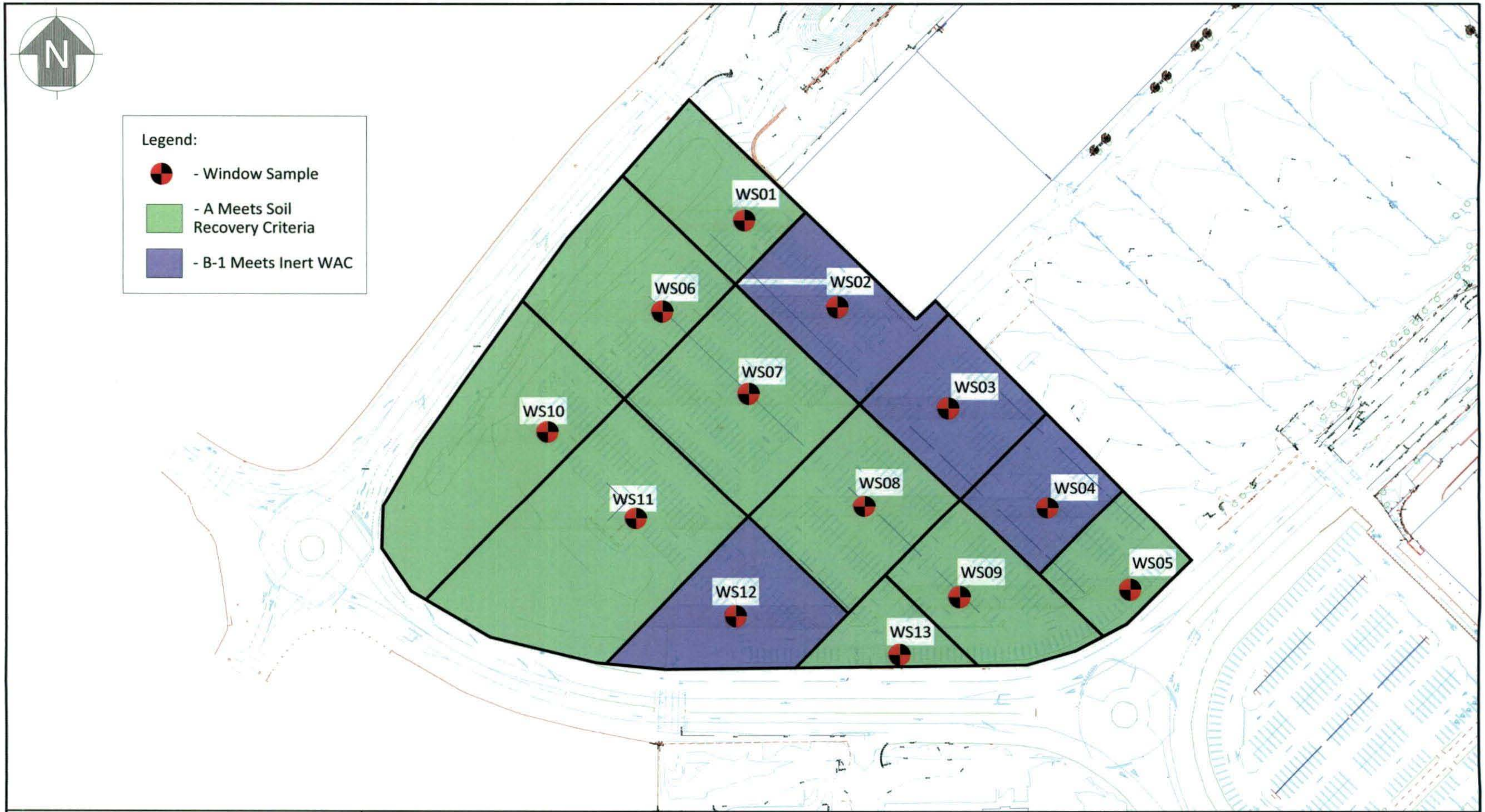

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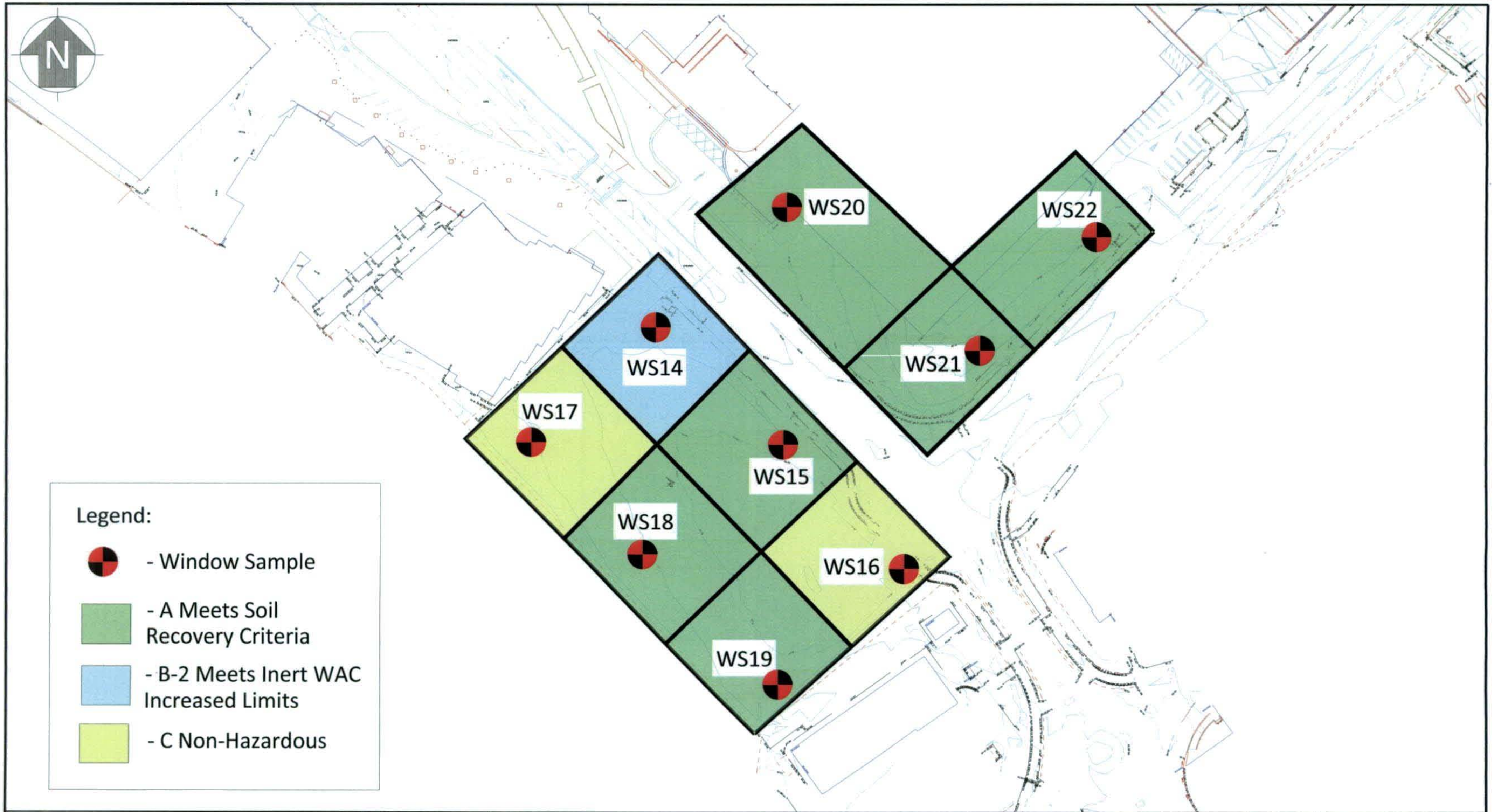
CLIENT	IGSL Limited	FIGURE No.	X
TITLE	Excavation Plan (WS01–WS13) 0.0–1.0 mbgl	SCALE SCALE	REV. A



