ACOUSTICS AND AIR

SYDNEY OLYMPIC PARK MASTER PLAN 2030

2016 REVIEW - NOISE MANAGEMENT GUIDELINES

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SYDNEY OLYMPIC PARK AUTHORITY
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TABLE OF CONTENTS

GLOSSARY OF ACOUSTIC TERMS

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

Maximum Noise Level (L_{Amax}) – The maximum noise level over a sample period is the maximum level, measured on fast response, during the sample period.

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

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

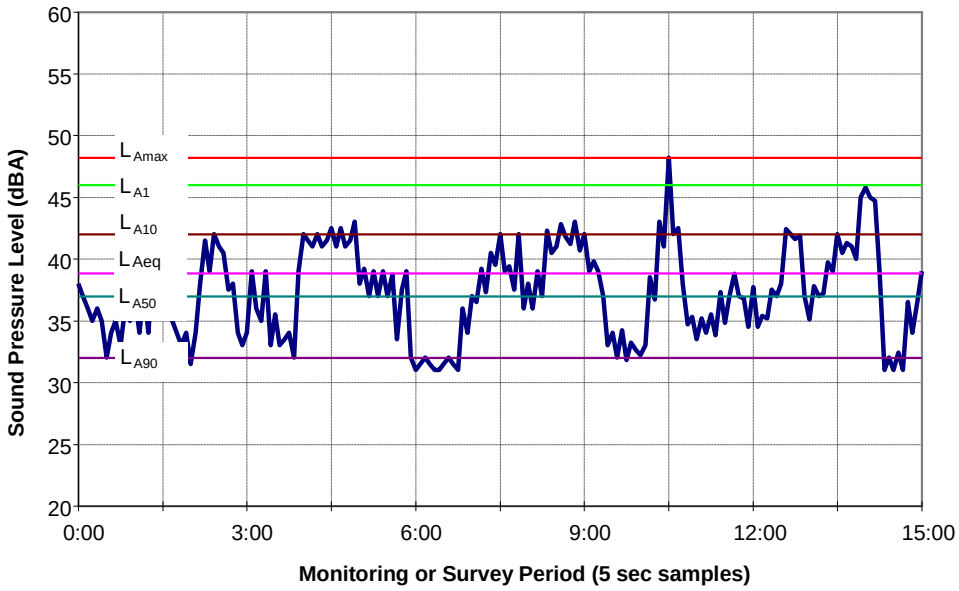
L_{A90} – The L_{A90} level is the noise level which is exceeded for 90% of the sample period. During the sample period, the noise level is below the L_{A90} level for 10% of the time. This measure is commonly referred to as the background noise level.

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

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

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

Typical Graph of Sound Pressure Level vs Time



1 INTRODUCTION

The Sydney Olympic Park Master Plan 2030 provides guidance for proposed development within the park. Under the Sydney Olympic Park Authority Act 2001, the Sydney Olympic Park Authority is required to maintain the Master Plan. Wilkinson Murray have been engaged to conduct a review and update the acoustic provisions within the Master Plan.

Sydney Olympic Park Master Plan 2030 (MP2030) came into effect on the 10 March 2010 and represents a 20-year vision for sustainable development. It includes detailed provisions for the development of land in the Town Centre at Sydney Olympic Park, as well as a requirement that the document be reviewed every 5 years after the date of adoption.

The 2016 review is underway and Wilkinson Murray have been engaged to review and update the acoustic provisions within the Master Plan 2030 against proposed changes to the Master Plan. The primary focus of these guidelines is to minimise potential acoustic impacts of sporting and entertainment venues on other land uses within and around the park. Our review includes the following noise sources:

- Noise sources associated with ANZ Stadium;
- Noise produced by Spotless Stadium events;
- Noise produced by traffic associated with events and day-to-day operation of the park;
- The Royal Easter Show outdoor carnival;
- Plant noise produced by commercial developments within the park; and
- Noise produced by the rail link.

