Cement Australia Glebe Island Throughput Increase Project

Noise Impact Assessment

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Cement Australia – Glebe Island Throughput Increase Project

Noise Impact Assessment

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EXECUTIVE SUMMARY

ERM Australia Pacific Pty Ltd (ERM) has been commissioned by Cement Australia (CA) to prepare a noise impact assessment (NIA) for a proposed throughput increase in the operational capacity of the cement shipping terminal and distribution facility at the Glebe Island Port facility in Sydney.

Due to sustained increased demand for cementitious materials, the existing facility needs to increase its operational capacity to ensure ongoing sustainable supply through Glebe Island.

The NIA provides an assessment of the landside, vessel and road traffic noise sources from the throughput increase by CA. The report also comments on the cumulative noise impact from the existing operations and the the other approved bulk handling and industrial activities throughout Glebe Island.

Recent noise assessments in the project area and historical noise monitoring were reviewed in order to establish the existing noise environment. The Glebe Island and White Bay Port Noise Policy (PNP) was used to establish criteria for operations.

Noise measurements conducted by ERM in 2019, SLR in May 2021 and noise monitoring reports from the Port Authority of NSW were used to determine the noise emissions from unloading activities at nearby receptors.

Noise modelling was undertaken to predict noise impacts generated by the throughput increase, including additional truck movement and facility mechanical equipment. Cumulative impact from predicted existing operations and from the throughput increase were also assessed. The predicted levels were assessed against the limits set in the PNP.

The assessment shows that the main noise contributor at the closest receptors in Balmain is vessel noise associated with the unloading activities at Berth 8. From the measured noise levels, a marginal exceedance of 2 dB at NCA1 in the night-time was observed on one occasion. Other measurements indicated compliance with the criteria.

The landside noise assessment concluded that the throughput increase from Cement Australia will be well below the Landside Precinct Noise Level criteria during all periods (day, evening and night). As such the Cement Australia facility when operating at the proposed increased throughput will not increase the collective benchmark noise level..

Night-time short term peak noise levels of truck movements from the throughout increase are also predicted to be below the the Nominal Maximum Permissible Screening Test limit.

The proposed throughput increase by Cement Australia will not change the noise emissions levels from vessels. However, the throughput increase will result into an increase in vessel movements, increasing the frequency of vessels at the port.

Cement Australia has limited control over the noise emissions from vessels, however continues to work closely with the Port Authority of NSW and CSL Australia to ensure that measures are in place during unloading activities. Bulk cement carriers currently using the Glebe Island berth 8 have been and are undergoing improvements to be fitted with noise attenuation controls including silencers fitted to cargo generators and exhausts installation of machinery room noise attenuator modules. The ongoing improvements will ensure noise emissions from future vessel are reduced.

The throughput increase will also cause a negligible increase of less than 1 dB in road traffic noise on the local road network. This increase complies with the noise criteria set in the NSW RNP.

General good practice recommendations have been made in order to manage and mitigate current and future noise impacts generated by the facility.

By implementing the recommended measures and from ongoing improvement works on vessels, it is predicted that noise emission from the throughput increase by CA will be minimised with the aim of adhering to the noise limits defined within the PNP.

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Acronyms and Abbreviations

Name	Description
CA	Cement Australia
dB	The decibel (dB) is a relative unit of measurement, widely used in acoustics. The dB is a logarithmic ratio between the measured level and a reference (threshold) level of 0dB
dBA	dBA denotes a single number sound pressure level that includes a frequency weighting (“A-weighting”) to reflect the subjective loudness of the sound level. The frequency of a sound affects its perceived loudness. Human hearing is less sensitive at low and very high frequencies, and so the A-weighting is used to account for this effect. An A-weighted decibel level is written as dBA.
DPIE	Department of Planning, Industry and Environment
EPA	Environment Protection Authority
L_{10}	The noise level exceeded for 10 per cent of the time and is approximately the average of the maximum noise levels. L_{A10} denotes A-weighted noise level.
L_{90}	The noise level exceeded for 90 per cent of the time and is approximately the average of the minimum noise levels. The L90 level is often referred to as the “background” noise level and is commonly used as a basis for determining noise criteria for assessment purposes. L_{A90} denotes A-weighted noise level.
L_1	The noise level exceeded for 1 per cent of the time and is approximately the average of the maximum noise levels. L_{A1} denotes A-weighted noise level.
L_{eq}	The ‘equivalent continuous sound level’, Leq, is used to describe the level of a time-varying sound or vibration measurement. Leq is often used as the “average” level for a measurement where the level is fluctuating over time. Mathematically, it is the energy-average level over a period of time (i.e. the constant sound level that contains the equivalent sound energy as the measured level). When the dBA weighting is applied, the level is denoted dB LAeq. L_{Aeq} denotes A-weighted noise level.
L_{max}	The maximum noise level during a measurement period or a noise event. L_{Amax} denotes A-weighted noise level.
L_{min}	The minimum noise level during a measurement period or a noise event. L_{Amin} denotes A-weighted noise level.
NCA	Noise Catchment Area
NIA	Noise Impact Assessment
NML	Noise Management Level
NPfI	Noise Policy for Industry (2017)
PE	Pacific Environment Consulting
POEO	Protection of the Environment Operations
PNP	The Glebe Island & White Bay Port Noise Policy published by the Port Authority of NSW
PNTL	Project-Specific Noise Trigger Level
RBL	Rating Background Level; The overall, single-figure background level representing each assessment period (day/evening/night) over the whole monitoring period.
SLR	SLR Consulting
SWL	Sound Power Level

1. INTRODUCTION

ERM Australia Pacific Pty Ltd (ERM) has been commissioned by Cement Australia (CA) to prepare a noise impact assessment (NIA) for a proposed throughput increase in the operational capacity of the cement shipping terminal and distribution facility at the Glebe Island Port facility in Sydney.

Due to sustained increased demand for cementitious materials, the existing facility needs to increase its operational capacity to ensure ongoing sustainable supply through Glebe Island.

The facility has a set of 30 Silos, 14 of which are operated by Sugar Australia and the other 16 by CA.

The NIA provides a qualitative assessment of the landside, vessel and road traffic noise sources from the throughput increase by CA. The report also comments on the cumulative noise impact from the existing operations and the proposed throughput increase at Glebe Island.

1.1 Objectives and Scope

The objective of this NIA is to meet the requirements of the Secretary's Environmental Assessment Requirements (SEARs). Noise related SEARS are outlined in Table 1.1.

Table 1.1: Response to SEARS

SEARS	Response
A quantitative noise and vibration impact assessment of operational activities undertaken by a suitably qualified person in accordance with the relevant Environment Protection Authority guidelines and including an assessment of nearby sensitive receivers	The noise assessment was undertaken by a suitably qualified acoustician in accordance with The Glebe Island & White Bay Port Noise Policy (PNP) published by the Port Authority of NSW. The PNP allows for a precinct approach for the assessment and noise management. Details of the assessment are presented in Chapters 5 and 6.
Cumulative impacts from existing onsite operations and from surrounding developments	Cumulative impacts based on this assessment and the results of the original noise assessment conducted by SLR in 2018 are presented in Chapter 6.
Details and justification of the proposed noise mitigation, management and monitoring measures.	Details and justification of proposed noise mitigation, management and monitoring measures have been outlined in Chapter 7.

To achieve the objectives, the following scope of works were undertaken:

- Identify and quantify the current acoustic environment;
- Identify noise sensitive receptors/areas which may be impacted by the throughput increase;
- Quantify the existing noise contribution from CA and establish noise management levels in accordance with the PNP;
- Predict potential noise impacts associated with throughput increase;
- Compare noise impacts, including cumulative impacts, against the PNP; and
- Provide a management framework and mitigation measures to minimise impacts, where possible.

2. PROJECT DESCRIPTION

The Glebe Island Port facility is part of the Bays Precinct, located approximately 2.3 km west of the Sydney CBD. The existing facility uses 16 grain silos for storage of cement. The modified Development Consent 350/91 prescribes a maximum throughput of 500,000 tonnes per annum (renewed annually in June) through the facility.

Cement Australia is seeking to extend the operating capacity of the facility by up to 1,200,000 tonnes per annum.

Noise sources associated with the throughput increase include:

- Landside and vessel noise – Industrial and shipping activity at White Bay and Glebe Island; and
- Road traffic noise from additional trucks on the local road network – Road traffic flows on the Western Distributor (Anzac Bridge), The Crescent and Victoria Road.

No construciton works are required to enable this proposed throughput increase.

An overview of the site including the port facility is shown in **Figure 2.1**.

Legend

Site Boundary

Site Features

Data Source:
Base data: DCDB/DTDB NSW
Imagery: Nearmap (04/10/2021)

Site Layout

2.1

Drawing No: 0488846m_NM_G001_R0.mxd		Glebe Island Noise Modelling
Date: 18/10/2021	Drawing Size: A4	
Drawn By: KV	Reviewed By:CGW	Client: Cement Australia

Coordinate System: GDA 1994 MGA Zone 56

0 100 200m

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This figure may be based on third party data or data which has not been verified by ERM and it may not be to scale. Unless expressly agreed otherwise, this figure is intended as a guide only and ERM does not warrant its accuracy.

