NIGHT SKY PROTECTION

Review of Mechanisms

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ACRONYMS AND ABBREVIATIONS

AO	Acceptable outcome
AS	Australian Standard
AS/NZ	Australian and New Zealand Standard
ADSA	Australasian Dark Sky Alliance
Council	Sunshine Coast Council
Cwth	Commonwealth
DAWE	(Cwth) Department of Agriculture, Water and the Environment
DP&E	(NSW) Department of Planning and Environment
DPIE	(NSW) Department of Planning, Industry and the Environment
IDA	International Dark-Sky Association
IDSP	International Dark Sky Place
km	Kilometres
MAB	Man and the Biosphere
NLPGW	National Light Pollution Guidelines for Wildlife
NSW	New South Wales
PO	Performance outcome
Qld	Queensland
SA	South Australia
ULMP	Urban Lighting Master Plan
UNESCO	United Nations Educational, Scientific and Cultural Organization

EXECUTIVE SUMMARY

At the Ordinary Meeting of the Sunshine Coast Council (council) on 30 January 2020, a Councillor moved a Notice of Motion, requesting that the Chief Executive Officer investigate appropriate mechanisms for application by council, including International Dark Sky Reserve Designations, that recognise, protect and celebrate the night sky. The council resolved unanimously to carry the motion and this report provides a preliminary assessment of the various mechanisms.

A dark sky is the natural occurrence of the sky at night, free from human-caused light pollution. Light pollution is excessive use of artificial light and is a side effect of industrial civilisation. When outdoor lighting is inefficient, overly bright, poorly targeted and/or improperly shielded, light spills into the sky, rather than focusing it on to the actual objects and areas that people want illuminated.(IDA 2020) Increasing urbanisation and over-lighting of the earth increases light pollution, decreasing the availability of night sky environments.

The purpose of this review is to collate relevant information for council's consideration, in particular:

- identification of existing mechanisms that recognise, protect and celebrate the night sky
- summarised benefits, constraints and considerations for each mechanism
- recommendations on the most appropriate mechanism(s) for the Sunshine Coast.

A dark night sky has many benefits, including:

- benefits for wildlife, particularly nocturnal and aerial species
- enable appreciation of astronomical features
- provide economic benefits through astro-tourism
- provide health and social benefits for communities
- provide economic benefits through decreased energy usage

Light pollution can have negative environmental consequences, and increased awareness and concern surrounding light pollution has led to the creation and implementation of mechanisms or other tools and approaches that recognise, protect, and/or celebrate the night sky. These have been adopted at the international, national, and local scale.

A literature review of mechanisms that recognise, protect, and/or celebrate the night sky was undertaken. This review involved summarising a selection of relevant dark sky certification mechanisms and assessing them against five criteria developed by council officers in conjunction with NGH consultants. These criteria provide an objective measure with which to examine each mechanism against how well placed it is to achieve council's objectives. Benefits and limitations of each of these mechanisms have also been considered.

The literature review also identified a number of other tools and approaches that could be considered, which either directly or indirectly recognise, protect, and/or celebrate night sky environments.

Based on the assessment, the two dark sky certification programs – an International Dark Sky Place through the International Dark Sky Association or a certified place through the Starlight Foundation (such as a Starlight Reserve) – are the most effective mechanisms to recognise, protect and celebrate the night sky. International Dark Sky Association rated slightly higher, as there are existing International Dark Sky Places within Australia which potentially provides additional benefits, such as greater opportunities to build partnerships and share knowledge. Council direction and consideration of these two mechanisms is required to progress the recognition, protection and celebration of the night sky.

1. INTRODUCTION

1.1. CONTEXT

At the Ordinary Meeting of the Sunshine Coast Council (council) on 30 January 2020, Councillor Jenny McKay moved a Notice of Motion, requesting that the Chief Executive Officer:

a. investigate appropriate mechanisms, including International Dark Sky Reserve Designations, that recognise, protect and celebrate the night sky; and
b. report the findings of this investigation to the Ordinary Meeting scheduled for November 2020.

The council resolved unanimously to carry the motion (Resolution OM20/16) and this report provides a preliminary assessment of the various mechanisms available to the council.

1.2. OBJECTIVES

The purpose of this review is to respond to Council Resolution OM20/16 and collate preliminary information for council's consideration, in particular:

- Identify existing mechanisms that recognise, protect and celebrate the night sky.
- Summarise the benefits, constraints and considerations for each mechanism.
- Provide recommendations on the most appropriate mechanisms for the Sunshine Coast.

2. BACKGROUND

2.1. SUNSHINE COAST

Located in South East Queensland (SEQ), 53 kilometres (km) north of Brisbane, the Sunshine Coast Council local government area covers an area of approximately 2,200 km^2 and is considered a major urban and economic centre and an emerging city-region.

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. The Sunshine Coast offers a desirable lifestyle and over the past decade around 6,500 people each year have chosen to make the region home. This annual growth in population, which is expected to continue in the foreseeable future, and exceed 500,000 by 2041 has led to significant urban development and supporting infrastructure. (SCC 2020)

2.1.1. Sunshine Coast Policy Context

Sunshine Coast Environment and Liveability Strategy

Council's Environment and Liveability Strategy (SCC 2017) provides long term strategic direction to shape the region by guiding growth and delivering the transformational change required to maintain a healthy environment and liveable Sunshine Coast.

Recognition, protection, and celebration of night skies on the Sunshine Coast broadly aligns with the policies and programs to provide for the long-term protection and management of the region's natural assets and embedding sustainable design into the built environment.

Council has also been considering greater levels of environmental recognition (nationally and internationally), which also support the region's economy, tourism, sustainability and liveability including progressing a nomination to be recognised by United Nations Educational, Scientific and Cultural Organisation (UNESCO) as an international site of excellence, known as a biosphere (refer Section 2.1.2).

