Torpedo Factory Renewal Project

Sub Base Platypus

Construction Noise and Vibration Management Sub Plan (CNVMP)

Taylor Construction Group Pty Ltd

Report number: 220188-Torpedo Factory-CNVMP-R3
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1 INTRODUCTION

Pulse White Noise Acoustics (PWNA) has been engaged by Taylor Construction Group Pty Ltd to prepare a Construction Noise and Vibration Management Plan (CNVMP) for the construction works to be undertaken as part of the of the Harbour Trust's Torpedo Factory Renewal project as part of the Sub Base Platypus site located at 120 High Street, North Sydney.

This CNVMP has been prepared to satisfy the requirements of Condition 7 of the consent given in the Planning Permit and Conditions, dated 12th May, 2021.

Onsite unattended noise levels have previously been determined for the project by Benbow Environmental *Noise Management Plan for Sydney Harbour Federation Trust Public Domain and Access Improvements: and Refurbishments of Selected Buildings – Platypus Renewal Project, North Sydney* submitted as part of the project approvals with reference 171067-02_NMP_Rev 5 and dated July 2017. The background noise survey undertaken at the side as part of the acoustic assessment have been used as the basis of this assessment.

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

1.1 Development Overview

The works to be undertaken as part of the renewal project includes the site being able to be opened for public access as well as the future use of buildings on the site. Areas of the site which are to undergo construction activities include the following:

1. Demolish the multi-level, harbour-facing portion of the Torpedo Factory building and part of the High Street-facing portion of the Torpedo Factory, to create:
    a. A new park on the foreshore focussed on First Nations Interpretation.
    b. A welcoming entry forecourt at High Street.
    c. Reveal the sandstone cliff beneath the factory building

2. Adaptively re-use the retained portion of the Torpedo to:
    a. Interpret the heritage values of the factory building and site.
    b. Provide public domain spaces.
    c. Provide public and visitor access including pedestrian connections and car parking.
    d. Create an 'Interpretation Walk' to interpret the site's multi-layered history

3. Interpret the site's multi-layered history - First Nation interpretation and recognition for the Cammeraygal people; and the defence heritage of Sub Base Platypus.

Details of the proposed construction activities to be undertaken on the site are included in the *Construction Management Plan*. The period of the proposed construction activities include a period of 12 months which are summarised below:

1. Project Commencement June 2022.

2. Demolition works occurring from June 2022 to the end of September 2022.

3. Clifftop terrace and carpark works September 2022 to December 2022.

4. Forecourt and pedestrian concourse commencement December 2022.

5. Landscaping of foreshore areas December 2022 to January 2023.

The proposed works to be undertaken as part of the demolition phase of the project is detailed in DECC *Demolition Control Plan* which is included in Appendix D.

Figure 1 Project Site Plan

1.2 Site Layout

The site is located at the Sub Based Platypus at 120 High Street, North Sydney. The site is located with the North Sydney Council local government area which includes an area which includes a typical suburban area of North Sydney. The site is bound by High Street to the south, Neutral Harbour to the north and exiting residential receivers to the west, south and north (opposite on Neutral Harbour) as well as industrial/commercial receivers to the north opposite on Neutral Harbour.

The nearest sensitive receivers to the site are identified below.

Receiver Location 1: Residential dwellings located to the north of the site opposite Neutral Harbour within Neutral Bay.

Receiver Location 2: Residential dwellings located to the west of the site including those located on Adderstone Avenue and Kiara Close.

Receiver Location 3: Residential dwellings located to the south of the site located on Kiara Close and High Street.

Receiver Location 4: Residential dwellings located to the south east of the site on High Street.

Receiver Location 5: Industrial Receiver located to the north of the site opposite Neutral Harbour.

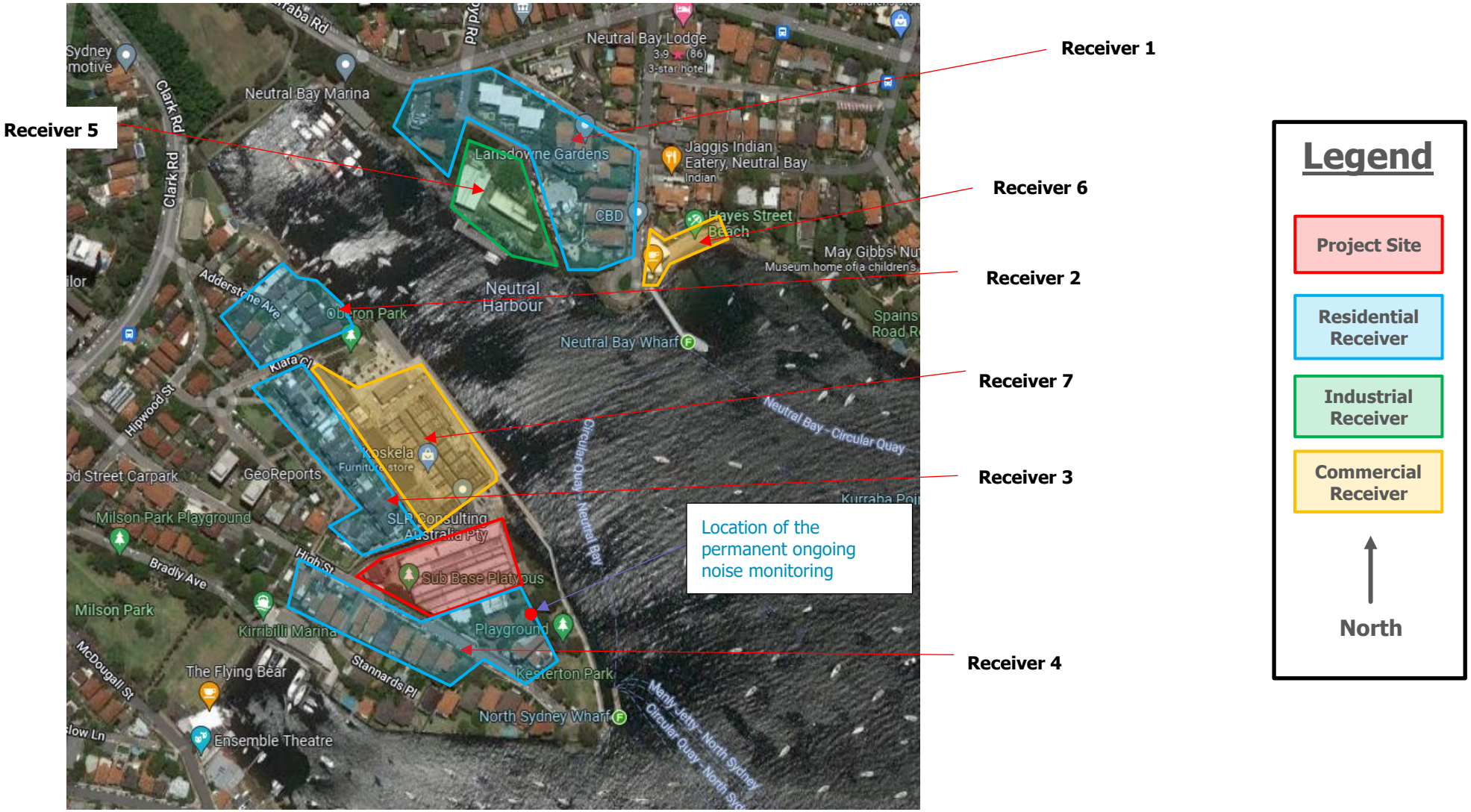
Receiver Location 6: Commercial Receiver located to the north of the site opposite Neutral Harbour.

Receiver Location 7: Commercial receivers located to the west of the site within the Subbase Platypus Precinct.

A map showing the site location as well as nearest receivers is provided in Figure 2 below.

The location of the permanent ongoing noise monitoring is also include in the figure below.

Figure 2 Site Map, Measurement Locations and Surrounding Receivers – Sourced from SixMaps



2 EXISTING ACOUSTIC ENVIRONMENT

Measured noise levels from the onsite acoustic survey undertaken by Benbow Environmental *Noise Management Plan for Sydney Harbour Federation Trust Public Domain and Access Improvements: and Refurbishments of Selected Buildings – Platypus Renewal Project, North Sydney* submitted as part of the project approvals with reference 171067-02_NMP_Rev 5 and dated July 20178.

Section 4 (*Project Criteria)* details the relevant background noise levels which have been assessed within the vicinity of the site. A summary of the noise survey undertaken by Benbow Environmental at the representative locations surrounding the site are detailed in the table below.

Table 1 Results of Noise Survey at the Site

Location	Time of Measurement	$L_{Aeq, 15min}$ dB(A)	$L_{A90, 15min}$ dB(A)	Comments
Locations to the North Opposite Neutral Harbour	Daytime periods	45	40	Noise level at the site dominated by vehicle movements on surrounding roadways and general environmental noise
Locations to the west of the site	Daytime periods	52	47	
Locations to the south of the site	Daytime periods	51	46	
Location to the southeast of the site	Daytime periods	49	44	

As part of this assessment an attended noise survey of the site has been undertaken such that the existing background noise level at the site can be characterised. The results of the background noise levels detailed below have been used as the basis of this assessment. The survey included attended noise level measurements at the site, during various times of the day on the 12th May, 2022.

Attended noise level testing was conducted using a Bruel and Kjaer 2236C type meter. The meter was calibrated before and after testing and no significant drift was recorded and in accordance with the acoustic measurement requirements of the Australian Standard AS1055.

The attended and unattended noise locations were selected to obtain suitable noise levels for the assessment of background noise levels ($L_{90\ (t)}$) as well as the existing ambient noise ($Leq_{(t)}$) during the daytime hours at the site. The results of the acoustic survey are detailed in the tables below which have been used as the basis of this assessment.

Table 2 Results of the Attended Noise Survey at the Site

Measurement Location	Time of the Measurement	$L_{Aeq,\ 15min}$ dB(A)	$L_{A90,\ 15min}$ dB(A)	Comments
Locations to the North Opposite Neutral Harbour	2.30pm to 2.45 pm	48	42	Noise resulting from traffic noise on surrounding streets and noise from surrounding land uses
Locations to the west of the site	2.50pm to 3.05 pm	54	48	
Locations to the south of the site	3.10pm to 3.25 pm	50	46	
Location to the southeast of the site	3.30pm to 3.45 pm	51	45	

Note 1: The L_{A90} noise level is representative of the "average minimum background sound level" (in the absence of the source under consideration), or simply the background level.

