



# EXTERNAL LIGHTING STRATEGY REPORT for Wee Waa High School

105-107 Mitchell St  
Wee Waa, NSW 2388

Project No: MN12159

Client:  
NSW Department of Education  
Public Works Authority

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MECHANICAL · ELECTRICAL · HYDRAULIC · FIRE · ENERGY · NABERS · STORMWATER · SECTION J · BEEC

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## LIGHTING REPORT

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## 1 INTRODUCTION

This External Lighting Strategy report has been produced by Marline Newcastle on behalf of the proponents NSW Department of Education & Schools Infrastructure in support of the proposed development of a the new Wee Waa High School at 105-107 Mitchell St, Wee Waa, NSW 2388.

The purpose of the report is to review the proposed development and to provide concept external lighting recommendations and modelling. The initial design process is also to consider methods to reduce and control the potential spill of obtrusive light onto neighbouring properties. It is expected that these design concepts and recommendations will be developed as part of the ongoing design associated with this development and that compliance with Australian standards will be certified as part of subsequent stages.

### 1.1 Project Scope

This report has been prepared as part of the State Significant Development Application (SSDA) which is submitted to the Minister for Planning and Public Spaces. The SSDA seeks consent for the demolition, excavation, design, construction and operation of a new high school at the site nominated above.

The proposed works for the SSDA include:

- Site preparation works including infrastructure upgrade works.
- Construction and use of a new high school facility, including a two-storey main education building, sports field, a cultural centre, and agricultural facilities.
- Any tree removal, landscaping, site services augmentation.

### 1.2 Site Description

The Site is an irregular shape with an area of approximately 6.03 ha. The site is located on the north side of Mitchell Drive, and is bounded by existing residential blocks on all sides. The is legally described as Lot 124 - DP 757125, Lot 125 - DP 757125, Lot 2 - DP 550633 and Lot 1 - DP 577294. Refer to Figure 1 for an aerial photo of the Site.



The immediate area surrounding the Site's boundary is characterised by low density residential uses to the east, west, south and north. The existing Wee Waa Primary School is located opposite the SE corner of the site.

### **1.3 Sensitive Receivers & Surrounding Properties**

One of the key aspects of an effective external lighting installation is the strict management and elimination of obtrusive spill lighting into the surrounding community. If not managed correctly, excessive lighting over the boundaries of a site can impact the well-being of nearby 'sensitive receivers' which can include nearby residents, businesses, foot and vehicle traffic, and even wildlife. Obtrusive lighting can affect the surrounding area and its inhabitants in a number of ways including direct discomfort glare from poorly or carelessly aimed luminaires, and increased night sky brightness from excessive wasted upwards light.

For this project, it is expected that the most at risk sensitive receivers are the existing residents of properties in the vicinity. Due to the proximity of the development to the pre-existing residential area, the control of all external lighting will be critical in ensuring that their existing conditions are maintained. It also is noted that poorly designed or excessive external lighting systems can have impacts well beyond the immediate vicinity of the development.

The control of upwards light will also be critical in ensuring that the night-sky brightness levels in the area are not significantly increased as part of the development.

### **1.4 External Lighting Overview**

The proposed development consists of several external activity areas including a new driveway, pedestrian/cycle pathways and undercover play areas. A concept external lighting design will be proposed to comply meet the requirements of AS/NZS 1158.3.1 and AS/NZS 4282, while also addressing Crime Prevention Through Environmental Design (CPTED) principles. It is recommended that these initial design recommendations are co-ordinated with all stakeholders and relevant parties throughout the future design of this project to ensure a safe, compliant, and aesthetically pleasing lighting design is provided.

Marline have not been made aware of any specific Dark Sky planning requirements for this site due to nearby observatory locations or protected environmental areas. If relevant to this site, the lighting design can be adapted to suit specific requirements of the NSW Department of Planning 'Dark Sky Planning Guideline'.

