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KINGS PARK WASTE METAL RECOVERY PROCESSING AND RECYCLING FACILITY

Addendum Noise Impact Assessment

10 June 2021

Sell & Parker

TK653-04F02 Report (r4).docx

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1 Introduction

Renzo Tonin & Associates was engaged to conduct a Noise and Vibration Impact Assessment for the proposed expansion of the existing Kings Park Waste Metal Recovery, Processing and Recycling Facility located at 23-43 and 45 Tattersall Road, Kings Park. The purpose of this assessment is to provide an environmental noise and vibration impact assessment of the Proposal with consideration of neighbouring residential and industrial premises. This report is an addendum report that replaces the Environment Impact Statement (EIS) noise report and has been prepared to address comments received from agencies on the EIS.

The Secretary's Environmental Assessment Requirements (SEARs), Environment Protection Authority (EPA) Submission and Blacktown City Council Submission for the Project nominates the following specific noise issues to be addressed in this assessment.

Table 1.1 – Secretary's Environmental Assessment Requirements (SEARs)

Secretary's Environmental Assessment Requirements (SEARs) – Noise and Vibration	Section of Report Addressing SEARs
• a quantitative assessment of potential construction, operational and transport noise and vibration impacts in accordance with relevant Environment Protection Authority guidelines, including any potential cumulative impacts, and be undertaken by a suitably qualified and experienced person(s); and;	Sections 7, 8 and 9
• details and justification of the proposed noise mitigation and monitoring measures.	Section 7, 8 and 9

Table 1.2 – Environment Protection Authority's (EPA) Submission

Environment Protection Authority (EPA) Submission	Section of Report Addressing Submission Content
• Identify all noise sources or potential sources from the development (including both construction and operation phases). Detail all potentially noisy activities including ancillary activities such as transport of goods and raw materials.	Section 7 and 8
• Specify the times of operation for all phases of the development and for all noise producing activities.	Section 2.1
• For projects with a significant potential traffic noise impact provide details of road alignment (include gradients, road surface, topography, bridges, culverts etc), and land use along the proposed road and measurement locations – diagrams should be to a scale sufficient to delineate individual residential blocks.	Section 8
• Identify any noise sensitive locations likely to be affected by activities at the site, such as residential properties, schools, churches, and hospitals. Typically the location of any noise sensitive locations in relation to the site should be included on a map of the locality.	Section 3
• Identify the land use zoning of the site and the immediate vicinity and the potentially affected areas.	Section 2 and 3
• Determine the existing background (L_{A90}) and ambient (L_{Aeq}) noise levels, as relevant, in accordance with the NSW Noise Policy for Industry.	Section 4
• Determine the existing road traffic noise levels in accordance with the NSW Road Noise Policy, where road traffic noise impacts may occur.	Section 8

Environment Protection Authority (EPA) Submission	Section of Report Addressing Submission Content
• The noise impact assessment report should provide details of all monitoring of existing ambient noise levels including: a. details of equipment used for the measurements b. a brief description of where the equipment was positioned c. a statement justifying the choice of monitoring site(s), including the procedure used to choose the site(s), having regards to Fact Sheets A and B of the NSW Noise Policy for Industry. d. details of the exact location of the monitoring site and a description of land uses in surrounding areas e. a description of the dominant and background noise sources at the site f. day, evening and night assessment background levels for each day of the monitoring period g. the final Rating Background Level (RBL) value h. graphs of the measured noise levels for each day should be provided i. a record of periods of affected data (due to adverse weather and extraneous noise), methods used to exclude invalid data and a statement indicating the need for any re-monitoring.	Section 4
• Determine the project noise trigger levels for the site. For each identified potentially affected receiver, this should include: a. determination of the project intrusive noise level for each identified potentially affected receiver b. selection and justification of the appropriate amenity category for each identified potentially affected receiver c. determination of the project amenity noise level for each receiver d. determination of the appropriate maximum noise level event assessment (sleep disturbance) trigger	Section 6
• Maximum noise levels during night-time period (10pm-7am) should be assessed to analyse possible affects on sleep. Determine expected noise level and noise character likely to be generated from noise sources during: e. site establishment f. construction g. operational phases h. transport including traffic noise generated by the proposal i. other services.	Section 7.2.1
• Determine the noise levels likely to be received at the reasonably most affected location(s) (these may vary for different activities at each phase of the development).	Section 7

Environment Protection Authority (EPA) Submission	Section of Report Addressing Submission Content
• The noise impact assessment report should include: a. a plan showing the assumed location of each noise source for each prediction scenario b. a list of the number and type of noise sources used in each prediction scenario to simulate all potential significant operating conditions on the site c. any assumptions made in the predictions in terms of source heights, directivity effects, shielding from topography, buildings or barriers, etc d. methods used to predict noise impacts including identification of any noise models used e. the weather conditions considered for the noise predictions f. the predicted noise impacts from each noise source as well as the combined noise level for each prediction scenario g. for developments where a significant level of noise impact is likely to occur, noise contours for the key prediction scenarios should be derived h. an assessment of the need to include modification factors as detailed in Fact Sheet C of the NSW Noise Policy for Industry.	Section 2, 5 and 7
• Discuss the findings from the predictive modelling and, where relevant noise criteria have not been met, recommend additional feasible and reasonable mitigation measures.	Section 7
• The noise impact assessment report should include details of any mitigation proposed including the attenuation that will be achieved and the revised noise impact predictions following mitigation. a. Where relevant noise/vibration levels cannot be met after application of all feasible and reasonable mitigation measures the residual level of noise impact needs to be quantified	Section 7
• For the assessment of existing and future traffic noise, details of data for the road should be included such as assumed traffic volume; percentage heavy vehicles by time of day; and details of the calculation process. These details should be consistent with any traffic study carried out in the EIS.	Section 8
• Determine the most appropriate noise mitigation measures and expected noise reduction including both noise controls and management of impacts for both construction and operational noise. This will include selecting quiet equipment and construction methods, noise barriers or acoustic screens, location of stockpiles, temporary offices, compounds and vehicle routes, scheduling of activities, etc.	Section 7

Environment Protection Authority (EPA) Submission	Section of Report Addressing Submission Content
• For traffic noise impacts, provide a description of the ameliorative measures considered (if required), reasons for inclusion or exclusion, and procedures for calculation of noise levels including ameliorative measures. Also include, where necessary, a discussion of any potential problems associated with the proposed ameliorative measures, such as overshadowing effects from barriers. Appropriate ameliorative measures may include: a. use of alternative transportation modes, alternative routes, or other methods of avoiding the new road usage b. control of traffic (eg: limiting times of access or speed limitations) c. resurfacing of the road using a quiet surface d. use of (additional) noise barriers or bunds e. treatment of the façade to reduce internal noise levels buildings where the night-time criteria is a major concern f. more stringent limits for noise emission from vehicles (i.e. using specially designed 'quite' trucks and/or trucks to use air bag suspension g. driver education h. appropriate truck routes i. limit usage of exhaust brakes j. use of premium muffles on trucks k. reducing speed limits for trucks l. ongoing community liaison and monitoring of complaints m. phasing in the increased road use.	Section 8

Table 1.3 – Blacktown City Council Submission

Blacktown City Council Submission	Section of Report Addressing Submission Content
• Determine the existing background ambient noise levels in accordance with the *NSW Industrial Noise Policy, 2000.*	Section 4
• Determine the existing road traffic noise levels in accordance with the *NSW Road Noise Policy.*	Section 8
• Conduct a noise assessment by a suitably qualified consultant in accordance with *NSW Industrial Noise Policy, 2000* that:	This Document
- Identifies all existing and proposed noise sources, including animal noises.	Section 7 and 8
- Identifies any noise sensitive locations which may be affected by activities.	Section 3
- Quantifies the cumulative noise impacts upon the surrounding receivers.	Section 7.3
- Assesses all construction noise associated with the proposal using the *Interim Construction Noise Guideline* (DECC, 2009)	Not applicable
- Specifies the proposed operating hours and includes an assessment of the maximum noise levels during the night-time period (10pm-7am) when additional activities are planned.	Section 2.1 and 7.2.1
- Assesses any increased road traffic generated at the premises.	Section 8
- Assesses the noise impact associated with use of access roads, internal roads and potential environmental impacts from increased vehicle movements and increased operational activities as a result of the proposal.	Section 8
• Outline the noise management and mitigation measures including appropriate controls for operational noise.	Section 7 and 8

Blacktown City Council Submission	Section of Report Addressing Submission Content
• The accumulative impact of this proposal along with adjacent development, particularly that to the west of the site.	Section 7.3

The work documented in this report was carried out in accordance with the Renzo Tonin & Associates Quality Assurance System, which is based on Australian Standard / NZS ISO 9001. Appendix A contains a glossary of acoustic terms used in this report.

2 Project description

Sell & Parker currently operates the Kings Park Waste Metal Recovery, Processing and Recycling Facility located at 23-43 and 45 Tattersall Road, Kings Park. The Proposal is to increase the approved throughput limit from 350,000 to 600,000 tonnes per annum.

The existing infrastructure at the Proposal site has the capacity to accommodate the increased throughput and would not require any physical works or change to the nature of operations. However, some adjustments to site processes such as internal traffic flows, stacking locations and scheduling would be required.

A plan for the Proposal site is presented in Figure 1 below.

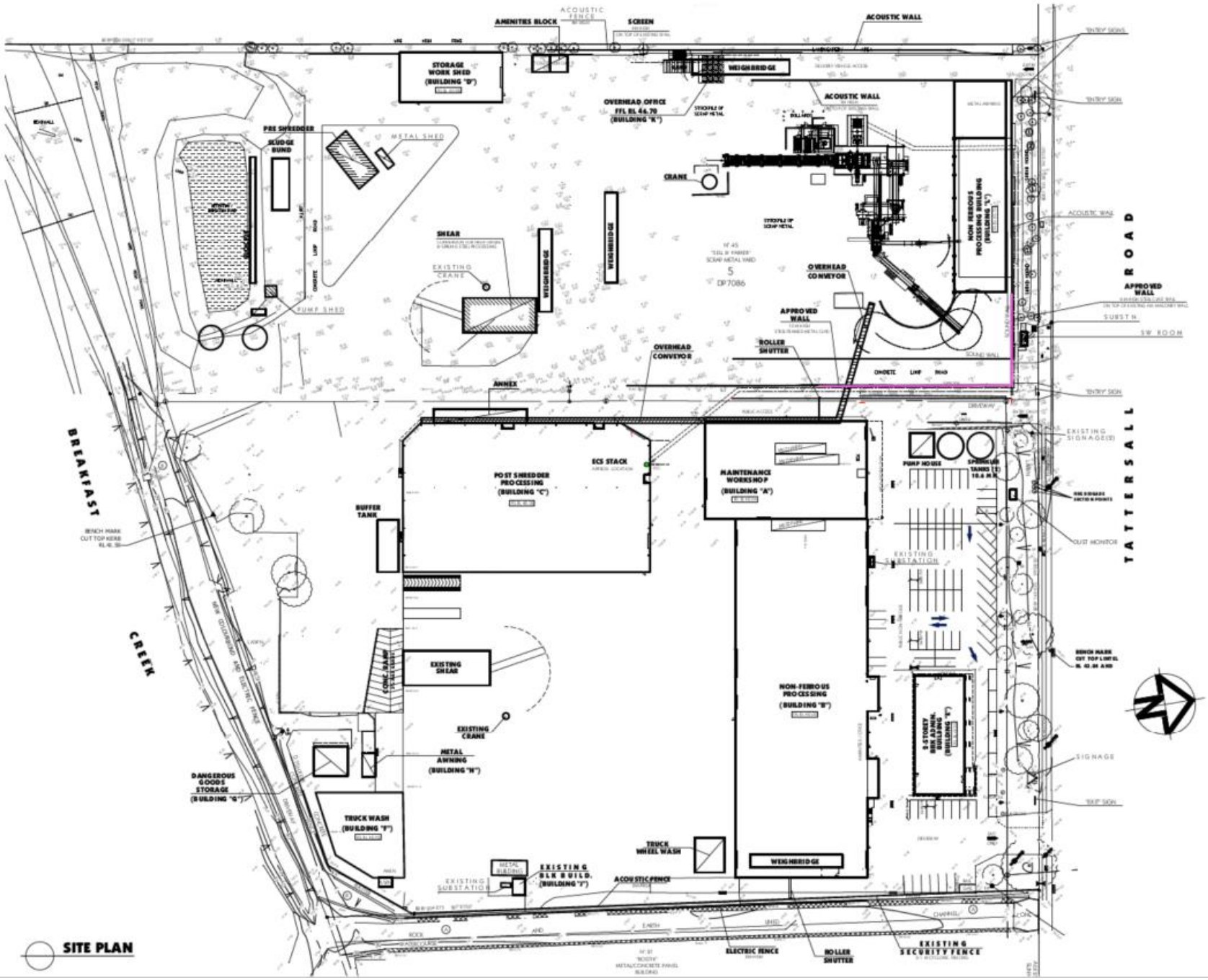
2.1 Hours of operation

The proposal would not impact or change the current approved hours of operation. The current approved hours of operation will be maintained as follows.

