Construction Noise and Vibration Management Sub-Plan (CNVMSP)

Kingscliff High School Upgrade
SSD-8744305

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Rev 8

RICHARD CROOKES CONSTRUCTIONS

Document Control

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Glossary/ Abbreviations

Abbreviations	Expanded Text
Ambient Noise	The all-encompassing noise associated within a given environment at a given time, usually composed of sound from all sources near and far.
Attenuation	The reduction in the level of sound or vibration.
CEMP	Construction Environmental Management Plan
CNVMSP	Construction Noise and Vibration Management Sub-Plan
dBA	Decibels using the A-weighted scale measured according to the frequency of the human ear.
DoE	NSW Department of Education
DPIE	NSW Department of Planning, Industry and Environment
EIS	Environmental Impact Statement
EMS	Environmental Management System
Environmental Aspect	Defined by AS/NZS ISO 14001:2015 as an element of an organisation's activities, products or services that can interact with the environment.
Environmental Impact	Defined by AS/NZS ISO 14001:2015 as any change to the environment, whether adverse or beneficial, wholly or partially resulting from an organisation's environmental aspects.
Environmental Objective	Defined by AS/NZS ISO 14001:2015 as an overall environmental goal, consistent with the environmental policy, that an organisation sets itself to achieve.
Environmental Target	Defined by AS/NZS ISO 14001:2015 as a detailed performance requirement, applicable to the organisation or parts thereof, that arises from the environmental objectives and that needs to be set and met in order to achieve those objectives.
EPA	NSW Environment Protection Authority
EP&A Act	*Environmental Planning and Assessment Act 1979*
EWMS	Environmental Work Method Statements
Feasible and Reasonable	Consideration of best practice taking into account the benefit of proposed measures and their technological and associated operational application in the NSW and Australian context. Feasible relates to engineering considerations and what is practical to build. Reasonable relates to the application of judgement in arriving at a decision, taking into account mitigation benefits and cost of mitigation versus benefits provided, community views and nature and extent of potential improvements.
LAeq (15min)	The A-weighted equivalent continuous (energy average) A-weighted sound pressure level of the construction works under consideration over a 15-minute period and excludes other noise sources such as from industry, road, rail and the community.
LA (max)	the A-weighted maximum noise level only from the construction works under consideration, measured using the fast time weighting on a sound level meter.
OEH	Office of Environment and Heritage

Abbreviations	Expanded Text
RBL	The Rating Background Level for each period is the medium value of the ABL values for the period over all of the days measured. There is therefore an RBL value for each period (day, evening and night)
SINSW	School Infrastructure NSW
SEARs	Secretary's Environmental Assessment Requirements
SWP	Sound Power Level
SPL	Sound Pressure Level

1 Introduction

This Construction Noise and Vibration Management Sub-Plan (CNVMSP or Plan) forms part of the Construction Environmental Management Plan (CEMP) for the Kingscliff High School (KHS) Upgrade (the Project).

This CNVMSP has been prepared to address the requirements of the Kingscliff High School Upgrade State Significant Development Conditions of Consent - SSD-8744305, DECCW Interim Construction Noise Guideline (DECCW 2009), NSW Industrial Noise Policy (EPA 2000), and Assessing Vibration: A Technical Guideline (DEC 2006) and all applicable legislation.

This plan has been prepared to meet condition B17 and C4-C8 of the SSD Conditions application number SSD-8744305. The compliance matrix is set out in Table 1.

Table 1: Condition B17 Compliance Table

Condition	Condition Requirements	Document Reference (Page Number)
B17	The Applicant must prepare a Construction Noise and Vibration Management Sub – Plan must address, but not limited to the following:	
	be prepared by a suitably qualified expert, in consultation with Council; **Note:** This plan has been drawn from the information presented in the EIS and the Noise and Vibration Impact Assessment which has been submitted to Council.	Appendix A
	describe procedures for achieving the noise management levels in EPA's *Interim Construction Noise Guideline* (DECC,2009);	19-32
	describe the measures to be implemented to manage high noise generating works such as piling, in close proximity to sensitive receivers;	19-32
	include strategies that have been developed with the community for managing high noise generating works;	19-32
	describe the community consultation undertaken to develop the strategies in condition B17(d);	NA
	include a complaints management system that would be implemented for the duration of the construction; and	34
	include a program to monitor and report on the impacts and environmental performance of the development and the effectiveness of the implemented management measures in accordance with the requirements of Condition B13.	19-32
C4-8	Hours of Work	17

1.1 Project Overview

As part of the NSW Governments $7 billion School Infrastructure Package, the KHS Upgrade Project will include the demolition of existing facilities including carparks, to facilitate the following planned upgrades:

- Construction of a new Visual Arts, Music and Performance Building (Building O) in the north-western portion of the site.
- A new hydrant booster, tank and pump room in the north-eastern portion of the site.
- A new Covered Outdoor Learning Area (COLA) to the east of existing Building H.
- Demolition of a footpath and new landscaping works to the north of the current Building F.
- Alterations and refurbishment of existing buildings 'C' and 'G'.

The proposed design is shown as Figure 1-1.

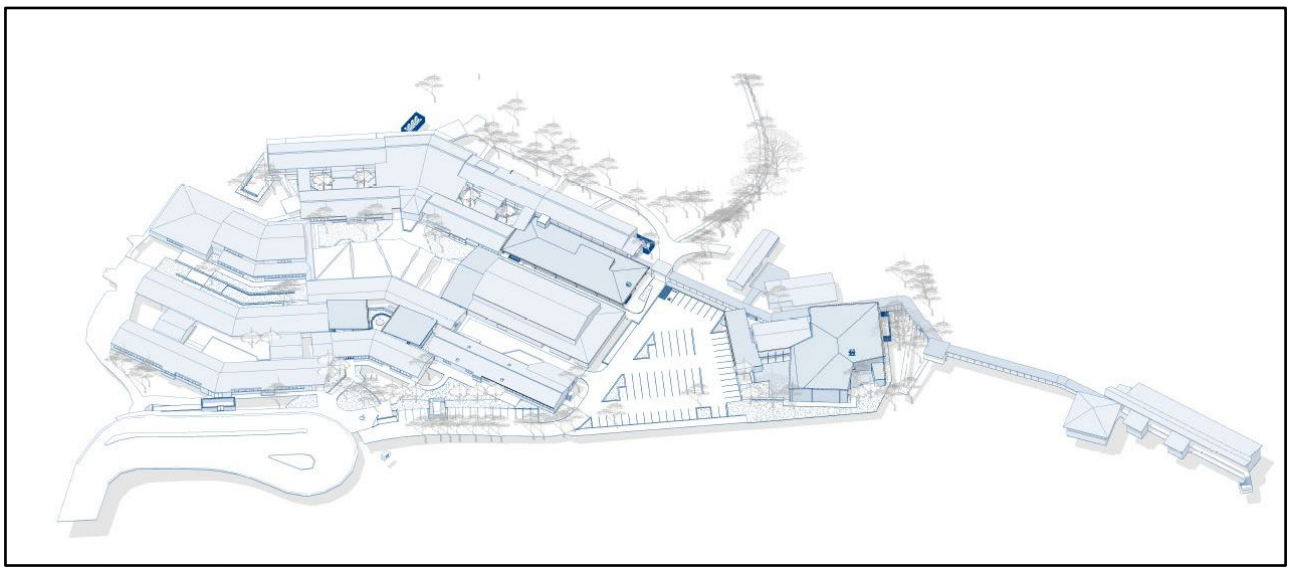

Figure 1-1 Proposed Design

A noise and vibration assessment prepared by Acoustic Works for the Department of Education (DoE) in 2021 assessed noise and vibration impacts on sensitive receivers during the proposed redevelopment of KHS. This assessment identified the potential for direct and indirect noise impacts on sensitive receivers but concluded that provided the proposed mitigation and management measures are implemented, no significant long-term impacts would be expected.

1.2 Site Description

KHS (the site) is located at 33 Oxford Street, Kingscliff and is legally described as Lot 57 DP 803814 and Lot 3 DP 803772. The site is located on the southern outskirts of Kingscliff, at the urban bushland interface.

2 Purpose and Objectives

2.1 Purpose

The purpose of this Plan is to describe how Richard Crookes Constructions (RCC) proposes to manage potential noise and vibration impacts during construction of the Project.

2.2 Objectives

The key objective of the CNVMSP is to ensure all measures derived from the Noise and Vibration Assessment, Development Conditions of Consent and licence/permit requirements relevant to noise and vibration are described, scheduled and assigned responsibility as outlined in:

- State Significant Development Conditions of Consent B17;
- DECCW Interim Construction Noise Guideline (DECCW 2009).

2.3 Targets

Targets have been established for the management of noise impacts during the Project to ensure:

- Full compliance with the relevant legislative requirements and the Conditions of Consent;
- Implementation of feasible and reasonable noise mitigation measures, with the aim of achieving the construction noise management levels detailed in the Interim Construction Noise Guideline (DECC, 2009);
- That demolition and construction activities are only undertaken at designated times and remain within established/agreed criteria; and,
- Complaints from the community and stakeholders are minimised.

3 Environmental Requirements

3.1 Relevant Legislation

3.1.1 Legislation

All legislation relevant to this plan is included in the CEMP.

3.1.2 Guidelines

The main guidelines, specifications, and policy documents relevant to this Plan include:

- NSW Interim Construction Noise Guideline (ICNG), Department of Environment and Climate Change 2009
- NSW Noise Policy for Industry, Environment Protection Authority 2017
- NSW Assessing Vibration – a technical guideline (AVTG), Department of Environment and Conservation 2006
- Development Near Rail Corridors and Busy Roads – Interim Guideline, Department of Planning, 2008
- Australian Standard AS/NZS 2107:2000 Acoustics - Recommended design sound levels and reverberation times for building interiors
- Australian Standard AS2436-1981 Guide to Noise Control on Construction, Maintenance and Demolition Sites

4 Existing Environment

KHS is located in the town of Kingscliff, situated on the north coast of New South Wales (NSW). The primary use of the site is for the education of children between the ages of 13 – 18 which correspond to grade 7 through to grade 12. The proposed redevelopment of the site will include the progressive removal/demolition of two existing buildings and subsequent construction of several buildings and supporting infrastructure.

Figure 4-1 Location of Proposed Redevelopment and surrounds

Surrounding land uses and local businesses include:

- North & North-East - Residential
- East - Bushland
- South – Cudgen Creek
- West – Kingscliff TAFE & Driver School

4.1 Potential Receivers

A review of the area surrounding the works identified the occurrence of low-density residential dwellings immediate to the sites north and north-east, with a commercial premises (driver school) and Kingscliff TAFE situated to the west. The noise and vibration assessment conducted by Acoustic Works for the site has grouped the residential allotments located in the north and north-east into four separate receivers. The receivers identified in the Acoustic Works Report are set out as follows:

- Receiver 1: Residential dwellings, located to the north of the school along Cambridge Court and Yale Street;
- Receivers 2: Residential dwellings, located to the north-east of the school along Oxford, Dinsey and Vulcan Streets;
- Receivers 3: Driving school, located to the west of the site; and,
- Receivers 4: TAFE Kingscliff campus, located to the north-west of the site.

The location and groupings of these receivers are illustrated in Figure 4-2.

Figure 4-2 Proposed Redevelopment and Receivers (Acoustic Works, 2021)

Due to the long-term nature of construction being greater than one year and the demolition and construction works being in close proximity to active classrooms and staff offices, the active classrooms and staff rooms of the Kingscliff High School are considered a sensitive receiver. The Kingscliff High School (depicted as the site) is classified as Receiver 5.

4.2 Ambient Noise

The DECC Interim Construction Noise Guidelines (ICNG) 2009 specify that a quantitative assessment for major projects and/or projects of state significance is required to assess and predict airborne noise levels from the proposed works, and subsequently provide an assessment against set criteria.

Noise monitoring of the ambient environment was conducted at two sites representative of the local noise environment by Acoustic Works in 2021. The two sites were positioned at the closest sensitive receiver to the north (Receiver 1: Residential dwellings) and north-east (Receivers 2: Residential dwellings of the proposed works. Monitoring was conducted for a period of 7 days to measure background noise levels and subsequently calculate the Rating Background Level (RBL) in accordance with the NSW Noise Policy for Industry. The calculated RBL was then utilised in the assessment of deriving a Noise Management Level (NML) for construction activities.

The surrounding area is primarily affected by noise from the surrounding road network, wildlife and other activities associated with the TAFE and Driving School.

5 Noise and Vibration Criteria for NSW

The EPA recommends management levels and goals when assessing construction noise and vibration. These are outlined in:

- The Interim Construction Noise Guideline (ICNG),
- NSW Assessing Vibration – a technical guideline (AVTG),

Relevant elements of these documents are summaries and discussed in this Chapter.

5.1 Construction Noise and Assessment Objectives

The DECC Interim Construction Noise Guideline (ICNG, July 2009) provides guidelines for the assessment and management of construction noise. The ICNG focuses on applying a range of work practices to minimise construction noise impacts rather than focusing on achieving numeric noise levels.

The main objectives of the ICNG are to:

- Identify and minimise noise from construction works;
- Focus on applying all 'feasible' and 'reasonable' work practices to minimise construction noise impacts;
- Encourage construction during the recommended standard hours only, unless approval is given for works that cannot be undertaken during these hours;
- Reduce time spent dealing with complaints at the project implementation stage, and;
- Provide flexibility in selecting site-specific feasible and reasonable work practices to minimise noise impacts.

5.2 Quantitative Noise Assessment Criteria

A quantitative noise assessment was carried out by Acoustic Works in 2021 (ref.20200400-1R01E Kingscliff High School ENV CNVMSP.docx) to ascertain the Rating Background Level (RBL dB(A)) in response to requirements of the DECC ICNG (2009) and the Planning Secretary's Environmental Assessment Requirements (SEARs).

Subsequently Noise Management Levels (LAeq 15 minutes) for sensitive receivers (Residential and Non-Residential) during Construction were determined by assessment against relevant criteria specified within Section 7.3.5 (Intrusiveness noise criteria) and Section 7.3.6 (Amenity Criteria) of the EIS Noise and Vibration Impact Assessment prepared by Acoustic Works (2021) as well as the Noise Policy for Industry, and which are listed in Section 5.3 below.

5.3 Adopted Project Noise Management Levels

The ICNG, sets out the criteria utilised in determining the noise management levels and how they are to be applied for sensitive receivers. These adopted values (Noise Management Level or NML) during standard construction hours for residential receivers is represented by the Rating Background Level (RBL) +10dB. Whereby, the noise level set represents the point above which there may be some community reaction to noise. The NML's for Receivers 1-3 are derived from the Acoustic Works RBL's +10dB whilst the NML's for Receivers 4-5 are derived from the ICNG (2009).

Time Period	Receiver 1 (Residential)	Receiver 2 (Residential)	Receiver 3 (Commercial)
	NML $L_{Aeq\ (15min)}$ dBA	NML $L_{Aeq\ (15min)}$ dBA	NML $L_{Aeq\ (15min)}$ dBA
Day	47	43	65
Evening	43	43	65
Night	38	38	65

Table 5-1 Project Specific Noise Management Levels: Receivers 1-3

Time Period	Receiver 4 (TAFE) and Receiver 5 (KHS)		
	Active Outdoor Recreational Area	Classroom Internal	Classroom External
	NML $L_{Aeq\ (15min)}$ dBA	NML $L_{Aeq\ (15min)}$ dBA	NML $L_{Aeq\ (15min)}$ dBA
Day	65	45	55
Evening	65	45	55
Night	65	45	55

Table 5-2 Project Specific Noise Management Levels: Receivers 4-5

Therefore, based on the assessment criteria provided in Table 5-1, residential sensitive receiver envelop R1 has an adopted NML value of 47dBA, R2 (residential) has an adopted NML value of 43dBA and R3 (Commercial) has a Noise Management Level of 65dBA. Sensitive Receiver R4 (TAFE) and R5 (KHS) has an external classroom NML of 55 dBA and an internal classroom NML of 45dBA (Table 5-2). The adopted NML's are during the specified construction hours of 7am – 6pm Monday to Friday and 7am – 1pm Saturday.

