ASSESSMENT OF PROPOSED BACKLIT SIGNS

M2 MOTORWAY

KENT STREET ADVERTISING SIGNAGES

PREPARED BY:

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Document Verification

Project Title	Assessment of Proposed Backlit Signs M2 MOTORWAY KENT STREET ADVERTISING SIGNAGES		**Project Number** S742B
Revision	**Date**	**Prepared By**	**Approved By**
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		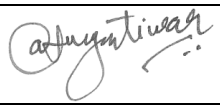	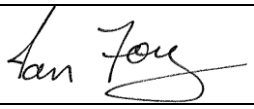
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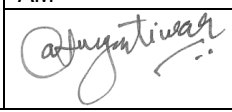
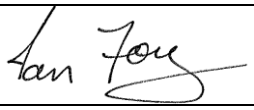
			

Certification

Certified By	Ashwin Mungantiwar
Engineering or other design qualifications	Grad Dip Des Sc - Building Services (USyd) Masters Des Sc – Illumination (USyd)
Accreditation / License Number	MIES – IESANZ 4898

1 INTRODUCTION

This report has been prepared by Webb Australia Group (NSW) Pty Ltd for Wattle Project Management, for the lighting impact assessment of the proposed ongoing use of existing backlit advertising signs, which are located over M2, on the footbridge via Kent Street.

The report covers the outcomes with regards to compliance with the following standards:

- AS4282:2023 - Control of the Obtrusive Effects of Outdoor Lighting.
- Transport Corridor Outdoor Advertising and Signage Guidelines under SEPP 64 – Nov 2017 (now updated to SEPP Industry & Employment - 2021).

View 1 – Eastbound

View 2 – Westbound

2 LIGHTING BASICS

To assist with the interpretation, some basic information about lighting parameters as applicable to this report is explained below for reference.

Luminous Flux - the measure of the quantity of light. For a lamp or luminaire, it normally refers to the total light emitted irrespective of the directions in which it is distributed. Unit of measurement is lumens (lm).

Illuminance - this is the amount of light that reaches an area or a surface. It is measured in lux. Illuminance reduces significantly with distance from the source. It also depends on the area being lit and the reflectances of various objects off which the light is reflected. Standard unit is lux (lx).

Luminous Intensity - the concentration of luminous flux emitted in a specified direction. Standard unit is candela (cd).

Luminance & Brightness - the physical quantity corresponding to the brightness of a surface (e.g. a lamp, luminaire, sky or reflecting material) in a specified direction. It is the luminous intensity of an area of the surface divided by that area. Standard unit is cd/m^2. (Non-Standard term is nits).

Luminance means the objective brightness of a surface as measured by a photometer, expressed in candelas per square meter. Levels differ as the signs will appear brighter when surrounding light levels in the area are low. Luminance levels should comply with Australian Standard AS4282 Control of the Obtrusive effects of Outdoor Lighting which recommends the following levels:

Maintenance Factor - ratio of the light flux emitted from a luminaire at a given time to that emitted initially.

Glare – is the potential difficulty with seeing things in the presence of bright lights. If the light source is excessively bright in relation to the general surrounding; a person's ability to see surrounding details is reduced.

Effects of Glare

- Squinting and Eye Fatigue.
- Annoyance and Inconvenience.
- Decreased Visual Comfort.
- Colour Distortion.
- Poor Depth Perception.
- Momentary loss or reduced quality of vision.
- Decreased Safety.

Threshold Increment (TI) - with respect to requirements in AS/NZS 1158; threshold increment is similar to disability glare which can be calculated either manually or by a calculation software. This measure of disability glare is expressed as the percentage increase in contrast required between an object and its background for it to be seen equally well with a source of glare present. Higher values of TI correspond to greater disability glare. As per the standard, TI should be less than 20%.