Note 2: The L_{Aeq} is the energy average sound level. It is defined as the steady sound level that contains the same amount of acoustical energy as a given time-varying sound.

Based on the results of the attended noise testing undertaken at the site and detailed above, the previously completed noise survey at the site is acoustically acceptable and the background noise levels included in the Benbow Environmental *Noise Management Plan for Sydney Harbour Federation Trust Public Domain and Access Improvements: and Refurbishments of Selected Buildings – Platypus Renewal Project, North Sydney* have been used as the basis of this assessment.

3 NOISE AND VIBRATION CRITERIA

Relevant noise and vibration criteria for construction activities are detailed below.

3.1 Notice of Determination

Conditions of the consent which relate to construction noise and or vibration include the consent given in the Planning Permit and Conditions, dated 12th May, 2021 which includes the following:

Condition 7:

7. Construction Noise Management Plan

A detailed Construction Noise Management Plan (CNMP) is to be submitted to the Harbour Trust prior to the commencement of works. The plan is to have regard to the Construction Noise Management Guidelines prepared by Benbow Environmental, dated November 2020 for the Torpedo Factory Renewal Project and must address the following:

a. Clearly indicate sensitive receptors throughout the proposed works
b. Clearly indicate the location of proposed noise monitoring throughout the works
c. Indicate Baseline Monitoring prior to the works or adopt
d. Indicate construction hours of work
e. Indicate proposed Operation Management and Mitigation Measures
f. Indicate site specific controls
g. Indicate where practical compliance with universal work practices
h. Indicate proposed plant and equipment with procedures to minimise and mitigate obtrusive noise
i. Provide details on community notification and complaints procedure. Procedure should

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include:

a. A brief outline of proposed construction activities
b. Proposed times and dates of construction
c. Outline in the Construction Program when noisy works are expected to occur
d. Details on noise mitigation measures
e. Details of the noise complaints procedure
f. Contact details of the nominated community liaison officer

j. Noise Monitoring - During the demolition, on-site and offsite noise monitoring must be conducted by a suitable qualified acoustic consultant during the construction period. Monitoring is to take place during the period predicted to have the highest noise impact (i.e. jackhammering).

Baseline measurements shall be established prior to the commencement of the works. Throughout the works, on-site measurements shall be taken at a reference point from the noise generating activities. Offsite noise monitoring shall be undertaken at the most exposed residential receivers. An independent firm of suitably qualified noise consultants should undertake the noise monitoring program.

An alternative to in-person acoustic measurements is noise monitoring on a continual basis using a noise monitoring system.

Condition 16:

16. Hours of Work

The hours of construction for all works shall be restricted as follows:

- 7am to 5pm, Mondays to Fridays inclusive;
- 8 am to 1 pm Saturday.
- No works on Sundays and public holidays.
- No hammering or sawcutting before 7.30 am Monday to Friday or before 8.30 am on Saturday

Unless otherwise approved, construction vehicles, machinery, goods or materials shall not be delivered to the Sub Base Platypus Precinct outside the approved hours of works.

Construction works are to comply with the NSW Interim Construction Noise Guideline prepared by Department of Environment and Climate Change NSW.

All works are to be undertaken in accordance with the NSW Department of Environment and Conservation Environmental Noise Control Manual – Construction Noise Criteria.

Any changes to Construction Hours, approved by the NSW Government in response to the COVID-19 pandemic, will apply to this project.

Out of hours work permits – In isolated instances, where works cannot be undertaken during the prescribed daytime or evening hours due to legitimate reasons such as pedestrian or worker safety, health or traffic reasons, the appointed principal works contractor must apply to the Harbour Trust for an out of hours work permit, at least 5 days prior to this permit being required.

Condition 30:

30. Construction Noise Management

Construction noise management must be managed in accordance with the approved CNMP and the requirements of **Condition 7** above.

3.2 Construction Noise Criteria

3.2.1 NSW EPA Interim Construction Noise Guideline (ICNG) – DECC 2009

Noise criteria for construction activities are discussed in the *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 residential receivers have been reproduced from the guideline and are listed in the table below.

Table 3 NMLs for quantitative assessment at residences

Time of Day	Noise Management Level $L_{Aeq(15minute)}$[1,2]	How to Apply
Approved construction hours	***"Noise Affected Level"*** 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 $L_{Aeq(15minute)}$ 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 Level" 75 dBA	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.

Table 3 NMLs for quantitative assessment at residences

Time of Day	Noise Management Level $L_{Aeq(15minute)}$[1,2]	How to Apply
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.

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).*

Note 3 *Requirements listed in the table above are in accordance with the Construction Hours listed in Condition C4 and C5.*

Based on the measured background noise levels summarised in section 2, and the NMLs outlined above the construction noise criteria to be used in this assessment are listed in below.

Table 4 NMLs as basis for the acoustic assessment

Receiver Types	NML, dB $L_{Aeq(15minute)}$	
	During Approved Construction Hours	**Outside Standard Hours**
Residential Receivers Location 1	*NAL*[1] of **50 dBA** in addition: *HNAL*[2] of **75 dBA**	RBL + 5dBA (determined if required)
Residential Receivers Location 2	*NAL*[1] of **57 dBA** in addition: *HNAL*[2] of **75 dBA**	RBL + 5dBA (determined if required)
Residential Receivers Location 3	*NAL*[1] of **56 dBA** in addition: *HNAL*[2] of **75 dBA**	RBL + 5dBA (determined if required)
Residential Receivers Location 4	*NAL*[1] of **59 dBA** in addition: *HNAL*[2] of **75 dBA**	RBL + 5dBA (determined if required)

Note 1 *NAL = Noise Affected Level (see Table 3).*

Note 2 *HNAL = Highly Noise Affected Level (see Table 3)*

Table 5 NMLs for quantitative assessment at Industrial/Commercial Receivers

Time of Day	Noise Management Level $L_{Aeq(15minute)}$[1,2]	How to Apply
Approved construction hours	***"Noise Affected Level"*** 70 dBA	The noise affected level represents the point above which there may be some community reaction to noise. • Where the predicted or measured $L_{Aeq(15minute)}$ 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 Level" 75 dBA	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.

3.3 Construction Traffic Noise Criteria

For existing residences and other sensitive land uses affected by additional traffic on existing roads, the NSW *Road Noise Policy (RNP)* states that for noise associated with increased road traffic generated by land use developments, any increase in the total traffic noise level should be limited to 2 dB during both day and night-time periods. An increase of 2 dB represents a minor impact that is considered barely perceptible to the average person.

3.4 Vibration Criteria

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. Refer to further discussion in Section 3.4.1.
- Effects on building contents – where vibration can cause damage to fixtures, fittings and other non-building related objects. Refer to further discussion in Section 3.4.2.
- Effects on building structures – where vibration can compromise the integrity of the building or structure itself. Refer to further discussion in Section 3.4.2.

3.4.1 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 6).
- Impulsive vibration – up to three instances of sudden impact e.g. dropping heavy items, per monitoring period (refer to Table 7).
- Intermittent vibration – such as from drilling, compacting or activities that would result in continuous vibration if operated continuously (refer to Table 8).

Table 6 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 7 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 8 Intermittent vibration impacts criteria ($m/s^{1.75}$) 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

3.4.2 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).

3.4.2.1 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 9 and illustrated in Figure 3.

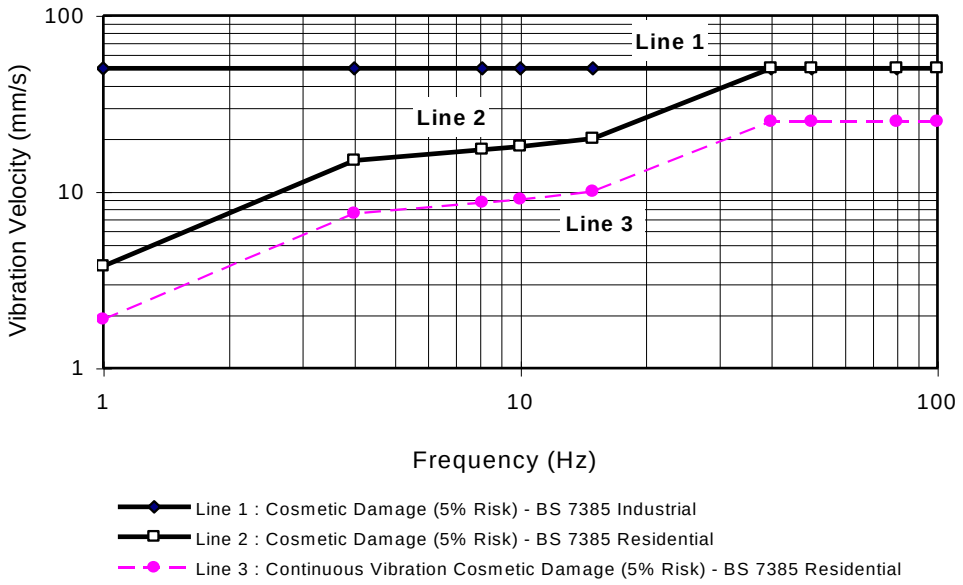
Table 9 Transient vibration criteria as per standard BS 7385 Part 2 - 1993

Line in Figure 3	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 9 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 9 may need to be reduced by up to 50% (refer to Line 3 in Figure 3).

Figure 3 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 9, 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 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 9 should not be reduced for fatigue considerations.

3.4.2.2 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 10. The criteria are frequency dependent and specific to particular categories of structures.

Table 10 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 1: For frequencies above 100Hz, at least the values specified in this column shall be applied.

3.5 Ground-Borne Noise Criteria

According to the NSW EPA *Interim Construction Noise Guideline (*ICNG) 2009, the criteria for ground-borne noise at residences is defined as follows:

- Maximum internal noise levels of 40 dB $L_{Aeq(15mins)}$ between 6:00pm and 10:00pm.

It is noted that the ground borne criteria will apply for construction works undertaken outside of standard hours. That is, work conducted during the evening period Monday to Friday between 6:00pm and 7:00pm only.

4 NOISE AND VIBRATION ASSESSMENT

4.1 Construction Noise Assessment

Sound power levels have been predicted for the construction tasks identified in the project program. The equipment anticipated for use in each task is based on previous project experience. The sound power levels for the equipment likely to be used for each of the listed tasks are provided in Table 11 below.

