

Transport for NSW
Ref: 3724.2

LIGHTING IMPACT ASSESSMENT
INTERNALLY ILLUMINATED SIGNAGE AT
HUME HIGHWAY OVERPASS, STRATHFIELD, NSW

Electrolight Australia
ABN: 44 600 067 392
australia@electrolight.com
www.electrolight.com

4/414 Bourke St
Surry Hills, NSW 2010
T + 61 2 9267 4777

DATE	REV	COMMENT	PREPARED BY	CHECKED BY
24/10/24	REV D	For Information	CB	RS

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1. INTRODUCTION

Electrolight have been appointed by Transport for NSW to undertake a Lighting Impact Assessment on the proposed permit extension of the existing internally illuminated signage on the Hume Highway Overpass, Strathfield, NSW. The objective of the assessment is to outline the requirements necessary for compliance with the State Environmental Planning Policy (Industry and Employment) 2021, NSW Transport Corridor Outdoor Advertising and Signage Guidelines, and AS/NZS 4282:2023 Control of the Obtrusive Effects of Outdoor Lighting.

This report outlines the operational requirements needed to comply with the guidelines and standards outlined above. It does not confirm compliance with these standards. Compliance must be determined by site specific luminance measurements of the existing signage.

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 can be 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 (perceived light power) emitted in a specified direction. Unit: candela (cd).

2.4 Dynamic content

Where the luminous image, pattern, colour or direction of light changes over an interval of less than 60 seconds.

Note: Definition source is AS4282.

2.5 Obtrusive Light

Spill light which, because of quantitative or directional attributes, gives rise to annoyance, discomfort, distraction, or a reduction in ability to see essential information such as transport signals.

Note: Obtrusive light includes the impact on humans and environmental receivers.

2.6 Threshold Increment

The measure of disability glare expressed as the percentage increase in luminance contrast threshold required between an object and its background for it to be seen equally well with a source of glare present.

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

2.7 Environmentally Sensitive Area (ESA)

Area of ecological value including, bushland, waterways and marine and coastal areas.

Note: Definition source is AS4282.

2.8 AGI32 Light Simulation Software

AGI32 (by U.S. company Lighting Analysts/Revalize) 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.

2.9 Upward Light Ratio Luminaire (ULR_L)

The ratio of the luminous flux of a luminaire that is emitted, at and above the horizontal, divided by the total luminaire flux when the luminaire is mounted in its designed position, and excluding reflected light from surfaces or obstructions.

Note: Definition source is AS4282.

2.10 Environmental Receiver

Any identified living species (plants, animals and other organisms) and their locations indicated, that may be impacted by the proposed lighting system.

Note: Definition source is AS4282.

3. SITE DESCRIPTION AND SCOPE

The existing signage is located on the Hume Highway Overpass, Strathfield, NSW and consists of two sides, Face A and Face B (**existing signage**). Face A is oriented towards the inbound direction of traffic on Hume Highway, and Face B is oriented towards the outbound direction of traffic on Hume Highway. The total illuminated area of the signage is 42.41 m² for each sign face. Refer to Appendix A for the signage location plan and elevations.

The existing signage is comprised of internally illuminated "light boxes". The existing lighting inside the signage shall be retained, unless required to be modified to comply with this assessment. Modifications could include installing dimmers and/or new lower output lighting, in order to reduce the luminance of the signage and satisfy the more stringent requirements outlined in the latest standards and guidelines (refer Section 4). If the signage lighting is modified in any way, the resulting luminance of the signage shall not be more than the existing luminance.

The signage lighting will be in operation all night and be switched off during the day. The signage has an Upward Light Ratio (ULR_L) of not more than 0.50. The signage is static and does not include dynamic content.

Environmental impact assessments, including the management of artificial light for the protection of specific entities protected by environmental legislation, is beyond the scope of this assessment.

4. DESIGN GUIDELINES AND STANDARDS

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

- State Environmental Planning Policy (Industry and Employment) 2021 (**SEPP Industry and Employment**)
- Transport Corridor Outdoor Advertising & Signage Guidelines 2017 (**Transport Guidelines**)
- AS/NZS 4282:2023 Control of the Obtrusive Effects of Outdoor Lighting (**AS4282**)

5. LUMINANCE ASSESSMENT

The maximum permissible night time luminance of the existing signage (Face A and Face B) is determined by the existing lighting and land use zoning environment of its surroundings. AS4282 outlines maximum average luminances for different Environmental Zones as shown in Table 1 below:

TABLE 1 - AS4282 MAXIMUM AVERAGE NIGHT TIME LUMINANCE FOR SIGNAGE		
	Description	Max Average Luminance (cd/m ²)
A4	High district brightness e.g. Town and city centres and other commercial areas, residential areas abutting commercial areas, industrial and Port areas and Transport Interchanges	350
A3	Medium district brightness e.g. Suburban areas in towns and cities, generally roadways with streetlighting through suburban, rural or semi-rural areas	250
A2	Low district brightness e.g. Sparsely inhabited rural and semi-rural areas, generally roadways without streetlighting through suburban, rural or semi-rural areas other than intersections	150
A1	Dark e.g. Relatively uninhabited rural areas (including terrestrial, marine, aquatic and coastal areas), generally roadways without streetlighting through rural areas	50
A0	Intrinsically Dark e.g. 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	0.1

Based on an assessment of the surrounding environment, the existing signage (Face A and Face B) is located within Environmental Zone A4 under AS4282, therefore, the maximum night time luminance is 350cd/m².

AS4282 does not include limits for daytime operation of illuminated signage. However, the Transport Guidelines outlines maximum permissible luminance limits for various lighting conditions, including daytime. Under the Transport Guidelines, the existing 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 internally illuminated signage within Zone 3 with an area over 10m² is 200cd/m² (taken to be 25% of the daytime limit of 800cd/m² as outlined in the previous revision of the Transport Guidelines). The luminance limits for operation of the signage during the daytime are not applicable as the signage is switched off during the day.

Tables 2 and 3 outline the maximum luminance levels to comply with AS4282 and the Transport Guidelines for the various lighting conditions listed below:

TABLE 2 - COMPLYING LUMINANCE LEVELS FOR INTERNALLY ILLUMINATED ADVERTISEMENTS (FACE A)		
Lighting Condition	Max Permissible Luminance (cd/m ²)	Compliant
Day	N/A - OFF	✓
Night Time	200	✓

TABLE 3 - COMPLYING LUMINANCE LEVELS FOR INTERNALLY ILLUMINATED ADVERTISEMENTS (FACE B)		
Lighting Condition	Max Permissible Luminance (cd/m2)	Compliant
Day	N/A - OFF	✓
Night Time	200	✓

6. AS4282 ASSESSMENT

The existing signage has been assessed against the lighting criteria and requirements outlined in AS4282.

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 the existing signage operates all night, it will be assessed against the more stringent post-curfew limits.

Spill light to any adjacent Environmentally Sensitive Areas are also assessed against the more stringent post-curfew limits, as outlined in Clause 3.2.1 of AS4282.

Illuminance Assessment

The AS4282 assessment includes a review of nearby residential dwellings and Environmentally Sensitive Areas and calculation of the amount of vertical illuminance (measured in Lux) that they are likely to receive from the signage during night time operation (when the signage is operated in accordance with this report).

The acceptable level of vertical 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 - AS4282 MAXIMUM VALUES OF VERTICAL ILLUMINANCE			
	Max Vertical Illuminance (lx)		Description
	Pre-curfew	Post-curfew	
A4	25	5	High district brightness e.g. Town and city centres and other commercial areas, residential areas abutting commercial areas, industrial and Port areas and Transport Interchanges
A3	10	2	Medium district brightness e.g. Suburban areas in towns and cities, generally roadways with streetlighting through suburban, rural or semi-rural areas
A2	5	1	Low district brightness e.g. Sparsely inhabited rural and semi-rural areas, generally roadways without streetlighting through suburban, rural or semi-rural areas other than intersections
A1	2	0.1	Dark e.g. Relatively uninhabited rural areas (including terrestrial, marine, aquatic and coastal areas), generally roadways without streetlighting through rural areas
A0	0	0	Intrinsically Dark e.g. 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

Residential Dwellings

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

Address	Zone	Address	Zone
26 Hedges Ave	A3	54 Cave Rd	A3
50 Cave Rd	A3	56 Cave Rd	A4
52 Cave Rd	A3	626 Hume Highway	A4
587 Hume Highway	A4		

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

The signage (and surrounding environment) was modeled in lighting calculation program AGI32 to determine the effect (if any) of the light spill from the existing signage. Photometric data for the signage was based on a diffused light panel (approximating a lambertian emitter) with the maximum luminance for each sign face corresponding to the night time limit outlined in Section 5. Appendix B shows the lighting model and the results of the calculations.

Under AS4282, the maximum allowable vertical illuminance to dwellings is 5 lux for Zone A4 and 2 lux for Zone A3 (as outlined in Table 3). It can be seen from the lighting model that the maximum illuminance for Zone A4 properties is 2.17 lux at 626 Hume Highway, and the maximum illuminance for Zone A3 properties is 0.38 lux at 26 Hedges Ave.