It is noted that this report does not address the provision or modification of street lighting to the existing roadways adjacent to the development as this is outside the scope of this study. This will need to be provided by a registered Level 3 accredited service provider (ASP)

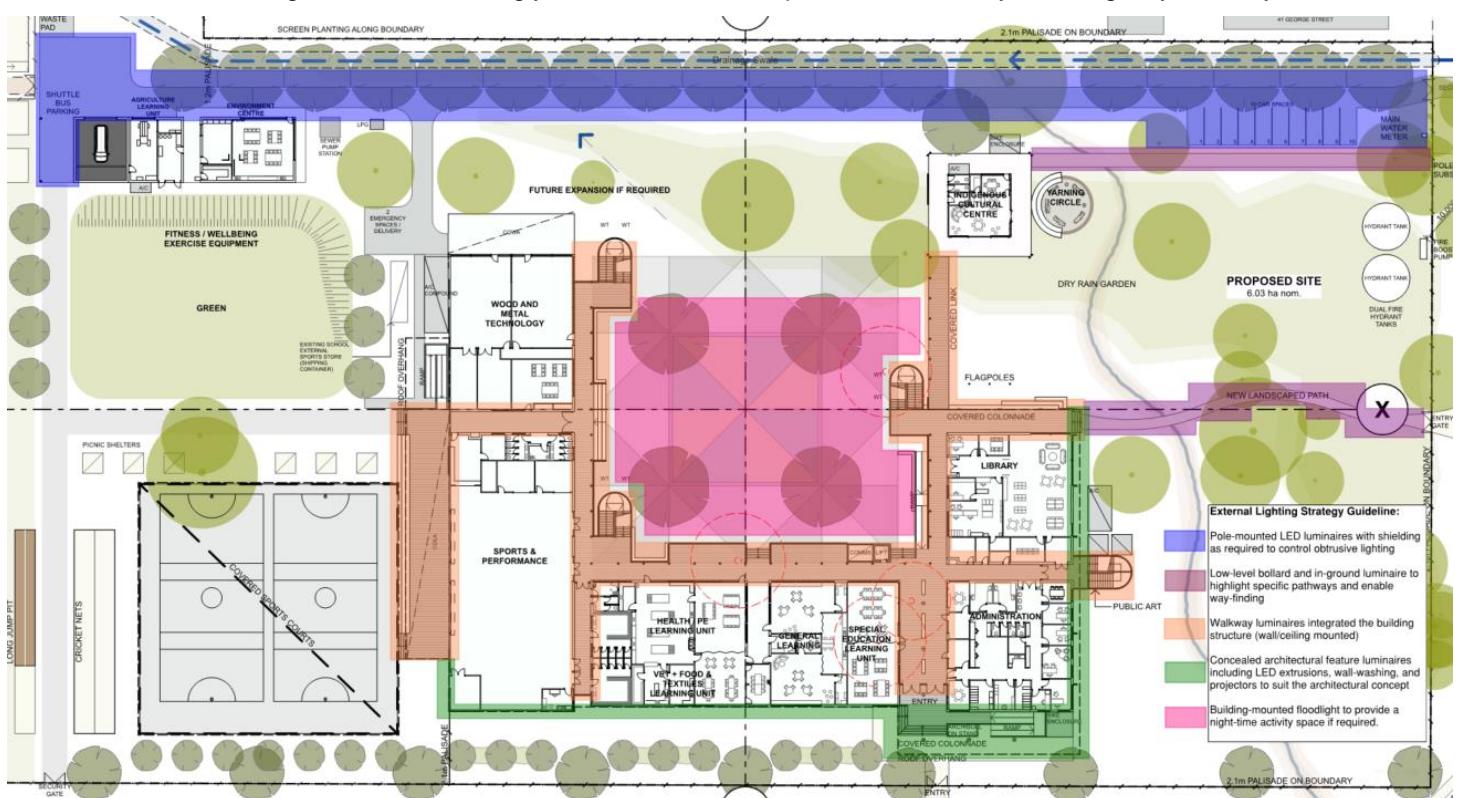
## 2 Concept External Lighting Designs

### 2.1 Lighting Design Concept

The external lighting design for this development is proposed to incorporate a range of efficiently and effectively placed luminaires of varying types, including pole-top area lighting, building mounted façade lighting, and low-level bollard luminaires. Where suitable, it is recommended that luminaires are integrated into the building and walkway structures as this allows for better control of the light output and often results in a more aesthetically-minded and economical installation. Luminaires will be provided to not only meet the minimum compliance levels noted above, but to highlight and complement specific architectural features of the design and to improve the perceived prestige and amenity of the development. As part of the specification process, careful consideration will be given to the environmental challenges of the area and preference will be given to luminaires that are design and warranted to survive in external applications (high IP and IK ratings). In order to improve the efficiency and lifespan of the installation, it is strongly recommended that only luminaires incorporating LED light sources be incorporated into the design.

