

# Acoustic Design Report – Mechanical Plant

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At:-

948 Barrenjoey Road,  
Palm Beach,  
NSW 2108

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February 2024

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Report No. nss24154 – Final

Prepared at the request of:-

**Peter Downes Designs**  
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Avalon Beach  
NSW 2107

Prepared by:-

## **NOISE AND SOUND SERVICES**

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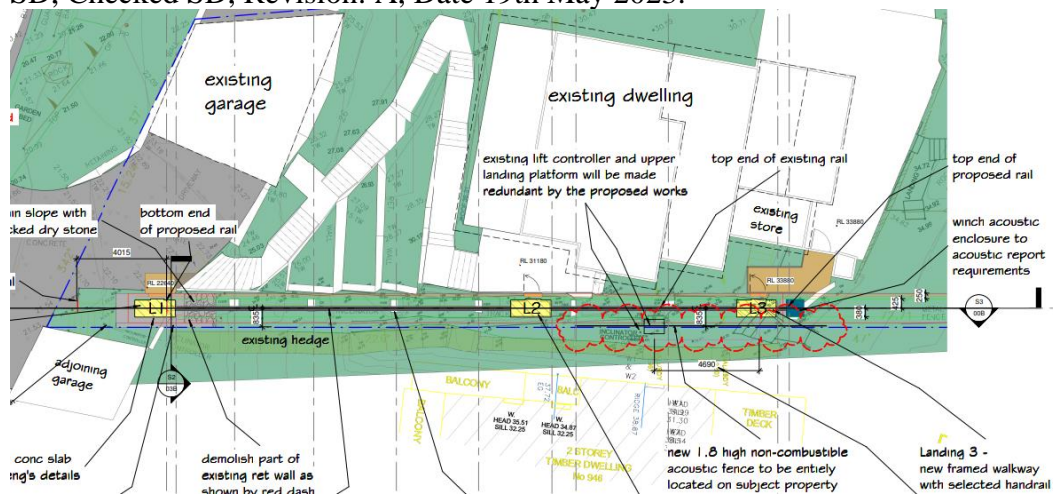
## 1. INTRODUCTION

Noise and Sound Services was requested by Peter Downes Designs of 77 Riviera Avenue, Avalon Beach, NSW 2107 to carry out an acoustic design report for an inclinator system at 948 Barrenjoey Road, Palm Beach, NSW 2108. An inclined lift is proposed for the existing driveway at landing 1, (L1) to provide access to the existing dwelling at L2 and L3.

The purpose of the survey is to assess mechanical plant noise levels and advise on any mitigation measures necessary in line with Northern Beaches Council requirements for this development.

## 2. SITE AND DEVELOPMENT DESCRIPTION

The location of the proposed inclinator at 948 Barrenjoey Road, Palm Beach, NSW 2108 is as shown in Figure 1 below. The nearest boundary from the proposed inclinator at the site is located approximately 2.5 metres from a window or deck of the residential dwelling at 946 Barrenjoey Road, Palm Beach. On the site it is proposed to construct an inclined passenger lift, or an inclinator. Full details are given in drawings provided by 'Peterdownes Designs', at 77 Rivera Avenue, Avalon Beach, NSW 2107, Drawing number: A2 2265 02B Drawn by: SD, Checked SD, Revision: A, Date 19th May 2023.



**Figure 1. Site Plan showing location of the Landings.**  
**Source: Peter Downes Designs**



**Figure 2. 1st Person Elevation showing location of the Measurements.**  
**Source: Google Earth.**

### 3. CRITERIA

Chapter 178 of the Noise Control Guideline on Pedestrian inclinator states: -

*“An Inclinator is a device for moving people up or down a slope or grade. The following conditions are commended for usage, having regard to local conditions:*

- (1) 24 movements per day maximum (excepting emergency use);*
- (2) Generally, to be within the 7am to 10pm time period;*
- (3) Alternative access shall be used during the 10pm and 7am time period unless this is reasonably impractical;*
- (4) The  $L_{Max}$  noise level shall not exceed 60 dB(A) when measured in the immediate vicinity of the external structure of any adjoining premises.*

