SYDNEY SHOWGROUND REDEVELOPMENT

ACOUSTIC ASSESSMENT

ACOUSTICS AND AIR

REPORT NO. 10239
VERSION D

WILKINSON MURRAY

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PREPARED FOR

APP COROPRATION PTY LIMITED
ADDRESS LINE 1
NORTH SYDNEY NSW 2059

Wilkinson Murray (Sydney) Pty Limited · ABN 39 139 833 060
Level 2, 123 Willoughby Road, Crows Nest NSW 2065, Australia • **Offices in SE Qld & Hong Kong**
t +61 2 9437 4611 • f +61 2 9437 4393 • e acoustics@wilkinsonmurray.com.au • w www.wilkinsonmurray.com.au

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GLOSSARY

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 overleaf, 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.

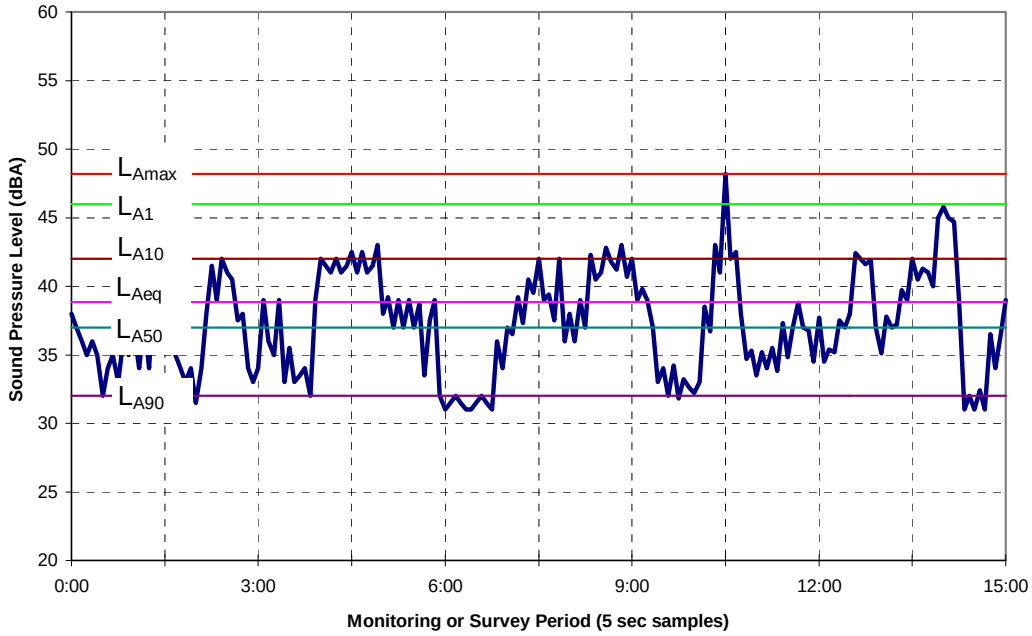
L_{A1} – The L_{A1} level is the noise level which is exceeded for 1% of the sample period. During the sample period, the noise level is below the L_{A1} level for 99% of the time.

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_{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.

L_{A50} – The L_{A50} level is the noise level which is exceeded for 50% of the sample period. During the sample period, the noise level is below the L_{A50} level for 50% of the time.

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.


60
55
50
45
40
35
30
25
20
Sound Pressure Level (dBA)
LAmax
LA1
LA10
LAeq
LA50
LA90
0:00
3:00
6:00
9:00
12:00
15:00
Monitoring or Survey Period (5 sec samples)

1 INTRODUCTION

It is proposed to redevelop the Sydney Showground Main Arena (Showground Main Arena) within Sydney Olympic Park to allow for its enhanced use as a multi-purpose cultural and sporting event venue.

In summary, the proposed redevelopment seeks to:

- reconfigure the Showground Main Arena into an oval capable of accommodating an enhanced range of sporting and cultural events in three modes - Show mode, Concert mode and Sporting mode;
- increase the number of seats to accommodate up to 25,000 (23,000 seated; 2,00 standing) patrons;
- incorporate new north-western and south-east stands;
- install a new video board and PA system;
- install two new light towers to replace existing eastern end light towers;
- install new retractable perimeter fencing on the southern and western sides of the grounds; and
- undertake minor internal refurbishment works.

This report assesses potential noise impacts associated with the operation of the redeveloped Sydney Showground. It does not assess any potential noise and vibration impacts resulting from its construction. These will be assessed separately once the Stadium's Construction Plan has been developed.

The assessment of potential operational noise impacts has been undertaken with reference to the noise criteria promulgated in Sydney Olympic Park Authority's *Draft Noise Management Plan (SOPA, 2010)*.

2 DESCRIPTION OF THE PROJECT

2.1 Project Justification

The design of the proposed Showground Main Arena redevelopment seeks to extend the venue's current function into a multi-purpose, boutique oval-based stadium. Whilst the proposal entails expanding the facility, the proposed capacity of up to 25,000 patrons (seated and standing), is less than the current maximum capacity of the Sydney Showground Arena taking into account its current standing capacity.

Where possible, the proposal will utilise the existing infrastructure of the Showground Main Arena. The proposal will enhance the range of sporting and cultural events as well as enhance the Showground Main Arena's usage opportunities during the Royal Easter Show.

The location of the existing Sydney Showground within the Sydney Olympic Park site is indicated in Figure 2-1.

