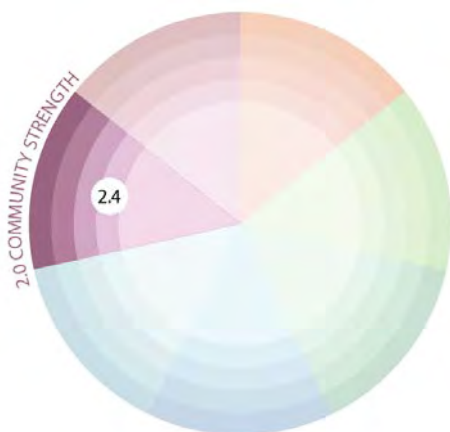**Primary Outcome | 1.0 Safe Community**

Secondary Outcome | 1.4 Safe Design (Public Realm)

Lighting can contribute to a safer public realm by providing visibility in the evening and in the early hours of the morning. Conversely, lighting may be excluded to prevent and deter access to environments or spaces that are deemed as unsafe or risks for public access.

Primary Outcome | 2.0 Community Strength

Secondary Outcome | 2.4 Vibrant Community

Lighting can support communities through the provision of community access to arts and cultural activities that encourage participation and connection amongst individuals or many.

Primary Outcome | 3.0 Healthy Community

Secondary Outcome | 3.4 Active Community

Lighting can provide the ability to participate in an active lifestyle in open space environments for passive and active sporting and recreational activities.
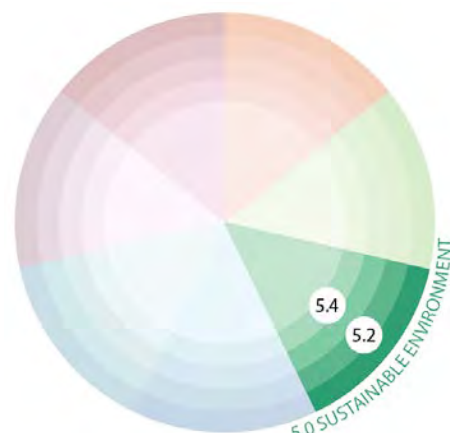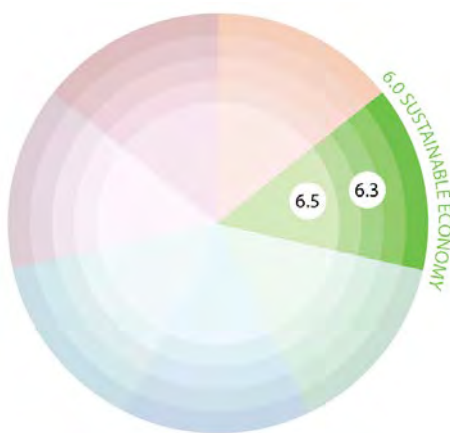

Primary Outcome | 5.0 Sustainable Environment

Secondary Outcome | 5.2 Open Space and Biodiversity

Secondary Outcome | 5.4 Responsible Resource Use

Lighting will contribute to the value, use and protection of open space environments, ecologies and biodiversity found within them. A sustainable environment will be supported with appropriate lighting levels, colour, emissions and reducing light pollution for a responsible and sensitive approach to lighting of public space.

Primary Outcome | 6.0 Sustainable Economy

Secondary Outcome | 6.3 Viable Investment

Secondary Outcome | 6.5 Diverse Economy

Lighting is a key component underpinning the day to night experiences of the municipality. It allows for social and economic activities to exists after dark, and with responsible and consider application, will achieve a favourable night time experiences and presence that contributes to the goals for a strong and sustainable economy.

4.3 The Basics of Lighting

Design considerations, expectations and benchmarks

The quality, quantity and colour of light affects our visual perception and experiences

As the night takes over, we look and see a different visual experience of space, a streetscape, a feature and the qualities and perceptions in the night landscape. As part of a range of components that contribute to our experiences of public spaces at night, lighting is important in balancing and complementing the design and physical parameters of these spaces and experiences.

