



**ACT**  
Government

Chief Minister, Treasury and  
Economic Development

## Freedom of Information Publication Coversheet

The following information is provided pursuant to section 28 of the *Freedom of Information Act 2016*.

FOI Reference: CMTEDDFOI 2019-056

Information to be published	Status
1. Access application	Published
2. Decision notice	Published
3. Documents and schedule	Published
4. Additional information identified	No
5. Fees	Waived
6. Processing time (in working days)	10
7. Decision made by Ombudsman	N/A
8. Additional information identified by Ombudsman	N/A
9. Decision made by ACAT	N/A
10. Additional information identified by ACAT	N/A

**From:** [REDACTED]  
**To:** [CMTEDD FOI](#)  
**Subject:** Freedom of Information request  
**Date:** Friday, 8 March 2019 10:44:46 PM

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Please find online enquiry details below. Please ensure this enquiry is responded to within fourteen working days.

### Your details

**All fields are optional, however an email address OR full postal address must be provided for us to process your request. An email address and telephone contact number will assist us to contact you quickly if we need to discuss your request.**

Title:

First Name:

Last Name:

Business/Organisation:

Address:

Suburb:

Postcode:

State/Territory:

Phone/mobile:

Email address:

**Request for information**

**(Please provide as much detail as possible, for example subject matter and relevant dates, and also provide details of documents that you are not interested in.)**

Under the Freedom of Information Act 2016 I want to access the following document/s (\*required field):

The [REDACTED] request all editions of the light and noise management plans for Manuka Oval from 2000 including any draft plans under consideration.

I do not want to access the following documents in relation to my request::

Thank you.  
Freedom of Information Coordinator



**ACT**  
Government

Chief Minister, Treasury and  
Economic Development

Our ref: CMTEDDFOI 2019-056

[REDACTED]

via email: [REDACTED]

Dear [REDACTED],

### **FREEDOM OF INFORMATION REQUEST**

I refer to your application under section 30 of the *Freedom of Information Act 2016* (the Act), received by the Chief Minister, Treasury and Economic Development Directorate (CMTEDD) on 8 March 2019, in which you sought access to “all editions of the light and noise management plans for Manuka Oval from 2000 including any draft plans under consideration”.

#### **Authority**

I am an Information Officer appointed by the Director-General under section 18 of the Act to deal with access applications made under Part 5 of the Act.

#### **Timeframes**

In accordance of section 40 of the Act, CMTEDD was required to provide a decision on your access application by 8 April 2019.

#### **Decision on access**

Searches were completed for relevant documents and 2 documents were identified that fall within the scope of your request.

I have included as **Attachment A** to this decision the schedule of relevant documents. This provides a description of each document that falls within the scope of your request and the access decision for each of those documents.

I have decided to grant full access to all relevant documents. The documents released to you are provided as **Attachment B** to this letter.

#### **Charges**

Pursuant to *Freedom of Information (Fees) Determination 2017 (No 2)* processing charges are applicable for this request because the total number of pages to be released to you exceeds the charging threshold of 50 pages. However, the charges have been waived in this instance in accordance with section 107(2)(b) of the Act.

#### **Online publishing – Disclosure Log**

Under section 28 of the Act, CMTEDD maintains an online record of access applications called a disclosure log. Your original access application, my decision and document

released to you in response to your access application will be published in the CMTEDD disclosure log after 28 March 2019. Your personal contact details will not be published.

You may view the CMTEDD disclosure log at  
<https://www.cmtedd.act.gov.au/functions/foi/disclosure-log>.

### **Ombudsman Review**

My decision on your access request is a reviewable decision as identified in Schedule 3 of the Act. You have the right to seek Ombudsman review of this outcome under section 73 of the Act within 20 working days from the day that my decision is published in CMTEDD disclosure log, or a longer period allowed by the Ombudsman.

If you wish to request a review of my decision you may write to the Ombudsman at:

The ACT Ombudsman  
GPO Box 442  
CANBERRA ACT 2601

Via email: [actfoi@ombudsman.gov.au](mailto:actfoi@ombudsman.gov.au)

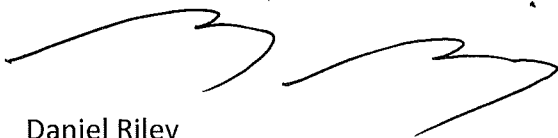
### **ACT Civil and Administrative Tribunal (ACAT) Review**

Under section 84 of the Act, if a decision is made under section 82(1) on an Ombudsman review, you may apply to the ACAT for review of the Ombudsman decision. Further information may be obtained from the ACAT at:

ACT Civil and Administrative Tribunal  
Level 4, 1 Moore St  
GPO Box 370  
Canberra City ACT 2601  
Telephone: (02) 6207 1740  
<http://www.acat.act.gov.au/>

Should you have any queries in relation to your request please contact me by telephone on 6207 7754 or email [CMTEDDFOI@act.gov.au](mailto:CMTEDDFOI@act.gov.au).

Yours sincerely,



Daniel Riley  
Information Officer  
Information Access Team  
Chief Minister, Treasury and Economic Development Directorate

25 March 2019



**ACT**  
Government

Chief Minister, Treasury and  
Economic Development

## FREEDOM OF INFORMATION REQUEST SCHEDULE

NAME	WHAT ARE THE PARAMETERS OF THE REQUEST	Reference NO.
[REDACTED]	All editions of the light and noise management plans for Manuka Oval from 2000 including any draft plans under consideration.	CMTEDDFOI2019-056

Ref No	Page number	Description	Date	Status	Reason for Exemption	Online Release Status
1	1-39	Manuka Oval Management Plan	August 2013	Full release	N/A	Yes
2	40-56	Manuak Oval Management Plan Final	August 2013	Full release	N/A	Yes
Total No of Docs						
2						

***Manuka Oval  
Light Management Plan***

***Territory Venues and Events***  
*August 2013*



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## Introduction

### Background

Development of the sports lights was approved in June 2012. A condition of the approval was that a light management plan was to be endorsed by the Environment Protection Authority (EPA) and submitted to the planning authority prior to the use of the broadcast lighting.

An interim Light Management Plan was endorsed by the EPA in January 2013 and it proposed that the effect of the broadcast lights and the measures proposed in the interim plan be reviewed between January 2013 and April 2013. A condition of the endorsement was that lights were only to be used until the end of April 2013 at which time a final light management plan was to be prepared for EPA endorsement.

Between January and April 2013 two Cricket and AFL events have been held at Manuka Oval under the lights. The operation of the lights was assessed during this period. The assessment included measurements of light spill. In addition, the ACT Government responded to an individual request regarding light spill at their apartment.

The final *Manuka Oval Light Management Plan* (the Plan) has been prepared by Territory Venues and Events of the ACT Government following completion of the assessment.

### Purpose

This plan replaces the Interim Light Management Plan. Its purpose is to provide an overview of the timing and operations of the sports lights at Manuka Oval and mitigation measures proposed to minimise any adverse effects on residents living in the surrounding area. The plan addresses impacts on the surrounding area and is not concerned with light levels within the venue.

The Plan reflects the outcome of design and compliance calculations prepared as part of the Development Application; design requirements specified as part of the construction tender process; subsequent assessment of the effect of the lights during operation and known operational requirements.

The Light Management Plan forms part of an overall Operations Plan for Manuka Oval. The Operations Plan includes the management of traffic, parking, noise and event day operations at Manuka Oval.

### About the Manuka Oval lights

Six sports light towers have been installed at Manuka Oval. Six towers were required due to the size of the playing surface, which is similar to the Melbourne Cricket Ground (MCG), and to meet television broadcast requirements for uniform light across the ground. The towers are 47 metres tall which is the maximum height allowed by National Capital planning regulations.

The towers have been designed and built on an incline to improve the angle of the lamps over the oval and to reduce any light spill.

The cost of the project was over \$5.0m including a Commonwealth Government contribution of \$2.5m. Cox Architecture provided engineering and design feasibility, and project superintendence. The towers were designed and built by international sports lighting specialists Abacus Lighting through Dialight Australia. Local company Affinity Electrical were the main sub-contractors for the build.

Construction of the lights has been completed and a certificate of completion issued. The lights were constructed in accordance with the development application. Since the lights were installed the playing surface has been replaced and lowered. As a consequence the lights will be refocused and retested.



## Objectives

The objectives of the Light Management Plan are to:

- document post-construction design assessment of light spill impacts
- identify event types, anticipated frequencies and event durations
- ensure no or minimal impact of the sports lights in broadcast mode on surrounding residents
- identify measures to mitigate any impacts on surrounding residents, and
- identify procedures for monitoring and reviewing the operation of the lights.

## Description of the Lights

### Lighting modes

Sports lighting at Manuka Oval will provide varying levels or modes of illumination depending on the event. Table 1 identifies the average lux levels for horizontal luminance for each lighting mode.

**Table 1 – Average Lux Levels for Event Types**

Event Type	Average Lux Levels
Broadcast sporting events	1,500
Non-broadcast sporting events	500
Training	200
Event exit and cleaning mode	100- 200

### What is lux?

Lux is the standard measure for the level of illumination on a surface. The higher the lux level the brighter an area will be. For example:

- Sunny day ~ 70,000 lux
- Overcast day ~ 20,000 lux
- Office environment ~ 400 lux
- Indoor car park ~ 40 lux
- Typical street lighting ~ 2-5 lux
- Full moonlight ~ 0.5 lux.

## Events Types

### Broadcast sporting events

Lighting for broadcast events is operated at maximum lux levels to provide sufficient light for high definition television recording requirements.

Cricket requires higher light levels on the centre pitch to allow television cameras to pick up the small ball and for slow-motion detail. Similar lighting requirements exist for AFL although this sport requires an even light spread across the entire field of play.

The average light levels in broadcast mode for both sports codes are around 1,500 lux, with the wicket in cricket lit to around 2,000 lux.

### Non-broadcast sporting events

Light lux levels are significantly reduced for non-broadcast sports. Lux levels for non-broadcast events are around 500 lux. Non-broadcast sporting events will represent the majority of games played under lights at Manuka Oval.

## Training

Training mode provides much lower light levels of around 200 lux sufficient for team and referee training. It is anticipated that training lights may be used two or three times per week during the respective AFL and Cricket playing seasons.

## Exit and cleaning

Cleaning and exit mode provides adequate light of around 100 lux for the safe egress of patrons and as work environment for venue and contract staff to carry out limited venue maintenance, such as a requirement to clean the venue after an event prior to another event the next day.

## Monitoring of Light Spill

The requirements for limiting light spill to the surrounding areas are set out in two Australian Standards (AS):

- AS 1158.3.1 – Pedestrian area (Category C) lighting: performance and design requirements
- AS 4282 – Control of the obtrusive effects of outdoor lighting

AS 1158.3.1 recommends required lighting levels in outdoor public places. ACTPLA requires that the pathways around the oval, between seating areas and ground entrances and exits meet the recommendations of the standard.

AS 4282 specifies control of light spill from a lighting installation however **broadcast lighting is specifically excluded from the standard.**

**Table 1: Light spill assessment benchmarks for non-broadcast mode**

Impact	Light technical parameter	Location of Assessment	Recommended maximum values	
			Pre-curfew	Post-curfew
Nuisance light to residences	Illuminance in the vertical plane	Boundary of commercial and residential areas (1)	25 lux(2)	4 lux
		Residential areas	10 lux(2)	2 lux
Discomfort glare to residents	Luminous intensity emitted by luminaires	Boundary of commercial and residential areas (1)	100,000 cd(3)	2,500 cd(3)
		Residential areas	100,000 cd(3)	1,000 cd (3)
Light spill into night sky	Luminous intensity emitted by luminaires	All	100,000 cd(3)	
Visibility of transport users	Threshold increment	Commercial roadways (2)	20%(3)	
		Residential roadways (2)	20%(3)	

Notes:

1. The term 'commercial' defined in the Standard as a generic description for zoning for uses other than residential. In this assessment, these targets are applied to all residences facing onto Manuka Circle.
2. Key parameter against which measurements are compared - refer to Appendix 1.
3. See discussion in Appendix 1 regarding assessment of glare and light spill.

AS 4282 does not contain a requirement to demonstrate compliance by measurement after installation. The reason for this is that it is very difficult to measure most of the parameters set out in the Standard:

- Discomfort glare to residents and light spill into the night sky – the luminous intensity parameter (measured in candela [cd]) – can practically be only measured in a laboratory;
- Visibility of transport users – threshold increment [%] – there is no way of measuring this;
- Nuisance light to residences – light spill lux levels. The light spill assessment relates to the light spill coming from the sports lighting, excluding all other light (eg street lighting, vehicle lights etc) and reflected light (eg sports lighting reflected off the ground). Therefore, any measurements that are taken following installation should exclude the existing lighting and reflected light. In practice, it is not possible to exclude other light sources during measurements.

## **Assessment of the Interim Light Management Plan**

The Interim Light Management proposed various actions to manage and monitor the effects of the sports lighting on the surrounding areas.

### **Light spill**

The interim light management plan proposed that the operation of the lights be assessed as an input into developing a final light management plan. The assessment has been completed and is summarized below. The assessment is at Attachment 1.

The anticipated light levels were assessed as part of the investigations undertaken for the development application submission. Subsequently, in accordance with the provisions of the interim light management plan, lighting levels were assessed on 23 January 2013 as part of the commissioning of the lights and on 6 March 2013.

The measurements of light in the surrounding area were taken at ground level at locations (1.5m above ground level) representing the nearest residential and commercial properties surrounding the site. Measurements of vertical and horizontal illuminances<sup>1</sup> were taken and the locations are similar to those used in the initial assessment. The approach was in accordance with accepted practice.

During the measurements in broadcast mode, a small number of floodlights in each tower were not operating but this was not expected to affect the measured lighting levels.

The majority of measurements outside of the Oval were conducted with all six lighting towers switched on. However, for measurements completed in broadcast lighting mode, Towers 1 and 6 were not operational when light levels were being measured in the area between the intersection of NSW Crescent and Manuka Circle and the east entry. No residences are located in this area (Figure 1). All towers were fully operational when measurements were completed in the other lighting modes.

Tower 1 is located in the south-west section of the Oval in the vicinity of the intersection of Canberra Avenue and Furneaux Street and faces north-east towards Manuka Pool and Telopea Park. Tower 6 is located in the south-east section of the Oval in the vicinity of the intersection of Canberra Avenue and Manuka Oval and faces north-west towards the cricket nets and Montgomery Oval. The non-operation of these light towers would not have affected light levels in the surrounding residential area.

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<sup>1</sup> Horizontal and vertical illuminance refers to the direction of a light meter in the hand: to horizontal illuminance refers to a light meter that 'lies' parallel to the palm facing upwards, and vertical illuminance refers to a light meter that 'stands' in the hand facing to one side.

## **Nearest residential areas and light spill**

### *Operation in broadcast mode*

In summary the assessment found that when the lights were in broadcast mode, light levels at the majority of residential properties were below the maximum standards specified in AS4282 with only a small number of properties experiencing higher levels. The shading provided by the trees blocks light spill at ground level. Light spill would be greater at apartments on the upper levels due to the reduced tree cover.

As noted previously lighting in broadcast mode is specifically excluded from AS4282.

### *Operation in non-broadcast mode*

From an operational perspective, the non-broadcast mode is required to deliver 25% of the illumination of broadcast mode. Assessment of the light spill with the lighting in non-broadcast mode was undertaken on 6 March 2013 and it was found that light levels at all residential locations were within the required pre-curfew standard.

## **Realm residences**

Two residents on levels 5 and 6 submitted complaints about light spill from the lights at Manuka Oval. In response, light levels reaching two balconies of the people complaining about the light were measured. The light spill at the residences was assessed with the lighting in broadcast mode, non-broadcast mode and with the Oval lighting switched off. Additional information is at Attachment 1.

Illuminance reaching the properties was measured from the direction of Manuka Oval. The measures included all lighting in the surrounding environment, including that from the Oval as well as street lighting and any lighting from other surrounding properties. The measurements were taken from the balcony and therefore exclude any impacts of the resident's glazing as the light meter was facing directly toward the Oval rather than out of the property, and thus measures the worst case scenario.

The results indicated that although light spill reached the two apartments, light levels were substantially below the standards specified in AS4282 in all lighting modes, including broadcast mode.