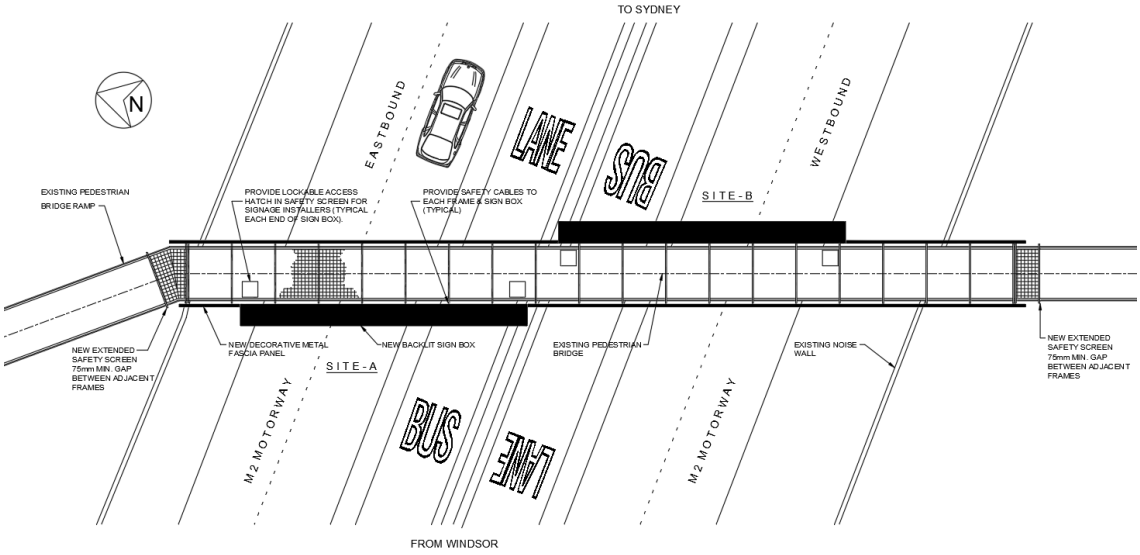
Veiling Luminance (Lv) - a measure of disability glare, veiling luminance is a luminance superimposed over the eye's retinal image that is produced by stray light within the eye.

3 SITE LOCATION

Webb Australia Group (NSW) Pty Ltd have conducted a desktop study of the proposed location of the signs, along with a desktop review of the surrounding areas. Drawings received were also reviewed.

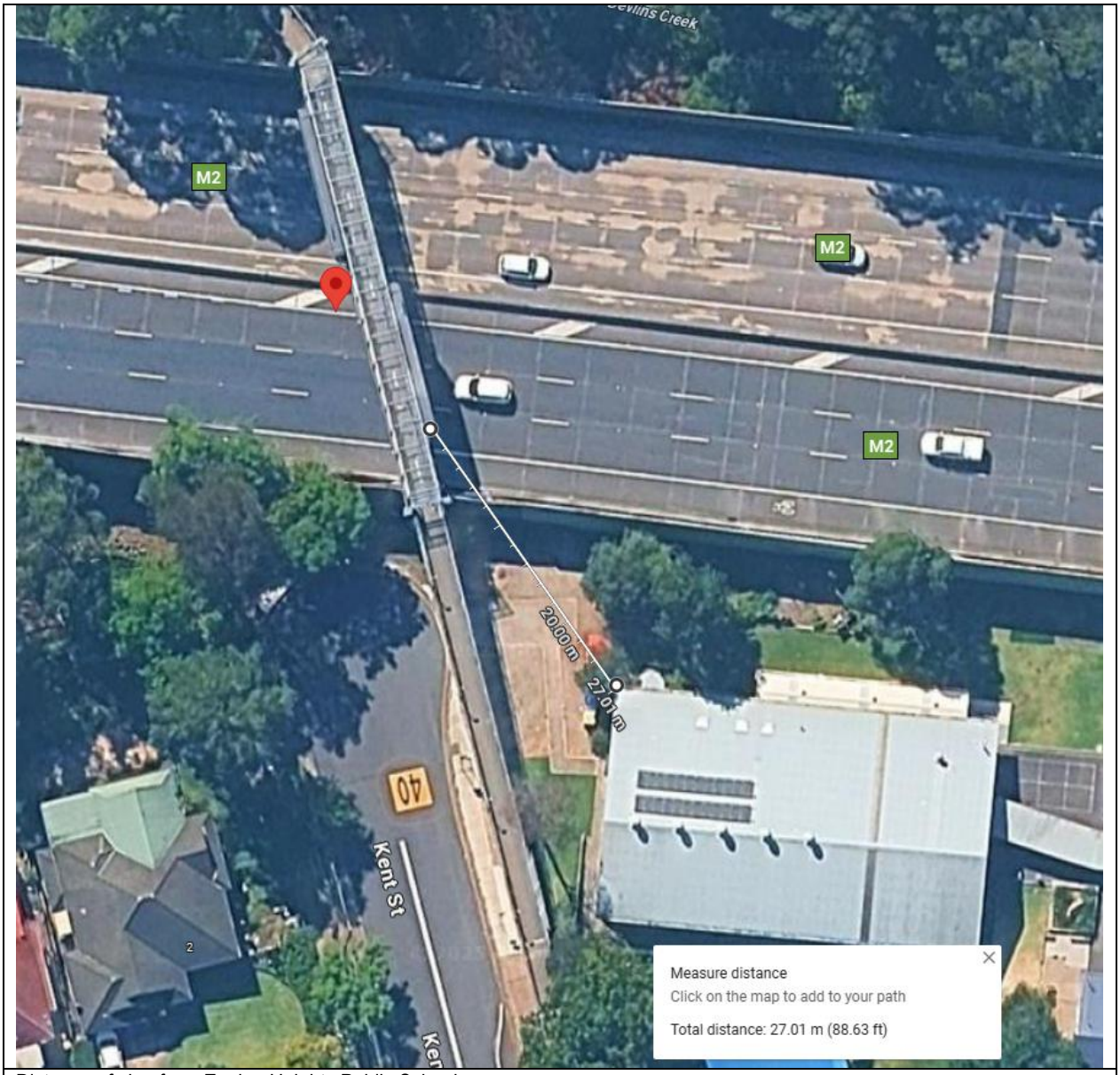
Land uses in the immediate vicinity around the sign include Epping Heights Public School and residences to the South & residences to the North. M2 motorway is elevated over Kent St & the signs are mounted on the sides of the footbridge. Acoustic / Noise walls are present on both sides of the motorway. Given the heights and the viewing angles only part of the signs could be visible from the neighbouring properties. Further sections of this report will discuss results from the obtrusive lighting assessment.

