REPORT

LOT 1 MILITARY ROAD

PORT KEMBLA

ACOUSTIC FEASIBILITY STUDY
RWDI # 2103335
30 June 2021

SUBMITTED TO

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Version	Status	Date	Prepared By	Reviewed By
A	Final	30 June 2021	Peter Thang	Neil Gross

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ACOUSTIC TERMINOLOGY

Most environments are affected by environmental noise which continuously varies, largely as a result of road traffic. To describe the overall noise environment, a number of noise descriptors have been developed and these involve statistical and other analysis of the varying noise over sampling periods, typically taken as 15 minutes. These descriptors are here defined.

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.

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.

Impulsive Noise – Having a high peak of short duration or a sequence of such peaks. A sequence of impulses in rapid succession is termed repetitive impulsive noise.

Intermittent Noise – The level suddenly drops to that of the background noise several times during the period of observation. The time during which the noise remains at levels different from that of the ambient is one second or more.

L_{Amax} – The L_{Amax} level over a sample period is the maximum level, measured on fast response, during the sample period.

L_{A1} – The L_{A1} level is the noise level which is exceeded for 1% of the sample period. During the sample period, the noise level is below the L_{A1} level for 99% of the time.

L_{A10} – The L_{A10} level is the noise level which is exceeded for 10% of the sample period. During the sample period, the noise level is below the L_{A10} level for 90% of the time. The L_{A10} is a common noise descriptor for environmental noise and road traffic noise.

L_{A90} – The L_{A90} level is the noise level which is exceeded for 90% of the sample period. During the sample period, the noise level is below the L_{A90} level for 10% of the time. This measure is commonly referred to as the background noise level.

L_{Aeq} – The equivalent continuous sound level (L_{Aeq}) is the energy average of the varying noise over the sample period and is equivalent to the level of a constant noise which contains the same energy as the varying noise environment. This measure is also a common measure of environmental noise and road traffic noise.

ABL – The Assessment Background Level is the single figure background level representing each assessment period (daytime, evening and night time) for each day. It is determined by calculating the 10th percentile (lowest 10th percent) background level (L_{A90}) for each period.

RBL – The Rating Background Level for each period is the median value of the ABL values for the period over all of the days measured. There is therefore an RBL value for each period – daytime, evening and night time.

Sound Absorption – The ability of a material to absorb sound energy through its conversion into thermal energy.

Sound Level Meter – An instrument consisting of a microphone, amplifier and indicating device, having a declared performance and designed to measure sound pressure level.

Sound Pressure Level – The level of noise, usually expressed in decibels, as measured by a standard sound level meter with a microphone.

Tonal Noise – Containing a prominent frequency and characterised by a definite pitch.

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1 INTRODUCTION

RWDI (formerly Wilkinson Murray) has been commissioned to complete an acoustic feasibility study for the proposed rezoning and development of Lot 1 Military Road, Port Kembla. It has been undertaken in consideration of the NSW EPA *Noise Policy for Industry* (NPfI).

The site, formerly the Port Kembla School, is located adjacent to industrially zoned land which includes the Port operations and surrounding associated industrial uses. The Port and surrounding industrial land will be referred to as "the Port" in this report. The site is located within Zone B4 which allows residential development subject to DA.

Wollongong City Council has supported a proposed rezoning of the site to allow for higher density residential. They also support the removal of the requirement to only allow for commercial use at ground level as this conflicts with their desire to regenerate the existing commercial centre of Port Kembla along Wentworth Street.

The Department of Planning have expressed concerns that the intensification of the proposed residential use of the site may overly restrict the expectation that the Port and surrounding industry will continue to operate and grow into the future.

This report addresses the competing interests of a need for more housing and the future noise generation of the Port and surrounding industrial lands. Since the Port operates 24/7, this report has focused on the night-time period.

Whilst it is accepted that there will be intermittent crashes and bangs, from a planning perspective this report will consider the amenity LAeq,9hour levels included in the NPfI.

