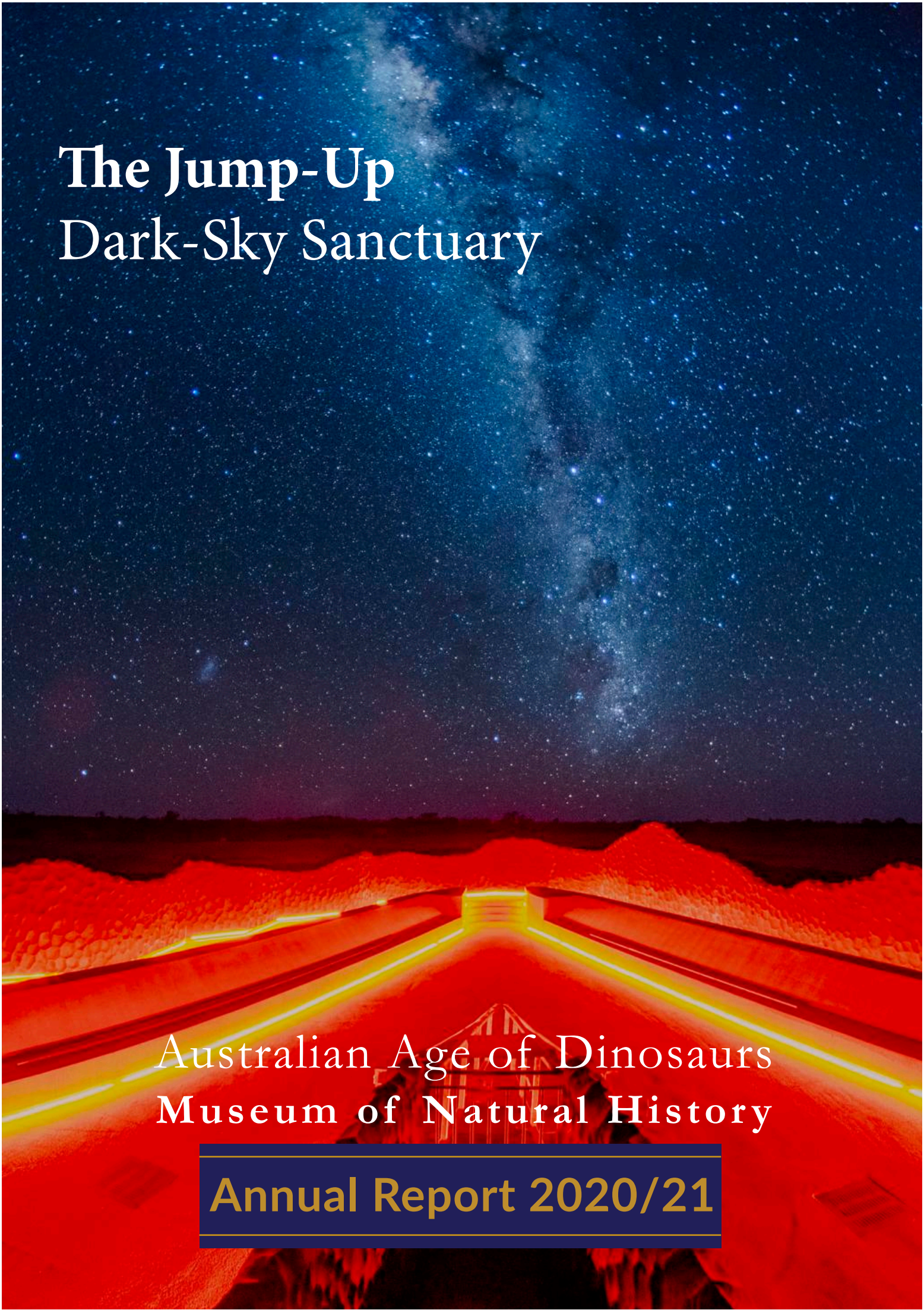

The Jump-Up
Dark-Sky Sanctuary
Australian Age of Dinosaurs
Museum of Natural History
Annual Report 2020/21

Sauropods and the Gondwana Stars Observatory
Photo Steve Lippis

Site information

Designation type	International Dark-Sky Sanctuary
Designation date	27 April 2019
Site name	The Jump-Up Dark-Sky Sanctuary
Site contact (primary)	Naomi Miles business@aaod.com.au +61 447 010 969
Site contact (secondary)	Trish Sloan collection@aaod.com.au +61 447 016 410

The Jump-Up visitor statistics (1 July to 30 June)

	2018/2019	2019/2020	2020/2021
Permanent Jump-Up population	1	1	1
Visitors to The Jump-Up	36,029	25,458	60,713

	2018/2019	2019/2020	2020/2021
Online visitors to the Museum's Dark-Sky page	329	1,755	3,546
Average time on the Dark-Sky page (minutes)	2:06	2:20	2:18

Measurements
Comparative sky-quality distribution across The Jump-Up using averaged data.

Table 1 Dinosaur Canyon (SQM 1.0)

	Period	20 to 22.5 MPSAS monthly average	20 to 22.5 MPSAS standard deviation	Average temp (°C)
2020	Jul	21.63	0.56	11.15
	Aug	21.62	0.61	11.88
	Sep	21.59	0.67	18.64
	Oct	21.68	0.65	20.89
	Nov	21.60	0.63	24.05
	Dec	21.71	0.67	25.29
2021	Jan	21.81	0.64	23.92
	Feb	21.84	0.70	23.50
	Mar	21.79	0.76	23.43
	Apr	21.54	0.51	19.65
	May	21.54	0.48	15.39
	June	21.63	0.54	12.12

Table 2 The Jump-Up base (SQM 2.0)

	Period	20 to 22.5 MPSAS monthly average	20 to 22.5 MPSAS standard deviation	Average temp (°C)
2020	Jul	21.49	0.52	11.54
	Aug	21.51	0.55	12.41
	Sep	21.00	0.51	18.63
	Oct	21.94	0.59	21.69
	Nov	21.58	0.61	25.14
	Dec	21.68	0.66	26.70
2021	Jan	21.84	0.61	25.10
	Feb	21.76	0.60	24.38
	Mar	21.67	0.62	24.74
	Apr	21.54	0.47	20.43
	May	21.57	0.49	16.39
	June	21.66	0.53	13.23

Table 3 The Jump-Up western side SQM 3.0

	Period	20 to 22.5 MPSAS monthly average	20 to 22.5 MPSAS standard deviation	Average temp (°C)
2020	Jul	21.50	0.50	14.63
	Aug	21.51	0.56	16.22
	Sep	21.53	0.58	21.97
	Oct	21.58	0.54	22.91
	Nov	21.50	0.56	26.17
	Dec	21.63	0.63	27.10
2021	Jan	21.63	0.53	25.59
	Feb	21.62	0.56	25.11
	Mar	21.53	0.59	25.09
	Apr	21.36	0.43	21.49
	May	21.37	0.43	17.33
	June	21.47	0.48	14.02

Introduction

Since The Jump-Up was designated an International Dark-Sky Sanctuary on 27 April 2019 the Australian Age of Dinosaurs Museum (the Museum) has continued its enthusiastic commitment to the long-term conservation of the night sky. The promotion of dark-sky conservation and education is gradually becoming embedded in the Museum's existing programs and future plans. This is evidenced in the Museum's adherence to the Lighting Management Plan for all existing and future buildings, funding and construction of the Gondwana Stars Observatory and promotions via signage, social media and advertising.