Figure 2-1 Sydney Olympic Park Venue Locations

2.2 Permitted Hours of Operation

Within Sydney Olympic Park, all outdoor events must be concluded by 11pm on any night of the week. This conclusion time is to include any “encore” period associated with the event (inclusive of fireworks). Where outdoor events involve the use of amplified sound systems, the commencement of the amplified sound cannot occur before 10am on any morning of the week.

2.3 Intended Uses of the Redeveloped Stadium

The redeveloped Showground will be used primarily for the purpose of hosting between 7 to 11 AFL matches per annum and the Royal Easter Show, the latter also utlising the Carnival Area (external concourse) immediately east of the stadium. The Showground Main Arena will be adaptable for secondary uses such as concerts, other cultural events and other sports (eg, baseball).

2.4 Traffic Generated by the Redeveloped Stadium

Traffic management for events within Sydney Olympic Park is indicated in the Sydney Olympic Park Master Plan 2030. The Master Plan's vehicular access and parking plans are indicated in Figure 2-2 and Figure 2-3 respectively.

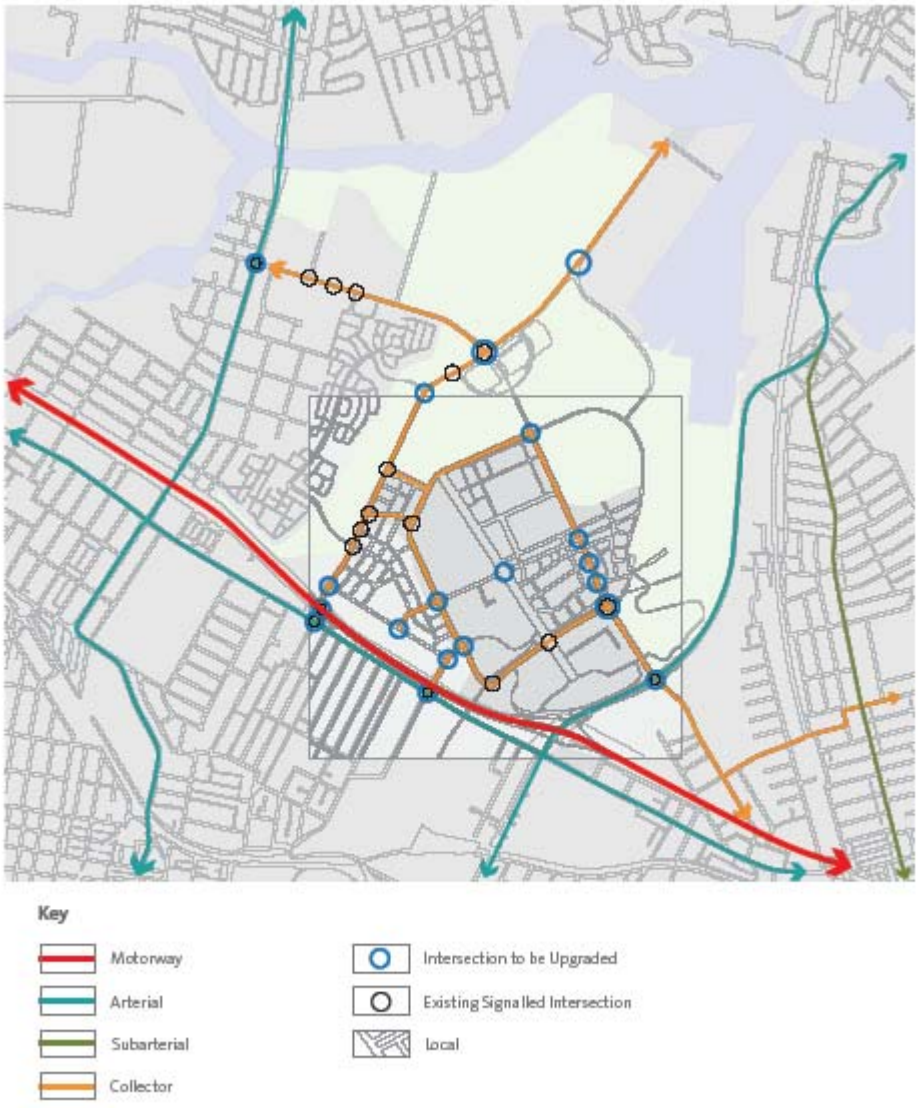


Figure 2-2 Vehicular Access Plan for Sydney Olympic Park

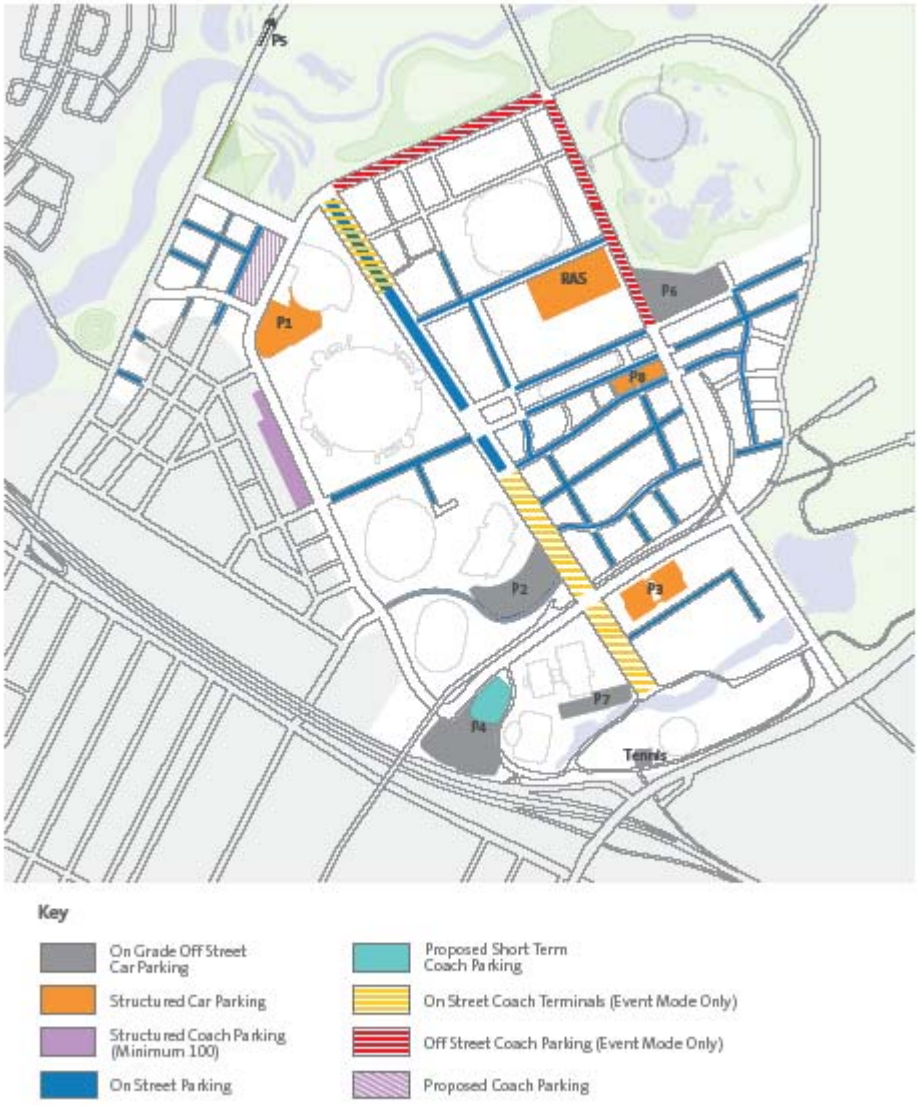


Figure 2-3 Sydney Olympic Park Vehicle Parking Plan

Section 5.3.2 of the proposal's *Traffic and Transport Assessment* (Halcrow, October 2010) indicates that:

> *"...the traffic generated by the Sydney Showground Main Arena will not increase traffic volumes above those currently observed during events.*
>
> *The Sydney Olympic Park and its major approach roads have been designed and constructed to be able to operate with high traffic volumes during the lead up to and following an event."*
>
> *Based on the above analysis, it is not expected that the project will result in any additional impacts on the operations of the road network."*

While the proposal will result in there being more events held at the Showground Main Arena (eg, approximately 7 to 11 newly-introduced AFL games per year), the traffic generated per event will be consistent with volumes currently experienced for Sydney Olympic Park events; namely, the Royal Easter Show and concerts and sports events held at ANZ Stadium.

Section 4.4.1 of the proposal's *Traffic and Transport Assessment* further advises that

> *"...Traffic access to the Sydney Showground main Arena will remain unchanged as a result of the development, with vehicles able to access the site from Grand Parade, as is the current situation."*