Specific NMLs for residential receivers are presented below in Table 5-3 which is extracted from Table 8, Section 7.4.2.1 of EIS Noise and Vibration Assessment prepared by Acoustic Works (2021).

Time of day	Criterion LAeq(15min) *	How to apply
Recommended standard hours	Noise affected RBL + 10dB	The noise affected level represents the point above which there may be some community reaction to noise. Where the predicted or measured LAeq (15 min) is greater than the noise affected level, the proponent should apply all feasible and reasonable work practices to meet the noise affected level. The proponent should also inform all potentially impacted residents of the nature of works to be carried out, the expected noise levels and duration, as well as contact details.
	Highly noise affected 75dBA	The highly noise affected level represents the point above which there may be strong community reaction to noise. Where noise is above this level, the relevant authority (consent, determining or regulatory) may require respite periods by restricting the hours that the very noisy activities can occur, taking into account: 1. times identified by the community when they are less sensitive to noise (such as before and after school for works near schools, or mid-morning or mid-afternoon for works near residences 2. if the community is prepared to accept a longer period of construction in exchange for restrictions on construction times.
Outside recommended hours	Noise affected RBL + 5dB	A strong justification would typically be required for works outside the recommended standard hours. The proponent should apply all feasible and reasonable work practices to meet the noise affected level. Where all feasible and reasonable practices have been applied and noise is more than 5 dB(A) above the noise affected level, the proponent should negotiate with the community. For guidance on negotiating agreements see section 7.2.2.

* Noise levels apply at the property boundary that is most exposed to construction noise, and at a height of 1.5 m above ground level. If the property boundary is more than 30 m from the residence, the location for measuring or predicting noise levels is at the most noise-affected point within 30 m of the residence.

Table 5-3 Noise Criteria for Quantitative Assessment – Residential (Acoustic Works 2021)

Specific NMLs for non-residential receivers are presented in Table 5-4 which was extracted from Section 7.4.2.2 of EIS Noise and Vibration Assessment prepared by Acoustic Works (2021).

Land use	Management level LAeq(15min)	Assessment location
Classrooms at schools and other educational institutions	45dBA	Internal
Hospital wards and operating theatres	45dBA	Internal
Places of worship	45dBA	Internal

Table 5-4: Noise Criteria for Quantitative Assessment - Other Uses (Acoustic Works 2021)

5.4 Vibration Criteria

There are three types of vibration as classified in the Assessing Vibration Technical Guideline 2006 which include:

- Continuous - vibration continues uninterrupted for a defined period (usually throughout daytime and/or night-time). This type of vibration is assessed on the basis of weighted RMS (root mean squared) acceleration values.
- Impulsive - rapid build up to a peak followed by a damped decay that may or may not involve several cycles. The duration is short, typically less than 2 seconds. Impulsive vibration (no more than three occurrences in an assessment period) is assessed on the basis of acceleration values.
- Intermittent - interrupted periods of continuous (e.g. a drill) or repeated periods of impulsive vibration (e.g. a pile driver), or continuous vibration that varies significantly in magnitude. Assessed on the basis of vibration dose values.

5.4.1 Acceptable values for continuous and impulsive vibration (1-80Hz)

The relevant criteria for continuous and impulsive vibration are set out in Table 5-3.

Type	Location	Assessment Period	Preferred values m/s²		Maximum values m/s²	
			z-axis	x & y axis	z-axes	x & y axes
Continuous Vibration	Critical Areas	Day or Night-time	0.005	0.0036	0.01	0.0072
	Residences	Day time	0.01	0.0071	0.02	0.014
		Night-time	0.007	0.005	0.014	0.01
	Offices, Schools & Places of Worship	Day or Night-time	0.02	0.014	0.04	0.028
	Workshops	Day or Night-time	0.04	0.029	0.08	0.058
Impulsive Vibration	Critical Areas	Day or Night-time	0.005	0.0036	0.01	0.0072
	Residences	Day time	0.3	0.21	0.6	0.42
		Night-time	0.1	0.071	0.2	0.14
	Offices, Schools & places of Worship	Day or Night-time	0.64	0.46	1.28	0.92
	Workshops	Day or Night-time	0.64	0.46	1.28	0.92

Table 5-5 Preferred Weighted RMS Vibration Acceleration Values

5.4.2 Acceptable values for intermittent vibration

Intermittent vibration is assessed using the vibration dose value (VDV) root-mean-quad method. VDV accumulates the vibration energy received over the daytime and night-time periods. The vibration dose methodology is as per standard BS 6472–1992.

6 Environmental Aspects and Impacts

6.1 Environmental Aspects

The Project will involve a range of activities incorporating various heavy machinery, plant and equipment that will operate within the grounds of the existing School envelop. In order to assess the level of potential impact on noise and vibration sensitive receivers, the broad categories of construction activity likely to interact with these receivers are identified below.

Major activities involved in construction of the Project include the following works:

- Site establishment.
- Demolition and removal of existing buildings and car park.
- Construction and renovation of new and existing buildings and parking areas.
- Site disestablishment.

High noise activities will include demolition of existing infrastructure which may include rock breaking attachments on excavators, jackhammers and concrete saws.

6.2 Environmental Impacts

The subject works, as described in Section 6.1, will commence with demolition works of existing infrastructure, followed by the construction program and renovation of some existing buildings. The predicted noise levels derived from the noise assessment compiled by Acoustic Works (2021) and summarized in Table 6-1, for demolition and construction activities. The modelled values are representative of noise levels expected at the sensitive receiver.

Receiver	Environment	Activity	LAeq (adjusted) at Receivers	Compliance with INCG	
				Noise Affected	High Noise Affected
R1	Residential North	Demolition	75	No	Yes
		Construction	66	No	Yes
R2	Residential North-East	Demolition	70	No	Yes
		Construction	60	No	Yes
R3	Commercial Driver School	Demolition	69	Yes	Yes
		Construction	60	Yes	Yes
R4	TAFE	Demolition	44	Yes	Yes
		Construction	37	Yes	Yes

Table 6-1 Predicted Noise Levels at Sensitive Receivers

6.2.1 Predicted Noise Levels

Predicted noise levels emitted from both construction and demolition activities occurring at the site are expected to exceed the recommended noise levels at residential receiver's locations with compliance predicted with the highly noise affected criteria. Demolition works are predicted to comply with the criteria for receivers 3 and 4 without the need for any additional acoustic treatment. Due to the proximity of neighbouring buildings, noise and vibration levels may need to be continually monitored during demolition and construction works and implement noise control measures located in Table 7.1 Noise and vibration management and mitigation measures.

No predicted noise modelling has been undertaken for active classrooms, adjacent construction work at KHS, however, due to the close proximity of the buildings in relation to the proposed construction work, it as anticipated both construction and demolition noise levels will exceed the NML's and the highly noise affected threshold. Subsequently mitigation measures specified within Section 7 of this plan will need to be implemented.

6.2.2 Predicted Vibration Levels

A new two-storey visual arts building, and nearby carpark are identified as the closest activity to noise sensitive receptors. A typical vibration limit of 10 mm/s is recommended for these locations. At 10m distance from excavating, the maximum vector sum peak particle velocity is usually expected to be approximately between 0.1mm/s to 4.5mm/s.

Due to proximity of neighbouring residential and school buildings, vibration levels in some cases may need to be monitored during demolition and earthworks depending on the ground substrate and equipment used. If complaints are received vibration control would be implemented as outlined in Table 7.1 Noise and vibration management and mitigation measures.

6.3 Hours of Work

The proposed hours of work (Standard Hours) for the project are in accordance with Condition C4 of SSD-8744305 and are as follows:

- Monday – Friday: 7 am – 6 pm;
- Saturday: 8 am – 1 pm; and,
- Sunday: No work on Sundays or Public Holidays.

In accordance with Condition C5, notwithstanding condition C4, provided noise levels do not exceed the existing background noise level plus 5dB, works may also be undertaken during the following hours:

- Between 6pm and 7pm, Mondays to Fridays inclusive; and
- Between 1pm and 4pm, Saturdays.

In accordance with Condition C8 of SSD-8744305, All intrusive noise activities such as rock breaking, rock hammering, sheet piling, pile driving and similar activities may only be carried out between the following hours:

- 9 am to 12 pm, Monday to Friday;
- 2 pm to 5 pm Monday to Friday; and
- 9 am to 12 pm, Saturday.

In accordance with Condition C6 of SSD-8744305, work outside of hours (OOHW) may be done under one of the following five categories;

- The delivery of oversized plant or structures that police or other authorities determine require special arrangements to transport along public roads;
- Emergency work to avoid the loss of life or damage to property, or to prevent environmental harm;
- Maintenance and repair of public infrastructure where disruption to essential services and/or considerations of worker safety do not allow work within standard hours;
- public infrastructure works that shorten the length of the project and are supported by the affected community, and;
- Works where a proponent demonstrates and justifies a need to operate outside the recommended standard hours.

For all works that meet the criteria listed above, community consultation will be required based on the level of impact received at the residence and duration of the event. Notification of such construction activities as referenced in condition C7 above must be given to affected residents before undertaking the activities or as soon as is practical afterwards.

For work outside the recommended hours, the criteria set in Table 8 of Section 7.4.2.1 Noise affected RBL +5dB) of the EIS Noise and Vibration Impact Assessment prepared by Acoustic Works 2021 is to be applied.

7 Environmental Mitigation and Management Measures

A range of environmental requirements and control measures are identified in the various environmental documents, including the Conditions of Consent, and the Noise and Vibration Assessment compiled by Acoustic Works as part of the EIS process. Specific actions and processes which will be implemented to comply and address these requirements and measures are outlined in Table 7-1.

Noise levels apply at the property boundary that is most exposed to construction noise, and at a height of 1.5 m above ground level. If the property boundary is more than 30 m from the residence, the location for measuring or predicting noise levels is at the most noise-affected point within 30 m of the residence.

Predicted noise impacts associated with demolition and construction of the proposed works has been assessed based on the source noise levels and procedures contained in AS2436-2010, as well as the results of previous noise measurements and assessments conducted by Acoustic Works. Calculations were performed based on the demolition and construction works being at the closest relevant distance to each of the existing receiver.

Predicted vibration levels at the new two storey building for Visual Arts and nearby refurbished car park would be the closest to the nearby noise sensitive noise receivers. A typical vibration limit of 10 mm/s is recommended for these locations as per Section 9 of the EIS Noise and Vibration Impact Assessment prepared by Acoustic Works (2021).

At 10m distance from excavating, the maximum vector sum peak particle velocity is usually expected to be approximately between 0.1mm/s to 4.5mm/s.

Section 10.1 of the EIS assessment prepared by Acoustic Works (2021) states that no further treatment is required for nearby sensitive receivers. Based on the measured noise levels and assessment of the site and surrounds, noise impacts at the nearby receiver locations are predicted to satisfy the assessment criteria for the proposed hours of operation without the need for further treatment. Due to the proximity of neighbouring buildings, vibration levels may need to be continually monitored during demolition works.

Table 7-1 Noise and vibration management and mitigation measures

ID	Measure / Requirement	Resource needed	When to implement	Responsibility	Reference
NV1	No later than 48 hours before the commencement of construction, a Community Communication Strategy must be submitted to the Planning Secretary for information. The Community Communication Strategy must provide mechanisms to facilitate communication between the Applicant, the relevant Council and the community (including adjoining affected landowners and businesses, and others directly impacted by the development), during the design and construction of the development and for a minimum of 12 months following the completion of construction. The Community Communication Strategy must: • identify people to be consulted during the design and construction phases; • set out procedures and mechanisms for the regular distribution of accessible information about or relevant to the development; • provide for the formation of community-based forums, if required, that focus on key environmental management issues for the development; • set out procedures and mechanisms: o through which the community can discuss or provide feedback to the Applicant; o through which the Applicant will respond to enquiries or feedback from the community; and o to resolve any issues and mediate any disputes that may arise in relation to construction and operation of the development, including disputes regarding rectification or compensation.	Development of a Community Communication Strategy	Prior to commencement of construction activities	Site Manager or their delegate (SINSW)	B10 Conditions of Consent

ID	Measure / Requirement	Resource needed	When to implement	Responsibility	Reference
NV2	In addition to meeting the specific performance measures and criteria in this consent, all reasonable and feasible measures must be implemented to prevent, and, if prevention is not reasonable and feasible, minimise any material harm to the environment that may result from the construction and operation of the development.	Development of CEMP and relevant sub-plans.	Ongoing	Site Manager or their delegate	A1 Conditions of Consent,
NV3	Prior to the commencement of any vibrational generating works that could impact on the buildings surveyed as required by Condition B9, the Applicant must: • provide a copy of the relevant survey to the owner of each residential building surveyed in the form of a Pre-Construction Survey Report; • submit a copy for the Pre-Construction Survey Report to the Certifier; and • provide a copy of the Pre-Construction Survey Report to the Planning Secretary when requested.	Suitably Qualified Person – Structural Engineer	Prior to finalisation of construction activities	Site Manager or their delegate	B9 Conditions of Consent
NV4 Refer to: Section 10.2 of EIS	Prior to installation of mechanical plant and equipment: • a detailed assessment of mechanical plant and equipment with compliance with the relevant specific noise criteria as recommended in the Noise and Vibration Impact Assessment, dated 27 July 2021 and prepared by Acoustic Works must be undertaken by a suitably qualified person; and; • evidence must be submitted to the Certifier that noise mitigation recommendations identified in the assessment carried out under (a) have been incorporated into the design to ensure the development will not exceed the project specific noise criteria identified in the Noise and Vibration Impact Assessment, dated 27 July 2021 and prepared by Acoustic Works.	Suitably qualified person with experience in acoustic assessments	Prior to commencement of construction activities	Site Manager or their delegate	B24 Conditions of Consent

ID	Measure / Requirement	Resource needed	When to implement	Responsibility	Reference
NV5	All construction plant and equipment used on site must be maintained in a proper and efficient condition and operated in a proper and efficient manner.		Prior to commencement of construction activities	Site Manager or their delegate	C2 Conditions of Consent
NV6	Construction, including the delivery of materials to and from site, may only be carried out between the following hours; • Monday to Friday 7am – 6pm • Saturday 8am – 1pm • No work on Sunday or public holidays		Ongoing	Site Manager or their delegate	C4 Conditions of Consent, Interim Construction Noise Guideline (DECCW 2009)
NV7	Notwithstanding condition C4, provided noise levels do not exceed the existing background noise level plus 5dB, works may also be undertaken during the following hours: • Between 6pm and 7pm, Mondays to Fridays inclusive; and • Between 1pm and 4pm, Saturdays.		Ongoing	Site Manager or their delegate	C5 Conditions of Consent, Interim Construction Noise Guideline (DECCW 2009)

NV8	Construction activities may be undertaken outside of the hours in condition C4 and C5 if required: • by the Police or a public authority for the delivery of vehicles, plant or materials; or • in an emergency to avoid the loss of life, damage to property or to prevent environmental harm; or • where the works are inaudible at the nearest sensitive receivers; or • where a variation is approved in advance in writing by the Planning Secretary or his nominee if appropriate justification is provided for the works. <u>Note</u>: Workers and delivery trucks do not congregate at or outside the site before 7am. This is an important factor for managing noise from the site. Notwithstanding the above measure, should works extend past approved SSD hours and have the potential of exceeding the severely impact noise criteria (75 $L_{Aeq\ (15mins)}$ dBA). • Notifying any affected residents as soon as it is identified that works and expected to continue beyond the approved hours and in accordance with Condition C7. • Amend construction methodology to accelerate completion of the works including adding accelerant compound to concrete mix to allow finishing to occur quicker. • Trowelling machines used periodically to ensure suitable finish is achieved with a broom finish. • During down periods while waiting for the concrete to finish, labour is return to the crib rooms. Task lighting installed and positioned to face away from affected residents		Ongoing	Site Manager or their delegate	C6 Conditions of Consent, Interim Construction Noise Guideline (DECCW 2009)

