



Construction Noise & Vibration Management Plan

Proposed Construction Works

Oxford Falls Grammar School Flexible Library Infill

Client:
Oxford Falls
Grammar School
C/o- EPM Projects



22 July 2022



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GLOSSARY

NOISE

Noise is produced through rapid variations in air pressure at audible frequencies (20 Hz – 20 kHz). Most noise sources vary with time. The measurement of a variable noise source requires the ability to describe the sound over a particular duration of time. A series of industry standard statistical descriptors have been developed to describe variable noise, as outlined in **Section 2** below.

NOISE DESCRIPTORS

L_{eq} – The sound pressure level averaged over the measurement period. It can be considered as the equivalent continuous steady-state sound pressure level, which would have the same total acoustic energy as the real fluctuating noise over the same time period.

L_{Aeq(15min)} – The A-weighted average equivalent sound level over a 15 minute period.

L_{A90} – The A-weighted noise level that has been exceeded for 90% of the measurement duration. This descriptor is used to describe the background noise level.

RBL – Rating Background Level. The overall single-figure background level representing each assessment period (day/evening/night) over the whole monitoring period (as opposed to over each 24hr period used for assessment background level) This is the level used for assessment purposes.

dB – Decibels. The fundamental unit of sound, a Bell is defined as the logarithm of the ratio of the sound pressure squared over the reference pressure squared. A Decibel is one-tenth of a Bell. Probably the most common usage of the Decibel in reference to sound loudness is dB sound pressure level (SPL), referenced to the nominal threshold of human hearing. For sound in air and other gases, dB(SPL) is relative to 20 micropascals (μPa) = 2×10^{-5} Pa, the quietest sound a human can hear.

A-WEIGHTING

"A-weighting" refers to a prescribed amplitude versus frequency curve used to "weight" noise measurements in order to represent the frequency response of the human ear. Simply, the human ear is less sensitive to noise at some frequencies and more sensitive to noise at other frequencies. The A-weighting is a method to present a measurement or calculation result with a number representing how humans subjectively hear different frequencies at different levels.

NOISE CHARACTER, NOISE LEVEL AND ANNOYANCE

The perception of a given sound to be deemed annoying or acceptable is greatly influenced by the character of the sound and how it contrasts with the character of the background noise. A noise source may be measured to have only a marginal difference to the background noise level, but may be perceived as annoying due to the character of the noise.

Acoustic Dynamics' analysis of noise considers both the noise level and sound character in the assessment of annoyance and impact on amenity.

1 INTRODUCTION

1.1 EXECUTIVE SUMMARY

Acoustic Dynamics is engaged by **EPM Projects** on behalf of **Oxford Falls Grammar School** to assess and, where required, make recommendations to reduce and manage the noise and vibration impact at the nearest potentially affected receivers resulting from the construction works and associated activities for the proposed development at 1078 Oxford Falls Road, Oxford Falls, NSW, 2100.

This report presents the relevant construction noise and vibration emission objectives, construction noise and vibration prediction calculations, an impact assessment and recommendations for mitigation and management measures to be implemented, to minimise the potential for adverse impact at the nearest potentially affected receivers, resulting from construction works.

This report is prepared in accordance with the various acoustic requirements of:

- (a) Northern Beaches Council;
- (b) NSW Environment Protection Authority (EPA); and
- (c) Australian Standards.

1.2 DESCRIPTION OF PROPOSAL

The subject construction works will be undertaken at Oxford Falls Grammar School, situated within a Deferred Matter (DM) land zone which, for the purposes of the State Environmental Planning Policy (SEPP) is assessed as an Environmental Management (E3) land zone. The subject development has road frontages direct to Oxford Falls Road, Dreadnought Road and Wakehurst Parkway.

Acoustic Dynamics is advised that use of noise generating equipment during the proposed works will be undertaken between the following operating hours, as shown in **Table 1.1**.

Table 1.1 Operating Hours of Noise Generating Equipment

| Activity | Permitted Work Hours |
|------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| All building, construction and site work, including site deliveries (except as detailed below) | <ul style="list-style-type: none"> • Monday to Friday – 7:00am to 5:00pm • Saturdays – 8:00am to 1:00pm • Sundays & public holidays – No work or deliveries permitted |

The subject site, adjacent receivers and surrounding area is shown in the Location Map, Aerial Image and Drawings presented within **Appendix A**.

2 ASSESSMENT CRITERIA AND STANDARDS

Acoustic Dynamics has conducted a review of the local council, state government and federal legislation that is applicable to the construction works associated with the subject site. The relevant sections of the legislation are presented below. The most stringent criteria which have been used in this assessment of the subject development are summarised below.

2.1 COUNCIL CRITERIA

2.1.1 COUNCIL CONDITIONS

Acoustic Dynamics advises that we have reviewed Council's conditions and the following conditions relevant to this assessment are included below:

2.1.2 COUNCIL PLANNING & DEVELOPMENT CONTROL INSTRUMENTS

Acoustic Dynamics has conducted a review of the relevant Northern Beaches Council's planning and development control instruments including the following documents:

- *Warringah Local Environmental Plan (LEP) 2011*; and
- *Warringah Development Control Plan (DCP) 2011*.

Acoustic Dynamics' review of the *Warringah LEP 2011* did not yield specific acoustic criteria or information relevant to this assessment.

Acoustic Dynamics' review of the *Warringah DCP 2011* did not yield specific acoustic criteria or information relevant to this assessment.

2.2 AUSTRALIAN STANDARDS

Acoustic Dynamics has conducted a review of relevant Australian Standards in relation to the subject development. The following details this review.

