Precinct Village and Carpark

Public domain lighting strategy

Issue 01

SSD 9835 Sydney Football Stadium Redevelopment
Section 4.55 Modification

ARUP

Contents

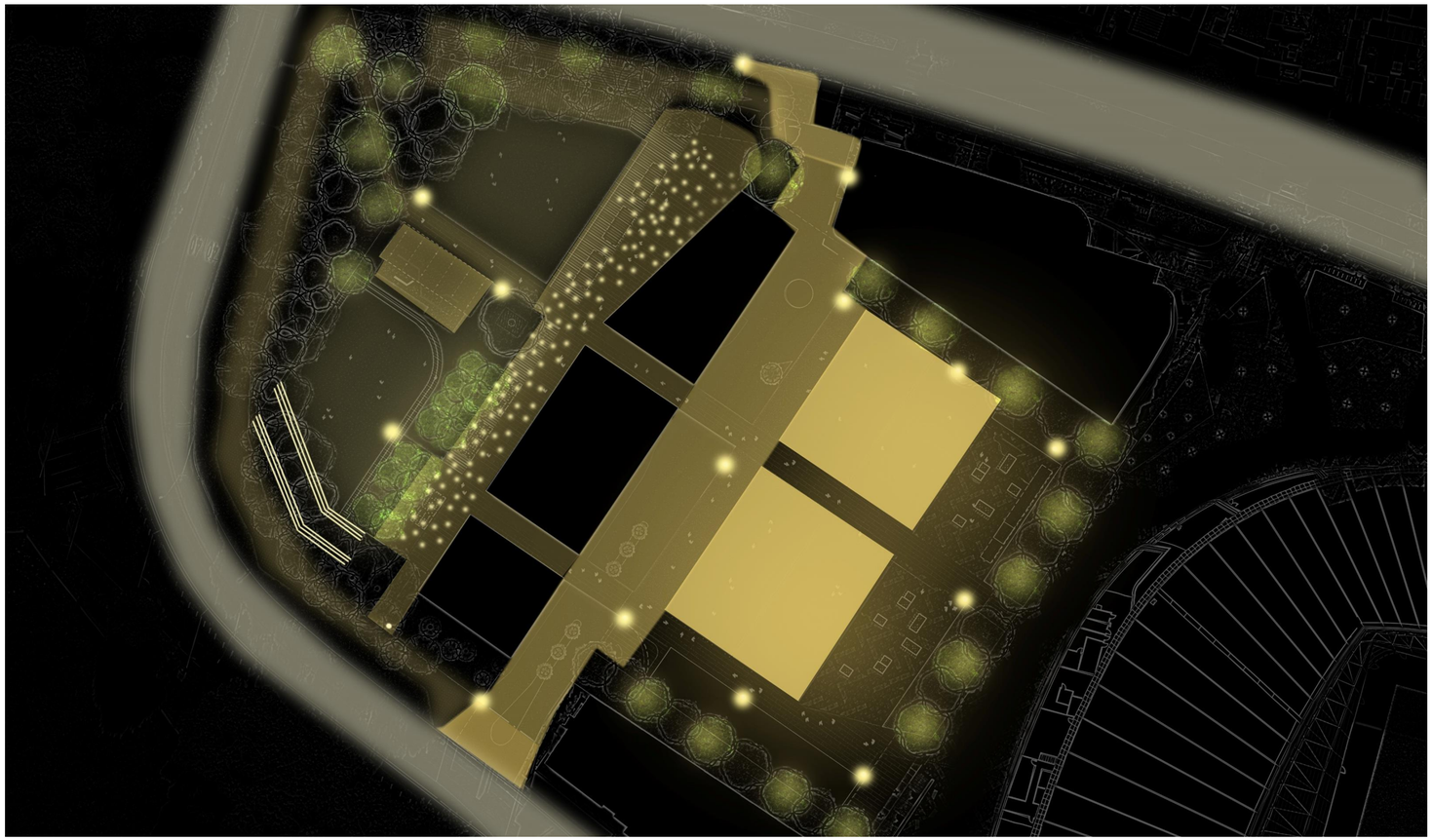

Figure 1: Precinct Village and Car Park Development - Lighting Hierarchy

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Executive Summary

In line with the proposed modification of SSDA 9835 for the purposes of the Village Precinct and Car Park , this lighting strategy outlines details pertaining to:

- How lighting and safe access will be provided between the public realm and pathways; and
- Compliance with AS1158 Public Lighting Code and AS 4282 Control of Effects of outdoor lighting in order to ensure that any nuisance light to adjoining properties and to passing vehicular traffic are controlled to an acceptable level;
- Compliance with the City of Sydney Lighting design guide;
- Compliance with the CPTED guidelines, and;
- Recommended measures to enhance night time expression through integrated lighting and lighting throughout the landscaping and architecture.