ID	Measure / Requirement	Resource needed	When to implement	Responsibility	Reference
NV9	Notification of such construction activities as referenced in condition C6 must be given to affected residents before undertaking the activities or as soon as is practical afterwards.	Development of a Community Communication Strategy	Ongoing	Site Manager or their delegate	C7 Conditions of Consent,
NV10	Rock breaking, rock hammering, sheet piling, pile driving and similar activities may only be carried out between the following hours: • 9am to 12pm, Monday to Friday; • 2pm to 5pm Monday to Friday; and • 9am to 12pm, Saturday		Demolition	Site Manager or their delegate	C8 Conditions of Consent
NV11	A site-specific induction will be provided to all site personnel, contractors, sub-contractors with an emphasis on understanding and managing noise impacts from the work activities being undertaken. The induction will include: • All relevant project specific and standard noise and vibration measures • Relevant licence and approval conditions • Approved work hours as per Condition C4 • Restriction on construction vehicles arrival to site and surrounding residential precincts to within the working hours as per Condition C4 • Location of nearest sensitive receivers • No high noise generating activities • Construction employee parking areas • Designated loading and unloading areas/ and procedures • Environmental incident procedures		Ongoing	Site Manager or their delegate	C13 Conditions of Consent

ID	Measure / Requirement	Resource needed	When to implement	Responsibility	Reference
NV12	The Applicant must ensure construction vehicles (including concrete agitator trucks) do not arrive at the site or surrounding residential precincts outside of the construction hours of work outlined under condition C14.		Ongoing	Site Manager or their delegate	C14 Conditions of Consent
NV13	The Applicant must implement, where practicable and without compromising the safety of construction staff or members of the public, the use of 'quackers' to ensure noise impacts on surrounding noise sensitive receivers are minimised. Any moveable plant (e.g., compressors should be located as far as practical from the residential premises.		Ongoing	Site Manager or their delegate	C15 Conditions of Consent
NV14	Vibration caused by construction at any residence or structure outside the site must be limited to: • For structural damage, the latest version of DIN 4150-3 (1992-02) Structural vibration - Effects of vibration on structures (German Institute for Standardisation, 1999); and • For human exposure, the acceptable vibration values set out in the Environmental Noise Management Assessing Vibration: a technical guideline (DEC,2006) (as may be updated or replaced from time to time).		Ongoing	Site Manager or their delegate	C16 Conditions of Consent, AVTG 2006
NV15	Vibratory compactors must not be used closer than 30 metres from residential buildings unless vibration monitoring confirms compliance with the vibration criteria specified in condition C16.		Ongoing	Site Manager or their delegate	C17 Conditions of Consent
NV16	The limits in conditions C16 and C17 apply unless otherwise outlined in a Construction Noise and Vibration Management Plan, approved as part of the CEMP required by condition B17		Ongoing	Site Manager or their delegate	C18 Conditions of Consent

ID	Measure / Requirement	Resource needed	When to implement	Responsibility	Reference
NV17	Prior to commencement of operation, the Applicant must engage a suitably qualified person and experienced expert to prepare a post-construction dilapidation report. This report is to: • ascertain whether the construction created any structural damage to public infrastructure by comparing results of the Post-Construction Dilapidation Report with the Pre-Construction Dilapidation Report as required by condition B5 of this consent; • have, if it's decided that there is no structural damage to public infrastructure, the written confirmation from the relevant public authority that there is no adverse structural damage to their infrastructure (including roads). • be submitted to the Certifier; • be forwarded to Council for information; and • be provided to the Planning Secretary when requested.	Suitably Qualified Person – Structural Engineer	Prior to finalisation of construction activities	Site Manager or their delegate	D13 Conditions of Consent
NV18	All contractors and workers are to receive an environmental induction, which must at least include: • Project specific and relevant standard noise and vibration mitigation measures. • Permissible hours of work. • Any limitations on high noise generating activities. • Location of nearest sensitive receivers. • Construction employee parking areas. • Designated loading/unloading areas and procedures. • Site opening/closing times (including deliveries). • Environmental incident procedures.	Site specific Induction	Ongoing	Site Manager or their delegate	Best practice
NV19	If further noise mitigation is required, acoustic barriers around the perimeter of the site can be installed during the work. If further noise reductions are required, install additional screening around noise sensitive areas.	Installation of temporary attenuation as required.	Prior to the commencement of Construction Activities	Site Manager or their delegate	Section 10.3.3.2 of the Acoustic Assessment for the EIS process

ID	Measure / Requirement	Resource needed	When to implement	Responsibility	Reference
NV20	Community consultation will be required with nearby residences and sensitive receivers during demolition and construction activities that are likely to exceed noise limits. The Responsible Person should notify the adjacent residential premises of the intention to commence work that may cause adverse impacts on surrounding residents. If plant is to be operated close proximity to residential premises, the Responsible Person should advise the occupants of the premises the length and time that the plant will be in operation proximate to the property boundary. Demolition and construction works are predicted to comply with the highly noise affected noise affected limit of 75 dB(A) LAeq 15min at all residential receiver locations and the criteria for receiver 3 and 4 without the need for any additional acoustic treatments.	Development of a Community Communication Strategy	Prior to the commencement of Construction Activities	Site Manager or their delegate	Section 10.3 of the Acoustic Assessment for the EIS process

ID	Measure / Requirement	Resource needed	When to implement	Responsibility	Reference
NV21	The Responsible Person maintain a record of complaints, which records the following details: • The time and date of lodgement of the complaint; • The name and telephone number of the complainant; • The nature of the complaint, including a description of the noise (e.g., likely noise source, duration of the noise event - is the noise continuous, or of a short duration); • The outcome of the investigation. Assign the task of managing noise emissions to a person (the 'responsible person') that is likely to be present on-site most of the time that activity is occurring (usually the Site Manager). This person would be responsible for handling noise complaints and ensuring that work does not commence before the specified allowable times. The name and contact details of the 'responsible person' should be displayed outside the principal construction office.	Development of a Community Communication Strategy	Ongoing	Site Manager or their delegate (SINSW)	Section 10.3.3 of the Acoustic Assessment for the EIS process
NV22	If a complaint regarding a particular piece of plant, the plant shall be inspected for working condition, with particular attention given to the condition of engine covers or enclosures, and exhaust system, if machinery is in good condition, a high-performance silencer should be installed. If complaints arise regarding noise, the complaint will be directed to the 'responsible person' who will determine the source of noise and take immediate steps to investigate further or mitigate the noise as required. This may involve moving the noise source further away from the affected premises, replacing the equipment, installing high performance silencers, or in some cases, engaging a qualified acoustic consultant to provide specialist control advice.		Ongoing	Site Manager or their delegate	Section 10.3 of the Acoustic Assessment for the EIS process

ID	Measure / Requirement	Resource needed	When to implement	Responsibility	Reference
NV23	Additional attenuation or alternative construction/demolition methodologies will be required to ensure predicted elevated noise levels are mitigated during these activities (jackhammers / concrete saws).	Installation of permanent and temporary attenuation	Prior to the commencement of Construction Activities	Site Manager or their delegate	Section 10.3 of the Acoustic Assessment for the EIS process
NV24	Vibration levels in some cases may need to be monitored during demolition and earthworks depending on the ground substrate and equipment used. Due to proximity of neighbouring buildings, vibration levels my need to be continually monitored during the demolition and construction works to ensure vibration levels remain generally compliant with the criteria nominated in Section 7.5 of the EIS Noise and Vibration Impact Assessment, dated 27 July 2021 and prepared by Acoustic Works. Due to the proximity of the school buildings, vibration is predicted to be an issue if not managed. If complaints are received from the school regarding vibration during demolition and basic construction works, it is recommended that continued vibration monitoring at the receiver location with SMS warning system issued to the responsible persons onsite. The Responsible Person shall cease works that may cause vibration intrusion and engage a qualified person to determine suitable management and physical controls to reduce excessive vibration cannot resume until satisfactory mitigation treatment is implemented.	Suitably Qualified Person – Noise and Vibration	During Demolition Activities	Site Manager or their delegate	Section 10.3 of the Acoustic Assessment for the EIS process

ID	Measure / Requirement	Resource needed	When to implement	Responsibility	Reference
NV25	The head contractor is to elect a “Responsible Person” who is onsite during construction hours and who has sufficient time and authority to implement the management plan. The Responsible Person will be required to receive, document and respond in an appropriate manner to complaints made against the centre with regards to noise. The Responsible Person is to keep record of performance indictors and feedback from management, staff, subcontractors, and adjacent noise receivers as appropriate. The person would also be responsible for documenting changes/modifications to the Noise Management Plan.	Suitably Qualified Person – Noise and Vibration	During Demolition Activities	Site Manager or their delegate	Section 10.3 of the Acoustic Assessment for the EIS process

ID	Measure / Requirement	Resource needed	When to implement	Responsibility	Reference
NV26	Management is to review the incident/complaints register on a regular basis (at least fortnightly) to determine any common or reoccurring issues to be addressed. The plan should be reviewed if processes or activities onsite are changed/modified or new activities are introduced. The plan should be reviewed if noise complaints are being made with regards to single activity or type of noisy activity occurring onsite. Document all changes/modifications to the Noise Management Plan. Management is to review the incident/complaints register on a regular basis (at least fortnightly) to determine any common or recurring issues to be addressed. The plan should be reviewed if processes or activities are introduced. The plan should also be reviewed if noise complaints are being made with regards to a single activity or type of noisy activity occurring onsite, Document all changes/modifications to the Noise Management Plan.				

ID	Measure / Requirement	Resource needed	When to implement	Responsibility	Reference
NV 27	The development must be constructed to achieve the construction noise management levels detailed in the Interim Construction Noise Guideline (DECC, 2009). All feasible and reasonable noise mitigation measures must be implemented and any activities that could exceed the construction noise management levels must be identified and managed in accordance with the management and mitigation measures identified in the approved Construction Noise & Vibration Management Plan. The following mitigation measures are considered and assessed prior to noisy works that could impact the school and neighbours: • The shifting of teaching activities away from the buildings directly adjacent to the works where possible. Staged planning has been revised to minimise noise and vibration impacts by not working in areas adjacent to learning areas. • The utilisation of one piece of machinery at a time in sensitive zones (although not guaranteed to reduce noise emissions below the threshold • Scheduling of construction activities causing significant noise to periods where the community are less sensitive to noise (such as before, during lunchbreak and after school). • In the event of severely noise affected threshold being exceeded, ie: rock breaking. RCC will look to incorporate 5 min respite periods every 10 minutes to alleviate elevated noise and provide respite to sensitive stakeholders. The implementation of this measures needs to be actioned in combination with mitigation measure NV10.		Ongoing	Project Manager or their delegate	C13 Conditions of Consent

8 Compliance Management

8.1 Roles and Responsibilities

The RCC Project Team's organisational structure and overall roles and responsibilities are outlined in the CEMP. Specific responsibilities for the implementation of environmental controls are detailed in Chapter 7 of this Plan.

When RCC become aware that works will potentially extend past the Hours of Work in accordance with Condition C4 of SSD-8378620, a responsible person from RCC will verbally notify and potentially affected residents as soon as it is practical that works are expected to continue beyond the approved hour and in accordance with Condition C7.

The advice may include but not limited to the type of works being undertaken and/if the expected length of time till complete. The following measures will be in place to mitigate community impact:

- Construction Methodology to accelerate completion of the works including adding accelerant compounds to concrete mix to allow finishing to occur quicker;
- Trowelling machine used periodically to ensue suitable finish is achieved with a broom finish; and,
- During down periods while waiting for the concrete to finish, labour to return to the crib rooms.
- Task lighting installed and positioned to face away from affected residents.

8.2 Training

All employees, contractors and staff working on site will undergo site induction training that includes construction noise and vibration management issues. The induction training will address elements related to noise and vibration management including:

- Existence and requirements of this sub-plan;
- Relevant legislation;
- Normal construction hours;
- The process for seeking approval for out of hours works, including consultation;
- Location of noise sensitive areas;
- Complaints reporting; and
- General noise and vibration management measures.

Further details regarding staff induction and training are outlined in the CEMP.

8.3 Inspection and Monitoring

Noise and vibration monitoring will be undertaken throughout the construction phase of the Project to verify the predicted noise and vibration impacts. This will assist in identifying impacts to sensitive receivers, quantifying and reporting compliance, determining if mitigation measures are effective and if any further mitigation measures are required to reduce and manage noise and vibration impacts.

If noise and vibration monitoring detect exceedances of the adopted NML's, the monitoring report will review the current mitigation measures and discuss if all feasible and reasonable mitigation measures have been adopted. Additional mitigation measures will be developed on a case-by-case basis depending on the noise generated, the sensitive receiver and the type of work being undertaken (eg rock breaking, bulk earthworks or piling).

If complaints from the school, students or the TAFE arise, internal classroom noise monitoring can be undertaken against the internal classroom NML's to determine the noise impact on students and staff. However, monitoring classrooms should only be undertaken in empty classrooms as noise generated from active classroom will influence the results. Internal classroom monitoring is best suited for Saturdays and School Holidays and is only required if complaints arise. External monitoring is considered the most appropriate monitoring and is required to be undertaken when the adopted NML's are anticipated to be exceeded (ie. Bulk earthworks, demolition, concrete cutting).

The policy and procedures for Noise and Construction Vibration monitoring are set out in section 12.3 and 12.4 of the Noise and Vibration Impact Assessment (Acoustic Works, 2021).

An excerpt (Sections 12.3 and 12.4) of the Acoustic Works report is provided as Appendix B.

8.4 Complaints

Complaint management will be undertaken as per the Community Communications Strategy, relevant to noise and vibration.

Complaints will be recorded and managed as detailed in the CEMP. Information to be recorded will include location of complaint, time/s of occurrence of alleged noise and vibration impacts (including nature of impact particularly with respect to vibration), perceived noise source, prevailing weather conditions and similar details that could be utilised to assist the investigation into the complaint.

8.5 Auditing

Audit requirements are detailed in the CEMP.

8.6 Reporting

Reporting requirements and responsibilities are documented in the CEMP.

9 Review and Improvement

9.1 Continuous Improvement

Continuous improvement of this Plan will be achieved by the ongoing evaluation of environmental management performance against environmental policies, objectives and targets for the purpose of identifying opportunities for improvement.

The continuous improvement process will be designed to:

- Identify areas of opportunity for improvement of environmental management and performance;
- Determine the cause or causes of non-conformances and deficiencies;
- Develop and implement a plan of corrective and preventative action to address any non-conformances and deficiencies;
- Verify the effectiveness of the corrective and preventative actions;
- Document any changes in procedures resulting from process improvement;
- Adopt additional noise and vibration mitigation measures (if required); and
- Make comparisons with objectives and targets.

9.2 Update and Amendment

The processes described in the CEMP may result in the need to update or revise this Plan. This will occur as needed.

Only the Environmental Site Representative, or delegate, has the authority to change any of the environmental management documentation.

A copy of the updated plan and changes will be distributed to all relevant stakeholders in accordance with the CEMP and the consent conditions SSD-8744305.

Appendix A – Consultant Qualification

KINGSLEY BALDWIN

Senior Environmental Scientist

B.App.Sci (Honours)

Qualifications & Training

- Bachelor (Honours) of Applied Science (Earth Sciences) University of Ballarat
- Erosion and Sediment Control Best Management Practices Workshop
- Management Systems Auditing
- Auditing Environmental Management Systems
- S1 -S3 Supervisors Training
- Certificate IV (Assessment and Workplace Training)
- Air Quality Short Course

Professional Overview

Kingsley is an Environmental Scientist with 22 years' experience in the provision of technical advice and support to the mining and civil engineering industries in regard to environmental management and geological processes. He provides a systematic and methodical approach to presenting comprehensive outcomes on all deliverable assigned to him.

Kingsley has extensive experience in field-based projects, including managing logistics associated with programs undertaken in remote areas. He has been involved in numerous projects that generate large data sets, and regularly manages projects that generate numerous rounds of field and laboratory data.

Kingsley's geological background enables him to extrapolate his knowledge into the hydrogeological and geochemical disciplines of environmental management.