The inclined lift must not be the cause of offensive noise. Offensive noise is defined in the NSW Protection of the Environment Operations Act 1997 (POEO Act) as being noise:-

- ‘a) that, by reason of its level, nature, character or quality, or the time at which it is made, or other circumstances:*

- i. *Is harmful to (or is likely to be harmful to) a person who is outside the premises from which it is emitted, or*
  - ii. *interferes unreasonably with (or is likely to Interfere unreasonably with) the comfort or repose of a person who is outside the premises from which it is emitted, or*
- b) *that, is of a level, nature, character or quality prescribed by the regulations or that is made at a time or in other circumstances, prescribed by the regulations.'*

In a Land and Environment Court judgement, (Appeal No. 11502 of 2004) the condition of consent for an inclined lift at residential premises was given as the following:- *“The maximum noise level  $L_{Amax}$  “fast response” from the inclinor is not to exceed 60 dB(A), when measured at the boundary of adjoining premises.”*

On this basis, we make the assumption that the noise from inclined lifts is not regarded as offensive if the maximum noise level at the nearest residential boundary is below 60 dBA and it is not used excessively at times of day when it is usual for people at neighbouring premises to be sleeping.

The NSW Noise Policy for Industrial (2017) specialty states that sources that are not dealt with by the policy include domestic/neighbourhood noise.

#### **4. AMBIENT NOISE MEASUREMENTS**

The existing noise environment was measured continuously for a period of 1 hour during peak time. This was obtained measuring with a sound level meter in front of the site at 948 Barrenjoey Road, Palm Beach (see Figure 1 above). Measurement instrumentation, procedure and results are described below.

##### **4.1 Instrumentation**

The instrumentation used during the noise source survey consisted of a Brüel and Kjær sound level meter model 2250 (serial no. 3008564). This meter conforms to Australian Standard AS IEC 61672.1-2004: *‘Electroacoustics - Sound level meters – Specifications’* as a class 1 precision sound level meter and has an accuracy suitable for both field and laboratory use. The calibration of the meter was checked before and after the measurement period with a Brüel and Kjær acoustical calibrator model 4231 (serial no. 2445349). No significant system drift occurred over the measurement period.

The sound level meter and calibrator were checked, adjusted and aligned to conform to the Brüel and Kjær factory specifications and issued with conformance certificates within the last 24 months as required by the regulations. The internal test equipment used is traceable to the National Measurement Laboratory at C.S.I.R.O., Lindfield, NSW, Australia.

## 4.2 Measurement Procedure

Free field noise monitoring was carried out on Wednesday 20<sup>th</sup> March 2024. Background and ambient noise levels in the area are influenced by local residential road traffic from Barrenjoey Road, Palm Beach. The ‘A’ frequency weighting and the ‘fast’ time weighting were used exclusively. Noise monitoring was completed during typical representative conditions.

## 4.3 Noise Measurement and Predicted Results

Measured ambient noise levels are assessed according to the NSW Noise Policy for Industry in terms of  $L_{Aeq}$  and  $L_{AF90}$  for the time periods defined as Day Evening: 7:00 am — 10:00 pm and Night: 10:00 pm – 7:00 am.

The measured background level ( $L_{AF90}$ ) and ambient ( $L_{Aeq}$ ) levels during the peak time of day, which is summarised below in Table 1.

**TABLE 1 – SUMMARY OF EXISTING / PREDITED\* NOISE LEVELS**

Time of Day	Rating Background Noise Levels ( $L_{AF90}$ ) dBA	Log Average Existing Ambient Noise Levels ( $L_{Aeq}$ ) dBA
Peak (07:00 – 22:00)	34	62
Off Peak (22:00 – 7:00)	30*	52*

Note 1- All levels rounded to the nearest whole decibel.

Note 2 - \* Predicted noise levels.

### 4.3.1 Previous Source Noise Measurements

Source noise measurements were carried out at another site with an existing, similar inclined lift winch system in operation (see Figure 1 above). The results are shown in Table 2 and 3 below. In which these results will be used as a representation of the new inclinor.