## **Glare to road users**

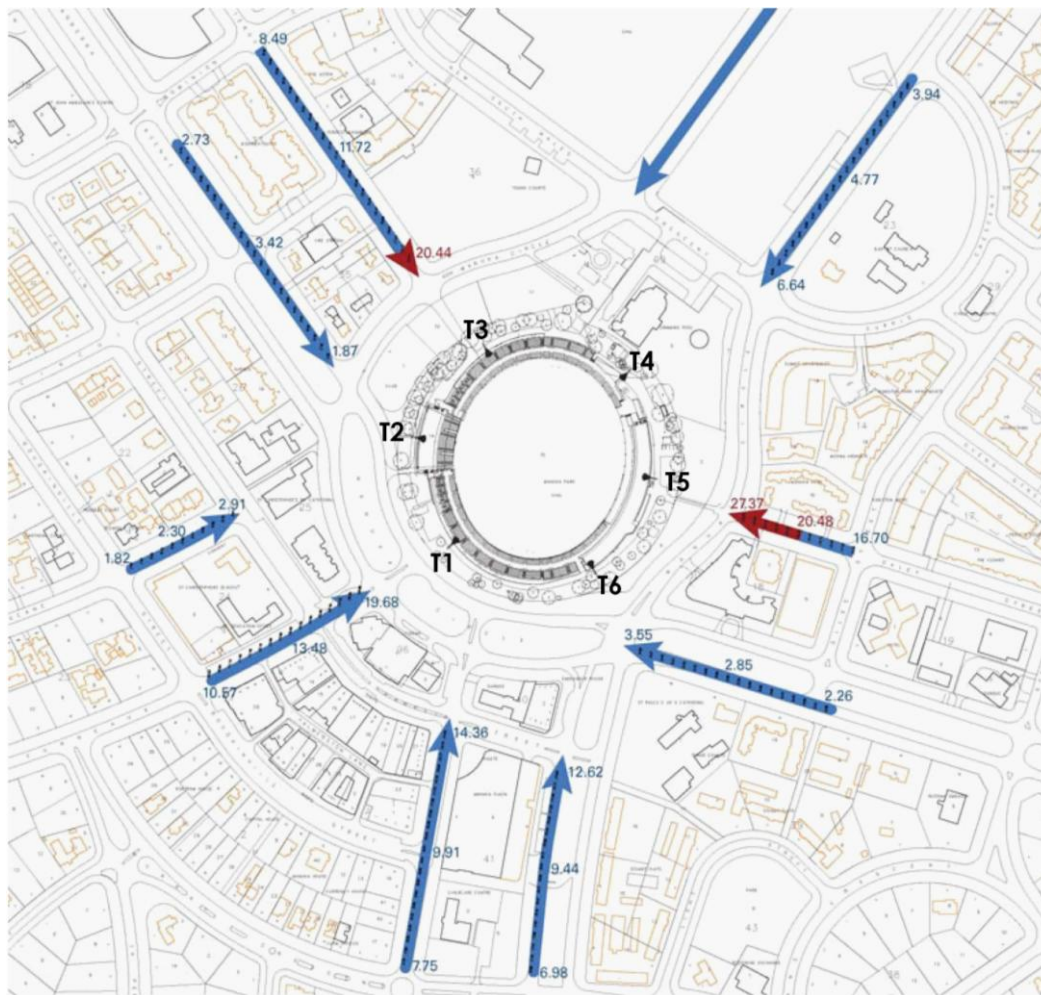
It is not possible to measure glare and levels have to be calculated. Glare levels were modelled as part of the initial planning of the lights. As the lights were installed in accordance with the design, glare has not been remodelled since the lights were constructed. The initial modelling assessed glare in broadcast and non-broadcast mode and assumed that the trees did not exist (worst case scenario).

The assessment concluded that the potential for glare to drivers on the surrounding streets was within the limits set by AS4282 when the lights operated in non-broadcast mode. Therefore mitigation measures are not required.

As noted above, AS4282 provides that glare levels from outdoor lighting should be less than a threshold increment of 20%. Technically the standards for glare do not apply to broadcast lighting. However irrespective of the type of light emitting glare, if the threshold increment level is above 20%, driver safety could be considered to be compromised. Therefore it is appropriate to consider glare from the lights in broadcast as well as in non-broadcast mode.

The assessment of glare when the lights were in broadcast mode identified two locations where glare exceeded the 20% threshold: the intersection of Manuka Circle and Fitzroy Street and the intersection of Manuka Circle and Oxley Street. Glare exceeds the 20% threshold increment along the western part of Oxley Street between Manuka Circle and Giles Street (Figure 1). Other roads surrounding the Oval are not affected by glare when the lights are in broadcast mode.

**Figure 1: Glare Levels on Roads Surrounding Manuka Oval**



The glare at the Oxley Street intersection is caused by light from the tower at the rear of the Bradman Stand. A deciduous tree (small tree immediately adjacent to the southern side of the entry to Manuka Circle) screens the lights most of the year (when the tree has leaves). It is estimated that the tree would lower the threshold increment reading below 20% along the extent of Oxley Street shown in red on Figure 1. Therefore glare is unlikely to be an issue in summer.

Based on the above results it is proposed to introduce measures to mitigate the potential effects of glare. Consideration should be given to planting a new evergreen tree near the east gate to shield the intersection. Until such time as a tree has sufficient height to screen the light, it is proposed to close Oxley Street to all but local traffic during winter night-time broadcast games. This traffic management measure is included in the mitigation measures below and has been agreed with RoadsACT. Traffic management measures have already been introduced at along Manuka Circle in the vicinity of Fitzroy Street. These measures will mitigate any effects at this intersection.

**Public notification**

The interim plan outlined the activities to be undertaken to advise the surrounding community about events at the Oval.

Territory Venues and Events advised surrounding residents about the PMs IX and the One Day International cricket games at Manuka Oval. The advice included information about the time and duration of the game and traffic and parking management arrangements. The information included a

contact point. In addition, information was posted on the Manuka Oval webpage about the games, the availability of parking in surrounding areas and the intention to book people parking illegally.

## **Complaints and monitoring**

The interim plan required Territory Venues and Events to maintain a record of complaints and to liaise with any affected residents.

There has been very limited community reaction against the lights in broadcast mode. The main objections have been from two residents living in the Realm development in Barton. As noted above light levels reaching the balconies of the people complaining about the light were measured. The results are summarised above.

## **Mitigation Measures**

Notwithstanding that the assessment of the sports lights post-construction indicates that they would meet the standards specified in AS4282 even though the standard does not apply to broadcast lighting, and that the surrounding community has generally accepted the installation of the lights and their effect, the following proposes ongoing mitigation measures for the operation of the lights.

### **Number and timing of events**

The number of events to be held annually has been estimated from known and probable events. An annual listing of potential night events is at Table 2. A list of events is maintained on the Manuka Oval website. At the end of each year TVE will review the number of events held annually and will apply to amend the light management plan if there is a need to do so.

### **Broadcast sporting events**

The number of events in broadcast lighting mode will be limited to fifteen (15) per calendar year.

The majority of broadcast events will conclude before 10.00pm after which the lights would be switched to non-broadcast mode (<500 lux) or lower to allow spectator exit and venue cleaning (if required).

The lights may be in broadcast mode until 10.00pm at 12 events annually. The lights may remain in broadcast mode until 11.30pm at three events annually to meet television broadcasting commitments. An example of an event that may extend past 10.00 pm is a One-Day International Cricket match. This timing is consistent with similar arrangements for outdoor concerts.

### **Non-broadcast events**

The number of events in non-broadcast lighting mode will be limited to twenty (20) per calendar year. Each non-broadcast event is to be concluded by 10.00 pm and the lights are to be switched to a lower mode at that time, if required. For many of these events, the lights will only be used to provide supplementary lighting for twilight matches or on days of heavy cloud cover.

### **Training and exit**

The number of times each year that the lights may be turned to training, exit and/or cleaning modes is unlimited. Similarly, the time when the lights in these modes are to be switched down or off is not prescribed by this management plan.

### **Concert events or similar activities**

Any concert events and similar activities to be held at Manuka Oval are not covered by this Plan. Such events would only be held subject to an approved Environmental Authorisation under the *Environmental Protection Act 1997*.

### **Review of the number of events at which the lights are used in broadcast and non-broadcast mode**

As noted above, this light management plan limits the number of events at which the lights may be switched on in broadcast or non-broadcast modes. It is anticipated that the number of events may need to change over time. The light management plan will be revised when it is proposed to change the number of events to be held under the lights in broadcast or non-broadcast mode.

### **Maintenance of the sports lights**

The number of times each year that the lights may be turned on for maintenance, including cleaning modes is not limited. Similarly, the time when the lights are to be turned on for maintenance or the lighting mode to which they are turned for this purposes is not prescribed by this management plan.

**Table 2 – Examples of Potential Annual Light Use at Manuka Oval**

Code/Level	Lighting Standard	Potential Number of matches
<b>AFL</b>		
AFL Giants	Broadcast	1-2
NEAFL / AFL Local	Non-broadcast	6-7
School competitions	Non-broadcast	2-3
<b>Cricket</b>		
PMXIs	Broadcast	1
International or touring game	Broadcast	1
Ryobi Cup	Broadcast	1-2
Sheffield Shield	Broadcast	1
Meteors	Non-broadcast	1-2
Comets	Non-broadcast	1-2
Konika-Minolta Competition	Non-broadcast	2
Women's finals	Non-broadcast	1
Training	Training Mode	2 to 3 times per week during respective playing seasons
Concert or similar	Non-broadcast	1

### **Driver visibility**

The effects of glare at the Oxley Street and Fitzroy Street intersections with Manuka Circle will be addressed in the following ways:

- to manage any impacts from glare at the intersection of Fitzroy Street and Manuka Circle, the existing traffic management arrangements will continue to be implemented during events at which the lights are switched on in broadcast or non-broadcast modes, that is Manuka Circle and the intersection will be closed to traffic
- to reduce glare at the Oxley Street/Manuka Circle intersection, mature evergreen tree(s) will be planted in the vicinity of the eastern entry to the Oval as soon as practicable. The intention is that when mature they will provide year-round protection from glare

- until the trees become sufficiently tall to reduce glare levels, Oxley St between Manuka Circle and Giles Street will be closed to all but local traffic, access to the VIP area and access for buses during all broadcast night-time games held in winter

The above measures will be included in the 2014 and subsequent TTMPs.

### **Lighting hoods and louvres**

Lighting modes are controlled and changed by switching on and off banks of lights. Fixed light hoods are integrated as part of the light construction. The hoods are included on all lights to control light spill into neighbouring properties and to reduce glare to drivers on nearby roads.

The lighting suppliers, Abacus Lighting, have designed the Manuka Oval sports lights to prevent light spill and nuisance to the residential area surrounding the ground. This management of light is controlled during the design process through meeting the restrictions that are determined by the International Standard CIE 150.1

The Challenger 3 range of floodlights has tightly focused beams to ensure the light is directed into the ground and not causing nuisance to the surrounding areas. The floodlights are precisely aimed by gun sight to specific co-ordinates set at design stage so the closest representation possible of the design is replicated in terms of ground levels and overspill containment.

In addition to the above methods of control of light, louvers have been used on the fronts of the floodlights, half concentric louvers to the top section of the mast above certain aiming elevation and single blade louvers to the lower portion at the lower floodlight elevation angles.

Adjustments to the lights would be made on an 'as required' basis and as part of the annual maintenance.

The louvers are fixed, however floodlight headframes can be accessed and individual floodlights altered with minimal effects to the lighting on the ground.

Any changes that affect light direction will be monitored and may require a re-calculation of on-ground light spread and a physical adjustment of the lights.

### **Refocusing the lights**

The installation of the broadcast lights is part of a program to progressively upgrade Manuka Oval. Some of the other upgrade works may necessitate refocusing of the lights. For example the current re-surfacing of the playing field will alter the ground levels and hence the lights will be refocused to ensure that lighting levels on the oval meet requirements.

Whenever the lights are refocused, the vertical and horizontal illumination levels in Manuka Circle east will be measured. If required, the light management plan would be modified to incorporate any additional management measures.

### **Public Notification of Broadcast and Major Events**

Notwithstanding the limited community concern about the lights Territory Venues and Events will:

- letter-box surrounding properties at least once annually to advise them of the timing of major events including when the lights are programmed to be used in broadcast mode
- advise surrounding residents of changes in the maximum number of events with the lighting in broadcast and non-broadcast modes, and
- advertise in the Canberra Times in advance of major events where the lights will operate in broadcast mode,



## **Monitoring**

Territory Venues and Events will monitor the effect of any changes to the lighting configuration, if that occurs.

## **Contact**

The Operations Manager; Territory Venues and Events

T: 6256 6700

E: [info@manukaoval.com.au](mailto:info@manukaoval.com.au)

Manuka Oval, Manuka Circle, Griffith, ACT 2603

PO Box 666 Jamison ACT 2614

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*Attachment 1 – Manuka Oval – Site Lighting Measurements*

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Subject Manuka Oval – Site Lighting Measurements

Date 20 June 2013

Job No/Ref

223208/PJG

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## 1 Executive summary

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- Site lighting measurements confirm that the installed sports lighting meets all requirements regarding both light on the field-of-play, and control of light spill to the surrounding neighbourhood.
- Spot measurements of illumination on the field-of-play indicate that all lighting modes are within specification. A bright patch was noted in front to tower T3 in non-broadcast match mode; this patch was noted to Abacus Lighting for investigation.
- Light spill measurements completed at ground level indicate little impact to the majority of the nearest surrounding residences. All measurements at residences are below the requirement set out in the obtrusive lighting standard. This is achieved largely because of the extensive shading provided by trees, where the trees are located either on the street kerb, or on and surrounding the Manuka Oval site. It is recommended that the lighting be switched down to a practice mode prior to curfew to prevent light spill beyond recommended maximum levels post-curfew.
- Lighting measurements completed at the apartments of residents who had complained about light spill from the sports lighting showed that the requirements of the obtrusive lighting standard were met under all lighting modes. The maximum allowable light spill specified by the standard is not exceeded, even in broadcast mode.
- It was not possible to complete light spill measurements at windows above ground level. Due to reduced tree coverage at higher levels, light spill at these locations could be higher than the levels measured at ground level. This could not be assessed through measurement. The residences most likely impacted at higher levels include 32-40 Canberra Ave (west of Manuka Oval) and 2 Currie Cres (east of Manuka Oval).
- The commercial property that was most clearly impacted by potential light spill from the sports lighting is the commercial building to the south-east of Manuka Oval, on Manuka Circle between Canberra Ave and Oxley St (refer Figures 5 and 8). Spill light to commercial properties is of less concern than that to residential properties. The obtrusive lighting standard is concerned primarily with residential properties, and does not set out requirements for light spill control to commercial properties.
- Glare was identified for drivers on Oxley St approaching the east gate with the lighting in broadcast mode. As the design meets the recommendations of AS 4282, it is not necessary to implement mitigation measures to ensure the installation meets the requirements of AS 4282. However, as observation indicates that glare could be an issue, good practice suggests that mitigation measures should be considered.
  - When planning new tree planting on the site, their placement should be considered to assist with glare control – this would include planting a new tree near the east gate that would obscure view of the tower from further up Oxley St.
  - An alternative mitigation measure is to block access to the identified intersection, for vehicles approaching the oval along Oxley St, during broadcast level events.
- Plenty of lighting is supplied to the seating and the pathways behind the stands in both broadcast and non-broadcast lighting modes. There was a small number of areas identified in the inspection where more illumination is recommended for these lighting modes. These include: the main (western) gate; behind the Hawke podium, at the northern end of the field; and near to the east gate.

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- Supplementary lighting around the grounds is required in all lighting modes by the relevant planning guidelines. Although the above indicates that plenty of light is provided around the pathways when the sports lighting is switched on, supplementary lighting will still be required for when the sports lighting is not switched on.

## 2 Purpose of document

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Lighting measurements were undertaken at and around Manuka Oval on the evenings of 23 January and 6 March 2013. The purposes of the lighting measurements were:

- To inform the client team with consideration of upcoming events and likely public response regarding light spill, through assessing light spill from the sports lighting to the surrounding properties;
- To assist the client team in responding to light spill complaints that had been received;
- To inform the client team regarding performance of the sports lighting on the field-of-play, through spot measurements of lighting levels in different lighting modes;
- To inform the design of supplementary lighting within the site, through assessing lighting levels within the oval grounds (excluding the field itself), with the sports lighting switched on; and
- To compare measurements with previous baseline measurements made before installation of the sports lighting, and with the recommendations made by AS 4282 – Control of the obtrusive effects of outdoor lighting, and AS 1158.3.1 – Pedestrian area lighting: performance and design requirements

This document summarises the lighting measurements and provides commentary for the information of the client team.