Table 2.1 – Currently approved hours of operation

Activity		Day	Hours
Operation	Oxy-acetylene torch cutting	Monday – Saturday	9am to 3pm
		Sunday & Public Holidays	Nil
	Maintenance and cleaning	Monday – Saturday	9am to 6pm
		Sunday	24 hours
	All other activities	Monday – Saturday	6am to 9pm
		Sunday & Public Holidays	Nil

Figure 1 – Proposal plan



3 Noise sensitive receivers and industrial receivers

As the existing acoustic environment surrounding the subject site varies, noise sensitive receivers have been grouped into Noise Catchment Areas (NCAs) based on areas with similar acoustic environments. NCAs have been included to address agency comments. The following noise catchment areas were nominated to provide an assessment of areas potentially affected by noise from the site.

Table 3.1 – Noise Catchment Areas

NCA	Description
NCA 1A	Noise catchment area directly east of the Kings Park Industrial Estate and on the eastern side of Sunnyholt Road. These receivers are not located behind the road noise barrier along Sunnyholt Road and have line of sight to Sunnyholt Road
NCA 1B	Noise catchment area directly east of the Kings Park Industrial Estate and on the eastern side of Sunnyholt Road. These receivers are located behind the road noise barrier along Sunnyholt Road and are shielded from traffic noise from Sunnyholt Road and general industrial noise from the Kings Park Industrial Estate.
NCA 2	Noise catchment area directly north of the Kings Park Industrial Estate and between Garling Road and Sunnyholt Road.
NCA 3	Noise catchment area directly west of the Kings Park Industrial Estate and includes receivers on Railway Road, Attard Avenue and Chedley Place.

The following residential receivers are potentially worst affected by noise from the site within each NCA.

- **Receiver R1A – 189 Sunnyholt Road, Blacktown**
  Residential receiver located approx. 315m east of the facility and considered representative of the nearest affected receivers within NCA1A.

- **Receiver R1B – 2 Anthony Street, Blacktown**
  Residential receiver located approx. 320m east of the facility and considered representative of the nearest affected receivers within NCA1B.

- **Receiver R2 – 249 Madagascar Drive, Kings Park**
  Residential receiver located approx. 650m north of the facility and considered representative of the nearest affected receivers within NCA2. It is noted that this replaces 17 Camorta Close, Kings Park, nominated in the EIS, as the worst affected receiver location to the north.

- **Receiver R3 – 3 Railway Road, Marayong**
  Residential receiver located approx. 830m west of the facility and considered representative of the nearest affected receivers within NCA3.

The following adjacent industrial receivers are potentially worst affected by noise from the site.

- **Receiver R4 – 38 Tattersalls Road, Kings Park**
  Industrial receiver to the north of the facility across Tattersalls Road.

- **Receiver R5 – 57-69 Tattersall Road, Kings Park**
  Industrial receiver to the west of the facility sharing a common site boundary.

- **Receiver R6 – 21 Tattersalls Road, Kings Park**
  Industrial receiver to the east of the facility sharing a common site boundary.

- **Receiver R7 – 38 Forge Street, Blacktown**
  Industrial receiver to the south of the facility across Breakfast Creek.

These locations are depicted in Figure 2 below.

Figure 2 – Site, noise monitoring and receiver locations

4 Existing acoustic environment

As the noise environment of an area almost always varies over time, background and ambient noise levels need to be determined for the operational times of the proposed development. For example, in a suburban or urban area the noise environment is typically at its minimum at 3am in the morning and at its maximum during the morning and afternoon traffic peak hours. The NSW 'Noise Policy for Industry' (NPfI) outlines the following standard time periods over which the background and ambient noise levels are to be determined:

- **Day:** 7am to 6pm Monday to Saturday and 8am to 6pm Sundays & Public Holidays
- **Evening:** 6pm to 10pm Monday to Sunday & Public Holidays
- **Night:** 10pm to 7am Monday to Saturday and 10pm to 8am Sundays & Public Holidays

The NPfI also outlines methods for assessing 'shoulder periods' being shorter periods on either side of a standard period, where the standard period noise levels are not representative. For example, a 'shoulder period' may be warranted for 5am to 7am or 10pm to 12am midnight where the night time period background noise level is not representative.

Given that the approved hours for the facility, as presented in Table 2.1, allows for activities (other than oxy-acetylene torch cutting and maintenance and cleaning) to begin at 6am from Monday to Saturday, a shoulder period would be applicable. Therefore, the shoulder period would be as follows:

- **Shoulder:** 6am to 7am Monday to Saturday

4.1 Noise monitoring locations

Noise monitoring is ideally carried out at the nearest or most potentially affected locations surrounding a development. An alternative, representative location should be established in the case of access restrictions or a safe and secure location cannot be identified. Furthermore, representative locations may be established in the case of multiple receivers as it is usually impractical to carry out measurements at all locations surrounding a site.

The long-term noise monitoring locations are outlined in Table 4.1 and shown in Figure 2.

Table 4.1 – Noise monitoring locations

ID	Address	Description
L1	187 Sunnyholt Road, Blacktown	The monitor was located in the front yard with line of sight to Sunnyholt Road. The noise monitoring location is considered representative of receiver locations within NCA1A

ID	Address	Description
L2	2 Anthony Street, Blacktown	The monitor was located in the side yard with no line of sight to Sunnyholt Road due to the concrete noise barrier located along the western boundary of the property. The monitor was located behind the noise barrier and was shielded from traffic noise along Sunnyholt Road and general noise from the Kings Park Industrial Estate. The noise monitoring location is considered representative of receiver locations within NCA1B
L3	19 Camorta Close, Kings Park	The monitor was located in the rear yard. The noise monitoring location is considered representative of receiver locations within NCA2
L4	1 Chedley Place, Marayong	The monitor was located in the rear yard. The noise monitoring location is considered representative of receiver locations within NCA3

The EIS noise report referred to noise monitoring undertaken in 2014 and 2015. Updated noise monitoring has been undertaken in response to agency comments. Long-term noise monitoring was carried out from Thursday 11th to Wednesday 24th February 2021. The noise level-vs-time graphs of the data are included in Appendix C.

Table 4.2 presents the overall single L_{A90} Rating Background Levels (RBL) and representative ambient L_{eq} noise levels for each assessment period, determined in accordance with the NPfI.

Table 4.2 – Long-term noise monitoring results, dB(A)

Monitoring location	L_{A90} Rating Background Level (RBL)				L_{Aeq} Ambient noise levels[1]			
	Shoulder[2]	Day[3]	Evening[4]	Night[5]	Shoulder[2]	Day[3]	Evening[4]	Night[5]
L1 - 187 Sunnyholt Road, Blacktown	56	54	52	42	62	64	62	59
L2 - 2 Anthony Street, Blacktown	46	45	44	42	52	60	56	52
L3 - 19 Camorta Close, Kings Park	42	43	41	37	55	57	51	47
L4 - 1 Chedley Place, Marayong	38	40	37	33	52	54	53	49

Notes:
1. As required by the NPfI, the external ambient noise levels presented are free-field noise levels. [i.e. no facade reflection]
2. Shoulder: 6am to 7am Monday to Saturday
3. Day: 7am to 6pm Monday to Saturday and 8am to 6pm Sundays & Public Holidays
4. Evening: 6pm to 10pm Monday to Sunday & Public Holidays
5. Night: 10pm to 7am Monday to Saturday and 10pm to 8am Sundays & Public Holidays

5 Meteorology

The NPfI recommends that project noise criteria are to apply under weather conditions characteristic of an area. These conditions may include calm, wind and temperature inversions. In this regard, the increase in noise that results from atmospheric temperature inversions and wind effects may need to be assessed. The noise levels predicted under characteristic meteorological conditions for each receiver are then compared with the criteria, to establish whether the meteorological effect will cause a significant impact.

The NPfI permits two approaches for assessing these effects – use of default parameters and use of site-specific parameters.

1. With using default parameters, general meteorological values are used to predict noise levels, foregoing detailed analyses of site-specific meteorological data. This approach assumes that meteorological effects are conservative, in that it is likely to predict the upper range of increases in noise levels. Actual noise levels may be less than predicted.

2. The use of site-specific parameters is a more detailed approach, which involves analysing site meteorological data to determine whether inversion and/or wind effects are significant features warranting assessment. Where assessment is warranted, default parameters are available for use in predicting noise or, where preferred, measured values may be used instead. The use of site-specific parameters provides a more accurate prediction of noise increases due to meteorological factors; however, is more costly especially if suitable site data is unavailable and long-term meteorological monitoring is required. Existing weather data may be used, provided the site is within a radius of 30 km of the collection point and in the same topographical basin.

For this assessment, the more detailed approach using site-specific meteorological parameters was conducted. Weather data was obtained from the Bureau of Meteorology's automatic weather station installed at the Horsley Park Equestrian Centre (station no. 067119), located approximately 12 km south of the Proposal site, over the period between 3rd January 2020 and 2nd January 2021. As the Proposal site is situated within an industrial complex with surrounding urban locality, the likelihood of night time temperature inversion occurrences is insignificant. Therefore, the consideration of night time temperature inversion is not required and only wind effects are considered from herein.

5.1 Temperature Inversions

Assessment of impacts from temperature inversions is confined to the winter night-time period, as this is the time likely to have temperature inversions and produce the greatest impact on amenity of nearby residences. As the Project operates at night-time, the potential for noise impact due to inversions have been considered.

5.2 Wind effects

The NPfI specifies a procedure for assessing the significance of wind effects, and a default wind speed to be used in the assessment where these effects are found to be significant. The procedure requires that wind effects be assessed where wind is a feature of the area.

Wind is considered to be a feature where source-to-receiver wind speeds (at 10 m height) of 0.5 m/s to 3 m/s occur for 30% of the time or more in any assessment period (day, evening and night) in any season. Winds with speeds of less than 0.5 m/s (calm conditions) and greater than 3 m/s (at 10 m height), are not included in the calculations of wind occurrence.

Where there is 30% or more occurrence of wind speeds between 0.5 m/s and 3 m/s (source-to-receiver component), then the highest wind speed is used (below 3 m/s) instead of the default. Where there is less than a 30% occurrence of wind between 0.5 m/s and 3 m/s (source-to-receiver component), wind is not considered to be a feature of the area and is not included in the noise-prediction calculations.

Analysis of the wind data from the Horsley Park Equestrian Centre automatic weather station was undertaken using the EPA's 'Noise Enhancement Wind Analysis' (NEWA) program to determine if wind is a 'feature' of the area as defined by the NPfI. The program determines whether there are prevailing source-to-receiver wind conditions. The results of the analysis are presented in Table 5.1 below:

Table 5.1 – Percentage of wind records (up to 3 m/s) from Proposal site to receiver, %

Direction	Summer			Autumn			Winter			Spring		
	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night
N	14.4	5.9	5	19.5	10.6	8.8	16.1	5.8	8.1	17.4	11.5	8.3
NNE	17.9	9.9	3.5	19	9.6	6.5	12.6	3.4	4.4	18.5	14.4	6.1
NE	18.1	19.1	3.3	14.8	9	2.7	6.9	2.2	0.3	16.1	14.4	3.1
ENE	15.2	19.9	4.2	11.7	7.3	1.6	5.2	3.8	0.2	12.6	13	3
E	15.9	27.7	6.9	12.6	9.9	1.4	7.5	4.9	0.3	13.4	15.2	3.9
ESE	15.8	**31.7**	10.8	13.1	12.2	1.9	8.6	8	0.7	12.5	17.9	5.6
SE	18	28	17	13.5	13.6	4.4	9.5	9.1	1.2	12.9	16.9	8.2
SSE	13.6	20.2	28.8	15	23.6	20.2	13.2	20.2	13	8.8	19.9	21.7
S	1.2	3.4	5.3	1.5	2.9	2.4	0.9	3.1	2.2	1.3	3.7	2
SSW	9.8	16.6	**30.1**	15.7	25.7	**31.3**	17	25.8	27.6	8	15.5	26.1
SW	6.6	11.3	20.3	13	23.5	29.5	21.6	28.5	**31.4**	8.5	11	22.5
WSW	6.1	9.5	15	13.7	20.4	**30.1**	23.3	**31.1**	**36.4**	9.7	10.4	20.3
W	5.7	7.6	8.8	13.6	15.9	22.1	23.6	26	**31.8**	10	10.9	15
WNW	6.1	4.8	6.1	12	12.5	11.1	21.2	17.1	18.1	11.7	9.1	10.5
NW	8.4	4.1	7	14.6	10.9	10	20.6	15.9	16.5	14.5	11.8	10.3
NNW	13.1	4.7	5.9	19.8	12.1	9.8	19.2	10.5	11.6	17.8	11.7	10.3

Notes: 1. **Bold** denotes greater than 30% occurrence of wind between 0.5 m/s and 3 m/s (source-to-receiver component)

The results above indicate that there are greater than 30% occurrence of winds between 0.5 m/s and 3 m/s (source-to-receiver component) for certain wind direction scenarios. Therefore, there are prevailing wind conditions in accordance with the NPfI, and wind effects are considered in this assessment.