With there being no substantive change in either individual event traffic volumes, traffic routes, or traffic composition (percentage of heavy vehicles, particularly buses ferrying patrons) it can reasonably be concluded that future traffic noise levels will be comparable to those currently experienced at Sydney Olympic Park, and that no traffic noise impacts will result. On this basis, the potential for noise impacts from traffic associated with the proposed development is not considered further in this assessment.

2.5 Noise Sources associated with the Redeveloped Stadium

The Showground complex comprises the Main Arena, the Carnival Area, the Exhibition Halls and a range of Pavilion buildings which can be used for various purposes. The Showground Main Arena is presently approved for uses including the annual Sydney Royal Easter Show (attended by almost one million people over 14 days), exhibitions, public entertainment and recreational and sporting activities, as well as being the home of the Royal Agricultural Society of New South Wales.

The main noise generating events in the redeveloped Showground Main Arena would include:

- rock concerts, festivals and other musical entertainment (eg, Big Day Out);
- fireworks, often associated with the Royal Easter Show;
- sporting events, eg. AFL and cricket matches, and
- the Carnival during the Sydney Royal Easter Show.

These uses will generate crowd noise, public address noise and motor sport noise from within the Showground Main Arena and noises from the Carnival area during the Sydney Royal Easter Show, including public address noise, amplified music, patron screams and fireworks displays.

This assessment does not consider noise generated by activities such as media helicopter movements; food; beverage and entertainment support; road traffic; public transport; aeroplane flight paths; emergency vehicles sirens; crowd arrival or departure from an event; and domestic parties and celebrations. Such noise sources are generally regulated on a per-event basis. Hearing conservation for people at an event is also a separate issue and is not covered in this report.

3 NOISE SENSITIVE RECEIVERS

Noise from the operation of the redeveloped stadium may potentially affect the following three groups of receivers:

- Existing and future residential receivers EXTERNAL to Sydney Olympic Park;
- Residential receivers WITHIN Sydney Olympic Park, and
- Commercial receivers WITHIN Sydney Olympic Park.

A summary of all receivers considered in this noise assessment is presented in Table 3-1 below.

