NDYLIGHT
LIGHTING DESIGN

CONSULTANT ADVICE NOTICE

PROJECT:	**43 MCFARLANE AVENUE GOOGONG NSW – LANDSCAPE LIGHTING ADVICE**	**CAN NO:**	**G-001[1.0]**
Date/Time:	29 September 2023	Project No: 40918 - 001	Pages: 10

Name	Company	Email
Giselle Ravaria	Urbane Studio	giselle@urbanestudio.com.au
Aaron Naylor	Googong Projects (NSW) Pty Ltd	aaron@voyagerprojects.com.au

SUBJECT: DA PHASE NSW POLICE REQUIREMENTS FOR LANDSCAPE LIGHTING CONSULTANTS ADVICE

Executive Summary

Googong Projects Pty Ltd and Urbane Studio require lighting consultant's advice to address a DA phase landscape lighting request from NSW police for the proposed landscape design at 43 McFarlane Avenue Googong NSW. The following extract outlines the NSW police request for the proposed landscape lighting design:

> **Lighting**: Sufficient Lighting should be placed in the communal area and the 7 entry/exit points to the communal area as well. A basic level of lighting should allow the identification of a face from a distance from 10 metres.
>
> In regards to the Communal area, if the developer wishes this to be used for night time use then consideration should be given to the design, type and placement and also the intensity of lighting. If the developer wishes the area not to be used at night further consideration should be given to the type and intensity of lighting.
>
> Lighting should be vandal proof and lights should be maintained and bushes, tress that block off light should be trimmed.

Figure 1.1 – Extract from NSW Police request DA phase lighting

We note that the above request does not outline specific lighting technical parameters and illuminance levels to satisfy the request. Based on this, NDYLIGHT has assumed illuminance requirements for the pathway and public area lighting in accordance with the recommendations outlined in the Australian Standard 1158.3.1.2020 - *Lighting for Roads and Public Spaces – Pedestrian Area (Category P) Lighting*. The Australian Standard 1158.3.1:2020 contains recommendations for lighting technical parameters pertaining to the location of the lighting installation, perceived risk of crime, types of pedestrian activity and need to enhance prestige.

NDYLIGHT has undertaken a technical assessment of the requirements stated within the NSW Police request, and the recommendations of the Australian Standard 1158.3.1.2020, to provide a reference lighting design and advice to assist with the DA phase planning requirements. The advice includes explanations of measures taken to achieve the illuminance requirements, typical luminaire types, a summary of assumed illuminance levels and a reference lighting layout.

It is understood the response to the RFI must demonstrate that the proposed landscape lighting design meets the NSW Police request and recommendations of the Australian Standard 1158.3.1.2020. To address the requirements, the advice considers the following factors:

- Horizontal and Vertical illuminance lighting calculations for site entry points, pathways, and communal areas for safety and security.
- Selection of luminaires with appropriate colour rendering index (CRI), ingress protection (IP rating) and impact ratings (IK rating) for vandal resistant application suitable for external public area lighting.
- A conceptual layout indicating luminaire locations with the proposed landscape and architectural design.

The lighting layouts and design criteria within this advice notice should be treated as a reference lighting design to inform the DA phase request. We note that the final design will likely vary from the proposed NDYLIGHT design, however, the associated NSW Police requirements and recommendations of the Australian Standards included in this advice will stand. Further development of the lighting design is expected to be required upon clarification and feedback of the lighting technical parameters by relevant authorities or project stakeholders and for coordination of exact luminaire locations and further assessment of obtrusive light spill requirements.

Appendices

- Refer to Appendix A for a summary of the assumed lighting criteria applied to the reference lighting design.
- Refer to Appendix B attached to this advice notice for the reference lighting layout to achieve the assumed design criteria.
- Refer to Appendix C for a summary of the lighting calculations.

Site Information

Based on the landscape plan provided, the proposed landscape design at 43 McFarlane Avenue, Googong, comprises several site entry points (7 no.), a network of pedestrian pathways within the site boundary and a communal area at the centre of the development. The site is surrounded by Gorman Drive to the North, McFarlane Avenue to the East and Wellsvale Drive to the West. A neighbouring allotment is located adjacent to the site on the southern side. Surrounding street lighting and footpath lighting beyond the site boundary are excluded from this assessment. Refer to figure 1.2 for the proposed site masterplan and areas included in the reference lighting design.

