

JCDecaux

LIGHTING IMPACT ASSESSMENT -

OUTDOOR SIGNAGE AT CHURCH ST BRIDGE, HUNTERS HILL, NSW

3rd September 2019
Ref: 1096.78

Lighting Impact Assessment Outdoor Signage at Church St Bridge, Hunters Hill, NSW

DATE	REV	COMMENT	PREPARED BY	CHECKED BY
3/09/2019	REV B	For Information	PB	RS

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1. INTRODUCTION

Electrolight have been appointed by JCDecaux to undertake a Lighting Impact Assessment on the proposed digital signage at Church St Bridge, Hunters Hill, NSW. The objective of the assessment is to report on compliance with the State Environmental Planning Policy No. 64 – Advertising and Signage (SEPP 64), NSW Transport Corridor Outdoor Advertising and Signage Guidelines, and AS4282-2019 Control of the Obtrusive Effects of Outdoor Lighting.

2. DEFINITIONS

2.1 Illuminance

The physical measure of illumination is illuminance. It is the luminous flux arriving at a surface divided by the area of the illuminated surface. Unit: lux (lx); 1 lx = 1 lm/m².

(a) Horizontal illuminance (E_h) The value of illuminance on a designated horizontal plane

(b) Vertical illuminance (E_v) The value of illuminance on a designated vertical plane

Where the vertical illuminance is considered in the situation of potentially obtrusive light at a property boundary it is referred to as environmental vertical illuminance (E_{ve}).

2.2 Luminance

The physical quantity corresponding to the brightness of a surface (e.g. a lamp, luminaire or reflecting material such as the road surface) when viewed from a specified direction. SI Unit: candela per square metre (cd/m²) – also referred to as “nits”.

2.3 Luminous Intensity

The concentration of luminous flux emitted in a specified direction. Unit: candela (cd).

2.4 Obtrusive Light

Spill Light which, because of quantitative, directional or spectral attributes in a given context, gives rise to annoyance, discomfort, distraction or a reduction in the ability to see essential information.

2.5 Threshold Increment

The measure of disability glare expressed as the percentage increase in contrast required between a standard object and its background (the carriageway) for it to be seen equally as well with the source of glare present as with it absent, derived in the specified manner. This metric is directly related to Veiling Luminance.

NOTE: The required value is a maximum for compliance of the lighting scheme.

2.6 AGI32 Light Simulation Software

AGI32 (by U.S. company Lighting Analysts) is an industry standard lighting simulation software package that can accurately model and predict the amount of light reaching a designated surface or workplane. AGI32 has been independently tested against the International Commission On Illumination (CIE) benchmark, CIE 171:2006, Test Cases to Assess the Accuracy of Lighting Computer Programs.

2.7 Upward Light Ratio (ULR)

The ratio between the luminous flux emitted above the horizontal plane to the total flux emitted by a light source. The ULR is used as a measure to limit direct spill light to the sky.

3. SITE DESCRIPTION AND SCOPE

The proposed digital signage is located at Church St Bridge, Hunters Hill. The signage consists of a digital screen facing the southbound traffic on Burns Bay Rd (Sign 1), and a digital screen facing the northbound traffic on Burns Bay Rd (Sign 2). Each screen has a total active display (illuminated) area of 39.94 m². The digital signage is to be in 24 hour operation. Refer Appendix A for proposed signage location plan and elevations.

The proposed digital signage is illuminated using LEDs installed within the front face. The brightness of the LEDs shall be controlled to provide upper and lower thresholds as required as well as automatically via a local light sensor to adjust to ambient lighting conditions.

For the purpose of this report the proposed manufacturer of the digital signage is noted as Daktronics, model type DVX-2801-10MN-6000-WC with performance parameters as outlined in Appendix B. The signage includes baffles which mitigate upward waste light, resulting in an Upward Light Ratio (ULR) of less than 50%. Alternative digital sign manufacturers may be used for this installation as long as they have equivalent lighting and performance characteristics and are commissioned as described in this report.

4. DESIGN GUIDELINES AND STANDARDS

The Lighting Impact Assessment will review the proposed digital signage against the following Criteria, Design Guidelines and Standards.

- State Environmental Planning Policy No. 64 – Advertising & Signage SEPP 64 (Refer Appendix C).
- Transport Corridor Outdoor Advertising & Signage Guidelines 2017
- AS 4282-2019 Control of the Obtrusive Effects of Outdoor Lighting.

