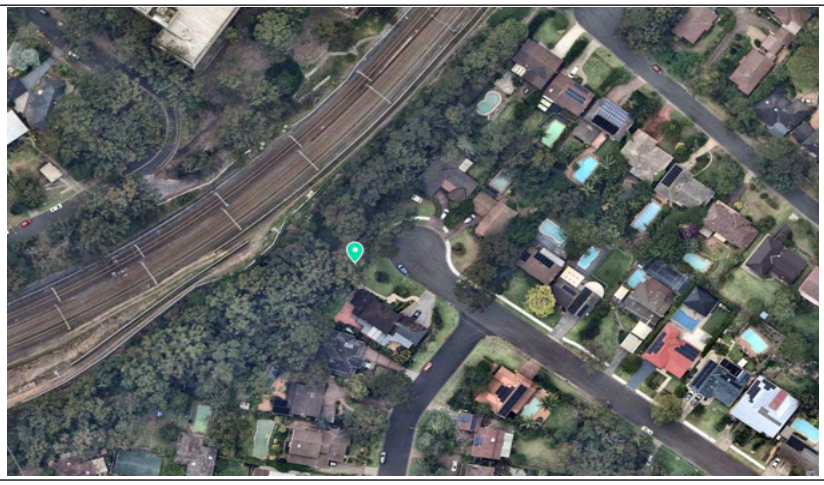
Note: Measurements conducted approximately 37m from the closest track.



Event No.	Passby Time	Duration (s)	LAE	LAMax	Track	Class/ Type	No. Cars/Wagons	Notes On Ambient Noise
1	08:24:17	20	76 dBA	69 dBA	Up	Intercity	8	Wheel defect near front of train
2	08:26:45	19	74 dBA	65 dBA	Down	Waratah	8	No influence from other noise sources
3	08:32:05	22	70 dBA	61 dBA	Up	Waratah	8	Wheel defect at front of train
4	08:39:44	23	83 dBA	75 dBA	Up	Intercity	8	Curving noise present throughout
5	08:41:52	22	76 dBA	68 dBA	Down	Waratah	8	No influence from other noise sources
6	08:47:34	17	71 dBA	62 dBA	Up	Waratah	8	No influence from other noise sources
7	09:00:02	71	88 dBA	80 dBA	Up	Freight	52	No influence from other noise sources
8	09:07:07	22	73 dBA	64 dBA	Up	Waratah	8	No influence from other noise sources
9	09:12:26	20	74 dBA	65 dBA	Down	Waratah	8	No influence from other noise sources
10	09:23:19	23	70 dBA	60 dBA	Up	Waratah	8	No influence from other noise sources
11	09:27:38	24	74 dBA	64 dBA	Down	Waratah	8	No influence from other noise sources
12	09:32:20	20	75 dBA	66 dBA	Down	Waratah	8	Curving noise present
13	09:38:15	17	71 dBA	62 dBA	Up	Waratah	8	Wheel defect at front of train
14	10:40:49	20	76 dBA	67 dBA	Down	Waratah	8	No influence from other noise sources
15	10:45:11	33	74 dBA	64 dBA	Down	Intercity	8	No influence from other noise sources
16	10:56:17	19	75 dBA	67 dBA	Down	Tangara	8	No influence from other noise sources
17	10:58:00	14	71 dBA	69 dBA	Up	Oscar	4	Wheel defect at front of train
18	11:08:47	21	72 dBA	65 dBA	Up	Waratah	8	No influence from other noise sources
19	11:10:46	23	73 dBA	63 dBA	Down	Waratah	8	No influence from other noise sources
20	11:14:19	15	66 dBA	57 dBA	Down	Oscar	4	No influence from other noise sources
21	11:23:57	23	71 dBA	61 dBA	Up	Tangara	8	Wheel defect near front of train
22	11:27:15	25	75 dBA	66 dBA	Down	Waratah	8	No influence from other noise sources
23	11:29:21	148	87 dBA	77 dBA	Down	Freight	54	Curving noise present. Car passbys excluded.
24	11:44:44	194	85 dBA	71 dBA	Up	Freight	89	No influence from other noise sources
25	11:53:11	24	70 dBA	60 dBA	Up	Waratah	8	No influence from other noise sources
26	11:56:39	19	74 dBA	65 dBA	Down	Waratah	8	No influence from other noise sources
27	11:58:43	19	68 dBA	59 dBA	Up	Oscar	4	No influence from other noise sources
28	12:08:53	21	71 dBA	62 dBA	Up	Waratah	8	Curving noise present
29	12:13:04	20	84 dBA	75 dBA	Down	XPT	7	Curving noise present throughout
30	12:19:47	20	70 dBA	62 dBA	Down	Oscar	4	No influence from other noise sources
31	12:23:44	22	71 dBA	64 dBA	Up	Waratah	8	Curving noise present
32	12:32:43	73	91 dBA	82 dBA	Up	Freight	58	Curving noise present. Wagon impact mid passby
33	12:45:59	20	84 dBA	77 dBA	Down	Intercity	8	Curving noise present
34	13:00:22	110	88 dBA	79 dBA	Down	Freight	41	Curving noise present throughout