Location Map

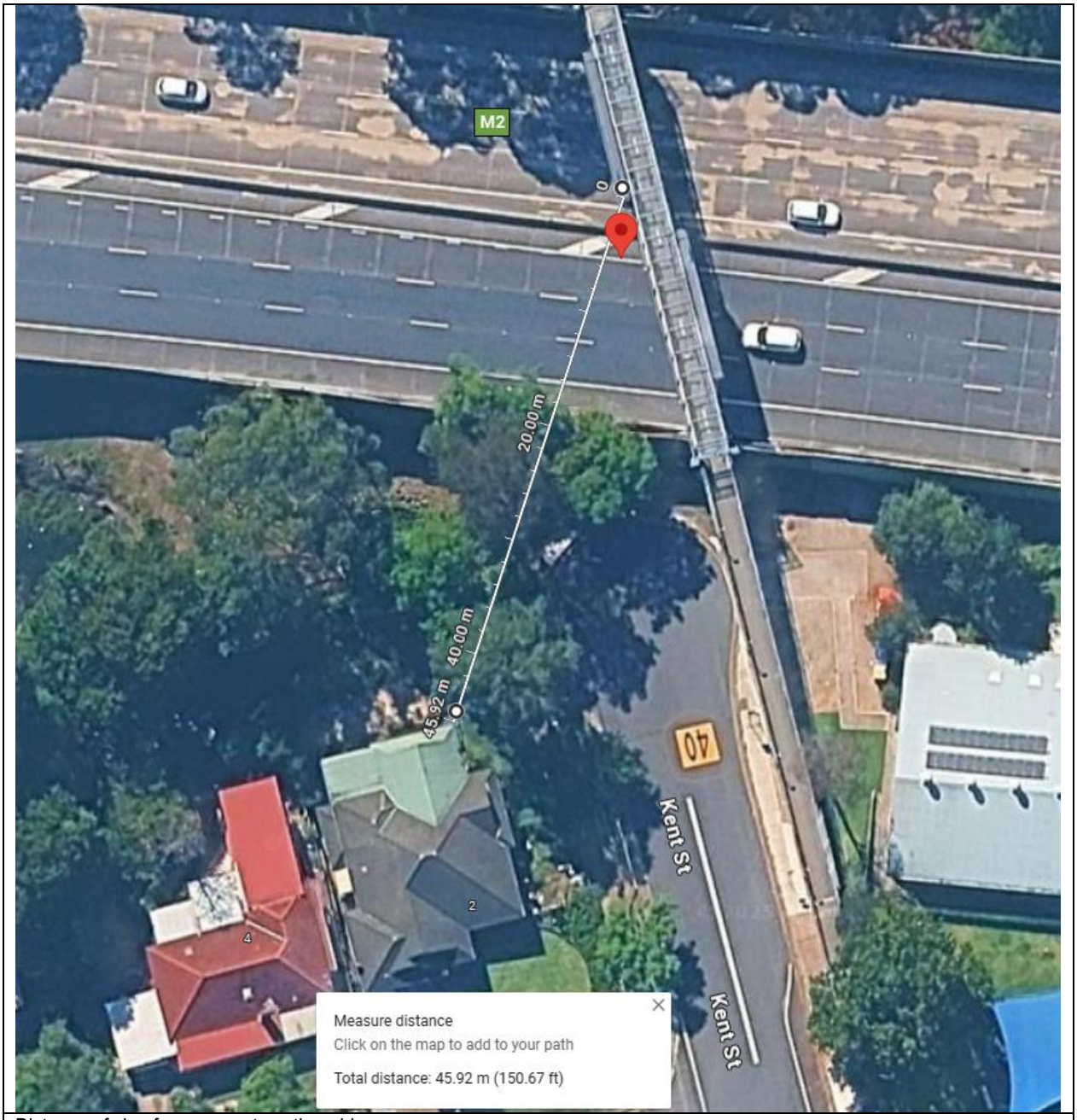


3.1 DISTANCES

The westbound sign is located approx. 27m from the edge of Epping Heights Public School. The eastbound is located approx. 46m from the nearest south residence.