Figure 1.2 Proposed landscape design at 43 McFarlane Avenue Googong NSW

Proposed Lighting Outcomes

Based on the assumed usage of the site, and the level of risk for crime, the following Australian Standard categories have been selected. These assumptions and categories may be subject to change upon further review and input received from the NSW Police and Authorities.

The reference lighting layout has been designed to meet the nominal illuminance criteria as set out within Australian Standard 1158.3.1:2020.

The key outcomes for the lighting - as stated in the aforementioned Australian Standard are as follows:

- Provide adequate vertical lighting at site entry points to enable facial recognition from a nominal distance of 10m.
- Provide luminaires with CRI >80 for good colour rendition for facial recognition.
- Provide luminaires with appropriate IP and IK ratings for safety and general vandal resistance.
- Provide for safe movement of pedestrians within the site along pathways and connecting elements.
- Provide for adequate illuminance levels at the communal area for safety and security.
- Provide for a sustainable and robust lighting system suitable for public areas.

AS1158.3.1.2020 – Lighting for Roads and Public Spaces – Pedestrian Area (Category P) Lighting Design Criteria

AS1158.3.1.2020 contains recommendations regarding lighting for public pedestrian areas. The standard considers the following factors:

- The location of the lighting installation.
- Perceived risk of crime at the site.
- Types of pedestrian activity at the site.
- Need to enhance prestige at the site.

Based on the above factors, an assumption of the lighting technical parameters required for the site has been undertaken for the areas requiring lighting. The following extracts summaries the assumed lighting technical parameters:

Lighting at Site Entry Points:

AS1158.3.1 Category PP1 lighting for pathways and has been selected to provide higher illuminance levels at the site entry points.

TABLE 3.4

VALUES OF LIGHT TECHNICAL PARAMETERS FOR PATHWAYS AND CYCLIST PATHS

1	2	3	4	5
	Light technical parameters (LTP)			
Lighting subcategory	Average horizontal illuminance[a,b] $(\bar{E}_h)$ lx	Point horizontal illuminance[a,b,d] (E_{Ph}) lx	Illuminance (horizontal) uniformity[c] Cat. P (U_{E2})	Point vertical illuminance[a,b] (E_{Pv}) lx
PP1	10	2	5	1
PP2	7	1	5	0.3
PP3	3	0.5	5	0.1
PP4	1.5	0.25	5	0.05[e]
PP5	0.85	0.14	5	0.02[e]

Figure 1.3: Extract from AS1158.3.1 Table 3.4 Category PP1 Lighting technical parameters for the site entry points.

Lighting for Pedestrian Pathways and Connecting Elements:

AS1158.3.1 Category PP4 lighting for pathways has been selected to provide illuminance levels for safe movement along the pedestrian pathways. And Category PP3 (PE2) lighting for connecting elements has been selected to provide illuminance levels for safe movement along the stairs and ramps.

TABLE 3.4

VALUES OF LIGHT TECHNICAL PARAMETERS FOR PATHWAYS AND CYCLIST PATHS

1	2	3	4	5
Lighting subcategory	Light technical parameters (LTP)			
	Average horizontal illuminance[a,b] $(\bar{E}_h)$ lx	Point horizontal illuminance[a,b,d] (E_{Ph}) lx	Illuminance (horizontal) uniformity[c] Cat. P (U_{E2})	Point vertical illuminance[a,b] (E_{Pv}) lx
PP1	10	2	5	1
PP2	7	1	5	0.3
PP3	3	0.5	5	0.1
PP4	1.5	0.25	5	0.05[e]
PP5	0.85	0.14	5	0.02[e]

Figure 1.4: Extract from AS1158.3.1 Table 3.4 Category PP4 Lighting technical parameters for public pedestrian pathways.