Project	**ETTT 5 Year Compliance Assessment**
Location ID	**N14**
Street	**27 Azalea Grove, Pennant Hills**
Date	**Wednesday, 8 November 2023**
Weather	**Clear, Gentle Winds, 20°**
Measurement Height	**1.5m above ground level**
Measurement Location	**Free-field**
Monitoring Equipment	**Brüel & Kjær 2270**
Equipment Serial No.	**3008204**

Note: Measurements conducted approximately 40m from the closest track.



Event No.	Passby Time	Duration (s)	LAE	LAMax	Track	Class/ Type	No. Cars/Wagons	Notes On Ambient Noise
1	08:58:41	15	64 dBA	56 dBA	Down	Waratah	8	No influence from other noise sources
2	09:07:55	16	62 dBA	54 dBA	Up	Waratah	8	Track defect influences noise levels
3	09:16:23	21	66 dBA	58 dBA	Down	Waratah	8	No influence from other noise sources
4	09:22:29	22	65 dBA	59 dBA	Down	Tangara	8	Dog barking nearby but no influence to nosie levls
5	09:28:55	28	65 dBA	59 dBA	Up	Intercity	8	Track defect influences noise levels
6	09:30:41	21	64 dBA	55 dBA	Down	Waratah	8	No influence from other noise sources
7	09:35:40	16	62 dBA	53 dBA	Down	Waratah	8	No influence from other noise sources
8	09:39:41	19	64 dBA	59 dBA	Up	Waratah	8	Track defect influences noise levels
9	09:54:29	16	62 dBA	53 dBA	Up	Waratah	8	Track defect influences noise levels
10	10:09:03	15	62 dBA	55 dBA	Up	Tangara	8	Track defect influences noise levels
11	10:11:27	27	66 dBA	60 dBA	Down	Tangara	8	No influence from other noise sources
12	10:13:11	139	79 dBA	66 dBA	Up	Freight	-	Wheel defects on last wagons. Speed and length unknown.
13	10:25:17	16	62 dBA	53 dBA	Up	Waratah	8	Track defect influences noise levels
14	10:33:56	153	79 dBA	70 dBA	Down	Freight	-	Curving noise present throughout. Speed and length unknown.
15	10:38:24	22	64 dBA	57 dBA	Up	Tangara	8	Track defect influences noise levels
16	10:43:52	121	74 dBA	63 dBA	Up	Freight	-	Curving noise present throughout. Speed and length unknown.
17	10:47:47	32	66 dBA	59 dBA	Down	Intercity	8	Dog barking nearby but no influence to nosie levls
18	10:53:10	15	65 dBA	58 dBA	Up	Waratah	8	Track defect influences noise levels
19	10:56:00	19	66 dBA	57 dBA	Down	Tangara	8	Curving noise present
20	11:09:05	16	63 dBA	54 dBA	Up	Waratah	8	Track defect influences noise levels
21	11:11:34	19	65 dBA	56 dBA	Down	Waratah	8	No influence from other noise sources
22	11:13:40	111	80 dBA	68 dBA	Up	Freight	-	Curving noise present throughout. Wheel defects throughout. Speed and length unknown.
23	11:26:27	16	61 dBA	52 dBA	Up	Tangara	8	Track defect influences noise levels
24	11:39:46	26	63 dBA	54 dBA	Up	Waratah	8	Track defect influences noise levels
25	11:41:40	20	64 dBA	54 dBA	Down	Waratah	8	No influence from other noise sources
26	11:44:22	26	66 dBA	57 dBA	Down	Intercity	8	Curving noise present
27	11:48:28	45	73 dBA	61 dBA	Up	Freight	-	Curving noise present throughout. Speed and length unknown.
28	11:49:33	73	81 dBA	74 dBA	Down	Freight	-	Curving noise present throughout. Wheel defects near middle of train. Speed and length unknown.