## 3 Assessment methodology

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Spot measurements of illuminance were made within and around the Manuka Oval site between 8.30 and 10.30pm on 23<sup>rd</sup> January 2013, and between 8.15 and 11pm on 6<sup>th</sup> March 2013. Measurements on the 23<sup>rd</sup> January were made in the presence of Rajesh Valera and Don Gilson (partially). Measurements on the 6<sup>th</sup> March were made in the presence of Fiona Scott, Ian Smith and John Telford (partially). An illuminance meter of type Yokogawa model 51002 was used to record the illumination levels. Weather conditions on both nights were warm and clear. All lighting measurements were taken after nightfall.

Illuminance measurements were completed at representative locations rather than a full grid of measurements across the site and across the neighbourhood of the oval. Measurement locations in the neighbourhood surrounding the oval and around the rear of the stands on the oval site were similar to those used in the initial site investigation on 13<sup>th</sup> June 2012.

Lighting measurements were completed under a range of different lighting modes, with the lighting towers switched to various levels for different measurement purposes. Lighting modes under which the different measurements were completed are described below.

Existing site lighting, excluding that installed on the lighting towers, was switched off during all measurements.

## 4 Lighting requirements

### 4.1 Lighting standards

Lighting requirements for the field-of-play were set out in the Sports Lighting Performance Specification.

Lighting requirements on site and the requirements for limiting light spill to the surrounds are set out in the following Australian Standards:

- AS 1158.3.1 – Pedestrian area (Category P) lighting: performance and design requirements
- AS 4282 – Control of the obtrusive effects of outdoor lighting

AS 1158.3.1 provides recommendations on required lighting levels in outdoor public spaces. ACTPla legislation requires that the pathways around the oval, between seating areas and ground entrances and exits, meet the recommendations of this Standard.

AS 4282 specifies control of light spill from the installation. It specifically excludes lighting from broadcast mode lighting. It is useful, however, to understand expected light spill under all lighting modes, including broadcast level lighting.

### 4.2 Field-of-play

The field-of-play lighting requirements for the various lighting modes are summarised below, taken from the Sports Lighting Performance Specification. The tables below show the ‘relaxed standard’ requirements as these were the minimum standards against which the performance of the sports lighting should be compared. The tables have been arranged to summarise the four lighting modes that have been adopted in the installation, rather than separating out the requirements of AFL and cricket as shown in the Performance Specification.

**Table 1: Field-of-play lighting requirements, broadcast mode**

Parameter	Relaxed Standard
Vertical illuminance, whole of field, 1.5m height (minimum to cameras)	> 1,000 lux
Uniformity (Ev,min/Ev,ave)	> 0.50
Uniformity (Ev,min/Ev,max)	> 0.30
Horizontal illuminance, whole of field, field surface (average over field-of-play)	> 1,500 lux
Uniformity (Eh,min/Eh,ave)	> 0.50
Uniformity (Eh,min/Eh,max)	> 0.30
Vertical illuminance, central pitch, 1.5m height (minimum to cameras)	> 1,600 lux
Uniformity (Ev,min/Ev,ave)	> 0.60
Uniformity (Ev,min/Ev,max)	> 0.50

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Parameter	Relaxed Standard
Vertical illuminance, infield, 1.5m height (minimum to cameras)	> 1,400 lux
Uniformity (Ev,min/Ev,ave)	> 0.50
Uniformity (Ev,min/Ev,max)	> 0.40
Vertical illuminance, outfield, 1.5m height (minimum to cameras)	> 1,000 lux
Uniformity (Ev,min/Ev,ave)	> 0.40
Uniformity (Ev,min/Ev,max)	> 0.30
Horizontal illuminance, central pitch, field surface (average over field-of-play)	> 1,600 lux
Uniformity (Eh,min/Eh,ave)	> 0.60
Uniformity (Eh,min/Eh,max)	> 0.50
Horizontal illuminance, infield, field surface (average over field-of-play)	> 1,400 lux
Uniformity (Eh,min/Eh,ave)	> 0.50
Uniformity (Eh,min/Eh,max)	> 0.40
Horizontal illuminance, outfield, field surface (average over field-of-play)	> 1,000 lux
Uniformity (Eh,min/Eh,ave)	> 0.40
Uniformity (Eh,min/Eh,max)	> 0.30
Uniformity gradient (both vertical and horizontal illuminance)	< 30% per 5m

**Table 2: Field-of-play lighting requirements, non-broadcast match mode**

Parameter	Relaxed Standard
Horizontal illuminance, whole of field, field surface (average over field-of-play)	> 400 lux
Uniformity (Emin/Eave)	> 0.50
Uniformity (Emin/Emax)	> 0.30
Vertical illuminance, infield, 1.5m height (average)	> 450 lux
Uniformity (Ev,min/Ev,ave)	> 0.50
Horizontal illuminance, infield, field surface (average over field-of-play)	> 500 lux
Uniformity (Eh,min/Eh,ave)	> 0.50
Horizontal illuminance, outfield, field surface (average over field-of-play)	> 400 lux
Uniformity (Eh,min/Eh,ave)	> 0.40
Uniformity gradient (both vertical and horizontal illuminance)	< 30% per 5m

**Table 3: Field-of-play lighting requirements, practice mode**

Parameter	Relaxed Standard
Horizontal illuminance, whole of field, field surface (average over field-of-play)	> 150 lux
Uniformity (E <sub>min</sub> /E <sub>ave</sub> )	> 0.50
Uniformity (E <sub>min</sub> /E <sub>max</sub> )	> 0.30
Vertical illuminance, infield, 1.5m height (average)	> 150 lux
Horizontal illuminance, infield, field surface (average over field-of-play)	> 200 lux
Uniformity (E <sub>h,min</sub> /E <sub>h,ave</sub> )	> 0.50
Horizontal illuminance, outfield, field surface (average over field-of-play)	> 100 lux
Uniformity (E <sub>h,min</sub> /E <sub>h,ave</sub> )	> 0.40

**Table 4: Field-of-play lighting requirements, non-contact AFL practice mode**

Parameter	Relaxed Standard
Horizontal illuminance, whole of field, field surface (average over field-of-play)	> 75 lux
Uniformity (E <sub>min</sub> /E <sub>ave</sub> )	> 0.30
Uniformity (E <sub>min</sub> /E <sub>max</sub> )	> 0.15

### 4.3 Light spill

Following the requirements of AS 4282, light spill is assessed against the following benchmarks. As noted above, these apply to non-broadcast mode lighting only. No light spill requirements are set out for broadcast mode lighting.

**Table 5: Light spill assessment benchmarks for non-broadcast mode**

Impact	Light technical parameter	Location of assessment	Recommended maximum values	
			Pre-curfew	Post-curfew
Nuisance light to residences	Illuminance in the vertical plane	Boundary of commercial and residential areas(1)	25 lux (2)	4 lux
		Residential areas	10 lux (2)	2 lux
Discomfort glare to residents	Luminous intensity emitted by luminaires	Boundary of commercial and residential areas(1)	100,000 cd(3)	2,500 cd(3)
		Residential areas	100,000 cd(3)	1,000 cd(3)
Light spill into night sky	Luminous intensity emitted by luminaires	All	100,000 cd(3)	
Visibility of transport users	Threshold increment	Commercial roadways(2)	20%(3)	
		Residential roadways(2)	20%(3)	

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Notes:

1. The term ‘commercial’ is defined in the Standard as a generic description for zoning for uses other than residential. In this assessment, these targets are applied to all residences facing onto Manuka Circle.
2. Key parameter against which measurements are compared – see discussion below.
3. See discussion below regarding assessment of glare and light spill

The measurements discussed below focus only on the nuisance light to residences. This is the only parameter that is possible to measure in some form on site. The other parameters, luminous intensity and threshold increment, are possible only to measure in a laboratory, if at all.

The key parameters in the above table against which the measurements were to be compared are the 25 and 10 lux light spill parameters (highlighted by note 2).

## 4.4 Lighting within the Manuka Oval grounds

The recommended levels of lighting around the grounds are summarised below.

**Table 6 – Recommended lighting levels within Manuka Oval site**

Location	Example	Horizontal illuminance	Vertical illuminance	Source
Stands (during TV broadcasts)	Menzies Stand	> 10 lux min	> 25% of that on field-of-play, first 10 rows of seating <sup>1</sup>	AFL lighting guide
Public activity areas	Concessions	> 14 lux ave, > 4 lux min	> 4 lux min <sup>2</sup>	AS 1158.3.1
Pathways	Behind Menzies Terrace	> 3.5 lux ave, > 0.7 lux min	> 0.7 lux min <sup>3</sup>	AS 1158.3.1

Notes:

1. Vertical illumination in the stands during broadcasts shall be 25% of the average vertical illuminance on the oval toward the cameras. This shall be measured at 1.5m above the floor of the stands (first 10 rows), facing toward the field.
2. Vertical illumination in public activity areas shall be measured at 1.5m above the ground, facing in two opposite directions which can be determined on site.
3. Vertical illumination on pathways shall be measured at 1.5m above the ground, facing in two opposite directions along the length of the pathway.

## 5 Site Findings

### 5.1 Field-of-play

Formal commissioning measurements on the field-of-play were completed by Abacus Lighting on 24 January 2013. These were completed under broadcast lighting mode.

Arup’s review of Abacus Lighting’s commissioning report (dated 11 February 2013) identified a small number of areas of concern in broadcast mode, and queried the responses regarding other lighting modes that were not measured.



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Abacus Lighting responded to the concerns raised regarding broadcast mode lighting through minor re-aiming works on 5 March 2013, followed by a series of measurements in selected locations affected by the re-aiming.

A series of spot measurements were completed by Arup on 6 March 2013 to verify that the changes made in broadcast mode were effective, and to verify performance in the other lighting modes. The measurements completed were not comprehensive, but aimed to give some confidence that the relevant targets were being achieved in a quick and simple manner.

### 5.1.1 Broadcast mode

Measurements completed in broadcast mode focused on two aspects that were identified in reviewing the Abacus Lighting commissioning report:

- Minimum illuminance level in the southern goal mouth in the direction of camera ‘V3’ (behind the southern goal)
- Vertical illuminance uniformity gradient in the northern goal mouth in the direction of cameras ‘V1’ and ‘V2’ (west and east sides of the ground respectively)

Spot measurements of vertical illuminance were completed in the southern goal mouth, looking in the direction of cameras V1 and V3. These measurements were considered representative of vertical illuminances in the direction of all cameras V1, V2 and V3, in both goal squares. The measurements are illustrated in Figure 1. Refer to Table 1 for the lighting requirements against which the measurements were compared.

The minimum vertical illuminance in the direction of any of the cameras must be greater than 1,000 lux at end-of-life. To achieve this level at end-of-life, they must be greater than 1,250 lux at beginning-of-life.

All measurements made were 1,250 lux or greater. The worst-case performance was close to the centre of the goal line in the direction of V3, where a minimum measurement of 1,250 lux was recorded.

Measurements in the direction of camera V1 were all easily greater than 1,250 lux. A level of 2,000-2,100 lux was measured at the goal line. A level of 2,700-2,900 lux was measured in the middle of the goal square, roughly 5m away from the goal line. These measurements indicate a uniformity gradient of close to 30%, with consideration of measurement precision and the variation in measurements at similar locations.

In summary, the spot measurements completed in broadcast mode show that the two concerns identified above have been addressed. In each case, the results are on the borderline of being acceptable, but are considered within specification.

### 5.1.2 Non-broadcast mode

Spot measurements of horizontal illuminance were completed across the field-of-play in non-broadcast lighting mode. The aim of these measurements was to check against the average and uniformity requirements of horizontal illuminance. The measurements are illustrated in Figure 2. Refer to Table 2 for the lighting requirements against which the measurements were compared.

Through the majority of the field, horizontal illuminance levels were in the range 1,000-1,400 lux.

Figure 1 - Lighting on Field of Play - Broadcast Mode

V1 Vertical lx ●

V3 Vertical lx ●

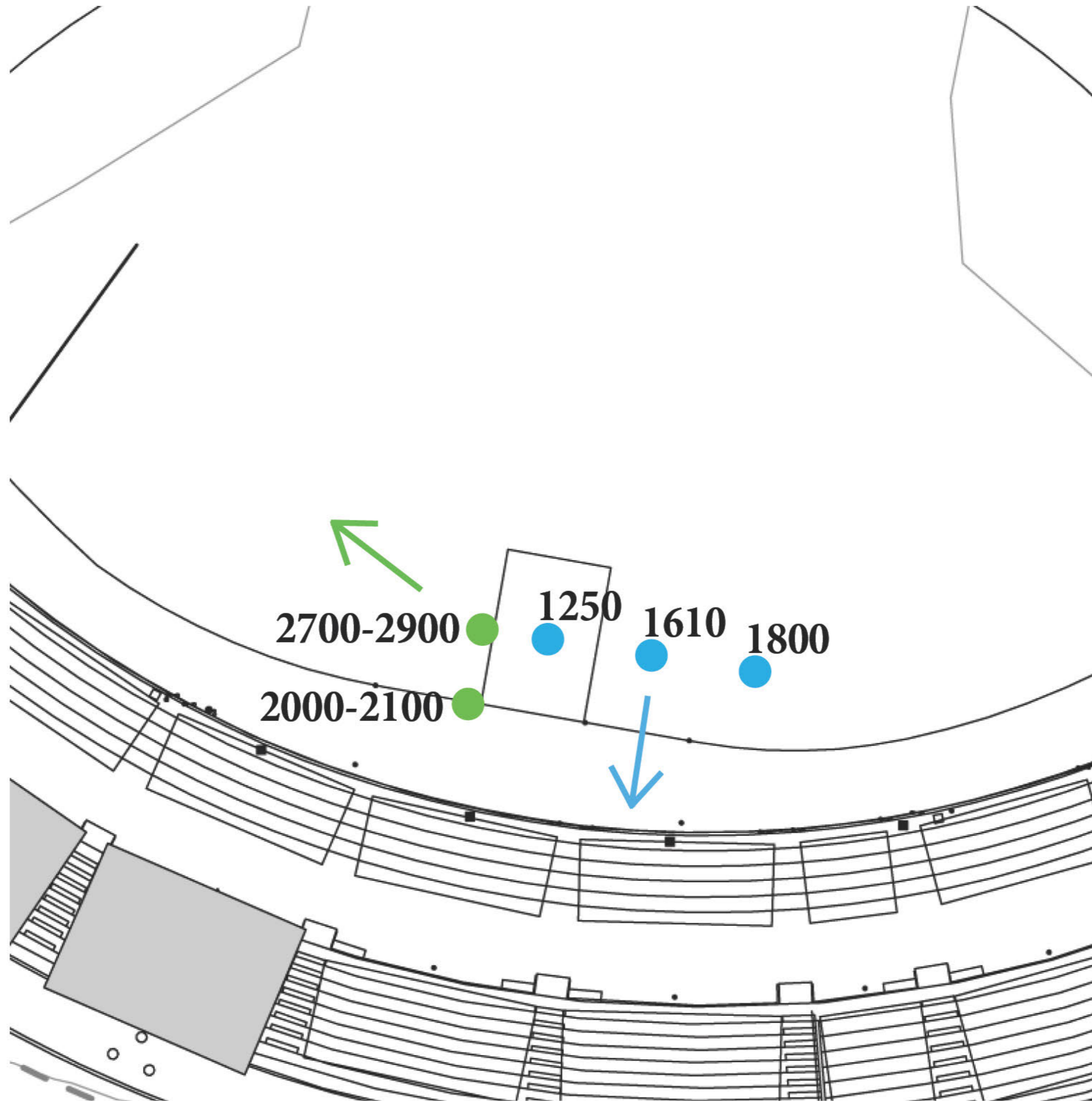
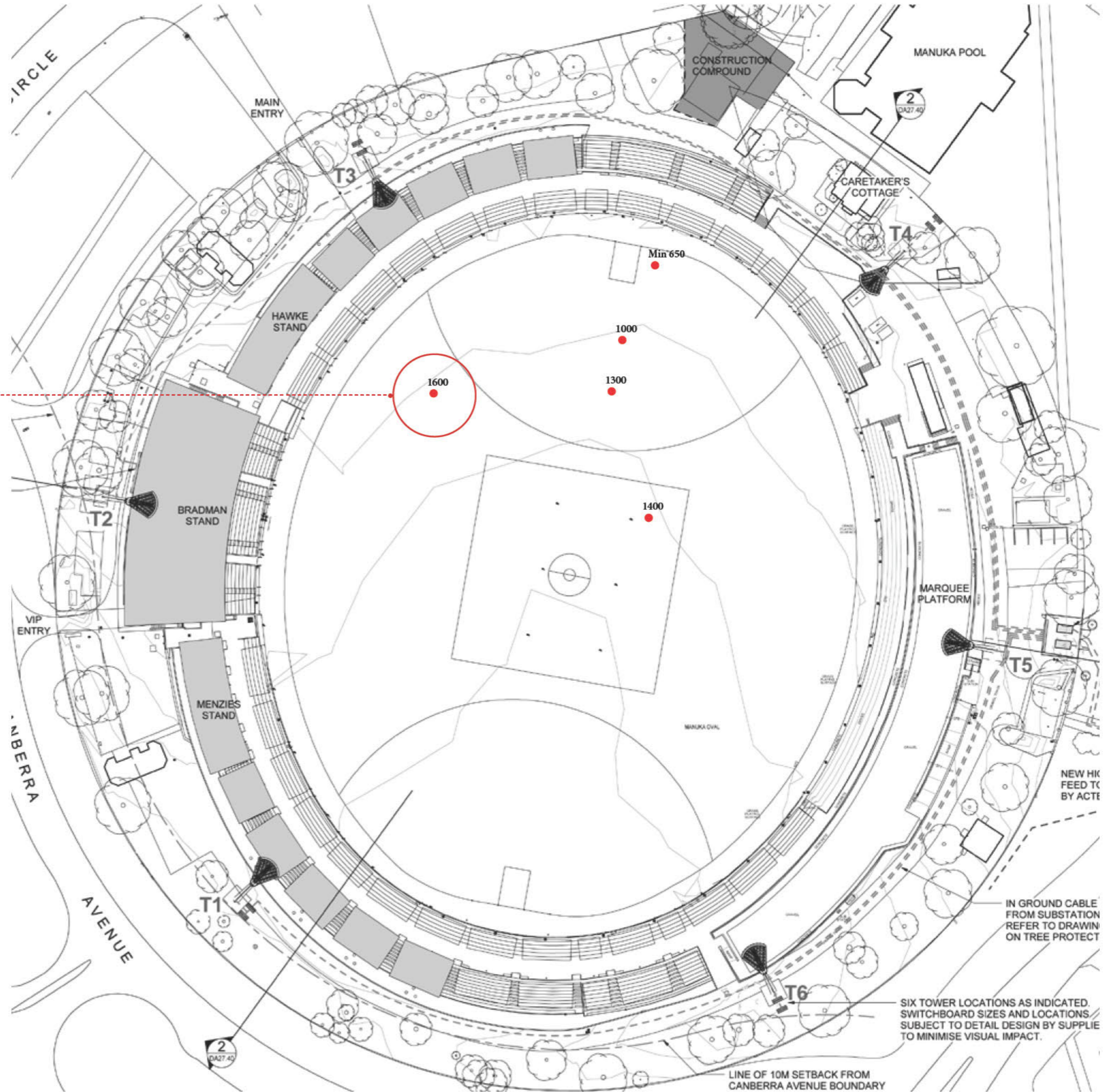


