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Tallawong Station Precinct - Stage 1

Construction Noise and Vibration Management Plan

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1 INTRODUCTION

Acoustic Logic has been engaged to prepare a Noise and Vibration Management Plan for the excavation and construction works associated with the Tallawong Station Precinct – Stage 1 to satisfy Condition of Consent C20 for SSD 10425.

The issues which will be addressed in this report are:

- Identification of the noise and vibration standards which will be applicable to this project.
- Identification of potentially impacted nearby development.
- Identification of likely sources of noise and vibration generation and prediction of noise levels at nearby development.
- Formulation of a strategy to comply with the standards identified and mitigation treatments in the event that compliance is not achievable.

2 CONSENT CONDITIONS SSD 10425.

2.1 CONDITION C20

Construction Noise and Vibration Management Sub-Plan

Prior to the commencement of any earthwork or construction, the Applicant shall submit to the satisfaction of the Certifier a Construction Noise and Vibration Management Sub-Plan (CNVMP) for the development. A copy of the CNVMP must be submitted to the Planning Secretary and Council for information. The Sub-Plan must include:

(a) identification of the specific activities that will be carried out and associated noise sources at the premises;

(b) identification of all potentially affected sensitive residential receiver locations;

(c) quantification of the rating background noise level (RBL) for sensitive receivers, as part of the Sub-Plan, or as undertaken in the EIS;

(d) the construction noise, ground-borne noise and vibration objectives derived from an application of the EPA Interim Construction Noise Guideline (ICNG), as reflected in conditions of approval;

(e) prediction and assessment of potential noise, ground-borne noise (as relevant) and vibration levels from the proposed construction methods expected at sensitive receiver premises against the objectives identified in the ICNG and conditions of approval;

(f) where objectives are predicted to be exceeded, an analysis of feasible and reasonable noise mitigation measures that can be implemented to reduce construction noise and vibration impacts;

(g) description of management methods and procedures, and specific noise mitigation treatments/measures that can be implemented to control noise and vibration during construction;

(h) where objectives cannot be met, additional measures including, but not necessarily limited to, the following should be considered and implemented where practicable; reduce hours of construction, the provision of respite from noise/vibration intensive activities, acoustic barriers/enclosures, alternative excavation methods or other negotiated outcomes with the affected community;

(i) where night-time noise management levels cannot be satisfied, a report shall be submitted to the Planning Secretary outlining the mitigation measures applied, the noise levels achieved and justification that the outcome is consistent with best practice;

(j) measures to identify non-conformances with the requirements of the Sub-Plan, and procedures to implement corrective and preventative action;

(k) suitable contractual arrangements to ensure that all site personnel, including sub-contractors, are required to adhere to the noise management provisions in the Sub-Plan;

(l) procedures for notifying residents of construction activities that are likely to affect their noise and vibration amenity;

(m) measures to monitor noise performance and respond to complaints;

(n) measures to reduce noise related impacts associated with offsite vehicle movements on nearby access and egress routes from the site;

(o) procedures to allow for regular professional acoustic input to construction activities and planning; and

(p) effective site induction, and ongoing training and awareness measures for personnel (e.g. toolbox talks, meetings etc).

3 SITE DESCRIPTION

3.1 PROPOSED WORKS

The proposed mixed use development comprises five residential apartment towers, ground floor retail, playground area and a park.

Typical works are as follows:

- Civil Works
- Excavation
- Erection of building structure
- Façade Installation
- Landscaping
- Internal fit out of apartments.

3.2 HOURS OF WORK

The hours of work are specified in Part D of the Consent Conditions detailed below:

HOURS OF CONSTRUCTION

D3. Construction, including the delivery of materials to and from the site, may only be carried out between the following hours:

(a) between 7am and 6pm, Mondays to Fridays inclusive; and

(b) between 8am and 1pm, Saturdays.

D4. No work may be carried out on Sundays or public holidays.

D5. Activities may be undertaken outside of these hours if required:

(a) by the Police or a public authority for the delivery of vehicles, plant or materials; or

(b) in an emergency to avoid the loss of life, damage to property or to prevent environmental harm.

D6. Notification of such activities must be given to affected residents before undertaking the activities or as soon as is practical afterwards.

D7. Rock breaking, rock hammering, sheet piling, pile driving and similar activities may only be carried out between the following hours:

(a) 9am to 12pm, Monday to Friday;

(b) 2pm to 5pm Monday to Friday; and

(c) 9am to 12pm, Saturday.

3.3 RECEIVER LOCATIONS

Surrounding receiver locations as presented in Figure 1 and detailed below. These locations will be used as a basis for this assessment.