5. LUMINANCE ASSESSMENT

The maximum permissible night time luminance of the signage is determined by the existing lighting environment of its surroundings. AS4282 outlines maximum average luminances for different Environmental Zones as shown in Table 1 below:

TABLE 1 - MAXIMUM NIGHT TIME AVERAGE LUMINANCE FOR SIGNAGE		
Environmental Zone	Description	Max Average Luminance (cd/m ²)
A4	High district brightness e.g. Town and city centres, commercial areas, and residential areas abutting commercial areas	350
A3	Medium district brightness e.g. suburban areas in towns and cities	250
A2	Low district brightness e.g. sparsely inhabited rural and semi-rural areas	150
A1	Dark e.g. relatively uninhabited rural areas. No Road Lighting	0.1
A0	Intrinsically Dark e.g. Major Optical Observatories. No Road Lighting	0.1

Note: Where the signage is viewed against a predominantly dark background (e.g. night sky) then the maximum applicable environmental zone is A2

Based on an assessment of the surrounding environment, the proposed signage is located within Environmental Zone A3 under AS4282, therefore the maximum night time luminance is 250 cd/m².

AS4282 does not include limits for daytime operation of illuminated signage. However, the Transport Corridor Outdoor Advertising & Signage Guidelines outlines maximum permissible luminance limits for various lighting conditions, including daytime. Under the Guidelines, the proposed signage is classified as being within Zone 3, which is described as an area with generally medium off-street ambient lighting, e.g. small to medium shopping/commercial centres. The maximum night time luminance of a digital signage within Zone 3 is 350 cd/m².

Luminance Assessment - Sign 1

Table 2 outlines the maximum luminance levels to comply with AS4282 and the Transport Corridor Outdoor Advertising & Signage Guidelines for the various lighting conditions listed below:

TABLE 2 - LUMINANCE LEVELS FOR DIGITAL ADVERTISEMENTS		
SIGN 1		
Lighting Condition	Max Permissible Luminance (cd/m ²) #	Compliant
Full Sun on face of Signage	No Limit	✓
Day Time Luminance (typical sunny day)	6000	✓
Morning and Evening Twilight and Overcast Weather	700	✓
Night time	100*	✓

The signage is to be dimmed on site to ensure the maximum luminance nominated above is not exceeded.

* The maximum permissible luminance allowable under AS4282 and the Transport Corridor Outdoor Advertising &

Signage Guidelines is actually 250cd/m2. The luminance limit shown above was derived as a result of the calculation and assessment in Section 5 and 6, to ensure compliance with other criteria of AS4282 and any additional lighting requirements as described in this report.

Luminance Assessment - Sign 2

Table 3 outlines the maximum luminance levels to comply with AS4282 and the Transport Corridor Outdoor Advertising & Signage Guidelines for the various lighting conditions listed below:

TABLE 3 - LUMINANCE LEVELS FOR DIGITAL ADVERTISEMENTS		
SIGN 2		
Lighting Condition	Max Permissible Luminance (cd/m2) #	Compliant
Full Sun on face of Signage	No Limit	✓
Day Time Luminance (typical sunny day)	6000	✓
Morning and Evening Twilight and Overcast Weather	700	✓
Night time	135*	✓

The signage is to be dimmed on site to ensure the maximum luminance nominated above is not exceeded.

* The maximum permissible luminance allowable under AS4282 and the Transport Corridor Outdoor Advertising & Signage Guidelines is actually 250cd/m2. The luminance limit shown above was derived as a result of the calculation and assessment in Section 5 and 6, to ensure compliance with other criteria of AS4282 and any additional lighting requirements as described in this report.

It is our opinion that a signage that is illuminated to the maximum luminances outlined above would be visually consistent with the existing ambient lighting and suitable for the local area. A more detailed night time lighting assessment is provided in Section 6.0.

6. AS4282 ASSESSMENT

The proposed signage has been assessed against AS 4282-2019 Control of the Obtrusive Effects of Outdoor Lighting as outlined in Section 4.

AS4282 provides limits for different obtrusive factors associated with dark hours (night time) operation of outdoor lighting systems. Two sets of limiting values for spill light are given based on whether the lighting is operating before a curfew (known as “pre-curfew” operation) or operating after a curfew (known as post-curfew or curfewed operation). Pre-curfew spill lighting limits are higher than post-curfew values, on the understanding that spill light is more obtrusive late at night when residents are trying to sleep. Under AS4282, the post-curfew period is taken to be between 11pm and 6am daily. As it is intended that the digital signage be illuminated all night, the assessment will review the proposed signage under the more stringent post-curfew limits.

Illuminance Assessment

The AS4282 assessment includes a review of nearby residential dwellings and calculation of the amount of illuminance (measured in Lux) that the properties are likely to receive from the signage during night time operation.