Figure 2: Cox Architecture Render

Introduction

1. Introduction

On 6 December 2018, the then Minister for Planning approved a concept development application and concurrent early works package (SSD 9249) to facilitate redevelopment of the Sydney Football Stadium.

The concept approval established the maximum building envelope, design and operational parameters for a new stadium with up to 45,000 seats for patrons and allowing for 55,000 patrons in concert mode. The concurrent Stage 1 works, which were completed on 28 February 2020, facilitated the demolition of the former SFS and associated buildings.

Stage 2 of the Sydney Football Stadium (SFS) Redevelopment (SSD 9835) was approved by the Minister for Planning and Public Spaces on 6 December 2019. Stage 2 provides for:

- construction of the stadium, including:
  - 45,000 seats (additional 10,000 - person capacity in the playing field in concert mode) in four tiers including general admission areas, members seating and corporate / premium seating;
  - roof cover over all permanent seats and a rectangular playing pitch;
  - a mezzanine level with staff and operational areas;
  - internal pedestrian circulation zones, media facilities and other administration areas on the seating levels;
  - a basement level (at the level of the playing pitch) accommodating pedestrian and vehicular circulation zones, 50 car parking spaces, facilities for teams and officials, media and broadcasting areas, storage and internal loading areas;
  - food and drink kiosks, corporate and media facilities; and
  - four signage zones.
- construction and establishment of the public domain within the site, including:
  - hard and soft landscaping works;
  - publicly accessible event and operational areas;
  - public art; and
  - provision of pedestrian and cycling facilities.
- wayfinding signage and lighting design within the site;
- reinstatement of the existing Moore Park Carpark 1 (MP1) upon completion of construction works with 540 at-grade car parking spaces and vehicular connection to the new stadium basement level;
- operation and use of the new stadium and the public domain areas within the site for a range of sporting and entertainment events; and
- extension and augmentation of utilities and infrastructure.

SSD 9835 has been modified on five previous occasions:

- MOD 1 amended Conditions B14 and B15 to satisfy the regulatory requirements of the Contaminated Land Management Act 1997;
- MOD 2 approved the design, construction and operation of the Stadium Fitness Facilities;
- MOD 3 approved design refinements to the western mezzanine and introduced a new condition to facilitate approval of signage details within the approved signage zones;
- MOD 4 relocated the approved photovoltaic array from the SFS roof to the Level 5 plant room roofs and revised the approved sustainability strategy; and
- MOD 5 updated plan references and dates in the Instrument of Consent.

A sixth modification which seeks approval for the fit out and operation of the SFS' eastern mezzanine for the Sydney Roosters Centre of Excellence (MOD 6) was placed on public exhibition by the Department of Planning, Industry and Environment between 19 August and 1 September 2021.

2. Precinct Village and Car Park

2.1 Vision

Venues NSW (VNSW) is proposing to introduce a village community space, event plaza and multi level car park to complement the SFS and adjoining Moore Park and Centennial Parklands.

The proposed development will facilitate the permanent closure of the EP2 on-grass parking areas within Moore Park opposite the MP1 car park and enable its use for open space purposes consistent with the Moore Park Masterplan.

The vision for the Precinct Village and Car Park is set out below:

The Precinct Village and Car Park provides a platform and canvas for an exceptional community asset and iconic design, that visually and physically connects to the adjacent Moore Park East and Kippax Lake. It provides patrons with quality café and dining experiences in an idyllic parkland setting and well-being play and relaxation nodes which engage with all ages. An event plaza, connected to the Stadium plaza provides a seamless opportunity for greater patron and community engagement through non-event and event day functions (Architectural Design Statement, Cox August 2021).