- **R1**: Residential Receivers located along Schofields Road to the south.
- **R2**: Single Residential Receiver located at 28 Tallawong Road to the north west.
- **R3**: Single Residential Receiver located at 43 Cudgegong Road to the north.
- **R4**: Single Residential Receiver located at 34 Cudgegong Road to the north east.
- **T1**: Tallawong Metro Station to the north.
- Tallawong Switching Station is located to the east

It is also noted that receivers R2 – R4 (located north of Tallawong Station) are also proposed to be developed in the near future. As such, it is likely that during all or part of the construction works proposed, these locations will either be vacant or under construction. In any case, potential noise impacts to these receivers have been considered as part of the assessment.

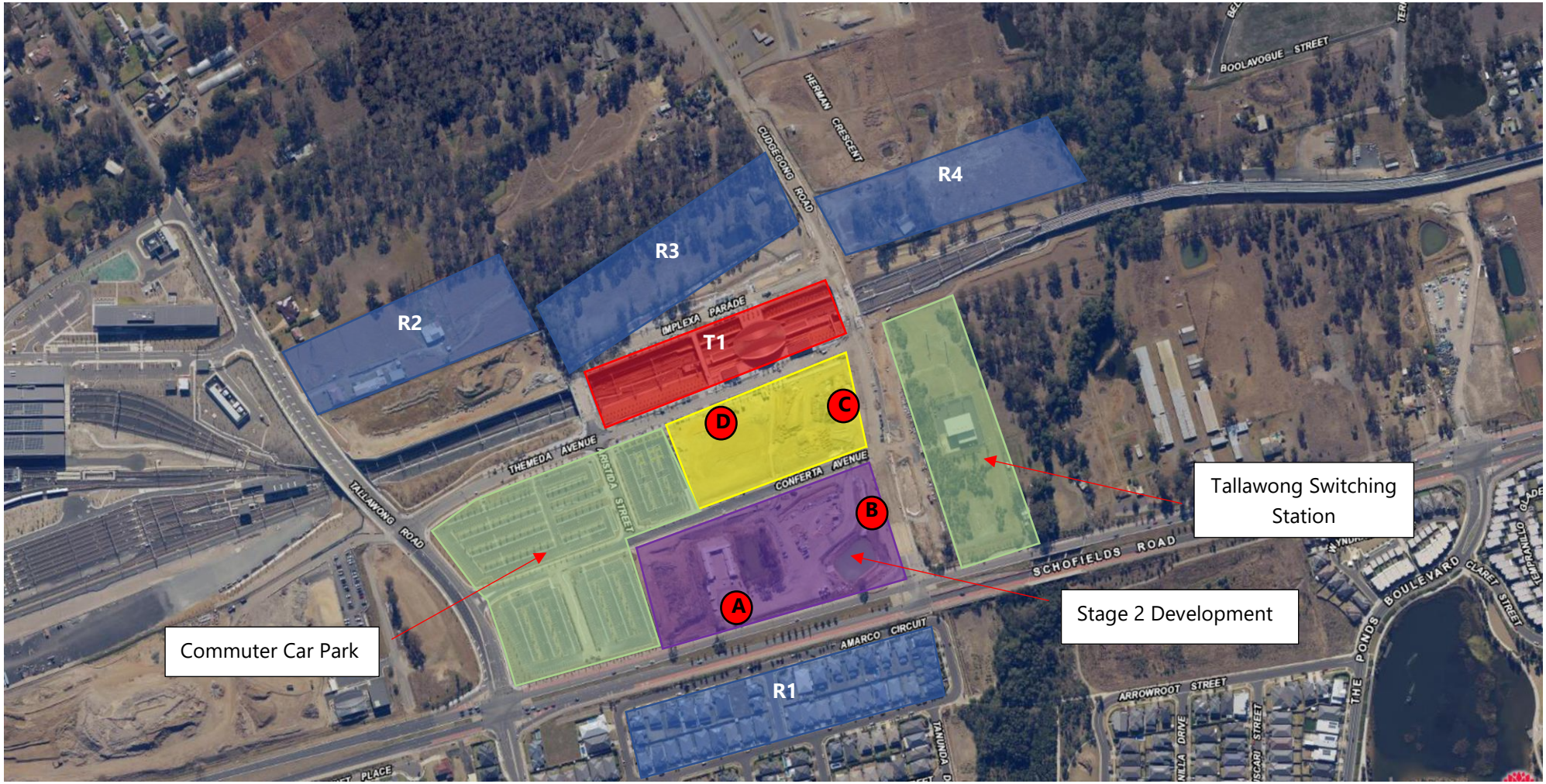


Figure 1 – Aerial Site Map

Source: Six Maps

Project Site

Tallawong Station

Residential Receiver

Unattended Noise Monitor Location

4 NOISE AND VIBRATION CRITERIA

4.1 NOISE

4.1.1 EPA Interim Construction Noise Guideline

The EPA Interim Construction Noise Guideline (ICNG) assessment requires:

- Determination of noise management levels (based on ambient noise monitoring).
- Review of operational noise levels at nearby development.
- If necessary, recommendation of noise controls strategies in the event that compliance with noise emission management levels is not possible.

