Our Ref: SSD-11099584-PA-18

Larissa Ozog
Senior Planning Advisor
Health Infrastructure NSW
1 Reserve Road
ST. LEONARDS, NSW 2065

Attn: Stephanie Jackman (stephanie.jackman@health.nsw.gov.au)

31/05/2022

Dear Ms. Ozog,

Sutherland Hospital Upgrade (SSD-11099584)
Notification of Change to Approved Out-of-hours Works, Condition C6(e)

I refer to the notification submitted to the Planning Secretary advising of a delay to the out-of-hours works (OOHW) approved to be carried out on 25 to 26 May 2022 at the Sutherland Hospital (SSD-11099584).

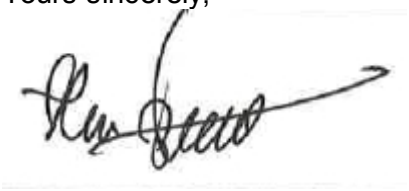
I note the notification states that:

- there is a delay in the delivery of the cooling tower proposed to be placed on the hospital roof;
- the OOHW is now planned to occur on 8 to 9 June 2022; and
- the scope of the OOHW as assessed shall not change.

Accordingly, the Department acknowledges receipt of your notification advising of a date change in the OOHW approved to be carried out under condition C6(e) of SSD-11099584.

If you have any questions or wish to discuss the matter further, please contact Hala Fua, who can be contacted at Hala.Fua@planning.nsw.gov.au.

Yours sincerely,



Shiraz Ahmed
Team Leader - Social Projects
Infrastructure Management

As nominee of the Secretary

HINDMARSH
Construction

RE: Construction Hours- Condition C6(E)- Out of Work Hours Works- SSDA-11099584

To whomever it may concern,

Hindmarsh Construction are seeking approval to perform proposed extended working hours for the use of a mobile crane over one night period in accordance with condition C6 (E) of the SSDA.

The justification for the reasoning for the works to occur out of hours is due to a new mechanical plant being required to be installed in an existing hospital plantroom. As the crane for access to the plantroom is to occur in front of the main entrance of the hospital, the works are required to be completed out of hours to accommodate the operational requirements of Sutherland Hospital.

The proposed works are to occur on one night only and organised around weather conditions. The proposed date of the works to occur is **Monday 25th May 2022 between 6:00pm – 6:00am**.

An "Extended Working Hours Acoustic Assessment" (attached Appendix B) has been completed inline with current draft "Out of Hours Works- Protocol & Application Requirements for HI Projects" dated 4th March 2022.

The Assessment includes the assessment of potential noise and vibration impacts on the surrounding receivers to the site and includes required acoustic mitigations and management controls to ensure noise and vibration can be minimised as a result of the use of the crane.

The Assessment responds to the requirements of the OOWW protocol and includes the following items:

- Nature and scope of each activity is captured in Section 7.2.1
- Detailed analysis to justify scheduling with predicted noise section 7.2.2. No works during daytime hours can be completed for the works due to the operational requirements of the hospital
- As no plausible alternatives for the use of the crane is possible, no other alternatives have been proposed.
- Details of the proposed mitigation strategies included in section 7.2.2. Respite period is not proposed due to not being relevant for the night time works.
- Predicted noise levels included in Table 10.
- RBL included in Section 4.1
- Background noise levels have been previously included in the projects approvals used in the assessment as detailed in Section 4.1.
- A diagram showing the location of noise monitoring location is included in Figure 1.
- A GIS has not been proposed to be undertaken as part of this assessment based on the single use location of the crane.

- A plain English noise results included in Table 10 and section 7.4 for the sleep disturbance.
- Based on the proposed appliances to be used during the works and the distance to receivers, vibration is not considered to cause any disturbance the surrounding neighbours as detailed in Section 7.1
- Recommended mitigation's have been included in Section 7.2 and 7.3.
- Details of how and when noise affected received will be notified are included in Section 8.
- Details of an appropriate noise and vibration monitoring program is included in Section 9.
- Discussion of the complaints handling management systems is included in Section 10.

A completion of the "Out of Hours Work Application" has also been completed and included as part of Appendix A of this submission.

If there is any further information you require, please feel free to give me a call.

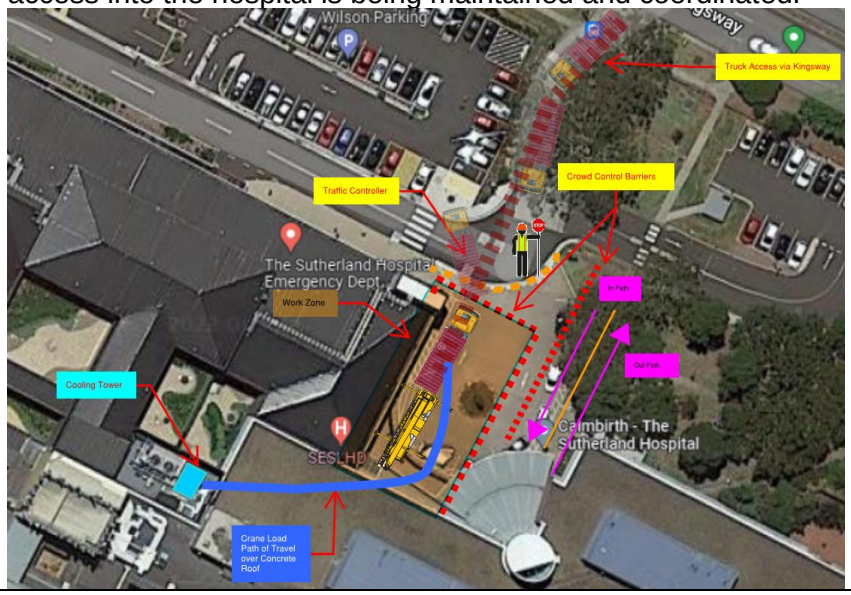
Yours Sincerely

Reg Struwig
Project Manager
0466 206 864

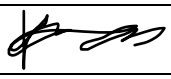
APPENDIX A- OUT OF HOURS WORK APPLICATION