The acceptable level of illuminance will in part be determined by the night time lighting environment around the dwellings. AS4282 categorises the night time environment into different zones with maximum lighting limits as shown in Table 4 below:

TABLE 4 - MAXIMUM VALUES OF LIGHT TECHNICAL PARAMETERS			
Environmental Zone	Max Vertical Illuminance (lx)		Description
	Pre-curfew	Post-curfew	
A0	0	0	Intrinsically Dark e.g. Major Optical Observatories. No Road Lighting
A1	2	0.1	Dark e.g. relatively uninhabited rural areas. No Road Lighting
A2	5	1	Low district brightness e.g. sparsely inhabited rural and semi-rural areas
A3	10	2	Medium district brightness e.g. suburban areas in towns and cities
A4	25	5	High district brightness e.g. Town and city centres, commercial areas, and residential areas abutting commercial areas

Based on an assessment of the surrounding areas, the nearest dwellings with potential views to the signage are at the following locations:

Address	Zone	Address	Zone
6 Joubert St	A3	5 Church St	A3
8 Joubert St	A3	12 Church St	A3
10 Joubert St	A3	3 Durham St	A3
12 Joubert St	A3	5 Durham St	A3
14 Joubert St	A3	7 Durham St	A3
16 Joubert St	A3	19 Reiby Rd	A3
16A-16D Joubert St	A3	5 The Avenue	A3
18 Joubert St	A3	2 Avenue Rd	A3

As such, the dwellings above will form the focus of the illuminance assessment.

The proposed signage (and surrounding environment) was modelled in lighting calculation program AGI32 to determine the effect (if any) of the light spill from the proposed signage. Photometric data for the screen was based on a diffused light panel (approximating a lambertian emitter) with luminances corresponding to the night time limits outlined in Section 5. Appendix D shows the lighting model and the results of the calculations.

It should be noted that some of the houses are shielded by mature vegetation which effectively obstructs the spill light of the signage. However calculations were undertaken assuming there was no vegetation present as outlined in AS4282.

It can be seen from the lighting model that the maximum illuminance to dwellings in Zone A3 is 0.77 lux at 12 Church Street. This illuminance level complies with the maximum AS4282 limits outlined in Table 4.

Threshold Increment Assessment

The Threshold Increment was also calculated for the traffic approaches on Burns Bay Rd (northbound), Burns Bay Rd (northbound) off ramp, Burns Bay Rd (southbound), Burns Bay Rd (southbound) off ramp, Durham St (northbound), Joubert St (northbound), and Joubert St (southbound). The calculation grids were located at 1.5m above ground level, with an approach viewing distance of between 10 m to 200 m

from the sign. The calculation results show that the Threshold Increment does not exceed 19.21% for any traffic approach (the allowable maximum under the standard is 20%).

Luminous Intensity

The luminous intensity limits nominated in the standard are not applicable for internally illuminated signage.

It can therefore be seen that the proposed digital signage complies with all relevant requirements of AS 4282-2019 Control of the Obtrusive Effects of Outdoor Lighting.

Additional Requirements:

The signage operator must ensure that the average luminance difference between successive images does not exceed 30% to ensure compliance with AS4282. The dwell time shall be 10 seconds or greater.

7. SUMMARY

- Sign 1 of the proposed signage to be installed at Church St Bridge, Hunters Hill, shall be commissioned on site to yield the following maximum luminances:

LUMINANCE LEVELS FOR DIGITAL ADVERTISEMENTS (SIGN 1)		
Lighting Condition	Max Permissible Luminance (cd/m ²)	Compliant
Full Sun on face of Signage	No Limit	✓
Day Time Luminance (typical sunny day)	6000	✓
Morning and Evening Twilight and Overcast Weather	700	✓
Night Time	100	✓

- Sign 2 of the proposed signage to be installed at Church St Bridge, Hunters Hill, shall be commissioned on site to yield the following maximum luminances:

LUMINANCE LEVELS FOR DIGITAL ADVERTISEMENTS (SIGN 2)		
Lighting Condition	Max Permissible Luminance (cd/m ²)	Compliant
Full Sun on face of Signage	No Limit	✓
Day Time Luminance (typical sunny day)	6000	✓
Morning and Evening Twilight and Overcast Weather	700	✓
Night Time	135	✓

- The signage operator must ensure that the average luminance difference between successive images does not exceed 30% to ensure compliance with AS4282. The dwell time shall be 10 seconds or greater.
- The proposed signage has been found to comply with all relevant requirements of AS 4282-2019 Control of the Obtrusive Effects of Outdoor Lighting
- The proposed signage has been found to comply with all the relevant requirements of SEPP 64 Transport Corridor Outdoor Advertising & Signage Guidelines.
- In complying with the above requirements, the proposed signage should not result in unacceptable glare nor should it adversely impact the safety of pedestrians, residents or vehicular traffic. Additionally, the proposed signage should not cause any reduction in visual amenity to nearby residences or accommodation.