The existing signage therefore complies with the relevant illuminance limits for nearby residential dwellings when operated at the maximum luminance levels shown in Table 2 and Table 3 of Section 5.

Environmentally Sensitive Areas

No Environmentally Sensitive Areas were identified in the vicinity of the existing signage. The limits in AS4282 therefore do not apply.

Threshold Increment Assessment

The Threshold Increment was also calculated for the inbound and outbound traffic approaches on Hume Highway. The calculation grids were located at 1.5m above ground level, with a viewing distance of between 10m to 200m from the signage and a windscreen cutoff angle of 20 degrees (as outlined in AS1158). The calculation results show that the Threshold Increment does not exceed 11.28% for any traffic approach (the allowable maximum under the standard is 20%). The existing signage therefore complies with the Threshold Increment requirement when it is operated at the maximum luminance levels shown in Table 2 and Table 3 of Section 5.

Upward Waste Light Assessment

In order to reduce light pollution and associated environmental impacts, AS4282 includes requirements that limit upward waste light into the night sky from signage. Clause 3.3.3.a) of AS4282 states that internally illuminated signage and other internally illuminated objects shall have an Upward Waste Light Ratio (ULR_L) of not more than 0.50. The ULR_L of the specified signage is not more than 0.50. The signage therefore complies with this requirement.

Luminous Intensity

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

AS4282 Assessment Summary

It can therefore be seen that the existing signage, when operated at the maximum luminance levels shown in Table 2 and Table 3 of Section 5, complies with all relevant requirements of AS4282.

Note : Luminance measurements on site are required to confirm that the existing signage luminance does not exceed the maximum luminance levels shown in Table 2 and Table 3 of Section 5 of this report.

7. SEPP ASSESSMENT

Table 4 below outlines the illumination assessment criteria from the SEPP Industry and Employment Schedule 5 - Clause 7 Illumination. Responses have been included demonstrating that the existing signage will comply when operated at the maximum luminance levels shown in Table 2 and Table 3 of Section 5.

TABLE 4 - ILLUMINATION ASSESSMENT CRITERIA		
Assessment Criteria	Response	Compliant?
Would illumination result in unacceptable glare?	The existing signage complies with the Threshold Increment limits of AS4282, demonstrating that the illumination will not cause unacceptable glare.	✓
Would illumination affect safety for pedestrians, vehicles or aircraft?	The existing signage complies with the Threshold Increment limits of AS4282, demonstrating that the illumination will not cause unacceptable glare. The relatively low intensity limits the risk to pedestrians, vehicles or aircraft.	✓
Would illumination detract from the amenity of any residence or other form of accommodation?	The existing signage, when installed according to this report, complies with the illuminance (spill lighting) limits of AS4282, demonstrating that the illumination will not detract from the amenity of any residence or other form of accommodation.	✓
Can the intensity of the illumination be adjusted, if necessary?	The existing signage is not dimmable, however the lighting within the signage can be modified as necessary to meet the requirements of this assessment. This may include installing of dimmers or new lower intensity lighting.	✓ (if required)
Is the illumination subject to a curfew?	The existing advertising signage, when installed according to this report, complies with the limits required during curfewed operation under AS4282 (nominally between the hours of 11pm and 6am). This means that a curfew is not required.	N/A

8. SUMMARY

- The existing signage (Face A and Face B) at Hume Highway Overpass, Strathfield, NSW shall be modified as necessary to not exceed the following maximum luminances:

COMPLYING LUMINANCE LEVELS FOR INTERNALLY ILLUMINATED ADVERTISEMENTS (FACE A)		
Lighting Condition	Max Permissible Luminance (cd/m2)	Compliant
Day	N/A - OFF	✓
Night Time	200	✓

COMPLYING LUMINANCE LEVELS FOR INTERNALLY ILLUMINATED ADVERTISEMENTS (FACE B)		
Lighting Condition	Max Permissible Luminance (cd/m2)	Compliant
Day	N/A - OFF	✓
Night Time	200	✓

- When the existing signage is operated in accordance with the above, the existing signage (Face A and Face B) will comply with all relevant requirements of AS4282, the Transport Guidelines and SEPP Industry and Employment.
- In complying with the above requirements, the existing signage (Face A and Face B) shall not result in unacceptable glare nor shall it adversely impact the safety of pedestrians, residents or vehicular traffic. Additionally, the signage shall not cause any unacceptable amenity impacts to nearby residential dwellings or accommodation or environmental receivers.