Table 11 Summary of predicted sound power levels

Tasks	Equipment	Sound Power Levels (dBA re 1pW)	Aggregate Sound Power Level per Task (dBA re 1pW)
Site Establishment Works	Mobile crane	110	113
	Power hand tools	109	
	Semi Rigid Vehicle [1]	105	
Ground Works	Excavator	112	120
	Hydraulic Hammer	118	
	Handheld jack hammer [1]	111	
	Dump truck [1]	104	
	Concrete saw [1]	114	
	Skid steer	110	
	Power hand tools	109	
Structure	Handheld jack hammer [1]	106	117
	Concrete saw [1]	114	
	Power hand tools	109	
	Welder	101	
	Concrete pump truck	110	
	Concrete agitator truck	108	
Internal Works	Power hand tools	109	109
Common and External Works	Concrete agitator truck	108	114
	Saw cutter [1]	104	
	Dump truck [1]	104	
	Concrete saw [1]	114	
	Power hand tools	109	

Note 1: An assumed time correction has been applied, this being 5 minutes of operation in any 15-minute interval.

Table 12 Receiver 1 – Summary of preliminary predicted construction noise levels

Phase	Activity	Aggregate Sound Power Level (dBA re 1pW)	Predicted Individual Noise Level at Receiver dBA $L_{Aeq\ 15\ minutes}$	Predicted Combined Noise Level at Receiver dBA $L_{Aeq\ 15\ minutes}$	Criteria dBA $L_{Aeq\ 15\ minutes}$	Summary of Result
Site Establishment Works	Mobile crane	113	52 to 55	55 to 59	**Standard Construction Hours:** Including approved working hours in the project's conditions of consent. **50** **Highly Noise Affected Level** Including approved working hours in the project's conditions of consent. **75**	Works indicatively predicted to have the potential to exceed the BG+10 dB(A). Noise levels not expected to include levels above the Highly Noise Affected Level of 75dB(A). Mitigations of construction noise required to be undertaken including measures detailed in this report.
	Power hand tools		51 to 54			
	Semi Rigid Vehicle		47 to 51			
Ground Works	Excavator	119	54 to 57	60 to 64		
	Handheld jack hammer		48 to 52			
	Dump truck		46 to 50			
	Concrete saw		56 to 60			
	Skid steer		52 to 55			
	Power hand tools		51 to 54			
Structure	Handheld jack hammer	117	48 to 52	59 to 63		
	Concrete saw		56 to 60			
	Power hand tools		51 to 54			
	Welder		43 to 46			
	Concrete pump truck		52 to 55			
	Concrete agitator truck		50 to 53			
Internal Works	Power hand tools	109	51 to 54	51 to 54		
Common and External Works	Concrete agitator truck	117	50 to 53	58 to 52		
	Saw cutter		46 to 50			
	Dump truck		46 to 50			
	Concrete saw		56 to 60			
	Power hand tools		51 to 547			

Table 13 Receiver 2 – Summary of predicted construction noise levels

Phase	Activity	Aggregate Sound Power Level (dBA re 1pW)	Predicted Individual Noise Level at Receiver dBA $L_{Aeq\ 15\ minutes}$	Predicted Combined Noise Level at Receiver dBA $L_{Aeq\ 15\ minutes}$	Criteria dBA $L_{Aeq\ 15\ minutes}$	Summary of Result
Site Establishment Works	Mobile crane	113	46 to 54	49 to 57	**Standard Construction Hours:** Including approved working hours in the project's conditions of consent. **57** **Highly Noise Affected Level** Including approved working hours in the project's conditions of consent. **75**	Works indicatively predicted to be within the required construction noise management levels at this receiver location.
	Power hand tools		45 to 53			
	Semi Rigid Vehicle		41 to 49			
Ground Works	Excavator	119	48 to 56	44 to 58		
	Handheld jack hammer		42 to 50			
	Dump truck		40 to 48			
	Concrete saw		40 to 58			
	Skid steer		46 to 54			
	Power hand tools		45 to 53			
Structure	Handheld jack hammer	117	42 to 50	43 to 59		
	Concrete saw		40 to 58			
	Power hand tools		45 to 53			
	Welder		37 to 45			
	Concrete pump truck		46 to 54			
	Concrete agitator truck		44 to 52			
Internal Works	Power hand tools	109	45 to 53	45 to 53		
Common and External Works	Concrete agitator truck	117	44 to 52	52 to 59		
	Saw cutter		40 to 58			
	Dump truck		40 to 58			
	Concrete saw		50 to 58			
	Power hand tools		45 to 53			

Table 14 Receiver 3 - Summary of predicted construction noise levels

Phase	Activity	Aggregate Sound Power Level (dBA re 1pW)	Predicted Individual Noise Level at Receiver dBA $L_{Aeq\ 15\ minutes}$	Predicted Combined Noise Level at Receiver dBA $L_{Aeq\ 15\ minutes}$	Criteria dBA $L_{Aeq\ 15\ minutes}$	Summary of Result
Site Establishment Works	Mobile crane	113	62 to 78	65 to 82	**Standard Construction Hours:** Including approved working hours in the project's conditions of consent. **56** **Highly Noise Affected Level** Including approved working hours in the project's conditions of consent. **75**	Works indicatively predicted to have the potential to exceed the BG+10dB(A) and could have the potential to be above the Highly Noise Affected Level (75dB(A)) when working near a receiver. Mitigations of construction noise required to be undertaken including measures detailed in this report.
	Power hand tools		61 to 77			
	Semi Rigid Vehicle		57 to 74			
Ground Works	Excavator	119	64 to 80	70 to 85		
	Handheld jack hammer		58 to 75			
	Dump truck		56 to 73			
	Concrete saw		66 to 83			
	Skid steer		62 to 78			
	Power hand tools		61 to 77			
Structure	Handheld jack hammer	117	58 to 75	69 to 84		
	Concrete saw		66 to 83			
	Power hand tools		61 to 77			
	Welder		53 to 69			
	Concrete pump truck		62 to 78			
	Concrete agitator truck		60 to 76			
Internal Works	Power hand tools	109	61 to 77	61 to 77		
Common and External Works	Concrete agitator truck	117	60 to 76	69 to 84		
	Saw cutter		56 to 73			
	Dump truck		56 to 73			
	Concrete saw		66 to 83			
	Power hand tools		61 to 77			

Table 15 Receiver 4 - Summary of predicted construction noise levels

Phase	Activity	Aggregate Sound Power Level (dBA re 1pW)	Predicted Individual Noise Level at Receiver dBA $L_{Aeq\ 15\ minutes}$	Predicted Combined Noise Level at Receiver dBA $L_{Aeq\ 15\ minutes}$	Criteria dBA $L_{Aeq\ 15\ minutes}$	Summary of Result
Site Establishment Works	Mobile crane	113	56 to 78	59 to 82	**Standard Construction Hours:** Including approved working hours in the project's conditions of consent. **59** **Highly Noise Affected Level** Including approved working hours in the project's conditions of consent. **75**	Works indicatively predicted to have the potential to exceed the BG+10dB(A) and could have the potential to be above the Highly Noise Affected Level (75dB(A)) when working near a receiver. Mitigations of construction noise required to be undertaken including measures detailed in this report.
	Power hand tools		55 to 77			
	Semi Rigid Vehicle		51 to 74			
Ground Works	Excavator	119	58 to 80	64 to 86		
	Handheld jack hammer		52 to 75			
	Dump truck		50 to 73			
	Concrete saw		60 to 83			
	Skid steer		56 to 78			
	Power hand tools		55 to 77			
Structure	Handheld jack hammer	117	52 to 75	63 to 85		
	Concrete saw		60 to 83			
	Power hand tools		55 to 77			
	Welder		47 to 69			
	Concrete pump truck		56 to 78			
	Concrete agitator truck		54 to 76			
Internal Works	Power hand tools	109	55 to 77	55 to 77		
Common and External Works	Concrete agitator truck	117	54 to 76	63 to 85		
	Saw cutter		50 to 73			
	Dump truck		50 to 73			
	Concrete saw		60 to 83			
	Power hand tools		55 to 77			

Table 16 Receiver 5 - Summary of predicted construction noise levels

Phase	Activity	Aggregate Sound Power Level (dBA re 1pW)	Predicted Individual Noise Level at Receiver dBA $L_{Aeq\ 15\ minutes}$	Predicted Combined Noise Level at Receiver dBA $L_{Aeq\ 15\ minutes}$	Criteria dBA $L_{Aeq\ 15\ minutes}$	Summary of Result
Site Establishment Works	Mobile crane	113	46 to 51	49 to 54	**Standard Construction Hours:** Including approved working hours in the project's conditions of consent. **50** **Highly Noise Affected Level** Including approved working hours in the project's conditions of consent. **75**	Works indicatively predicted to have the potential to exceed the BG+10 dB(A). Noise levels not expected to include levels above the Highly Noise Affected Level of 75dB(A). Mitigations of construction noise required to be undertaken including measures detailed in this report.
	Power hand tools		45 to 50			
	Semi Rigid Vehicle		41 to 46			
Ground Works	Excavator	119	48 to 53	54 to 59		
	Handheld jack hammer		42 to 47			
	Dump truck		40 to 45			
	Concrete saw		50 to 55			
	Skid steer		46 to 51			
	Power hand tools		45 to 50			
Structure	Handheld jack hammer	117	42 to 47	53 to 58		
	Concrete saw		50 to 55			
	Power hand tools		45 to 50			
	Welder		37 to 42			
	Concrete pump truck		46 to 51			
	Concrete agitator truck		44 to 49			
Internal Works	Power hand tools	109	45 to 50	45 to 50		
Common and External Works	Concrete agitator truck	117	44 to 49	52 to 57		
	Saw cutter		40 to 45			
	Dump truck		40 to 45			
	Concrete saw		50 to 55			
	Power hand tools		45 to 50			