5.3 Summary of meteorological assessment conditions

Based on the findings in Section 5.1, Table 5.2 below presents a summary of the meteorological conditions considered for the operational noise computer modelling for each assessment period.

Table 5.2 – Summary of Meteorological Assessment Conditions

Period	Meteorological Assessment Condition
Shoulder	Calm
	SSW wind
	SW wind
	WSW wind
	W wind
Day	Calm
Evening	Calm
	ESE wind
	WSW wind
Night	Calm
	SSW wind
	SW wind
	WSW wind
	W wind
	F-Class Temperature Inversion
	F-Class Temperature Inversion with SSW wind
	F-Class Temperature Inversion with SW wind
	F-Class Temperature Inversion with WSW wind
	F-Class Temperature Inversion with W wind

6 Criteria

Noise impact is assessed in accordance with the NPfI. The assessment procedure has two components:

- Controlling intrusive noise impacts in the short-term for residences; and
- Maintaining noise level amenity for residences and other land uses.

In accordance with the NPfI, noise impact should be assessed against the project noise trigger level which is the lower value of the project intrusiveness noise levels and project amenity noise levels.

6.1 Project intrusive noise levels

According to the NPfI, the intrusiveness of a noise source may generally be considered acceptable if the equivalent continuous (energy-average) A-weighted level of noise from the source (represented by the $L_{Aeq,15min}$ descriptor) does not exceed the background noise level measured in the absence of the source by more than 5dB(A). The project intrusiveness noise level, which is only applicable to residential receivers, is determined as follows:

- **$L_{Aeq,15min}$ Intrusiveness noise level = Rating Background Level ('RBL') plus 5dB(A)**

Based on the background noise monitoring results and the proposed operating hours of the facility, the intrusiveness noise levels for the residential receivers are reproduced in Table 6.1 below.

Table 6.1 – Intrusiveness noise levels

NCA / Receiver Location	Intrusiveness noise level, $L_{Aeq,15min}$			
	Shoulder	Day	Evening	Night
NCA1A / Receiver R1A	56 + 5 = **61**	54 + 5 = **59**	52 + 5 = **57**	42 + 5 = **47**
NCA1B / Receiver R1B	46 + 5 = **51**	45 + 5 = **50**	44 + 5 = **49**	42 + 5 = **47**
NCA2 / Receiver R2	42 + 5 = **47**	43 + 5 = **48**	41 + 5 = **46**	37 + 5 = **42**
NCA3 / Receiver R3	38 + 5 = **43**	40 + 5 = **45**	37 + 5 = **42**	33 + 5 = **38**

6.2 Amenity noise levels

The project amenity noise levels for different time periods of the day are determined in accordance with Section 2.4 of the NPfI. The NPfI recommends amenity noise levels ($L_{Aq,period}$) for various receivers including residential, commercial, industrial receivers and sensitive receivers such as schools, hotels, hospitals, churches and parks. These "recommended amenity noise levels" represent the objective for total industrial noise experienced at a receiver location. However, when assessing a single industrial development and its impact on an area, "project amenity noise levels" apply.

The recommended amenity noise levels applicable for the subject area are reproduced in Table 6.2 below.

Table 6.2 – Recommended amenity noise levels, dB(A)

Type of Receiver	Noise Amenity Area	Time of Day	Recommended amenity noise level, $L_{Aeq,}$
Residential	Urban	Day	60
		Evening	55
		Night	45
Industrial premises	All	When in use	70

Notes:
1. Daytime 7am to 6pm; Evening 6pm to 10pm; Night-time 10pm to 7am
2. On Sundays and Public Holidays, Daytime 8am to 6pm; Evening 6pm to 10pm; Night-time 10pm to 8am.
3. The L_{Aeq} index corresponds to the level of noise equivalent to the energy average of noise levels occurring over a measurement period.
4. The recommended amenity noise levels refer only to noise from industrial sources. However, they refer to noise from all such sources at the receiver location, and not only noise due to a specific project under consideration.

To ensure that the total industrial noise level (existing plus new) remain within the recommended amenity noise levels for an area, the project amenity noise level that applies for each new industrial noise source is determined as follows:

$$\mathbf{L_{Aeq,period}\ Project\ amenity\ noise\ level = L_{Aeq,period}\ Recommended\ amenity\ noise\ level - 5dB(A)}$$

Furthermore, given that the intrusiveness noise level is based on a 15 minute assessment period and the project amenity noise level is based on day, evening and night assessment periods, the NPfI provides the following guidance on adjusting the $L_{Aeq,period}$ level to a representative $L_{Aeq,15minute}$ level in order to standardise the time periods.

$$\mathbf{L_{Aeq,15minute} = L_{Aeq,period} + 3dB(A)}$$

The project amenity noise levels ($L_{Aeq,\ 15min}$) applied for this project are reproduced in Table 6.3 below, based on a 'urban' noise amenity area.

Table 6.3 – Project amenity noise levels

Type of Receiver	Noise Amenity Area	Time of Day	Recommended Noise Level, dB(A)	
			$L_{Aeq,\ Period}$	$L_{Aeq,\ 15min}$
Residence	Urban	Day	60 – 5 = 55	55 + 3 = **58**
		Evening	50 – 5 = 45	45 + 3 = **48**
		Night	45 – 5 = 40	40 + 3 = **43**
Industrial Premises	All	When in use	70 – 5 = 65	65 + 3 = **68**

Notes:
1. Daytime 7am to 6pm; Evening 6pm to 10pm; Night-time 10pm to 7am
2. On Sundays and Public Holidays, Daytime 8am to 6pm; Evening 6pm to 10pm; Night-time 10pm to 8am.
3. The L_{Aeq} index corresponds to the level of noise equivalent to the energy average of noise levels occurring over a measurement period.

6.3 Project noise trigger levels

In accordance with the NPfI the project noise trigger levels (PNTL), which are the lower (ie. more stringent) value of the project intrusiveness noise level and project amenity noise level, have been determined as shown in Table 6.4 below.

Table 6.4 – Project noise trigger levels

Receiver Location	$L_{Aeq,\ 15min}$ Project noise trigger levels, dB(A)			
	Shoulder[1]	Day	Evening	Night
NCA1A / Receiver R1A	58	58	48	43
NCA1B / Receiver R1B	51	50	48	43
NCA2 / Receiver R2	47	48	46	42
NCA3 / Receiver R3	43	45	42	38
Receiver R4 – 38 Tattersalls Road[2]	68	68	68	68
Receiver R5 – 57-69 Tattersalls Road[2]	68	68	68	68
Receiver R6 – 21 Tattersalls Road[2]	68	68	68	68
Receiver R7 – 38 Forge Street[2]	68	68	68	68

Notes: 1. Where the daytime project amenity noise level is more stringent than the shoulder project intrusive noise level, the daytime project amenity noise level has been adopted for the shoulder period as the Proposal site is located within an industrial estate where the majority of neighbouring facilities are operational during the shoulder period, and the ambient noise environment for residential receivers during the shoulder period is similar to the day time period

2. Receivers R4, R5, R6 and R7 are industrial receivers and only the amenity project amenity noise levels are applicable to these receivers when in use.

6.4 Cumulative noise Levels

For cumulative noise levels, the NPfI project recommended amenity noise levels are applicable as it is intended to control the total noise level at a receiver location from all industrial developments. Cumulative noise levels are therefore assessed against the recommended amenity project noise levels nominated in Table 6.2.

6.5 Sleep disturbance noise levels

The potential for sleep disturbance from maximum noise level events from the premises during the night-time period needs to be considered. In accordance with NPfI, a detailed maximum noise level event assessment should be undertaken where the subject development night-time noise levels at a residential location exceed:

- $L_{Aeq,15min}$ 40dB(A) or the prevailing RBL plus 5dB, whichever is the greater, and/or
- L_{AFmax} 52dB(A) or the prevailing RBL plus 15dB, whichever is the greater.

Where there are noise events found to exceed the initial screening level, further analysis is undertaken to identify:

- The likely number of events that might occur during the night assessment period,
- The extent to which the maximum noise level exceeds the rating background noise level.

The sleep disturbance noise levels for the project are presented in Table 6.5.

Table 6.5 – Sleep disturbance assessment levels, dB(A)

Receiver Location	Shoulder period 6am – 7am		Night period 10pm – 6am	
	Assessment Level $L_{Aeq,15min}$	Assessment Level L_{AFmax}	Assessment Level $L_{Aeq,15min}$	Assessment Level L_{AFmax}
NCA1A / Receiver R1A	56 + 5 = **61**	56 + 15 = **71**	42 + 5 = **47**	42 + 15 = **57**
NCA1B / Receiver R1B	46 + 5 = **51**	46 + 15 = **61**	42 + 5 = **47**	42 + 15 = **57**
NCA2 / Receiver R2	42 + 5 = **47**	42 + 15 = **57**	37 + 5 = **42**	37 + 15 = **52**
NCA3 / Receiver R3	38 + 5 = **43**	38 + 15 = **53**	**40**[1] (33 + 5 = 38)	**52**[2] (33 + 15 = 48)

Note: 1. As the prevailing RBL plus 5dB is less than the minimum of $L_{Aeq,15min}$ 40dB(A), 40dB(A) has been adopted as the $L_{Aeq,15min}$ assessment level

2. As the prevailing RBL plus 15dB is less than the minimum of L_{Amax} 52dB(A), 52dB(A) has been adopted as the L_{Amax} assessment level

It is noted that the $L_{Aeq,15min}$ assessment level for sleep disturbance in Table 6.5 are the same or higher than the corresponding shoulder or night time project noise trigger levels in Table 6.4. Therefore, compliance with the night time project noise trigger levels will deem compliance with the $L_{Aeq,15min}$ sleep disturbance assessment levels. Therefore, the sleep disturbance assessment will only consider the L_{AFmax} assessment levels from herein.

7 Predicted noise levels

7.1 Noise sources

7.1.1 Operational noise

A summary of mobile and fixed equipment included in the noise modelling for the Proposal, and relevant sound power levels, is provided in Table 7.1 and Table 7.2. Sound power levels for this assessment were determined based on site measurements and data from similar projects. In order to address agency comments, additional attended on site noise measurements were undertaken on Monday, 8th March 2021 to capture noise from existing plant and equipment on site and to undertake verification of the noise model with these noise sources. Additional attended on site noise measurements included measurements of individual plant items as well as measurement of activities / processes such as hammer milling and metal shearing, where a number of plant items were operating within an area concurrently and completing typical routine / cycle.

Table 7.1 – $L_{Aeq,\ 15min}$ Sound power level of proposed plant, dB(A) re. 1pW,

Plant[1]	$L_{Aeq,\ 15min}$ Sound Power Level (per item)	Number of items (included in noise model)
General operations (6am – 9pm)		
Hammer mill[2]	117	1
Metal shear[3]	112	2
Seram / pedestal crane	110	2
Excavator	107	2
Front End Loader	107	2
Pre shredder[3]	107	1
Material handler	105	3
Truck movement (travelling in and out of site)	105	7
Oxy-acetylene torch	102	1
Maintenance and cleaning (24 hours)		
Forklift	90	3
Hand tools	105	1
Pressure hose	97	1
Crane	107	3

Notes:
1. Only the noisiest and most dominant noise sources have been presented
2. Presented sound power level of the hammer mill includes noise generated by the shaker
3. Plant item was not operational during site visit on 8th March 2021 and presented sound power level is based on previous measurements

Table 7.2 – L_{Amax} Sound power level of proposed activities, dB(A) re. 1pW

Activities	L_{Amax} Sound Power Level (per activity)
General operations (6am – 9pm)	
Hammer milling – includes noise from hammer mill, front end loaders pushing materials, crane loading materials into hammer mill and trucks dumping materials into stockpiles	127
Metal shearing – includes noise from metal shear, crane loading materials into shear, excavator sorting materials and trucks dumping materials into stockpiles	129
Maintenance and cleaning (24 hours)	
Maintenance and cleaning – includes noise from forklift, hand tools, pressure hose and crane	117

Notes: 1. Only the noisiest and most dominant noise activities have been presented

Noise measurements undertaken at Kings Park Waste Metal Recovery, Processing and Recycling Facility site and other similar metal recycling facilities were analysed for tonal or low frequency characteristics as per the methodology prescribed in NPfI, and after accounting for acoustic shielding provided by intervening structures between the site and both residential and industrial receptors, is not considered to be tonal or have low frequency characteristics

An analysis of intermittent noise was also undertaken. It is noted that intermittent noise is to be applied for the night time period only and plant items used during the night time period are only for maintenance and cleaning activities. Noise from the usage of plant items used for maintenance and cleaning activities, including forklift, hand tools, pressure hose and crane, were found not to exhibit intermittent character. Therefore, the character of noise as perceived at the receiver location from night time activities is not considered to be intermittent.

