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ENVIRONMENT PROTECTION AUTHORITY

THIS IS THE APPROVED Noise Management Plan

REFERRED TO IN CONDITION U - 1551

OF EPA AUTHORISATION NUMBER 1126

DELEGATE K Williams DATE 02/08/2023

Noise Management Plan

Adelaide Brighton Cement Limited

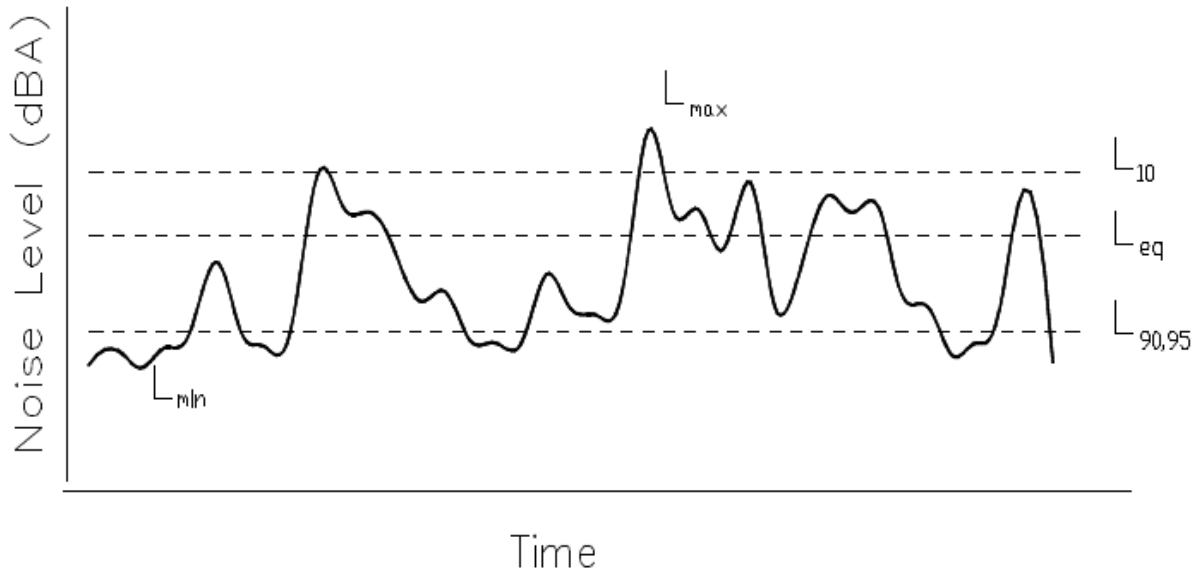
Licence number: 1126
Premises Address: Victoria & Elder Roads, Peterhead
(Birkenhead Site)

June 2023

Contents

Glossary of acoustic terminology

dB(A)	A unit of measurement, decibels(A), of sound pressure level which has its frequency characteristics modified by a filter ("A-weighted") so as to more closely approximate the frequency response of the human ear.
L_1	The noise level which is equalled or exceeded for 1% of the measurement period. L_1 is an indicator of the impulse noise level, and is used in Australia as the descriptor for intrusive noise (usually in dBA).
L_{10}	The noise level which is equalled or exceeded for 10% of the measurement period. L_{10} is an indicator of the mean maximum noise level, and is used in Australia as the descriptor for intrusive noise (usually in dBA).
L_{90}	The noise level which is equalled or exceeded for 90% of the measurement period. L_{90} is an indicator of the mean minimum noise level, and is used in Australia as the descriptor for background or ambient noise (usually in dBA).
L_{eq}	The equivalent continuous noise level for the measurement period. L_{eq} is an indicator of the average noise level (usually in dBA).
L_{max}	The maximum noise level for the measurement period (usually in dBA).



Note: *The subjective reaction or response to changes in noise levels can be summarised as follows*:

A 3 dB(A) increase in sound pressure level is required for the average human ear to notice a change; a 5 dB(A) increase is quite noticeable and a 10 dB(A) increase is typically perceived as a doubling in loudness

1.0 Purpose

This plan details how noise is managed at the Birkenhead site, to minimise impacts on the local community.

It outlines how Adelaide Brighton Cement Limited (ABC) assesses and manages the impacts of noise generated at the Birkenhead site, with the aim of ensuring that

- Noise impacts are considered as part of routine operations
- Noise emissions are controlled at source by good operational practices, physical and management controls
- Appropriate, reasonable and practicable measures are taken to reduce noise emissions from the site and the impact on nearby receptors in the local community

2.0 Scope

The Noise Management Plan (NMP) addresses

- Monitoring of noise emissions from the site
- Identification of major noise sources
- Provision of measures to manage the cumulative impact of noise sources on site
- Compliance with relevant legislative requirements
- Management of noise complaints
- Continuous improvement in noise emissions
- Reporting on the implementation and effectiveness of the Plan
- Provision of public access to quarterly and annual reports and this plan

3.0 Applicable legislative requirements and guidance

South Australian Environment Protection Act 1993

South Australian Environment Protection Regulations 2009

South Australian Environment Protection (Noise) Policy 2007 (EP (Noise) Policy)

Guidelines for the use of the Environment Protection (Noise) Policy 2007, June 2009, Environment Protection Authority

Port Adelaide Enfield (City) Development Plan, Consolidated February 2018

South Australian Development Act 1993

Adelaide Brighton Cement‘s EPA Licence No1126, 1/11/2022, condition U – 1551

1.6 SITE NOISE MINIMISATION (U - 1551)

The licensee must:

1.6.1 take all reasonable and practicable measures to minimise noise generated at the Premises;

1.6.2 develop a Noise Management Plan to the satisfaction of the EPA by the compliance date listed below;

1.6.3 ensure that the Noise Management Plan includes but need not be limited to:

a detailed action and response strategies that will be undertaken by the Licensee to prevent and minimise noise generated at the Premises;

b a methodology and framework for providing public access to the Noise Management Plan (or any revised plan approved by the EPA) and to quarterly and annual reporting;

1.6.4 submit a quarterly report to the EPA by the 15th day of February, May, August and November of each year that includes but need not be limited to:

a a summary of action and response strategies undertaken during the quarter to minimise noise generated at the Premises;

b a review and analysis of noise related complaints received and recorded during the quarter pursuant to condition U-1553;

1.6.5 submit an annual report to the EPA by the 15th of February of each year, that includes but need not be limited to:

a a review of the effectiveness of all action and response strategies identified pursuant to this condition;

b a review and analysis of noise related complaints received and recorded pursuant to condition U-1553;

c identification of potential opportunities for improvement in noise management at the Premises; and

1.6.6 implement the Noise Management Plan approved in writing by the EPA (or any revised plan approved in writing by the EPA).

Compliance Date: 30-Jun-2023

Adelaide Brighton Cement's EPA Licence No1126, 1/11/2022, condition U – 1553

3.5 COMPLAINTS REGISTER (U - 1553)

The Licensee must:

3.5.1 prepare and maintain a register of all complaints received concerning environmental issues that includes:

a the date and time that the complaint was made;

b details of the complaint, including the likely cause of the events giving rise to the complaint;

c the contact details of the complainant (if permitted by the complainant);

d an estimate of the temperature, wind speed, wind direction and rainfall at the time of the events giving rise to the complaint;

e the date, time and details of any action taken by the Licensee in response to the complaint and to prevent a recurrence of the events giving rise to the complaint;

3.5.2 respond to the complainant within 72 hours; and

3.5.3 ensure that a summary report of complaints received is made publicly available.

4.0 Background

4.1 Site context

The Birkenhead plant is located on the Le Fevre Peninsula and has the Shell/ExxonMobil Birkenhead Terminal to the north, the Port River Expressway (A9) to the south, Victoria Road (A16) to the west

and the Dry Creek-Port Adelaide railway freight line to Outer Harbour on the east as well as the Port Adelaide River.

ABC has been operating its cement and clinker manufacturing plant at Birkenhead for over 100 years which produces approximately 1.6 million tonnes of cement annually and operates 24 hours a day seven days a week.

ABC's customers and suppliers use the major arterial roads servicing the Birkenhead plant for the delivery of goods by road.

In addition, ABC has access to the deep-water port facilities of Port Adelaide for the receipt of raw materials and export of finished product. ABC's shipping movements can be summarised as follows:

- 7,500 tonnes of limestone (the main raw material used for cement manufacture) is received from Klein Point on a daily basis via ABC's purpose built limestone carrier. The vessel normally discharges from late afternoon continuously over a 12 hour period, but can discharge anytime in a 24hr period;
- Bulk cement exports in vessels ranging in size from 16,000 tonnes to 38,000 tonnes are loaded approximately every seven days, continuously from 24 to 48 hours;
- Slag imports are received in 28,000 tonne vessels approximately every six weeks and are unloaded continuously over about a four-day period;
- Other raw materials are received in vessels ranging between 12,000 tonnes and 38,000 tonnes from time to time; and
- Bulk clinker is exported in 4,000 tonne shipments, approximately every 6 to 8 weeks.

4.2 Noise

4.2.1 Introduction

Noise generation is an inherent part of most activities and has an almost unlimited range of sources including industrial activities, road traffic, and domestic activities.

The response to noise by individuals can be as wide and as varied as the number of activities that produce it.

A contemporary noise policy needs to have the flexibility to consider the range of factors that include the level of noise, time of day, how loud or quiet that area is expected to be, the history of the area in which the noise is located, the solutions that are applied to the noise in other similar situations and the capacity to deliver the solutions that result in noise reduction.

The Environment Protection (Noise) Policy therefore provides a set of appropriate guidelines for industry, acoustic consultants and regulators to manage the impact of noise emissions.

ABC uses acoustic noise specialists to undertake regular noise measurements on site, and in the local community in accordance with EPA noise measurement guidelines.

Acoustic engineer's reports note that there are other ambient noise sources, particularly road traffic, which contribute to the background ambient noise level and measured noise levels are not necessarily due to ABC operations alone.

4.2.2 Assessment of site noise emissions

To provide context for the noise management plan, the most recent site noise Assessment Report "Birkenhead Plant – Annual Noise Survey Report – May 2022" report 50B-22-0069-TRP-34608-

3, dated 29 June 2022, (Report), has been prepared by Vipac Engineers and Scientists Limited (Vipac), a copy of which is included in Appendix A.

The report provides measured noise emissions, noise modelling, assessment of new works and implementation of reasonable and practical noise mitigation projects undertaken by ABC to manage and minimise noise emissions from the Birkenhead site over the last few years.

4.2.2.1 Indicative noise levels

The relevant indicative noise levels, determined in accordance with the EP (Noise) Policy that are applicable for sensitive receivers near the site are contained in Table 1: Indicative noise levels.

Table 1: Indicative noise Levels

	Indicative noise Levels (L_{eq}, dB(A))	
	Day-time (7 am to 10pm)	**Night-time (10pm to 7am)**
Suburban Neighbourhood zone)	57	49
General Neighbourhood zone	57	49

4.2.2.2 Noise emission profile

The noise emissions from the Birkenhead site operations are characterised as continuous broadband, steady-state noise, not comprising of any modulating or impulsive characteristics and the absence of tones.

In general, noise levels comply with the day-time indicative noise level of 57 Leq,dB(A) refer to table 1. Noise levels comply with the night-time indicative noise levels of 49 Leq,dB(A), for most noise sensitive receivers. Where noise levels exceed the 49 dB(A) night-time criterion, the exceedance is generally less than 3 dB(A) which subjectively is a ‘just noticeable change’ when compared with the indicative noise level.

To provide a consistent basis on which to evaluate noise impacts within the local community from plant operations and to evaluate effectiveness of mitigation measures, noise levels are measured at defined locations outside the plant boundary (refer to Appendix B). Figure 1 shows the attended noise monitoring locations in the local community.

Figure 1 Attended noise monitoring locations

Recent night-time attended measurements show that both the L_{Aeq} and L_{A90} night time criterion for all measurement locations, with the exception of the following locations noted in Table 2 night-time survey exceedances

Table 2 Night-time survey exceedances

Location	L_{Aeq} [dB(A)]	L_{A90} [dB(A)]	Criterion [dB(A)]	Exceedance [dB(A)]
R2	53	**52**	49	3
R5	**50**	48	49	1
R10	54	**50**	49	1
R12	54	**52**	49	3
R15	53	**52**	49	3
N2	**50**	48	49	1

In general exceedances of the night-time criterion are generally limited to receivers within approximately 250 metres of the site boundary

Unattended noise logging surveys during normal operations and plant shutdown periods conducted near Victoria Road show that there is a significant contribution of road traffic noise from this major arterial road during both shutdown periods and normal operations with average

noise levels between 58dB(A) and 60 dB(A)being observed during the day period. This significant noise source contributes to higher noise levels being measured and hence an over estimate of ABC's noise emissions. Noise modelling has been used to supplement attended and unattended noise monitoring to provide an estimate of noise levels resulting from ABC's emissions alone (i.e., excluding the influence of other noise sources such as road traffic).

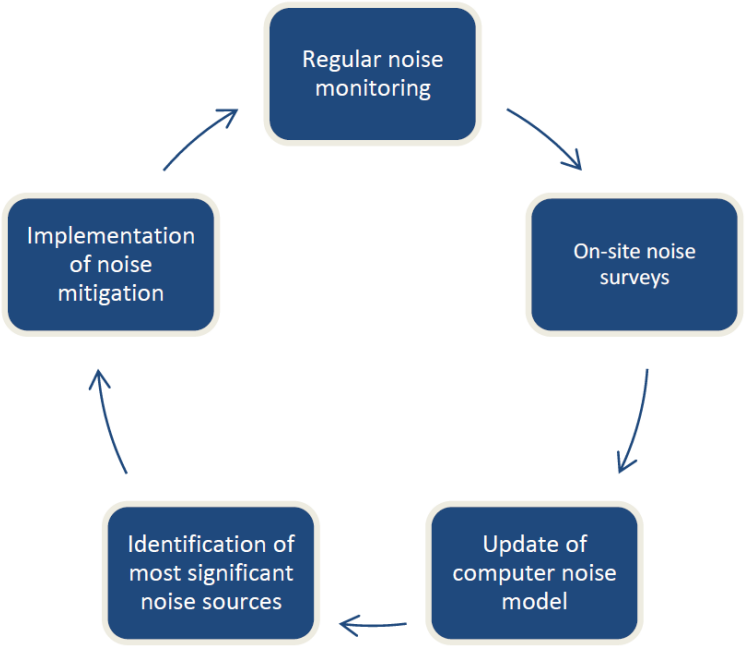
In response to resident concerns, ABC engaged Resonate Acoustics to undertake ground vibration monitoring studies in the vicinity of the nearest residential properties. The results of this work concluded that it is unlikely that ABC operations were a direct cause of measured peak vibration levels and that the likely cause was due to vehicle movements on adjacent or localised activity close to the accelerometer (monitor).

4.2.3 Approach to noise management

The approach that ABC takes to noise management is twofold:

1. Ongoing daily management of operational activities to minimise the impact of noise emissions on sensitive receptors and includes:
    - Maintenance of plant and equipment to minimise unnecessary noise emissions
    - Employees and contractors are aware of site noise requirements and their responsibilities to take action to minimise and prevent noise complaints
    - Ensuring that potential noise impacts are assessed and mitigated when plant modification and equipment changes are made
    - Investigation of noise complaints and implementation of corrective/preventative action
2. Continuous improvement in noise emissions through an ongoing programme to identify noise sources and implement reasonable and practical measures to reduce noise levels from these sources. This is summarised in Figure 2 Approach to continuous improvement.