As a result of government-imposed COVID-19-related closures and restrictions the Museum's planned programs and activities, including the commencement of tours through the Gondwana Stars Observatory, were put on hold. Despite this set back, the Museum has continued to collect night-sky data, affirming the sky above The Jump-Up remains pristine and free from light pollution.

This report briefly summaries the activities undertaken by the Museum over the last 12 months (2020/2021) under the following sections: measuring the night sky; conserving the night sky; outreach, promotions and media relations; commercial endeavours; and discussion.

Measuring the night sky

Was sky-quality data taken in the past year?

Yes. Six permanent sky-quality meters are situated at three sites on The Jump-Up. SQM 1.0 and its back-up 1.1 are located at Dinosaur Canyon, SQM 2.0 and its back-up 2.1 are located at the base of The Jump-Up at the Star Gallery and SQM 3.0 and its back-up 3.1 are located in the western corner of The Jump-Up.

In *Tables 1* to *3* the monthly data from July 2020 to June 2021 was filtered to include only measurements from 20 MPSAS to 22.5 magnitudes per square arcsecond (MPSAS). Despite the two furtherest sky-quality meters being 5km apart, all three SQMs presented similar data as summarised in *Table 4*. This sky-quality distribution shows an average reading of 21.52 to 21.67 MPSAS, a standard deviation of 0.53 to 0.62 and a temperature of 19.16 to 21.47°C. The Jump-Up Night-Sky Brightness of 21.67 MPSAS at the zenith is stable and consistent and routinely satisfies the 21.5 MPSAS in the visual band threshold for International Dark-Sky Sanctuaries.

Did sky brightness increase over the previous year?

No. The recorded sky brightness is on par with previously recorded and reported data outlined in the Museum's International Dark-Sky Sanctuary application and the Museum's previously submitted annual report. The exceptional sky quality on The Jump-Up is best demonstrated in the data available in *Tables 5* to *7*. Over a year the dark-sky meters at Dinosaur Canyon recorded the darkest night skies (21.67 MPSAS) and recorded colder overall temperatures (19.16°C). This is also the location of the Museum's Gondwana Stars Observatory.

Table 4 Summary of sky-quality distribution across The Jump-Up (based on Tables 1, 2 and 3)

	Dinosaur Canyon (SQM 1.0)			The Jump-Up base (SQM 2.0)			The Jump-Up western side (SQM 3.0)		
Period	**20 to 22.5 MPSAS monthly average**	**20 to 22.5 MPSAS standard deviation**	**Average temp (°C)**	**20 to 22.5 MPSAS monthly average**	**20 to 22.5 MPSAS standard deviation**	**Average temp (°C)**	**20 to 22.5 MPSAS monthly average**	**20 to 22.5 MPSAS standard deviation**	**Average temp (°C)**
July 2020 to June 2021	21.67	0.62	19.16	21.60	0.56	20.02	21.52	0.53	21.47

Is a permanently mounted sky monitor installed, or are there plans to install one?

The Museum has installed four permanent sky-quality meters at two sites across The Jump-Up. From 2020/2021 an additional two permanent sky-quality meters were set up on the far side of The Jump-Up to ensure the entire site (1,800 hectares) is monitored. Each location has a battery-powered and solar-powered SQM meter set up side by side to ensure the integrity of the information collected (refer to *Map 1*).

Map 1 SQM locations across The Jump-Up.

Tables 5 to 7 demonstrate the monthly average MPSAS, standard deviation, monthly number of readings greater than 21.5 MPSAS from 9pm to 4am and the total number of records over the entire month exceeding 21.5 and 21.75 MPSAS.

Table 5 Dinosaur Canyon SQM 1.0 (-22.481956, 143.171739)

	Period	MPSAS 9pm to 4am monthly average	9pm to 4am standard deviation monthly average	Monthly no. readings 21.5 to 21.74 MPSAS	Monthly no. readings ≥21.75 MPSAS	% monthly readings 21.5 to 21.74 MPSAS	% monthly readings ≥21.75 MPSAS
2020	Jul	19.83	1.08	483	306	36	23
	Aug	19.81	1.05	472	407	35	31
	Sep	19.37	1.28	612	553	47	43
	Oct	20.32	0.94	650	624	49	47
	Nov	20.49	1.18	632	490	49	38
	Dec	20.59	0.79	673	595	50	45
2021	Jan	20.70	0.76	707	622	53	47
	Feb	20.36	1.59	679	638	56	53
	Mar	20.41	1.31	704	632	53	47
	Apr	20.22	0.85	621	461	48	36
	May	20.11	0.96	569	302	43	23
	Jun	20.16	1.02	594	396	46	31

Table 6 The Jump-Up base SQM 2.0 (-22.463273, 143.193474)

	Period	MPSAS 9pm to 4am monthly average	9pm to 4am standard deviation monthly average	Monthly no. readings 21.5 to 21.74 MPSAS	Monthly no. readings ≥21.75 MPSAS	% monthly readings 21.5 to 21.74 MPSAS	% monthly readings ≥21.75 MPSAS
2020	Jul	19.84	1.08	445	306	33	23
	Aug	19.86	1.03	526	449	39	34
	Sep	19.32	1.22	629	571	49	44
	Oct	20.26	0.91	647	615	49	46
	Nov	20.40	1.26	624	475	48	37
	Dec	20.53	0.78	673	581	50	44
2021	Jan	20.60	0.87	707	650	53	49
	Feb	20.28	1.52	682	648	57	54
	Mar	20.10	1.81	701	652	53	49
	Apr	20.22	0.85	668	505	52	39
	May	20.15	0.95	661	380	50	28
	Jun	20.15	1.15	696	449	54	35

Table 7 The Jump-Up western side SQM 3.0 (-22.483736, 143.148186)

	Period	MPSAS 9pm to 4am monthly average	9pm to 4am standard deviation monthly average	Monthly no. readings 21.5 to 21.74 MPSAS	Monthly no. readings ≥21.75 MPSAS	% monthly readings 21.5 to 21.74 MPSAS	% monthly readings ≥21.75 MPSAS
2020	Jul	19.64	1.06	317	225	24	17
	Aug	19.55	1.07	417	338	31	25
	Sep	19.99	1.08	559	448	43	35
	Oct	20.17	0.89	630	543	47	41
	Nov	20.38	1.09	554	433	43	34
	Dec	20.40	0.86	639	487	48	37
2021	Jan	20.50	0.77	678	485	51	36
	Feb	20.21	1.55	657	506	55	42
	Mar	20.23	1.27	628	467	49	36
	Apr	20.18	0.75	532	131	41	10
	May	20.07	0.85	439	128	33	10
	Jun	19.98	1.04	481	199	37	15

Conserving the night sky

What percentage of your site's lighting is in compliance with its Lighting Management Plan?