As shown in the following lighting masterplan the most effective method to provide the required illumination levels to large activity areas and driveways is via pole-mounted LED luminaires. In order to minimise the effects of glare to both people in the area and within surrounding properties, it is recommended that a maximum pole-height of 4m be used throughout the development. Along roadways, luminaires with wide-throw asymmetric distributions will be used to maximise the spacing between luminaires. Within the courtyard and carpark areas, larger symmetric distributions can be provided, while some luminaires can be provided at lower levels to highlight specific activity areas where required.

If required, lighting of the athletics track and football field are to be provided in accordance with the applicable sections of the AS/NZS 2560 series. These standards clearly outline the minimum requirements for pole height, location, and orientation, as well as additional requirements for the shielding and limitation of obtrusive lighting into the surrounding areas. As with all other luminaires, the use of LED light sources is strongly recommended to improve the efficiency and longevity of the system.



## 2.2 Obtrusive Lighting

As part of the detailed design process undertaken prior to construction of the development, a detailed study to demonstrate compliance with AS 4282 will be undertaken. This must take into account specific locations and specifications of all external lighting (including decorative building lighting) and the positioning of adjacent residences, roadways, and businesses. In order to control the obtrusive light spill from the development and the potential affects on sensitive viewers, it is recommended that the following measure are considered:

- Detailed design is to be certified as compliant with AS 4282 for a suitable district brightness level
- Low-level luminaires (4m or lower) are to be used in preference to higher mounting locations (4m+)
- Highly controlled optics are recommended to specifically illuminate specific areas in place of wide-angle 'flood' type luminaires that incorporate little control of the light distribution.
- Position luminaires away from boundaries or behind physical obstructions which will assist in controlling the spread of light
- Provide backlight shields and glare reduction hoods as a last resort where other methods are not effective or applicable.

It is expected that a careful and deliberate application of the above principles will result in an external lighting system that will control the obtrusive lighting produced and limit any impacts on the surrounding sensitive receivers.

### 3 Proposed Lighting Levels

The classification of different lighting zones and varying illuminance levels for public spaces and roadways intended for pedestrian/mixed use is defined within AS/NZS1558.3.1. This standard outlines a number of different subcategories for public lighting systems and includes criteria for selecting these based on the following criteria: fear of crime, activity level, night time activity level, and the need to enhance prestige. As part of this design process, initial assumptions have been made about the levels appropriate for this development based on these characteristics.

It is strongly recommended that the user groups and all involved parties review these assumptions and provide confirmation that they are suitable or submit an alternative as the preferred option.

#### 3.1 Pedestrian & Cycle Pathways

Lighting is to be provided to the incoming and internal pedestrian pathways to ensure sufficient illumination of all users and potential obstacles. This will ensure safe operation of these pathways and limit the risks associated with their use throughout the day. Based on the characteristics shown in the below table from AS/NZS 1158.3.1, it is recommended that a classification of PP4 is applied over these areas

TABLE 2.2  
LIGHTING SUBCATEGORIES FOR PEDESTRIAN AND CYCLIST PATHS

1	2	3	4	5
Type of pathway	General description	Selection criteria <sup>a,b,c</sup>		Applicable lighting subcategory
Basic operating characteristics		Pedestrian/ cycle activity	Fear of crime	
Pedestrian or cycle orientated pathway, e.g. footpaths, including those along local roads <sup>d</sup> and arterial roads <sup>e</sup> , walkways, lanes, park paths, cyclist paths	Pedestrian and or cycle traffic only	N/A	High	PP1 <sup>c</sup>
		High	Medium	PP2 <sup>c</sup>
		Medium	Medium	PP3
		Medium	Low	PP4
		Low	Low	PP5

<sup>a</sup> The selection criteria of Columns 3 to 4 should be separately evaluated. The highest level of any of the selection criteria that is deemed appropriate for the pathway will determine the applicable lighting subcategory.