ERM

2.1 Noise Sensitive Receptors

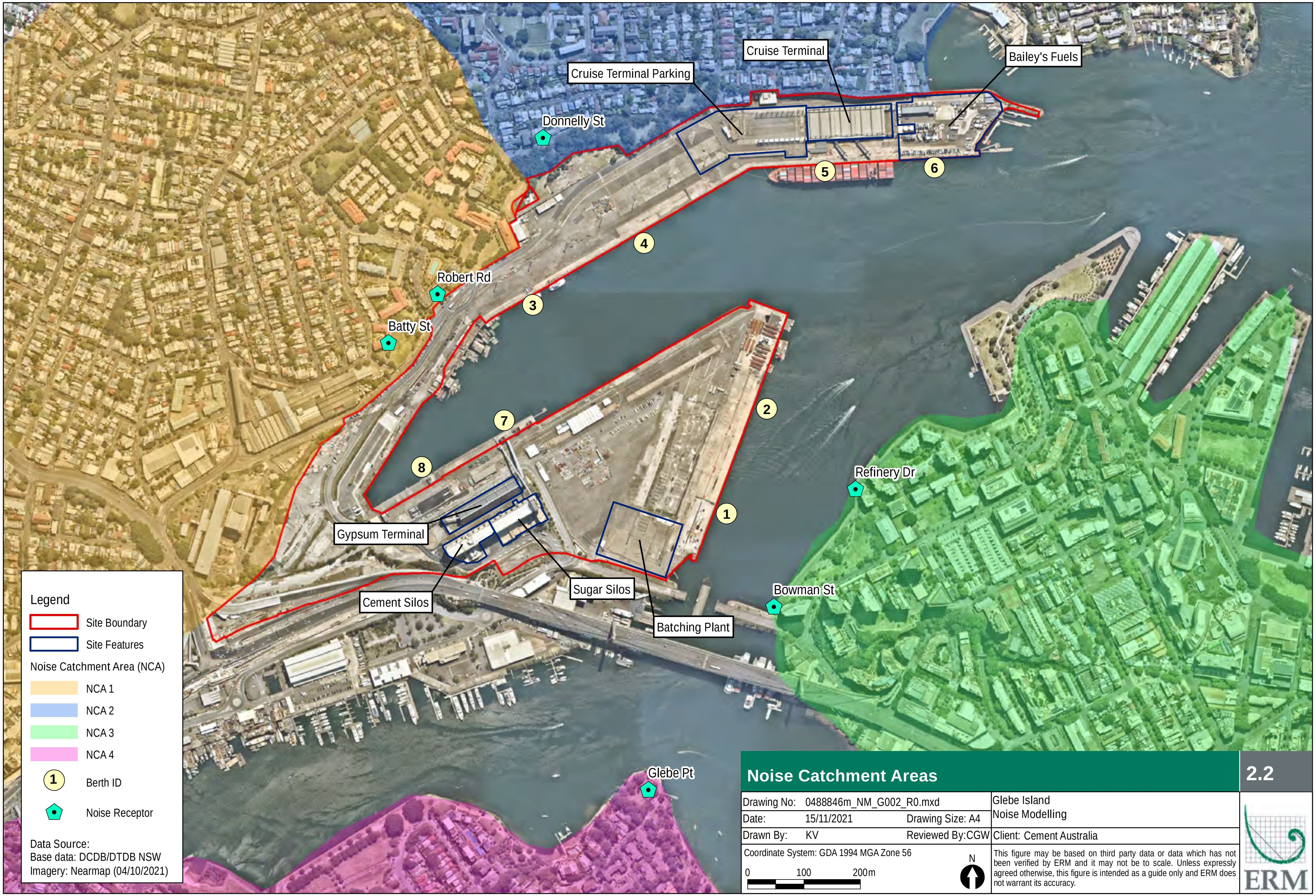
The closest noise sentive receptors are residential areas, including dwellings and multi-storey apartment buildings, located in the suburbs of Rozelle to the west, Balmain to the north, Pyrmont to the east, and Glebe on the southern side of Blackwattle bay across the Anzac Bridge.

The potentially most impacted receptors are residential apartment blocks on Batty Street, Balmain and Refinery Drive, Pyrmont, both with direct line of sight to the port facility. Receptors in Glebe and Rozelle are shielded by intervening structures and exposed by existing road traffic noise from the Anzac Bridge, and are expected to be less impacted by the proposed throughput increase.

The noise sensitive residential areas have been grouped into four Noise Catchment Areas (NCAs) as ssummarised in **Table 2.1**. **Figure 2.2** shows the most affected streets of the potentially affected residential areas and berth locations.

Table 2.1: Noise Catchment Areas (NCA)

Noise Catchment Area (NCA)	Locality / Suburb	Representative Closest Street
1	Balmain	Batty Street
2	Balmain	Donnelly Street
3	Pyrmont	Refinery Drive
4	Glebe Point	Leichhardt Street



Noise Catchment Areas

2.2

Drawing No: 0488846m_NM_G002_R0.mxd		Glebe Island Noise Modelling
Date: 15/11/2021	Drawing Size: A4	
Drawn By: KV	Reviewed By: CGW	Client: Cement Australia

Coordinate System: GDA 1994 MGA Zone 56

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3. NOISE ENVIRONMENT

The Glebe Island Port facility is currently operational and contritubes to the noise environment to adjoining Noise Catchment Areas (NCAs). The main noise sources include industrial activities and vessel noise at White Bay and Glebe Island. The project area is also currently exposed to road traffic noise from traffic flows on the Western Distributor (Anzac Bridge), The Crescent and Victoria Road.

3.1 Vessel Noise – Unloading Activities and Ship at Berth

3.1.1 Measured Vessel Noise Emissions in 2019

ERM conducted a series of site inspections in 2019 to measure noise emissions at noise sensitive receptors from the unloading activities from ships at berth. The measurements provide an understanding of the existing noise environment from vessel noise, including unloading activities.

Attended measurements were undertaken on three occasions as follows:

1. 6th February 2019 – Measurements were conducted at four locations to capture noise impacts generated from unloading activities from the “MV Luga” vessel;
2. 3rd June 2019 – Measurements were conducted at five locations to capture noise impacts generated from unloading activities from the “MV Wyuna” vessel; and
3. 18th June 2019 – Measurements were conducted at five locations to capture noise levels with no unloading activities for comparison purposes.

All the attended measurements were conducted using an NTi XL2 sound level meter. Measurements were undertaken over 15-minute intervals generally in accordance with the recommendations contained in Australian Standard AS1055[1]. Field calibration was checked before and after each measurement with no significant drift (±0.5 dB) observed. The results of the attended measurements conducted on the three occasions are summarised in Table 3-1.

Where necessary, additional measurements were undertaken near the facility and in the Balmain NCA (Donnelly Street and Buchanan Street) to further inform measured noise emissions in those areas.

[1] AS1055:2018 – Description and measurement of environmental noise

Table 3-1: Summary of Attended Noise Measurements

NCA	Locality	Location	Date/Time	Noise Source Activity	Measured Noise Level, in dBA 15-minute samples				Observations
					L_{max}	L_{10}	L_{eq}	L_{90}	
1	Balmain	Batty Street	06/02/2019 23:45	"MV Luga" Vessel Unloading	61	57	56	55	Unloading noise observed with constant mechanical noise at 55-56dBA, short peak up to 58dBA. Insects, occasional birds observed.
			03/06/2019 22:26	"MV Wyuna" Vessel Unloading	69	57	56	55	Unloading noise observed with constant mechanical noise at 56 dBA, short peak up to 60 dBA. Aircraft noise observed.
			18/06/2019 22:11	No Unloading Activities	64	52	50	48	No unloading noise observed. Noise from cement trucks, road traffic and aircraft observed.
2	Balmain	Donnelly Street	03/06/2019 22:56	"MV Wyuna" Vessel Unloading	72	51	50	48	Unloading noise observed with constant ship hum at approximately 45 dBA). Road traffic noise observed.
			18/06/2019 22:32	No Unloading Activities	65	50	49	47	No unloading noise observed. Mechanical/industrial noise from other site, road traffic and birds noise observed.
		Buchanan Street	03/06/2019 23:28	"MV Wyuna" Vessel Unloading	75	52	53	47	Unloading noise observed with constant ship hum at 48 dBA. Road traffic noise observed.
			18/06/2019 22:59	No Unloading Activities	82	50	52	42	No unloading noise observed. Noise from road traffic and air conditioning from nearby residence observed.
-	Rozelle (next to facility)	Solomons Way	06/02/2019 23:19	"MV Luga" Vessel Unloading	71	61	61	59	Unloading noise observed, including vacuum and mechanical noise. Local road traffic noise observed.

NCA	Locality	Location	Date/Time	Noise Source Activity	Measured Noise Level, in dBA 15-minute samples				Observations
					L_{max}	L_{10}	L_{eq}	L_{90}	
3	Pyrmont	Refinery Drive	06/02/2019 22:12	"MV Luga" Vessel Unloading	61	52	50	49	Unloading noise inaudible. Road traffic noise, seagulls observed. Noise from cruise ship observed constant at 49 dBA.
			04/06/2019 00:28	"MV Wyuna" Vessel Unloading	68	56	55	53	Unloading noise barely audible above ambient noise. Local traffic noise observed.
			18/06/2019 23:56	No Unloading Activities	66	53	53	49	No unloading noise observed. Noise from road traffic and birds observed.
4	Glebe	Leichhardt Street	06/02/2019 23:02	"MV Luga" Vessel Unloading	62	57	56	54	Unloading noise inaudible. Noise from local road traffic, nearby café air conditioning observed.
			03/06/2019 23:47	"MV Wyuna" Vessel Unloading	55	51	49	47	Unloading noise barely audible above ambient noise. Local road traffic noise observed.
			18/06/2019 23:27	No Unloading Activities	66	53	52	51	No unloading noise observed. Noise from road traffic and birds observed.

The attended noise measurements conducted by ERM in 2019, as presented in Table 3-1, shows the following:

- NCA1 Balmain – At Batty Street, measured noise levels for unloading activities are 6 dB higher compared to measured noise levels with no unloading activities. Unloading activities are the dominant noise source measured at 56 dBA L_{eq}, as the background L_{90} is only 1 dB below the measured L_{eq}. The background L_{90} drops to 48 dBA in the absence of unloading activities;
- NCA2 Balmain – At Donnelly Street and Buchanan Street, the measured difference between unloading activities and no activities is 1 dB, indicating that the impact of the activities are negligible along these streets;
- NCA3 Pyrmont – At Refinery Drive, the unloading activities are observed to be barely audible. The measurements indicate that the background L_{90} is not significantly influenced by the unloading activities. This indicates that the impact of the activities are negligible along Refinery Drive; and
- NCA4 Glebe – At Leichhardt Street, the unloading activities are observed to be inaudible. Measured levels are influenced by local human activity, such as road traffic noise. The impact of the unloading activities are negligible along Leichhardt Street.

