RODNEY STEVENS ACOUSTICS
Acoustic Consultants

REPORT 210231R1

Revision 0

Aircraft Noise Impact Assessment
Proposed Residential Development
2-10 The Appian Way, Mount Vernon NSW 2178

PREPARED FOR:
Dinastia Renovations and Additions
2-10 The Appian Way
Mount Vernon NSW 2178

25 May 2021

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1 INTRODUCTION

Rodney Stevens Acoustics Pty Ltd (RSA) has been engaged by Dinastia Renovations and Additions to prepare a noise assessment for the proposed residential additions and alterations at 2-10 The Appian Way, Mount Vernon NSW 2178.

Penrith City Council requires that an aircraft noise assessment be submitted as part of the Development Application.

The primary purpose of this assessment is to address the impact of aircraft noise intrusion associated with the operation of the proposed Western Sydney Airport on the amenity of the proposed additions and alterations and will form part of the submission to Council. This report presents an assessment against the requirements of Australian Standard 2021:2015 *"Acoustics - Aircraft noise intrusion - Building siting and construction"*. Architectural plan details are provided in Appendix B.

Specific acoustic terminology is used in this report. An explanation of common acoustic terms is provided in Appendix A.

2 PROPOSED DEVELOPMENT

2.1 Site Location

The proposed development is located at 2-10 The Appian Way, Mount Vernon NSW. The proposed site and surroundings are shown in Figure 2-1.

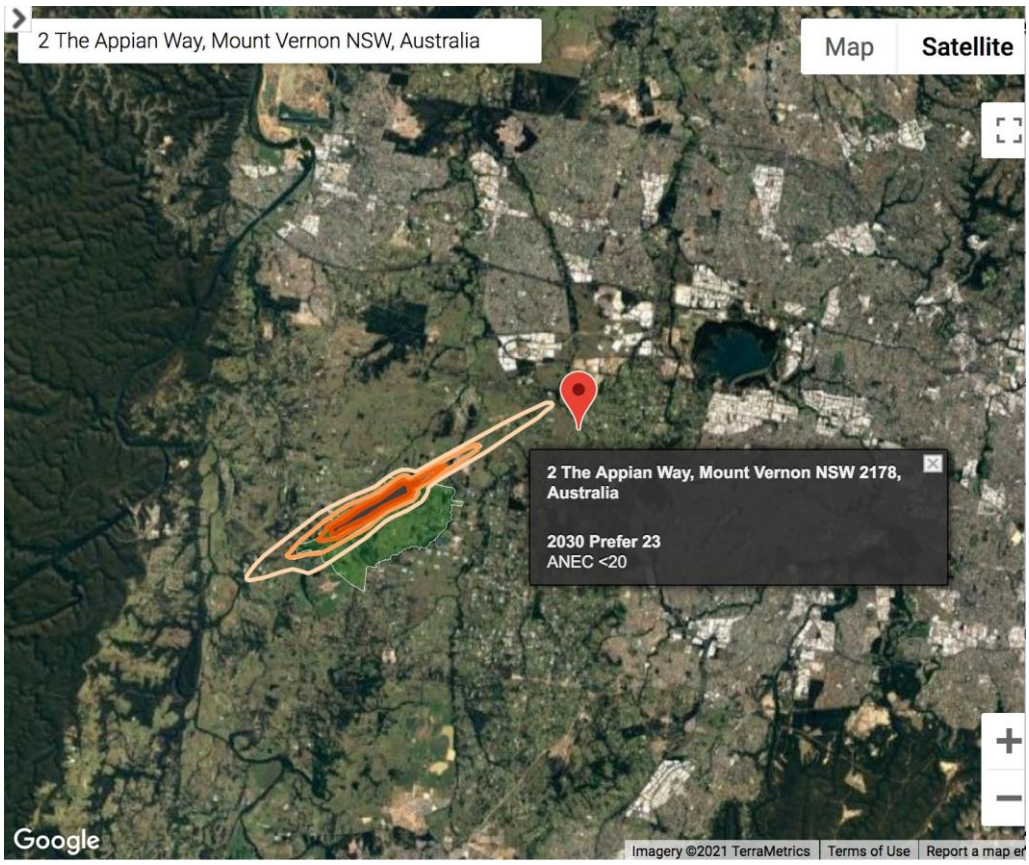
Figure 2-1 Site Location

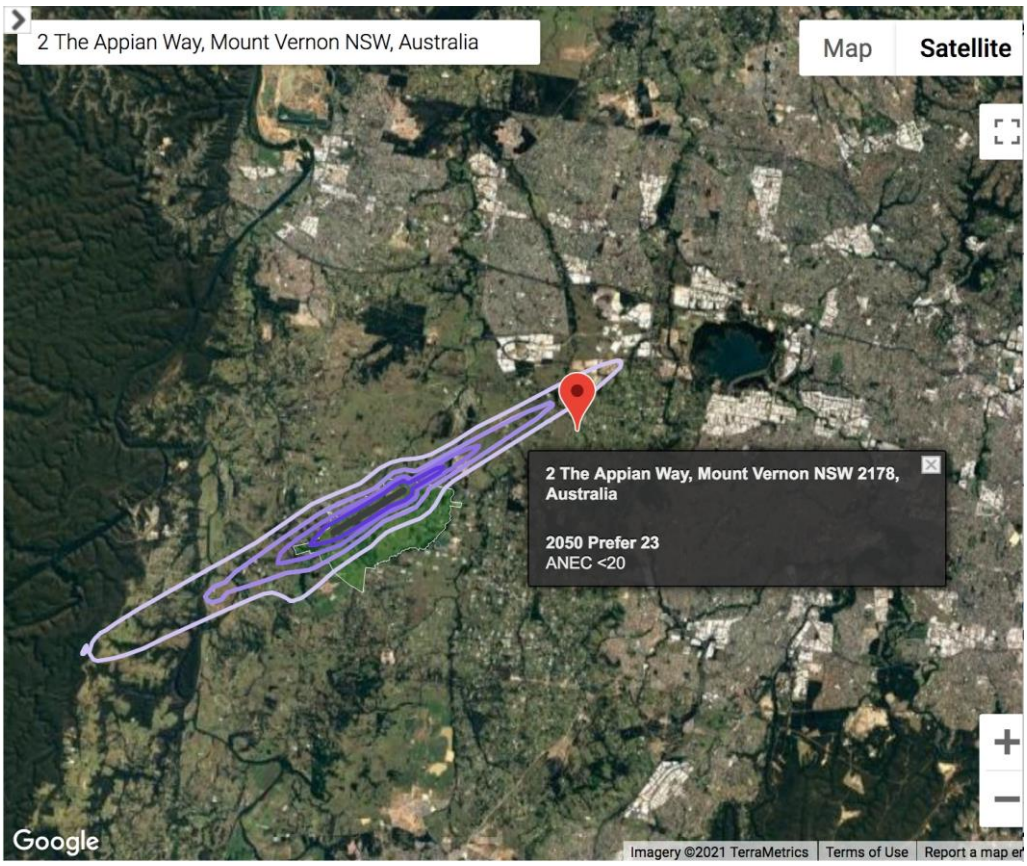
Aerial image courtesy of Google Maps © 2021