Table 17 Receiver 6 - Summary of predicted construction noise levels

Phase	Activity	Aggregate Sound Power Level (dBA re 1pW)	Predicted Individual Noise Level at Receiver dBA $L_{Aeq\ 15\ minutes}$	Predicted Combined Noise Level at Receiver dBA $L_{Aeq\ 15\ minutes}$	Criteria dBA $L_{Aeq\ 15\ minutes}$	Summary of Result
Site Establishment Works	Mobile crane	113	54 to 57	57 to 60	**Standard Construction Hours:** Including approved working hours in the project's conditions of consent. **50** **Highly Noise Affected Level** Including approved working hours in the project's conditions of consent. **75**	Works indicatively predicted to have the potential to exceed the BG+10 dB(A). Noise levels not expected to include levels above the Highly Noise Affected Level of 75dB(A). Mitigations of construction noise required to be undertaken including measures detailed in this report.
	Power hand tools		53 to 56			
	Semi Rigid Vehicle		49 to 52			
Ground Works	Excavator	119	56 to 59	62 to 65		
	Handheld jack hammer		50 to 53			
	Dump truck		48 to 51			
	Concrete saw		58 to 61			
	Skid steer		54 to 57			
	Power hand tools		53 to 56			
Structure	Handheld jack hammer	117	50 to 53	61 to 65		
	Concrete saw		58 to 61			
	Power hand tools		53 to 56			
	Welder		45 to 48			
	Concrete pump truck		54 to 57			
	Concrete agitator truck		52 to 55			
Internal Works	Power hand tools	109	53 to 56	53 to 56		
Common and External Works	Concrete agitator truck	117	52 to 55	60 to 64		
	Saw cutter		48 to 51			
	Dump truck		48 to 51			
	Concrete saw		58 to 61			
	Power hand tools		53 to 56			

Table 18 Receiver 7 - Summary of predicted construction noise levels

Phase	Activity	Aggregate Sound Power Level (dBA re 1pW)	Predicted Individual Noise Level at Receiver dBA $L_{Aeq\ 15\ minutes}$	Predicted Combined Noise Level at Receiver dBA $L_{Aeq\ 15\ minutes}$	Criteria dBA $L_{Aeq\ 15\ minutes}$	Summary of Result
Site Establishment Works	Mobile crane	113	56 to 78	59 to 82	**Standard Construction Hours:** Including approved working hours in the project's conditions of consent. **59** **Highly Noise Affected Level** Including approved working hours in the project's conditions of consent. **75**	Works indicatively predicted to have the potential to exceed the BG+10dB(A) and could have the potential to be above the Highly Noise Affected Level (75dB(A)) when working near a receiver. Mitigations of construction noise required to be undertaken including measures detailed in this report.
	Power hand tools		55 to 77			
	Semi Rigid Vehicle		51 to 74			
Ground Works	Excavator	119	58 to 80	64 to 86		
	Handheld jack hammer		52 to 75			
	Dump truck		50 to 73			
	Concrete saw		60 to 83			
	Skid steer		56 to 78			
	Power hand tools		55 to 77			
Structure	Handheld jack hammer	117	52 to 75	63 to 85		
	Concrete saw		60 to 83			
	Power hand tools		55 to 77			
	Welder		47 to 69			
	Concrete pump truck		56 to 78			
	Concrete agitator truck		54 to 76			
Internal Works	Power hand tools	109	55 to 77	55 to 77		
Common and External Works	Concrete agitator truck	117	54 to 76	63 to 85		
	Saw cutter		50 to 73			
	Dump truck		50 to 73			
	Concrete saw		60 to 83			
	Power hand tools		55 to 77			

4.2 Construction Traffic Noise Assessment

It is proposed that the construction traffic would access the site via High Street.

From the criteria discussed in Section 3, it is noted that vehicle numbers on surrounding roads would need to increase by around 60% from existing traffic flows, for a 2 dB increase in road traffic noise to occur. As noted previously, a 2 dB increase in road traffic noise is not considered to be noticeable.

Based on the number of vehicles projected over each of the phases, it is concluded that noise impacts from construction traffic is unlikely to have an impact at the nearest affected properties. As a result, no further assessment is required.

4.3 Vibration Assessment

In order to maintain compliance with the human comfort vibration criteria discussed in Section 3, it is recommended that the indicative safe distances listed in Table 19 should be maintained. These indicative safe distances should be validated at the start of construction works by undertaking measurements of vibration levels generated by construction equipment to be used on site.

Additionally, any vibration levels should be assessed in accordance with the criteria discussed in Section 3. This information should also be included as part of the CNVMSP.

Table 19 Recommended indicative safe working distances for vibration intensive plant

Plant	Rating / Description	Safe Working Distances (m)	
		Cosmetic Damage (BS 7385: Part 2 DIN 4150: Part 3)	Human Comfort (AVTG)
Vibratory roller	< 50 kN (Typically 1 – 2 tonnes)	5	15 – 20
	< 100 kN (Typically 2 – 4 tonnes)	6	20
	< 200 kN (Typically 4 – 6 tonnes)	12	40
	< 300 kN (Typically 7 – 13 tonnes)	15	100
	> 300 kN (Typically more than 13 tonnes)	20	100
Small hydraulic hammer[1]	300 kg, typically 5 – 12 tonnes excavator	2	7
Medium hydraulic hammer[1]	900 kg, typically 12 – 18 tonnes excavator	7	23
Large hydraulic hammer[1]	1600 kg, typically 18 – 34 tonnes excavator	22	73
Jackhammer	Hand held	1	Avoid contact with structure and steel reinforcements

Note 1: The use of pulverisers is proposed rather than concrete hammering where possible.

5 NOISE AND VIBRATION MANAGEMENT PLAN

5.1 Acoustic Management Procedures

5.1.1 Summary of Management Procedures

Table 20 below summarises the management procedures recommended for airborne noise and vibration impact. These procedures are also further discussed in the report. Hence, where applicable, links to further references are provided in Table 20.

Table 20 Summary of mitigation procedures

Procedure	Abbreviation	Description	Further Reference
General Management Measures	GMM	Introduce best-practice general mitigation measures in the workplace which are aimed at reducing the acoustic impact onto the nearest affected receivers.	Refer to Section 5.9 For noise impact, also refer to Section 5.2 For vibration impact, also refer to Section 5.4.1
Project Notification	PN	Issue project updates to stakeholders, discussing overviews of current and upcoming works. Advanced warning of potential disruptions can be included. Content and length to be determined on a project-by-project basis.	Refer to section 5.6
Verification Monitoring	V	Monitoring to comprise attended or unattended acoustic surveys. The purpose of the monitoring is to confirm measured levels are consistent with the predictions in the acoustic assessment, and to verify that the mitigation procedures are appropriate for the affected receivers. If the measured levels are higher than those predicted, then the measures will need to be reviewed and the management plan will need to be amended.	For noise impact, refer to Section 5.3.1 and Section 5.4.2. For vibration impact, refer to Section 5.1.3
Complaints Management System	CMS	Implement a management system which includes procedures for receiving and addressing complaints from affected stakeholders	Refer to Section 5.7
Specific Notification	SN	Individual letters or phone calls to notify stakeholders that noise levels are likely to exceed noise objectives. Alternatively, contractor could visit stakeholders individually in order to brief them in regard to the noise impact and the mitigation measures that will be implemented.	Refer to section 5.1
Respite Offer	RO	Offer provided to stakeholders subjected to an ongoing impact in the event noise levels are above 'hing noise affected' levels.	Refer to section 5.3
Alternative Construction Methodology	AC	Contractor to consider alternative construction options that achieve compliance with relevant criteria. Alternative option to be determined on a case-by-case basis. It is recommended that the selection of the alternative option should also be determined by considering the assessment of on-site measurements (refer to Verification Monitoring above).	-

The application of these procedures is in relation to the exceedances over the relevant criteria. For airborne noise, the criteria are based on NMLs. The allocation of these procedures is discussed in Section 5.1.2

For vibration, the criteria either correspond to human comfort, building damage or scientific and medical equipment. The application of these procedures is discussed in Section 5.1.3.

5.1.2 Allocation of Noise Management Procedures

For residences, the management procedures have been allocated based on noise level exceedances at the affected properties, which occur over the designated NMLs (refer to section 3). The allocation of these procedures is summarised in Table 21 below.

Table 21 Allocation of noise management procedures – residential receivers

Construction Hours	Exceedance over NML (dB)	Management Procedures (see definition above)
Approved Working Hours	0 - 3	GMM
	4 - 10	GMM, PN, V [1], CMS, AC
	> 10	GMM, PN, V [1], CMS, SN, AC
	> 75dBA	GMM, PN, V [1], CMS, SN, AC & RO
Outside Standard Hours	0 - 10	GMM, AC
	11 - 20	GMM, PN, V [1], CMS, AC
	> 20	GMM, PN, V [1], CMS, SN, RO, AC

Notes

1. Verification monitoring to be undertaken upon complaints received from affected receivers

Please note the following regarding the allocation of these procedures:

- The exceedances have been estimated as part of the acoustic assessment, and these are summarised in Section 4.1.
- The allocation of procedures is based on the assumptions used for noise level predictions (refer to Section 4.1). Consequently, these allocations can be further refined once additional details of the construction program become available.

For non-residential receivers (such as commercial), management measures are provided in Section 0.

5.1.3 Allocation of Vibration Management Procedures

Table 22 below summarises the vibration management procedures to be adopted based on exceedance scenarios (i.e., whether the exceedance occurs over human comfort criteria, building damage criteria, or criteria for scientific and medical equipment). Please note these management procedures apply for any type of affected receiver (i.e., for residences as well as non-residential receivers).

Table 22 Allocation of vibration management procedures

Construction Hours	Exceedance Scenario	Management Procedures
Approved Working Hours	Over human comfort criteria (refer to Section 3)	GMM, PN, V [1], RO
	Over building damage criteria (refer to Section 3)	GMM, V [1], AC
Outside Standard Hours	Over human comfort criteria (refer to Section 3)	GMM, SN, V [1], RO, CMS
	Over building damage criteria (refer to Section 3)	GMM, V [1], AC

Notes

1. Verification monitoring to be undertaken upon complaints received from affected receivers

5.2 Site Specific Noise Mitigation Measures

5.2.1 General Comments

The contractor will, where reasonable and feasible, apply best practice noise mitigation measures. These measures shall include the following:

- Maximising the offset distance between plant items and nearby noise sensitive receivers.
- Preventing noisy plant working simultaneously and adjacent to sensitive receivers.
- Minimising consecutive works in the same site area.
- Orienting equipment away from noise sensitive areas.
- Carrying out loading and unloading away from noise sensitive areas.

In order to minimise noise impacts during the works, the contractor will take all reasonable and feasible measures to mitigate noise effects.

The contractor will also take reasonable steps to control noise from all plant and equipment. Examples of appropriate noise control include efficient silencers and low noise mufflers.

The contractor should apply all feasible and reasonable work practices to meet the NMLs and inform all potentially impacted residents of the nature of works to be carried out, the expected noise levels, duration of noise generating construction works, and the contact details for the proposal.