3.1.2 Vessel Noise Levels – SLR 2021

Subsequent to the noise measurements of the unloading activities conducted by ERM in 2019, SLR Consulting conducted additional noise measurements of unloading activities from the bulk cargo vessel "Akuna" in June 2021[2] (SLR 2021 Report). These measurements will be used to further inform this assessment.

The monitoring report from SLR noted that "the measured noise levels presented include noise from ship unloading activity as well as ambient noise unrelated to GI-8 including the operational noise of [the bulk cargo vessel] Mareeba at GI-7".

The noise emissions from the report are presented in **Table 3.2** and are representative of the "Akuna" vessel unloading activities at Berth 8.

[2] AKUNA Glebe Island Berth 8 Compliance Noise Monitoring Report, SLR Ref: 610.04309-R07 Version No: -v1.0 June 2021, prepared by SLR Consulting Australia Pty Ltd

Table 3.2: Noise Measurements – Unloading "Akuna" Vessel (SLR 2021)

Location as per SLR 2021 Report (All within NCA1)	Measurement Assessment Period	Measured Noise Levels, in dBA			
		$L_{eq\ (15min)}$	$L_{10\ (15\ min)}$	$L_{90\ (15min)}$	$L_{max\ (15min)}$ – Berth 8 related
Batty Street, Balmain	Day	53	55	51	55
		52	53	50	53
		54	55	51	63
		56	58	53	64
Batty Street, Balmain	Night	53	54	52	58
		53	54	51	65
		54	55	52	60
Buchanan Street, Balmain	Night	52	53	51	58

3.1.3 Vessel Noise Levels – Port Authority of NSW (June 2021)

Vessel noise source measurements were obtained from the Vessel Noise Operating Protocol - Noise Monitoring Reports for June 2021 as published in on the Port Authority of NSW online portal[3]. The data is presented for discussion purposes only and provides an indication to existing vessel noise impact. As part of the reports published by the Port Authority of NSW, a compliance assessment with the applicable criteria are also demonstrated.

The results of the June 2021 noise monitoring reports for ships at Glebe Island and White Bay conducted are summarised in Table 3.3.

[3] https://www.portauthoritynsw.com.au/environment/noise-management/vessel-noise-operating-protocol-noise-monitoring-reports/

Table 3.3: Noise Compliance Monitoring Data (June 2021)

Measurement Date (Ships at Berth)	NCA	Measurement Location	Time	Measured Noise Levels, in dBA		
				L_{max} (related to ship)	$L_{eq\ (15min)}$	$L_{90\ (15min)}$
1 June 2021 (Kondili at Glebe Island Berth 8)	NCA1	Batty Street, Balmain	3.35pm	58	57	55
			3.56pm	58	58	55
			4.14pm	64	57	56
			4.30am	59	57	55
			4.46am	57	56	55
2 June 2021 (Kondili at Glebe Island Berth 8 and AAL Shanghai at Glebe Island Berth 2	NCA2	Buchanan Street, Balmain	3.17am	54	53	52
			3.33am	54	53	52
			3.49am	54	53	52
2 June 2021 (Kondili at Glebe Island Berth 8 and AAL Shanghai at Glebe Island Berth 2)	NCA1	Batty Street, Balmain	4.38am	55	55	54
			4.53am	59	55	52
	NCA2	Buchanan Street, Balmain	4.07am	59	57	56
11 June 2021 (Akuna at Glebe Island Berth 8)	NCA1	Batty Street, Balmain	12.23am	58	53	52
			12.38am	65	53	51
			12.53am	60	54	52
			11.13am	55	53	51
			11.29am	53	52	50
			11.49am	63	54	51
			12.20pm	64	56	53
	NCA2	Buchanan Street, Balmain	1.10am	58	52	51
13 June 2021 (Mareeba at Glebe Island Berth 7)	NCA1	Batty Street, Balmain	12.53am	55	50	47
			1.08am	54	50	48
			1.25am	54	49	47
			1.20pm	52*	55	51
			1.35pm	51*	52	48
			1.51pm	52	52	49
	NCA2	Buchanan Street, Balmain	1.42am	53	52	45
			2.08pm	53*	58	47

Source*: Vessel Noise Operating Protocol - Noise Monitoring Reports June 2021; available at Vessel Noise Operating Protocol - Noise Monitoring Reports | Port Authority New South Wales (portauthoritynsw.com.au)*

Note: **ERM notes that the reported Lmax values are lower than the Leq(15 min) as per the information source.*

The noise monitoring report for June 2021 shows that:

- Measured noise levels at NCA1 Batty Street, Balmain are in the range of 52-58 dBA L_{eq} from Berth 8 and Berth 2, and marginally lower in the range of 49-55 dBA L_{eq} from Berth 7; and
- Measured noise levels at NCA2 Buchanan Street, Balmain are in the range of 52-57 dBA L_{eq} from Berth 8, and in the range of 52-58 dBA L_{eq} from Berth 7;

The differences in measured levels are typically due to the measurements being conducted at different times of the day and the ambient noise levels influencing the measurements at the time.

3.1.4 Summary of Vessel Noise Emissions

Both the measurements from SLR in May 2021 and from the published monitoring report in June 2021 by Port Authority of NSW are noted to be consistent with the measurements conducted by ERM in 2019. The slight differences are typically due to the ambient environment at the time of the measurement, such as local road traffic noise.

For the vessel noise assessment, the most accurate (uncontaminated) measured vessel noise levels at Berth 7 and 8 from the above mentioned sources are summarised in Table 3.4.

Table 3.4: Summary of Vessel Noise Levels

Berth Location	NCA	Maximum Measured Noise Levels, in dBA		
		Day ($L_{Aeq,15min}$) (7am to 10pm)	Night ($L_{Aeq,15min}$) (10pm to 7am)	Night (L_{Amax}) (10pm to 7am)
Glebe Island 7 and 8	1	58	57	65
	2	58	53	58
	3	Inaudible or indistinguishable		
	4	Inaudible or indistinguishable		

3.2 Landside Noise – Predicted Operational Noise Activities (SLR 2018)

SLR Consulting conducted a noise impact assessment of the operational activities in 2018[4] (SLR 2018 NIA Report) for Hanson Construction Materials Pty Ltd (Hanson) . The assessment predicted operating amenity noise levels from the facility. The results of this assessment will assist in understanding potential additional impact from the proposed throughput increase by Cement Australia (CA).

The results of the SLR 2018 NIA Report applicable to the landside noise assessment are summarised in **Table 3.5**.

[4] Glebe Island Concrete Batching Plant Noise Impact Assessment, Report Number 610.17533-R01, dated 15 March 2018, v2.0, prepared by SLR Consulting Australia Pty Ltd

Table 3.5: Predicted Operating Activities Amenity Noise Levels (SLR 2018)

NCA	Locality	Location	Predicted Combined Noise Levels, in dBA		
			Day	Evening	Night
1	Balmain	Batty Street / Roberts Road	43	40	37
2	Balmain	Donnelly Street	40	36	34
3	Pyrmont	Refinery Drive	46	42	41
4	Glebe	Glebe Point Road	38	34	33

The cumulative landside noise assessment will be based on the predicted results presented in **Table 3.5** and the predicted impact from the throughput increase from CA.

4. NOISE CRITERIA

The noise impact associated with proposed throughput increase at the Glebe Island Port facility (PORT FACILITY) by Cement Australia (CA) is assessed in accordance with the Glebe Island & White Bay Port Noise Policy published by the Port Authority of NSW (Port Noise Policy).

4.1 Overview of the Port Noise Policy (PNP)

The port of Glebe Island and White Bay is an established long term infrastructure. Any environmental noise, even from long established infrastructure, has the potential to cause annoyance and health impacts. The Port Noise Policy seeks to manage the noise from port operations.

4.1.1 NSW Environmental Legislation for Noise Emissions

The *Protection of the Environment Operations (POEO) Act 1997* and the *POEO (Noise Control) Regulation* 2017 *(Noise Control Regulation)* provide the main legal framework and basis for managing noise in NSW. It also makes certain agencies the appropriate regulatory authority (ARA) responsible for various premises/activities. This includes local councils, the EPA, Marine Parks Authority, Roads and Transport for NSW.

4.1.1.1 Noise Policy for Industry (2017)

The EPA's Noise Policy for Industry (NPfI) 2017 was designed to ensure that potential noise impacts associated with industrial projects are managed effectively. This policy sets out the requirements for the assessment and management of noise from industry in NSW. It aims to ensure that noise is kept to acceptable levels in balance with the social and economic value of industry in NSW.

When new industry is being proposed or existing industry is being upgraded, redeveloped or needs review, attention needs to be paid to controlling noise. The NPfI is designed to assist industry and approval/regulatory authorities ensure that potential noise impacts associated with industrial projects are managed effectively.

The Port Noise Policy is an application of the NPfI. As such all new and upgraded operations need to be assessed to identify potential noise impacts and feasible and reasonable mitigation applied.

4.1.1.2 NSW Environment Protection Licences (EPL) under the POEO Act

Under the *POEO Act*, an Environment Protection Licence (EPL) may be required for port activities, depending on the nature of the activities. Currently, some EPLs in Glebe Island and White Bay have noise limits and some do not. Hence different premises in the port have different noise requirements and limits.

The Port Noise Policy thereby aims to address inconsistencies in approvals and EPLs by ensuring that all vessels visiting the port of Glebe Island and White Bay are required to meet the same noise standard.

4.1.2 Objectives of the Port Noise Policy

The policy aims to ensure that noise from all vessels is managed in a consistent, transparent and fair manner, regardless of vessel and cargo type.