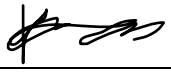
Item	Description	Information/Comments
1	**PROJECT NAME AND ADDRESS**	The Sutherland Hospital Corner of Kingsway and Kareena Road
2	**REF/ SSD APPROVAL NUMBER**	SSD-11099584
3	**DETAILED DESCRIPTION OF OOHW** Provide a detailed description of construction methodology and list of plant/ equipment	Mobile crane set up to install mechanical roof plant (cooling tower) to existing hospital plant room. The crane is to be set up in front of the main hospital entrance.
4	**CONTRACTOR PERORMING WORKS**	Hindmarsh Construction
5	**LOCATION OF WORKS** Attach site plan including proposed worksites	In front of the main hospital entrance. Site plan located within Extended Working Hours Acoustic Assessment
6	**START DATE**	Monday 25th May
7	**FINISH DATE**	Tuesday 26th May
8	**START TIME**	6:00pm
9	**FINISH TIME**	6:00am
10	**CATEGORY OF OOHW** In accordance with the ICNG categories of works that may be required to be undertaken outside the recommended standard construction hours	OOHW Period 2
11	**JUSTIFICATION** Provide full justification why the OOHW are required to be undertaken outside approved hours	As the crane for access to the plantroom is to occur in front of the main entrance of the hospital, the works are required to be completed out of hours to accommodate the operational requirements of Sutherland Hospital.
12	**CONSULTATION**	• Attach evidence of support for the OOHW from the LHD •
13	**CNVIS** • Attach and reference CNVIS • Description of high noise generating plant/equipment and construction scenarios	Appendix B

<table>
<tr><td></td><td>Provide CNVIS noise predictions to the nearest and potentially worst-affected receivers.</td><td>
<table>
<tr><th>Time of day</th><th>Noisiest Plant/Equipment/ Construction Scenario</th><th>Receiver Type</th><th>Construction Noise Level</th><th>Attenuation</th><th>Predicted Noise Level</th><th>RBL</th><th>Exceedance of RBL</th></tr>
<tr><td>Day OOWH</td><td>N/A</td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>Evening OOWH</td><td>N/A</td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>Night OOWH</td><td>Crane & material movement</td><td>Residential</td><td>Up to 105 Db (A) SWL</td><td>-51</td><td>Up to 54 Db (A) Leq 15 min</td><td>39 dB (A) L90</td><td>Up to 15 dB (A)</td></tr>
</table>
</td></tr>
<tr><td></td><td>Identification of AMM requiring consideration (refer to Appendix 2 of the OOHW Protocol)</td><td>Refer to 7.2 and 7.3 of the assessment</td></tr>
<tr><td>14</td><td>TRAFFIC

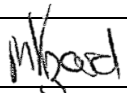
Will the work require traffic control?</td><td>Yes inside the hospital roads only</td></tr>
<tr><td></td><td>Describe the location and nature of disruption to traffic proposed? (provide plan is required)</td><td>Traffic control will be present to ensure alternative pedestrian access into the hospital is being maintained and coordinated.
 
</td></tr>
</table>

	Who is planning traffic control?	Kontro Traffic Control through Hindmarsh Construction
15	**Lighting** What lighting is to be provided for night work	No additional lighting is required to be provided for the night works. Automatic Existing hospital lighting will be used.
	Will light have impacts external to the work? If so, how will they be mitigated?	No
16	**COMMUNICATION** Is a Disruption Notice required? If so, attach a copy of the community notification	Yes
	Has one been issued?	No, but will be issued once OOWA has been approved as agreed by TSH due to review and approval lead times.

PREPARED BY	
Name:	
Signature:	Reg Struwig
Comments:	

CONTRACTOR PROJECT MANAGER APPROVAL	
Name:	
Signature:	Reg Struwig
Comments:	

HI SPD APPROVAL	
Name:	Tim Shoolman
Signature:	
Comments:	Supported for issuance to DPIE to provide formal approval of this out of hours works application.

HI DIRECTOR APPROVAL	
Name:	Matt Vizard
Signature:	
Comments:	Supported for issuance to DPIE to provide formal approval of this out of hours works application.

APPENDIX B- Extended Working Hours Acoustic Assessment

Sutherland Hospital, Operating Theatre Upgrade

Extended Working Hours Acoustic Assessment

Hindmarsh

Report Reference: 220143 – Sutherland Hospital, Operating Theatre Upgrade – Extended Working Hours Acoustic Assessment – R2
Date: 27 April 2022

Revision: R2

Project Number: 220143

PULSE WHITE NOISE ACOUSTICS Level 5, 73 Miller Street, North Sydney NSW 2060
P 1800 4 PULSE (1800 478 573) **E** info@pwna.com.au **pwna.com.au** ABN 95 642 886 306

DOCUMENT CONTROL

Project Name:	Sutherland Hospital, Operating Theatre Upgrade
Project Number:	220143
Report Reference:	220143 – Sutherland Hospital, Operating Theatre Upgrade – Extended Working Hours Acoustic Assessment – R2
Client:	Hindmarsh

Revision	Description	Reference	Date	Prepared	Checked	Authorised
0	For Information	220142 – Sutherland Hospital – Extended Working Hours – R0	25/03/22	Ben White	Matthew Furlong	Ben White
1	For Information	220142 – Sutherland Hospital – Extended Working Hours – R1	12/04/22	Ben White	Matthew Furlong	Ben White
2	For Information	220142 – Sutherland Hospital – Extended Working Hours – R2	27/04/22	Ben White	Matthew Furlong	Ben White

PREPARED BY:

Pulse White Noise Acoustics Pty Ltd
ABN: 95 642 886 306
Address: Level 5, 73 Miller Street, North Sydney, 2060
Phone: 1800 4 PULSE

TABLE OF CONTENTS

Figures

Tables

1 INTRODUCTION

Pulse White Noise Acoustics (PWNA) has been engaged to undertake an acoustic assessment of the proposed extended working hours for the use of crane on the Sutherland Hospital, Operating Theatre Upgrade project which is required to be used for 1 night based on the operational requirements of the hospital.

Works will be scheduled such that they can be undertaken on one night based on weather forecasts.

The following assessment focusses on the potential noise and vibration impacts during the proposed 24-hour use of the crane for a single night.

The assessment has been undertaken in conjunction with the requirements of the EPA's *Interim Construction Noise Guideline* and the projects DA Conditions of Consent.

This report includes the assessment of potential noise and vibration impacts on the surrounding receivers to the site and includes required acoustic mitigations and management controls to ensure noise and vibration can be minimised as a result of the use of the crane.

The proposed use of the crane outside of approved working hours of the project is required to accommodate the operational requirements of Sutherland hospital.

A glossary of acoustic terminology used throughout this report is included in Appendix A.