TABLE 3.4

VALUES OF LIGHT TECHNICAL PARAMETERS FOR PATHWAYS AND CYCLIST PATHS

1	2	3	4	5
Lighting subcategory	Light technical parameters (LTP)			
	Average horizontal illuminance[a,b] $(\bar{E}_h)$ lx	Point horizontal illuminance[a,b,d] (E_{Ph}) lx	Illuminance (horizontal) uniformity[c] Cat. P (U_{E2})	Point vertical illuminance[a,b] (E_{Pv}) lx
PP1	10	2	5	1
PP2	7	1	5	0.3
PP3	3	0.5	5	0.1
PP4	1.5	0.25	5	0.05[e]
PP5	0.85	0.14	5	0.02[e]

Figure 1.5: Extract from AS1158.3.1 Table 3.4 Category PP3 (PE2) Lighting technical parameters for connecting elements.

Lighting for the Communal Space:

AS1158.3.1 Category PA2 lighting for public activity areas has been selected to provide higher illuminance levels for security and safe movement within the communal space.

TABLE 3.5

VALUES OF LIGHT TECHNICAL PARAMETERS FOR PUBLIC ACTIVITY AREAS (EXCLUDING CAR PARKS)

1	2	3	4	5
Lighting subcategory	Light technical parameters (LTP)			
	Average horizontal illuminance[a,b] $(\bar{E}_h)$ lx	Point horizontal illuminance[a,b] (E_{Ph}) lx	Illuminance (horizontal) uniformity[c] Cat. P (U_{E2})	Point vertical illuminance[a,b,d] (E_{Pv}) lx
PA1	21	7	8	7
PA2	14	4	8	4
PA3	7	2	8	2

Figure 1.6: Extract from AS1158.3.1 Table 3.5 Category PA2 Lighting technical parameters for the communal public area

Proposed Lighting Installation

The reference lighting design consists of several luminaire types to achieve the proposed general lighting design criteria. The following summarises indicative luminaire types for each application:

Lighting at Site Entry Points:

Pole mounted lights at the site entry points over a distance of 10m to achieve the minimum lighting technical parameters as set out in AS1158.3.1.2020 Category PP1 for public pathways. Pole luminaire mounting heights are at 5m above the finished surface of the pathway. The table below provides technical information of the typical luminaire types used in the design.

Indicative pole mounted light:

Fitting manufacturer	WE-EF
Model	LTM440
Image	
Lamp Type	LED
Wattage	20W
CRI	>80
Lumen Output	2300lm
Beam Angles	Type III
Colour Temperature	3000K
IP Rating	IP66
IK Rating	IK09

Lighting for Pedestrian Pathways and Connecting Elements:

Low level 1m high bollard lights or wall lights at equal spacing along pathways and 5m high pole mounted lights at ramps and stairs to achieve the minimum lighting technical parameters as set out in AS1158.3.1.2020 Category PP4 for public pathways and Category PP3 for connecting elements. The table below provides technical information of the typical luminaire types used in the design.

Indicative bollard light:

Fitting manufacturer	Ewo
Model	FA Bollard
Image	
Lamp Type	LED
Wattage	12W
CRI	>80
Lumen Output	1000lm
Beam Angles	Asymmetric Wide
Colour Temperature	3000K
IP Rating	IP66
IK Rating	IK09

Indicative pole mounted light:

Fitting manufacturer	WE-EF
Model	LTM440
Image	
Lamp Type	LED
Wattage	20W
CRI	>80
Lumen Output	2300lm
Beam Angles	Type III
Colour Temperature	3000K
IP Rating	IP66
IK Rating	IK09

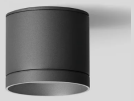
Lighting for the Communal Space:

Pole mounted lights surrounding the perimeter of the communal space and downlights beneath the BBQ canopy to achieve the minimum lighting technical parameters as set out in AS1158.3.1.2020 Category PA2 for public activity areas. Pole luminaire mounting heights are at 6m above the finished surface of the pathway. The table below provides technical information of the typical luminaire types used in the design.