The Port Noise Policy outlines an approach to manage all landside activities and vessels at Glebe Island and White Bay in a single consistent approach.

4.1.2.1 Vessel Noise Assessment

For vessels, this includes all new and existing operations that, prior to the PNP, may or may not have had noise criteria set in planning approvals or EPLs. For each of these vessel operations the PNP provides a mechanism for ongoing noise reduction and noise criteria.

4.1.2.2 Landside Noise Activities Assessment

For landside activities, all existing and new landside activity noise levels will be evaluated individually and as a whole. Many existing criteria, prior to the PNP, permit noise levels that are higher than could reasonably be expected for the operations. Landside criteria for all existing operators shall be reviewed so any criteria applied to an individual operator only reflects a fair and reasonable value that a well managed site could be expected to emit. This approach ensures that summed individual criteria and cumulative operational noise levels for port landside operations do not exceed the cumulative noise limit.

Over time, the criteria applied to each individual operator will be reviewed after considering all reasonable and feasible noise mitigation that could be applied to the operations which is likely to result in a downward trend to the cumulative noise limit.

4.2 Port Noise Policy Assessment Criteria

The Vessel Noise Guideline (Appendix F of the PNP) and Landside Precinct Noise Guideline (Appendix G of the PNP) outline the processes for setting and assessing noise criteria for port activities and communicating the outcomes to community and other stakeholders.

The environmental noise criteria in this policy aim to provide protection for noise sensitive receivers in the areas surrounding Glebe Island and White Bay.

4.2.1 Vessel Noise Guideline

Management of vessel noise is addressed in the Vessel Noise Guideline which has been developed by using Section 10 of the EPA’s NPfI to set a trigger noise level for vessels at berth based on noise levels that may reasonably be achieved while minimising impacts on the community.

The requirement for vessels visiting Glebe Island and White Bay to comply with the trigger noise level is included in access agreements for tenants and terms and conditions for ship operators.

The Vessel Noise Guideline sets noise trigger levels for vessels berthing at the port based on levels that may be reasonably achieved by a ship of a given type and weight, while minimising the impact on the community. Sources of noise which are assessed in the guideline are defined as *“all noise produced by mechanical plant that is part of the vessel”.*

The Vessel Trigger Noise Levels apply on a 24/7 basis. However, during the daytime period a +5 dB short term allowance is applied, to accommodate for vessels that have to restrict to night-time unloading rates to mmet the night-time Vessel Trigger Noise Level.

The current Vessel Trigger Noise Levels for Berth 1, 2, 7 and 8 in use at the port are outlined in **Table 4.1**. Note the vessel trigger noise levels will be periodically reviewed to consider whether the triggers may be lowered to reduce overall port noise. The trigger level is applicable at the worst affected sensitive receiver at the time of commencing this policy.

Table 4.1: Vessel Target Noise Levels (External)

Noise target level applied to vessels at berth	Assessment Location	Target Noise Levels (External), in dBA		
		Day ($L_{Aeq,15hr}$)[1] (7am to 10pm)	Night ($L_{Aeq, 1hr}$) (10pm to 7am)	Night (L_{Amax}) (10pm to 7am)
Glebe Island 1 and 2	The highest noise level experienced at any sensitive receiver measured from each respective berth	60	55	65
Glebe Island 7 and 8		60	55	65
White Bay 3		60	55	65
White Bay 4 (non-cruise)		60	55	65

Note 1: This includes a 5dBA allowance in the short term for vessels that cannot meet the night time vessel trigger noise level without restrictions to unloading speeds. The 24/7 goal is the median unloading noise level for vessels which is applied as the night time vessel trigger noise level.

Source: Glebe Island & White Bay Port Noise Policy.

4.2.2 Landside Precinct Noise Guideline

The Landside Precinct Noise Guideline adopts the concepts of noise management precincts outlined in the EPA NPfI. A Noise Management Precinct enables an area with many proponents to operate as a single site that is required to meet the amenity level, where feasible and reasonable. This approach simplifies assessment and compliance by setting a single noise goal which all tenants must collectively meet.

The concept of a Noise Management Precinct will be introduced in all port tenant leases of Glebe Island and White Bay from January 2021. Under each lease, each tenant has been allocated an individual maximum permissible noise level which collectively will meet the assessment criteria for the precinct.

The guideline sets the processes for undertaking an environmental assessment within the Noise Management Precinct for a port development and equitably allocates permissible noise emission and the burden of noise mitigation to each proponent. It also outlines ongoing noise monitoring and compliance requirements.

Precincts provide the flexibility to apply additional noise mitigation to an existing proponent if this is more cost effective and practicable than just mitigating noise from a new proponent. If this mechanism is utilised, the permissible noise emission for a proponent may change over time if a new proponent seeks approval to operate within a port and it is more cost effective to additionally mitigate an existing proponent.

The Noise Management Precinct will not include the operations of construction projects and staging support being carried out on Glebe Island and White Bay. This is because these activities are governed by their own separate planning processes and noise criteria defined in planning approval conditions (not directly related to port precinct criteria), and which are not anticipated to continue with port operations in the long term.

Noise sources which are assessed under this guideline is classified in the Port Noise Policy (PNP) as noise "*produced by equipment and mechanical plant that is associated with onshore handling or processing of materials and passengers"*. This includes both permanent and temporary noise sources, excluding any equipment associated with construction works.

4.2.2.1 Cumulative Noise Limit

The cumulative noise limit is a fixed limit referenced against the industrial amenity criteria specified for an industrial urban interface in the Noise Policy for Industry. It represents the upper noise limit permitted from all current and future landside operations as a combined landside activity noise level.

Collectively, the operators within the precinct will be required to comply with the Cumulative Noise Limit for the precinct, derived using the NPfI amenity criteria for an urban industrial interface. This noise limit is presented in **Table 4.2**. For a port with 24/7 operation, it is typically the night-time noise criteria which constraints overall emission.

Table 4.2: Landside Precinct Cumulative Noise Limit

Category	Assessment Location	Cumulative Noise Limit, in dBA		
		Day ($L_{eq,11hr}$) (7am to 6pm)	Evening ($L_{eq,4hr}$) (6pm to 10pm)	Night ($L_{eq,9hr}$) (10pm to 7am)
External environmental criteria applied to the Noise Management Precinct	All residential land near the port	65	55	50
Internal environmental criteria applied to the noise Management Precinct	Other noise sensitive receivers	Refer to the NSW EPA's Noise Policy for Industry Table 2.2		

4.2.2.2 Collective Benchmark Noise Levels

The collective benchmark noise level is the combined noise level from all current operational landside port activities. Approval authorities should consider the collective benchmark noise level against the cumulative noise limit when assessing noise limits for developments. The collective benchmark noise level should not exceed the cumulative noise limit. Ensuring that the collective benchmark noise level does not exceed the cumulative noise limit is important to manage noise impacts on the community.

To conform with the Cumulative Noise Limit as a precinct, each operator will have a Maximum Permissible Noise Level which they must comply with. The current Maximum Permissible Noise Levels have been carried over from noise limits pre-dating the PNP. However, the noise levels of the port operating using these limits currently exceeds the Cumulative Noise Limit given in Table 4.2 for the evening and night time assessment periods.

Under the Port Noise Policy, existing noise limits will be reviewed by Port Authority of NSW to identify new Maximum Permissible Noise Levels with the goal of meeting the Cumulative Noise Limit. The Benchmark Noise Levels, as given in Appendix H of the PNP, are presented in **Table 4.3**.

Table 4.3: Precinct Benchmark Noise Levels

Location	NCA	Benchmark Noise Levels, in dBA		
		Day ($L_{eq,11hr}$) (7am to 6pm)	Evening ($L_{eq,4hr}$) (6pm to 10pm)	Night ($L_{eq,9hr}$) (10pm to 7am)
Cameron Cove, Balmain	2	62	58	53
Grafton St, Balmain	2	62	58	53
Donnelly St, Balmain	2	61	58	53
Buchanan St, Balmain	1/2	64	59	53
Jacksons Landing, Pyrmont	3	62	59	53
Oxley St, Glebe	4	62	56	53

***Note**: All assessment locations are residential land near the port.*

4.2.2.3 Nominal Maximum Permissible Noise Level for Sleep disturbance

Sleep disturbance events are not cumulative and do not form part of the cumulative noise limit or collective benchmark noise level. As such, nominal maximum permissible noise level for sleep disturbance are set as screening tests. The screening tests are a form of assessing sleep disturbance. Should the screening test limit be exceeded, further evaluation should be completed of the magnitude of the predicted maximum noise level events.

Nominal maximum permissible noise levels for sleep disturbance are presented in **Table 4.4**.

Table 4.4: Nominal Maximum Permissible Noise Level

NCA	Locality	Location	Screening test limit[1] L_{max} in dBA	Reference level for further evaluation L_{max} in dBA
1	Balmain	Batty Street	57	65
2		Donnelly Street	55	
3	Pyrmont	Refinery Drive	62	
4	Glebe	Leichhardt Street	55	

Note 1: Should the screening test limit be exceeded, further evaluation should be completed of the magnitude of the predicted maximum noise level events
Source: Glebe Island & White Bay Port Noise Policy Appendix G

4.3 NSW Road Noise Policy

The NSW Road Noise Policy (RNP) (DECCW 2011) provides guidance on noise criteria for road upgrade projects and projects which result in additional traffic generating noise impacts at sensitive receptors.

The proposed throughput increase is a traffic generating development as it will increase the number of trucks accessing the site via the local road network.

For existing residences and other sensitive land uses affected by additional traffic on existing roads generated by land use developments, the RNP states that any increase in the total traffic level should be limited to 2 dB above the road traffic noise level without the development.

5. VESSEL NOISE ASSESSMENT

This chapter summarises the noise impact assessment of vessel noise, in accordance with the Vessel Noise Guideline of the PNP as described in Section 4.