Sunshine Coast Council Corporate Plan

Council implements a range of policies to provide long-term protection and management of natural assets and promote approaches to support a more sustainable, resilient and low carbon way of living. These are reflected in the Corporate Plan 2020-2024:

Vision: Australia's most sustainable region – Healthy, Smart, Creative

A Healthy Environment: Maintaining and enhancing the region's natural assets, liveability and environmental credentials.

Strategic pathways:

- *A resilient region shaped by clever planning and good design*
- *Protection and enhancement of our natural assets and distinctive landscapes*
- *Responsive, accessible and well managed assets and infrastructure*
- *Transitioning to a sustainable and affordable way of living*
- *A reputation for innovation and sustainability.*

2.1.2. Existing international mechanisms being progressed

Council is investigating and implementing a suite of initiatives to greater protect and preserve the unique natural environment of the Sunshine Coast into the future.

One of the initiatives is the UNESCO Man and the Biosphere (MAB) Programme. The MAB Programme was developed in the 1960s, with the first international projects adopted in 1971 and the first Biosphere Reserves designated in 1976. It aims to establish a scientific basis for enhancing the relationship between people and their environments. It promotes socially and culturally appropriate views to economic development which are environmentally sustainable, safeguarding natural and managed ecosystems (UNESCO 2019).

The MAB Programme focuses on sites identified within the World Network of Biosphere Reserves to:

- identify and assess the changes in the biosphere resulting from human and natural activities and the effects of these changes on humans and the environment, in particular in the context of climate change;
- study and compare the dynamic interrelationships between natural/near-natural ecosystems and socio-economic processes, in particular in the context of accelerated loss of biological and cultural diversity with unexpected consequences that impact the ability of ecosystems to continue to provide services critical for human well-being;

- ensure basic human welfare and a liveable environment in the context of rapid urbanisation and energy consumption as drivers of environmental change; and
- promote the exchange and transfer of knowledge on environmental problems and solutions, and to foster environmental education for sustainable development (UNESCO 2019).

The World Network of Biosphere Reserves currently counts 701 sites in 124 countries, including 21 transboundary sites.

At the time of writing, council is progressing their application to become a Biosphere Reserve. The Biosphere Nomination was endorsed by council in October 2019, and the Queensland and Australian Governments are currently reviewing the nomination. If endorsed, the nomination will be submitted to the UNESCO MAB Programme. It should be noted that the MAB Programme is not designed to specifically address night sky environments; rather it identifies sites on earth for their intrinsic values.

Seeking dark sky designation is one complementary opportunity that council is considering to recognise, protect, and conserve its areas of natural value.

2.2. DARK SKIES

A dark sky is the natural occurrence of the sky at night, free from human-caused light pollution. Light pollution is excessive use of artificial light and is a side effect of industrial civilisation. Sources of light pollution include building exterior and interior lighting, advertising, commercial properties, offices, factories, streetlights, and illuminated sporting venues. When this outdoor lighting is inefficient, overly bright, poorly targeted, and/or improperly shielded, light spills into the sky, rather than focusing it on to the actual objects and areas that people want illuminated (IDA 2020).

A dark night sky has many benefits, including:

- For wildlife, particularly nocturnal and aerial species.
- Enables appreciation of astronomical features.
- Provides economic benefits through astro-tourism.
- Provides health and social benefits for communities.
- Provides economic benefits through decreased energy usage (IDA 2020).

Dark skies naturally occur in largely unpopulated areas on earth. Urbanised areas have increased amounts of light pollution, which impacts on the quality of dark skies.

Light pollution can have negative consequences, including:

- increased energy consumption
- disruption of ecosystems
- impacts to wildlife, including disruption of breeding and migration patterns of nocturnal animals
- harming human health
- affecting observatories' ability to observe the night (DPIE 2019).

Increased awareness and concern surrounding light pollution has led to the creation and implementation of a variety of mechanisms and tools that recognise, protect, and/or celebrate the night sky. These have been adopted at the international, national, and local scale.

2.3. EXISTING MECHANISMS TO PROTECT DARK SKIES

2.3.1. International

Several international organisations have been established which aim to recognise and protect dark sky environments, whether as their whole focus or part of a broader objective (e.g. International Dark Sky Association [Section 4.1], and Starlight Foundation [Section 4.2]). Some of these organisations have implemented certification processes that formally recognise certain dark sky environments around the world and help to maintain and protect these environments, while recognising their importance and promoting them as astro-tourism sites.

2.3.2. National and state

National strategies designed to mitigate light pollution or protect dark skies include:

- The National Light Pollution Guidelines for Wildlife, which provide best practice lighting design principles to be followed at the design stage of projects (Section 6.4.3).
- Australian Standards relating to light pollution (Section 6.4).

For the most part, these tools are designed to mitigate the effects of lighting on people and the terrestrial environment and are not necessarily useful as measures to recognise, protect and celebrate the dark night sky. However, state and local governments have acted independently to implement such measures. Examples include:

- New South Wales (NSW) has implemented a dark sky planning guideline to assist local governments (DPE 2016) (Section 6.2).
- Mid Murray Council, South Australia (SA) has implemented a Dark Sky Policy (Section 6.3)
- In Western Australia (WA), Astrotourism Towns are recognised for their excellent dark night skies and are supported by local communities. Carnamah and the Wongan-Ballidu Shire are both recognised as Astrotourism Towns (Astrotourism WA 2020) (Section 6.6).

2.4. EXISTING COUNCIL PLANS

2.4.1. Sunshine Coast Planning Scheme 2014

Like all planning schemes in Queensland, the Sunshine Coast Planning Scheme 2014 establishes the framework for managing development in the local government area, in a way that advances the purpose of the *Planning Act 2016* (Act) (SCC 2014). This purpose is premised on achieving ecological sustainability when undertaking land use planning and through the development assessment process.

Ecological sustainability includes the protection of biological diversity and conservation or enhancement of places of special aesthetic, architectural, cultural, heritage, scientific, social or spiritual significance. Areas that retain a dark sky environment may be considered such a place of special significance.

