Sunshine Coast COUNCIL

Attachment Folder

Item 8.2

Ordinary Meeting

Thursday, 26 March 2026

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Sunshine Coast Council

Sunshine Coast Dark Sky Reserve Lighting Management Plan 2026

Sunshine Coast COUNCIL

Edition February 2026

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Acknowledgements

Council wishes to thank all contributors and stakeholders involved in the development of this document.

Reference document

This document should be cited as follows: Sunshine Coast Dark Sky Reserve Lighting Management Plan. 2026.

Disclaimer

To the extent this document contains future plans, activities, policies and strategies, these matters are aspirational and subject to change at any time without notice.

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Traditional acknowledgement

Sunshine Coast Council acknowledges the Sunshine Coast Country, home of the Kabi Kabi peoples and the Jinibara peoples, the Traditional Custodians, whose lands and waters we all now share.

We recognise that these have always been places of cultural, spiritual, social and economic significance. The Traditional Custodians' unique values, and ancient and enduring cultures, deepen and enrich the life of our community.

We commit to working in partnership with the Traditional Custodians and the broader First Nations (Aboriginal and Torres Strait Islander) communities to support self-determination through economic and community development.

Truth telling is a significant part of our journey. We are committed to better understanding the collective histories of the Sunshine Coast and the experiences of First Nations peoples. Legacy issues resulting from colonisation are still experienced by Traditional Custodians and First Nations peoples.

We recognise our shared history and will continue to work in partnership to provide a foundation for building a shared future with the Kabi Kabi peoples and the Jinibara peoples.

We wish to pay respect to their Elders – past, present and emerging, and acknowledge the important role First Nations peoples continue to play within the Sunshine Coast community.

Together, we are all stronger.

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1.0 Introduction

1.1 Background

The Sunshine Coast is widely acknowledged as a highly desirable place to live, work and play. It has a strong reputation as a lifestyle region defined by its subtropical climate, picturesque coastline and beaches, extensive waterways and wetlands, and the hinterland mountain ranges. The natural environment and distinct landscapes are the foundations of the Sunshine Coast way of life.

Since first formed in 2008, Sunshine Coast Council (Council) has been working towards a vision of being Australia's most sustainable region. Council recognises that the region's valued natural assets underpin and enhance liveability for the community, and that living sustainably within the environment is key to achieving this corporate vision. This commitment has been reinforced through the adoption of Council's Environment and Liveability Strategy, which is based on three key pillars as shown in Figure 1.

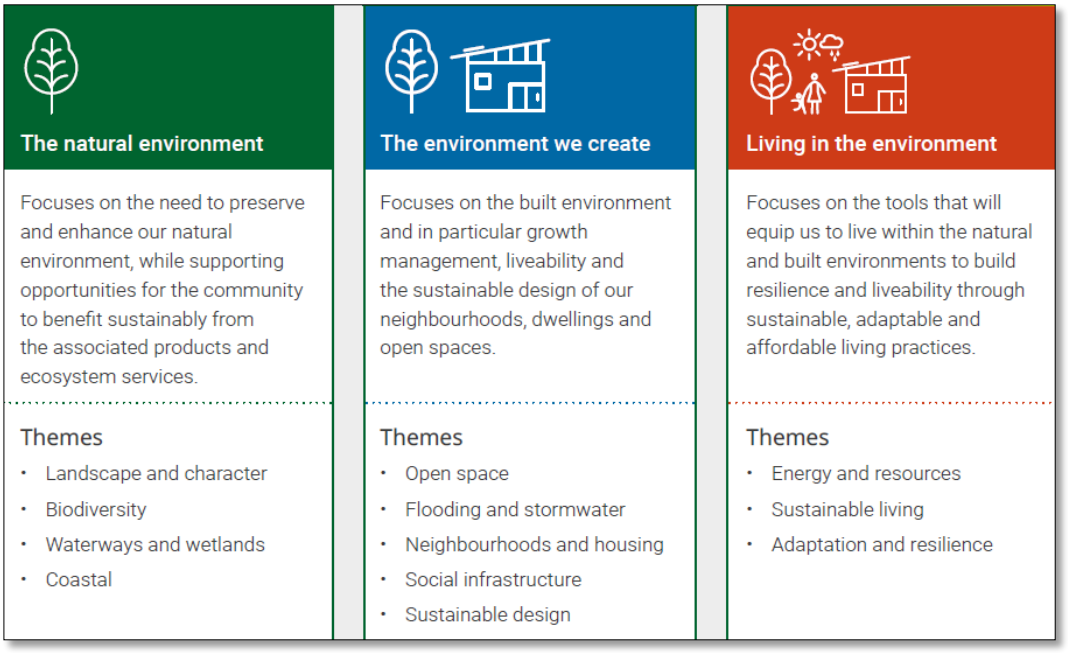


Figure 1: Sunshine Coast Environment and Liveability Strategy sections and themes.

To complement our region's recognition in 2022 by UNESCO as an international site of excellence – the Sunshine Coast Biosphere, Council has been considering potential mechanisms to recognise the values associated with our night skies.

Our night sky is an important aspect of our valued Sunshine Coast landscape and character and the recognition, protection and celebration of dark skies forms part of our strategic directions to preserve our distinctive and diverse landscapes. A dark sky is the natural occurrence of the sky at night free from human-caused light pollution.

Light pollution is the excessive use of artificial light. The amount of light pollution on the Sunshine Coast could be expected to increase as our population increases across the next 20 years and beyond. Responding to such a challenge and planning for the management of our night skies (by reducing light pollution) can deliver many benefits to the community and our natural environment including health and wellbeing, emissions reduction and wildlife sensitive habitat outcomes.

Aligning with this philosophy, sustainable lighting practices have been at the heart of Council's public lighting framework since 2016. The adoption of the Urban Lighting Master Plan (ULMP) saw a shift away from traditional approaches to public lighting, with increased focus on the environmental implications of light at night.

Formalised accreditation of an International Dark Sky Reserve on the Sunshine Coast provides further long-term protection of the region's natural assets. Recognition as an International Dark Sky Reserve has a number of benefits to the Sunshine Coast region including:

- Reducing light pollution.
- Supporting our overall aspirations for a sustainable Sunshine Coast and enhancing our national and international recognition.
- Helping to preserve the hinterland landscape and character of the reserve area through protection of its dark sky environment.
- Supporting the health and wellbeing of Sunshine Coast residents and visitors.
- Promoting wildlife sensitive environments.
- Recognising community efforts being made to protect the night skies of the designated area.
- Enhancing both local and regional public education on the importance of dark sky environments and how community can contribute.
- Astronomical science opportunities.
- Attracting visitors to the area and bringing economic benefits to surrounding communities associated with astrotourism.

1.2 Purpose

This Lighting Management Plan (LMP) has been prepared to provide strategic direction, and shape the selection, placement, installation and operation of outdoor lighting for the Sunshine Coast Dark Sky Reserve. The LMP has been developed in accordance with DarkSky International (DSI) guidelines for a Dark Sky Reserve designation to align with the objectives of the DSI International Dark Sky Places Program.

The implementation of the LMP is to be undertaken in conjunction with associated Council policies and planning tools for the following applications:

- **Council controlled outdoor lighting**

  Provide direction for provisioning of new, and upgrade of existing Council-controlled outdoor lighting installations in public open spaces and other public outdoor lighting where appropriate within the Sunshine Coast Dark Sky Reserve.