Indicative pole mounted light:

Fitting manufacturer	WE-EF
Model	LTM440
Image	
Lamp Type	LED
Wattage	20W
CRI	>80
Lumen Output	2300lm
Beam Angles	Type IV
Colour Temperature	3000K
IP Rating	IP66
IK Rating	IK09

Indicative downlight:

Fitting manufacturer	Bega
Model	Ceiling mounted downlight
Image	
Lamp Type	LED
Wattage	20W
CRI	>80
Lumen Output	2200
Beam Angles	Wide
Colour Temperature	3000K
IP Rating	IP65
IK Rating	IK08

Lighting Calculation Methodology Overview

Lighting Calculations for Site Entry Points:

Lighting calculations (Appendix C) for the Site Entry points were performed over a distance 10m at each entry point to assess compliance with AS1158.3.1 Category PP1. Lighting calculations were performed based on a maintenance factor of 0.8 to allow for depreciation of the light source over time due to accumulation of dust and loss of light output to due aging of the system. Lighting calculation points were determined in accordance with the recommendations of Australian Standard 1158.2.2020 - *Computer procedures for the calculation of light technical parameters for Category V and Category P lighting.*

Lighting Calculations for Pedestrian Pathways and Connecting Elements:

Typical light spacing calculations (Appendix C) for the landscape Pedestrian Pathways were performed for pathway widths of 1.5m and 3.0m as per the proposed landscape design to assess compliance with AS1158.3.1 Category PP4. Typical light spacing calculations for the connecting elements were performed to assess compliance with AS1158.3.1 Category PP3 (PE2). Lighting calculations were performed based on a maintenance factor of 0.8 to allow for depreciation of the light source over time due to accumulation of dust and loss of light output to due aging of the system. Lighting calculation points were determined in accordance with the recommendations of Australian Standard 1158.2.2020 - *Computer procedures for the calculation of light technical parameters for Category V and Category P lighting.*

Lighting Calculations for the Communal Space:

Lighting calculations (Appendix C) for the Communal Space were performed over the entirety of the communal space area to assess compliance with AS1158.3.1 Category PA2. Lighting calculations were performed based on a maintenance factor of 0.8 to allow for depreciation of the light source over time due to accumulation of dust and loss of light output to due aging of the system. Lighting calculation points were determined in accordance with the recommendations of Australian Standard 1158.2.2020 - *Computer procedures for the calculation of light technical parameters for Category V and Category P lighting.*

Assumptions & Disclaimers

- AS1158.3.1 Categories within this advice noticed have been selected based upon an assumed usage, location and risk of crime, and, as such, may be subject to change upon further comment/ input provided by NSW Police and/or relevant Authorities.
- NDY/ NDYLIGHT shall not be liable in any way should the reference design be implemented, further engineered, or installed by other parties.
- AGi32 lighting calculation software has been used for the calculations provided in this report. Maintenance factors, surface finishes, colours and associated reflectance values have been assumed for these calculations.
- This Consultant's Advice notice should be used for reference only and not be considered for final and/ or completed lighting design.

Appendices

- Refer to Appendix A for a summary of the assumed lighting criteria applied to the reference lighting design.
- Refer to Appendix B attached to this advice notice for the reference lighting layout to achieve the assumed design criteria.
- Refer to Appendix C for a summary of the lighting calculations.

