BUILDING SERVICES ENGINEERS

External Lighting Concept Design Report

for

Wyndella Road, Lochinvar

34 Wyndella Road, Lochinvar, NSW 2321

Project No: MN15061

Client:
Commercial 7 Pty Ltd ATF Commercial 7 Investment Trust

Architect:
BDA Architecture

Prepared By:
Josiah Hosking
Marline Newcastle

Marline Newcastle Pty Ltd
ABN 49 612 456 381
ACN 612 456 381
www.marline.com.au

Managing Director Brian Hunt, BE, MBA MIEAust
Director Daniel White, BE (Hons), B.BUS, MIEAust
Director Brendan Maher

Unit F 56 Clyde Street
Hamilton North NSW 2292
P 02 4925 9300
mail@marline.com.au

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LIGHTING REPORT

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1 INTRODUCTION

This External Lighting report has been produced by Marline Newcastle on behalf of Commercial 7 Pty Ltd ATF Commercial & Investment Trust (Commercial 7) in support of the proposed development of a Manufactured Home Estate at 34 Wyndella Road, Lochinvar NSW 2321

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, environment, and surrounding infrastructure. 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.

All external lighting concepts will be developed in accordance with the requirements of AS/NZS 1158.3.1 - 2020 and AS/NZS 4282 – 2019 to ensure safety and amenity for the users of the facility and to minimise impacts on surrounding areas.

1.1 Project Scope

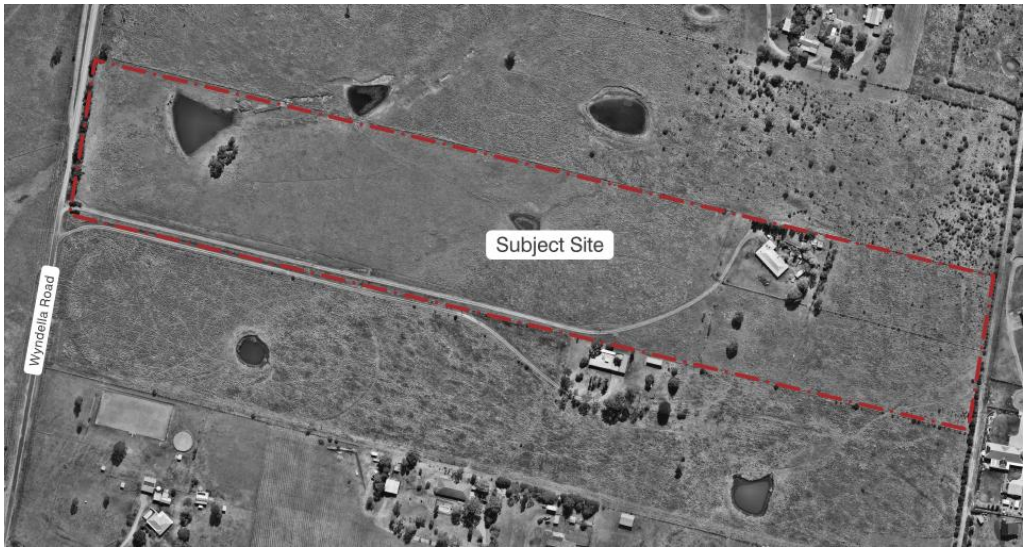
Commercial 7 are working on the design, construction and operation of Manufactured Home Estate development at Lochinvar, NSW 2321.

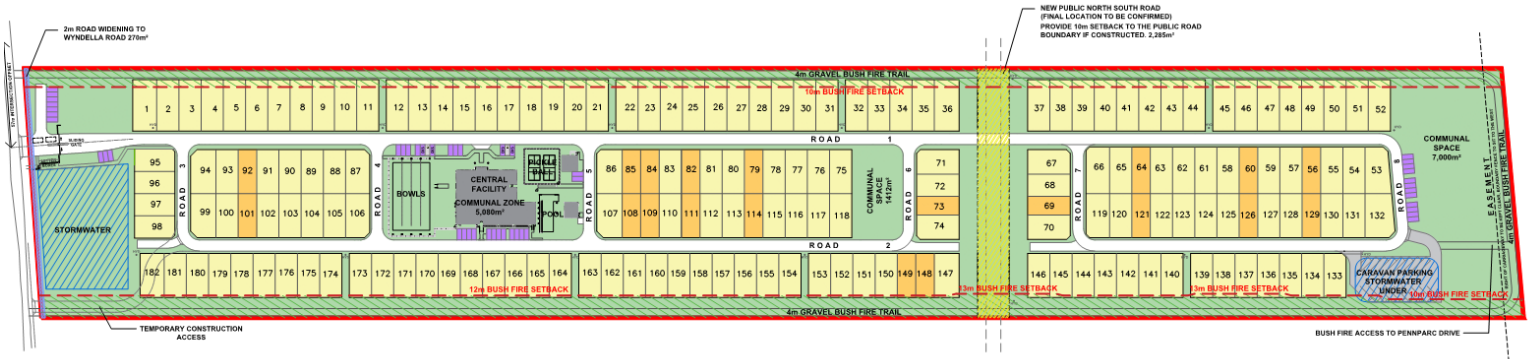
As a high level summary, this project would include the following works:

- Site preparation works including demolition of existing structures and excavation.
- Development of 182 dwelling sites for manufactured homes.
- Construction of a community centre and associated resident facilities.
- Construction of a small caravan storage area.
- Construction of a landscaped buffer to the eastern end of the site
- Construction of a screen planting arrangement to the southern and eastern boundaries
- Development of surrounding roadways and carparks, all of which will be illuminated as per AS/NZS 1158.3.1.