8. DESIGN CERTIFICATION

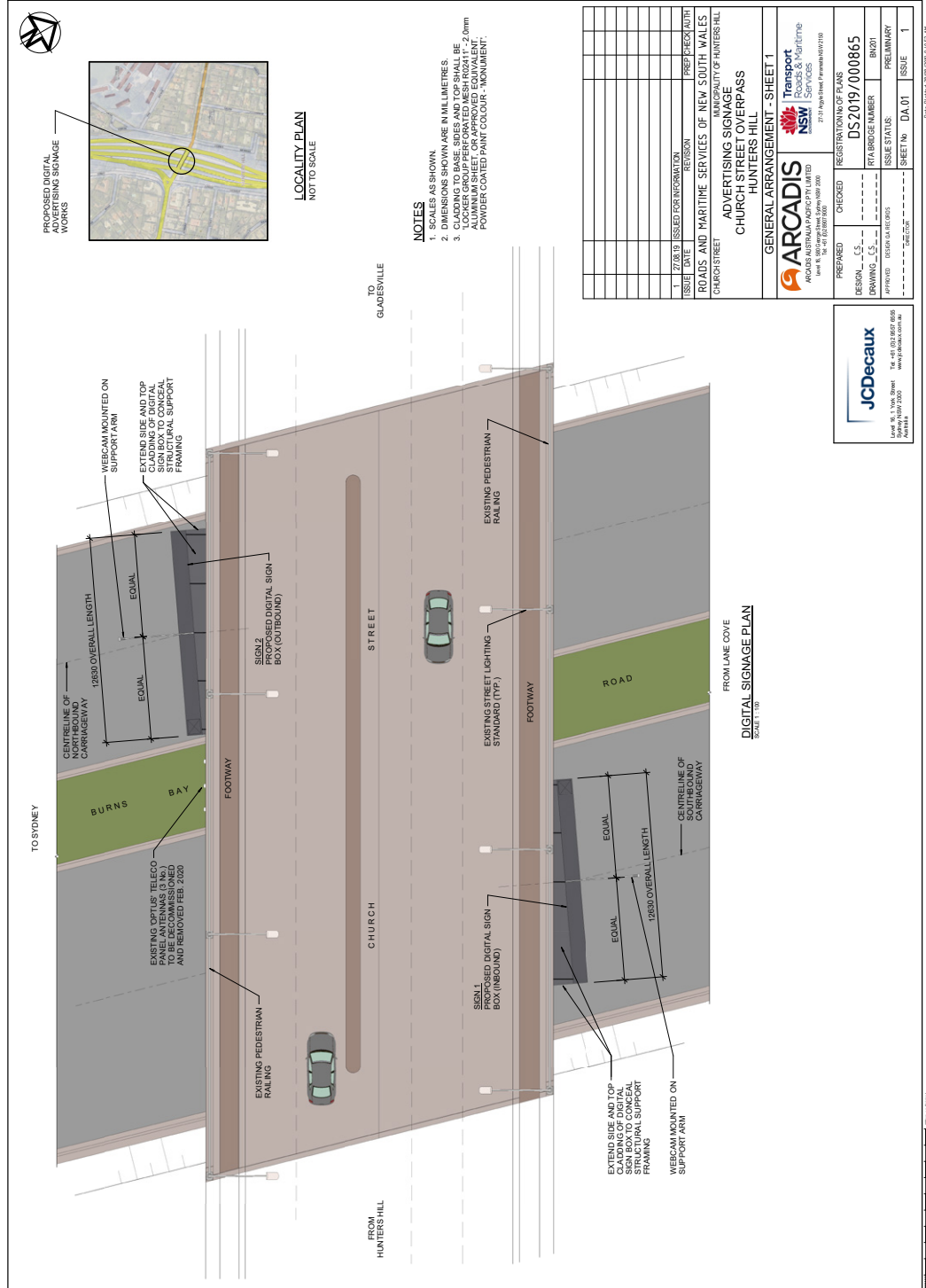
The signage proposed to be installed at Church St Bridge, Hunters Hill, NSW, if commissioned according to this report, complies with the following criteria, guidelines and standards:

- State Environmental Planning Policy No. 64 – Advertising & Signage SEPP 64 (Refer Appendix B).
- Transport Corridor Outdoor Advertising & Signage Guidelines 2017.
- AS 4282-2019 Control of the Obtrusive Effects of Outdoor Lighting.

A handwritten signature in black ink, appearing to read 'Ryan Shamier', with a long horizontal stroke extending to the right.

Ryan Shamier
Senior Lighting Designer
Electrolight Sydney
3/09/2019

APPENDIX A SIGNAGE LOCATION PLAN



- NOTES**
1. SCALES AS SHOWN
 2. DIMENSIONS SHOWN ARE IN MILLIMETRES.
 3. CLADDING TO BASE, SIDES AND TOP SHALL BE LOCKER GROUP PER OPERATED BEST PRACTICE. TOP AND SIDE CLADDING SHALL BE EXTERIOR GRADE POWDER COATED PAINT COLOUR - 'MONUMENT'.

