

# Noise Monitoring Report

Bowral Waste Centre - EPL 13366

May 2022



## Document information

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## Acknowledgement of Country

4Pillars acknowledges the Traditional Owners of the land on which this study was conducted, the people of the Gundungurra and Tharawal nations. We pay our respects to their Elders past and present.

## Introduction and background

### *Objective and scope of work*

Bowral Landfill engaged 4Pillars Environmental Consulting (4Pillars) to conduct noise monitoring for the Bowral Waste Centre (8 Kiama Street, Bowral, NSW – the Site), to assess compliance with Environment Protection Licence (EPL) 13366.

4Pillars' scope of work was as follows:

- Conduct attended noise monitoring during the daytime period (07:00 to 18:00) at four monitoring points located at nearby residential receivers surrounding the Site;
- Analyse data against EPL 13366 noise criteria; and
- Prepare a noise monitoring report and draw conclusions regarding compliance.

### *Site details and monitoring requirements*

The subject Site is 8 Kiama Street, Bowral, NSW, 2576 – part lots 13 and 14 in DP1022146. The landfill site is located within the Wingecarribee Shire local government area (LGA). The landfill site falls within the IN1 (general industrial) development zone under the *Wingecarribee Local Environment Plan 2010*. Surrounding land zoning includes IN1 and IN2 (light industrial), R3 and R2 (medium and low density residential), RU4 (primary production small lots) and RE1 (public recreation). The majority of the surrounding land uses are agricultural or industrial, such as horticulture, landscaping supply, self-contained storage, sewerage treatment, car repairs, etc. The nearest residential area is medium density and occurs immediately to the east of the Site, along Railway Parade. Residential and business receivers are located to the east and west of the Site (refer Figure 5).

The landfill licence was transferred to Bowral Waste Pty Ltd (the Licensee) in July 2019. The site was not operational until November 2019. Since the commencement, the site progressively reached full scale of operations in February 2020.

As noted above, the Site is subject to EPL 13366. Regarding the assessment of noise and noise emission, the licence states:

#### ***"L5 Noise Limits***

*L5.1 – Noise from the land filling operations must not exceed an LA10 (15 minute) noise emission criterion of 50 dB(A), except as expressly provided by this licence.*

*L5.2 – Noise from the premises is to be measured or computed at any point within 6 meters of any residence or other noise sensitive area in the vicinity of the premises to determine compliance with condition L5.1. 5dB(A) must be added if the noise is tonal or impulsive in character."*

## Noise monitoring methodology

### *Sampling locations*

The Site EPL does not identify the locations where sampling must be carried out, instead stating that samples must be obtained within 6 m of any residence or noise sensitive area in the vicinity of the premises. 4Pillars has previously identified four locations in the 2020-21 noise report. The locations considered appropriate to assess noise levels are (refer Figure 6):

- R1. 23 Kiama Street (immediately southwest of the Site access gate);
- R2. 1 Funston Street (northeast of the Site recycling area);
- R3. 24 Railway Parade (east of the Site recycling area); and
- R4. 23 Loftus Street (further east of Railway Parade).

Noise assessment equipment was placed within 6 m from the edge of the relevant property boundaries and sufficient distance away from any reflecting structures at the locations listed above. The sample locations were considered representative of noise conditions experienced at the receiver locations and modelling for computed results has not been deemed necessary.

### *Description of Noise Logger*

Attended noise monitoring was carried out on 14 April 2022 by two qualified and experienced environmental scientists (Mr J E-Sonter and Ms M Shrestha), using an Ngara Real Time Sound Acquisition System developed by Acoustic Research Labs Pty Ltd. This is a Class 1 (IEC 61672-3:2013), Type 1 (AS1259.1:1990 and AS1259.2:1990) instrument. A Type 1 instrument is intended for field use, with typical applications in technical studies of sound, general consulting work in acoustics and noise, and measurements. The meter was calibrated at a NATA-accredited laboratory within two years of the measurement period. The calibration certificate is provided in Appendix 2. The Ngara unit uses a UC-53A RION microphone attached to a NH-17 with 5 metre cable and preamplifier. The microphone is mounted to the end of a supplied 1.2 m microphone post, to comply with the relevant standards. It is highly sensitive and, for this reason, exposure to rain and other extremes in weather is not acceptable during sampling. It is noted that windy conditions prevailed during measuring periods (refer to Table 1).

### *Comparison logger*

To determine the noise levels emitted directly from the Site, a “comparison logger” was set up at the entrance to the Site. Recordings were taken with this logger concurrently with the sample logger. This allowed comparison of the results for both loggers, to further assist with determining the site contribution to the measured noise level.

The internal clock of the comparison logger was coordinated with the clock on the primary logger, to ensure that the chronology of noise measurements was aligned.

