



SOUTHBANK MAJOR PUBLIC ART COMMISSION

LIGHTING IMPACT ASSESSMENT REPORT

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BRISBANE CANBERRA GOLD COAST MELBOURNE NEWCASTLE SUNSHINE COAST SYDNEY NEW ZEALAND

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1. EXECUTIVE SUMMARY

The proposed lighting arrangement was modelled in AGI32, with various luminance and illuminance calculations undertaken along adjacent properties and roadways. The calculations for the proposed installation were completed linear LED fittings with an average output of 300lm/m to represent the neon tubes for illumination calculations. The actual average is estimated to be 291 lm/m. The peak level of 758 lm/m is used for the luminance calculations.

The key findings from the calculations are detailed below:

- Luminance levels obtained were well below the recommended levels and no further dimming is necessary.
- Illuminance levels at the residential properties are negligible and compliant with all relevant standards.
- The threshold increments calculations complied with all relevant standards.
- The proposed artwork conforms in full to the requirements of the existing Melbourne Planning Scheme Clause 15.01-1L-02.

2. INTRODUCTION

Webb Australia Group has been engaged to provide a lighting impact assessment for the proposed new artwork on Dodds St to be installed on the roof of the University of Melbourne Stables building. The works include a 83.5m x 2m neon installation facing west. It will be switched off between the hours of 11pm and 6am according to City of Melbourne policy. This report has been prepared to assess the compliance of the proposed works with the following documents:

- AS/NZS 4282:2023 Control of the Obtrusive Effects of Outdoor Lighting
- Department of Transport and Planning Requirements and Guidelines for Illuminated Outdoor Advertising Signage 4th October 2023 (DTP Guidelines)
- Melbourne Planning Scheme – Clause 15.01-1L-02 Signs

The following guidelines will also be considered within this report:

- Australian Standard 4282:2019. Control of the obtrusive effects of outdoor lighting
- City of Melbourne Lighting Strategy 2021
- City of Melbourne Lighting Guidelines
- Australian Standards AS/NZS 1158.3.1:2020
- VicRoads TCG 006: Guidelines to Street Lighting Design
- Melbourne Planning Scheme – Clause 15.03 – Heritage

Document findings in report format to support permit application requirements.

Recommendations for mitigation to ensure allowable levels are not exceeded are provided.

Programming parameters are provided to inform luminance levels and operating times.

2.1 METHODOLOGY

The assessment methodology involves 3D modelling of the lighting impacts within the lighting program AGI32 version 22.1.0.043 to enable the detailed and complex calculations required.

This involved:

- Collation of data through site survey and previous design experience in Dodds Street.
- Modelling of the lighting impacts based on design detail provided by the project team and Artist. The final neon colours have not been selected so a conservative output allowing for the brighter colours will be used.
- The luminance and illuminance levels at property boundaries and particularly at windows of surrounding buildings has been modelled. The effects of adjacent buildings blocking light to buildings in the distance will be considered.

3. LIGHTING BASICS

To assist with understanding the lighting terminology, the following section details information about lighting parameters that are applicable to this report.

Luminous Flux (lm) - 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. The standard unit is lumens (lm).

Illuminance (lx) - 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 reflectance of various objects from which light is reflected. The standard unit is lux (lx).

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

Luminance & Brightness (cd/m²) - 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/m². (Non-Standard term is nits).

Glare - 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. Some effects of glare are:

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

Veiling Luminance - A measure of disability glare. It is the luminance superimposed over the eye's internal retinal image that is produced by stray light within the eye.

Veiling luminance is caused by glare sources in the observer's field of view. Illuminated signage operating at night is an example of a glare source that can cause veiling luminance to drivers.

Veiling luminance to the observer is dependent on the size, orientation, location and luminance of the glare source with respect to the observer's view.

Threshold Increment - the measure of disability glare 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. TI is used to quantify disability glare—a form of glare that affects vision without necessarily causing discomfort.

Note: Higher values of TI correspond to greater disability glare.