9. DESIGN CERTIFICATION

The existing signage (Face A and Face B) at Hume Highway Overpass, Strathfield, NSW, if operated according to this report, complies with the following criteria, guidelines and standards*:

- State Environmental Planning Policy (Industry and Employment) 2021
- Transport Corridor Outdoor Advertising & Signage Guidelines 2017
- AS/NZS 4282:2023 Control of the Obtrusive Effects of Outdoor Lighting



Ryan Shamier MIES

M.Des.Sc(Illumination) B.Eng (Elec)

Member of the Illuminating Engineering Society of Australia and New Zealand (MIES)

Registered Professional Engineer - New South Wales (PRE0000868)

Senior Lighting Designer

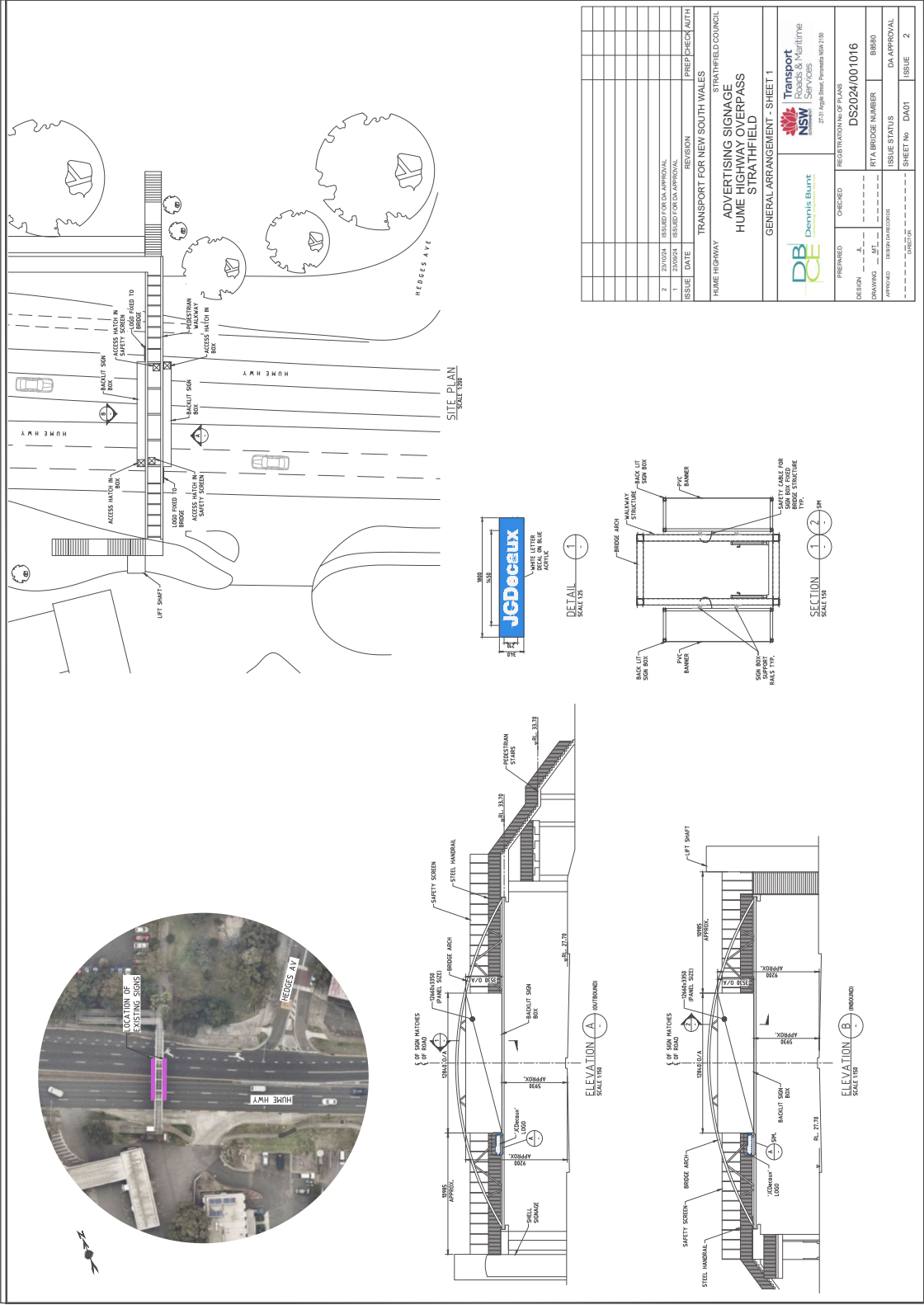
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*This design certification is only valid if the existing signage operates in accordance with this report, which includes not exceeding the maximum luminance limits outlined in Table 2 and Table 3 of Section 5. The luminance of the signage can be verified via site measurement, with luminance readings taken at night with the signage displaying a 100% white image.