To meet the benchmark expectations and performance of lighting, we look to the parameters and guidelines for minimal lighting to be achieved that are set by the governing standards and industry guidelines. These include the following:

Relevant standards and guidelines include, but are not limited to the following:

– AS/NZS 1158 series (all parts) – Lighting for Roads & Public Spaces
– AS/NZS 4282-1997-Control of Obtrusive Effects of Outdoor Lighting
– AS/NZS 2560 series (all parts) – Sports Lighting
– National Light Pollution Guidelines for Wildlife
– International Commission on Illumination (CIE)
– International Dark-Sky Association (IDA) guidelines
– The Australasian Dark Sky Alliance (ADSA) guidelines
– VicRoads- TCG 006: Guidelines to Street Lighting Design
– Parks Victoria Guidelines

Relevant Authorities and stakeholders include, but are not limited to the following:

– United Energy / Zinfra
– Parks Victoria
– VicRoads
– Australian Communications Authority (ACMA)
– Catchment management authorities

General Definitions

Light

Light is a form of energy; electromagnetic radiation. Visible light is a segment of the electromagnetic spectrum that is visible to the human eye.

Brightness

Brightness is a visual perception of a source appearing to reflect light.

Luminous Flux

Luminous flux is a measure of the total quantity of light radiated by a light source.

Luminous Intensity

Luminous intensity represents the luminous flux of light emitted in a certain direction.
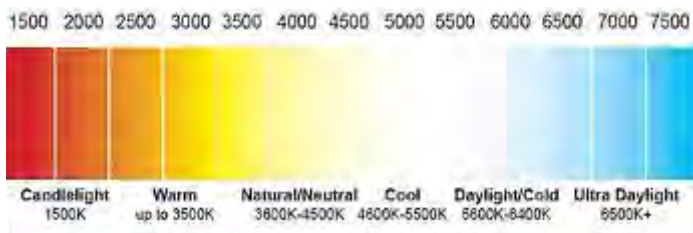
Illuminance

Illuminance represents the luminous flux on an area of surface in units.

Luminance

Luminance represents the light emitted from a unit area in a certain direction.

Colour Temperature

Colour temperature is a measure of the colour of light in Kelvins (K). This is represented in the diagram below (website search: source unknown).

To expand, white light is a mixture of colours, not all whites are the same since they depend on their constituent colours. So a white with a higher proportion of red will appear 'warmer'. Whereas, a white with a higher proportion of blue will appear cooler.

Colour Rendering Index (CRI)

CRI represents a rating for the ability of a light source to produce an accurate representation, a render, of actual colour to the human eye for objects that it illuminates.

Impacts of Lighting

Humans, Flora and Fauna

Research has found that artificial light can alter our circadian rhythm; our biological 'body clock' that regulates our biological processes and behaviour. This disruption impacts humans, fauna, flora and ecosystems.

'Humans have evolved to the rhythms of the natural light-dark cycle of day and night. The spread of artificial lighting means most of us no longer experience truly dark nights. Research suggests that artificial light at night can negatively affect human health...Evidence suggests that artificial light at night has negative effects on many creatures...Artificial Lighting can disrupt the Ecosystems if careful consideration is not given to the design.' (Source: International Dark-sky Association website)

Light Pollution

Light pollution refers to the *'excessive or inappropriate use of outdoor artificial light can affect human health, wildlife behaviour and our ability to observe stars and other celestial objects.'* (Source: National Geographic Society website)

Obtrusive Light

'Direct or reflected light that, because of quantitative, directional or spectral attributes in a given context, causes annoyance, discomfort, distraction or a reduction in the ability to see.' {Source: Illuminating Engineering Society website)

Glare

Glare is considered excessive brightness that causes visual discomfort and inability to see properly.