EPA guidelines adopt differing strategies for noise control depending on the predicted noise level at the nearest residences:

- *"Noise affected" level*. Where construction noise is predicted to exceed the "noise effected" level at a nearby residence, the proponent should take reasonable/feasible work practices to ensure compliance with the "noise effected level". For residential properties, the "noise effected" level occurs when construction noise exceeds ambient levels by more than 10dB(A)$L_{eq(15min)}$.
- "*Highly noise affected level*". Where noise emissions are such that nearby properties are "highly noise effected", noise controls such as respite periods should be considered. For residential properties, the "highly noise effected" level occurs when construction noise exceeds 75dB(A)$L_{eq(15min)}$ at nearby residences.

In addition to the above management levels for residential receivers, the ICNG nominates a Management Level of 70dB(A) $L_{eq(15min)}$ at commercial receiver facades. This level will be applied for the adjacent switching station.

Unattended noise monitoring was conducted and detailed in the Koikas Acoustics report for the development (document ref: *3947R20200202jtTallawong StationPrecinctSouth_DAv3.docx, Version 3, dated 07/05/2020*). See **Figure 1** for noise monitor locations.

In order to establish management noise levels pertaining to the site, results of background noise monitoring are presented in the Table 1 below.

Table 1 – Measured Background Noise Levels, dB(A) L_{90}

Noise Monitor Location	Period / Time	Background Noise Level dB(A) L_{90}
A	Day (7am to 6pm)	50
B		46
C		43
D		41

A summary of the recommended noise levels from the ICNG is presented below in Table 2.

Table 2 – Noise Management Levels

Receiver Type	Affected Receiver	"Noise Affected" Level - dB(A)$L_{eq(15min)}$	"Highly Noise Affected" Level - dB(A)$L_{eq(15min)}$
Residential	R1	60	75
	R4	53	75
	R2,R3	51	75
Commercial	Tallawong Switching Yard	70	-

If noise levels exceed the management levels identified in the tables above, reasonable and feasible noise management techniques will be reviewed.

4.2 VIBRATION

Vibration impacts on surrounding residential receivers will be assessed to the following documents:

- For structural damage vibration, German Standard DIN 4150-3 *Structural Vibration: Effects of Vibration on Structures; and*
- For human exposure to vibration, the acceptable vibration values set out in the Environmental Noise Management Assessing Vibration: a technical guideline (DEC, 2006).

Vibration impacts to the Tallawong Metro Station will be assessed with reference to TfNSW requirements detailed in condition A32, and other relevant guidelines and technical submissions relevant to rail infrastructure.

4.2.1 For Residential Receivers

4.2.1.1 Structure Borne Vibrations (Building Damage Criteria)

German Standard DIN 4150-3 (1999-02) provides vibration velocity guideline levels for use in evaluating the effects of vibration on structures. The criteria presented in DIN 4150-3 (1999-02) are presented in Table 4.

It is noted that the peak velocity is the value of the maximum of any of the three orthogonal component particle velocities as measured at the foundation, and the maximum levels measured in the x- and y-horizontal directions in the plane of the floor of the uppermost storey.

Table 3 – DIN 4150-3 (1999-02) Safe Limits for Building Vibration

	TYPE OF STRUCTURE	PEAK PARTICLE VELOCITY (mms^{-1})			
		At Foundation at a Frequency of			**Plane of Floor of Uppermost Storey**
		< 10Hz	**10Hz to 50Hz**	**50Hz to 100Hz**	**All Frequencies**
1	Buildings used in commercial purposes, industrial buildings and buildings of similar design	20	20 to 40	40 to 50	40
2	Dwellings and buildings of similar design and/or use	5	5 to 15	15 to 20	15
3	Structures that because of their particular sensitivity to vibration, do not correspond to those listed in Lines 1 or 2 and have intrinsic value (e.g. buildings that are under a preservation order)	3	3 to 8	8 to 10	8

The surrounding educational buildings would be considered a Type 1 structure, whilst residences would be considered a Type 2 structure.

4.2.1.2 Assessing Amenity

The NSW EPA document "*Assessing Vibration: A Technical Guideline*" provides procedures for assessing tactile vibration and regenerated noise within potentially affected buildings and is used in the assessment of vibration impact on amenity.

Relevant criteria are presented below.