ISSUE	DATE	ISSUED FOR INFORMATION	REVISION	PREP	DESIGN
1	27/02/19				
2					
3					
4					
5					
6					
7					
8					
9					
10					

ROADS AND MARITIME SERVICES OF NEW SOUTH WALES
 CHURCH STREET
 LOCALITY OF HUNTERS HILL
 HUNTERS HILL
GENERAL ARRANGEMENT - SHEET 1
ADVERTISING SIGNAGE
CHURCH STREET OVERPASS
HUNTERS HILL

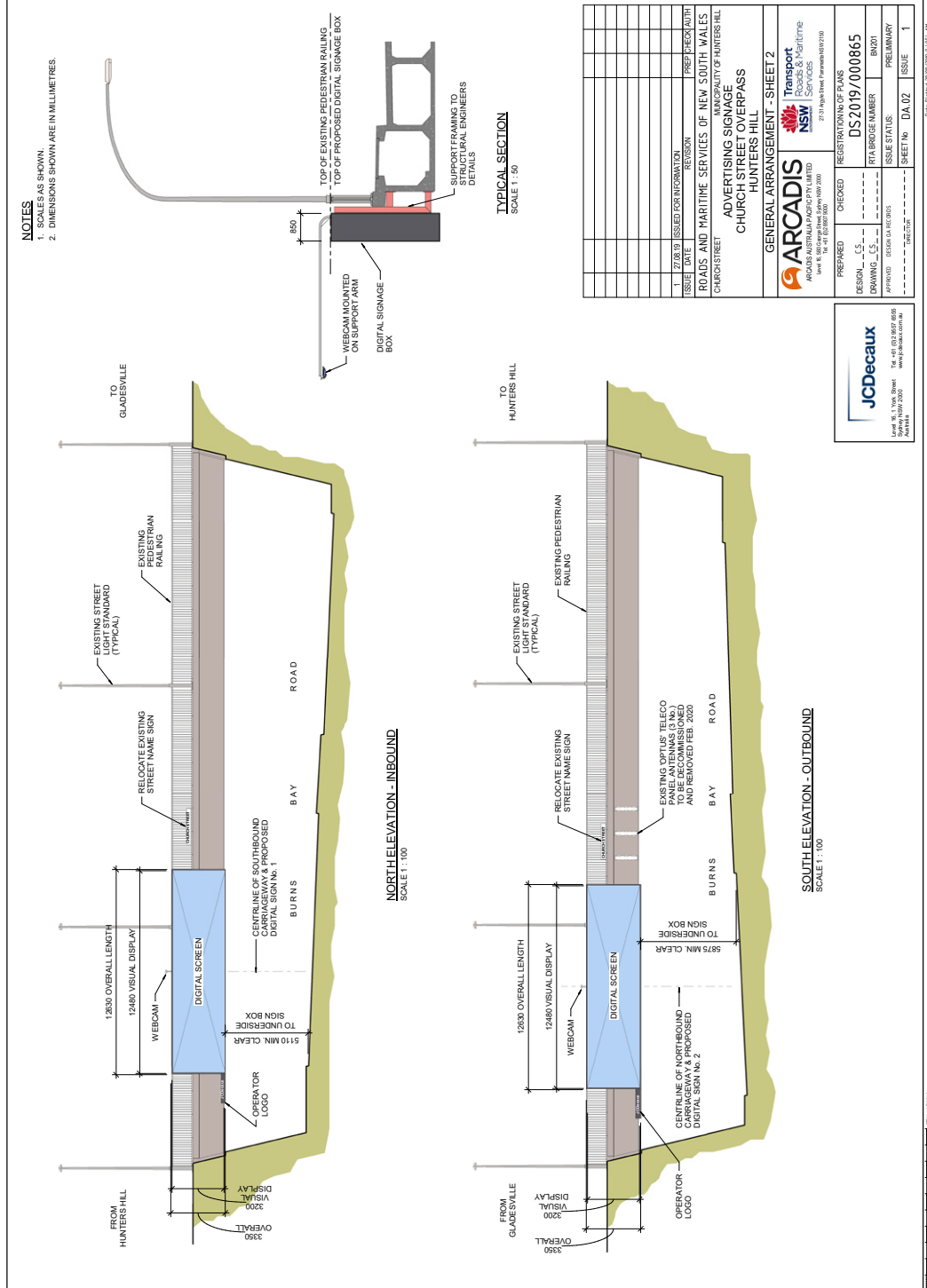
ARCADIS
 TRANSPORT & INFRASTRUCTURE
 ARCADIS AUSTRALIA PRACTICE LIMITED
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 Fax: +61 (0)2 9230 7001
 www.arcadis.com.au

DESIGN: CS
 DRAWING: CS
 APPROVED: CS
 PREPARED: CS
 CHECKED: CS
 REGISTERED NO OF PLANS: DS2019/000865
 RFA/BIDGE NUMBER: B201
 ISSUE STATUS: PRELIMINARY
 SHEET No: DA.01
 ISSUE: 1