1.2 Site Description

The site has a roughly rectangular layout with an area of approximately 10.75 ha and is described as Lot 225 on DP246447. The Site has a western frontage of approximately 132m to Wyndella Road, and an eastern frontage of approximately 131m to an unsealed shared driveway.





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 and environment. 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, infrastructure foot and vehicle traffic, and even wildlife. Obtrusive lighting can affect the surrounding area and its inhabitants in several 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 and the surrounding environment. Additionally, there is a relatively low district brightness, due to the rural nature of the area.

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.

Due to the proximity of the nearby Maitland Aerodrome, luminaires will be selected and positioned to limit the likelihood of lighting from the development impacting pilots in accordance with CASA guidelines, Civil Aviation Regulation 1988 – Regulation 94, and the National Airports Safeguarding Framework Guideline E ("Managing the risk of distraction to pilots from lighting in the vicinity of airports").

1.4 External Lighting Overview

The proposed development consists of two primary external activity areas: the internal private roadways, and the community centre. 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.

2 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/NZS 1158.3.1. 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. These have been confirmed with the development team as being appropriate for the development but should be reviewed and confirmed as part of the detailed design process.

2.1 Internal Roadways

Pole-mounted LED lighting is to be provided to all internal roadways to ensure sufficient illumination of all users and potential obstacles. This will ensure safe operation of these areas and limit the risks associated with their use. Based on the characteristics shown in the below table from AS/NZS 1158.3.1, it is recommended that a classification of PR3 is applied over these areas generally.

Pedestrian/cycle activity = Medium, expected to be generally limited to residents and guests

Fear of Crime = Low, relatively remote area with other security features

Need to Enhance Amenity = Medium

TABLE 2.1

LIGHTING SUBCATEGORIES FOR ROAD RESERVES IN LOCAL AREAS

1	2	3	4	5	6
Type of road or pathway		Selection criteria[a,b]			Applicable lighting subcategory[c,d]
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[f] or PR4[f]
		Low	Low	Low	PR5
Local roads or streets used primarily for access to abutting properties, including residential, commercial and industrial precincts		N/A	High	N/A	PR1
		High	Medium	High	PR2
		Medium	Low	Medium	PR3[f] or PR4[f]
		Low	Low	Low	PR5
		N/A	N/A	N/A	PR6[e]
Common area, forecourts of cluster housing		N/A	High	N/A	PR1
		High	Medium	High	PR2
		Medium	Low	Medium	PR3[f] or PR4[f]
		Low	Low	Low	PR5

[a] 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.

[b] See Appendix A for guidance on choosing the applicable level of each selection criteria for the environment and purpose of a lighting scheme.

[c] All lighting subcategories apply across the whole of the road reserve width, including the footpath.

[d] 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.

[e] 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.

[f] 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[a,b] $(\bar{E}_h)$ lx	Point horizontal illuminance[a,b] (E_{Ph}) lx	Illuminance (horizontal) uniformity[c] Cat. P (U_{E2})
PR1	7	2	8
PR2	3.5	0.7	8
PR3[e]	1.75	0.3	8
PR4[d,e]	1.3	0.22	8
PR5[d,e]	0.85	0.14	10
PR6[d]	0.7	0.07	10

[a] These values are maintained.

[b] Conformance is achieved by being greater than or equal to the applicable table value.

[c] Conformance is achieved by being less than or equal to the applicable table value.

[d] See Clause 3.2 pertaining to lumen derating values for non-white light sources.

[e] 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.

2.2 Community Centre

LED lighting is to be provided around the perimeter of the proposed community centre to increase the amenity of the building and allow use of the facilities at night. This lighting is not expected to have a substantial impact on the surrounding area due to the low level of illumination expected and the central location of the building within the site.

Any paths or external areas associated with the community centre may need to be considered as part of the detailed design process. Illumination of any external facilities (community centre, pools, bowls, etc) have not been considered as part of this report, but would need to be designed in accordance with the relevant requirements of AS 4282 to ensure they do not impact surrounding areas.

2.3 Obtrusive Lighting

In order to ensure that the 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/NZS 4282. Based on the siting of the development in a remote rural area with very limited surrounding properties, it is recommended that the area is categorised as having a 'low district brightness' as classified in AS/NZS 4282 Table 3.1. This zoning is appropriate for sparsely inhabited semi-rural areas and requires a high level of control of the potential spill lighting across any boundaries and into any residences.