As summarised in Section 3.1.4, vessel noise from Berth 7 and 8 were measured at NCA1 and NCA2 to be a maximum of 58 dBA $L_{eq,15min}$ in the day-time, and 57 dBA $L_{eq,15min}$ and 65 dBA L_{max} in the night-time.

In accordance with the Vessel Noise Guideline, the following assessment is made:

- Compliance with day-time criteria of 65 dBA L_{eq} is achieved by 7 dB;
- Compliance with the night time criteria of 65 dBA L_{max} is achieved by 0 dB; and
- Marginal exceedances of up to 2 dB with the night-time criteria of 55 dBA L_{eq} is expected at NCA1. Compliance is achieved at NCA2 by 2 dB. This exceedance was observed on one occasion only from the measurements conducted by ERM, SLR and Port Authority of NSW.

5.1 Discussion of Results

The proposed throughput increase by Cement Australia will not change the noise emissions levels from vessels. The throughput increase will result into an increase in vessel movements, increasing the frequency of vessels at the port.

Cement Australia has limited control over the noise emissions from vessels. However, it is noted that bulk cement carriers currently using the Glebe Island berth 8 have been and are undergoing improvements to be fitted with noise attenuation controls including silencers fitted to cargo generators and exhausts installation of machinery room noise attenuator modules.

The ongoing improvements will ensure noise emissions from future vessel are reduced. CSL Australia and Cement Australia continue to work with the Port Authority of NSW to ensure noise mitigation measures are in place during unloading activities.

Regular compliance monitoring for ships at berth is conducted by Port Authority of NSW, with the results publically available on the Port Authority of NSW website[5]. This information should be monitored to assess any measured future reduction in vessel noise emissions.

Given the marginal measured exceedances of 2 dB at NCA1 in the night-time, it is expected that with ongoing improvements, compliance with the Vessel Noise Guideline of the PNP will be achieved in the long-term.

[5] https://www.portauthoritynsw.com.au/environment/noise-management/vessel-noise-operating-protocol-noise-monitoring-reports/

6. LANDSIDE NOISE ASSESSMENT

This chapter summarises the noise impact assessment of the landside noise operations in accordance with Landside Noise Guideline of the PNP as described in Section 4.

6.1 Landside Noise Modelling

The assessment of the landside activities from the proposed throughput increase is based on noise modelling of the operations.

6.1.1 Landside Noise Activities

The landside activities included in the model are as follows:

1. Truck movements associated with the throughput increase by Cement Australia on road transport trucks:
   - During the site inspection conducted by ERM, truck movements at the site were observed to be the dominant noise source. Cement export on road trucks can occur 24 hours per day; and
2. Facility mechanical equipment associated with the throughput increase:
   - During the site inspection conducted by ERM, mechanical equipment, such as blowers and compressors, were observed to be housed under silos or shielded behind the facility. As a result, it is expected that mechanical equipment will not contribute significantly to the overall noise impact; and

The proposed throughput increase by Cement Australia does not involve any physical changes to operations or their emissions, only to their frequency or duration. The modelling considers the daof the throughput increase only and does not include existing noise sources.

6.1.2 Noise Modelling Methodology

Noise modelling has been undertaken using the ISO 9613[6], as implemented in the CadnaA v2019 acoustic modelling package. The noise modelling takes into consideration the sound power level (SWL) of the proposed site operations, activities and equipment, and applies adjustments for attenuation from geometric spreading, acoustic shielding from intervening ground topography, ground effects, and atmospheric absorption.

Typical noise enhancing night-time meteorological conditions were modelled (Temperature 10°C, Humidity 90%, no wind). Neutral meteorology settings were used in the model, with the harbour 100% acoustically reflective and the surrounding land areas 50% acoustically reflective to represent a conservative modelling output.

6.1.3 Noise Sources Sound Power Levels

The SWL for unloading operations were calculated and calibrated from measurements conducted by ERM and SLR, as presented in Section 3.2 of this report. Night-time measurements were used for calibration purposes as they were less influenced by noise sources unrelated to the port's activity.

For truck movements, it is assumed that, as a worst-case, a cement truck is filled and exits the facility 16 times per hour during the day-time and evening assessment periods, and 12 times per hour during the night-time period. Trucks exit the weighbridge, then travel around the site from the western side to the east.

[6] ISO 9613-2:1996 Acoustics — Attenuation of sound during propagation outdoors — Part 2: General method of calculation

The trucks would complete a circuit around the site following the access route as follows:

- Entry from James Craig Drive into Solomons Way to Weighbridge
- Exit via Solomons Way, Port Access Road and Solomons Way back to James Craig Road

The SWL for facility mechanical equipment were based on representative data from ERM's database.

The modelled sound power level (SWL) of all sources in the model is presented in **Table 6.1**. The model only includes noise sources from the proposed throughput increase associated with landside operations.

Table 6.1: Sound Power Level (SWL) of Modelled Sources

Equipment	SWL per Frequency (Hz) (dBA)								Total SWL (dBA)
	63	125	250	500	1k	2k	4k	8k	
12 Trucks*	87	92	96	97	102	99	94	85	**106**
16 Trucks*	88	93	98	98	103	101	95	86	**107**
Facility Mechanical Equipment	71	73	86	91	93	88	78	65	**96**

**Truck movements were modelled as line sources to reflect the transport routes at PORT FACILITY.*

6.2 Predicted Impact of Throughput Increase

The impact of the proposed throughput increase was predicted at the identified sensitive receptors. The predicted results in **Table 6.2** show the noise impact contribution from truck movement noise and facility mechanical equipment. The overall impact is then compared to the Port Noise Policy (PNP) Landside Precinct Noise Guideline *Collective Benchmark Noise Levels* for each receptor.

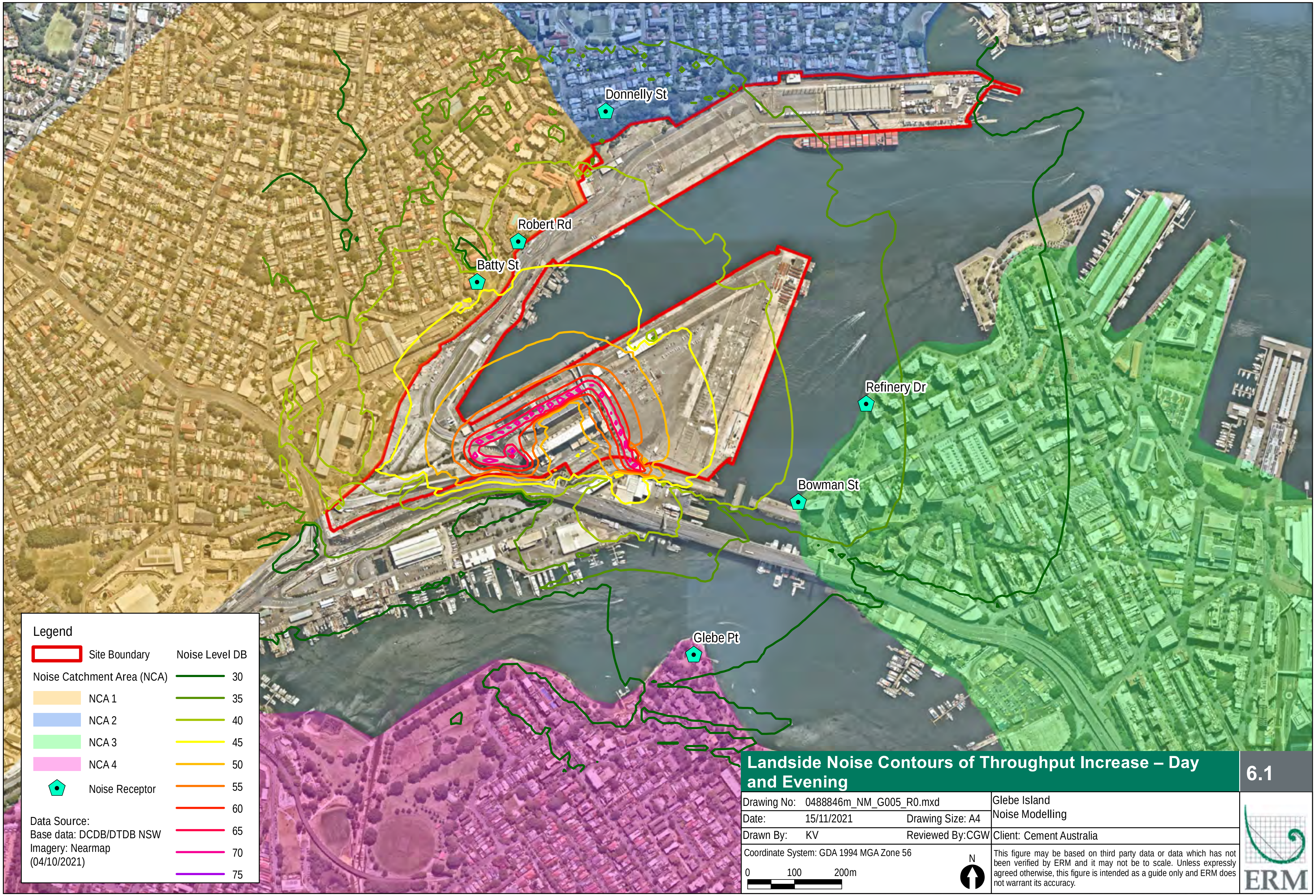
Table 6.2: Predicted Noise Impact of Throughput Increase from Cement Australia

NCA	Location	Collective Benchmark Noise Levels, $L_{eq,period}$ in dBA			Predicted Impact from Throughput Increase, $L_{eq,period}$ in dBA (Truck Movement & Mechanical Equipment)	
		Day	Evening	Night	Day / Evening	Night
1	Batty Street, Balmain	64	59	53	42	41
2	Donnelly Street, Balmain	61	58	53	38	37
3	Refinery Drive, Pyrmont	62	59	53	37	35
4	Leichhardt Street, Glebe	62	56	53	31	30

The predicted results show that at all NCAs, the impact from the throughput increase is significantly lower (more than 10 dB) than the collective benchmark noise levels for the assessment periods. This means that the impact from throughput increase will not increase the collective benchmark noise levels.