As the purpose of a planning scheme is to regulate development generally, there is a limited capacity to establish a singular focus on one aspect of land use planning, such as the recognition, protection, and celebration of the night sky. Provisions in respect of lighting, for example, generally relate to functionality and public safety, to which protection of the night sky is incidental only. The planning scheme can support the protection of dark skies; however, a targeted mechanism with a primary goal to protect the night sky was the focus of this investigation.

2.4.2. Urban Lighting Master Plan

The Urban Lighting Master Plan (ULMP) (SCC 2016) was developed in order to set the strategic guidance for public lighting. Its development was part of the Public Lighting Project, which aims to deliver improvements to the public lighting network by upgrading street lights to energy efficient technology. The project aimed to also address the age and condition of lights, the associated cost, the current high energy usage and the future 'Smart City' vision. The ULMP:

- Adopts a design focused on pedestrians;
- Differentiates appropriate lighting between coastal areas and hinterland areas;
- Provides various luminaire options with a range of energy savings depending on luminaire type, road type and in conjunction with the lighting design standard for that road;
- Details the upgrade plans for the Sunshine Coast across 27 localities and delivers overall energy savings of around 50%;
- Recommends the use of LED lighting with 'smart control' nodes which vastly improve management and monitoring capabilities whilst also providing cost efficiencies and accelerating timeframes for the deployment of 'Smart City' solutions;
- Proposes an environmental lighting overlay across the entire region to guide property developers, sporting clubs and their associated lighting designers to provide public lighting that is safe, energy efficient, smart and sensitive to the environment; and
- Is consistent with the UN Environment Program for the native Loggerhead Turtle and the International Dark Sky Association conventions.

The ULMP is applicable to all new private developments and council renovation projects[1].

The Public Lighting Project looked at transferring ownership of around 27,000 public lighting assets from the distribution network service provider Energex to council and investing in upgrading the streetlights to smart controlled energy efficient technology operated and maintained via a performance management contract. However the project was terminated in 2017 after Energy Queensland determined that streetlight assets will remain with Energex as a Government owned Corporation.

The two new major master planned communities on the Sunshine Coast (total population of Aura approximately 50,000 and Harmony approximately 15,000) will all have Rate 3 LED smart control ready lights installed. Suncentral Maroochydore also has smart LED rate 3.

[1] SC6.14 Planning scheme policy for development works deals with lighting:
The lighting element must comply with council's public lighting plan; and street lighting tariff 3.

3. METHODOLOGY

3.1. LITERATURE REVIEW

A literature review of mechanisms that recognise, protect, and celebrate the night sky was undertaken. Relevant mechanisms that may meet council's objectives of this review were selected for further assessment. Each of these mechanisms has been summarised, highlighting its objectives, credentials, and benefits and constraints, and then assessed against a standardised set of criteria, as described below.

Input was obtained from a wildlife lighting specialist, a principal ecologist, and an environmental and planning lawyer.

3.2. ASSESSMENT CRITERIA

Five assessment criteria were developed by council officers in conjunction with NGH consultants. The criteria were developed to provide an objective measure with which to examine each mechanism against how well placed it is to help achieve council's objectives.

Each mechanism was assessed against these five criteria and given a rating between 1 and 3, where 1 indicates the mechanism does not meet the criteria, and 3 indicates it meets the criteria well. Each criterion is described further below.

3.2.1. Responding to council's vision

Criteria 1: The mechanism has an enduring framework that integrates and embeds council's vision to be Australia's most sustainable region - healthy, smart, creative (social, economic, environment and cultural aspirations).

Rating:

1. The mechanism does not provide a management framework that is useful for integrating and embedding council's aspiration for the region.
2. The mechanism either partly provides a useful framework or readily changes potential undermining the objective of embedding long term support for council's aspirations.
3. The mechanism provides a framework which integrates and embeds long term support for council's aspirations.

3.2.2. Responding to council's strategic directions

Criteria 2: The mechanism complements and enhances council's other strategic planning tools.

Rating:

1. The mechanism 'cuts across' council's existing strategic planning tools and/or does not provide a framework or additional tools for recognition and protection of our night sky environment.
2. The mechanism has advantages in how it recognises and protects the night sky environments but will require adjustment to council's existing strategic planning.
3. The mechanism complements and or reinforces council's existing approaches to the recognition and protection of night sky environments and provides additional useful tools.

3.2.3. Responding to national/international recognition

Criteria 3: The extent to which the mechanism brings credible, independent national and international recognition for the protection of night sky environments.

Rating:

1. The mechanism is not recognised as a credible, independent national and international recognition for the protection of night sky environments.
2. The mechanism is promoted by a credible independent organisation and/or can be used at the discretion of council.
3. The mechanism is regulated by a credible, independent organisation. Use of the mechanism requires independent authentication and endorsement of council's stewardship approach by an organisation with national/international credibility.

3.2.4. Responding to a collaborative approach and leading by example

Criteria 4: The mechanism provides leading practice examples to recognise and protect the night sky and a platform to build partnerships, share knowledge and experience and celebrate this environment.

Rating:

2. The mechanism does not provide access to leading practice examples to recognise and protect night sky and is not a useful platform to build partnerships, share knowledge, experience and celebrate this environment.
3. The mechanism provides access to leading practice examples however the case studies of direct relevance to the Sunshine Coast local government context have limited application. Opportunities to build partnerships, share knowledge and experience and celebrate are limited.
4. The mechanism provides access to directly relevant leading practice and is a beneficial platform to build partnerships, share knowledge and experience and celebrate this environment.

3.2.5. Responding to resource implications

Criteria 5: The resourcing implications required to manage and maintain association with the mechanism.

Rating:

1. The mechanism will require substantial additional community resource and or council staff resources and or recurrent funding implications.
2. The mechanism will require some additional community resources and/or council staff resourcing and or recurrent funding implications.
3. The mechanism places no or minimal additional resource requirements on council and the community.