We trust this Consultants Advice Notice addresses the request

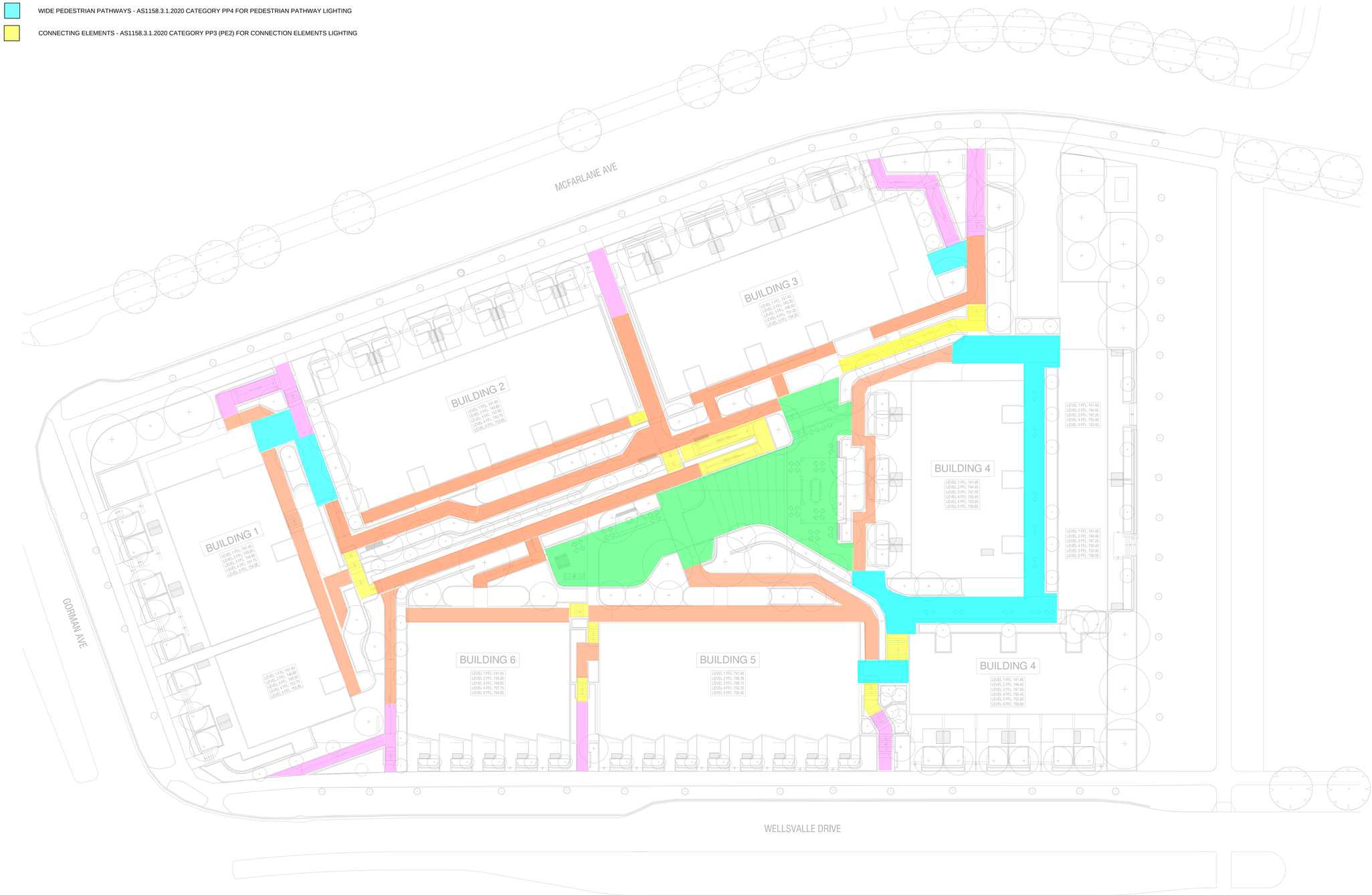
Chris Cody | Sydney Studio Manager
c.cody@ndylight.com

ASSUMED ILLUMINANCE LEVELS - KEY PLAN

- COMMUNAL AREA - AS1158.3.1.2020 CATEGORY PA2 FOR PUBLIC ACTIVITY AREA
- SITE ENTRY POINTS - AS1158.3.1.2020 CATEGORY PP1 FOR ENTRY POINT PEDESTRIAN PATHWAY LIGHTING
- NARROW PEDESTRIAN PATHWAYS - AS1158.3.1.2020 CATEGORY PP4 FOR PEDESTRIAN PATHWAY LIGHTING
- WIDE PEDESTRIAN PATHWAYS - AS1158.3.1.2020 CATEGORY PP4 FOR PEDESTRIAN PATHWAY LIGHTING
- CONNECTING ELEMENTS - AS1158.3.1.2020 CATEGORY PP3 (PE2) FOR CONNECTION ELEMENTS LIGHTING

GENERAL NOTES

LANDSCAPE ILLUMINANCE REQUIREMENTS ARE ASSUMED IN ACCORDANCE WITH AS1158.3.1.2020. ALL FINAL ILLUMINANCE REQUIREMENTS ARE TO BE VERIFIED BY THE CLIENT PRIOR TO FURTHER DOCUMENTATION OF THE LIGHTING DESIGN.