Table 4 – EPA Recommended Vibration Criteria

		RMS acceleration (m/s^2)		RMS velocity (mm/s)		Peak velocity (mm/s)	
Place	Time	Preferred	Maximum	Preferred	Maximum	Preferred	Maximum
Continuous Vibration							
Residences	Daytime	0.01	0.02	0.2	0.4	0.28	0.56
Offices		0.02	0.04	0.4	0.8	0.56	1.1
Workshops		0.04	0.08	0.8	1.6	1.1	2.2
Impulsive Vibration							
Residences	Daytime	0.3	0.6	6.0	12.0	8.6	17.0
Offices		0.64	1.28	13.0	26.0	18.0	36.0
Workshops		0.64	1.28	13.0	26.0	18.0	36.0

4.2.2 Vibration Impacts to Tallawong Metro Train Station

In the absence of specific vibration controls for construction impacts to the Tallawong Metro Station, the following guidelines have been referenced to provide guidance on appropriate criteria. The criteria nominated in the following section have been developed based on relevant Australian Standards and vibration criteria typically adopted by Transport for NSW with respect to damage to rail infrastructure.

The following documents have been utilised to form vibration emission goals at the location of the Stabling Yard.

- Australian Standard AS2187.2 (2006) – "Explosives – Storage and Use – Part 2: Use of Explosives";
- NSW Department of Planning document titled *"Development Near Rail Corridors and Busy Roads – Interim Guideline"*;
- Transport for NSW Standard *"External Developments"* (*Ref: T HR CI 12080 ST*).
- Transport for NSW Standard *"Development Near Rail Tunnels"* (*Ref: T HR CI 12051 ST*); and

These standards and their application at the site are discussed in the following sections.

4.2.2.1 Australian Standard AS2187.2 (2006) – Building Damage

Australian Standard AS2187.2 (2006) – "*Explosives – Storage and Use – Part 2: Use of Explosives*" presents vibration guide values to determine the effect of ground movement on structures. The values in AS2187.2 are directly reproduced from British Standard BS7385-2.

The guidelines are presented in the table below:

Table 3.2 AS 2187.2 (2006) - Guideline for Building Vibration

Line	Type of Building	Peak component particle velocity in frequency range of predominant pulse	
		4 Hz – 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 structure. Residential or light commercial type buildings	15 mm/s at 4 Hz and above increasing to 20mm/s at 15 Hz	20 mm/s at 4 Hz and above increasing to 50mm/s at 40 Hz and above

Notes:
1. Values referred to are at the base of the building
2. For line 2, at frequencies below 4 Hz, a maximum displacement of 0.6 mm ZTP (zero to peak) should not be exceeded.

4.2.2.2 NSW Department of Planning Development Near Busy Roads and Rail Corridors – Interim Guideline

Part D of the NSW Department of Planning document *"Development Near Busy Roads and Rail Corridors – Interim Guideline"* outlines potential impacts of adjacent development on roads and railway. As there are no specific guidelines with regard to maximum vibration levels towards the rail corridor during construction, Transport for NSW standards have been used to assess recommended maximum vibration levels.

4.2.2.3 Transport for NSW External Developments (T HR CI 12080 ST)

Section 6.4 of the NSW Government document titled *"External Developments (Version 1.0)"* dated 5th February 2015 states the following with regard to noise and vibration levels from new development adjacent to rail infrastructure:

> *"The effects of noise and vibration from rail operations shall be considered in the design of the development. The noise from construction and rail operation shall be considered against statutory and project noise vibration limit requirements."*

4.2.2.4 Transport for NSW Development Near Rail Tunnels (T HR CI 12051 ST)

NSW Government Transport Asset Standards Authority Standard *Development Near Rail Tunnels* dated 15 November 2018 states:

> *Any development that occurs within a distance of 25 m horizontally from first reserve shall assess the vibration on the rail tunnels. The assessment criteria shall be a maximum peak particle velocity (PPV) of 15 mm/s at the tunnel lining for brick or mass concrete in good condition or a maximum PPV of 20 mm/s at the tunnel lining for cast iron, steel or concrete segment lining*

4.2.2.5 Summary of Vibration Criteria

consideration of the above guidelines, we note:

- AS2178.2 provides reference for the point at which vibration is likely to cause structural damage. Considering the disruption structural damage to the rail infrastructure would provide, vibration should be below this level at all times.
- The TfNSW guideline relating to train tunnels provides further guidance on an appropriate maximum level of vibration that is acceptable to buried rail assets (as opposed to on grade lines). This level is nominated as a maximum of 20mm/s PPV, which is consistent with the upper limits of AS2178.2.
- Based on the above, a maximum/stop work PPV vibration level of 15mm/s is considered acceptable to protect the light rail infrastructure.
    - A trigger/notification level is typically set below this maximum criterion to alert construction workers the maximum vibration limit is being approached - this is typically 25% lower than the maximum allowable vibration level, or 12mm/s PPV in this case.
    - If the nominated vibration levels are exceeded, the following should occur:
        - 12mm/s PPV – If this level is exceeded as a result of construction activities, a full review of the ongoing site activities and potential cause of exceedance is to be undertaken.
        - 17mm/s PPV - If this level is exceeded as a result of construction activities then work is to cease immediately.