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FROM LANE COVE
DIGITAL SIGNAGE PLAN
 SHEET 1 OF 6

APPENDIX A SIGNAGE LOCATION PLAN



APPENDIX B
DIGITAL SIGNAGE SPECIFICATION

DAKTRONICS PRODUCT SPECIFICATION

SERIES SPECIFICATION DVX-2801-10MN-6000-WC

Pixel Configuration	RGB 3-in-1 SMD
Line and Column Spacing	0.4 inches - 10.16 millimeters
Module Configuration - Pixels (RxC)	36 x 36 pixels
Module Dimensions (HxW)	14.4 x 14.4 inches - 365.76 x 365.76 mm
Maximum Power per Module ¹	67.6512 Watts
Average Power per Module ¹	16.913 Watts
Display Weight per Module ²	13 pounds - 5.9 kilograms
Processing	16 bit
Color Capacity	281 Trillion Colors
Dimming	100 levels
Color Temperature	3,000 ^o -10,000 ^o kelvin (adjustable)
Calibration	Pixel to Pixel
LED Refresh Rate	2400 hertz
LED Lifetime	100,000 hrs
Brightness - Typical Nits	6000 nits (cd/sm)
Horizontal Viewing Angle	160 ^o
Vertical Viewing Angle (Up/Down)	+15/-55 ^o
Contrast Ratio	1200:1
Service Access	Front or Rear
Cabinet Depth	4 inches - 101.6 millimeters
Cabinet Construction	Steel and Aluminum (corrosion resistant)
Ingress Protection Rating	IP-66 Rated Components
Working Temperature Rating ³	-40 ^o to 113 ^o F - -40 ^o to 45 ^o C
Ventilation	Fan, Vent Panel
Data Transmission to Display	Direct: Fiberoptic Cable Remote; Internet/Network (IP)

Note 1: Power draw varies depending on display ventilation.

Note 2: Display Weight per Module factors in cabinet, but not the structure.

Note 3: Temperature range is based on typical usage (100% daytime brightness, 50% content, 250W/m² solar, no wind).

Note 4: Ventilation solution may require external supplemental A/C in some areas of the world. Please consult your Daktronics representative regarding your area.

Note 5: Consistent with Daktronics policy of continuing product improvement, specifications shown on this document are subject to change without notice.

Note 6: See contract specific drawings for customized product weights

DISPLAY SPECIFICATION

DVX-2801-10MN-6000-WC-HC-288x1224-230V-LT-MR-CNTLRM

Active Screen Size (HxW)	9.6 feet x 40.8 feet - 2.93 meters x 12.44 meters
Active Screen Size (Square Dimensions)	391.68 square feet - 36.45 square meters
Number of Modules (HxW)	8 Modules x 34 Modules
Total Modules	272 Modules
Matrix Size (HxW)	288 pixels x 1224 pixels
Aspect Ratio	0.2353 (Reference - 16:9 = .5625 and 4:3 = .75)
Display Weight ⁶	3536 lb - 1604.8 kg
Display Weight per Square Dimension	9.03 lb/sq. ft - 44.03 kg/sq. m
Total Average Power Consumed	4600.336 Watts
Total Maximum Power Consumed	18401.13 Watts
Maximum Power Consumption per Square Dimension	47 W/sq. ft - 504.8W/sq. m
Current Draw	51.1 amps @ 208v 3P (3L - N - G) 76.7 amps @ 240v Split Phase (2L - N - G) 26.7 amps @ 230/400v 3P (3L - N - G)
Control Method	Rack Mount Control System

APPENDIX C

State Environmental Planning Policy No. 64 - Advertising and Signage

Schedule 1 Assessment criteria

(Clauses 8, 13 and 17)

1. Character of the area

- Is the proposal compatible with the existing or desired future character of the area or locality in which it is proposed to be located?
- Is the proposal consistent with a particular theme for outdoor advertising in the area or locality?

2. Special areas

- Does the proposal detract from the amenity or visual quality of any environmentally sensitive areas, heritage areas, natural or other conservation areas, open space areas, waterways, rural landscapes or residential areas?

3. Views and vistas

- Does the proposal obscure or compromise important views?
- Does the proposal dominate the skyline and reduce the quality of vistas?
- Does the proposal respect the viewing rights of other advertisers?
-

4. Streetscape, setting or landscape

- Is the scale, proportion and form of the proposal appropriate for the streetscape, setting or landscape?
- Does the proposal contribute to the visual interest of the streetscape, setting or landscape?
- Does the proposal reduce clutter by rationalising and simplifying existing advertising?
- Does the proposal screen unsightliness?
- Does the proposal protrude above buildings, structures or tree canopies in the area or locality?
- Does the proposal require ongoing vegetation management?

5. Site and building

- Is the proposal compatible with the scale, proportion and other characteristics of the site or building, or both, on which the proposed signage is to be located?
- Does the proposal respect important features of the site or building, or both?
- Does the proposal show innovation and imagination in its relationship to the site or building, or both?