Figure 2 - Lighting on Field of Play - Non-Broadcast Mode

Horizontal lx ●

Identified hot spot



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A minimum illuminance of 650 lux was measured near the northern goal square.

A relatively bright region of field was identified close to the Hawke Stand (refer Figure 2). Measurements in this region revealed a maximum illuminance around 1,600 lux. This could be caused by either a mis-aimed or mis-programmed floodlight on tower T3.

The measurements indicate that the required average illuminance across the field of 400 lux is easily achieved.

With a minimum illuminance of 650 lux, the average and maximum illuminances must be less than 1,300 and 2,200 lux respectively to meet the illuminance uniformity requirements. The completed measurements indicate that the uniformity requirements are likely to be achieved.

In summary, the spot measurements completed in non-broadcast mode indicate that all lighting levels are within specification. The bright patch noted in front of the Hawke Stand was notified to Abacus Lighting for investigation.

### 5.1.3 Practice mode

Spot measurements of horizontal illuminance were completed across the field-of-play in practice lighting mode. The aim of these measurements was to check against the average and uniformity requirements of horizontal illuminance. The measurements are illustrated in Figure 3. Refer to Table 3 for the lighting requirements against which the measurements were compared.

Through the majority of the field, horizontal illuminance levels were in the range 400-600 lux.

A minimum illuminance of 310 lux was measured in front of tower T4.

The measurements indicate that the required average illuminance across the field of 150 lux is easily achieved.

With a minimum illuminance of 310 lux, the average and maximum illuminances must be less than 620 and 1,030 lux respectively to meet the illuminance uniformity requirements. The completed measurements indicate that the uniformity requirements are likely to be achieved.

In summary, the spot measurements completed in practice mode indicate that all lighting levels are within specification.

### 5.1.4 Non-contact AFL practice mode

Spot measurements of horizontal illuminance were completed across the field-of-play in non-contact AFL practice lighting mode. The aim of these measurements was to check against the average and uniformity requirements of horizontal illuminance. The measurements are illustrated in Figure 4. Refer to Table 4 for the lighting requirements against which the measurements were compared.

Through the majority of the field, horizontal illuminance levels were in the range 150-300 lux.

A minimum illuminance of 130 lux was measured in front of tower T4.

The measurements indicate that the required average illuminance across the field of 75 lux is easily achieved.

Figure 3 - Lighting on Field of Play - Practice Mode

Horizontal lx ●

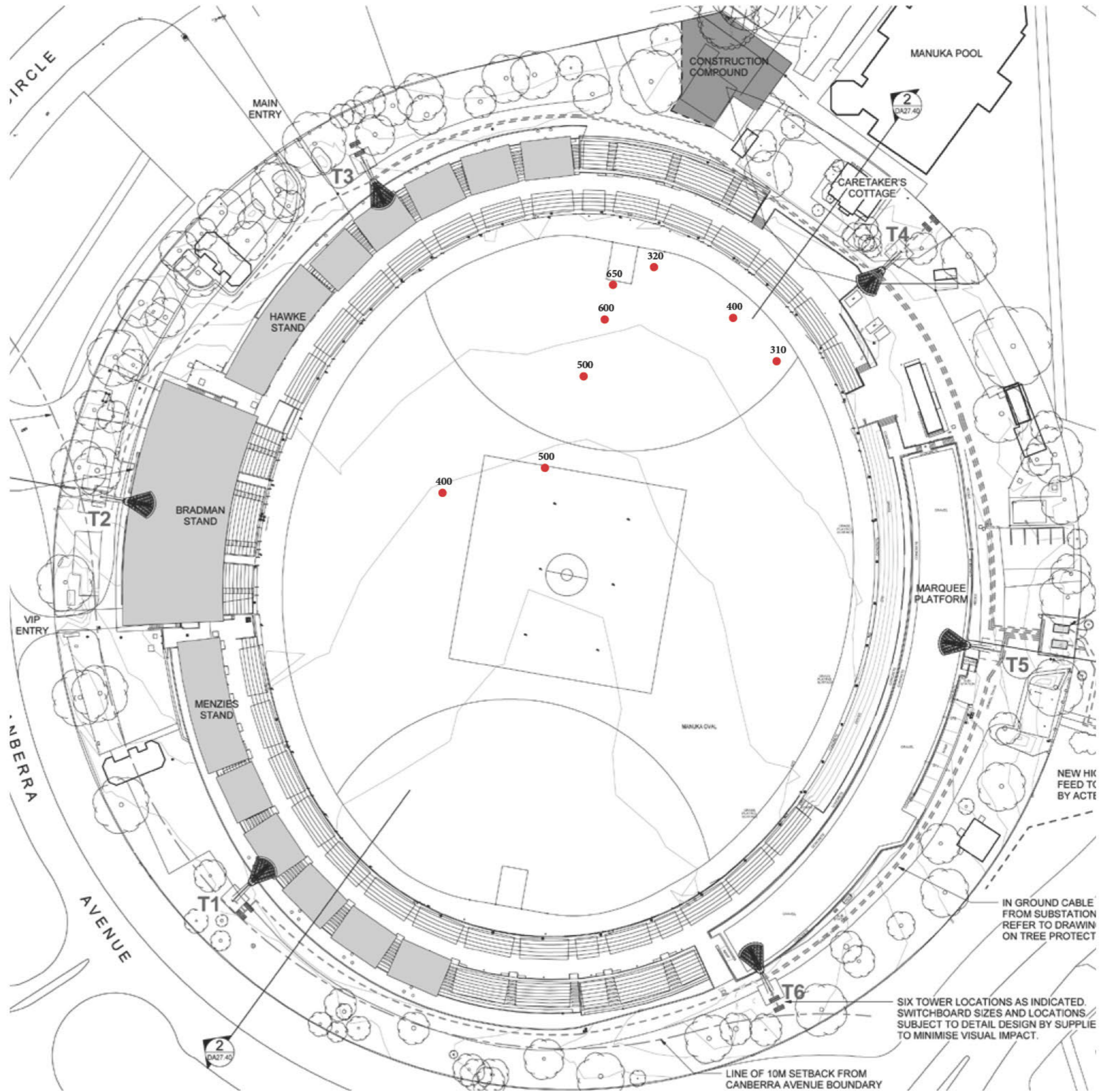
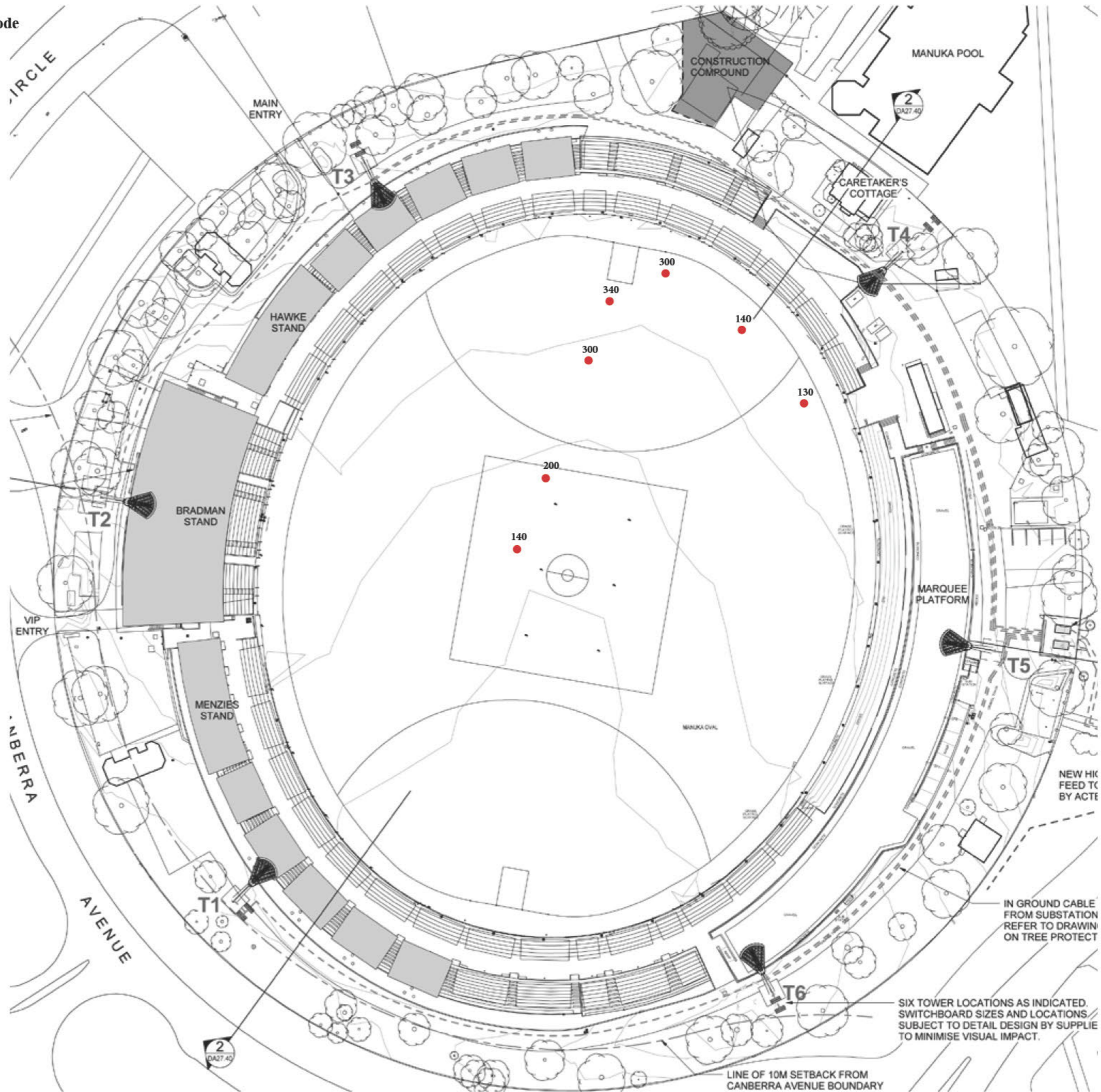


Figure 4 - Lighting on Field of Play - Non-Contact Practice Mode

Horizontal lx ●



SIX TOWER LOCATIONS AS INDICATED. SWITCHBOARD SIZES AND LOCATIONS SUBJECT TO DETAIL DESIGN BY SUPPLIER TO MINIMISE VISUAL IMPACT.

LINE OF 10M SETBACK FROM CANBERRA AVENUE BOUNDARY

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With a minimum illuminance of 130 lux, the average and maximum illuminances must be less than 430 and 870 lux respectively to meet the illuminance uniformity requirements. The completed measurements indicate that the uniformity requirements are likely to be achieved.

In summary, the spot measurements completed in practice mode indicate that all lighting levels are within specification.

## 5.2 Light spill to the surrounding neighbourhood

A series of different measurements and observations were made to assess light spill to the neighbourhood surrounding Manuka Oval:

- Measurements at street level in the streets immediately surrounding Manuka Oval, at residences and commercial properties, in broadcast and non-broadcast lighting modes; and
- Measurements in various lighting modes in the apartments of residents who had submitted complaints about light spill;
- Observations regarding glare to road users, in broadcast and non-broadcast lighting modes.

These different assessments are summarised below. A discussion is also provided that considers the impact of trees on these assessments, and how results could change between seasons.

### 5.2.1 Nearest residences

Night time spill light measurements surrounding the grounds of Manuka Oval are illustrated in attached Figures 5 and 8. These show spot measurements of horizontal and vertical illuminances in locations indicated by the coloured markings.

Measurements focused largely on the nearest residences, particularly the following:

- West of Manuka Oval, on Manuka Circle between Fitzroy St and Canberra Ave
- West of Manuka Oval, on Canberra Ave facing north-east
- East of Manuka Oval, on Manuka Circle between Oxley St and Currie Cres

Selected measurements were also taken at the nearest commercial properties, to the south and east of Manuka Oval.