Figure 2: Approach to continuous improvement



5.0 Responsibilities

The organisational chart presented in Figure 3 shows personnel with roles that have been assigned in the noise management plan

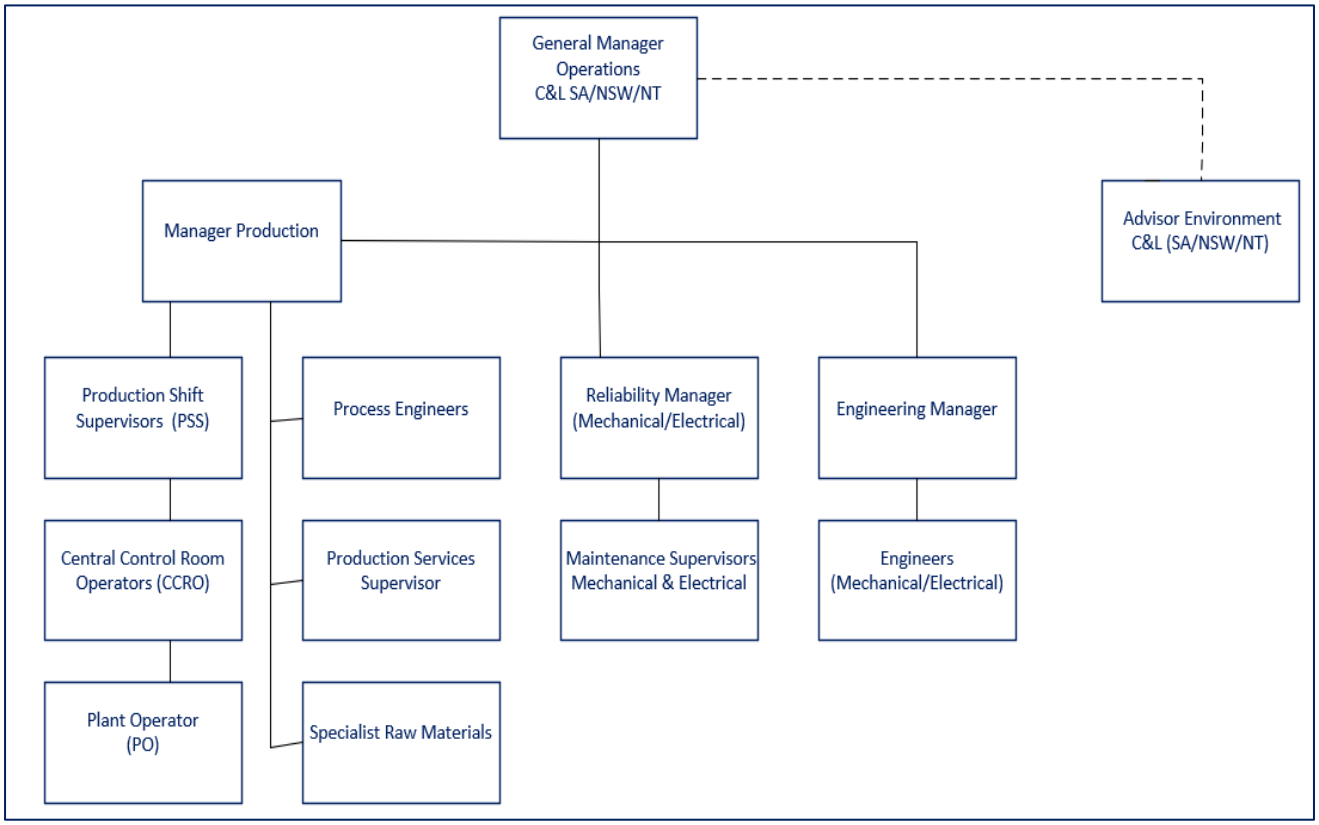


Figure 3 Organisation chart showing positions at the Facility with responsibilities under the NMP

All employees are responsible for complying with this plan, which includes:

- Taking action to minimise or prevent noise complaints
- Identifying and reporting noisy plant, equipment and activities

Table 2 General Responsibilities details the responsibilities that apply in relation to this NMP.

Table 2: General Responsibilities

Position	Responsibility
All Employees	Responsible for complying with the Noise Management Plan. This includes: • Taking action to minimise or prevent noise complaints • Reporting noisy plant, equipment and activities
Production Shift Supervisors, Supervisors	Responsible for minimising noise emissions from operational activities. This includes: • Monitoring operations and maintenance work to ensure noise emissions do not result in noise complaints • Investigating and responding to noise complaints received outside of business hours and taking immediate action (if possible) to reduce noise emissions • Identifying and reporting noisy plant, equipment and activities • Taking action to minimise or prevent noise complaints
Manager Production, Engineering Manager, Process Engineers, Engineers, Reliability Manager & Supervisors	Responsible for minimising noise emissions from operational activities. This includes: • Ensuring employees and contractors are trained with respect to noise awareness, responsibilities, instructions, procedures • Monitoring operations and maintenance work to ensure noise emissions do not result in noise complaints • Timely plant and equipment maintenance to minimise noise emissions • Investigation of noise complaints, identification and implementation of corrective/preventative action • Developing and implementing contingency plans where there is a potential for nuisance noise complaints arising from activities such as demolition, construction, major shut down activities. • Noise impacts from plant modifications/equipment changes are assessed and appropriate controls identified before they are implemented • Reviewing operations and implementing noise reduction solutions.
Advisor Environment - C&L (SA/NSW/NT)	Responsible for: • Ensuring annual noise monitoring is undertaken • Noise monitoring, modelling and assessments are undertaken by qualified acoustic engineers • Identification of noise mitigation opportunities • Inclusion of noise mitigation opportunities in an Environmental Improvement Plan (EIP) • Verifying implementation of corrective and preventive actions (via noise measurements / internal audits) • Reviewing noise complaints to identify noise issues/trends • Quarterly and annual noise reporting requirements

Position	Responsibility
	• Informing the EPA of activities with potential to result in off-site atypical noise emission impacts on sensitive receptors • Informing affected sensitive receptors of the nature/duration of activities with potential to result in off-site, atypical noise emission impacts • Ensuring noise awareness is included in site induction and environmental training
General Manager Operations - C&L (SA/NSW/NT)	Responsible for: • Implementation of the Noise Management Plan Ensuring employees and contractors are aware of the site EPA licence, and other regulatory requirements relating to plant noise • Providing resources to reasonably and practically implement this plan

6.0 Measures to manage the cumulative impact of noise sources on site

6.1 Noise monitoring

Compliance noise monitoring is to be undertaken by qualified acoustic engineers in accordance with the EP (Noise) Policy and EPA noise measurement guidelines.

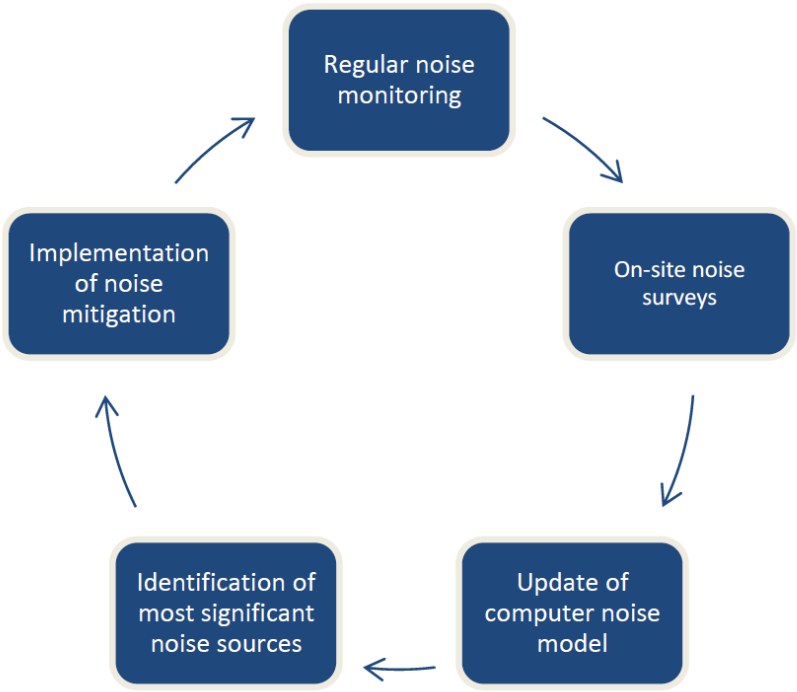
Noise measurements (attended and unattended) are to be undertaken for the following purposes:

- To determine the impact of plant operations on the local community
- Provide noise data at selected locations over time
- Provide baseline data for continuous improvement
- Evaluation of the plant operations against EP(Noise)Policy goals
- Provide data for noise impact modelling (Sound PLAN 3D noise modelling)
- Noise surveys to Identify highest risk noise sources and opportunities for noise mitigation
- Where appropriate assist in resolution of noise complaints and issues
- Confirm effectiveness of implemented noise attenuation/mitigation projects
- On completion of significant changes to plant, equipment or process
- To capture periods of atypical noise emissions e.g., shutdowns, construction, demolition activities

To provide a consistent basis on which to evaluate noise impacts within the local community from plant operations and to evaluate effectiveness of mitigation measures, noise levels are to be measured at defined locations outside the plant boundary (refer to Appendix B).

Noise measurements are used to drive continuous improvement in noise emissions as illustrated in Figure 2 Approach to continuous improvement.

Figure 2: Approach to continuous improvement



An annual report prepared by a qualified Acoustic Engineer in accordance with the EP (Noise) Policy and EPA noise measurement guidelines that includes:

- Attended measurement of noise at defined locations within the community (Appendix B)
- A plant noise survey to identify highest risk noise sources
- Confirm implemented noise attenuation measures are effective
- Update the site noise model accordingly
- Identify opportunities to mitigate noise emissions

6.2 Management control measures

6.2.1 Employee and contractor awareness and training

All employees and contractors should, through delivery of appropriate training and induction programmes, understand that noise arising from activities that are undertaken on site could impact on residents and the need to:

- Take action to report, minimise and prevent noise complaints
- Understand the most appropriate times to undertake high noise generating activities
- Keep doors closed on buildings containing noisy equipment
- Respond to conditions that can result in noise complaints
- Use suitable equipment and noise controls such acoustic enclosures when undertaking noisy activities
- Investigate and resolve noise complaints

ABC has an on line site induction and inbuilt assessment package, which records relevant details (name, company, date of successful completion of the induction training) within the induction database. All contractors and employees are required to successfully complete the site induction training package on the following frequency: contractors annually, employees every 2 years.

6.2.2 Acoustic planning

Noise prevention and abatement controls will be considered in the planning process for;

- Activities that are likely to impact on the local community
- Plant shutdowns for maintenance
- Purchasing replacement plant and equipment
- Process improvements and modifications
- Appropriate training and supervision of employees and contractors

Assessment of noise impacts during planning activities will be undertaken through the use of appropriate assessment tools and processes that may include

- Risk assessments
- HAZOP studies
- Plant design and modification processes
- Acoustic modelling
- Use of Acoustic and engineering consultants
- Noise measurements
- Current practice, knowledge and experience of similar process or equipment

6.3 Physical measures

6.3.1 Overview of existing plant noise attenuation techniques

The majority of the site operations are undertaken in fully enclosed buildings that act as a noise barrier, attenuating noise emissions from the enclosed plant, process and operational activities.

Where reasonably practicable particularly noise plant/equipment is located in acoustically designed enclosures, e.g., compressors. Identified noisy plant and equipment that has a high risk of off-site noise impact has noise attenuation measures applied such as silencers, lagging, vibration mountings, acoustic baffles etc.

6.3.2 Acoustic barriers /noise attenuation

Acoustic barriers / noise attenuation controls are to be applied primarily to fixed machinery and plant with identified noise issues. Acoustic barriers may include the following:

- Acoustically treated walls/panels etc. to absorb noise
- Enclosed rooms or enclosures for stationary machinery such as compressors
- Noise attenuating equipment e.g., white noise reversing alarms, vibration isolation mountings
- Silencers
- Where possible plant/equipment modifications

6.4 Noise Contingency Measures

6.4.1 Noise Complaints

ABC provides a range of ways in which it can be contacted by members of the public about any matter of concern which include:

- A 24 hour, 7-day hotline phone number 8300 0520. This 24/7 service provides the option to be called back immediately by the on-site supervisor or to be contacted the next business day
- ABC's main switchboard on 8300 0300 between our normal business hours of 8:30 am to 5pm
- By email: BirkenheadCommunity@adbri.com.au
- By completing and submitting an online feedback form accessed through ABC Community webpage https://adelaidebrightoncommunity.com.au/contact/
- A process for community engagement, documented in a Community Engagement Plan, licence condition U-1552

Complaints are managed in accordance with EPA licence 1126, 1/11/2022, condition U-1553. Details of all noise complaints are logged into the complaints database and are communicated to the appropriate staff member to be investigated.

Immediate action is to be taken to mitigate identified sources of noise complaints and longer term corrective action will be identified to minimise a reoccurrence.

Identified noisy plant, equipment and activities reported by site employees and contractors are logged into the complaints database and managed in the same way as external noise complaints.

6.4.2 Plant shutdowns/major site works

Planned events where the activity to be undertaken has the potential to change the characteristics of the normal plant background noise, such as plant shutdowns, demolition and construction activities, will be risk assessed and appropriate controls implemented to manage off site impacts. The manager with responsibility for the activity/project is to ensure a risk assessment appropriate to the nature of the activity and potential noise emissions impact is undertaken (refer section 6.2.2 Acoustic planning).

These controls may include,

- Where appropriate, the development of a specific noise minimisation plan for that activity
- Limiting particular activities to certain times of the day where this is reasonably practical
- Identification of controls to minimise noise from specific activities
- Noise measurements to ensure identified measures are effective (refer 6.1 Noise measurements)

The EPA is to be informed of activities that have the potential to result in atypical off-site noise emissions and advised of the nature, relevant details, duration and controls in place to mitigate off site noise impacts from such activities prior to their commencement. Sensitive receptors will be advised of relevant details (nature/duration of activities) prior to their commencement through the current accepted communication channels at the time, which may include letter box drops/print media/website/CLG meetings)

6.4.3 Emergency noise

Emergency alarms and sirens are used to alert people to a risk to their personal safety and plant process issues.

Metropolitan Fire Services personnel need to investigate fire alarms and assess that the situation / plant / building is safe, before fire alarms can be cancelled/silenced.

Audible pre warning alarms that are a mandatory safety requirement to alert employees to imminent plant /equipment start up are located within buildings close to the piece of equipment.

Plant process alarms are managed within the plant SCADA systems, which are, monitored 24/7 in a centralised control room manned by control room operators. Plant conditions giving rise to process alarms are addressed promptly to correct the process conditions generating the alarm. Most of the audible alarms are located within a building close to the relevant part of the process. The Kiln flush alarm is located externally within the preheater towers to alert process operators in these areas for safety reasons. The process conditions generating a kiln flush alarm occurs infrequently and sound several times for about one minute duration over about a thirty min period as the process conditions are rectified.

6.5 Continuous improvement and reporting measures

Activities that drive continuous improvement in noise management are summarised in table 3

Table 3: Summary of activities driving continuous improvement in noise management

Activity:	Description:
On-site noise surveys	On-site noise surveys are conducted regularly to identify significant noise sources and inform updates to the noise model. The on-site surveys allow the effectiveness of previous noise mitigation projects to be quantified, and an accurate noise model of the site to be maintained. Regular on-site noise surveys also allow for the continued effectiveness of previous noise mitigation projects to be verified.
Computer noise modelling	Computer noise modelling of the site allows for an understanding of the relative contribution of each noise source to noise emissions in the community to be developed, which allows for a risk-based approach to noise mitigation to be adopted. The noise model is updated regularly (approximately every 12 months) to reflect recent changes in the noise profile of the plant (e.g., to incorporate recent noise mitigation projects)
Identification of highest risk noise sources	From the updated noise model (and site noise surveys), the noise sources with the highest risk of off-site noise impacts are identified (based on their relative contribution to predicted noise levels), and noise mitigation projects are targeted at these noise sources.
Noise mitigation	Noise mitigation projects are targeted at the noise sources which pose the greatest risk to off-site noise impacts within the community (as identified above). This ensures that the maximum benefit to the community is realised.
Regular attended and unattended noise monitoring	Regular attended and unattended noise monitoring is undertaken in the community to determine the effectiveness of recent noise mitigation projects, validate the noise model for the site, and to form a baseline for the next round of noise mitigation projects. Regular noise monitoring at the same locations allows for trends over time to be observed with regard to noise impacts.

Activity:	Description:
Ad-hoc noise monitoring	In addition to regular attended and unattended noise monitoring, ad-hoc surveys are also undertaken to capture periods of atypical noise emissions (such as shut-downs, construction projects and demolition activities, or introduction of new noise sources), and to address specific noise complaints. Surveys undertaken during shutdown periods also allow an understanding of the contribution of major noises to be gained, as well as an understanding of the noise level present in the absence of significant on-site noise sources to be developed.
Procurement/process changes	Consideration of lower noise emission products when selecting new plant and equipment, or when process changes are made.
Management processes	Management and communication processes that help facilitate awareness of noise emissions and provide avenues for identifying, communicating, reporting, assessing, controlling and reducing site noise emissions, include: • Internal and external management system audits. • Certified ISO 14001 Environmental Management System • Internal process change requests • Equipment/Task risk assessments (safety/environment/quality) • Housekeeping /workplace inspections • Plant equipment preventative maintenance schedules • Production meetings & tool box talks • Weekly and monthly management meetings
Complaints management	ABC provides a range of options for members of the public to raise concerns about operations, including a 24/7 telephone hotline, email, and an online feedback form. All complaints are logged into ABC's database and are responded to within 72 hours. Immediate action to resolve the issue is taken if possible, and longer-term actions are taken to prevent recurrence.
Community engagement	ABC makes monitoring reports and plans available to the community on its website where appropriate and participates in community liaison group meetings.
Training	ABC ensures that employees and contractors are trained and aware of requirements relating to noise (including reporting and taking action when noisy plant, equipment or processes are identified) through site inductions and environmental awareness training.