### *Sampling procedure*

Measurements were taken during the day period only, as the Site is not operational during evening or night periods. The meter was operated in accordance with the manufacturer’s specifications and other relevant reference documents (i.e., AS 2659.1988). During recording, the meter was set to ‘fast’ time weighting and ‘A’ frequency weighting. The microphone was fitted with a foam windscreen and positioned 1.2 m above ground level during recording. Once the microphone was set up, checked and ready to log data, recording was started by the operator.

Samples were obtained over a period of at least 15 minutes at each location, with sound pressure level and equivalent LAeq readings taken every 100 ms. Prior to and during recording, detailed notes were taken on parameters including weather, time interval, location, meter settings, operating equipment and plant and noise sources not related to the activity. The equipment was handled with care, packaged, and transported in accordance with the manufacturer’s specifications.

### *Site operations*

The Site was operational on the day of sampling. The operation of the landfill at the time of monitoring included the acceptance of waste, deposition of waste in designated recycling bays, sorting waste for resource recovery, deposition of waste in the active cell and waste compaction. The heavy machinery present on site at the time of monitoring included a 14-tonne excavator, 20-tonne excavator, dump truck, one front end loader and compactor. The site was observed to be at peak operations around mid-afternoon, coinciding with when monitoring took place, during which time several customer trucks entered and exited the site. The trucks that entered the site included walking floor vehicles, truck, and dog vehicles, semi-trailer vehicles and light vehicles (cars, trailers, four-wheel drives, and vans).

### *Extraneous noise sources*

During sampling, there were several extraneous noise sources in the area. The Bowral Brickworks shares the northern boundary of the Site and uses the Site’s haul road to access its active quarry, which is located immediately adjacent (south-west) to the landfill pit. On the day of sampling, activities at Bowral Brickworks were audible, particularly at the monitoring locations on Kiama Street and Railway Parade.

Vehicle movements on public roads (not associated with the Site) were a significant contributor to noise levels on the day of sampling. The impact was most significant at sampling locations on Railway Parade, Funston Street and Loftus Street. The impact was less significant at 29 Kiama Street, which is located on a no-through-road.

Passenger and freight trains travelling along the Southern Railway line were identified as another very significant noise source not related to the Site. Two trains passed during monitoring events. Their impact on sound pressure levels was a function of their length and whether the horn was used as it approached stations and the nearby level crossing. Generally speaking, trains are considered an ongoing source of background noise during the daytime period within the vicinity of receivers and at the Site and removal of noise emissions from the Southern Railway was not practical due to the frequency and level of disturbance.



At 24 Railway Parade and 23 Loftus Street, noise from other industrial activities was generally audible, but not dominant or impulsive. At 29 Kiama Street, noise from activities at the landfill and nearby industrial sites were dominant.

The time that extraneous noise sources occurred were noted in the field for the purposes of excising the noise from monitoring data, limiting the impact of extraneous noise on the results to the extent possible.

## Results and discussion

### *Weather and meteorological conditions*

Sampling took place between 13:33 and 15:37 on 14 April 2022. During this time, the average temperature was approximately 18°C and cloud cover was low with no rainfall. A wind rose for the month in which the monitoring period occurred is presented in Figure 1. The wind rose indicates that for the period of monitoring, winds from the west, south-east and east were dominant. The average wind speed for the period was 5.2 m/s and the percentage occurrence of calm wind conditions was 5% (speed less than or equal to 0.5 m/s).

The meteorological conditions during sampling sessions met the criteria for 'noise-enhancing conditions' under Table D1 of the EPA's *Noise Policy for Industry 2017*. The policy states that light to moderate daytime winds, temperature inversions and source to receiver winds have the potential to increase noise levels. As average wind speeds greater than 3 m/s were present at the time of sampling, there is a possibility that noise levels were enhanced. The impact of weather and extraneous noise sources downwind during readings has been taken into account when estimating the operational noise levels.