3.1 Residential Receivers EXTERNAL to Sydney Olympic Park

Sydney Olympic Park is surrounded by land occupied and or to be developed for residential and commercial uses. As described below these suburban residential receivers are categorised into four distinct zones (north, south, east and west) according to their geographical proximity with respect to Sydney Olympic Parkland.

3.1.1 Receivers North of Sydney Olympic Park

This region comprises residential apartments on the western foreshore of Homebush Bay, as well as detached housing in those parts of the suburbs of Ermington and Melrose Park bordered by Victoria Road to the north, Wharf Road to the east, Silverwater Road to the west and the Parramatta River to the south.

3.1.2 Receivers South of Sydney Olympic Park

This region comprises predominantly detached housing and some apartments in those parts of the suburbs of Auburn, Lidcombe and Homebush West bordered by the M4, Arthur Street/Broughton Road, Homebush Road and St Hilliers Road to the north, south, east and west respectively.

3.1.3 Receivers East of Sydney Olympic Park

This region comprises a mixture of detached housing and apartments in those parts of the suburbs of North Strathfield, Concord West, Liberty Grove and Rhodes bordered by the Parramatta River, the M4 and Concord Road to the north, south and east respectively.

3.1.4 Receivers West of Sydney Olympic Park

This region comprises the suburb of Newington, with a mixture of detached housing and apartments bordered by Holker Street, the M4, Hill Road and Silverwater Road to the north, south, east and west respectively.

3.2 Residential Receivers WITHIN Sydney Olympic Park

Although there are presently no residential premises within Sydney Olympic Park, development approval has been granted for approximately 700 residential apartments on the south east

corner of the intersection of Australia Avenue and Herb Elliot Ave (referred to as Sydney Olympic Park Site 3).

Consistent with Master Plan 2030, over the next 10 to 20 years further residential development is expected in the south-east and the north-west area of the Town Centre comprising some 6,500 dwellings. Figure 3-1 (taken from p37 of the Sydney Olympic Park Master Plan 2030) shows the proposed residential land uses relative to the event/entertainment uses – the Showground Main Arena being located in the yellow-coloured northern section of Figure 3-1.

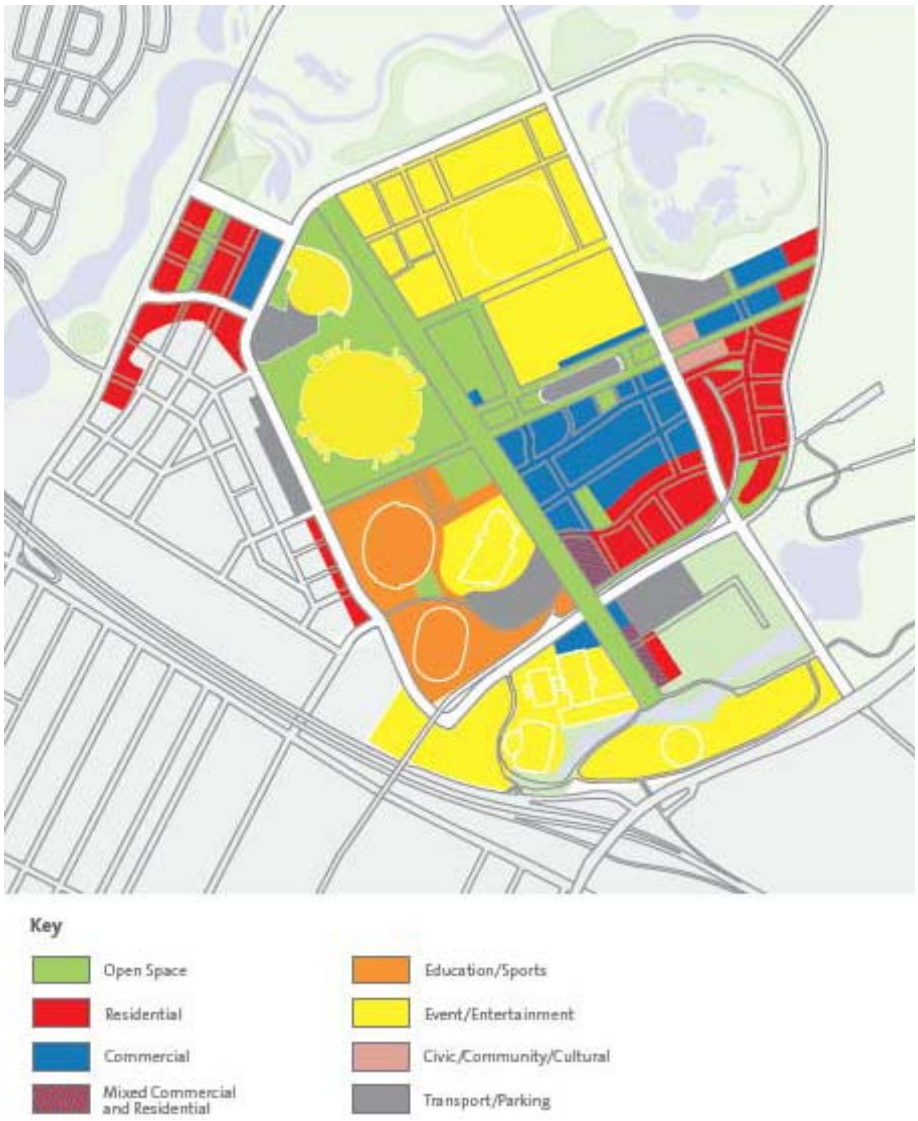


Figure 3-1 Proposed Land Uses for Sydney Olympic Park

3.3 Commercial (Accommodation) Receivers WITHIN Sydney Olympic Park

There are a number of hotels and related accommodation premises having functions similar to those of residential uses already in existence or planned for Sydney Olympic Park. These

include the:

- Novotel/Ibis Hotel located on Olympic Boulevard;
- Pullman Hotel located on the corner of Olympic Boulevard and Herb Elliott Avenue;
- Formule 1 Hotel and Quest Serviced Apartments located in the area between Edwin Flack Avenue, Bernie Avenue, and Uhrig Road; and
- Site 9 Private Hospital (approved but not constructed).