2 PROJECT DESCRIPTION

The Sydney Olympic Park Master Plan area shown in Figure 2-1 is bounded by Hill Road and Kevin Coombs Avenue to the north, Australia Avenue and Bennelong Parkway to the east, Homebush Bay Drive to the south and the Carter Street precinct to the west.

Since the Master Plan 2030 first came into effect, Sydney Olympic Park has grown considerably with the addition of residential and commercial developments.

The Carter Street priority precinct to the west of ANZ Stadium was gazetted by the NSW Department of Planning in November 2015. It is proposed that this rezoned area will include residential, business, retail and recreation uses, as well as transport upgrades.

Figure 2-1 Lands covered by the Sydney Olympic Park Master Plan 2030

2.1 Differences from current Master Plan 2030

The main changes proposed for the 2016 review relate to building reconfigurations in the Parkview and Central precincts. These are generally an increase in floor space ratio and development density allowing taller buildings in these areas and some changes to allow further mixed-use development. There has also been some minor changes in the Stadia precinct with respect to commercial buildings near the boundary and infill development around the main Stadium.

In summary, the 2016 Review proposes an overall Gross Floor Area (GFA) increase from approximately 1.5M to 1.96M square metres, comprising:

- Residential uses - 855,000 square metres (49% increase)
- Commercial uses – 412,000 square metres (14% decrease)
- Retail uses – 100,000 square metres (203% increase)
- Other supporting uses

Increases in building heights are proposed to accommodate increased density.

The three precincts are shown in Figure 2-2 below.

Figure 2-2 Precincts where some changes have been proposed (shown in Green)

Other considerations incorporated into our review include:

- the reduced screening effect of development that is lower than prescribed Master Plan (MP) heights (eg. the first stages of site 60 are several stories lower than the MP height);
- changes which allow for commercial offices to be used for education uses;
- a greater proportion of Central and Parkview sites are now mixed use, resulting in greater flexibility in the location of residential uses; and

- Impact of recent amendments to SOPA Act 2001 No 57, Division 5, Cl 48A *Legal proceedings and other noise abatement action*, which sets a maximum noise threshold at Sydney Olympic Park.

In this review we have provided three different assessment heights (up from the previous two) to better reflect the buildings proposed.

The following aspects of our model have been changed to better reflect the current operational status of some sources:

- Seating and facilities modifications in Spotless Stadium that provide additional shielding;
- Modifications to barrier buildings in and around the Stadia precinct; and
- Slight reconfiguration of the Royal Easter Show carnival area to reflect current operations.

3 MODELLED SCENARIOS

Five operational noise scenarios have been considered for the 2030 case. Whilst there are other noise generating activities held in the park, these are considered the most critical. These were:

- Carnival noise (Royal Easter Show);
- Late night party noise;
- Football (Spotless Stadium) and concerts (ANZ Stadium);
- Traffic Noise; and
- Rail Noise.

The indicative building locations and heights have been provided by the Sydney Olympic Park Authority. Where necessary, a height of 3.5m has been assumed per storey.

Site-related noise emissions were modelled with the "CadnaA" noise prediction program, using the Concawe noise prediction algorithms. Factors that are addressed in the noise modelling are:

- Sound level emissions and location;
- Screening effects from buildings;
- Ground topography;
- Noise attenuation due to geometric spreading;
- Ground absorption; and
- Atmospheric absorption.

The impact of different scenario noise sources were considered individually and cumulatively on the acoustic suitability for residential development of different areas of the Sydney Olympic Park site. Each source has been modelled at heights of 20m and 40m and 80m above ground, to reflect the impact of the least screened portions of mid-rise buildings, high-rise buildings, and towers respectively.

The noise contour plots are derived from the individual modelled scenarios. However, they are not discussed in detail in this report as the long-term strategy for the development is best informed by the combined effects, as illustrated by the plots identifying the acoustic suitability for residential development of the different areas of the park. These have been derived from all five of the most critical scenarios identified above on the basis that they would generally occur at different times of the day and would therefore not act cumulatively.

3.1 Source noise levels

The sound power levels for Sydney Olympic Park (SOP) events used in this assessment are drawn from our previous assessments and more recent event monitoring data. These are summarised in Table 3-1.