2.2.1 AS2436 "GUIDE TO NOISE CONTROL ON CONSTRUCTION ... SITES"

Australian Standard 2436-2010: "*Guide to Noise and Vibration Control on Construction, Demolition and Maintenance Sites*" provides guidance on noise control in respect of engineering construction, maintenance and demolition works, including guidance in investigation and identification of noise sources, measurement of sound, and its assessment, with a view to planning of measures for noise control.

Acoustic Dynamics advises that AS 2436 contains the following information relating to appropriate noise emission goals for construction sites:

“3.2 NOISE AND VIBRATION IMPACTS ON THE COMMUNITY

Whether or not noise from a construction, maintenance or demolition site is likely to constitute a problem depends upon a number of considerations, such as –

- (a) existing background noise level;*
- (b) distance between the site and the areas likely to be affected by the construction noise;*
- (c) nature of buildings and the activity therein, where the noise is likely to be heard;*
- (d) the likely duration of construction, maintenance and demolition operations and the hours during which the above operations will be carried out (whether during the day, night or weekends);*
- (e) the nature of the noise, e.g. audible pure tone components and impulsive character; and*
- (f) the number of items of major plant and equipment being utilized simultaneously on the site for their cumulative impact.*

Some construction or demolition activities are by their very nature noisy. The authorities responsible for setting noise level criteria for essential works will take note of the constraints imposed by such activities, especially when they are of short duration.”

Acoustic Dynamics advises that determination of appropriate noise emission goals for the proposed works in accordance with the EPA’s guidelines will satisfy the recommendations and guidelines detailed within AS 2436.

We advise that assessment of the proposed works, detailed within this document, has been carried out in accordance with the information and guidelines detailed within AS 2436.

2.3 NSW EPA INTERIM CONSTRUCTION NOISE GUIDELINE

In this section, the relevant construction noise emission criteria and conditions applicable to the works are outlined, based on the NSW Environment Protection Authority’s (EPA’s) *Interim Construction Noise Guideline (ICNG)*.

The NSW EPA’s ICNG is developed to manage noise from construction works. The ICNG advises that a quantitative methodology of assessment of construction noise emission may be undertaken for long-term (greater than three weeks) works.

Acoustic Dynamics advises that the most appropriate methodology for the assessment of noise emission from the proposed works is a quantitative assessment, to ensure noise emission from the works is minimised. Note should be made that the ICNG states that when developing noise mitigation strategies for reducing construction noise emission focus should be given to *“applying all ‘feasible’ and ‘reasonable’ work practices to minimise construction noise impacts”*.

Accordingly, relevant noise emission goals have been determined for the proposed works, in accordance with the information contained within the ICNG, which should be achieved where possible.

The ICNG provides information on management levels (noise emission goals) for construction noise emission at residential receivers, and other various sensitive receivers. The management noise levels at residential receivers are dependent upon the relevant rated background level (RBL) at the residential receiver, and the time of day that the construction noise is to be generated.

Acoustic Dynamics has determined the daytime background noise environment at the subject property, as referred to in the EPA's ICNG. Acoustic Dynamics notes that the noise levels recorded at the subject property are likely to be representative of the noise levels heard at the nearest residential receivers. The results of operator-attended noise measurements on at the subject site on 8 July 2022 are presented in **Table 2.1**.

Table 2.1 Measured Ambient Noise Environment

| Location | Period | Measured Noise Levels [dB] ^{1,2} | |
|-----------------------------|----------------------|-------------------------------------------|------------------|
| | | RBL (L _{A90}) | L _{Aeq} |
| Oxford Falls Grammar School | Daytime (7am to 5pm) | 51 | 59 |

- Note: 1) Measured noise levels are ambient, and do not include any subject works or associated activities.
 2) Works at the site will not take place outside daytime hours of 7am to 5pm Monday to Saturday.

Based on the measured background noise environment, **Table 2.2** presents the construction external noise emission management levels/objectives, as detailed in the EPA's ICNG, for the nearest residential, commercial and industrial receivers:

Table 2.2 Site Specific Construction External Noise Objectives at Receivers

| Time of Day | EPA Management Level (L _{Aeq} (15 min)) | Site specific construction noise emission goals L _{Aeq} (15 min) [dB] |
|-----------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------|
| Recommended Standard Hours: Monday to Friday 7am to 4pm Saturday 8am to 3pm No work on Sundays or Public Holidays | Residences | Noise affected RBL + 10 dB |
| | Active Recreation Area (characterised by sporting activities and activities which generate their own noise or focus for participants, making them less sensitive to external noise intrusion) | 65 |

- Note: 1) Works at the site are not expected to take place outside recommended standard hours.

Further to the table above, **Table 2.3** presents the construction noise emission management levels/objectives, as detailed in the EPA's ICNG, for other sensitive land uses:

Table 2.3 Site Specific Construction Internal Noise Objectives for Noise-Sensitive Receivers

| Time of Day | EPA Management Level (L_{Aeq} (15 min)) | Site specific internal noise emission goals L_{Aeq} (15 min) [dB] |
|-----------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------|------------------------------------------------------------------------|
| Recommended Standard Hours: Monday to Friday 7am to 4pm Saturday 8am to 3pm No work on Sundays or Public Holidays | Classrooms at schools and other educational institutions | 45 |
| | Commercial Premises | 70 |
| | Place of Worship - Internal | 45 |

Note: 1) Works at the site are not expected to take place outside recommended standard hours.

Based on the information contained within the EPA’s ICNG, Acoustic Dynamics recommends that noise emission from the proposed works achieves the following noise emission goals, when possible.

Note should be made that as night-time works are not expected to occur, the assessment of sleep disturbance is not warranted.