<sup>b</sup> See Appendix A for guidance on choosing the applicable level of each selection criteria for the environment and purpose of a lighting scheme.

<sup>c</sup> Where there are vertical surfaces of high reflectance (e.g. light coloured walls bordering on an alleyway) alongside the pathway, the next lower lighting subcategory may be selected.

<sup>d</sup> Where the footpath is along a local road and subcategory PP1 or PP2 is selected, the light technical parameters for that subcategory should only apply to the formed footpath.

<sup>e</sup> Footpaths associated with arterial roads are deemed not to require separate lighting provided that—

(a) the road is lit to at least the applicable level of Category V lighting conforming to AS/NZS 1158.1.1; and

(b) the footpath is unshaded, e.g. there are no substantially continuous building awnings, trees (refer to AS/NZS 1158.1.2) and the footpath is contiguous with the roadway.

TABLE 3.4  
VALUES OF LIGHT TECHNICAL PARAMETERS  
FOR PATHWAYS AND CYCLIST PATHS

1	2	Light technical parameters (LTP)			
		Average horizontal illuminance <sup>a,b</sup> ( $E_h$ ) Ix	Point horizontal illuminance <sup>a,b,d</sup> ( $E_{ph}$ ) Ix	Illuminance (horizontal) uniformity <sup>c</sup> Cat. P ( $U_{EZ}$ )	Point vertical illuminance <sup>a,b</sup> ( $E_{PV}$ ) Ix
PP1	10	2	5	5	1
PP2	7	1	5	5	0.3
PP3	3	0.5	5	5	0.1
PP4	1.5	0.25	5	5	0.05 <sup>e</sup>
PP5	0.85	0.14	5	5	0.02 <sup>e</sup>

<sup>a</sup> These values are maintained. See Clause 3.2 pertaining to lumen derating values for non-white light sources.

<sup>b</sup> Conformance is achieved by being greater than or equal to the applicable table value.

<sup>c</sup> Conformance is achieved by being less than or equal to the applicable table value.

<sup>d</sup> Conformance of 50% of  $E_{ph}$  shall also be demonstrated over an area of 5 m either side of the pathway—where a verge exists—or up to any structure/fence/property boundary that forms the edge of the pathway, unless deemed otherwise by the relevant authorities (see Clause 3.1.3.5).

<sup>e</sup> For luminaires with mounting heights of 1.5 m or less, the  $E_{PV}$  values need not be applied.

### 3.2 Entry Driveway

Based on the expected use of the parking access and delivery driveway, it is recommended that it is designed to comply with the requirements of a PR4 roadway. This aligns with the expected need to needs for low fear of crime and a medium need to enhance prestige. The requirements for this subcategory are as below.

TABLE 2.1  
LIGHTING SUBCATEGORIES FOR ROAD RESERVES IN LOCAL AREAS

1	2	3	4	5	6
Type of road or pathway		Selection criteria <sup>a,b</sup>			Applicable lighting subcategory <sup>c,d</sup>
General description	Basic operating characteristics	Pedestrian/cycle activity	Fear of crime	Need to enhance amenity	
Collector roads or non-arterial roads which collect and distribute traffic in an area, as well as serving abutting properties	Mixed vehicle and pedestrian traffic	N/A	High	N/A	PR1
		High	Medium	High	PR2
		Medium	Low	Medium	PR3 <sup>f</sup> or PR4 <sup>f</sup>
		Low	Low	Low	PR5
		N/A	High	N/A	PR1
	Common area, forecourts of cluster housing	High	Medium	High	PR2
		N/A	High	N/A	PR1
		High	Medium	High	PR2
		Medium	Low	Medium	PR3 <sup>f</sup> or PR4 <sup>f</sup>
		Low	Low	Low	PR5

<sup>a</sup> The selection criteria of Columns 3 to 5 should be separately evaluated. The highest level of any of the selection criteria that is deemed appropriate for the road will determine the applicable lighting subcategory.

