13 Omaru Street
Loganholme QLD 4129
+61 401 811 834 m
scott_forbes@rubidiumlight.com.au e
www.rubidiumlight.com.au w

Proposed McDonalds Development

Pinjarra Road
Pinjarra WA

Technical Report

rubidium light

Version	Author/Reviewer	Date	Description of changes
V1	Scott Forbes	20/05/2025	Draft for Comment

Prepared by

Scott Forbes MIES, RLP
Rubidium Light

30/8 Riverland Drive
Loganholme Queensland
Australia 4129
ABN: 150 778 923 06
Phone: +61 401 811 834
scott_forbes@rubidiumlight.com.au
www.rubidiumlight.com.au

About Rubidium Light

Rubidium Light is a specialist lighting design consultancy that works with stakeholders across many areas of development from concept to final construction.

Rubidium Light has been operating since 2011 and brings together an in-depth knowledge of lighting and its application in technically difficult lighting solutions.

Rubidium Light prides itself on its ability to react quickly and in a cost-effective manner to provide outcomes both responsible and cost effective to its clients and the environment.

Prepared for:
McDonald's Australia

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rubidium light

INTRODUCTION

Rubidium Light was engaged by Planning Solutions to undertake an external lighting design and Lighting Impact Assessment on the external lighting for the proposed McDonald's at Pinjarra WA. The objective of this assessment is to quantify the possible adverse effects of light from the proposed lighting in accordance with procedures as outlined AS/NZS4282-2023 *Control of the Obtrusive Effects of Outdoor Lighting* and Australian Government Civil Aviation Safety Authority Part 139 Manual of Standards 2019.

DEFINITIONS

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 direction in which it is distributed. Unit: lumen (lm)

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

Luminance
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. Unit: candela per square meter (cd/m²)

Illumination
A general expression for the quantity of light arriving at a surface. The physical measure of illumination is illuminance.

Illuminance
The luminous flux arriving at a surface divided by the area of the illuminated surface. Unit: lux (lx)

Reflectance
The ratio of the total luminous flux reflected from a surface to the total luminous flux which arrives at the surface. Usually expressed as a decimal in the range of 0 to 1 but may also be expressed as a percentage.

Glare
The discomfort or impairment of vision experienced when parts of the field of view (e.g., lamps, luminaires, sky) are excessively bright in relation to the general surroundings.

Luminaire
Equipment which houses the light source and directs the light in the desired directions. It includes items necessary for fixing, protecting, and operating the light source.

Threshold increment (TI)
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. Higher values of TI correspond to a greater disability glare.

Astronomical Twilight
Astronomical twilight is defined as when the geometric centre of the Sun is between 18° and 12° below the horizon.

SITE DESCRIPTION

The property on which the proposed lighting is to be installed is part of a larger development bounded by Pinjarra Road, George Street and Murray Street, Pinjarra WA. The balance of the development is an ALDI supermarket and it is not part of this assessment.

Other development surrounding the site is predominantly commercial in nature, with some residences Murray Street.

OPERATION

The lighting scheme has been evaluated for non-curfew and curfew operation, that is to say 24 hours operation.

No curfew time has been nominated, however the default curfew hours from AS/NZS4282 are 11pm to 6am. This will be subject to council approval.

PROPOSED LIGHTING

All lights used in the proposed scheme are flat-glass with zero upward-waste-light.

Carparks and associated elements comply with AS/NZS1158.3.1:2020 for sub-categories PC1, PCD and PCX.

Illuminated signage has also been included in the assessment.

RELEVANT GUIDELINES AND STANDARDS

The proposed exterior lighting is reviewed against the requirements of the following standards to ensure compliance and reduce the adverse effects of lighting at night to road users, aircraft (if in the vicinity of aerodromes) and the surrounding environment.

AS/NZS 4282:2023 *Control of the obtrusive effects of outdoor lighting*

5.2.1. Environmental Zones

This document outlines Environmental Zones to which the proposed lighting will be evaluated based on the location of the proposed lighting relative to its surrounding environment.

Excerpt from Standard Table 3.1 Environmental Zone

Zones	Description	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

The proposed lighting is evaluated under the requirements of **A4**

5.2.2. Maximum Values of Light Technical Parameters

Excerpt from Standard Table 3.2 Maximum Values of Light Technical Parameters (including to lit surfaces illuminated signs).