Table 3-1 Sound Power Levels used in noise modelling of SOP Events

Event, Location & Plan Label	Sound Power Level (dBA L_{Aeq})
ANZ Stadium Events (3)	
ANZ Stadium Sport Events (80,000 people) Crowd & PA Noise	136
ANZ Stadium Rock Concert + Crowd Noise	145
Spotless Stadium Events (1)	
Showground Rock Concert On-axis power level for single speaker stack	142
Showground Rock Concert Crowd Noise	128
Showground AFL / Cricket (25,000 people in Main Arena) Crowd & PA Noise	131
Royal Easter Show – Main Arena event, Crowd & PA	125
Royal Easter Show – Carnival rides external to Main Arena	118
Athletics Centre (4)	
Athletics Event Crowd & PA Noise	129
Allphones Arena (2)	
(Indoor) Rock Concert	120 (external to arena)

These venues are shown in Figure 3-1 below.

Figure 3-1 Major venues located in the Town Centre

4 ACOUSTIC SUITABILITY FOR RESIDENTIAL DEVELOPMENT

Each scenario / noise type was modelled separately and noise contours were derived based on the external criteria. Contours with respect to the corresponding criteria were then summed graphically to form contours of 'Acoustic Suitability for Residential Development', covering all noise types.

For the individual scenarios there are differing noise criteria that determine the suitability of a site, these criteria are set out in Table 4-1. The table also identifies the levels that correspond to the contours for 'Some Mitigation Required', 'Maximum Mitigation Required', and 'Not Suitable for Residential Development' conditions shown on the plots.

Table 4-1 Residential noise criteria for each noise type and contour levels

Noise Type	Source of Criterion	Noise Measure	External Criterion[5]	Some Mitigation Required	Substantial Mitigation Required	Maximum Mitigation Required	Not Suitable for Residential Development
Sports & Concerts	SOP Guidelines[1]	L_{AMax}	60dBA	>60dBA	>70dBA	>80dBA	>85dBA
Late Night Parties	SOP Guidelines[1]	$L_{eq,125Hz,15min}$	50dB	>50dB	>60dB	>70dB	>75dB
Industrial	Industrial Noise Policy[2]	$L_{Aeq,15min}$	45dBA	>45dBA	>55dBA	>65dBA	>70dBA
Carnival Area	Development Consent	$L_{A10,15min}$	45dBA	>45dBA	>55dBA	>65dBA	>70dBA
Road Traffic	Road Noise Policy[3]	$L_{Aeq,9hr\ (10pm\ to\ 7am)}$	50dBA	>50dBA	>60dBA	>70dBA	>75dBA
Rail Traffic	Department of Planning[4]	$L_{Aeq,9hr\ (10pm\ to\ 7am)}$	45dBA	>45dBA	>55dBA	>65dBA	>70dBA

Notes:
1) Sydney Olympic Park Noise Management Guidelines, Report No. 99053, July 2002.
2) Night time amenity criterion for 'Urban' areas, NSW Industrial Noise Policy, EPA.
3) NSW Road Noise Policy, EPA (formerly the ECRTN).
4) Development Near Rail Corridors and Busy Roads – Interim Guideline, NSW Department of Planning.
5) The equivalent internal noise criterion is 10dBA below the external criterion, 10dBA being the typical attenuation of an open window.

Although some of the relevant policies have changed, the actual noise criteria / trigger levels have not and the criteria presented in Table 4-1 have not changed since our last assessment. However, we have revised the exceedance categories to more accurately represent higher levels of noise mitigation that may be incorporated in the building design.

The following three figures present the Acoustic Suitability for Residential Development (ASRD). Figure 4-1 shows these areas at a 20m receiver height, representing mid-rise buildings, and valid when assessing buildings <25m height. Figure 4-2 shows this at a 40m receiver height representing mid-rise buildings between 25m and 50m height. Figure 4-3 shows this at an 80m receiver height representing high-rise buildings over 50m height. There is minimal difference in the contours above this height due to lack of shielding, therefore Figure 4-3 can be used for buildings 100m tall and above.