5.3 Site Specific Noise Mitigation Measures – High Noise Affected Levels

Predicted noise levels outlined in section 4.1 indicate exceedances above the Noise Management Levels (NMLs) as well as the Highly Noise Affected Level (HNAL) when in proximity to a boundary. To militate against any exceedances, the site will need to introduce periods of respite for activities which are creating noise levels above the HNAL only (i.e. greater than 75dBA). See below.

Table 23 Recommended Respite Periods

Monday to Friday	Saturday
7:00am to 7:30am – No noisy works (No hammering)	8:00am to 8:30am – No noisy works (No hammering)
7:30am to 11:30am – Works	8:30am to 1:00pm – Works
11:30am to 12:30pm – No noisy works (No hammering)	
12:30pm to 4:30pm – Works	
After 4:30pm - No noisy works (No hammering)	

In accordance with the NSW EPA ICNG should continuously noise levels be above 75dBA at a receiver location, respite periods greater than the 45 minutes discussed above are required to be provided. Typically, this responds to for every 3-4hours of work, an hour respite must be provided.

Additionally, no excavation machinery is to operate on Sunday or Public Holidays.

No construction works are to occur on Saturdays (after 1pm) and on Sundays or Public Holidays.

5.3.1 Noise Monitoring

Noise monitoring, if required, will be performed by an acoustical consultant directly engaged by the contractor.

Noise monitoring is recommended to be undertaken by attended noise measurements at the start of any new phase of works (i.e. excavation or remediation works etc.). The statistical parameters to be measured should include the following noise descriptors: L_{Amin}, L_{A90}, L_{A10}, L_{A1}, L_{Amax} and L_{Aeq}. Unattended noise measurements should be conducted over consecutive 15 minute periods.

This monitoring should also be complemented by undertaking attended noise measurements in order to:

- Differentiate between construction noise sources and other extraneous noise events (such as road traffic and aircraft noise)
- Note and identify any excessive noise emitting machinery or operation.

In addition, should any complaints be received which have not been determined previously, it should be confirmed by conducting additional noise measurements.

The survey methodology and any equipment should comply with the requirements discussed in Standard AS 1055.1-1997.

5.3.2 Alternate Equipment or Process

Exceedance of the site's NMLs should result in an investigation as to whether alternate equipment could be used, or a difference process could be undertaken.

In some cases, the investigation may conclude that no possible other equipment can be used, however, a different process could be undertaken.

5.3.3 Acoustic Enclosures/Screening

Typically, on a construction site there are three different types of plant that will be used: mobile plant (i.e., excavators, skid steers, etc.), semi mobile plant (i.e., hand tools generally) or static plant i.e. (diesel generators).

For plant items which are static it is recommended that, in the event exceedances are being measured due to operation of the plant item, an acoustic enclosure/screen is constructed to reduce impacts. These systems can be constructed from Fibre Cement (FC) sheeting or, if airflow is required, acoustic attenuators or louvres.

For semi mobile plant, relocation of plant should be investigated to either be operated in an enclosed space or at locations away from a receiver.

With mobile plant it is generally not possible to treat these sources. However, investigations into the machine itself may result in a reduction of noise (i.e., mufflers/attenuators etc).

5.3.4 Piling

Piling is not required to be used on the site.

5.3.5 Site Cranes (Permeant)

Permanent cranes are not proposed as part of the works on the site.

5.4 Site Specific Vibration Mitigation Measures

5.4.1 General Comments

As part of the CNVMP, the following vibration mitigation measures should be implemented:

- Any vibration generating plant and equipment is to be in areas within the site in order to lower the vibration impacts.
- Investigate the feasibility of rescheduling the hours of operation of major vibration generating plant and equipment.
- Use lower vibration generating items of construction plant and equipment; that is, smaller capacity plant.
- Minimise conducting vibration generating works consecutively in the same area (if applicable).
- Use only dampened rock breakers and/or "city" rock breakers to minimise the impacts associated with rock breaking works.
- Conduct attended measurements of vibration generating plant at commencement of works in order to validate the indicative safe working distances advised in Table 19 and, consequently, to establish safe working distances suitable to the project. Measurements should be conducted at the nearest affected property boundary. These safe working distances should be defined by considering the vibration criteria discussed in Section 3 (i.e., criteria for structural damage, human comfort and impact to scientific or medical equipment).

  Construction appliances can be undertaken on the site within the recommended safe work distances providing vibration generated by the proposed activities are within the project vibration criteria as detailed in Section 4.3 of this report.

5.4.2 Vibration Monitoring

Vibration monitoring will be undertaken at the nearest most affected structures and include the following:

1. Attended vibration surveys resulting from high vibration generating activities which are within the recommended safe working distances detailed in Table 19 above. Vibration assessments should include attended vibration measurements of proposed activities to be undertaken on the site.

The vibration monitoring equipment would be operated and analysed by the acoustical consultant.

Reports of the measured vibration levels and their likely impacts would be prepared by the acoustical consultant and issued to the contractor.

All vibration measurements are to be undertaken in accordance with the methodologies outlined in British Standard 7385-1:1990 Evaluation and measurement for vibration in buildings, DIN V 4150-1 Vibrations in Building; Influence on Persons in Buildings and DIN 4150-1 Effects On Structures.

The monitoring location would be on a stiff part of the structure (at the foundation) on the side of the structure adjacent to the subject works, or in a suitable location at the site boundary.

5.5 Noise and Vibration Monitoring

As part of the management of noise from the proposed construction activities to be undertaken on the site the following noise and vibration monitoring is to be undertaken:

1. Noise Monitoring–

    a. Permanent noise monitoring location, monitoring will be undertaken at representative location of construction activities such that construction noise impacts can eb assessed. The noise monitor will be located at a representative location based on the activities being undertaken on the site and could be relocated at various stages of the construction period based on the zone where works are being conducted.

    The monitor will include remote access for downloading, reporting of the results of monitoring will be undertaken on a monthly basis.

    b. Attended noise monitoring of excavation and construction activities is to be undertaken during the following periods:
        i. Commencement of any rock breaking or sawing on the site within close proximity to residential receiver locations 2, 3 or 4.
        ii. Monthly site surveys for the period of construction being undertaken on the site. Attended noise monitoring to include measurements at the affected residential receivers during periods which are coordinated with the builder to include periods when typical construction works are being undertaken on the site.
        iii. In response to any ongoing complaints received from neighbours.

2. Vibration – Based on the proximity of the surrounding receivers to the works magnitudes of vibration resulting from construction activities required to be undertaken on the site are not expected to approach vibration limits detailed in Section 3.4 of this report.

    Attended vibration monitoring is to be undertaken at the following periods:
    a. Commencement of any high vibration generating activities including hydrail hammering, rock breaking or vibration rolling on the site within close proximity of residential receiver locations 2, 3 or 4.
    b. receiver location in the event complaints resulting from construction activities resulting from the perception of vibration are experienced by the occupants of buildings within the vicinity of the site.

5.6 Community Consultation

Active community consultation and the maintenance of positive relations with local residents and businesses would assist in alleviating concerns and thereby minimising complaint. It is common for construction projects to provide community consultation if an exceedance of noise goals has been predicted. This communication is commonly conducted in the form of a letter box drop or more active engagement with more highly impacted receivers.

This form of notification should provide specific notification of the duration and timing of the construction activities so that residents are informed about the proposed works ahead of time. The letter should also provide the community with a hotline number for a community liaison officer available to adequately respond to all project related enquiries.

Ideally the hotline number should provide concerned locals an opportunity to raise any concerns with the project proponent and provide an opportunity to determine the best method to satisfy all requirements.

The communication, however, should not be limited to the beginning of the onsite works but throughout, providing the community with constant updates on the progress and upcoming works. In our experience these could include:

- Site noticeboard;
- Email notifications; and
- Letterbox drops.

5.7 Complaints Management System

Any complaints can be registered using the *Community Liaison Officer* using either online functions or phone numbers including the following:

1. Community Liaison Officer relating to site operations (including noise)– Site Manager Marcus Borchert 0438 365 652 (24hrs)
2. Sydney Harbour Federation Trust General Enquiries 02 8969 2100 (active during office hour)

Should complaints arise they must be dealt with in a responsible and uniform manner, therefore, a management system to deal with complaints is detailed below:

Local residents and land owners should be informed by direct mail of a direct 24-hour telephone line where any noise complaints related to the construction will be recorded. The 24-hour telephone line number will be made available on the construction site signage.

All 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.

Post receiving a noise and or vibration complaint, the process outlined in the *Contingency Plans* below should be undertaken.

A Noise and Vibration Checklist regarding the process which will be undertaken in the event of a compliant in included in Appendix C.

5.8 Contingency Plans

Contingency plans are required to address noise or vibration problems if excessive levels are measured at surrounding sensitive receivers and/or if justified complaints occur. Such plans include:

- Stop the onsite works.
- Identify the source of the main equipment within specific areas of the site which is producing the most construction noise and vibration at the sensitive receivers; and
- Review the identified equipment and determine if an alternate piece of equipment can be used or the process can be altered.
- In the event an alternate piece of equipment or process can be used, works can re-commence.
- In the event an alternate piece of equipment or process cannot be determined implement a construction assessment to be performed by a suitably qualified acoustic consultant.

The Superintendent shall have access to view the Contractor's noise measurement records on request. The Superintendent may undertake noise monitoring if and when required.

5.9 General Mitigation Measures (Australia Standard 2436-2010)

As well as the above project specific noise mitigation controls, AS 2436-2010 "*Guide to Noise and Vibration Control on Construction, Demolition and Maintenance Sites*" sets out numerous practical recommendations to assist in mitigating construction noise emissions. Examples of strategies that could be implemented on the subject project are listed below, including the typical noise reduction achieved, where applicable.

5.9.1 Adoption of Universal Work Practices

- Regular reinforcement (such as at toolbox talks) of the need to minimise noise and vibration.
- Regular identification of noisy activities and adoption of improvement techniques.
- Where possible, avoiding the use of equipment that generates impulsive noise.
- Minimising the need for vehicle reversing for example (particularly at night), by arranging for one-way site traffic routes.
- Use of broadband audible alarms on vehicles and elevating work platforms used on site.
- Minimising the movement of materials and plant and unnecessary metal-on-metal contact.
- Minimising truck movements.

5.9.2 Plant and Equipment

- Choosing quieter plant and equipment based on the optimal power and size to most efficiently perform the required tasks.
- Selecting plant and equipment with low vibration generation characteristics.
- Operating plant and equipment in the quietest and most efficient manner.