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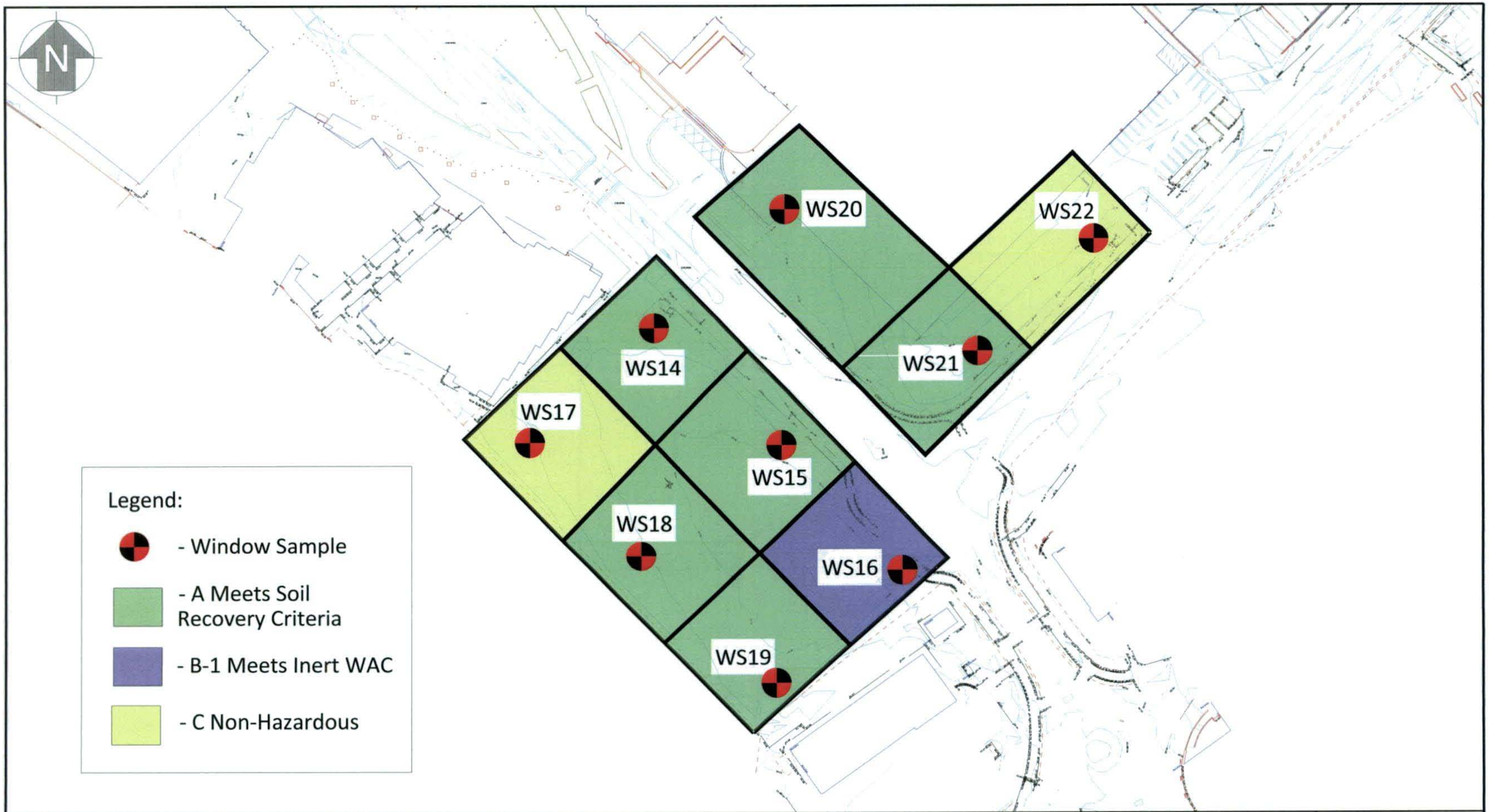
REV.	A



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CLIENT: IGSL Limited	FIGURE No.: X
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Appendix D

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PROPG INWARD NOISE IMPACT ASSESSMENT OF PROPOSED SITE B & C MIXED USE DEVELOPMENT, BLANCHARDSTOWN

Technical Report Prepared For

Blanche Retail Nominee Limited

Technical Report Prepared By

Alistair Maclaurin BSc PgDip MIOA

Our Reference

AM/21/12583NR01a

Date of Issue

4 March 2022

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Signature		
Name	Alistair Maclaurin	Stephen Smyth
Title	Senior Acoustic Consultant	Associate (Acoustics)
Date	4 March 2022	4 March 2022

EXECUTIVE SUMMARY

AWN Consulting has been commissioned to carry out a study in relation to the potential noise impacts incident to the proposed residential development at Site B (Library Car Park) and Site C (Blue Car Park) sites at Road C and Road D, Blanchardstown Town Centre, Coolmine, Dublin 1. The focus of this report is to provide input into the acoustic design of the proposed development, identify any potential noise impacts and provide measures to minimise or mitigate those impacts.

A baseline noise survey has been undertaken at the development site to determine the existing environment at the site. Based on the survey results and a noise model developed of the site the assessment has classified the development site as having noise risk classification of medium risk.

A noise assessment has been undertaken based on the results of the noise model as recommended in the *ProPG: Planning & Noise* guidance document. The assessment concludes that all residents will enjoy a 'Good' internal noise environment when the appropriate enhanced acoustic glazing and mechanical ventilation is employed as Detailed within this document.

CONTENTS

1.0 INTRODUCTION

AWN Consulting has been commissioned to carry out a study in relation to the potential noise impacts incident to the proposed residential development at Site B (Library Car Park) and Site C (Blue Car Park) sites at Road C and Road D, Blanchardstown Town Centre, Coolmine, Dublin 1. The focus of this report is to provide input into the acoustic design of the proposed development, identify any potential noise impacts and provide measures to minimise or mitigate those impacts.

Figure 1 presents the approximate outline of the proposed development site.

Figure 1 Proposed Development Layout

Appendix A presents a glossary of acoustic terminology that is used throughout this report.

2.0 DESIGN CRITERIA

2.1 FCC NAP

The *Fingal County Council Noise Action Plan (NAP) 2018 – 2023* is of relevance here. The NAP indicates that guidance within the *ProPG Planning and Noise: Professional Practice Guidance on Planning and Noise* document should be referred to:

> *"In the scenario where new residential development or other noise sensitive development is proposed in an area with an existing climate of environmental noise, there is currently no clear national guidance on appropriate noise exposure levels. The EPA has suggested in the interim, that Action Planning Authorities should examine planning policy guidance notes, such as ProPG (2017). Such guidance notes have been produced with a view to providing practitioners with guidance on a recommended approach to the management of noise within the planning system."*

In accordance with this NAP policy, the following Acoustic Report has been prepared to comply with the requirements of this policy.

In addition to ProPG, the *Fingal County Council Noise Action Plan 2018 – 2023* has been published in order to address the requirements of the European Noise Directive 2002/49/EC. This NAP produced noise maps in order to determine the population exposure to undesirably high noise levels and also to identify areas with desirably low noise that should be preserved into the future. The NAP defines the following ranges for these descriptions:

> *"Areas with desirable low noise levels are defined as areas with a night time level less than 50 dB(A) and\or a daytime level less than 55 dB(A).*
>
> *Areas with undesirable high noise levels are defined as areas with a night time level greater than 55 dB(A) and a daytime level greater than 70 dB(A)."*

It is important to note that the NAP does not recommend that residential development be restricted within areas identified as having undesirably high noise levels. Rather it recommended a range of noise mitigation measures be required for new residential developments within these areas.