4. PROPOSED DETAILED DESCRIPTION

4.1 ELEVATION

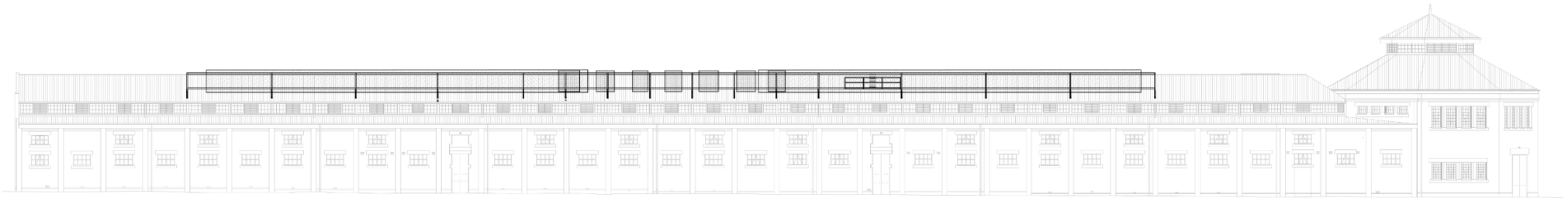


Figure 1: Elevation from Dodds Street

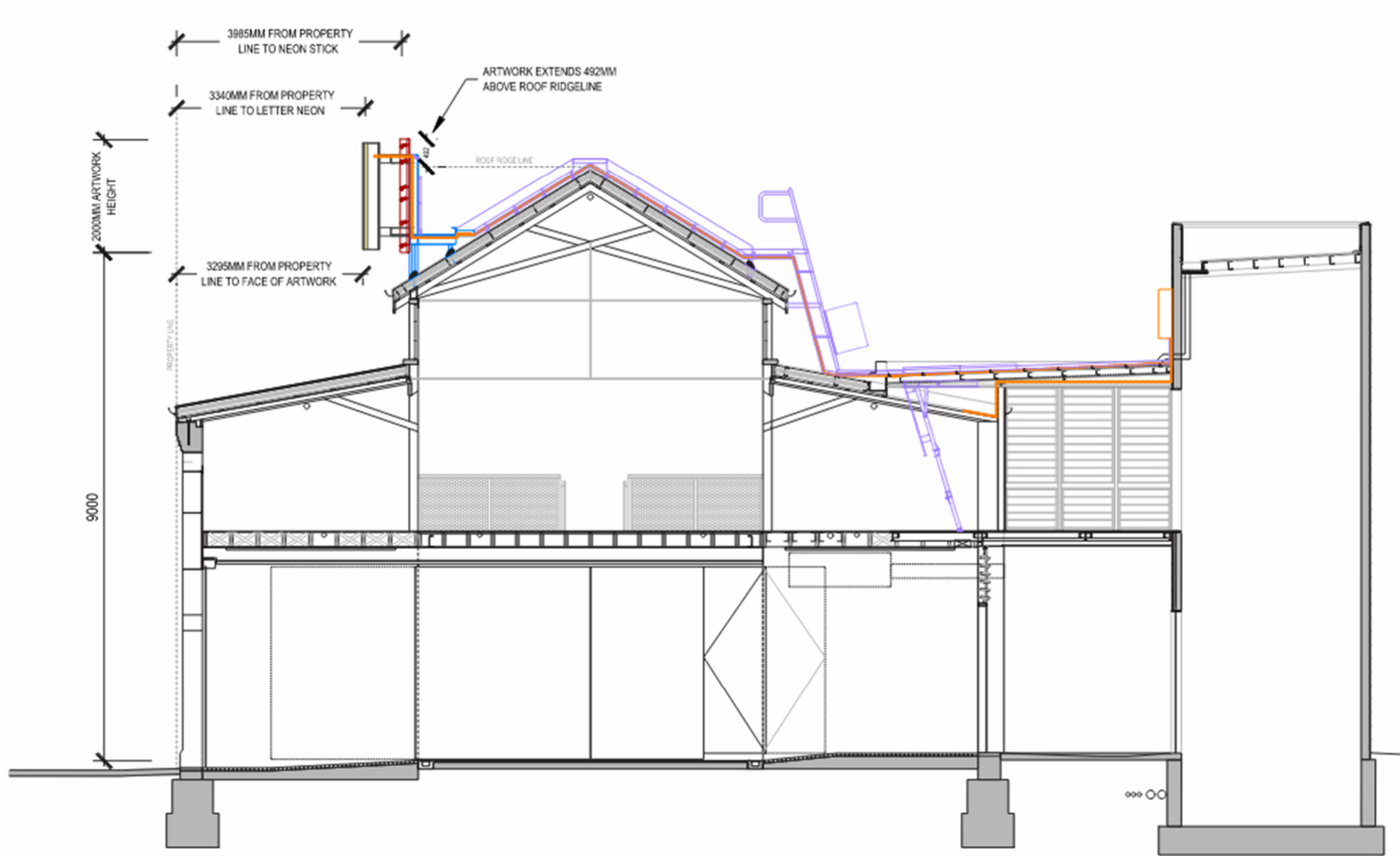


Figure 2: Section Through Artwork with dimensions

4.2 COLD CATHODE (NEON) PARAMETERS

In this installation the lead glass tubes will be 12mm diameter and operated at 25mA. The peak lumen output used for the luminance calculations is Emerald Green at 758 lumens per meter. The average lumen output assuming all colours are used equally is 291 lm/m. 300 lm/m was assumed for the illuminance calculations.

Lumen per meter data for the chosen colours is provided in the table following:

Colour No.	Colour Description	Lumen Output at 25mA (lm/m)
13A	Light Blue	226
14A	Standard Blue	145
15A	Brilliant Blue	150
16A	Midnight Blue	34
19A	Purple Haze	110
29A	Bright Pink	153
32A	Ruby Neon	49
34A	Argon Red	80
35A	Turquoise	502
36A	Aquamarine	491
39A	Golden Yellow	206
42A	Standard Green	525
43A	Emerald Green	758
45A	Lime Green	404
M51A	Old Gold	340
49A	Brite Yellow	468

5. PLANNING POLICIES AND STANDARDS

Though this is an artwork, to be complete the requirements for illuminated signage were also considered as per the policies and standards below as the element is an illuminated structure:

- Department of Transport and Planning Requirements and Guidelines for Illuminated Outdoor Advertising Signage 4th October 2023 (DTP Guidelines)
- AS/NZS 4282:2023 Control of the Obtrusive Effects of Outdoor Lighting
- Melbourne Planning Scheme – Clause 15.01-1L-02 Signs (Draft – undergoing amendment process C395melb)

It should be noted that the artwork is not being used for advertising and therefore could be considered exempt from some of the elements of the Melbourne Planning Scheme.

5.1 ENVIRONMENTAL ZONING

AS/NZS 4282:2023 provides limits based on the environmental zones selected. Based on Table 3.1 of the standard, the environmental zone for the development was determined as A4 (high district brightness).