Project	**ETTT 5 Year Compliance Assessment**
Location ID	**N16**
Street	**56 Yarrara Road, Pennant Hills**
Date	**Thursday, 21 December 2023**
Weather	**Overcast, Gentle Winds, 20°C**
Measurement Height	**1.5m above ground level**
Measurement Location	**Free-field**
Monitoring Equipment	**Brüel & Kjær 2270**
Equipment Serial No.	**3029485**

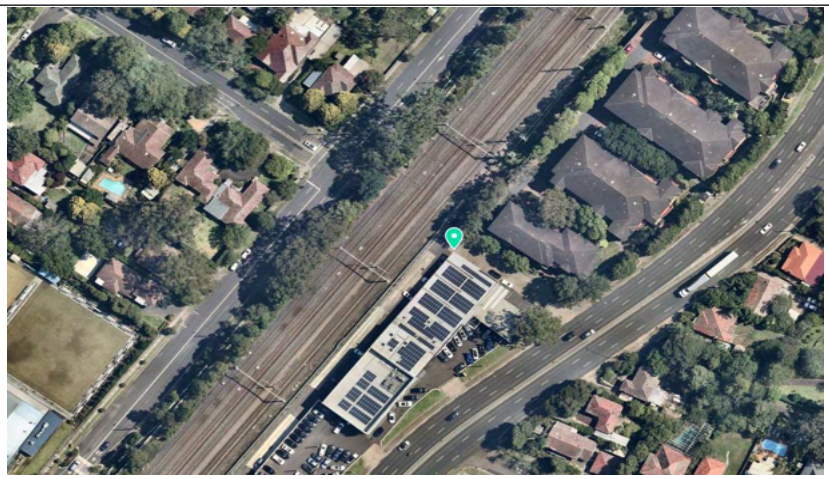
Note: Measurements conducted approximately 30m from the closest track.