2.4 CONSTRUCTION VIBRATION CRITERIA

Structural and cosmetic damage vibration criteria are guided by the vibration levels presented within the standards BS 7385 and DIN 4150 and the NSW EPA document “Assessing Vibration - a technical guide”.

In terms of the most recent relevant vibration damage criteria, British Standard 7385: Part 2-1993 “Evaluation and measurement for vibration in buildings Part 2 - Guide to damage levels from ground-borne vibration” represents a definitive standard against which the likelihood of building damage from ground vibration can be assessed.

Although there is a lack of reliable data on the threshold of vibration-induced damage in buildings both in countries where national standards already exist and in the UK, BS 7385: Part 2 has been developed from an extensive review of UK data, relevant national and international documents and other published data.

The standard sets guide values for building vibration based on the lowest vibration levels above which damage has been credibly demonstrated. These levels are judged to give a minimum risk of vibration-induced damage, where minimal risk for a named effect is usually taken as a 95% probability of no effect.

Sources of vibration, which are considered in the standard, include blasting (carried out during mineral extraction or construction excavation), excavation, piling (sheet, bored, contiguous), ground treatments (e.g. compaction), construction equipment, tunnelling, road and rail traffic and industrial machinery.

The guide values from this standard for transient vibration judged to result in a minimal risk of cosmetic damage to residential buildings and industrial buildings are presented numerically in **Table 2.3** and graphically in **Figure 2.4**.

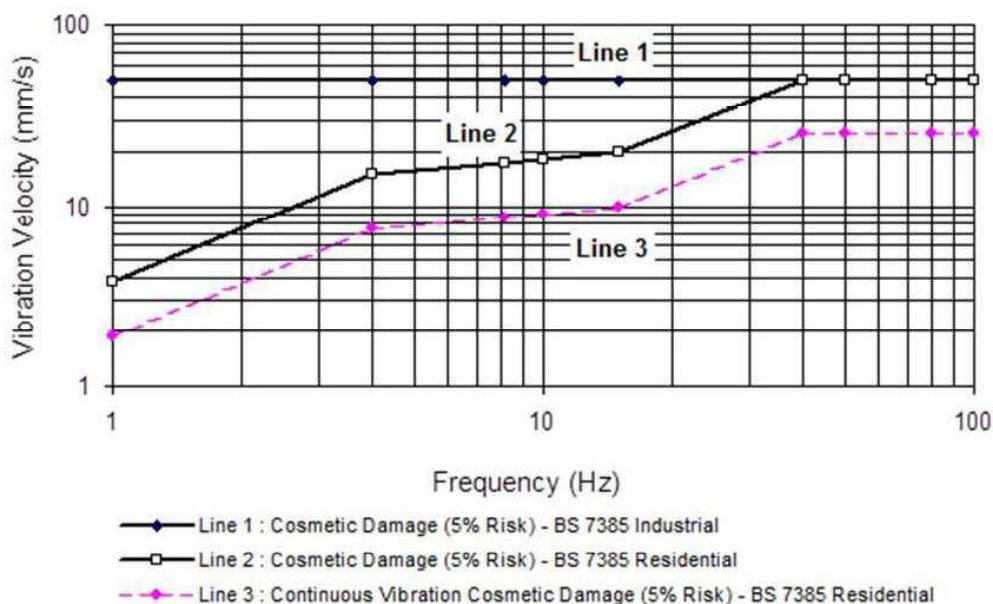
Table 2.3 Transient Vibration Guide Values - Minimal Risk of Cosmetic Damage

| Line | Type of Building | Peak Component Particle Velocity in Frequency Range of Predominant Pulse | |
|------|-------------------------------------------------------------------------------------------|--------------------------------------------------------------------------|-----------------------------------------------------------------|
| | | 4 Hz to 15 Hz | 15 Hz and above |
| 1 | Reinforced or framed structures Industrial and heavy commercial buildings | 50 mm/s at 4 Hz and above | |
| 2 | Unreinforced or light framed structures residential or light commercial type buildings | 15 mm/s at 4 Hz increasing to 20 mm/s at 15 Hz | 20 mm/s at 15 Hz increasing to 50 mm/s at 40 Hz and above |

In relation to guide values for continuous vibration relating to cosmetic damage, the standard states that the guide values in **Table 2.5** relate predominantly to transient vibration, which does not give rise to the resonant responses in structures, and to low-rise buildings.

Where the dynamic loading caused by continuous vibration is such as to give rise to dynamic magnification due to resonance, especially at lower frequencies where lower guide values apply, then the guide values in **Table 2.5** may need to be reduced by up to 50%, as is the case with continuous vibration from rock breaking.

Figure 2.4 Graph of Transient Vibration Guide Values for Cosmetic Damage



The standard goes on to state that minor damage is possible at vibration magnitudes, which are greater than twice those given in **Table 2.3**, and major damage to a building structure may occur at values greater than four times the tabulated values.

It is noteworthy that in addition to the guideline values presented in **Table 2.3**, the standard also states the following:

“Some data suggests that the probability of damage tends towards zero at 12.5 mm/s peak component particle velocity. This is not inconsistent with an extensive review of the case history information available in the UK.”

Note is made that **cosmetic damage** to buildings occurs at vibration levels significantly lower than those causing **structural damage**.

- British Standard 7385 indicates a 5% risk of **cosmetic damage** to commercial/industrial buildings at 50 mm/s from transient vibration and at 25 mm/s from continuous vibration; and
- British Standard 7385 indicates a 5% risk of **cosmetic damage** to residential and light framed structures at 15 mm/s at 4 Hz from transient vibration and at 7.5 mm/s at 4 Hz from continuous vibration.