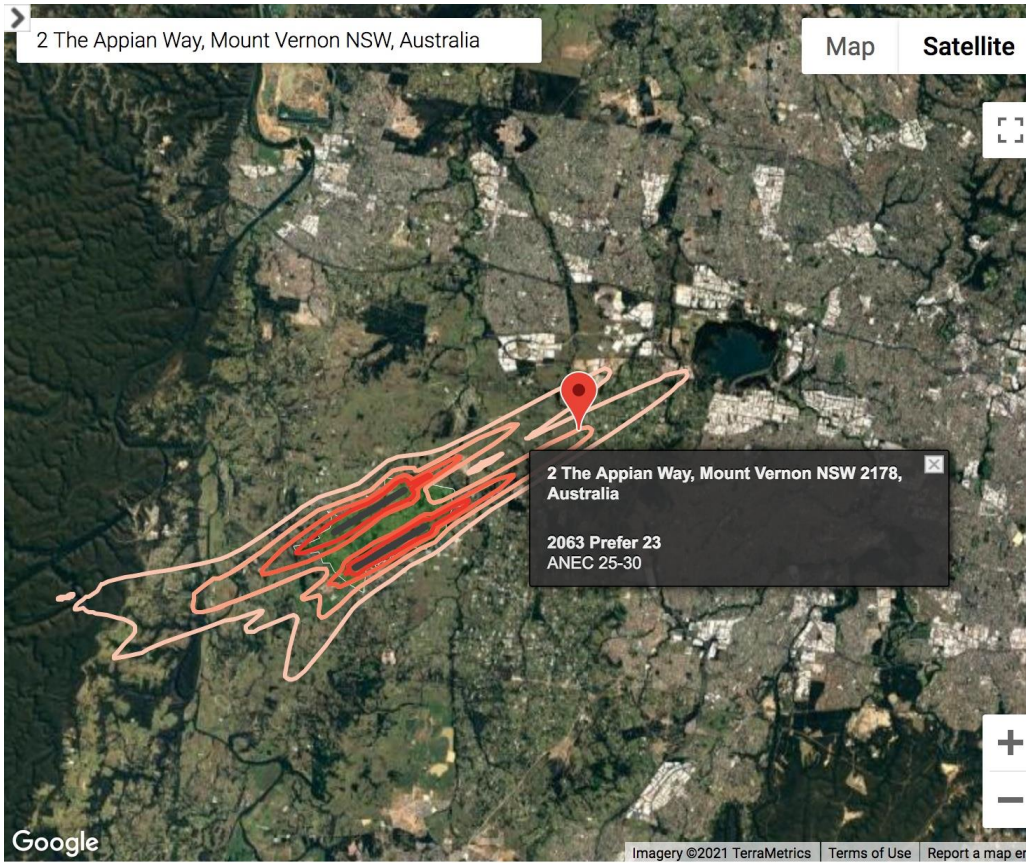
The proposed development lies inside the ANEC 25-30 contour lines (for noise predictions for 2063) for the proposed Western Sydney Airport ANEC (Aircraft Noise Exposure Contours). The ANEC shows that the development site is outside of the noise prediction curves during time periods before 2063.

The project area relative to the ANEC curve for the site is presented in Figure 2-2.

Figure 2-2 Site in Relation to ANEF Curves – 2030, 2050 and 2063







Map courtesy of Department of Infrastructure and Regional Development

3 NOISE CRITERIA

The proposed development site falls within the bounds of Penrith City Council. The Council's DCP, *Penrith Development Control Plan 2014, Part C12 Noise and Vibration, Section 12.3 Aircraft Noise, Control 1* states:

> ***1) General***
>
> *a) Council will not grant consent to any development unless it is demonstrated to Council's satisfaction that:*
>
> *i) The building site is considered acceptable for the proposed development based upon ANEF (Australian Noise Exposure Forecast) zones in accordance with Australian Standard 2021-2000.*
>
> *ii) Where a building site is classified by AS 2021-2000 as 'conditionally acceptable', an assessment of the proposed development is to be conducted by an accredited acoustical consultant in accordance with the procedures set out in Australian Standard 2021-2000 to ensure that the indoor design sound levels of the Standard are achieved within the various areas of occupancy.*
>
> ***2) Determination of Noise Levels***
>
> *a) Assessment of site acceptability shall be determined by means of the most recent ANEF contour map available for the Second Sydney Airport (see Figure C12.1).*

b) Determination of maximum noise levels due to aircraft flyovers at the site shall be conducted in accordance with the procedures laid down in Australian Standard 2021-2000.