Therefore, it is not necessary to apply modifying factors to correct for the character of the noise.

7.1.2 Carpark vehicle movement on site

Noise generated by car park activities which may contribute to the overall L_{Aeq} noise level emission from the site includes vehicle doors closing, vehicle engines starting and vehicles moving. To assess this noise, the L_{Aeq} noise levels were determined for the relevant time period based on the number of vehicle activities expected to occur during that period at the nearest affected receiver locations. Sound power level measurements from our database and library files were used for the purpose of this assessment.

The sound power levels of the car park activities are shown in Table 7.3 below.

Table 7.3 – Sound Power Levels of car park activities

Activity	Sound Power Level, dB(A) re. 1pW
Vehicle door closing	86
Vehicle engine starting	92
Vehicle moving (10km/h)	79 per metre

The facility is proposed to have a maximum staff capacity of 79 employees plus an additional 4 visitors. Assuming all employees and visitors drive to site and arrive / leave within a one hour period; for modelling purposes, the worst case scenario for the car park would include 83 vehicle doors closing, 83 vehicle engine starts and 83 vehicles manoeuvring in the carpark, within a one hour period.

It is noted that carpark activities do not include movements of trucks delivering and pick up material. Noise from these activities are assessed as part of the overall operational noise of the site and source noise levels are presented in Table 7.1 and Table 7.2.

7.2 Predicted noise levels

Noise emissions were predicted by modelling the noise sources, receiver locations, topographical features of the intervening area, and possible noise control treatments using CadnaA (version 2021 MR 1) noise modelling computer program utilising the ISO9613 standard. The program calculates the contribution of each noise source at each specified receptor point and allows for the prediction of the total noise from a site.

The noise prediction model takes into account:

- Location of noise sources and receiver locations
- Height of sources and receivers
- Separation distances between sources and receivers
- Ground type between sources and receivers (hard)
- Attenuation from barriers (natural and purpose built).

The following assumptions were made for noise prediction purposes:

<u>General operations (6am – 9pm)</u>

- All fixed and mobile plant operating concurrently
- Seven (7) trucks moving on site concurrently
- Acoustic screen fencing / walls erected around the existing site's northern, eastern and western boundaries and along existing driveways as shown on in Figure 1.

<u>Maintenance and cleaning (24 hours)</u>

- For crane operations, only one crane is located on Tattersalls Road at any one time with the remaining two cranes operating anywhere within the boundaries of the Proposal site
- All other mobile plant operating concurrently and operating anywhere within the boundaries of the Proposal site. This is a conservative assumption as it is unlikely that all mobile plant will be operating concurrently.

Predicted noise levels based on the above assumptions are summarised in Table 7.4 below.

Table 7.4 – Predicted operational noise levels at nearest potentially affected receivers, $L_{Aeq,15min}$

Receiver Location	Project Trigger Noise Levels, dB(A)				Predicted Noise Levels, dB(A)																	
					Shoulder					Day	Evening			Night								
	Shoulder	Day	Evening	Night	Calm	SSW Wind	SW Wind	WSW Wind	W Wind	Calm	Calm	ESE Wind	WSW Wind	Calm	SSW Wind	SW Wind	WSW Wind	W Wind	Temp. Inv.	Temp. Inv. with SSW Wind	Temp. Inv. with SW Wind	Temp. Inv. with WSW Wind	Temp. Inv. with W Wind
NCA1A / Receiver R1A – 189 Sunnyholt Road, Blacktown	*58*	*58*	*48*	*43*	46	44	48	48	48	46	46	48	48	39	39	42	42	42	43	43	43	43	43
NCA1B / Receiver R1B – 2 Anthony Street, Blacktown	*51*	*50*	*48*	*43*	43	45	45	45	45	43	43	45	45	37	39	39	39	39	41	41	41	41	41
NCA2 / Receiver R2 – 249 Madagascar Drive, Kings Park	*47*	*48*	*46*	*42*	37	42	42	42	41	37	37	40	42	32	36	36	36	35	37	37	37	37	37
NCA3 / Receiver R3 – 3 Railway Road, Marayong	*43*	*45*	*42*	*38*	36	33	36	36	36	36	36	40	36	30	27	28	28	28	35	31	31	31	31
Receiver R4 – 38 Tattersalls Road, Kings Park	*68*	*68*	*68*	*68*	60	61	61	60	60	60	60	60	60	64	66	65	65	65	66	66	66	66	66
Receiver R5 – 57-69 Tattersalls Road, Kings Park	*68*	*68*	*68*	*68*	54	55	55	54	54	54	54	55	54	48	49	48	48	48	49	49	49	49	49
Receiver R6 – 21 Tattersalls Road, Kings Park	*68*	*68*	*68*	*68*	54	54	54	54	54	54	54	54	54	49	49	50	50	50	51	50	50	50	51
Receiver R7 – 38 Forge Street, Blacktown	*68*	*68*	*68*	*68*	63	61	61	61	63	63	63	62	61	56	55	55	55	56	58	56	57	57	57

The predicted operational noise levels at the nearest potentially affected receivers were found to be within the nominated project trigger noise levels for all time periods and during adverse meteorological conditions.

Operational noise contours for the calm and the combined worst case wind enhancement for each time period are presented in Appendix B.

7.2.1 Sleep disturbance predicted levels

In addition to the above predicted noise levels, Table 7.5 below presents a summary of the predicted sleep disturbance noise levels at residential receivers during the night time and shoulder periods from 10pm to 7am.

Table 7.5 – Predicted L_{Amax} sleep disturbance noise levels at nearest potentially affected residential receivers, dB(A)

Receiver Location	Sleep disturbance assessment level (10pm to 7am)		Predicted Noise Levels, dB(A)													
			Night										Shoulder				
	Night	Shoulder	Calm	SSW Wind	SW Wind	WSW Wind	W Wind	Temp. Inv.	Temp. Inv. with SSW Wind	Temp. Inv. with SW Wind	Temp. Inv. with WSW Wind	Temp. Inv. with W Wind	Calm	SSW Wind	SW Wind	WSW Wind	W Wind
NCA1A / Receiver R1A – 189 Sunnyholt Road, Blacktown	*57*	*71*	44	44	46	47	47	47	47	47	48	48	57	55	58	58	58
NCA1B / Receiver R1B – 2 Anthony Street, Blacktown	*57*	*61*	37	41	43	43	43	45	45	45	45	45	52	55	54	54	54
NCA2 / Receiver R2 – 249 Madagascar Drive, Kings Park	*52*	*57*	37	36	41	41	39	41	42	42	42	41	50	55	55	55	55
NCA3 / Receiver R3 – 3 Railway Road, Marayong	*52*	*53*	30	34	32	32	32	39	35	35	35	35	45	43	46	46	46

The predicted sleep disturbance noise levels at the nearest potentially affected residential receivers were found to be within the nominated sleep disturbance assessment levels for all time periods and during adverse meteorological conditions

7.3 Cumulative noise levels

The assessment of cumulative noise impacts considers the total and relative noise from the Proposal site, the neighbouring resource recovery facility at 46-50 Tattersall Road, Kings Park and the metal recovery and recycling facility at 57-69 Tattersall Road, Kings Park. The contribution of noise from the two sites at 46-50 Tattersall Road and 57-69 Tattersall Road, Kings Park has been taken from the following assessments:

- "46-50 Tattersall Road Kings Park – Environmental Impact Statement", prepared by Claron Consulting (2019)
- "Proposed Metal Recovery and Recycling Facility 57-69 Tattersall Road, Kings Park, NSW – Environmental Noise & Vibration Assessment" prepared by Day Design (2019).

The assessment for 46-50 Tattersall Road, Kings Park states the following:

> *"The site is located within an existing Industrial Area. The proposal would not introduce new noise sources to the local area nor is it expected to reduce the acoustical amenity of the nearby area. It is expected the noise level contribution from the proposal would be considered insignificant when compared to the existing levels of industrial noises including those of traffic and transport noise from the surrounding roads and operations at the Tattersall Road industrial precinct."*

Since noise contributions from 46-50 Tattersall Road, Kings Park were found to be insignificant when compared to existing levels of industrial noise for the area it is expected that the noise emissions from this site would not add to the cumulative noise levels of the Proposal site and neighbouring sites. Therefore, cumulative noise contributions from 46-50 Tattersall Road, Kings Park are not considered further from herein.

The assessment of 57-69 Tattersall Road, Kings Park has identified Receivers R1A and R3 as noise affected receiver locations from the development. The cumulative noise impacts of 57-69 Tattersall Road, Kings Park and the Proposal site for Receivers R1A and R3 are shown in the table below.

It is noted that the assessment of cumulative noise impacts is undertaken in consideration of the average L_{Aeq} noise level over a period (day, evening and night). For a conservative assessment, the predicted $L_{Aeq(15\ min)}$ for each period has been used which corresponds to the worst case 15 minute noise emissions occurring continuously over the entire period. The assessment is, therefore, conservative as it is based on the worst case 15-minute noise emissions from all sites which is highly unlikely to occur over the entire period.

Table 7.6 – Cumulative noise levels from 57-69 Tattersall Road and the Proposal site, dB(A)

Receiver ID	Recommended amenity levels				Proposal site				57-69 Tattersall Road				Cumulative noise				Complies? (Yes/No)			
	Shoul-der	Day	Eve	Night	Shoul-der	Day	Eve	Night	Shoul-der	Day	Eve	Night	Shoul-der	Day	Eve	Night	Shoul-der	Day	Eve	Night
Receiver R1A – 189 Sunnyholt Road, Blacktown (residences to the east along Sunnyholt Road)	*60*	*60*	*55*	*45*	48	48	48	43	<50	<50	N/A	N/A	<52	<52	48	43	Yes	Yes	Yes	Yes
Receiver R3 – 3 Railway Road, Marayong (residences to the west along Railway Road)	*60*	*60*	*55*	*45*	36	36	36	35	<47	<47	N/A	N/A	<47	<47	36	35	Yes	Yes	Yes	Yes

From Table 7.6, it can be seen that the cumulative noise from 57-69 Tattersall Road, Kings Park and the Proposal site would comply with the recommended amenity noise levels from the NPfI.

7.4 Statement of noise impact

From the results it is shown that noise emission levels to the residential receivers (Receivers R1A, R1B, R2 and R3) comply with the project noise trigger levels and sleep disturbance assessment levels without any additional noise mitigation measures.

Furthermore, noise emission levels to the neighbouring industrial receivers (Receivers R4, R5, R6 and R7) also comply with the project noise trigger levels.

Therefore, noise emissions for all receivers comply with relevant project noise trigger levels without any additional noise mitigation measures.

8 Road traffic noise assessment

8.1 Road traffic noise criteria

The EPA's 'Road Noise Policy' (RNP) is used to assess the potential traffic noise impact generated from the site's operations. Table 3 – '*Road traffic noise assessment criteria for residential land uses*' divides land use developments into different categories and lists the respective criteria for each case.

Based on functionality, Sunnyholt Road is categorised as an 'arterial road'. The potentially affected residential properties are located in the vicinity of Sunnyholt Road, and all have an acoustic environment which is dominated by traffic noise from Sunnyholt Road. Therefore, the appropriate traffic noise criteria for these residences are the 'arterial road' noise criteria presented in Table 8.1.

Table 8.1 – EPA Road Traffic Noise Criteria, dB(A)

Road Category	Type of project/land use	Assessment Criteria, dB(A)	
		Day 7am – 10pm	Night 10pm – 7am
Freeway/arterial/sub-arterial roads	3. Existing residences affected by additional traffic on existing freeways/arterial/sub-arterial roads generated by land use developments	$L_{Aeq(15hr)}$ 60 (external)	$L_{Aeq(9hr)}$ 55 (external)

According to the guidelines, for existing residences affected by additional traffic on existing roads generated by land use developments, any increase in the total traffic noise level should be limited to 2dB(A) above that of the corresponding 'no build option'. In all cases, traffic arising from the development should not lead to an increase in existing traffic noise levels of more than 2dB(A).

8.2 Road traffic noise predictions & assessment

Existing annual average daily traffic (AADT) volumes along Sunnyholt Road have been obtained from traffic counting undertaken by Transport for NSW (TfNSW) at a permanent traffic counting station (station no. 69198) located on Sunnyholt Road, 30m South of Devitt Street. The AADT volume from 2018 is reported to be 36,215 vehicles at the traffic counting station. It is noted that vehicle movements from the Proposal site would be insignificant (approximately 513 vehicle movements per day as presented in Traffic Study) in comparison to the AADT along Sunnyholt Road and therefore, the increase in road traffic noise due to traffic generated by the Proposal site would also be insignificant for residential properties currently experiencing traffic noise from Sunnyholt Road.