Table 3.1 — Environmental zones

Environmental zones	Ambient light conditions	Descriptions/ Examples
A0	Intrinsically dark	UNESCO Starlight Reserve. IDA: Dark Sky Parks, Reserves or Sanctuaries Major optical observatories Other accreditations for dark sky places for example astrotourism, heritage value, astronomical importance, wildlife/ecosystem protection Lighting for safe access may be required
A1	Dark	Relatively uninhabited rural areas (including terrestrial, marine, aquatic and coastal areas) Generally roadways without streetlighting through rural areas
A2	Low district brightness	Sparsely inhabited rural and semi-rural areas Generally roadways without streetlighting through suburban, rural or semi-rural areas other than intersections
A3	Medium district brightness	Suburban areas in towns and cities Generally roadways with streetlighting through suburban, rural or semi-rural areas
A4	High district brightness	Town and city centres and other commercial areas Residential areas abutting commercial areas Industrial and Port areas Transport Interchanges
TV	High district brightness	Vicinity of major sport and event stadiums during TV broadcasts
NOTE Zones A0 and A1 would normally have a minimum area of 50 ha.(0.5 km ²). There may be smaller environmentally sensitive areas.		

5.2 DEPARTMENT OF TRANSPORT AND PLANNING - REQUIREMENTS AND GUIDELINES FOR ILLUMINATED OUTDOOR ADVERTISING SIGNAGE (2023)

As this is an illuminated artwork these requirements do not require compliancy however for completeness conformance is provided.

This document dated 4 October 2023 sets out the requirements for illuminated outdoor advertising signage when it is visible from Transport Zone 2. Transport Zone 2 (TRZ2) refers to the principal road network, primarily major arterial roads.