3) Noise Impact Statements - specific requirements

a) Any development classified as 'conditionally acceptable' in Australian Standard 2021-2000 is to include a Noise Impact Statement which is to be prepared in accordance with the minimum requirements set out in Appendix F3 of this DCP. In addition, the following additional specific information is to be provided:

i) The site acceptability classification based upon ANEF zones in accordance with AS 2021-2000;

ii) The maximum noise level due to aircraft flyover at the site and the method used for determination (i.e. in accordance with AS 2021-2000, or based upon information supplied by the relevant Government Aviation Authority);

iii) The indoor design sound level for aircraft flyovers in accordance with AS 2021-2000;

iv) The aircraft noise reduction(s) (ANR) required to be incorporated in the building envelope;

v) Details of building components and construction techniques required to provide sufficient noise reduction;

vi) A map clearly indicating the location of the development site in relation to the most recent ANEF contour map produced for the second Sydney airport;

vii) Sketch plans of the site illustrating building locations and any other relevant details, together with detailed floor plans and elevations;

viii) Any other significant or relevant acoustic information concerning the project; and

ix) A statement of opinion confirming compliance with the acoustical design criteria requirements.

Penrith Development Control Plan 2014, Part D1 Rural Land Uses, Section 1.2.8 Land Use in the Vicinity of Proposed Second Sydney Airport, Controls states:

C. Controls

***1)** New dwellings (or significant alterations and/or additions to existing dwellings) within the 20-25 Australian Noise Exposure Forecast (ANEF) zone shall be designed to achieve the requirements discussed in the section on 'Aircraft Noise' in the 'Noise and Vibration' section of this Plan.*

***2)** New dwellings (or significant alterations and/or additions to existing dwellings) will not be permitted on land where the ANEF exceeds 25.*

This acoustic assessment will therefore use Australian Standard 2021 – 2015 Acoustic – Aircraft Noise as the basis for its assessment.

4 ASSESSMENT OF AIRCRAFT NOISE

4.1 Site Location and Classification

AS 2021-2015 contains a detailed procedure for assessing maximum levels of aircraft noise intrusion based on the location of a building with respect to ANEF contours. The suitability of the site for a given building type is then ranked as either “Unacceptable”, “Conditionally Acceptable” or “Acceptable”. Based on the acceptability of the site for the proposed building use, there are further detailed procedures to determine the noise reduction required from the building construction to control maximum internal noise levels during aircraft flyovers.

Figure 2-2 shows the location of the residential property with respect to the Western Sydney Airport ANEF contour map. The figure shows that the project site is located outside the ANEC 20 contours until noise predictions for 2063 where it lies within the ANEC 25-30 contours.

In accordance with the methods provided in AS 2021:2015, distance coordinates for the project site relative to the Western Sydney Airport runway have been determined. Given the site location, the distance coordinates with respect to the Western Sydney Airport runway are presented in Table 4-1 below.

Table 4-1 Distance Coordinates to Development Site

Site Location	Runway	Distance Coordinate		
		DS	DL	DT
2-10 The Appian Way	50/230	300 m	8,000 m	11,300 m

4.2 Aircraft Noise Levels

The maximum aircraft flyover noise level at the proposed development site has been calculated in accordance with the methodology in Section 3.1 of AS 2021- 2015. The calculated noise level is 83 dB(A), this level was calculated from a Boeing 747-400. We note that this aircraft is being phased out in favor of newer and quieter aircraft, therefore the next highest calculated level will be used. The calculation shows that a Boeing 767-300 has a level of **78 dB(A)**, this noise level will be used as the basis of aircraft noise impact assessment. It should be noted that as the noise exposure is based on 2063 noise prediction contours, it is likely that the aircraft currently in use will have been phased out for quieter aircraft by this period. Notwithstanding this, this assessment will be based on the worst case scenario of current noise levels.

4.3 Aircraft Noise Reduction

AS 2021 provides recommendations for acceptable internal noise levels within various areas of occupancy inside buildings during aircraft flyovers.

The recommended indoor design noise levels relating to residential premises and the relevant noise exposure levels are presented in Table 4-2.

Table 4-2 Aircraft Noise Reduction

Area of Occupancy	Aircraft Noise Reduction (ANR)
Sleeping Areas, Dedicated Lounges	28
Other Habitable Areas	23
Bathrooms, Toilets etc.	18

The internal design noise levels and the ANR derived above assume that the windows and external entry doors are closed. As it is necessary for the windows and doors to remain closed to comply with AS 2021:2015, an alternative means of ventilation approved by Council and in accordance with the relevant regulations such as the National Construction Code (NCC) and AS 1668.2 may be required.

5 BUILDING ENVELOPE CONSTRUCTION

5.1 Recommended Noise Control Treatment

The calculation procedure establishes the required noise insulation performance of each surface component such that the internal noise level is achieved whilst an equal contribution of aircraft noise energy is distributed across each component. Building envelope components with a greater surface area must therefore offer increased noise insulation performance.

All recommendations must be checked by others to ensure compliance with other non-acoustic requirements that Council or other authority may impose (e.g. Thermal requirements for BASIX compliance).

5.2 Glazing

The R_w rating required for each window will vary from room to room. Recommendations for windows also apply to any other item of glazing located on the external facade of the building in a habitable room unless otherwise stated.

Note that the R_w rating is required for the complete glazing and frame assembly. The minimum glazing thicknesses will not necessarily meet the required R_w rating without an appropriate frame system. It will be therefore necessary to provide a window glass and frame system having a laboratory tested acoustic performance meeting the requirements below.

The window systems must be tested in accordance with both of the following:

- Australian Window Association Industry Code of Practice Window and Door – Method of Acoustic Testing; and
- AS 1191 Acoustics – Method for laboratory measurement of airborne sound insulation of building elements.

It is necessary to submit such Laboratory certification for the proposed glazing systems (i.e. windows and framing systems) (e.g. NAL or CSIRO) for approval by RSA prior to ordering or commitment.

The entire frame associated with the glazing must be sealed into the structural opening using acoustic mastics and backer rods. Normal weather proofing details do not necessarily provide the full acoustic insulation potential of the window system. The manufacturers' installation instructions for the correct acoustic sealing of the frame must be followed.