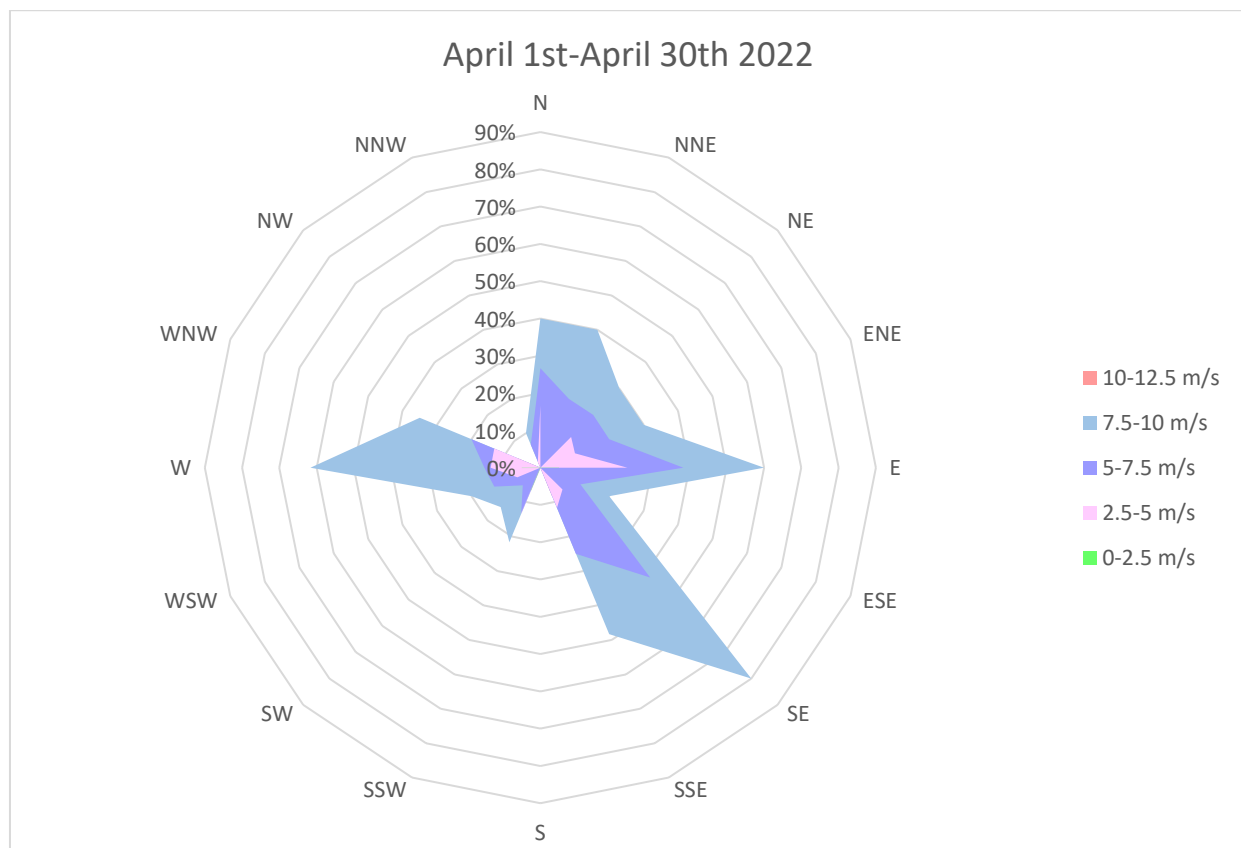


Figure 1: Windrose from Moss Vale AWS (Station ID 068239) for 1 April to 30 April 2022 (from 09:00 to 15:00).

Table 1: Meteorological conditions during sampling. Wind speed and direction figures represent 1-minute interval readings, averaged over the sampling period. Meteorological condition categories are consistent with those specified in the Noise Policy for Industry 2017 (Table D1).

Date	Monitoring location	Session start time	Rainfall (mm)	Average Wind speed (m/sec)	Wind direction	Stability class	Meteorological Conditions
14/04/22	29 Kiama Street	13:48	0	3.6	NE	A-D	NEC
	1 Funston Street	14:20	0	3.6	NE	A-D	NEC
	24 Railway Parade	14:43	0	3.6	NE	A-D	NEC
	23 Loftus Street	15:07	0	3.6	NE	A-D	NEC
KEY		STD: Standard conditions   NEC: Noise-enhancing conditions   VNE: Very noise-enhancing conditions					

### Data analysis

The data obtained during each 15-minute monitoring session was analysed using Microsoft Excel, and raw values for LA10 (15 minutes) were determined for each session. These raw values were then compared to the relevant noise level limits for each EPL Point.

### Assessment process

Where the raw values exceeded the permitted limits, the data was subjected to a thorough assessment process, to determine if the exceedances could be attributed to the Site. This process included scrutinising both the field sheets and audio files against each other, to confirm what contributions were extraneous and which were from the Site.

Where there was an exceedance of permitted limit by raw LA10: The full data set was inspected, and extraneous noise sources were cross referenced with both the field sheets and the audio files to confirm their nature, and accordingly removed if appropriate. The first step was to investigate all noise events on the field notes which were noted as being extraneous and removing these data points. Following this, remaining LAeq peaks were investigated with the audio files being revisited to confirm whether these peaks could be attributed to extraneous noise sources. Once these data points had been removed, the LA10 (15 min) were recalculated and a revised LA10 (15 min) value was reported (see Table 4).

Where the raw results obtained were below the permitted limits, no further assessment was undertaken to determine more accurate levels. However, we expected that the results obtained were substantially higher than the Site's contribution to measured noise levels, considering the complex noise environment, which includes multiple industrial sources, busy roads, and natural sources (e.g., birds and other animals).

**Comparison of loggers** – As well as the three-stage assessment process for individual sessions, a general comparison between the noise levels recorded at each monitoring location and with the Site comparison logger was made.