Table 5 – Summary of Vibration Criteria

Scenario	Vibration Level
Trigger Level/Assessment Level	12 mm/s PPV
Stop Work Level	17 mm/s PPV

5 NOISE AND VIBRATION ASSESSMENT AND RECOMMENDATIONS

5.1 ACTIVITIES TO BE CONDUCTED AND THE ASSOCIATED NOISE LEVELS

Typically, the most significant sources of noise generated during a construction project will be demolition, excavation, civil works and piling. A summary of sound power levels of major construction processes/equipment is detailed in Table 5.

With respect to construction noise, the impact on nearby development will be dependent on the activity in question and where on the site the activity is undertaken. The primary construction equipment and sound power levels associated with the works are as follows:

Table 6 – Sound Power Levels (SWL) of Equipment

EQUIPMENT /PROCESS	SOUND POWER LEVEL dB(A)
Excavation	
Excavator with Bucket (up to 35 tonnes)	114
Angle Grinder	114
Rock Hammering	120*
Concrete Saw	115
Trucks (up to 12 tonnes)	100
Concrete Pump	107
Construction	
Electric Tower Crane	104
Trucks (up to 12 tonnes)	100
Large Trailers	116
Drilling	94*
Hammering (jackhammers)	120*
Angle grinders	114*
Power Saw	115*
Impact drill	110*
Concrete/Shortcrete Pump	107
Cement Mixing Truck	105

***Noise levels take into account correction factors for tonality where necessary).**

The noise levels presented in the above table are derived from the following sources:

1. Table D2 of Australian Standard 2436-1981 & Table A1 of Australian Standard 2436-2010; and
2. Data held by this office from other similar studies.

5.2 NOISE IMPACT ASSESSMENT

The predicted noise levels during excavation and construction will depend on:

- The activity undertaken; and
- The distance between the work site and the receiver. For many of the work areas, the distance between the noise source and the receiver will vary depending on which end of the site the work is undertaken. For this reason, the predicted noise levels will be presented as a range.

Predicted noise levels are presented in the tables below. Predictions take into account the noise reduction as a result of distance only.

Table 7 – Predicted Noise Generation to R1

Activity	Predicted Level – dB(A) $L_{eq(15min)}$ (External Areas)	Comment
Excavator with Bucket (up to 35 tonnes)	57-61	Marginally above NAML, below HNAML at all times
Angle Grinder	57-61	
Rock Hammering	66-70	Exceeds NAML, below HNAML at all times
Concrete Saw	58-62	Marginally above NAML, below HNAML at all times
Trucks (up to 12 tonnes)	43-47	Below NAML at all times
Concrete Pump	50-54	
Electric Tower Crane	50	
Drilling	37-41	
Hammering (jackhammers)	63-67	Exceeds NAML, below HNAML at all times
Powered Hand Tools	53-57	Below NAML at all times
Cement Mixing Truck	48-52	

Table 8 – Predicted Noise Generation to R2/R3

Activity	Predicted Level – dB(A) $L_{eq(15min)}$ (External Areas)	Comment
Excavator with Bucket (up to 35 tonnes)	55-62	Exceeds NAML, below HNAML at all times
Angle Grinder	55-62	
Rock Hammering	64-71	
Concrete Saw	56-63	
Trucks (up to 12 tonnes)	41-48	Below NAML at all times
Concrete Pump	48-55	Marginally above NAML when operating close to boundary, below HNAML at all times
Electric Tower Crane	48	Below NAML at all times
Drilling	35-42	
Hammering (jackhammers)	61-68	Exceeds NAML, below HNAML at all times
Powered Hand Tools	51-58	Generally Exceeds NAML, below HNAML at all times
Cement Mixing Truck	46-53	Below NAML at all times

Table 9 – Predicted Noise Generation to R4

Activity	Predicted Level – dB(A) $L_{eq(15min)}$ (External Areas)	Comment
Excavator with Bucket (up to 35 tonnes)	56-65	Exceeds NAML, below HNAML at all times
Angle Grinder	56-65	
Rock Hammering	65-74	
Concrete Saw	57-66	
Trucks (up to 12 tonnes)	42-51	Below NAML at all times
Concrete Pump	49-58	Marginally above NAML when operating close to boundary, below HNAML at all times
Electric Tower Crane	50	Below NAML at all times
Drilling	36-45	Below NAML at all times
Hammering (jackhammers)	62-71	Exceeds NAML, below HNAML at all times
Powered Hand Tools	52-61	Generally Exceeds NAML, below HNAML at all times
Cement Mixing Truck	47-56	Marginally above NAML when operating close to boundary, below HNAML at all times