4. ASSESSMENT

The following mechanisms were identified as being the most relevant to achieving the council's objectives:

1. International Dark Sky Places Program
2. Starlight Foundation (Fundación Starlight).

These mechanisms have been summarised and assessed against the five criteria (Section 3.2).

4.1. INTERNATIONAL DARK SKY PLACES PROGRAM

4.1.1. Summary

The International Dark Sky Places (IDSP) program was established by the International Dark-Sky Association (IDA) in 2001 (IDA 2020). Headquartered in the United States, the IDA is a leading global authority on light pollution, with a mission to "…*preserve and protect the night time environment and our heritage of dark skies through environmentally responsible outdoor lighting.*" The IDSP program is one tool utilised to achieve this mission by recognising and promoting excellent stewardship of the night sky.

The IDSP program offers six types of designations:

1. **International Dark Sky Communities**: legally organised cities and towns that have shown dedication to the preservation of the night sky by implementing quality outdoor lighting ordinances and undertaking efforts to educate residents about the importance of dark skies. These communities promote responsible lighting and dark sky stewardship, setting" an excellent example for other areas" (IDA 2020).
2. **International Dark Sky Parks**: land possessing exceptional or distinguished quality of starry nights and a nocturnal environment, protected for natural conservation that implement good outdoor lighting and provide dark sky programs for visitors.
3. **International Dark Sky Reserves**: land possessing an exceptional or distinguished quality of starry nights and nocturnal environment that is specifically protected for its scientific, natural, educational, cultural, heritage and/or public enjoyment. Reserves consist of a dark "core" zone meeting minimum criteria for sky quality and natural darkness, surrounded by a populated periphery where policy controls are enacted to protect the darkness of the core.
4. **International Dark Sky Sanctuaries:** the most remote (and often darkest) places in the world whose conservation state is most fragile. These are public or private land with an exceptional or distinguished quality of starry nights and a nocturnal environment that is protected for its scientific, natural, or educational value, its cultural heritage and/or public enjoyment. These are typically situated in a very remote location with few (if any) nearby threats to the quality of its dark night skies and do not otherwise meet the requirements for designation as a park or reserve.
5. **Urban Night Sky Places**: sites near or surrounded by large urban environs whose planning and design actively promote an authentic night time experience in the midst of significant artificial light at night, and that otherwise do not qualify for designation within any other International Dark Sky Places category.
6. **Dark Sky Friendly Developments of Distinction**: subdivisions, master planned communities, and unincorporated neighbourhoods and townships whose planning actively promotes a more natural night sky but does not qualify them for the IDSP designation.

There are over 130 certified IDSPs located around the world, including three in Australia:

1. Warrumbungle National Park, NSW, established in 2016:
   - Designated as an IDA Dark Sky Park, Warrumbungle National Park is a 23,000 hectare (ha) park in the Orana region of NSW. The Park is home to the Siding Spring Observatory, which was relocated from Canberra to its current location in the 1950s to escape light pollution. The presence of the observatory encouraged early conservation of dark skies in the area, including the Warrumbungle National Park, which eventually lead to the site's designation as an IDA Dark Sky Park (IDA 2016).
2. River Murray: Swan Reach Conservation Park, SA, established in 2019:
   - The River Murray was designated an IDA Dark Sky Reserve following the establishment of the Swan Reach Conservation Park in 1970, which was established primarily to protect the endangered southern hairy-nosed wombat (*Lasiorhinus latifrons*), It is a 320,000 ha area located approximately 100km east of Adelaide, entirely within the Mid Murray Council. Planning restrictions limit development within the park, and there are currently no facilities, aside from rough tracks, within the park boundaries (IDA 2019a).
3. The Jump Up: The Australian Age of Dinosaurs Museum of National History, Qld, established in 2019:
   - The Jump-Up is an IDA Sanctuary located around the site of the not for profit organisation Australian Age of Dinosaurs' headquarters located in Winton, Queensland, approximately 650km west of Mackay. Founded in 2002, the organisation operates the Australian Age of Dinosaurs Museum of Natural History (the Museum), holds annual dinosaur digs, and oversees the operation of Australia's most productive dinosaur fossil preparation laboratory. The Museum has been awarded several tourism attraction awards, and its rural location naturally protects its dark sky environment (IDA 2019b).

These places were designated following a thorough application process that requires demonstration of strong community support and documentation of specific program requirements. The application process is extensive and can take over three years to complete.

Once a place is certified as an IDSP, IDA promotes their work through media relations, member communications, and social media. Designation as an ISDP can increase tourism and local economic activity by enhancing the place's visibility.

While IDSP is a robust certification providing national and international recognition, the rigorous application process and ongoing governance would utilise additional council resources.

Ongoing governance

Once a site is designated as an IDSP, there are ongoing requirements dictated by IDA that must be maintained to achieve ongoing status as an IDSP. Depending on the type of designation, these may include:

- A comprehensive Lighting Management Plan (LMP);
- Evidence of community commitment to dark skies and quality outdoor lighting;
- Light pollution measurement program;
- Identification of current and potential future threats to the dark sky area;
- Programs (education, economic incentives, regulations, etc.) to encourage night sky friendly lighting;
- Appropriate signage surrounding the IDSP;
- Acknowledgement of the IDSP by government or regulatory agencies that dark skies are an important value, as shown by planning documentation; and
- Annual report detailing activities and progress towards fulfilling IDSP goals and documenting the achievement of minimum program requirements and compliance with LMPs.

To ensure ongoing compliance is met, and to retain status as an IDSP, a working group or board may be established. This would require ongoing council resources and partnerships with key organisations, which may include State Government agencies, lighting manufacturers, community members and organisations, and utility providers.