6.5.1 Measurement and reporting of improvement

6.5.1.1 Improvement projects

- Identified noise attenuation projects with a high risk of off-site noise impacts are to be captured in an Environmental Improvement Plan (EIP). The EIP provides a framework that summarises project details, implementation time frames and expected improvement in noise emissions. The EIP also provides a mechanism for communicating a commitment to continuous improvement in noise emissions to sensitive receptors.
- Noise measurements will be undertaken pre and post implementation of identified noise attenuation projects to verify effectiveness of the project.

6.5.1.2 Reporting

A quarterly report will be prepared detailing noise management activities for the quarter.

Quarterly reports will include where applicable:

- Details of noise complaints (excluding complainant name and identifying address details (for reasons of confidentiality), received during the quarter, including outcomes of the complaint investigation and where applicable corrective actions implemented
- Details on the progress of noise attenuation projects including effectiveness
- Details of noise monitoring reports
- Details of other noise minimisation activities

The annual report will include where applicable:

- Graph of noise complaints received for the year and trend report in noise complaints compared with the previous year
- Summary of noise monitoring in the local community and an assessment of results against previous monitoring results to identify trends in noise levels.
- Summary of noise minimisation actions and overall effectiveness
- Details of other noise minimisation activities
- Assessment of the effectiveness of this noise management plan

Quarterly noise reports will be submitted to the EPA, by the 15th of February, 15th of May, 15th of August and 15th of November and the annual report to be submitted to the EPA by 15th of February.

Reports will be made available on the ABC Community Web Site, within 7 business days of the reporting period.

6.5.2 Public Access

A copy of the current version of this Plan, as approved by the EPA, will be made available on the ABC Community Web Site within 7 business days.

7.0 Plan Submission

Submitted by:

Name: Craig Mackenzie

Position: Advisor Environment – C&L (SA/NSW/NT)

Authorised on behalf of

ADELAIDE BRIGHTON CEMENT LTD.

Dated: 30/6/2023

8.0 Plan Approval

Approved by:

…….

DELEGATE OF THE ENVIRONMENT PROTECTION AUTHORITY

Signed : ……..

Dated : ……/……../……...

Appendix A

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Adelaide Brighton Cement Ltd

Birkenhead Plant – Annual Noise Survey

Noise Survey Report – May 2022

50B-22-0069-TRP-34608-3

29 June 2022

Job Title:	Birkenhead Plant – Annual Noise Survey
Report Title:	Noise Survey Report – May 2022
Document Reference:	50B-22-0069-TRP-34608-3

Prepared For:	**Prepared By:**
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Author:	Saksham Garg 29 June 2022	Senior Engineer
Reviewer:	Mark Ogilvie 29 Jun 2022	Senior Engineer
Issued By:	Saksham Garg 29 Jun 2022	Senior Engineer

Revision History:

Rev. #	*Comments / Details of change(s) made*	*Date*	*Revised by:*
Rev. 00	Original issue	29 Jun 22	

Table of Contents

1 Introduction

Vipac Engineers & Scientists (Vipac) were engaged by Adelaide Brighton Cement Limited (ABC) to undertake an on-site noise measurement survey of selected plant (plant upgraded or refurbished since previous noise survey in September 2021), environmental noise survey at residential locations within proximity of the ABC Birkenhead plant during typical operations and update the computer noise model (SoundPLAN model) for the plant based on the survey results. The noise survey (off-site and on-site) was conducted during the month of May 2022.

This report provides details of the results of the on-site and off-site attended noise survey, details of the noise model update and comparison of the results of the noise survey and the updated noise model predictions against the three most recent previous surveys.

2 References

[1] Vipac report 50B-18-0036-TRP-8950467-0 "Attended Noise Survey April 2019", dated 16 April 2019.

[2] Vipac report 50B-20-0065-TRP-10950285-3 "Birkenhead Plant Noise Survey - May 2020", dated 29 May 2020.

[3] Vipac report 50B-18-0036-TRP-6755126-2 "Birkenhead Environmental Noise–Noise Model Update and Abatement Options", dated 27 February 2019.

[4] Environment Protection Act 1993, Government of South Australia (1995).

[5] Licence No. 1126 Adelaide Brighton Cement Limited (issued 01 November 2017), Environment Protection Authority

[6] Environment Protection (Noise) Policy 2007, Government of South Australia (2008).

[7] Guidelines for the Use of the Environment Protection (Noise) Policy 2007, Environment Protection Authority (SA) (2009).

[8] AS 1055.1-1997 Acoustics – Description and measurement of environmental noise – Part 1: General procedures, Standards Australian (1997).

[9] Port Adelaide Enfield Council Development Plan (consolidated 30 April 2020), Department of Planning, Transport and Infrastructure (DPTI). *Revoked & replaced by The Planning & Design Code on 19 March 2021*.

[10] Australian Standard AS IEC 61672.1-2004 Electroacoustics – Sound level meters Specifications, Standards Australia (2004).

[11] 50B-20-0065-TRP-45950069-2, *'New Cooling Tower Noise Assessment Report'*, dated 11 December 2020.

[12] 50B-20-0065-TRP-16550032-1, *'Tertiary Recycle Project Acoustics'*, dated 06 July 2020.

[13] 50B-20-0065-TRP-16550045-3, *'Cement Mill 6 Upgrade Noise Assessment Report'*, dated 02 July 2020.

[14] Plan SA website, https://sappa.plan.sa.gov.au/.

[15] The Planning & design Code SA.

[16] 50B-21-0078-TRP-47284453-1, *'Demolition Works Noise Report'*, dated 14 April 2021.

[17] 50B-21-0078-TRP-26964-0, *'January 2022 Demolition Noise Survey Report'*, dated 02 February 2022.

[18] 50B-21-0078-TRP-21553-2, *'Annual Noise Survey Report 2021'*, dated 11 November 2021.

[19] 50B-22-0061-TRP-31009-1, *'ABC Birkenhead Burner Replacement – Noise Report'*, dated 13 April 2022.

[20] 50B-21-0078-TRP-25617-2, *'AJ279 Blend Silo DA Acoustics Report'*, dated 02 February 2022.

3 Background

Adelaide Brighton Cement's (ABC) Birkenhead operations are licensed by the EPA for conduct of an activity identified in Schedule 1 of the *Environment Protection Act 1993* [4]. Condition U-787 of ABC's EPA License for the Birkenhead site [5] relates to noise. Specifically, ABC is required to develop and implement a noise management plan for the site. Regular attended noise monitoring surveys, development of a computer noise model for the site, and identification and implementation of noise abatement projects form part of the noise management plan.

ABC, therefore, have engaged Vipac to conduct annual attended noise monitoring surveys (day and night time) in the community surrounding the plant and within the plant for selected equipment/machinery refurbished or upgraded in the preceding year, and to annually update a computer noise model for the site (most recently updated in September 2021 [2]). This report provides details of the noise surveys, detailed computer noise model review, and provides a comparison of the predicted and measured noise levels against the historical data.

Please note that the environmental noise criterion has been updated in this report to reflect the changes in South Australian legislation, which included revoking of Council Development Plan and replacing it with a single Planning & Design Code ("The Code"). The implications of this change are discussed in the Section 4.

4 Assessment Criteria

4.1 Environment Protection (Noise) Policy 2007

Noise from industrial activities (such as those conducted at the ABC Birkenhead site) is subject to the provisions of the *Environment Protection (Noise) Policy 2007* (Noise EPP) [6]. The Noise EPP outlines Noise Goals which provide one method for demonstrating compliance with the General Environmental Duty under Section 25 of the *Environment Protection Act 1993* (the Act) [4]. Compliance with the Noise Goals may be achieved by demonstrating compliance with the Indicative Noise Levels (INLs) applicable to the site, as determined in accordance with Clause 5 of the Noise EPP and the Planning and Design Code of SA provisions.

Previously (until 19 March 2021), the INLs were derived in accordance with the land use and zoning provided by the Port Adelaide Enfield Council Development Plan. However, with the change in the SA policies, the Planning & Design Code has replaced the Council Development [15]. The change, essentially, includes incorporating all council development policies in SA into a single *Code*. This has resulted in slight change of zone designation/naming; however, the promoted use of the land remains same/similar.

As such, with reference to the Code, the site is located within the "Strategic Employment" (SE) zone. The nearest noise sensitive receptors (NSRs) are located within "Suburban Neighbourhood" (SN) zone and "General Neighbourhood" (GN) zone.

In accordance with the Development Plan, the "Strategic Employment" zone primarily accommodates industrial, logistical, warehouse, storage and transport land uses, and the "General Neighbourhood" and "Suburban Neighbourhood" zone promotes residential land use. With reference to the *Guidelines for the Use of the Environment Protection (Noise) Policy 2007* [7], it is therefore considered that the "Strategic Employment" zone principally promotes the "General Industry" Land Use Category, as set out in Table 2 of the Noise EPP. With reference to the relevant development plan provisions, it is considered that the "General Neighbourhood" and " Suburban Neighbourhood" zone principally promote the "Residential" land use category.

As such, the following Indicative Noise Levels (INLs) apply to ABC's operations:

- Suburban & General Neighbourhood NSR's
  - Day-time – 59 dB(A)
  - Night-time – 50 dB(A)

However, Vipac notes that the historical (annual) noise survey and assessment conducted for ABC Birkenhead has been based on the criteria (INL's) listed in Table 4-1. Even though the criteria derived in accordance with the Code is higher (slightly relaxed) than the criteria listed below, and considering that the criteria (Table 4-1) has been advised and agreed upon by EPA SA, Vipac has conducted the assessment against the Table 4-1 criteria.

Table 4-1 – Indicative Noise Levels

Zone	Indicative Noise Levels (L_{eq}, dB(A))	
	Day-time (7am to 10pm)	Night-time (10pm to 7am)
Suburban Neighbourhood Zone	57	49
General Neighbourhood Zone	57	49

NOTE: The Environment Protection Authority (EPA) has advised that comparison of the L_{A90} noise level descriptor measured within 100 metres of the centre line of Victoria Road with the above Indicative Noise Levels is an acceptable method for eliminating the influence of short-term/transient noise level events (such as intermittent passing road traffic, for example) on the results. This includes measurement positions N1, R2, R10, R12, R15 and R16. At distances greater than 100 metres, the use of the L_{Aeq} descriptor is required.

4.2 Adjustment for Characteristics

For a noise containing a characteristic (tonal, impulsive, low frequency or modulating), the following adjustments are to be made to the source noise level:

- Noise containing 1 characteristic; a 5dB(A) penalty must be added to the noise level (continuous),
- Noise containing 2 characteristics; an 8dB(A) penalty must be added to the noise level (continuous),
- Noise containing 3 or 4 characteristics, a 10dB(A) penalty must be added to the noise level (continuous).

5 Noise Survey Details

5.1 Off-Site Environmental Noise Survey

5.1.1 Survey Methodology

All measurements were conducted in accordance with the requirements of the *Environment Protection (Noise) Policy 2007* [6], with guidance from the *Guidelines for the Use of the Environment Protection (Noise) Policy 2007* [7] and AS 1055.1-1997 [8], on the following days:

- 11 May 2022 – between 10:10PM and 01:30AM the following day,
- 12 May 2022 – between 12:30PM and 04:00PM, and

The measurements were conducted during EPA defined day-time and night-time period, to measure the noise impact to the nearest noise sensitive receivers due to the plant operation. Following methodology and equipment were used to conduct the survey:

- Measurements using the noise descriptors L_{Aeq} and L_{A90} were taken for a period of 15 minutes at each receiver location.
- Where possible, measurements were paused to avoid influence from the extraneous sources (such as traffic, etc.).
- Where heavy traffic was observed (near or on Victoria Road), Vipac has provided comments to reflect the noise influence.
- Where continuous noise influence from other noise sources (residential noise, construction noise, dog barking, etc.) was observed, Vipac has provided comments to reflect the possible influence.
- The sound level meters (details provided below) were mounted on approved tripods, minimum 1.5m above the ground level. The monitors were installed minimum 2m away from reflective surfaces (cars, fence, walls, etc.).

5.1.2 Survey Equipment

The following equipment was used to conduct the off-site noise survey. Please note that the sound level meters satisfy the requirements of AS IEC 61672.1-2004 [10].

- Equipment 1:
  - *Model* – Brüel & Kjær Type 2250 Class 1 sound level meter.
  - *Serial number* – 3012267
  - *Calibration* – Due for calibration on June 2023
  - *Spot calibration check* – The calibration of the sound level meter was checked before and after measurements and no drift in sensitivity was detected.
- Equipment 2:
  - *Model* – Brüel & Kjær Type 2250 Class 1 sound level meter.
  - *Serial number* – 3002841
  - *Calibration* – Due for calibration on April 2024
  - *Spot calibration check* – The calibration of the sound level meter was checked before and after measurements and no drift in sensitivity was detected.

5.1.3 Off-Site Survey Locations

Monitoring locations for both the day-time and night-time surveys were consistent with the previous attended measurement surveys, including the most recent survey conducted in September 2021 [1][2][3][18]. The monitoring locations are summarised in Table 5-1, with an overview of the monitoring locations provided in Figure 5-1.

Table 5-1: Summary of off-site attended measurement locations

Measurement Location	Location Address/ Description
R2	Corner of Alfred St and Hargrave St, Peterhead
R3	Adjacent to 145 Hargrave St, Peterhead (facing Fletcher Rd)
R4	Corner of Robert St and Hargrave St, Birkenhead
R5	Adjacent to 23 Levi St, Birkenhead
R6	Adjacent to 19 Craigie St, Birkenhead
R8	Adjacent to 39 Mary St, Peterhead
R9	Corner of Wills St and Whyte St, Peterhead
R10	Corner of Olive St and Victoria Rd, Largs Bay
R11	Adjacent to 158 Fletcher Rd, Largs Bay (facing east along Olive St)
R12	Adjacent to 33 Hilton St, Birkenhead
R13	Adjacent to 28 Whyte St, Peterhead (facing east down Matilda St)
R14	Adjacent to 15 Waverley St, Largs Bay
R15	Adjacent to 9 Walton St, Peterhead
R16	Adjacent to 77 Victoria Rd, Birkenhead
R17	Corner of Fletcher Rd and Rose St, Birkenhead (adjacent to 53 Fletcher Rd)
R18	Adjacent to 20 Fletcher Rd, Birkenhead (In the park)
N1	Corner of Gunn St and Well St, Birkenhead (adjacent to 39 Well St)
N2	Adjacent to 9 Mary St, Peterhead
N3	Corner of Walton St and Mary St, Peterhead (adjacent to 23 Mary St)

Figure 5-1: Overview of attended monitoring locations

5.2 On-Site Noise Survey

5.2.1 Survey Methodology

An attended noise survey of selected plant on-site was conducted to obtain updated noise measurement data for items of plant which were serviced, refurbished/upgraded since the previous noise survey or identified as the major noise source during previous noise survey and computer noise model update. The following survey methodology was followed:

- Measurements were taken at distances varying between 1-5m, depending on the access to the equipment/machinery.
- Where possible, multiple measurements were taken around an equipment/machinery to appropriately analyse the emanating sound pressure levels.
- Due to the operational conditions in the plant (typical), it is usually difficult to isolate a single source from sources directly abutting the measured source. In such case, Vipac has taken measurements at several locations around the plant area in question. This enabled Vipac to verify the combined noise levels predicted from the noise model against the measured values i.e., adjusting source noise levels to comply against the measured noise levels at the measurement location.

5.2.2 Survey Equipment

The following equipment were used to conduct the on-site noise survey. Please note that the sound level meters satisfy the requirements of AS IEC 61672.1-2004 [10].

- Equipment Details
  - *Model* – Brüel & Kjær Type 2250 Class 1 sound level meter.
  - *Serial number* – 3012267
  - *Calibration* – Due for calibration on June 2023
  - *Spot calibration check* – The calibration of the sound level meter was checked before and after measurements and no drift in sensitivity was detected.

5.2.3 On-Site Survey Locations

As identified by ABC, the plant/equipment upgraded are listed in Table 5-2.

Table 5-2: EIP Projects

Plant/Equipment	Environmental Improvement Programme (EIP) Number	Time
CM1/7 Gantry Fans	EIP 14	2020
Kiln Feed Elevator Gear Box	EIP 16	2019
BH Gas Train	EIP 15	2020

In addition to above, measurements for the recently commissioned infrastructure (refer Table 5-3) were undertaken. Please note that the listed equipment was commissioned prior to the previous noise survey (2021) and were also included in the noise model update, however, the equipment noise levels were remeasured to assess/monitor any changes in the noise emissions.

Table 5-3: DA Projects undertaken since previous noise survey

Plant/Equipment	DA Programme Number	Upgrade/Abatement Works	Time
Tertiary Recycle (TAD) Project	DA 040/1190/20	Construction of tertiary dust and material return systems and associates structures	2020/21
Cement Mill 6 200t Fringe Silo	DA 040/0892/20	The construction of a new silo and upgrades and alterations to an existing silo, support structures and systems	2020/21
Colling Tower Project (4A)	DA 040/3617/20	Installation of replacement cooling towers and decommissioning of existing cooling tower (in association with established clinker kiln plant and cement production operations)	2020/21

Noise measurements were conducted generally at a distance of 1-5 metres from the subject plant. For pre-existing plant, where possible, measurements were conducted at the same position as during previous surveys [1].