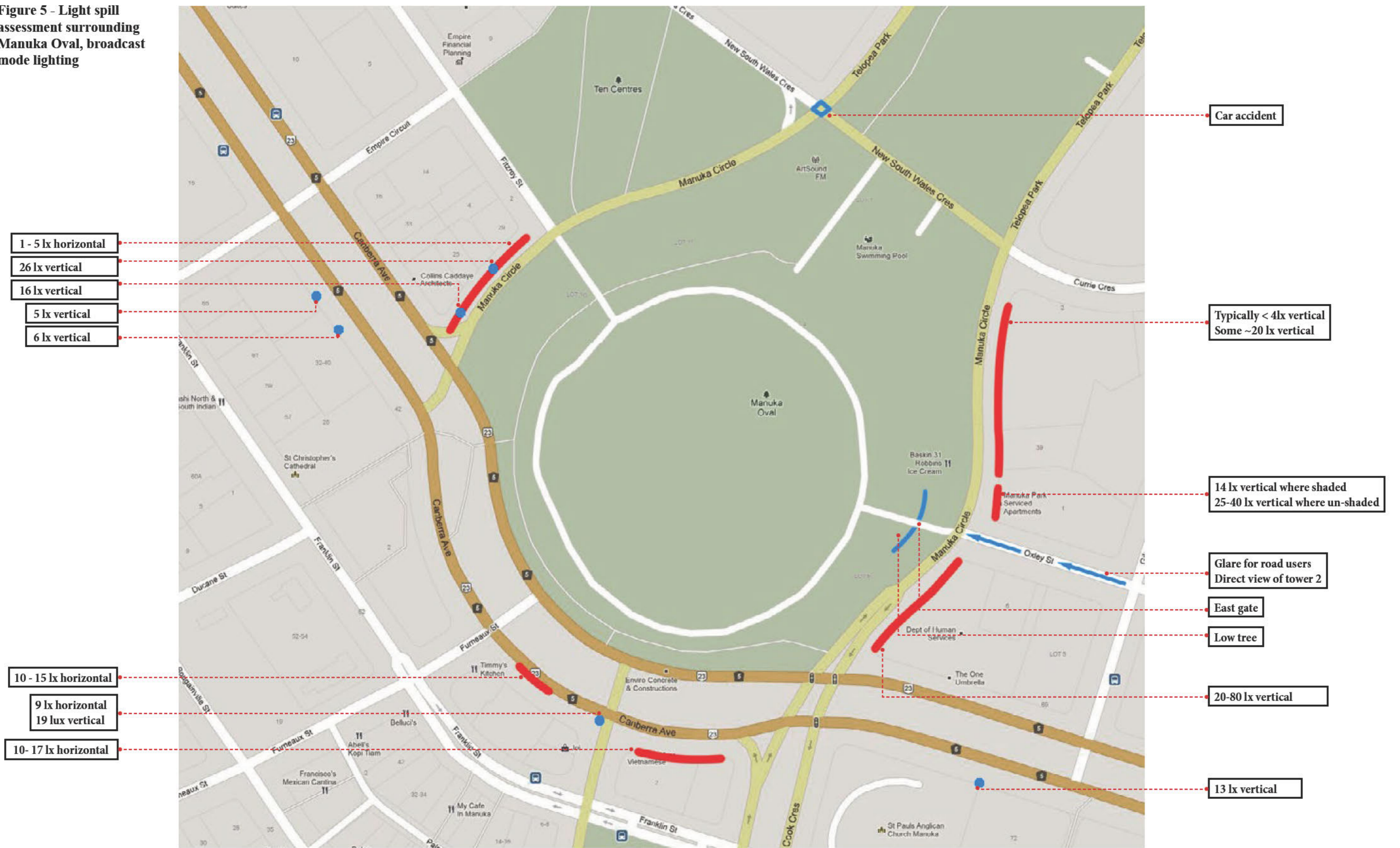
All measurements were completed at ground level. It was not possible to complete measurements at heights similar to first and second storey windows. As the upper level windows are less protected by trees, they would likely receive more spill light than was measured at ground level.

#### 5.2.1.1 Broadcast mode

With the lighting switched to broadcast mode, there was a small number of floodlights not operating on each tower; these were not expected to make a significant difference to measured lighting levels. For the latter part of the measurements completed outside of Manuka Oval, lighting towers T1 and T6 were switched off entirely.

Light spill measurements completed at ground level indicate little impact to the majority of the nearest surrounding residences. Measurements indicate that spill light levels are well below the levels set out in Table 5, even in broadcast lighting mode.

**Figure 5 - Light spill assessment surrounding Manuka Oval, broadcast mode lighting**





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This is achieved largely because of the extensive shading provided by trees, where the trees are located either on the street kerb, or on and surrounding the Manuka Oval site.

In a small number of locations, higher levels of spill light were measured between gaps in the tree coverage. In most locations, even these spill light levels were less than the 25 lux pre-curfew requirement at the boundary of residential and commercial zones (in non-broadcast mode).

A 26 lux vertical illuminance was measured at 27 Manuka Circle (refer Figures 5 and 6), and vertical illuminances in the range 25-40 lux were measured at the Manuka Park Serviced Apartments (refer Figures 5 and 7). Each of these was above the 25 lux pre-curfew requirement at the boundary of residential and commercial zones. Note however that this is with the lighting in broadcast mode, which is specifically excluded from the obtrusive lighting standard.



**Figure 6 – Light spill between trees, 23-27 Manuka Circle (west of Manuka Oval)**



**Figure 7 – Light spill to Manuka Park Serviced Apartments**

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As noted above, it was not possible to complete light spill measurements at windows above ground level. Due to reduced tree coverage at higher levels, light spill at these locations could be higher than the levels measured at ground level. This could not be assessed through measurement. The residences most likely impacted at higher levels include 32-40 Canberra Ave (west of Manuka Oval) and 2 Currie Cres (east of Manuka Oval).

### 5.2.1.2 Non-broadcast mode

Figure 8 illustrates spill light measurements surrounding the grounds of Manuka Oval with the lighting switched to non-broadcast match mode. As with the broadcast mode lighting, all measurements were completed at ground level.

The small number of measurements shown in Figure 8 represent the maximum light spill levels that were measured at ground level. All measurements at residences are below the 25 lux pre-curfew requirement set out in the obtrusive lighting standard.

The non-broadcast match mode lighting should be switched down to a practice mode prior to curfew to prevent light spill beyond recommended maximum levels post-curfew.

### 5.2.2 Realm Residences, 1 Sydney Avenue Barton

Residents on levels 5 and 6 of Realm Residences, 1 Sydney Ave Barton, submitted complaints about light spill from the Manuka Oval sports lighting. To address their complaints, measurements were completed at the apartments on the evening of 6 March 2013.

These measurements were of illuminance reaching the balconies of these properties, from the direction of Manuka Oval. The measurements include all lighting in the surrounding environment, comprising that from the Oval as well as street lighting and any lighting coming from other surrounding properties. The measurements are of a worst-case scenario, being measured on the balcony to exclude any impacts of the resident's glazing, and with the light meter facing directly toward the Oval rather than directly out of the property. The recommended method of measurement excludes light coming from the surrounding environment, with the meter facing directly out of the property – this method would result in lower spill light measurements.

The light spill measurements are summarised in Table 7 below.

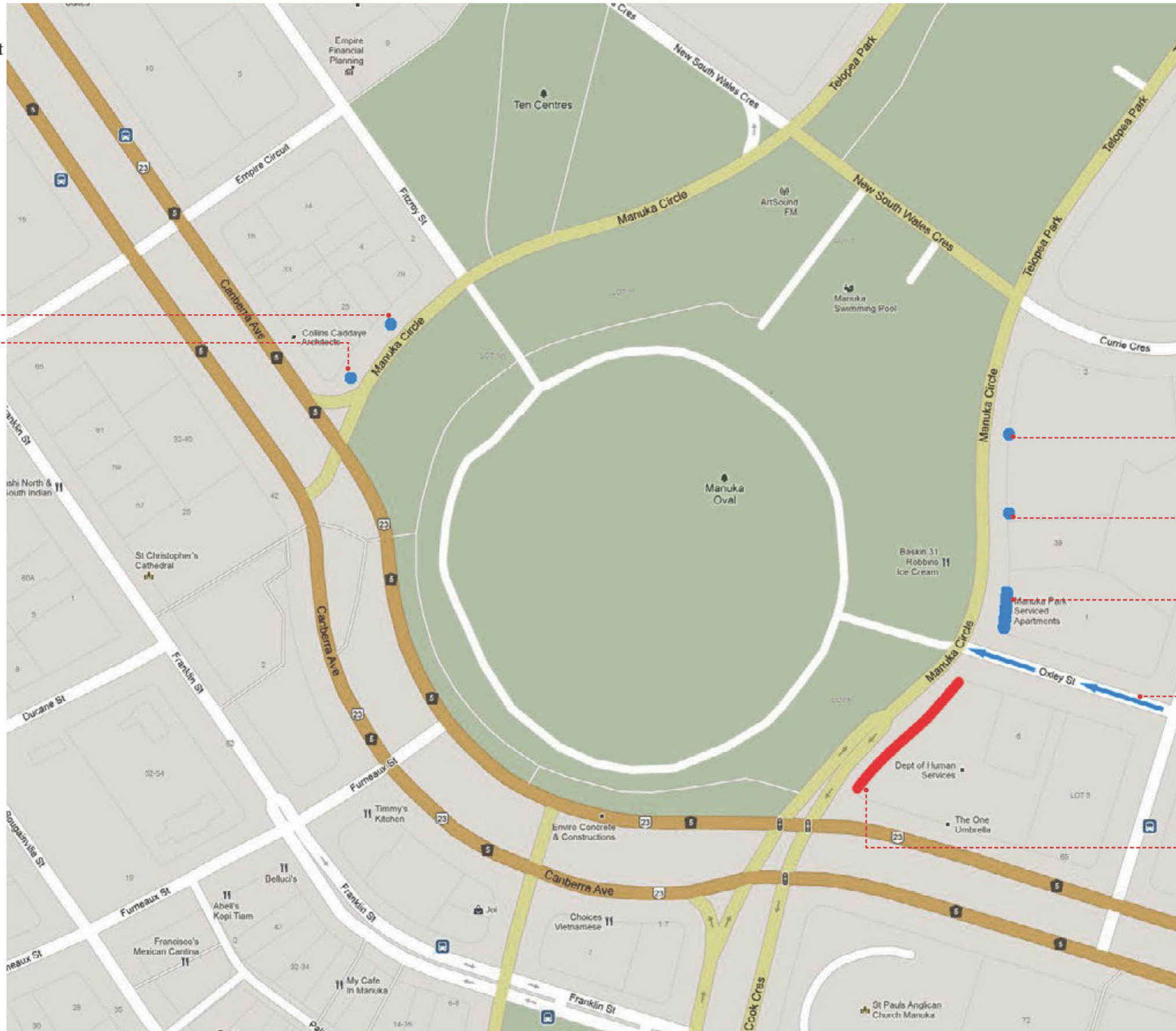
**Table 7 – Light spill measurements at Realm Residences**

Apartment	Broadcast mode	Non-broadcast mode	Oval lighting off
Level 5	3.5 lux	1.9 lux	1.1 lux
Level 6	2.9 lux	1.2 lux	0.6 lux

The maximum reading recorded at both residences with the sports lighting on the broadcast (maximum) setting was 3.5 lux. This indicates that the maximum allowable light spill specified by the standard (10 lux in this location) is not exceeded, even in broadcast mode.

**Figure 8 - Light spill assessment surrounding Manuka Oval, Non-Broadcast Mode**

9 lx vertical  
8 lx vertical



7 lx vertical

9 lx vertical

15-20 lx vertical

Less glare for road users

20-40 lx vertical

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### **5.2.3 Commercial properties**

The commercial property that was most clearly impacted by potential light spill from the sports lighting is the commercial building to the south-east of Manuka Oval, on Manuka Circle between Canberra Ave and Oxley St (refer Figures 5 and 8). There are little to no trees between this building and the sports lighting.

Spill light to commercial properties is of less concern than that to residential properties. AS 4282 is concerned primarily with residential properties, and does not set out requirements for light spill control to commercial properties. The measurements at these properties are summarised below for information.

#### **5.2.3.1 Broadcast mode**

With the sports lighting switched to broadcast mode, vertical illuminance levels between 20 and 80 lux were measured in front of this building at ground level (refer Figure 5).

The commercial properties to the south of Manuka Oval received less spill light, due to the greater tree coverage in that direction.

#### **5.2.3.2 Non-broadcast mode**

With the sports lighting switched to non-broadcast match mode, vertical illuminance levels between 20 and 40 lux were measured in front of the identified commercial building at ground level (refer Figure 8).

Measurements were not repeated at the commercial properties south of Manuka Oval as the measurements summarised above under broadcast mode lighting were already less than the 25 lux level set out in Table 5 for residential properties.

### **5.2.4 Glare to road users**

#### **5.2.4.1 Non-broadcast mode**

It is not possible to make a site assessment of threshold increment to compare with the recommendations set out in Table 5. Threshold increment is a measure that can only be assessed by calculation. As such, it is not possible to determine on site whether the requirements regarding glare for transport users set out in AS 4282 are met; compliance is demonstrated through calculation on the installed lighting design.

Threshold increment calculations performed on the installed design indicate that the threshold increment criteria will be easily met in non-broadcast mode. As such, the design meets the recommendations of AS 4282.

The threshold increment calculations indicated that the strongest experience of glare for road users would be on Oxley St, approaching Manuka Oval's east gate. Informal assessment of glare for road users was made on Oxley St with the lighting in non-broadcast match mode. Glare is clearly reduced in non-broadcast mode compared to broadcast mode (refer below). The impact on road users is likely to be significantly less.

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### 5.2.4.2 Broadcast mode

Threshold increment calculations performed for broadcast mode indicated that the section of Oxley St that is closest to Manuka Oval exceeds 20%. This is also the case for the intersection of Fitzroy St and Manuka Circle. However, these assessments did not consider the impact of the trees in between these locations and the lighting tower headframes. As the tree illustrated in Figure 10 clearly obstructs view of the headframe from the intersection of Oxley St and Manuka Circle, it is likely that the 20% threshold increment recommendation will not be exceeded at this location.

Noting that it is not possible to make a site assessment of threshold increment to compare with the recommendations set out in Table 5, informal assessment of potential glare to road users was completed on Oxley St, approaching Manuka Oval's east gate. Cars moving down Oxley St toward the oval have a direct view of tower T2. This could appear glary in the driver's view and impede visibility of the intersection they are approaching (Oxley St and Manuka Circle).

Refer to Figures 9 and 10 for daytime views of the lighting towers as seen from Oxley St. Figure 9 shows the view from halfway up Oxley St (near the East Hotel). Figure 10 shows the view from closer to the Manuka Circle intersection. It can be seen that there is a medium-size tree just inside the Oval's east gate. This tree partially obscures view of the tower T2 headframe for drivers close to the intersection. The complete headframe is visible from further up Oxley St.

### 5.2.4.3 Mitigation measures

As described above, the installation meets the requirements of AS 4282. It is therefore not necessary to implement mitigation measures to ensure the installation meets the requirements of AS 4282. However, as observation indicates that glare could be an issue, good practice suggests that mitigation measures should be considered:

- It is not possible to add further louvers and hoods to the floodlights – all floodlights already have either louvers or hoods or both.
- When planning new tree planting on the site, their placement should be considered to assist with glare control – this would include planting a new tree near the east gate that would obscure view of the tower from further up Oxley St.
- An alternative mitigation measure is to block access to the identified intersection, for vehicles approaching the oval along Oxley St, during broadcast level events.

### 5.2.5 Impact of trees

It is clear that the trees on and around the site and on the streets surrounding the site have a significant impact on light spill received at the surrounding properties. At the time of the measurements reported above, all trees were in full summer foliage. It is useful to consider what would be the impact of the reduced tree foliage in winter.

To understand the level of foliage that can be expected in winter, we refer to the photos taken at a previous site inspection on 13 June 2012. At this date it can be expected that the majority of leaves would have fallen from the trees. Figures 11-13 show photos of trees around the site in three different directions.

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**Figure 9 – View of tower T2 from halfway up Oxley St (near East Hotel)**



**Figure 10 – Partly obscured view of tower T2 at intersection of Oxley St and Manuka Circle**

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**Figure 11 – Winter tree foliage outside 23-27 Manuka Circle (west of Manuka Oval)**



**Figure 12 – Winter tree foliage outside 2 Currie Cres (east of Manuka Oval)**



**Figure 13 – Winter tree foliage near east gate**

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Figure 11 shows the residences to the west of Manuka Oval, at 23-27 Manuka Circle. Significant foliage is still present on the trees in this area. This indicates that the trees will provide protection from light spill to these properties both in summer and in winter.

Figure 12 shows the residences to the east of Manuka Oval, at 2 Currie Cres, as seen from within Manuka Oval near to the scoreboard. This indicates a mixture of foliage, with some trees significantly lacking in leaves, and others in full foliage. Reduced protection from light spill can be expected to these properties in winter, but still some significant protection will be provided. Measurements completed in winter indicate that trees on the east side of Manuka Circle still provide significant shading in the winter.