It is possible that structural demands for wind loading or fire rating or the like may require more substantial glass and framing assemblies than nominated above. Where this is the case the acoustic requirements must clearly be superseded by the structural or fire rating demands.

Table 5-1 presents the minimum recommended R_w (weighted noise reduction) for glazing elements.

Table 5-1 Minimum Acoustic Rating (R_w) Required For Glazing Elements

Level	Room	Window	Glazed Door/Door
Ground	Dining/Kitchen/Lounge/ Game/Gym	Rw 30	Rw 30
Ground	Main Bedroom	Rw 34	Rw 34

5.3 Mechanical Ventilation

Windows need to be closed in order to comply with the internal noise criteria. This would interfere with the natural ventilation of the residence. As such, ventilation approved by Council and in accordance with the relevant regulations such as the National Construction Code (NCC Vol.1, Part 4.5 *Ventilation of rooms*) and AS1668.2-2002 *The use of ventilation and air conditioning* will be required.

A specific mechanical plant selection has not been supplied at this stage. It is anticipated that the building will be serviced by typical mechanical ventilation/air conditioning equipment.

It is likely that future noise emissions may be met through the use of conventional noise control methods (e.g. selection of equipment on the basis of quiet operation and, where necessary, providing enclosures, localised barriers, silencers and lined ductwork).

An appropriately qualified acoustic consultant should review the mechanical plant associated with the development at the detailed design stage when final plant selections have been made.

6 CONCLUSION

Rodney Stevens Acoustics has conducted a review of the proposed residential additions and alterations at 2-10 The Appian Way, Mount Vernon NSW. The review has comprised establishment of noise criteria and an acoustic assessment with regard to Penrith City Council's conditions.

To achieve aircraft noise levels that comply with the design criteria for residential habitable and other spaces as given in Australian Standard AS 2021-2015, windows and external doors must remain closed. As such a system of mechanical ventilation will be required.

In conclusion, with the incorporation of the acoustical treatment recommended in this report, the proposed residential development is expected to conform to the requirements of AS 2021-2015.

Approved:-

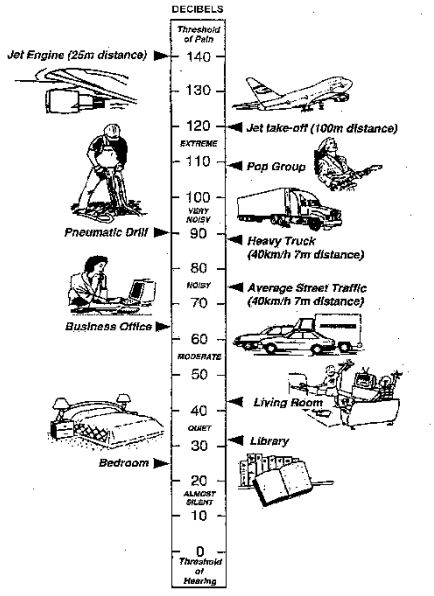
Rodney Stevens

Manager/Principal

Appendix A – Acoustic Terminology

A-weighted sound pressure	The human ear is not equally sensitive to sound at different frequencies. People are more sensitive to sound in the range of 1 to 4 kHz (1000 – 4000 vibrations per second) and less sensitive to lower and higher frequency sound. During noise measurement an electronic '*A-weighting*' frequency filter is applied to the measured sound level *dB(A)* to account for these sensitivities. Other frequency weightings (B, C and D) are less commonly used. Sound measured without a filter is denoted as linear weighted dB(linear).
Ambient noise	The total noise in a given situation, inclusive of all noise source contributions in the near and far field.
Community annoyance	Includes noise annoyance due to: ▪ character of the noise (e.g. sound pressure level, tonality, impulsiveness, low-frequency content) ▪ character of the environment (e.g. very quiet suburban, suburban, urban, near industry) ▪ miscellaneous circumstances (e.g. noise avoidance possibilities, cognitive noise, unpleasant associations) ▪ human activity being interrupted (e.g. sleep, communicating, reading, working, listening to radio/TV, recreation).
Compliance	The process of checking that source noise levels meet with the noise limits in a statutory context.
Cumulative noise level	The total level of noise from all sources.
Extraneous noise	Noise resulting from activities that are not typical to the area. Atypical activities may include construction, and traffic generated by holiday periods and by special events such as concerts or sporting events. Normal daily traffic is not considered to be extraneous.
Feasible and reasonable measures	Feasibility relates to engineering considerations and what is practical to build; reasonableness relates to the application of judgement in arriving at a decision, taking into account the following factors: ▪ Noise mitigation benefits (amount of noise reduction provided, number of people protected). ▪ Cost of mitigation (cost of mitigation versus benefit provided). ▪ Community views (aesthetic impacts and community wishes). ▪ Noise levels for affected land uses (existing and future levels, and changes in noise levels).
Impulsiveness	Impulsive noise is noise with a high peak of short duration or a sequence of these peaks. Impulsive noise is also considered annoying.
Low frequency	Noise containing major components in the low-frequency range (20 to 250 Hz) of the frequency spectrum.

Noise criteria	The general set of non-mandatory noise levels for protecting against intrusive noise (for example, background noise plus 5 dB) and loss of amenity (e.g. noise levels for various land use).
Noise level (goal)	A noise level that should be adopted for planning purposes as the highest acceptable noise level for the specific area, land use and time of day.
Noise limits	Enforceable noise levels that appear in conditions on consents and licences. The noise limits are based on achievable noise levels, which the proponent has predicted can be met during the environmental assessment. Exceedance of the noise limits can result in the requirement for either the development of noise management plans or legal action.
Performance-based goals	Goals specified in terms of the outcomes/performance to be achieved, but not in terms of the means of achieving them.
Rating Background Level (RBL)	The rating background level is the overall single figure background level representing each day, evening and night time period. The rating background level is the 10th percentile min L_{A90} noise level measured over all day, evening and night time monitoring periods.
Receptor	The noise-sensitive land use at which noise from a development can be heard.
Sleep disturbance	Awakenings and disturbance of sleep stages.
Sound and decibels (dB)	Sound (or noise) is caused by minute changes in atmospheric pressure that are detected by the human ear. The ratio between the quietest noise audible and that which should cause permanent hearing damage is a million times the change in sound pressure. To simplify this range the sound pressures are logarithmically converted to decibels from a reference level of 2 x 10-5 Pa. The picture below indicates typical noise levels from common noise sources.



dB is the abbreviation for decibel – a unit of sound measurement. It is equivalent to 10 times the logarithm (to base 10) of the ratio of a given sound pressure to a reference pressure.