Firstly, the Port will be expected to adopt feasible and reasonable mitigation and management measures as it continues to operate and expand throughput. There are also existing residential areas surrounding the Port where noise limits would already apply and that would already restrict future port development, such that this particular site at 1 Military Road wouldn't make noise management measures more onerous. Of course, this doesn't mean there aren't more people potentially affected by the noise with the potential to complain – but this shouldn't be a sufficient reason to refuse new residential development nearby.

Secondly, through judicious design and the inclusion of Section 10.7 certificates on the title it is clear for future owners / occupiers that their property is noise affected to some degree by a 24-hour operating port. Whilst this in itself doesn't preclude the ability to complain, it should mean that as long as the noise generators within the Port and surrounding area are operating in accordance with their consent conditions and commitments in Noise Management Plans then no further action to reduce noise needs to be taken.

This report predicts the typical noise levels affecting the site, reviews two preferred layout options considered by the urban designers and following input by the planning panel which has addressed noise as well as other urban design considerations.

2 SITE DESCRIPTION AND PREFERRED CONCEPTS

The site is bounded by Reservoir Street, Electrolytic Street, Marne Street and Military Road and includes 1 land parcel: Lot 1 DP811699, known as Lot 1 Military Road, Port Kembla. Adjacent to the site is St Stephens Anglican Church at the corner of Church Street and Military Road. To the north of the site is the former PKC smelter and refinery, to the north west is a mixture of commercial and light industrial land, and to the east, south east, and south west are residential buildings.

Two concepts were proposed with various layouts. The two concepts contain a mixture of multi-storey apartment buildings, townhouses, and single dwelling buildings with varying building heights. The significant difference between the two concepts is the inclusion of an aged care facility in the northern precinct of the site. **Figure 2-1** and **Figure 2-2** presents the two concepts.

Figure 2-1 Proposed Site and Context – Preferred 1

Figure 2-2 Proposed Site and Context – Preferred 2 (Aged Care in Yellow)

3 NOISE CRITERIA

3.1 Operational Noise Criteria

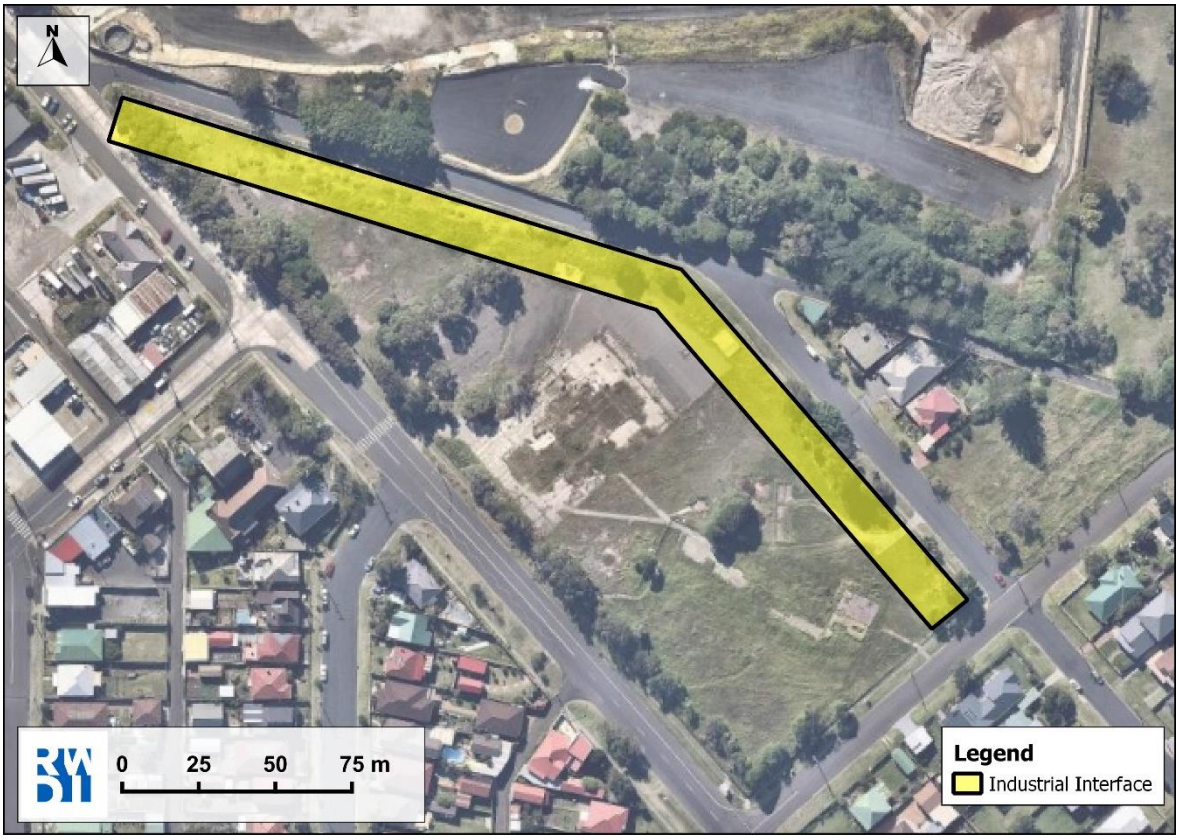
When planning a new residential development adjacent to an existing industrial area then the amenity criteria of the NPfI are the most appropriate. Given the site overlooks the Port and industrial areas then the Urban residential category is the most suitable and in this particular location the industrial interface needs to be adopted.