5.9.3 On Site Noise Mitigation

- Maximising the distance between noise activities and noise sensitive land uses.
- Installing purpose-built noise barriers, acoustic sheds and enclosures.

5.9.4 Work Scheduling

- Provide a restriction of very noisy activities to time periods that least affect the nearby noise sensitive locations, restricting the number of nights that after-hours work is conducted near residences or by determining any specific requirements.
- Scheduling work to coincide with non-sensitive periods.
- Planning deliveries and access to the site to occur quietly and efficiently and organising parking only within designated areas located away from the sensitive receivers.
- Optimising the number of deliveries to the site by amalgamating loads where possible and scheduling arrivals within designated hours.
- Including contract conditions that include penalties for non-compliance with reasonable instructions by the principal to minimise noise or arrange suitable scheduling.

5.9.5 Source Noise Control Strategies

Some ways of controlling noise at the source are:

- Where reasonably practical, noisy plant or processes should be replaced by less noisy alternatives.
- Modify existing equipment: Engines and exhausts are typically the dominant noise sources on mobile plant such as cranes, graders, excavators, trucks, etc. In order to minimise noise emissions, residential grade mufflers should be fitted on all mobile plant utilised on site.
- Siting of equipment: locating noisy equipment behind structures that act as barriers, or at the greatest distance from the noise-sensitive area; or orienting the equipment so that noise emissions are directed away from any sensitive areas, to achieve the maximum attenuation of noise.
- Regular and effective maintenance.

5.9.6 Miscellaneous Comments

Deliveries should be undertaken, where possible, during standard construction hours.

Maximise hammer penetration (and reduce blows) by using sharp hammer tips. Keep stocks of sharp profiles at site and monitor the profiles in use.

It is advised that mobile plant and trucks operating on site for a significant portion of the project are to have reversing alarm noise emissions minimised. This is to be implemented subject to recognising the need to maintain occupational safety standards.

No public address system should be used on site (unless emergency evacuation system).

5.9.7 Project Construction Management Plan

Construction works will be undertaken in accordance with the specific requirements of the site including the projects *Construction Management Plan.*

6 CONCLUSION

Pulse White Noise Acoustics (PWNA) has been engaged by Taylor Construction Group Pty Ltd to prepare a Construction Noise and Vibration Management Plan (CNVMP) for the construction works to be undertaken as part of the of the Harbour Trust's Torpedo Factory Renewal project as part of the Sub Base Platypus site located at 120 High Street, North Sydney.

This CNVMP has been prepared to satisfy the requirements of Condition 7 of the consent given in the Planning Permit and Conditions, dated 12th May, 2021.

An assessment of noise and vibration impacts from the required processes to be undertaken during the construction period of the project (including excavation and construction) has been undertaken and suitable treatments, management controls, perioding measurements and community engagement has been detailed in this report.

Providing the recommendations in this report are included in the construction of the site, compliance with the relevant EPA's Interim Construction Noise Guideline Objectives and Item 7 of the projects *Conditions of Consent* can be achieved.

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

Regards

Ben White
Director

APPENDIX A – GLOSSARY OF TERMS

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 100dB the sound of a rock band 115dB limit of sound permitted in industry 120dB deafening
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 L_{90} 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 B – AUTHOR CURRICULUM VITAE (CV)

Curriculum Vitae – Benjamin White

Employment Experience:

Director – Pulse White Noise Acoustics:	November 2020 – Present
Director - White Noise Acoustics:	March 2019 – Present
Director/Engineer - Acoustic Logic Consultancy:	March 2001 – July 2018

Experience:

Ben White the Director of White Noise has over 17 years of experience in acoustic.

Ben has significant experience in providing acoustic services and expert advice in the following areas:

- Residential acoustic reports including aircraft noise (AS2021) assessments, traffic noise, train noise and vibration assessments.
- Noise emission assessments for various projects including assessments with planning requirements using EPA, Department of Planning, Council DCP's and similar regulatory requirements.
- Planning approvals including Development Applications for multi dwelling residential developments, commercial developments, hotels and boarding houses, places of entertainment, carparks, mixed use developments, shopping centres and the like.
- Expert court witness including Land and Environment Court and other expert witness work.
- Project planning and specifications for types of projects including residential, commercial, retail, hotel accommodation, warehouses and industrial developments and mixed-use projects.
- Project delivery for all types of projects including, design advice and project delivery requirements at all stages of projects during design and construction.
- Certification works including on site testing for the provision of certification of all types of projects including items required to comply with Part F5 of the BCA as well as project specific acoustic requirements.
- Mechanical design and advice for the treatments of mechanical services with project requirements.
- External façade design and specification.
- Specialised acoustic design advice including areas of projects.
- Issues with existing building include site surveys and audits as well as advice regarding rectification if required.

APPENDIX C – NOISE AND VIBRATION INVESTIGATION CHECKLIST

Noise & Vibration Investigation Checklist

220188-Torpedo Factory- N+V Checklist

Pulse White Noise Acoustics (PWNA) have prepared the following noise and vibration investigation checklist to assist the onsite construction team in investigation any received noise and vibration complaint or identifying an exceedance over the management levels. This checklist should be completed in conjunction with the *Construction Noise Vibration Management Plan* prepared by PWNA.

Should any noise and vibration complaint be received, the contractor must complete the following steps:

Exceedance/Complaint Information

Complaint reference number:.....

Date Received: .....

Location of Complaint: .....

Complainant Contact Details:.....

Step	Task	Completed Response
1	Pause onsite works	
2	Identify the main source(s) construction noise and/or vibration within specific areas of the site which is impacting the most at the sensitive receiver.	
3	Review the identified equipment and determine if an alternate piece of equipment can be used or the process can be altered. ***(If no, skip to step 5)***	
4	In the event an alternate piece of equipment or process can be used, works can re-commence incorporating possible and practical mitigation measures.	
5	In the event an alternate piece of equipment or process cannot be determined implement a construction assessment to be performed by a suitably qualified acoustic consultant. This may include additional respite periods.	

PULSE WHITE NOISE ACOUSTICS Level 5, 73 Walker 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

7 APPENDIX D – DECC, DEMOLITION CONTROL PLAN

DECC

DEMOLITION • ENVIRONMENTAL • CIVIL • CONTRACTORS

DECC HEALTH SAFETY & ENVIRONMENTAL MANAGEMENT SYSTEM

DEMOLITION CONTROL PLAN

HMAS Platypus Sub-Base
120 High Street
North Sydney NSW 2060

PROJECT DETAILS

PROJECT NAME	:	HMAS PLATYPUS DEMOLITION WORKS
CLIENT NAME	:	TAYLOR CONSTRUCTION GROUP
PROJECT ADDRESS	:	120 HIGH STREET, NORTH SYDNEY NSW 2060
DOCUMENT NUMBER	:	DCP – 001 DEMOLITION CONTROL PLAN

PREPARED BY (PROJECT MANAGER)	:	***NAME:*** Ivan Lim	***SIGNATURE:***	***DATE:***
AUTHORISED BY (STATE GENERAL MANAGER)	:	***NAME:*** Frank Lombardi	***SIGNATURE:***	***DATE:***
PROJECT MANAGER (RESPONSIBLE FOR IMPLEMENTATION)	:	***NAME:*** Ivan Lim	***SIGNATURE:***	***DATE:***
SITE FOREMAN (APPROVED FOR USE ON SITE)	:	***NAME:*** Jim Pavone ***NAME:*** Matthew Penitani	***SIGNATURE:***	***DATE:***

DOCUMENT CONTROL					
No.	USER	POSITION	VERSION No.	DATE REVISED	COMMENTS
1	Ivan Lim	Project Manager	1	29/04/22	Issued for Initial Review
2	Ivan Lim	Project Manager	2	04/05/22	Issued for Approval

Distribution List

Controlled versions of this WHS Management Plan have been issued to the persons listed below.

No.	USER	POSITION	VERSION No.	DATE
1	Adam Vassallo	Taylor Construction – Project Manager	2	04/05/22
2	Ben Folkard	Taylor Construction	2	04/05/22
3	Peter Salib	Taylor Construction	2	04/05/22
4	Ash Zeinolabedin	Taylor Construction	2	04/05/22
5	Frank Lombardi	DECC – Director	2	04/05/22
6	Jim Pavone	DECC – Operations Manager	2	04/05/22
7	Blair Fowler	DECC – WHS Manager	2	04/05/22
8	Aimee-Lee Bohan	DECC – WHS Advisor	2	04/05/22
9	Ivan Lim	DECC – Project Manager	2	04/05/22
10	Richard Yan	DECC – Project Engineer	2	04/05/22
11	Matthew Penitani	DECC – Site Manager	2	04/05/22

HEAD OFFICE ADDRESS	CONTACT DETAILS	LICENCES
Unit: 30 19 McCauley Street PORT BOTANY, NSW, 2036	Phone: (02) 9003 0684 FAX: (02) 9003 0688 EMAIL: www.decc.com.au	NSW: AD211299 QLD: 230503 ACT: 2011503

Contents

1. Introduction

This Demolition Control Plan (DCP) has been prepared specifically for the Main Demolition works at HMAS Platypus Sub-Base, 120 High Street, North Sydney NSW 2060. The scope includes the demolition and hazardous material removal works to the following buildings that are in Figure: 1 below.