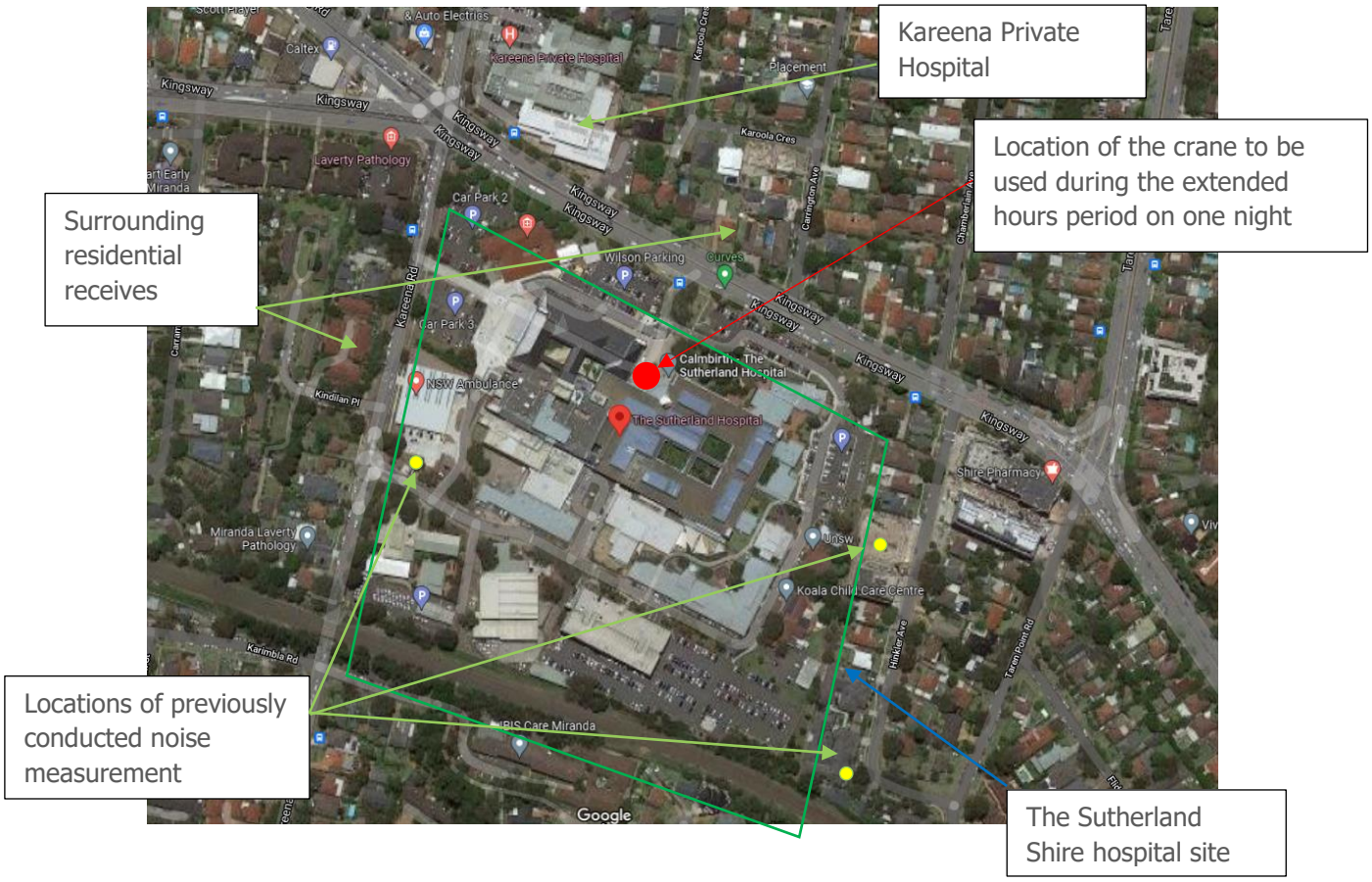
2 DEVELOPMENT DESCRIPTION

The development includes the alterations and additions to the operating facilities Sutherland Hospital located at the Kingsway and Kareena Road, Caringbah. The required construction of the project will include limited demolition and excavation activities as well as construction of the new facility.

The surrounding receivers to the site include residential receivers located to the north and west of the site as well as Kareena Private Hospital located to the north of the site.

The site location, in relation to surrounding buildings, is shown in Figure 1 below.

Figure 1 Site Map and Surrounding Receivers



Based on the proposed location of the crane to be used during the extended hours period the potentially affected residential receivers include those to the north of the site opposite on the Kingsway.

3 CONDITIONS OF CONSENT

The management of noise and vibration assassinated with the required construction works to be undertaken as part of the project will be undertaken in conjunction with the requirements of the SSD-11099584 consent, including Item C16 that requires the construction of the project to comply with NSW Dept of Env & Climate Change *"Interim Construction Noise Guideli*ne" 2009 and includes the following:

B16. The Construction Noise and Vibration Management Sub-Plan must address, but not be limited to, the following:

(a) be prepared by a suitably qualified and experienced noise expert;

(b) describe procedures for achieving the noise management levels in EPA's *Interim Construction Noise Guideline* (DECC, 2009);

(c) describe the measures to be implemented to manage high noise generating works such as piling, in close proximity to sensitive receivers;

(d) include strategies that have been developed with the community for managing high noise generating works;

(e) describe the community consultation undertaken to develop the strategies in condition B16(d);

(f) include a complaints management system that would be implemented for the duration of the construction; and

(g) 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.

4 EXISTING ACOUSTIC ENVIRONMENT

The proposed works associated with the Operating Theatre Upgrade are located within Sutherland Hospital. The hospital is located with the Kingsway to the north of the site and Kareena Road to the west. As detailed in Figure 1 above.

Existing environmental noise levels at the site are dominated by traffic noise generated predominantly from surrounding roadways and existing environmental noise levels.

As part of the SSD-11099584 approval of the site JHA Services has undertaken a *Noise and Vibration Impact Assessment* for SSDA (SSD-11099584) of the site which is included in their report dated 30/6/2021 revision E. As part of the *Noise and Vibration Impact Assessment* for SSDA a background noise survey of the site has been undertaken, the results of which have been used as the basis of this report.

4.1 Noise Survey Results

The JHA Services *Noise and Vibration Impact Assessment* for SSDA includes a noise survey of the site. The survey undertaken by JHA services includes long term monitoring locations undertaken in accordance with the requirements of the EPA. The results of the survey undertaken by JHA Services has been used as the basis of this assessment, a summary of the background noise levels within the JHA Services *Noise and Vibration Impact Assessment* for SSDA are included in Table 1 below.