Key Areas of Expertise

Environmental Management

Preparation, implementation and administration of management plans:

- Construction Environmental Management Plans
- Noise and Vibration Management Plans
- Air Quality Management Plans
- Dewatering Management Plans
- Soil and Water Management Plans
- Acid Sulfate Soils Management Plans
- Remediation Management Plans
- Remediation Action Plans
- Erosion and Sediment Control Plans

Environmental Compliance

- Environmental Inspections
- Site specific HSE Audits
- Site erosion and sediment control inspections
- Soil, sediment, surface water and groundwater sampling
- Noise, vibration and air quality monitoring
- Soil remediation and validation
- Waste classification

Compliance Reporting

- Annual Environmental Monitoring Reports
- Noise and Vibration Monitoring Reports
- Surface Water Monitoring Reports
- Groundwater Monitoring Reports
- Air Quality Monitoring Reports
- Waste Classification
- Remediation Validation Reports
- National Pollution Inventory
- Greenhouse Challenge
- EPA Annual Returns

Approvals and Assessments

- Environmental Impact Statements
  - Noise
  - Air Quality
- Water NSW Dewatering Approval Process
- EPA Waste Classification Exemptions
- TfNSW OOHW Noise Assessments and Approvals
- Pre/Post Construction Land Clearance Assessments

Project Management

- Subcontractor procurement and management
- Managing environmental conditions over multiple civil projects to ensure compliance
- Active consultation with stakeholders
- Systems based approach

Professional History

- 2023 – Present: ENV Solutions (Senior Environmental Scientist)
- 2020 – 2022: ENV Solutions (Environmental Scientist)
- 2017 – 2019: Lendlease Engineering (Environmental Advisor)
- 2016 – 2017: North Line Copper (Environmental Advisor)
- 2013 – 2016: CST Mining (Environmental Advisor)
- 2011 – 2013: CST Mining (Project Geologist)
- 2010 – 2011: Katana Iron (Technical Services Manager)
- 2008 – 2010: Diatreme Resources (Senior Exploration Geologist)
- 2007 – 2008: Bendigo Mining (Environmental Coordinator)
- 2003 – 2006: Bendigo Mining (Environmental Officer)
- 2002 – 2003: BeMaX Resources (Exploration Geologist)
- 1999 – 2000: Reef Mining (Mine/Exploration Geologist)

Contact

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Appendix B – Noise and Construction Vibration Monitoring Policy and Procedures (Acoustic Works, 2021)

The following is an excerpt of *Acoustic Works (2021) Noise & Vibration Impact Assessment Kingscliff High School.*

12.3 Noise monitoring

If required, short-term operator-attended noise measurements will be suitable for investigating 'spot-checks' of noise complaints in most situations. The methodology must establish the level of noise from the noise source being investigated and check for compliance.

12.3.1 Equipment

Sound level meters must have an accuracy at least equivalent to a Type 1 meter as described in Australian Standard AS1259. The sound level meter must be fitted with a windshield and must have a current laboratory calibration certificate or label in accordance with calibration requirements outlined in AS1259 and AS2659. Equipment should also be calibrated in the field in accordance with these standards.

The sound level meter must be capable of L_{eq} measurement and statistical L_n measurement (e.g. L_{10}, L_{90} etc), using the broadband 'A' scale frequency weighting.

12.3.2 Parameters

For measurement of ambient noise (without site noise), the sound level meter must be set to the following parameters;

- 15 minute measurement duration.
- Broadband
- 'Fast' time response.
- 'A' frequency weighting.

The measured descriptors of ambient noise are background noise $L_{A90,15min}$ and $L_{Aeq,15min}$.

For measurement of noise from construction activities at the site, the sound level meter must be set to the following parameters;

- 15 minute measurement duration.
- 'Z' (Linear) frequency weighting for 1/3 octave frequency spectrum.
- 'A' frequency weighting for overall broadband result.
- 'Fast' time response.

The measured descriptors of site noise should include (when available on a sound meter); L_{eq}, Lp, and 1/3 octave spectrum (to establish any tonal characteristics).

Measurement duration may change depending on the duration of each relevant source.

12.3.3 Procedure for measuring noise

12.3.3.1 Where to measure noise

In accordance with the code, noise levels should be measured at the property boundary that is most exposed to construction noise, at a height of 1.5 m above ground level. If the property boundary is more than 30 m from the residence, the location for measuring or predicting noise levels is at the most noise-affected point within 30 m of the residence. Typically this would be an outdoor location in the most exposed position in a receivers' yard. The address of locations for assessment should be those locations where complaints have been received.

The sound level meter should be held at arm's length or set up on a tripod so the microphone is 1.5 metres above the ground. Where possible the measurement position should be 3 to 5 metres from walls, buildings and other reflecting surfaces.

The location of vegetation also needs to be considered, because noise levels can be increased locally by even a light breeze rustling leaves. Noise due to wind in vegetation can make accurate measurement difficult. Where possible, move away from nearby plants if rustling noise is present.

12.3.3.2 When to measure ambient noise

Ambient noise should be measured when it is representative of minimum levels that would occur during the time the activity would typically be conducted. Suitable times may include;

- Prior to commencement of daily activities.
- During smoko or lunchbreak (if site activities are ceased).
- On RDO's (rostered days off).
- After completion of daily activities.

Ideally, a number of ambient noise measurements should be taken at various times of day. Ambient noise measurement should only be done at times or locations unaffected by noise from the site.

12.3.3.3 When to measure noise from construction

Measurements of construction noise should be taken at the time(s) when the noise is representative of the current maximum level of noise emanating from the site, or at times when a complaint has been received.

12.3.3.4 What to avoid

The following conditions shall be avoided during the noise assessment;

- Average wind speed (at the microphone height) greater than 5m/s (approximately 20km/h). Typically at a wind speed of 5 m/s, leaves and branches would be in constant motion and the wind would extend a small flag.
- Rain periods (if intermittent, any affected data can be excluded).
- Other extraneous noise, such as train passby etc.
- Noise such as talking or physically bumping the sound level meter in a manner that will affect the readings.

12.3.3.5 Steps for measurement

The steps for performing a noise measurement are as follows;

10. Calibrate the sound level meter before commencing noise measurements. The sound pressure level shown on the meter should match the stated sound pressure level for the calibrator being used. The equipment should not vary by more than 1 dB. If it has then the measurements may be invalid.
11. Ensure the meter is set to 'Fast' time weighting, 'A' frequency weighting for broadband measurement, 'Z' weighting for 1/3 octave measurement. Descriptors include L_{90}, L_{eq}, and LpA.
12. Measure the ambient noise level continuously for 15 minutes (where possible), excluding all distinct extraneous noises. If extraneous noise is present, pause the meter when this occurs or choose another measuring time or restart the measurement at another location. If more than one valid noise measurement of the ambient noise for a location is obtained, use the lowest level as the ambient noise level. Note the $L_{A90,15min}$ value and other relevant values as described above. Where it is not possible to continuously measure over a 15-minute period, then note the duration of the measurement.
13. Measure the noise emanating from the site, excluding all distinct extraneous noises. Note the duration of the measurement. Note the relevant measured values and description of the types of noise that were audible/measurable from the site.
14. Note whether the measured noise appears to contain tonal or impulsive characteristics and apply correction factors where appropriate.
15. Check the field calibration at the end of the monitoring period in accordance with Australian Standard IEC 61672.1-2004 and Australian Standard 2659. Re-monitoring may be required where there is a calibration drift greater than that allowed by the standards.

12.3.3.6 Information to be reported

Any reporting should be concise. The minimum requirements to be included in a report are;

- Date of measurements.
- Time of measurements.
- Person(s) performing measurements.
- Equipment used for measurements.
- Location of measurements.
- Measured values.
- Corrected values (where applicable).
- Notes regarding audibility of noise sources.
- Notes regarding any extraneous sources that may have influenced measurements.
- Detail of instrumentation and calibration.
- Meteorological conditions.

12.4 Construction vibration monitoring

The preferred measurement technique is one which records unfiltered data from which any desired values can later be determined, including frequency-weighted RMS and peak values.

Vibration monitoring equipment should be calibrated in accordance with relevant Australian or standards.

Vibration should be measured on a structural surface designed to support a person, with the floor or ground as the preferred reference surface. The z-axis (vertical) shall be measured. Ideally more than two points in a receiver location should be measured at one time to obtain space average vibration levels. If the above is not practicable, one position of the receiver location is chosen where, in the opinion of an authorised officer, the vibration level is the greatest. The locations should be either clearly marked or clearly defined on a diagram for later identification. The transducer should not be attached to a flexible floor covering which may damp the vibration. The transducer shall be firmly fixed in the position, and the method of fixing shall be reported.

Items to be reported include;

- Date and time of measurement.
- Location of measurements (including diagram of measurement positions).
- Equipment used for measurements (including calibration details).
- Method of fixing of transducer.
- Description of the type of equipment or source of vibration (where possible).
- One-third octave band frequency analysis (1Hz to 80Hz) reported as z-axis r.m.s acceleration in units of ms^{-2}. For each measurement this should include starting and ending time and brief description of events occurring within the measurement time frame.
- Overall broadband peak particle velocity (ppv) reported as z-axis velocity in units of ms^{-1}. For each measurement this should include starting and ending time and brief description of events occurring within the measurement time frame.
- The results of the one-third octave band analysis and peak particle velocity analysis should be compared with the vibration limits.
- Statement of whether the vibration complies with the recommended limits.

Appendix C – Noise Monitoring Report December 2022

ENV Solutions

ENVIRONMENTAL | ASBESTOS | REMEDIATION | RESOURCE RECOVERY

KINGSCLIFF HIGH SCHOOL ENVIRONMENTAL MONITORING

Noise Monitoring Compliance Report

33 Oxford Street, Kingscliff, NSW 2487

December 2022

For:

Richard Crookes Construction

By:

ENV Services

Date:

16/01/2023

ENV Services

313 River Street, Ballina NSW 2478

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DOCUMENT CONTROL

Job No:	ENV216701
Client:	Richard Crookes Construction

	Name:	**Date:**	**Signature:**
Prepared By:	Timothy Bischof	16/01/2023	TCB
Reviewed By:	Harry Chapman	16/01/2023	
Approved By:	Harry Chapman	16/01/2023	

Revision:	**Date:**	**Details:**
v1	16/01/2023	First version issued to client

SCOPE OF ENGAGEMENT AND LIMITATIONS

This report has been prepared by ENV Services at the request of Richard Crookes Construction for the purpose of a Noise Monitoring Compliance Report. No other parties may rely on the contents of this report for any purposes except those stated.

This report has been prepared based on the information provided to us and from other information obtained as a result of enquiries made by us. ENV accepts no responsibility for any loss or damage suffered howsoever arising to any person or corporation who may use or rely on this document for a purpose other than that described above.

No part of this report may be reproduced, stored, or transmitted in any form without the prior consent of ENV.

ENV declares that it does not have, nor expects to have, a beneficial interest in the subject project.

To avoid this advice being used inappropriately, it is recommended that you consult with ENV before conveying the information to another who may not fully understand the objectives of the report. This report is meant only for the subject site/project and should not be applied to any other.

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LIST OF APPENDICES

1. INTRODUCTION

ENV has been engaged by Richard Crookes Construction to conduct noise monitoring during the construction phase of the Kingscliff High School (KHS), located at 33 Oxford Street, Kingscliff, NSW 2487. The Site is legally identified as Lot 57 of Deposited Plan (DP) 803814.

This Noise Monitoring Compliance Report has been prepared to assess the impact of construction noise on nearby sensitive receivers and determine whether additional noise controls are required for the works. Noise monitoring data was collected during the monitoring period 28th November – 21st December 2022.

2. OBJECTIVES

The objective of this report is to compare set criteria, as outlined in the Construction Noise and Vibration Sub Management Plan (CNVSMP) for the Site, against noise data recorded during the monitoring period to assess the performance of the project and provide recommendations for additional management measures where necessary.

3. ASSESSMENT CRITERIA

The Project Specific Noise Criteria for the site, is outlined within the CNVMSP. The Noise Management Level (NML) for the most sensitive receiver to the construction works (Residential Receiver R1) is 47 $LA_{eq15min}$ dB_A with a highly noise affected threshold of 75 $LA_{eq15min}$ dB_A. The noise levels for construction and demolition work outlined within the CNVMSP (2022) were predicted to exceed the NML but comply with the highly noise affected threshold. Predicted LA_{eq} values during construction at R1 is 66 dB_A, exceeding the adopted NML.

As noise levels are predicted to exceed the adopted NML's at all residential receivers, compliance with the NML's is not practically feasible. Compliance for the construction works at the KPS is assessed against the with highly noise affected threshold of 75 $LA_{eq15min}$ dB_A.

A key metric for assessing the success of noise mitigation measures is the number of formal complaints. The CNVMP (2022) target for the site is to minimize the number of complaints received over the duration of the project.

4. SITE ACTIVITIES

Site activities at the time of monitoring primarily included the installation of formwork, concreting, excavations, installation of footings, loading out material and delivery of materials within proximity of residential dwellings and the adjacent school buildings.

5. METHODOLOGY

The noise meter was commissioned on the morning of the 28th of November 2022 by a suitably qualified Environmental Scientist (Timothy Bischof). The noise meter was installed on the northern boundary of the site adjoining R1, southwest of the site office. The location of the noise meter is illustrated in **Appendix 1, Figure 2** and photographs of the noise monitor and general construction works are provided in **Appendix 3.**

Noise monitoring was conducted in accordance with Australian Standard (AS) 1055 Description and Measurement of Environmental Noise (2018). One monitor was installed within the site boundary adjacent to the most sensitive at the time of construction works. The monitor was installed directly south of the closest residential receiver, R1 as illustrated in **Appendix 1, Figure 2.** The noise monitor was installed within 1m of the site boundary adjacent the timber boundary fence at a height of 1.5 m above ground level. The location of the noise monitor was limited due to site works, power, accessibility and safety. As per AS 1055 Section 6.3.2-3, results within 1m of a façade are to be subtracted by 2.5dB to represent the free field incident level. All results represented in this report have been subtracted by 2.5dB as per AS 1055.

One Class 1 Svantek 977 noise meter was used for continuous 24 hour noise monitoring 7 days a week. dBA Noise data was recorded by the noise monitor continuously and data was log averaged over a 15 minute period to produce a running LAeq(15 min) result. Monitors operated continuously regardless of weather conditions, including during periods with winds of greater than 5 m/s and during periods of rainfall. Noise from sources other than construction works on-site has not been excluded. As such, the noise data presented here includes background noise as well as noise produced by construction activities on-site representing worst case noise emissions at the site.

The meter provided RCC with instantaneous SMS and email alert notifications when noise levels of 70 $LA_{eq15min}$ dB_Awere recorded to allow RCC site staff to take action before the Highly Noise Affected threshold of 75 $LA_{eq15min}$ dB_A was reached. A secondary notification was set at the Highly Noise Affected threshold of 75 $LA_{eq15min}$ dB_A. Notifications were set to only send threshold exceedances within construction hours.

6. RESULTS AND DISCUSSION

Figures 3-6 provided as **Attachment 2** present a summary of the $LA_{eq15min}$ values recorded during the reporting period. Noise levels continually exceeded the NML within and outside construction hours with $LA_{eq15min}$ values generally being higher outside construction hours than within construction hours. This increase in overnight noise levels is assumed to associated wind due to the close proximity to large trees. Due to equipment failure, data between 29/11/22 3:49am and 02/12/22 at 3:54pm and 19/12/22 at 8:56am and 19/12/22 at 4:04pm was not recorded. The data recorded and presented in this report is considered sufficient for noise compliance purposes.

Throughout the reporting period, the highly noise affected threshold of 75 $LA_{eq15min}$ dBA was not exceeded. The maximum $LA_{eq15min}$ value recorded within the reporting period was 72.27 dBA on the 3 December 2022 at 9:39pm, outside construction hours. The maximum $LA_{eq15min}$ value recorded within construction hours was 63.03 dBA on the 3 December 2022 at 8:34am indicating construction noise emissions were below the predicted values outlined in the CNVMSP.

Based on noise data collected during the monitoring period, construction noise did not exceed the highly noise affected threshold between the 28th November – 21st December 2022. No SMS or email notifications were sent during this period.

7. NOISE COMPLAINTS

A noise complaint was submitted on the 29 November 2022 relating to works undertaken outside of the specified construction hours. The complaint stated works had occurred from 6:15AM, before the site-specific construction hours. RCC have identified the person/persons responsible for this early works and noise and have retrained all workers onsite of the specified construction times through toolbox talks.

8. CONCLUSIONS

The noise monitoring results obtained from the monitoring period 28th November – 21st December 2022 are presented graphically for each week in **Figure 3 to Figure 6, Appendix 2**.