- **Outdoor lighting controlled by other key stakeholders**

  Establish a common set of principles to guide light provisioning by other key stakeholders within the Sunshine Coast Dark Sky Reserve including Energex, Department of Transport and Mains Roads (TMR), Queensland Rail (QR), Queensland Parks and Wildlife Service and Partnerships (QPWS&P) and the community.

- **New developments**

  Provide direction for the application of good practice lighting principles for outdoor lighting associated with new developments within the Sunshine Coast Dark Sky Reserve, to inform the Sunshine Coast Planning Scheme.

- **Community awareness**

  Raise community awareness of the Sunshine Coast Dark Sky Reserve and provide education as to how the community can support dark sky aspirations through the application of good practice outdoor lighting principles.

The principles and control measures established under the LMP are intended to shape the use of artificial light at night (ALAN) by prescribing when, where and how much is needed for a specific task.

While the Lighting Management Plan is specifically for the Dark Sky Reserve, it is encouraged that good practice outdoor lighting principles be adopted more broadly across the Sunshine Coast region to help reduce light pollution both within and beyond the Dark Sky Reserve.

Where deemed to be required, the LMP supports planning and decision making to ensure artificial lighting prioritises community safety while minimising the impact of such light on protected outdoor spaces, viewsheds and wildlife.

1.3 Policy and planning context

The directions outlined in this LMP have been informed and guided by applicable international, Commonwealth and state legislation, policies, standards and guidelines. The LMP has also been prepared in line with existing Council documents, policies, plans, strategies, and manuals. These key planning documents and policies are highlighted below in Figure 2 and show the relationship between each.

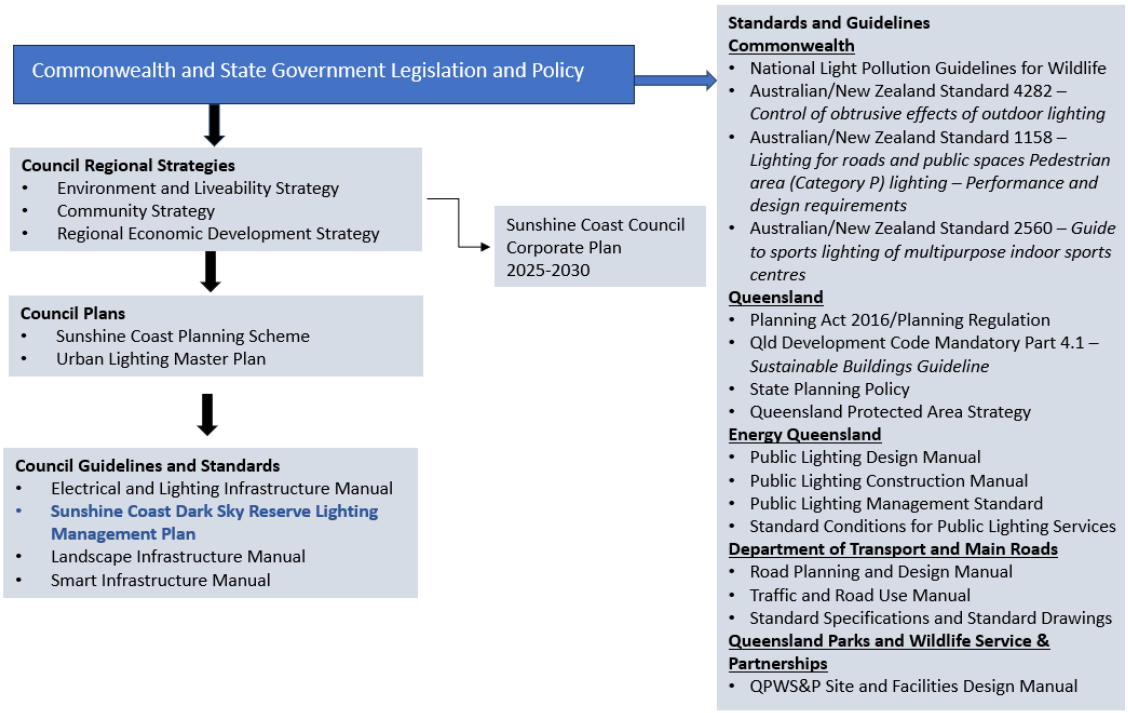


Figure 2: Planning context – lighting management.

1.4 Geographic context

The Sunshine Coast Dark Sky Reserve is located in the western region of the local government area (LGA) in the vicinity of Obi Obi, Maleny, Conondale, Mapleton and Kenilworth (Figure 3). The area is approximately 873km^2 in size and is primarily bounded by the Mary River Catchment within the Sunshine Coast Local Government Area.