4.1.2. Assessment

The following table assesses certification under the IDA International Dark Sky Program against the assessment criteria:

Criteria	Rating
1. The mechanism has an enduring framework that integrates and embeds Council's vision to be Australia's most sustainable region - healthy, smart, creative (social, economic, environment and cultural aspirations).	3
2. The mechanism complements and enhances council's other strategic planning tools.	3
3. The extent to which the mechanism brings credible, independent national and international recognition for the protection of night sky environments.	3
4. The mechanism provides leading practice examples to recognise and protect the night sky and a platform to build partnerships, share knowledge and experience and celebrate this environment.	3
5. The resourcing implications required to manage and maintain association with the mechanism.	1
Total	**13**

4.2. STARLIGHT FOUNDATION (FUNDACIÓN STARLIGHT)

4.2.1. Summary

The Starlight Foundation is a non-profit organisation created by the Canary Islands Institute of Astrophysics (IAC) with the aim to provide society a different way of valuing the starry sky. It is a branch of the Starlight Initiative, an international campaign to defend the values associated with the night sky. The program is supported and promoted by UNESCO, The World Tourism Organization (UNWTO), and the International Astronomical Union (IAU).

The Starlight Foundation has created a certification system with the intention of generating an economy in rural territories by accrediting areas that have excellent sky quality and represent an example of protection and conservation. Modalities for certification under the Starlight Foundation are:

- **Starlight Reserve**: protected natural area where a commitment to protecting the quality of the night sky and access to starlight is established. Its function is to preserve the quality of the night sky and the different associated values, whether cultural, scientific, astronomical, or the natural landscape. It's made up of a core or exclusion zone, a protection zone, and a general zone. Each Reserve is accompanied by a Participatory Action Plan and a set of recommendations aimed at preserving or restoring the quality of the night sky, taking into consideration the cultural, educational, scientific and environmental benefits.

- **Straight Tourist Destinations**: locations with ideal conditions for observing the stars and where light pollution is controlled, making them logical destinations for tourism based on the appreciation of the sky as part of the natural world. These areas must also have appropriate tourism infrastructure (accommodation, means of observation available to visitors, trained staff for astronomical interpretation, etc.) integrated into nocturnal nature. If the site does not have yet these facilities and activities, the Foundation evaluates the project to develop them in the future.
- **Starlight Villages**: small towns with their own identity and a mainly rural nature, which are looking to diversifying their economy through the development of astro-tourism, with the aim of favouring the economic and sustainable growth of the territory and preventing the depopulation of the same. While similar to a Starlight Tourist Destination, these areas retain a small scale with more limited activities and objectives.
- **Starlight Rural Hotels and Houses**: a qualification awarded to those establishments which, as well as offering accredited quality accommodation, also become involved as active agents in the promotion of the Starlight Foundation's values and which provide their customers with information about starlight as well as means and instruments for astronomical observation.
- **Starlight Stellar Parks**: rural areas generally belonging to municipalities that protect its night sky sufficiently to allow observational, educational, cultural or recreational activities linked to astronomical events (passing comets, eclipses of the sun and moon, planet alignments, meteor showers, etc.). These sites usually contain amateur observation facilities. Light pollution protection measures should be reinforced with specific actions by the municipality or private entities to adapt artificial lighting.
- **Starlight Stellariums**: simple, permanent infrastructure installed in areas with a clear, dark sky. They allow leisure activities related to the contemplation of the stars and astronomical observation. They are "viewpoints open to the sky", promoted by governments, organisations or private entities to encourage interest in the contemplation of the heavens and astronomical knowledge among the public. They are intended to facilitate cultural and educational knowledge and provide a basic tool to groups and associations of amateur astronomers for their observations. These facilities can be located in places with good sky quality (Reserves/Destinations) or locations with a lower quality sky but with good conditions to for observation.
- **Starlight Camps**: accredited facilities that organise activities to promote awareness of the starry sky as part of nature and offer sustainable tourism that respects the environment and protects the night sky.
- **Starlight Wilderness**: designed for applicants (institutions, organisations, individuals) who simply want to qualify and certify the quality of the sky in an area over which they have competence but no immediate intention of developing astronomical, tourist or any other activities. The Starlight Foundation, at the request of stakeholders, offers to conduct a consultancy study to consider which astronomy-related educational or tourism possibilities could be developed in these places.
- **Other modalities**: the possibility of awarding other accreditations to those spaces or places that meet a number of less restrictive conditions and which are favourable to the contemplation of the stars. These may be, for example, certain routes or camps.

These places are designated following an application process that requires a suite of necessary information and documentation. Depending on the type of certification, this may include:

- Adoption of the Declaration in Defence of the Night Sky and the Right to Starlight (La Palma Declaration, 2007);
- An outline of an Action Plan for the continued protection and promotion of the site;
- Measurements of the quality of the night sky;
- Information on proposed or existing lighting, energy, and air quality related policies and bylaws; and
- Starlight-related natural and cultural values to be protected.

Once the information has been reviewed, the application and proposed site are audited by independent experts before a decision is made. There are currently no Starlight Foundation certified areas in Australia.

Once a place is certified, it is recognised by a number of organisations, including the Starlight Foundation, UNESCO, UNWTO, and IUN. The place is listed on these organisation's websites as an area which preserves the dark sky, potentially increasing tourism and local economic activity by enhancing the place's visibility.

While Starlight Foundation is a robust certification providing national and international recognition, the rigorous application process and ongoing governance would utilise additional council resources.

Ongoing governance

Once a site is certified by the Starlight Foundation, a detailed Action Plan should be developed to outline the objectives of the site and state the active commitment to preserve the night sky. This Action Plan may include components such as:

- Culture and education;
- Astronomical observation;
- Environment and biodiversity conservation;
- Intelligent lighting and light pollution; and
- Sustainable tourism and starry skies.

To ensure ongoing compliance is met, and to retain status as a certified place, a working group or board may be established. This would require ongoing council resources and partnerships with key organisations, which may include State Government Agencies, lighting manufacturers, community members and organisations, and utility providers.