Maximum recorded LAeq15min results were 72.27dBA which occurred outside construction hours. The maximum LAeq15min results within construction hours were 63.05dBA. As predicted within the CNVMSP (2022), the construction noise levels exceeded the NML, however, were below the predicted noise levels at R1 of 66dBA. Furthermore, the highly noise affected threshold of 75 LAeq15min dBA was not exceeded during the monitoring period.

Although the adopted NML was exceeded, the highly noise affected threshold was not exceeded and no complaints have been received within construction hours during the monitoring period. A key metric for assessing the success of noise mitigation measures is the number of formal complaints. One complaint was received on the 29th November relating to works conducted outside construction hours. RCC have addressed the complaint by retraining all workers on the site's construction hours through toolbox talks. Following RCC's corrective action, no further complaints were received throughout the monitoring period.

Based on the monitoring results and the number of received complaints, ENV consider the implemented controls are sufficient for the ongoing construction and demolition works. Works can continue provided all required controls provided within the Construction Noise and Vibration Management Sub Plan remain in place.

9. REFERENCES

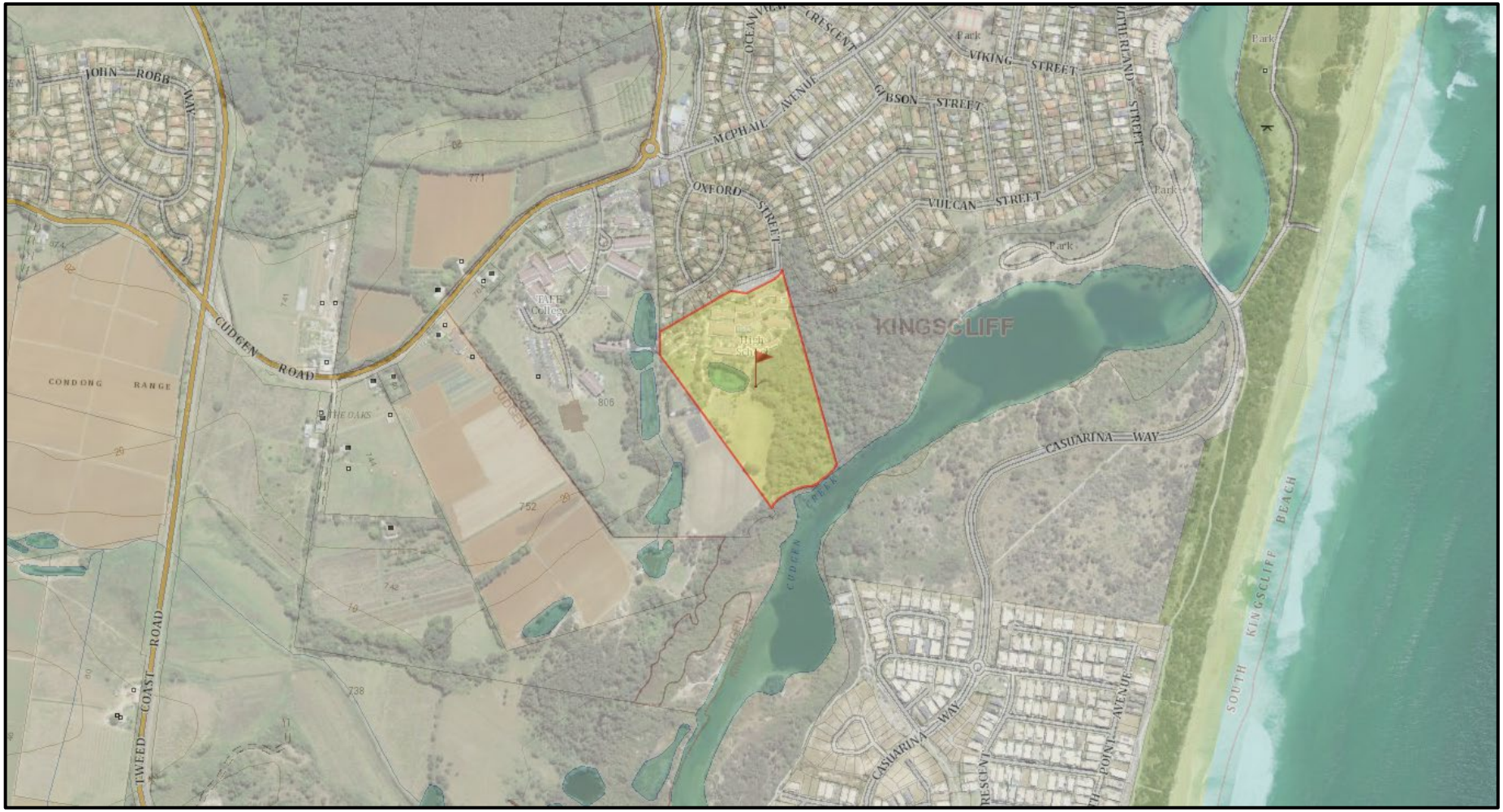
ENV Solutions (2022). *Kingscliff High School Redevelopment – Construction Noise and Vibration Management Sub Plan*

New South Wales. Department of Environment and Climate Change (2009). *Interim Construction Noise Guideline*

New South Wales. Environment Protection Authority (2017). *Noise Policy for Industry*

Standards Australia (2018). *AS 1055.2018 Acoustics - Description and measurement of environmental noise*

APPENDIX A



Legend

Site Location

0 0.1 0.2km

Figure 1 – Site Location
33 Oxford Street, Kingscliff NSW 2487

Project: Noise Monitoring
Client: Richard Crookes Construction
ENV Project Number: 216701

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Legend

- Site Location (approximate)
- General Construction Works Location (approximate)
- Residential Sensitive Receivers (approximate)
- 1 Receiver Number
- Noise Monitor Location (approximate)

Image Source: Intramaps (2022)

Figure 2 – Noise Monitor Location
12 Orient Street, Kingscliff NSW 2487

Project: Noise Monitoring
Client: Richard Crookes Construction
ENV Project Number: 216701