Event No.	Passby Time	Duration (s)	LAE	LAMax	Track	Class/ Type	No. Cars/Wagons	Notes On Ambient Noise
1	22:18:58	10	72 dBA	67 dBA	Down	Oscar	4	No influence from other noise sources
2	22:20:09	23	70 dBA	62 dBA	Up	Waratah	8	No influence from other noise sources
3	22:31:33	20	72 dBA	64 dBA	Down	Waratah	8	No influence from other noise sources
4	22:33:58	26	70 dBA	62 dBA	Up	Waratah	8	No influence from other noise sources
5	22:47:15	29	74 dBA	68 dBA	Up	Waratah	8	No influence from other noise sources
6	22:47:42	18	70 dBA	61 dBA	Down	Waratah	8	Wheel defect near front of train
7	22:59:56	25	70 dBA	60 dBA	Down	Waratah	8	No influence from other noise sources
8	23:02:07	30	69 dBA	62 dBA	Up	Waratah	8	No influence from other noise sources
9	23:07:08	12	65 dBA	58 dBA	Up	Oscar	4	No influence from other noise sources
10	23:14:53	24	75 dBA	69 dBA	Down	Tangara	8	No influence from other noise sources
11	23:16:56	28	70 dBA	63 dBA	Up	Waratah	8	No influence from other noise sources
12	23:21:06	20	79 dBA	75 dBA	Down	Intercity	4	No influence from other noise sources
13	23:31:55	21	76 dBA	71 dBA	Down	Waratah	8	No influence from other noise sources
14	23:44:57	19	76 dBA	71 dBA	Down	Waratah	8	No influence from other noise sources
15	23:47:13	30	72 dBA	65 dBA	Up	Tangara	8	No influence from other noise sources
16	23:52:32	24	72 dBA	63 dBA	Up	Waratah	8	No influence from other noise sources
17	23:55:41	29	68 dBA	57 dBA	Up	Waratah	8	No influence from other noise sources
18	23:59:57	22	69 dBA	60 dBA	Down	Waratah	8	Wheel defect near front of train
19	00:14:51	18	70 dBA	61 dBA	Down	Waratah	8	No influence from other noise sources
20	00:25:39	21	68 dBA	61 dBA	Up	Intercity	8	No influence from other noise sources
21	00:29:38	25	69 dBA	60 dBA	Down	Waratah	8	No influence from other noise sources
22	00:44:51	22	70 dBA	60 dBA	Down	Waratah	8	Wheel defect near end of train
23	00:54:47	16	72 dBA	64 dBA	Up	Tangara	8	No influence from other noise sources
24	01:27:13	15	73 dBA	65 dBA	Down	Oscar	8	No influence from other noise sources
25	02:19:59	16	71 dBA	63 dBA	Down	Oscar	8	No influence from other noise sources
26	02:31:03	140	87 dBA	76 dBA	Down	Freight	32	Slow passby. Wagon bunching towards end
27	02:49:07	12	69 dBA	63 dBA	Down	Oscar	4	No influence from other noise sources
28	02:53:03	55	82 dBA	70 dBA	Up	Freight	52	Wheel defect near front of train.
29	02:58:16	102	85 dBA	79 dBA	Up	Freight	47	Waon impact towards rear of train
30	03:01:49	103	98 dBA	88 dBA	Down	Freight	52	Curving noise present throughout

Project	**ETTT 5 Year Compliance Assessment**
Location ID	**N17**
Street	**1 Stevens Street, Pennant Hills**
Date	**Wednesday, 8 November 2023**
Weather	**Overcast, Light winds, 22°C**
Measurement Height	**1.5m above ground level**
Measurement Location	**Free-field**
Monitoring Equipment	**Brüel & Kjær 2270**
Equipment Serial No.	**3008204**

Note: Measurements conducted approximately 20m from the closest track.

Further monitoring conducted on 18 December due to rain on 8 November.