Table 1 Results of Noise Survey at the Site

Measurement Location	Time of Measurement	$LA_{eq,\ 15min\ dB(A)}$	$LA_{90,\ 15min\ dB(A)}$	Comments
Location 1 – Kingsway to the north	Day	62	60	Noise level at the site dominated by vehicle movements on surrounding roadways and natural noise levels
	Evening	59	53	
	Night	56	39	
Location 2 – To the east of Sutherland Hospital	Day	54	47	
	Evening	50	45	
	Night	45	39	
Location 3 – to the west of the site on Kareena Road	Day	59	48	
	Evening	57	45	
	Night	52	40	

The results of the noise survey previously undertaken at the site (and detailed above) have been used as the basis of this report.

5 PROJECT REQUIREMENTS

The assessment of the proposed use of the mobile crane during an extended hours period include a single night.

The application of extended hours for the use of the mobile crane on the site is required based on the operational requirements of the hospital such that the proposed works are not possible during the approved construction working hours of the project.

No other construction works (including demolition or construction activities) are proposed during the proposed extended working hours period.

The assessment of noise during the proposed extended hours period has been undertake in accordance with the Environmental Protection Authorities (EPA) *Interim Construction Noise Guideline* as required by the project Conditions of Consent.

5.1 EPA – Interim Construction Noise Guideline

Noise criteria for construction activities are discussed in the EPA's Interim Construction Noise Guideline (ICNG). The ICNG also recommends procedures to address potential impacts of construction noise on residences and other sensitive land uses. The main objectives of the ICNG are summarised as follows:

Promote a clear understanding of ways to identify and minimise noise from construction works;

Focus on applying all "feasible" and "reasonable" work practices to minimise construction noise impacts;

Encourage construction to be undertaken only during the recommended standard hours unless approval is given for works that cannot be undertaken during these hours;

Streamline the assessment and approval stages and reduce time spent dealing with complaints at the project implementation stage; and

Provide flexibility in selecting site-specific feasible and reasonable work practices in order to minimise noise impacts.

The ICNG contains a quantitative assessment method which is applicable to this project. Guidance levels are given for airborne noise at residences and other sensitive land uses.

The quantitative assessment method involves predicting noise levels at sensitive receivers and comparing them with the Noise Management Levels (NMLs). The NML affectation categories for receivers have been reproduced from the guideline and are listed in the table below.

Table 2 Noise Management Levels from Construction – Quantitative Assessment

Receiver Type	Time of Day	Noise Management Level LAeq(15minute)[1,2]	How to Apply
Residential	Normal Working Hours	Noise affected RBL + 10 dB	The noise affected level represents the point above which there may be some community reaction to noise. Where the predicted or measured LAeq(15minute) 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 75 dB(A)	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 standard hours	Noise affected RBL + 5 dB	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 above the noise affected level, the proponent should negotiate with the community.

Office, retail outlets	When is use	Highly noise affected 70 dB(A)	The external noise levels should be assessed at the most-affected occupied point of the premises

Note 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. Noise levels may be higher at upper floors of the noise affected residence.*

Note 2 *The RBL is the overall single-figure background noise level measured in each relevant assessment period (during or outside the recommended standard hours). The term RBL is described in detail in the NSW Noise Policy for Industry (EPA 2017).*

The EPA's Interim Construction Noise Guideline defines normal day time hours as the following:

2.2 Recommended standard hours

The recommended standard hours for construction work are shown in Table 1; however, they are not mandatory. There are some situations, as described below, where construction work may need to be undertaken outside of these hours. The likely noise impacts and the ability to undertake works during the recommended standard hours should be considered when scheduling work.

Table 1: Recommended standard hours for construction work

Work type	Recommended standard hours of work*
Normal construction	Monday to Friday 7 am to 6 pm Saturday 8 am to 1 pm No work on Sundays or public holidays
Blasting	Monday to Friday 9 am to 5 pm Saturday 9 am to 1 pm No blasting on Sundays or public holidays

* The relevant authority (consent, determining or regulatory) may impose more or less stringent construction hours.

6 EXTENDED WORKING HOURS NOISE CRITERIA

Based on the requirements of the EPA *Interim Construction Noise Guideline*, suitable construction noise criteria levels for the proposed extended working hours (including 24 hours periods) are detailed in the table below.

Table 3 Site Construction Noise Management Levels

Noise Source	Standard	Time Period	Receiver Type	Construction Noise Management Level	Resulting Noise Level Criteria
Proposed use of the mobile crane	EPA	Outside of recommended standard hours	Residential Receivers on the Kingsway	Background Noise + 5 dB(A)	Evening – 49 dB(A) LAeq (15min) Night – 45 dB(A) LAeq (15min)

Note 1: Construction noise management levels based on the Interim Construction Noise Guideline.

7 CONSTRUCTION NOISE AND VIBRATION ASSESSMENT

This section of the report details the assessment of noise associated with the proposed use of the mobile crane during the proposed extended hours period include 1 evening and night time period.

The assessment has been undertaken to assess the potential noise and vibration impacts from the proposed use of the mobile crane include the following:

1. Use of the mobile crane.
2. Moving of materials associated with the mobile crane.

During the proposed extended working hours periods there are no proposed construction activities to be undertaken as part of the project.

7.1 Construction Vibration Assessment

This section of the report details the assessment of construction vibration impacts on surrounding receivers.

- Effects of ground borne vibration on buildings may be segregated into the following three categories:
- Human comfort – vibration in which the occupants or users of the building are inconvenienced or possibly disturbed.
- Effects on building contents – where vibration can cause damage to fixtures, fittings and other non-building related objects.
- Effects on building structures – where vibration can compromise the integrity of the building or structure itself.

7.1.1 Vibration Criteria – Human Comfort

Vibration effects relating specifically to the human comfort aspects of the project are taken from the guideline titled "Assessing Vibration – A Technical Guideline" (AVTG. This type of impact can be further categorised and assessed using the appropriate criterion as follows:

- Continuous vibration – from uninterrupted sources (refer to Table 4).
- Impulsive vibration – up to three instances of sudden impact e.g., dropping heavy items, per monitoring period (refer to Table 5).
- Intermittent vibration – such as from drilling, compacting or activities that would result in continuous vibration if operated continuously (refer to Table 6).