2.2 ProPG: Planning & Noise

The *Professional Guidance on Planning & Noise* (ProPG) document was published in May 2017. The document was prepared by a working group comprising members of the Association of Noise Consultants (ANC), the Institute of Acoustics (IOA) and the Chartered Institute of Environmental Health (CIEH). Although not a government document, since its adoption it has been generally considered as a best practice guidance.

The ProPG outlines a systematic risk-based 2-stage approach for evaluating noise exposure on prospective sites for residential development. The two primary stages of the approach can be summarised as follows:

- Stage 1 - Comprises a high level initial noise risk assessment of the proposed site considering either measured and or predicted noise levels; and,

- Stage 2 – Involves a full detailed appraisal of the proposed development covering four "key elements" that include:
  - Element 1 - Good Acoustic Design Process;
  - Element 2 - Noise Level Guidelines;
  - Element 3 - External Amenity Area Noise Assessment
  - Element 4 - Other Relevant Issues

A key component of the evaluation process is the preparation and delivery of an Acoustic Design Statement (ADS) which is intended for submission to the planning authority. This document is intended to clearly outline the methodology and findings of the Stage 1 and Stage 2 assessments, so as the planning authority can make an informed decision on the permission.

ProPG outlines the following possible recommendations in relation to the findings of the ADS:

Planning consent may be granted without any need for noise conditions:

A. *Planning consent may be granted subject to the inclusion of suitable noise conditions;*
B. *Planning consent should be refused on noise grounds in order to avoid significant adverse effects ("avoid"); or,*
C. *Planning consent should be refused on noise grounds in order to prevent unacceptable adverse effects ("prevent").*

Section 3.0 of the ProPG provides a more detailed guide on decision making to aid local authority planners on how to interpret the findings of an accompanying Acoustic Design Statement (ADS). A summary of the ProPG approach is illustrated in Figure 2.

2.3 BS 8233

There are no statutory guidelines or specific local guidelines relating to appropriate internal noise levels within Libraries. In this instance, reference is made to BS 8233: 2014: *Guidance on sound insulation and noise reduction for buildings.*

BS 8233 sets out recommended internal noise levels for non-domestic buildings from external noise sources such as traffic. The guidance is primarily for use by designers and hence BS 8233 may be used as the basis for an appropriate schedule of noise control measures. The recommended internal noise levels for residential developments are set out below.

Activity	Location	(07:00 to 23:00hrs)	(23:00 to 07:00hrs)
Resting	Living room	35 dB $L_{Aeq,16hr}$	-
Dining	Dining room/area	40 dB $L_{Aeq,16hr}$	-
Sleeping (Daytime Resting)	Bedroom	35 dB $L_{Aeq,16hr}$	30 dB $L_{Aeq,8hr}$ 45 dB $L_{AFmax,T}$ *

Table 1 Summary of recommended internal noise levels from BS8233

* Note The document comments that the internal $L_{AFmax,T}$ noise level may be exceeded no more than 10 times per night without a significant impact occurring.

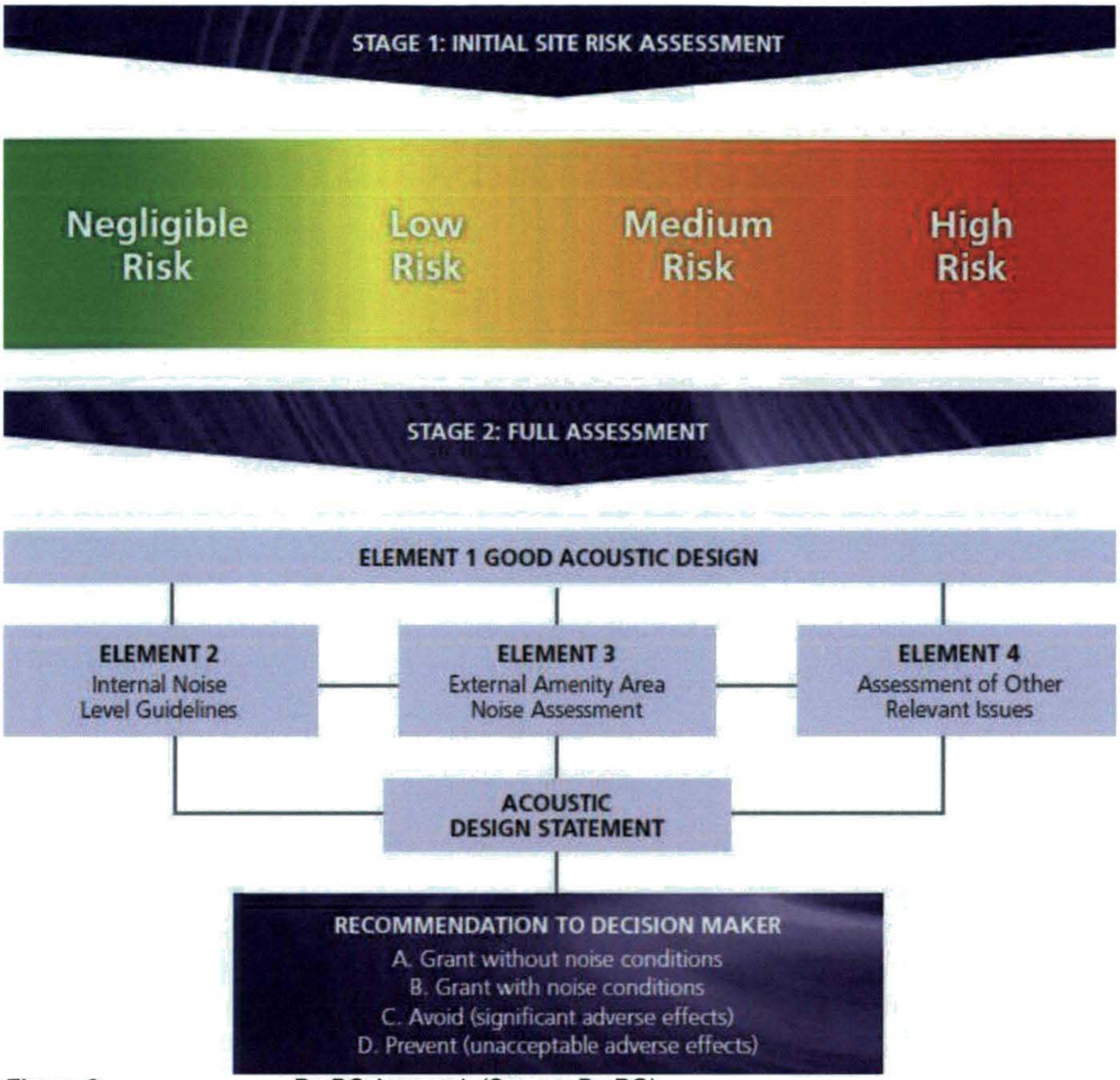


Figure 2 ProPG Approach (Source: ProPG)

3.0 ProPG STAGE 1 – NOISE RISK ASSESSMENT

3.1 Methodology

The initial noise risk assessment is intended to provide an early indication of any acoustic issues that may be encountered. It calls for the categorisation of the site as a negligible, low, medium or high risk based on the pre-existing noise environment. Figure 3 presents the basis of the initial noise risk assessment; it provides appropriate risk categories for a range of continuous noise levels either measured and/or predicted on site.

It should be noted that a site should not be considered a negligible risk if more than 10 L_{AFmax} events exceed 60dB during the night period and the site should be considered a high risk if the L_{AFmax} events exceed 80dB more than 20 times a night.