6. Associated devices and logos with advertisements and advertising structures

- Have any safety devices, platforms, lighting devices or logos been designed as an integral part of the signage or structure on which it is to be displayed?

7. Illumination

- Would illumination result in unacceptable glare?
- Would illumination affect safety for pedestrians, vehicles or aircraft?
- Would illumination detract from the amenity of any residence or other form of accommodation?
- Can the intensity of the illumination be adjusted, if necessary?
- Is the illumination subject to a curfew?

8. Safety

- Would the proposal reduce the safety for any public road?
- Would the proposal reduce the safety for pedestrians or bicyclists?
- Would the proposal reduce the safety for pedestrians, particularly children, by obscuring sightlines from public areas?

APPENDIX D

OBTRUSIVE LIGHTING AND THRESHOLD INCREMENT CALCULATIONS

Calculation Summary LIA			
Label	CalcType	Units	Max
10 Joubert St_III_Seg1	Obtrusive Light - III	Lux	0.00
10 Joubert St_III_Seg2	Obtrusive Light - III	Lux	0.00
12 Church St_III_Seg1	Obtrusive Light - III	Lux	0.62
12 Church St_III_Seg2	Obtrusive Light - III	Lux	0.77
12 Joubert St_III_Seg1	Obtrusive Light - III	Lux	0.00
12 Joubert St_III_Seg2	Obtrusive Light - III	Lux	0.00
12 Joubert St_III_Seg3	Obtrusive Light - III	Lux	0.00
14 Joubert St_III_Seg1	Obtrusive Light - III	Lux	0.00
14 Joubert St_III_Seg2	Obtrusive Light - III	Lux	0.00
14 Joubert St_III_Seg3	Obtrusive Light - III	Lux	0.00
14 Joubert St_III_Seg4	Obtrusive Light - III	Lux	0.00
16 Joubert St_III_Seg1	Obtrusive Light - III	Lux	0.00
16 Joubert St_III_Seg2	Obtrusive Light - III	Lux	0.71
16 Joubert St_III_Seg3	Obtrusive Light - III	Lux	0.00
16 Joubert St_III_Seg4	Obtrusive Light - III	Lux	0.53
16A-16D Joubert St_III_Seg1	Obtrusive Light - III	Lux	0.14
16A-16D Joubert St_III_Seg2	Obtrusive Light - III	Lux	0.35
16A-16D Joubert St_III_Seg3	Obtrusive Light - III	Lux	0.40
16A-16D Joubert St_III_Seg4	Obtrusive Light - III	Lux	0.00
18 Joubert St_III_Seg1	Obtrusive Light - III	Lux	0.00
18 Joubert St_III_Seg2	Obtrusive Light - III	Lux	0.00
19 Reiby Rd_III_Seg1	Obtrusive Light - III	Lux	0.00
19 Reiby Rd_III_Seg2	Obtrusive Light - III	Lux	0.52
19 Reiby Rd_III_Seg3	Obtrusive Light - III	Lux	0.00
19 Reiby Rd_III_Seg4	Obtrusive Light - III	Lux	0.70
19 Reiby Rd_III_Seg5	Obtrusive Light - III	Lux	0.56
2 Avenue Rd_III_Seg1	Obtrusive Light - III	Lux	0.00
2 Avenue Rd_III_Seg2	Obtrusive Light - III	Lux	0.00
3 Durham St_III_Seg1	Obtrusive Light - III	Lux	0.00
3 Durham St_III_Seg2	Obtrusive Light - III	Lux	0.00
3 Durham St_III_Seg3	Obtrusive Light - III	Lux	0.00
3 Durham St_III_Seg4	Obtrusive Light - III	Lux	0.00
5 Church St_III_Seg1	Obtrusive Light - III	Lux	0.00
5 Church St_III_Seg2	Obtrusive Light - III	Lux	0.11
5 Durham St_III_Seg1	Obtrusive Light - III	Lux	0.00
5 Durham St_III_Seg2	Obtrusive Light - III	Lux	0.00
5 The Avenue_III_Seg1	Obtrusive Light - III	Lux	0.00
5 The Avenue_III_Seg2	Obtrusive Light - III	Lux	0.00
5 The Avenue_III_Seg3	Obtrusive Light - III	Lux	0.00
5 The Avenue_III_Seg4	Obtrusive Light - III	Lux	0.00
6 Joubert St_III_Seg1	Obtrusive Light - III	Lux	0.00
6 Joubert St_III_Seg2	Obtrusive Light - III	Lux	0.00
6 Joubert St_III_Seg3	Obtrusive Light - III	Lux	0.00
6 Joubert St_III_Seg4	Obtrusive Light - III	Lux	0.00
6 Joubert St_III_Seg5	Obtrusive Light - III	Lux	0.00
7 Durham St_III_Seg1	Obtrusive Light - III	Lux	0.00
7 Durham St_III_Seg2	Obtrusive Light - III	Lux	0.00
8 Joubert St_III_Seg1	Obtrusive Light - III	Lux	0.00
8 Joubert St_III_Seg2	Obtrusive Light - III	Lux	0.00