Table 2: Noise limits detailed in Condition L5.1 of the EPL

		Noise level limits (dB(A))			
		EPL Point			
Period	Parameter	29 Kiama Street	1 Funston Street	24 Railway Parade	23 Loftus Street
Morning Day Shoulder	LA10 (15 mins)	50	50	50	50

Table 3: Raw values for LA10 (15 mins) obtained for each session, prior to the three-stage assessment (to the nearest whole number). Colours have been used to show compliance (green) and non-compliance (red) with the relevant limits. Note these are raw values and are not necessarily reflective of the Site contribution to the recorded noise levels. \*Note: This slight exceedance is considered negligible due to the extraneous noise sources present during the monitoring session and Noise Enhancing Conditions experienced.

Date	Period	Session Start	EPL Point	LA10 (15 mins)
14/04/2022	Day (afternoon)	13:48:00	29 Kiama Street	55.2
14/04/2022	Day (afternoon)	14:20:00	1 Funston Street	56.9
14/04/2022	Day (afternoon)	14:43:00	24 Railway Parade	51*
14/04/2022	Day (afternoon)	15:07:00	23 Loftus Street	52
# Compliant				1
# Non-compliant				3

### Comparison of monitoring location logger and Site logger

To determine whether there was a clear correlation between the values obtained for each monitoring location and the Site noise source, the results obtained were compared to those from the comparison logger, following identical statistical analyses as the monitoring location results. Simple correlation plots were prepared for the LAFmax (15 minutes) values are shown below in Figure 2. Note, the plot has been prepared based on the values obtained following the three-stage assessment process, and therefore do not account for all data points. Furthermore, where values were determined to be “less than the limit”, the limit has been used in place of a calculated value.

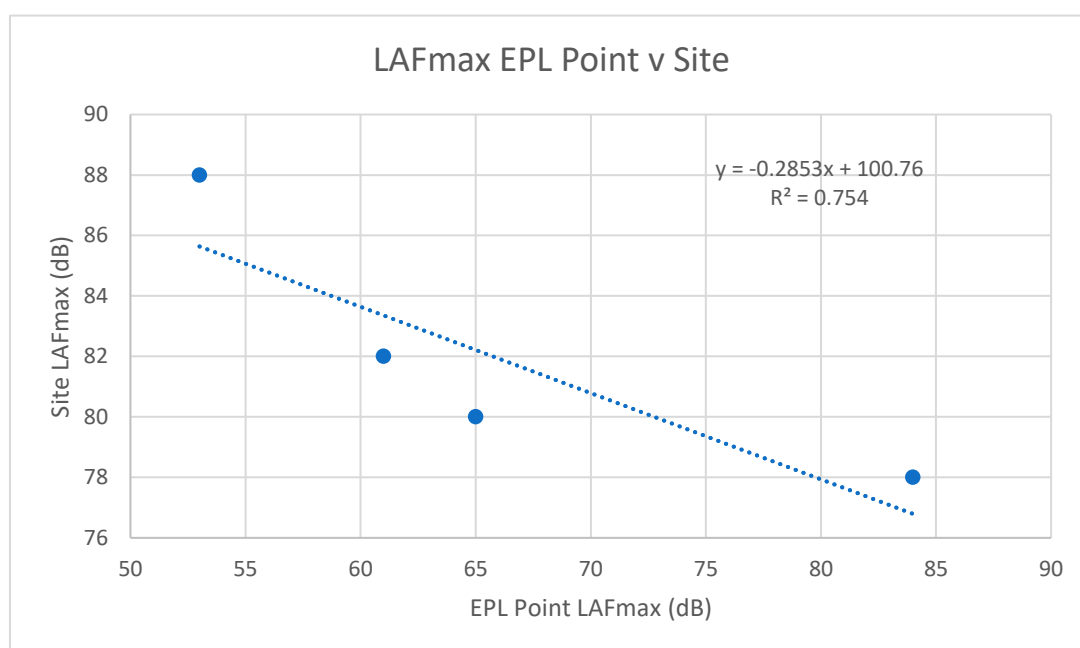


Figure 2: Comparison of LAFmax values during each monitoring session at each EPL Point and the comparison logger (i.e., Site noise source). A linear trendline has been included. Note: For values that were determined to be “less than the limit”, the limit has been entered.