Table 4 Continuous vibration acceleration criteria (m/s2) 1 Hz-80 Hz

Location	Assessment period	Preferred Values		Maximum Values	
		z-axis	x- and y-axis	z-axis	x- and y-axis
Residences	Daytime	0.010	0.0071	0.020	0.014
	Night-time	0.007	0.005	0.014	0.010
Offices, schools, educational institutions and places of worship	Day or night-time	0.020	0.014	0.040	0.028
		0.04	0.029	0.080	0.058
Workshops	Day or night-time	0.04	0.029	0.080	0.058

Table 5 Impulsive vibration acceleration criteria (m/s2) 1 Hz-80 Hz

Location	Assessment period	Preferred Values		Maximum Values	
		z-axis	x- and y-axis	z-axis	x- and y-axis
Residences	Daytime	0.30	0.21	0.60	0.42
	Night-time	0.10	0.071	0.20	0.14
Offices, schools, educational institutions and 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 6 Intermittent vibration impacts criteria (m/s1.75) 1 Hz-80 Hz

Location	Daytime		Night-time	
	Preferred Values	Maximum Values	Preferred Values	Maximum Values
Residences	0.20	0.40	0.13	0.26
Offices, schools, educational institutions and places of worship	0.40	0.80	0.40	0.80
Workshops	0.80	1.60	0.80	1.60

7.1.2 Vibration Criteria – Building Contents and Structure

The vibration effects on the building itself are assessed against international standards as follows:

For transient vibration: British Standard BS 7385: Part 2-1993 "Evaluation and measurement for vibration in buildings Part 2: Guide to damage levels from ground borne vibration" (BSI 1993); and

For continuous or repetitive vibration: German DIN 4150: Part 3 – 1999 "Effects of Vibration on Structure" (DIN 1999).

Standard BS 7385 Part 2 – 1993

For transient vibration, as discussed in standard BS 7385 Part 2-1993, the criteria are based on peak particle velocity (mm/s) which is to be measured at the base of the building. These are summarised in Table 7 and illustrated in Figure 2 below.

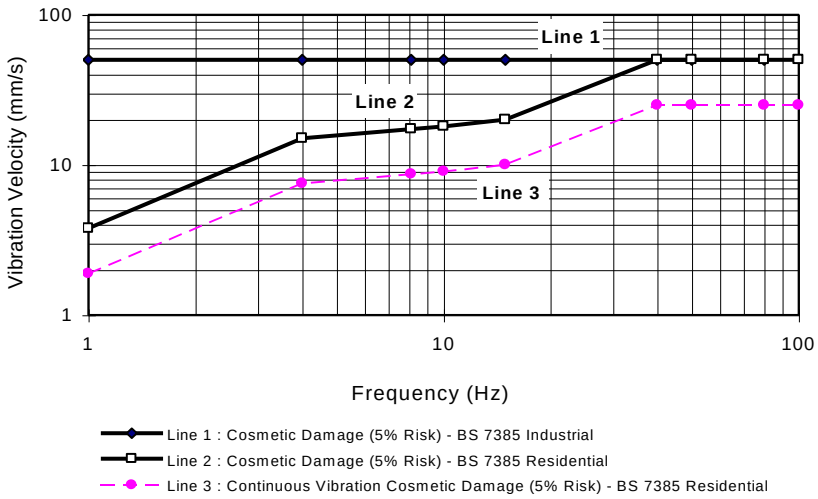
Table 7 Transient vibration criteria as per standard BS 7385 Part 2 - 1993

Line in figure below	Type of Building	Peak Component Particle Velocity in Frequency Range of Predominant Pulse	
		4 Hz to 15 Hz	15 Hz and Above
1	Reinforced or framed structures Industrial and heavy commercial buildings	50 mm/s at 4 Hz and above	
2	Unreinforced or light framed structures Residential or light commercial type buildings	15 mm/s at 4 Hz increasing to 20 mm/s at 15 Hz	20 mm/s at 15 Hz increasing to 50 mm/s at 40 Hz and above

Standard BS 7385 Part 2 – 1993 states that the values in Table 7 relate to transient vibration which does not cause resonant responses in buildings.

Where the dynamic loading caused by continuous vibration events is such as that results in dynamic magnification due to resonance (especially at the lower frequencies where lower guide values apply), then the values in Table 7 may need to be reduced by up to 50% (refer to Line 3 in the figure below).

Figure 2 BS 7385 Part 2 – 1993, graph of transient vibration values for cosmetic damage



In the lower frequency region where strains associated with a given vibration velocity magnitude are higher, the recommended values corresponding to Line 2 are reduced. Below a frequency of 4 Hz, where a high displacement is associated with the relatively low peak component particle velocity value, a maximum displacement of 0.6 mm (zero to peak) is recommended. This displacement is equivalent to a vibration velocity of 3.7 mm/s at 1 Hz.

The standard also states that minor damage is possible at vibration magnitudes which are greater than twice those given in Table 7, and major damage to a building structure may occur at values greater than four times the tabulated values.

Fatigue considerations are also addressed in the standard and it is concluded that unless a calculation indicates that the magnitude and number of load reversals is significant (in respect of the fatigue life of building materials) then the values in Table 7 should not be reduced for fatigue considerations.

Standard DIN 4150 Part 3 – 1999

For continuous or repetitive vibration, standard DIN 4150 Part 3-1999 provides criteria based on values for peak particle velocity (mm/s) measured at the foundation of the building; these are summarised in Table 8. The criteria are frequency dependent and specific to particular categories of structures.

Table 8 Structural damage criteria as per standard DIN 4150 Part 3 - 1999

Type of Structure	Peak Component Particle Velocity, mm/s			
	Vibration at the foundation at a frequency of			Vibration of horizontal plane of highest floor at all frequencies
	1 Hz to 10 Hz	10 Hz to 50 Hz	50 Hz to 100 Hz[1]	
Buildings used for commercial purposes, industrial buildings and buildings of similar design	20	20 to 40	40 to 50	40
Dwellings and buildings of similar design and/or use	5	5 to 15	15 to 20	15
Structures that, because of their sensitivity to vibration, do not correspond to those listed in lines 1 and 2 and are of great intrinsic value (e.g. buildings that are under a preservation order)	3	3 to 8	8 to 10	8
Note 3 Note 1:For frequencies above 100Hz, at least the values specified in this column shall be applied.				

7.1.3 Summary of Construction Vibration Criteria

Based on the details of the vibration criteria detailed in the sections above, the recommended construction vibration impact criteria to protect the receivers neighbouring the site includes the following:

All surrounding receivers – 7 mm/s

Based on the proposed works to be undertaken as part of the extended hours periods, including use of the mobile crane and materials movement, compliance with the relevant construction vibration criteria will be achieved without additional mitigations or controls.

7.2 Noise Impact Assessment

This section of the report details the assessment of extended hours noise impacts from the proposed use of the mobile crane and the movement of materials.

The assessment of noise impact includes the period of evening and night time which the proposed mobile crane is proposed to be used.

7.2.1 Proposed Appliances

The proposed appliances which will be used as part of the internal construction works are detailed in the table below.