A simple approach would be to classify the whole site as industrial interface however, we have also taken the approach to apply the industrial interface to only the first row or any other row of buildings which has line of sight to the Port and industrial land. **Table 3-1** presents the proposed noise limits. **Figure 3-1** presents the extent of the industrial interface, this area would essentially include the first row of receivers for each of the concepts.

Table 3-1 NPfI Amenity Levels – dBA

Period	Time	Descriptor	Industrial Interface	Other Receiver
Day	7.00am – 6.00pm	$L_{Aeq,11hour}$	60	55
Evening	6.00pm – 10.00pm	$L_{Aeq,4hour}$	50	45
Night	10.00pm – 7.00am	$L_{Aeq,9hour}$	45	40

Figure 3-1 Industrial Interface



External noise criteria have been designed in order to achieve an appropriate internal noise level, especially for the night-time period where potential sleep disturbance is a concern. AS NZS 2107-2016 provides a range of recommended internal noise levels for residential spaces. For houses and apartments in inner city areas or entertainment districts or near major roads the recommended night-time internal noise levels for sleeping areas ranges between 35 – 40dBA.

A 10dB reduction is typically achieved from noise ingress through a partially open façade. Thus, an external level of 45 – 50dBA may be appropriate when compared to the recommendations of AS NZS 2107-2016.

3.2 Sleep Disturbance Criteria

Additionally, for the night period, the NPfI requires an assessment of the potential for sleep disturbance. when the subject development/premises night-time noise levels at a residential location exceeds:

- $L_{Aeq,15min}$ 40dBA or RBL+5dB, whichever is greater, and/or
- L_{AFmax} 52dBA or RBL+15dB, whichever is greater.

These levels are independent of the receiver category, including industrial interface. Strict adherence to these external noise levels would preclude residential development in many locations, including along transport corridors. The option to close windows and achieve an acceptable internal noise environment is an acceptable solution in these circumstances.

4 NOISE ASSESSMENT

4.1 Noise Modelling Methodology

RWDI has previously developed a noise model to support the Land Use Conflict study addressing Port / Industrial noise to Port Kembla. The noise modelling was completed using the CadnaA noise prediction software. To complete this, a representative 3D model within the software was constructed of the Port and surrounding areas. Noise source levels used in this model was a combination of measured and referenced noise levels. Refer to WM Report 17172 - Version A June 2018 for further information.

The main factors that are addressed in the model include:

- Implementation of noise propagation algorithm based on ISO9613;
- Source sound level emissions, locations, and height;
- Screening effects from buildings / fences / etc;
- Ground topography from NSW Government – Land & Property Information;
- Attenuation due to geometric spreading;
- Reflections; and
- Absorption (ground and atmospheric).

This model was considered suitable to assess noise at the proposed site, although the following adjustments were made.