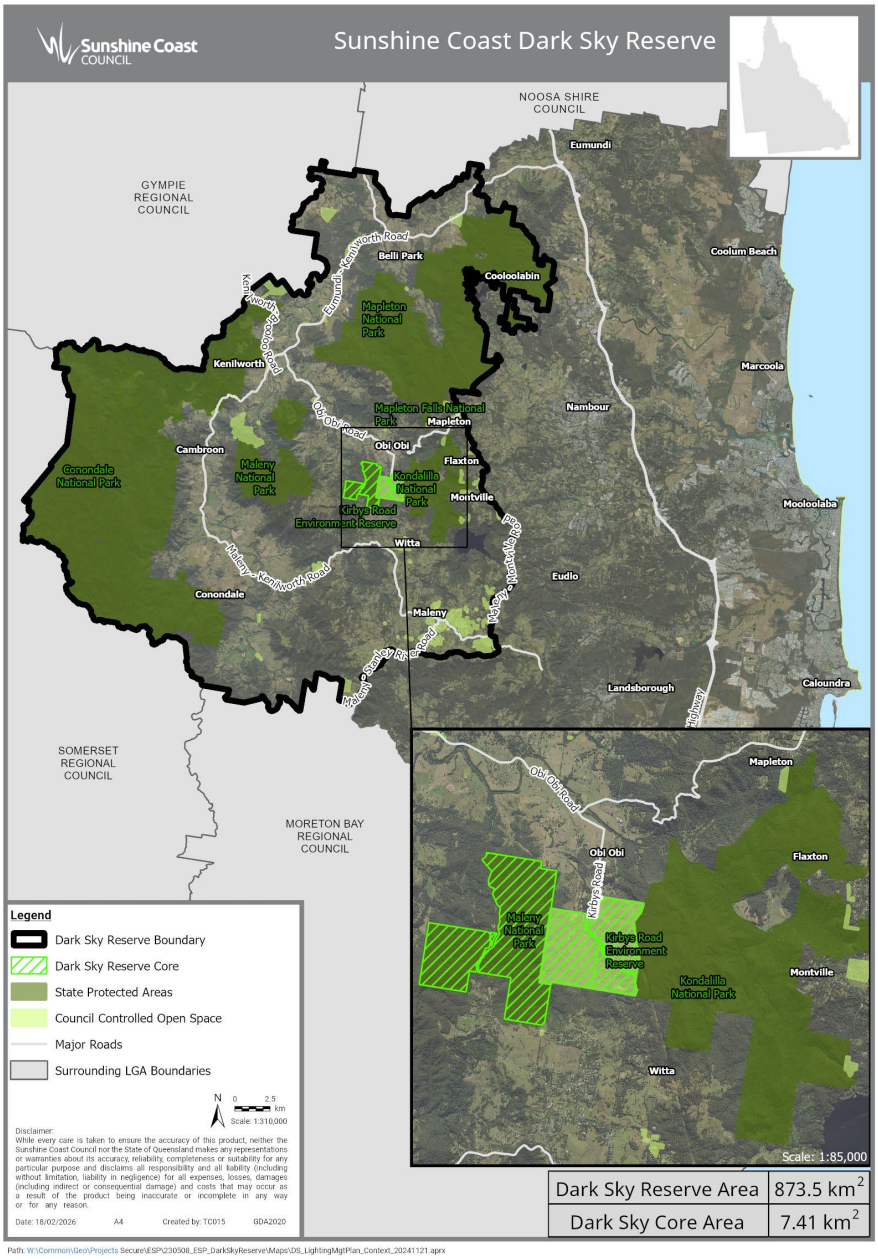


Figure 3: Sunshine Coast Dark Sky Reserve area.

This Sunshine Coast Dark Sky Reserve is characterised by the following features:

- Approximately 40% of the area is government land, with the majority being State Protected Areas.
- Comprises a population of approximately 13,000 residents which includes the townships of (but not limited to) Maleny, Mapleton, Montville, Witta, Flaxton and Conondale.
- Includes two functioning observatories:
  - The Mapleton Observatory, located at the Mapleton School and has been operating since 2002.
  - Maleny Observatory, designated as an observatory in 2021 by the Brisbane Astronomical Society.
- Includes active community groups such as the local chapter of the Brisbane Astronomical Society.

The Sunshine Coast Dark Sky Reserve consists of two key areas as defined by Dark Sky International (DSI) program guidelines. These are summarised in Table 1.

Table 1: Geographic components of the Sunshine Coast Dark Sky Reserve.

Area	Description	
CORE	Kirbys Road Environment Reserve and Maleny National Park (Lot 728 NPW787) is the core of the Dark Sky Reserve due to: ● Pre-existing dark sky qualities ● Protected in the conservation estate ● Surrounded by National Parks and rural areas ● Management and planning aligns to dark sky places program objectives i.e. sustainable nature-based activities.	
	Land area:	Approximately 7.14km^2
	Land manager:	Sunshine Coast Regional Council Queensland Parks and Wildlife Service and Partnerships
PERIPHERAL	The peripheral zone surrounds the core. The area follows the Mary River Catchment boundary within the western portion of the Sunshine Coast local government area with the addition of Mapleton National Park and Mapleton Forest Reserves in their entirety. The Mary River is one of the most environmentally and economically diverse catchments in Queensland (Sunshine Coast Biodiversity Report, 2024). Its headwaters are in the Conondale and Blackall Ranges (within the Sunshine Coast local government area) with flows heading north for hundreds of kilometres, influencing the coastal environment of Hervey Bay and ultimately the Coral Sea and Great Barrier Reef. Large areas of the catchment are protected natural areas and support several iconic threatened wildlife species. Within the Sunshine Coast, native vegetation covers 68% of the catchment area and contributes to approximately 65% of the local government area's native vegetation.	

Area	Description	
	The peripheral zone encompasses a number of State Protected Areas including the Conondale, Mapleton, Maleny and Kondalilla National Parks. The area comprises small townships including (but not limited to) Maleny, Mapleton, Montville and Conondale.	
	Land area:	Approximately 870km^2
	Land manager:	Multiple interests
	Key partners:	Energy Queensland (Energex)
		Queensland Department of Transport and Main Roads
		Queensland Parks and Wildlife Service and Partnerships
		Sunshine Coast community

1.5 Application of the lighting management plan

1.5.1 Document structure and interpretation

The LMP is intended to provide both technical and non-technical support to guide the installation or upgrade of a variety of different possible outdoor lighting types within the Sunshine Coast Dark Sky Reserve. The LMP has been developed in the following sections:

1. **Purpose:** Establishes the strategic context of the Sunshine Coast Dark Sky Reserve and provides an overview of how the LMP is intended to be used to help protect the integrity of the night sky environment. This section also includes a summary of mandatory versus encouraged application of the LMP. Where an application is considered encouraged, the LMP is intended to be used for education purposes to encourage community participants to follow dark sky friendly practices wherever possible.
2. **General requirements**: Highlights the fundamental principles that must be considered for all artificial lighting installations within the Sunshine Coast Dark Sky Reserve in order to fulfil the objectives of the LMP.
3. **Lighting performance criteria**: Provides specific guidance to be applied where necessary to various lighting installations in order to meet the fundamental principles established in Section 2.
4. **Operational requirements:** Outlines additional operational control measures to be applied where necessary to the Sunshine Coast Dark Sky Reserve.
5. **Glossary of terms**: Provides a summary of key terms used throughout the LMP.

1.5.2 Lighting typology

Within the Sunshine Coast Dark Sky Reserve, there is expected to be a number of different outdoor lighting types, dependent on the location and function of the outdoor space. These lighting installations may be applicable to public areas as well as privately owned and operated businesses and residences. Lighting typologies in the context of their application to Sunshine Coast Dark Sky Reserve areas are summarised in Table 2.

Table 2: Expected lighting typology and relevance to Sunshine Coast Dark Sky Reserve areas.

Lighting Type	CORE	PERIPHERAL
Street lighting (including pedestrian crossings)	✗	✓
Pathway lighting	✓	✓
Public activity area lighting	✗	✓
Carpark lighting	✓	✓
Sports field lighting	✗	✓
Building mounted security / flood lighting	✓	✓
Decorative / feature lighting	✗	✓

1.6 Partnering for dark skies

Achieving dark skies in our Dark Sky Reserve requires strong partnerships and collaboration to ensure the successful delivery of the LMP. Sunshine Coast Regional Council (Council) is the local government authority which governs the Sunshine Coast local government area and the location of the Dark Sky Reserve. Council manages and maintains a number of public lighting assets across the region including street lighting, public open space lighting, sport field lighting, pathway lighting etc.

There are a number of other stakeholders, such as Queensland Government Departments, and community (residents, businesses etc), who install, manage and maintain public and private outdoor lighting in the Sunshine Coast Dark Sky Reserve area. These include:

- **Energy Queensland – Energex**

  Energy Queensland is a government-owned electricity company who service customers and communities through their distribution businesses such as Energex. Energex provides energy services to Queenslanders and manages and owns many of the region's street lights.

- **Department of Transport and Main Roads**

  The Department of Transport and Main Roads (DTMR) plan, manage and deliver Queensland transport environment including road, rails, air and sea, DTMR own lighting assets on controlled roads and bikeways.

- **Queensland Parks and Wildlife Service and Partnerships**

  Queensland Parks and Wildlife Services and Partnerships (QPWS&P) is a division of the Department of Environment Tourism, Science and Innovation (DETSI) in the Queensland Government. QPWS&P manage and maintain State Protected Areas within Queensland including National Parks, State Forests etc. A large portion of the Dark Sky Reserve area is State Protected Areas and some areas include carparking, picnic areas, camping areas, amenities etc. QPWS&P are committed to implementing the LMP within its parks and forests across the Dark

Sky Reserve area and are land manager of Maleny National Park (Lot 728 NPW787) located within the core.