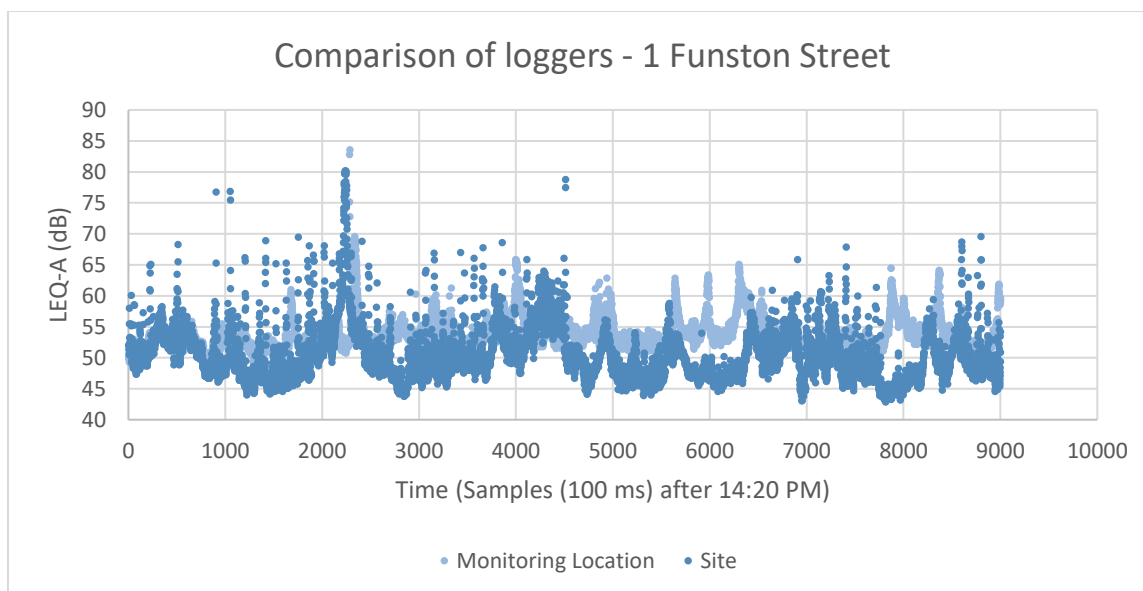


Figure 3: All data points obtained during the session at 1 Funston Street from the monitoring logger, and the comparison logger at the Site.

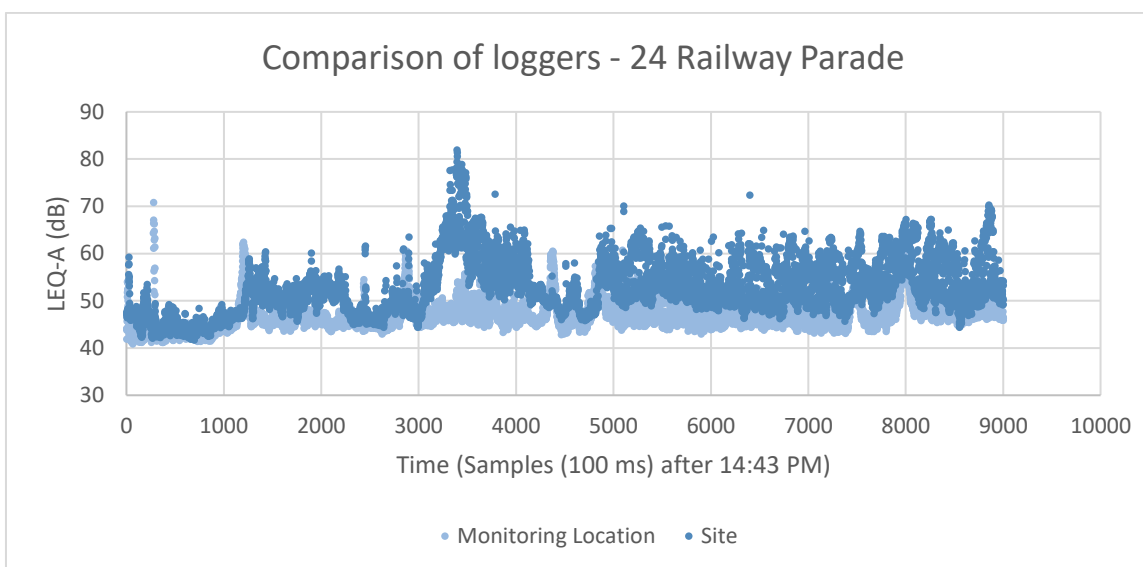


Figure 4: All data points obtained during session at 24 Railway Parade from the monitoring logger, and the comparison logger at the Site.

### Noise results

The results of noise sampling events are provided below in Table 4. It should be noted the measured noise levels include noise from all sources, including sources external to the Site. Raw measurements of LA10 noise levels at the four monitoring points varied between 51 and 56.9 dBA. Following the assessment process detailed earlier in this report, revised LA10 values were determined which more closely reflected the contribution of the Site to the noise levels experienced at each monitoring location. However, due to an unexpected technical error, the audio file for sessions sampled from 2:00pm to 3:00pm was corrupted and unable to be inspected thoroughly, and accordingly, the assessment possible for these sessions and subsequent revision of LA10 values was limited. As such, the revised LA10 values for both Funston Street and Railway Parade were revised largely off field sheet notes, which detailed specific peaks of extraneous noise sources, which could be removed from the data to be analysed.



The attended noise monitoring results indicate noise levels at the monitoring points are strongly influenced by an array of surrounding noise sources, in particular non-site related traffic, industrial activities, passing freight trains and residential activities including lawn mowing and residents entering and exiting their houses. It has proven difficult to isolate operational noise from the Site with a high degree of accuracy and doing so is not feasible.