Figure 13 shows a view of the tree within Manuka Oval's east gate. This is the same tree as is shown in Figure 10 that provides partial blockage of the tower T2 headframe as seen from the intersection of Manuka Circle and Oxley St. This tree clearly loses its leaves in the winter, reducing the obscuration discussed above regarding glare for drivers on Oxley St. If a new mature tree was to be planted in this area, as was recommended above, it is recommended that this tree should be evergreen to provide year-round protection from glare.

### **5.3 Lighting within the Manuka Oval grounds**

Light measurements were completed within the grounds of Manuka Oval with the sports lighting switched on to broadcast and non-broadcast match modes, and no other existing supplementary lighting switched on. The completed measurements and comments are discussed below and illustrated in Figures 14 and 15.

#### **5.3.1 Broadcast mode**

Towers T1 and T6 were switched off at the time of measurements completed with the lighting switched to broadcast mode. Measurements were completed around the north part of the oval, from the rear of the Hawke stand around to the east gate, where the impact of towers T1 and T6 was reduced. The completed measurements and comments are illustrated in Figure 14.

The majority of measurements indicate plenty of lighting to the pathways and the seating areas. Measured lighting levels were typically in the range 100-400 lux, compared with the 10-14 lux minimum requirements set out in Table 6.

Limited measurements were not completed in the seating area. However, the measurements that were completed between the Hawke and Bradman stands indicate that there is also plenty of light over the seating areas.

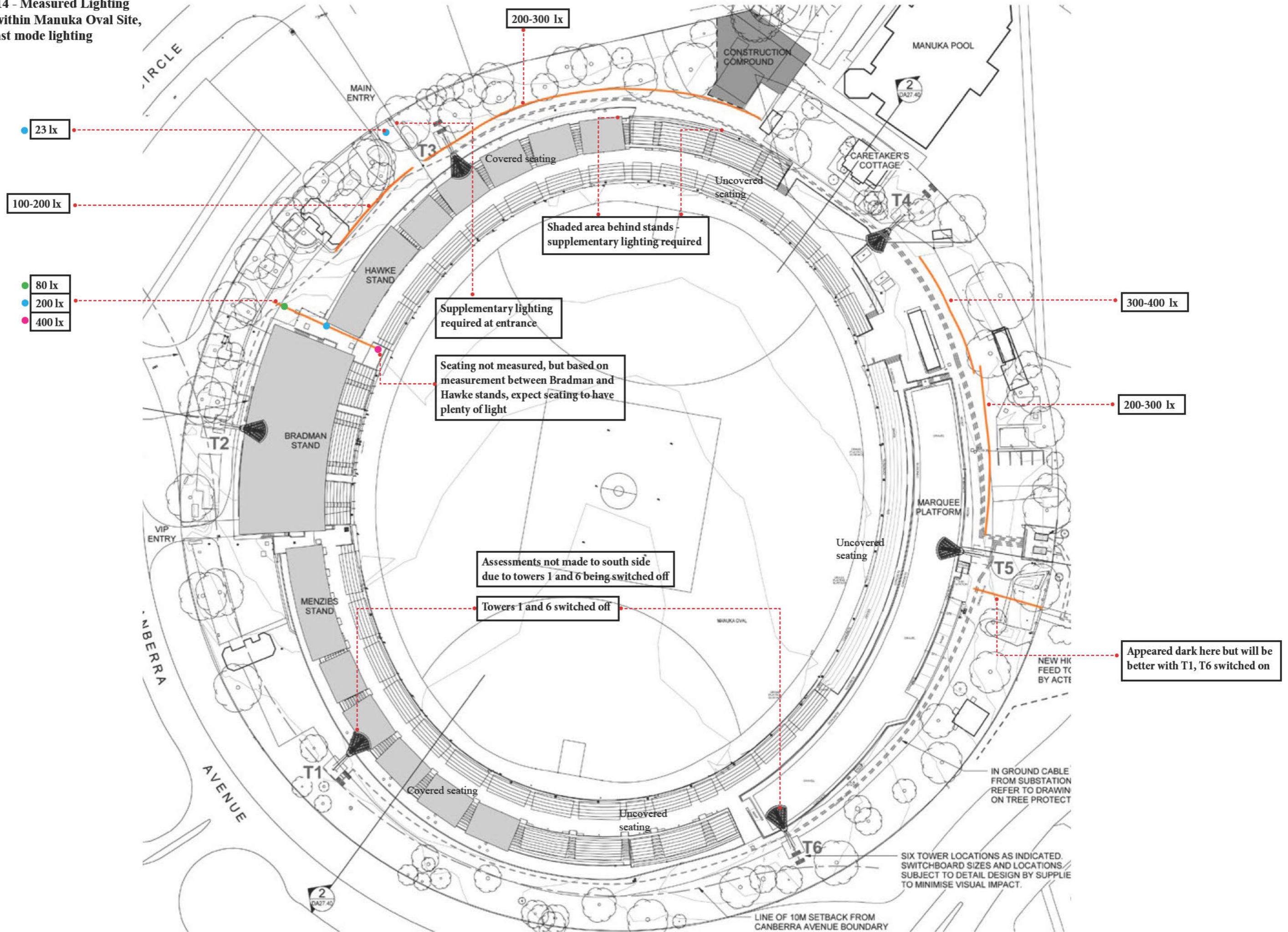
#### **5.3.2 Non-broadcast mode**

Measurements completed in non-broadcast match mode are illustrated in Figure 15. All lighting towers were switched to the appropriate lighting mode and measurements were completed all around the oval perimeter.

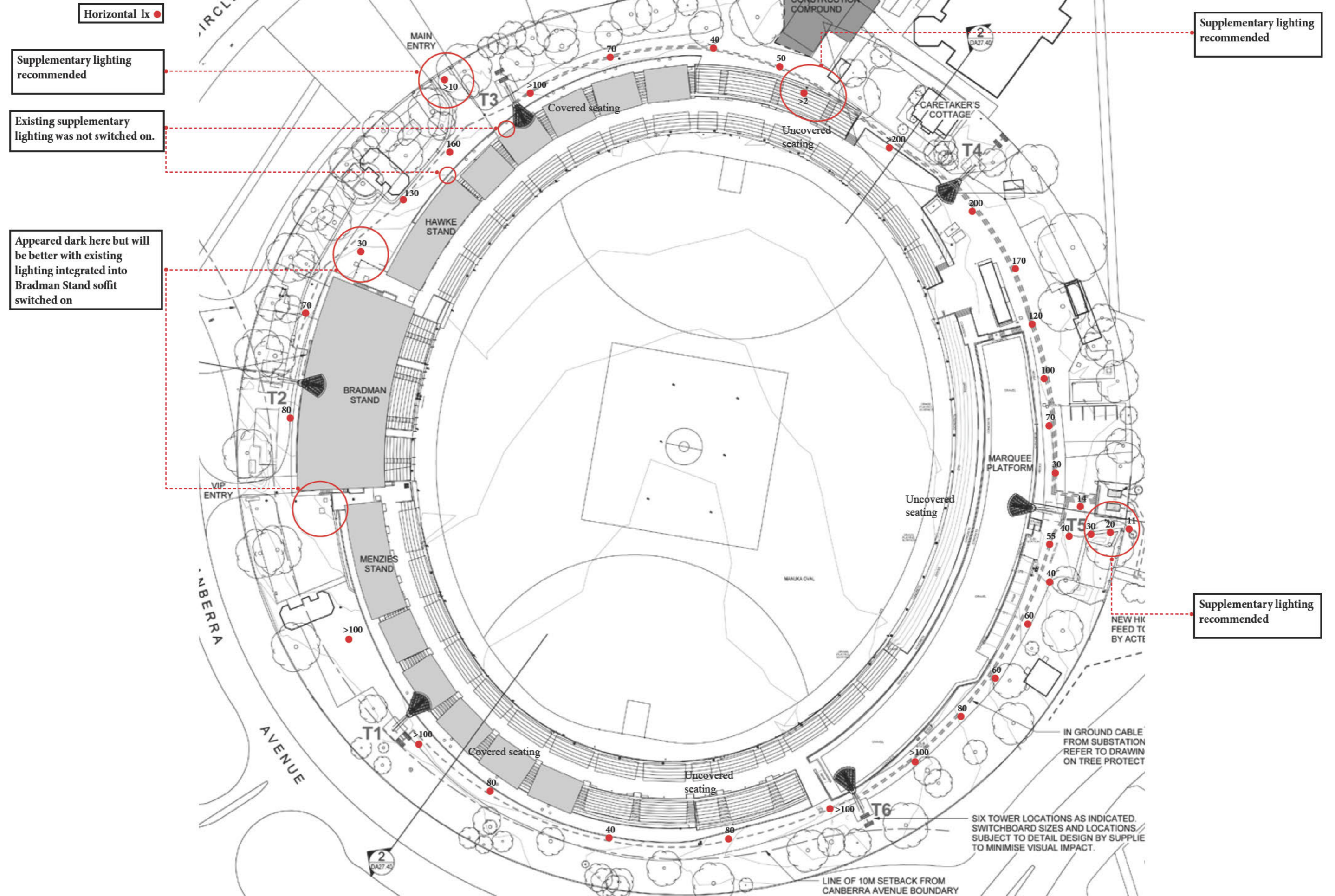
Measurements in this lighting mode also indicate plenty of lighting to the pathways behind the stands. Measured lighting levels were typically in the range 40-200 lux, compared with the 10-14 lux minimum requirements set out in Table 6.



**Figure 14 - Measured Lighting Levels within Manuka Oval Site, broadcast mode lighting**



**Figure 15 - Lighting Levels within the Manuka site in Non-Broadcast Mode**



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There was a small number of areas identified in the inspection where more illumination is recommended. These include the following:

- At the main (western) gate – this area looked dark compared with the brightly lit area behind the Hawke stand. There is existing site supplementary lighting installed on the rear of the Hawke stand, and in the tree next to the gate – neither of these was switched on at the time of inspection. Switching these existing luminaires on during events may be sufficient to illuminate the gate area.
- Behind the Hawke podium, at the northern end of the field – overhangs at the rear of the podium create deep shadows in localised locations. Some existing supplementary lighting exists in these areas, such as the small floodlights located over the large garage doors. Switching these luminaires on during events may be sufficient to fill these dark shadows.
- Near to the east gate – the area immediately at the gate appeared dark compared with the area closer to the rear of the marquee platform. The existing LED floodlight that is pole-mounted in this area is not sufficient to illuminate the gate.
- Immediately behind the Hawke and Menzies stands and adjacent to the Bradman stand – the illumination from tower T2 was blocked from these areas by the Bradman stand. Existing floodlights mounted to the Bradman stand were not operating at the time of measurement; these would serve to fill these areas of shadow.

### 5.3.3 Other lighting modes

Supplementary lighting around the grounds is required in all lighting modes by the relevant planning guidelines (ACTPla, Crime Prevention Through Environmental Design General Code). Although the above indicates that plenty of light is provided around the pathways when the sports lighting is switched on, supplementary lighting will still be required for when the sports lighting is not switched on.

## 6 Recommendations

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- With the lighting switched to non-broadcast match mode, a relatively bright region of field was identified close to the Hawke Stand (refer Figure 2). The bright patch was notified to Abacus Lighting for investigation.
- All measurements of spill light at residences the region surrounding Manuka Oval are below the 25 lux pre-curfew requirement set out in the obtrusive lighting standard. It is recommended that the lighting be switched down to a practice mode prior to curfew to prevent light spill beyond recommended maximum levels post-curfew.
- Glare was identified for drivers on Oxley St approaching the east gate with the lighting in broadcast mode. As the design meets the recommendations of AS 4282, it is not necessary to implement mitigation measures to ensure the installation meets the requirements of AS 4282. However, as observation indicates that glare could be an issue, good practice suggests that mitigation measures should be considered.
  - When planning new tree planting on the site, their placement should be considered to assist with glare control – this would include planting a new tree near the east gate that would obscure view of the tower from further up Oxley St.
  - An alternative mitigation measure is to block access to the identified intersection, for vehicles approaching the oval along Oxley St, during broadcast level events.

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- It was not possible to complete light spill measurement at the level of residential windows above ground level. If complaints are received from such neighbours, it is possible for lighting measurements to be completed at these windows for comparison with the recommendations of AS 4282, if access is provided by the residents.
- Supplementary lighting around the grounds is required in all lighting modes by the relevant planning guidelines (ACTPla, Crime Prevention Through Environmental Design General Code). Although the above indicates that plenty of light is provided around the pathways when the sports lighting is switched on, supplementary lighting will still be required for when the sports lighting is not switched on.



**MANUKA OVAL  
NOISE MANAGEMENT PLAN  
August 2013**

*AVU 03313 v1*

**for**  
**Territory Venues and Events**  
**Economic Development Directorate**  
**ACT Government**

**by**  
**Marion Burgess, BSc (Hons) MSc (Acoust), FAAS**  
**Acoustics & Vibration Unit**  
**School of Engineering and Information Technology**  
**UNSW, Canberra**

**MANUKA OVAL  
NOISE MANAGEMENT PLAN  
August 2013  
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ACT Government**

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# **MANUKA OVAL NOISE MANAGEMENT PLAN August 2013**

*AVU 03313 v1*

## **for Territory Venues and Events Economic Development Directorate ACT Government**

**Marion Burgess, BSc (Hons) MSc (Acoust), FAAS  
Acoustics & Vibration Unit, School of Engineering and Information Technology  
UNSW, Canberra**

### **1.0 INTRODUCTION**

This noise management plan has been prepared by the Acoustics and Vibration Unit (AVU) University of New South Wales, Canberra, following the request from Territories and Events, ACT Government which is responsible for managing the use of Manuka Oval facilities. A noise management plan was provided in October 2012 [AVU 02212-1] to give guidance to the venue management of measures required to ensure compliance with the requirements of the Environment Protection Authority in regard to noise emissions from the use of the venue at that time. The refurbishment of Manuka Oval facilities has continued since October and further improvements are subject to the Development Approval 201324118. As part of the review of the DA an updated noise management plan has been requested to include:

- *Propose noise management measures based on the findings of the monitoring*
- *Determine noise correlations between internal monitoring points and boundary to enable internal monitoring*
- *Provide broad specifications for new speakers, eg, noise levels at patrons face and at boundary (old speakers will be removed as part of works)*
- *Identify risks from various activities to be undertaken at the venue and identify how they will be managed to be within acceptable levels*

This report comprises the noise management plan and the Annex provides the background material on the noise assessment and noise monitoring.

## **2.0 NOISE MANAGEMENT PLAN**

The following noise management plan should be applicable for the first year of operation. During this 12 months noise monitoring should be undertaken at the edge of the Section 14, Griffith during one major day/night event. After the 12 months a review should consider the compliance with this noise management plan, the experience from the operations including any concerns from the community regarding noise and the data from the noise monitoring and present a revised noise management plan for the future operation of the venue.

### **2.1 Compliance Noise Levels**

The assessment of the noise zone standards [refer to the Annex of this report] around the venue indicated that the critical area for compliance is the residential area to the east of the venue, namely Section 14, Griffith. In this area the applicable noise zone standard from Schedule 2 of the ACT Environmental Protection Regulation [*ACT Environmental Protection Regulation 2005, Schedule 2, Noise Zones, noise standards and conditions*] takes into consideration the adjoining land uses which vary along the boundary and the most critical would be:

45 dBA Mon-Sat 07.00-22.00hrs, Sun Public hols 08.00-22.00hrs

35 dBA Mon-Sat 22.00- 07.00 hrs, Sun Public hols 22.00-08.00hrs.

Noise monitoring over a week at the nearest boundary of the residential zone [refer to the Annex of this report] showed that the  $L_{A10,10min}$  is typically above 60 dBA ( $L_{A10}$ ) till 1800 hrs. Between 1800 and 2200 hours the levels drop to approximately 58 dBA. Thus the noise levels along the boundary of Section 14, Griffith are normally more than 13 to 15 dB above the noise zone standard of 45 dBA to 2200 hrs.

It is therefore proposed that the noise management plan aim to ensure that noise from Manuka Oval will be managed so that they are consistent with background levels and with the objective of meeting noise requirements.



## 2.2 Permitted Events

### 2.2.1 Number and Type of Events

The primary use of the venue is for sporting events and the annual calendar of such events be limited to the following schedule in Table 2.1. Limits to the sound output for the Public Address (PA) system and the extended system are discussed in a following section.

A calendar of events at Manuka Oval should be readily available from the website for Manuka Oval and regularly advertised in local media and around the venue. The Table 2.1 provides a schedule of permitted events during the first 12 months of operation. This schedule of permitted events to be revised following the review after 12 months of operation.