4.2.2. Assessment

The following table assesses certification under the Starlight Foundation's scheme against the assessment criteria:

Criteria	Rating
1. The mechanism has an enduring framework that integrates and embeds Council's vision to be Australia's most sustainable region - healthy, smart, creative (social, economic, environment and cultural aspirations).	3
2. The mechanism complements and enhances council's other strategic planning tools.	3
3. The extent to which the mechanism brings credible, independent national and international recognition for the protection of night sky environments.	3
4. The mechanism provides leading practice examples to recognise and protect the night sky and a platform to build partnerships, share knowledge and experience and celebrate this environment.	2
5. The resourcing implications required to manage and maintain association with the mechanism.	1
Total	**12**

5. SUMMARY

A summary of the results of the assessment of each mechanism against the criteria is provided below.

Mechanism	Criteria Rating						Comment
	1	2	3	4	5	Total	
International Dark Sky Places Program	3	3	3	3	1	**13**	IDSP designation is a respected, robust method to ensure that night sky environments are protected and celebrated. IDSP designation is one of the most globally recognised and respected certifications identifying dark skies. Three IDSP exist in Australia, offering opportunities to build partnerships and share knowledge. However, the rigorous application process can take several years and requires evidence of strong community support and ongoing maintenance to retain IDSP status.
Starlight Foundation Certification Program	3	3	3	2	1	**12**	Certification under the Starlight Foundation's scheme is a respected, robust method to ensure that night sky environments are recognised, protected and celebrated. Designation as a Starlight Reserve or other place under the Starlight Foundation's certification program is one of the most globally recognised and respected certifications identifying dark skies. The Starlight Foundation offers a range of certification types to protect and identify many areas, including reserves, tourist destinations, and hotels. A rigorous application process to meet stringent criteria is required. At the time of writing, there are no places in Australia certified under this program. Opportunities to build partnerships and share knowledge, particularly within Australia, may be limited.

6. OTHER APPROACHES

This review also identified other approaches that could be further investigated for their potential application to recognise, protect and celebrate the Sunshine Coast night sky environment.

6.1. PLANNING SCHEME

Whilst the planning scheme is restricted in its capacity to protect dark skies, it may incorporate measures that recognise and regulate certain aspects of development and uses to mitigate the impact of artificial light and protect the night sky environment in certain locations and circumstances. The planning scheme already incorporates some measures to control the impact of light, such as through codes that restrict the intensity and use of light where it may cause a nuisance or for illuminated advertising devices.

Another possible way in which the planning scheme could protect particular locations identified as dark sky areas is through an overlay. Overlays show the unique features of an area, such as characteristics to protect and identify locations that, for example, may be sensitive to certain types or aspects of development.

The development of an overlay would require further investigation by council to identify the feasibility of such a process and would also require a major amendment to the planning scheme. This process would be heavily dependent on the support of the community and the ability to avoid conflict with, for example, existing uses.

6.2. NSW DARK SKY PLANNING GUIDELINE

The Guideline informs development controls within a designated Dark Sky Region (DPE 2016). The Dark Sky Region is centred upon the Siding Spring Observatory at the edge of Warrumbungle National Park, extending to a 200 km radius, to protect Australia's most important visible light observatory.

The Guideline aims to deliver better quality lighting to support the economy and cultural identity of the Dark Sky Region by providing guidance and technical information on good lighting design. Specifically, it encourages the use of shielded, downward facing and site appropriate lighting.

This Guideline was designed to:

- assist planning professionals in state and local government with the assessment of development proposals
- be a tool for planners, developers, builders and other professionals when preparing a development application
- inform the wider community about the lighting practices that support maintenance of a dark night sky and improve lighting practice.

In accordance with the *Environmental Planning & Assessment Act 1979* (NSW), the Guideline must be considered for all development located within the four local government areas which comprise the Dark Sky Region. The Guideline must also be considered under other development pathways and is included in local environment plans for the relevant local government areas.

The Guideline:

> *…assist[s] consent authorities to consider the impacts of lighting associated with a development application. The consent authority may impose conditions in relation to design of light fittings, shielding of light, the design and operation of development and hours of lighting operation to manage contribution to artificial skyglow. Other considerations may include the design of roads, dust mitigation and night time operations for extractive industries, coal seam gas and other development types.* (DPE 2016)

Council may consider developing and implementing a dark sky planning guideline, modelled on the NSW Guideline, the objective of which would be to establish measures that better protect the night sky environment, providing technical information for planners, developers, and the broader community (NSW DPE 2016).

Planning guidelines sit outside the planning scheme, and as such are non-statutory. This would therefore not require an amendment to the planning scheme and would promote a cohesive set of measures aimed at protecting the night sky.

Limitations of this option include:

- As it is non-statutory, there are no requirements to implement these measures – it therefore may not have the ultimate desired effect to protect the night sky.
- It would require some additional resources for council to develop and promote.

6.3. DARK SKY POLICY, MID MURRAY COUNCIL (SOUTH AUSTRALIA)

Mid Murray Council is located in South Australia, approximately 100km east of Adelaide, and contains the IDA River Murray Dark Sky Reserve (designated in 2019) (refer Section 4.1.1). The Mid Murray Council's Dark Sky Policy was adopted in May 2018, with a stated purpose to:

> *…confirm Mid Murray Council's commitment to encouraging and preserving the natural dark skies in the area known as the "River Murray Dark Sky Reserve". Along with the Light Management Plan, this Policy's objective is to ensure that the River Murray Dark Sky Reserve satisfies the criteria set by the International Dark Sky Association ensuring its promotion and longevity*. (Mid Murray Council 2018)

The primary aims of this Policy include:

- Raising community awareness of and support for the dark sky environment
- Promoting the Dark Sky Reserve as part of Council's economic development and tourism plan
- Guiding development and engage with local residents so as not to impact on the dark sky environment.

Council may consider the option to draft a night sky policy modelled on an existing local government policy, such as the Mid Murray Council Dark Sky Policy. This would require some additional council resources to develop, depending on the level of statutory incorporation. The policy would clearly establish council's position in respect to the dark sky environment and would provide transparency and accountability to the community.