3.4 Summary of Receivers considered in this Noise Assessment

Table 3-1 indicates those receiving locations selected as being representative of the groups of receivers identified in Sections 3.1 to 3.3 above, and considered in this assessment. In some cases multiple receiving locations are defined at the same building, representing different levels of the building.

Table 3-1 Noise-Sensitive Receivers Considered in this Assessment

ID	Receiver Location	Indicative Building Heights	Direction from Showground
Receivers EXTERNAL to Sydney Olympic Park			
1	Newington North	2-3 storeys	NW
2	Newington	2 storeys	WNW
3	Newington South	2-3 storeys	W
4	Lidcombe North – Delhi St	Single storey	SW
5	Lidcombe North – Gallipoli St	Single storey	SSW
6	Homebush – Coleman Ave	Single storey	SSE
7	Concord West – Conway Ave	Single storey	SE
8	Liberty Grove – Wentworth Dr	4 storeys	E
9	Mariners Cove (East)	8 storeys	NNE
10	Mariners Cove (West)	8 storeys	NNE
11	Melrose Park – Lancaster Ave	Single storey	NNE
12	Ermington – Gregory St	Single storey	N
Receivers WITHIN Sydney Olympic Park			
13	Haslam's Precinct (Upper Floors)	7th of 7 storeys	W
14	Haslam's Precinct (Lower Floors)	1st of 7 storeys	W
15	Formule 1 Hotel (Upper Floors)	3rd of 3 storeys	SSW
16	Formule 1 Hotel (Lower Floors)	1st of 3 storeys	SSW
17	Ibis Hotel (Rear Upper Floors)	7 storeys	S
18	Novotel Hotel (Upper Floors)	18th of 18 storeys	S
19	Novotel Hotel (Mid-level Floors)	9th of 18 storeys	S
20	Novotel Hotel (Lower Floors)	1st of 18 storeys	S
21	Site 9A Hospital (Upper Floors)	6th of 6 storeys	S
22	Site 9A Hospital (Mid-level Floors)	3rd of 6 storeys	S

23	Site 9A Hospital (Lower Floors)	1st of 6 storeys	S
24	Site 3 Residential (Upper Floors)	30th of 30 storeys	SE
25	Site 3 Residential (Mid-level Floors)	15th of 30 storeys	SE
26	Site 3 Residential (Lower Floors)	1st of 30 storeys	SE

4 NOISE CRITERIA

4.1 Noise Criteria for Events held at the Redeveloped Showground

SOPA's *Draft Noise Management Plan* identifies three categories for its Major Events, as identified in Table 4-1.

Table 4-1 Major Event Categories

Category Type	Criteria
Category 1 Major Events World Tour Events	Attendance in excess of 50,000 patrons Usually a "one off" event and unlikely to recur in the short to medium term Use of high output amplified sound system
Category 2 Major Events Major Entertainment	Attendance in excess of 20,000 patrons A "one off" event or annually recurring event Use of high output amplified sound system
Category 3 Major Events Sports & Cultural	Attendance in excess of 10,000 patrons One off or recurring events Limited use or medium level output of amplified sound system

The Redeveloped Showground will host Category 2 and 3 events, but not Category 1 events. All events held at the Showground will cease by 11pm, in keeping with SOPA's Draft Noise Management Plan.

Tables 4-2 to 4-4 outline the noise criteria stipulated in the Draft Noise Management Plan for receivers potentially affected by noise from Sydney Olympic Park events. These criteria are expressed as limits to be met at the receiver.

Table 4-2 Noise Criteria for Residences EXTERNAL to Sydney Olympic Park

Event Category	Noise Criteria	
Category 1 Major Events	85dB($L_{A10,15min}$)	
Category 2 Major Events	65dB(L_{Amax})	60dB($L_{A10,15min}$)
Category 3 Major Events	60dB(L_{Amax})	55dB($L_{A10,15min}$)

Table 4-3 Noise Criteria for Residences WITHIN Sydney Olympic Park

Event Category	Noise Criteria	
Category 1 Major Events	85dB($L_{A10,15min}$)	
Category 2 Major Events	70dB(L_{Amax})	65dB($L_{A10,15min}$)
Category 3 Major Events	65dB(L_{Amax})	60dB($L_{A10,15min}$)

Table 4-4 Noise Criteria for Commercial Premises WITHIN Sydney Olympic Park

Event Category	Noise Criteria	
Category 1 Major Events	85dB($L_{A10,15min}$)	
Category 2 Major Events	70dB(L_{Amax})	65dB($L_{A10,15min}$)
Category 3 Major Events	65dB(L_{Amax})	60dB($L_{A10,15min}$)

There is an approval to develop a hospital facility within Site 9 of the Boundary Creek precinct at the southern end of Sydney Olympic Park, although the development has not been enacted upon at the time of writing this report. The *Draft Noise Management Plan* does not nominate noise criteria for the protection of this special-use receiver but it is reasonable to assume that a noise criterion more stringent than those indicated in Table 4-4 should apply. Indicatively, many of the internal spaces of the hospital would likely need to be designed to provide for an ambient internal noise level of not greater than 35dBL_{Aeq}. (approximately 38dBL_{A10}).