Zones	Vertical illuminance levels (Ev) Lx		Threshold increment (TI)		Sky glow
	Non-curfew	Curfew	%	Default adaptation level (Lad)	Upward light ratio
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

NOTES:

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} ≤0.25 cd/m^2

Excerpt from Standard Section 3.3.3.4 *Control of upward waste light*

Digital signs shall have ULR_L of ≤ 0.45

5.2.3. Maximum Average Luminance of Surfaces (cd/m²)

Excerpt from Standard Table 3.4 Maximum Average Luminance of Surfaces (cd/m²)

Application conditions	Environmental zones				
	A0	A1	A2	A3	A4
See Clause 3.3.3	0.1	50	150	250	350

As the proposed signs are located within an A4 Environmental Zone, the resulting luminance limit shall be 350cd/m^2.

5.3. Australian Government Civil Aviation Safety Authority Part 139 (Aerodromes) Manual of Standards 2019

This guide outlines the requirements of upward spill light within 6000m of an aerodrome. This requirement ensures no light sources interfere with the take-off and landing operations of aircraft.

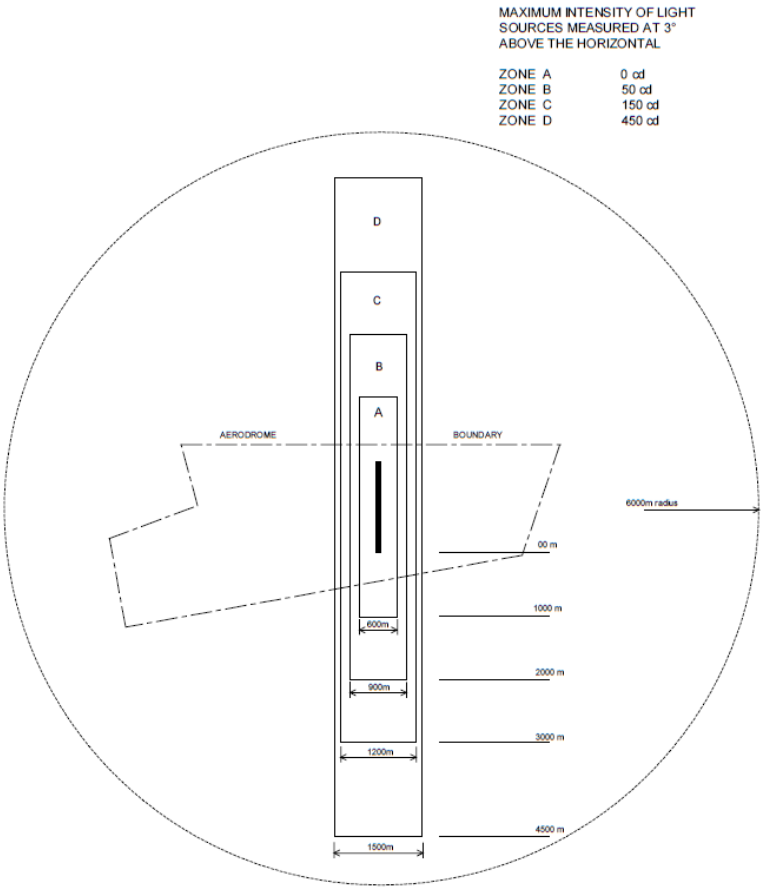

Figure 9.21-1: Maximum lighting intensities

As the proposed site location is not with a 6000m radius of an aerodrome this requirement **does not apply**.

5.2. Combined Relevant Maximum Values of Light Technical Parameters

Below is a summary of the combined Maximum Value of Light Technical Parameter at which the proposed lighting will be evaluated for its surrounding environmental conditions and time of day.

Zones	Vertical illuminance levels (Ev) Lx		Threshold increment (TI)		Sky glow Upward light ratio
	Non-curfew	Curfew	%	Default adaptation level (Lad)	%
A4	25	5	20%	1	50% (including signs)

6.1 Sky glow Upward Light Ratio

Analysis of the lighting model shows that the proposed lighting (excluding illuminated signs) achieves 0% of Upward Light Ratio.

Analysis of the illuminated signs shows that the UWLR is 12.9% which is less than the allowed 50%.