TABLE 3.1

ENVIRONMENTAL ZONES

Zones	Description	Examples
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.

These classifications can be applied to any detailed calculations undertaken during future detailed design iterations.

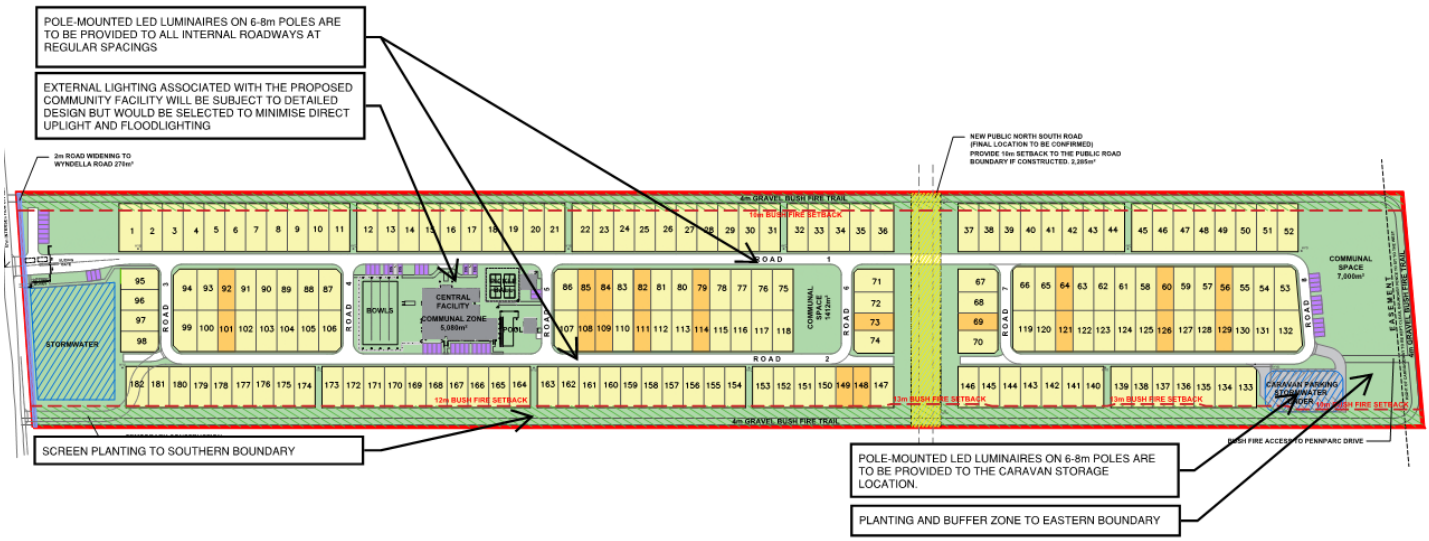
3 Concept External Lighting Designs

3.1 Lighting Design Concept

The following sketch provides a proposed indication of how the new roadways would be illuminated. The internal roadways and entry driveway would primarily be illuminated via pole-mounted LED luminaires (selected to ensure minimal uplight components). These luminaires would be positioned away from boundaries and arranged to ensure compliance with AS/NZS 4282 with respect to obtrusive light. Optical control via lensed luminaires is expected to provide sufficient control, but backlight shields can be provided as required. It is also noted that the majority of luminaires will be shielded from the surrounding properties by the houses within the proposed development.

Lighting will be positioned to direct light within the site boundary to reduce the risk of obtrusive lighting into neighbouring properties. Lighting shall be kept to a minimum while still demonstrating compliance with the relevant standards and highlight accident prone areas such as stairs and changes of level. Luminaires will generally be set back a significant distance from the boundaries. Additionally, to help reduce the impact of the lighting on the surrounding community, screen planting zones will be provided along the southern boundary along with a dense planting buffer zone on the eastern boundaries.

All external lighting shall be controlled by an arrangement of photocell and time switches to suit the end users' requirements. Manual override switches will be provided to allow for manual/off control when required.



Indicative Site Lighting Concept

3.2 Obtrusive Lighting Prevention

As part of the detailed design process undertaken prior to construction of the development, a detailed study to demonstrate compliance with AS/NZS 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 effects on sensitive viewers, it is recommended that the following measure are considered:

- Detailed design is to be certified as compliant with AS/NZS 4282 for the nominated district brightness level
- Low-level luminaires (8m or lower) are to be used in preference to higher mounting locations (8m+)
- 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/planting 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.
- Ensure luminaires with minimal direct uplight component are selected in accordance with CASA and National Airport Safeguarding Framework requirements

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.

4 Summary

4.1 Summary

Through the careful selection and design of the external lighting systems for the proposed Wyndella Road development, it is expected that an effective installation can be provided that will comply with all requirements of AS/NZS 1158.3.1, AS/NZS 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.

5 Typical Isolux Plots

5.1 Summary

The below simulations are based on a typical luminaire only and are provided for information and demonstration of concept only. Complete detailed design calculations will be required to show complete compliance with the requirements of AS/NZS 1158.3.1 and AS/NZS 4282.