Event No.	Passby Time	Duration (s)	LAE	LAMax	Track	Class/ Type	No. Cars/Wagons	Notes On Ambient Noise
1	18:22:51	15	80 dBA	73 dBA	Up	Waratah	8	Track condition influencing noise levels
2	18:24:18	24	79 dBA	70 dBA	Down	Intercity	8	Track condition influencing noise levels. Wheel defect near end of train
3	18:27:49	13	77 dBA	71 dBA	Up	Intercity	4	No influence from other noise sources
4	18:36:50	14	81 dBA	73 dBA	Up	Waratah	8	No influence from other noise sources
5	18:37:31	14	83 dBA	78 dBA	Down	Waratah	8	Track condition influencing noise levels
6	18:51:20	21	79 dBA	71 dBA	Down	Waratah	8	No influence from other noise sources
7	18:52:05	13	84 dBA	81 dBA	Up	Waratah	8	Track condition influencing noise levels. Wheel defect near front of train
8	18:54:23	28	81 dBA	75 dBA	Down	Intercity	8	No influence from other noise sources
9	18:56:14	23	75 dBA	67 dBA	Up	Oscar	4	No influence from other noise sources
10	19:06:35	17	80 dBA	72 dBA	Up	Waratah	8	No influence from other noise sources
11	19:10:08	15	81 dBA	72 dBA	Down	Tangara	8	No influence from other noise sources
12	19:11:08	245	91 dBA	79 dBA	Up	Freight	85	No influence from other noise sources. Slower passby with wagon bunching towards end
13	19:18:16	16	79 dBA	70 dBA	Down	Waratah	8	No influence from other noise sources
14	19:26:45	11	76 dBA	70 dBA	Up	Intercity	4	No influence from other noise sources
15	19:29:58	15	81 dBA	73 dBA	Down	Waratah	8	Wheel defect near end of train
16	19:17:32	14	78 dBA	70 dBA	Down	Waratah	8	No influence from other noise sources
17	19:21:05	17	77 dBA	68 dBA	Down	Oscar	8	No influence from other noise sources
18	19:21:59	15	84 dBA	76 dBA	Up	Tangara	8	Track condition influencing noise levels
19	19:29:05	15	79 dBA	70 dBA	Down	Waratah	8	No influence from other noise sources
20	19:35:37	9	84 dBA	79 dBA	Up	Intercity	4	No influence from other noise sources
21	19:40:09	14	84 dBA	76 dBA	Up	Waratah	8	Track condition influencing noise levels
22	19:43:08	16	79 dBA	70 dBA	Down	Waratah	8	No influence from other noise sources
23	19:46:21	25	77 dBA	67 dBA	Down	Intercity	4	No influence from other noise sources
24	19:52:04	14	85 dBA	76 dBA	Up	Waratah	8	Track condition influencing noise levels
25	19:57:39	15	82 dBA	73 dBA	Up	Oscar	8	No influence from other noise sources
26	19:58:13	14	79 dBA	71 dBA	Down	Waratah	8	No influence from other noise sources
27	20:06:56	15	85 dBA	77 dBA	Up	Waratah	8	Track condition influencing noise levels
28	20:13:04	13	80 dBA	72 dBA	Down	Waratah	8	No influence from other noise sources
29	20:22:00	14	84 dBA	76 dBA	Up	Waratah	8	Track condition influencing noise levels
30	20:26:44	12	82 dBA	75 dBA	Up	Intercity	4	Track condition influencing noise levels
31	20:28:00	14	80 dBA	72 dBA	Down	Waratah	8	No influence from other noise sources
32	20:31:02	11	87 dBA	80 dBA	Up	Waratah	8	Track condition influencing noise levels
33	20:37:10	15	84 dBA	75 dBA	Up	Waratah	8	Track condition influencing noise levels
34	20:43:03	14	81 dBA	74 dBA	Down	Waratah	8	No influence from other noise sources
35	20:46:21	15	77 dBA	69 dBA	Down	Intercity	4	No influence from other noise sources
36	21:05:20	15	86 dBA	78 dBA	Up	XPT	7	No influence from other noise sources
37	19:38:02	54	89 dBA	80 dBA	Down	Freight	25	Additional measurement conducted 8 February 2024. No influence from other noise sources
38	22:51:24	226	86 dBA	76 dBA	Down	Freight	21	Additional measurement conducted 8 February 2024. Slow passby with wagon bunching towards end

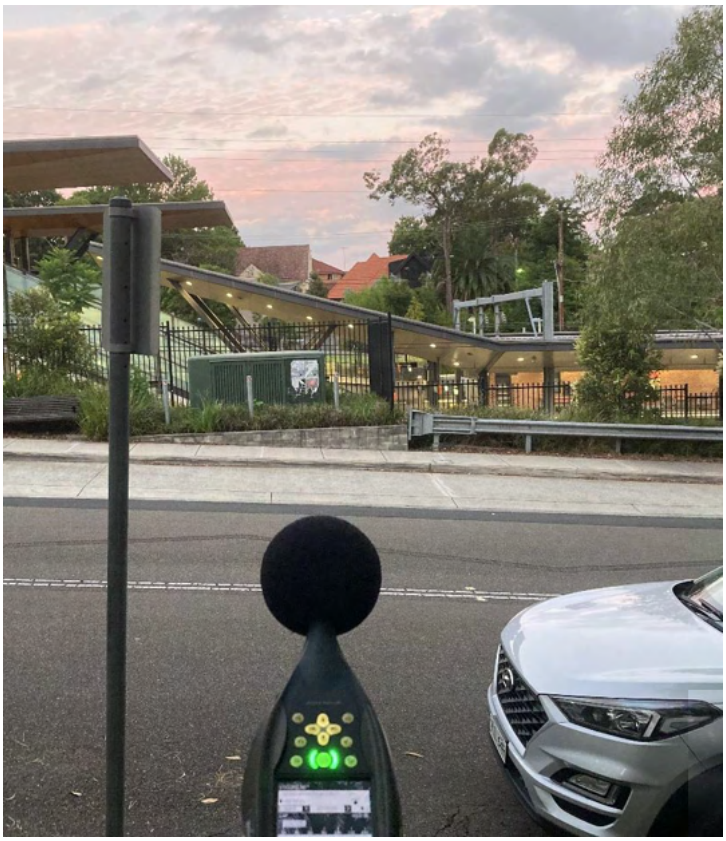
Noise Monitoring Location	N18	Photo of Noise Monitoring Location
Noise Monitoring Address	**Cheltenham Station**	