Table 9 Noise Levels from Expected Material Deliver and Removal Appliances

Tasks	Equipment	Sound Power Levels per task dB(A) L_{max}	Aggregate Sound Power Level per Task dB(A) L_{max}	Aggregate Sound Power Level per Task dB(A) L_{eq}
Proposed use of the Mobile Crane	Materials Movements	100	105	100
	Mobile Crane	105		

Note: Noise levels of proposed equipment to be used on the site are based on the Australian Standard AS2436-2010 and noise level measurements previously undertaken of similar equipment on construction sites.

A summary of the proposed activities to be undertaken during the proposed extended hours period includes the following:

- Crane Lift to be arranged for positioning of the Cooling Tower on level 4 roof adjacent to existing cooling towers
- The Crane to be set up in front of the Hospital's main entrance on level 2 in the drop-off area
- Cooling tower will come in 2 components. 2 lifts to be arranged from the truck straight to the cooling tower plantroom and positioned in place
- The work will take place at night so some temporary lighting to be organized for the plantroom area however will not impede on any residents across the road.
- A High-risk Crane workshop template has been attached and will be completed closer to the date.
- Crane study will be conducted prior to the works occurring.

7.2.2 Noise Impact Assessment

A quantitative assessment of the construction noise levels resulting from the proposed extended hours period for materials delivery and removal has been undertaken. The assessment includes a number of assumptions, including the following:

All materials delivery and removal from the site will be undertaken using electric cranes with material to be received and removed from the projects hoarding located on King Street.

The assessment has been based on the expected noise levels to be generated as a result of the proposed extended hours period.

Calculation of the resulting construction noise levels at the surrounding receivers within proximity to the site (see Figure 1) is detailed in the table below.

Based on the location of the proposed mobile crane and the proximity to the surrounding residential receivers noise levels have been assessed to the locations on the Kingsway where noise levels have the potential to exceed construction noise goals. Noise levels at other surrounding receivers including Kareena Road will comply with the relevant construction noise goals for the proposed works.

Table 10 Quantitative Assessment of Construction Noise during Extended Hours Periods – Materials Delivery and Removal

Receiver Location	Source Noise	Time Period	Noise Source	Aggregate Sound Power Level dB(A) L_{eq}	Corrections including Time of Use and Screening	Distance correction	Calculated Noise Levels dB(A) $L_{eq\ 15\ min}$	Extended Hours Noise Criteria dB(A) $L_{eq\ 15\ min}$	Comment
Residential Receiver on the Kingsway	Use of the Mobile Crane and material movement	Evening Period Up to 10pm	Activities and equipment detailed in Section 7.2.1	100	-5 dB	-46 dB (80m)	Up to 49	58 dB(A)	Noise levels during evening periods expected to be within background + 5 dB(A)
		Night Time Periods 10pm to 7am	Activities and equipment detailed in Section 7.2.1	100	-5 dB	-46 dB (80m)	Up to 49	44 dB(A)	Possible noise level of up to 10 dB(A) above EPA extended working hour noise levels

Based on the assessment of noise levels above the resulting noise levels from the use of the mobile crane and the materials movement has the potential to result in noise levels above the recommended construction noise level of the EPA *Interim Construction Noise Guideline* during night time period during periods with maximum noise level generation.

Based on the above quantitative assessment of construction noise associated with the proposed extended hours period from the use of the mobile crane and materials movement to be undertaken externally to the building the following is discussed:

1. Noise levels resulting from activities including materials movement and the use of the mobile crane will have the potential to result in noise levels which are greater than the recommended extended hours noise levels at the surrounding residential buildings. These noise level would be limited to period when maximum noise is being generated with a predicted noise level of up to 54 dB(A).

2. The predicted noise level of 54 dB(A) represents a noise which would be less than that generated from the passing of a car on the Kingsway. The predicted noise levels are similar to the measured 15 minute exiting ambient noise levels of 59 dB(A) evening and 56 dB(A) night time which are experienced by the residential receivers on the Kingsway.

3. Works proposed to be conducted as part of the use of the mobile crane and materials handling during the extended hours period cannot practically be conducted during the normal working hours as a result of the required operation of Sutherland Hospital.

4. Calculated noise level includes the possible maximum noise levels. Typically, noise levels will include magnitudes less than those presented in the table above. The predicted maximum noise levels would not occur continuously during the proposed works, but rather only during limited periods.

5. Residence on the Kingsway are required to be informed using letter drops or registered email when proposed use of the mobile crane is to be undertaken. Notifications area to be provided no less than a week prior to the works commencing. The information will aid in residence being able to close windows during periods when the construction in proposed to be undertaken during the proposed extended hours periods.

6. Notifications are to include site contract numbers in the event that complaints are to be registered.

7. In addition to the above, the proposed construction works will include all possible and practical mitigation of noise is undertaken. This to include the following:
    a. Toolbox meetings to be undertaken to inform works of their requirement to minimise noise to surrounds as well as periods when construction activities are not to be undertaken.
    b. No playing of radios on the site during the proposed extended hours period.
    c. The delivery of the mobile crane and all materials to the site is to be undertaken during the currently approved construction hours.
    d. The proposed works are to be scheduled to occur on one evening and night time period only. If possible the mobile crane works should be undertaken during a day of the week when there are typically higher background noise levels such as a Thursday or Friday night.
    e. All equipment are to be fitted with 'quacker' type reversing alarms.

Subject to the implementation of suitable management measures and consultation with the surrounding receivers (including those detailed in this report), the resulting noise impact from the proposed use of the mobile crane on the Sutherland Hospital, operating theatre upgrade site will be considered to be acoustically acceptable.

7.3 Construction Noise Management – Qualitative Assessment

Based on the assessment conducted of the expected construction noise levels generated from the use of the mobile crane during the proposed extended hours construction period, the following management controls are required to be included as part of the externed hours working scheme to ensure noise levels to the surrounding receivers include all possible and practical mitigations:

1. All plant and equipment are to be maintained such that they are in good working order.
2. A register of complaints is to be recorded in the event of complaints being received, including location, time of complaint, nature of the complaint and actions resulting from the complaint.
3. A contact number is to be available during the period of works are being conducted such that complaints can be registered, investigated and mitigation undertaken.
4. If required, a noise level measurement of the offending plant item generating complaints is to be conducted and noise mitigations undertaken to reduce noise levels to within noise emission criteria. Alternatively, the equipment/activity is not to be undertaken during the extended hours period
5. Location of the mobile crane to be positioned to include a line of sight barrier from exiting buildings on the site or with the engine facing away from the residence on the Kingsway if possible.
6. All recommended mitigations and controls include in the section above are to be incorporated into the proposed extended works hours for external constriction activities.