ASSUMED ILLUMINANCE LEVELS - SITE PLAN

REFERENCE DESIGN ONLY
NOT FOR TENDER OR CONSTRUCTION

APPENDIX A

Rev	Description	Date
P1	DA PHASE REFERENCE RFI	29.09.23

NDY QA SYSTEM
Reason For Issue
Authorisation
By
Verification Of Latest Amendment
By

NDYLIGHT
LIGHTING DESIGN
NDYLight 60 MILLER STREET NORTH SYDNEY NSW 2060 AUSTRALIA
TELEPHONE +61 2 9928 6800 FACSIMILE +61 2 9955 6900 www.ndy.com
A SPECIALIST DIVISION OF NDY Management Pty Ltd ABN 29 003 234 571

Project: LANDSCAPE LIGHTING DA PHASE
43 MCFARLANE AVENUE GOOGONG NSW

Title: SPECIALIST LIGHTING
GROUND LEVEL - LANDSCAPE LIGHTING
PROPOSED ILLUMINANCE LEVELS

Scale	Project Commencement	Drawn	Design	Project No.
1 : 200 @ A0	SEP.2023	ICE	CC	S40918-001N

Revit Version 2020
DRAWING IN COLOUR
Drawing No. E-0G-001
Revision

A0 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150 When reproduced at correct scale this line measures 150mm

GENERAL NOTES

LIGHTING LAYOUT IS INDICATIVE ONLY AND PROVIDED AS A REFERENCE DESIGN FOR DA PHASE SUBMISSION. THIS DRAWING IS NOT FOR TENDER OR CONSTRUCTION .

LUMINAIRE LOCATIONS ARE BASED ON ASSUMED ILLUMINANCE REQUIREMENTS IN ACCORDANCE WITH AS1158.3.1.2020. ALL FINAL ILLUMINANCE REQUIREMENTS ARE TO BE VERIFIED BY THE CLIENT PRIOR TO FURTHER DOCUMENTATION OF THE LIGHTING DESIGN.

ALL LUMINAIRE LOCATIONS ARE INDICATIVE ONLY AND ARE SUBJECT TO FINAL COORDINATION WITH THE LANDSCAPE DESIGN AND OTHER SERVICES.

ALL FINAL LUMINAIRE SELECTIONS ARE SUBJECT TO APPROVAL OF THE CLIENT AND LANDSACPE ARCHITECT.

LIGHTING LAYOUT IS BASED ON MEETING GENERAL FUNCTIONAL REQUIREMENTS ONLY - ARCHITECTURAL AND LANDSCAPE INTEGRATED LIGHTING IS NOT CURRENTLY INCLUDED WITHIN THIS REFERENCE DESIGN.

LUMINAIRE LEGEND

- EXTERIOR RATED SURFACE MOUNTED DOWNLIGHT
- GROUND MOUNTED BOLLARD LIGHT INSTALLED FACING PATHWAY
- POLE MOUNTED LUMINAIRE INSTALLED FACING PATHWAY

LANDSCAPE LIGHTING LAYOUT - REFERENCE DESIGN

REFERENCE DESIGN ONLY
NOT FOR TENDER OR CONSTRUCTION

APPENDIX B

Rev	Description	Date
P1	DA PHASE REFERENCE RFI	29.09.23

NDY QA SYSTEM
Reason For Issue
Authorisation
By
Verification Of Latest Amendment
By

NDYLIGHT
LIGHTING DESIGN
NDYLight 60 MILLER STREET NORTH SYDNEY NSW 2060 AUSTRALIA
TELEPHONE +61 2 9928 6800 FACSIMILE +61 2 9955 6900 www.ndy.com
A SPECIALIST DIVISION OF NDY Management Pty Ltd ABN 29 003 234 571

Project: LANDSCAPE LIGHTING DA PHASE
43 MCFARLANE AVENUE GOOGONG NSW

Title: SPECIALIST LIGHTING
GROUND LEVEL - LANDSCAPE LIGHTING LAYOUT
REFERENCE DESIGN

Scale	Project Commencement	Drawn	Design	Project No.
1 : 200 @ A0	SEP.2023	ICE	CC	S40918-001N