Sound Level Meter Device Type: Brüel and Kjær 2270, Serial No: 3008204

Attended noise monitoring conducted at a location representative of residential receivers on The Crescent, Cheltenham.

Cheltenham Station Noise Levels (LAmax):
PA announcements: 45-49 dBA

Recorded Noise Levels (LAmax):
Light-vehicle traffic The Crescent: 60-71 dBA, Trains: 57-70 dBA, Birds: 56-60 dBA, Aircrafts: 54-57 dBA, Insects: 55-57 dBA



Attended Noise Measurement Results

Date	Start Time	Measured Noise Level (dBA)		
		LA90	LAeq	LAmax
08/02/2024	8:25 pm	51	58	72

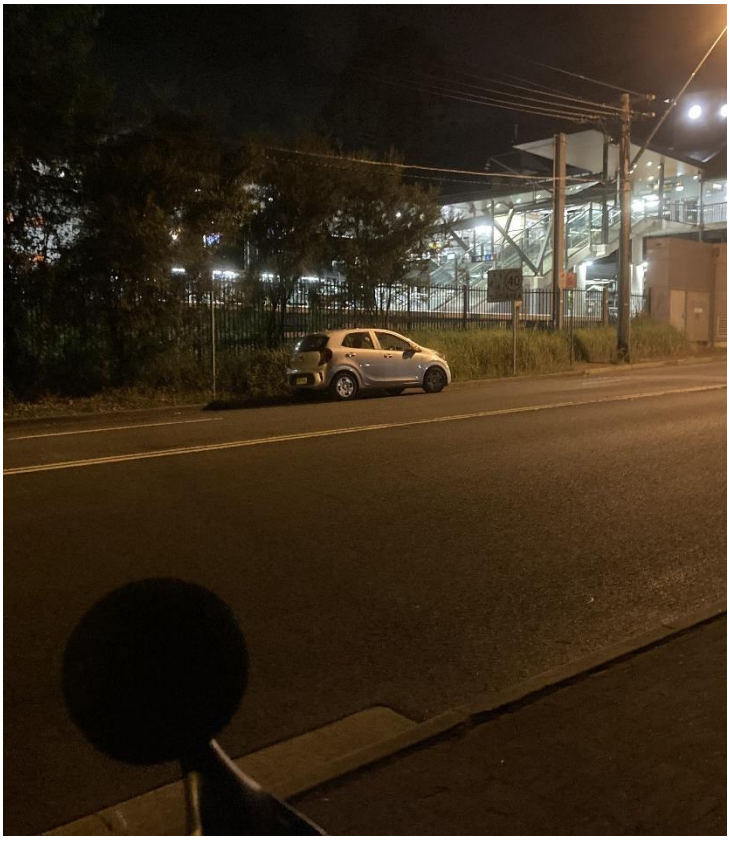
Noise Monitoring Location	N19	Photo of Noise Monitoring Location
Noise Monitoring Address	**Pennant Hills Station**	

Sound Level Meter Device Type: Brüel and Kjær 2270, Serial No: 3008204

Attended noise monitoring conducted at a location representative of residential receivers on Yarrara Road, Pennant Hills.