Paragraph 2.9 of ProPG states that,

> *"The noise risk assessment may be based on measurements or prediction (or a combination of both) as appropriate and should aim to describe noise levels over a "typical worst case" 24 hour day either now or in the foreseeable future."*

In this instance reference is made to baseline noise surveys undertaken at the site. The results of the survey are detailed in Section 3.2.

ProPG states the following with respect to the initial risk assessment:

> *"The risk assessment should not include the impact of any new or additional mitigation measures that may subsequently be included in development proposals for the site and proposed as part of a subsequent planning application. In other words, the risk assessment should include the acoustic effect of any existing site features that will remain (e.g. retained buildings, changes in ground level) and exclude the acoustic effect of any site features that will not remain (e.g. buildings to be demolished, fences and barriers to be removed) if development proceeds."*

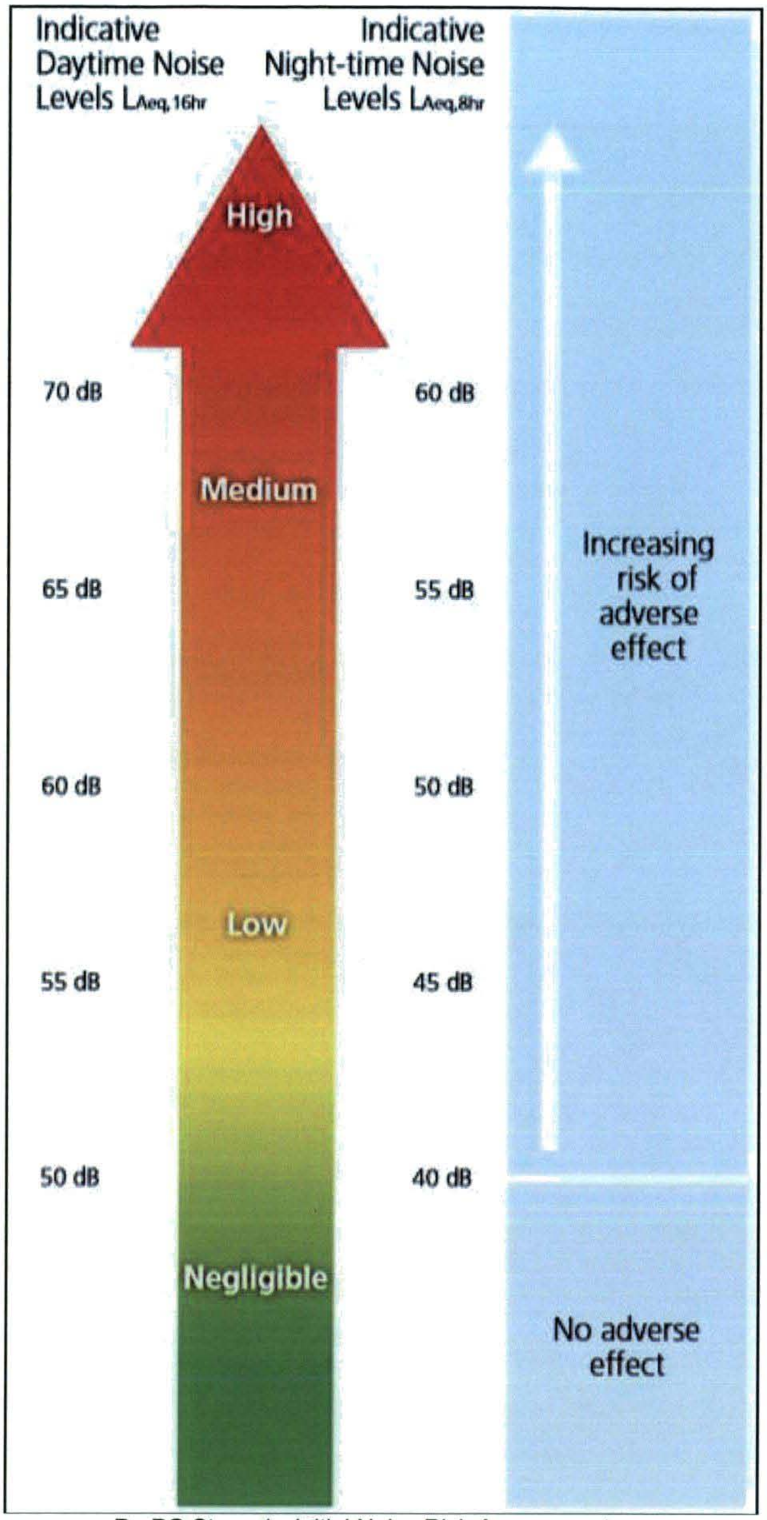


Figure 3 ProPG Stage 1 - Initial Noise Risk Assessment

3.2 Existing Noise Environment

An environmental noise survey was conducted to quantify the existing noise environment. The survey was conducted in general accordance with ISO 1996: 2017: *Acoustics – Description and measurement and assessment of environmental noise*. Specific details are set out below.

The noise survey was conducted between the 26th and 30th November.

3.2.1 Measurement Locations

The monitoring locations are discussed below:

Location A Attended measurements located within the western boundary of Site C in line with the proposed building facade.

Location B Attended measurements located within the southern boundary of Site C in line with the proposed building facade.

Location C Attended measurements located within the eastern boundary of Site B in line with the proposed building facade.

Location D Unattended measurement undertaken on the roof of Penny's adjacent to Site C.

Figure 4 indicates the approximate location of each measurement position.

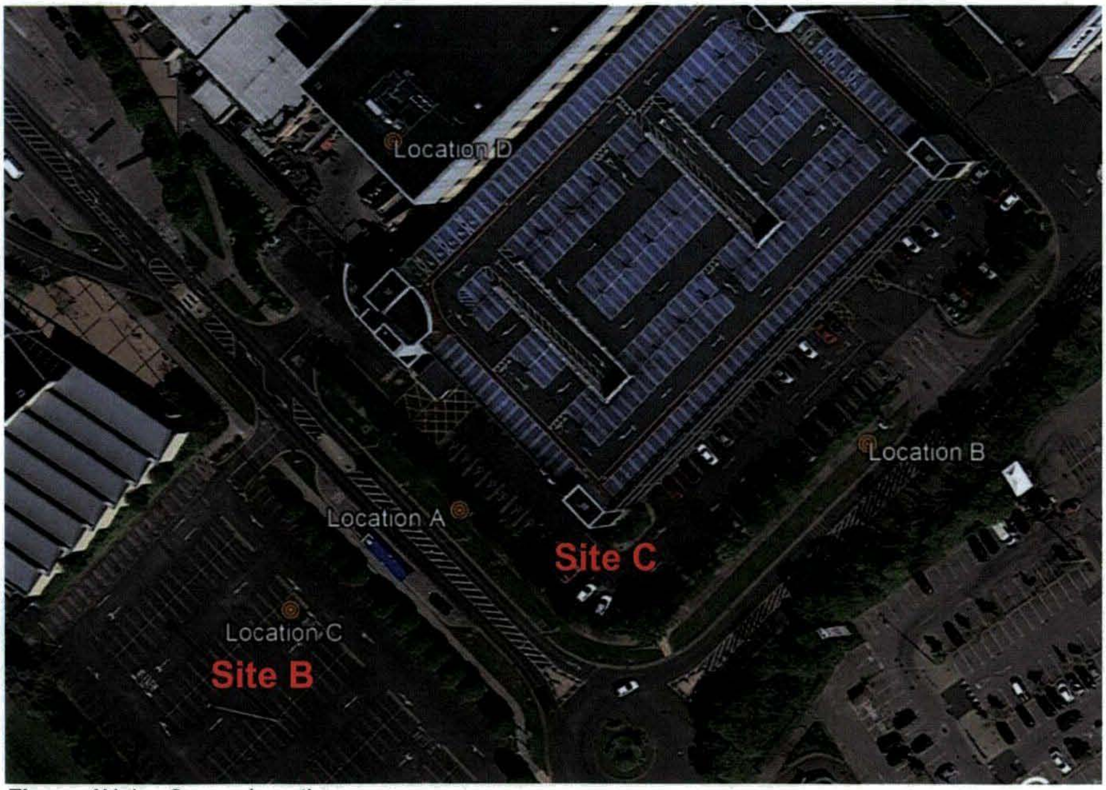


Figure 4 Noise Survey Locations

3.2.2 Measurement Parameters

The noise survey results are presented in terms of the following parameters:

L_{Aeq} is the equivalent continuous sound level. It is a type of average and is used to describe a fluctuating noise in terms of a single noise level over the sample period.