### *Site contribution to measured noise levels*

#### *Kiama Street*

The noise levels measured at 23 Kiama Street would ordinarily be considered the most representative of noise generated at the Site. While this monitoring location captures the majority of noise occurrences at the Site, it also captures a number of extraneous noise contributions from the many surrounding industrial Site activities, including Bowral Brickworks, the timber yard and associated truck movements along the street.

Audible extraneous noise sources included industrial noise, truck, and mobile plant movements at the southern end of the brickworks site. The level of noise emanating from Bowral Brickworks, and Bowral Waste were considered equal.

The raw LA10 (15 min) value calculated for 23 Kiama Street was 55.2 dBA. It is understood that due to the high number of industrial works and associated activities conducted along Kiama Street, that the general background noise level is likely to have an LA10 (15 minute) value, higher than the LA10 (15 minute) limit (50 dBA) adopted in Condition L5.1 of the EPL. This idea was supported by a noise assessment conducted in 2019 which measured background noise levels when the Site was non-operational. Results for approximate background noise levels were 58 dBA.

Given the complex contribution of extraneous noise sources at this monitoring point, and the close proximity of the logger to the Site (compared to the other 3 monitoring points) and surrounding industrial activities, it is considered that Site contribution at this measurement point is estimated to be below the LA10 (15 min) limit of 50 dBA. It is also noted that climatic conditions, in particular the moderate north westerly winds blowing towards the receiver during measurements, are likely to have enhance overall sound pressure levels (SPLs) recorded for this session.

#### *Funston Street*

Measurements taken at 1 Funston Street returned a raw LA10 (15min) value of 56.9 dBA which exceeds the limit by 6.9 dbA. It is noted that for this monitoring session, audio files were unable to be inspected and additional extraneous noises removed. Noise events recorded on the field sheet were not noted as being contributed from the Site and Bowral Waste Facility was noted as being *non-audible*. This strongly suggests that extraneous noise sources were the cause of the elevated LA10 (15 min) level recorded.

It is assumed that, had the audio file been able to be scrutinised for additional extraneous noise sources, that the overall LA10 (15min) value from the Site contribution would be less than the limit of 50 dbA.

#### *Railway Parade*

Monitoring at 24 Railway Parade is representative of recycling operations at Bowral Waste Centre with recycling operations being audible from Railway Parade. Sounds from passing trains, train horns and passing vehicles are not considered an anomaly at this location as they are common elements of the surrounding environment, thus were not removed from the monitoring data in the determination of site contributions.

The raw LA10 (15min) value estimated for the residential receivers at 24 Railway Parade was 51 dbA. This slight exceedance is considered negligible when considering the extraneous noise sources which weren't removed from the session and the Noise Enhancing Conditions during this monitoring session.

#### *Loftus Street*

Loftus Street was estimated to have a Site contribution of LA10 (15min) value of 49.4 dbA, which was below the limit of 50 dBA. At this location Bowral Waste Facility was noted as being non-audible on the field sheets, with the majority of noise contributions being associated with extraneous noise sources. Prior to data cleaning, the raw LA10 (15min) value was 52 dBA. Accordingly, it is estimated with a high degree of certainty that Site contributions at this monitoring location are compliant.

### *Compliance Assessment*

The NSW Industrial Noise Policy (2000) stated "A development will be deemed to be in non-compliance with a noise consent or licence condition if the monitored noise level is more than 2 dB above the statutory noise limit specified in the consent or licence condition". While the updated *Noise Policy for Industry* (2017) no longer includes this statement, the principle

remains relevant for assessing the impact of an exceedance. The effect of noise-enhancing weather conditions must also be taken into account. The revised LA10 results at Kiama Street and Funston Street exceed 50 dB(A) by approximately 5 dB(A), however the estimated noise contribution from the landfill operations at each monitoring location, given the impact of Noise enhancing conditions and complex extraneous noise sources are considered to be compliant with Condition L5.1 of the EPL (No.13366), as shown in Table 4.

## Conclusion

The results of attended noise monitoring indicate that under the meteorological and surrounding noise conditions experienced at the time of monitoring, Bowral Waste was compliant with the EPL noise limits at all monitoring locations.

Given the results of past noise assessments, and the minimal noise complaints received, Bowral Landfill intends on ceasing further noise monitoring, and note ***that should operations change, or noise complaints be received, that further noise monitoring will resume, in the following period.***

## Appendices

The following appendices are attached to this report.

- Appendix 1. Site figures and photographs.
- Appendix 2. Sound Level meter calibration certificate.
- Appendix 3. Definitions for key terms.

## Limitations of this assessment

To the best of our knowledge and based on information provided to us by the client or their representatives, the information contained in this report is accurate at the date of issue. 4Pillars has used a degree of care and skill ordinarily exercised in similar investigations by reputable members of the environmental sector in Australia. No other warranty, expressed or implied, is made or intended. The opinions and judgements expressed in this report should not be construed as legal opinions or advice. 4Pillars is also not responsible or liable for any third-Party use or reliance on this report.