Sound power Level (SWL)

The sound power level of a noise source is the sound energy emitted by the source. Notated as SWL, sound power levels are typically presented in *dB(A)*.

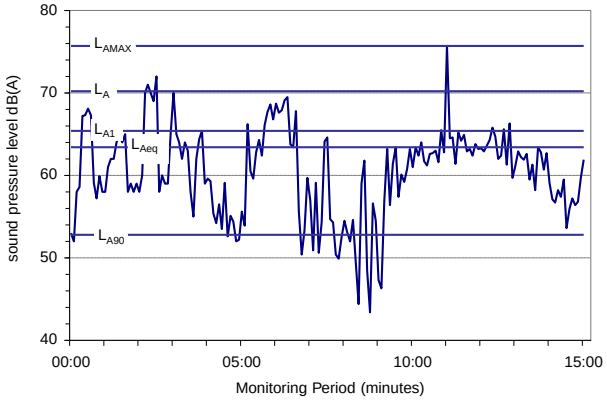
Sound Pressure Level (SPL)

The level of noise, usually expressed as SPL in *dB(A)*, as measured by a standard sound level meter with a pressure microphone. The sound pressure level in *dB(A)* gives a close indication of the subjective loudness of the noise.

Statistic noise levels

Noise levels varying over time (e.g. community noise, traffic noise, construction noise) are described in terms of the statistical exceedance level.

A hypothetical example of A weighted noise levels over a 15 minute measurement period is indicated in the following figure:



Key descriptors:

L_{Amax} Maximum recorded noise level.

L_{A1} The noise level exceeded for 1% of the 15 minute interval.

L_{A10} Noise level present for 10% of the 15 minute interval. Commonly referred to the average maximum noise level.

L_{Aeq} Equivalent continuous (energy average) A-weighted sound pressure level. It is defined as the steady sound level that contains the same amount of acoustic energy as the corresponding time-varying sound.

L_{A90} Noise level exceeded for 90% of time (background level). The average minimum background sound level (in the absence of the source under consideration).

Threshold

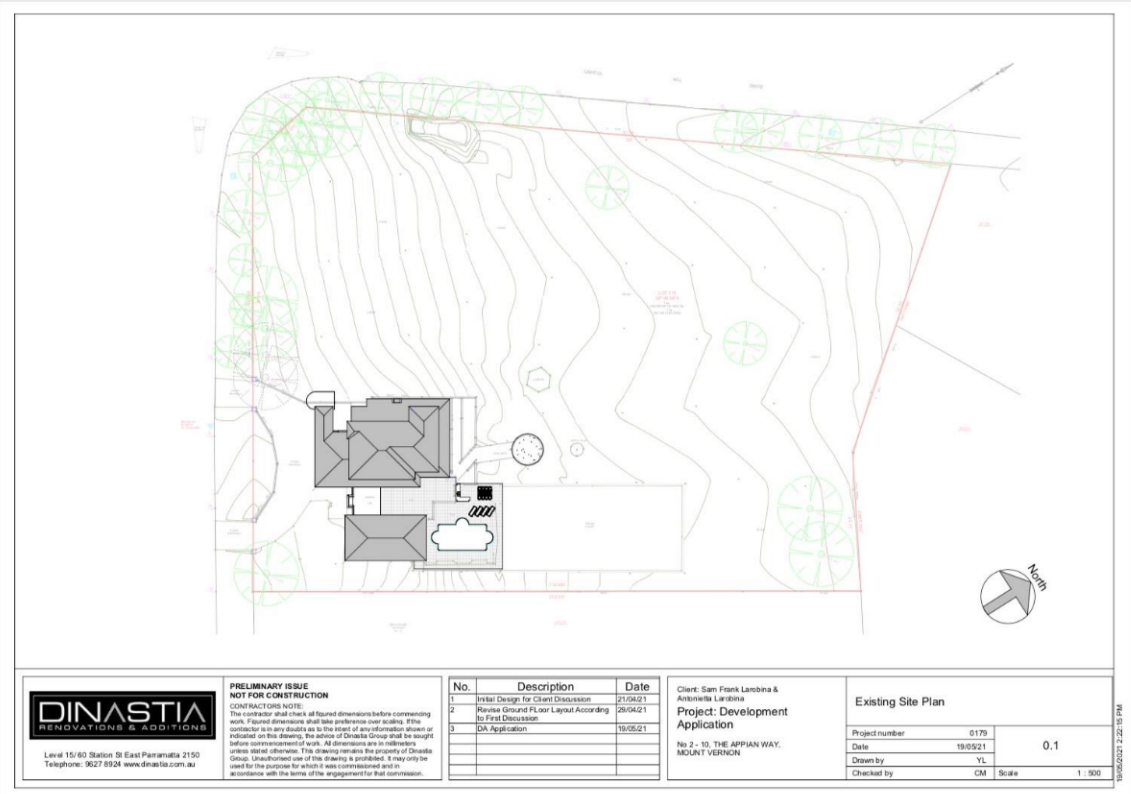
The lowest sound pressure level that produces a detectable response (in an instrument/person).