Rather than seeking to control noise from the various venues of Sydney Olympic Park to achieve lower ambient noise levels, the Sydney Olympic Park Authority has provision in such instances to invoke “Public Positive Covenants” which require new landowners and lessees to acknowledge the “events and entertainment” character of Sydney Olympic Park, and therefore assume the responsibility for constructing their development with appropriate acoustically-rated building elements (eg, double-glazed facades). To this end, the hospital need not be considered further in this assessment, as the remaining responsibility to ensure suitable internal ambient noise levels within the hospital would fall to the designers of the development.

5 NOISE MODELLING

5.1 The CadnaA Noise Modelling Software

Noise emissions from the redeveloped Showground - including the areas adjacent to the Main Arena as are used for the annual Royal Easter Show - were modeled using the CadnaA acoustic noise prediction software. Factors that are addressed in the noise modelling are:

- source sound level emissions and location;
- screening effects from buildings;
- receiver locations;
- ground topography;
- noise attenuation due to geometric spreading;
- ground absorption;
- atmospheric absorption; and
- weather conditions.

5.2 Noise Modelling Assumptions

The noise model incorporated the anticipated future topography of the built environment (buildings and stadia) of Sydney Olympic Park as indicated in Section 5 of the Sydney Olympic Park Master Plan 2030. The Master Plan presents indicative locations and heights for some but not all buildings expected for the Park.

The building envelope design of the redeveloped Showground Main Arena adopted in the noise model was based on the proposal's Stage 1A design information provided by Populous (September 2010) which reflects the stadium seating design in tis final form without roofing to the new south-east and north stands. Specifically, the height of the additional seating for the proposed new north-east and south-east stands was taken to be +25m above the Main Arena's surface playing level, raking down to +20m at its lowered ends near the scoreboard. The open (non-seated) concourse area either side of the proposed scoreboard was assumed to sit approximately +6m above the level of the playing surface. The scoreboard was assumed to stand proud of the flat concourse area by +9m.

The approved hospital for Site 9A has been modelled as a 7-storey building (approx 22m high) although SEPP2009 indicates that Site 9A may be developed up to 122m high.

The Showground Main Arena was assumed to have an evenly-distributed (as opposed to a centralised) crowd PA system for sporting events. In the case of rock concerts, the PA stacks were assumed to be positioned at the northern (scoreboard) end of the Main Arena facing south to the existing stand. The sound power levels used to predict noise emission from each type of Showground event are detailed in Table 6-1.

5.3 Validation of the Noise Model

In order to establish the veracity of the noise level predictions of this assessment, the project model was validated against noise levels from Sydney Olympic Park events previously monitored by Wilkinson Murray. Table 5-1 details the comparison of predicted and monitored noise levels. Noise levels are expressed as a range to reflect the variation in typical maximum noise levels measured over different monitoring sessions, different receivers within the one region (eg, "Newington North") and the difference in received noise levels during calm ("neutral") and adverse wind conditions.

Note that the meteorological conditions at any time during monitoring are not known, and hence only a general comparison can be made between the range of monitored levels and the range of levels predicted under different meteorological conditions. In calculations, "neutral" conditions refers to zero wind and no vertical temperature gradient, while "adverse" conditions refers to either a temperature gradient of 3 degrees C per 100m, or a wind speed of 3 m/s from source to receiver.

Table 5-1 Validation of Noise Model

Receiver	Noise Source	CadnaA	Monitoring	Comment
Showground Main Arena – Rock Concert (M-One Concert, 2002)				
Newington North	Band Music	58-59 (Neutral) 63-64 (Adverse)	61-62	General agreement
Newington South	Band Music	55-60 (Neutral) 60-66 (Adverse)	61-66	General agreement
Concord West	Band Music	54 (Neutral) 60 (Adverse)	52-58	General agreement
SOPA Site 3 (12m above ground)	Band Music	59 (Neutral) 63 (Adverse)	56-58	1-3dBA over-prediction
Novotel Hotel	Band Music	55 (Neutral) 59 (Adverse)	58-60	1dBA under-prediction
ANZ Stadium – Rock Concert (Rumba Festival, 2002)				
SOPA Site 3 (30m above ground)	Band music	54 (Neutral) 59 (Adverse)	54-56	General agreement
Newington South	Band music	54-60 (Neutral) 59-65 (Adverse)	50-53	1-4dBA over-prediction
	Crowd cheers	55 (Neutral) 60 (Adverse)	55	General agreement
ANZ Stadium –Sport Event (NRL Grand Final, 2002)				
SOPA Site 3 (12m above ground)	Crowd Cheering	58 (Neutral) 63 (Adverse)	55	3dBA over-prediction
Newington North	Crowd Cheering	51-53 (Neutral) 56-58 (Adverse)	54-55	General agreement
ANZ Stadium – Sport Event (Rugby World Cup Opening, 2003)				
Newington North	Crowd	51-53 (Neutral)	54-57 L_{Aeq}	General

	Cheering	56-58 (Adverse)	agreement

Table 5-1 indicates that general agreement between modelled and measured results is obtained for most locations. The largest discrepancy is for a rock concert held at ANZ Stadium, measured at Newington South, with an over-prediction of 1 – 4 dBA. The most likely reason for this is the differing sound levels used by different groups – some groups at the Rumba Festival were popular music acts likely to use lower sound power levels than the levels assumed for a generic rock concert.