Table 10 – Predicted Noise Generation to Switching Station

Activity	Predicted Level – dB(A) $L_{eq(15min)}$ (External Areas)	Comment
Excavator with Bucket (up to 35 tonnes)	60-74	Marginal exceedance of NAML when operating close to the boundary
Angle Grinder	60-74	
Pneumatic Hammering	69-83	Generally Exceeds NAML, below HNAML at all times
Concrete Saw	63-74	Marginal exceedance of NAML when operating close to the boundary
Trucks (up to 12 tonnes)	46-60	Below NAML at all times
Concrete Pump	53-67	
Electric Tower Crane	53	
Drilling	40-54	
Hammering (jackhammers)	66-80	Generally Exceeds NAML, below HNAML at all times
Powered Hand Tools	56-70	Below NAML at all times
Cement Mixing Truck	51-65	

5.3 DISCUSSION – NOISE

It is expected that the proposed construction works would be below the highly noise affected management level at all times. Activities expected to exceed the noise affected management level are generally restricted to heavy works such as hammering, concrete sawing and grinding which are typically limited to the excavation and structural phases of the project.

Noise impacts to surrounding receivers is expected during this time, however we note the following:

- Concrete truck/pumping activities are intended to be scheduled, and as such a notification process will be possible to assist surrounding receivers to manage noise impacts.
- The duration of the excavation and structural works of the development will be of a relatively short duration. Once complete, noise impacts from general construction activities are expected to be reduced.

The majority of works required during general construction (which will be of a longer duration) are generally below the noise affected management level.

5.4 DISCUSSION - VIBRATION

Typically, excavation in rock or vibrated piling are the activities with the greatest potential for generation of vibration. It is recommended that vibration monitoring be undertaken representative of impacts to the Tallawong Metro station and the eastern boundary respectively. Section 5.6 addresses the vibration monitoring proposal for the site.

5.5 RECOMMENDATIONS

In light of the above, we recommend:

- The scheduling of construction activities should be undertaken to reasonably minimise noise impacts to all surrounding land uses.
    - In this regard, rock breaking or rock hammering should be limited to the times identified in condition D7.
- Community consultation/notification - Notification (leaflet or similar) of nearby residents is recommended, detailing the duration of excavation works and schedule of planned concrete pours.
- Materials handling/vehicles:
    - vehicles not to idle outside of site prior to working hours
    - Access routes to and from site should be planned to minimise noise impact on nearby residential receivers.
    - Trucks and bobcats to use a non-tonal reversing beacon (subject to OH&S requirements) to minimise potential disturbance of neighbours.
    - Avoid careless dropping of construction materials into empty trucks.
    - Trucks, trailers and concrete trucks (if feasible) should turn off their engines during idling to reduce noise impacts (unless truck ignition needs to remain on during concrete pumping).
- Vibration monitoring is recommended at the northern boundary of the site adjacent to the Metro Station as well as the eastern boundary. Refer to Section 5.6 for further detail.
- Complaints handling:
    - An after hours contact number is displayed outside of the building site, so that in the event that surrounding development believes that a noise breach is occurring, they may contact the site.

- In the event of complaint, the procedures outlined in Section 8 are to be adopted. Additional methods of control of construction noise and additional noise control measures which may be adopted by the site are detailed in Sections 6 and 7.
- In the event of strong community reaction to construction noise, or complaint from a specific receiver, attended noise measurements may be required to quantify the levels of construction noise at identified locations. The measured levels are to be compared to the relevant management levels, and where exceedances are identified a review of the reasonable and feasible measures in place to be undertaken to further mitigate noise impacts.

5.6 VIBRATION MONITORING

5.6.1 Vibration Monitoring Equipment

Vibration monitoring is to be conducted using Texcel ETM type monitors with externally mounted tri-axial geophones. The geophones will be located as close as practicably possible to the location of the sensitive structure. It is noted that the location of the monitor may need to be placed within the site in question due to security risks.

The monitors are to be set to send an SMS message when alert levels have been exceeded at the location of the geophone.

5.6.2 Vibration Monitoring Locations

Vibration monitoring is recommended when rock hammering is required to be undertaken (generally limited to the excavation stage of the project) at the following locations:

- Eastern boundary of site – representative of the switching station.
- Northern boundary of site – representative of Tallawong Metro Station

In the event that ongoing construction activities are considerably below the relevant vibration levels, it is recommended that vibration monitoring requirements for the project be reviewed with the relevant stakeholders.

5.6.3 Vibration Monitoring Results

The ETM vibration monitors can be downloaded remotely to actively review all monitoring data recorded at the monitoring location, including any vibration events found to exceed the trigger levels nominated in Section 4.2..

In the event multiple events exceeding the nominated trigger levels are recorded, all data recorded by the monitor is to be reviewed and forwarded to a nominated representative of the building contractor. It is proposed that reports are provided regular intervals, with any exceedance in the nominated vibration criteria documented.

5.6.4 Vibration Monitoring Alerts

The following personnel will receive alarms in the event that the nominated vibration trigger levels are exceeded at the site:

1. Acoustic consultant/advisor;
2. Excavation site foreman;
3. The superintendent and any other representative nominated by the project superintendent.