Skyglow

Skyglow refers to the 'brightening of the night sky over inhabited areas', which has become increasingly apparent across the globe with the advent of electricity and lighting technology. (Source: International Dark-sky Association website)

Background Exposure

Numerous studies and investigations have been carried out regarding Wi-Fi, EMR, 5G & Electro Sensitivity, but there appears to be no real scientific evidence to suggest any health concerns. In Australia – ACMA – Australian Communications Authority is the regulatory body for these matters.

Lighting Technology Criteria

The criteria for lighting technology includes the following:

– Energy efficiency
– Industry standard or better LED
– Price competitive or cost effective
– Real whole-of-life cost: purchase price, installation cost, operation and maintenance cost implications
– Robustness; to be suitable to application and context to mitigate issues such as, but not limited to, galvanic corrosion and substrate corrosion
– Longevity and quality
– Low maintenance and easy to replace and repair if needed
– Products that are readily available
– Products that are easy to upgrade as technology improves

The aim must be to consider, design and specify lighting technology that is long-lasting, low emissions, has visual appeal and balances practical maintenance requirements without compromising on design, quality and outcome.

As part of individual project evaluation and design criteria, the use of more luminaires (lower wattage/output) versus less luminaires (higher wattage/output) is dependent on the application and space. The visual effect of light and physical presence within a space can be greatly altered in this way, and therefore an important consideration.

4.4 Lighting Design Principles & Guidelines

Guidance in lighting

Public lighting within Frankston City will align with the three fundamental principles of lighting.

Natural sunlight offers optimum light for us to engage in day-to-day activities and experiences. When dusk comes, our urbanised cities have street lights and other sources of artificial lighting that provides us with visibility into the nighttime to engage and move through spaces after dark.

Frankston City Council is seeking to determine the best forms of public lighting and experiences to enhance the City, to provide quality of public realm after dark that complements its strategic goals and values. In order to achieve this, the future of lighting in the City will need to align with the fundamental principles of lighting; that it is functional, provides experience and contributes to a sustainable future.

Each of the three principles has a set of guidelines to determine the delivery of an appropriate response for future lighting projects. These principles and associated guidelines outline the basis for lighting and form part of the key criteria for the assessment of suitable, viable and prioritised lighting projects within the municipality.

The three overarching Principles of Lighting and the ten Lighting Design Guidelines:

1 **Functional**
   – Legibility / Orientation
   – Security / Safety
   – Accessibility

2 **Experience**
   – Character / Identity
   – Heritage
   – Nature
   – Foreshore

3 **Sustainable**
   – Social
   – Economic
   – Environment

Principles of Lighting | Functional

Functional lighting provides visibility and definition of objects and spaces when there is not enough natural light. This allows us to understand what we see, where we are going and provides us with confidence to move through to where we need to be after dark.

Functional - Lighting Design Guidelines

Legibility / Orientation

This functional guideline should:

- Contribute to the ability to understand and navigate public space and to orientate ourselves from day to night through recognisable landmarks, elements and signage.
- Prioritise pedestrians.
- Provide legible environment between spaces, connections and key destinations.
- Propose quantity and quality of light, as well as consistency to contribute to lighting amenity.
- Provide accuracy of colour rendering; the accuracy of colours we see with artificial light sources, to allow people to depict and understand what they are looking at, including facial recognition.
- Offer lighting that provides definition of space, surfaces and boundaries.
- Contribute to understanding the hierarchy of public space.
- Allow for clearer night-time visibility and access.

Security / Safety

This functional guideline should:

- Contribute to improved perceptions of safety and provides confidence in public space.
- Mitigate anti-social behaviour and unwanted activity.
- Provide clear expectations of lighting in car parks, roads and open space.
- Propose opportunity for dimming controls to match peak and off-peak lighting needs.