2.2 Location

The Precinct Village and Car Park is proposed to be located on the land west of the SFS, currently approved under SSD 9835 as the MP1 Car Park. It will extend to Moore Park and Driver Avenue and will adjoin the existing UTS, Rugby Australia and NRL Central buildings, all of which are to be retained and do not form part of the project site. A Location Plan is provided at Figure 2.

2.3 Development Description

The Precinct Village and Car Park has been designed to align with the conditions and commitment established within SSD 9835, particularly relating to delivering a LEED Gold rated sustainable precinct, and will include:

- Up to a maximum of 1,500 space multilevel carpark below ground level with the following access arrangements:
  - 1 x egress point onto Moore Park Road to be used on event days only;
  - 1 x two-lane access point from Driver Ave to be used on event and non-event days; and
  - dedicated area within the car park for operation/servicing vehicles.
- Reconfiguration of the currently approved drop off requirements for the elderly and mobility impaired.
- Free flow level pedestrian access to and from the SFS concourse from Driver Ave and Moore Park Road.
- Electric car charging provision.
- A versatile and community public domain, comprising:
  - provision for 4 x north-south orientated tennis courts on non-event days with the potential to become an event platform on event days;
  - children's playground;
  - 1,500m^2 cafe / retail / restaurants with associated amenities in a single storey pavilion (6 metre) low level;
  - customer service office and ticket window; and
  - vertical transport provisions.
- Utilities provision augmentation.

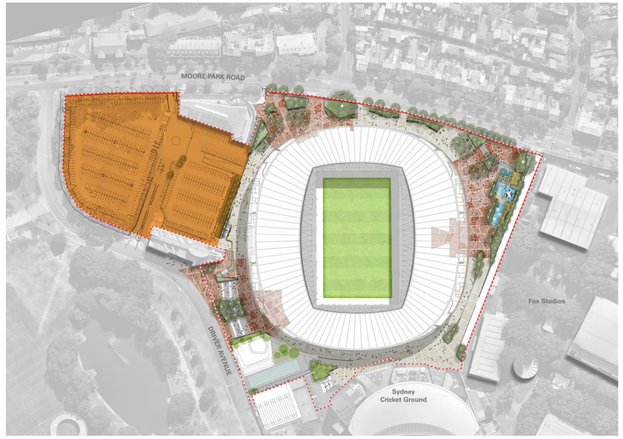

Figure 3 – Precinct Village and Car Park Location

Figure 3 illustrates the proposed Precinct Village and Car Park concept. Refer to the architectural within the Architectural Design Statement (Cox, August 2021) and landscape plans (Aspect, August 2021) for further details.

Introduction

Figure 4 – Precinct Village and Car Park Development

2.4 Proposed Operation

The Precinct Village is proposed to be accessible from 8am to 11pm to align with the approved operating hours for the SFS.

The tennis court operating hours are proposed to be the same as the approved operating hours for the Stadium Fitness Facilities.

The car park will be automated, replicating the existing arrangements at the nearby Entertainment Quarter and will be accessible 24 hours a day, 7 days a week.

The public domain is proposed to be curated as a series of distinct, flexible and purpose specific settings for event day patrons and the general public. These inviting public places will offer rich, engaging and shared experiences. An indication of the activity types, frequencies and durations proposed within the public domain is provided in the Architectural Design Statement (Cox Architecture, August 2021) and Planning Statement (Ethos Urban, August 2021).

2.5 Delivery

The Precinct Village and Car Park is proposed to be delivered in two stages:

- Stage 1, herein referred to as the East Car Park, consists of the area between the Rugby Australia and NRL Central buildings, immediately adjacent to the SFS concourse.
- Stage 2, herein referred to as the West Car Park, consists of the residual area immediately adjacent to the proposed East Car Park, bounded by Driver Ave and Moore Park Road.

The East Car Park is proposed to be delivered ahead of the opening of the SFS in 2022. The West Car Park is proposed to be delivered after the SFS opening, sometime in 2023.

3. Proposed Modifications

To facilitate the Precinct Village and Car Park, SSD 9249 and SSD 9835 are required to be modified. The proposed modification to SSD 9249 (concept development application) has been submitted under separate cover. SSD 9835 is proposed to be modified to facilitate construction, fit-out and operation of Precinct Village and Car Park as described above.