Distance of sign from Epping Heights Public School



Distance of sign from nearest south residence

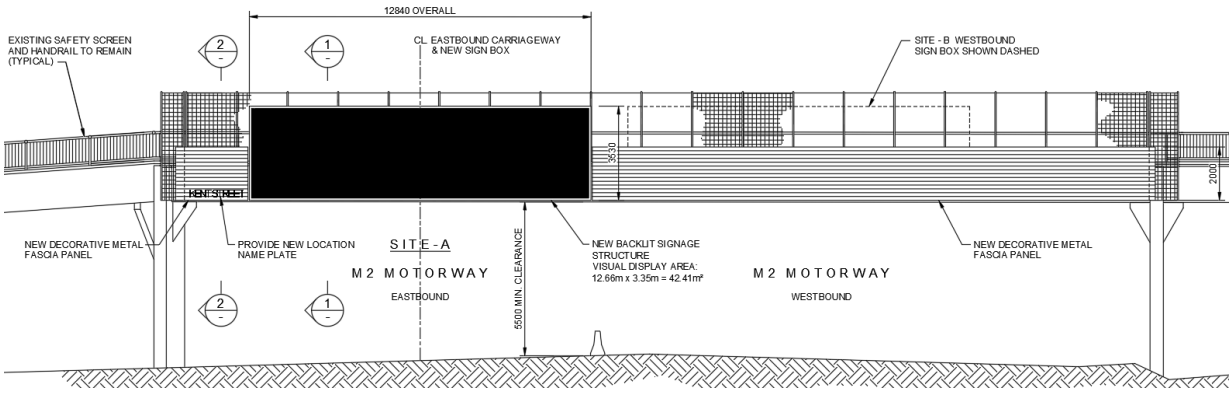
The signs are oriented away from all the neighbouring properties.

Given the combination of line of sight, distance, orientation, height of signs; the maximum intensity (candela) & illuminance (lux) from the signs will not adversely impact the users.

4 SPECIFICATION OF SIGNS

4.1 PROPOSED SIZE

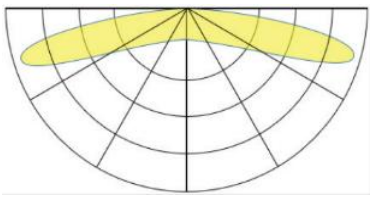
The visual size of each of the sign is 3.35m (high) x 12.66m (wide).
The signs are subject to DA, and no physical changes are proposed to the signs.
The signs are backlit using LED modules - M23GX11D SA M-NV 24V Series.
The modules for each sign are laid are 50 modules horizontally at 220mm centres & 5 rows high. The modules are setback at 800mm.
The vinyl used for the signs is the EFLUMA BACKLIT 510gsm with a light translucency of 38%.
The bottom of the signs would be minimum 5.5m above the road surface.

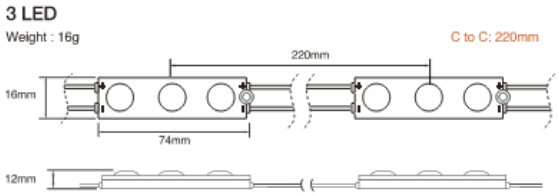


4.2 PROPOSED LED PARAMETERS

SAled - SA M-NV 24V Series – SA2398

LED Type	Single Colour 6500K with CRI upto 80
Dimension	74 x 16 x 12mm
IP Rating	IP67
Beam Angle	175º
Efficiency	up to 170lm/W
Dimmable	Yes
Power	1.08W (each module with 3 LEDs)
Luminous Flux	185lm





4.3 PROPOSED BRIGHTNESS CONTROL

The signs will operate 24 hours.

In its basic form, at night, when the ambient light level is close to 1 lux; the screen brightness will be permanently adjusted to 45% dimming of max value = producing a maximum of 57 cd/m^2.

Each of the values can be adjusted during set up and commissioning such that there is full control and monitoring over the system.

5 COMPLIANCE OF PROPOSED SIGNS WITH AS4282

This Standard specifically refers to the potentially adverse effects of outdoor lighting on nearby residents (e.g. of dwellings such as houses, hotels, hospitals), users of adjacent roads (e.g. vehicle drivers, pedestrians, cyclists) and transport signalling systems (e.g. air, marine, rail), and on astronomical observations.

The 2023 version of the Standard specifically includes:

(a) Public lighting.
(b) Sports lighting.
(c) Internally & Externally illuminated sign.

Since the proposed signs are backlit illuminated advertising sign; the requirements of AS4282 apply to it.

The standard states that; internally illuminated surfaces shall have an Upward Light Ratio of max 50% and design shall include facilities to mitigate upward waste light.