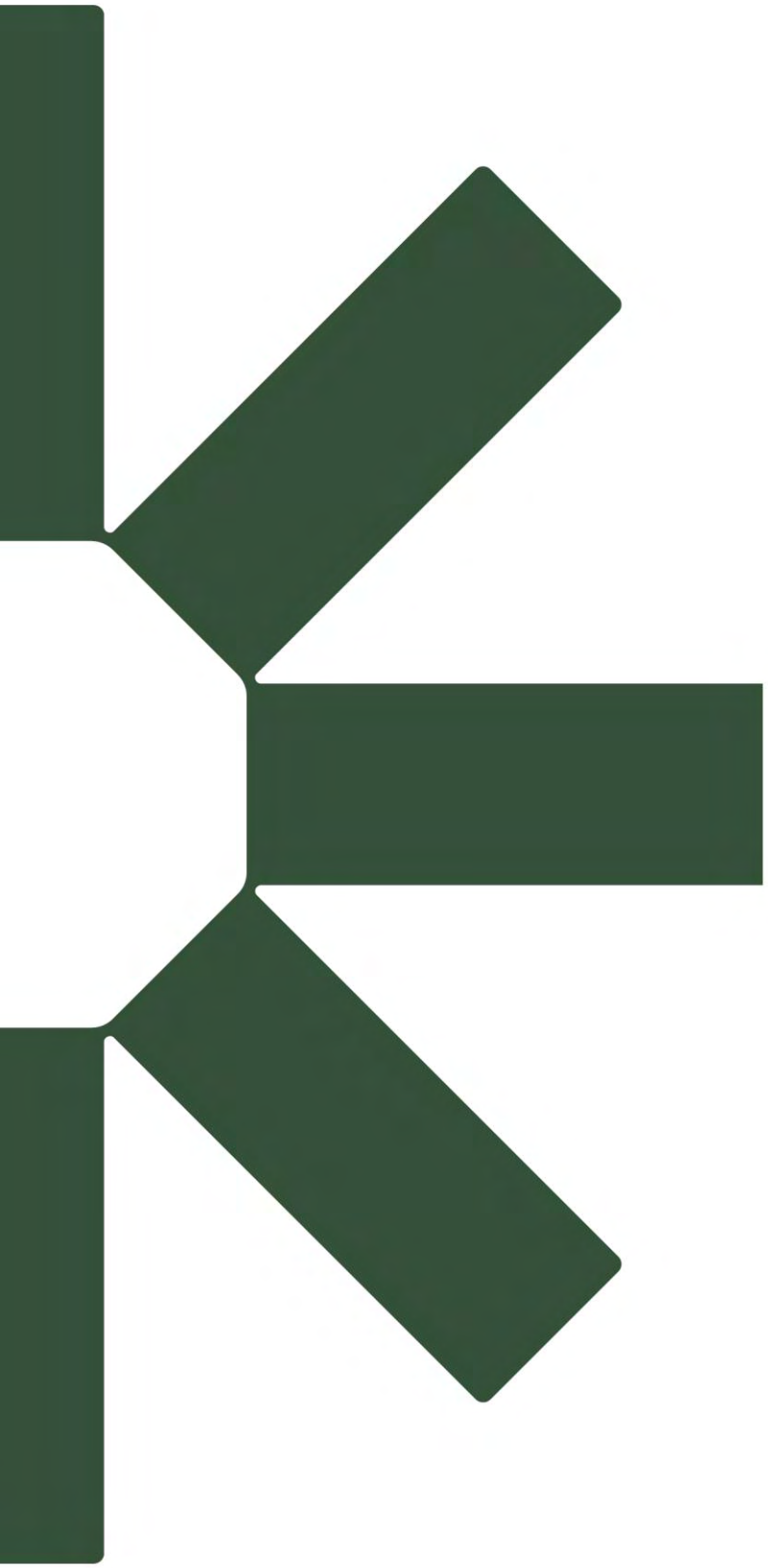
Pennant Hills Station Noise Levels (LAmax):
PA announcements: 50-55 dBA

Recorded Noise Levels (LAmax):
Light-vehicle traffic Yarrara Road: 63-70 dBA, Heavy-vehicle traffic Yarrara Road: 71-74 dBA, Trains: 56-60 dBA, Aircrafts: 57-65 dBA



Attended Noise Measurement Results

Date	Start Time	Measured Noise Level (dBA)		
		LA90	LAeq	LAmax
08/02/2024	9:09 pm	49	62	74



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