COMPLIANT

6.2 Threshold Increment

Threshold Increment has been evaluated using computer modelling with AGI32 version 21.2.0.61 software. All relevant travel directions towards to the site have been evaluated has been analysed as per the method outlines in AS/NZS4282-2023 at an adaptation luminance of 1 applied.

COMPLIANT

6.3 Vertical illuminance Levels

Residences were evaluated as per the method outlines in AS/NZS4282-2023 for a A4 zone non-curfew and curfew.

COMPLIANT

CERTIFICATION

The exterior lighting and illuminated signage for the proposed development, is compliant with all relevant standards if installed in accordance with the designs shown on the drawing set MCD02539-E01 dated 20/05/2025.

Scott Forbes MIES RLP #2715
Principal Lighting Engineer
Rubidium Light

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PROPOSED MCDONALDS
PINJARRA
WA

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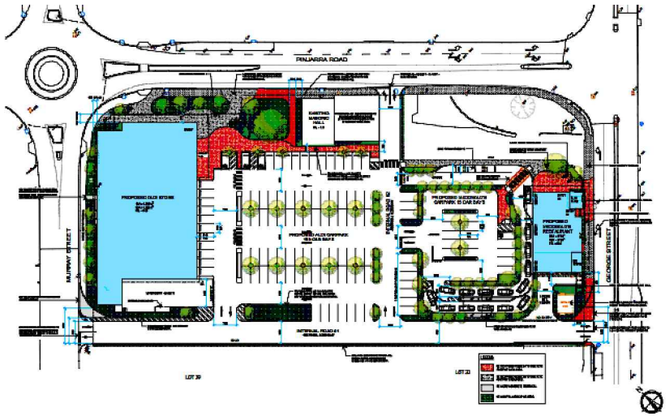
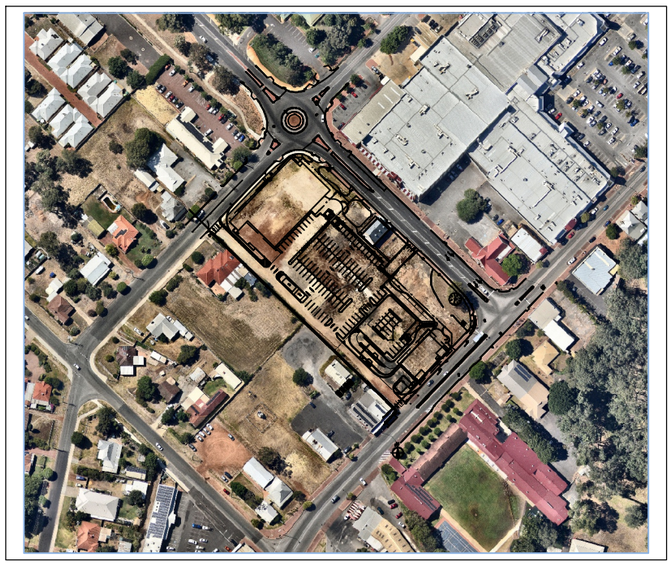


SITE PLAN
SCALE: N.T.S.



LOCALITY PLAN
SCALE: N.T.S.

GENERAL LIGHTING NOTES:

1. THE PROPOSED LIGHTING SCHEME MEETS OR EXCEEDS THE REQUIREMENTS OF AS/NZS1158.3.1:2020 FOR SUBCATEGORY PC1, PCD AND PCX.
2. UNLESS NOTED OTHERWISE, THE VALUES SHOWN ARE HORIZONTAL MAINTENANCE ILLUMINANCE ON AN OPEN UNOBSTRUCTED PLANE AT GRADE.
3. ALL LUMINAIRE DATA IS SUPPLIED BY MANUFACTURER.
4. DESIGN SOFTWARE USED AGI32 V22
5. ALL CALCULATIONS AND RESULTS PROVIDED ARE SUBJECT TO TOLERANCES IN ACCORDANCE WITH AS/NZS3827.1-1998 AND AS.NZS3827.2-1998 *LIGHTING SYSTEM PERFORMANCE AND ACCURACY TOLERANCES*.
6. FOR CLARITY, ONLY HORIZONTAL ILLUMINANCE PLANES ARE SHOWN.
7. THE NUMBER OF FITTINGS SHOWN, AND THE TYPE OF FITTINGS ARE THE MINIMUM REQUIRED AND ADDITIONAL FITTINGS MAY BE NECESSARY IN THE FINAL COORDINATION.