The Central and Parkview precincts are affected by noise and residential development in these areas will require varying levels of noise mitigation. There are no areas within the Central or Parkview precincts where residential development will be unsuitable.

Figure 4-1 Acoustic suitability for residential development, under 25m building height

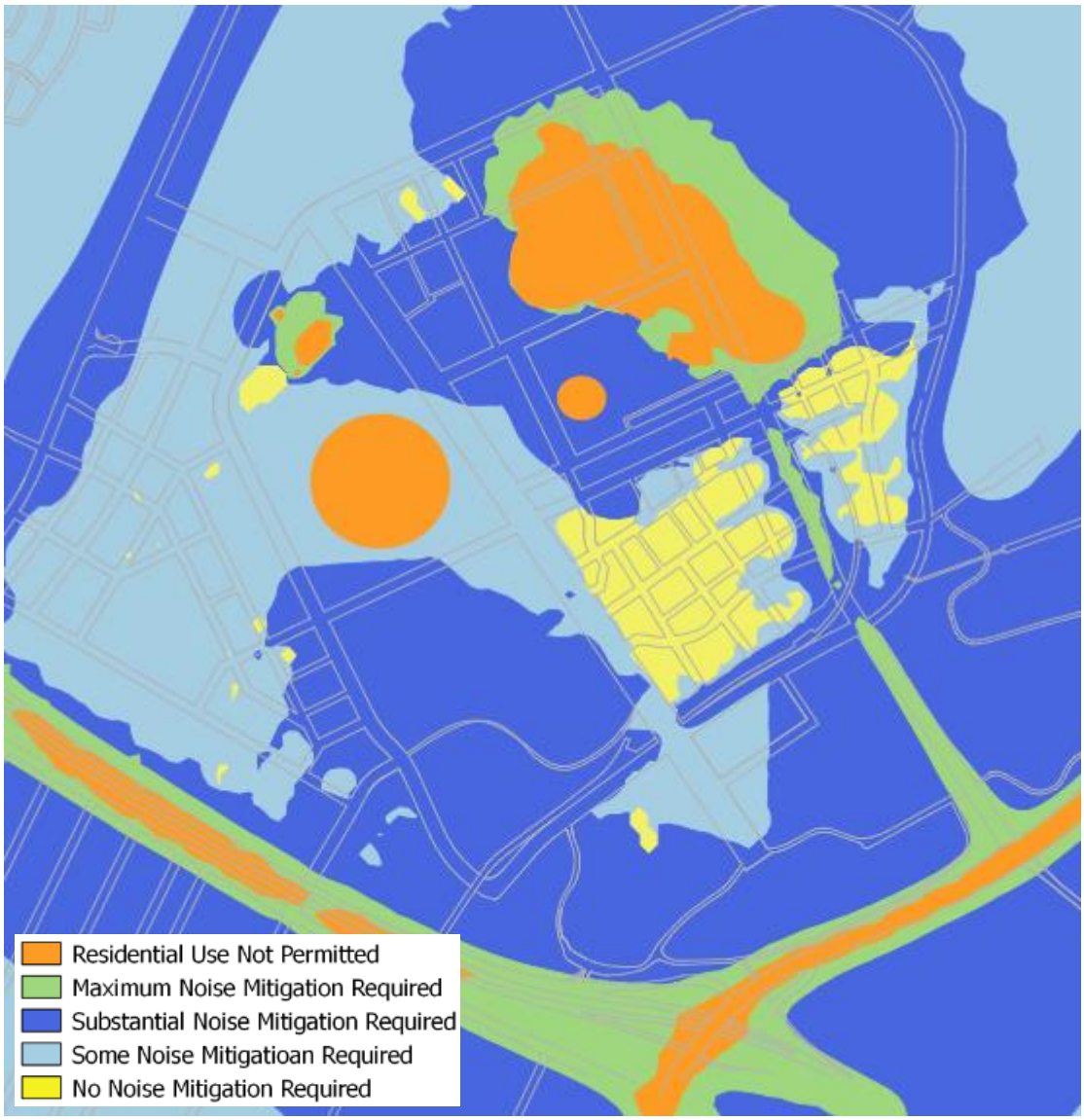


Figure 4-2 Acoustic suitability for residential development, 25m to 50m building height