Accessibility

This functional guideline should:

- Provide equitable access in the night for all ages and abilities.
- Contribute to greater legibility of the public realm with considerate use of reflective surfaces and contrast.
- Balance the contrast from day to night
- Propose colour and outputs of light that are appropriate for those who may have sensory processing needs (ie. no strobe/ dynamic lights on key pathways).
- Provide amenity lighting along accessible paths for nighttime navigation.
- Propose an appropriate amount of light to mitigate glare impacts for those with visual impairment.
- Offer uniformity of lighting to provide visual consistency.

Principles of Lighting | Experience

Lighting is part of the positive attributes of experiences of place and space. It should allow us to participate, enjoy, observe and gain a sense of character and memorable value of what is revealed.

Experience - Lighting Design Guidelines

Character / Identity

This experience should:

- Contribute to highlighting and the representation of local identity and characteristics of a localised area.
- Promote a sense of 'place', developed in engaged consultation with stakeholders and the broader community.
- Contribute to a vibrant and creative City.

Heritage

This experience should:

- Contribute to cultural heritage and historical significance inherent or found within a localised area.
- Develop a complementary lighting response that enhances and acknowledges cultural heritage values.
- Promote indigenous cultural values developed in meaningful consultation with local indigenous Traditional Owners.

Nature

This experience should:

- Contribute to access, understanding and value of natural environments, ecologies and biodiversity.
- Promote a sensitive ambient lighting approach that balances access and protection of natural values.
- Balance introduced lighting with natural moonlight.
- Retain the value of darkness in public space to protect local ecologies from artificial light in alignment with the 'Dark Sky' movement.

Foreshore

This experience should:

- Contribute to access and enjoyment of the foreshore environment.
- Balance introduced lighting with natural moonlight.
- Retain the value of darkness in public space to protect local ecologies from artificial light in alignment with the 'Dark Sky' movement.

Principles of Lighting | Sustainable

Lighting is part of a sustainable City; to build upon its social fabric, identity, financial viability (as a place to live, work and visit) and its commitment to protecting its environment.

Sustainable - Lighting Design Guidelines

Social

This sustainable guideline should:

– Facilitate and encourage social interactions after dark that contribute to vibrant, active and connected communities.
– Facilitates social interactions that involve the appreciation of natural light and darkness.
– Provide lighting to activate spaces.
– Provide lighting to allow recreational activities in the community.
– Consider health and well-being effects of artificial lighting on circadian rhythms (for humans, wildlife and invertebrates).

Economic

This sustainable guideline should:

– Provide after dark ambience to support activity areas and the nighttime economy.
– Support retail and hospitality precincts and public open space which allow outdoor dining and footpath activity.
– Encourages activities that support the local economy to thrive.

Environment

This sustainable guideline should:

– Propose sustainable lighting technologies for greater efficiency, longevity and low maintenance.
– Seeks opportunities for reducing environmental impacts, such as carbon emissions and light pollution, by lowering light levels or switching off during off-peak times.
– Encourage use of high quality luminaires that allow control of light levels and outputs, orientation (to surfaces, not up to the sky) to reduce negative light pollution impacts and obtrusive lighting.
– Provide incentives for private building owners to make the switch to more sustainable lighting technologies to complement their surrounds.
– Retain the value of darkness in public space to protect local ecologies from artificial light in alignment with the 'Dark Sky' movement.
– Provide vandalism proofing and robust lighting products installed in public spaces.

4.5 Lighting Experience Typologies

The seven lighting experiences

Lighting is an experiential and powerful component within public space. The after-dark experience can be improved with effective lighting to bring about positive experiences from day to night.

Our movement and relationship to space in the nighttime is associated with the amount and quality of light that is available; primarily by moonlight, public lighting and spill lighting within our environment. The after-dark experience should optimize the availability of additional light for participation and inclusion with clear boundaries and performance requirements.

Urban designers, landscape architects and other design disciplines involved in the creation of the public realm, need to utilize public lighting to reinforce the design principles for public realm design that are to be achieved. The application of lighting in the right context will contribute to ideas of place, liveability, resilience and community. Good lighting is not always noticeable, bad lighting is often overwhelming.