6.4. LIGHTING STANDARDS

6.4.1. Australian Standards

Two principal Australian Standards (AS) inform development in the Sunshine Coast local government area and are referenced in the planning scheme. These are the AS/NZS 1158 *Lighting for roads and public spaces* (series) and AS/NZS 4282 *Control of the obtrusive effects of outdoor lighting* (2019).

AS/NZS 4282:2019 Control of the obtrusive effects of outdoor lighting

This standard addresses the effects of development that involves the provision of outdoor lighting.

This is the only referenced AS that provides maximum limits to the amount of light pollution caused by a luminaire or installation. The limits provided in the standard are restricted to the amount of light falling on windows, the brightness of building facades and the intensity of light sources and does not consider environmentally sensitive areas such as turtle nesting beaches or rural locations.

The standard does not apply to street lighting unless decided by the relevant authority. In the ULMP, Council has gone beyond the requirements of AS 4282 by applying the limits to all lighting, including streetlights, in accordance with the ULMP model overlay.

AS/NZS 1158 Lighting for roads and public spaces

In general, the three main objectives of public lighting are to:

1. Facilitate and assist safe movement of pedestrians and vehicles
2. Discourage illegal acts
3. Contribute to the amenity through increased aesthetic appeal.

Guidance is provided in AS/NZS 1158 for determining the category of roadways, based on the size and use of the roadway. The category dictates the minimum lighting requirements permitted on the roadway. This approach does not necessarily facilitate the achievement of council's objective to be the most sustainable region in Australia, nor does it promote protection of the night sky, as there are no maximum light levels specified under the standard.

Another relevant standard is AS/NZS 2560 series for sports lighting, which, similar to AS/NZS 1158, establishes minimum limits only. Hence this standard does not provide a means to reduce light spill. It makes recommendations, but does not set requirements, for obtrusive light released into the environment from sports lighting installations.

These standards are generally specific to safety, amenity and/or human interaction.

6.4.2. ADSA Approved Luminaires

The Australasian Dark Sky Alliance (ADSA) was established in early 2019 following a meeting in September 2018 of one hundred delegates at Siding Spring Observatory for Australia's first conference on light pollution (ADSA 2020).

ADSA is an independent, non-profit organisation that aims to:

- educate the public and policymakers about night sky conservation
- promote environmentally responsible outdoor lighting
- assist in the designation of IDA Dark-Sky Places
- create business opportunities
- celebrate our night sky heritage.

ADSA has identified Approved Luminaires, which are lighting products that conform to Australian standards and guidelines pertaining to dark sky principles. They fall into one of three categories:

1. ADSA Approved: a luminaire delivering appropriate levels of performance for use in dark sky friendly lighting designs.
2. ADSA Prized – Human Sensitive: a higher level of luminaire management and performance, providing even greater control over sky glow and associated light pollution, as well as glare and other human factors.
3. ADSA Prized Wildlife – Wildlife Sensitive: areas where the sensitivities of the local wildlife and ecosystems take priority.

While ADSA partners with IDA, the ADSA Approved Luminaires program ensures certified products comply specifically with Australasian legislation and guidelines.

6.4.3. National Light Pollution Guidelines for Wildlife

The National Light Pollution Guidelines for Wildlife were released in January 2020 by the Australian Department of Agriculture, Water and the Environment (DAWE). It is the most current and informative reference for designing for the night sky environment. These guidelines provide best practice lighting design principles to be followed at the design stage of projects (DAWE 2020).

Best practice lighting design incorporates the following principles.

- Start with natural darkness and only add light for specific purposes.
- Use adaptive light controls to manage light timing, intensity, and colour.
- Light only the object or area intended – keep lights close to the ground, directed, and shielded to avoid light spill.
- Use the lowest intensity lighting appropriate for the task.
- Use non-reflective, dark-coloured surfaces.
- Use lights with reduced or filtered blue, violet, and ultra-violet wavelengths.

6.4.4. Integration of lighting standards into the planning scheme

Council may also consider adopting lighting standards. These could be:

1. Adopted by the council for their own works – where, for example, the council is installing new, or upgrading existing, light systems.
2. Integrated into the planning scheme – undertaking an amendment to the planning scheme to integrate these standards for new developments.
    - ADSA Approved Luminaries conform with AS/NZS 4282:2019 Control of the obtrusive effects of outdoor lighting and the National Pollution Guidelines for Wildlife (DAWE 2020), which are accepted standards.
    - Existing provisions of the scheme that already regulate lighting, could be amended to ensure that best practice standards for minimising light pollution are required for development.

Council may also consider other alternatives to promote these standards, including:

- Develop and promote guidelines and/or fact sheets identifying these principles;
- Ensuring council standards meet the criteria of these standards; or
- Ensure planning scheme policies are consistent with the guidelines.

6.5. QUEENSLAND ASTROFEST

The Queensland Astrofest, a convention for amateur astronomers, has been run since 1993. It is organised by a number of local astronomical groups, including the South East Queensland Astronomical Society, the Brisbane Astronomical Society, the Astronomical Association of Queensland, and the Southern Astronomical Society (Qld Astrofest 2020). Queensland Astrofest hosts numerous guest speakers, talks, workshops, discussions, and social activities. Held in Linville, Qld (166 kms north-west of Brisbane and in a dark sky environment), it is an opportunity for those passionate about astronomy to convene and celebrate the night sky with like-minded individuals.

Opportunities may exist for council to either promote and/or sponsor existing festivals that celebrate the night sky (which has reduced resource implications, as per Criteria 5), or to initiate its own festival or conference (which allows council to implement it as desired).