5.6.5 Additional Recommendations

Should ongoing measurements of excessive vibration criteria occur (or in the event trigger levels are exceeded) immediate measures shall be undertaken to investigate the cause of the exceedance and identify the required changes to work practices.

In the case of exceedances of the vibration limits all vibration intensive equipment shall cease until the exceedance is investigated.

The effectiveness of any changes shall be verified before continuing. Documentation and training of site staff shall occur to ensure the practices that produced the exceedances are not repeated.

All repeated exceedances of the trigger level should be fully investigated and reported to management. The investigation of a complaint shall involve where applicable:

- Measurement of vibration at the affected location;
- An investigation of the activities occurring at the time of the incident;
- Inspection of the activity to determine whether any undue vibration is being emitted by equipment/activity; and
- Whether work practices were being carried out either within established guidelines or outside these guidelines.

Where an activity is found to be emitting excessive vibration, the cause is to be rectified as soon as possible.

5.6.6 Contingency Plans

The following course of action is recommended to address situations where vibration exceeding recommended levels are recorded at the site.

Selection of Alternate Equipment or Process

Where an activity is found to generate excessive vibration levels, it may be possible to select an alternative approach or appliance. For example; the use of a hydraulic hammer on certain areas of the site may potentially generate high levels of vibration. By replacing this activity with the use of pneumatic hammers, bulldozers ripping and/or milling machines; the result will be a reduction of vibration at the vibration sensitive rail line.

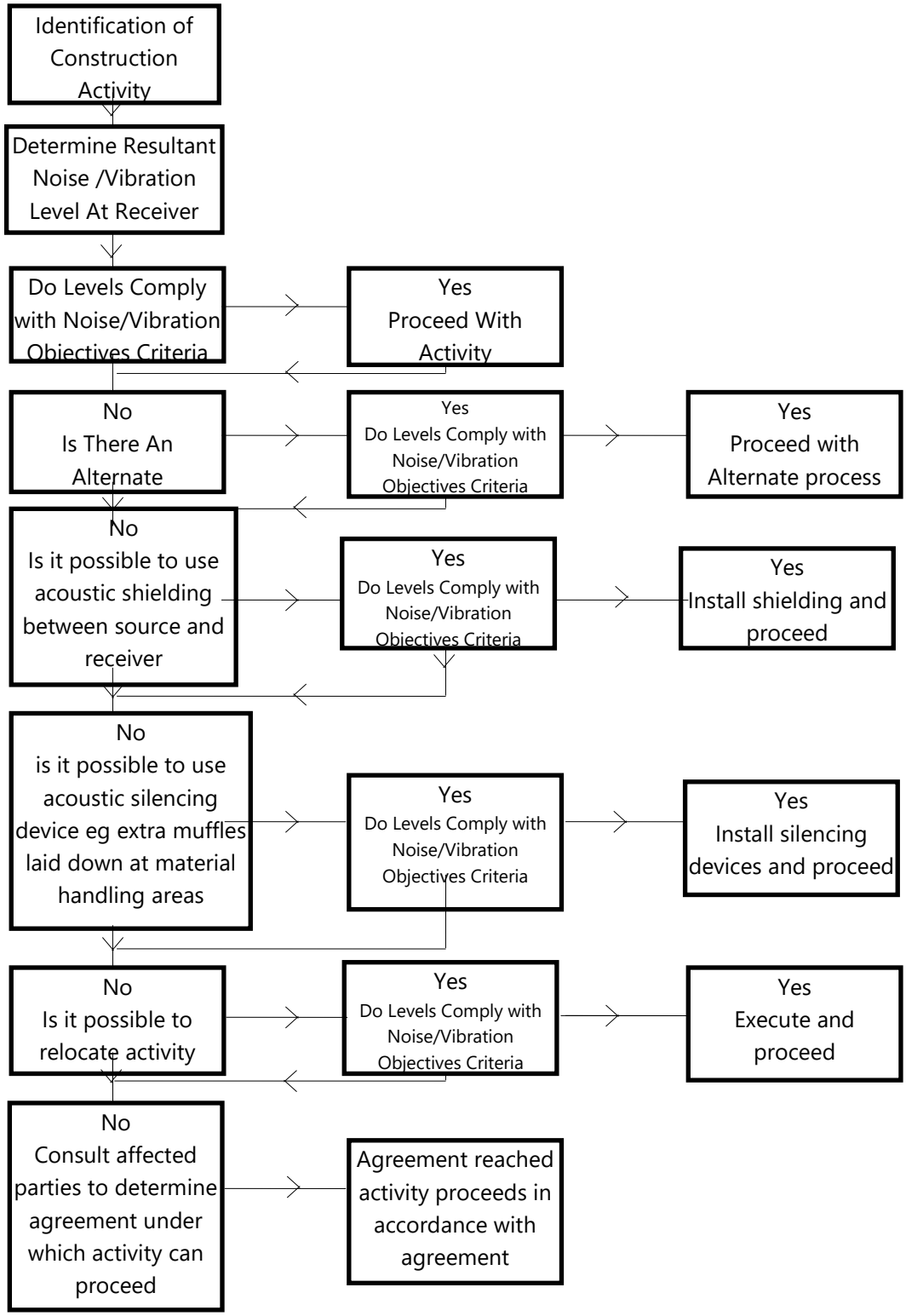
The use of saw cutting equipment to break the ridged connection between areas of rock being excavated and vibration sensitive structure is also an effective way to significantly reduce the transfer of vibration.