The night time landscape of Frankston City reveals a diversity of lighting responses and the opportunity to adopt successes and build upon them. To achieve this, the City has distilled the existing and imagined future lighting landscapes into seven lighting experience typologies. These typologies provide the fundamental approach and expected lighting responses to create diverse, creative and sensitive and resilient lighting landscapes for the current and future City. The typologies consider the balance of artificial light, moonlight and dark skies.

The following typologies provide a guideline for the planning, design and implementation of open space lighting within the City of Frankston. Whilst lighting projects should primarily be considered on a case by case basis, the following typologies are to facilitate future decision-making on lighting.

The following outlines the seven Lighting Experience Typologies:

- **Active Spirit**
- **Foreshore Experience**
- **Navigation & Local Identity**
- **Luminous City**
- **Creative Lighting**
- **Night in Nature**
- **Safety on the Streets**

Active Spirit
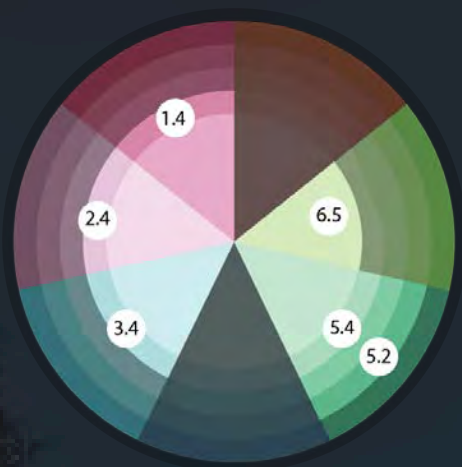
Outcomes Framework Policy Domains
This typology relates to the following key outcomes:

- 1.4 Safe Design (Public Realm)
- 2.4 Vibrant Community
- 3.4 Active Community
- 5.2 Open Space and Biodiversity
- 5.4 Responsible Resource Use
- 6.5 Diverse Economy

Active Spirit celebrates a collective active community encouraging people to be outdoors within their community.

The use of lighting to allow activation of public parks and recreational spaces for after-hour activites supports a healthy and active lifestyle.

The active community works in various scales of city, residential and neighbourhood areas where the provision of lighting is largely people-focused; both individually and for groups, in the appropriate context. With the framework for a 'lifestyle capital', the City seeks to create quality and added value to its open space network to contribute to healthy and engaged communities.

The future of the park lies within its offering from day to night, for access to open space for community wellbeing, connection, health and active recreation. The benefits are a stronger, healthy community and contribution to a sustainable economy and environment.

Lighting requirements in sports and recreation reserves will vary depending on the facilities available, location and use.

Lighting of open spaces shall facilitate:
- High Usage – Walking Tracks/Dog Exercise.
- Safe Interconnection between key destinations.
- Night-time activities – Sports Training & Competition.

Suitable Landscapes
The following represents potential landscape typologies subject to feasibility study and further assessment:

- Recreational open space
- Access and circulation within key open space parks

The criteria for a suitable site that may benefit from public lighting may include the following:
- use demands
- links to public transport
- public surveillance

The criteria will be taken into account when assessing the feasibility, risk and safety factors. Each lighting project is unique to its context, suggested locations are subject to due diligence within a consultation and evaluation processes.

Example Sites
The mapping (right) represents example sites that may be suitable for this lighting design typology subject to feasibility study and further assessment.

