

JCDeaux

LIGHTING IMPACT ASSESSMENT -  
OUTDOOR SIGNAGE AT PACIFIC HIGHWAY, PYMBLE, NSW (OUTBOUND)

22nd March 2022  
Ref: 3023.16

## Lighting Impact Assessment Outdoor Signage at Pacific Highway, Pymble, NSW (Outbound)

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## 1. INTRODUCTION

Electrolight have been appointed by JCDeaux to undertake a Lighting Impact Assessment on the proposed outbound digital signage at Pacific Highway, Pymble, NSW. The objective of the assessment is to report on compliance with the State Environmental Planning Policy (Industry and Employment) 2021, 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);  $1 \text{ lx} = 1 \text{ lm/m}^2$ .

(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 ( $\text{cd/m}^2$ ) – 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 Pacific Highway, Pymble, NSW and replaces the existing south-west facing externally illuminated signage on the site. The signage faces the outbound traffic on Pacific Highway. The total active display (illuminated) area of the proposed digital sign is 39.94 m<sup>2</sup>. The digital signage is to be in 24 hour operation. Refer to 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 screen is noted as Big Screen Video model type BSV-YATR-10, 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 not more 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 (Industry and Employment) 2021 (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/m2)
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 4, which is described as an area with Generally low levels of off-street ambient lighting, or areas that have residential properties nearby. The maximum night time luminance of a digital signage within Zone 4 is 200 cd/m2.

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		
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	500	✓
Night Time Pre-Curfew (Until 11pm)	200	✓
Night Time Post-Curfew (11pm - 6am)	140*	✓

# 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 200 cd/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 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 signage be illuminated all night, the assessment will review the proposed signage under both the pre-curfew and 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
1026-1028 Pacific Highway	A3
1022 Pacific Highway	A3
1012 Pacific Highway	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 signage. Photometric data for the screen was provided by the screen manufacturer\*, with the maximum luminance corresponding to the night time limits outlined in Section 5 for pre-curfew and post-curfew operation. Appendix D shows the lighting model and the results of the calculations.

It can be seen from the lighting model that the maximum illuminance to dwellings in Zone A3 is 2.75 lux at 1026-1028 Pacific Highway during pre-curfew operation, and 1.56 lux at 1026-1028 Pacific Highway during post-curfew operation. The illuminance level above complies with the maximum AS4282 limit of 10 lux for pre-curfew and 2 lux for post-curfew as outlined in Table 4.

#### Threshold Increment Assessment

The Threshold Increment was also calculated for the north-west bound traffic on Pacific Highway. The calculation grids were located at 1.5m above ground level for general traffic approaches, 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 11.5% for any traffic approach during pre-curfew and 3.4% post-curfew operation (the allowable maximum under the standard is 20%).

#### Luminous Intensity

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

#### 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.

#### Summary:

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.

\* Electrolight takes no responsibility for the accuracy of third party provided photometric data

7. SUMMARY

- The proposed outbound digital signage to be installed at Pacific Highway, Pymble, NSW, shall be commissioned on site to yield the following maximum luminances:

LUMINANCE LEVELS FOR DIGITAL ADVERTISEMENTS		
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	500	✓
Night Time Pre-Curfew (Until 11pm)	200	✓
Night Time Post-Curfew (11pm - 6am)	140	✓

- 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 to comply with AS4282.
- The proposed signage has been found to comply with all relevant requirements of AS 4282-2019 Control of the Obtrusive Effects of Outdoor Lighting.
- In complying with the above requirements, the digital signage should not result in unacceptable glare nor should it adversely impact the safety of pedestrians, residents or vehicular traffic. Additionally, the signage should not cause any reduction in visual amenity to nearby residences or accommodation.