6.6. COMMUNITY ENGAGEMENT OPPORTUNITIES

Further options offer opportunities to recognise and celebrate the night sky by promoting community engagement and raising awareness of dark sky environments. These may include:

- Establishing astrotourism town(s), such as Carnama or Wongan Ballidu shire in WA (Astrotourism WA 2020). This could involve community cooperation and engagement with local astronomical organisations. As part of this, or as a separate measure, fact sheets could be developed about special dark sky locations in the region.
- Running a dark sky competition in schools. In 2018, the NSW government organised a competition where students competed to develop the best ideas to protect the night sky. This would require promotion, resources to promote, manage and judge the competition, and a prize for the winning idea (DPE 2020).
- Organisation of talks and/or seminars at the local observatories in Mapleton and Wappa Falls.
- Organisation of and/or participation in festivals that recognise and celebrate the night sky, such as Queensland Astrofest.
- Promotion and involvement in organised international events designed to promote and celebrate the night sky, such as International Dark Sky Week. Organised by IDA, it includes presentations, question and answer sessions, and opportunities for community participation, such as counting visible stars to assist in measuring light pollution around the globe (Weule 2020).

7. RECOMMENDATION

The designation of an International Dark Sky Place through the International Dark-Sky Association or certification by the Starlight Foundation rated highly through the application of the assessment criteria. IDA designation rated slightly higher than certification by the Starlight Foundation: while there are three existing IDSP in Australia, there are currently no Starlight Foundation certified places in Australia. This may limit opportunities to build partnerships and share knowledge.

Both options bring strong recognition to a dark sky area through a credible international, independent organisation, provide international support for the protection of the place, and can increase eco-tourism opportunities whilst ensuring the ongoing recognition, celebration, and protection of the place.

The application process for either program is lengthy, rigorous, and would require additional council resources. An ability to demonstrate strong community support and critical partnerships with the State Government and professional organisations is also crucial. Maintenance of IDSP and/or Starlight Foundation Certified status would require additional planning controls and/or the implementation of other complimentary mechanisms, as identified in this report.

Should council resolve to explore these options, council may wish to engage in early discussions with both organisations to identify the strengths and challenges for each certification program, depending on the type of site council wishes to certify.

There are also a number of other approaches that may be investigated further for their potential application to recognise, protect, and celebrate the night sky (Refer Section 6).

8. REFERENCES

Astrotoursim Western Australia (2020)
https://astrotourismwa.com.au/, accessed April 2020

Australasian Dark Sky Alliance (2020)
https://www.australasiandarkskyalliance.org/adsa-approved, accessed April 2020

Australian Department of Agriculture, Water and the Environment (2020), *National Light Pollution Guidelines for Wildlife Including Marine Turtles, Seabirds and Migratory Shorebirds*
https://www.environment.gov.au/biodiversity/publications/national-light-pollution-guidelines-wildlife

Australian Standard AS1158: Lighting for Roads and Public Spaces (2007)

Australian/New Zealand Standard AS/NZS 4282:2019: Control of the Obtrusive Effects of Outdoor Lighting (2019)

BiosphereSmart (2020), Map of Dark Sky Protected Locations
http://www.biospheresmart.org/?showMap=Starlight

International Dark-Sky Association (2016), *Warrumbungle National Park (Australia)*
https://www.darksky.org/our-work/conservation/idsp/parks/warrumbungle/, accessed June 2020

International Dark-Sky Association (2019a), *River Murray (Australia)*
https://www.darksky.org/our-work/conservation/idsp/reserves/river-murray/, accessed June 2020

International Dark-Sky Association (2019b), *The Jump-Up (Australia)*
https://www.darksky.org/our-work/conservation/idsp/sanctuaries/the-jump-up-australia/https://www.darksky.org/, accessed June 2020

International Dark-Sky Association (2020)
https://www.darksky.org/, accessed April 2020

Mid Murray Council SA (2018), *Dark Sky Policy,*
https://www.mid-murray.sa.gov.au/__data/assets/pdf_file/0031/169564/Dark-Sky-Policy-V1.pdf, accessed April 2020

NSW Department of Planning and Environment (2016), *Dark Sky Planning Guideline*
https://www.planning.nsw.gov.au/-/media/Files/DPE/Guidelines/dark-sky-planning-guideline-2016-06.pdf

NSW Department of Planning, Industry and Environment (2020), *Dark Sky education*
https://www.planning.nsw.gov.au/darkskyeducation, accessed April 2020

NSW Department of Panning, Industry and Environment (2019), *Dark Sky*
https://www.planning.nsw.gov.au/Policy-and-Legislation/Environment-and-Heritage/Dark-Sky, accessed April 2020

Queensland Astrofest (2020)
https://www.qldastrofest.org.au/, accessed April 2020

StarLight (2020), accessed May 2020. https://starlight2007.net/index.html

Starlight Foundation (Fundación Starlight) (2020)
https://fundacionstarlight.org/en/index.php, accessed April 2020

Sunshine Coast Council (2014), *Sunshine Coast Planning Scheme 2014*
https://www.sunshinecoast.qld.gov.au/Development/Planning-Documents/Sunshine-Coast-Planning-Scheme-2014/View-the-Sunshine-Coast-Planning-Scheme-2014-Text, accessed April 2020

Sunshine Coast Council (2016), *Urban Public Lighting Master Plan*
https://www.sunshinecoast.qld.gov.au/Council/Planning-and-Projects/Council-Plans/Urban-Public-Lighting-Master-Plan, accessed April 2020

Sunshine Coast Council (2017), *Environment and Liveability Strategy*
https://els.sunshinecoast.qld.gov.au/About-the-strategy, accessed June 2020

Sunshine Coast Council (2020), *Sunshine Coast Counci Corporate Plan 2020-2024*
file:///C:/Users/hannah.w/Downloads/CorporatePlan20200221.pdf, accessed June 2020

UNESCO (2020a), *Portal to the Heritage of Astronomy*
https://www3.astronomicalheritage.net/index.php/2-public/33-dark-skies-information, accessed April 2020

UNESCO (2020b), *Man and the Biosphere Programme*
http://www.unesco.org/new/en/natural-sciences/environment/ecological-sciences/, accessed April 2020

Weule, G.; ABC News (2020), *Count stars in the Southern Cross during Dark Sky Week and help measure light pollution around the world.*
https://www.abc.net.au/news/science/2020-04-23/count-stars-in-the-southern-cross-and-measure-light-pollution/12166374, accessed April 2020