The standard categorizes pre and post curfew limits on the lighting. Since the sign will be illuminated during night-time; the requirements will be applied for curfewed hours as per Table 3.2, 3.3 & 3.4 of AS4282. The sign is located on top of the carriageway of the road; and the road is surrounded by a predominantly residential area; hence the sign would be considered to lie in Environmental Zone A2 (Low District Brightness) (Generally roadways without streetlighting through suburban areas) as per the standard and the following requirements would apply.

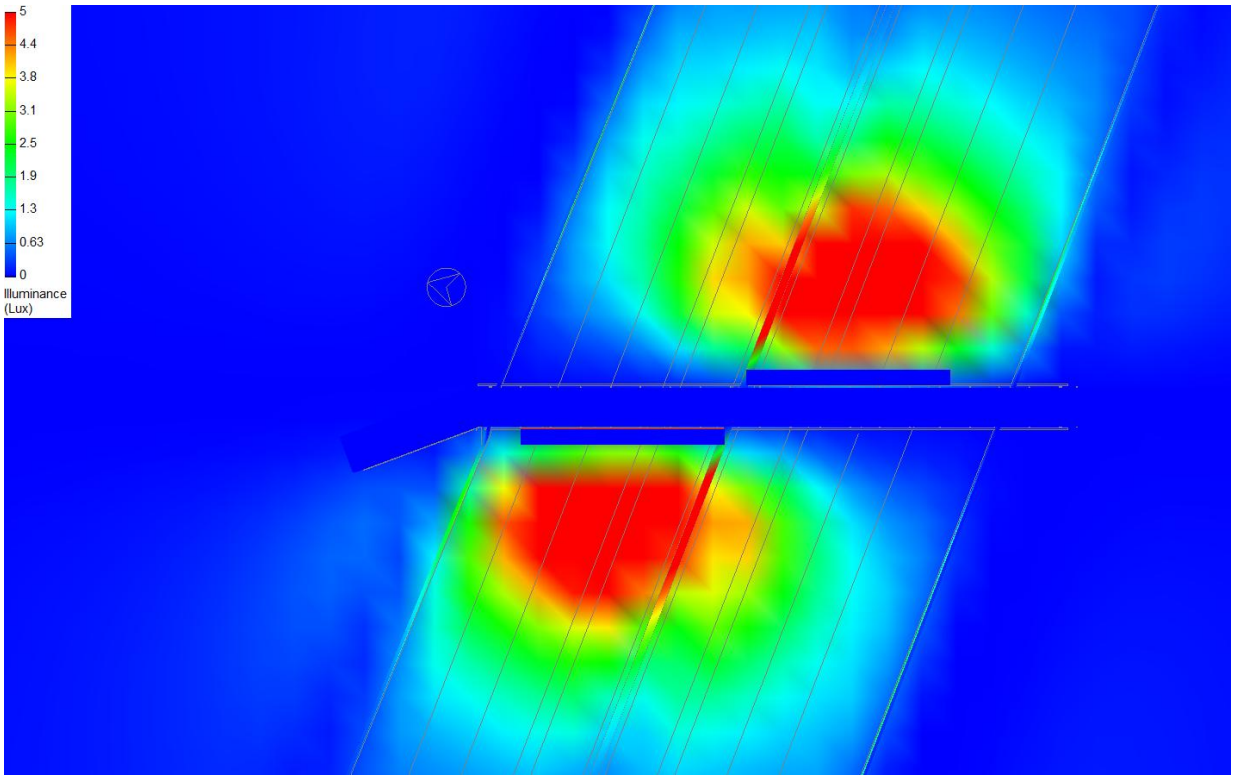
Item Number	Recommended maximum values
1. Illuminance in vertical plane	1 lux (on windows to habitable rooms)
2. Luminous Intensity emitted by each luminaire	1000 cd
3. Threshold Increment	20% based on adaptation luminance of ≤0.25 cd/m2
4. Max Average Luminance	150 cd/m2
5. ULR	<50% + mitigate upward waste light

5.1 CALCULATION ASSUMPTIONS

A computer simulation was carried out to accurately depict the maximum values of illuminance, luminous intensity, threshold increment and ULR. A model replicating the existing conditions was created based on a desktop survey, drawings provided and Google Earth images. “IES” data received from the LED supplier was used to simulate the signs.