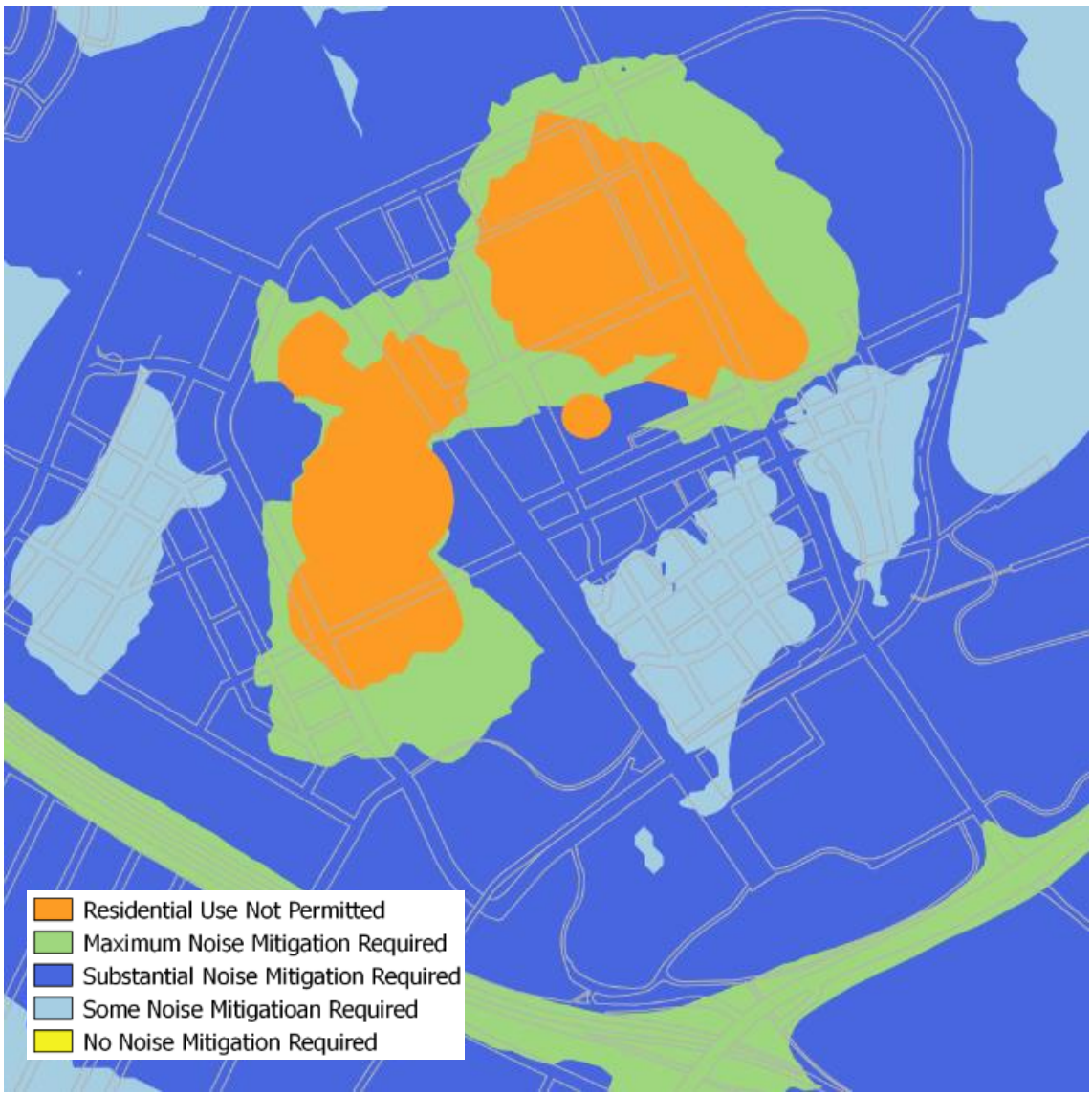