Furthermore, the additional traffic on Sunnyholt Road as a result of the Proposal site would not contribute to the existing traffic noise levels from Sunnyholt Road to the affected residences and would be significantly less than the allowable 2dB(A) increase to existing traffic noise levels.

9 Vibration impact assessment

9.1 Vibration criteria

Vibration levels during the operation of the site will be insignificant at each residential receiver due to the large separation distances between the plant and equipment used on site and the nearest residential receivers. As such, this report only assesses vibration levels to adjacent industrial premises.

The effects of ground vibration on buildings resulting from construction may be segregated into the following three categories:

1. Disturbance to building occupants - vibration in which the occupants or users of the building are inconvenienced or possibly disturbed,
2. Effects on building contents - vibration where the building contents may be affected; and
3. Effects on building structures - vibration in which the integrity of the building or structure itself may be prejudiced.

In general, vibration criteria for human disturbance (1) are more stringent than vibration criteria for effects on building contents (2) and building structural damage (3). Hence, compliance with the more stringent limits dictated by human disturbance (1), would ensure that compliance is also achieved for the other two categories.

9.1.1 Disturbance to buildings occupants

Assessment of potential disturbance from vibration on human occupants of buildings is in accordance with the EPA's '*Assessing Vibration; a technical guideline*' (EPA, 2006). The guideline provides criteria which are based on the British Standard BS 6472-1992 '*Evaluation of human exposure to vibration in buildings (1-80Hz)*'. Sources of vibration are defined as either 'Continuous', 'Impulsive' or 'Intermittent'.

Table 10.1 provides definitions and examples of each type of vibration. Vibration sources are defined as continuous, impulsive or intermittent.

Table 9.1 – Types of Vibration

Type of Vibration	Definition	Examples
Continuous vibration	Continues uninterrupted for a defined period (usually throughout the day-time and/or night-time)	Machinery, steady road traffic, continuous construction activity (such as tunnel boring machinery).
Impulsive vibration	A rapid build-up to a peak followed by a damped decay that may or may not involve several cycles of vibration (depending on frequency and damping). It can also consist of a sudden application of several cycles at approximately the same amplitude, providing that the duration is short, typically less than 2 seconds	Infrequent: Activities that create up to 3 distinct vibration events in an assessment period, e.g. occasional dropping of heavy equipment, occasional loading and unloading.

Type of Vibration	Definition	Examples
Intermittent vibration	Can be defined as interrupted periods of continuous or repeated periods of impulsive vibration that varies significantly in magnitude	Trains, nearby intermittent construction activity, passing heavy vehicles, forging machines, impact pile driving, jack hammers. Where the number of vibration events in an assessment period is three or fewer, this would be assessed against impulsive vibration criteria.

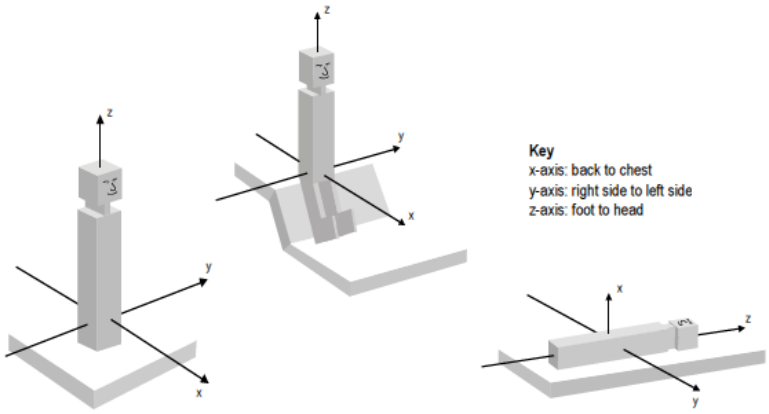
Source: Assessing Vibration; a technical guideline, Department of Environment & Climate Change, 2006

The vibration criteria are defined as a single weighted root mean square (rms) acceleration source level in each orthogonal axis. Section 2.3 of the guideline states:

> *'Evidence from research suggests that there are summation effects for vibrations at different frequencies. Therefore, for evaluation of vibration in relation to annoyance and comfort, overall weighted rms acceleration values of the vibration in each orthogonal axis are preferred (BS 6472).'*

When applying the criteria, it is important to note that the three directional axes are referenced to the human body, i.e. x-axis (back to chest), y-axis (right side to left side) or z-axis (foot to head). Vibration may enter the body along different orthogonal axes and affect it in different ways. Therefore, application of the criteria requires consideration of the position of the people being assessed, as illustrated in Figure 3. For example, vibration measured in the horizontal plane is compared with x- and y-axis criteria if the concern is for people in an upright position, or with the y- and z- axis criteria if the concern is for people in the lateral position.

Figure 3 – Orthogonal Axes for Human Exposure to Vibration



The preferred and maximum values for continuous and impulsive vibration impacting on the adjacent industrial premises are defined in Table 2.2 of the guideline and are reproduced in Table 9.2.

Table 9.2 – Preferred and Maximum Levels for Human Comfort, m/s^2

Location	Assessment period[1]	Preferred values		Maximum values	
		z-axis	x- and y-axis	z-axis	x- and y-axis
Continuous vibration (Weighted RMS Acceleration, m/s^2, 1-80Hz)					
Workshops	Day- or night-time	0.04	0.029	0.080	0.058

Location	Assessment period[1]	Preferred values		Maximum values	
		z-axis	x- and y-axis	z-axis	x- and y-axis
Impulsive vibration (Weighted RMS Acceleration, m/s^2, 1-80Hz)					
Workshops	Day- or night-time	0.64	0.46	1.28	0.92

Notes: 1. Daytime is 7:00am to 10:00pm and night-time is 10:00pm to 7:00am

The acceptable vibration dose values (VDV) for intermittent vibration impacting on the adjacent industrial premises are defined in Table 2.4 of the guideline and are reproduced in Table 9.3.

Table 9.3 – Acceptable vibration dose values for intermittent vibration, m/s$^{1.75}$

Location	Daytime[1]		Night-time[1]	
	Preferred value	Maximum value	Preferred value	Maximum value
Workshops	0.80	1.60	0.80	1.60

Notes: 1. Daytime is 7:00am to 10:00pm and night-time is 10:00pm to 7:00am

9.2 Vibration measurements and assessment

In order to quantify the vibration levels from the highest vibration producing plant, attended vibration measurements were undertaken for the hammer mills at the Kings Park site. Vibration measurements were conducted on Friday 9th May 2014, between 10.30am and 11.30am. The measurement location was approximately 10m from the plant item which corresponds to the distance from the hammer mill to the boundary at the Kings Park site. Vibration measurements were conducted over one (1) minute periods with the plant item operating normally with continuous feed over the time of measurement.

Vibration measurements were also taken for a large metal shear located at the Sell & Parker Darwin plant with a capacity of 350,000 tonnes a year which is similar to the existing metal shear for the Kings Park development. Vibration measurements were conducted on Monday 25th May 2015, between 3.30pm and 6.30pm, and on Tuesday 26th May 2015, between 8:30am and 11:30am. The measurements were conducted at different distances from the plant item over five (5) minute periods with the plant item operating continuously with continuous feed over the time of measurement.

Vibration levels were measured in three orthogonal axes (x, y and z) using a Sinus Soundbook precision sound and vibration analyser and three PCB Type 393B12 accelerometers or three Endevco Type 61C13 accelerometers. The PCB Type 393B12 accelerometers were calibrated using factory settings. The Endevco Type 61C13 accelerometers were calibrated before and after the measurements using a Bruel & Kjaer Type 4294 calibration exciter. No significant drift in calibration was observed.

Based on the vibration measurements conducted, the vibration sources are classified as continuous and/or intermittent as per the definitions presented in Table 9.1. The vibration sources do not exhibit the characteristics of impulsive vibration and therefore, the assessment for impulsive vibration is not considered further from herein.

9.2.1 Hammer mill

The following results were obtained for the hammer mill.

Table 9.4 – Measured vibration levels for the hammer mill

Plant Item	Measurement No.	Approximate distance to plant	Measured weighted rms acceleration, m/s^2		
			x-axis	y-axis	z-axis
Hammer Mill[1] (9^{th} May 2014)	1	10m	0.001	0.001	0.007
	2		0.001	0.001	0.007
	3		0.001	0.001	0.006
	4		0.001	0.001	0.006
	5		0.001	0.001	0.006
	6		0.001	0.001	0.006

Notes: 1. Measured vibration levels for the hammer mill include the operation of the shaker

For the table above it can be seen that vibration levels from the existing Kings Park hammer mill in the x and y axes are up to 0.001 m/s^2 and in the z axis up to 0.007 m/s^2 when at 10 m from the plant. When assessed against the established vibration criteria presented in Table 9.2, the measured vibration levels comply with the preferred limits for continuous vibration of 0.029 m/s^2 in the x and y axes and the preferred limit of 0.04 m/s^2 in the z axis.

The operation of the hammer mill is also assessed against the intermittent vibration criteria and the results are presented in the table below:

Table 9.5 – Measured intermittent vibration levels for hammer mill

Plant Item	Measurement No.	Approximate distance to plant	Measured vibration dose value, $m/s^{1.75}$
Hammer Mill (9^{th} May 2014)	1	10m	0.025
	2		0.025
	3		0.023
	4		0.023
	5		0.021
	6		0.023

Based on the measured vibration dose values presented in Table 9.5 the estimated vibration dose value over the daytime (7:00am to 10:00pm) is 0.13 $m/s^{1.75}$ and the estimated vibration dose value over the night-time (10:00pm to 7:00am) is 0.06 $m/s^{1.75}$. It is noted that the plant operates only from 6:00am to 9:00pm. When assessed against the established vibration criteria presented in Table 9.3, the estimated vibration dose values comply with the preferred limits for intermittent vibration of 0.80 $m/s^{1.75}$ for both day and night periods.

Given that the measured vibration levels were measured at approximately 10m from the hammer mill and the nearest industrial receiver is in excess of 30m from the hammer mill, it is not expected that

vibration levels in the z axis will exceed the preferred limits for continuous vibration at the nearest receivers. Therefore, vibration levels from the operation of the hammer mill will comply with the applicable vibration criteria at nearby receivers.

9.2.2 Metal shear

The following results were obtained from vibration measurements of the metal shear located at the Darwin site.

Table 9.6 – Measured continuous vibration levels for metal shear

Plant Item	Measurement No.	Approximate distance to plant	Measured weighted rms acceleration, m/s^2		
			x-axis	y-axis	z-axis
Metal Shear (25^{th} & 26^{th} May 2015)	1	5.5m	0.006	0.001	0.003
	2		0.002	0.001	0.006
	3		0.002	0.001	0.006
	4		0.048	0.002	0.004
	5		0.015	0.002	0.004
	6		0.018	0.002	0.003
	7	9m (rear of metal shear)	0.012	0.003	0.003
	8		0.008	0.002	0.005
	9		0.008	0.002	0.002
	10	50m	0.006	0.001	0.001
	11		0.017	0.006	0.001
	12		0.018	0.006	0.001
	13		0.015	0.006	0.001

It can be seen from the above table that vibration levels in the x and y axes are up to 0.018 m/s^2 and in the z axis up to 0.001 m/s^2 when at 50m from the plant. When assessed against the established vibration criteria presented in Table 9.2, the measured vibration levels comply with the preferred limits for continuous vibration of 0.029 m/s^2 in the x and y axes and the preferred limit of 0.04 m/s^2 in the z axis.

The operation of the metal shear is also assessed against the intermittent vibration criteria and the results are presented in the table below for a distance of 50m.

Table 9.7 – Measured intermittent vibration levels for metal shear

Plant Item	Measurement No.	Approximate distance to plant, m	Measured vibration dose value, $m/s^{1.75}$
Metal Shear (25^{th} & 26^{th} May 2015)	10	50m	0.017
	11		0.194
	12		0.270
	13		0.166

Based on the measured vibration dose value in in Table 9.6 the estimated vibration dose value over the daytime (7:00am to 10:00pm) is 0.75 $m/s^{1.75}$ and the estimated vibration dose value over the night-time (10:00pm to 7:00am) 0.39 $m/s^{1.75}$. It is noted that the plant operates only from 6:00am to 9:00pm. When assessed against the established vibration criteria presented in Table 9.3, the estimated vibration dose values comply with the preferred limits for intermittent vibration of 0.80 $m/s^{1.75}$ for both day and night periods.

The metal shear at the Proposal site is located in excess of 50m from the boundary of the nearest adjoining industrial premises. The measured vibration levels from the Darwin site shows compliance with the vibration criteria for both continuous vibration and intermittent vibration at 50m. It is noted that the foundations of the metal shear at the Darwin site are embedded in rock and the surrounding soil is hard, unlike the geology of the Kings Park site which consists of soft clayey soil. The vibration levels from the metal shear at the Proposal site are expected to be lower than the measured levels accounting for the ground impedance of softer ground at the Proposal site. Therefore, vibration levels from the operation of the metal shear will comply with the applicable vibration criteria at the nearby industrial receivers.