Tonality

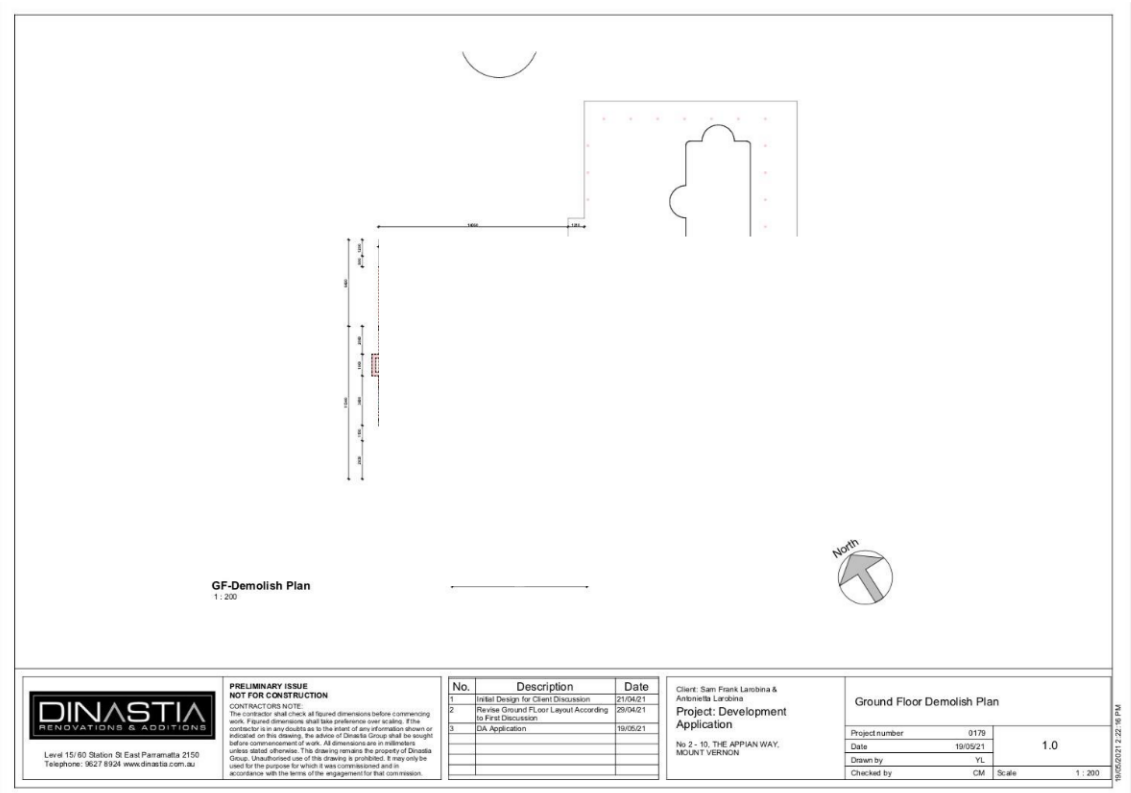
Tonal noise contains one or more prominent tones (and characterised by a distinct frequency components) and is considered more annoying. A 2 to 5 dB(A) penalty is typically applied to noise sources with tonal characteristics