Date & time at start	Location	LAeq (15min)	Raw LA10 (15min)	LA90 (15min)	Revised LA10 following data assessment*	Estimated Site contribution to measured LA10(15 min)	Estimated effect of Meteorological conditions	Confidence in estimate	Notes on noise sources
14/04/22 13:48	23 Kiama Street	61	55.2	49.7	55	<50	Moderate	Moderate	Bowral Brickworks audible Landfill vehicles audible Residents' vehicles Birds
14/04/22 14:20	1 Funston Street	56	56.9	51.4	56.3	<50	Moderate	Moderate	Bowral Brickworks machinery audible Resident garden mowing Cars and bikes passing Birds Train passing Pedestrians
14/04/22 14:43	24 Railway Parade	49	51	43.8	50.7	<50	Moderate	Moderate	Landfill machinery audible Bowral Brickworks machinery audible Cars passing Pedestrians Birds
14/04/22 15:07	23 Loftus Street	50	52	42.7	49.4	<50	Moderate	Moderate	Train passing Cars passing Pedestrians and residents Birds

Table 4: Results of attended noise monitoring. All sound measurements are in decibels (dB), A-weighted and averaged over a 15-minute period. \*Note: These values were determined following the removal of extraneous noises where possible. It was not possible to remove all extraneous noises for some sessions due to an error with the audio recording.



## Appendix 1 – Figures and Photographs

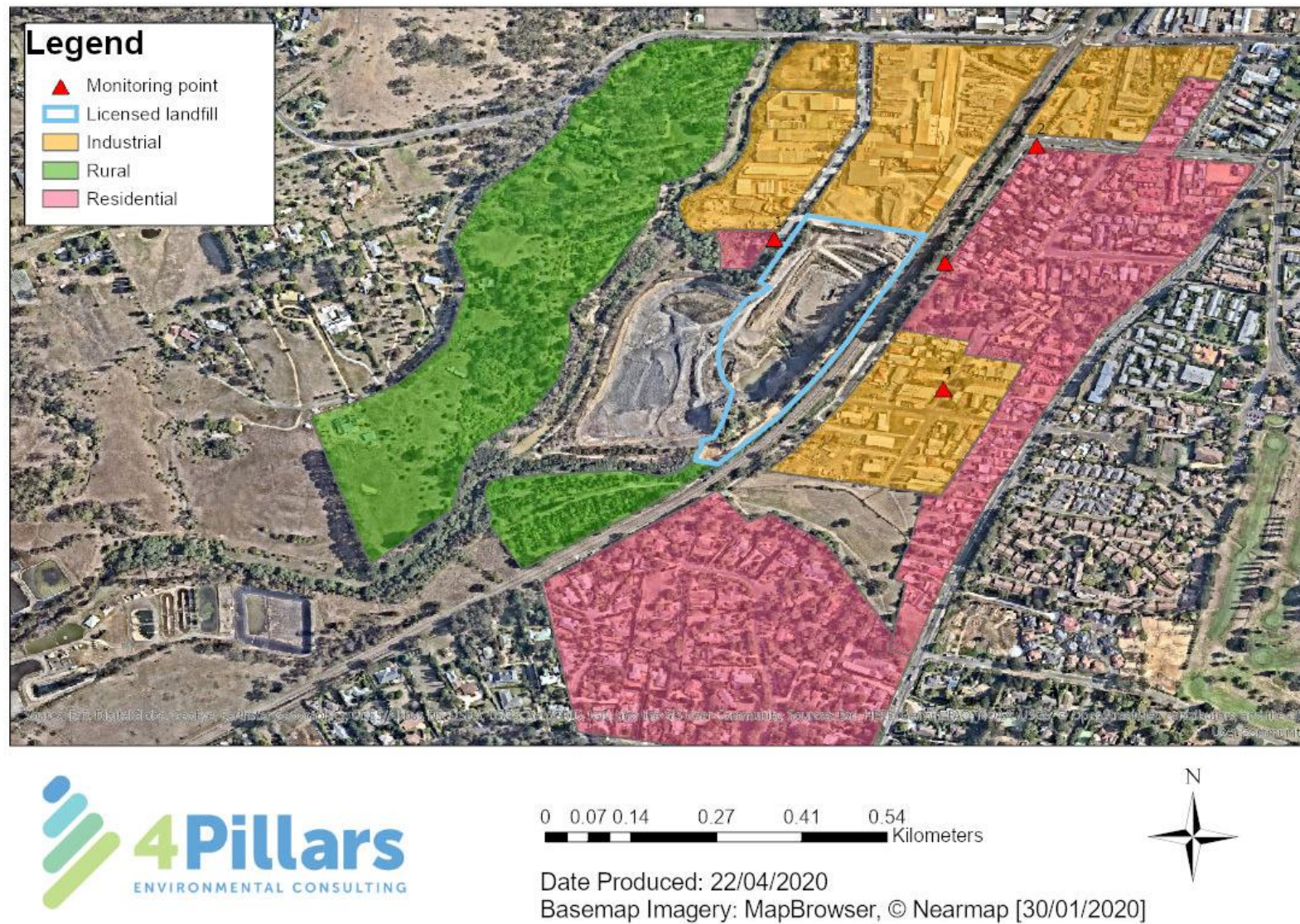
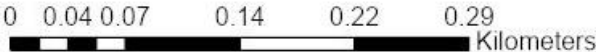


Figure 5: Surrounding land use and noise monitoring points.