1 IMAGE: Fogarty Park, Cairns, QLD. WE-EF

OPEN SPACE NETWORK

- Regional
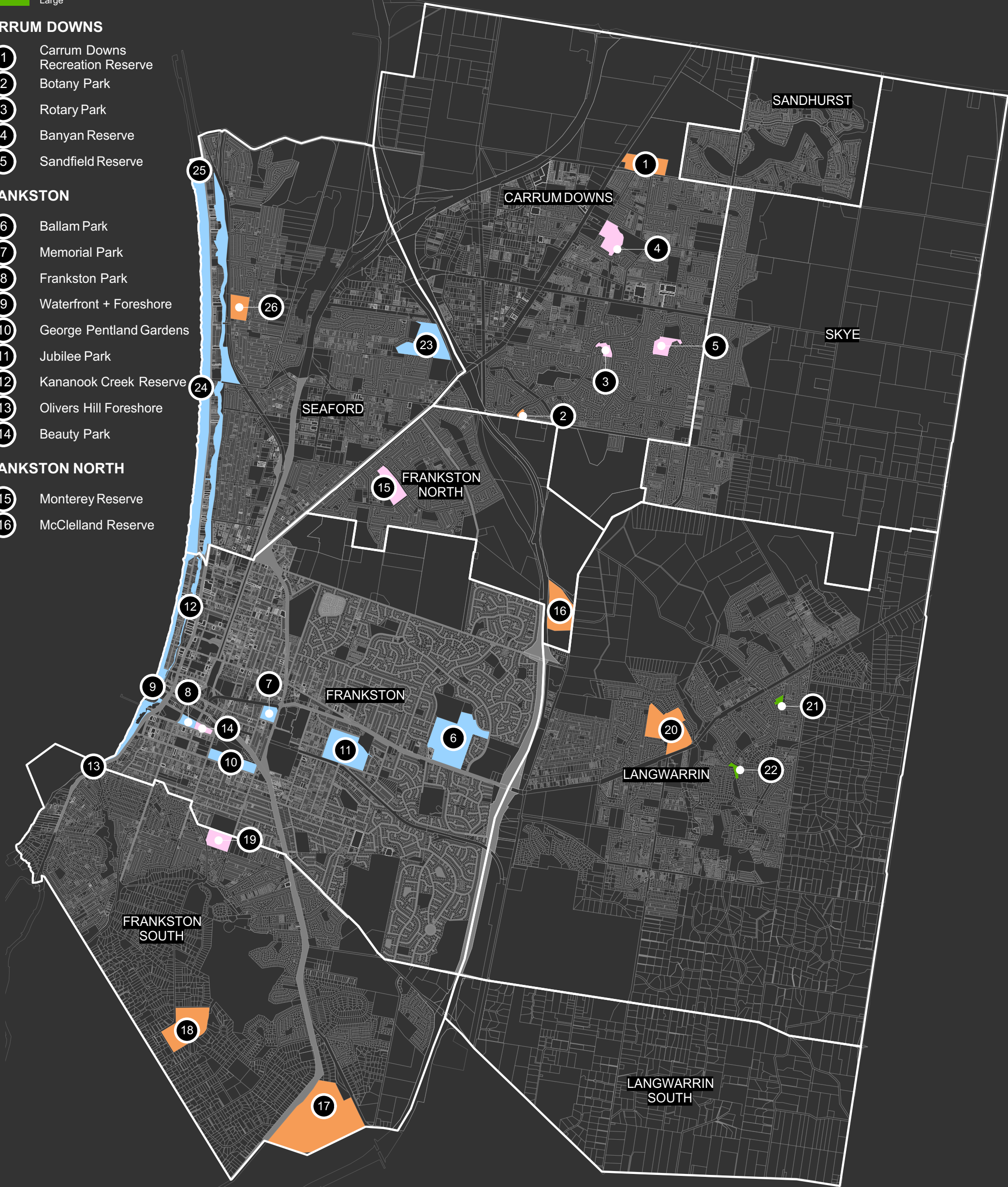- District
- Community
- Local
  Large

CARRUM DOWNS

1. Carrum Downs Recreation Reserve
2. Botany Park
3. Rotary Park
4. Banyan Reserve
5. Sandfield Reserve

FRANKSTON

6. Ballam Park
7. Memorial Park
8. Frankston Park
9. Waterfront + Foreshore
10. George Pentland Gardens
11. Jubilee Park
12. Kananook Creek Reserve
13. Olivers Hill Foreshore
14. Beauty Park