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APPENDIX B

Figure 3

KHS Noise Monitoring 28/11/22 - 04/12/22

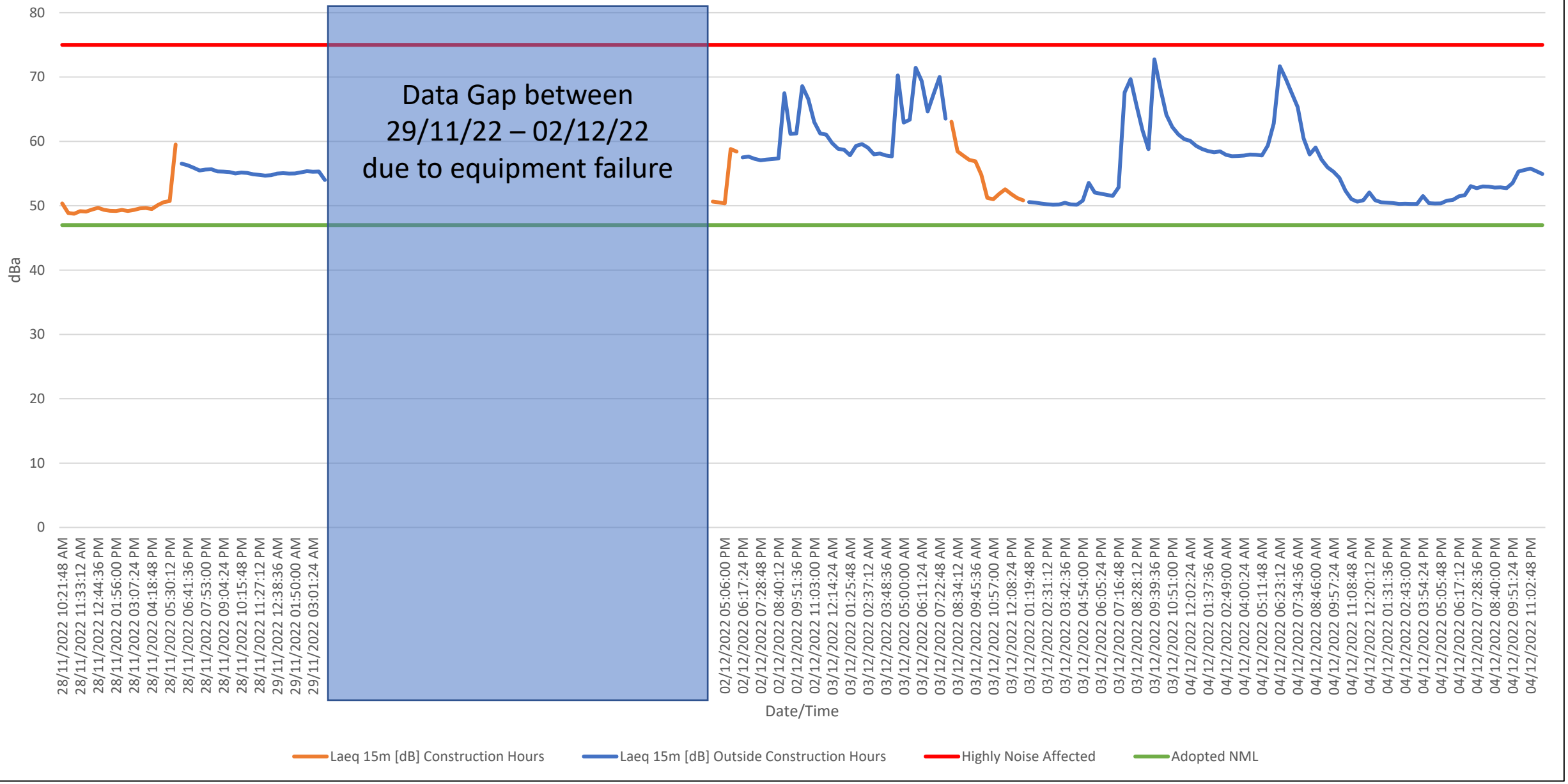


Figure 4
KHS Noise Monitoring 05/12/22 - 11/12/22

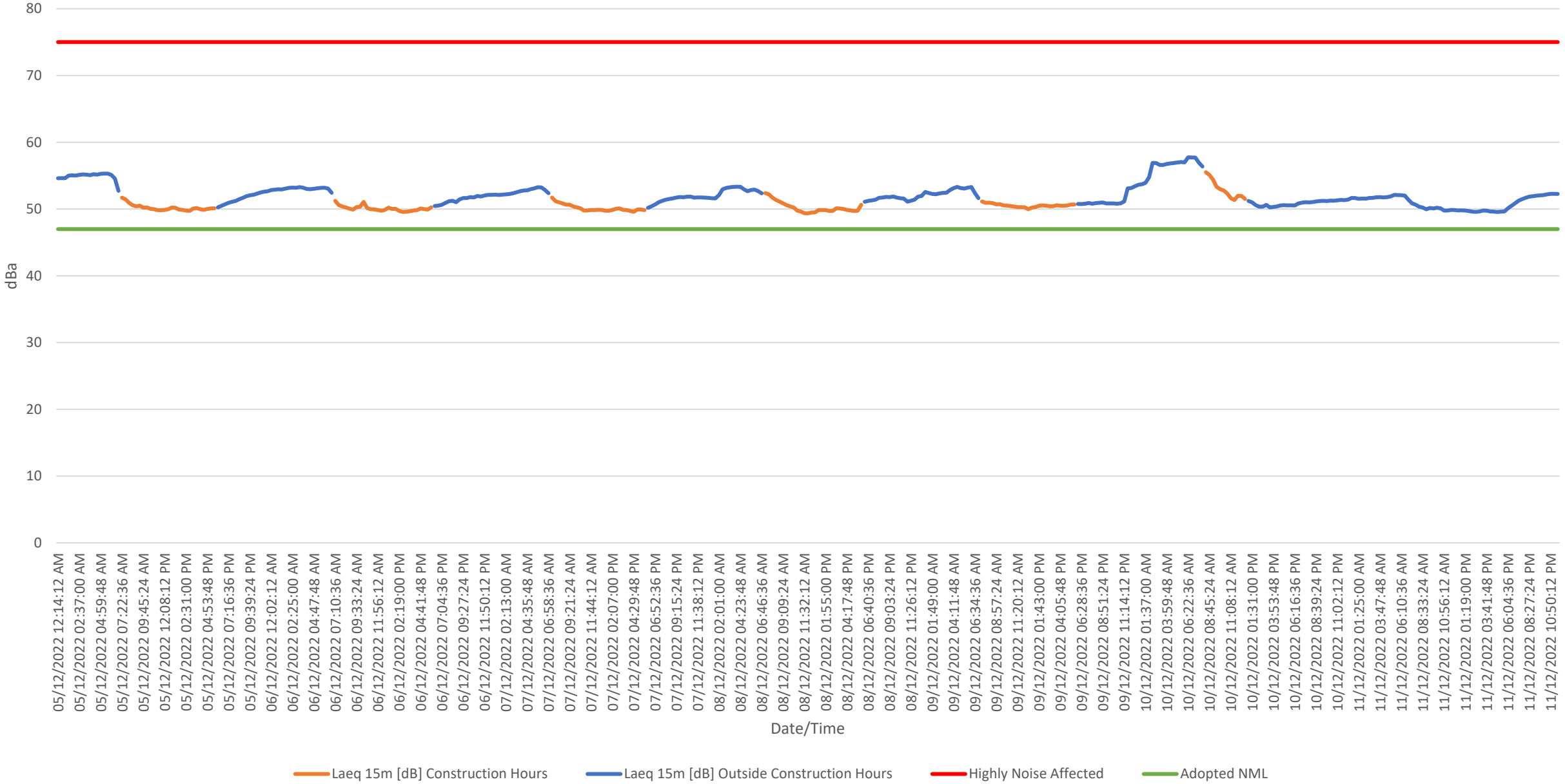


Figure 5

KHS Noise Monitoring 12/12/22 - 18/12/22

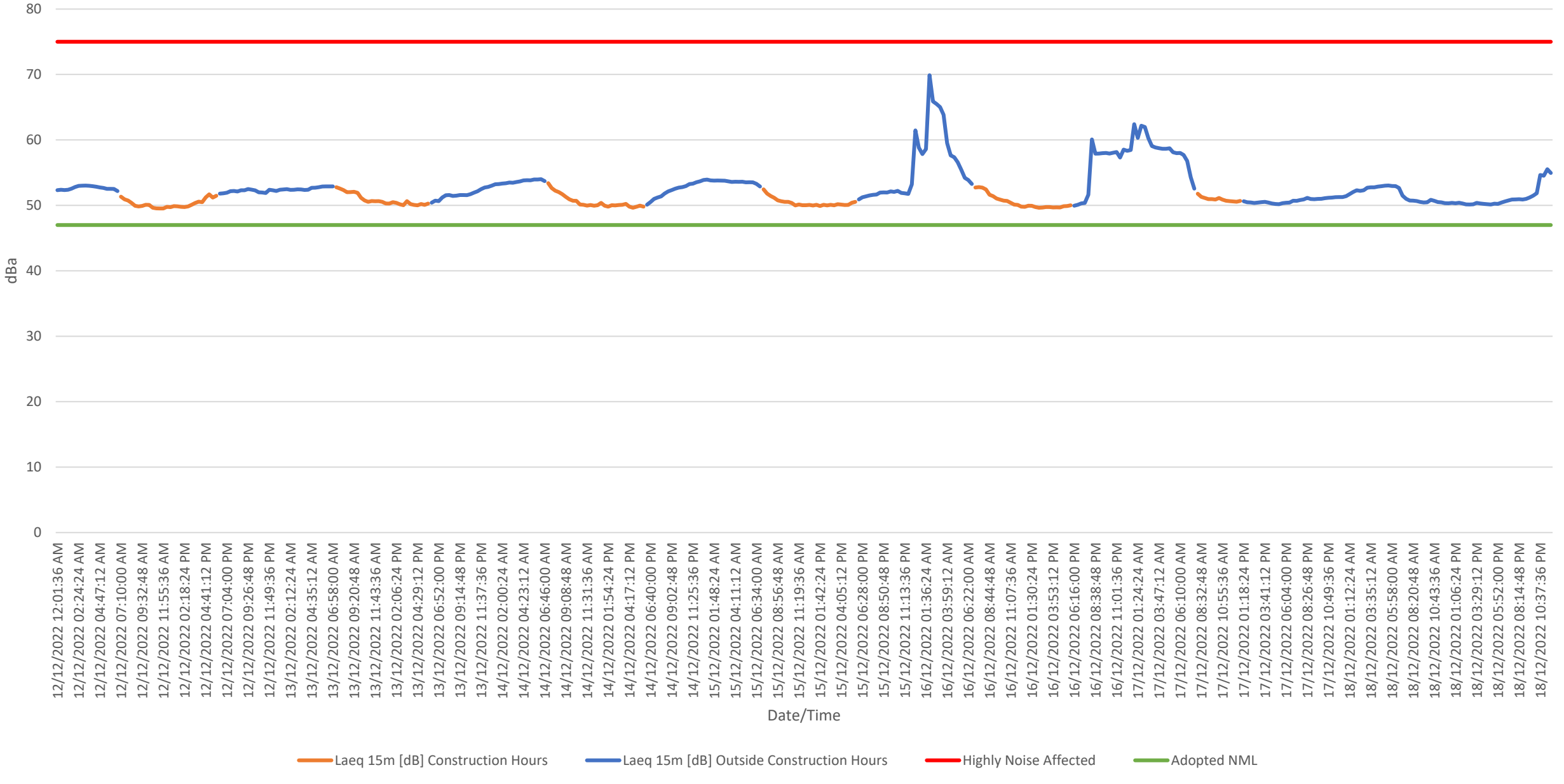
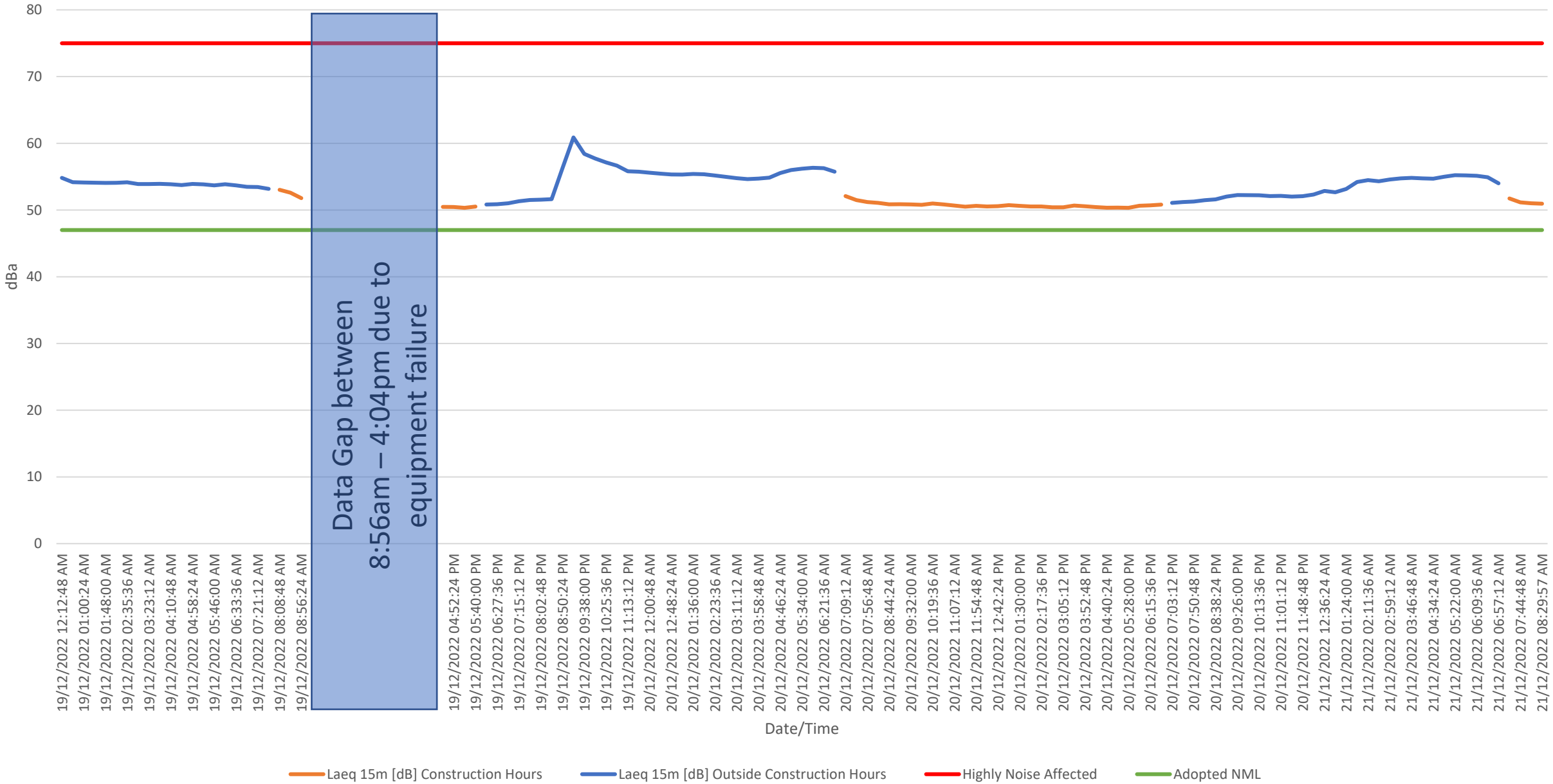


Figure 6

KHS Noise Monitoring 19/12/22 - 21/12/22



APPENDIX C

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PHOTOGRAPHIC LOG

Client Name	Site Location	Project
Richard Crookes Construction	33 Oxford Street, Kingscliff, NSW	KHS Noise Monitoring

Photo No.	Date
1	28/11/2022

Description

Image showing direction of noise monitor.

Photo No.	Date
2	28/11/2022

Description

Image showing the noise monitor against the boundary fence.

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PHOTOGRAPHIC LOG

Client Name	Site Location	Project
Richard Crookes Construction	33 Oxford Street, Kingscliff, NSW	KHS Noise Monitoring

Photo No.	Date
3	28/11/2022

Description

Image showing construction site.

Photo No.	Date
4	28/11/2022

Description

Image showing construction site.

Appendix D – Noise Monitoring Report Feb - March 2023

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KINGSCLIFF HIGH SCHOOL ENVIRONMENTAL MONITORING

Noise and Vibration Monitoring Compliance Report

33 Oxford Street, Kingscliff, NSW 2487

Feb - March 2023

For:

Richard Crookes Construction

By:

ENV Services

Date:

30/05/2023

ENV Services

313 River Street, Ballina NSW 2478

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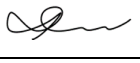
www.envsolutions.com.au

DOCUMENT CONTROL

Job No:	ENV216701
Client:	Richard Crookes Construction

	Name:	**Date:**	**Signature:**
Prepared By:	Leah Carr	30/05/2023	
Reviewed By:	Timothy Bischof	30/05/2023	
Approved By:	Kingsley Baldwin	30/05/2023	

Revision:	**Date:**	**Details:**
v1	30/05/2023	First version issued to client

SCOPE OF ENGAGEMENT AND LIMITATIONS

This report has been prepared by ENV Services at the request of Richard Crookes Construction for the purpose of a Noise and Vibration Monitoring Compliance Report. No other parties may rely on the contents of this report for any purposes except those stated.

This report has been prepared based on the information provided to us and from other information obtained as a result of enquiries made by us. ENV accepts no responsibility for any loss or damage suffered howsoever arising to any person or corporation who may use or rely on this document for a purpose other than that described above.

No part of this report may be reproduced, stored, or transmitted in any form without the prior consent of ENV.

ENV declares that it does not have, nor expects to have, a beneficial interest in the subject project.

To avoid this advice being used inappropriately, it is recommended that you consult with ENV before conveying the information to another who may not fully understand the objectives of the report. This report is meant only for the subject site/project and should not be applied to any other.

TABLE OF CONTENTS

LIST OF APPENDICES

1. INTRODUCTION

ENV has been engaged by Richard Crookes Construction to conduct noise and vibration monitoring during the demolition and construction of the Kingscliff High School (KHS), located at 33 Oxford Street, Kingscliff, NSW 2487, hereafter referred to as the 'Site'. The Site is legally identified as Lot 57 of Deposited Plan (DP) 803814.

State of NSW and Department of Environment and Climate Change NSW provides criteria and guidelines for management of vibration and noise for the protection of the health and wellbeing of the community.

This Noise and Vibration Monitoring Compliance Report has been prepared to assess the impact of noise and vibration levels caused by construction activities. This report aims to assess monitoring data against industry standards and considers the impact of construction activity on nearby sensitive receivers. If construction activity at the Site is deemed to be disturbing the community, additional controls may be required for the works. Noise and vibration monitoring data was collected during the monitoring period 15th February – 24th March 2023.

2. OBJECTIVES

The objective of this report is to identify environmental impacts from noise and vibration created during the KHS construction works, and to advise on environmental controls relating to the site as required. Data from noise and vibration monitoring instrumentation on-site will be compared to the adopted criteria for the Site that was developed in the Construction Noise and Vibration Management Sub-Plan (CNVMSP). Where criteria are exceeded, ENV will provide recommendations for environmental controls and management measures to reduce the environmental impacts of construction related noise and vibration on the community.

3. ASSESSMENT CRITERIA

3.1. Noise

The CNVMSP sets out criteria for managing noise levels during construction activity. Noise levels discussed include the Noise Management Level (NML), the predicted noise levels, and the highly noise affected level.

The project CNVMSP outlines the NMLs for sensitive receivers near the site. The NML represents the point above which there may be some community reaction to noise. The NML for the most sensitive receiver to the construction works (Residential Receiver R1) is $LAeq_{15min}$ 47 dB(A).

The NSW Interim Construction Noise Guideline 2009 provides guidelines for determining noise assessment criteria on construction sites. In these guidelines, the point above which there may be strong community reaction to noise is described as 'highly noise affected'. The level of noise that is defined as highly noise affected for residential areas is $LAeq_{15min}$ >75 dB(A).

Environmental impacts listed in the CNVMSP include a predicted LAeq value at sensitive receiver R1 of 66 dBA during construction. The noise levels for construction and demolition work outlined within the CNVMSP (2021) are predicted to exceed the NML but comply with the highly noise affected threshold. As noise levels of site demolition and construction works have been predicted to exceed the adopted NML's at all residential receivers, compliance with the NML's is not practically feasible. Therefore, **noise levels for the construction works at the Kingscliff High School will be compared to the highly noise affected threshold of $LAeq_{15min}$ 75 dB(A)**.

If site noise frequently exceeds the specified criterion or disturbs the community, management and control measures will be advised. Controls for the sensitive receiver at R1 will also be considered for complaints when acoustic levels at sensitive receiver R1 exceed 66 dB(A). It should be noted that a key metric for qualitative assessment of the success of noise mitigation measures is the number of formal complaints. The CNVMP (ENV, 2021) target for the site is to minimize the number of complaints received over the duration of the project.

3.2. Vibration

Criteria for vibration are outlined within the Noise and Vibration Management Sub-Plan for the site, were derived from the NSW government guideline *Assessing Vibration: a technical guideline* (Department of Environment and Conservation, 2006). The vibration occurring on site during the reporting period (15th February – 24th March) associated with construction activities is classified as intermittent vibration.

The NSW government guidelines for assessing vibration define intermittent vibration as interrupted periods of continuous (e.g. a drill) or repeated periods of impulsive vibration (e.g. a pile driver), or continuous vibration that varies significantly in magnitude. This type of vibration is assessed on the basis of vibration dose values.

Vibration targets are based on acceptable vibration dose values for intermittent vibration (mm/s) prescribed in BS 6472–1992 and *Assessing Vibration: a technical Guideline*. **The upper threshold for intermittent vibration for schools, offices and places of worship during the day is 0.80 $m/s^{1.75}$ (maximum), or 0.40 $m/s^{1.75}$ (preferred)**. The CNVMSP also states that vibration levels at sensitive receivers may need to be managed if vibration exceeds a limit of 10 mm/s in maximum vector sum peak particle velocity. However, it should be noted that the CNVMP (ENV, 2021) target for the site is to minimize the number of complaints received over the duration of the project.

4. SITE ACTIVITIES

Site activities at the time of monitoring were associated with the demolition of redundant site infrastructure. These works included including concrete cutting, earthworks, removal/delivery of materials and general construction works.

5. METHODOLOGY

Noise and vibration on site were monitored continuously 24 hours per day, seven days per week using a SVAN 958AG Class 1, four-channel noise and vibration monitor. Vibration was monitored via three channels on orthogonal axes to assess vibration entering the body on planes represented by x, y, or z, for which there are different vibration criteria. The highest vibration data was compared to the most conservative criteria (x and y). All data was processed using the supporting software SvanPC++ version 3.4.9.

The noise and vibration monitor was commissioned on the morning of the 15th of February 2023 by a suitably qualified Environmental Scientist (Timothy Bischof). The noise meter was installed near the northern boundary of the site across from sensitive receiver R1. Due to site limitations associated with limited storage footprint, site works, power, accessibility and safety implications, the meter was subsequently relocated further to the northeast of the site. The location of the noise and vibration monitor is illustrated in **Appendix 1, Figure 2.** Photographs of the noise and vibration monitor and general construction works are provided in **Appendix 3.**

Noise monitoring was conducted in accordance with Australian Standard (AS) 1055: Description and Measurement of Environmental Noise (2018), and the CNVMSP. Noise data was logged over a 15-minute period and results were presented as $LAeq_{15min}$ and compared to the specified criteria. Monitors operated continuously regardless of weather conditions, including periods with winds exceeding 5 m/s and during periods of rainfall. Noise from sources other than construction works on-site have not been excluded. As such, the noise data presented here includes background noise as well as noise produced by construction activities on-site representing worst-case noise emissions at the site.

Vibration monitoring was conducted in accordance with the site CNVMSP. Vibration data was assessed using the vibration dose value (VDV) for intermittent vibration, which is deemed to be the most appropriate category for the assessment of vibration impacts derived from site activities during the reporting period. This is the method adopted from the guideline *Assessing vibration: a technical guideline* (NSW Department of Environment and Conservation, 2006).

The monitor was programmed to provide RCC with instantaneous SMS and email alert notifications before maximum threshold noise and vibration criteria were exceeded. Instantaneous SMS and email alert notifications were sent when noise levels exceeded 70 $LAeq_{15min}$ dB(A). This notification allowed RCC site staff to take action before the Highly Noise Affected threshold of 75 $LAeq_{15min}$ dB(A) was reached. A secondary notification was set at the Highly Noise Affected threshold of 75 $LAeq_{15min}$ dB(A).

6. RESULTS AND DISCUSSION

6.1. Noise

The noise monitoring results obtained from the monitoring period 15th February – 24th March 2023 are presented graphically for each week in **Figure 3 to Figure 7, Appendix 2**.

Noise levels oscillated daily around the NML. Noise levels at the site exceeded the NML daily at 6am and subsequently decreased below the NML between the hours of 8-10pm. This oscillating pattern continued throughout the weekend when construction was not occurring and therefore recorded noise levels are heavily influenced by extraneous noise sources associated with urbanisation of the surrounding area. During construction hours, maximum noise levels were slightly higher than they were on weekends but did not exceed the highly noise affected level.

Acoustic data collected during the monitoring period indicates that construction noise did not exceed the highly noise affected threshold between the 15th February – 24rd March 2023. The maximum $LAeq_{15min}$ value recorded within the reporting period was 74.2 dB(A) on the 28 February 2023 due to ENV personal making adjustments and moving the monitor. The maximum $LAeq_{15min}$ value recorded associated with construction and demolition was 72.7 dB(A) on the 23 March 2023 at approximately 8:30am. This value was below the highly affected noise value outlined in the CNVMSP. Daily noise peaks during construction hours ranged from $LAeq_{15min}$ 55-65 dB(A), with some occasional spikes between 65-70 dB(A). Peak noise levels on-site were higher during construction hours compared to the weekends.

Acoustic data is not available for the time period between 15th February 11:30am and 27th February 11:47 pm due to malfunction of the noise monitoring equipment. Due to the absence of community complaints, ENV considers the site to be compliant with regards to noise pollution over this period.