Lighting Calculations were carried out in AGI software with the following assumptions being made:

(a) Significant reduction in the luminous flux occurs during the life of the lamp, primarily as a result of a gradual depreciation in light output and an accumulation of dirt on the transmitting or reflecting surfaces of the luminaires. But in order to replicate a brand-new installation a maintenance factor of 1 was assumed for the calculations. With time, the calculated results will keep decreasing.
(b) For the purpose of calculation, the area was considered free of trees, vehicles and any other obstructions. In real situation, the presence of obstructions will further reduce the illuminance levels.
(c) Calculations of Illuminance Vertical Plane were carried out on all surrounding properties. The calculation grids were inserted for 5m x 2m spacing and for 10m height.
(d) All calculations are subject to accuracies and tolerances nominated in Australian and New Zealand Standards AS/NZS 3827.1:1998 and AS/NZS 3827.2:1998.
(e) The image displayed on the advertising sigh would reduce the maximum calculations by 30% (depending on the colour), which is industry standard. The calculations model a worst-case scenario featuring a fully white front vinyl.
(f) The calculations have been carried out at night-time curfewed hours operating levels, consistent with Section 4.3 of this report.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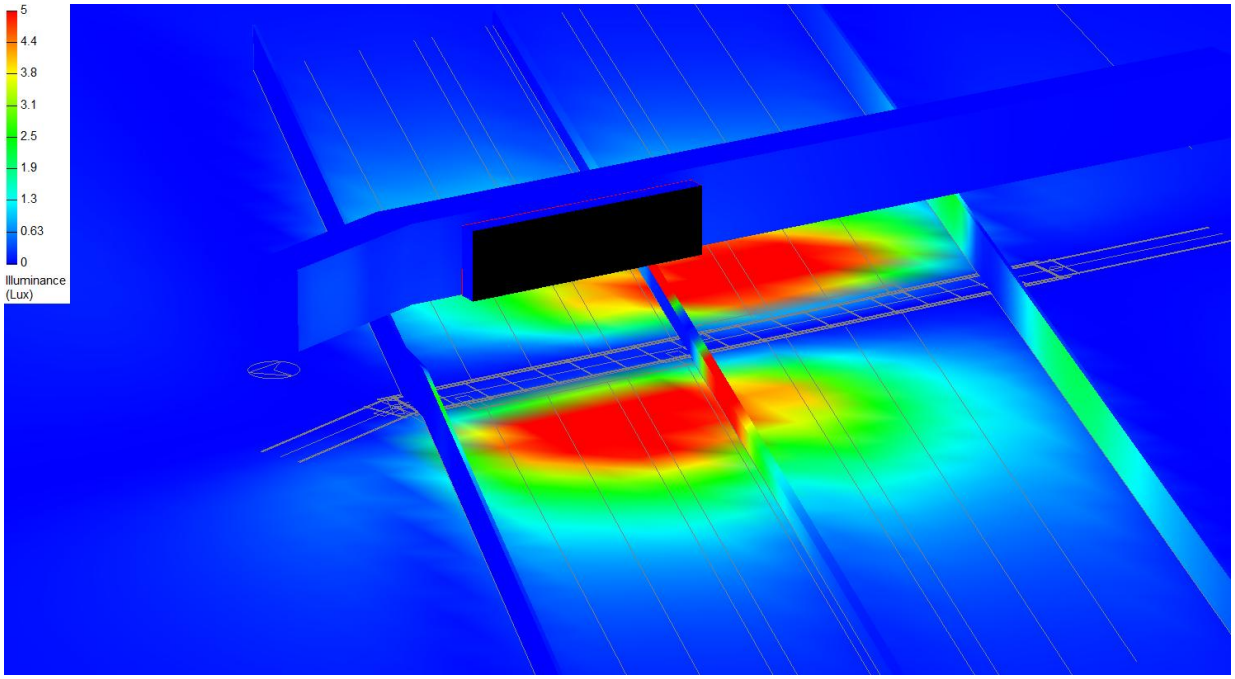
4.4
3.8
3.1
2.5
1.9
1.3
0.63
0
Illuminance
(Lux)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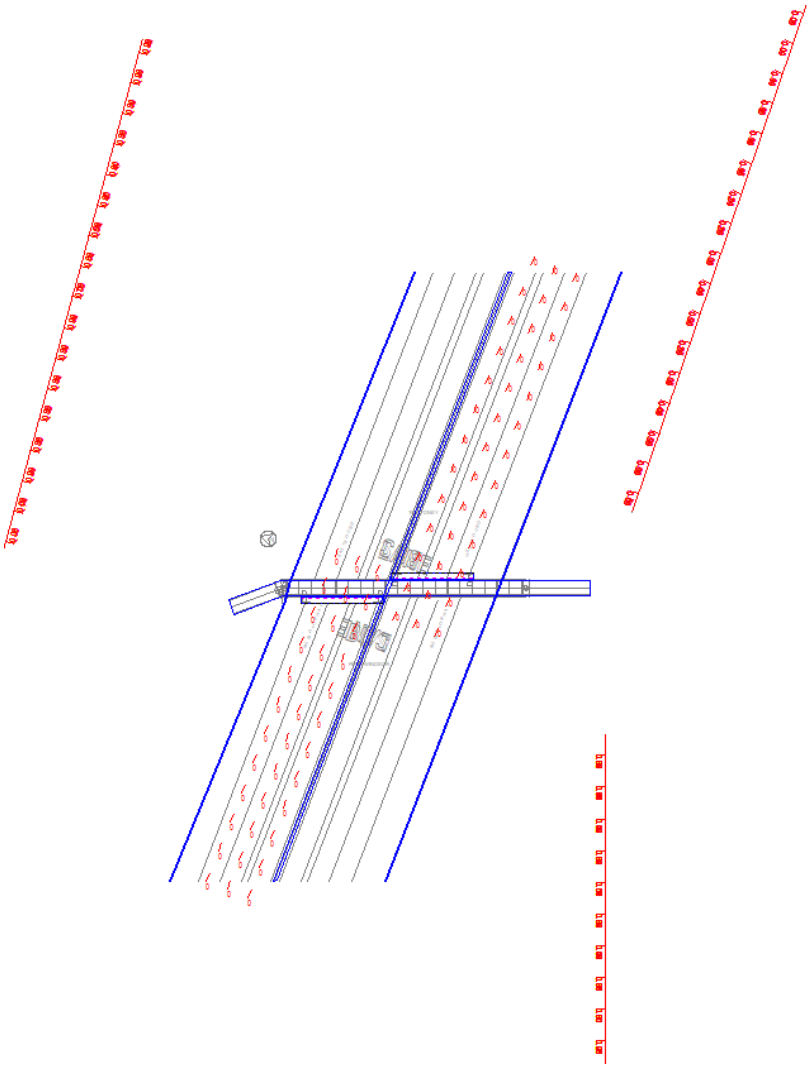
Illuminance
(Lux)