All lighting on The Jump-Up is now 100% compliant with the Museum's Lighting Management Plan (LMP) and the IDA regulations. This compliance includes the Museum's latest infrastructure, the Gondwana Stars Observatory and the *March of the Titanosaurs* exhibition building. To further ensure compliance is met, all rooms at Maloney Lodge include a guest compendium that includes the Museum's LMP and lighting curfew (refer to *Appendix* for updated Lighting Management Plan).

Were any new lighting projects completed this year? If so, please describe.

On 8 May 2021 the Museum completed the Dynamic Destination project. The project, located largely at Dinosaur Canyon, includes the following: the *March of the Titanosaurs* exhibition (a building over the Snake Creek tracksite); two life-sized bronze sauropods depicting the trackmakers; a shuttle-bus station at the Reception Centre; a bitumen road between the Reception Centre and Dinosaur Canyon; and the Gondwana Stars Observatory. The completion of the project was delayed as a result of the COVID-19 pandemic and associated restrictions.

The Gondwana Stars Observatory is a meteorite-textured observatory that will allow the general public to experience dark-sky tours of The Jump-Up. Outdoor lighting includes 191m of red-strip lighting at 5W, 70 lumens and 3,000 kelvins. All new lighting has been included in the lighting inventory in the Lighting Management Plan.

The red-strip lighting at the Gondwana Stars Observatory creates an other-worldly atmosphere,without affecting the brightness of the night sky.

Outreach

The completed Gondwana Stars Observatory.

Do you have any data on the economic benefits of the International Dark-Sky Place designation?

Due to COVID-19-related closures and the subsequent delay in capital construction to facilitate the viewing of the night sky for the public, the economic benefit of The Jump-Up's designation as an International Dark-Sky Sanctuary has not been fully realised yet. However, once the Gondwana Stars Observatory is operational the economic benefits will be easier to quantify. These benefits include:

- creation of an additional six FTE employees to operate the latest capital projects including the Gondwana Stars Observatory
- increased overnight visitation and expenditure through destination packaging with other regional attractions to better appeal to the burgeoning international tourism market and
- expansion of the Museum's tourism offering and natural-history exhibitions to create a more comprehensive visitor experience.

Promotions and media relations

Any new media coverage you would like us to know about?

The Jump-Up continues to receive excellent regional and national coverage following the announcement of its International Dark-Sky Sanctuary designation. This coverage has ranged from radio, TV, internet outlets and print media. The Museum has maintained a consistent social media presence highlighting the positive effects of dark skies and the ways to prevent light pollution.

Media

9 March 2021 - 5 Aussie Adventures That Will Trick Your Brain Into Thinking You're Overseas, Pedestrian
18 March 2021 - The best places for stargazing around Australia, Concrete Playground
8 May 2021 - Dinosaurs create Winton visitor stampede, Queensland Government
10 May 2021 - Winton's Australian Age of Dinosaurs Museum receives $4.9 million in new additions, Australasian Leisure Management
14 May 2021 - Tourists flock to paleo attractions in outback Queensland, with new discoveries added to dinosaur trail, ABC Western Queensland

Facebook

Date	Topic	People reached
20 October 2020	The Jump-Up Dark-Sky Annual Report	3,360
12 November 2020	Award-winning photographer Steve Lippis night-sky photo	3,081
10 January 2021	Setting up telescopes at the Gondwana Stars Observatory	5,451
26 March 2021	Celebrating Earth Hour	2,167
5 April 2021	Celebrating International Dark-Sky week	5,990
6 April 2021	Making your home dark-sky friendly	2,408
8 April 2021	Light pollution information	1,930
8 May 2021	Lighting at the Gondwana Stars Observatory	11,818
9 May 2021	Lighting at the Gondwana Stars Observatory	7,056
11 May 2021	The Gondwana Stars Observatory at night	14,466
15 May 2021	Dark-Sky Serenade promotion	1,905
19 May 2021	Dark-Sky Serenade promotion	1,796

Commercial endeavours

Dark-Sky retail products

Over the last 12 months the Museum has invested in the promotion of the dark sky by developing the following products (available online and in store):

- *Gordo the Guardian, a night-time adventure* by Inge Daniels
- Southern Hemisphere night-sky planispheres
- The Jump-Up dark-sky pin
- Handheld sky-quality meters

Events

On 21 May the Museum hosted a Dark-Sky Serenade under the stars. The inaugural Festival of Outback Opera was presented by Opera Queensland, in association with Camerata Queensland's Chamber Orchestra. Around 160 guests enjoyed the bass baritone voice of internationally acclaimed singer Teddy Tahu Rhodes along with Eva Kong, Xenia Puskarz Thomas, Kang Wang and Jason Barry-Smith. The performances were led by renowned Australian conductor Vanessa Scammell who curated the program with Camerata's Artistic Director Brendan Joyce.

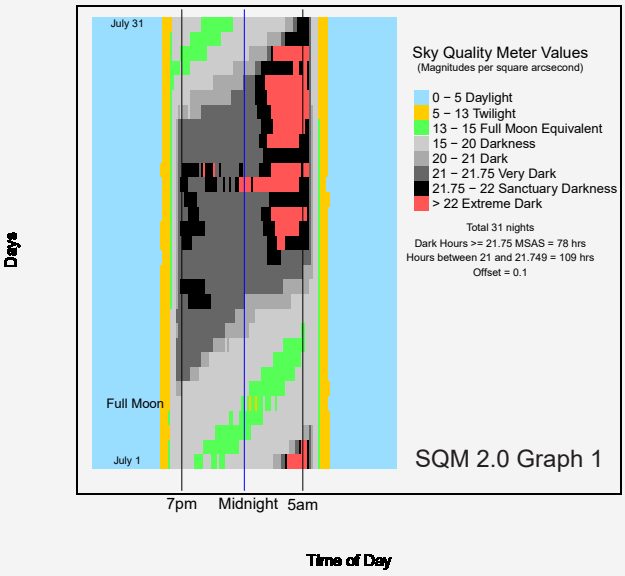
Discussion

While COVID-19-related closures and restrictions have not directly affected the Museum's visitation, the completion of the construction of the Gondwana Stars Observatory was delayed until 8 May 2021. The Museum continues to receive significant local and national support, as well as public interest in the observatory, which will be opened over the 2021/2022 summer season.