- **Community**

  Sunshine Coast community is a key partner of the LMP. There is a population of approximately 13,000 residents within the area including townships of (but not limited to) Maleny, Mapleton, Witta, Flaxton and Conondale.

In Australia, the Commonwealth Government has the highest authority and sets broad national laws and standards. Below that, the Queensland State Government has more power than local councils and controls state legislation, policies, and standards. Energy Queensland Ltd is owned by the Queensland State Government and is the parent company of Energex, which operates the electricity distribution network in South East Queensland, including the Sunshine Coast. Councils and state departments work with Energex to install, maintain, and upgrade lights in line with Commonwealth and State requirements.

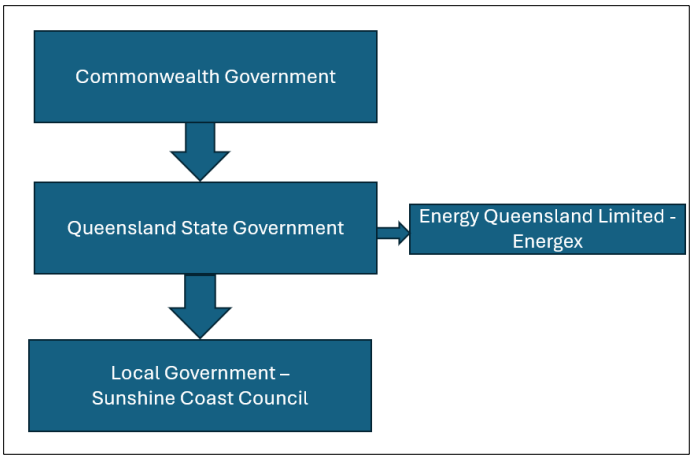


Figure 4: Australian context of authority

As outlined on page 6 of the Dark Sky Reserve Guidelines, lighting required by law under the authority of any entity having higher legal jurisdiction over either the core or peripheral zones may be formally exempted from the requirements of this section. From a Sunshine Coast context, if Commonwealth Government or Queensland Government requires specific lighting, Council's own standards are exempt to comply with that higher obligation.

The implementation of the Dark Sky Reserve aims to strengthen existing partnerships and foster new collaborations, supporting the sustained collective effort required to reduce light pollution and to recognise, protect, and celebrate the region's dark skies.

1.7 Lighting management plan application

The LMP is intended to be applied in conjunction with other Council guidelines and specifications, notably the Urban Lighting Master Plan (ULMP) and Electrical and Lighting Infrastructure Manual (ELIM). These two associated guidelines apply to the whole of the Sunshine Coast Local Government Area, while the LMP has been developed for application specifically within the Sunshine Coast Dark Sky Reserve. The lighting requirements established in the LMP have been

developed to complement or exceed whole-of-region expectations as clarified in the ULMP and ELIM.

The LMP is intended to be applied through the following mechanisms:

- **Mandatory application:**

  Mandatory application relates to how Council can lead and improve new or upgraded outdoor lighting in the Reserve through management of its own network and planning provisions.

  - **Council owned and operated outdoor lighting**: All new or upgraded outdoor lighting provided within the Sunshine Coast Dark Sky Reserve that is owned and operated by Council must comply with the LMP. This generally includes street and roadway lighting, lighting in parks and gardens spaces (including public pathways), Council controlled sports lighting, lighting associated with Council buildings and facilities, etc.
  - **New development**: The requirements of the LMP will inform new outdoor lighting provisions in the Sunshine Coast Planning Scheme which would apply to all new assessable development as directed through development conditions, as well as some new accepted development. Existing development would not be affected.

- **Encouraged application:**
  - **Existing private development**: While the application of provisions of the LMP are not mandatory to existing lawful private development, principles established in the LMP (refer to Section 2.1) are strongly encouraged for all new or upgraded lighting installations.
  - **Energex unmetered public lighting**: Lighting infrastructure provisioned under Rate 1, Rate 2 and Rate 4 tariff arrangements are governed by Energex standard requirements and equipment selections. While the requirements of the LMP are not directly enforceable to these installations, Council's ELIM recognises the collaborative approach with Energex and potential opportunities to further contribute to dark skies.
  - **Other public body (non-Council) unmetered public lighting**: Other public bodies such as the Department of Transport and Main Roads or Queensland Rail may control lighting installations under a Rate 3* tariff arrangement in spaces such as state-controlled roads or rail precincts. Lighting within these areas is governed by the standards and requirements of the relevant public body and are not enforceable under this LMP. It is strongly encouraged that equipment selections and installation factors take guidance from this LMP.

The LMP does not apply to the following installation types:

- Lighting installations required temporarily for the safe performance of nighttime tasks (such as construction works). Refer to Section 4.2 for additional considerations.
- Outdoor lighting controlled with motion-activated switches limiting the duration of illumination to less than five (5) minutes after activation.

** Rate 3 - Unmetered public lighting supplied, installed, owned and maintained by the public body.*

2.0 General requirements

2.1 Fundamental principles

The technical parameters established under this LMP are derived to satisfy overarching responsible lighting principles established by DSI. These principles are summarised in Table 3.

Table 3: Responsible lighting principles (Source: *DarkSky International*).

Principle	Description and Application
Useful *All light should have a clear purpose*	Outdoor lighting should only be provided to fulfill a defined purpose, enhancing the safety, usability or amenity of a night-time space. Prior to installation or replacement of any lighting within the Sunshine Coast Dark Sky Reserve, consideration must be given to: ● Whether the light is required and what purpose it will fulfill. ● How the light may impact the surrounding area including neighbouring properties, wildlife and the environment. ● Whether there are alternatives to permanently installed lighting that may fulfill the same purpose (such as reflective paints or self-luminous markers).
Targeted *Light should be directed only to where it's needed*	Where fixed lighting is deemed to be required, it must be directed in such a way as to fulfill its intended purpose without causing unnecessary spill or other obtrusive effects to surrounding areas. The following strategies should be utilised to ensure any lighting installed within the Sunshine Coast Dark Sky Reserve is appropriately targeted to fulfill its intended function: ● Application of appropriate standards such as *AS/NZS 4282 - Control of the obtrusive effects of outdoor lighting*. ● Undertaking design activities by qualified lighting professionals/RPEQ-Electrical engineers. ● Use of appropriate luminaire distribution profiles. ● Use of shielding (factory-fitted to the luminaire, or external built elements). **Refer to Sections 3.2 and 3.3**
Low Light Levels *Illumination should be no higher than necessary*	In conjunction with control strategies, when planning for a lighting installation within the Sunshine Coast Dark Sky Reserve, ensure operational factors are carefully considered and well understood to ensure lighting levels adopted are appropriate for the task and any associated risk factors. Within the Sunshine Coast Dark Sky Reserve, the lowest light levels are recommended. Consideration should also be given to surface conditions, as some surfaces may reflect more light into the night sky than was intended. **Refer to Section 3.4**

Principle	Description and Application
Controlled *Light should be used only when it is useful*	Lighting installations must utilise controls such as timers or motion sensors to ensure that light is available when it is needed, dimmed when possible, and switched off when not needed. **Refer to Section 3.5**
Colour *Use warmer-colour lights where possible*	Lighting installations within the Sunshine Coast Dark Sky Reserve must limit the amount of shorter wavelength light to the least amount needed. "Short wavelength" is generally regarded as blue and violet light whose wavelengths are below 500 nanometres (nm). **Refer to Section 3.6**

2.2 Design advice

While the LMP is intended to provide standalone guidance for general application to all types of outdoor lighting installations within the Sunshine Coast Dark Sky Reserve, it is recommended that design services or advice be sought when provisioning or upgrading outdoor lighting. Design and documentation services are required for all Council owned / operated lighting installations and as required through planning scheme provisions (refer to Council's ELIM standard for further guidance). Minimum qualifications for design advice are typically defined as:

- RPEQ Electrical Engineer, or
- Member of Illuminating Engineering Society (MIES).