The noise contours for the throughput increase from Cement Australia are presented in **Figure 6.1** and **Figure 6.2** for the day/evening and night-time assessment periods respectively.

The noise contours include the noise impact from landside facility operations only. The difference between the day/evening and night-time noise contours is the truck movements which are at a lower frequency in the night-time period.



Landside Noise Contours of Throughput Increase – Day and Evening

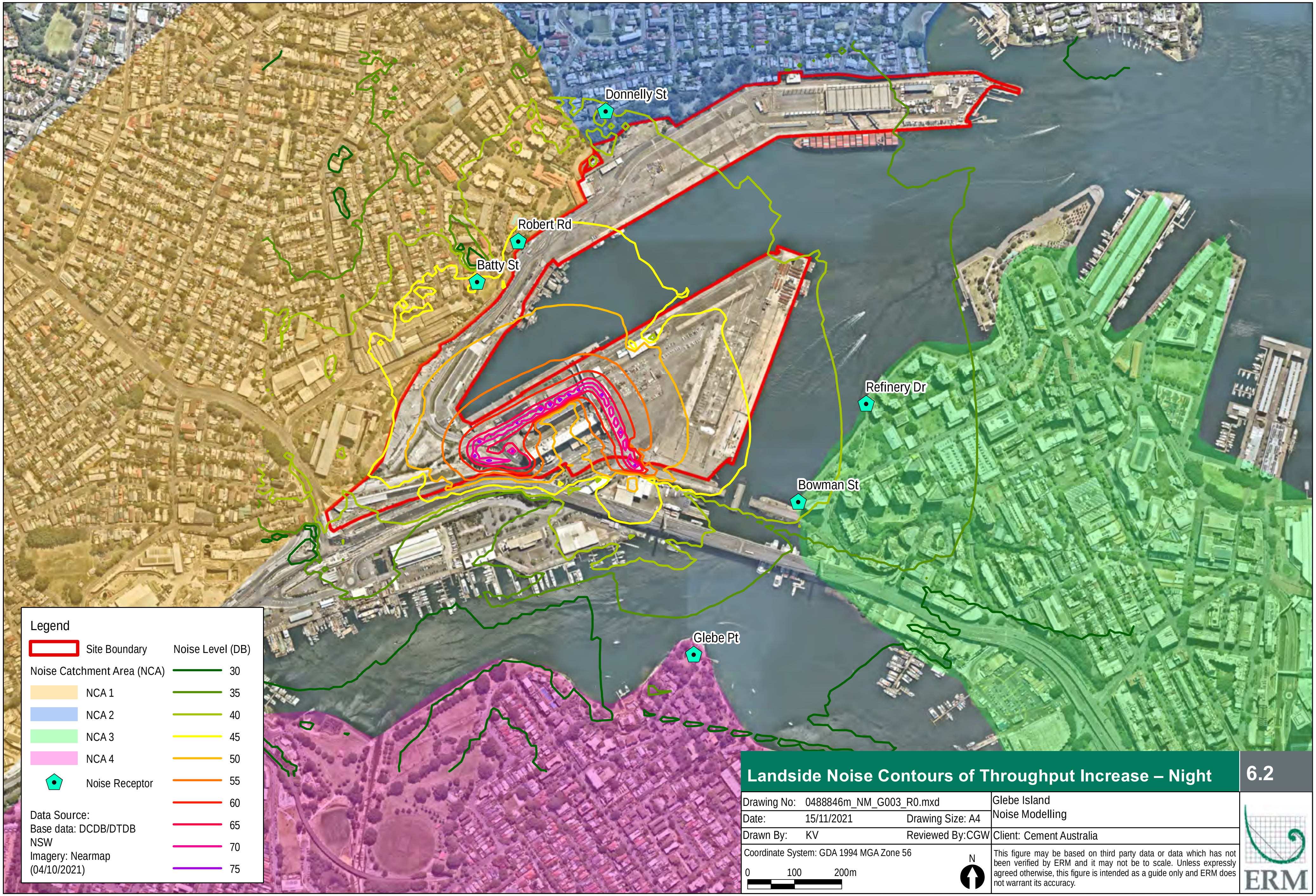
6.1

Drawing No: 0488846m_NM_G005_R0.mxd		Glebe Island Noise Modelling
Date: 15/11/2021	Drawing Size: A4	
Drawn By: KV	Reviewed By: CGW	Client: Cement Australia

Coordinate System: GDA 1994 MGA Zone 56

This figure may be based on third party data or data which has not been verified by ERM and it may not be to scale. Unless expressly agreed otherwise, this figure is intended as a guide only and ERM does not warrant its accuracy.

ERM



Landside Noise Contours of Throughput Increase – Night **6.2**

Drawing No: 0488846m_NM_G003_R0.mxd
Date: 15/11/2021 Drawing Size: A4
Drawn By: KV Reviewed By: CGW
Coordinate System: GDA 1994 MGA Zone 56

Glebe Island
Noise Modelling
Client: Cement Australia

This figure may be based on third party data or data which has not been verified by ERM and it may not be to scale. Unless expressly agreed otherwise, this figure is intended as a guide only and ERM does not warrant its accuracy.

ERM

6.3 Cumulative Impacts of Throughput Increase and Existing Operations

For the assessment of the cumulative impacts, the predicted results of the proposed throughoput increase by Cement Australia are combined with the exsiting predicted noise impact of the activities from Hanson at the port (Refer to Section 3.2).

The cumulative impact and comparison to the Landside Precinct Noise Guideline *Cumulative Noise Limit* are presented in **Table 6.3** at the idenfied noise sensitive receptors.

Table 6.3: Predicted Cumulative Impact at the Port

NCA	Location	Cumulative Noise Limit $L_{eq,period}$ in dBA			Predicted Noise Levels, $L_{eq,Period}$ in dBA									Compliance with Cumulative Noise Limit?		
					Predicted Existing Operations from Hanson (SLR 2018)			Total Impact from Throughput Increase		Cumulative Impact						
		D	E	N	D	E	N	D / E	N	D	E	N		D	E	N
1	Batty Street, Balmain	65	55	50	43	40	37	42	41	**46**	**44**	**42**		**Yes (-19 dB)**	**Yes (-11 dB)**	**Yes (-8 dB)**
2	Donnelly Street, Balmain				40	36	34	38	37	**42**	**40**	**39**		**Yes (-23 dB)**	**Yes (-15 dB)**	**Yes (-11 dB)**
3	Refinery Drive, Pyrmont				46	42	41	37	35	**47**	**43**	**42**		**Yes (-18 dB)**	**Yes (-12 dB)**	**Yes (-8 dB)**
4	Leichhardt Street, Glebe				38	34	33	31	30	**39**	**36**	**35**		**Yes (-26 dB)**	**Yes (-19 dB)**	**Yes (-15 dB)**

D – Day-time; E – Evening; N – Night-time Assessment Periods.

The predicted cumulative assessment results show that compliance with the cumulative noise limit criteria for all assessment periods is achieved at all NCAs by 8-26 dB.

6.4 Maximum Noise Impact

From the proposed throughput increase operations, short term peak noise levels are expected from onsite truck movements which will cause maximum noise levels. Potential noise emissions include air brake release and/or high engine revving (low gear).

To assess the potential for sleep disturbance, a 115 dBA SWL noise source representative of an air brake release was positioned at the closest points of the onsite vehicle route to the residences in Balmain, located approximately 300 metres away with direct line of sight.

This maximum impact noise model predicted an impact of up to 53 dBA L_{max} at the closest receptors. The predicted impacts are below the Nominal Maximum Permissible Screening Test limit at all NCAs by 2-9 dB. Sleep disturbance at the NCAs is not expected from short term peak noise levels of truck movements.

6.5 Discussion of Results

The predicted impact from the throughput increase from Cement Australia and the cumulative impact shows that compliance with the cumulative noise limit criteria for all assessment periods is achieved at all NCAs by 8-26 dB.

The predicted impact from the throughput increase will also not increase the collective benchmark noise levels.

Night-time short term peak noise levels of truck movements from the throughout increase are also predicted to be below the the Nominal Maximum Permissible Screening Test limit.

Based on the landside noise assessment of the throughput increase, no additional mitigation or management measures are recommended to Cement Australia.

It is expected that under the Port Noise Policy, existing noise limits will be reviewed by Port Authority of NSW to identify new Maximum Permissible Noise Levels with the goal of meeting the Cumulative Noise Limit. This assessment should be reviewed should future noise limits be revised.

7. ROAD TRAFFIC NOISE ASSESSMENT

Access to the weighbridge is off the City West Link via James Craig Drive. Once the trucks connect onto City West Link, it is anticipated that approximately 40% of trucks will travel east and 60% to the west.

The total truck traffic generation as a result of the throughput increase is as follows[7]:

- Existing (No additional throughput) – 21,536 truck loads per annum; and
- Future (Additional throughput) – 48,459 truck loads per annum

The throughput increase equates to eight additional trucks in the network AM peak and five additional trucks in the PM peak.

Land use adjacent to James Craig Drive is a combination of industrial and commercial and would not be adversely impacted by additional traffic movements.

The closest most sensitive residential receptors are located off City West Link and Victoria Road in Lillyfield and Rozelle to the west and Pyrmont to the East.

Assuming a worst-case scenario where all cement trucks are travelling to/from the site via The Crescent through Lillyfield during the night-time period (10pm to 7am), this equates to an additional 54 heavy vehicle movements.

Comparing the additional movements to the existing night time traffic flow of approximately 1500 vehicles with 10% heavy vehicles, this results in a night-time traffic noise increase of approximately 0.8 dB. This increase is considered insignificant and would not trigger an exceedance of the NSW Road Noise Policy (RNP) criteria.