L_{AFMax} is the maximum sound pressure level recorded during the sample period.

The "A" suffix denotes the fact that the sound levels have been "A-weighted" in order to account for the non-linear nature of human hearing. All sound levels in this report are expressed in terms of decibels (dB) relative to $2x10^{-5}$ Pa.

3.2.3 Unattended Survey Results

L_{Aeq} and L_{AFMax} values were measured at 15-minute intervals over the duration of the survey. Figures 5 and 6 present the number of measured $L_{Aeq,15\text{-}min}$ and L_{AFMax} events for each decibel level during the day and night periods for each location.

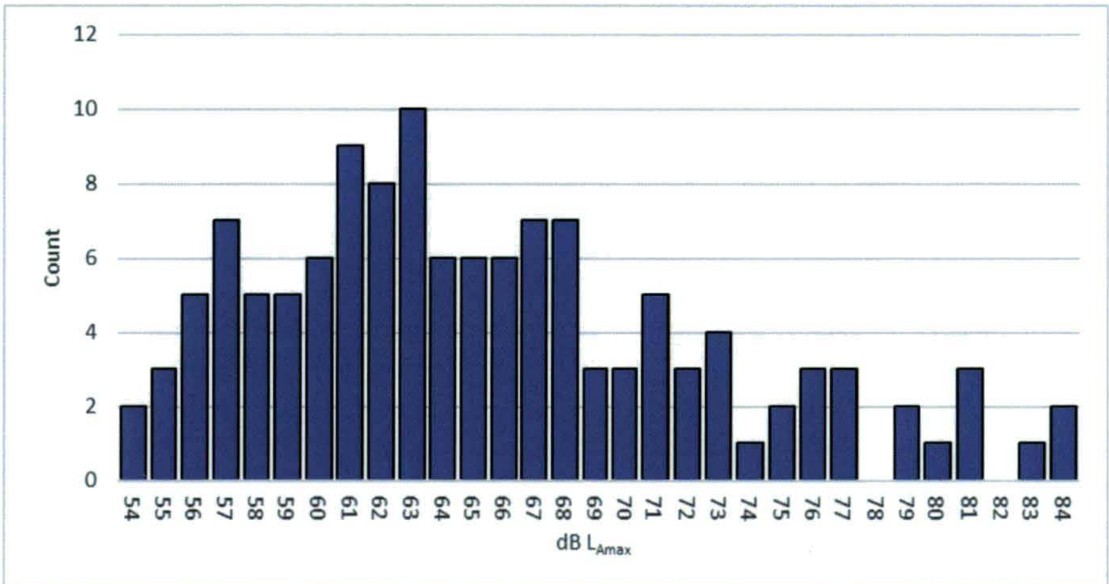


Figure 5 Number of L_{Amax} events at each decibel level measured during the night

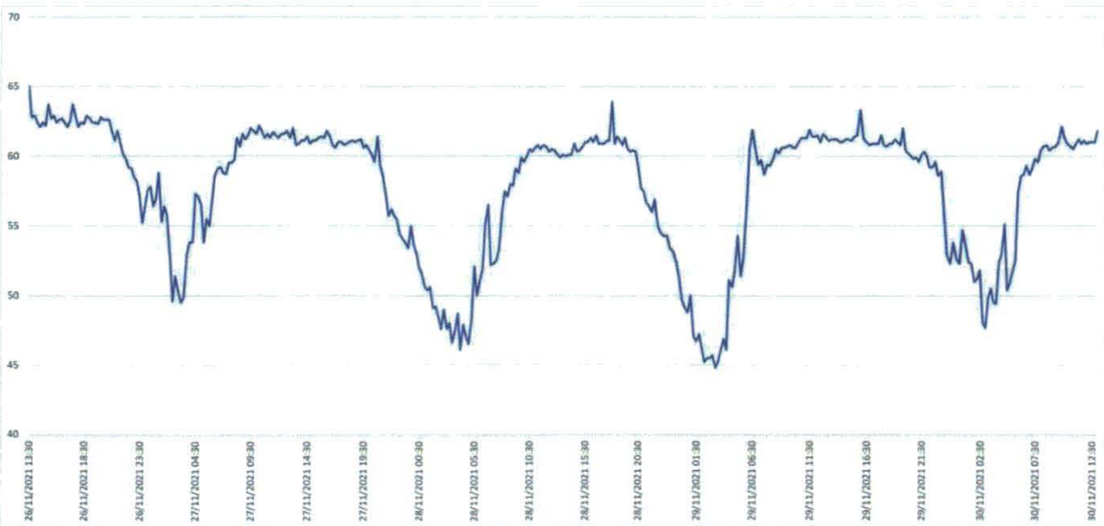


Figure 6 Measured L_{Aeq} over the duration of the survey

3.2.4 Attended Survey Results

Location A

Table 2 presents the average $L_{Aeq,15min}$ noise levels at Location A.

Date and Time	$L_{Aeq,15min}$ dB(A)	$L_{Amax,15min}$ dB(A)
26/11/21 13:58	63.5	81.5
26/11/21 14:19	62.2	71.7
26/11/21 14:40	61.5	70.1
30/11/21 12:44	61.5	85.0
30/11/21 13:05	60.7	87.8
30/11/21 13:25	60.5	70.8

Table 2 Location A Noise Measurement Results

At location A noise was generally attributed to passing road traffic, buses utilising the local bus stop and nearby pedestrian activity. The average measured noise level was 62 dB $L_{Aeq, 15min}$.

Location B

Table 3 presents the average $L_{Aeq,15min}$ noise levels at Location B.

Date and Time	$L_{Aeq,15min}$ dB(A)	$L_{Amax,15min}$ dB(A)
26/11/21 14:57	68.2	82.4
26/11/21 15:37	68.5	81.7
30/11/21 13:25	67.5	76.5
30/11/21 14:07	67.8	81.3
30/11/21 13:25	67.9	75.3

Table 3 Location B Noise Measurement Results

At location B noise was generally attributed to passing road traffic, movements in the car park and nearby pedestrian activity. The average measured noise level was 68 dB $L_{Aeq, 15min}$.

Location C

Table 4 presents the average $L_{Aeq,15min}$ noise levels at Location C.

Date and Time	$L_{Aeq,15min}$ dB(A)	$L_{Amax,15min}$ dB(A)
26/11/21 15:56	67.3	57.6
26/11/21 15:37	67.2	59.6
26/11/21 15:37	66.9	60.0
30/11/21 15:00	61.3	76.9
30/11/21 15:22	61.4	81.3
30/11/21 15:38	62.0	78.0

Table 4 Location C Noise Measurement Results

At location C noise was generally attributed to passing road traffic, buses utilising the local bus stop and nearby pedestrian activity. The average measured noise level was 65 dB $L_{Aeq, 15min}$.