5.3 Survey Weather Conditions

Temperatures ranging between 10 – 21 degrees Celsius were observed throughout the survey, with wind speeds well below 5m/s observed during the noise survey. No rainfall was observed.

The meteorological data is presented in **Appendix F**.

6 Noise Modelling

Based on the results of the attended noise monitoring survey (on-site and off-site), and the plant data provided by ABC, the existing noise model for the Birkenhead plant was significantly updated. Noise level predictions for each of the annual off-site attended measurement survey positions were generated, along with noise contour plots for "neutral" and "worst case" weather conditions. Dominant noise sources were identified for each survey position (where possible), and the effect of significantly reducing or eliminating the noise source was then investigated. Details of the updated noise model, and the methodology followed in constructing the noise model and generating predictions are discussed below.

The purpose of the annual noise survey and the model update is to assess the existing noise conditions in the locality abutting the plant. As such, to conduct a conservative assessment, Vipac has not included the infrastructure currently under Development Application (DA) approval stage. This includes infrastructure associated with the AJ279 Blend Silo Project [20] and Burner Replacement Project [19]. Once these projects are approved, constructed and commissioned, Vipac will conduct the noise survey and update the noise model accordingly.

6.1 Modelling Assumptions

The following assumptions were relied upon in developing the 3D computer noise model (using SoundPLAN software) for the Birkenhead cement plant:

- The ground areas within and surrounding the ABC Birkenhead plant were assumed to be flat terrain.
- Ground absorption within the Birkenhead site was assumed to be fully reflective (based on on-site observations and Vipac's previously validated predictive noise model of the Birkenhead cement plant).
- Ground absorption outside of the site was assumed to be partially reflective grass terrain, with the exception of roads and other reflective surfaces which were assumed to be fully reflective.
- The heights and location of buildings and other on-site structures were generally based on the information provided by ABC (plant geometry provided in dxf format on 08 November 2018) and on-site observations.
- All doors and openings closed during operations.
- Traffic noise and other noise sources not included.
- Where the on-site noise measurements indicate no apparent change in noise emissions from the specific plant/equipment, the source noise levels were not changed in the model.

6.2 Input Data

Sound power levels for each noise source were calibrated based on on-site survey data conducted on 26 May 2022. Please note that source noise levels for several plant/equipment were measured during the site survey. As such, computer noise model was only updated for the sources where significant change in noise emissions was observed. Whereas, for the remaining sources, the sound power level was based on previous data.

Details of all noise sources included in the model, their sound power level, and position within the plant (including measurement position) are provided in **Appendix B** and the data for the plant/equipment measured during the May 2022 on-site survey are presented in **Appendix D**.

6.3 Modelling Scenarios

Noise predictions were generated for "neutral" and "worst-case" meteorological conditions corresponding to the recommended conditions detailed in the *Guidelines for the Use of the Environment Protection (Noise) Policy 2007* [7] for each of the above modelling scenarios. In accordance with standard practice, noise predictions were also generated for the existing situation using weather conditions corresponding to the May 2022 attended measurement survey (average wind speed of 2m/s) for the purposes of calibration of the updated noise model against the survey results.

6.4 Calibration

As discussed above, noise model calibration was carried out against the results of Vipac's most recent noise monitoring survey. Noise level predictions at each standard receiver position (R1-R18, N1-N3) were generated for the current situation using meteorological conditions corresponding to the day of night-time attended measurement survey (average wind speed of 2m/s), with the results compared against the noise levels measured at the relevant location during the survey. Meteorological conditions were based on a combination of on-site observations (for wind speed and direction), and Bureau of Meteorology (BOM) data for other parameters (temperature, pressure, and humidity).

A comparison of the predicted noise levels from the computer noise model and the attended off-site survey has been discussed in Section **7.3.2** below. The predicted results show good agreement with measured noise levels.

7 Assessment Results & Discussion

7.1 Off-Site Environmental Noise Survey

The off-site noise survey results for day-time and night-time period are presented in **Appendix A**, with results discussion and comparison against historical data discussed below. As discussed in Section 4.1 above, for measurement positions within 100 metres of the centreline of Victoria Road the L_{A90} descriptor has been used to eliminate the influence of short-term transient noise sources (such as passing road traffic) from the results. For each measurement position, the descriptor used for comparison with the noise goal is indicated by bold text and shading in the results table in **Appendix A**.

7.1.1 Day-Time

The day-time attended survey was conducted on 12 May 2022 (12:40PM – 03:45PM), with following conditions observed during the survey:

- Wind speeds of less than 5m/s observed during the noise survey.
- No rainfall was observed.

The results of the day-time survey are provided in Appendix A.

Both the L_{Aeq} and L_{A90} noise levels met the day-time criterion for all measurement locations, with the exception of the following (the descriptor used for comparison with the noise goal is indicated by bold text and shading).

Table 7-1: Day-time survey exceedances

Location	L_{Aeq} [dB(A)]	L_{A90} [dB(A)]	Criterion [dB(A)]	Exceedance [dB(A)]
R10	74	**61**	57	4
R16	78	**64**	57	7

Receivers R10 and R16 show significant exceedance, which are influenced by the road traffic noise, with frequent vehicles pass-by on Victoria Road contributing significantly to noise levels (dominant source). Since both the measurement locations are abutting Victoria Road, high traffic noise influence was expected. This has also been documented in our preceding annual noise survey reports that locations in close proximity to Victoria Road, specifically R10 and R16, are dominated by traffic noise impact. This is expected as Victoria Road provides a major thoroughfare for trucks and other heavy vehicles and is a designated Type A Road (The Planning & Design Code [15], SAPPA [14]). Additionally, it has been noted in the previous noise surveys that due to dominance of traffic noise, the plant is usually inaudible at both the measurement locations.

7.1.2 Night-Time

The night-time survey was conducted on 11 Amy 2022 (between 10:00PM – 04:00AM), with following conditions observed during the survey:

- Wind speeds generally below 5m/s observed over the course of the survey.
- No rainfall was observed.

The results of the night-time survey are provided in Appendix A.

Both the L_{Aeq} and L_{A90} noise levels met the night-time criterion for all measurement locations, with the exception of the following (the descriptor used for comparison with the noise goal is indicated by bold text and shading).

Table 7-2: Night-time survey exceedances

Location	L_{Aeq} [dB(A)]	L_{A90} [dB(A)]	Criterion [dB(A)]	Exceedance [dB(A)]
R2	53	**52**	49	3
R5	**50**	48	49	1
R10	54	**50**	49	1
R12	54	**52**	49	3
R15	53	**52**	49	3
N2	**50**	48	49	1

The exceedance at R2, R5, R10, R12, R15 and N2 were mostly associated with traffic noise influence from nearby road (Victoria Road and Fletcher Road). However, no characteristic noise was observed at any measurement location. Please note that a 'screeching noise' was also observed during Vipac's May 2020, 2021 annual noise survey. ABC had advised that the noise was an unusual occurrence and was later rectified.

Notwithstanding, the measured L_{A90} levels at R5 and N2 achieved the noise criterion.

In addition to above and as discussed in our previous survey reports [2], Vipac notes that contributions from distant traffic noise and potentially other industrial sites to the east were also noted in a number of measurements, which may have increased the measured noise levels. This is particularly relevant considering that wind conditions favourable to noise propagation were present during the night-time survey, which may have increased the contribution of these sources to measured noise levels. As such, the noise levels measured during the night-time survey are likely to be representative of worst case noise emissions from the plant, and are useful for validation of future computer noise model predictions for the plant. Weather conditions are discussed further below.

7.1.3 Result Comparison with Previous Surveys

The L_{A90} noise levels measured during the 2022 attended measurement survey were compared against the noise levels measured during the two most recent attended measurement surveys (2020 [1] and 2021 [2]). Similar to our previous surveys, the L_{A90} descriptor was considered to provide a more meaningful comparison between measurement surveys as it is less susceptible to the influence of extraneous transient noise sources. Table 7-3 and Table 7-4 show the comparison between the 2022 survey and preceding year results.

Table 7-3: Day-Time Survey Results Comparison

Receiver Location	Day-Time L_{A90} Noise Level (dB(A))				
	Criterion	2020	2021	2022	Difference (2021/2022)
R2	57	53	50	54	4
R3	57	44	42	43	1
R4	57	38	37	34	-3
R5	57	49	47	48	1
R6	57	38	39	37	-2
R8	57	41	44	44	0
R9	57	37	37	34	-3
R10	57	59	59	61	2
R11	57	39	41	38	-3
R12	57	53	51	53	2
R13	57	36	38	36	-2
R14	57	36	37	32	-5
R15	57	50	48	52	4
R16	57	61	59	64	5
R17	57	42	40	37	-3
R18	57	42	42	48	6
N1	57	47	47	46	-1
N2	57	42	48	42	-6
N3	57	44	47	46	-1

Table 7-4: Night-Time Survey Results Comparison

Receiver Location	Night-Time L_{A90} Noise Level (dB(A))				
	Criterion	2020	2021	2022	Difference (2021/2022)
R2	49	54	53	52	-1
R3	49	49	47	47	0
R4	49	44	43	41	-2
R5	49	52	49	48	-1
R6	49	46	43	39	-4
R8	49	47	46	47	1
R9	49	42	40	40	0
R10	49	47	47	50	3
R11	49	39	39	36	-3
R12	49	54	52	52	0
R13	49	43	44	42	-2
R14	49	42	40	39	-1
R15	49	53	52	52	0
R16	49	55	53	47	-6
R17	49	45	43	40	-3
R18	49	46	44	38	-6
N1	49	49	46	43	-3
N2	49	49	47	42	-5
N3	49	50	49	48	-1

Noise levels were observed to decrease at a number of locations, however; a number of increases were also observed. The discrepancies may be attributed to a number of factors, such as:

- The day of the week and time of day that the measurement was conducted,
- Extraneous noise sources present during the measurement,
- Weather conditions during the measurement (such as temperature, humidity, wind speed and wind direction); and,
- Specific site operations during the measurement.

As discussed above, in Appendix A and in our previous noise annual noise survey reports, the day-time noise measurements are heavily influenced and dominated by road traffic noise and other activities around the measurement locations (such as construction noise, resident noise, bird noise, dog barking, etc.). Hence, Vipac considers the night-time measurements provide appropriate comparison to the historical data.

The night-time survey results show an increment in noise levels at R8 and R10 in comparison to 2021 results. The increment at R8 is considered insignificant as in terms of human response to change in noise levels, a 3 dB(A) increase in sound pressure level is just perceptible to the average human ear to notice a change, a 5 dB(A) increase is quite noticeable and a 10 dB(A) increase is typically perceived as a doubling in loudness. Therefore, a 1 dB(A) increment at R8 can be considered acceptable. Also, despite an increase in noise levels compared to the 2021 survey, the measured noise level are same as the 2020 survey results.

Location R10 show an increment of 3 dB(A) in comparison to 2021 and 2020 results. It should be noted (also discussed above), location R10 is inherently affected and dominated by traffic noise on Victoria Road. This has been continually documented by ViPAC is previous years' reports.

7.1.4 Influence of Extraneous Noise Sources

With reference to the survey results and our previous surveys, the L_{A90} noise levels were found to be a better descriptor of the plant noise emissions, which is expected due to the steady-state nature of the majority of the noise emitted by the plant. However, Vipac notes that frequent traffic noise from nearby roads and noise from other industrial properties (particularly at night when weather conditions were more favourable to noise propagation from distant sources) may have also contributed to the background noise level. As such, the measured L_{A90} background noise levels during the survey may be considered to represent a slight over-estimate of the noise level contributed by the ABC plant to the measured noise levels.

Irrespective of the noise conditions during the measurement, the L_{A90} noise levels are considered to be a better estimate of noise emissions than the L_{Aeq} noise levels for ABC's operations. As discussed above, the Environment Protection Authority (EPA) has advised that the L_{A90} descriptor may be used only for locations in close proximity to Victoria Road (within 100 metres of the centreline of the road), which includes measurement positions N1, R2, R10, R12, R15 and R16.

Even though care was taken to minimise the influence of extraneous noise sources (such as passing vehicles, and traffic on nearby major roads) by pausing the sound level meter and erasing the extraneous noise influence (by using back erase function in B&K Sound Level Meter), it was not possible to entirely remove the influence of these noise sources. In particular, high volumes of road traffic on Victoria Road influenced the measurements at locations R10 and R16 to such a degree that road traffic noise is overwhelmingly the dominant noise source at these positions. As such, the results presented in Appendix A for these measurement locations provide a representation of the traffic noise impact at these locations, and are not reflective of noise emissions from the ABC site.

Due to the lower traffic volume at night, better quality measurements were obtained at R10 and R16 during the night-time survey, and the measured L_{A90} noise levels at these locations provide a reasonable estimate of worst-case noise emissions at these locations. Similarly, frequent vehicle movements on Fletcher Road made measurements at locations R3, R11, R17 and R18 difficult, particularly during the day-time survey.

To analyse the contribution of extraneous noise sources, Vipac had conducted a background noise survey (29 March 2021) with the Birkenhead Plant not operating during the survey period. The results of the background noise survey, compared against this year's annual noise survey results for night-time period, are presented below.

Table 7-5: Background Noise Survey Results Comparison Against Plant Noise Survey Results (night-time)

NSR Location	2021 Background Noise Results *(Limited operation of plant)*	May 2022 Survey Results *(Plant under full operation)*	Noise Criterion dB(A)
	$L_{Aeq,15min}$ dB(A)	$L_{Aeq,15min}$ dB(A)	
R2	53	53	**49**
R3	55	49	**49**
R4	52	45	**49**
R5	55	50	**49**
R6	45	42	**49**
R8	41	49	**49**
R9	39	43	**49**
R10	64	54	**49**
R11	43	38	**49**
R12	55	54	**49**
R13	43	46	**49**
R14	41	42	**49**
R15	49	53	**49**
R16	70	50	**49**
R17	51	43	**49**
R18	52	43	**49**
N1	49	45	**49**
N2	44	46	**49**
N3	46	50	**49**

Based on the results presented above, Vipac comments as follows:

Site Notes – Observations during survey

- No plant noise was audible at any NSR location during the survey.
- Major noise influence from traffic movements along Victoria Road and Fletcher Road was observed.
- Neighbourhood noise influence was also observed at some locations (dog barking, residents talking, etc.).
- At locations R2 and R15, noise influence from the nearby petrol station was also observed.
- The measurements were conduct for a continuous 15-minute period, without any pause.

Environmental Noise Criterion

- The background noise levels were **exceeding** the environmental noise criterion (night-time) at locations R2, R3, R4, R5, R10, R12, R16, R17 and R18.
- The background noise levels were **within/below** the environmental noise criterion (night-time) at locations R6, R8, R9, R11, R13, R14, R15, N1, N2 and N3.

Comparison Against Plant Noise

Based on the results presented in Table 7-5, we note the following:

- The background noise levels (with limited plant operation) exceed the noise levels measured with full plant operation (May 2022) at locations R2, R3, R4, R5, R6, R10, R11, R12, R13, R16, R17, R18 and N1. This indicates that at these locations, the major noise contributor are extraneous noise sources such as traffic noise, residential noise, etc. As such, the plant noise influence at these locations is insignificant as compared to noise influence from other sources.
- The noise levels measured with full plant operation marginally exceed (< 3dB(A)) the background noise levels (with limited plant operation) at locations R14 and N2. Typically (subjectively) for an average human ear, a 3 dB(A) increase in sound pressure level is **just** noticeable, whereas, a 5 dB(A) increase is quite noticeable and a 10 dB(A) increase is typically perceived as a doubling in loudness. As such, Vipac believes that the noise influence from the plant should not be detrimental to NSR's amenity/comfort.

  In addition to above, Part 4 (General Noise Control Provisions), Clause 18, Subclause 2a of Noise EPP [6], states that the noise from a source complies with the noise goals if the source noise level does not exceed the background noise level plus 5 dB(A). Considering this, noise from the plant achieves the EPA defined noise goals at the locations highlighted above.
- The noise levels measured with full plant operation exceed the background noise levels (more than 5 dB(A)) at locations R8, R9, R15 and N3. Location R9 shows unusually high levels considering the separation between R9 and the plant boundary. Based on the site notes, it is noted that the measurement at R9 was influenced by traffic noise, train pass-by and aircraft fly-by, which may have resulted in higher levels.

  Similar to 2021 survey results, noise from the ABC plant is dominant (major contributor) at locations R8, R9 and N3. This is evident considering that these receivers fall along the same line on Mary Street and Walton Street.