10 Conclusion

An addendum assessment of environmental noise impact from the proposed expansion of the Kings Park Waste Metal Recovery, Processing and Recycling Facility has been undertaken. A number of changes on the EIS assessment have been incorporated in this assessment, including updated noise monitoring results, updated noise criteria, inclusion of NCAs, updated sound power levels based on recent measurements, and updated modelling methodology as per agency comments.

Noise impact from the proposed expansion upon the potentially most affected noise sensitive residential locations and existing neighbouring industrial premises, has been quantified and compared to the noise guidelines set by the EPA.

Noise emissions to residential receivers are predicted to comply with the project noise trigger levels and sleep disturbance assessment levels without noise mitigation measures.

Noise and vibration emissions from site operations to neighbouring industrial premises also comply with the project noise trigger levels.

Potential traffic noise associated with the operation of the facility and impacting nearby residential receivers is assessed as being insignificant and would comply with the relevant EPA road noise policy.

In summary, noise and vibration emissions from the operation of the proposed expansion will comply with the relevant requirements of the NSW EPA.

APPENDIX A Glossary of terminology

The following is a brief description of the technical terms used to describe noise to assist in understanding the technical issues presented.

Adverse weather	Weather effects that enhance noise (that is, wind and temperature inversions) that occur at a site for a significant period of time (that is, wind occurring more than 30% of the time in any assessment period in any season and/or temperature inversions occurring more than 30% of the nights in winter).
Ambient noise	The all-encompassing noise associated within a given environment at a given time, usually composed of sound from all sources near and far.
Assessment period	The period in a day over which assessments are made.
Assessment Point	A point at which noise measurements are taken or estimated. A point at which noise measurements are taken or estimated.
Background noise	Background noise is the term used to describe the underlying level of noise present in the ambient noise, measured in the absence of the noise under investigation, when extraneous noise is removed. It is described as the average of the minimum noise levels measured on a sound level meter and is measured statistically as the A-weighted noise level exceeded for ninety percent of a sample period. This is represented as the L90 noise level (see below).
Decibel [dB]	The units that sound is measured in. The following are examples of the decibel readings of common sounds in our daytime environment:

threshold of hearing	0 dB	The faintest sound we can hear
	10 dB	Human breathing
almost silent	20 dB	
	30 dB	Quiet bedroom or in a quiet national park location
generally quiet	40 dB	Library
	50 dB	Typical office space or ambience in the city at night
moderately loud	60 dB	CBD mall at lunch time
	70 dB	The sound of a car passing on the street
loud	80 dB	Loud music played at home
	90 dB	The sound of a truck passing on the street
very loud	100 dB	Indoor rock band concert
	110 dB	Operating a chainsaw or jackhammer
extremely loud	120 dB	Jet plane take-off at 100m away
threshold of pain	130 dB	
	140 dB	Military jet take-off at 25m away

dB(A)	A-weighted decibels. The A- weighting noise filter simulates the response of the human ear at relatively low levels, where the ear is not as effective in hearing low frequency sounds as it is in hearing high frequency sounds. That is, low frequency sounds of the same dB level are not heard as loud as high frequency sounds. The sound level meter replicates the human response of the ear by using an electronic filter which is called the "A" filter. A sound level measured with this filter switched on is denoted as dB(A). Practically all noise is measured using the A filter.
dB(C)	C-weighted decibels. The C-weighting noise filter simulates the response of the human ear at relatively high levels, where the human ear is nearly equally effective at hearing from mid-low frequency (63Hz) to mid-high frequency (4kHz), but is less effective outside these frequencies.

Frequency	Frequency is synonymous to pitch. Sounds have a pitch which is peculiar to the nature of the sound generator. For example, the sound of a tiny bell has a high pitch and the sound of a bass drum has a low pitch. Frequency or pitch can be measured on a scale in units of Hertz or Hz.
Impulsive noise	Having a high peak of short duration or a sequence of such peaks. A sequence of impulses in rapid succession is termed repetitive impulsive noise.
Intermittent noise	The level suddenly drops to that of the background noise several times during the period of observation. The time during which the noise remains at levels different from that of the ambient is one second or more.
L_{Max}	The maximum sound pressure level measured over a given period.
L_{Min}	The minimum sound pressure level measured over a given period.
L_1	The sound pressure level that is exceeded for 1% of the time for which the given sound is measured.
L_{10}	The sound pressure level that is exceeded for 10% of the time for which the given sound is measured.
L_{90}	The level of noise exceeded for 90% of the time. The bottom 10% of the sample is the L90 noise level expressed in units of dB(A).
L_{eq}	The "equivalent noise level" is the summation of noise events and integrated over a selected period of time.
Reflection	Sound wave changed in direction of propagation due to a solid object obscuring its path.
SEL	Sound Exposure Level (SEL) is the constant sound level which, if maintained for a period of 1 second would have the same acoustic energy as the measured noise event. SEL noise measurements are useful as they can be converted to obtain Leq sound levels over any period of time and can be used for predicting noise at various locations.
Sound	A fluctuation of air pressure which is propagated as a wave through air.
Sound absorption	The ability of a material to absorb sound energy through its conversion into thermal energy.
Sound level meter	An instrument consisting of a microphone, amplifier and indicating device, having a declared performance and designed to measure sound pressure levels.
Sound pressure level	The level of noise, usually expressed in decibels, as measured by a standard sound level meter with a microphone.
Sound power level	Ten times the logarithm to the base 10 of the ratio of the sound power of the source to the reference sound power.
Tonal noise	Containing a prominent frequency and characterised by a definite pitch.

APPENDIX B Operational noise contours

Figure 4 – Operational noise contours for shoulder period during calm conditions, $L_{Aeq, 15min}$

Figure 5 – Operational noise contours for shoulder period with worst case wind enhancement, $L_{Aeq, 15min}$

Figure 6 – Operational noise contours for day period during calm conditions, $L_{Aeq, 15min}$

Figure 7 – Operational noise contours for evening period during calm conditions, $L_{Aeq, 15min}$

Figure 8 – Operational noise contours for evening period with worst case wind enhancement, $L_{Aeq, 15min}$

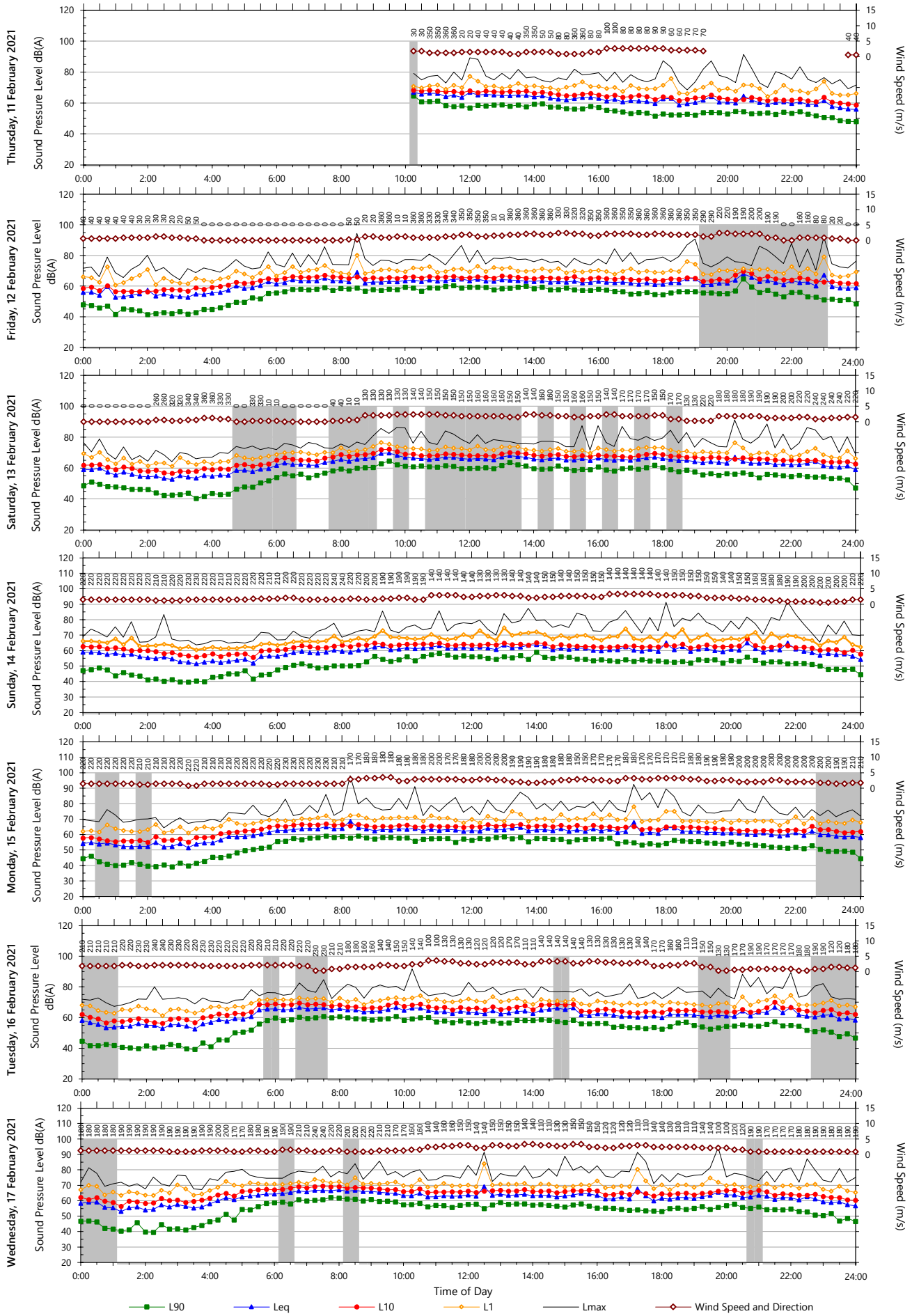
Figure 9 – Operational noise contours for night period during calm conditions, $L_{Aeq, 15min}$

Figure 10 – Operational noise contours for night period with worst case meteorological enhancement, $L_{Aeq, 15min}$

APPENDIX C Long term noise monitoring results

Unattended Monitoring Results

Location: 187 Sunnyholt Road, Blacktown

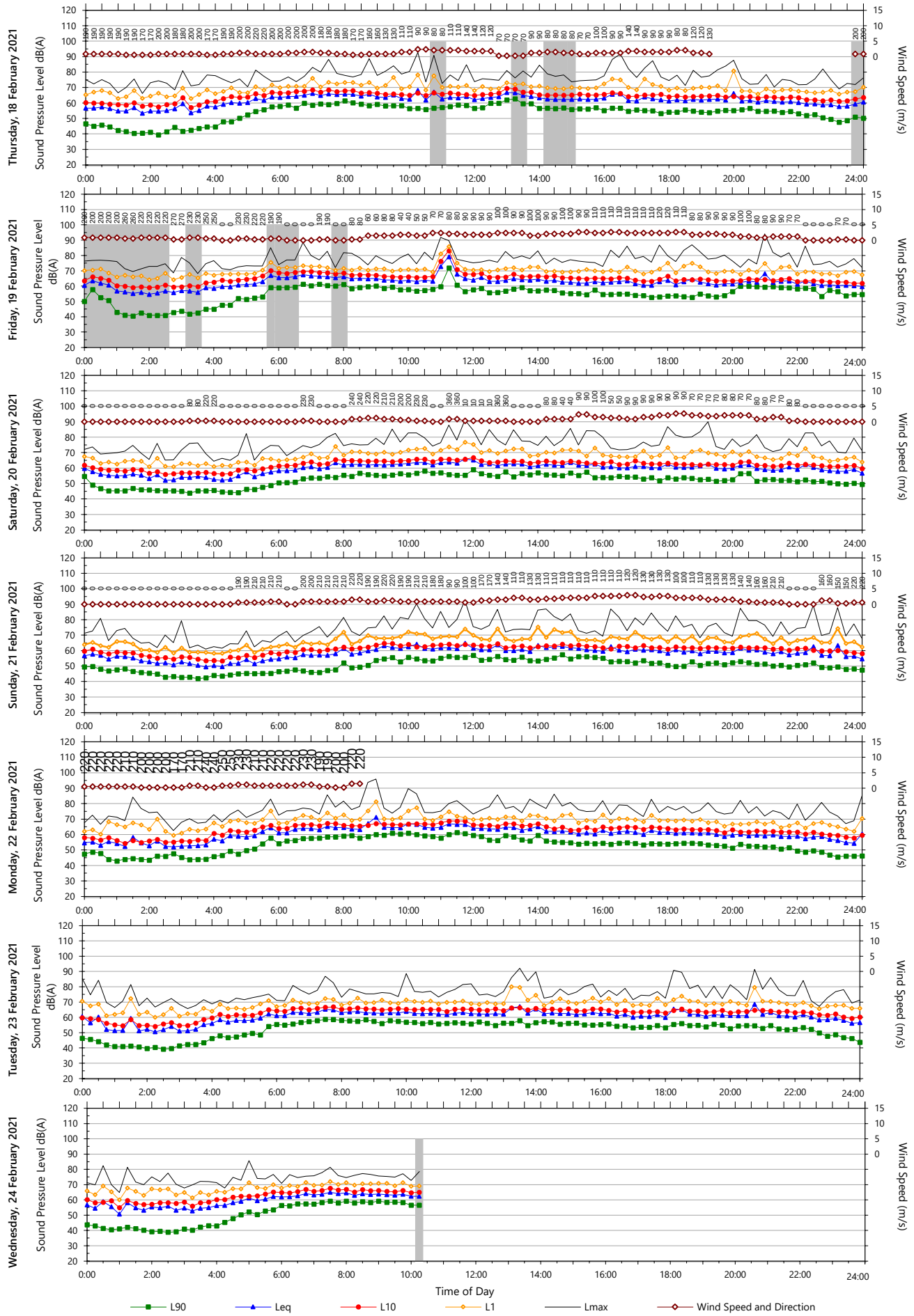


Data File: 2021-02-11_SLM_000_123_Rpt_Report.txt

Template: QTE-26 Logger Graphs Program (r34)