Date Produced: 22/04/2020  
Basemap Imagery: MapBrowser, © Nearmap [30/01/2020]

Figure 6: Noise sources ordinarily associated with the development



## Appendix 2 – Calibration certificate



**Acoustic  
Research  
Labs Pty Ltd**

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[www.acousticresearch.com.au](http://www.acousticresearch.com.au)

**Sound Level Meter**  
**IEC 61672-3:2013**  
**Calibration Certificate**  
Calibration Number C21878

<b>Client Details</b>	Acoustic Research Labs Pty Ltd 36/14 Loyalty Road North Rocks NSW 2151
<b>Equipment Tested/ Model Number :</b>	ARL Ngara
<b>Instrument Serial Number :</b>	8780D7
<b>Microphone Serial Number :</b>	322712
<b>Pre-amplifier Serial Number :</b>	27607
<b>Pre-Test Atmospheric Conditions</b>	<b>Post-Test Atmospheric Conditions</b>
<b>Ambient Temperature :</b> 23.6°C	<b>Ambient Temperature :</b> 23.7°C
<b>Relative Humidity :</b> 48.2%	<b>Relative Humidity :</b> 47.7%
<b>Barometric Pressure :</b> 100.4kPa	<b>Barometric Pressure :</b> 100.41kPa
<b>Calibration Technician :</b> Lucky Jaiswal	<b>Secondary Check:</b> Harrison Kim
<b>Calibration Date :</b> 24 Dec 2021	<b>Report Issue Date :</b> 24 Dec 2021
<b>Approved Signatory :</b>	Ken Williams

Clause and Characteristic Tested	Result	Clause and Characteristic Tested	Result
12: Acoustical Sig. tests of a frequency weighting	Pass	17: Level linearity incl. the level range control	N/A
13: Electrical Sig. tests of frequency weightings	Pass	18: Toneburst response	Pass
14: Frequency and time weightings at 1 kHz	Pass	19: C Weighted Peak Sound Level	N/A
15: Long Term Stability	Pass	20: Overload Indication	Pass
16: Level linearity on the reference level range	Pass	21: High Level Stability	Pass

The sound level meter submitted for testing has successfully completed the class 1 periodic tests of IEC 61672-3:2013, for the environmental conditions under which the tests were performed.

However, no general statement or conclusion can be made about conformance of the sound level meter to the full requirements of IEC 61672-1:2013 because evidence was not publicly available, from an independent testing organisation responsible for pattern approvals, to demonstrate that the model of sound level meter fully conformed to the requirements in IEC 61672-1:2013 and because the periodic tests of IEC 61672-3:2013 cover only a limited subset of the specifications in IEC 61672-1:2013.

Uncertainties of Measurement -			
Acoustic Tests		Environmental Conditions	
125Hz	±0.13dB	Temperature	±0.1°C
1kHz	±0.13dB	Relative Humidity	±1.9%
8kHz	±0.14dB	Barometric Pressure	±0.014kPa
Electrical Tests	±0.10dB		

*All uncertainties are derived at the 95% confidence level with a coverage factor of 2.*



This calibration certificate is to be read in conjunction with the calibration test report.

Acoustic Research Labs Pty Ltd is NATA Accredited Laboratory Number 14172.  
Accredited for compliance with ISO/IEC 17025 - Calibration.

The results of the tests, calibrations and/or measurements included in this document are traceable to SI units.

NATA is a signatory to the ILAC Mutual Recognition Arrangement for the mutual recognition of the equivalence of testing, medical testing, calibration and inspection reports.

## Appendix 3 – Definitions for key terms

DESCRIPTOR	DEFINITION
LA	The A-weighted root mean squared (RMS) noise level at any instant
LAF <sub>MAX</sub>	The maximum A-weighted noise level over a time period or for an event
LA <sub>10</sub>	The noise level, which is exceeded for 10 percent of the time, which is approximately the average of the maximum noise levels
LA <sub>90</sub>	The level exceeded for 90 percent of the time, which is approximately the average of the minimum noise levels. The LA90 level is often referred to as the “background” noise level and is commonly used to determine noise criteria for assessment purposes
LA <sub>EQ</sub>	The average noise energy during a measurement period
dB(A)	Noise level measurement units are decibels (dB). The “A” weighting scale is used to describe human response to noise