Revit Version 2020
DRAWING IN COLOUR
Drawing No. E-0G-002
Revision

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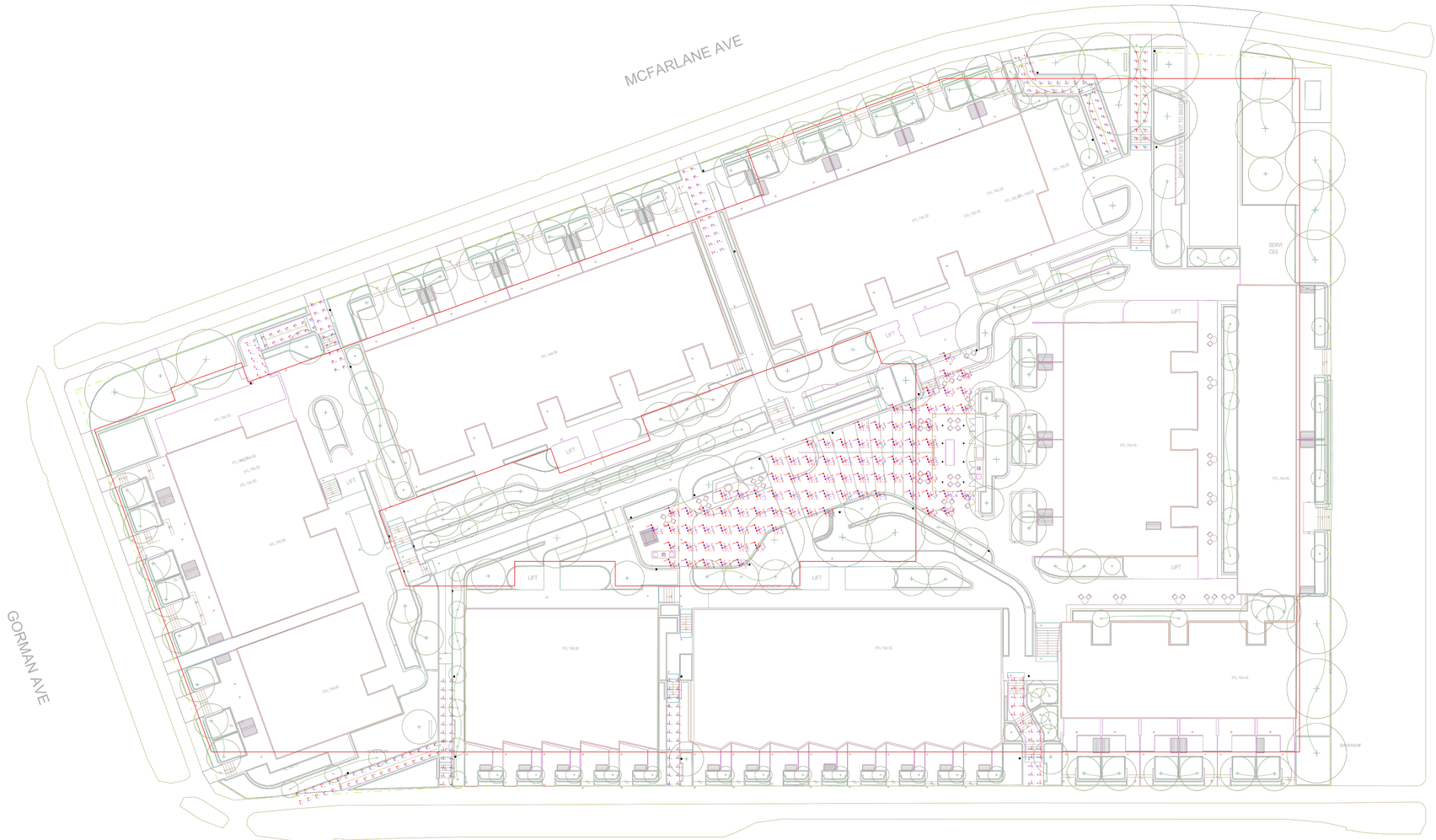
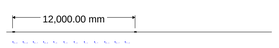


ENTRY POINTS AND COMMUNAL SPACE CATEGORIES PP1 AND PA2 CALCULATIONS

TYPICAL CATEGORY PP3 SPACING CALCULATION

TYPICAL NARROW PATHWAY CATEGORY PP4 SPACING CALCULATION



TYPICAL WIDE PATHWAY CATEGORY PP4 SPACING CALCULATION

Luminaire Schedule

Symbol	Qty	Label	LLF	Luminaire Lumens	Luminaire Watts
	8	ewo_PM300246_C100146497_FA170	0.800	1020	12.3
	11	115-1527	0.800	2359	20
	8	BE_2440K3	0.800	2226	19
	18	115-1525	0.800	2340	20