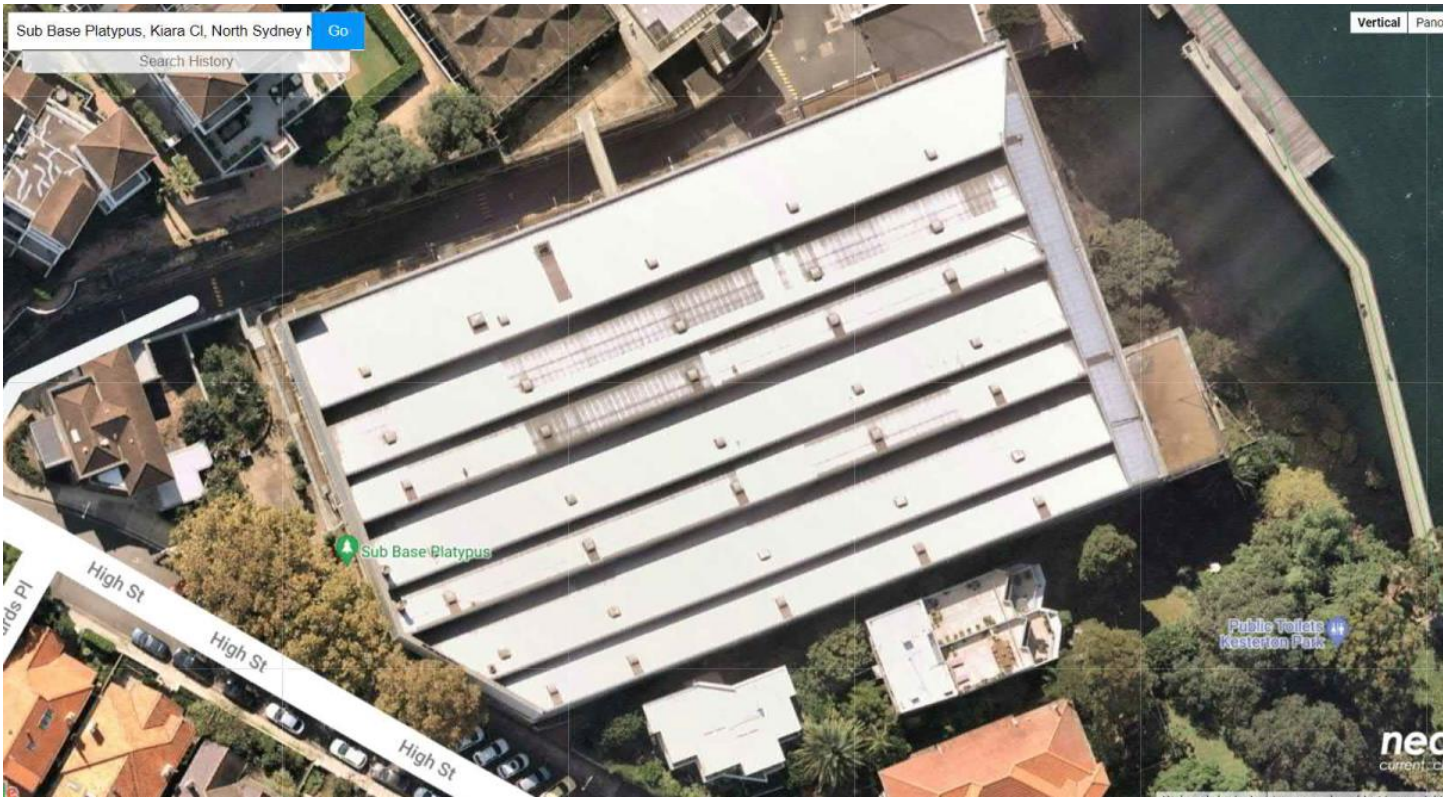


Figure 1 – HMAS Platypus Sub-Base, 120 High Street, North Sydney NSW 2060

The following documents have been used as background for preparation of this DCP:

- AS2601 – Demolition of Structures (2001)
- WH&S Act 2011, WH&S Regulations 2017
- NSW Waste Avoidance and Resource Recovery Strategy 2014-21
- Demolition Work Code of Practice 2019
- Protection of the Environment Operations Act 1997;
- Protection of the Environment Operations (Waste) Regulation 2014; and

2. Site Particulars

2.1 Scope of Works

The works under contract consist of the following:

1. Disconnection, capping and removal of redundant services – by others
2. Environmental Controls (Erosion and Sediment controls) put in place, where required
3. Removal of hazardous material, as per the Hazardous Material Report, prior to demolition work starting
4. Strip out of existing structures
5. Structural Demolition
6. Removal of concrete slab

2.2 Access Dates

Anticipated access dates are as follows:

Milestone Number	Description	Time Period for Giving Site Access	Time Period for Completion
1	Disconnection, capping and removal of redundant services	May 2022	Refer to DECC program
2	Environmental Controls (Erosion and Sediment controls) put in place, where required	May 2022	Refer to DECC program
3	Removal of hazardous material	May to June 2022	Refer to DECC program
4	Strip Out of existing	May to June 2022	Refer to DECC program
5	Structural Demolition	July to August 2022	Refer to DECC program
6	Removal of concrete slabs	July to August 2022	Refer to DECC program

2.3 Site Location

120 High Street, North Sydney NSW 2060

2.4 Site Description

The site is located on High Street at HMAS Platypus Sub-Base consisting of a steel portal framed structure ranging up to 15m in height, previously used as a Torpedo Manufacturing Factory.

The site is enclosed by High Street (West), Platypus Lane (North), Neutral Harbour (East) and 140 High Street residential units (South).

The project involves hazardous material removal and demolition of the existing structures.

2.5 Distance to Boundaries

Approximate:

North: 0-5m

West: 0-5m

East: 0m

South: 0m

2.6 Overall Height

Approximately 15m – Tallest structure

2.7 Duration

Refer to DECC program

2.8 Structural Support System

Structures are generally in a sound and stable condition. The site is reasonably tidy with minor loose debris/rubbish across the site with sparse vegetation and trees.

The structures consist of concrete slabs, steel columns, internal brick/masonry walls and steel reinforcement throughout.

2.9 Scaffold Plan

Scaffold will be erected to all four (4) boundaries of the building – combination of partial building height and full building height.

2.10 Building Descriptions and General Site Conditions

The structure is in a stable condition for conventional demolition techniques.

A Structural Engineer will assess the buildings, as required and determine if proposed demolition techniques, slab loadings imposed by demolition and debris build up is permitted prior to the commencement of demolition

A Dilapidation Report will be undertaken prior to the commencement of demolition works.

2.11 Structure to be Retained

Multiple bays of the steel portal framed structure will remain – *Refer to Drawing No. A050 – Demolition Plan Building Envelope Issue A dated 11/03/22.*

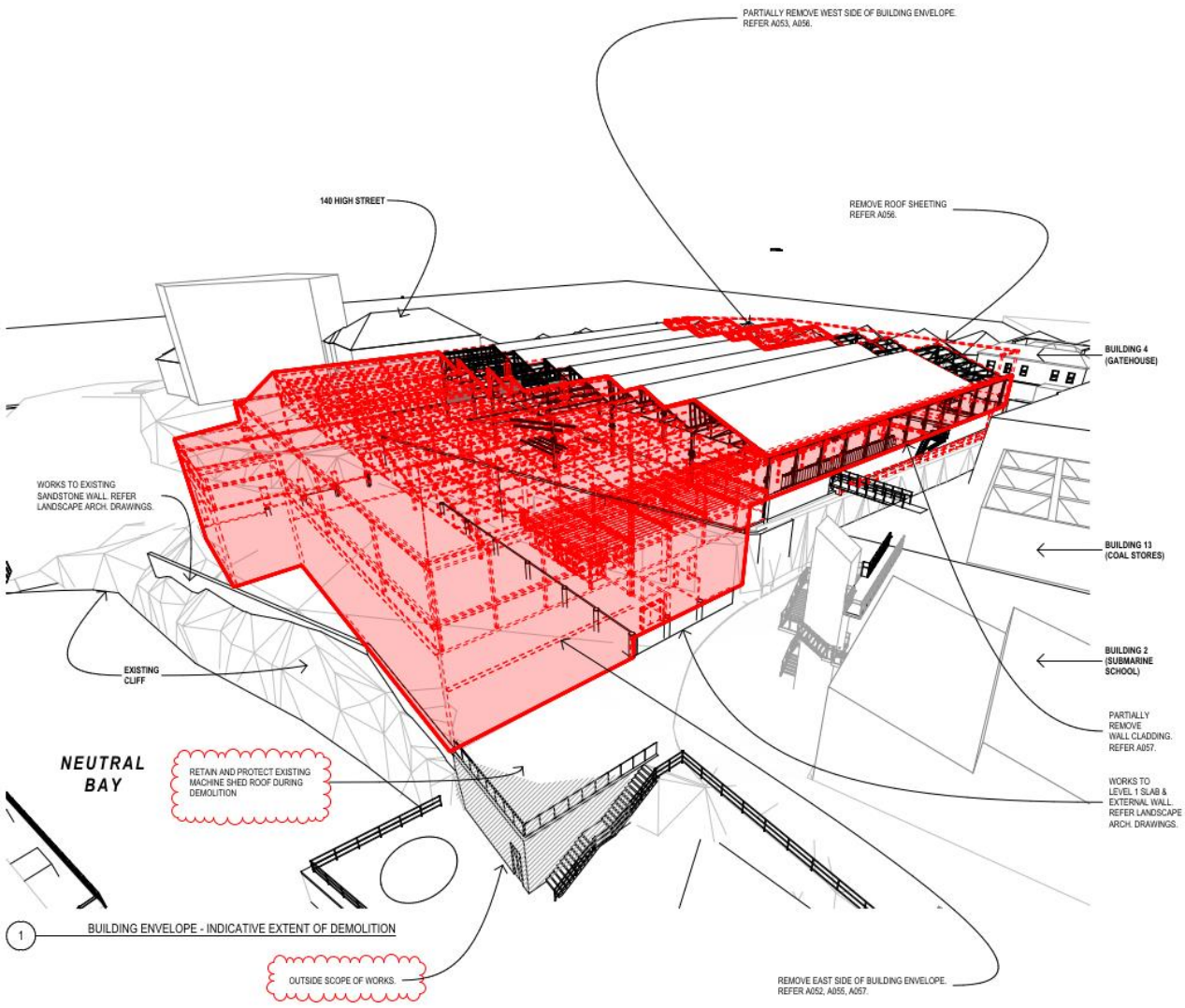


Figure 2 - Building Envelope - Indicative Extent of Demolition

2.12 Services Information

All services are to be disconnected/terminated at site boundary to allow the demolition of structures on site. Disconnection certificates/confirmation to be provided prior to commencing any demolition works.

Services isolated for demolition include, but not limited to:

- Power excluding disconnection of substation (by others);
- Fibre/Communications;
- Gas;
- Stormwater/Sewer;
- Fire;
- Water

Note: Temporary water to be maintained for dust suppression, site amenities and demolition/construction purposes).

2.13 Hazardous Materials

A hazardous material report will be used to ascertain the quantity and location of the hazardous materials (Asbestos, SMF, Lead Dust, PCB's and the like).

Removal of hazardous material (hazmat) will take place prior to commencement of structural demolition.

A licenced Asbestos / Hazardous Material Removal Contractor will undertake the works in accordance with an approved Asbestos / Hazmat Removal Control Plan (ARCP / HMRCP)

An independent occupational hygienist will undertake daily monitoring whilst hazardous material removal is undertaken, when required.

The hygienist will provide a Clearance Certificate prior structural demolition.