3.3 Noise Risk Assessment Conclusion

Giving consideration to the measured presented in the previous sections the initial site noise risk assessment has concluded that the there is a medium level of risk across the site.

Additionally, the Stage 1 Noise Risk Assessment requires analyses of the L_{AFmax} noise levels. The results indicate that L_{AFmax} noise levels are unlikely to exceed 80dB more than 20 times per night on facades exposed to the on the main site road and hence the maxima levels will not increase the noise risk of the site.

ProPG states the following with respect to medium risks:

Medium Risk	*As noise levels increase, the site is likely to be less suitable from a noise perspective and any subsequent application may be refused unless a good acoustic design process is followed and is demonstrated in an ADS which confirms how the adverse impacts of noise will be mitigated and minimised, and which clearly demonstrate that a significant adverse noise impact will be avoided in the finished development.*

Given the above it can be concluded that the development site may be categorised as *Medium* and as such an Acoustic Design Strategy will be required to demonstrate that suitable care and attention has been applied in mitigating and minimising noise impact to such an extent that an adverse noise impact will be avoided in the final development. It should be noted that ProPG states the following with regard to how the initial site noise risk is to be used,

> *"2.12 It is important that* ***the assessment of noise risk at a proposed residential development site is not the basis for the eventual recommendation to the decision maker****. The recommended approach is intended to give the developer, the noise practitioner, and the decision maker an early indication of the likely initial suitability of the site for new residential development from a noise perspective and the extent of the acoustic issues that would be faced. Thus, a site considered to be high risk will be recognised as presenting more acoustic challenges than a site considered as low risk. A site considered as negligible risk is likely to be acceptable from a noise perspective and need not normally be delayed on noise grounds. A potentially problematical site will be flagged at the earliest possible stage, with an increasing risk indicating the increasing importance of good acoustic design."*

Therefore, following the guidance contained in ProPG does not preclude residential development on sites that are identified as having medium or high-risk noise levels. It merely identifies the fact that a more considered approach will be required to ensure the developments on the higher risk sites are suitably designed to mitigate the noise levels. The primary goal of the approach outlined in ProPG is to ensure that the best possible acoustic outcome is achieved for a particular site.

4.0 ProPG STAGE 2 – ACOUSTIC DESIGN STATEMENT

4.1 Element 1 – Good Acoustic Design Process

4.1.1 ProPG Guidance

In practice, good acoustic design should deliver the optimum acoustic design for a particular site without adversely affecting residential amenity or the quality of life or occupants or compromising other sustainable design objectives. It is important to note that ProPG specifically states that good acoustic design is not equivalent to overdesign or "*gold plating*" of a new development rather that it seeks to deliver the optimum acoustic environment for a given site.

Section 2.23 of the ProPG outlines the following checklist for Good Acoustic Design (GAD):

- Check the feasibility of relocating, or reducing noise levels from relevant sources;
- Consider options for planning the site or building layout;
- Consider the orientation of proposed building(s);
- Select construction types and methods for meeting building performance requirements;
- Examine the effects of noise control measures on ventilation, fire regulation, health and safety, cost, CDM (construction, design and management) etc;
- Assess the viability of alternative solutions; and,
- Assess external amenity area noise.

In the context of the proposed development, each of the considerations listed above have been addressed in the following subsections.

4.1.2 Application of GAD Process to Proposed Application

Relocation or Reduction of Noise from Source

The main site roads are not under the control of the developer and therefore it is beyond the scope of this development to introduce any noise mitigation at source.

Planning, Layout and Orientation

Consideration has been given to the location of both the buildings and external amenity areas. The orientation of the site is such that the buildings themselves screen the common external amenity areas associated with the development, or that the external areas are raised so that the podium itself shield's the amenity area from excessive noise.

Select Construction Types for meeting Building Regulations

Masonry constructions will be used in constructing the external walls of the development. This construction type offers high levels of sound insulation performance. However, as is typically the case the glazed elements and ventilation will be the weakest elements in the façade in terms of sound insulation performance.

Consideration will therefore be given to the provision of upgraded glazing and mechanical ventilation. The proposal here will be to provide dwelling units with glazed elements that have good acoustic insulation properties so that when the windows are closed the noise levels internally are good.

In order to ensure indoor air quality, a mechanical ventilation system with heat recovery will be utilised as per Part F of the Building Regulations, providing the requisite air changes per hour. The fresh air provided to all the apartments is tempered and filtered as part of the delivery process. Residents will not need to open their windows in terms of providing fresh air. In terms of extract, all of the bathrooms, kitchens and utility spaces will be exhausted to the outside via the mechanical ventilation system on a continuous basis. Inhabitants will be able to open the windows if they wish, however, doing so will increase the internal noise level. This approach to mitigation is supported in ProPG where it states the following:

> "2.22 *Using fixed unopenable glazing for sound insulation purposes is generally unsatisfactory and should be avoided; occupants generally prefer the ability to have control over the internal environment using openable windows, even if the acoustic conditions would be considered unsatisfactory when open. Solely relying on sound insulation of the building envelope to achieve acceptable acoustic conditions in new residential development, when other methods could reduce the need for this approach, is not regarded as good acoustic design. Any reliance upon building envelope insulation with closed windows should be justified in supporting documents* "
>
> *Note 5 Designing the site layout and the dwellings so that the internal target levels can be achieved with open windows in as many properties as possible demonstrates good acoustic design. Where it is not possible to meet internal target levels with windows open, internal noise levels can be assessed with windows closed, however any façade openings used to provide whole dwelling ventilation (e.g. trickle ventilators) should be assessed in the "open" position and, in this scenario, the internal L_{Aeq} target levels should not normally be exceeded*
>
> 2.34 *Where the LPA accepts that there is a justification that the internal target noise levels can only be practically achieved with windows closed, which may be the case in urban areas and at sites adjacent to transportation noise sources, special care must be taken to design the accommodation so that it provides good standards of acoustics, ventilation and thermal comfort without unduly compromising other aspects of the living environment. In such circumstances, internal noise levels can be assessed with windows closed but with any façade openings used to provide "whole dwelling ventilation" in accordance with Building Regulations Approved Document F (e.g. trickle ventilators) in the open position (see Supplementary Document 2). Furthermore, in this scenario the internal L_{Aeq} target noise levels should not generally be exceeded.*"

Impact of noise control measures on fire, health and safety etc

The good acoustic design measures that have been implemented on site, e.g. placing outdoor space on the quiet side of buildings, are considered to be cost neutral and do not have any significant impact on other issues.

Assess Viability of Alternative Solutions

Due to the height and location of the proposed buildings it is considered that any acoustic screens along the boundary of the site to attenuate traffic noise would be ineffective.

Assess External Amenity Area Noise

ProPG provides the following advice with regards to external noise levels for amenity areas in the development:

> *"The acoustic environment of external amenity areas that are an intrinsic part of the overall design should always be assessed and noise levels should ideally not be above the range 50 – 55 dB $L_{Aeq,16hr}$."*

Noise levels across external amenity areas associated with the development are presented in Section 4.3.

Summary

Considering the constraints of the site, in so far as possible and without limiting the extent of the development area, the principles of Good Acoustic Design have been applied to the development.

In terms of viable alternatives to acoustic treatment of façade elements, there are no further options for mitigation outside of proprietary acoustic glazing and mechanical ventilation.

4.2 Element 2 – Internal Noise Guidelines

4.2.1 Internal Noise Criteria

Element 2 of the ProPG document sets out recommended internal noise targets derived from BS 8233 and WHO's *Community Noise Guidelines*. The recommended indoor ambient noise levels are set out in Table 5 and are based on annual average data, that is to say they omit occasional events such as New Year's Eve.