Obtrusive Light - Compliance Report

AS/NZS 4282:2023, A2 - Low District Brightness, Curfew
Filename: S742B KENT ST SIGNAGES
13-06-2025 16:05:05

Illuminance

Maximum Allowable Value: 1 Lux

Calculations Tested (3):

Calculation Label	Test Results	Max. Illum.
OL North Residences_Ill_Seg1	PASS	0.94
OL South Residences_Ill_Seg1	PASS	0.84
OL Epping Heights Public School_Ill_Seg1	PASS	0.79

Luminous Intensity (Cd) At Vertical Planes

Maximum Allowable Value: 1000 Cd

Calculations Tested (3):

Calculation Label	Test Results
OL North Residences_Cd_Seg1	PASS
OL South Residences_Cd_Seg1	PASS
OL Epping Heights Public School_Cd_Seg1	PASS

Threshold Increment (TI)

Maximum Allowable Value: 20 %

Calculations Tested (4):

Calculation Label	Adaptation Luminance	Test Results
TI Westbound	0.2	PASS
TI Eastbound	0.2	PASS
TI Eastbound Bus Lane	0.2	PASS
TI Westbound Bus Lane	0.2	PASS

5.2 ILLUMINANCE COMPLIANCE

Lux levels were calculated for the following locations. Therefore, as none of the calculations in the vicinity of the signs recorded values greater than 1 lux (applicable for residential windows), the illuminance levels comply with AS4282.

Calculation Location	Maximum Calculated Illuminance	Compliance
Epping Heights Public School	0.79 lux	✓
South Residences	0.84 lux	✓
North Residences	0.94 lux	✓

5.3 LUMINOUS INTENSITY COMPLIANCE

Intensity levels were calculated for the following locations. Therefore, as none of the calculations in the vicinity of the signs recorded values greater than 1000 cd, the luminous intensity levels comply with AS4282.

Calculation Location	Maximum Calculated Intensity	Compliance
Epping Heights Public School	55 cd	✓
South Residences	24 cd	✓
North Residences	17 cd	✓

5.4 THRESHOLD INCREMENT COMPLIANCE

Threshold increment was calculated for each lane, in each direction. Therefore, as none of the calculated values are greater than 20%, the threshold increment complies with AS4282. There would be no adverse impact to road users, specifically excessive glare.

Calculation Location	Maximum Threshold Increment	Compliance
Eastbound	2 %	✓
Eastbound Bus Lane	3 %	✓
Westbound	2 %	✓
Westbound Bus Lane	3 %	✓

5.5 MAX AVERAGE LUMINANCE COMPLIANCE

At night-time curfewed hours, the sign will be dimmed to 45% of its maximum brightness and will operate at 57 cd/sqm. As can be seen from the requirements, the luminance levels comply with AS4282.

5.6 UPWARD LIGHT RATIO COMPLIANCE

As can be seen from the calculations, the maximum ULR is slightly above 50%, but this data if from the raw ies file used in the software. Since the LED modules are setback 800mm from the front of the signs, the max ULR levels comply with AS4282.

Maximum UWLR	Compliance
50.9%	✓

As can be seen sections 5.2, 5.3, 5.4, 5.5 & 5.6 of this report; the maximum Illuminance, intensity, threshold increment, average luminance & ULR; all comply with the requirements of AS4282 for curfewed hours in residential surrounding.