Calculation Summary

Label	CalcType	Units	Avg	Max	Min	Max/Avg	Compliance Commentary
Typical Conn Element - PP3 Horizontal	Illuminance	Lux	12.49	16.5	4.0	1.32	PP3_3lux Avg, 0.5lux Min, Ue2 <5
Typical Conn Element - PP3 Vertical	Illuminance	Lux	9.31	19.2	0.9	2.06	PP3_0.1lux Min
Entry Point 3B - PP1 Vertical	Illuminance	Lux	11.22	23.5	1.1	2.09	PP1_1lux Min
Entry Point 4A - PP1 Vertical	Illuminance	Lux	14.83	23.0	3.1	1.55	PP1_1lux Min
Entry Point 4B - PP1 Vertical	Illuminance	Lux	8.57	19.0	1.1	2.22	PP1_1lux Min
Typical Narrow Pathway - PP4 Horizontal	Illuminance	Lux	28.61	89.3	0.6	3.12	PP4_1.5lux Avg, 0.25lux Min, Ue2 <5
Typical Wide Pathway - PP4 Horizontal	Illuminance	Lux	8.75	33.7	0.8	3.85	PP4_1.5lux Avg, 0.25lux Min, Ue2 <5
Entry Point 5 - PP1 Vertical	Illuminance	Lux	12.11	18.9	5.3	1.56	PP1_1lux Min
Entry Point 6 - PP1 Vertical	Illuminance	Lux	8.55	23.0	1.0	2.69	PP1_1lux Min
Entry Point 7 - PP1 Vertical	Illuminance	Lux	12.28	20.2	1.1	1.64	PP1_1lux Min
Entry Point 1 - PP1 Vertical	Illuminance	Lux	12.26	20.1	3.6	1.64	PP1_1lux Min
Entry Point 2 - PP1 Vertical	Illuminance	Lux	14.22	22.2	4.3	1.56	PP1_1lux Min
Entry Point 3 - PP1 Vertical	Illuminance	Lux	13.65	22.3	2.4	1.63	PP1_1lux Min
Entry Point 3B - PP1 Horizontal	Illuminance	Lux	14.34	24.4	3.5	1.70	PP1_10lux Avg, 2lux Min, Ue2 <5
Entry Point 4A - PP1 Horizontal	Illuminance	Lux	22.29	28.1	10.6	1.26	PP1_10lux Avg, 2lux Min, Ue2 <5
Entry Point 4B - PP1 Horizontal	Illuminance	Lux	17.17	26.4	11.4	1.54	PP1_10lux Avg, 2lux Min, Ue2 <5
Entry Point 5 - PP1 Horizontal	Illuminance	Lux	19.12	22.4	13.8	1.17	PP1_10lux Avg, 2lux Min, Ue2 <5
Entry Point 6 - PP1 Horizontal	Illuminance	Lux	19.07	31.6	5.2	1.66	PP1_10lux Avg, 2lux Min, Ue2 <5
Entry Point 7 - PP1 Horizontal	Illuminance	Lux	23.15	32.3	17.3	1.40	PP1_10lux Avg, 2lux Min, Ue2 <5
Entry Point 1 - PP1 Horizontal	Illuminance	Lux	18.14	21.7	13.2	1.20	PP1_10lux Avg, 2lux Min, Ue2 <5
Entry Point 2 - PP1 Horizontal	Illuminance	Lux	18.11	22.4	5.4	1.24	PP1_10lux Avg, 2lux Min, Ue2 <5
Entry Point 3A - PP1 Horizontal	Illuminance	Lux	19.15	23.6	7.9	1.23	PP1_10lux Avg, 2lux Min, Ue2 <5
Rec Area 1 - PA2 Public Activity Vertical 1	Illuminance	Lux	11.52	18.4	4.0	1.60	PA2_4lux Min
Rec Area 1 - PA2 Public Activity Vertical 2	Illuminance	Lux	13.89	17.7	4.4	1.27	PA2_4lux Min
Rec Area 1 - PA2 Public Activity Horizontal	Illuminance	Lux	22.38	105.8	8.9	4.73	PA2_14lux Avg, 4lux Min, Ue2 <8

APPENDIX C

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