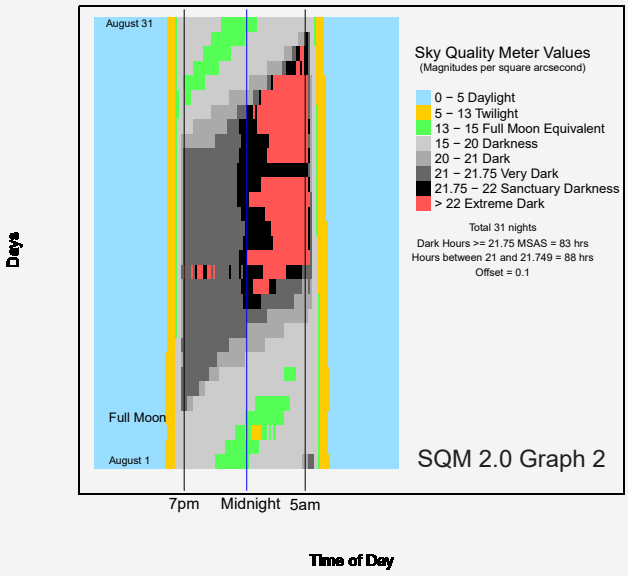
While the delay in the construction of the Observatory has not stopped the Museum from hosting night-sky talks during its wholesale three-course dinner events on The Jump-Up, interpretative tours of The Jump-Up night sky won't be regularly available to the public from 2022. The exceptional sky quality on The Jump-Up remains consistent as evidenced in the data displayed in *Tables 1* to *7*. Further SQM reporting on the far side of The Jump-Up has also commenced to ensure the data remains consistent across the entire 1,800-hectare site.

Comparative monthly sky-darkness graphs based on a full day/night cycle from 2.0 The Jump-Up base and SQM 1.0 Dinosaur Canyon.

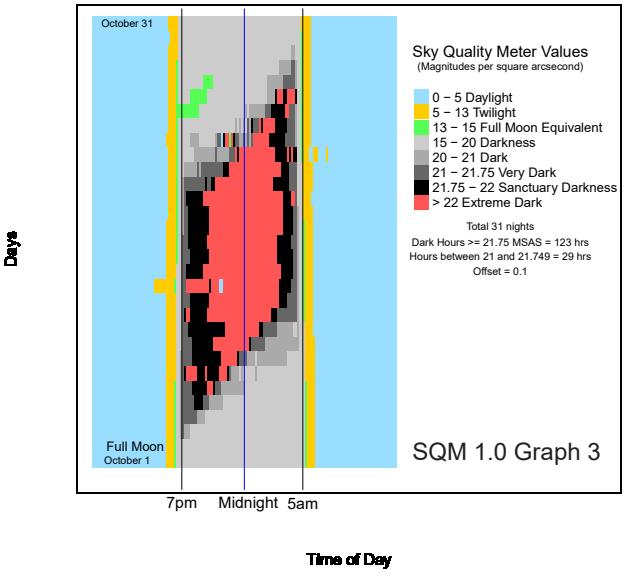
Sky Darkness Plot July 1 to July 31, 2020
Base 1



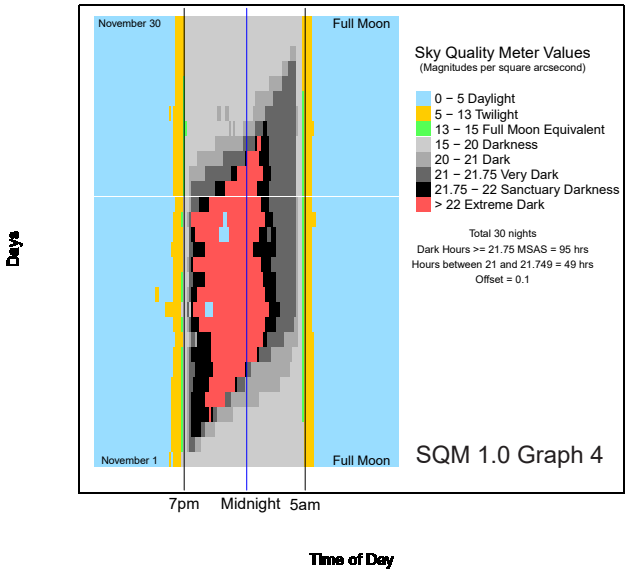
Sky Darkness Plot August 1 to August 31, 2020
Base 1



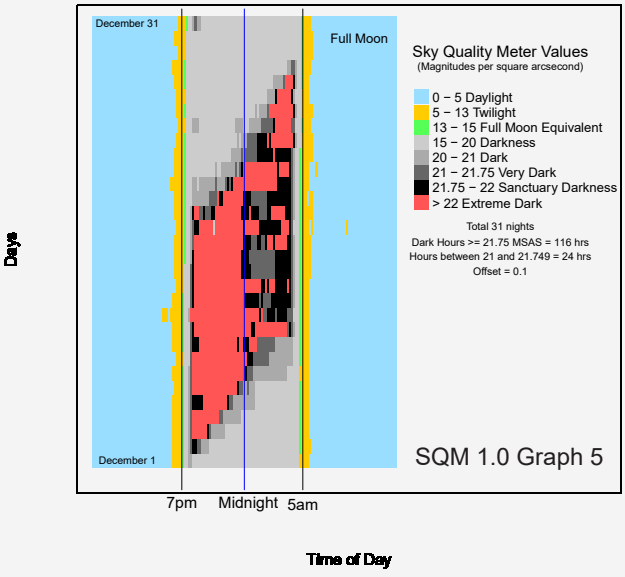
Sky Darkness Plot October 1 to October 31, 2020
Dinosaur Canyon SQM1



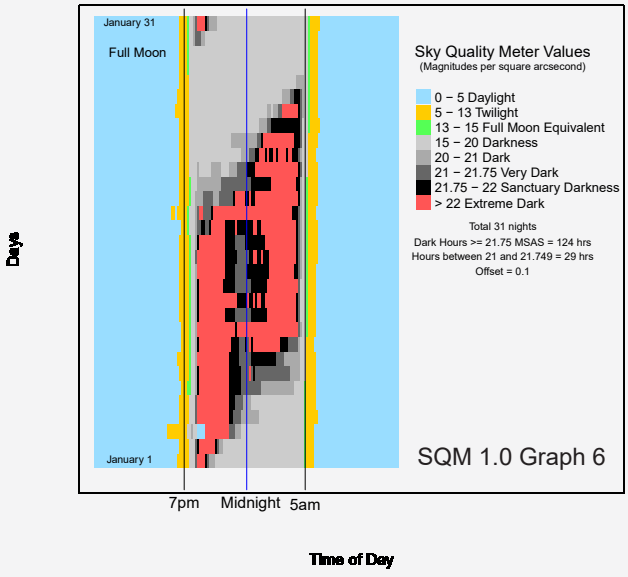
Sky Darkness Plot November 1 to November 30, 2020
Dinosaur Canyon SQM1