As such, due to the influence of extraneous noise sources in the measured levels, the results do not necessarily reflect an exceedance of the noise criteria due to ABC operations alone and essentially provide an upper limit to the noise levels that may be contributed by ABC's operations.

7.2 On-Site Noise Survey

An attended noise survey of selected plant on-site was conducted to obtain updated noise measurement data for items of plant which were serviced, refurbished/upgraded since the previous noise survey or identified as the major noise source during previous noise survey and computer noise model update. The results of the survey are presented in Appendix D.

7.3 Computer Noise Model

7.3.1 Noise Level Predictions

The computer noise model representing the current operations of the ABC Birkenhead plant predicts the incident noise levels at each noise sensitive receiver location used for the attended noise survey during day-time and night-time period, as highlighted in Figure 5-1 and Table 5-1 above. The model predicted noise levels for "neutral" and "worst case" meteorological conditions (as discussed above). The predicted noise levels are presented in Table 7-6 below.

Please note that the results from attended noise survey within the plant (Appendix D) were compared against the source noise levels used in the SoundPLAN model. Wherever the site measurements showed significant change in source noise levels for each measured equipment, the model was updated. Please note that in cases where the change in source noise levels was less than 2 dB(A), the model source levels were not changed. A 1 dB(A) change is not considered significant as it may have resulted due to wind conditions/direction and the noise from nearby extraneous sources.

Table 7-6: Computer Noise Modelling (SoundPLAN) Results

Receiver ID	Night-Time Criterion	Neutral Weather Conditions (CONCAWE Category 4) dB(A)			Worst- Case Weather Conditions (CONCAWE Category 6) dB(A)		
		2022 Model Results (Updated)	2021 Model Results (Previous)	Difference	2022 Model Results (Updated)	2021 Model Results (Previous)	Difference
R2	49	51	51	0	53	53	0
R3	49	43	43	0	45	45	0
R4	49	38	38	0	41	41	0
R5	49	50	50	0	52	52	0
R6	49	40	40	0	43	43	0
R8	49	44	44	0	46	46	0
R9	49	37	37	0	40	40	0
R10	49	46	46	0	50	50	0
R11	49	38	38	0	41	41	0
R12	49	49	49	0	53	53	0
R13	49	39	39	0	42	42	0
R14	49	37	37	0	40	40	0
R15	49	50	50	0	51	51	0
R16	49	51	51	0	53	53	0
R17	49	40	40	0	43	43	0
R18	49	38	38	0	40	40	0
N1	49	47	47	0	48	48	0
N2	49	46	46	0	48	48	0
N3	49	47	47	0	49	49	0

Note: Corresponding noise contour maps are provided in Appendix C.

The results show no change is noise conditions at the NSR locations. This is expected as no new infrastructure has been added to the plant since September 2021. Even with the source noise levels update (for several plant/equipment), the plant shows no overall change in noise emissions.

7.3.2 Calibration Results

A comparison of the computer noise model predictions against the off-site noise measurements (night-time), has been presented below:

Table 7-7: Results Comparison

Receiver	Predicted Noise Levels (L_{Aeq}, dB(A))	Measured Noise Levels (L_{Aeq}, dB(A))	Measured Noise Levels (L_{A90}, dB(A))
R2	53	53	52
R3	45	49	47
R4	41	45	41
R5	52	50	48
R6	43	42	39
R8	46	49	47
R9	40	43	40
R10	50	54	50
R11	41	38	36
R12	53	54	52
R13	42	46	42
R14	40	42	39
R15	51	53	52
R16	53	50	47
R17	43	43	40
R18	40	43	38
N1	48	45	43
N2	48	46	42
N3	49	50	48

Predicted noise levels generated by the updated model showed good calibration with most of the NSR's, except R5, R6, R11, R16, N1 and N2. However, it should be noted that at locations were the L_{A90} descriptor does not show good calibration, the L_{Aeq} descriptor shows good agreement. This indicates that the attended survey results are influenced by extraneous noise sources (traffic noise, etc.), which may have resulted in the discrepancy. Throughout the preceding annual noise surveys, it has been noted that at several NSR locations, traffic noise is the dominant source, which is also evident from the background noise survey results presented in Table 7-5. Additionally, it should be noted that the discrepancy between the measured and predicted values change/vary every year depending on the background noise conditions, weather conditions and other factors during the survey time/day.

As such, considering the complexity of the computer noise model and the varying conditions during the attended surveys, the predicted results are considered to show good calibration with the measured noise levels.

7.3.3 Noise Source Contribution

Based on the predicted noise levels presented for the current operational conditions in Table 7-6 above, the noise sources predicted to contribute most significantly at each NSR were identified. For receiver locations where worst-case predicted noise levels exceed the Noise EPP night-time goals, the most significant sources and their contributions to noise levels at the receiver location were identified.

The predicted worst-case night-time noise levels at NSR locations where current noise levels exceed the night-time goal noise level, along with the most significant noise sources at each location and their relative contribution to worst-case predicted noise levels at that location are presented in Table 7-8.

Table 7-8: Most significant noise sources

Receiver	Worst-case predicted noise level	Noise Source	Contribution
R2	53	Road Bulk Station DC30	45dB(A)
		Gas Train	42dB(A)
		CS4/CS5 Dust Collector Fan	42dB(A)
		Kiln Cooling Fans	37dB(A)
R5	52	CM1&7 Clinker Gantry Fans	42dB(A)
		Gas Train	35dB(A)
		CM1&7 Clinker Gantry Fans	47dB(A)
		Road Bulk Station DC30	42dB(A)
R10	50	Kiln 4 Airslide fan	40dB(A)
		CM1 (western façade)	39dB(A)
		4B EP duct	40dB(A)
		Woodchip plant 2	40dB(A)
R12	53	CM1&7 gantry fans	48dB(A)
		CM7 (western façade)	47dB(A)
		Gas train	35dB(A)
		Limestone reclaimer shed	41dB(A)
		CSC Compressor	39dB(A)
R15	51	Ventilation Oven Fan	41dB(A)
		Kiln 4 Airslide fan	38dB(A)
		4B EP duct	39dB(A)
		Woodchip plant 1	39dB(A)
		Woodchip plant 2	37dB(A)
		Kiln Feed Elevator Gearbox	29dB(A)
R16	53	Gas train	37dB(A)
		Limestone reclaimer shed	48dB(A)
		CM7 (western façade)	41dB(A)
		Kiln Feed Elevator Gearbox	31dB(A)

Based on the results above, Vipac comments as follows:

- The noise contribution from significant sources at NSR's listed above are same as the contributors and levels mentioned in Vipac's previous annual noise survey report [2].

- This was expected as all the new sources added to the plant did not show any significant contribution during the attended noise survey.
- Overall, it should be noted that the noise emissions from the plant have largely remained *unchanged* even with the inclusion of new noise sources since 2020.

8 Additional Comments

It should be noted that there is an inherent difficulty in isolating noise emissions from the plant with the existing background noise (other sources such as traffic, etc.) during the annual noise survey in the community area (NSR's). To overcome this, Vipac had conducted a background noise survey at the NSR's in 2021, with the plant not operating. The survey indicated that at, most of the NSR's, the dominant source is not the Birkenhead plant noise. However, ABC has been continuously working towards reducing noise emissions from their Birkenhead plant which is evident from the Environment Improvement Plans (EIP Projects) undertaken by ABC throughout the years. ABC has also implemented a comprehensive Noise Management Plan (NMP) and remain engaged with the community to ensure the amenity of the community members is not compromised.

With continual improvements, a significant reduction in noise levels at various NSR's has been observed (as indicated in result comparison presented in Appendix E). As such, for the next annual noise survey (2023), a noise survey for all major noise sources in the ABC plant, specifically the sources identified as major contributors in Table 7-8, should be conducted.

Overall, Adelaide Brighton Cement have implemented all practicable and reasonable measures to reduce and eliminate noise emissions from the plant operation and intends to continue to do so in future as well.

Appendix A : Environmental Noise Survey Results

Day-Time Noise Survey Results

Location	Start time (hh:mm)	L_{Aeq} [dB(A)]	L_{A90} [dB(A)]	Criterion [dB(A)]	Exceedance [dB(A)]	Observations / Comments
R2	15:02	57	54	57	-	Plant audible, noise from petrol station, traffic noise from Victoria Rd dominant source, resident noise
R3	13:01	49	43	57	-	Traffic noise from nearby roads, street sweeping on nearby roads, plant inaudible
R4	12:40	47	34	57	-	Helicopter noise, plant inaudible, traffic noise, resident noise (gardening)
R5	14:45	52	48	57	-	Plant slightly audible, continuous road works on Levi Street (see pic), traffic noise from Victoria Rd and nearby streets, dog barking intermittent
R6	14:01	46	37	57	-	Continuous construction works in the park (see picture), plant inaudible, intermittent resident noise and dog barking, police siren, helicopter
R8	13:38	47	44	57	-	Plant slightly audible, dog barking (continuous) and traffic noise influence
R9	12:52	43	34	57	-	Construction noise, resident noise, intermittent traffic noise, plant inaudible
R10	15:41	74	61	57	4	Traffic noise dominant source, plant inaudible
R11	14:59	53	38	57	-	Plant inaudible, traffic noise dominant source
R12	15:23	58	53	57	-	Road works noise from Levi street (finishing work, clearing), traffic noise from Victoria Road dominant source (continuous noise), plant inaudible
R13	13:15	42	36	57	-	Traffic noise dominant source, plant inaudible, aircraft fly-by
R14	12:31	39	32	57	-	Intermittent bird noise and aircraft fly-by noise. Noise from nearby residents (talking), traffic noise, plant inaudible
R15	14:47	56	52	57	-	Plant audible, traffic noise from Victoria Road dominant source
R16	15:38	78	64	57	7	Continuous traffic noise from Victoria Rd (dominant source), plant inaudible
R17	13:23	48	37	57	-	Dog barking (intermittent), birds' noise, traffic on nearby roads, plant inaudible, helicopter, street sweeping on nearby roads
R18	13:44	56	48	57	-	Continuous construction works in the park (see picture), intermittent dog barking, traffic noise from Fletcher Rd, plant inaudible
N1	14:22	51	46	57	-	Helicopter noise, traffic noise from Victoria Rd (continuous), plant inaudible, continuous construction works in the park (see picture)
N2	14:23	48	42	57	-	Plant audible with traffic noise being the dominant source
N3	14:01	51	46	57	-	Plant audible with continuous traffic noise (dominant source)

Night-Time Noise Survey Results

Location	Start time (hh:mm)	L_{Aeq} [dB(A)]	L_{A90} [dB(A)]	Criterion [dB(A)]	Exceedance [dB(A)]	Observations / Comments
R2	0:42	53	52	49	3	Traffic noise from Victoria Road with plant being clearly audible
R3	22:36	49	47	49	-	Plant slightly audible with intermittent truck noise from Victoria Road
R4	22:12	45	41	49	-	Plant slightly audible, traffic noise from Victoria road and nearby streets (dominant source)
R5	0:22	50	48	49	1	Traffic noise from Victoria Road with plant being clearly audible
R6	23:43	42	39	49	-	Continuous resident noise (screaming, high pitched talking, etc.), plant inaudible with intermittent truck noise from Victoria Road
R8	23:21	49	47	49	-	Plant audible with continuous traffic noise
R9	22:31	43	40	49	-	Plant inaudible, traffic noise from nearby roads and streets, train noise and aircraft fly-by (1-off)
R10	0:54	54	50	49	1	Plant audible, traffic noise (dominant source) Victoria Road
R11	0:35	38	36	49	-	Plant barely audible, intermittent traffic noise from far away streets and roads
R12	1:06	54	52	49	3	Traffic noise (dominant source) from Victoria Road and nearby streets, plant clearly audible
R13	22:54	46	42	49	-	Plant audible with continuous dog barking and some influence from traffic and 1-off aircraft fly-by
R14	22:10	42	39	49	-	Intermittent dog barking, traffic noise (dominant), plant slightly audible
R15	0:16	53	52	49	3	Plant clearly (continuous) audible with intermittent traffic noise
R16	1:25	50	47	49	-	Plant audible with traffic noise being the dominant source
R17	23:01	43	40	49	-	Intermittent traffic noise from nearby streets. Plant inaudible with continuous noise from a nearby residential house on Fletcher Road
R18	23:24	43	38	49	-	Plant inaudible. Traffic noise from Victoria Road dominant source. The measurement was undertaken 20m away from the designated spot due to the measurement spot being fenced for upgrade works
N1	0:00	45	43	49	-	Plant clearly audible, however, traffic noise was dominant (continuous) source
N2	23:57	46	42	49	-	Plant audible with continuous traffic noise and 1 event of house alarm at a property located in nearby streets
N3	23:41	50	48	49	1	Plant audible with continuous traffic noise

Appendix B : Noise Source Inventory

ID	Group	Noise source	Type	Source Position (UTM co-ordinates zone 54H)			Sound Power Level (dB(A) re 1pW)																													
				X	Y	Z	Overall	25	31.5	40	50	63	80	100	125	160	200	250	315	400	500	630	800	1k	1.25k	1.6k	2k	2.5k	3.15k	4k	5k	6.3k	8k	10k
1	CM7	Dust Collector Discharge	Point	271852	6142575	20	**100**	55	65	55	68	70	75	76	80	87	87	86	91	90	89	89	91	91	89	83	79	78	76	76	71	68	65	63
2	Kiln 4	Kiln Cooling Fan 1	Point	271686	6142840	4	**104**	45	50	55	58	68	69	75	82	82	85	92	93	92	95	95	95	95	94	93	91	89	87	85	81	77	74	68
3	Kiln 4	Kiln Cooling Fan 7	Point	271668	6142835	2	**96**	41	49	54	53	59	63	63	70	71	76	81	86	81	82	86	84	86	89	87	85	83	81	79	75	75	73	70
4	Kiln 4	Kiln Cooling Fan 6	Point	271666	6142849	5	**91**	44	50	54	59	58	60	66	71	69	78	77	80	83	81	81	81	81	80	79	78	77	75	72	70	68	64	59
5	Kiln 4	Kiln Cooling Fan 4	Point	271672	6142850	5	**93**	50	52	55	61	63	65	66	67	71	76	77	79	86	81	82	83	84	85	81	80	78	75	72	68	69	67	57
6	Kiln 4	Kiln Cooling Fan 5	Point	271672	6142836	5	**104**	54	61	70	72	73	71	75	77	83	82	84	91	96	95	92	96	96	94	91	90	88	86	83	79	76	72	68
7	Kiln 4	Kiln Cooling Fan 3	Point	271678	6142838	5	**103**	53	61	69	70	71	71	72	76	81	84	83	90	94	94	92	95	96	93	91	89	87	86	83	79	77	73	66
8	Kiln 4	Kiln Cooling Fan 2	Point	271683	6142838	5	**101**	50	58	67	68	69	71	71	75	82	81	83	88	93	91	89	93	93	91	90	87	86	83	80	76	74	70	65
9	Kiln 4	Kiln 4 Primary Air Fan	Point	271671	6142837	5	**83**	37	43	50	48	51	54	54	59	62	66	66	70	71	73	72	72	72	71	68	67	69	77	66	66	67	58	60
10	Slag Dryer	Slag Dryer	Line	271780	6142824	2	**97**	63	59	61	72	86	76	74	79	77	80	82	82	83	85	86	86	91	88	84	83	82	80	78	77	76	74	68
11	Kiln 4	Ventilation Oven Fan 1	Line	271631	6142835	5	**115**	60	65	70	72	74	83	82	86	92	104	101	99	107	105	105	105	105	105	103	103	101	97	92	89	85	81	77
12	Kiln 4	Ventilation Oven Fan 2	Line	271660	6142841	5	**115**	60	65	70	72	74	83	82	86	92	104	101	99	107	105	105	105	105	105	103	103	101	97	92	89	85	81	77
13	Raw mill 4B	EP Outlet Duct	Line	271611	6142876	5	**110**	66	69	72	76	80	86	88	90	101	100	98	96	98	99	100	100	98	99	98	95	92	90	87	85	83	79	76
14	Raw mill 4B	4B Air Slide Blower	Point	271598	6142880	35.5	**94**	43	50	56	71	79	74	72	75	73	78	74	74	78	82	88	77	76	81	82	83	85	83	82	81	79	75	72
15	4A/4B Tower	4A Elevator Discharge Air Slide Fan	Point	271602	6142821	37.3	**90**	38	40	43	51	58	53	59	58	68	79	80	78	79	79	85	79	77	76	76	73	72	69	69	68	65	61	59
16	Transfer Conveyors	D/C- CS1/CS2 Central Tower	Point	271662	6142805	16	**102**	43	47	55	68	65	71	73	76	84	85	84	85	92	95	95	93	92	92	89	86	86	84	81	79	75	71	67
17	Transfer Conveyors	D/C - CR1/CR2 Conveyors	Point	271610	6142802	13	**91**	46	49	50	54	59	63	63	64	69	73	75	74	81	80	81	84	83	79	76	78	80	79	76	73	69	68	65
18	Level 3 Dust Collector Area	D/C - CS 2 Conveyor	Point	271600	6142791	22	**91**	49	52	55	59	60	66	72	71	76	78	76	77	78	76	78	81	79	81	79	77	76	76	78	81	80	76	72
19	Level 3 Dust Collector Area	D/C - North Gantry Building	Point	271599	6142798	24	**101**	52	58	64	70	67	73	77	76	82	84	96	87	88	92	92	89	89	88	86	84	83	83	83	83	81	76	72
20	Level 3 Dust Collector Area	D/C - CS2/CS3A/CS4 Conveyor	Point	271596	6142790	22	**91**	51	51	55	66	62	67	67	68	75	76	81	80	80	80	80	80	80	82	78	76	75	76	75	76	74	73	71
21	Level 3 Dust Collector Area	CR4 DC	Point	271592	6142798	22.5	**95**	54	58	61	63	64	68	69	74	78	83	83	83	87	88	80	81	80	86	82	80	80	78	78	77	73	68	63
22	Transfer Conveyors	D/C - 36 Bypass Dust Disposal	Point	271585	6142821	15.5	**86**	40	43	51	56	53	58	62	68	70	71	71	69	73	73	73	75	77	80	76	75	73	70	64	61	59	55	51
23	4A/4B Tower	4A Elevator Drive	Point	271601	6142847	87	**100**	55	61	63	65	61	64	67	70	73	78	85	92	88	88	89	96	100	87	86	85	84	82	81	78	75	70	65
24	4A/4B Tower	D/C - 41 Kiln 4 Feed Surge Bin	Point	271605	6142837	87	**97**	47	50	63	63	60	73	76	77	75	80	86	86	88	86	85	88	88	86	88	83	79	78	74	72	68	65	62