LIGHTING SYSTEM MAINTENANCE

THE COMBINED LIGHT-LOSS FACTOR APPLIED TO THESE CALCULATIONS IS BASED ON:

8. 72 MONTHS CLEANING INTERVAL OF LUMINAIRES IN A URBAN POLLUTION SUB-CATEGORY ENVIRONMENT.
9. IP6X LUMINAIRE
10. 20 YEAR DESIGN LIFE.
11. SPOT REPLACEMENT OF FAILED LIGHT SOURCES.

OBTRUSIVE LIGHTING ANALYSIS

12. COMPLIANCE WITH AS/NZS4282-2023 IS DEMONSTRATED FOR AN A3 ENVIRONMENTAL ZONE FOR NON-CURFEW AND CURFEW OPERATION (i.e. 24 HOURS)
13. ALL OBTRUSIVE LIGHT ANALYSIS IS EVALUATED AT INITIAL FLUX.

Drawing List

Drawing Number	Sheet Number	Revision	Title
MCD02539-E01	1	A	Title Page
MCD02539-E01	2	A	General Arrangement
MCD02539-E01	3	A	Obstrusive Light Analysis

LIGHTING CERTIFICATION

LIGHTING CERTIFIED TO COMPLY WITH:

AS/NZS1158.3.1:2020 SUB-CATEGORY PC1, PCD AND PCX, AND

AS/NZS4282-2023 FOR AN A4 ENVIRONMENTAL ZONE FOR NON-CURFEW AND CURFEW OPERATION (i.e. 24 HOURS).

* INSTALLATION MUST COMPLY WITH AS3000.
* ALL LUMINAIRE DATA HAS BEEN SUPPLIED BY MANUFACTURER.

PROPOSED MCDONALDS

MIES RLP No. 2715

Rev.	Date	Drn.	Description	Chkd.
0	20/05/2025	SAF	ISSUED FOR APPROVAL	
A	10/06/2025	SAF	REVISED BASEPLAN	

Project:
PROPOSED MCDONALDS
PINJARRA
WA

Title:
ELECTRICAL SERVICES
LIGHTING SYSTEMS
TITLE PAGE

Drawn:	Checked:	Date:	Scale:
SAF	TD	10/06/2025	NTS

Drawing No. MCD02539-E01A-1
Rev A
Size A3

Rubidium Light
A 30/8 Riverland Drive Loganholme QLD 4129
E admin@rubidiumlight.com.au