## 8. DESIGN CERTIFICATION

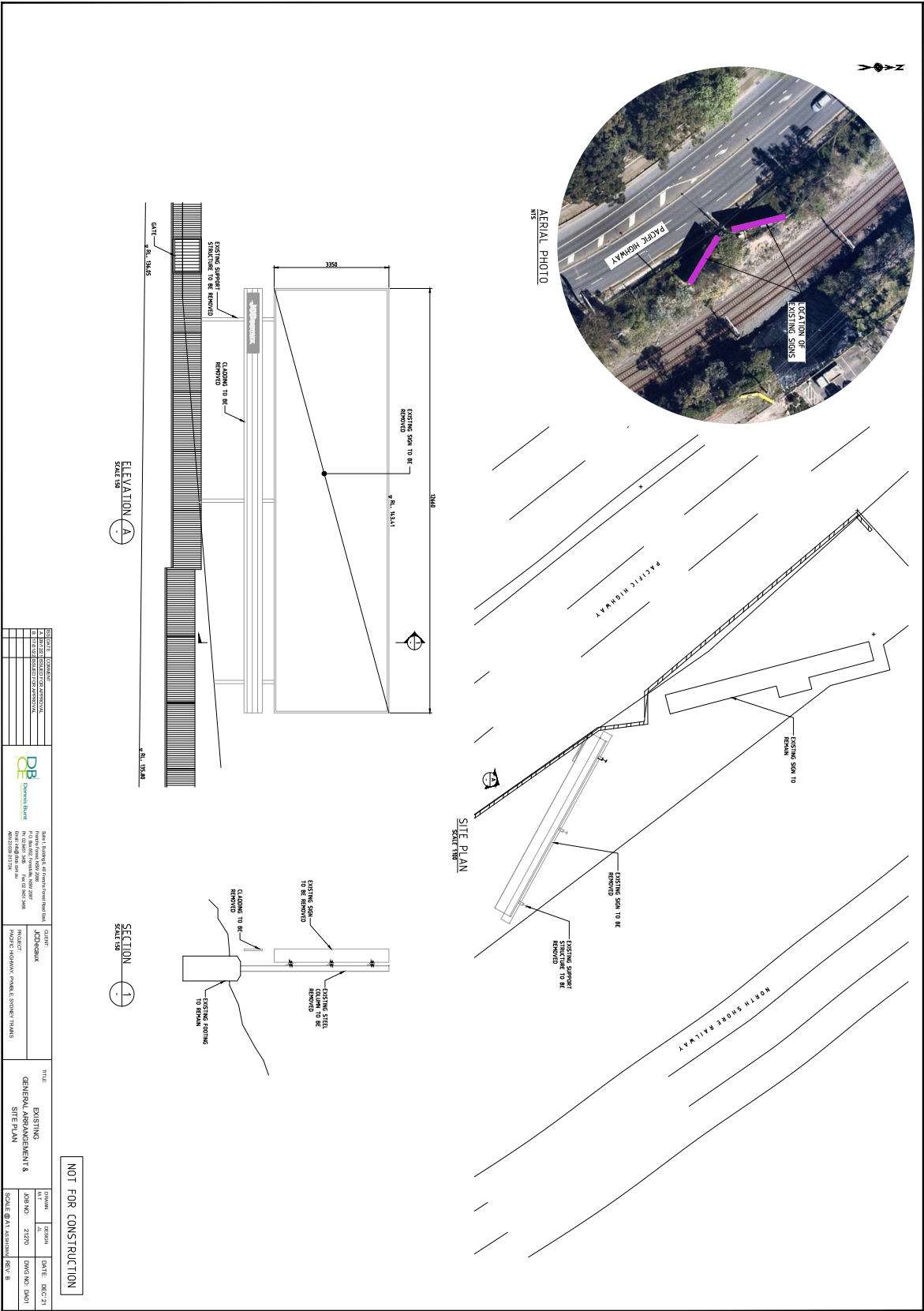
The outbound digital signage proposed to be installed at Pacific Highway, Pymble, NSW, if commissioned according to this report, complies with the following criteria, guidelines and standards:

- State Environmental Planning Policy (Industry and Employment) 2021 (Refer Appendix C).
- Transport Corridor Outdoor Advertising & Signage Guidelines 2017.
- AS 4282-2019 Control of the Obtrusive Effects of Outdoor Lighting.