APPENDIX D

OBTRUSIVE LIGHTING AND THRESHOLD INCREMENT CALCULATIONS



APPENDIX D

OBTRUSIVE LIGHTING AND THRESHOLD INCREMENT CALCULATIONS

Calculation Summary LIA			
Label	CalcType	Units	Max
Burns Bay Rd NB	Obtrusive Light - TI	%	19.21
Burns Bay Rod NB Off Ramp	Obtrusive Light - TI	%	4.64
Burns Bay Rod SB Off Ramp	Obtrusive Light - TI	%	3.38
Burns Bay Rod SB	Obtrusive Light - TI	%	19.14
Durham Rd NB	Obtrusive Light - TI	%	0.03
Joubert Rd NB	Obtrusive Light - TI	%	0.25
Joubert Rd SB	Obtrusive Light - TI	%	0.00



APPENDIX D

OBTRUSIVE LIGHTING AND THRESHOLD INCREMENT CALCULATIONS

Obtrusive Light - Compliance Report

AS/NZS 4282:2019, A3 - Medium District Brightness, Curfew
 Filename: 1096.78 Church St Bridge Hunters Hill rev A
 8/16/2019 6:04:29 PM

Illuminance

Maximum Allowable Value: 2 Lux

Calculations Tested (49):

Calculation Label	Test Results	Max. Illum.
16A-16D Joubert St_III_Seg1	PASS	0.14
16A-16D Joubert St_III_Seg2	PASS	0.35
16A-16D Joubert St_III_Seg3	PASS	0.40
16A-16D Joubert St_III_Seg4	PASS	0.00
16 Joubert St_III_Seg1	PASS	0.00
16 Joubert St_III_Seg2	PASS	0.71
16 Joubert St_III_Seg3	PASS	0.00
16 Joubert St_III_Seg4	PASS	0.53
14 Joubert St_III_Seg1	PASS	0.00
14 Joubert St_III_Seg2	PASS	0.00
14 Joubert St_III_Seg3	PASS	0.00
14 Joubert St_III_Seg4	PASS	0.00
12 Joubert St_III_Seg1	PASS	0.00
12 Joubert St_III_Seg2	PASS	0.00
12 Joubert St_III_Seg3	PASS	0.00
10 Joubert St_III_Seg1	PASS	0.00
10 Joubert St_III_Seg2	PASS	0.00
8 Joubert St_III_Seg1	PASS	0.00
8 Joubert St_III_Seg2	PASS	0.00
6 Joubert St_III_Seg1	PASS	0.00
6 Joubert St_III_Seg2	PASS	0.00
6 Joubert St_III_Seg3	PASS	0.00
6 Joubert St_III_Seg4	PASS	0.00
6 Joubert St_III_Seg5	PASS	0.00
5 Church St_III_Seg1	PASS	0.00
5 Church St_III_Seg2	PASS	0.11
12 Church St_III_Seg1	PASS	0.62
12 Church St_III_Seg2	PASS	0.77
7 Durham St_III_Seg1	PASS	0.00
7 Durham St_III_Seg2	PASS	0.00
5 Durham St_III_Seg1	PASS	0.00
5 Durham St_III_Seg2	PASS	0.00
3 Durham St_III_Seg1	PASS	0.00
3 Durham St_III_Seg2	PASS	0.00
3 Durham St_III_Seg3	PASS	0.00
3 Durham St_III_Seg4	PASS	0.00
19 Reiby Rd_III_Seg1	PASS	0.00
19 Reiby Rd_III_Seg2	PASS	0.52
19 Reiby Rd_III_Seg3	PASS	0.00
19 Reiby Rd_III_Seg4	PASS	0.70
19 Reiby Rd_III_Seg5	PASS	0.56
5 The Avenue_III_Seg1	PASS	0.00
5 The Avenue_III_Seg2	PASS	0.00
5 The Avenue_III_Seg3	PASS	0.00
5 The Avenue_III_Seg4	PASS	0.00
18 Joubert St_III_Seg1	PASS	0.00
18 Joubert St_III_Seg2	PASS	0.00
2 Avenue Rd_III_Seg1	PASS	0.00
2 Avenue Rd_III_Seg2	PASS	0.00

Threshold Increment (TI)

Maximum Allowable Value: 20 %

Calculations Tested (7):

Calculation Label	Adaptation Luminance	Test Results
Burns Bay Rd NB	1	PASS
Burns Bay Rod NB Off Ramp	1	PASS
Burns Bay Rod SB Off Ramp	1	PASS
Burns Bay Rod SB	1	PASS
Durham Rd NB	1	PASS
Joubert Rd NB	1	PASS
Joubert Rd SB	1	PASS