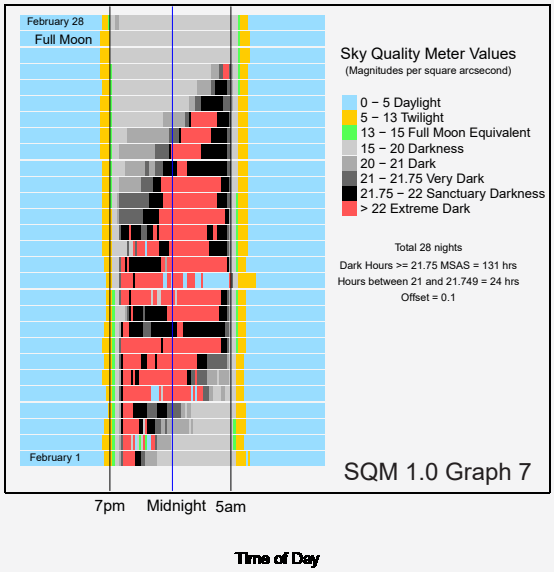
Sky Darkness Plot December 1 to December 31, 2020
Dinosaur Canyon SQM1



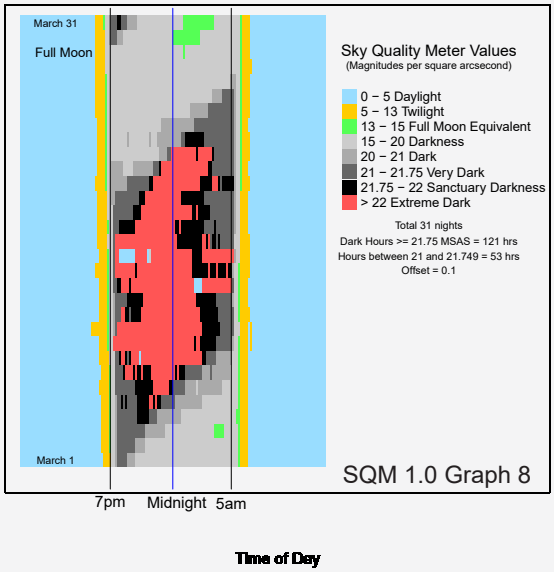
Sky Darkness Plot January 1 to January 31, 2021
Dinosaur Canyon SQM1



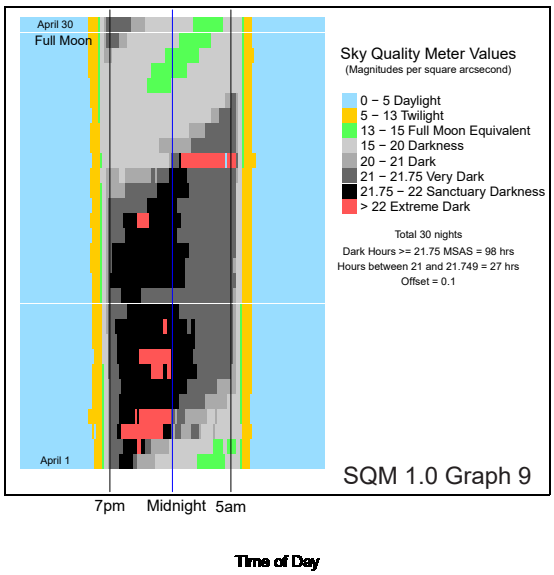
Sky Darkness Plot February 1 to February 28, 2021
Dinosaur Canyon SQM1



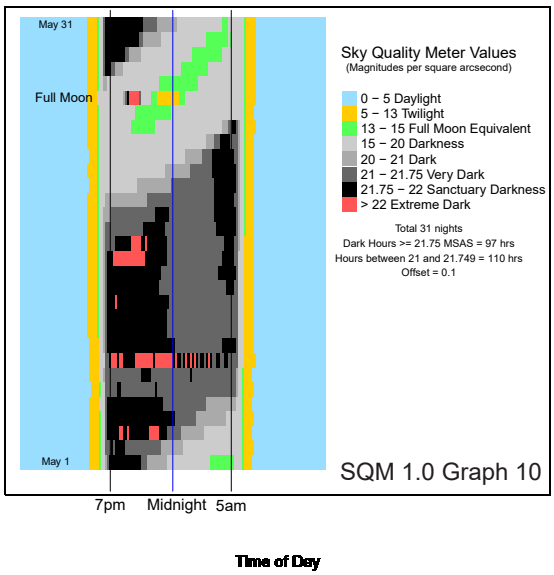
Sky Darkness Plot March 1 to March 31, 2021
Dinosaur Canyon SQM1



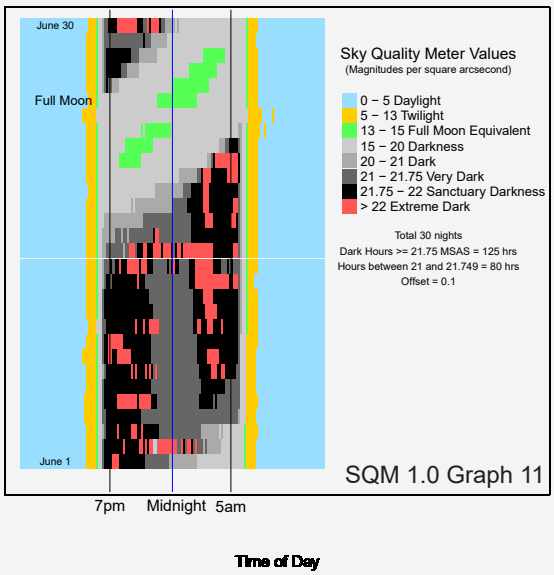
Sky Darkness Plot April 1 to April 30, 2021
Dinosaur Canyon SQM1



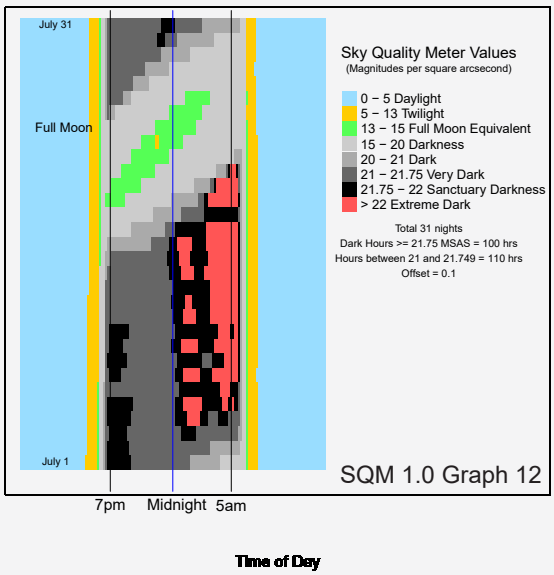
Sky Darkness Plot May 1 to May 31, 2021
Dinosaur Canyon SQM1