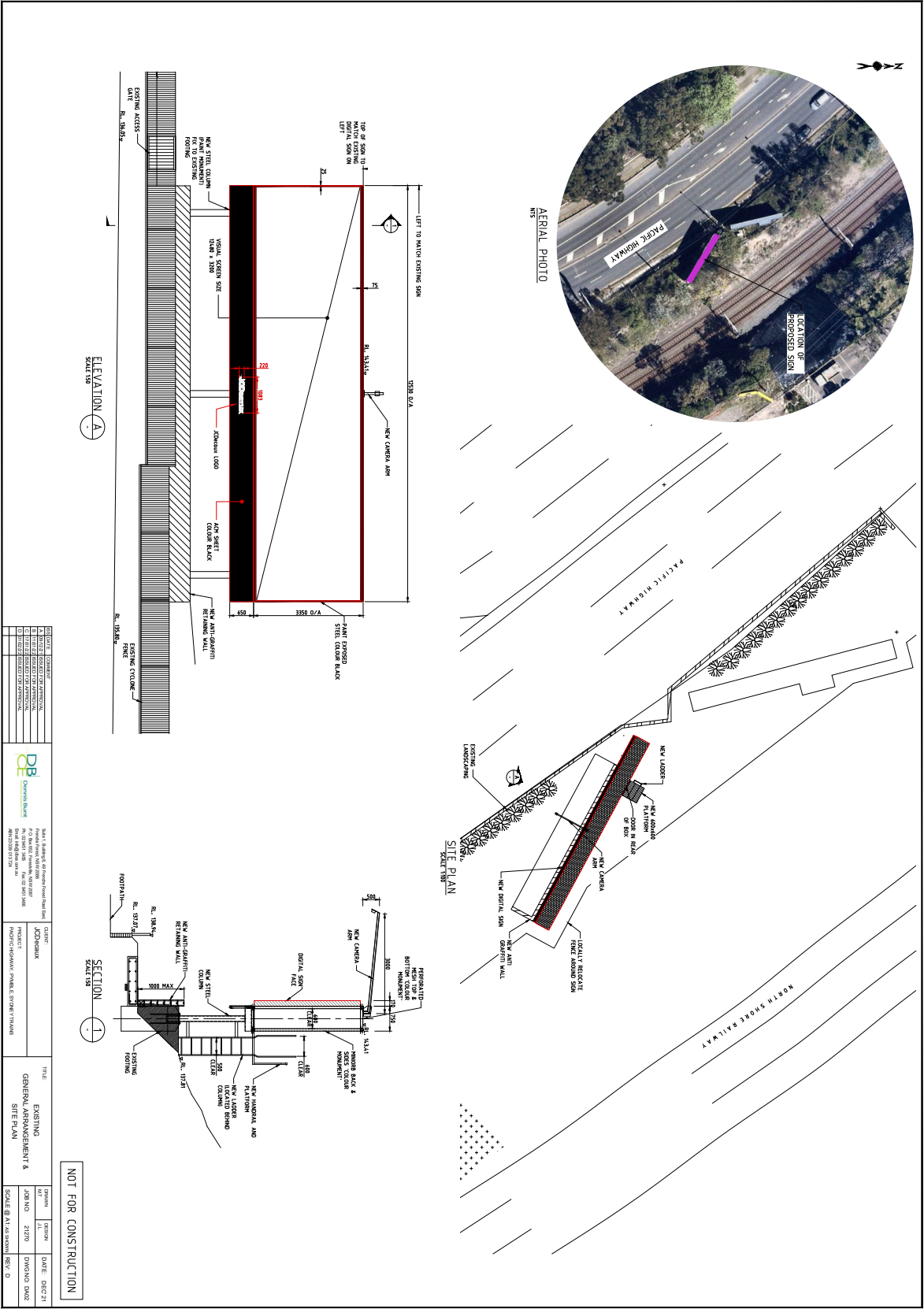
A handwritten signature in black ink, appearing to read 'Ryan Shamier', with a long horizontal stroke extending to the right.

Ryan Shamier  
Senior Lighting Designer  
Electrolight Sydney  
22/03/22

APPENDIX A  
EXISTING SIGNAGE



APPENDIX A  
SIGNAGE LOCATION



Big Screen Video

Display Specification.

Product Specifications - 10mm Supersite	
Active Screen Size (WxH)	12.48m x 3.2m
Active Screen Size (Sqm)	39.94sqm
Matrix Size (WxH)	1248 pixels x 320 pixels
Aspect Ratio	3.9:1
Display Weight	2316kg
Display Weight per Sqm	58kg/m2
Total Avg. Power Consumed	8.4kw
Total Max. Power Consumed	24kw
Max. Power Consumption per Sqm	600w/m²
Current Draw	104 amps max load*
Mains Recommendation	Three-phase rated at 50 amps per phase

\*Doesn't allow for in-rush current

Bringing spaces to life.

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Big Screen Video

# Specs: Outdoor 10mm SMD

Product Specifications		Product Specifications	
Catalogue no.	BSV-YATR-10	Refresh Rate	3840+ Hz
Physical Pitch	10mm, physical	Display Control	Synchronous control
Pixel Density	10,000 pixel/m2	Power Supply	220V, 50Hz
Pixel Configuration	SMD LED	Operation Temp.	-20° ~60°
Module Dimensions (WxH )	320mm x 160mm	Display Dimming	Auto/Manual, 8-256 Levels
Module Resolution (WxH )	32 x 16 pixels	Signal Transfer	Text, image, graphics animations, video
Cabinet Material	Steel	Power Consumption (Max./Avg.)	0.6kw/sqm; 0.2kw/sqm
Viewing Angle	H 140 Deg. / V 140 Deg.	MTBF	10,000hrs
Best Viewing Distance	10+m	Luminance	7000 nits
Maintenance	Rear access	Lifetime (Normal Temp)	100,000Hrs
Protection Degree	IP65 front; IP54 rear		
Panel Net Weight	approx. 58kg/sqm		
Gray Scale	16-bit Color Processing Depth		