- Industrial noise source height lowered from 16m to 8m
- Noise levels for the one industrial site adjacent to 1 Military Road have been adjusted to ensure it would meet the required noise limits at the existing residential and noise sensitive receivers surrounding 1 Military Road.

The model was run for both concepts to allow determination of noise from:

1. All noise sources;
2. Only Port noise sources;
3. Only surrounding Industry noise sources (without the industrial site directly adjacent); and
4. Only surrounding Industry noise sources (with the industrial site directly adjacent).

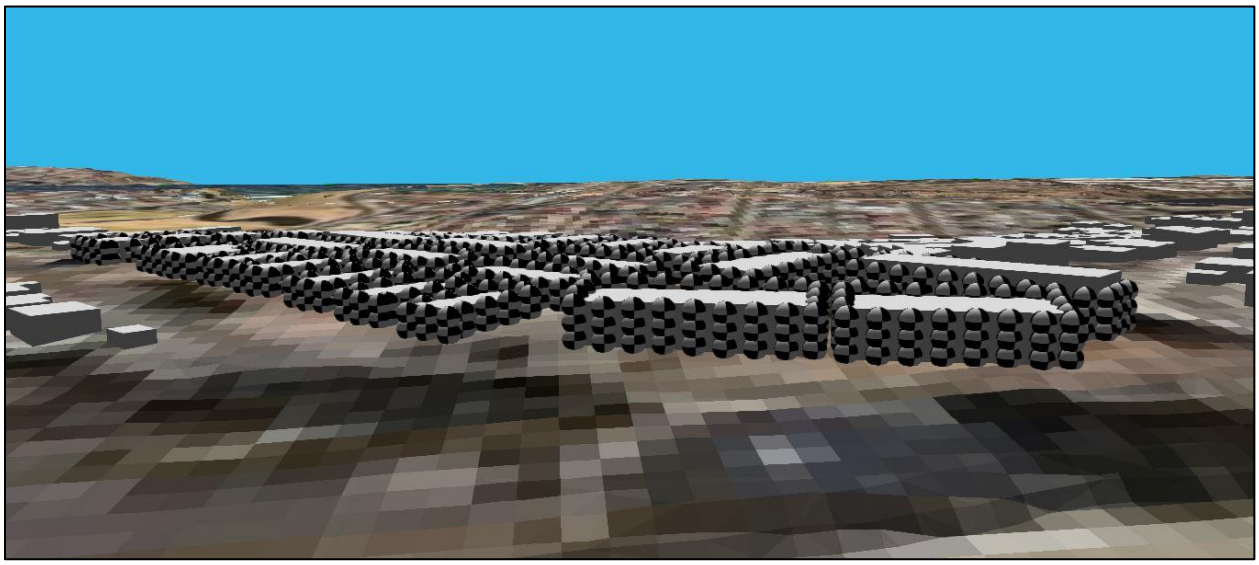
Noise distribution contours have been produced at a 4.5m height which is consistent with the 2018 Port Kembla noise study.

A baseline study was completed to examine the current noise distribution across the site, see **Figure 4-1**. It can be seen that a large portion of the site will experience levels of 45 – 50dBA, with levels dropping down to 40dBA in the southern eastern corner of the site.

For both options, receiver points were located every 5m along the building façade for each floor level. An example is represented in **Figure 4-2**. A total of 858 points were included in the model for Option 1.

Figure 4-1 Current Noise Distribution (Vacant Site)

Figure 4-2 3D View of Receiver Points for Option 1



4.2 Noise Modelling Output and Recommendations

The overall distribution in façade noise levels for the two options were relatively similar.

Table 4-1 below shows the total number of receiver points for each option and the number of receiver points which exceed various noise limits for various noise generation scenarios and the percentage of total points. This essentially summarises the percentage of the development affected to various degrees.