ID	Group	Noise source	Type	Source Position (UTM co-ordinates zone 54H)			Sound Power Level (dB(A) re 1pW)																												
				X	Y	Z	Overall	25	31.5	40	50	63	80	100	125	160	200	250	315	400	500	630	800	1k	1.25k	1.6k	2k	2.5k	3.15k	4k	5k	6.3k	8k	10k
25	4A/4B Tower	D/C - 38 Blending Silo Top	Point	271596	6142866	35.5	**84**	35	40	46	54	70	59	66	63	68	70	73	74	78	73	73	72	70	71	69	66	67	67	65	63	66	66	59
26	Woodchip Plant 1	Dust Collector	Point	271588	6142903	5	**105**	64	67	70	75	75	76	78	80	86	87	89	94	94	100	95	92	95	95	92	89	86	83	82	81	77	75	72
27	Slag Dryer	D/C - Slag Outfeed	Point	271769	6142823	7	**87**	39	45	48	53	52	56	59	60	63	69	71	72	72	81	78	78	80	79	73	72	69	68	67	65	59	55	50
28	Clinker Gantry	Cement Mill 1 & 7-Clinker Gantry 1	Point	271865	6142494	15	**97**	55	57	63	65	66	67	70	70	73	74	82	85	85	86	89	89	88	90	90	88	81	76	73	69	65	60	54
29	Clinker Gantry	Cement Mill 1 & 7-Clinker Gantry 2	Point	271869	6142460	15	**97**	55	57	63	65	66	67	70	70	73	74	82	85	85	86	89	89	88	90	90	88	81	76	73	69	65	60	54
30	Clinker Gantry	Cement Mill 1 & 7-Clinker Gantry 3	Point	271873	6142426	15	**97**	55	57	63	65	66	67	70	70	73	74	82	85	85	86	89	89	88	90	90	88	81	76	73	69	65	60	54
31	Clinker Gantry	Cement Mill 1 & 7-Clinker Gantry 4	Point	271888	6142427	15	**97**	55	57	63	65	66	67	70	70	73	74	82	85	85	86	89	89	88	90	90	88	81	76	73	69	65	60	54
32	Clinker Gantry	Cement Mill 1 & 7-Clinker Gantry	Point	271883	6142463	15	**97**	55	57	63	65	66	67	70	70	73	74	82	85	85	86	89	89	88	90	90	88	81	76	73	69	65	60	54
33	Clinker Gantry	Cement Mill 1 & 7-Clinker Gantry 6	Point	271877	6142496	15	**97**	55	57	63	65	66	67	70	70	73	74	82	85	85	86	89	89	88	90	90	88	81	76	73	69	65	60	54
34	Clinker Gantry	Clinker Blend Building CM1 Shed motor	Point	271871	6142391	1	**85**	42	49	52	55	57	61	62	65	71	71	71	74	74	77	77	78	75	72	73	70	68	69	65	61	56	52	47
35	Clinker Gantry	Clinker Blend Building CM1 Shed motor	Point	271877	6142392	1	**84**	41	49	52	55	57	61	65	66	71	70	70	76	77	76	75	73	71	69	69	68	67	65	62	58	55	52	46
36	Wharf Bulk Loading Station	D/C - CSC Bulk	Point	271910	6142540	26	**91**	61	65	67	70	73	75	77	79	81	77	80	79	79	79	80	81	82	79	76	73	71	71	69	69	67	66	62
37	Clinker Gantry	D/C - 23 CE1 Conveyor	Point	271868	6142535	6	**105**	71	77	81	86	89	91	94	95	96	95	95	93	95	92	92	94	90	87	85	83	82	82	81	78	76	74	70
38	Wharf Silos	D/C - 20 Wharf 30000T Silo #2	Point	271927	6142529	51	**83**	40	45	49	49	53	59	60	64	68	72	70	72	73	72	73	73	72	74	71	68	67	67	64	62	61	60	54
39	Wharf Silos	D/C - 19 Wharf 30000T Silo #1	Point	271933	6142532	51	**95**	41	52	55	55	61	67	70	71	72	80	82	90	81	82	85	86	84	81	83	83	80	79	75	73	69	66	62
40	Wharf Silos	D/C -18 Ship Loader	Point	271932	6142551	20	**87**	42	49	52	60	78	72	78	75	75	77	74	72	72	79	67	69	71	74	73	73	70	71	70	68	66	61	56
41	Wharf Silos	D/C - 16000 Silo Top (South)	Point	271928	6142566	50	**95**	53	59	59	79	78	71	72	69	75	83	87	84	83	84	87	83	83	83	84	80	77	75	73	71	68	65	63
42	Wharf Silos	D/C - 16000 Silo Top (North)	Point	271927	6142567	50	**82**	32	40	47	69	66	59	63	65	68	74	75	71	70	69	72	69	66	67	69	66	66	62	60	59	55	51	48
43	Wharf Silos	D/C - Silo Bottom 16000	Point	271929	6142576	6	**91**	56	64	69	74	77	77	78	78	78	77	80	79	73	77	77	75	84	83	78	76	74	74	72	72	69	65	61
44	Woodchip Plant 1	Woodchip Compressor Dryer	Point	271570	6142913	0.5	**73**	5	11	15	20	24	28	31	34	37	65	67	55	60	67	55	62	63	65	57	57	55	49	54	31	35	34	28
45	CM6	Cooling Tower North CM 6	Point	271610	6142760	1.9	**89**	-45	39	-35	57	-26	-23	60	67	-13	70	69	74	79	80	83	83	78	77	74	72	68	63	1	1	0	52	46
46		CSC Compressor	Point	271708	6142551	1	**93**	-45	-39	-35	-30	-26	-23	61	63	-13	70	69	82	79	78	78	79	86	88	80	77	78	77	1	1	0	69	57
47	Wharf Bulk Loading Station	Air Slide SE BDC	Point	271909	6142546	21	**93**	-45	-39	-35	-30	-26	-23	68	70	73	81	-9	86	83	73	82	84	85	84	83	80	79	74	69	1	0	-1	55
48		4A Stack	Point	271649	6142814	75	**100**	8	16	23	50	59	71	82	86	96	85	83	79	81	82	83	89	92	89	81	75	71	69	68	62	56	51	44

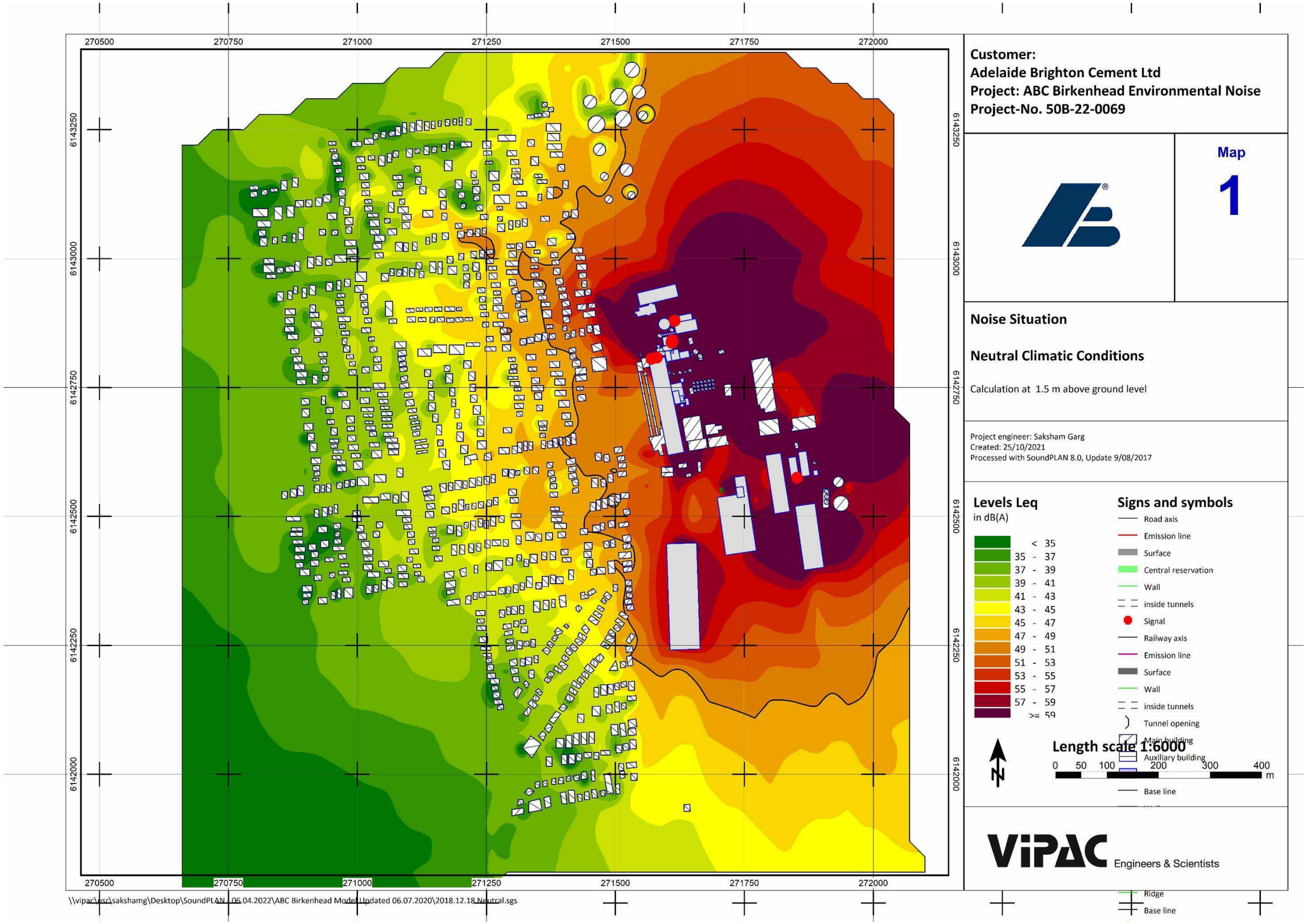
ID	Group	Noise source	Type	Source Position (UTM co-ordinates zone 54H)			Sound Power Level (dB(A) re 1pW)																													
				X	Y	Z	Overall	25	31.5	40	50	63	80	100	125	160	200	250	315	400	500	630	800	1k	1.25k	1.6k	2k	2.5k	3.15k	4k	5k	6.3k	8k	10k
49	4A/4B Tower	4B Stack	Point	271604	6142847	95	**103**	63	62	64	69	67	74	79	88	84	85	87	91	90	91	91	94	95	91	92	90	89	89	87	85	86	83	76
50	Level 3 Dust Collector Area	Gantry Dust Collector Fan Housing	Point	271598	6142796	21	**98**	57	60	61	62	66	77	71	75	81	82	91	87	87	87	88	86	86	86	82	79	79	79	80	83	79	73	74
51	Transfer Conveyors	T2 Dust Collector Fan	Point	271855	6142639	12	**108**	62	65	68	72	73	77	83	91	96	94	96	94	96	97	99	99	99	96	94	92	91	87	83	78	74	68	63
52	Level 3 Dust Collector Area	CS4/CS5 Dust Collector Fan	Point	271629	6142603	12	**99**	55	57	62	66	69	71	76	78	78	87	87	88	88	86	90	89	89	89	85	84	83	78	74	70	67	61	56
53	Road Bulk Loading Station	Dust Collector DC 30	Point	271711	6142746	26	**94**	49	59	50	62	64	69	71	74	82	81	80	85	85	84	83	85	86	83	78	73	72	70	70	65	62	59	57
54	Road Bulk Loading Station	Southern Fan Discharge	Point	271711	6142744	26	**86**	59	67	67	69	71	72	73	73	74	74	75	76	75	77	76	72	71	71	69	67	67	66	69	65	64	62	61
55	Level 3 Dust Collector Area	CR3 Dust Collector	Point	271596	6142799	22	**96**	63	69	73	78	80	83	84	86	87	87	87	86	86	83	82	80	79	77	76	74	75	73	72	72	69	67	66
56	4A/4B Tower	4A Airslide East Fan	Point	271608	6142844	37	**101**	49	51	54	62	69	64	70	69	79	90	91	89	90	90	96	90	88	87	87	84	83	80	80	79	76	72	70
57	Raw Mill 4B	4B Elevator Drive	Point	271607	6142879	37	**90**	42	45	51	58	61	61	63	67	69	80	80	77	77	80	79	83	79	79	76	75	74	72	71	70	68	66	62
58	4A/4B Tower	Kiln 4 Airslide Fan	Point	271595	6142849	75	**102**	48	54	57	60	60	62	67	74	76	78	80	82	89	93	91	92	98	91	88	87	85	86	82	80	76	74	71
59	Kiln 4	Kiln burner	Point	271673	6142844	12	**112**	49	54	61	74	63	68	74	79	83	92	93	91	92	88	87	89	88	86	89	88	89	90	90	95	109	109	92
60	Gas Train	Gas Train	Point	271566	6142622	2	**93**	51	57	59	65	69	70	71	73	77	77	78	78	79	81	83	86	91	91	91	90	91	90	88	90	94	92	89
61	CM1	Compressor Room Exhaust & Opening	Point	271884	6142587	2.5	**88**	35	44	45	51	62	61	62	63	71	74	72	74	73	77	80	79	79	77	76	74	72	71	71	70	71	69	68
62		Point source 02	Point	271893	6142582	2.5	**88**	35	44	45	51	62	61	62	63	71	74	72	74	73	77	80	79	79	77	76	74	72	71	71	70	71	69	68
63	CM1	CM1 - South Roof	Area	271868	6142590	25	**91**	-	-	-	71	70	74	73	76	79	79	85	80	81	82	81	77	74	74	76	76	74	72	69	66	-	-	-
64	CM1	CM1 - North Roof	Area	271864	6142614	25	**91**	-	-	-	71	70	74	73	76	79	79	85	80	81	82	81	77	74	74	76	76	74	72	69	66	-	-	-
65	CM1	CM1 - South Facade	Area	271869	6142578	10	**95**	-	-	-	69	70	74	79	82	85	87	88	87	86	84	83	80	78	76	79	78	76	73	68	64	-	-	-
66	CM1	CM1 - West Facade	Area	271858	6142601	12.7	**102**	-	-	-	76	77	81	86	89	92	93	95	94	92	91	89	86	84	83	85	84	83	79	74	71	-	-	-
67	CM1	CM1 - North Facade	Area	271862	6142626	10	**95**	-	-	-	69	70	74	79	82	85	87	88	87	86	84	83	80	78	76	79	78	76	73	68	64	-	-	-
68	CM1	CM1 - East Facade	Area	271874	6142603	12.7	**101**	-	-	-	75	76	80	85	88	91	92	94	93	91	90	88	85	83	82	84	83	82	78	73	70	-	-	-
69	CM1	DC26 CM1	Point	271876	6142588	12	**101**	63	64	64	73	80	85	86	89	90	92	100	98	100	102	100	99	96	95	96	93	91	88	85	80	77	71	64
70	CM6	CM6 Lower - South	Area	271625	6142720	4	**108**	53	57	65	68	67	68	74	79	84	82	89	93	92	96	99	98	98	102	97	95	93	92	91	88	85	81	74
72	CM6	CM6 Lower - North	Area	271618	6142758	4	**94**	47	51	58	60	51	57	66	73	79	70	77	87	78	82	89	82	82	86	81	79	76	76	78	76	74	71	69
73	CM6	Cm6 Lower - East	Area	271632	6142741	4	**97**	50	53	61	63	54	60	68	75	81	72	80	90	80	84	91	84	85	88	84	81	79	79	80	79	77	74	72