<sup>b</sup> See Appendix A for guidance on choosing the applicable level of each selection criteria for the environment and purpose of a lighting scheme.

<sup>c</sup> All lighting subcategories apply across the whole of the road reserve width, including the footpath.

<sup>d</sup> Where there is a significant fear of crime or where required by the relevant authority, then, for enhanced lighting of the formed pathways, see Table 2.2.

<sup>e</sup> Use of subcategory PR6 shall be discretionary.

Generally, subcategory PR6 is only applied to the replacement of existing luminaires installed on existing electricity distribution poles or for the initial application of a lighting scheme where the cost to re-configure these poles limits or precludes conformance to subcategory PR4 and PR5 respectively.

NOTE: It is also appropriate to use one subcategory lower to take advantage of the cost reductions available when utilizing electricity distribution poles rather than dedicated lighting columns, i.e. if the desired subcategory is PR3, PR4 or PR5 and if electricity distribution poles are used then levels PR4, PR5 or PR6 respectively, may be used.

However, it is recognized that, for some authorities, there may be some specific lighting tasks where subcategory PR5 could be deemed to be excessive in terms of providing adequate level of service and meeting with community expectations. In this case subcategory PR6 may be used.

<sup>f</sup> Category PR3 is generally used in Australia and Category PR4 is generally used in New Zealand.

TABLE 3.3  
VALUES OF LIGHT TECHNICAL PARAMETERS  
FOR ROADS IN LOCAL AREAS

1	2	3	4
Lighting subcategory	Light technical parameters (LTP)		
	Average horizontal illuminance <sup>a,b</sup> ( $\bar{E}_h$ ) lx	Point horizontal illuminance <sup>a,b</sup> ( $E_{ph}$ ) lx	Illuminance (horizontal) uniformity <sup>c</sup> Cat. P ( $U_{xz}$ )
PR1	7	2	8
PR2	3.5	0.7	8
PR3 <sup>e</sup>	1.75	0.3	8
PR4 <sup>d,c</sup>	1.3	0.22	8
PR5 <sup>d,c</sup>	0.85	0.14	10
PR6 <sup>d</sup>	0.7	0.07	10

<sup>a</sup> These values are maintained.

<sup>b</sup> Conformance is achieved by being greater than or equal to the applicable table value.

<sup>c</sup> Conformance is achieved by being less than or equal to the applicable table value.

<sup>d</sup> See Clause 3.2 pertaining to lumen derating values for non-white light sources.

<sup>e</sup> When the luminaires are to be supported on existing electricity reticulation poles, the subcategories PR3, PR4 and PR5 may be reduced to the next lower subcategory PR4, PR5 and PR6 respectively.

### 3.3 External Carparks

While small, it is recommended that all external carparks will be assigned a classification in accordance with AS/NZS 1158.3.1 to improve staff and student safety. As this subcategory is partly selected in accordance with the expected night-time occupancy rate, it is recommended that external carparks are generally designed to meet a PC3 level, with additional lighting provided over PWD carparks and pedestrian crossings in order to comply with the requirements for PCD areas respectively.

**TABLE 2.5**  
**LIGHTING SUBCATEGORIES FOR OUTDOOR CAR PARKS**  
**(INCLUDING ROOF-TOP CAR PARKS)**

1 Type of area	2	3	4
	Selection criteria <sup>a,c</sup>		
	Night time vehicle and/or pedestrian movements	Fear of crime	Applicable lighting subcategory <sup>b</sup>
Parking spaces, aisles and circulation roadways	High	High	PC1
	Medium	Medium	PC2
	Low	Low	PC3
Designated parking spaces specifically intended for people with disabilities	N/A	N/A	PCD
For any designated areas for pedestrians to cross	N/A	N/A	PCX

<sup>a</sup> The selection criteria of Columns 2 to 4 should be separately evaluated. The highest level of any of the selection criteria that is deemed appropriate for the area type will determine the applicable lighting subcategory.