**TABLE 2 – THE INCLINATOR NOISE LEVEL MEASUREMENT RESULTS.**

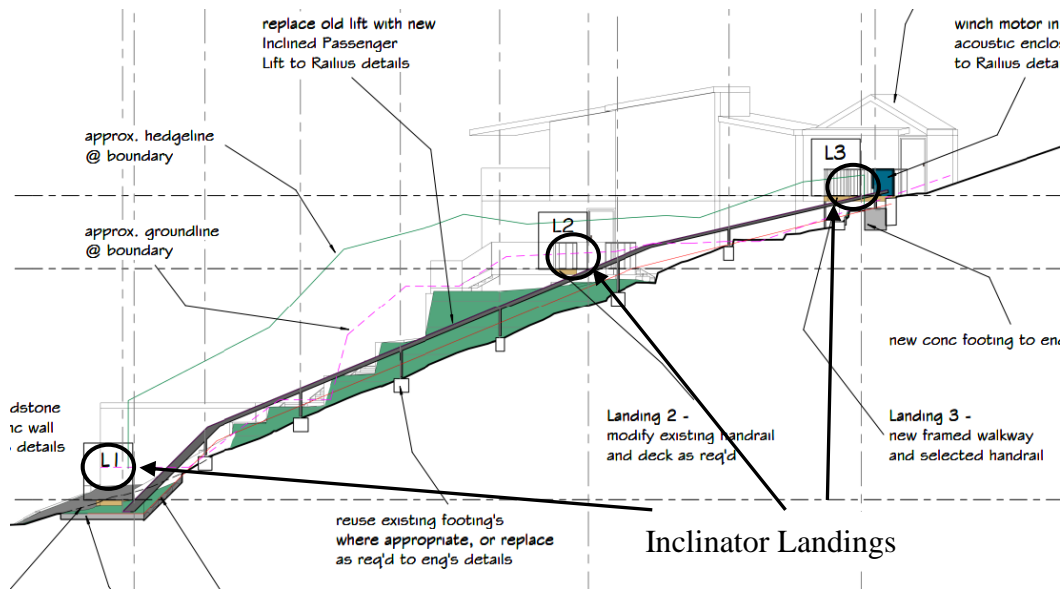
Distance from Cable and Winch Enclosure	Inclined lift Direction and Load	Measured Sound Pressure Level dBA		
		L <sub>Aeq, sample</sub> (1 Min)	L <sub>Aeq, sample</sub> (15 Min)	L <sub>AFmax</sub>
2 metres	Down only at Top – 1 Person	55	43	60/62
2 metres	Up and down at Top - Empty	58	46	62
2 metres	Up and down at Halfway – Empty	58	46	62
N/A	Motor @ 1 metre slow /fast /slow	74	62	78
N/A	Motor @ 1 metre fast	75	63	78

*Note: All levels rounded to the nearest whole decibel.*

**TABLE 3 – THE INCLINATOR NOISE LEVEL MEASUREMENT RESULTS.**

Distance from Cable and Winch Enclosure	Inclined lift Direction and Load	Measured Sound Pressure Level dBA		
		L <sub>Aeq, sample</sub> (1 Min)	L <sub>Aeq, sample</sub> (15 Min)	L <sub>AFmax</sub>
2 metres	Up and down at Top – 1 Person	54	42	72
2 metres	Up and down at Top - Empty	52	40	70
2 metres	Up and down at Halfway – Empty	59	47	67
2 metres	Down – Halfway 1 Person	57/58	45/46	66/67
2 metres	Up – Halfway – 1 Person	55/57	43/45	66/71

*Note: All levels rounded to the nearest whole decibel.*



**Figure 3. Elevation Plan showing location of the Proposed Inclined Passenger Lift. Source: Railius.**

#### 4.4 Site Specific Noise Goals

Site-specific inclinator noise goals ( $L_{Aeq}$ , 15 minute period) in line with Northern Beaches council conditions, are **39 dBA** (from 34 dBA plus 5 dB) for on peak times.