Activity	Location	(07:00 to 23:00hrs)	(23:00 to 07:00hrs)
Resting	Living room	35 dB $L_{Aeq,16hr}$	-
Dining	Dining room/area	40 dB $L_{Aeq,16hr}$	-
Sleeping (daytime resting)	Bedroom	35 dB $L_{Aeq,16hr}$	30 dB $L_{Aeq,8hr}$ 45 dB $L_{Amax,T}$*

Table 5 ProPG Internal Noise Levels

*Note The document comments that the internal $L_{AFmax,T}$ noise level may be exceeded no more than 10 times per night without a significant impact occurring.

Giving consideration to the external noise levels, it will be necessary to use acoustic glazing and mechanical ventilation to meet the recommended internal noise levels.

In terms of the ventilation strategy it is understood that the air supply will be via mechanical ventilation which typically provides a sound insulation performance substantially improved over passive in-frame or wall vents.

4.2.2 Façade Levels

Based on the information outlined in Section 3.2 facades of the proposed development that are predicted to require upgraded sound insulation are highlighted in green and red in Figure 7.

Figure 7 Facades Requiring Upgraded Sound Insulation

4.2.3 Proposed Façade Treatment

The British Standard BS EN 12354-3: 2000: *Building acoustics – Estimation of acoustic performance of buildings from the performance of elements – Part 3: Airborne sound insulation against outdoor sound* provides a calculation methodology for determining the sound insulation performance of the external envelope of a building. The method is based on an elemental analysis of the building envelope and can take into account both the direct and flanking transmission paths.

The Standard allows the acoustic performance of the building to be assessed taking into account the following:

- Construction type of each element (i.e. windows, walls, etc.);
- Area of each element;
- Shape of the façade, and;
- Characteristics of the receiving room.

The principals outlined in BS EN 12354-3 are also referred to in BS8233 and Annex G of BS8233 provides a calculation method to determine the internal noise level within a building using the composite sound insulation performance calculated using the methods outlined in BS EN 12354-3. The methodology outlined in Annex G of BS8233 has been adopted here to determine the required performance of the building facades.

Glazing

As is the case in most buildings, the glazed elements of the building envelope are typically the weakest element from a sound insulation perspective. In this instance it has been calculated that the various facades are to be provided with glazing that, when closed, achieve the minimum sound insulation performance as set out in Table 6 (and assigned to each façade as displayed in Figure 7).

Façade Ref	Nominal R_w (dB)	SRI (dB) per Octave Band Centre Frequency (Hz)					
		125	250	500	1k	2k	4k
RED	40	27	29	36	41	42	52
GREEN	38	26	27	34	40	38	46

Table 6 Sound Insulation Performance Requirements for Glazing, SRI (dB)

Test data should be sought from the supplier of the glazing at detailed design stage to ensure that the acoustic specification is met.

It is important to note that the acoustic performance specifications detailed herein are minimum requirements which apply to the overall glazing system. In the context of the acoustic performance specification the 'glazing system' is understood to include any and all of the component parts that form part of the glazing element of the façade, i.e. glass, frames, seals, openable elements etc.

The assessment has demonstrated that the recommended internal noise criteria can be achieved through consideration of the proposed façade elements at the design stage. The calculated glazing specifications are preliminary and are intended to form the basis for noise mitigation at the detailed design stage. Consequently, these may be subject to change as the project progresses.

Wall Construction

In general, all wall constructions (i.e. block work or concrete) offer a high degree of sound insulation, much greater than that offered by the glazing systems. Therefore, noise intrusion via the wall construction will be minimal. The calculated internal noise levels across the building façade have assumed a minimum sound reduction index of 50dB R_w for this construction.

Ventilation

The ventilation strategy for the development is for mechanical ventilation. Mechanical ventilation systems typically offer a high performance in terms of preventing sound intrusion from external sources, consequently there is no assessment of the ventilation system required for this noise impact assessment.

Internal Noise Levels

Taking into account the external façade levels and the specified building envelope, the internal noise levels have been calculated. In all instances the good internal noise criteria are achieved for daytime and night-time periods.

4.3 Element 3 – External Amenity Area Noise Assessment

In terms of the external amenity areas within the proposed development, balcony spaces overlooking the main local roads are expected to exceed the recommended range of noise levels from ProPG of between 50 – 55dB $L_{Aeq,16hr}$. However, ProPG does provide a way to offset higher than desirable external noise levels in private amenity areas through "*provision of a relatively quiet, protected, nearby, external amenity space for sole use by a limited group of residents as part of the amenity of their dwellings*". For this development there are external podium areas that are elevated some 4m from ground height at Site C. Taking account of the attenuation provided by distance from the road as well as attenuation from the barrier affect due to the removal of line of sight to the road it is expected that the majority of the podium areas will meet the recommended range of noise levels from ProPG. In addition, to the podium areas of Site C, Site B has external amenity areas to the rear of the property shielded from the local roads by the buildings themselves. These areas will experience noise levels within the ProPG recommended levels for external amenity space.

Given both sites provide amenity spaces with noise levels that achieve the recommended ProPG criteria it is considered that the objectives of achieving suitable external noise levels is achieved within the overall site.

4.4 Element 4 – Assessment of Other Relevant Issues

Element 4 gives consideration to other factors that *may* prove pertinent to the assessment, the items that are defined in the document that are relevant here are:

- 4(i) compliance with relevant national and local policy
- 4(ii) magnitude and extent of compliance with ProPG

Each is discussed in turn below.

4.4.1 Compliance with Relevant National and Local Policy

There are no National policy documents relating to the acoustic design of residential dwellings. Locally the *Dublin Agglomoration Noise Action Plan 2018 – 2023* specifies that the guidance contained within ProPG should be used in assessing the noise impact on new residential developments. This Acoustic Design Statement has been prepared in compliance with the requirements of ProPG and therefore complies with the requirements of local policy.

4.4.2 Magnitude and Extent of Compliance with ProPG

As discussed within this report the following conclusions have been drawn with regards to the extent of compliance with ProPG:

- All dwellings as part of the development have been designed to achieve the good level of internal noise levels specified within ProPG.
- The vast majority of shared external amenity areas have been shown to have an external noise level that complies with the recommended criterion set out in ProPG.

Based on the preceding it is concluded that the proposed development is in full compliance with the requirements of ProPG.

4.5 Acoustic Design Statement Conclusion

An initial site noise risk assessment has been carried out on the proposed residential development at Blanchardstown. The assessment has classified the development site as having a medium noise risk. This was determined through measurements of noise levels on site.

Further discussion is presented in terms of the likely noise impact of both the external and internal areas of the proposed development. It has been found that the majority of the inhabitants will have access to a quiet external area that is screened by the development itself from road traffic noise. All habitable rooms will achieve a good internal noise environment with the enhanced acoustic glazing and mechanical ventilation.

APPENDIX A

GLOSSARY OF ACOUSTIC TERMINOLOGY

Ambient noise The totally encompassing sound in a given situation at a given time, usually composed of sound from many sources, near and far.

Background noise The steady existing noise level present without contribution from any intermittent sources. The A-weighted sound pressure level of the residual noise at the assessment position that is exceeded for 90 per cent of a given time interval, T ($L_{AF90,T}$).

dB Decibel - The scale in which sound pressure level is expressed. It is defined as 20 times the logarithm of the ratio between the RMS pressure of the sound field and the reference pressure of 20 micro-pascals (20 μPa).

dB(A) An 'A-weighted decibel' - a measure of the overall noise level of sound across the audible frequency range (20 Hz – 20 kHz) with A-frequency weighting (i.e. 'A'–weighting) to compensate for the varying sensitivity of the human ear to sound at different frequencies.