<sup>b</sup> Providing a lighting scheme that meets the requirements of more than one subcategory by the use of switching is permitted.

<sup>c</sup> Consider the use of adaptive lighting controls for variable night time utilization.

**TABLE 3.7**  
**VALUES OF LIGHT TECHNICAL PARAMETERS FOR OUTDOOR CAR PARKS (INCLUDING ROOF-TOP CAR PARKS)**

1 Lighting subcategory	2	3	4	5
	Light technical parameters (LTP)			
	Average horizontal illuminance <sup>a,b</sup> ( $\bar{E}_h$ ) lx	Point horizontal illuminance <sup>a,b</sup> ( $E_{Ph}$ ) lx	Illuminance (horizontal) uniformity <sup>c</sup> Cat. P ( $U_{E2}$ )	Point vertical illuminance <sup>a,b</sup> ( $E_{Pv}$ ) lx
PC1	14	3	8	3
PC2	7	1.5	8	1
PC3	3.5	0.7	8	—
PCD <sup>d</sup>	—	$\geq 14$ and $\geq (\bar{E}_h)$ <sup>d</sup>	—	—
PCX <sup>e</sup>	21	5	8	—

<sup>a</sup> These values are maintained.

<sup>b</sup> Conformance is achieved by being greater than or equal to the applicable table value.

<sup>c</sup> Conformance is achieved by being less than or equal to the applicable table value.

<sup>d</sup>  $E_{Ph}$  shall be determined for each PCD area in the car park and, in each case, it shall be greater than the value stated and greater than the average for the overall car park.

<sup>e</sup> This level shall be used for any marked areas for pedestrians to cross.

### 3.4 Obtrusive Lighting

In order to ensure that the public lighting provided to all open areas does not adversely impact the surrounding properties and residents, it is recommended that the lighting design is provided in compliance with AS 4282. Based on the location of the site along the main road of a small regional town and the intended commercial and community uses, it is recommended that the area is categorised as having a 'medium district brightness' as classified in AS 4282 Table 3.1. This zoning would generally be appropriate for suburban areas of regional towns and will ensure a high level of control of the potential spill lighting across any boundaries and into any residences.

The classification can be applied to any detailed calculations undertaken during future detailed design iterations. Care will need to be taken to ensure the amenity and feature lighting can be accomplished in a sensitive and controlled manner while still achieving a compliant and effective outcome.

**TABLE 3.1**  
**ENVIRONMENTAL ZONES**

<b>Zones</b>	<b>Description</b>	<b>Examples</b>
A0	Intrinsically dark	UNESCO Starlight Reserve, IDA Dark Sky Parks. Major optical observatories No road lighting -unless specifically required by the road controlling authority
A1	Dark	Relatively uninhabited rural areas No road lighting - unless specifically required by the road controlling authority
A2	Low district brightness	Sparsely inhabited rural and semi-rural areas
A3	Medium district brightness	Suburban areas in towns and cities
A4	High district brightness	Town and city centres and other commercial areas Residential areas abutting commercial areas
TV	High district brightness	Vicinity of major sports stadium during TV broadcasts
V	Residences near traffic routes	Refer AS/NZS1158.1.1
R1	Residences near local roads with significant setback	Refer AS/NZS 1158.3.1
R2	Residences near local roads	Refer AS/NZS 1158.3.1
R3	Residences near a roundabout or local area traffic management device	Refer AS/NZS 1158.3.1
RX	Residences near a pedestrian crossing	Refer AS/NZS 1158.4

NOTE: Recreational areas are not considered commercial.

## 4 SUMMARY

Through the careful selection and design of the external lighting systems for the proposed Wee Waa HS, it is expected that an effective installation can be provided that will comply with all requirements of AS/NZS 1158.3.1, AS 4282, and all other applicable standards and DA conditions. Alignment of the lighting design with the CPTED principles incorporated into the design of the site will also ensure that the lighting system assists in promoting the safe use of the facility. The designs provided within this report are intended to provide a guide for the subsequent detailed design process and assist in refining the masterplan and concept designs.