APPENDIX A

PROPOSED SIGNAGE LOCATION, ELEVATIONS & PHOTOMONTAGES



APPENDIX B
OBTRUSIVE LIGHTING CALCULATIONS



*There are no residential dwellings within the vicinity of Face A

APPENDIX B

OBTRUSIVE LIGHTING CALCULATIONS

Calculation Summary			
Project: A3			
Label	CalcType	Units	Max
26 Hedges Ave Ill Seg1	Obtrusive - Ill	Lux	0.17
26 Hedges Ave Ill Seg2	Obtrusive - Ill	Lux	0.38
50 Cave Rd Ill Seg1	Obtrusive - Ill	Lux	0.00
50 Cave Rd Ill Seg2	Obtrusive - Ill	Lux	0.00
52 Cave Rd Ill Seg1	Obtrusive - Ill	Lux	0.15
52 Cave Rd Ill Seg2	Obtrusive - Ill	Lux	0.01
54 Cave Rd Ill Seg1	Obtrusive - Ill	Lux	0.00
54 Cave Rd Ill Seg2	Obtrusive - Ill	Lux	0.00

Calculation Summary			
Project: A4			
Label	CalcType	Units	Max
56 Cave Rd Ill Seg1	Obtrusive - Ill	Lux	0.00
56 Cave Rd Ill Seg2	Obtrusive - Ill	Lux	0.00
587 Liverpool Rd Ill Seg1	Obtrusive - Ill	Lux	1.69
587 Liverpool Rd Ill Seg2	Obtrusive - Ill	Lux	1.31
626 Hume Hwy Ill Seg1	Obtrusive - Ill	Lux	0.38
626 Hume Hwy Ill Seg2	Obtrusive - Ill	Lux	2.17

APPENDIX B
THRESHOLD INCREMENT CALCULATIONS



Calculation Summary			
Project: TI			
Label	CalcType	Units	Max
Hume Hwy Inbound	Obtrusive - TI	%	11.28
Hume Hwy Outbound	Obtrusive - TI	%	10.55

APPENDIX B

OBTRUSIVE AND THRESHOLD INCREMENT CALCULATIONS

Obtrusive Light - Compliance Report

AS/NZS 4282:2023, A3 - Medium District Brightness, Curfew
Filename: 3724.2 - Hume Hwy Overpass - Rev B
16/09/2024 2:13:47 PM

Illuminance

Maximum Allowable Value: 2 Lux

Calculations Tested (8):

Calculation Label	Test Results	Max. Illum.
54 Cave Rd_III_Seg1	PASS	0.00
54 Cave Rd_III_Seg2	PASS	0.00
52 Cave Rd_III_Seg1	PASS	0.15
52 Cave Rd_III_Seg2	PASS	0.01
50 Cave Rd_III_Seg1	PASS	0.00
50 Cave Rd_III_Seg2	PASS	0.00
26 Hedges Ave_III_Seg1	PASS	0.17
26 Hedges Ave_III_Seg2	PASS	0.38

Obtrusive Light - Compliance Report

AS/NZS 4282:2023, A4 - High District Brightness, Curfew
Filename: 3724.2 - Hume Hwy Overpass - Rev B
16/09/2024 2:12:58 PM

Illuminance

Maximum Allowable Value: 5 Lux

Calculations Tested (6):

Calculation Label	Test Results	Max. Illum.
56 Cave Rd_III_Seg1	PASS	0.00
56 Cave Rd_III_Seg2	PASS	0.00
626 Hume Hwy_III_Seg1	PASS	0.38
626 Hume Hwy_III_Seg2	PASS	2.17
587 Liverpool Rd_III_Seg1	PASS	1.69
587 Liverpool Rd_III_Seg2	PASS	1.31

Obtrusive Light - Compliance Report

AS/NZS 4282:2023, A4 - High District Brightness, Curfew
Filename: 3724.2 - Hume Hwy Overpass - Rev B
16/09/2024 2:16:29 PM

Threshold Increment (TI)

Maximum Allowable Value: 20 %

Calculations Tested (2):

Calculation Label	Adaptation Luminance	Test Results
Hume Hwy Inbound	5	PASS
Hume Hwy Outbound	5	PASS