In addition to the above standard, the German Standard DIN 4150 provides guideline values of vibration velocity for evaluating the effects of short-term vibration. Table 1 of DIN 4150 is reproduced as **Table 2.5** below.

Table 2.5 Guideline values of vibration velocity, v_i , for evaluating the effects of short-term vibration

| Line | Type of structure | Vibration Velocity, v_i , in mm/s | | | |
|------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------|-------------|----------------|-----------------------------------------|
| | | Foundation | | | Plane of floor of uppermost full storey |
| | | At a frequency of | | | Frequency mixture |
| | | Less than 10 Hz | 10 to 50 Hz | 50 to 100)* Hz | |
| 1 | Buildings used for 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 and 2 and are of great intrinsic value (e.g. buildings that are under a preservation order) | 3 | 3 to 8 | 8 to 10 | 8 |

*) For frequencies above 100 Hz, at least the values specified in this column should be applied.

In view of the foregoing, the following **conservative** site assessment control limits could be adopted for the purposes of monitoring and evaluating the measured vibration levels from the excavation works, should this be required:

Structures Adjacent to Proposed Works:

- All buildings and structures adjacent to works – 7.5 mm/s peak component particle velocity (site control level).

3 INSTRUMENTATION AND MEASUREMENT STANDARDS

All measurements were conducted in general accordance with Australian Standard 1055.1-1997, “Acoustics - Description and Measurement of Environmental Noise Part 1: General Procedures”. Acoustic Dynamics’ sound measurements were carried out using precision sound level meters conforming to the requirements of IEC 61672-2019 “Electroacoustics: Sound Level Meters – Part 1: Specifications”. The survey instrumentation used during the survey is set out in **Table 3.1**.

Table 3.1 Noise Survey Instrumentation

| Type | Serial Number | Instrument Description |
|------|---------------|---------------------------------------------------------|
| 2250 | 2679541 | Brüel & Kjaer Modular Precision Sound Level Meter |
| 4189 | 2670479 | Brüel & Kjaer 12.5 mm Prepolarised Condenser Microphone |
| 4230 | 1234136 | Brüel & Kjaer Acoustic Calibrator |

The reference sound pressure level was checked prior to and after the measurements using the acoustic calibrator and remained within acceptable limits. The prevailing weather conditions during the measurements were generally calm and did not influence the noise measurements taken.

4 ASSESSMENT METHODOLOGY

Acoustic Dynamics has performed calculations to predict maximum L_{Aeq} noise emission levels at adjacent receiver locations resulting from the proposed works and operations.

Acoustic Dynamics has conducted operator-attended noise monitoring of similar/equivalent equipment at various other sites on numerous occasions. Based on previous operator-attended surveys of similar activities and equipment, prediction calculations have been undertaken to predict the noise impact at adjacent receiver locations, resulting from the proposed works, in accordance with the information and guidelines detailed **Section 2**.

Within our calculations and acoustic modelling, noise emission contributions from the development have been considered taking the following factors into account:

- Airborne noise losses due to distance and ground topography;
- Losses due to direction and diffraction;
- Increases due to reflections; and
- Acoustic shielding.

4.1 NOISE SOURCES AND OPERATIONS

Acoustic Dynamics advises that the project is likely to be undertaken in one main stage:

1. Construction (approximately 7 months duration).

Acoustic Dynamics understands that the following items of noise emitting equipment and machinery are likely to be used during the proposed works.

For the purpose of noise assessment, the likely maximum “*at source*” noise levels (A-weighted sound pressure levels at 1 metre) have been used as detailed below.

Table 4.1 Predicted Noise Sources and Operations

| Source | Sound Pressure Level @ 1m L_p [dBA] |
|------------------------------------------------|------------------------------------------|
| Construction Works and Site Restoration | |
| Hammers | 85 |
| Kanga Hammers | 103 |
| Saws | 101 |
| Grinders | 80 |
| Drills | 80 |
| Mud/cement mixers | 85 |
| Compressors | 92 |
| Nail guns | 85 |
| Concrete trucks/pumps | 95 |
| Trucks (for delivery of materials) | 92 |
| Trades | N/A |
| Other typical building tools and equipment | 90 |

Accordingly, assessment of the operation of the above items requires calculation of their noise emission levels to nearby potentially affected receiver locations.

4.2 NEAREST RECEIVERS

The cumulative noise impact has been assessed to the potentially most affected point at the adjacent sensitive receiver properties and presented in **Table 4.2** below.

Table 4.2 Nearest Sensitive Receiver Locations

| Source | Location | Direction |
|------------------------------|--------------------------------------------------|------------|
| Residential Receivers | | |
| R ₁ | 1081 Oxford Falls Road | North-East |
| R ₂ | 1083 Oxford Falls Road | East |
| R ₃ | 1100 Oxford Falls Road | South |
| Commercial Receivers | | |
| B ₁ | 2511 Oxford Falls Road | North |
| B ₂ | C3 College Campus – Classroom Internal | West |
| B ₃ | Oxford Falls Grammar School – Classroom Internal | North |
| Other | | |
| A ₁ | Oxford Falls Grammar School Playground | North |
| A ₂ | C3 College Campus Prayer Hall | West |

Acoustic Dynamics advises that by achieving compliance with the nearest sensitive receiver locations, compliance will also be achieved at all other sensitive receiver locations further away.

5 NOISE AND VIBRATION EMISSION PREDICTION AND ASSESSMENT

In this section Acoustic Dynamics provides an assessment of noise emission from proposed construction works at the subject site.

5.1 PREDICTED EXTERNAL NOISE EMISSION LEVELS

The results from Acoustic Dynamics’ noise prediction calculations and modelling are presented in **Table 5.1** below, and represent calculated **maximum** received external noise emission levels resulting from the use and operation of the highest noise emitting items listed above.