It can be concluded from Table 5-1 that the CadnaA noise model was suitably calibrated for the prediction of noise from the Showground events.

6 PREDCTION OF NOISE LEVELS

Tables 4-2, 4-3 and 4-4 indicate that there are two noise criteria for Category 2 and 3 events, expressed as L_{A10} and L_{Amax}. However, it is the L_{Amax} criterion that is typically the determining criterion. The L_{A10} noise level will generally be more than 5dBA below the L_{Amax} noise level from the same event, and hence compliance with the L_{AMax} criterion ensures compliance with the L_{A10} criterion. As such, this assessment will characterise noise impact from an event on the basis of the predicted L_{Amax} noise level from the event.

6.1 Sound Power Levels Adopted for Noise Model

Table 6-1 indicates the sound power levels used in the noise modelling. The sound power levels are expressed as L_{Amax} levels expected from the source, and were derived from noise monitoring data for previous Sydney Olympic Park events.

Table 6-1 L_{Amax} Sound Power Levels used in Noise Modeling

Event	Sound Power Level (dBA L_{Amax})
Showground Events	
Showground Rock Concert On-axis power level for single speaker stack	150
Showground AFL/Cricket (25,000 people in Main Arena) Crowd & PA Noise	136
Showground Rock Concert Crowd Noise	133
Royal Easter Show – Main Arena event, Crowd & PA	130
Royal Easter Show – Carnival rides external to Main Arena	113 per stall
ANZ Stadium Events	
ANZ Stadium Sport Events (80,000 people) Crowd & PA Noise	141
ANZ Stadium Rock Concert Crowd Noise	138

6.2 Predicted Operational Noise Levels

Table 6-1 indicates the predicted noise level for each receiver for all proposed Showground events under “neutral” and “adverse” (noise-enhancing) meteorological conditions. Results shown shaded indicate instances where the predicted level of noise at the receiver exceeds the relevant noise criterion.

Table 6-2 L_{Amax} Operational Noise Levels at Receivers from Events held at the Redeveloped Sydney Showground

ID	Receiver	Noise Level (dBA L_{Amax}) Neutral Conditions			Noise Level (dBA L_{Amax}) Adverse Meteorological Conditions			Criterion
		Concert	AFL / Cricket	Easter Show	Concert	AFL / Cricket	Easter Show	dBA L_{Amax}
Receivers External to Sydney Olympic Park								
1	Newington North	59	49	42	64	54	46	65
2	Newington	60	49	42	65	54	47	65
3	Newington South	60	46	38	**66**	51	43	65
4	Lidcombe North – Delhi St	59	40	32	65	45	37	65
5	Lidcombe North – Gallipoli St	59	42	31	65	47	36	65
6	Homebush – Coleman Ave	55	38	31	61	43	37	65
7	Concord West – Conway Ave	54	40	35	60	46	40	65
8	Liberty Grove – Wentworth Dr	56	47	42	61	52	46	65
9	Mariners Cove (East)	57	51	45	62	56	49	65
10	Mariners Cove (West)	57	50	43	62	55	48	65
11	Melrose Park – Lancaster Ave	48	35	29	55	41	35	65
12	Ermington – Gregory St	49	36	30	55	41	35	65
Receivers WITHIN Sydney Olympic Park								
13	Haslam's Precinct (Upper Floors)	66	55	48	70	60	53	70
14	Haslam's Precinct (Lower Floors)	64	55	46	68	60	51	70
15	Formule 1 Hotel (Upper Floors)	69	48	41	**74**	53	46	70
16	Formule 1 Hotel (Lower Floors)	61	44	34	66	49	38	70

17	Ibis Hotel (Rear Upper Floors)	62	49	46	67	54	50	70
18	Novotel Hotel (Upper Floors)	**74**	61	55	**78**	66	60	70
19	Novotel Hotel (Mid-level Floors)	**73**	57	51	**78**	62	56	70
20	Novotel Hotel (Lower Floors)	55	38	34	59	43	38	70
21	Site 9A Hospital (Upper Floors)	55	37	30	60	42	34	70
22	Site 9A Hospital (Mid-level Floors)	51	33	27	56	38	32	70
23	Site 9A Hospital (Lower Floors)	48	31	27	53	36	31	70
24	Site 3 Residential (Upper Floors)	**72**	61	61	**76**	66	64	70
25	Site 3 Residential (Mid-level Floors)	68	60	61	**72**	64	64	70
26	Site 3 Residential (Lower Floors)	59	49	47	63	54	51	70

Note 1: Shaded cells indicate values that exceed the noise criterion

The results in Table 6-2 indicate that during periods of neutral meteorological conditions (no wind), the level of noise predicted from all Showground events will comply with the relevant criteria at receivers within and external to Sydney Olympic Park with only the following exceptions. Noise from Showground rock concerts will give rise to exceedances of approximately 2-4 dBA at the upper levels of both the Novotel Hotel and the residential tower proposed for Site 3.

During periods of adverse meteorological conditions (either wind in the direction of a receiver or periods of temperature inversions), noise from Showground rock concerts may give rise to noise exceedances also at the most exposed residences in Newington South and the upper levels of the Formule 1 Hotel.

At Newington South the predicted exceedance under adverse conditions is 1 dBA, which is not considered significant. Hence, effective compliance is predicted at al external receivers under both neutral and adverse meteorological conditions.