### 5 RECOMMENDATIONS

The noise level ( $L_{AFmax}$ ) from the proposed cable and winch enclosure of the inclinator lift is not expected to exceed the Land and Environment Court's condition of consent of 60 dBA when measured at the nearest residential boundary (approximately 2.5 metres in this case). The movement of the car/carriage is generally less than the noise level from the motor. Therefore, the winch motor area is to be enclosed with acoustic material (See Appendix B) as previous motor have been high when measured close up, this covering any receiver areas on 946 Barrenjoey Road. This will reduce the noise level (both  $L_{Aeq}$  and  $L_{Amax}$ ) and minimise the chance of any noise complaints.

An acoustic fence 1.8 metres high and 3 metres long near landing 3 (L3) is required due to the landing 3 and winch motor proposed approximately 2.5 metres away from the residential area and therefore minimizing the chance of any noise complaints.



## 6 SUMMARY AND CONCLUSIONS

An acoustical design for the proposed inclinator at 948 Barrenjoey Road, Palm Beach, NSW 2108 has been carried out. It is proposed to construct an inclined passenger lift or inclinator.

It is shown that the peak (daytime) criterion will be met for the inclinator provided recommendations as given in section 6 above are carried out. This is at the proposed location for an inclinator as given in Figure 3 above.

Status	Date	Prepared by:
Draft	20 <sup>th</sup> March 2024	Mark Scannell BA MAAS
Status	Date	Checked by:
Draft	21 <sup>st</sup> March 2024	Ken Scannell MSc MAAS
Status	Date	Issued by:
Final	27 <sup>th</sup> March 2024	Mark Scannell BA MAAS

**Important Note.** All products and materials suggested by 'Noise and Sound Services' are selected for their acoustical properties only. All other properties such as airflow, aesthetics, chemical, corrosion, combustion, construction details, decomposition, expansion, fire rating, grout or tile cracking, loading, shrinkage, ventilation, etc are outside of 'Noise and Sound Services' field of expertise and **must be** checked with the supplier or suitably qualified specialist before purchase.

## APPENDIX A – MEASURED SOUND PRESSURE LEVELS

Environmental noise levels can vary considerably with time; therefore, it is not adequate to use a single number to fully describe the acoustic environment. The preferred, and now generally accepted, method of recording and presenting noise measurements is based upon a statistical approach. For example, the  $L_{AF10}$  noise level is the level exceeded for 10% of the time, and is approximately the average maximum noise level. The  $L_{AF90}$  level is the level that is exceeded for 90% of the time, and is considered to be approximately the average of the minimum noise level recorded. This level is often referred to as the ‘background’ noise level. The  $L_{Aeq}$  level represents the average noise energy during the measurement period.

The measurement procedure and the equipment used for the noise survey are given in section 4 of this report. The measurement results are shown in Table A1 below with previous measurements close to the site shown in Table A2 below. All sound pressure levels in Tables A1 and A2 below are rounded to the nearest whole decibel.

**TABLE A1 – 948 BARRENJOEY ROAD, PALM BEACH, NSW 2108, 20<sup>th</sup> March 2024**

Time		Sound Pressure Level (dBA)					
Start	Finish	$L_{Aeq}$	$L_{AF1}$	$L_{AF10}$	$L_{AF50}$	$L_{AF90}$	$L_{AF99}$
12:00	12:15	61	71	66	57	42	38
12:15	12:30	62	72	67	55	38	34
12:30	12:45	62	72	67	56	34	31
12:45	13:00	61	70	66	55	38	34
<b>12:00</b>	<b>13:00</b>	<b>62</b>	<b>72</b>	<b>67</b>	<b>56</b>	<b>34</b>	<b>31</b>

## APPENDIX B – GLOSSARY OF TECHNICAL TERMS

**‘A’ Frequency Weighting** – The most widely used sound level frequency filter is the A scale, which roughly corresponds to the inverse of the 40 dB (at 1 kHz) equal-loudness curve. Using this filter, the sound level meter is less sensitive to very high and, in particular, very low frequencies. Sound pressure level measurements made with this filter are commonly expressed as **dB<sub>A</sub>**.