Unattended Monitoring Results

Location: 187 Sunnyholt Road, Blacktown

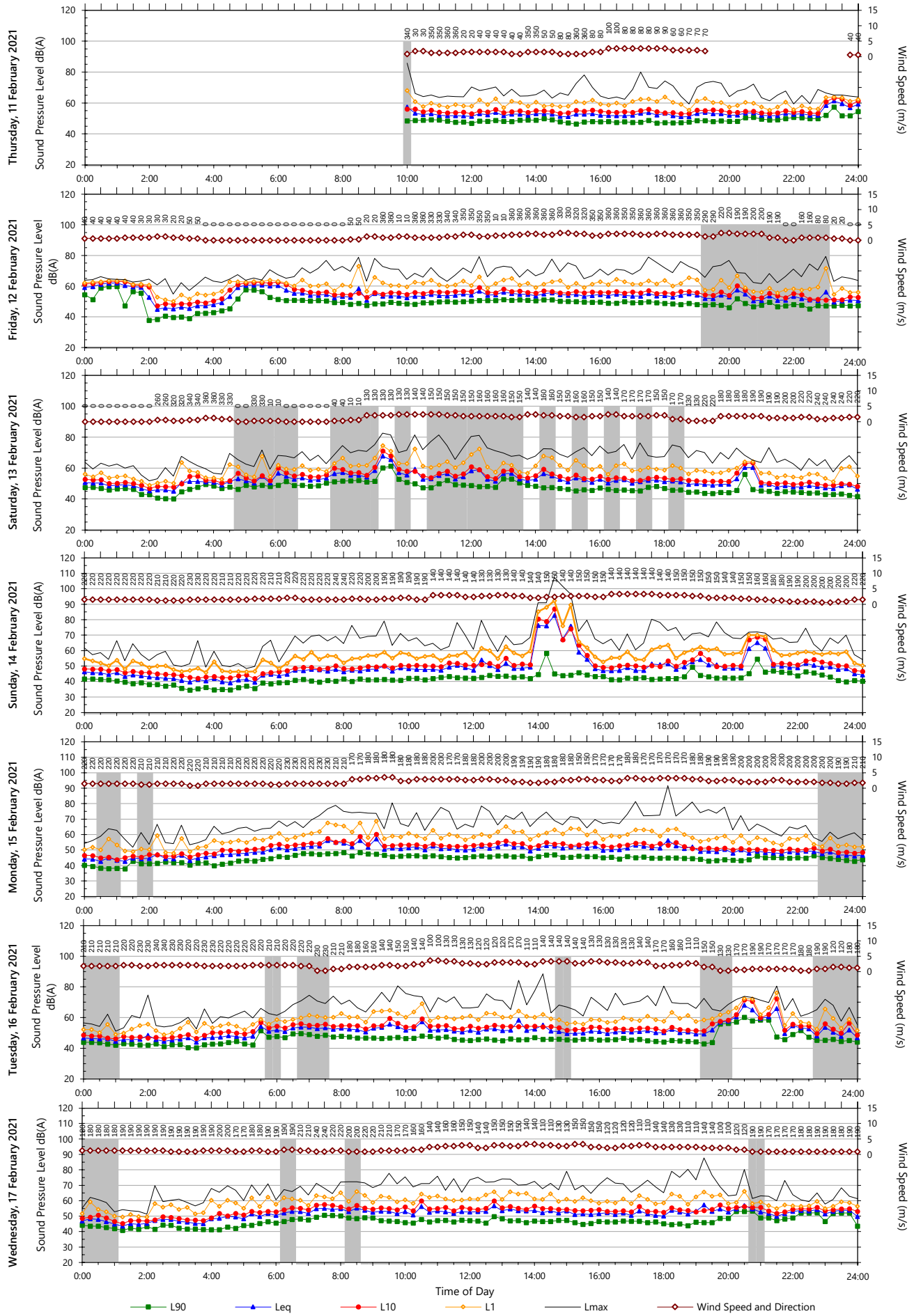


Data File: 2021-02-11_SLM_000_123_Rpt_Report.txt

Template: QTE-26 Logger Graphs Program (r34)

Unattended Monitoring Results

Location: 2 Anthony Street, Blacktown



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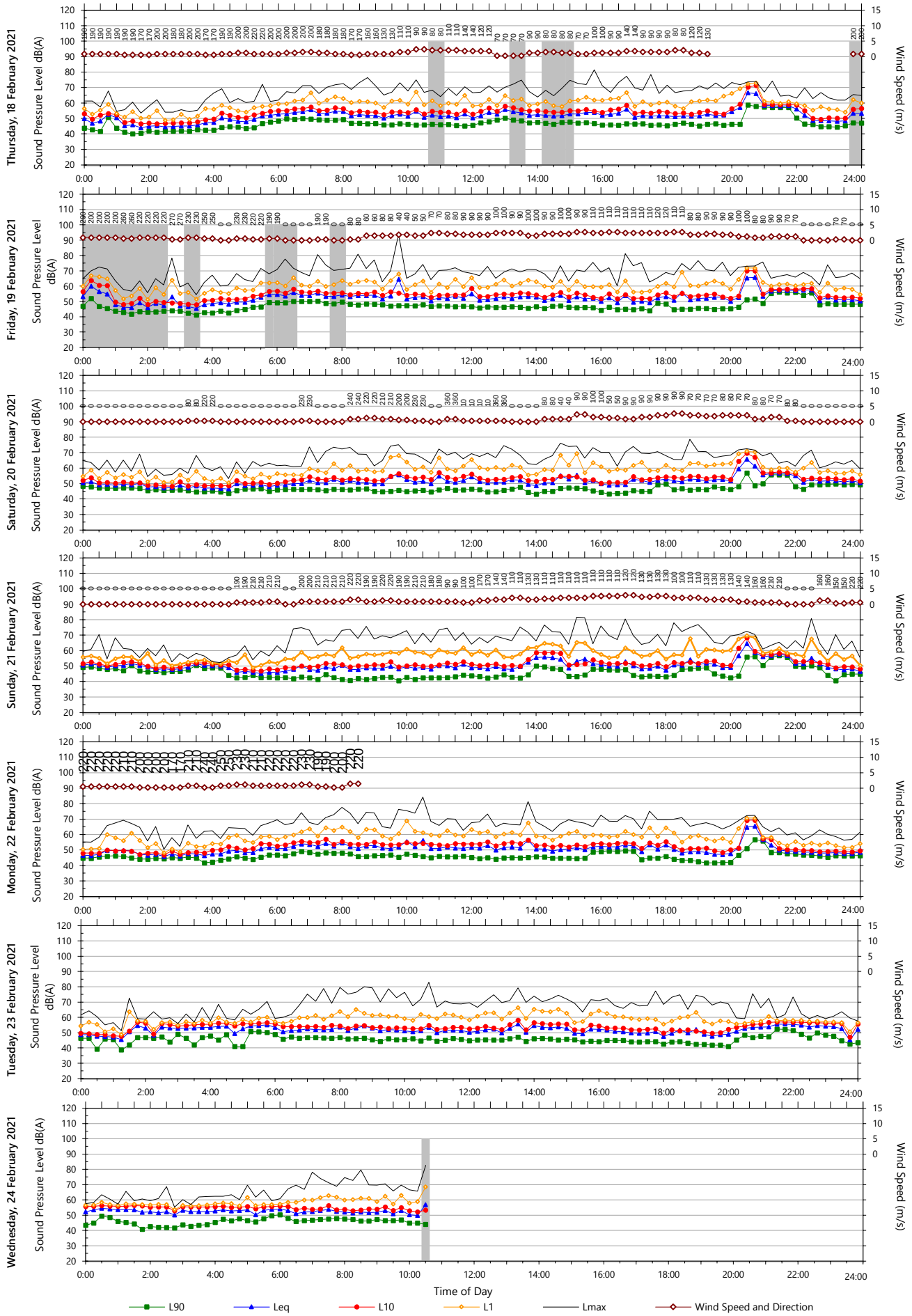
Template: QTE-26 Logger Graphs Program (r34)

Unattended Monitoring Results

Location: 2 Anthony Street, Blacktown

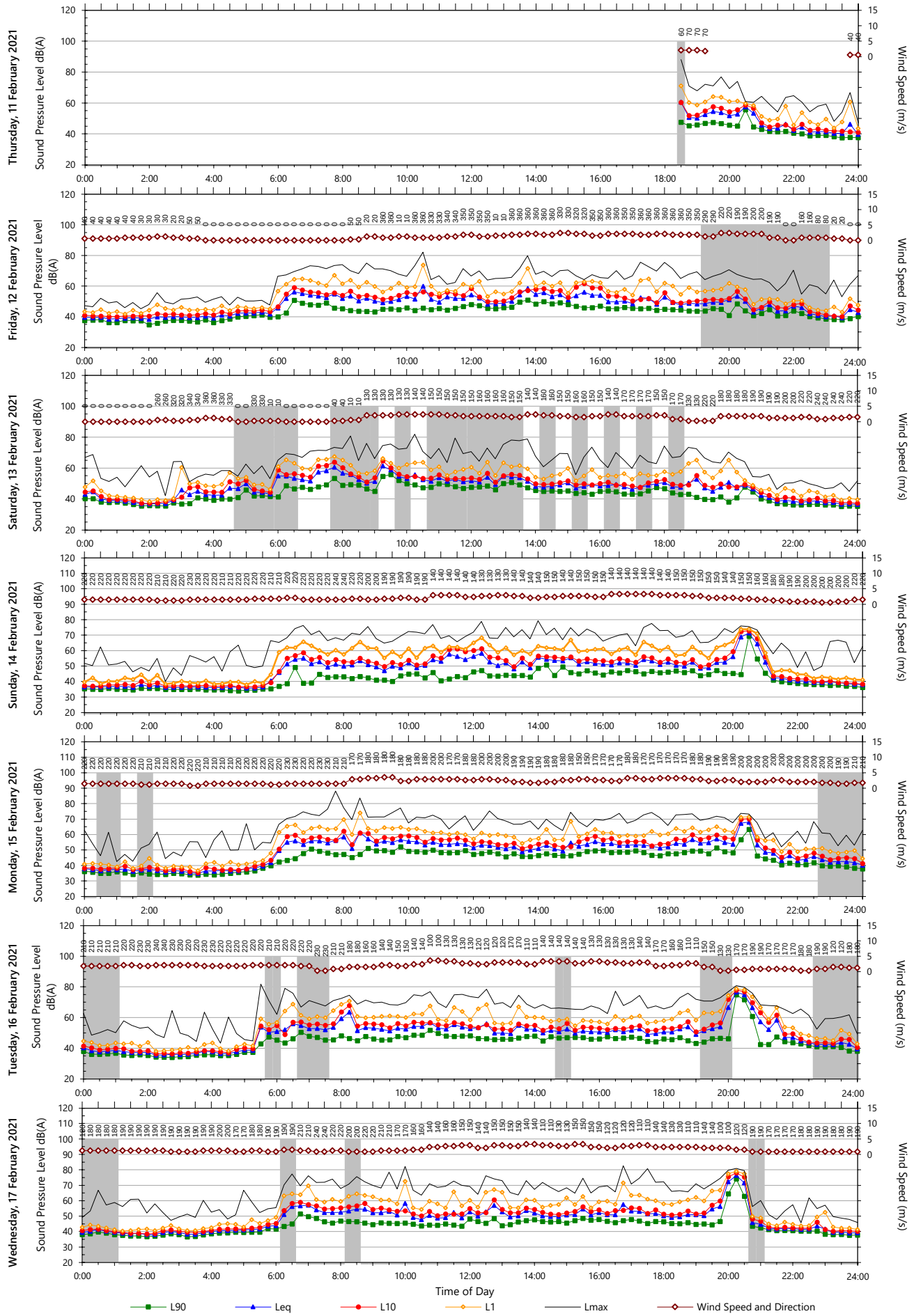


Data File: 2021-02-11_SLM_000_123_Rpt_Report.txt

Template: QTE-26 Logger Graphs Program (r34)