Providing the recommended mitigation and management measures detailed in this report are included as part of the proposed use of the mobile crane outside of the normal construction hours, the resulting noise impacts to the surrounding receivers site would be considered to be acoustically acceptable.

7.4 Sleep Disturbance

This section of the report details the relevant sleep disturbance noise level criteria for the assessment of noise emissions from the site during the proposed night-time hours. The assessment of sleep disturbance includes intermittent noise levels from operations such as deliveries and vehicle movements on the site during the proposed night-time working period.

The most recent NSW guidance in relation to sleep disturbance is contained in the NSW EPA's online *Application notes – NSW industrial noise policy*. For the purposes of this assessment a night-time sleep disturbance 'screening criterion' noise goal of RBL +15 dB(A) is applied.

The term 'screening criterion' indicates a noise level that is intended as a guide to identify the likelihood of sleep disturbance. While it is not a firm criterion to be met, where the criterion is met, sleep disturbance is not likely. When the screening criterion is not met, a more detailed analysis is required.

With regard to reaction to potential sleep awakening events, the RNP gives the following guidance:

> From *the research on sleep disturbance to date it can be concluded that:*
>
> - *maximum internal noise levels below 50–55 dBA are unlikely to awaken people from sleep*
> - *one or two noise events per night, with maximum internal noise levels of 65–70 dB(A), are not likely to affect health and wellbeing significantly.*

The EPA's *Industrial Noise Policy for Industry* (NPfI) and the *NSW Road Noise Policy (RNP)* includes suitable criteria for the assessment of potential sleep awakening events, which have been used as the basis of this report.

The NPfI includes the following commentary regarding possible sleep awakening events:

> ***2.5 Maximum noise level event assessment***
>
> *The potential for sleep disturbance from maximum noise level events from premises during the night-time period needs to be considered. Sleep disturbance is considered to be both awakenings and disturbance to sleep stages.*
>
> *Where the subject development/premises night-time noise levels at a residential location exceed:*
>
> - $L_{Aeq,15min}$ *40 dB(A) or the prevailing RBL plus 5 dB, whichever is the greater, and/or*
> - L_{AFmax} *52 dB(A) or the prevailing RBL plus 15 dB, whichever is the greater,*
>
> *A detailed maximum noise level event assessment should be undertaken.*
>
> *The detailed assessment should cover the maximum noise level, the extent to which the maximum noise level exceeds the rating background noise level, and the number of times this happens during the night-time period. Some guidance on possible impact is contained in the review of research results in the NSW Road Noise Policy.*

The RNP includes the following comments regarding sleep disturbance:

> *From the research on sleep disturbance to date it can be concluded that:*
>
> - *maximum internal noise levels below 50–55 dB(A) are unlikely to awaken people from sleep*
> - *one or two noise events per night, with maximum internal noise levels of 65–70 dB(A), are*
>
> *not likely to affect health and wellbeing significantly.*

Based on the relevant standards detailed above, a summary of the sleep disturbance noise level criteria is detailed in the following table.

Table 11 – Sleep Disturbance Criteria

Type of Receiver	Location	Policy	Description	Background Noise level at 6am	Resulting Maximum Noise Level
Residential Receiver	External Noise levels	Noise Policy for Industry	The potential for sleep disturbance from maximum noise level events	39 dB(A) L $L_{90,15min}$	$L_{Aeq,15min}$ 44 dB(A) Externally
					L_{AFmax} 54 dB(A) Externally
	Within the residential dwelling	Road Noise Policy	1 or 2 events unlikely to awaken people from sleep		65-70 dB(A) Lmax Internally
			Maximum internal noise unlikely to awaken people from sleep		50-55 dB(A) Lmax Internally

Based on the details included within the NPfI and the RNP, in the event a noise level of 54 dB(A) L_{max} or 44 $L_{Aeq\ 15\ min}$ does not occur externally at the residential receiver as a result of the use of the operation of the property (internally within the residential receiver) then noise levels are *unlikely to awaken people from sleep,* and compliance with the requirements of the NPfI and the RNP regarding sleep disturbance would be achieved.

Based on the proposed use of the mobile crane during the extended hours period, an assessment of the potential for maximum noise level events has been undertaken. The assessment includes the potential for maximum noise level events on the site within the closest proximity to neighbours opposite the site.

The assessment of maximum noise levels occurring on the proposed development included noise generated as part of the proposed extended hours period.

The assessment of the screening criteria has been undertaken for external noise levels, which is included in the sample calculation below.

Table 12 – Maximum Noise level events Screening Criteria to Residential Receivers (externally)

	Descriptor
Noise Source	Use of the mobile crane and materials movement
Noise Source level	105 dB(A) L_{Max}
Distance Correction (80m)	-46 dB
Barrier Corrections	-5 dB
Resulting External Noise Level	54 dB(A) L_{AFmax}
Screening Noise Level –	54 dB(A) L_{AFmax}

Based on the predicted noise levels above the proposed noise levels resulting from the use of the mobile crane and associated events during the extended hours period are not expected to result in noise levels which will impact sleep disturbance of the surrounding residential receivers.

8 COMMUNITY ENGAGEMENT

Prior to the commencement of the proposed use of the mobile crane outside of normal working hours it is required to engage in community interaction. The community interaction and notification should include the following:

1. Notification of the proposed works to be undertaken on the site and the periods when works will be conducted, including information regarding the programme of works such as demolition and excavation. Notification of the works is to be undertaken at the following locations:
    a. Residential receivers located on Kingsway including the residential dwellings located at 437 to 425B the Kingsway inclusively.
2. Details of the relevant site representative where complaints can be registered.
3. Details of the methodology to respond to complaints raised from the surrounding receivers.
4. A register of complaints, to be kept on site including record of time and nature of the complaint as well as the outcomes and comments regarding investigations resulting from the complaint.
5. Details of a site representative and contact numbers in the event of a complaint should be included on the perimeter of the site.
6. Communication is required to be undertaken using letter drops or registered email no less than 1 week prior to the works being undertaken.

9 NOISE AND VIBRATION MONITORING

As part of the management of noise and vibration during the proposed extended hours period the following noise and vibration measurements are recommended to be undertaken:

1. Noise –
    a. Attended noise level measurements of at the commencement of the use of the mobile crane is required to confirm noise level are within the expected levels included in this report.
    b. The attended noise monitoring is to be undertaken at a representative location to the residential receivers located on the Kingsway at 437 to 425B the Kingsway inclusively.
2. Vibration monitoring – based on the proposed activities to be conducted on the location of the site, vibration monitoring is not proposed for the works to be conducted during the extended hours period.