2.3 Obtrusive lighting compliance considerations

The LMP is intended to work in conjunction with broader compliance requirements and recommendations outlined in AS/NZS 4282. AS/NZS 4282 outlines the process for assessment of the impacts of obtrusive effects of outdoor lighting. Compliance with AS/NZS 4282 is mandatory for all Council-controlled public outdoor lighting installations as established in Council's ELIM standard. Compliance for private installations assessable under the Planning Scheme will be mandated through development conditions (to suit the nature of the development). Compliance is encouraged for all private lighting installations located within the Sunshine Coast Dark Sky Reserve whether or not the planning scheme applies.

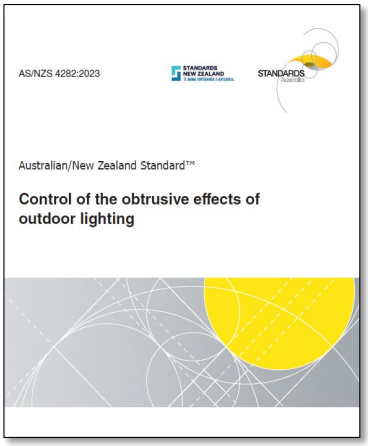
The following points provide guidance for the application of AS/NZS 4282 within the Sunshine Coast Dark Sky Reserve:

- **Environmental zones:** With reference to AS/NZS 4282 Table 3.1, the following environmental zones should be applied within the Sunshine Coast Dark Sky Reserve:
  - Sunshine Coast Dark Sky Reserve core: Zone A0 – Intrinsically Dark
  - Town centres within Sunshine Coast Dark Sky Reserve peripheral: Zone A3 – Medium district brightness
  - Suburban areas within Sunshine Coast Dark Sky Reserve peripheral: Zone A2 – Low district brightness

  - All other areas within Sunshine Coast Dark Sky Reserve peripheral: Zone A1 - Dark

- **Public lighting zones**: Selected in accordance with AS/NZS 4282 Table 4.1 and Council's ELIM standard.
- **Curfew:** Unless otherwise established through formalised development conditions, the curfew within the Sunshine Coast Dark Sky Reserve should be interpreted as between the hours of 11:00PM and 6:00AM.

AS/NZS 4282 assessment results and certification must be provided as part of design submissions. This must include a summary of relevant assessment parameters utilised.



3.0 Lighting performance criteria

3.1 General

The following subsections contain specific guidance and performance criteria that should be achieved for all lighting installations located within the Sunshine Coast Dark Sky Reserve as identified under 'Mandatory application'. As introduced in Section 2.0, prior to installation of lighting elements consideration must be given to justifying the overarching need for lighting in the first instance. The guidance contained within the following subsections assumes that this need has been justified and the required extent of lighting has been confirmed.

Note that whilst this guidance applies across both core and peripheral zones, Core requirements may be more stringent than that required in the peripheral. This will be quantified where applicable.

3.2 Shielding

Shielding of light sources is a key mechanism to protect the integrity of the night sky environment. Shielding helps to fulfill two of the fundamental principles of good practice lighting introduced in Section 2.2; ensuring lighting *targeted* towards a specific area and is therefore *useful* in fulfilling its intended purpose.

Shielding within the Sunshine Coast Dark Sky Reserve is considered in two layers:

- All outdoor lighting fixtures emitting greater than 500 initial lumens must be fully shielded.
- Shielding of incidental light emissions from indoor spaces: To the greatest possible extent, light emissions from indoor spaces into the outdoor environment must be limited through consideration of the following:
    - The use of appropriate building materials, reducing transparency and translucency where possible.
    - The use of window coverings such as curtains, blinds or shutters. This should extend to considerations for minimising artificial light transmission through skylights.
    - The installation of physical barriers such as walls or screens.
    - Appropriate control strategies such as timers or occupancy sensors.
    - Other measures as deemed appropriate.

Fully shielded outdoor luminaires permit zero upward waste light (or light beyond the 90^{o} plane tangential to the light source) as highlighted by the reference image in Figure 5.

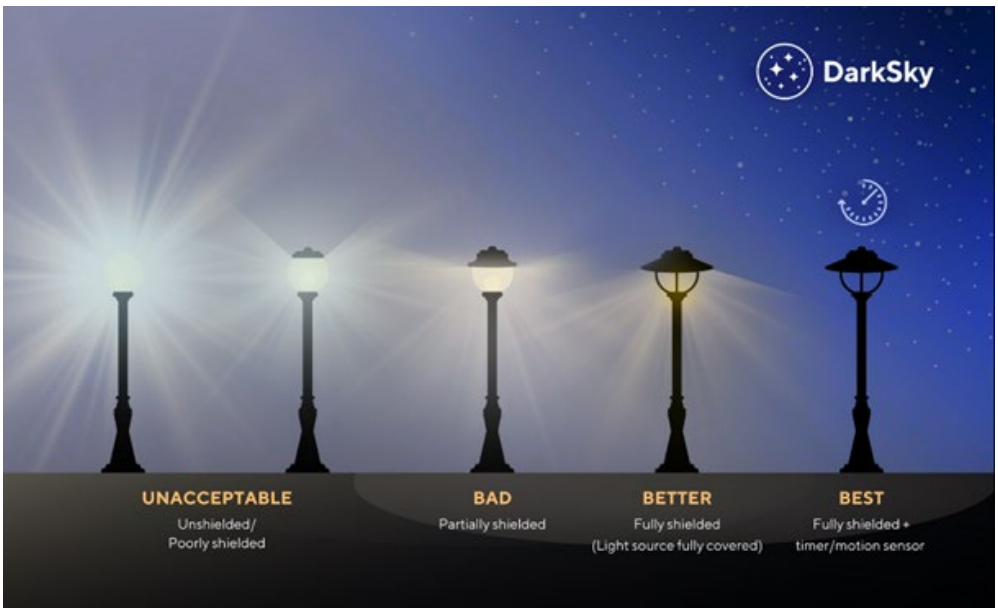


Figure 5: Shielding concepts – reference images (Source: DarkSky International)

Shielding requirements are typically satisfied through the selection of appropriate luminaires that have been manufactured to prevent upward waste light. Examples of these are shown in Figure 6.