Note should be made that the highest noise emitting items of plant and equipment are unlikely to be used for long durations.

Note should be made that the predicted noise levels presented in **Table 5.1** below, are the **maximum** predicted L_{Aeq} noise levels at the nearest boundaries of the listed properties, resulting from proposed demolition, excavation and construction works at the subject site. Typically, received L_{Aeq} noise emission levels would be expected to be lower than these during the majority of the works. Significantly lower noise levels than those presented in the table would also be expected within (inside) the nearby dwellings.

Table 5.1 Maximum Excavation and Construction Works Noise Emission and Criteria

| Receiver Location | Predicted Range of L _{Aeq} Noise Levels ¹ [dB] | EPA L _{Aeq} Noise Management Levels [dB] | | Achieves EPA Guidelines? | |
|-------------------|--------------------------------------------------------------------|---------------------------------------------------|-----------------------|--------------------------|-----------------------|
| | | Noise Affected | Highly Noise Affected | Noise Affected | Highly Noise Affected |
| R ₁ | 46 – 47 | 61 | 75 | Yes | Yes |
| R ₂ | 45 – 54 | 61 | 75 | Yes | Yes |
| R ₃ | 48 – 50 | 61 | 75 | Yes | Yes |
| B ₁ | 44 – 47 | 70 | 70 | Yes | Yes |
| B ₂ | 41 – 44 | 45 | 45 | Yes | Yes |
| B ₃ | 40 – 44 | 45 | 45 | Yes | Yes |
| A ₁ | 42 – 54 | 65 | 65 | Yes | Yes |
| A ₂ | 39 – 41 | 45 | 45 | Yes | Yes |

Note: 1) Calculated noise level at nearest residential boundary or nearest exposed facade.
 2) Instances considered “highly noise affected” will be infrequent, and are unlikely to unreasonably disturb the adjoining properties.

5.2 EXTERNAL NOISE EMISSION ASSESSMENT

The predicted noise emission levels presented in **Table 5.1** above indicate:

1. L_{Aeq} noise emission associated with all proposed construction works is expected to **comply** with the relevant “Noise Affected” construction noise management level at the following receivers:
 - R₁ Residential receiver at 1081 Oxford Falls Road;
 - R₂ Residential receiver at 1083 Oxford Falls Road;
 - R₃ Residential receiver at 1100 Oxford Falls Road;
 - B₁ Commercial receiver at 2511 Oxford Falls Road;
 - B₂ Commercial receiver at C3 College Campus;
 - B₃ Commercial receiver at Oxford Falls Grammar School;
 - A₁ Commercial receiver at Oxford Falls Grammar School Playground; and
 - A₂ Place of Worship receiver at C3 College Campus Prayer Hall.

2. L_{Aeq} noise emission associated with all proposed demolition, excavation and construction works is expected to **comply** with the relevant “Highly Noise Affected” construction noise management level at the following receivers:
 - a. R₁ Residential receiver at 1081 Oxford Falls Road;
 - b. R₂ Residential receiver at 1083 Oxford Falls Road;
 - c. R₃ Residential receiver at 1100 Oxford Falls Road;
 - d. B₁ Commercial receiver at 2511 Oxford Falls Road;
 - e. B₂ Commercial receiver at C3 College Campus;
 - f. B₃ Commercial receiver at Oxford Falls Grammar School;
 - g. A₁ Commercial receiver at Oxford Falls Grammar School Playground; and
 - h. A₂ Place of Worship receiver at C3 College Campus Prayer Hall.

Although all construction activities are **expected to comply** with the relevant “*Highly Noise Affected*” noise management level set by the EPA Guidelines, the magnitude of the predicted exceedance may lead to complaint and appropriate strategies should be developed for management of noise emission and community liaison.

To ensure that construction noise emission levels from the proposed works are kept to a minimum, Acoustic Dynamics provides recommendations for feasible and reasonable noise mitigation and management in **Section 6**, which should be incorporated into the noise management plan for the proposed construction works.

5.3 PREDICTED VIBRATION EMISSION LEVELS

Acoustic Dynamics has been advised that excavation is not expected to be associated with the construction works. Based on this information, we advise that there is likely to be minimal perceivable vibration levels (human comfort) at nearby/ adjacent receivers.

6 RECOMMENDATIONS AND ADVICE

Further to the predicted noise emission levels presented in **Section 5**, Acoustic Dynamics advises that measures are required to minimise and manage noise emission and impact from the proposed construction works at the subject site.

6.1 NOISE AND VIBRATION MANAGEMENT PLAN

Acoustic Dynamics recommends that the use of noise generating equipment during the proposed works at the subject site only be carried out during the following construction hours:

- **Monday to Friday:** 7:00am to 5:00pm; and
- **Saturday:** 8:00am to 12:00pm.

Acoustic Dynamics recommends the following measures be implemented to minimise and manage noise and vibration emission from the subject construction works:

1. Noise & vibration induction of all site staff – including the explanation of noise and vibration control and minimisation and a discussion of project specific reduction strategies;
2. Implementation of an appropriate community liaison procedure – including a noise and vibration management and noise and vibration complaint procedure and continual liaison with nearby potentially affected receivers;
3. Implementation of a noise and vibration monitoring and reporting programme (where necessary – to protect the interest of all parties or should complaints arise);
4. The use of temporary noise barriers around particularly noisy activities (where feasible and reasonable);
5. Use of quietest available equipment and lowest vibration generating equipment for works (where feasible and reasonable);
6. Scheduling high noise generating activities outside of school operating times, and in particular, liaising with school administration to avoid disturbances during sensitive school events e.g. exam periods;
7. Implementation of periods of respite, where highly intensive activities produce loud noise (i.e. greater than 75 dB(A) at nearby receivers) to minimise disturbance on nearby receivers; and
8. Should trucks or other vehicles be required to be on site for longer than five minutes, Acoustic Dynamics advises that engines should be switched off for the duration.