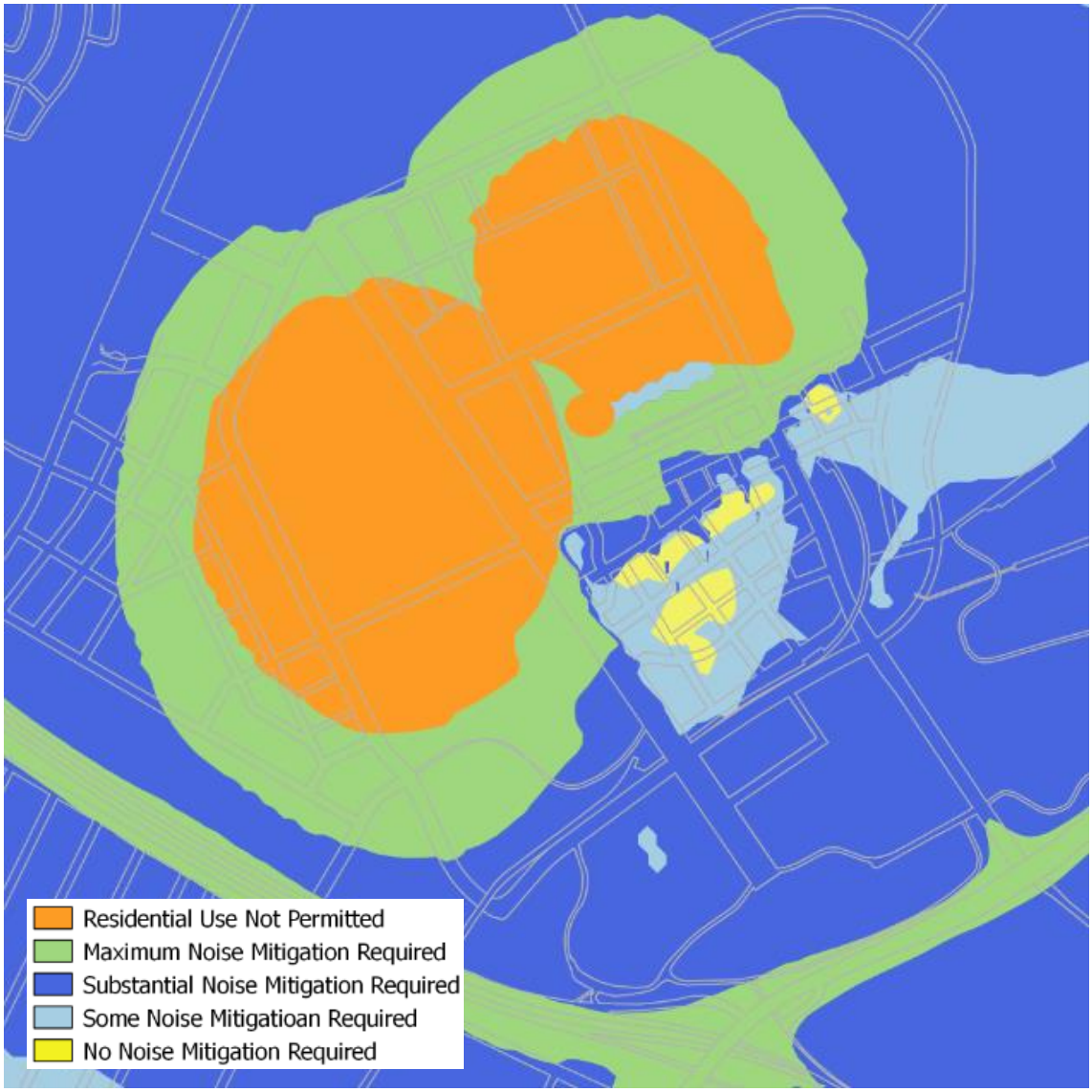