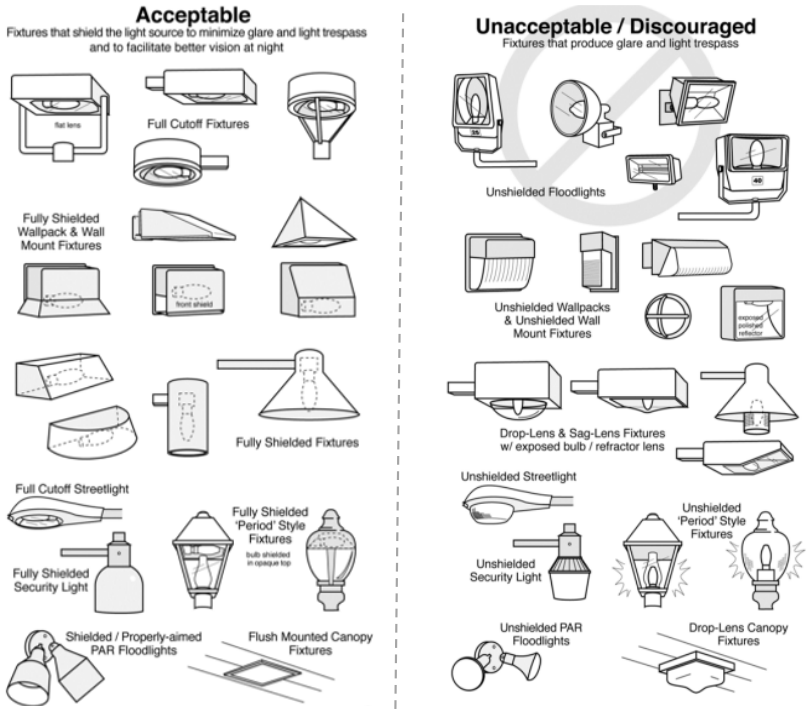


Figure 6: Acceptable/Unacceptable lighting fixtures in relation to glare and light trespass.
Source: DarkSky International.

To simplify the selection process for luminaires to be installed within the Sunshine Coast Dark Sky Reserve, it is strongly encouraged that selections be made from either one of the following approved product listings:

- DarkSky International – Dark Sky Approved product program. https://darksky.org/what-we-do/darksky-approved/products-companies/
- Australasian Dark Sky Association (ADSA) – Approved Light Fitting program https://www.australasiandarkskyalliance.org/certified-luminaires

Where luminaires to be installed within the Sunshine Coast Dark Sky Reserve are not chosen from these certification programs, there should be sufficient technical data to demonstrate compliance with the requirements of this LMP.

In conjunction with shielding properties of the luminaire itself, consideration may also be given to the fitting of shielding elements or installation of the luminaire in a location that provides the same limitations for light emissions above 90°. This may include one or more of the following strategies:

- Internal shields or baffles, including clip on components that may be provided as an option or accessory from the luminaire manufacturer to assist with minimisation of obtrusive light.
- External shields custom fitted to the luminaire body (note – this may impact on product warranties and should be confirmed with the luminaire supplier prior to fitment).
- Recessed installation in lieu of wall-mounted lighting.
- The use of vertical screening elements or the like to remove upward waste light components.

3.3 Light distribution

Distribution and directionality of light is an important factor to consider in conjunction with shielding. Appropriate consideration of light distribution ensures that lighting is *targeted* to fulfill its intended purpose whilst minimising spill light into surrounding areas (as highlighted by Figure 7).

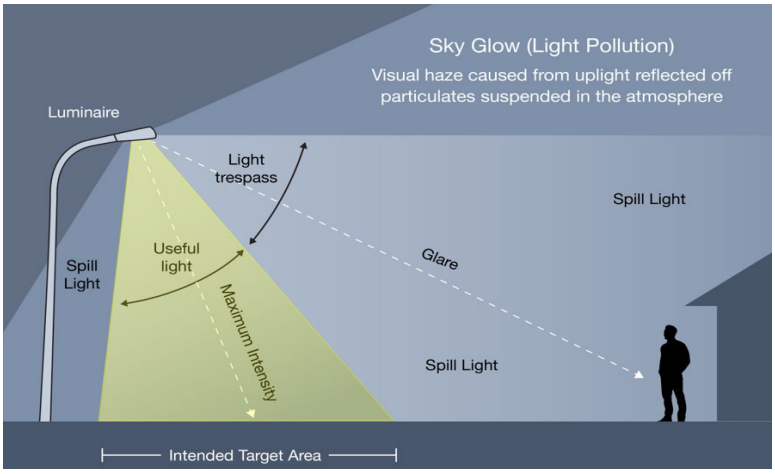


Figure 7: Targeted light distribution. Adapted from: Evluma: https://evluma.com/dark-sky-friendly-lighting/

Similar to shielding concepts outlined in Section 3.3, targeted distributions can typically be achieved through careful selection of luminaire products with distribution profiles to suit the required extent of illumination.

Targeted distribution can also be achieved through aiming of adjustable luminaires. However great care must be taken if utilising adjustable luminaires to ensure that:

- Upward waste light requirements are not compromised.
- Aiming does not create issues with direct glare.

3.4 Lighting levels

In order to protect the integrity of the night sky environment and fulfill the overarching requirements of classification as a Sunshine Coast Dark Sky Reserve, lighting levels within the Sunshine Coast Dark Sky Reserve must be carefully considered. "Appropriate" illuminance within the Sunshine Coast Dark Sky Reserve would be defined as the minimum illuminance required to fulfill the intended lighting purpose, taking into consideration the relevant operational and risk profile of the area to be illuminated.

The guidance presented in Table 4 should be adopted to suit the nature of the proposed lighting installation, where relevant in the core or peripheral zone.

Table 4: Guidance for selection of appropriate lighting levels.

Installation Type	Lighting Level Guidance
Street / roadway lighting	Standard: To AS/NZS 1158.1.1 (Category V) or AS/NZS 1158.3.1 (Category PR) Street lighting levels should comply with AS/NZS 1158 based on the sub-category of the roadway (as nominated by the appropriate Road Controlling Authority) to suit operational characteristics. However, consideration must be given to the following: ● Selection of the lowest possible lighting sub-category that meets the minimum operational requirements of the roadway. ● Options for dual classification of roadways, with control strategies to switch/dim to lower levels during low usage times. Refer to Section 3.6 for additional information regarding lighting control options. ● The use of luminaires with the lowest possible output that meet the compliance requirements of the standard.

Installation Type	Lighting Level Guidance
Pedestrian crossing lighting	Standard: To AS/NZS 1158.4 (Category PX) While pedestrian crossing lighting categories should be chosen in accordance with the guidance in AS/NZS 1158.4, consideration should be given to limiting sub-category classification to PX2 wherever possible. Assessment should take into account broader road safety risk mitigation factors such as: ● Raised crossings to limit vehicle speeds. ● Reflective line markings or other visual indicators to enhance crossing visibility. ● Limited approach lighting to enhance awareness and visibility.
Pathway lighting	Standard: To AS/NZS 1158.3.1 (Category PP) Pathway lighting levels should comply with AS/NZS 1158.3.1 based on the sub-category of the pathway (as nominated by the appropriate Controlling Authority) to suit operational characteristics. However, consideration must be given to the following: ● Selection of the lowest possible lighting sub-category that meets the minimum operational requirements of the pathway. ● Options for dual classification of pathways, with control strategies to switch/dim to lower levels during low usage times. Refer to Section 3.6 for additional information regarding lighting control options. ● The use of luminaires with the lowest possible output and restrictive glare controls at specific angles that meet the compliance requirements of the standard. ● Relaxation of AS/NZS 1158.3.1 compliance requirements such as vertical illuminance and/or surround zone illuminance to suit the risk assessed operational profile of the installation and maintain lower lighting levels with less spill light.
Public activity area lighting	Standard: To AS/NZS 1158.3.1 (Category PA) Lighting of public activity areas is not recommended within the Sunshine Coast Dark Sky Reserve. Where lighting is being considered for a public activity area, it is recommended that risk assessment be undertaken to determine the application and extent of lighting required to suit intended operational and/or safety considerations. If absolutely required, consideration should be given to relaxation of vertical illuminance requirements to minimise overall lighting levels within the area.