Additional Vibration Monitoring

Additional attended vibration monitoring measurements can be undertaken to determine the effectiveness of measures which have been implemented. The results of monitoring can be used to devise further control measures and identify vibration generating activity.

6 CONTROL OF CONSTRUCTION NOISE AND VIBRATION – PROCEDURAL STEPS

The flow chart presented below illustrates the process that will be followed in assessing construction activities.



7 ADDITIONAL NOISE AND VIBRATION CONTROL METHODS

In the event of complaints, there are a number of noise mitigation strategies available which can be considered.

The determination of appropriate noise control measures will be dependent on the particular activities and construction appliances. This section provides an outline of available methods.

7.1 SELECTION OF ALTERNATE APPLIANCE OR PROCESS

Where a particular activity or construction appliance is found to generate excessive noise levels, it may be possible to select an alternative approach or appliance. For example; the use of a hydraulic hammer on certain areas of the site may potentially generate high levels of noise. Undertaking this activity using bulldozers, ripping and/or milling machines will result in lower noise levels.

7.2 ACOUSTIC BARRIER

The placement of barriers at the source is generally only effective for static plant. Equipment which is on the move or working in rough or undulating terrain cannot be effectively attenuated by placing barriers at the source.

Barriers can also be placed between the source and the receiver.

The degree of noise reduction provided by barriers is dependent on the amount by which line of sight can be blocked by the barrier. If the receiver is totally shielded from the noise source reductions of up to 15dB(A) can be effected. Where only partial obstruction of line of sight occurs, noise reductions of 5 to 8dB(A) may be achieved. Where no line of sight is obstructed by the barrier, generally no noise reduction will occur.

As barriers are used to provide shielding and do not act as an enclosure, the material they are constructed from should have a noise reduction performance that is approximately 10dB(A) greater than the maximum reduction provided by the barrier. In this case the use of a material such as 10mm or 15mm thick plywood (radiata plywood) would be acceptable for the barriers.

7.3 MATERIAL HANDLING

The installation of rubber matting over material handling areas can reduce the sound of impacts due to material being dropped by up to 20dB(A).

7.4 TREATMENT OF SPECIFIC EQUIPMENT

In certain cases it may be possible to specially treat a piece of equipment to dramatically reduce the sound levels emitted.

7.5 ESTABLISHMENT OF SITE PRACTICES

This involves the formulation of work practices to reduce noise generation. A more detailed management plan will be developed for this project in accordance to the construction methodology outlining work procedures and methods for minimising noise.

A copy of the CNVMP should be made available at the site office and included as part of site induction. Management to ensure ongoing awareness of requirements of CNVMP is maintained.

7.6 ACOUSTIC ADVICE

Ongoing consultation with project acoustic consultant is recommended to ensure noise and vibration objectives are achieved and to provide advice regarding noise and vibration mitigation where objective cannot be met.

7.7 COMBINATION OF METHODS

In some cases it may be necessary that two or more control measures be implemented to minimise noise.

8 DEALING WITH COMPLAINTS

Should ongoing complaints of excessive noise or vibration criteria occur immediate measures shall be undertaken to investigate the complaint, the cause of the exceedances and identify the required changes to work practices.

If a noise complaint is received the complaint should be recorded. Any complaint form should list:

- The name and address of the complainant (if provided);
- The time and date the complaint was received;
- The nature of the complaint and the time and date the noise was heard;
- The name of the employee who received the complaint;
- Actions taken to investigate the complaint, and a summary of the results of the investigation;
- Required remedial action, if required;
- Validation of the remedial action; and
- Summary of feedback to the complainant.

A permanent register of complaints should be held.

9 CONCLUSION

An assessment of noise from construction works associated with Tallawong Station Precinct – Stage 1 has been presented within this report to satisfy Condition Consent C20 for SSD 10425.

Potential noise and vibration impacts on nearby development have been assessed. Provided that the mitigation techniques recommended in sections 5.5, 5.6, 6, 7 & 8 of this report are adopted, noise and vibration impacts on the adjacent buildings are expected to be acceptable.

Please contact us should you have any further queries.

Yours faithfully,

Acoustic Logic Pty Ltd
Ross Ferraro