Unattended Monitoring Results

Location: 19 Camorta Close, Kings Park

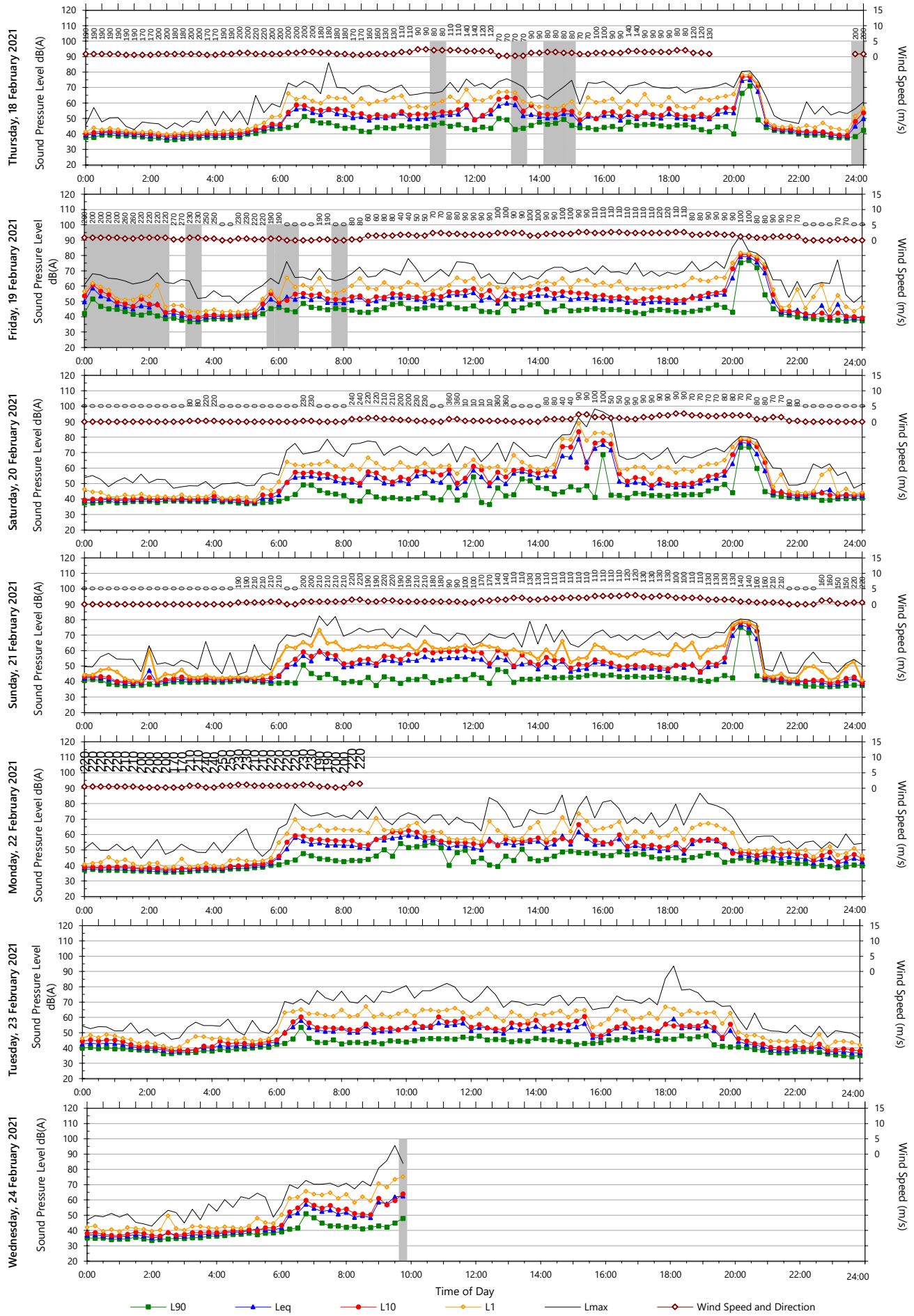


Data File: 2021-02-11_SLM_000_123_Rpt_Report.txt

Template: QTE-26 Logger Graphs Program (r34)

Unattended Monitoring Results

Location: 19 Camorta Close, Kings Park

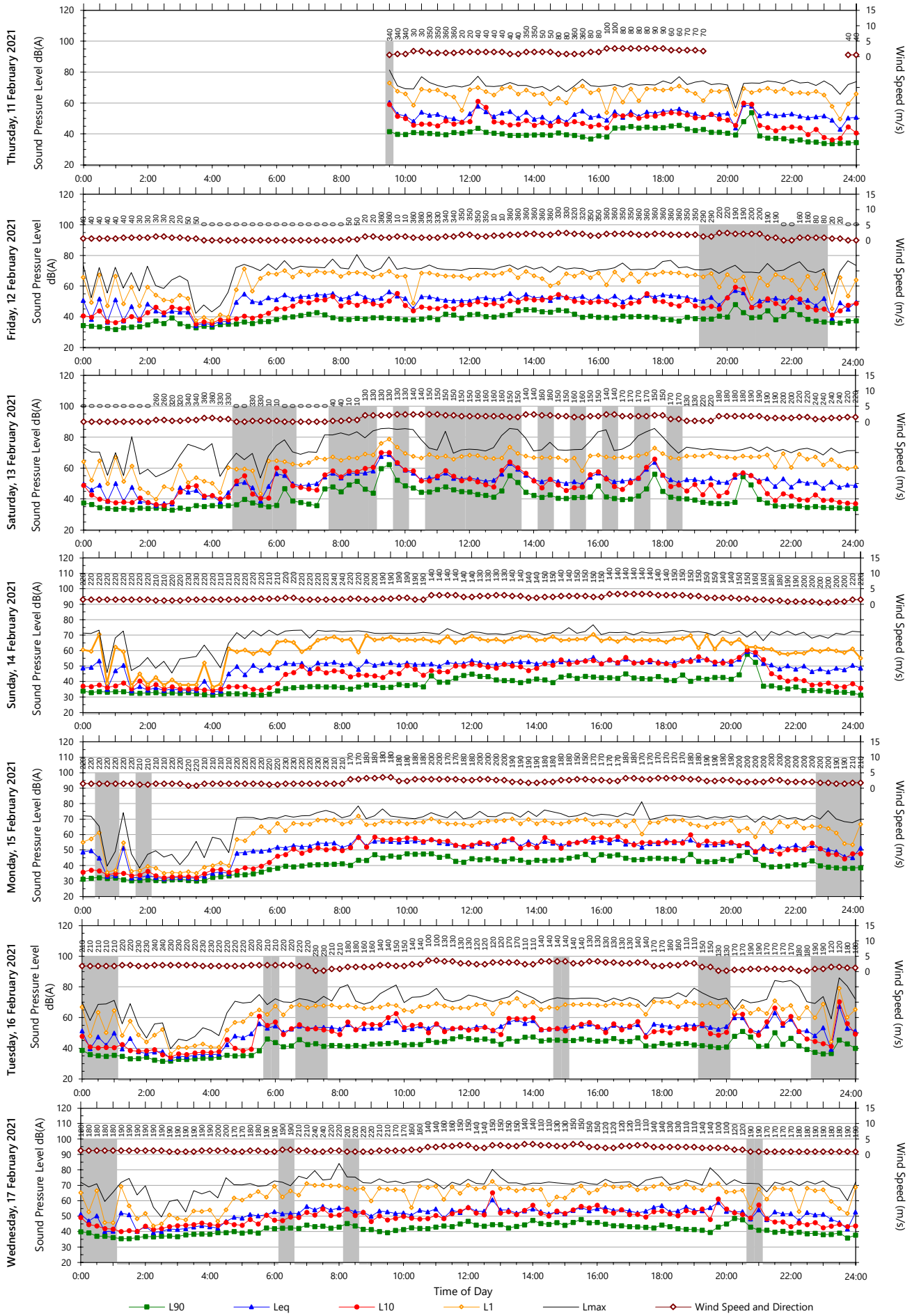


Data File: 2021-02-11_SLM_000_123_Rpt_Report.txt

Template: QTE-26 Logger Graphs Program (r34)

Unattended Monitoring Results

Location: 1 Chedley Place, Marayong

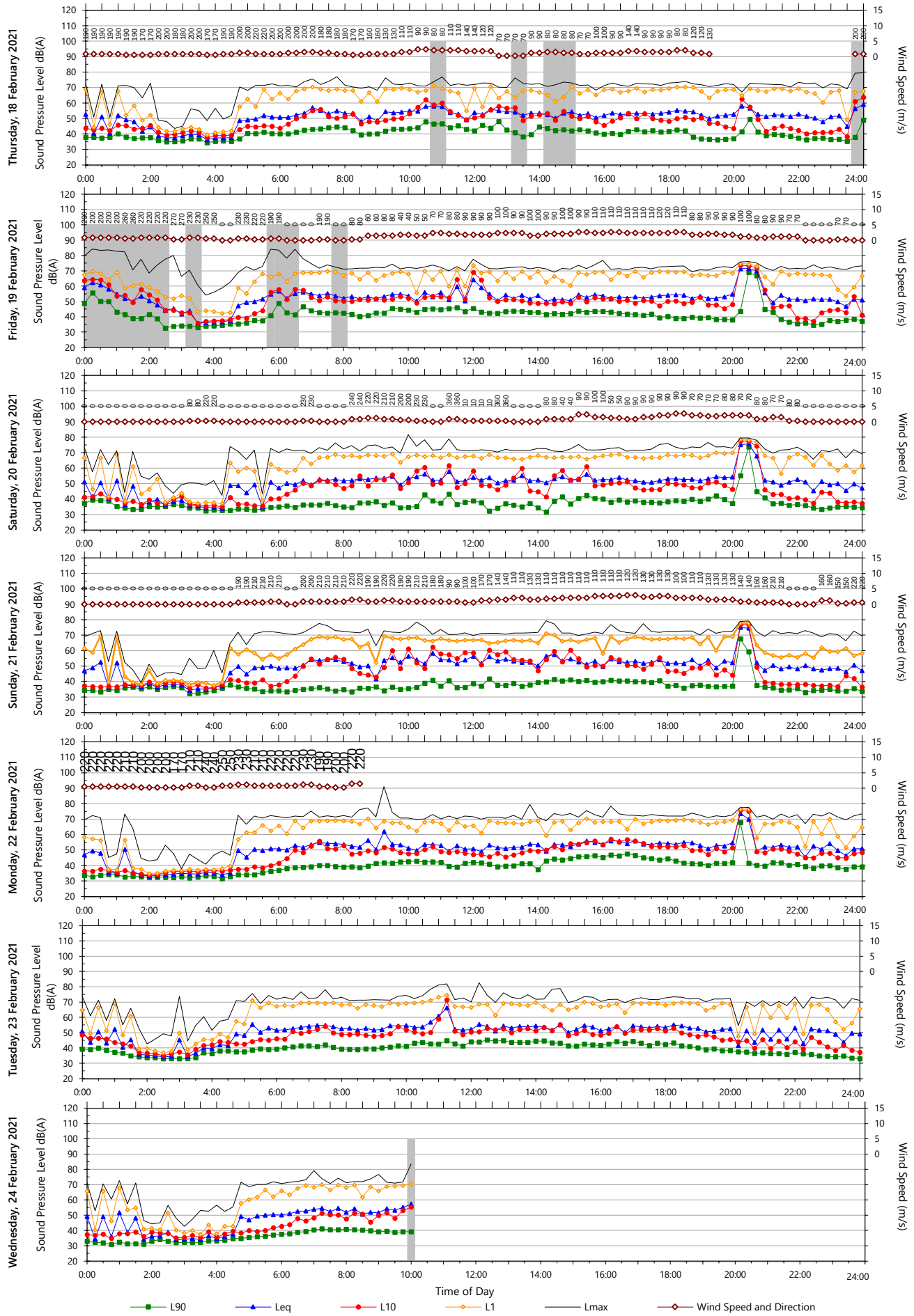


Data File: 2021-02-11_SLM_000_123_Rpt_Report.txt

Template: QTE-26 Logger Graphs Program (r34)

Unattended Monitoring Results

Location: 1 Chedley Place, Marayong



Data File: 2021-02-11_SLM_000_123_Rpt_Report.txt

Template: QTE-26 Logger Graphs Program (r34)