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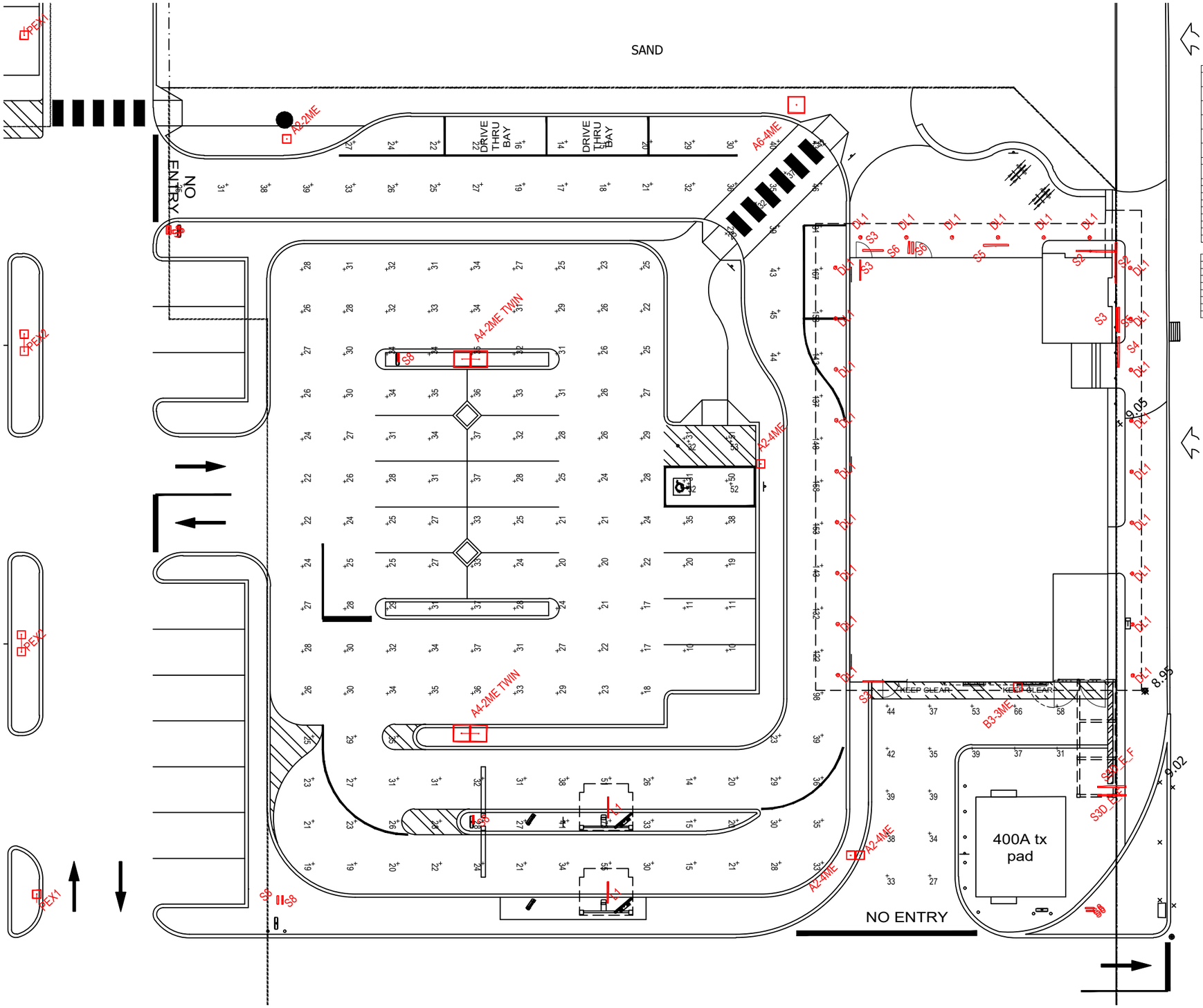

Luminaire Schedule

Symbol	Qty	Label	Description	LLF	Luminaire Lumens	Luminaire Watts	Filename
	1	A2-2ME	47W LED AREA LIGHT ON 6m POLE - ADLT XSPSM-D-HT-2ME-SL-40K7-UL-SV-N	0.800	4193	46.15	XSPSM-D-HT-2ME-SL-40K7-UL-SV-N w_XA-SPR3BLS_PL12759-001B.ies
	3	A2-4ME	47W LED AREA LIGHT ON 6m POLE - ADLT XSPSM-D-HT-4ME-SL-40K7-UL-SV-N_PL12485-001B.ies	0.800	5256	47.28	XSPSM-D-HT-4ME-SL-40K7-UL-SV-N_ PL12485-001B.ies
	2	A4-2ME TWIN	TWIN 69W LED AREA LIGHT ON 8m POLE - ADLT XSPSM-D-HT-2ME-8L-40K7-Ux-SV-N	0.800	7775	69	XSPSM-D-HT-2ME-8L-40K7-Ux-SV-N_ CONFIGURED.ies
	1	A6-4ME	94W LED AREA LIGHT ON 6m POLE ADLT XSPE024MEE40K_94W	0.800	11387	94	XSPE024MEE40K_94W-PL11703-032.IES
	1	B3-3ME	67W LED AREA LIGHT ON AWNING ABOVE XSPSM-D-HT-3ME-SL-40K7-UL-SV-N	0.800	7723	66.29	XSPSM-D-HT-3ME-SL-40K7-UL-SV-N_ PL12434-001B.ies
	24	DL1	25W DOWNLIGHT IN SOFFIT	0.800	2755	27	DR-5-28C120T-4000K.IES
	2	L1	DARKON HIP IP67_118E_NA_BLK_OV_HE_350mA_3000K CRI90 18W 3000K LED SURFACE-MOUNTED PROFILE BLACK	0.800	1619	18.3	HIP IP67_118E_NA_WHT_OV_HE_ 350mA_3000K CRI90.IES
	2	PEX1	ALDI - WE-EF 9m POLE	0.800	10307	96	108-1079.ies
	2	PEX2	ALDI WE-EF DOUBLE OUTREACH 9m POLE	0.800	10307	96	108-1079.ies
	2	S2	SIGN PLAYPLACE 2400 x 690	0.800	891	26.6321	PP-6X6-28S90 4000K.IES
	4	S3	SIGN GOLDEN ARCH WALL 1370 x 1200mm	0.800	642	26.6321	PP-6X6-28S90 4000K.IES
	2	S3D_E_F	SIGN GOLDEN ARCH LOGO 1910 x 1670mm	0.800	1248	26.6321	PP-6X6-28S90 4000K.IES
	1	S4	ENTRY CLIP 1811 x 221	0.800	615	26.6321	PP-6X6-28S90 4000K.IES
	2	S5	McCAFE BLADE 1492 x 700	0.800	934	26.6321	PP-6X6-28S90 4000K.IES
	2	S6	McCAFE BLADE 700 x 700	0.800	654	26.6321	PP-6X6-28S90 4000K.IES
	8	S8	SIGN DIRECTIONAL	0.800	46	26.6321	PP-6X6-28S90 4000K.IES