Sky Darkness Plot June 1 to June 30, 2021
Dinosaur Canyon SQM1



Sky Darkness Plot July 1 to July 31, 2021
Dinosaur Canyon SQM1



APPENDIX: LIGHTING MANAGEMENT PLAN AND LIGHTING INVENTORY

Reviewed **1 June 2021**

LIGHTING MANAGEMENT PLAN

Document name	The Jump-Up Lighting Management Plan
Document purpose	To provide regulations for the management of all outdoor lighting on The Jump-Up
Adopted by the AAODL Board	 David Elliott, Executive Chairman 14 January 2019
Distribution list	Executive Chairman Business Development Manager Operations Manager Laboratory Supervisor
Review frequency	Annually
Reviewed	21 April 2020 1 June 2021

INTRODUCTION

The Jump-Up is the location of the Australian Age of Dinosaurs Museum of Natural History (the Museum), the current site of The Star Gallery and future Gondwana Stars Observatory. The following Lighting Management Plan exceeds the necessary outdoor lighting requirements stipulated in Australian state and national regulations: Queensland Planning Regulation 2017 (QPR), Queensland Environmental Protection Act 1994 (QEPA) and the Australian Standard: *Control of the obtrusive effects of outdoor lighting* (AS 4282). The Museum has adopted established IDA previsions on The Jump-Up to reduce light emissions and ensure new lighting is good lighting and all existing lighting conforms to International Dark Sky standards. Note: The most stringent restrictions apply within a 10km radius of the Museum site.

LOCATION

This Lighting Management Plan (LMP) covers the entire Jump-Up area of 1,400 ha, though a 10km radius from the north-west corner of The Jump-Up (using the Reception Centre as the epicentre) is the focus of the most stringent restrictions.

STATE AND NATIONAL REGULATIONS

The following list summaries the lighting requirements outlined by the QPR, QEPA and AS 4282.

- Queensland Planning Regulation 2017 (QPR): outdoor lighting on the premises does not adversely impact on the amenity of relevant neighbouring premises.

- Queensland Environmental Protection Act 1994 (QEPA): environmental nuisance is unreasonable interference or likely interference with an environmental value caused by aerosols, fumes, light, noise, odour, particles or smoke or an unhealthy, offensive or unsightly condition because of contamination; or another way prescribed by regulation.

- The Australian Standard: *Control of the obtrusive effects of outdoor lighting* (AS 4282): specifically refers to the potential adverse effects of outdoor lighting on nearby residents, users of adjacent roads, transport systems and astronomical observations. However it does not apply to:

- some parts of public lighting
- internally illuminated advertising signs
- the obtrusive effects of brightly lit surfaces eg floodlit buildings and externally lit advertising signs
- lighting systems which are of a cyclic or flashing nature and
- environmental impacts associated with the daytime appearance of outdoor lighting systems, including their support structures.

Further the objective of the AS 4282 does not:
- address the requirements that may be necessary for lighting systems to facilitate the activities for which they are designed and
- stipulate compliance when relating to light spillage (although information and guidance is provided).

While the Museum conforms to all state and national regulations relating to outdoor lighting, in the absence of detailed and stringent guidelines to protect the pristine dark-skys above The Jump-Up the following IDA supported Lighting Management Plan will be adhered to.

CERTIFICATION AS AN INTERNATIONAL DARK-SKY SANCTUARY

With increasing skyglow from uncontrolled urban uplight, stars are quickly disappearing in the night sky around the world. However, The Jump-Up's very remote location in Central West Queensland puts it in a unique position to actively preserve some of the darkest sky in the world. The Jump-Up continues to meet the criteria of an IDA International Dark-Sky Sanctuary as it:

- is located on 1,400 ha of freehold land
- possesses an exceptionally dark night sky
- is located on a mesa that is a home to an array of unique flora and fauna reliant on a nocturnal environment
- falls in line with the Museum's objective to promote and preserve Australian natural history for future generations to learn from and
- is very remote with no nearby threats to the quality of its dark night skies.

As an International Dark-Sky Sanctuary the Museum is committed to furthering the awareness of dark skies and promote its long-term conservation in Australia.

OUR AIMS

This LMP aims to preserve the dark skies of The Jump-Up by ensuring that all new and existing lighting is compliant to the IDA and national standards. The Museum is committed to meeting "...the current and future national environmental legislative and regulatory requirements and continue to work towards attaining international environmental requirements." (AAOD Environmental Plan, 2018).

As the Museum will be taking a leading role in defining best sustainable practice to minimise light pollution within the region, all visitors to the Museum and The Jump-Up will be informed of the Museum's aims as well as how to minimise light pollution in their own lives.

GOALS OF THE LIGHTING MANAGEMENT PLAN

The overarching goal of the LMP is to ensure The Jump-Up remains compliant with its lighting. This will be achieved by maintaining the existing low-light standards across The Jump-Up and actively managing light-control measures in the future.

1. MANAGEMENT OF LIGHT SOURCES

The Museum is committed to preserving the dark skies above The Jump-Up by:

- ensuring that lighting complies with the relevant QPR, QEPA and AS 4282 regulations
- selecting fully shielded/cutoff light fixtures, regardless of their output in lumens, to prevent uplight
- ensuring that the correlated colour temperature of all lighting is 3,000 Kelvins or less

- providing outreach material to visitors to educate them on light pollution and ways to reduce their own impact
- preventing lights reflecting from white or other surfaces
- limiting light size to requirements and using the minimum number and size of lights
- switching lights off/dimming lights when not in use
- installing time switches or motion sensor switches
- ensuring down lights are deeply recessed with effective low-glare baffles
- ensuing any structural part of the luminaire or the surrounding material is securely and permanently fixed: where the luminaire is bracket mounted from a white or similar highly reflective surface, the light-emitting surface of the light fixture facing the wall must be rendered opaque
- ensuring all future security lights are fitted with a motion-sensor switch to prevent continuous use
- reducing light intensity and using lights with blue-light blocking coating on the inside, LED and compact fluorescent bulbs
- taking measures to ensure lights are switched off no more than five minutes after activation and
- installing blinds, curtains, roller doors or shutters to prevent light escape, particularly if operational requirements demand strong interior lighting (eg the Industrial Laboratory).