Considering the existing traffic flows of over 140,000 AADT on Anzac Bridge, over 60,000 AADT on Victoria Road and on the City West Link, the additional six truck movements per hour from the throughput increase will cause a negligible increase of less than 1 dB in road traffic noise. This increase complies with the noise criteria set in the NSW RNP.

It is concluded that the road traffic noise impact on the local road network from the throughput increase to be insignificant at identified receptors. No additional mitigation or management measures are recommended to Cement Australia.

[7] Glebe Island Cement Distribution Facility Traffic Impact Assessment, Ref.: 18.618r01v04, dated Sept 2021

8. MANAGEMENT AND MITIGATION MEASURES

The proposed throughput increase from Cement Australia will not impact the predicted noise emission levels of individual vessels or individual landside operations. The throughput increase will actually increase the duration of the noise sources and operations.

Cement Australia is committed to meeting the Port Noise Policy requirements and pathway through implementing mitigation and management measures, in collaboration with Port Authority of NSW.

Upgrades to vessels to reduce noise emissions are managed by CSL. The vessels are undergoing improvements to be fitted with noise attenuation controls including silencers fitted to cargo generators and exhausts installation of machinery room noise attenuator modules.

To limit the impacts on surrounding receptors, the following general measures are recommended:

- Ensure plant and equipment is well maintained and not generating excessive noise;
- Where vessels are ungraded, include noise source mitigation on the cement unloading system to minimise noise emissions;
- Where reasonable and feasible, investigate noise mitigation options for vessel mechanical plant contributing to noise emissions during vessel unloading ;
- Request to the shipping contractor such as noise mitigation and management as part of the unloading system as new ships are commissioned;
- Operate machinery in a manner which reduces maximum noise level events;
- Site awareness training / environmental inductions that include a section on noise mitigation techniques / measures to be implemented when ship unloading operations are occurring; and
- Operation of a community complaints management program, including complaints hotline and response management procedure.

By implementing the above general measures and ongoing improvement works on vessels, it is concluded that noise emission from the throughput increase will be minimised with the aim of adhering to the noise limits defined within the Port Noise Policy.

9. CONCLUSION

ERM Australia Pacific Pty Ltd (ERM) was commissioned by Cement Australia (CA) to prepare a noise impact assessment (NIA) for a proposed throughput increase in the operational capacity of the cement shipping terminal and distribution facility at the Glebe Island Port facility in Sydney.

Recent noise assessments in the project area and historical noise monitoring were reviewed in order to establish the existing noise environment. The Glebe Island and White Bay Port Noise Policy (PNP) was used to establish criteria for the assessment of the throughput increase and cumulative impact.

Based on noise measurements and noise modelling of the noise impacts generated by the throughput increase, it is concluded that compliance with the landside cumulative noise limit criteria for all assessment periods is achieved at all NCAs by 8-26 dB. The predicted landside impact from the throughput increase will also not increase the collective benchmark noise levels.

Night-time short term peak noise levels of truck movements from the throughout increase are also predicted to be below the the Nominal Maximum Permissible Screening Test limit.

The vessel noise assessment concluded that compliance is achieved with day-time L_{eq} criteria by 7 dB. Compliance with the night time L_{max} criteria is also achieved by 0 dB. However, marginal exceedances of up to 2 dB with the night-time L_{eq} criteria is expected at NCA1 only. Compliance is achieved at NCA2 by 2 dB. This exceedance was observed on one occasion only. Other measurements indicated compliance with the criteria.

The proposed throughput increase by Cement Australia will not change the noise emissions levels from vessels. The throughput increase will result into an increase in vessel movements, increasing the frequency of vessels at the port.

Given the marginal measured exceedances of 2 dB at NCA1 in the night-time, it is expected that with ongoing improvements, compliance with the Vessel Noise Guideline of the PNP will be achieved in the long-term. The ongoing improvements will ensure noise emissions from future vessel are reduced. CSL Australia and Cement Australia continue to work with the Port Authority of NSW to ensure noise mitigation measures are in place during unloading activities.

The throughput increase will also cause a negligible increase of less than 1 dB in road traffic noise on the local road network. This increase complies with the noise criteria set in the NSW RNP.

Recommendations have been made in order to manage and mitigate current and future noise impacts generated by the facility.

By implementing the recommended measures and from ongoing improvement works on vessels, it is predicted that noise emission from the throughput increase by CA will be minimised with the aim of adhering to the noise limits defined within the PNP.

10. REFERENCES

AECOM Australia, *2018 Glebe Island Multi User Facility Construction and Operational Noise and Vibration Assessment*

Australian Standard AS 1055:2018, *Acoustics – Description and measurement of environmental noise*

International Standards Organisation (1996), ISO 9613-2:1996, *Acoustics -- Attenuation of sound during propagation outdoors -- Part 2: General method of calculation*

NSW Environmental Protection Authority (2017), *Noise Policy for Industry (NPI)*

Port Authority of NSW, Glebe Island & White Bay Port Noise Policy (2021)

SLR, *Glebe Island Concrete Batching Plant – Noise Impact Assessment (2018)*

SLR, *Noise Compliance Monitoring Reports White Bay Berth 4 and Glebe Island Berth 1 and 2 (2017, 2018)*

APPENDIX A ACOUSTICAL GLOSSARY

Glossary – Acoustical Concepts and Terminology

What Is Noise And Vibration?

Noise

Noise is often defined as a sound, especially one that is loud or unpleasant or that causes disturbance[8] or simply as unwanted sound, but technically, noise is the perception of a series of compressions and rarefactions above and below normal atmospheric pressure.

Vibration

Vibration refers to the oscillating movement of any object. In a sense noise is the movement of air particles and is essentially vibration, though, in regard to an environmental assessment vibration, is typically taken to refer to the oscillation of a solid object(s). The impact of noise on objects can lead to vibration of the object, or vibration can be experienced by direct transmission through the ground, this is known as ground-borne vibration.

Essentially, noise can be described as what a person hears, and vibration as what they feel.

What Factors Contribute To Environmental Noise?

The noise from an activity, like construction works, at any location can be affected by a number of factors, the most significant being:

How loud the activity is?

How far away the activity is from the receiver?

What type of ground is between the activity and the receiver location e.g. concrete, grass, water or sand?

How the ground topography varies between the activity and the receiver? For example, is it flat, hilly, mountainous? Blocking the line of sight to a noise source will generally reduce the level of noise; and

Any other obstacles that block the line of sight between the source to receiver e.g. buildings or purpose built noise walls.

How To Measure And Describe Noise?

Noise is measured using a specially designed 'sound level' meter which must meet internationally recognised performance standards. Audible sound pressure levels vary across a range of 10^7 Pascals (Pa), from the threshold of hearing at 20μPa to the threshold of pain at 200Pa. Scientists have defined a statistically described logarithmic scale called Decibels (dB) to more manageably describe noise.

To demonstrate how this scale works, the following points give an indication of how the noise levels and differences are perceived by an average person:

0 dB - represents the threshold of human hearing (for a young person with ears in good condition).

50 dB – represents average conversation.

70 dB – represents average street noise, for example local traffic.

90 dB – represents the noise inside an industrial premises or factory.

140 dB - represents the threshold of pain – the point at which permanent hearing damage may occur.

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[8] Copyright © 2011 Oxford University Press

Human Response to Changes in Noise Levels

The following concepts offer qualitative guidance in respect of the average response to changes in noise levels:

Differences in noise levels of less than approximately 2 dBA are generally imperceptible in practice, an increase of 2 dBA is hardly perceivable.

Differences in noise levels of around 5 dBA are considered to besignificant.

Differences in noise levels of around 10 dBA are generally perceived to be a doubling (or halving) of the perceived loudness of the noise. An increase of 10 dBA is perceived as twice as loud. Therefore an increase of 20 dBA is four times as loud and an increase of 30 dBA is eight times as loud.

The addition of two identical noise levels will increase the dBA level by about 3 dBA. For example, if one car is idling at 40 dBA and then another identical car starts idling next to it, the total noise level will be about 43 dBA.

The addition of a second noise level of similar character which is at least 8 dBA lower than the existing noise level will not add significantly to the overall dBA level.

A doubling of the distance between a noise source and a receiver results approximately in a 3 dBA decrease for a line source (for example, vehicles travelling on a road) and a 6 dBA decrease for a point source (for example, the idling car discussed above).

A doubling of traffic volume for a line source results approximately in a 3 dBA increase in noise, halving the traffic volume for a line source results approximately in a 3 dBA decrease in noise.

Terms to Describe the Perception of Noise

The following terms offer quantitative and qualitative guidance in respect of the audibility of a noise source:

Inaudible / Not Audible - the noise source and/or event could not be heard by the operator, masked by extraneous noise sources not associated with the source. If a noise source is 'inaudible' its noise level may be quantified as being less than the measured L_{90} background noise level, potentially by 10 dB or greater.

Barely Audible – the noise source and/or event are difficult to define by the operator, typically masked by extraneous noise sources not associated with the source. If a source is 'barely audible' its noise level may be quantified as being 5 - 7 dB below the measured L_{A90} or L_{Aeq} noise level, depending on the nature of the source e.g. constant or intermittent.

Just Audible – the noise source and/or event may be defined by the operator. However there are a number of extraneous noise sources contributing to the measurement. The noise level should be quantified based on instantaneous noise level contributions, noted by the operator.

Audible - the noise source and/or event may be easily defined by the operator. There may be a number of extraneous noise sources contributing to the measurement. The noise level should be quantified based on instantaneous noise level contributions, noted by the operator.

Dominant – the noise source and/or event are noted by the operator to be significantly 'louder' than all other noise sources. The noise level should be quantified based on instantaneous noise level contributions, noted by the operator.

The following terms offer qualitative guidance in respect of acoustic terms used to describe the frequency of occurrence of a noise source during an operator attended environmental noise measurements:

Constant – this indicates that the operator has noted the noise source(s) and/or event to be constantly audible for the duration of the noise measurement e.g. an air-conditioner that runs constantly during the measurement.