Calculation Summary

Label	CalcType	Avg	Max	Min	Max/Avg
CARPARK Eh	Illuminance	28.0	51	10	1.8
CARPARK Ev1	Illuminance	21.8	33	13	N.A.
CARPARK Ev2	Illuminance	22.6	34	13	N.A.
DOCK	Illuminance	40.8	66	27	1.6
DRIVE-THROUGH Eh	Illuminance	43.8	167	14	3.8
PCD BAY	Illuminance	42.3	53	32	1.3
PX1	Illuminance	34.0	42	25	1.2

Rev.	Date	Drn.	Description	Chkd.
0	20/05/2025	SAF	ISSUED FOR APPROVAL	
A	10/06/2025	SAF	REVISED BASEPLAN	

Project:
PROPOSED MCDONALDS
PINJARRA
WA

Title:
ELECTRICAL SERVICES
LIGHTING SYSTEMS
GENERAL ARRANGEMENT

Drawn:	Checked:	Date:	Scale:
SAF	TD	10/06/2025	NTS
Drawing No.		Rev	Size
MCD02539-E01A-2		A	A3

Rubidium Light
A 30/8 Riverland Drive
Loganholme QLD 4129
E admin@rubidiumlight.com.au

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Obtrusive Light - Compliance Report

AS/NZS 4282:2023, A4 - High District Brightness, Curfew
Filename: MCD02539 - 1
20/05/2025 9:52:56 AM

Illuminance

Maximum Allowable Value: 5 Lux

Calculations Tested (4):

Calculation Label	Test Results	Max. Illum.
REL BDY MURRAY ST_Ill_Seg1	PASS	0.0
REL BDY MURRAY ST_Ill_Seg2	PASS	0.0
REL BDY MURRAY ST_Ill_Seg3	PASS	0.0
REL BDY 30 MURRAY ST_Ill_Seg1	PASS	2.0

Luminous Intensity (Cd) At Vertical Planes

Maximum Allowable Value: 2500 Cd

Calculations Tested (4):

Calculation Label	Test Results
REL BDY MURRAY ST_Cd_Seg1	PASS
REL BDY MURRAY ST_Cd_Seg2	PASS
REL BDY MURRAY ST_Cd_Seg3	PASS
REL BDY 30 MURRAY ST_Cd_Seg1	PASS

Threshold Increment (TI)

Maximum Allowable Value: 20 %

Calculations Tested (3):

Calculation Label	Adaptation Luminance	Test Results
THRESHOLD INCREMENT 1	5	PASS
THRESHOLD INCREMENT 2	5	PASS
THRESHOLD INCREMENT 3	5	PASS

Upward Waste Light Ratio (UWLR)

Maximum Allowable Value: 50.0 % (includes signs)

Calculated UWLR: 12.9 %
Test Results: PASS

Rev.	Date	Drn.	Description	Chkd.
0	20/05/2025	SAF	ISSUED FOR APPROVAL	
A	10/06/2025	SAF	REVISED BASEPLAN	

Project:
PROPOSED MCDONALDS
PINJARRA
WA

Title:
ELECTRICAL SERVICES
LIGHTING SYSTEMS
OBTRUSIVE

Drawn: SAF
Checked: TD
Date: 10/06/2025
Scale: NTS
Drawing No. MCD02539-E01A-3
Rev A
Size A3

Rubidium Light
A 30/8 Riverland Drive
Loganholme QLD 4129
E admin@rubidiumlight.com.au

Rb rubidium light