FRANKSTON NORTH

15. Monterey Reserve
16. McClelland Reserve

FRANKSTON SOUTH

17. Baxter Park
18. Overport Park
19. Delacombe Park

LANGWARRIN

20. Lloyd Park
21. Northgateway Reserve
22. Southgateway Reserve

SEAFORD

23. Belvedere Reserve
24. Seaford Foreshore
25. Keast Park
26. Seaford North Reserve

SANDHURST

CARRUM DOWNS

SKYE

SEAFORD

FRANKSTON NORTH

FRANKSTON

LANGWARRIN

FRANKSTON SOUTH

LANGWARRIN SOUTH

NORTH

0   500   1000   2000   3000 M

Sports Fields

Typical Lighting Responses & Desired Outcomes

− Provides effective sports field lighting where required, for specific playing levels with lighting controls to cater for training, breaks, competition, events and to Australian Standards.
− Implementation of staged lighting for different levels of practice, competition and ground usages.
− Promotes sustainable lighting initiatives which allow for peak and off-peak lighting. Sports.

Recommended Lighting Technology

− Sports floodlighting with lighting control (curfew timer / dimming controls) including discussion with private owners who may have responsibility and ownership of lighting infrastructure.
− Options for integration of additional technology for occupancy sensing and event recording.
− Sports Lighting 'grid' connected power installations
− "Smart Pole" installations to integrate lighting, power, communications & CCTV

Customisation

− Conventional sports lighting to reserves, ovals, fields & pitches. Customised fixtures for themed spaces to be assessed for each application.
− Adaptive 'Smart' lighting controls with dimming, occupancy sensing, timed operation / day light sensing

Daytime Visual and Spatial Impacts of Light Fittings

− Sporting venue/reserve - floodlighting poles/masts are prominent structures. Minimalist design and high quality finish can assist to minimise their visual impact.
− Leisure reserves and play areas - lighting can be low level with less visual impact.

Regional Park / District Park

Typical Lighting Responses & Desired Outcomes

− Proposes quality and quantity of light and measures for implementation appropriate to different categories and responsive to context and in consultation with Council.
− Promotes sustainable lighting initiatives which allow for peak and off-peak lighting.
− Considers existing street lighting.
− Provides selective lighting to primary circulation, access paths and entry spaces only. Lighting is limited and at a level that provides visibility to the surrounds, light contrast and definition of elements in the vicinity of the path to increase perception of visibility.

Recommended Lighting Technology

− Timed operation, day light sensing lighting controls and dimming controls to general pathway areas.
− After hours occupancy sensor control for security.
− Solar powered integration could be provided for low level lighting and areas where little or no electrical infrastructure exists. Review integrated solar collectors or alternative central vertical arrays with sub electrical reticulation.
− High usage area lighting installations to be 'grid' connected.
− "Smart Pole" installations to integrate lighting, power, communications & CCTV

Customisation

− Localised and orientation lighting to minimise visual impact.
− Adaptive 'Smart' lighting controls with dimming, occupancy sensing, timed operation / day light sensing

Daytime Visual and Spatial Impacts of Light Fittings

− Public park settings- lighting can be considered as a feature, visible visual element or receding element for amenity.
− The design of the lighting product finish and colour can assist to make this prominent or recede as desired.
− Maintain set distances between lighting that provides rhythm within the space, responds to circulation requirements and expressed desire lines. Minimalist design and high quality finish can assist to minimise their visual impact.
− Leisure reserves and play areas - lighting can be low level with less visual impact.

Large / Small Local Park

Typical Lighting Responses & Desired Outcomes

− Proposes quality and quantity of light and measures for implementation appropriate to different categories and responsive to context and in consultation with Council.
− Promotes sustainable lighting initiatives which allow for peak and off-peak lighting.
− Considers existing street lighting.
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− High usage area lighting installations to be 'grid' connected.