2. PROHIBITED LIGHT SOURCES AND ACTIVITIES

The Museum has banned the use of the following light sources on The Jump-Up:

- searchlights and similar high-intensity lights except when needed for operational activities such as spotlighting for pest control and survey or in emergencies by police or fire personnel
- handheld battery-operated laser pointers with a power greater than one milliwatts. (These are considered prohibitive weapons that require reasonable excuse for lawful possession. A person in possession of a laser pointer must be able to provide details of a membership to a recognised astronomical organisation or be personally supervised by a member of a recognsed astronomical organisation, and the person's reason for possession or acquisition of the laser pointer is to take part in activities associated with astronomy; and for astronomical related activity, the power output of the laser pointer must be less than 20 mW)
- floodlights as used for sports lighting and showground activities
- light art performance photography or light painting and
- all illuminated outdoor signage (reflective lighting for wayfinding or information signage is permitted).

3. EXCEPTIONS AND OTHER LIGHT SOURCES

The following types of outdoor lighting installations are permitted on The Jump-Up and are not subject to the other regulations of this LMP:

1. lighting installations required by the relevant local, regional or national legal jurisdiction and
2. lighting installations required temporarily for the safe performance of night-time tasks, such as construction, at the discretion of the Museum Management Team (MMT).

Other light sources with restrictions are set out below.

PRIVATE LIGHTING

- When guests stay on The Jump-Up in their own caravans they must comply with the Museum's lighting regulations and lighting curfew. All guests will receive a copy of the Museum's on-site compendium on arrival, containing this LMP, and asked to comply with the document. A temporary lighting exclusion for the use of spotlighting equipment is in place for flora or fauna surveys carried out by Museum staff or contractors.

EVENT LIGHTING

- Occasionally the Museum will host small events or concerts on The Jump-Up. In this scenario, a written request to the MMT for a short-term exemption from the requirements of the LMP for temporary outdoor lighting may be submitted.
  The request for the exemption must contain, at a minimum, the following information:
  – date, time and length of event (including period of use of proposed event lighting)
  – reason for the requested exemption and what kind of exemption is requested

– proposed location of all outdoor lighting (including a map to demonstrate each lighting location)
– details of lights being used, screening and positioning of the lights and
– total wattage and light output.

The MMT may ask for additional information or that event organises use unshielded low-intensity event (one-off) lighting. Notification of the MMT decision will be issued in writing within ten working days.

TEMPORARY LIGHTING

- Allowable installations of outdoor lighting on The Jump-Up for temporary purposes, as exempted above, shall be limited to the minimum number of nights required to complete the task that the lighting illuminates. Museum staff responsible for such installations will follow these guidelines to the greatest practical extent, and will endeavor to limit as much as possible the on-site impacts of such lighting.

VISITOR AND TENANT LIGHTING

- Lighting of vehicle exteriors, caravans and other personal property belonging to Museum visitors shall be limited to ensure the natural integrity of The Jump-Up is maintained and that other visitors and tenants are not disturbed. All lighting shall be restricted in intensity and extent to provide for the legitimate needs of visitors and be extinguished no later than The Jump-Up curfew (10pm). Inappropriate high-intensity light painting, the use of searchlights, and similar uses of outdoor lighting by visitors, is prohibited.

4. COMPLIANCE REQUIREMENTS

The guiding principle of lighting on The Jump-Up is that light is used only when and where it is needed, and is appropriate for the specific task for which it is intended. In addition, lighting fixtures are required to be fully shielded, with either control timers or motion sensors wherever possible.

The installation of new outdoor lighting on The Jump-Up is permitted only in instances where the MMT has determined that a public safety hazard exists that can only be mitigated through the use of outdoor lighting at night. Where light at night is required for the safe performance of tasks or safe transit between locations, it will be used; otherwise, the default policy on The Jump-Up is not to install additional lighting.

5. SHIELDING

All outdoor lighting fixtures with lamps that have an intensity of equal to or greater than 500 lumens shall be fully shielded. Lighting with lamps that have an intensity of less than 500 lumens may be left unshielded as decided by the MMT. These lights shall not be exempt from the other requirements of the LMP, and must be designed in such a way as to minimise impact to the night-time environment. Further, to the greatest possible extent, the MMT will endeavor to limit the inadvertent or incidental emission of light from indoor spaces to outdoor areas through the use of window coverings, indoor lighting timers/switches and other appropriate measures.

6. SELECTING OUTDOOR LIGHTING FIXTURES

Outdoor lighting used on The Jump-Up must be energy efficient and minimise the emissions of short-wavelength light into the night-time environment. Lighting on The Jump-Up will avoid white light wherever practicable and not exceed 3,000 Kelvins. The following table gives the maximum outdoor luminance (the amount of luminous flux per unit area) that is allowed on The Jump-Up unless a demonstrated need for larger values exists (refer to 3. Exceptions and other light sources).

Application	Lumens	Lux / m^2	Notes
Recessed path lighting	80	8lx / 10m^2	1
Motion-sensor lighting	700	28lx / 25m^2	2
Outdoor path lighting	700	46lx / 15m^2	3
Fluorescent lighting	1,350	67lx / 20m^2	4

Table notes

1. *Night-time lighting at Dinosaur Canyon is via a pathway with recessed 2-watt LED lighting powered by solar energy. This light source is only turned on for short periods of time as a safety precaution during evening tours.*
2. *Night-time lighting at the Gondwana Stars Observatory is via 191m red strip lighting with recessed 5-watt LED lighting powered by solar energy. This light source is only turned on for short periods of time as a safety precaution during evening tours.*
3. *Motion-sensor lighting is available at Maloney Lodge and is fully shielded. Illumination is limited to two minutes.*
4. *Night-time lighting of the pathways at the Reception Centre and Dinosaur Canyon is by fully shielded bollard lights that are only turned on for short periods during evening tours.*
5. *Fluorescent lighting is either used during the day or otherwise fully shielded at night and turned on for limited time by tenants of Maloney Lodge, Cottages 1 and 2 and subject to curfew.*

7. ILLUMINATED SIGNS

Internally illuminated signs and signs illuminated by electronic means such as LEDs and similar lighting are prohibited on The Jump-Up.

8. CURFEW

Dusk-to-dawn lighting is not generally allowed on The Jump-Up. All outdoor lighting must be extinguished from 10pm until one hour before sunrise.

9. LIGHT POLLUTION AWARENESS (EDUCATION AND INTERPRETATION)

The importance of this LMP cannot be understated. By ensuring the dark skies above The Jump-Up remain clear of light pollution through the use of quality and measured lighting sources the Museum is able to promote lighting solutions and night-sky appreciation through the Museum's growing interpretative tours. As well as adoption in the Museum's tours, the following strategies are being developed to further the Museum's education outreach:

1. information relating to Australian night skies in education and public information booklets
2. publication of a Dark-Sky book entitled *Gondwana Stars*
3. inclusion of The Jump-Ups DSS in all marketing material, media kit and information packs
4. articles in the *Winton Herald* and *Longreach Leader* and
5. inclusion of information relating to light pollution, dark-sky appreciation and resources on the Museum's website.