Table 4-1 Predicted Noise Distribution on Building Facades

Option	Scenario	>40dBA		>45dBA		>50dBA	
		No Pts	%	No Pts	%	No Pts	%
Preferred 1 858 Points	1 All Noise	510	58.0%	280	31.9%	66	7.5%
	2 Port Only	478	54.4%	226	25.7%	0	0.0%
	3 Industry no adjacent	0	0.0%	0	0.0%	0	0.0%
	4 Industry with adjacent	161	18.3%	3	0.3%	0	0.0%
Preferred 2 723 Points	1 All Noise	303	50.5%	116	19.3%	18	3.0%
	2 Port Only	287	47.8%	103	17.2%	0	0.0%
	3 Industry no adjacent	0	0.0%	0	0.0%	0	0.0%
	4 Industry with adjacent	59	9.8%	1	0.2%	0	0.0%

Review of **Table 4-1** indicates that 58% of the facades of Preferred Concept 1 and 55% of the residential facades of Preferred Concept 2 will experience noise levels greater than 40dBA from all noise sources. Noise modelling indicated that no facades would experience levels greater than 52dBA.

Preferred Concept 1 has more private residential facades exposed to levels above 40dBA when compared to Preferred Concept 2. This would be due to the two additional residential buildings located in the north western precinct, where the Aged Care facility is located in Preferred Concept 2.

When considering the sleep disturbance noise requirements outlined in Section 3 of this report, 32% of the facades of Preferred Concept 1 and 27% of the facades of Preferred Concept 2 will experience noise levels greater than 45dBA from all noise sources. It is recommended, where feasible that the more noise sensitive rooms (bedrooms) be located away from the port to minimise external noise levels. Façade design and glazing should also be designed with maximising noise reduction in mind.

With a relatively high specification glazing such as 10mm laminated construction for windows and glazed doors an internal to external noise reduction of at least 25dB can be achieved, resulting in external levels of up to 60dBA still allowing internal levels of 35dBA to be achieved.

Predicted received noise levels on the facades of the aged care facility ranged between 34-52dBA from Scenario 1, with approximately 92% of the facades experiencing noise levels above 40dBA. Internal noise requirements for aged care facilities are similar to residential receivers, however, can be controlled via improved glazing and is more likely to be fully air conditioned. The design of the glazing for the aged care facility will need to be addressed during its Development Application process.

Figure 4-3 Preferred 1 All Noise

Figure 4-4 Preferred 2 All Noise

5 CONCLUSION

RWDI has completed an acoustic feasibility study for the proposed rezoning and development of Lot 1 Military Road, Port Kembla.

Modelling has confirmed that a proportion of the development will be affected by Port and industrial noise at a level higher than desirable for many people but not all. In these cases, particularly, the development should consider the following measures to reduce impacts.

With the main noise sources to the north in most cases it will be possible to orientate living areas and balconies to the north, with bedroom areas facing south. Considering this aspect in conjunction with the Apartment Design Guide which considers natural and cross ventilation as well as noise, apartment layouts which extend from one side of the building to the other or use internal light wells, which would be shielded from Port noise may assist.

In addition to considering apartment layouts it is recommended that the proposed glazing be reviewed, such that when windows are closed, low internal noise levels can be achieved. At these times the need to provide sufficient fresh air ventilation and thermal comfort need to be addressed.

Whilst the effects are relatively small, due to the topography in the area, the proposed new development will also provide further shielding to the existing residences behind on Military Road, which are currently the “front line”. These residences would have been built before noise was taken into consideration.

Following the noise modelling assessment, the intention of the Planning Proposal to rezone the land from B4 Mixed Use to R3 Medium Density is feasible provided the following:

- the inclusion of Section 10.7 certificates on the title so it is clear for future owners / occupiers that their property is noise affected to some degree by a 24-hour operating port.
- It is the landowner’s responsibility to ensure that the new dwellings incorporate appropriate noise attenuation measures to mitigate impacts from the Port acceptable levels. This should particularly consider any low frequency component of port noise and adopt a façade construction which also performs better at low frequencies. In this regard a masonry style construction is likely to achieve better outcomes than lightweight material. Irrespective the façade design should be reviewed by an acoustical consultant.
- Buildings and apartments are designed to orientate noise sensitive rooms away from the Port and nearby industry, consider glazing design and ventilation requirements.