Installation Type	Lighting Level Guidance
Carpark lighting	Standard: To AS/NZS 1158.3.1 (Category PC) Carpark lighting levels should comply with AS/NZS 1158.3.1 based on the sub-category of the carpark. Sub-categories should be adopted to suit the operational characteristics of the carpark. However, consideration must be given to the following: ● Selection of the lowest possible lighting sub-category that meets the minimum operational requirements of the carpark. ● Options for dual classification of carparks, with control strategies to switch/dim to lower levels during low usage times. Refer to Section 3.6 for additional information regarding lighting control options. ● The use of luminaires with the lowest possible output that meet the compliance requirements of the standard. ● Relaxation of AS/NZS 1158.3.1 compliance requirements such as vertical illuminance and reduction or omission of higher compliance levels for disability parking spaces and pedestrian walkways (where justified).
Sports field lighting	Standard: To AS 2560 and relevant sporting body guidelines Lighting levels for sports fields should be considered based on the anticipated level of play as outlined in AS 2560.2 (including any relevant sporting body requirements). In addition to standard guidelines, all sports lighting installations within the Sunshine Coast Dark Sky Reserve should include the following considerations with regards to lighting levels: ● The installation should include control mechanisms to facilitate dimming and/or switching of lighting elements to achieve lower levels to suit the on-site operational intent. Refer to Section 3.6 for additional information regarding lighting control options. ● The average illuminance on the field of play should be no more than 10% above the average target illuminance levels defined by AS 2560.2 or the sporting body. ● No High Intensity Discharge (HID) luminaires are to be utilised. All sports lighting to be Solid-State Lighting (SSL) installed with zero-degree tilt (or as close as practicable).
Building mounted lighting	Building mounted lighting could be installed for a number of reasons and (where deemed required) must take into account the following considerations: ● Operational/task lighting: Lighting levels adopted should reflect the nature of the required task and be located directly over the area of operation. ● Security lighting: ensure security lighting is considered in conjunction with other security measures (that may facilitate a reduction in lighting levels) based on a formalised security risk assessment. Additional guidance is provided in Section 3.7 with regards to illuminated signage and façade lighting.

Installation Type	Lighting Level Guidance
Decorative / feature lighting	Where deemed to be required, decorative lighting elements should be used sparingly, with low light levels adopted to compliment surrounding features. Lighting intensity should provide suitable visibility only from the intended viewing angle and distance. The use of uplighting is discouraged. Colour temperature of decorative lighting elements should be 3000K or lower. RGBW (colour changing) lighting should minimise the use of the blue spectrum.

3.5 Lighting controls

Lighting control strategies will vary depending on the nature of the lighting installation. All lighting installed within the Sunshine Coast Dark Sky Reserve must utilise an appropriate control strategy to ensure lighting is used only when required and is not inadvertently left on overnight when not needed to fulfill its purpose.

The guidance presented in Table 5 should be adopted to suit the nature of the proposed lighting installation, where relevant in the core or peripheral zone.

Table 5: Guidance for selection of appropriate lighting controls.

Installation Type	Lighting Control Guidance
Street / roadway lighting	**Council controlled:** Switching and dimming control via Council Central Management System. Refer to Council's ELIM standards for specific requirements.
Pedestrian crossing lighting	**Council controlled:** Switching and dimming control via Council Central Management System. Refer to Council's ELIM standards for specific requirements.
Pathway lighting	**Council controlled:** Switching and dimming control via Council Central Management System. Refer to Council's ELIM standards for specific requirements. **Private installation:** ● Recommended: PE cell and presence detection to facilitate occupancy-based switching and/or dimming modes when in use. ● Minimum required: PE cell and time clock to facilitate scheduled switching.
Public activity area lighting	**Council controlled:** Switching and dimming control via Council Central Management System or equivalent communication protocol. Refer to Council's ELIM standards for specific requirements.

Installation Type	Lighting Control Guidance
Carpark lighting	**Council controlled:** Switching and dimming control via Council CMS. Refer to Council's ELIM standards for specific requirements. **Private installation:** ● Recommended: PE cell and presence detection to facilitate occupancy-based switching and/or dimming modes. ● Minimum required: PE cell and time clock to facilitate scheduled switching.
Sports field lighting	Sports field lighting controls must comply with the following requirements (as outlined in *DSI Outdoor Sports Lighting Guidelines*): 1. Automatic Controls: Automatic control system with remote control capability via smartphone apps or direct remote communication (eg. SMS messaging) is required to enforce shut-off at the pre-defined curfew time. 2. Manual Controls: The automatic control system may include onsite manual and/or remote-control capability to allow for the lights to be turned on or off at will (between dusk and curfew) to ensure that only active sports fields are lit. Manual controls should be accessible to authorized personnel only. 3. Dimming Controls: The control system should include automatic and manual dimming capability to implement uniform and variable illumination levels to adapt to different on-field applications (such as level of play to AS 2560). Dimming for the different uses should be programmed as presets for each of the uses. 4. Separate Control Zones: Lighting controls are required to separate fields of play into different zones to ensure only fields / playing areas in operation are utilised. Field lighting should be controlled separately from other site lighting elements such as carparks, pathways etc.
Building mounted lighting	Recommended: PE cell and presence detection to facilitate occupancy-based switching and/or dimming modes. Minimum required: PE cell and time clock to facilitate time-scheduled switching.
Decorative / feature lighting	Recommended: Dimmable control system or equivalent communication protocol to facilitate adjustment of lighting levels to achieve minimum requirements for decorative purpose. Minimum required: PE cell and time clock to facilitate time-scheduled switching.