The following sections provide detail about the various measures listed above and how they are to be incorporated into the noise management procedures for the proposed works.

6.2 NOISE AND VIBRATION INDUCTION OF ALL SITE STAFF

Acoustic Dynamics recommends all site staff be inducted, ensuring each person is aware of the noise and vibration management and mitigation procedures applicable to the site and subject site works.

6.3 COMMUNITY LIASON PROCEDURE

Acoustic Dynamics recommends implementation of an appropriate community liaison procedure, including a noise management and compliant procedure, and continual liaison with the nearby potentially affected receivers. The following should be carried out by the proponent:

1. A sign is to be located near the entry to the site with 24 hour contact details (mobile phone numbers and email addresses for receipt of complaints); and
2. A detailed (physical) log of all complaints relating to noise is to be kept on site. Such a log should include details of:
 - i. the address of the complainant;
 - ii. the date and time of the complaint;
 - iii. the date and time the subject noise was heard;
 - iv. a description of the activities being undertaken at the time of the subject complain;
 - v. a contact telephone number for the complainant; and
 - vi. detail of the person who fielded and logged the complaint;
 - vii. the signature of the project manager or site foreman confirming the complaint has reached an appropriate level of responsibility;
 - viii. detail of the action taken to respond to the complaint and the timing of this response; and
 - ix. the signature of the project manager or site foreman signing off confirmation that the complaint has been appropriately addressed.
3. Neighbouring residents should be notified in writing prior to the commencement of excessively noisy activities. Notices should include an approximate timeframe of the works and a site contact phone number. The following would be suitable phrasing to include within a notification letter:

“Dear Resident

We are writing to inform you of the upcoming works and activities that will be occurring at Oxford Falls Grammar School.

Between 1 September 2022 and 1 April 2023, we will be conducting construction activities and removal of site waste.

The works will be occurring weekdays (7:00am to 5:00pm) and Saturdays (8:00am to 1:00pm).

To ensure amenity impacts are controlled, we are implementing management measures such as restricting the duration of noisy activities, allowance for respite periods and selecting low noise equipment.

The contact details for the site manager are listed below should you wish to discuss any aspect of the noise impacts associated with the works.

We appreciate your understanding during this inconvenience.”

NB: Note is made that should the complaint require the services of an independent consultant to investigate or conduct measurements, such services shall be engaged promptly and dates and times of contact with such a consultant shall be maintained/detailed within the complaints log.

6.4 USE OF TEMPORARY NOISE BARRIERS

Where feasible and reasonable, Acoustic Dynamics recommends the use of temporary noise barriers around (or along) the boundaries of the site to assist with reducing noise emission during high noise generating activities to the pedestrian paths and residential receivers surrounding the site. Acoustic Dynamics recommends consideration be given to the use of temporary noise barriers along the Northern and Western boundaries of the site to assist with reducing noise emission during high noise generating activities to Oxford Falls Grammar School outdoor pedestrian areas and C3 College Campus.

A suitable, temporary noise barrier is likely to:

- Contain **no gaps** along the surface area of the screen, and be **close fitting (ie within 30mm) to the ground** (to prevent the transmission of noise below the barrier); and
- The temporary noise barrier(s) should provide a minimum surface density of **14 kg/m²**, and contain **no gaps** along the surface of the barrier(s).
 - i. 25mm thick marine plywood; or
 - ii. A minimum 9mm thick compressed fibre-cement sheeting; or
 - iii. Other suitable material (minimum surface density of **14 kg/m²**); and
- Design of supports of any temporary noise barrier(s) must be verified by a suitably qualified person to ensure sufficient structural and wind loading support is provided.

6.5 USE OF QUIETEST AVAILABLE EQUIPMENT FOR WORKS

Acoustic Dynamics recommends that plant and equipment used during the proposed works be selected to ensure that the quietest available equipment will be used.

As indicated within **Section 6.5**, Acoustic Dynamics will carry out operator-attended noise measurements of site equipment and operations (as required/requested), to ensure quietest techniques and equipment are being used for the subject works.

6.6 PREPARATION OF A DILAPIDATION SURVEY OF ADJACENT BUILDINGS AND STRUCTURES

Where there is any risk of damage, a detailed dilapidation survey of adjacent buildings and structures completed prior to the commencement of any excavation works would provide an appropriate reference condition, against which post works inspections can be compared.

6.7 PROVISION OF RESPITE PERIODS DURING INTENSIVE ACTIVITIES

Where there is potential for receivers to be affected by sustained high noise levels (i.e. greater than $L_{Aeq}(15\text{minute})$ 75 dB at nearby residences), periods of respite are to be provided. Such respite may include provisions:

1. Not to commence such noisy activities prior to 8:00am;
2. Not to undertake such noisy activities after 4:30pm; and
3. Not to undertake such noisy activities for any sustained period greater than 3 hours without a minimum 30-minute period of respite.

6.8 RESTRICTING THE USE OF HIGH NOISE EMISSION APPLIANCES

Acoustic Dynamics recommends that the operation of high noise emission appliances, plant and/or machinery such as pile-drivers, rock breakers and hydraulic hammers and those which are not listed in Groups B, C, D, E or F of Schedule 1 of the City of Sydney Code of Practice/Noise 1992 and Australian Standard 2436-2010 Guide to Noise Control on Construction, Maintenance and Demolition Sites be restricted to the following construction hours only:

- **Monday to Friday:** 9:30am to 1:00pm; and
- **Monday to Friday:** 2:00pm to 4:30pm.