ID	Group	Noise source	Type	Source Position (UTM co-ordinates zone 54H)			Sound Power Level (dB(A) re 1pW)																												
				X	Y	Z	Overall	25	31.5	40	50	63	80	100	125	160	200	250	315	400	500	630	800	1k	1.25k	1.6k	2k	2.5k	3.15k	4k	5k	6.3k	8k	10k
74	CM6	CM6 Upper - West Roof	Area	271616	6142730	19	**91**	50	52	59	65	59	60	65	69	73	69	76	86	77	79	84	79	79	82	75	72	70	69	68	66	64	59	54
75	CM6	CM6 Upper - East Roof	Area	271622	6142732	19	**91**	50	52	59	65	59	60	65	69	73	69	76	86	77	79	84	79	79	82	75	72	70	69	68	66	64	59	54
76	CM6	CM6 Upper - South	Area	271621	6142719	13.5	**90**	49	51	58	65	58	59	64	68	72	68	75	86	76	78	83	79	78	81	75	71	69	68	68	65	63	59	53
77	CM6	CM6 Upper - West	Area	271613	6142730	13	**93**	52	54	61	67	61	62	67	71	75	71	78	88	79	81	86	81	81	84	77	74	72	71	70	68	66	61	56
78	CM6	CM6 Upper - North	Area	271616	6142743	13.5	**90**	49	51	58	65	58	59	64	68	72	68	75	86	76	78	83	79	78	81	75	71	69	68	68	65	63	59	53
79	CM6	CM6 Upper - East	Area	271625	6142732	13	**93**	52	54	61	67	61	62	67	71	75	71	78	88	79	81	86	81	81	84	77	74	72	71	70	68	66	61	56
80	CM6	Compressor Room - South Opening	Point	271633	6142764	1	**88**	37	39	44	49	48	50	53	57	61	64	80	74	69	75	73	72	75	76	74	74	79	82	70	73	75	68	60
81	CM6	Compressor Room - North Opening	Point	271632	6142766	1	**102**	42	44	48	54	57	58	62	65	69	77	101	87	80	85	84	83	86	85	85	84	88	90	83	83	83	78	73
82	CM7	CM7 - Roof (north)	Area	271844	6142605	25	**86**	**-**	-	-	67	68	68	68	72	75	76	78	73	75	73	74	71	70	70	74	74	72	70	68	67	**-**	-	-
83	CM7	CM7 - Roof (south)	Area	271847	6142585	25	**86**	**-**	-	-	67	68	68	68	72	75	76	78	73	75	73	74	71	70	70	74	74	72	70	68	67	**-**	-	-
84	CM7	CM7 - South	Area	271848	6142575	10	**93**	**-**	-	-	57	63	69	72	73	77	84	85	87	83	84	83	80	76	74	77	75	71	68	61	57	**-**	-	-
85	CM7	CM7 - East	Area	271853	6142596	12.7	**98**	**-**	-	-	62	68	74	77	78	82	90	90	92	88	90	88	85	81	79	82	80	76	73	66	62	**-**	-	-
86	CM7	CM7 - North	Area	271842	6142615	10	**93**	**-**	-	-	57	63	69	72	73	77	84	85	87	83	84	83	80	76	74	77	75	71	68	61	57	**-**	-	-
87	CM7	CM7 - West	Area	271838	6142594	12.7	**103**	**-**	-	-	67	73	79	82	83	87	95	95	97	93	95	93	90	86	85	87	85	81	78	71	67	**-**	-	-
88	CM7	CM7 Compressor Room Opening	Area	271841	6142571	3.5	**98**	41	41	46	57	56	60	63	72	71	75	78	76	83	81	76	80	77	87	83	87	91	90	92	81	80	79	75
89	Kiln 4	Heat Exchanger Fan	Point	271674	6142826	16	**91**	41	49	61	60	60	66	67	71	71	83	77	80	83	81	80	81	81	80	77	75	74	72	69	66	66	63	54
105	Limestone Reclaimer Shed	Eastern Roof	Area	271646	6142345	19.5	**93**	**-**	-	-	69	75	78	79	81	81	79	80	79	91	79	77	77	73	72	73	73	72	69	65	63	**-**	-	-
106	Limestone Reclaimer Shed	Western Roof	Area	271617	6142344	19.5	**93**	**-**	-	-	69	75	78	79	81	81	79	80	79	91	79	77	77	73	72	73	73	72	69	65	63	**-**	-	-
107	Limestone Reclaimer Shed	West Facade	Area	271603	6142344	3.5	**86**	47	51	52	61	67	71	72	70	72	69	71	69	81	74	74	74	74	74	74	72	69	66	62	58	53	48	42
108	Limestone Reclaimer Shed	South Facade	Area	271635	6142242	11.1	**85**	46	50	51	60	66	70	71	69	70	68	70	68	80	73	73	73	73	73	73	71	68	65	61	57	52	47	40
109	Limestone Reclaimer Shed	East Facade	Area	271661	6142346	3.5	**86**	47	51	52	61	67	71	72	70	72	69	71	69	81	74	74	74	74	74	74	72	69	66	62	58	53	48	42
110	Limestone Reclaimer Shed	North Facade	Area	271628	6142448	11.1	**85**	46	50	51	60	66	70	71	69	70	68	70	68	80	73	73	73	73	73	73	71	68	65	61	57	52	47	40
111	Woodchip Plant 1	Roof	Area	271561	6142900	15	**93**	**-**	-	-	57	63	63	73	91	76	81	78	84	73	80	77	76	72	71	61	58	56	53	51	53	51	45	40
112	Woodchip Plant 1	Facade 01	Area	271552	6142889	7.5	**89**	**-**	-	-	53	59	59	69	87	73	77	74	80	69	76	73	72	68	67	57	54	52	49	48	49	47	41	36

ID	Group	Noise source	Type	Source Position (UTM co-ordinates zone 54H)			Sound Power Level (dB(A) re 1pW)																													
				X	Y	Z	Overall	25	31.5	40	50	63	80	100	125	160	200	250	315	400	500	630	800	1k	1.25k	1.6k	2k	2.5k	3.15k	4k	5k	6.3k	8k	10k
113	Woodchip Plant 2	Facade 02	Area	271542	6142890	7.5	**84**	-	-	-	48	54	54	63	82	67	72	69	74	64	70	67	66	63	61	51	48	47	43	42	44	41	36	31
114	Woodchip Plant 2	Facade 03	Area	271540	6142892	7.5	**81**	-	-	-	46	52	52	61	80	65	70	67	72	61	68	65	64	60	59	49	46	45	41	40	41	39	33	28
115	Woodchip Plant 1	Facade 04	Area	271538	6142894	7.5	**84**	-	-	-	48	54	54	63	82	67	72	69	74	64	70	67	66	62	61	51	48	47	43	42	44	41	36	31
116	Woodchip Plant 1	Facade 05	Area	271542	6142898	7.5	**86**	-	-	-	50	56	56	66	84	70	74	71	77	66	73	70	69	65	64	54	51	49	46	45	46	44	38	33
117	Woodchip Plant 1	Facade 06	Area	271545	6142902	7.5	**84**	-	-	-	48	54	55	64	82	68	73	70	75	64	71	68	67	63	62	52	49	47	44	43	44	42	36	31
118	Woodchip Plant 1	Facade 07	Area	271555	6142908	7.5	**90**	-	-	-	54	60	60	69	88	73	78	75	80	70	76	73	72	68	67	57	54	53	49	48	49	47	42	36
119	Woodchip Plant 1	Facade 08	Area	271564	6142911	7.5	**-**	-	-	-	38	32	32	22	4	18	14	17	11	22	15	18	19	23	24	34	37	39	42	44	42	44	50	55
120	Woodchip Plant 1	Facade 09	Area	271568	6142913	7.5	**86**	-	-	-	50	56	56	65	84	69	74	71	76	66	72	69	68	64	63	53	50	49	45	44	45	43	38	33
121	Woodchip Plant 1	Facade 10	Area	271572	6142913	7.5	**81**	-	-	-	45	51	51	60	79	64	69	66	72	61	67	65	63	60	58	48	46	44	41	39	41	38	33	28
122	Woodchip Plant 1	Facade 11	Area	271575	6142912	7.5	**83**	-	-	-	47	53	53	62	81	66	71	68	73	63	69	66	65	61	60	50	47	46	42	41	42	40	35	29
123	Woodchip Plant 1	Facade 12	Area	271579	6142904	7.5	**89**	-	-	-	53	59	59	68	87	72	77	74	80	69	75	73	71	68	66	56	54	52	49	47	49	46	41	36
124	Woodchip Plant 1	Facade 13	Area	271575	6142894	7.5	**87**	-	-	-	51	58	58	67	86	71	76	73	78	67	74	71	70	66	65	55	52	51	47	46	47	45	39	34
125	Woodchip Plant 1	Facade 14	Area	271569	6142892	7.5	**79**	-	-	-	43	49	49	58	77	62	67	64	69	59	65	62	61	57	56	46	43	42	38	37	38	36	31	26
126	Woodchip Plant 1	Facade 15	Area	271565	6142890	7.5	**85**	-	-	-	50	56	56	65	84	69	74	71	76	65	72	69	68	64	63	53	50	49	45	44	45	43	37	32
127	Woodchip Plant 1	Facade 16	Area	271561	6142890	7.5	**80**	-	-	-	44	50	50	60	78	63	68	65	71	60	66	64	62	59	58	47	45	43	40	38	40	38	32	27
128	Woodchip Plant 2	Roof	Area	271582	6142930	14	**95**	-	-	-	-	71	73	69	80	76	76	77	78	77	79	88	83	81	91	86	76	74	73	70	70	67	64	-
129	Woodchip Plant 2	South Façade	Area	271585	6142918	7	**92**	-	-	-	-	68	71	66	77	74	73	74	75	74	76	85	81	78	88	84	74	71	70	67	67	65	62	-
130	Woodchip Plant 2	West Facade	Area	271545	6142921	7	**88**	-	-	-	-	63	66	61	72	69	68	69	71	69	71	80	76	73	83	79	69	66	65	62	62	60	57	-
131	Woodchip Plant 2	North Façade	Area	271579	6142942	7	**92**	-	-	-	-	68	71	66	77	74	73	74	75	74	76	85	81	78	88	84	74	71	70	67	67	65	62	-
132	Woodchip Plant 2	East Facade	Area	271620	6142939	7	**88**	-	-	-	-	63	66	61	72	69	68	69	71	69	71	80	76	73	83	79	69	66	65	62	62	60	57	-
133	CM 6 - 200T Silo	Dust Collector	Point	271631.4	6142709	21	**85**	-	-	-	-	38	-	-	53	-	-	62	-	-	73	-	-	78	-	-	81	-	-	80	-	-	71	-
134	CM 6 - 200T Silo	Blower	Point	271628.5	6142712	3	**91**	-	-	-	-	68	-	-	77	-	-	83	-	-	85	-	-	86	-	-	83	-	-	78	-	-	73	-
135	CM 6 - 200T Silo	In-Line Screw Conveyor	Point	271632.4	6142713	4	**91**	-	-	-	-	69	-	-	73	-	-	80	-	-	82	-	-	84	-	-	88	-	-	79	-	-	74	-
136	CM 6 - 200T Silo	In-Line Screw Conveyor	Point	271632.8	6142715	4	**91**	-	-	-	-	69	-	-	73	-	-	80	-	-	82	-	-	84	-	-	88	-	-	79	-	-	74	-

ID	Group	Noise source	Type	Source Position (UTM co-ordinates zone 54H)			Sound Power Level (dB(A) re 1pW)																													
				X	Y	Z	Overall	25	31.5	40	50	63	80	100	125	160	200	250	315	400	500	630	800	1k	1.25k	1.6k	2k	2.5k	3.15k	4k	5k	6.3k	8k	10k
137	CM 1 - 400T Silo	In-Line Screw Conveyor	Point	271882.9	6142601	4	**91**	-	-	-	-	69	-	-	73	-	-	80	-	-	82	-	-	84	-	-	88	-	-	79	-	-	74	-
138	Tertiary Recycle Plant- Dust Collector	Façade 01	Area	271584.3	6142827	7.5	**57**	57	44	48	-	58	59	63	56	61	61	66	68	69	67	64	63	62	62	62	59	53	51	-	-	47	45	-
		Façade 02	Area	271586.1	6142830	7.5	**56**	57	44	48	-	58	59	63	56	61	61	66	68	69	67	64	63	62	62	62	59	53	51	-	-	47	45	-
		Façade 03	Area	271582.7	6142833	7.5	**57**	57	44	48	-	58	59	63	56	61	61	66	68	69	67	64	63	62	62	62	59	53	51	-	-	47	45	-
		Façade 04	Area	271580.9	6142829	7.5	**56**	57	44	48	-	58	59	63	56	61	61	66	68	69	67	64	63	62	62	62	59	53	51	-	-	47	45	-
139	Tertiary Recycle Plant	Fresh Air Blower	Point	271609	6142838	8	**98**	50	53	58	63	63	75	71	75	81	84	86	84	87	89	88	88	88	88	87	86	84	80	78	75	74	71	64
140	Tertiary Recycle Plant	Air-cooled Screw Conveyor	Point	271610.4	6142839	6	**96**	56	54	59	64	66	69	74	78	80	82	83	84	83	85	85	85	86	86	85	84	86	81	79	77	75	70	65
141	Tertiary Recycle Plant	TAD Elevator Drive (Gearbox + Motor)	Point	271610.1	6142842	35	**94**	58	57	59	64	64	72	70	75	77	79	81	81	82	83	86	85	83	86	83	83	80	76	74	71	66	62	58
142	Tertiary Recycle Plant	Roller Crusher	Point	271609.5	6142837	4	**96**	55	55	61	64	66	75	73	74	78	81	82	84	85	85	86	87	87	87	85	84	83	79	78	75	73	69	63
143	Kiln Cooling Tower Unit	4A Cooling Tower 1 & 2	Point	271615	6142880	11	**91**	44	46	49	57	64	59	65	64	74	85	86	84	85	85	91	85	83	82	82	79	78	75	75	74	71	67	65