Figure 4-3 Acoustic suitability for residential development, over 50m building height



4.1 In-principle acoustic facade design

The acoustic design of a building facade – particularly where full-width and / or full-height glazing is preferred – is dictated by the acoustic performance of its glazing.

The design of any acoustically-rated facade can only be confirmed at the detailed design stage once building parameters, such as building orientation, glazing dimensions, room furnishings and decisions on including additional acoustic building elements, such as soffit absorption, blade wall or baffles are known. The in-principle facade treatments below are based on generic design details of habitable rooms located on exposed facades. The identification of such generic treatments is for the purpose of establishing the feasibility of siting residential buildings in the chosen locations. Each proposed development should be subject to a detailed acoustic assessment to be submitted with the development application.

Table 4-2 outlines typical in-principle glazing treatments that will provide the level of noise reduction required for each building facade.

Table 4-2 In-principle facade treatments for project buildings

Glazing Option	Description	Noise Reduction dBA for Relevant Sources
Option 1	Openable sliding door – 6.38mm glass + acoustic seals	< 26
Option 2	Openable sliding door – 10.38mm glass + acoustic seals	26 – 30
Option 3	Single-Leaf, double-glazed sliding door – 12.38mm laminated glass + 7.52 laminated glass + 22mm air gap + acoustic seals	30 – 32
Option 4	Acoustically-enclosed balcony	> 32

Note: 1. Noise reductions are specified with regard for dominant noise source, eg. ANZ rock concert, Athletics crowd or traffic respectively.

5 ACOUSTIC SUITABILITY FOR COMMERICAL DEVELOPMENT

Commercial developments are expected to be far less sensitive to noise. This is primarily due to hours of use, the loudest noise sources (football games and concerts) are all expected to be out of normal business hours. The only current exception to this is the Royal Easter Show which will continue for approximately two weeks in March.

The criteria for commercial premises are shown in Table 5-1.

Table 5-1 Limits for commercial premises and hotels – All noise types

Noise Sensitive Receiver	Noise Measure	Noise Limit
Commercial Premises, business hours	L_{Aeq}	70dBA
	L_{AMax}	75dBA
Hotels after 11pm	L_{Aeq}	65dBA
	L_{AMax}	70dBA
	L_{Aeq}	72dBA
	$L_{Max\ (125Hz)}$	77dB

Source: Sydney Olympic Park Noise Management Guidelines, Report No. 99053, July 2002.

Potential noise exposure for commercial developments within the Stadia precinct is clearly dominated by ANZ Stadium activities (sporting events and concerts). Given that these events will normally be happening well outside standard business hours, we expect that these two uses will cohabitate successfully. However, suitable controls should be put in place (planning instruments, approvals, etc) to ensure that activities at ANZ Stadium can continue unimpeded by any such commercial development. Noise generated by the Royal Easter Show carnival is not likely to be significant at this location.

6 CONCLUSION

Wilkinson Murray have conducted a review of the acoustic provisions for the Master Plan 2030 (2016 review). The work conducted in our assessment is based on the original study for the Master Plan 2030 and addresses the impact of changes proposed under the 2016 Review. Criteria for this assessment have been taken from the Sydney Olympic Park Noise Management Guidelines (original Report: 99053, July 2002) with updated references from the latest government guidelines.

Changes included in the Master Plan 2030 are mainly in the Parkview, Central, and Stadia precincts. Revised building heights have been incorporated in our noise model and new contours of 'Acoustic Suitability for Residential Development' provided. The proposed changes in the Parkview and Central precincts will be satisfactory providing appropriate levels of noise mitigation are incorporated into the building design. Changes to the Stadia precinct will be for commercial development only, and are expected to function cooperatively with the ANZ Stadium.

We recommend that our revised contours of 'Acoustic Suitability for Residential Development' (Figure 4-1, Figure 4-2, and Figure 4-3) are included in the draft amended Master Plan. There is no need to change the nominated criteria as these reflect current standards.