To summarise the results, noise levels derived from construction activities exceeded the predicted noise levels at the closest sensitive receiver (R1) however the exposure levels did not exceed the highly noise affected threshold. No complaints were received during the reporting period and elevated ambient noise levels derived from the localised urban hum consistently exceeded the sites Noise Management Levels during the day and evening periods.

6.2. Vibration

The vibration monitoring results obtained for the monitoring period 15th February – 24th March 2023 are presented graphically for the entire period in **Figure 8 and Figure 9, Appendix 2**.

Vibration levels measured in VDV exceeded the maximum acceptable criteria (0.8 $m/s^{1.75}$) and preferred criteria (0.4 $m/s^{1.75}$) for schools during the monitoring period on numerous occasions. Three exceedances recorded on the 15th February, 17th February and 28th February are attributed to vibration generated by ENV staff in the maintenance of the meter and are not associated with construction and demolition. There was a single VDV exceedance of 1.486 $m/s^{1.75}$ on the 02/03/2023 at 3:20pm which quickly spiked and was unsustained, and vibration levels quickly returned to below the Preferred Intermittent Vibration Levels.

There were four exceedances of PPV of 248mm/s on 02/03/2023 (Thursday) at 3:13pm, 50.7mm/s on 06/03/2023 (Monday) at 3:25pm, 16.22mm/s on the 12/03/2023 (Sunday) at 3:17pm and 16.21mm/s on the 21/03/23 (Tuesday) at 3:31pm. All exceedance values quickly spiked and were unsustained and quickly returned below the adopted management level.

The location of the vibration monitor was in close proximity of the main entry and is likely to detect vibration associated with school pupils entering and exiting the school. As all exceedance values quickly spiked and returned to the adopted management level between 3:13pm and 3:31pm, it is likely the detected values are associated with school pupils leaving the school. The exceedance on the 12/03/2023 on a Sunday, outside of construction hours, indicates non-construction vibration occurred in this location and the total vibration detected may not be associated with construction and demolition activities.

Complaints were not received from the community for any vibration exceedances during the monitoring period. No additional controls were required for the management of vibration on site during the monitoring period.

7. NOISE COMPLAINTS

No complaints were received for noise or vibration during the reporting period.

8. CONCLUSIONS

Exceedance of the highly noise affected level of 75dB was not recorded at any time during the monitoring period. Daily noise peaks during construction hours ranged from 55-65 dB(A) ($LAeq_{15min}$), with some occasional spikes between 65-70 dB(A) ($LAeq_{15min}$). These occasional peaks in noise were higher than the predicted noise levels modelled at sensitive receiver site R1. However, noise levels only rarely exceeded the predicted noise level of 66 dB(A) at sensitive receiver R1 and no complaints were received.

There was a single VDV event that exceeded the maximum acceptable level of vibration and four PPV events that exceeded the adopted management level during the monitoring period. All vibration points quickly spiked and were unsustained and quickly returned below the adopted assessment criteria. All other VDV exceedances were due to the repositioning of the monitor caused by ENV staff. Four PPV exceedances occurred on the 2nd, 6th, 12th and 21st of March between 3:13pm and 3:31pm. Exceedances on the 2nd, 6th and 21st were in construction hours and quickly spiked and were unsustained and quickly returned below the acceptance criteria.

Due to the location of the monitor likely to detect vibration caused by footsteps and timing of exceedances when pupils are leaving the school, it is likely the detected values were caused by the footsteps or movement of pupils. The exceedance on the 12th of March was on Sunday, out of construction hours indicating non-construction vibration occurred in this location and the total vibration detected may not be associated with construction and demolition activities.

No complaints have been received within construction hours during the monitoring period. A key metric for assessing the success of noise and vibration mitigation measures is the number of formal complaints. No complaints were received during the monitoring period.

Based on the monitoring results and the absence of complaints, ENV considers that the implemented controls for the Kingscliff High School Redevelopment project were sufficient to achieve the environmental impact goals of the CNVMSP.

9. REFERENCES

ENV Solutions (2021). *Kingscliff High School Redevelopment – Construction Noise and Vibration Management Sub Plan*

New South Wales. Department of Environment and Climate Change (2009). *Interim Construction Noise Guideline*

New South Wales. Environment Protection Authority (2017). *Noise Policy for Industry*

Standards Australia (2018). *AS 1055.2018 Acoustics - Description and measurement of environmental noise*

Department of Environment and Conservation (2006). *Assessing Vibration: a technical guideline*

APPENDIX A

Site and Monitor Locations

Construction Envelop (Approximate)

Monitoring Location 1 (15-02-2023 – 28/02/2023)

Monitoring Location 2 (28/04/2023 – 24/03/2023)

0 30 60m

Image source: IntraMpas (2023)

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Figure 1 - Site Location
33 Oxford St Kingscliff NSW 2487 Australia

Project: 216701
Client: Richard Crooks Construction
Assessment Date: 15/02/2023 – 24/03/2023

APPENDIX B

Noise and Vibration Monitoring Results

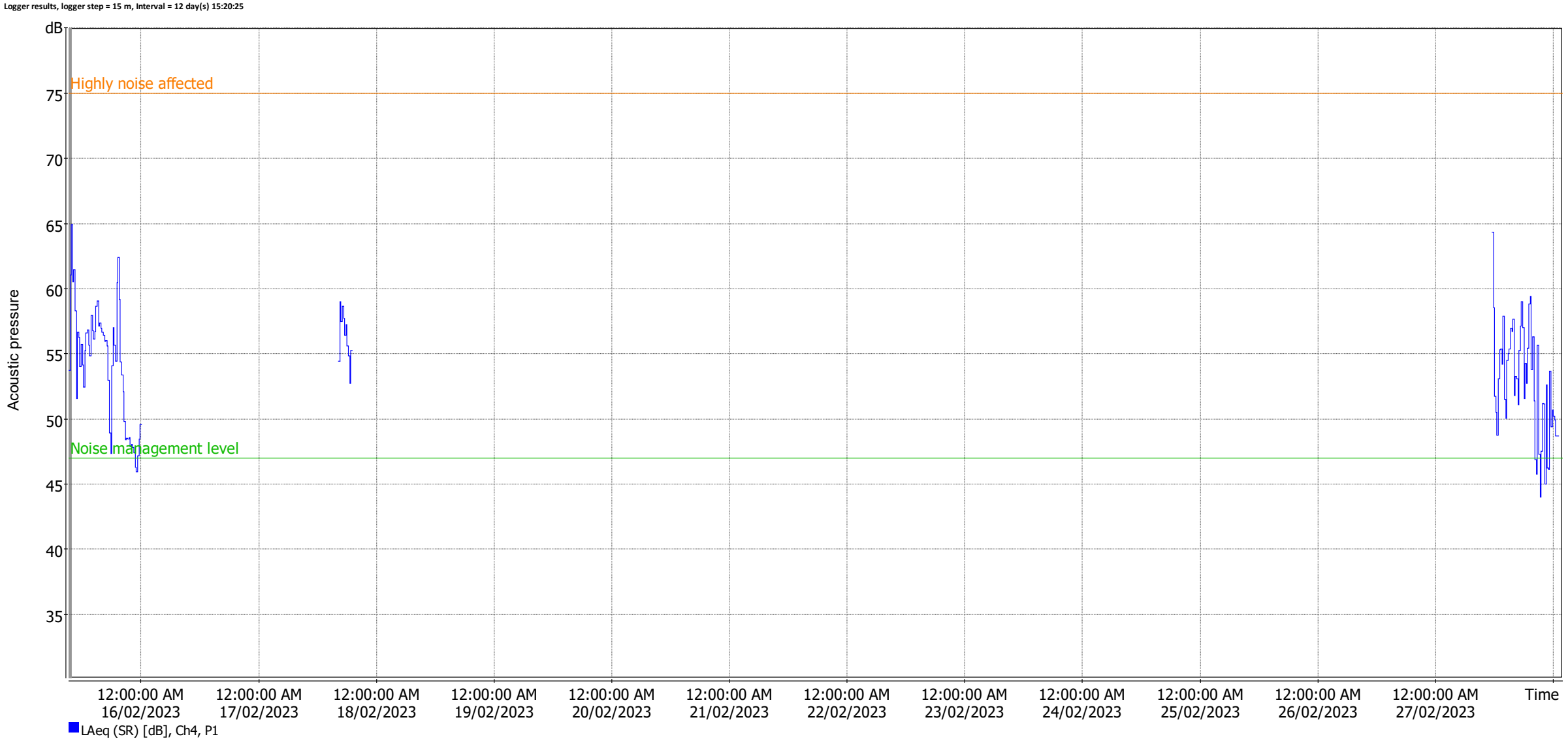

Figure 3. Construction noise ($LA_{eq15min}$) from February 15 – February 27th 2023. There is a data gap over this timeframe due to malfunction of the sound monitor.

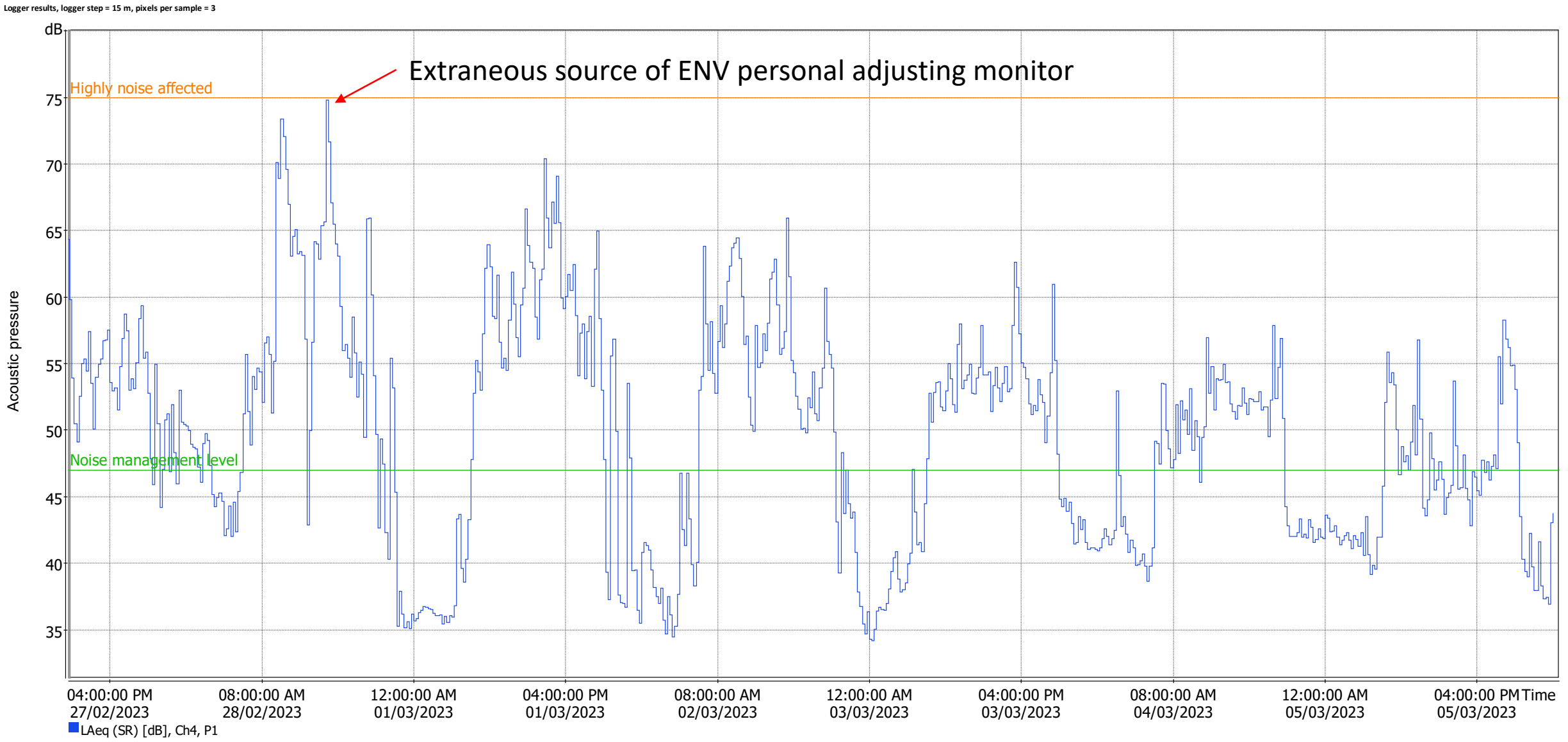

Figure 4. Construction noise ($LA_{eq15min}$) from February 27 – March 5th 2023. The noise that approached the highly noise affected level at approximately 15:00 on 28/02/2023 was due to monitor adjustments made by ENV.

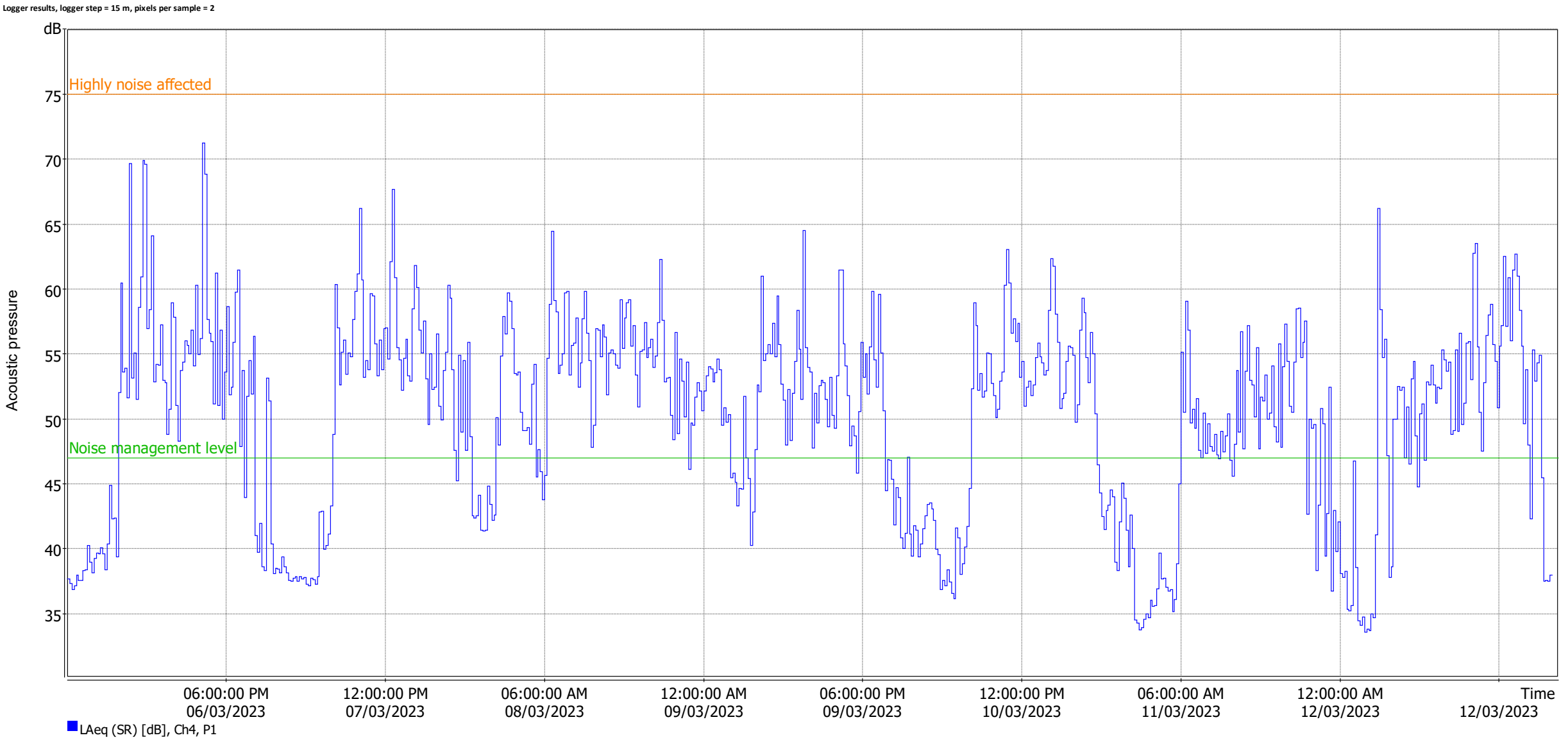

Figure 5. Construction noise ($LA_{eq15min}$) from March 6th – March 12th, 2023.