At certain receivers within Sydney Olympic Park, exceedances of up to 8 dBA are predicted from concerts, depending on meteorological conditions. It should be observed that the predictions of noise from Showground concerts was based on a sound power level of 150dBAL_{Amax} (Table 6-1) which reflects the music speaker power level expected from a major international rock act such as the Rolling Stones. Not all concerts operate at this speaker power emission level, and indeed, it would be reasonable to expect that concerts of lesser-known or local acts may operate at noise levels 3-5dBA lower than this level.

To ensure compliance with relevant criteria at these locations, real-time noise monitoring – using either attended monitoring or unattended monitors capable of identifying the source of measured noise - would need to be used. If noise levels approach the relevant criterion, then sound levels from the PA system would need to be reduced.

7 COMPARISON OF PREDICTED SHOWGROUND NOISE LEVELS WITH NOISE LEVELS FROM OTHER VENUES

This section presents a comparison of noise emissions expected from Sydney Showground events and that from comparable ANZ Stadium events. The purpose of this analysis is to give context to the predicted Showground event levels presented in Table 6-2.

The comparison of event noise from the redeveloped Sydney Showground and the existing ANZ Stadium is presented in Table 7-1. The noise levels presented are the levels predicted using the CadnaA noise model under neutral meteorology (no wind) conditions.

Table 7-1 Comparison of Noise Levels predicted by Noise Model across Venues (under Neutral Meteorological Conditions (No wind))

Receiver	Showground Events dBA L_{Amax}		ANZ Stadium Events dBA L_{Amax}	
	Concerts (eg Pink)	Sports (eg AFL)	Concerts (eg U2)	Sports (eg NRL Grand Final)
Receivers External to Sydney Olympic Park				
Newington North	59	49	63	53
Newington	60	49	62	56
Newington South	60	46	60	55
Lidcombe North – Delhi St	59	40	61	56
Lidcombe North – Gallipoli St	59	42	63	56
Homebush – Coleman Ave	55	38	45	45
Concord West – Conway Ave	54	40	49	45
Liberty Grove – Wentworth Dr	56	47	51	45
Mariners Cove (East)	57	51	61	47
Mariners Cove (West)	57	50	61	47
Melrose Park – Lancaster Ave	48	35	Below ambient	Below ambient
Ermington – Gregory St	49	36	Below ambient	36
Receivers WITHIN Sydney Olympic Park				
Haslam's Precinct (Upper Floors)	66	55	61	65
Haslam's Precinct (Lower Floors)	64	55	59	52
Formule 1 Hotel (Upper Floors)	69	48	69	65
Formule 1 Hotel (Lower Floors)	61	48	53	61
Ibis Hotel (Rear Upper Floors)	62	49	62	49
Novotel Hotel (Upper Floors)	74	61	72	71

Novotel Hotel (Mid-level Floors)	73	57	67	66
Novotel Hotel (Lower Floors)	55	38	61	48
Site 9A Hospital (Upper Floors)	55	37	53	40
Site 9A Hospital (Mid-level Floors)	51	33	53	39
Site 9A Hospital (Lower Floors)	48	31	53	49
Site 3 Residential (Upper Floors)	72	61	65	61
Site 3 Residential (Mid-level Floors)	68	60	63	58
Site 3 Residential (Lower Floors)	59	49	54	42

Table 7-1 indicates that at receivers external to Sydney Olympic Park, where noise levels from Showground events are relatively high (57dBA or more), the noise level from an equivalent event in ANZ Stadium is higher.

On the other hand, for the most critical receivers within Sydney Olympic Park – the Novotel Hotel and the proposed Site 3 Residential towers – noise levels from a concert in the Showground will be higher than for the same concert at ANZ Stadium. This emphasises that if it is required to meet the relevant criterion of 70dBA at these locations, stricter controls than currently exist for concerts at ANZ Stadium will be required. Such controls would most likely take the form of either imposing a noise limit at the concert mixing desk or, in the case of new residential developments (eg, the proposed Site 3 residential towers), prescribing appropriate acoustic design construction for at least the exposed facades of their upper storeys. As described in Section 4.1, the Sydney Olympic Park Authority retains the provision to require new developments to assume control for providing suitable internal acoustic environments *within* their development despite its siting within a major sport and entertainment events precinct that may be subject to high noise events from time to time. This will be achieved by creating a 'Section 88D' instrument for developments on Sydney Olympic Park land (or a 'Section 88E' instrument for developments on non– Sydney Olympic Park land.

8 CONCLUSION

This assessment concludes that at residences external to Sydney Olympic Park, noise levels from all proposed events within the redeveloped Showground will be within relevant criteria, under both neutral and adverse meteorological conditions. (A predicted exceedance of 1dBA at one location under adverse conditions is not considered significant.)

On the other hand, at several locations within Sydney Olympic Park – the Novotel and Formule 1 Hotels and the residential towers proposed for Site 3 - exceedances are predicted during high-level rock concert. These exceedances range up to 8 dBA under adverse meteorological conditions. Furthermore, noise levels at these locations due to a concert in the redeveloped Showground would be higher than for the same concert at ANZ Stadium.

Compliance at these locations would require the deployment of real-time noise monitoring at sensitive locations during Showground concerts, to allow source noise levels to be controlled at the concert mixing desk. Alternatively, in the instance of *new* developments within Sydney Olympic Park, the Sydney Olympic Park Authority has the provision to require that the development assume responsibility for appropriately designing its façade construction to mitigate external noise levels within Sydney Olympic Park.

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