Based on this guideline, the installation is classified as a Category A illuminated sign and is required to meet the following requirements:

	CATEGORY A MAXIMUM VALUES OF LIGHT TECHNICAL PARAMETERS			CATEGORY B MAXIMUM VALUES OF LIGHT TECHNICAL PARAMETERS		
Lighting Condition	Max Average Luminance (cd/m2)	Threshold Increment (Note 1)		Max Average Luminance (cd/m2)	Threshold Increment (Note 1)	
		Max %	Adaptation Luminance		Max %	Adaptation Luminance
Full sun on face of signage	No limit	-	-	No limit	-	-
Daytime luminance	6000	-	-	4000	-	-
Morning and evening twilight and overcast weather (Note 2)	700	-	-	400	-	-
Night Time - High District Brightness (Note 3)	350	20%	5	200	15%	5
Night Time - Medium District Brightness (Note 3)	250	20%	1	150	15%	1
Night Time - Low District Brightness (Note 3)	150	20%	0.25	Not Permitted	N/A	N/A

5.3 AS/NZS 4282:2023 - CONTROL OF THE OBTRUSIVE EFFECTS OF OUTDOOR LIGHTING

AS/NZS 4282:2023 provides guidelines for the design, installation, and operation of outdoor lighting to minimize its obtrusive impacts. This includes controlling light spill (light trespass), glare, and sky glow, which can affect nearby residents, road users, wildlife, and astronomical observations.

In relation to nearby residents, the standard refers to where light enters habitable rooms within dwellings, whereby a dwelling is defined as a *'building, or part thereof, in which people reside, especially during the hours of darkness, e.g. house, hotel, motel, hospital'*. The standard defines that obtrusive lighting calculations for habitable rooms are to be taken on the windows of dwelling and in the specific viewing direction of the lighting installation.

Under this definition, the adjacent buildings along Dodds Street are not applicable as they are now defined as dwellings, however, for completeness the calculations have been extended to these buildings to allow for the City of Melbourne to advise the expected effects to these buildings to the operators of these buildings.

The calculations completed for this standard solely consider the effects of the illuminated artwork and no other adjacent light sources (such as streetlighting) as recommended in the standard.

Table 3.2 of AS/NZS 4282:2023 provides the vertical illuminance (E_v) and threshold increment (TI) values that must be adhered to:

Table 3.2 — Light technical parameter limits

Zones	Maximum vertical illuminance (E_v) lux		Threshold increment (TI)		Upward Light Ratio
	Non-curfew	Curfew	Maximum TI %	Default Adaptation level (L_{ad}) cd/m ²	Maximum ULR _S or ULR _L
A0	0 ^a	0.0	N/A	N/A	0.00
A1	2	0.1	20	0.1	0.00
A2	5	1	20	0.2 ^b	0.01
A3	10	2	20	1	0.02
A4	25	5	20	5	0.03
TV	N/A	N/A	20	10	0.08

^a For A0, E_v shall be as close to zero as practicable without impacting safety considerations.
^b For an internally illuminated sign in a A2 zone, $L_{ad} \leq 0.25$ cd/m²

The threshold increment value defined in AS/NZS 4282:2023 is the same as the Department of Transport guideline (maximum 20%).

For illuminated signs, the Maximum Upward Light Ratio (UWLR) is defined by **Clause 3.3.3.4** of the standard as below:

3.3.3.4 Control of upward waste light

The upward light impact of lighting included under [Clause 3.3.3](#) shall be assessed as individual items as follows:

- (a) Internally illuminated signs and other internally illuminated objects shall have a ULR_L of ≤ 0.50 .

The luminous intensity is more commonly understood as the brightness of the luminaire and must meet the requirements defined in **Table 3.3** below:

Table 3.3 — Maximum luminous intensities per luminaire

Zone	Luminous intensity (I), cd		
	Non-curfew Level 1 (L1)	Non-curfew Level 2 (L2)	Curfew
A0	See Note	See Note	0
A1	2 500	5 000	500
A2	7 500	12 500	1 000
A3	12 500	25 000	2 500
A4	25 000	50 000	2 500
TV	100 000	165 000	0

NOTE For A0, I shall be as close to zero as practicable without impacting safety considerations.

5.4 MELBOURNE PLANNING SCHEME - CLAUSE 15.01-1L-02

Clause 15.01-1L-02 of the Melbourne Planning Scheme details requirements for signage. It is understood that the planning scheme with regard to signage is being reviewed however a completed draft was not available at this time. This is an illuminated artwork so is considered under this requirement.

The following requirements are detailed in the standard:

General Strategies

Discourage signs that obscure architectural features of buildings, including windows.

Design signs to integrate with the:

Surrounds, including responding to views of the sign from all angles.

Architectural form and design of the subject building.

Supporting structure, including hiding cabling.

Encourage wall or fascia signs that are applied directly to the building or on a flush mounted panel with minimum projection.