7 CONCLUSION

Acoustic Dynamics has undertaken a quantitative assessment of the noise impact at the nearest potentially affected receivers resulting from the demolition, excavation and construction works and associated activities, for the proposed works at Oxford Falls Grammar School. This report is prepared in accordance with the various acoustic requirements of:

- (a) Northern Beaches Council;
- (b) NSW Environment Protection Authority (EPA); and
- (c) Australian Standards.

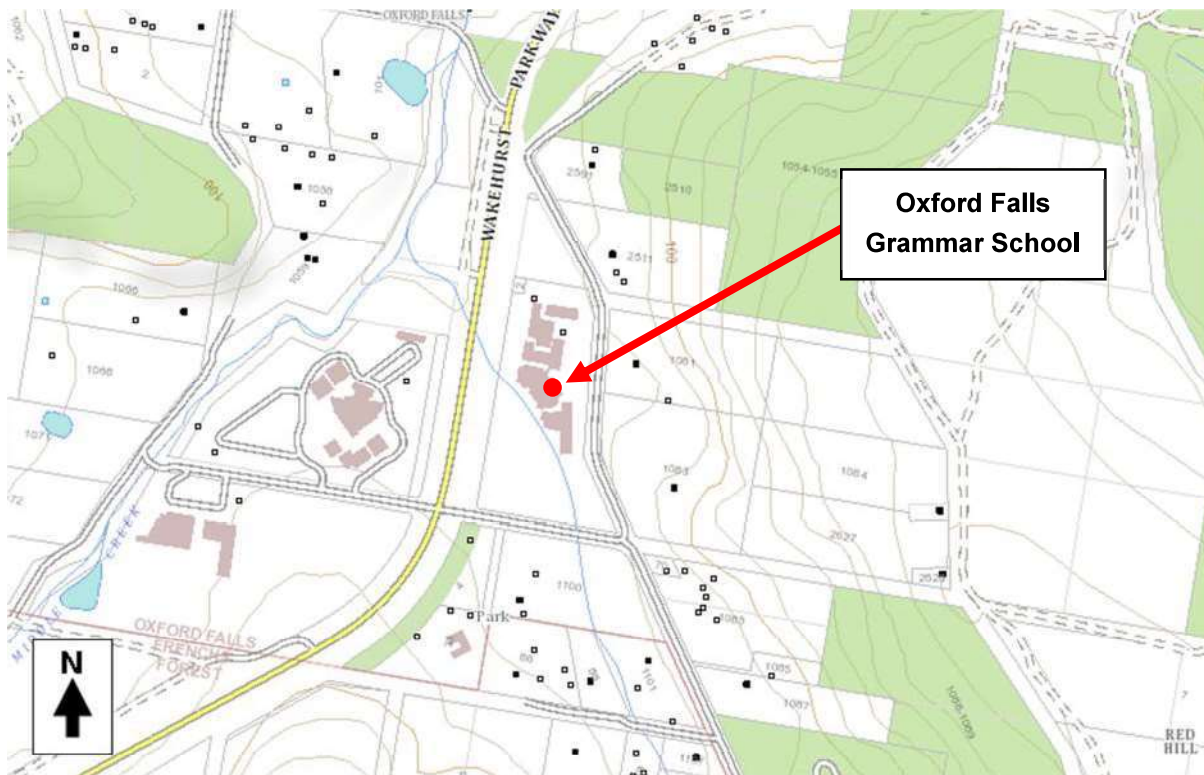
Acoustic Opinion

The magnitude of the predicted noise exceedances above the construction noise goals (determined in accordance with the EPA's ICNG) may lead to complaint (adverse comment) and appropriate strategies should be developed for management of noise emission and community liaison. Acoustic Dynamics advises that implementation of the recommendations contained in Section 6 of this report will assist with the mitigation and management of noise emission from excavation and construction activities at the subject development site.

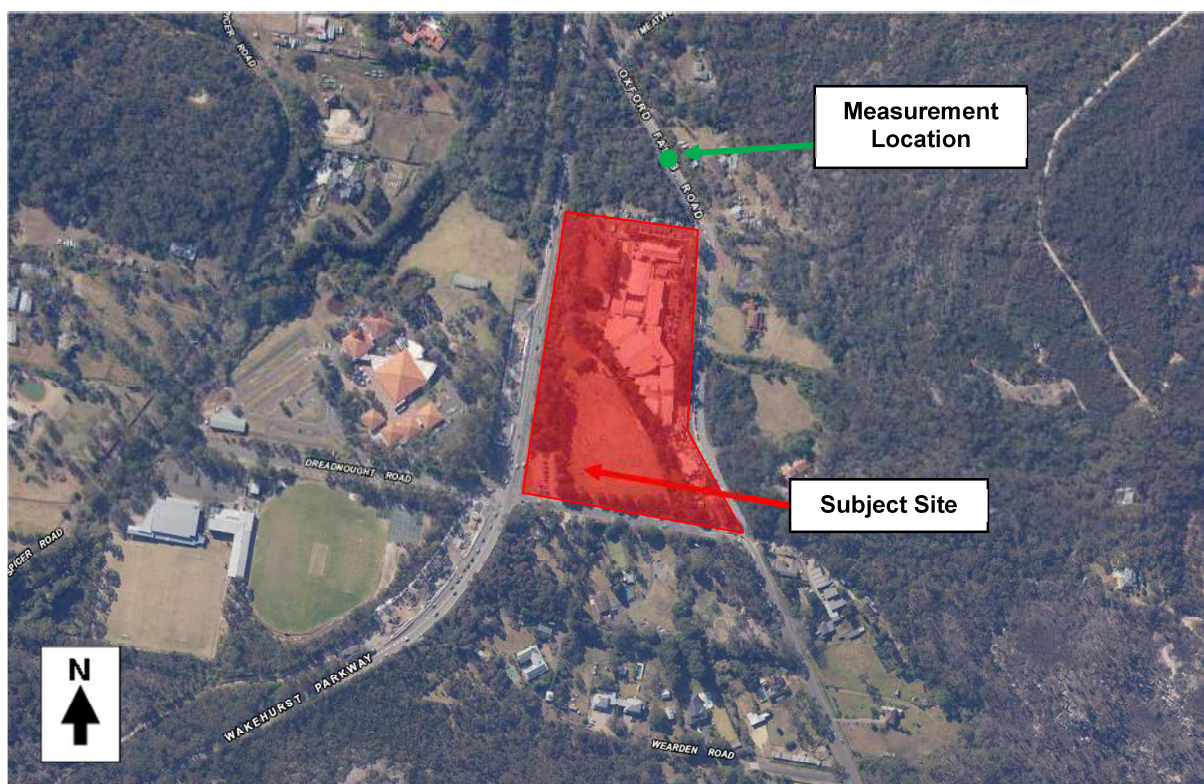
We trust that the above information meets with your present requirements and expectations. Please do not hesitate to contact us on 02 9908 1270 should you require more information.