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## APPENDIX C

# State Environmental Planning Policy (Industry and Employment)

### Schedule 5 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

THRESHOLD INCREMENT & OBTRUSIVE LIGHTING CALCULATIONS

PRE-CURFEW OPERATION

Calculation Summary			
Label	CalcType	Units	Max
1012 Pacific Highway I11 Seg1	Obtrusive - I11	Lux	0.0
1012 Pacific Highway I11 Seg2	Obtrusive - I11	Lux	0.0
1022 Pacific Highway I11 Seg1	Obtrusive - I11	Lux	0.0
1022 Pacific Highway I11 Seg2	Obtrusive - I11	Lux	0.0
1026-1028 Pacific Highway I11 Se	Obtrusive - I11	Lux	0.00
1026-1028 Pacific Highway I11 Se	Obtrusive - I11	Lux	2.75





APPENDIX D

THRESHOLD INCREMENT & OBTRUSIVE LIGHTING CALCULATIONS

PRE-CURFEW OPERATION

Calculation Summary			
Label	CalcType	Units	Max
Pacific Highway (NW bound)	Obtrusive - TI	%	11.5



## APPENDIX D

### OBTRUSIVE LIGHTING CALCULATIONS AND THRESHOLD INCREMENT CALCULATIONS PRE-CURFEW OPERATION

#### **Obtrusive Light - Compliance Report**

AS/NZS 4282:2019, A3 - Medium District Brightness, Non-Curfew L1

Filename: 3023.16\_LIA Pacific Highway Pymble pre-curfew

22/12/2021 11:34:26 AM

#### **Illuminance**

Maximum Allowable Value: 10 Lux

Calculations Tested (6):

Calculation Label	Test Results	Max. Illum.
1022 Pacific Highway_III_Seg1	<b>PASS</b>	0.0
1022 Pacific Highway_III_Seg2	<b>PASS</b>	0.0
1012 Pacific Highway_III_Seg1	<b>PASS</b>	0.0
1012 Pacific Highway_III_Seg2	<b>PASS</b>	0.0
1026-1028 Pacific Highway_III_Seg1	<b>PASS</b>	0.00
1026-1028 Pacific Highway_III_Seg2	<b>PASS</b>	2.75

#### **Threshold Increment (TI)**

Maximum Allowable Value: 20 %

Calculations Tested (1):

Calculation Label	Adaptation Luminance	Test Results
Pacific Highway (NW bound)	1	<b>PASS</b>

APPENDIX D

THRESHOLD INCREMENT & OBTRUSIVE LIGHTING CALCULATIONS

POST-CURFEW OPERATION

Calculation Summary			
Label	CalcType	Units	Max
1012 Pacific Highway I1l Seg1	Obtrusive - I1l	Lux	0.0
1012 Pacific Highway I1l Seg2	Obtrusive - I1l	Lux	0.0
1022 Pacific Highway I1l Seg1	Obtrusive - I1l	Lux	0.0
1022 Pacific Highway I1l Seg2	Obtrusive - I1l	Lux	0.0
1026-1028 Pacific Highway I1l Se	Obtrusive - I1l	Lux	0.00
1026-1028 Pacific Highway I1l Se	Obtrusive - I1l	Lux	1.56





APPENDIX D

THRESHOLD INCREMENT & OBTRUSIVE LIGHTING CALCULATIONS

POST-CURFEW OPERATION

Calculation Summary			
Label	CalcType	Units	Max
Pacific Highway (NW bound)	Obtrusive - TI	%	3.4



## APPENDIX D

### OBTRUSIVE LIGHTING CALCULATIONS AND THRESHOLD INCREMENT CALCULATIONS POST-CURFEW OPERATION

#### **Obtrusive Light - Compliance Report**

AS/NZS 4282:2019, A3 - Medium District Brightness, Curfew  
Filename: 3023.16\_LIA Pacific Highway Pymble post-curfew  
22/12/2021 11:29:50 AM

#### **Illuminance**

Maximum Allowable Value: 2 Lux

Calculations Tested (6):

Calculation Label	Test Results	Max. Illum.
1022 Pacific Highway_III_Seg1	PASS	0.0
1022 Pacific Highway_III_Seg2	PASS	0.0
1012 Pacific Highway_III_Seg1	PASS	0.0
1012 Pacific Highway_III_Seg2	PASS	0.0
1026-1028 Pacific Highway_III_Seg1	PASS	0.00
1026-1028 Pacific Highway_III_Seg2	PASS	1.56

#### **Threshold Increment (TI)**

Maximum Allowable Value: 20 %

Calculations Tested (1):

Calculation Label	Adaptation Luminance	Test Results
Pacific Highway (NW bound)	1	PASS