10. RISK IDENTIFICATION

Given The Jump-Up's remote location it faces few current risks to its dark-sky status. Isolation from the nearest urban centre means that light pollution is not noticeable. Public lighting is controlled by the Museum and adheres to the QPR, QEPA, AS 4282 and IDA regulations. The following risk is unlikely, though warrants acknowledging:

PRIVATE DEVELOPMENT

- The majority of private titles in the Winton Shire consist of large blocks of pastoral land, there are minimal development rights and subdivision is notoriously difficult. Although pastoral property homesteads are all located well away from The Jump-Up, property owners wishing to install any infrastructure that requires lighting within 10km of The Jump-Up will be encouraged to adopt IDA regulations, and a revised LMP will be submitted to the IDA.

11. LIGHTING PLAN AND SUPPORTING INFORMATION

A lighting plan must be submitted with any development application by the Museum pursuant to part 2 of the Winton Shire Planning Scheme, assessable against the Rural Zone Code.
The lighting plan should include the:

- location and mounting height of all proposed and existing luminaries
- type of light source with power (watts), light output (lumens) and colour temperature and
- details of all shielding necessary to meet the requirements of this scheme including those incorporated in the luminaire construction.

REPLACING LIGHT FITTINGS

- If any existing non-complying external light fitting is replaced, it must be replaced with a complying fitting. If an existing, non-complying external light fitting can be made to comply by replacing the lamp (light source) with a different type, then this must be done when the lamp fails. Within five years of achieving Dark-Sky Sanctuary certification, 90% of lights will comply with IDA regulations.

12. REPORTING

The Museum will submit an annual report to IDA by each year detailing activities and progress towards fulfilling IDA DSS goals during the previous year.

13. REFERENCES

REGULATIONS, STANDARDS, GUIDELINES

- Environmental Planning and Assessment Act 1979
- Standards Australia (1997) Australian Standard: *Control of the obtrusive effects of outdoor lighting* (AS 4282). Strathfield, NSW: Standards Australia International
- Queensland Planning Regulation 2017
- Queensland Environmental Protection Act 1994

MANAGEMENT DOCUMENTS

- Environmental Policy 2015
- Charter for Sustainability and Responsible Tourism 2015
- Environmental Management Plan 2018

FORMS

- Museum Lighting Plan

14. RESPONSIBILITY

The following table summaries the responsibilities as they relate to the LMP.

Title	Responsibility	Authority level
Business Development Manager	To ensure: • publication of the LMP • roles and responsibilities as they relate to the LMP are clearly communicated • where required, training in the implementation of the LMP is conducted and • the recommended controls and management safeguards are undertaken in accordance with the LMP.	Review and approval
Operations Manager	• To sign off and give authority to the LMP and to ensure its implementation and ongoing acceptance is successful • To ensure the annually review of the LMP	Approval

LIGHTING INVENTORY

Location	Fixture	Full-shielded?	Operable?	Special purpose (≤500 initial lumens) and ≤3,000k	Application	Conformity with LMP	Image
Reception Centre	8 x recessed in roof (down lights) 7W	Yes	Yes	Yes 680 lumens 3,000 kelvins	Only used during night events	Yes	
	4 x square bollards with recessed LED (down lights) 6W	Yes	Yes	Yes 374 lumens 3,000 kelvins	Only used during night events	Yes	
Laboratory	No external lighting.						
Dinosaur Canyon Outpost	7 x recessed internal roof (down lights)13W	Yes	Yes	Yes 825 lumens 3,000 kelvins	Only used during night events	Yes	
	3 x recessed in passage way roof (down lights) 13W	Yes	Yes	Yes 825 lumens 3,000 kelvins	Only used during night events	Yes	
	91 x recessed pathway railing (down lights) 2W	Yes, with opal diffuser	Yes	Yes 80 lumens 3,000 kelvins	Only used during night events	Yes	
	75 x recessed pathway railing (down lights) 2W	Yes	Yes	Yes 80 lumens 3,000 kelvins	Only used during night events	Yes	
Amenities building	All outdoor lighting has been sealed inside a new storage facility. No external lighting.						

Location	Fixture	Full-shielded?	Operable?	Special purpose (≤500 initial lumens) and ≤3,000k	Application	Conformity with LMP	Image
Industrial Laboratory	All outdoor lighting has been sealed behind roller doors. No external lighting.						
Cottage 1	1 x LED wall (down light) 36W	Yes	Yes	Yes 240 lumens 3,000 kelvins	Used only when required by tenant	Yes	
Cottage 2	1 x LED wall (down light) 36W	Yes	Yes	Yes 240 lumens 3,000 kelvins	Used only when required by tenant	Yes	
Maloney Lodge	4 x LED wall (down lights) 36W	Yes	Yes	Yes 240 lumens 3,000 kelvins	Motion sensors - when required by tenants	Yes	
	2 x undercover florescent lights (down lights) 36W	Yes	Yes	Yes 240 lumens 3,000 kelvins	Used only when required by tenants	Yes	
	1 x undercover florescent light (down light) 36W	Yes	Yes	Yes 240 lumens 3,000 kelvins	Used only when required by tenants	Yes	
Gondwana Stars Observatory	191m recessed red strip lighting 5W	Yes	Yes	Yes 70 lumens 3,000 kelvins	Only used during night events	Yes	
***March of the Titanosaurs* exhibition**	3 x LED lights (down lights) 36W	Yes	Yes	Yes 375 lumens 3,000 kelvins	Only used during night events	Yes	

OTHER LIGHTING CONDITIONS

- **Hosted dark-sky dinners**

Hosted dark-sky dinners are specialised tours for wholesale groups that include an evening tour and BBQ. These tours are conducted at the Reception Centre where lighting is turned off by no later than 10pm. Outdoor lighting is turned off for dark-sky tours following the dinner.

- **The Reception Centre**

Internal lighting is turned off at 5.30pm daily. During hosted dark-sky dinners (once a week during peak season) only compliant outdoor lighting is used.

- **Amenities building**

All outdoor lighting has been sealed inside a new storage facility, no external lighting is visible.

- **Fossil Preparation Laboratory and Industrial Laboratory**

Internal lighting in both facilities is turned off prior to 5.30pm daily, no external lighting is visible.

- **Maloney Lodge**

Rooms are fitted with curtains and sensor-operated LED lights along both sides of the building.

- **Cottages 1 and 2 (private lighting)**

All cottage windows have external downward-facing metal slats reducing light in and out of the building. In addition, all windows are fitted with internal blinds and curtains.

- **Events**

Occasionally the Museum will host small events or concerts on The Jump-Up, in accordance with the LMP organisers must submit a completed Lighting Plan in writing to the MMT.

Version no	Review date	Review team	Nature of amendment
1	21/4/2020	Kate Louis, Tour Guide Naomi Miles, Business Development Manager	Lighting review
2	1 June 2021	David Elliott, Executive Chairman Naomi Miles, Business Development Manager	Lighting review
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