Appendix B – Architectural Pans

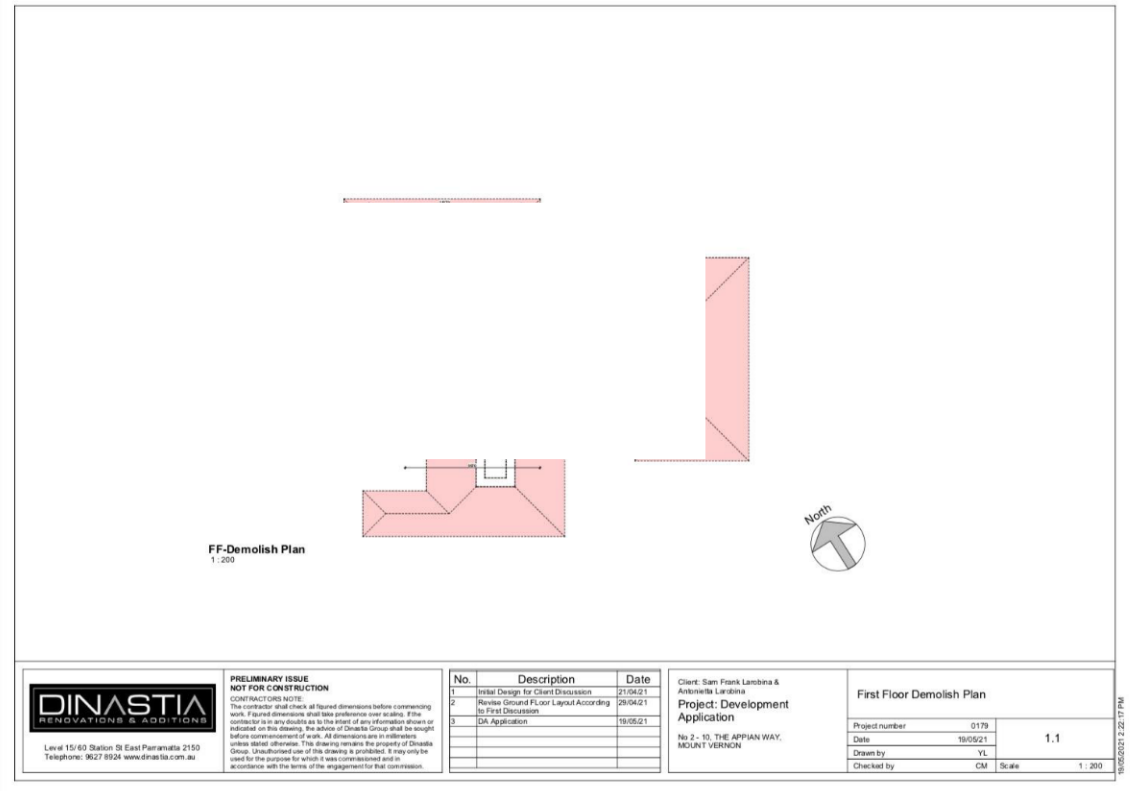
Existing Site Plan



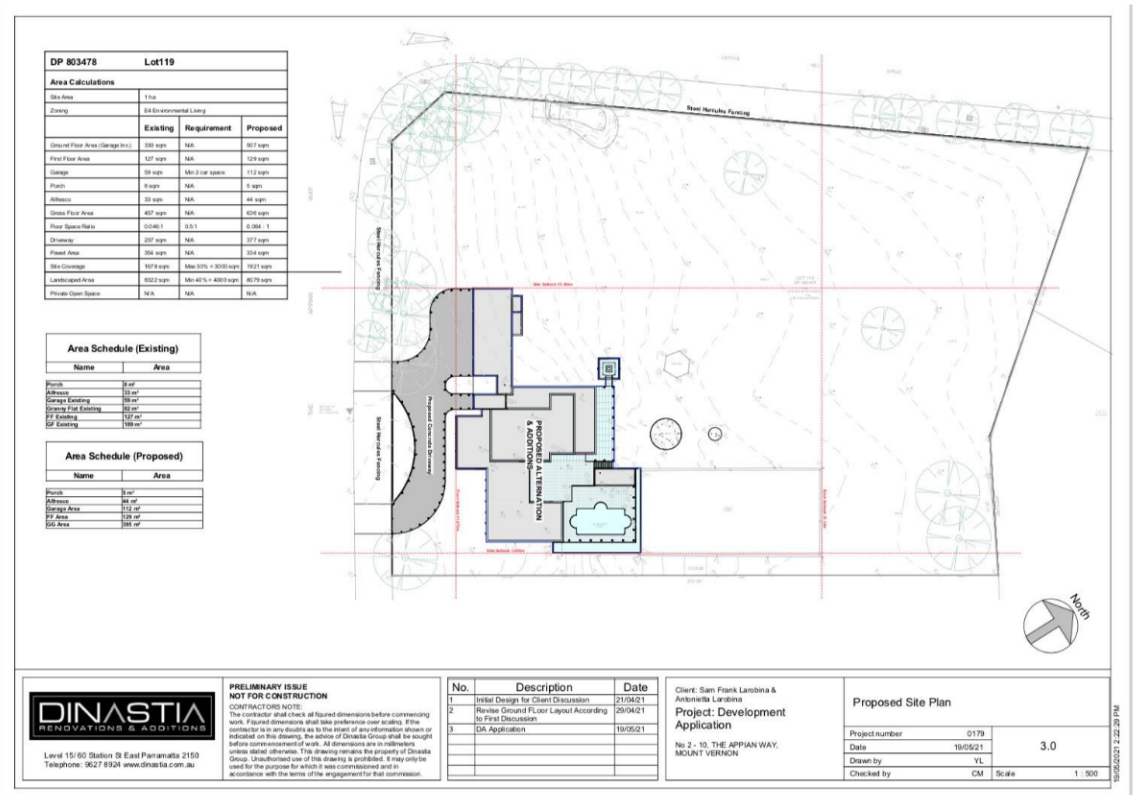
Demolition Plan – Ground Floor



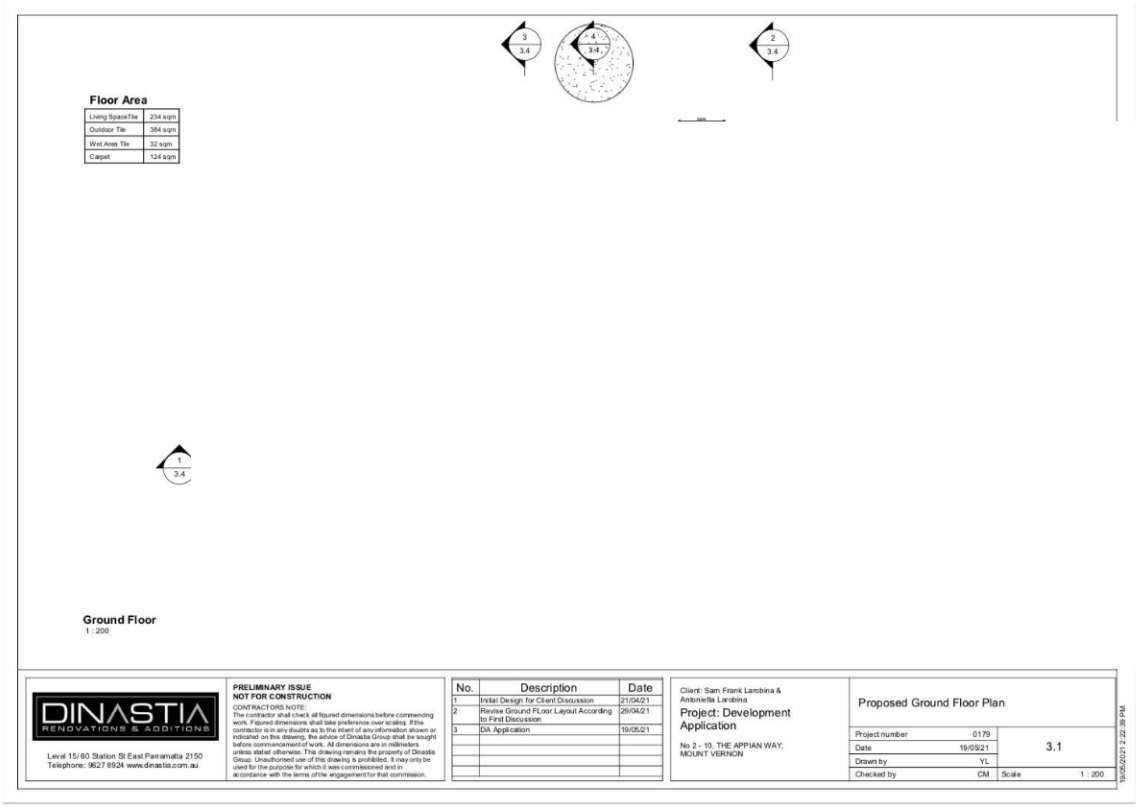