Encourage signs that adopt an integrated approach to the provision of signage on buildings with more than one occupancy.

Ensure signs do not interrupt important views and vistas along roads leading to and out of the Central City.

Discourage promotion, panel and sky signs.

Encourage signs where illumination is concealed within, or integral to the sign through use of neon or an internally lit box or by sensitively designed external spot-lighting.

Encourage signs (including their support structure) to allow adequate clearance for the servicing requirements of streets and lanes.

Encourage the retention of signs that are attached to or form part of a building (including painted signs) and that contribute to the cultural heritage significance of a place.

Ensure signs that advertise gaming in the Mixed-Use Zone, Public Use Zone, Public Park and Recreational Zone, Commercial Zones, Industrial Zones, Docklands Zone and Schedule 5 to the Capital City Zone are not the dominant feature of any building where a gaming venue is located.

6. CALCULATIONS & RESULTS

The proposed installation was modelled in AGI 32 with all neon tubes represented using linear LED fittings with an output of 300lm/m. Only buildings that can view the lighting installation were considered as part of the calculations and obstructed buildings were exempt (e.g. lighting from the artwork is blocked from the ABC building by the Southbank theatre and the VCA Performing Arts Buildings).

Appendix A displays all locations where calculations were completed.

The calculated results are displayed below:

Obtrusive Light - Compliance Report

AS/NZS 4282:2023, A4 - High District Brightness, Non-Curfew L1 Filename: P125C_cal
18/08/2025 1:24:09 PM RPH

Illuminance

Maximum Allowable Value: 25 Lux

Calculations Tested (8):

Calculation Label	Results	Illum.
Somerton Apartments_III_Seg1	PASS	0.00
Melbournian Apartments_III_Seg1	PASS	0.00
Australia 108_III_Seg1	PASS	0.00
VCA Gallery_III_Seg1	N/A	5.4
VCA performing Arts Lower Set Back Windows	N/A	25.0
VCA Perf Arts Higher Windows_III_Seg1	N/A	32.7
Melbourne Recital Centre Window_III_Seg1	N/A	9.7
Sutherland Aprtments_III_Seg1	PASS	0.00

Luminous Intensity (Cd) At Vertical Planes

Maximum Allowable Value: 25000 Cd

Calculations Tested (8):

Somerton Apartments_Cd_Seg1	PASS
Melbournian Apartments_Cd_Seg1	PASS
Australia 108_Cd_Seg1	PASS
VCA Gallery_Cd_Seg1	PASS
VCA performing Arts Lower Set Back Windows	PASS
VCA Perf Arts Higher Windows_Cd_Seg1	PASS
Melbourne recital Centre Window_Cd_Seg1	PASS
Sutherland Aprtments_Cd_Seg1	PASS

Threshold Increment (TI)

Maximum Allowable Value: 20 %

Calculations Tested (2):

Calculation Label	Luminance	Results
Dodds Road	1	PASS
Dodds Road (facing North)	1	PASS

Note: File modified to replace non-residential buildings with N/A.

The calculated results are much lower than maximum values specified in AS/NZS 4282:2023 for all residential properties (dwellings). The proposed lighting arrangement also complied with these standards along the non-residential properties immediately facing the artwork along Dodds Street except at the windows of the VCA Performing Arts Building (Drama School). Note: the standard does not apply to non-residential buildings.

Additionally, the proposed works conform in full to the requirements of the existing Melbourne Planning Scheme Clause 15.01-1L-02.

7. CONCLUSIONS

The proposed lighting arrangement was modelled in AGI32, with luminance and illuminance calculations undertaken.