$D_{n,e,w}$ Weighted element-normalized level difference. This is the value of sound insulation performance of a ventilator measured under laboratory conditions. It is a weighted single figure index that is derived from values of sound insulation across a defined frequency spectrum. Technical literature for acoustic ventilators typically presents sound insulation data in terms of the $D_{n,e,w}$ parameter.

Hertz (Hz) The unit of sound frequency in cycles per second.

$L_{Aeq,T}$ This is the equivalent continuous sound level. It is a type of average and is used to describe a fluctuating noise in terms of a single noise level over the sample period (T).The closer the L_{Aeq} value is to either the L_{AF10} or L_{AF90} value indicates the relative impact of the intermittent sources and their contribution. The relative spread between the values determines the impact of intermittent sources such as traffic on the background.

L_{AFN} The A-weighted noise level exceeded for N% of the sampling interval. Measured using the "Fast" time weighting.

L_{AF90} Refers to those A-weighted noise levels in the lower 90 percentile of the sampling interval; it is the level which is exceeded for 90% of the measurement period. It will therefore exclude the intermittent features of traffic and is used to estimate a background level. Measured using the "Fast" time weighting.

L_{AF10} Refers to those A-weighted noise levels in the upper 10 percentile of the sampling interval; it is the level which is exceeded for 10% of the measurement period. It is typically representative of traffic noise levels. Measured using the "Fast" time weighting.

L_{AFmax} is the instantaneous fast time weighted maximum sound level measured during the sample period.

Octave band A frequency interval, the upper limit of which is twice that of the lower limit. For example, the 1,000Hz octave band contains acoustical energy between 707Hz and 1,414Hz. The centre frequencies used for the designation of octave bands are defined in ISO and ANSI standards.

R_w Weighted Sound Reduction Index – This is the value of the sound insulation performance of a partition or element measured under laboratory conditions. It is a weighted single figure index that is derived from values of sound insulation across a defined frequency spectrum. Technical literature typically presents sound insulation data in terms of the R_w parameter.

R'_w Weighted Apparent Sound Reduction Index – This is similar to R_w but is used to express *in-situ* sound insulation performance, where issues such as flanking issue noise transfer may affect the measured level. As stated previously, technical literature typically uses the R_w parameter. In order to reflect the likely *in-situ* performance of an element an appropriate correction should be applied for the expected reduction in performance. Note that in instances where significant flanking issues are present the *in-situ* performance may be further reduced.

Appendix E

Photo-montage Report Blanchardstown, Dublin

Photomontage Methodology

3D Modelling
2D CAD drawings were supplied by O'Mahony Pike Architects. Visual Lab used these drawings to produce a detailed 3D model of the proposed building and associated landscaping. Existing topographical surveys were also provided by O'Mahony Pike Architects.

Photography
All photographs we taken by BML Media using a high resolution Sony 7R2 35mm Camera with a 24 mm Cannon mark 2 shift lens.

A plumb line was used to mark the position of the centre of the camera and to confirm a camera height of 1.6m. A mark was sprayed on the ground at each camera position and a photograph taken of the camera position for reference. Additional detail photographs of the site area and surrounds were also taken for reference purposes using a variety of lenses.

Survey Information
In all cases the camera positions and control points were surveyed by CSS Surveys. Key static points that were visible in the photographs were also surveyed to serve as control points. The camera positions and control points were then related back and aligned into the Base Model (all at National Grid).

Base Model
The provided topographical survey and proposed model were over-laid and aligned to create a 'Base' model file. This Base model allowed for the accurate alignment of the proposed buildings, camera positions and reference points. This Base model was updated throughout the design process.

Photo matching
Using 3D Studio Max software a virtual camera was positioned using the camera locations from surveyed information and an accurate fit between the camera and the photograph was achieved by precisely matching the surveyed static features (control points) in the rendering to the corresponding points in the background photograph.

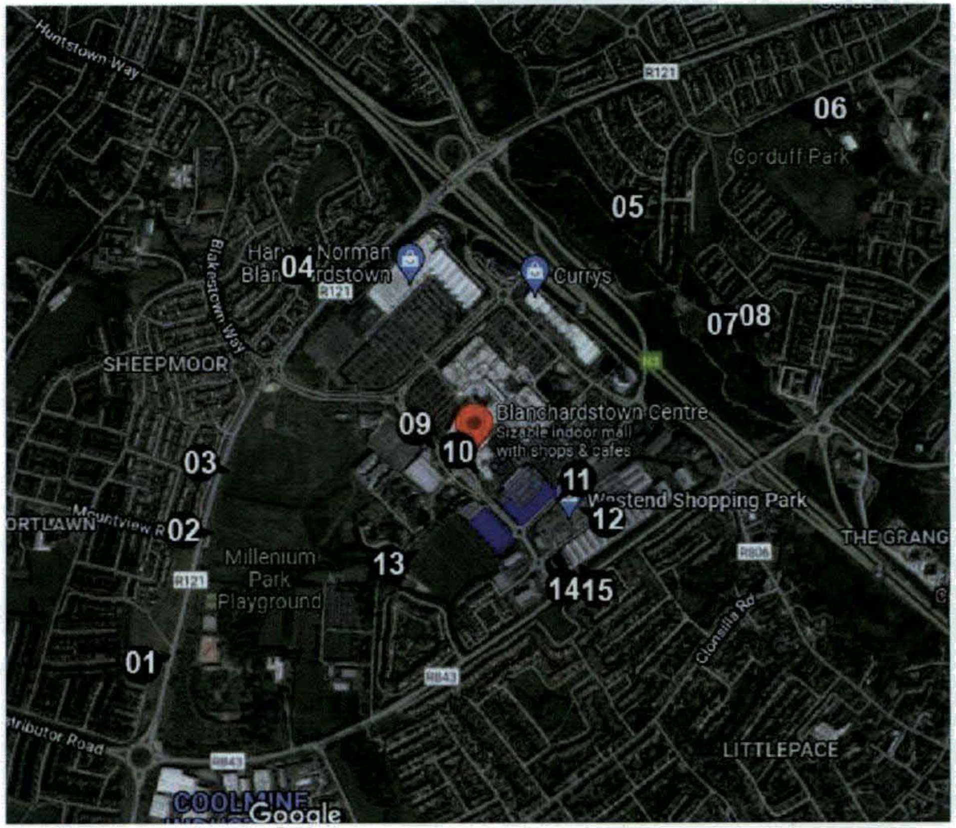
Rendering
The models were textured and rendered using VRAY rendering engine. The materials and lighting were adjusted to try an mimic real work scenarios - building within the scene were used as a reference to obtain valuable visual clues as to how the light would react with the proposed building. A computer image was produced (rendered) and then combined with the background photograph using digital compositing software.
Using the detail photographs for reference the images were then cropped to remove any parts that would be screened by existing trees, topography or buildings, leaving only the parts, which would be visible. The photomontages are presented as "proposed", with additional proposed planting.

Presentation
As photography cannot present what the eye sees in reality, it is intended that the photomontages are used as a tool to aid visual assessment. They should be viewed on site and compared with the real scene.

Each view is presented on 2 sheets:
Sheet 1 - Existing site pre construction
Sheet 2 - Proposed scheme

Conclusion
We have outlined our procedure for the generation of the photo-match. We have re-verified our results and we are confident that these images give a fair and true representation of the proposed development.

Notes
Subject to accurate survey information, the position and scale of a building in a scene can be verified mathematically. Whilst position, height and scale will be objectively accurate, subjective judgement must be used when lighting is being assessed and therefore a definitive and objectively verified agreement on lighting is not possible.
Visual Lab recommends that all parties are mindful that Environmental Statement photomontage should be used as a complement to site based assessment.



Location of Camera's

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