3.6 Spectral composition

Lighting to be installed within the Sunshine Coast Dark Sky Reserve must be chosen to minimise the amount of short-wavelength light emitted into the nighttime environment. To achieve this, all

lighting should comply with one or more of the following requirements (note: these metrics can be sourced from manufacturer data sheets for lighting products):

1. The correlated colour temperature (CCT) of the light source must not exceed 3000K.

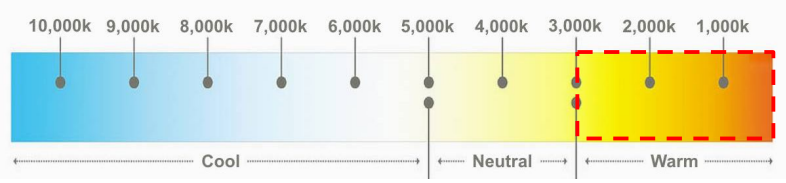
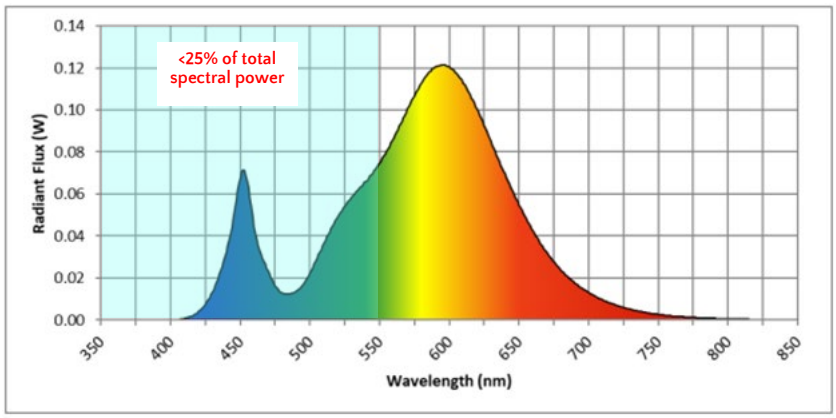


Figure 8: CCT scale.

2. Lighting must not emit more than 25% of its total spectral power at wavelengths shorter than 550nm



3. The scotopic-to-photopic (S/P) ratio of lighting must not exceed 1.3.

3.7 Lit surfaces and signage

Lit surfaces are defined as surfaces that may produce obtrusive light either by emitted or reflected light. Examples include internally and externally illuminated signage, façade lighting and other objects such as flag poles. Lit surfaces could also include ground surfaces, walls and/or other general structures located directly adjacent a permanent lighting installation. While there are no specific performance targets for reflectances from incidental surfaces, consideration should be given to the use of darker, less reflective surface finishes to minimise the adverse effects of reflected light.

Sign illumination is permitted only while the associated activity is taking place or sign illumination is switched off from one hour after sunset and one hour before sunrise and minimises sky glow and light spill. For existing business signage within the Reserve, extinguishing sign illumination outside the hours the business is strongly encouraged. Lit surfaces used for Illuminated signage within the Sunshine Coast Dark Sky Reserve must comply with the following requirements:

- Sunshine Coast Planning Scheme - Advertising Devices Code and relevant local plan, as applicable
- AS/NZS 4282 Section 3.3.3
- The maximum average luminance of a lit surface must not exceed 100 nits (100 cd/m^2). Note: lower values are required for AS/NZS 4282 Zones A0 and A1 as defined in AS/NZS 4282 Table 3.4.
- Displays must be single-color on a black background.
- The luminous/illuminated surface area of an individual sign must not exceed 18.6m^2.

4.0 Operational requirements

4.1 Visitor activities

The following requirements must be observed by all persons visiting the Dark Sky Reserve core:

Kirbys Road Environment Reserve

- A permit must be obtained for vehicle access overnight to the core.
- As a condition of the permit any lighting brought into the core is to be minimal and only used where necessary to prioritise preservation of natural darkness and minimise disruption to wildlife.
- Lighting of vehicle exteriors, and other personal property of visitors is minimsed to ensure natural darkness and character of the environment reserve is maintained and to avoid any potential nuisance for other visitors.
- Appropriate illumination for visitor safety is acceptable - use of low wattage, amber colour lights is recommended (i.e. red-filtered flashlights).
- Subject to permit conditions campfires must be extinguished no later than the curfew of 10pm.
- Inappropriate “light painting,” the use of searchlights, and similar activities is prohibited in the core.
- Lighting required in emergency situations is exempt from compliance.

Night-time access is not permitted at Maleny National Park (Lot 728 NPW787).

4.2 Temporary lighting installations

Temporary lighting for night-time tasks is permitted in the core however must be limited and controlled to reduce light pollution by adhering to the Lighting Management Plan as far as practical.

All temporary lighting within the core is to be removed as soon as nighttime task is completed.

Glossary of terms

Table 6: Key terms.

Term	Description
AS 2560	*Sports lighting* Australian standard providing requirements for sports lighting applications.
AS/NZS 1158.1	*Lighting for roads and public spaces Vehicular traffic (Category V) lighting* Australian standard providing requirements for lighting of arterial road types where the requirement of the motorist is dominant.
AS/NZS 1158.3.1	*Lighting for roads and public spaces Pedestrian area (Category P) lighting* Australian standard providing requirements for lighting of local road types and other outdoor spaces where the requirement of the pedestrian is dominant.
AS/NZS 1158.4	*Lighting for roads and public spaces Lighting of pedestrian crossings* Australian standard providing requirements for lighting of pedestrian crossings.
AS/NZS 4282	*Control of the obtrusive effects of outdoor lighting* Australian standard outlining guidelines for minimising obtrusive light for exterior lighting installations.
Dark Sky Reserve peripheral	The peripheral zone is the remaining area within the Dark Sky Reserve boundary which surrounds the core zone.
Dark Sky Reserve core	The core zone of the Dark Sky Reserve is Kirbys Road Environment Reserve and Maleny National Park (Lot 728 NPW787).
Correlated Colour Temperature (CCT)	A measure of the "colour" of a light source, expressed in kelvins (K). It corresponds to the temperature of an ideal black body that would emit light of a similar "colour." Measured on a scale from 1,000 to 10,000 K.
ELIM	Electrical and Lighting Infrastructure Manual Council standard outlining requirements for electrical and public lighting infrastructure delivered for Council-controlled open spaces.
Glare	The reduction of visual performance or the disturbance of perception, as caused by high luminances or contrasts in luminance within a visual environment.
LED	Light Emitting Diode. Semiconductor device that emits visible light when an electrical current passes through it.
Luminaire	A complete lighting fixture that includes a light source (such as an LED) as well as any necessary components such as a housing, reflectors, lenses, diffusers, etc.
Obtrusive light	Spill light which, because of quantitative, directional or spectral attributes in a given context, gives rise to annoyance, discomfort, distraction or a reduction in the ability to see essential information. This includes general impacts on humans and the environment.
Rate 1 Lighting	Unmetered public lighting supplied, installed, owned and maintained by Energex.

Term	Description
Rate 2 Lighting	Unmetered public lighting for which all supply and installation costs are funded by the Public Body (or Developer) and then ownership is vested in Energex on completion of the installation. Energex then assumes responsibility for maintenance of the installation.
Rate 3 Lighting	Unmetered public lighting supplied, installed, owned and maintained by the public body.
Rate 4 Lighting	Public Body funds the replacement of Rate 1 luminaire with an LED luminaire and gifts the LED luminaire to Energex. The associated pole and cabling remain owned, operated and maintained by the Energex.
RPEQ	Registered Professional Engineer of Queensland.
Scotopic-to-photopic (S/P) ratio	A method to indicate how good a light source will be under photopic, mesopic and scotopic conditions, which is the scotopic lamp lumens divided by the photopic lamp lumens.
Spectral power density	Specifies the amount of power a light source contains at each wavelength in the visible spectrum.
Spill light	Unwanted light falls outside the target area of illumination. Spill light can be a source of obtrusive light and light pollution.
Tilt	The angle at which a luminaire is tilted above the horizontal (zero degree) plane.
UNESCO	United Nations Educational, Scientific and Cultural Organization
Upward waste light	The proportion of the luminous flux emitted by the luminaire above the horizontal, in the installed position.

Sunshine Coast COUNCIL

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