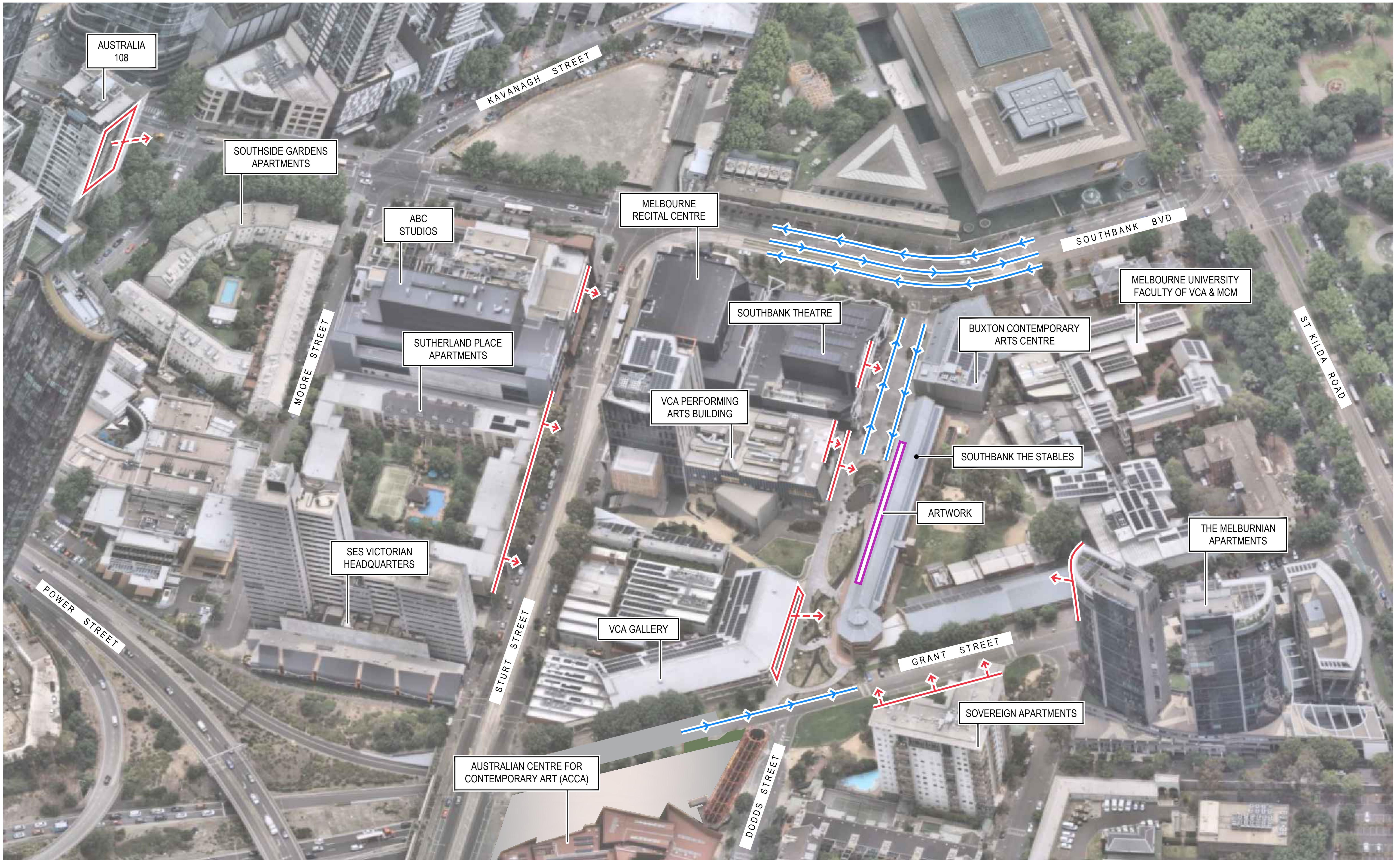
Cold cathode (neon) tubing has a relatively low brightness level at full output compared to typical LED signs. The calculations found that the luminance levels obtained were well below the recommended levels and no further dimming is necessary.

The illuminance levels at the residential properties found that the illuminance levels would be negligible and compliant with all relevant standards.

The properties within Dodd Street are not considered dwellings and consequently do not have to comply with the vertical illuminance requirements of AS/NZS 4282:2023. However, all buildings did comply to these standards except for the VCA Performing Arts which had a calculated vertical illuminance greater than the 25-lx recommended in the standard.

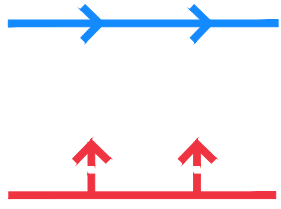
The proposed works conforms in full to the requirements of the existing Melbourne Planning Scheme Clause 15.01-1L-02.

8. APPENDIX A – LIGHTING CALCULATIONS LOCATION PLAN



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 LIGHTING IMPACT STUDY
 LOCATION PLAN – LIGHTING CALCULATIONS
 P125C L-001 Rev-01 21.08.25



ROAD THRESHOLD INCREMENT CALCULATIONS

VERTICAL LUMINANCE AND ILLUMINANCE CALCULATIONS
 AT PROPERTY WINDOWS