6 SITE ZONING AS PER STATE ENVIRONMENTAL PLANNING POLICY NO. 64

The NSW Department of Planning guidelines that specifically addresses the signage lighting requirement and referenced in this report, is: State Environmental Planning Policy No. 64 – Advertising and Signage (SEPP 64) and supported by the Transport Corridor Outdoor Advertising and Signage Guidelines (the Guidelines). With the provisions now contained within Chapter 3 and Schedule 5.7 of SEPP Industry & Employment – 2021

The guideline outlines best practice for the planning and design of outdoor advertisements in transport corridors such as along or adjacent to classified roads, freeways, tollways, transitways, railway corridors or on bridges or road and rail overpasses.

All internally & externally illuminated signs should comply with the requirement in regard to the maximum allowable luminance / brightness of its surface.

An illuminated sign refers to any sign illuminated by an artificial source. Illuminated sign include variable message sign, video and/or animated sign and any conventional billboard illuminated by fluorescent and/or incandescent bulbs.

The general design guideline of sign state that:

Illumination of advertisements must not result in unacceptable glare or reduce safety for pedestrians, vehicles or aircraft. Illumination of advertisements must not cause light spillage into nearby residential properties, national parks or nature reserves.

The guideline identifies 4 different zones based on amount of off-street lighting levels.

Zone 1 - covers areas with generally very high off-street ambient lighting, e.g. display centres similar to Kings Cross, central city locations

Zone 2 - covers areas with generally high off-street ambient lighting eg. Some major shopping/commercial centres with a significant number of off-street illuminated advertising devices and lights.

Zone 3 - covers areas with generally medium off-street ambient lighting e.g. small to medium shopping/ commercial centres.

Zone 4 - covers areas with generally low levels of off-street ambient lighting e.g. most rural areas, many residential areas.

Based on the site study and descriptions in SEPP 64; the signs which are located over M2, on the footbridge via Kent Street can be classified to lie in a **Zone 4** area which covers areas with generally low levels off-street ambient lighting.

SEPP64 has now been repealed by the NSW government. But the maximum luminance will still be complied with for this location.

6.1 COMPLIANCE OF PROPOSED SIGNS WITH SEPP 64

Table 6 below; from the guidelines; specifically addresses the maximum luminance levels of signs at various times of the day.

Table 6: LUMINANCE LEVELS FOR ADVERTISEMENTS			
LUMINANCE LEVELS – **Luminance** means the objective brightness of a surface as measured by a photometer, expressed in candelas per square meter. Luminance levels should comply with the following levels:			
Lighting Condition	**Zone 1**	**Zones 2 and 3**	**Zone 4**
Full Sun on Face of Signage	No Limit	No Limit	No Limit
Daytime Luminance		6000 cd/sqm	6000 cd/sqm
Morning and Evening Twilight and Inclement Weather	700 cd/sqm	700 cd/sqm	500 cd/sqm
Night Time	350 cd/sqm	350 cd/sqm	200 cd/sqm

6.2 PROPOSED LUMINANCE AND ADJUSTMENTS

The proposed signs have a maximum brightness (luminance) of 130 cd/sqm. At night the signs shall be programmed to achieve the maximum yield as nominated below, in accordance with the Zone 4 requirement.

Lighting Condition	**Maximum Dimming Level**	**Maximum Luminance**	**Compliance**
Night Time	45%	57 cd/sqm	✓

The dimming level directly corresponds with the luminance level based on a linear curve.

As can be seen from Section 4 of this report, and the tables above; the proposed sign complies with the requirements as it has enough inbuilt control to change the luminance levels based on the ambient light levels.

7 SUMMARY & CONCLUSION

7.1 SIGNAGE

The signs are is proposed to operate at the luminance levels shown in Section 4.3 and Section 6.2.

Further to the calculations and data received from the LED module supplier, the following assessment can be confirmed for the proposed backlit advertising signs, which are located over M2, on the footbridge via Kent Street.

The proposed signage complies with the requirements of AS4282 – refer Section 5 of this report. The proposed signs will not have any adverse impact on the surrounding properties or the road users.

The proposed signage will have a maximum luminance of 57 cd/m^2 during the night. This is within the maximum allowable luminance of 150 cd/m^2 as per AS4282 and also within the maximum allowable luminance of 200 cd/m^2 as per SEPP 64 (which is now SEPP Industry & Employment – 2021).

7.2 MITIGATION

In case of a failure of the drivers; the signs shall be capable of being programmed such that the module are switched off completely.

As another measure of mitigation, the sign shall be tested during the first 6 months of continued operation to confirm compliance with luminance levels as provided in this report. The supplier shall allow for fine tuning and reduction of luminance levels as may be required.