10 COMPLIANT REGISTER

Up to 54All complaints should be investigated by the Contractor in accordance with the procedures outlined in Australia Standard 2436-2010. Consequently, a complaint response procedure should be implemented. Information to be gathered as part of this process should include:

- location of complainant
- time/s of occurrence of alleged noise or vibration impacts
- nature of impact particularly with respect to vibration
- Perceived source
- Prevailing weather conditions and similar details that could be utilised to assist in the investigation of the complaint.

All resident complaints will be responded to in the required timeframe and action taken recorded.

11 CONCLUSION

This report details the construction noise and vibration assessment of the proposed use of the mobile crane and associated materials movement outside of the normal construction hours as part of the Sutherland Hospital, Operating Theatre Upgrade project. The Assessment includes the potential noise impacts from the proposed use of the mobile crane, during the one evening and night when the use of the mobile crane is proposed.

An assessment of noise and vibration impacts from the required processes to be undertaken during the extended working hours period has been completed and recommendations, including noise mitigations and community engagement, have been presented in this report.

Providing the recommended mitigation and management measures detailed in this report are included as part of the proposed use of the mobile crane outside of the normal construction hours, the resulting noise impacts to the surrounding receivers site would be considered to be acoustically acceptable.

For any additional information please do not hesitate to contact the person below.

Regards

Ben White
Director

Pulse White Noise Acoustics

12 APPENDIX A: ACOUSTIC GLOSSARY

The following is a brief description of the acoustic terminology used in this report:

Ambient Sound	The totally encompassing sound in a given situation at a given time, usually composed of sound from all sources near and far.
Audible Range	The limits of frequency which are audible or heard as sound. The normal ear in young adults detects sound having frequencies in the region 20 Hz to 20 kHz, although it is possible for some people to detect frequencies outside these limits.
Character, acoustic	The total of the qualities making up the individuality of the noise. The pitch or shape of a sound's frequency content (spectrum) dictate a sound's character.
Decibel [dB]	The level of noise is measured objectively using a Sound Level Meter. The following are examples of the decibel readings of every day sounds; 0dB the faintest sound we can hear 30dB a quiet library or in a quiet location in the country 45dB typical office space. Ambience in the city at night 60dB Martin Place at lunch time 70dB the sound of a car passing on the street 80dB loud music played at home 90dB the sound of a truck passing on the street 100dBthe sound of a rock band 115dBlimit of sound permitted in industry 120dBdeafening
dB(A)	A-weighted decibels The ear is not as effective in hearing low frequency sounds as it is hearing high frequency sounds. That is, low frequency sounds of the same dB level are not heard as loud as high frequency sounds. The sound level meter replicates the human response of the ear by using an electronic filter which is called the "A" filter. A sound level measured with this filter switched on is denoted as dB(A). Practically all noise is measured using the A filter. The sound pressure level in dB(A) gives a close indication of the subjective loudness of the noise.
Frequency	Frequency is synonymous to pitch. Sounds have a pitch which is peculiar to the nature of the sound generator. For example, the sound of a tiny bell has a high pitch and the sound of a bass drum has a low pitch. Frequency or pitch can be measured on a scale in units of Hertz or Hz.
Loudness	A rise of 10 dB in sound level corresponds approximately to a doubling of subjective loudness. That is, a sound of 85 dB is twice as loud as a sound of 75 dB which is twice as loud as a sound of 65 dB and so on
LMax	The maximum sound pressure level measured over a given period.
LMin	The minimum sound pressure level measured over a given period.

L1	The sound pressure level that is exceeded for 1% of the time for which the given sound is measured.
L10	The sound pressure level that is exceeded for 10% of the time for which the given sound is measured.
L90	The level of noise exceeded for 90% of the time. The bottom 10% of the sample is the L90 noise level expressed in units of dB(A).
Leq	The "equivalent noise level" is the summation of noise events and integrated over a selected period of time.
dB (A)	'A' Weighted overall sound pressure level
Sound Pressure Level, LP dB	A measurement obtained directly using a microphone and sound level meter. Sound pressure level varies with distance from a source and with changes to the measuring environment. Sound pressure level equals 20 times the logarithm to the base 10 of the ratio of the rms sound pressure to the reference sound pressure of 20 micro Pascals.
Sound Power Level, Lw dB	Sound power level is a measure of the sound energy emitted by a source, does not change with distance, and cannot be directly measured. Sound power level of a machine may vary depending on the actual operating load and is calculated from sound pressure level measurements with appropriate corrections for distance and/or environmental conditions. Sound power levels is equal to 10 times the logarithm to the base 10 of the ratio of the sound power of the source to the reference sound power of 1 picoWatt

APPENDIX C- Neighbour Notification

HINDMARSH
Construction

xx May 2022

RE: OUT OF HOURS WORKS- Monday 25th May 2022 between 6:00pm and 6:00am

Dear Local Resident,

Hindmarsh Construction have been given approval to perform works out of the approved SSDA hours for the date and time as noted above.

Hindmarsh Construction would like to take this opportunity to notify you that works will entail setting up a mobile crane and delivery of mechanical plant on the existing hospital plant room. The works are required to be completed out of hours due to having to maintain operation of the existing main entrance to the hospital during normal hours.

Residents may hear some low-level noise impacts of the crane in works and 'quakers' from the truck movements around the site shown below.

If you have any complaints or issues during the out of hours works mentioned above and below. Please call the complaint hotline on 0414 899 334.

The work area is as shown below.

T +61 2 6129 1500
F +61 2 6247 8898
65 Constitution Avenue
Campbell ACT 2612

T +61 2 9274 1100
F +61 2 6247 8898
Level 27, 100 Miller St
North Sydney NSW 2060

T +61 7 3259 2000
F +61 2 6247 8898
Level 2, 31 Musk Ave
Kelvin Grove QLD 4059

T +61 8 8228 4188
F +61 2 6247 8898
57 Wyatt Street
Adelaide SA 5000

Hindmarsh Construction Australia Pty Ltd ABN 15 126 578 176

If, however, there are any issues that would like to be raised, please feel free to contact Andrew Barkby, Senior Site Manager, on 0414 899 334 or 02 9274 1100 or email the project team at SESLHD-Sutherland-HospitalRedevelopment@health.nsw.gov.au We thank you in advance for your patience and understanding.

Yours Sincerely

Andrew Barkby
Senior Site Manager