APPENDIX A – LOCATION MAP, AERIAL IMAGE, PLANS

A.1 LOCATION MAP

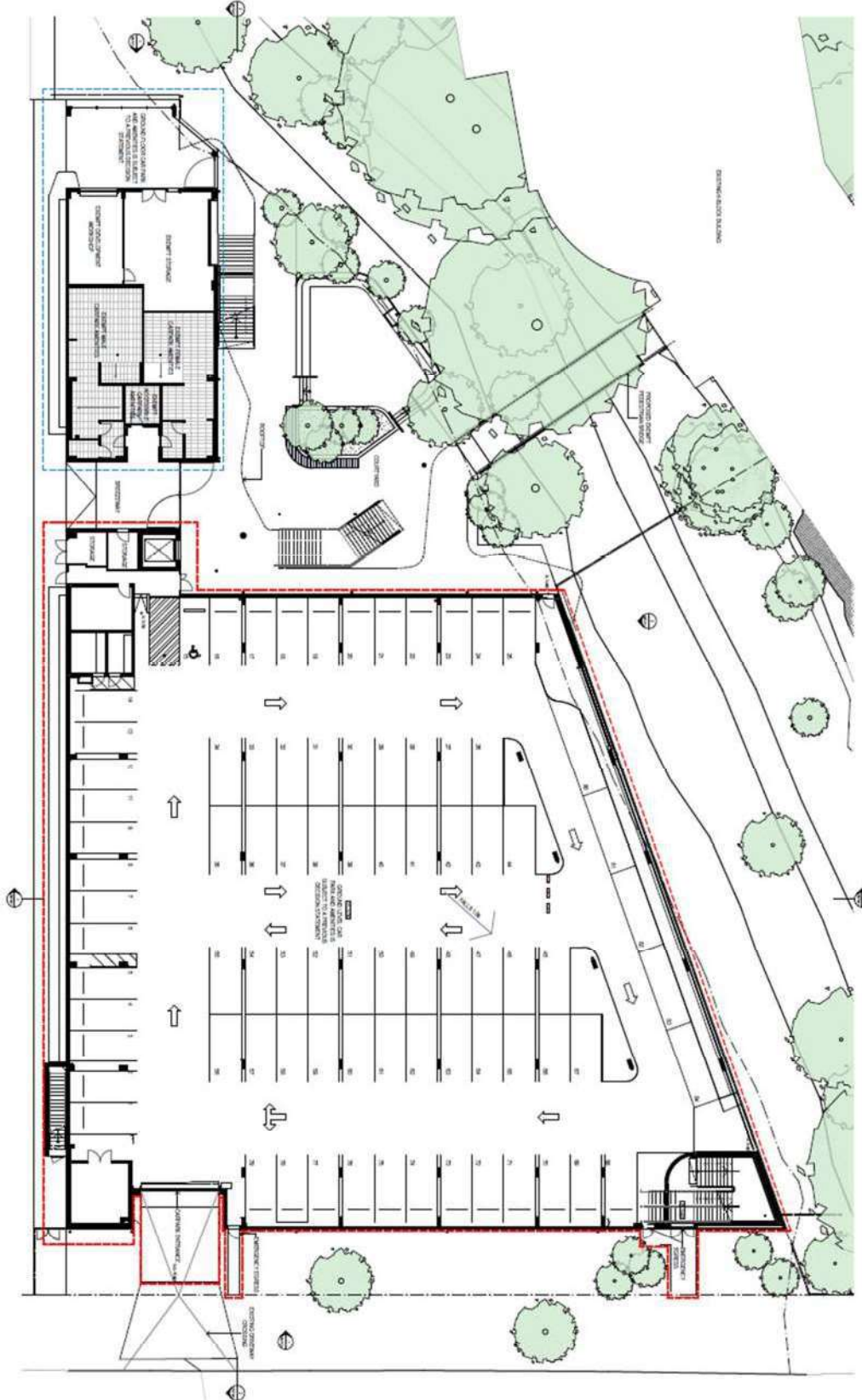


A.2 AERIAL IMAGE (COURTESY OF SIX MAPS)



A.3 ARCHITECTURAL PLANS

A.3.1 GROUND FLOOR PLAN



A.3.3 ROOF PLAN