**Acoustic Fence** – A fence which has enough mass to reflect a significant amount of sound and has no holes or gaps (including at the base). The noise barrier, fence wall, or screen may be constructed of timber, or one or more of the following materials as shown in the Table below.

### RECOMMENDED MATERIALS FOR CONSTRUCTION OF NOISE BARRIERS

Material	Typical Thickness (mm)	Surface Density (kg/m <sup>2</sup> )
Polycarbonate	8 to 12	10-14
Acrylic	15	18
Timber	15 to 30	22
Aerated Concrete	100	161

Timber fences should be constructed of not less than 15 mm thick lapped and capped timber provided such thickness can be maintained to prevent warping. For all constructions, the fence must not contain any acoustically untreated holes or gaps. Occasional small gaps at the base of the fence to allow drainage may be necessary but should be kept to a minimum and not provide a line of sight from the noise source to the receiver. The fence must be professionally constructed using a safe and secure method to ensure total stability in all predictable wind and weather conditions.

**Ambient Sound** – The all-encompassing sound associated with that environment being a composite of sounds from many sources, near and far.

**Assessment Background Level (ABL)** – The tenth percentile value of the recorded  $L_{AF90}$  level for each day, evening and night period.

**Background Noise Level ( $L_{AF90, T}$ )** – A statistical parameter used for assessments of constantly varying noise levels. The  $L_{AF90}$  is the ‘A’ frequency weighted noise level that is exceeded for 90 % of the measurement period, ‘T’. The measurement period is normally 15 minutes. The background noise is therefore the lowest noise level that occurs for 1.5 minutes in any 15 minute period.

**Decibel (dB)** – The logarithmic ratio of any two quantities and relates to the flow of energy (power). A scale used in acoustical measurement related to power, pressure or intensity. Expressed in dB, relative to standard reference values.

**Energy Average Noise Level ( $L_{Aeq, T}$ )** – The  $L_{Aeq}$  noise level is also known as the equivalent continuous sound pressure level. This is the ‘A’ frequency weighted logarithmic average of the sound energy of the measurement time ‘T’. When measured over a 15 minute time period the symbol  $L_{Aeq, 15 \text{ minute}}$  is used. This is the standard descriptor used for source noise measurements and ambient noise measurements.

**‘Fast’ Time Weighting** – The root-mean-squared energy averaging of the sound pressure with time. ‘Fast’ time weighting is 125 milliseconds.

**Percentile Levels ( $L_{AF10}$ ,  $L_{AF10}$ ,  $L_{AF90}$ )** - Environmental noise levels can vary considerably with time; therefore, it is not adequate to use a single number to fully describe the acoustic environment. The preferred, and now generally accepted, method of recording and presenting noise measurements is based upon a statistical approach. For example, the  $L_{AF10}$  noise level is the ‘A’ frequency weighted and ‘fast’ time weighted level exceeded for 10% of the time and is approximately the average maximum noise level. The  $L_{AF90}$  level is the level that is exceeded for 90% of the time and is considered to be approximately the average of the minimum noise level recorded. This level is often referred to as the ‘background’ noise level.

**Rating Background Level (RBL)** – The median value of the tenth percentile value (ABL) for the recorded  $L_{AF90}$  levels for each day, evening and night period over the complete 7 days or more of noise monitoring. The tenth percentile is also referred to as the Assessment Background Level (ABL).

**Sound Power** - Sound power is the energy rate - the energy of sound per unit of time (J/s, Watts in SI-units) from a sound source.

**Sound Power Level ( $L_w$ )** – Sound power level is a logarithmic measure of the sound power in comparison to a specified reference level ( $10^{-12}$  Watts). The unit less decibel term is a measure of the sound emission of a source independent of distance. When ‘A’ frequency weighted the symbol becomes  $L_{WA}$ .

**Sound Pressure ( $L_p$ )** – Sound pressure is the pressure caustic by an acoustic event over and above atmospheric presume in Pascals.

**Sound Pressure Level (SPL)** – 20 times the logarithm to the base 10 of the ratio of the r.m.s. sound pressure of 20 micro Pascals.