All daily air monitoring results to be provided, when required. A clearance certificate from a licensed asbestos assessor will be issued upon completion of all hazmat removal.

2.14 Confined Spaces

There are no known confined spaces that will require access in the building or in the site by DECC (or other site personnel) during demolition works.

2.15 Underground Structures

All underground services in the demolition zone will be isolated, disconnected or confirmed as redundant prior to demolition activities.

Location of services will be done by using Dial Before You Dig drawings and a licensed locating contractor will be engaged to physically mark all live services within the site footprint.

Footings and redundant services will be removed up to a depth of 1m below slab on ground.

2.16 Work Hours

The typical working hours are as follows:

- Monday to Friday (inclusive): 7am to 5pm
- Saturday: 8am to 1pm
- No works on Sundays and on Public Holidays

Work outside these hours will not take place unless it is necessary.

Note: DECC to comply with Council approved DA (or equivalent) conditions

3. Demolition Methodology

3.1 Early Commencement

DECC to notify Safework NSW of intent to carry out hazmat removal and demolition work at least five (5) days prior to the work starting on site. Approval from Safework NSW prior to commencement of demolition.

DECC will investigate and isolate services. This will be done in consultation with relevant trades. Water will be kept live for use later during the demolition work.

DECC will take care to review the hazardous materials within the buildings prior to any service strip out. Any hazardous materials likely to be disturbed during this work will be clearly marked as asbestos.

Strip of all furniture, doors, cupboards etc with stockpiling on the floors.

Load out continuously.

3.2 Site Preparation, Hazardous Materials Removal and Strip Out Works

Preparation of project management plans, safe work method statements, and other relevant documentation required for the project. **HOLD POINT.**

All workers to be inducted into the management plans, SWMS etc prior to commencement of works.

All workers to be equipped with the correct PPE at all time (hard hats, hi viz vests, safety boots etc).

Set up site fencing, amenities and environmental controls (erosion and sediment controls).

Establish demolition and hazmat removal exclusion zone using ATF fences.

All buildings to be checked prior to any works commencing demolition for any squatters or vandals present in the building. Syringes to be collected and properly disposed at approved sites. **HOLD POINT.**

Services to be isolated and signoffs/certificates/confirmation from licensed Electricians and Plumbers (including provision of temporary services) to be obtained. **HOLD POINT.**

Strip out items remaining in building by hand and mechanical means as required to minimise general waste to landfill.

Only soft elements will be removed by hand and small machine (excavators and bobcats) to prepare the work for the large excavators.

The purpose of the “strip out phase” is to remove all non-load bearing partitioning, FFE, ceilings, floor finishes and loose debris prior to structural demolition. The material debris from the strip out phase will then be processed mechanically into waste streams for removal off site.

Removal of any trees and shrubs (as per approved tree management plan or relevant reports) will be cleared and sorted by excavators as required.

Asbestos removal to be performed by licensed contractor. Upon completion, DECC will receive a Hazardous Materials Clearance Certificate and issue to the Client. Note: strip out of loose fixtures (such as chairs, tables etc.) can be completed prior to hazmat removal works. **HOLD POINT.**

The building will be stripped by hand and / or small excavators (excavators and bobcats). The strip out phase is to reduce the building to a concrete and steel shell in readiness for structural demolition. Materials will be removed from the building by dropping into a designated area Demolition Exclusion Zone (DEZ).

Note: A third party structural engineering certificate must be in place prior to placing any machines on suspended slabs.

3.3 Demolition

Demolition of Structures (post strip out and hazmat completion)

ATF fences will be used to de-lineate demolition exclusion zones (DEZ).

Demolition of the structure will commence with small excavators (up to 8t) fitted with hydraulic attachments to reduce the structure down to a safe height to allow demolition with large excavators **(if/where required)**.

A mobile crane will be used to lift small excavators and bobcats onto the roof to create a penetration to lift machines and equipment onto the floors (**if required)**.
Note: This may occur during the strip out stage if machines are used to strip the building.

Demolition of structures will progress in a bay-by-bay manner and in a systematic sequence using conventional demolition methods i.e., “top down forward”, undertaken by large excavators fitted with hydraulic attachments (hammers, pulverizer & grapple attachments) up to 48T excavators from the ground.

Large excavator(s) will ‘walk through’ the remainder of the structure by demolishing upper slab/roof, beams, columns, walls, and lower slab using conventional demolition techniques (in a systematic bay by bay manner).

Additional access to the demolition face may be achieved by building rubble mounds that will be used to extend the safe reach of excavators during the demolition process. During demolition water will be used to suppress dust either from fixed points and/or mobile points.

Specialized attachments such as demolition pulverizes, shears, extension arms may be used to reduce noise and vibration during demolition.

Note: Pulverizers used for concrete and shears used for steelwork photos below.

Demolition will be undertaken by experienced demolition operators under the supervision of a DE1 Unrestricted Demolition Supervisor.

All trucks leaving site will be loaded to within their limits and have the necessary waste tracking documentation.

The concrete hardstand will remain for the duration of the above ground demolition of structures. Once the structures have been felled, separated and processed, the hardstand will then be demolished.

Figure 3 – Demolition of Structures with Large Excavators and Rubble Mound

Figure 4 – Processing of Concrete Materials with Pulverizer Attachment

Figure 5 – Process of Steelwork with Shear Attachment

3.4 Removal of Hardstand, External Pavements

Once all buildings have been demolished, hardstands and external pavements will be pulled up, processed and removed off site. This will commence from the furthest point and work toward the site exit point.

All redundant services and footings to a depth of 1m below ground level will be removed.

All waste material generated from the buildings will be sorted and placed within the DEZ (Demolition Exclusion Zone) for future load out. Secondary large excavators and/or bobcats may assist in the loading out process.

3.5 General Site Demolition Works

Debris will be processed, separated and be placed into stockpiles prior to loading and disposal of waste materials.

Excavators will be fitted with hydraulic attachments such as shears (for cutting of steel), pulverisers, hammers (for concrete breaking) as well as grapple attachments for loading.

Stockpiles will be loaded out into semi tippers and / or truck and dogs. These vehicles will then head to their respective destinations for disposal of waste.

Exclusion zones will be established during the demolition process and maintained throughout the course of the works, particularly around the materials area.

Water will be used during the demolition and loading out stage to suppress any Silica Dust.

All trucks will be loaded to their weight limits and will enter and leave site in accordance with approved traffic control procedures.

The site will be cleared of demolition material/debris and upon completion of the pavement and redundant service removal work, the site will be track rolled and sealed to ensure a free draining site.

DECC will have a full-time Site Supervisor (Unrestricted Demolition License Holder) present on site for the duration of the project.

Site workers will make use of Two-Way Radios to maintain contact and ensure different work zones are operating smoothly and safely.

3.6 Materials Handling

Waste generated from the demolition works will be separated into materials streams, this includes:

- General Waste – This material will go to a licenced landfill with all tipping dockets maintained in a register
- Steel and Non-Ferrous Metals – Recycled at Sell & Parker (St Marys / Blacktown) – Possible recycler
- Brick and Concrete – Recycled to a Concrete Recycler. Boral/Concrete Recyclers or Crushing Dynamics. – Possible recyclers

All waste material generated from the buildings will be sorted and placed within the DEZ (Demolition Exclusion Zone) for future load out into stockpiles prior to disposal. Secondary large excavators and/or bobcats may assist in the loading out process. We will separate the concrete from steel; the concrete to be sent to a concrete recycler and steel to go to a steel recycler.

3.7 Plant and Equipment

Intended plant and equipment to be used during structural demolition phase, include.

- Up to 48T excavators (fitted with Hydraulic attachments).
- Bobcats and articulated trucks.

3.8 Protective Measures

All site personnel are to be inducted into DECC management system.

- All personnel to wear approved PPE, as a minimum this includes hardhat, high visibility vest/clothes and steel capped boots.
- Daily pre-starts, tool box talks and SWMS inductions.
- Hold points: Hazmat Clearance Certificates, Service Disconnections, Structural Engineer Reports, and Soil Classification.
- No demolition personnel to work from heights unless DECC site foreman approves the work, Working At Heights Permit is completed and the worker(s) have the necessary training (Working At Heights ticket).
- Demolition Exclusion Zones are established and maintained.
- Temporary fencing to site perimeter.
- Locked and/or manned gates during demolition works.

3.9 Exclusion Zones

The exclusion zone will be the entire site. Any openings / gates that remain open for truck movement etc will be manned.

Any secondary exclusion zones required will be established with fencing or bunting and be clearly delineated and manned with a spotter.

Referenced Documents

AS2601 – Demolition of structures

COP – Demolition Work

Project SWMS

Project Management Plans

Hazardous Materials Report for the property

ATTACHMENTS AVAILABLE UPON REQUEST	
Attachment 1	Demolition and Asbestos License
Attachment 2	Hazardous Material Removal Control Plan
Attachment 3	DECC Program
Attachment 4	Hazmat Removal and Demolition – Inspection and Test Plan (ITP's) Template

4. Site Workers and Management Declaration

My signature which appears below hereby confirms that I have read and understand this Demolition Control Plan (DCP) and I will ensure my work process is carried out and completed according to the above information.

Before signing, I had the opportunity to have input into the contents of this Demolition Control Plan and agree to carry out my work on site as per the information contained within this Demolition Control Plan.

If a work process must change from what is in this document and or the SWMS, then I (the worker) will stop work, barricade the area and get the DECC Site Foreman / Supervisor.

Work will not resume until I (the worker) and the work group, are satisfied that any changes made to control the risks, are satisfactory and will provide a safe work environment.

Any changes will be documented in a revised SWMS and or a Toolbox Meeting.

NAME	COMPANY	SIGNATURE	DATE

Site Workers and Management Declaration

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Any changes will be documented in a revised SWMS and or a Toolbox Meeting.

NAME	COMPANY	SIGNATURE	DATE

Demolition Control Plan Review

PROCESS FOR MONITOR AND REVIEW:

The Project Manager and or Site Foreman will conduct regular inspections of the work activities and work environment applicable to monitor the effectiveness of this document. This document will be reviewed regularly where workers, supervisors and managers will be provided with an opportunity to have input into the effectiveness of the processes stipulated in it. A record of all inspections/audits and toolbox talks used in the monitoring and reviewing will be retained on-site.

This document will be reviewed every 30 days.

Foreman / Supervisor, Site Management and Senior Management to review this document								
No.	Print Name	Changed			Toolbox Required		Signature	Date Reviewed
		YES	NO	Page:	YES	NO		
1.								
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