**Table 2.1** Schedule of permitted events during the first 12 months of operation

<b>Type of event</b>	<b>Number of events</b>	<b>Additional conditions</b>
Few spectators and no PA	Unlimited	
Daytime events using the PA system	6	To 1800 hrs Music minor component
Major daytime events using the PA system plus big screen	8	To 1800 hrs Music during all breaks
Day/evening events using the PA system plus big screen	4	To 2200 hrs Music minor component
Major Day/evening events using the PA system plus big screen plus additional speakers	2	To 2200 hrs Music during all breaks
<b>Number of days per annum</b>	<b>20</b>	
Non sporting events using the PA system plus big screen plus additional speakers	2	Subject to request for authorisation and conditions under the ACT Outdoor Concert Policy

### **2.2.2 Community Advice**

While it is not a control measure in itself, keeping the surrounding community informed of major events, especially those in the evening, can reduce the potential annoyance. General signs around the oval may be adequate advice of the daytime events which are similar to those that have been held at the venue in the past. For the major events going into the evening, information should be provided to the surrounding residential areas advising the nature of the event, listing the times for the event and giving a contact number to a hot line should any resident be concerned.

### **2.2.3 Contact Telephone**

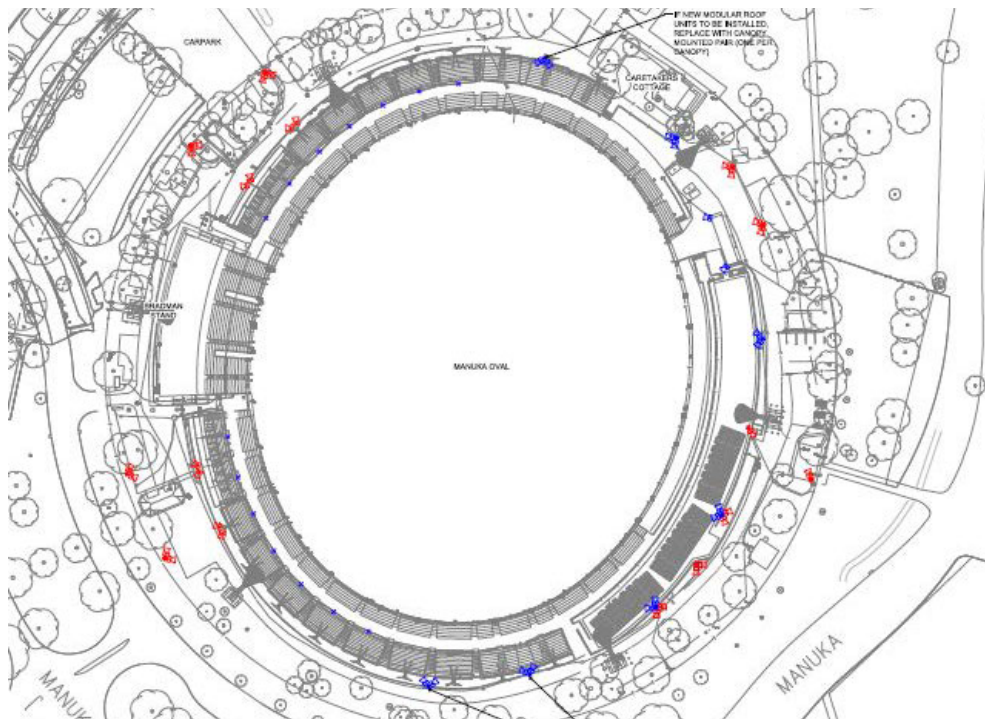
The community advice on events should identify a contact number should any resident be concerned. This number should be manned during business hours on the days before and after the event as well as during the event.

All calls that come in before, during and after the event should be carefully recorded and passed to the event management for action. A record of the action taken should also form part of the record. This record is to be inspected as part of the 12 month review process.

## 2.3 Amplified sound

### 2.3.1 PA system

The proposed PA system is reproduced in Figure 2.1. There are two separated systems – one to service the seating areas and the other the concourse around the perimeter.



**Figure 2.1** PA system installation [from plans submitted for DA]

The installation plan is based on the loudspeakers to service the seating areas being located on the underside of the canopies over the seating bays or on poles along the rear row of seats. The distribution of a number of loudspeakers around the oval will ensure good coverage of the seating areas without excessive volume at each loudspeaker. All these loudspeakers are to be selected and positioned so that the sound is focussed onto the seating area with minimal spread outside the target area. The PA should be adjusted so that the sound level at the seating area does not exceed 75 dBA. The set up of the full system to achieve this should be clearly documented and the same procedure followed during the sound checks for all events.

The installation plan is based on the loudspeakers to service the concourse being mainly on the outer perimeter and facing inwards to the ground. On the south east corner they are on the rear of the temporary seating areas and facing outward. All these loudspeakers are to be selected and positioned so that the sound is focussed onto the concourse with minimal spread outside the target area. Particular attention must be paid to the sound distribution of the loudspeakers facing outward in the direction of Section 14 Griffith, to ensure no exceedance of the compliance level. The PA should be adjusted so that the sound level in the concourse does not exceed 70 dBA. The set up of the full system to achieve this should be clearly documented and the same procedure followed during the sound checks for all events.

Once the PA system has been finalised a revised model of the sound distribution, similar to that provided by Arup in the "Statement against criteria" submitted with the DA, should be provided to confirm that the levels stated above will meet compliance with a noise level not exceeding 60 dBA in the residential area.

### **2.3.2 Enhanced Audio System**

The enhanced audio system involves loudspeakers installed at ground level within the Oval. The infrastructure of the venue provides shielding and so there is less risk of excessive noise in the surrounding areas from these loudspeakers.

### **2.3.3 Music Audio System**

For sporting events that involve live music a small stage and associated sound system is installed. The stage should be set up so that the loudspeakers are facing away from the residential area on the eastern boundary. The stage should be as low as practical to achieve beneficial shielding from the infrastructure of the venue. The loudspeakers for this stage should be selected and positioned as low as practical to ensure that the sound is focussed onto the audience area and that there is minimal sound spill outside the venue. The sound system should be adjusted so that the sound level in the area immediately in front of the stage should not exceed 80-85 dBA.

Events that involve a set up of a large concert stage need individual noise management plans which would be based on the actual proposal and submitted as part of the Authorisation process for an outdoor concert. The general guidance is that the stage should be set up so that it faces away from the residential area on the eastern side of the venue and that the loudspeaker arrays be set as low as practical and adjusted to focus the sound on the audience area with minimal sound spill outside the venue.

### **2.3.4 Siren**

The siren is only used for AFL games to clearly warn the players about the time. It is only sounded for 2-4 sec but may be sounded up to 20 times during the game and needs to be loud enough to be clearly heard by all on the field. Once the sound system has been optimised for the general amplified sound, a trial of the sound from the siren will be required to ensure that it does not produce excessive noise in the residential area to the east of the venue

## **2.4 Associated Noises**

### **2.4.1 Generators**

The noise from a generator providing power to the temporary lights at the entrance was noted during the noise measurements for the ODI in 2013. The upgrade will involve installation of powered lights at the entrances and the generator will no longer be needed for this purpose.

Should a generator be required for any use around the perimeter of the venue, the low noise generator now available within the venue facilities should be used.

### **2.4.2 Busses**

The noise from the busses idling while waiting for passengers at the end of the event was noted during the noise measurements for the ODI in 2013. The bus pickup area is across the road from the residential area of Block 14, Griffith. The master plan for the venue involves the relocation of the bus pick up area to the northern perimeter of the venue. This relocation will remove this noise source away from the residential area.

Marion Burgess, August 2013

# MANUKA OVAL NOISE MANAGEMENT PLAN August 2013

## ANNEX

### A1 BACKGROUND

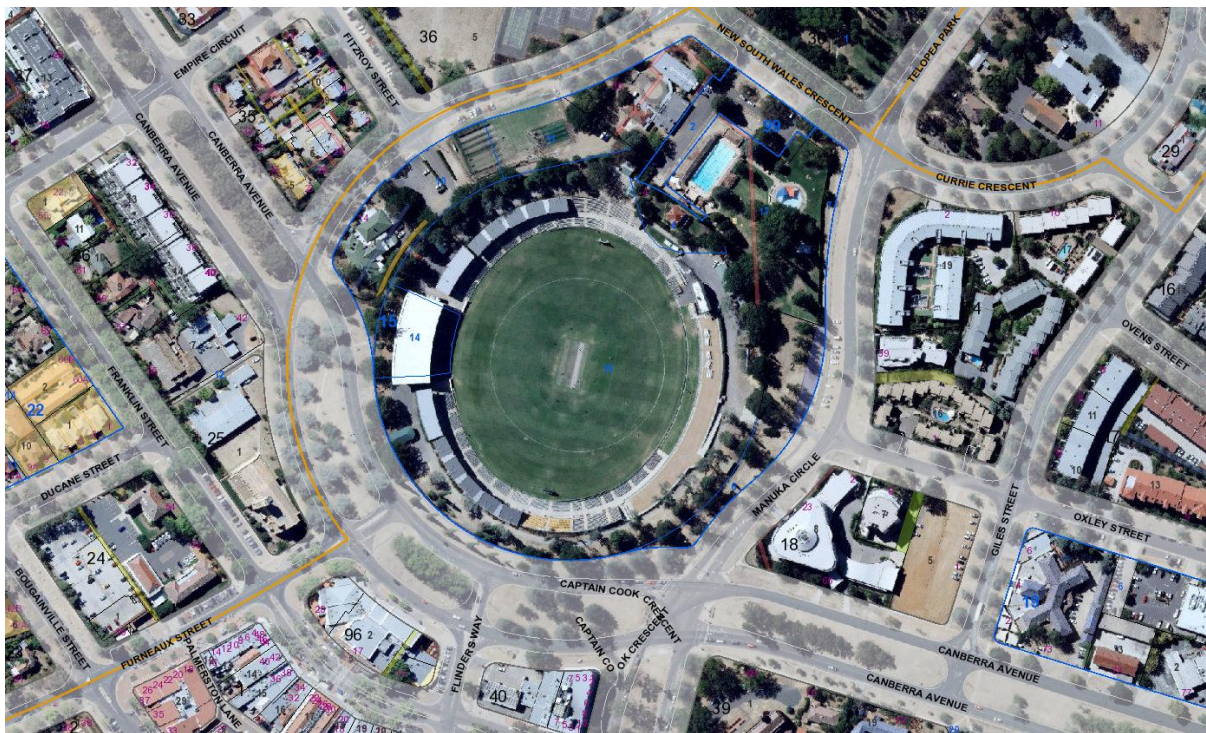
Prior to the upgrades to the Oval in 2012 and 2013, the events held at Manuka Oval have been focused on daytime sporting events and primarily cricket matches. Figure A1.1 shows the locality for Manuka Oval. It is surrounded by roads servicing the Manuka Group Centre and the adjacent residential areas. The main business area of Manuka is towards the south and west and in the other directions are mixed use, high density and core residential areas. The land uses from the Territory Plan are shown in Figure A1.2.

The criteria for noise in the ACT are established in Schedule 2 of the ACT Environmental Protection Regulation [*ACT Environmental Protection Regulation 2005, Schedule 2, Noise Zones, noise standards and conditions*]. These are based on “noise zone standards” which take into account the applicable land use from the Territory Plan. The “daytime” criteria apply till 22.00 hrs and are 10 dB higher than the “night time” criteria. Portion of the table, including the noise zone standards for the land uses in the vicinity of Manuka Oval, is reproduced as Table A1.1.

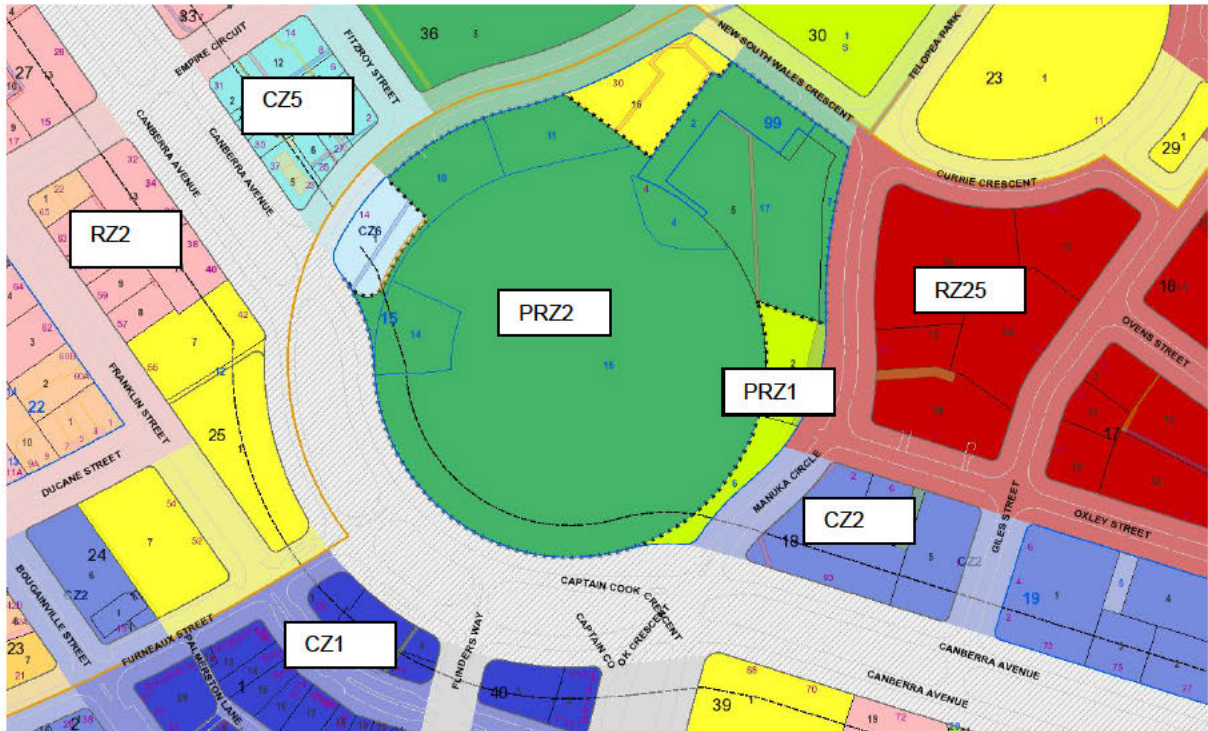
The noise zone standards are established in terms of  $L_{A10,T}$  ie the level exceeded for 10% of the measurement time period. The measurement period is for a minimum of 10 mins. The **A weighting** is a frequency filter that has a similar frequency response to human hearing and is widely used for environmental noise guidelines.