Intermittent – this indicates that the operator has noted the noise source(s) and/or event to be audible, stopping and starting intervals for the duration of the noise measurement e.g. car pass-by's.

Infrequent – this indicates that the operator has noted the noise source(s) and/or event to be constantly audible, however; not occurring regularly or at intervals for the duration of the noise measurement e.g. a small number of aircraft are noted during the measurement.

How to Calculate or Model Noise Levels?

There are two recognised methods which are commonly adopted to determine the noise at particular location from a proposed activity. The first is to undertake noise measurements whilst the activity is in progress and measure the noise, the second is to calculate the noise based on known noise emission data for the activity in question.

The second option is preferred as the first option is largely impractical in terms of cost and time constraints, notwithstanding the meteorological factors that may also influence its quantification. Furthermore, it is also generally considered unacceptable to create an environmental impact simply to measure it. In addition, the most effective mitigation measures are determined and implemented during the design phase and often cannot be readily applied during or after the implementation phase of a project.

Because a number of factors can affect how 'loud' a noise is at a certain location, the calculations can be very complex. The influence of other ambient sources and the contribution from a particular source in question can be difficult to ascertain. To avoid these issues, and to quantify the direct noise contribution from a source/site in question, the noise level is often calculated using noise modelling software packages. The noise emission data used in may be obtained from the manufacturer or from ERM's database of measured noise emissions.

Acoustic Terminology & Statistical Noise Descriptors

Environmental noise levels such as noise generated by industry, construction and road traffic are commonly expressed in dBA. The A-weighting scale follows the average human hearing response and enables comparison of the intensity of noise with different frequency characteristics. Time varying noise sources are often described in terms of statistical noise descriptors. The following descriptors are commonly used when assessing noise and are referred to throughout this acoustic assessment:

Decibel (dB is the adopted abbreviation for the decibel) – the unit used to describe sound levels and noise exposure. It is equivalent to 10 times the logarithm (to base 10) of the ratio of a given sound pressure to a reference pressure.

dBA – the unit used to measure 'A-weighted' sound pressure levels. A-weighting is an adjustment made to sound-level measurement to approximate the response of the human ear.

dBC – the unit used to measure 'C-weighted' sound pressure levels. C-weighting is an adjustment made to sound-level measurements which takes account of low-frequency components of noise within the audibility range of humans.

dBZ or dBL – the unit used to measure 'Z-weighted' sound pressure levels with no weighting applied, linear.

Hertz (Hz) - the measure of frequency of sound wave oscillations per second. 1 oscillation per second equals 1 hertz.

Octave – a division of the frequency range into bands, the upper frequency limit.

1/3 Octave – single octave bands divided into three parts.

L_{eq} - this level represents the equivalent or average noise energy during a measurement period. The $L_{eq,\ 15\ minute}$ noise descriptor simply refers to the L_{eq} noise level calculated over a 15 minute period. Indeed, any of the below noise descriptors may be defined in this way, with an accompanying time period (e.g. $L_{10,\ 15\ minute}$) as required.

L_{max} - the absolute maximum noise level in a noise sample.

L_N - the percentile sound pressure level exceeded for N% of the measurement period calculated by statistical analysis.

L_{10} - the noise level exceeded for 10 per cent of the time and is approximately the average of the maximum noise levels.

L_{90} - the noise level exceeded for 90 per cent of the time and is approximately the average of the minimum noise levels. The L_{90} level is often referred to as the "background" noise level and is commonly used as a basis for determining noise criteria for assessment purposes.

Sound Power Level (L_W) - this is a measure of the total power radiated by a source. The Sound Power of a source is a fundamental property of the source and is independent of the surrounding environment.

Sound Pressure Level (L_P) - the level of sound pressure; as measured at a distance by a standard sound level meter with a microphone. This differs from L_W in that this is the received sound as opposed to the sound 'intensity' at the source.

Background noise – the underlying level of noise present in the ambient noise, excluding the noise source under investigation, when extraneous noise is removed. This is described using the L_{90} descriptor.

Ambient noise – the all-encompassing noise associated within a given environment. It is the composite of sounds from many sources, both near and far. This is described using the L_{eq} descriptor.

Assessment Background Level (ABL) - is a single figure background level representing each assessment period (day, evening and night). Its determination is by the tenth percentile method, of the measured L_{90} statistical noise levels.

Rating Background Level (RBL) - is the overall single figure background level representing each assessment period (day, evening and night) over the whole monitoring period (as opposed to over each 24 hour period used for the ABL). This is the level used for assessment purposes. It is the median value of:

All the day assessment background levels over the monitoring period for the day;

All the evening assessment background levels over the monitoring period for the evening; or

All the night assessment background levels over the monitoring period for the night.

Cognitive noise – noise in which the source is recognised as being annoying.

Masking – the phenomenon of one sound interfering with the perception of another sound. For example, the interference of traffic noise with use of a public telephone on a busy street.

Extraneous noise – noise resulting from activities that are not typical of the area. Atypical activities may include construction, and traffic generated by holiday periods and by special events such as concerts or sporting events. Normal daily traffic is not considered to be extraneous.

Most affected location(s) – locations that experience (or will experience) the greatest noise impact from the noise source under consideration. In determining these locations, one needs to consider existing background levels, exact noise source location(s), distance from source (or proposed source) to receiver, and any shielding between source and receiver.

Noise criteria – the general set of non-mandatory noise level targets for protecting against intrusive noise (for example, background noise plus 5 dB) and loss of amenity (for example, noise levels for various land uses).

Noise limits – enforceable noise levels that appear in conditions on consents and licences. The noise limits are based on achievable noise levels which the proponent has predicted can be met during the environmental assessment. Exceedance of the noise limits can result in the requirement for either the development of noise management plans or legal action.

Project Specific Noise Levels – target noise levels for a particular noise generating facility. They are based on the most stringent of the intrusive criteria or amenity criteria. Which of the two criteria is the most stringent is determined by measuring the level and nature of existing noise in the area surrounding the actual or propose noise generating facility.

Compliance – the process of checking that source noise levels meet with the noise limits in a statutory context.

Non-compliance – development is deemed to be in non-compliance with its noise consent/ licence conditions if the monitored noise levels exceed its statutory noise limit by more than 2 dBA, dBC or dBZ.

Feasible and Reasonable measures – feasibility relates to engineering considerations and what is practical to build. reasonableness relates to the application of judgement in arriving at a decision, taking into account the following factors:

Noise mitigation benefits (amount of noise reduction provided, number of people protected);

Cost of mitigation (cost of mitigation versus benefit provided);

Community views (aesthetic impacts and community wishes);

Noise levels for affected land uses (existing and future levels, and changes in noise levels).

Meteorological Conditions – wind and temperature inversion conditions.

Temperature Inversion – an atmospheric condition in which temperature increases with height above the ground.

Adverse Weather – weather effects that enhance noise (that is, wind and temperature inversions) that occur at a site for a significant period of time (that is, wind occurring more than 30% of the time in any assessment period in any season and/or temperature inversions occurring more than 30% of the nights in winter).

Operator Attended Noise Measurements

Table A.1 below presents typical abbreviations that are used to describe common noise sources that may be noted during environmental noise measurements.

Table A.1 General Field Note Abbreviations

Noise Source	Abbreviation
'Wind-blown vegetation'	WBV
'Car pass-by'	CP
'Operator Noise'	OP
'Animal Noise'	AN
'Distant Traffic'	DT
'Near Traffic'	NT
'Aircraft Noise'	AN
'Metal on Metal contact'	MMC

During operator attended noise measurements, the sound level meter will present the instantaneous noise level and record acoustical and statistical parameters. In certain acoustical environments, where a range of noise sources are audible and detectable, the sound level meter cannot measure a direct source noise level and it is often necessary to account for the contribution and duration of the sources.

Noted Percentile Contribution – *Table A.2* presents noise level deductions that are typically applied based on the percentage contribution of a noise source(s). **Noted Time Contribution** – *Table A.3* presents noise level deductions that may be applied based on the percentage of time that a noise source(s) is audible during a 15 minute measurement.

Where the noise emission from a source is clearly detectable and the contribution can be measured, these deductions are not necessary.

Table A.2 Noise Level Deductions – Noted Percentile Contribution

Percentage Contribution	Noise Level Adjustment, dBA
5%	-13.0
10%	-10.0
15%	-8.2
20%	-7.0
25%	-6.0
30%	-5.2
35%	-4.6
40%	-4.0
45%	-3.5
50%	-3.0
55%	-2.6
60%	-2.2
65%	-1.9

Percentage Contribution	Noise Level Adjustment, dBA
70%	-1.5
75%	-1.2
80%	-1.0
85%	-0.7
90%	-0.5
95%	-0.2
100%	0.0

1. ***EXAMPLE:** the measured $L_{eq,\ 15\ minute}$ noise level is 49 dBA and the site contribution was observed to be 10% of this level (extraneous noise sources were noted to dominate the measurement), therefore the $L_{eq,\ 15\ minute}$ noise level deduction is 10 dBA, with a resultant noise level contribution of approximately 39 dBA.*

Table A.3 Noise Level Deductions – Noted Time Contribution

Event Duration (minutes)	Noise Level Adjustment, dBA
1	-11.8
2	-8.8
3	-7.0
4	-5.7
5	-4.8
6	-4.0
7	-3.3
8	-2.7
9	-2.2
10	-1.8
11	-1.3
12	-1.0
13	-0.6
14	-0.3
15	0.0

1. ***EXAMPLE:** the measured $L_{eq,\ 15\ minute}$ noise level contribution of an excavator was noted to be 56 dBA, however it was only audible for six minutes during the 15 minute measurement period, therefore the $L_{eq,\ 15\ minute}$ noise level deduction is 4 dBA, with a resultant noise level contribution of approximately 52 dBA.*