Customisation

− Localised and orientation lighting to minimise visual impact.
− Adaptive 'Smart' lighting controls with dimming, occupancy sensing, timed operation / day light sensing

Daytime Visual and Spatial Impacts of Light Fittings

− Public park settings- lighting can be considered as a feature, visible visual element or receding element for amenity.
− The design of the lighting product finish and colour can assist to make this prominent or recede as desired.
− Maintain set distances between lighting that provides rhythm within the space, responds to circulation requirements and expressed desire lines.

Sports Fields

Typical Dimensions, Parameters and Offsets

– Sports field floodlighting poles/masts mounting heights dependent on sporting code. Varies from 15m up to 30m above ground level.
– Minimum playing area offsets for lighting pole installations shall be maintained in accordance with AS/NZS 2560 standard recommendations for the nominated sport.

Recommended Lighting Level

– Access lighting to the sports reserve/ pavilion etc., in accordance with AS/ NZS 1158 – Part 3.1 – Pedestrian Area (Category P)
– Sports lighting in accordance with regulatory recommendations in accordance with – AS/NZS 2560 – (All Sections/latest Editions).
– Illuminance levels to be determined for the actual level of play for the nominated sports in accordance with AS/NZS 2560 standards. Minimum "Training" illuminance 50 lux Average, Minimum Competition Standard- 100 lux Average
– Spill Lighting shall be minimised in accordance with the requirements of AS/ NZS 4282 – "Control of Obtrusive Effects of Outdoor Lighting".

Recommended Light Quality

– Standard sports lighting colour temperature – 5000K, consideration of "warmer" 4000K colour temperature to be utilised where environmental concerns.

Image References
(Page 42)

1 Beauty Park, Frankston, VIC.

2 Overport Park Oval, Frankston South, VIC.

3 Frankston Oval gates, Frankston, VIC.

4 Rotary Park, Carrum Downs, VIC. Trip Advisor

5 Jubilee Park, Frankston, VIC. Trip Advisor

6 Ballam Park, Frankston, VIC.

7 Banyan Reserve, Carrum Downs, VIC. FCC website

(Current Page)

1 Lighting along key path to facilitate after-house activites and movement through the park, Lincoln Park, Carlton, VIC.

2 Circuit path lighting, Heatherton Park. WE-EF

3 Shared path lighting, Elwood Foreshore, Elwood, VIC.

4 Primary path lighting, Fogarty Park, Cairns, QLD. WE-EF

5 Pole top lighting to facilitate activities and events, Frankline Square, Hobart, TAS. WE-EF

6 Sports floodlighting, Adelaide Oval, North Adelaide, SA. WE-EF

Regional Park / District Park

Typical Dimensions, Parameters and Offsets

– Pedestrian footpaths pole mounted fittings typically between 4 to 6m mounting height.
– Minimum off-sets for pole lighting installations in accordance with standards recommendations – AS/NZS 1158, (nominal 1m from edge of pathways).

Recommended Lighting Level

– Lighting in accordance with regulatory recommendations as a minimum standard – AS/NZS 1158 – Part 3.1 – Pedestrian Area (Category P).
– Consider Pedestrian/Cycle Activity and Fear of Crime to determine applicable lighting category PP1 (High) – PP5 (Low).

Recommended Light Quality

– Warm colour temperature of 3000K

Large / Small Local Park

Typical Dimensions, Parameters and Offsets

– Pedestrian footpaths pole mounted fittings typically between 4 to 6m mounting height.
– Minimum off-sets for pole lighting installations in accordance with standards recommendations – AS/NZS 1158, (nominal 1m from edge of pathways).

Recommended Lighting Level

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– Consider Pedestrian/Cycle Activity and Fear of Crime to determine applicable lighting category PP1 (High) – PP5 (Low).

Recommended Light Quality

– Warm colour temperature of 3000K