Demolition Plan – First Floor



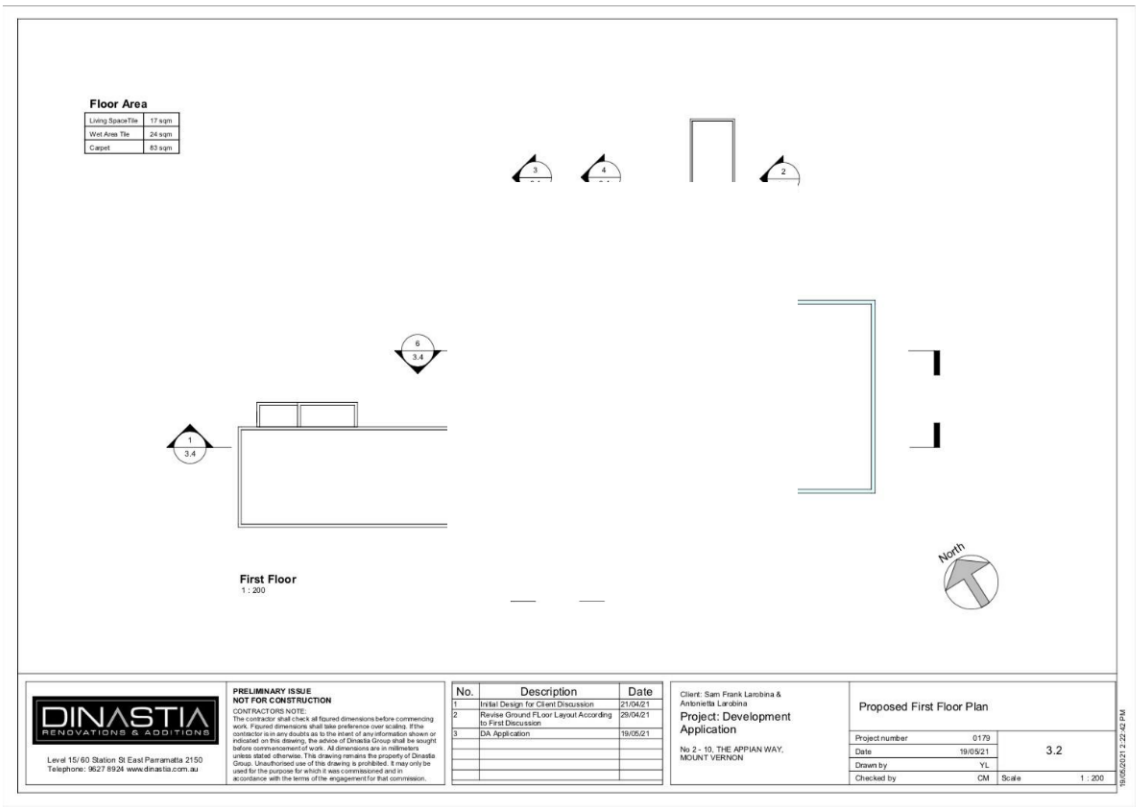
Proposed Site Plan



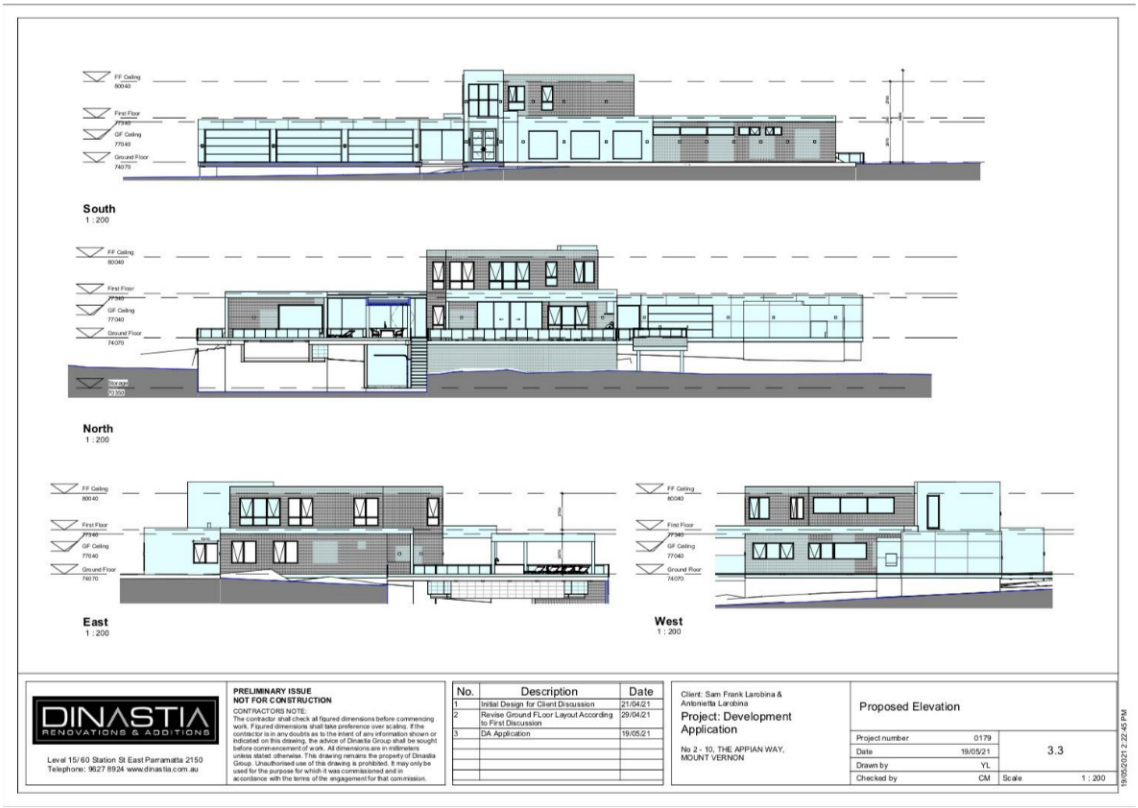
Ground Floor Plan



First Floor Plan



Elevations



Sections