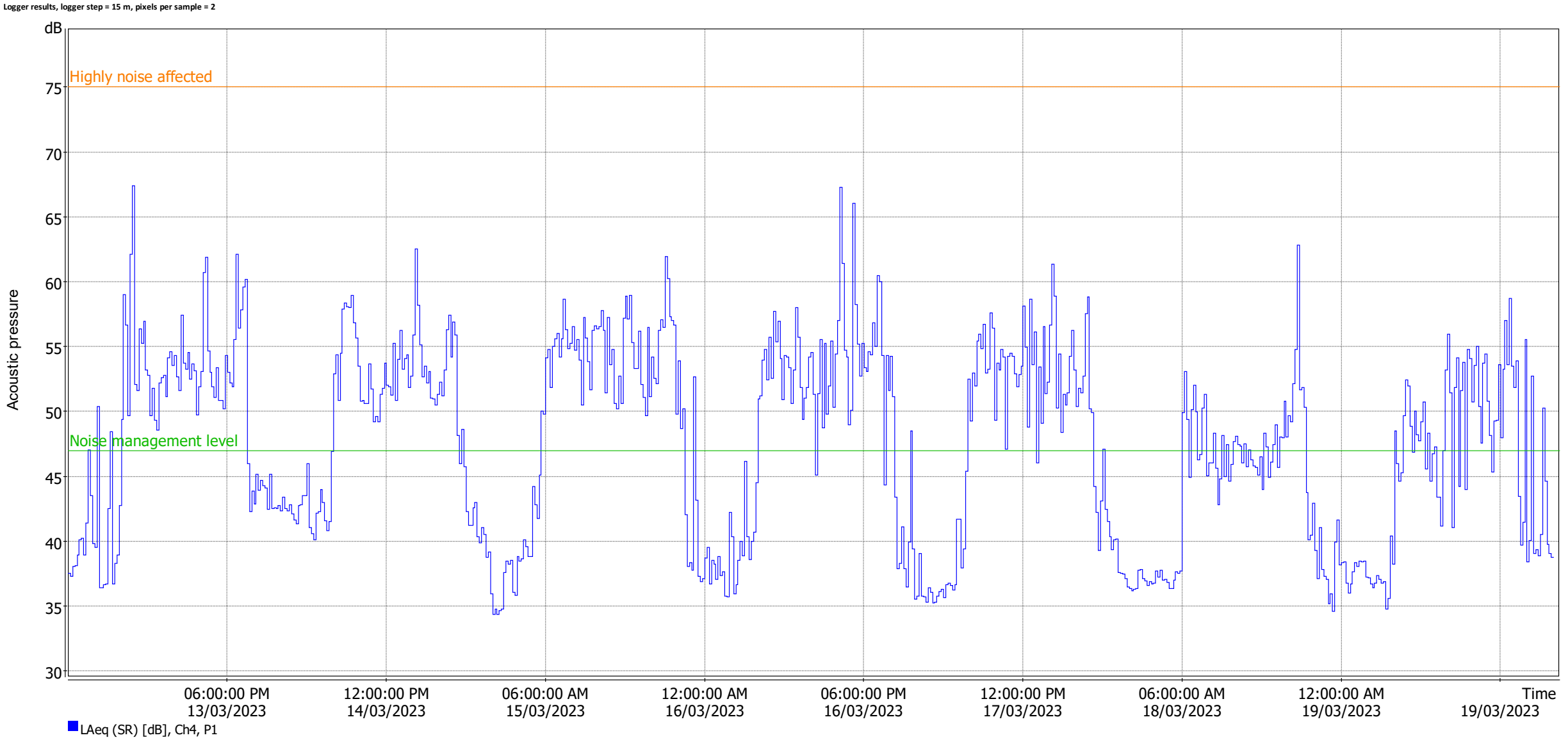

Figure 6. Construction noise ($LA_{eq15min}$) from March 13 – March 19th, 2023.

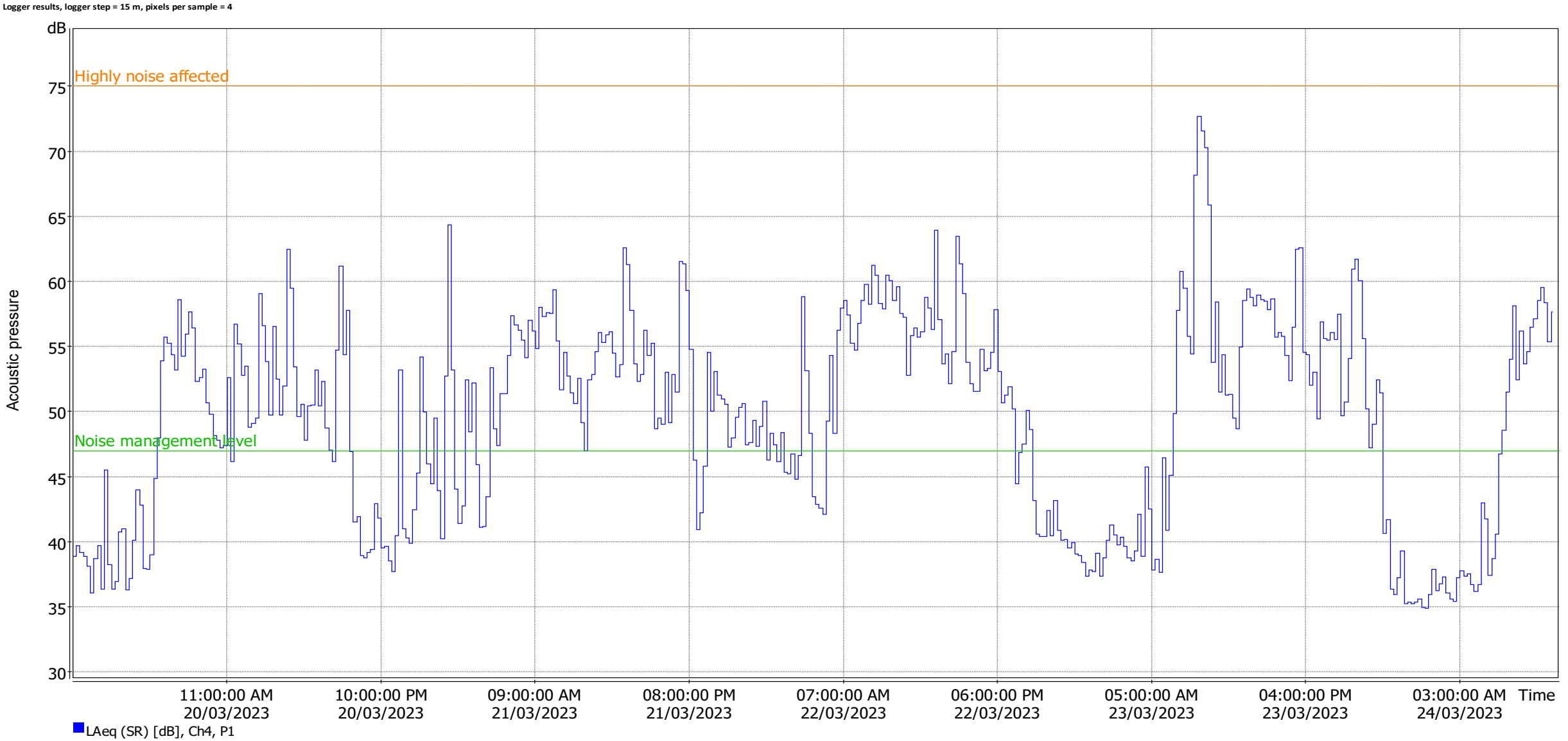

Figure 7. Construction noise ($LA_{eq15min}$) from March 20th – March 24th, 2023.

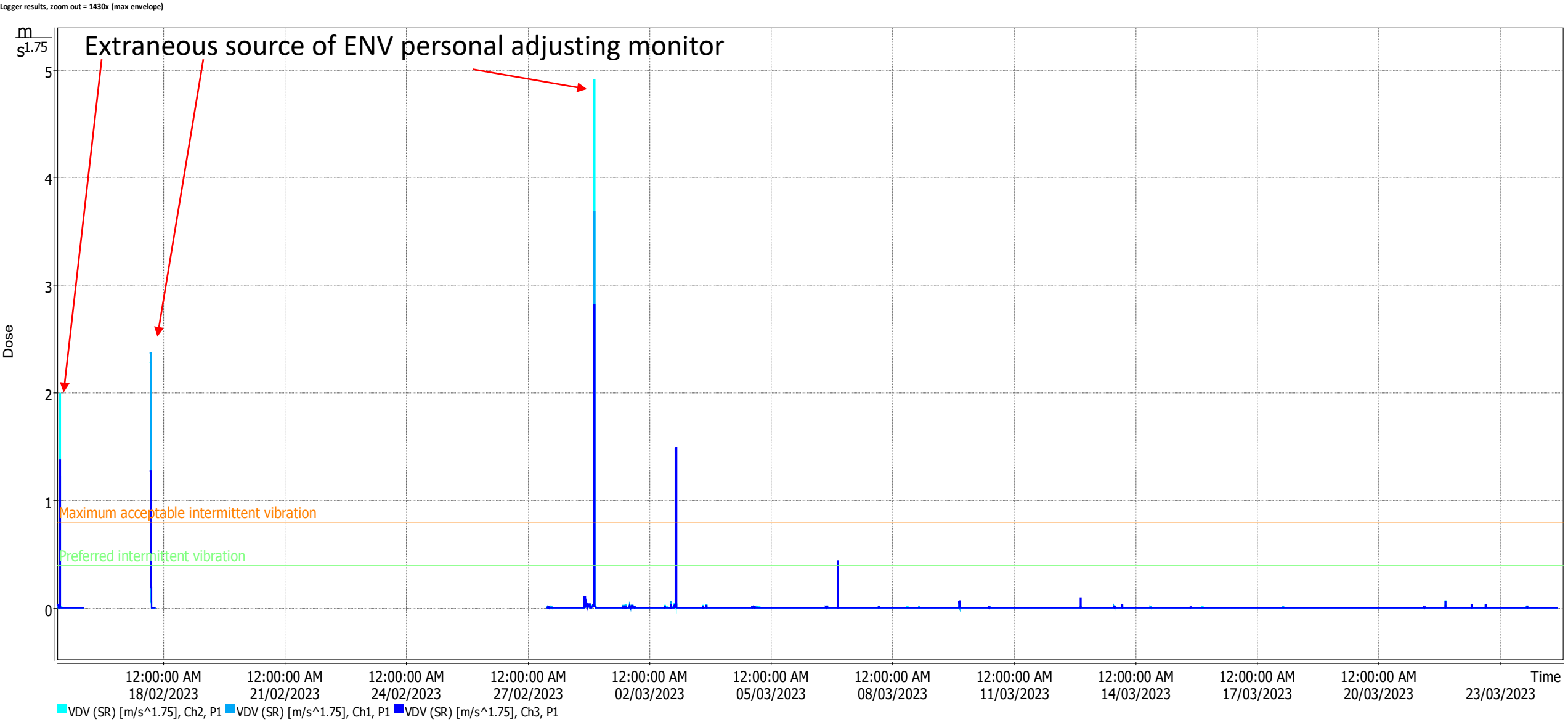

Figure 8. Site vibration (VDV, root-mean-quad approach) from February 15^{h} – March 24th, 2023.

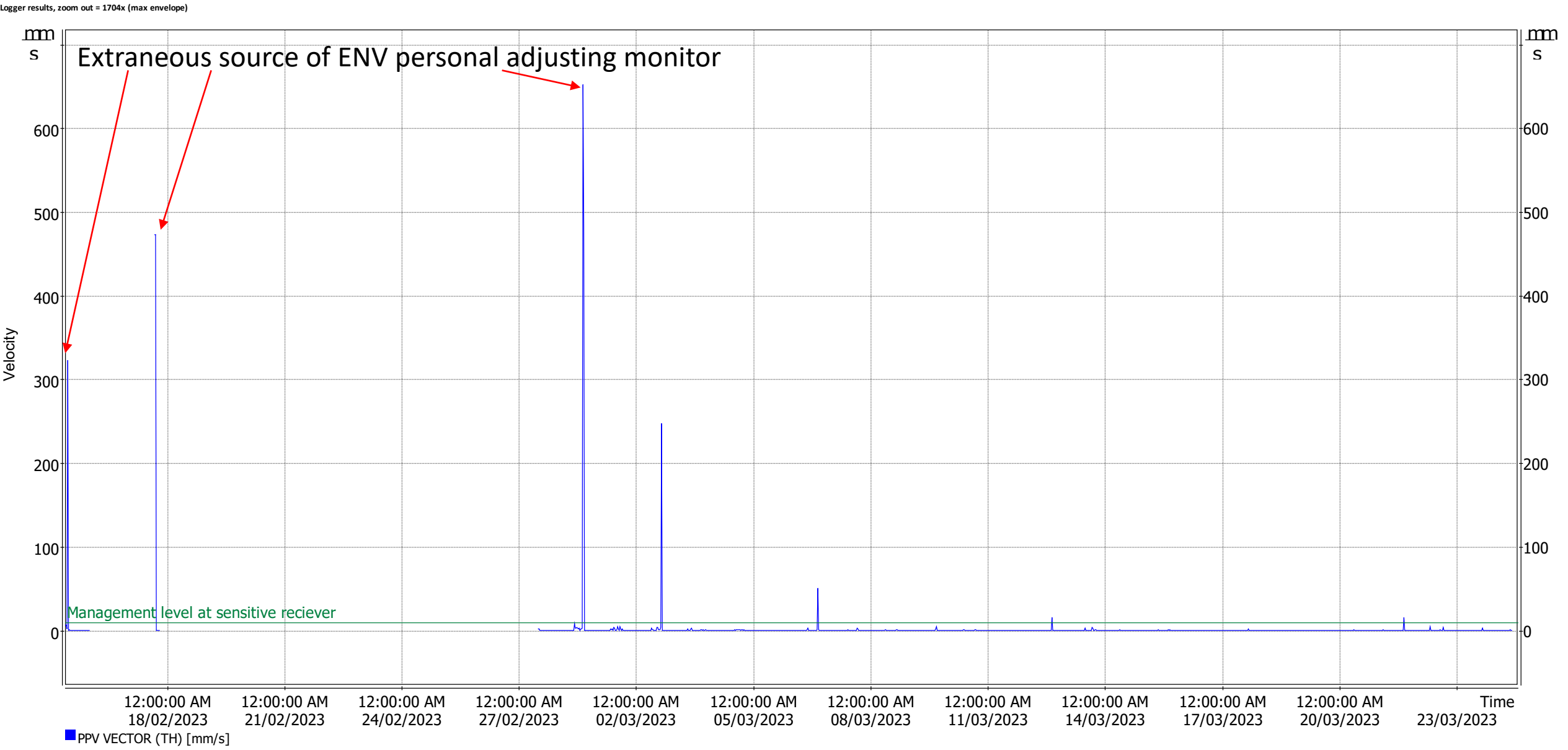

Figure 9. Site vibration (peak particle velocity vector) from February 15^{h} – March 24th, 2023.

APPENDIX C

Photographs

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PHOTOGRAPHIC LOG

Client Name	Site Location	Project
Richard Crookes Construction	33 Oxford Street, Kingscliff, NSW	Sound and Vibration Compliance Report

Photo No.	Date
1	15/02/2023

Description
Demolition Area.

Photo No.	Date
2	15/02/2023

Description
Monitoring Location 1.

ENV Solutions
ENVIRONMENTAL | ASBESTOS | REMEDIATION | RESOURCE RECOVERY

PHOTOGRAPHIC LOG

Client Name	Site Location	Project
Richard Crookes Construction	33 Oxford Street, Kingscliff, NSW	Sound and Vibration Compliance Report

Photo No.	Date
3	28/02/2023

Description
Monitoring Location 2.

Photo No.	Date
4	28/02/2023

Description
Monitoring Location 2 aspect.