**Table A1.1** Portion of Schedule 2 of the ACT Environmental Protection Regulation including the noise zone standards in the vicinity of Manuka Oval [extracted from ACT Environmental Protection Regulation 2005, Schedule 2, Noise Zones, noise standards and conditions ]

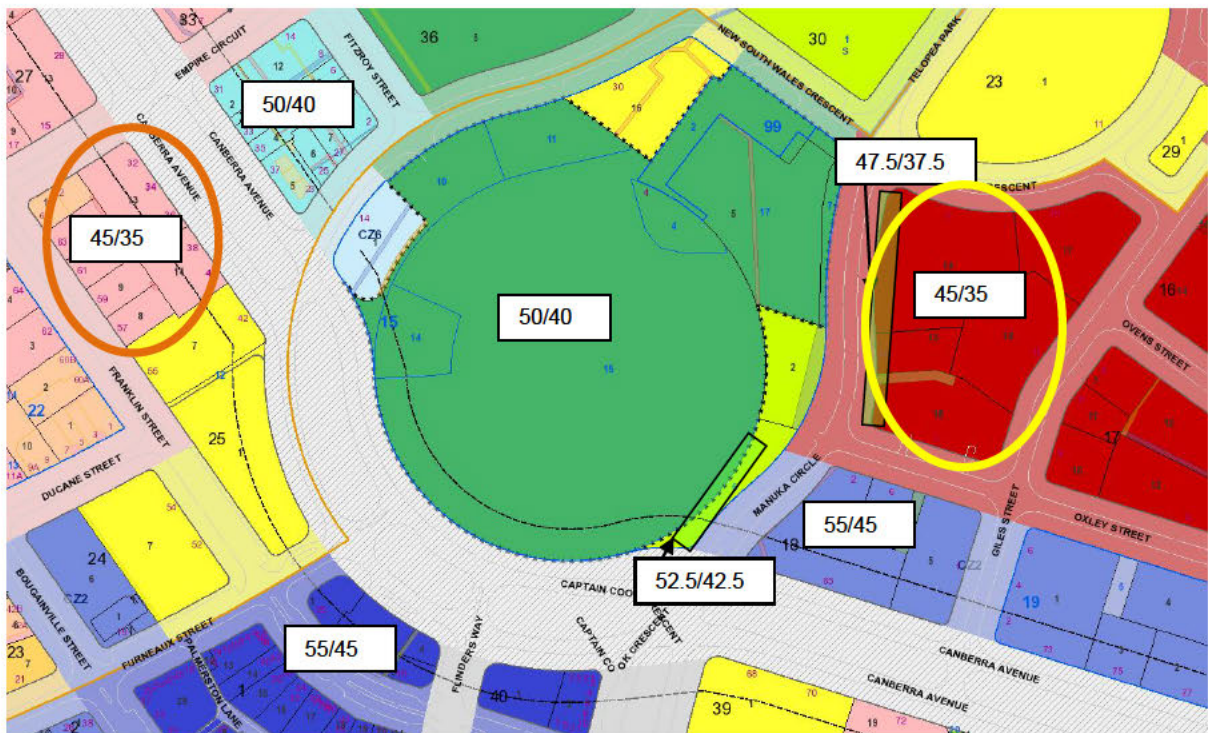
Noise Zone	Land Use	Noise Standard, L <sub>A10</sub> dB	
		Mon-Sat 07.00-22.00hrs. Sun Public hols 08.00-22.00hrs	Mon-Sat 22.00- 07.00 hrs. Sun Public hols 22.00-08.00hrs
Zone C	Group Centres	55	45
Zone E	Restricted access recreation	50	40
Zone F	Commercial CZ5	As for the adjacent land use with the higher noise level	
Zone G	Residential	45	35



**Figure A1.1** Map of the region showing Manuka Oval and the locality [extracted from [www.actmapi.act.gov.au/](http://www.actmapi.act.gov.au/)]



**Figure A1.2** Map of the region showing Manuka Oval and the surrounding area with the land uses indicated [extracted from [www.actmapl.act.gov.au/](http://www.actmapl.act.gov.au/)]



**Figure A1.3** Map of the region showing Manuka Oval and the surrounding area with the applicable noise zone standards indicated and the two with the lower noise zone standards circled [extracted from [www.actmapl.act.gov.au/](http://www.actmapl.act.gov.au/)]



Overlaid on Figure A1.3 are the applicable noise zone standards in the immediate vicinity of Manuka Oval. One point to note is that where there is a common boundary between two zones with differing noise zone standards, the applicable level on that boundary is a value that is halfway between the two zone standards.

The most critical area around the Oval is the residential area to the east. The boundary of this RZ25 land use has a portion in common with PRZ1, open space with noise zone standards of 45/35 dBA and a portion in common with restricted access recreation with noise zone standards of 50/40 dBA. The applicable noise zone standard for this assessment is taken as the more critical of these, namely 45/35 dBA on the edge of the residential area nearest to Manuka Oval.

## **A2.0 NOISE IMPACT ASSESSMENT**

As part of the documentation for the initial DA application an assessment of “Noise Impact from Public Address System” was undertaken by Arup [June 2012]. Acoustic modelling was undertaken for three uses of the public address system

- Siren as used for sporting events
- Music
- Speech – announcements

Each of these sources was measured at the venue when the output was in a manner that was “consistent with typical operation”. That data, along with the details of the surroundings, was used by Arup in a Sound Plan model and the spread of the sound presented graphically in the June 2012 report.

Noise monitoring was undertaken by the AVU during two major events using the upgraded facilities during the summer of 2013: Prime Ministers XI (PMXI) on 29 January and One Day International (ODI) on 7 February 2013 (report AVU 00713).

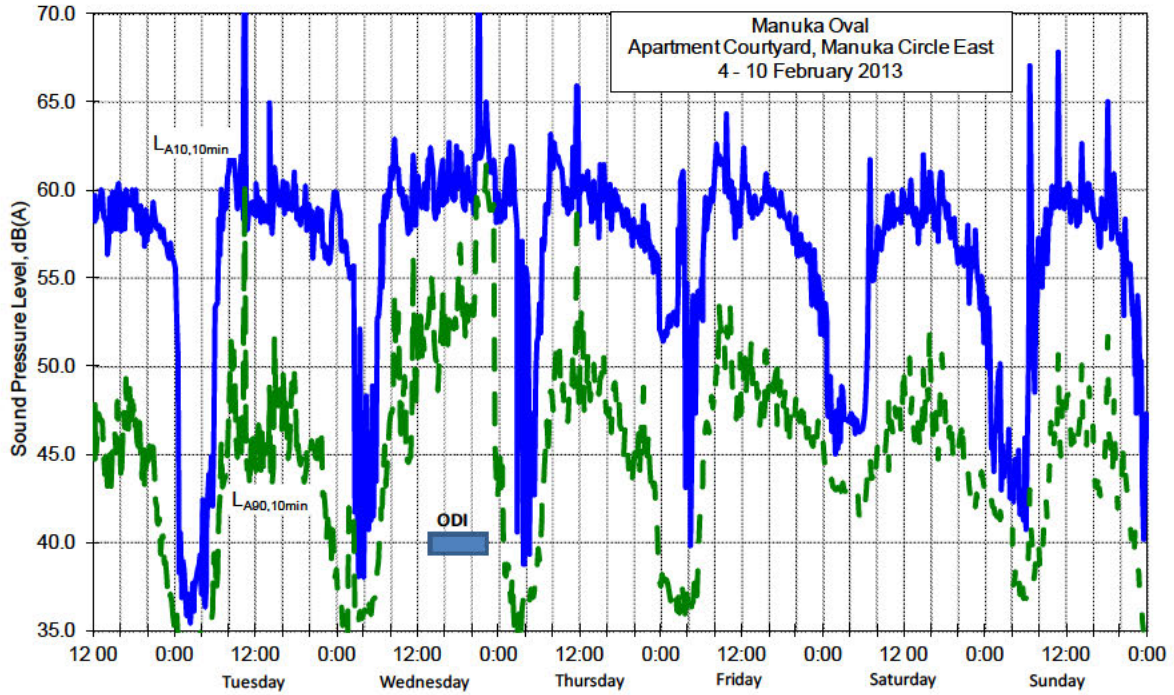
The survey around the venue during the PMXI identified that the focus for detailed investigation should be on the eastern side of the venue.

The ODI was a major event with a maximum capacity crowd and used the Public Address (PA) system provided at Manuka Oval plus an enhanced system for the music segments. This system was on a small stage along the north eastern side of the oval with additional loudspeakers at the front of the stage. The sound of the PA system and the music within the venue were subjectively assessed during the event and were judged to be clear.

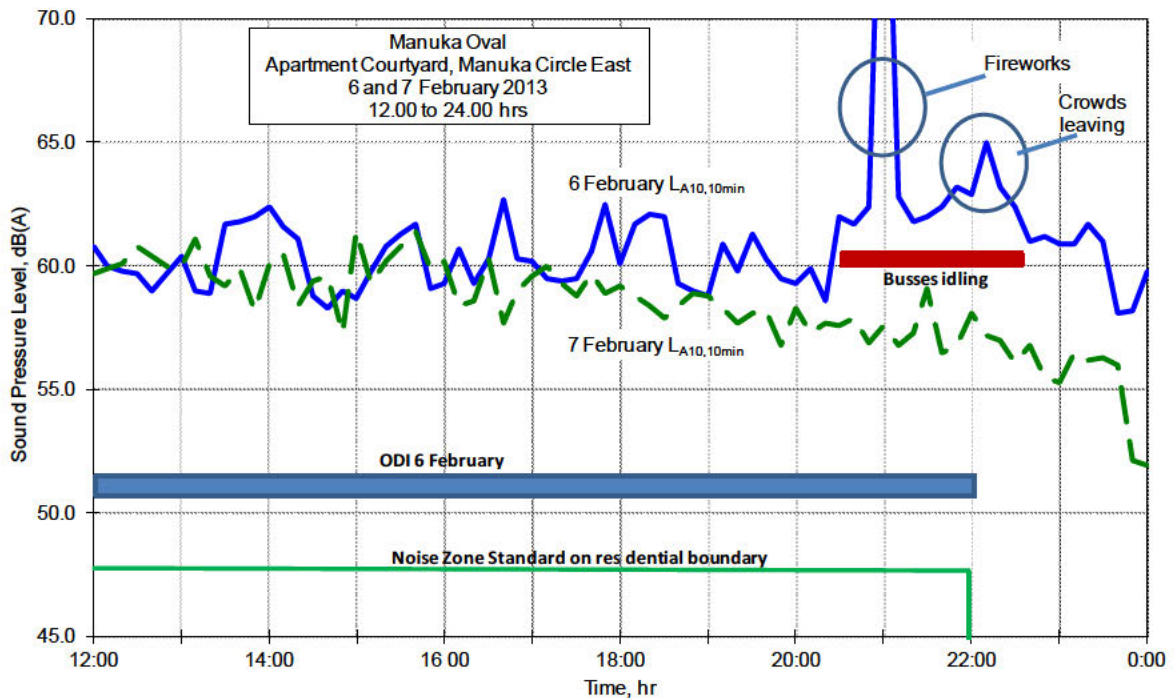
At the edge of the nearest residential area the noise levels from the announcements could be heard in the quiet periods between the traffic and were approximately 60 dBA. This level is in reasonable agreement with the predicted noise levels from the Arup report. The sound from the music using the enhanced system was at a similar level. During the event there was general crowd noise from cheering which was typically in the range 55-60 dBA.

In addition to attended monitoring during the ODI, an environmental noise logger was left in location for a week in the residential area to obtain data on the typical noise levels in the area for comparison with the noise levels during the ODI and with the noise zone standards. Figure A2.1 presents the data over the week in terms of the  $L_{A10,10min}$  level exceeded for 10% of each 10 minutes of the placement. This data shows that the  $L_{A10,10min}$  is typically above 60 dBA ( $L_{A10}$ ) till 1800 hrs. Between 1800 and 2200 hours the levels drop to approximately 58 dBA. Thus the noise levels along the eastern boundary are normally more than 10 dB above the noise zone standard of 45 dBA to 2200 hrs.

The effect of the ODI on the noise levels in the area can be more clearly seen in Figure A2.2 which presents a comparison of a 12 hour period of the day of the ODI (6 February) and the day following (7 February). This shows that, except during the time of the fireworks, when the buses were lined up and the crowds leaving, the increase in noise level due to the activity within the venue was less than 5 dB.

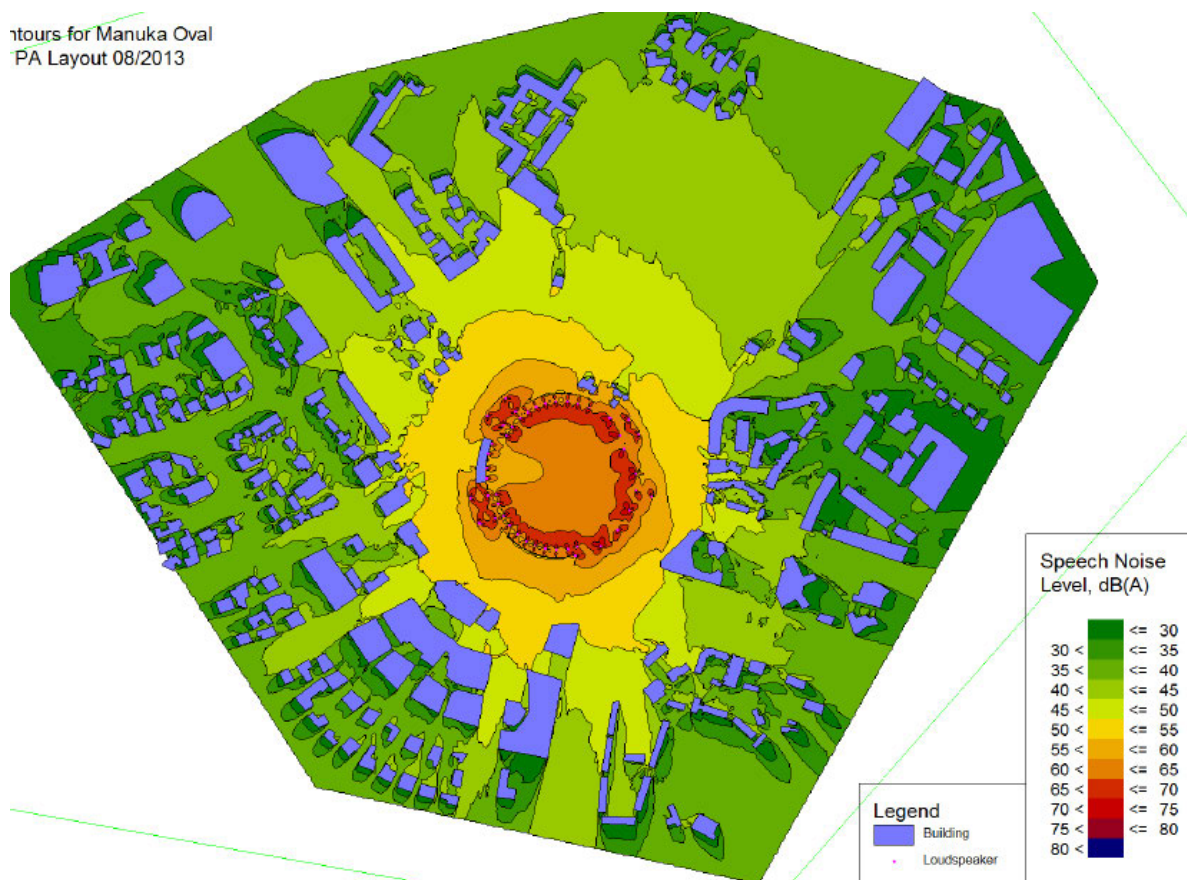


**Figure A2.1** Noise level data at the monitoring location over the week - the ODI was on Wednesday.



**Figure A2.2** Comparison of the noise level at the monitoring location on the day of the ODI and on the following day.

As part of the DA 201324118 for further works including a replacement of the Public Address (PA) system, modelling of the sound distribution from the proposed new sound system was undertaken by Arup based on an indicative layout of the new system. Figure A2.3 is an extract from the “Planning Report Statement Against Criteria, August 2013” submitted as part of the DA. This image shows that for noise levels in the vicinity of the new loudspeakers, noise levels of approximately 75 dBA will be less than 60 dBA at the boundary of the residential area to the east of the venue.



**Figure A2.3** Extract from “Planning Report Statement Against Criteria” of the model of the sound distribution from an indicative layout of the sound system provided by Arup.

### A3.0 PROPOSED USE OF MANUKA OVAL

Table A3.1 presents a schedule of the proposed uses for Manuka Oval per annum. So on average there would be 1 to 2 events per 4 weeks. Major events and those going into the evening would be on average 1 per 8 weeks.

It is relevant to note that this is not a new venue and the daytime events with modest use of the existing PA system would be typical of those that have been held at Manuka Oval over past decades. The change in use is applicable for the events into the evening and those with entertainment from music and the big screen.

**Table A3.1** Schedule of events at Manuka Oval during the first 12 months of operation

Type of event	Number of events	Additional conditions
Few spectators and no PA	Unlimited	
Daytime events using the PA system	6	To 1800 hrs Music minor component
Major daytime events using the PA system plus big screen	8	To 1800 hrs Music during all breaks
Day/evening events using the PA system plus big screen	4	To 2200 hrs Music minor component
Major Day/evening events using the PA system plus big screen plus additional speakers	2	To 2200 hrs Music during all breaks
<b>Number of days per annum</b>	<b>20</b>	
Non sporting events using the PA system plus big screen plus additional speakers	2	Subject to request for authorisation and conditions under the ACT Outdoor Concert Policy

### A4.0 CONCLUSION

In conclusion, with careful attention to the installation of the PA system and the supplementary audio systems the sound from events at Manuka Oval can be controlled to be within 5 dB of the existing noise levels in the area. Monitoring should be undertaken during a major event to verify compliance.

Marion Burgess, August 2013