Appendix C : Noise Contour Plots


270500
270750
271000
271250
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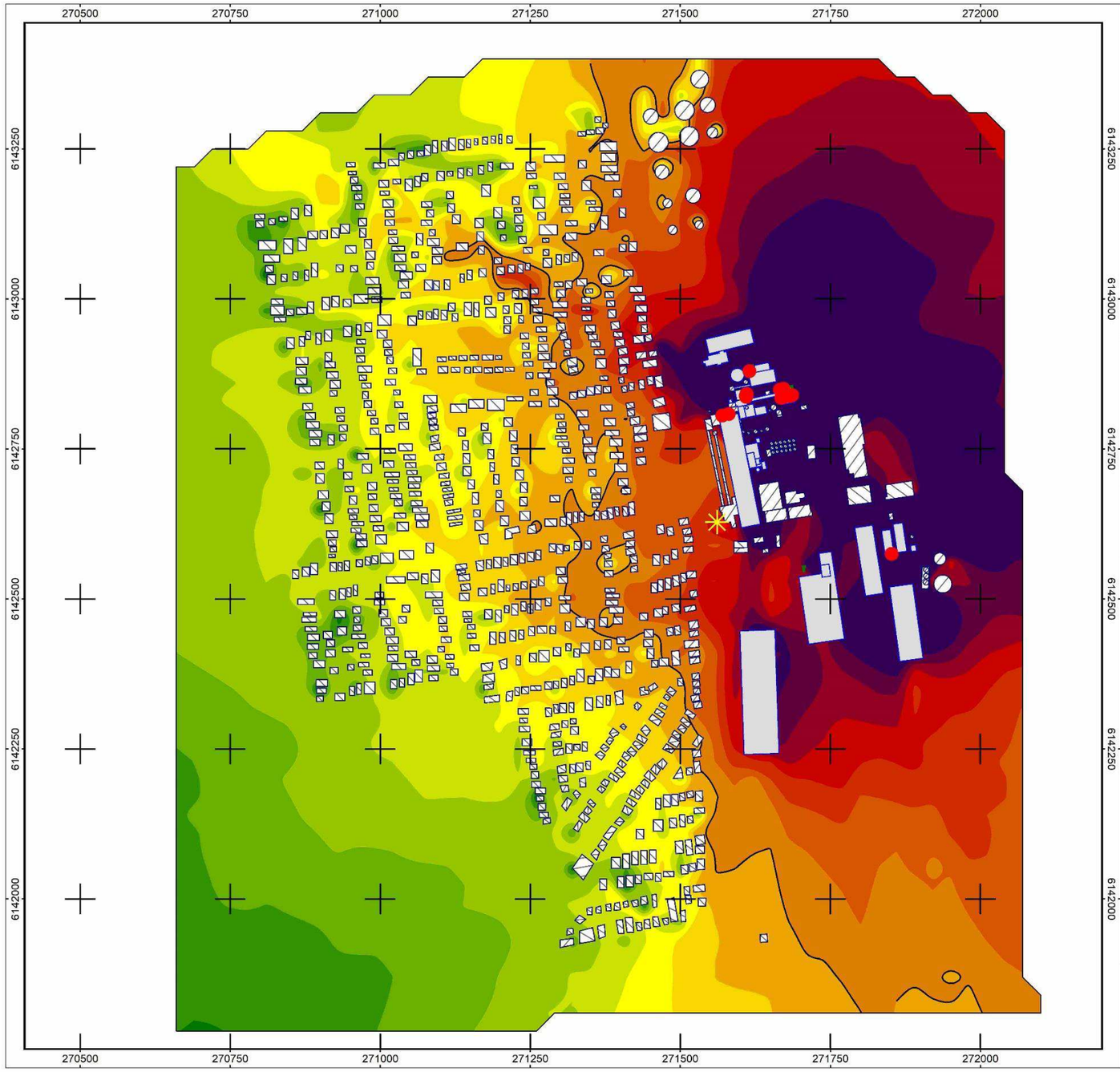
271750
272000
6143250
6143000
6142750
6142500
6142250
6142000
\\vipac\vsr\sakshamg\Desktop\SoundPLAN_06.04.2022\ABC Birkenhead Model Updated 06.07.2020\2018.12.18 Neutral.sgs
Customer:
Adelaide Brighton Cement Ltd
Project: ABC Birkenhead Environmental Noise
Project-No. 50B-22-0069
Map
1
Noise Situation
Neutral Climatic Conditions
Calculation at 1.5 m above ground level
Project engineer: Saksham Garg
Created: 25/10/2021
Processed with SoundPLAN 8.0, Update 9/08/2017
Levels Leq
in dB(A)
< 35
35 - 37
37 - 39
39 - 41
41 - 43
43 - 45
45 - 47
47 - 49
49 - 51
51 - 53
53 - 55
55 - 57
57 - 59
>= 59
Signs and symbols
Road axis
Emission line
Surface
Central reservation
Wall
inside tunnels
Signal
Railway axis
Emission line
Surface
Wall
inside tunnels
Tunnel opening
Main building
Auxiliary building
Base line
Ridge
Base line
N
Length scale 1:6000
0 50 100 200 300 400 m
ViPAC Engineers & Scientists



Customer:
Adelaide Brighton Cement Ltd
Project: ABC Birkenhead Environmental Noise
Project-No. 50B-22-0069

Map
2

Noise Situation

Worst-case Climatic Conditions

Calculation at 1.5 m above ground level

Project engineer: Saksham Garg
Created: 25/10/2021
Processed with SoundPLAN 8.0, Update 9/08/2017

Levels Leq
in dB(A)

< 35
35 - 37
37 - 39
39 - 41
41 - 43
43 - 45
45 - 47
47 - 49
49 - 51
51 - 53
53 - 55
55 - 57
57 - 59
59 - 61

Signs and symbols
- Road axis
- Emission line
- Surface
- Central reservation
- Wall
- inside tunnels
- Signal
- Railway axis
- Emission line
- Surface
- Wall
- inside tunnels

N

Length scale 1:6404
0 50 100 200 300 400 m

ViPAC Engineers & Scientists

\\vipac\usr\sakshamg\Desktop\SoundPLAN - 06.04.2022\ABC Birkenhead Model Updated 06.07.2020\2018.12.18 Worst case.sgs

Appendix D : On-Site Survey Data

Measurements	Plant/Equipment	Distance (m)	L_{Aeq}	L_{Amax}	L_{A90}	L_{A10}	Notes
001	TAD Crusher	1	93	90	85	89	-
002	TAD Screw	1	93	91	85	89	-
003	TAD Fan	1	94	90	84	88	-
004	TAD Elevator	1	91	88	82	86	General plant noise influence/interference
005	TAD Elevator	1	88	88	82	86	General plant noise influence/interference
006	TAD Elevator	1	88	91	85	89	General plant noise influence/interference
007	Kiln Elevator	1	90	90	85	88	-
008	Kiln Elevator	1	91	89	83	86	-
009	Kiln Elevator	1	90	90	86	89	-
010	4B Conditioner Tower Water Jets	1	83	86	80	84	Normal operation
011	4B Conditioner Tower Water Jets	1	82	87	80	85	Normal operation
012	4B Conditioner Tower Water Jets	1	85	86	81	85	Normal operation
013	4B Conditioner Tower Water Jets	1	85	86	80	85	Normal operation
014	4B Conditioner Tower Water Jets	1	86	85	79	83	Normal operation
015	4B Conditioner Tower Water Jets	1	86	83	78	81	Normal operation
016	4B Conditioner Tower Water Jets	1	85	84	77	81	Normal operation
017	4B Conditioner Tower Water Jets	1	87	83	78	82	Normal operation
018	4B Conditioner Tower Water Jets	1	85	84	78	82	Normal operation
019	4B Conditioner Tower Water Jets	1	86	86	79	83	Normal operation
020	4B Conditioner Tower Water Jets	1	83	86	80	84	High flow, distinct tone
021	4B Conditioner Tower Water Jets	1	83	86	80	84	High flow, distinct tone
022	4B Conditioner Tower Water Jets	1	84	86	81	85	High flow, distinct tone
023	4B Conditioner Tower Water Jets	1	85	86	80	84	High flow, distinct tone
024	4B Conditioner Tower Water Jets	1	86	84	78	82	High flow, distinct tone
025	4B Conditioner Tower Water Jets	1	86	84	79	82	High flow
026	4B Conditioner Tower Water Jets	1	86	84	78	82	High flow
027	4B Conditioner Tower Water Jets	1	86	84	77	81	High flow
028	4B Conditioner Tower Water Jets	1	86	84	78	82	High flow, distinct tone
029	4B Conditioner Tower Water Jets	1	85	85	79	83	High flow
030	4B EP Outlet Duct	8	95	89	83	87	Directly beneath
031	4B EP Outlet Duct	12	92	88	83	87	-
032	4B CT Drag Chain	1	111	103	97	101	Resonant Cavity dominated by 4B EP, HF Intermittent Squeak
033	4B CT Drag Chain	1	111	102	96	100	Resonant Cavity dominated by 4B EP, HF Intermittent Squeak

Measurements	Plant/Equipment	Distance (m)	L_{Aeq}	L_{Amax}	L_{A90}	L_{A10}	Notes
034	4B Drag Chain 3	1	96	92	86	90	Metal rub 1.6khz
035	4B Drag Chain 3	1	94	90	84	89	Metal rub 1.6khz
036	4B EP Drag Chains 1 & 2	1	92	82	77	80	Metal rub 800hz
037	4B EP Drag Chains 1 & 2	1	88	81	75	79	Metal rub 800hz
042	North Clinker Gantry Fan East	1	84	83	77	81	-
043	North Clinker Gantry Fan West	1	83	82	74	80	-
044	4A Cooling Tower	1	91	92	87	90	-
045	4A Cooling Tower	1	87	90	84	88	-
047	4A Cooling Tower	1	88	90	84	88	-
048	CM6 Fringe Sile Dust Collector	1	85	86	80	84	-
049	CM6 Fringe Sile Dust Collector	1	84	85	79	84	-
050	Gas Train	1	69	81	68	75	Heavy traffic noise
051	Gas Train	1	72	75	68	73	Gas Train Audible /w Traffic Noise
052	Gas Train	1	71	72	66	70	Heavy traffic noise
053	CM 1 & 7 Clinker Fans	40	75	80	73	78	20m from edge of building loudest location.
054	CM 1 & 7 Clinker Fans	40	75	79	73	78	20m from edge of building loudest location.
055	CM 1 & 7 Clinker Fans	40	78	80	71	77	20m from edge of building loudest location.

Measurements 38-41 and 46 were not considered reliable and were therefore removed from the data

Appendix E : Annual Noise Survey Results Comparison

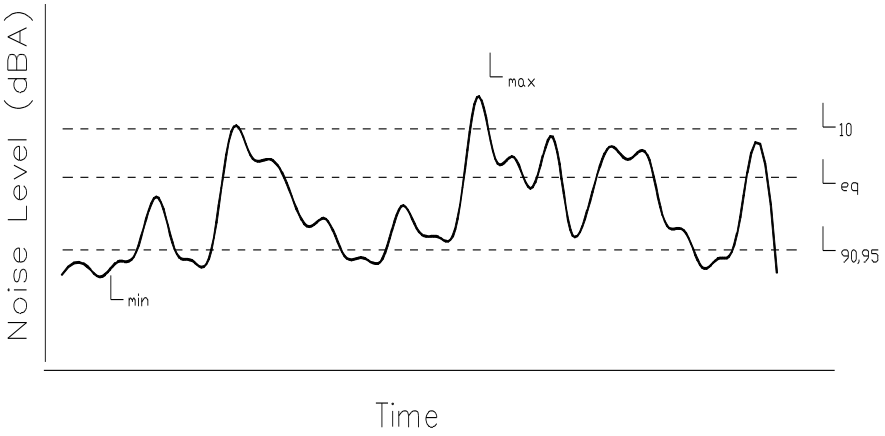
Receiver Location	Night-Time L_{A90} Noise Level Comparison, (dB(A))					
	2017	2018	2019	2020	2021	2022
R2	55	55	54	54	53	52
R3	49	48	48	49	47	47
R4	44	43	41	44	43	41
R5	52	51	50	52	49	48
R6	45	44	46	46	43	39
R8	50	47	48	47	46	47
R9	43	40	41	42	40	40
R10	50	49	47	47	47	50
R11	42	39	41	39	39	36
R12	54	51	52	54	52	52
R13	46	43	43	43	44	42
R14	42	40	41	42	40	39
R15	54	53	53	53	52	52
R16	59	54	56	55	53	47
R17	47	43	43	45	43	40
R18	49	41	43	46	44	38
N1	51	48	48	49	46	43
N2	51	50	48	49	47	42
N3	52	51	50	50	49	48

Appendix F : Meteorology Data

Time	Temperature	Dew Point	Humidity	Wind	Wind Speed	Wind Gust	Pressure
10:00 PM	50 °F	46 °F	87 %	CALM	0 mph	0 mph	30.20 in
10:30 PM	55 °F	50 °F	82 %	CALM	0 mph	0 mph	30.20 in
11:00 PM	63 °F	52 °F	68 %	W	1 mph	0 mph	30.20 in
12:30 AM	63 °F	52 °F	68 %	W	6 mph	0 mph	30.20 in
1:00 AM	64 °F	54 °F	68 %	W	5 mph	0 mph	30.20 in
1:30 AM	64 °F	54 °F	68 %	WSW	7 mph	0 mph	30.20 in
2:00 AM	64 °F	52 °F	64 %	W	7 mph	0 mph	30.17 in
2:30 AM	64 °F	54 °F	68 %	WSW	8 mph	0 mph	30.17 in
3:00 AM	64 °F	54 °F	68 %	WSW	8 mph	0 mph	30.14 in
3:30 AM	64 °F	52 °F	64 %	WSW	9 mph	0 mph	30.14 in
4:00 AM	66 °F	52 °F	60 %	SW	8 mph	0 mph	30.11 in
4:30 AM	68 °F	54 °F	60 %	SW	7 mph	0 mph	30.11 in
5:00 AM	70 °F	52 °F	53 %	E	7 mph	0 mph	30.08 in
5:30 AM	68 °F	50 °F	52 %	ESE	5 mph	0 mph	30.08 in
6:00 AM	70 °F	50 °F	49 %	ESE	6 mph	0 mph	30.05 in
6:30 AM	70 °F	46 °F	43 %	E	16 mph	0 mph	30.05 in
7:00 AM	70 °F	50 °F	49 %	SE	14 mph	0 mph	30.05 in
7:30 AM	68 °F	50 °F	52 %	ESE	13 mph	0 mph	30.05 in
8:00 AM	66 °F	50 °F	56 %	ESE	10 mph	0 mph	30.08 in
8:30 AM	64 °F	50 °F	59 %	SE	9 mph	0 mph	30.08 in
9:00 AM	64 °F	50 °F	59 %	ESE	9 mph	0 mph	30.08 in
9:30 AM	63 °F	50 °F	63 %	SE	10 mph	0 mph	30.08 in
10:00 AM	61 °F	50 °F	68 %	SSE	8 mph	0 mph	30.08 in
10:30 AM	61 °F	50 °F	68 %	S	6 mph	0 mph	30.08 in
11:00 AM	63 °F	50 °F	63 %	S	5 mph	0 mph	30.11 in
11:30 AM	63 °F	50 °F	63 %	SSW	5 mph	0 mph	30.08 in
12:00 PM	61 °F	50 °F	68 %	S	6 mph	0 mph	30.08 in
12:30 PM	61 °F	50 °F	68 %	SSE	3 mph	0 mph	30.08 in
01:00 PM	59 °F	50 °F	72 %	NE	6 mph	0 mph	30.08 in
01:30 PM	59 °F	50 °F	72 %	ENE	2 mph	0 mph	30.05 in
2:00 PM	61 °F	52 °F	72 %	ESE	10 mph	0 mph	30.05 in
2:30 PM	61 °F	52 °F	72 %	ESE	7 mph	0 mph	30.05 in

Appendix G : Glossary of Acoustic Terminology

dB(A)	A-weighted decibels; a unit of measurement of sound pressure level which has its frequency characteristics modified by a filter ("A-weighted") so as to more closely approximate the frequency response of the human ear.
L_{10} or L_{A10}	The noise level which is equalled or exceeded for 10% of the measurement period. L_{10} is an indicator of the mean maximum noise level, and is used in Australia as the descriptor for intrusive noise (usually in dB(A)).
L_{90} or L_{A90}	The noise level which is equalled or exceeded for 90% of the measurement period. L_{90} is an indicator of the mean minimum noise level, and is used in Australia as the descriptor for background or ambient noise (usually in dB(A)).
L_{eq} or L_{Aeq}	The equivalent continuous noise level for the measurement period. L_{eq} is an indicator of the average noise level (usually in dB(A)).
L_{max} or L_{Amax}	The maximum noise level for the measurement period (in dB(A))
Broadband noise	Noise comprising energy distributed across a large range of frequencies
Impulsive noise	A noise distinguished by a sharp rise and fall in noise level. Often characterised as thumping or banging.
Low frequency noise	A noise characterised as rumbling, roaring, booming or similar.
Modulating noise	A noise that fluctuates in either frequency (such as a wailing siren), or loudness (such as intermittent traffic). May be described as varying, fluctuating, pulsating or similar.
Tonal noise	A noise having a well-defined pitch or note which is clearly audible above other noise.



Note: *The subjective reaction or response to changes in noise levels can be summarised as follows*:

A 3 dB(A) increase in sound pressure level is required for the average human ear to notice a change; a 5 dB(A) increase is quite noticeable and a 10 dB(A) increase is typically perceived as a doubling in loudness.

Appendix B

Noise Measurement Locations:

Measurement Location	Location Address/ Description
R2	Corner of Alfred Street and Hargrave Street, Peterhead
R3	Adjacent to 145 Hargrave Street, Peterhead (facing Fletcher Road)
R4	Corner of Robert Street and Hargrave Street, Birkenhead
R5	Adjacent to 23 Levi Street, Birkenhead
R6	Adjacent to 19 Craigie Street, Birkenhead
R8	Adjacent to 39 Mary Street, Peterhead
R9	Corner of Wills Street and Whyte Street, Peterhead
R10	Corner of Olive Street and Victoria Road, Largs Bay
R11	Adjacent to 158 Fletcher Road, Largs Bay (facing east down Olive Street)
R12	Adjacent to 33 Hilton Street, Birkenhead
R13	Adjacent to 28 Whyte Street, Peterhead (facing east down Matilda Street)
R14	Adjacent to 15 Waverley Street, Largs Bay
R15	Adjacent to 9 Walton Street, Peterhead
R16	Adjacent to 77 Victoria Road, Birkenhead
R17	Corner of Fletcher Road and Rose St., Birkenhead (adjacent 53 Fletcher Rd)
R18	Adjacent to 20 Fletcher Road, Birkenhead (in the Park)
N1	Corner of Gunn Street and Well Street, Birkenhead (adjacent to 39 Wells St)
N2	Adjacent to 9 Mary Street, Peterhead
N3	Corner of Walton Street and Mary Street, Peterhead (adjacent to 23 Mary St.)

Figure 6-1: Overview of attended noise measurement locations (note that unattended noise logging was previously also conducted at R2)