4. Purpose of this Report

This strategy has been prepared to support the Precinct Village and Car Park modification. Compliance with the Australian Standards will be further confirmed prior to installation as required under Condition B53 of the Stage 2 SSDA approval consent.

Compliance with standards relating to obtrusive lighting will be included in the lighting strategy as well as measures to reduce light spill into the surrounding sensitive receivers.

This Public domain lighting strategy is to be read in conjunction with the following reports and documents:

- Planning Statement prepared by Ethos Urban (August, 2021);
- Architectural plans/elevations/sections and Architectural Design Statement, prepared by Cox Architecture (August, 2021);
- Design Integrity Assessment Report prepared by Cox Architecture (August, 2021);
- Landscape plans and Landscape Design Report prepared by Aspect (August, 2021);
- Transport Assessment prepared by JMT (August, 2021);
- Noise and Vibration Assessment prepared by Arup (August, 2021);
- Stormwater and Flooding Assessment prepared by Arup (August, 2021);
- Visual Impact Assessment prepared by Ethos Urban (August, 2021);
- Social/Economic Statement prepared by Ethos Urban (August, 2021);
- Heritage Impact Statement prepared by Artefact (August, 2021);
- Sustainability Assessment prepared by LCI (August, 2021);
- Security Statement/CPTED prepared by Intelligent Risks (August, 2021);
- Contamination Assessment prepared by Douglas Partners (August, 2021);
- Aboricultural Assessment prepared by Tree IQ (August, 2021);
- Wind Assessment prepared by Arup (August, 2021);
- Infrastructure Services Strategy prepared by Arup (August, 2021);
- Geotechnical Assessment prepared by Arup (August, 2021);
- Accessibility Statement prepared by Before Compliance (August, 2021);
- BCA Assessment prepared by Blackett Maguire Goldsmith (August 2021).

Lighting Strategy **Summary**

The primary focus of the lighting masterplan for the Precinct Village and Car Park design is to enhance the night-time experience, increase perception of safety and stimulate the night-time amenity. Lighting within the urban environment provides another layer to reinforce the narrative and interpretation of a site's history, past, present and future.

Lighting principles

- Achieve a distinctive night-time ambience which will make the Precinct an attractive place to visit at night
- Create a visibly legible link between pathways, pick up and drop off areas and the Village Precinct
- Improve the sense of safety and comfort for all users
- Provide a clear hierarchy of circulation paths through public realm
- Provide lighting conditions that vary from day to night
- Memorable, dynamic and engaging
- Lighting strategies to incorporate CPTED principles.

The following legislative and design targets will be met:

- AS1158 Lighting for roads and public spaces
    - External P category lighting for public activity areas
    - External P Category for pathways and cyclists paths
- AS4282 Control of the effects of obtrusive lighting
- AS2560 2.1 Outdoor tennis
- City of Sydney Lighting Design Guide

Figure 5: Gobo lighting effect, Source unknown

Figure 6: Low level lighting – QV1, Perth

Figure 7: Adjustable pole lighting – Source unknown

Figure 8: Catenary lighting – Source unknown

Lighting Strategy
Lighting Typologies

A distinct night-time character will be achieved through the layering of light.

1. The overall functional lighting throughout will be provided by pole lighting with adjustable heads. The overall typology will be consistent with the approved Sydney Football stadium public domain design and AS1158 Lighting for roads and public spaces, AS 4282 Control of the effects of Obtrusive lighting and City of Sydney Lights.
2. These poles will have a dual functionality in that they can provide gobo lighting and coloured lighting in the form of red, green, blue and white (RGBW) effects to achieve a sense of play through the space. Pole lighting to provide required light levels to sporting areas with dimming ability to allow for dual functionality for events. Poles will light the main thoroughfares and pathways.
3. Low level lighting will be provided via integrated linear lighting to the underside of benches, terraces and integrated within landscaping furniture.
4. Awnings and canopies along the retail and food and beverage areas will be lit either through downlighting or uplighting to awnings.
5. Catenary lighting will be provided through food and beverage areas both for functional lighting and ambience.
6. Low level lighting to feature trees will provide ambience and lighting of vertical elements within the space.
7. Lighting to the pavilion will create a dynamic and multifunctional space, lighting will be integrated with the architecture and have dimming capabilities for flexibility.
8. The lighting will be controlled by extending the Dynalite lighting control system.

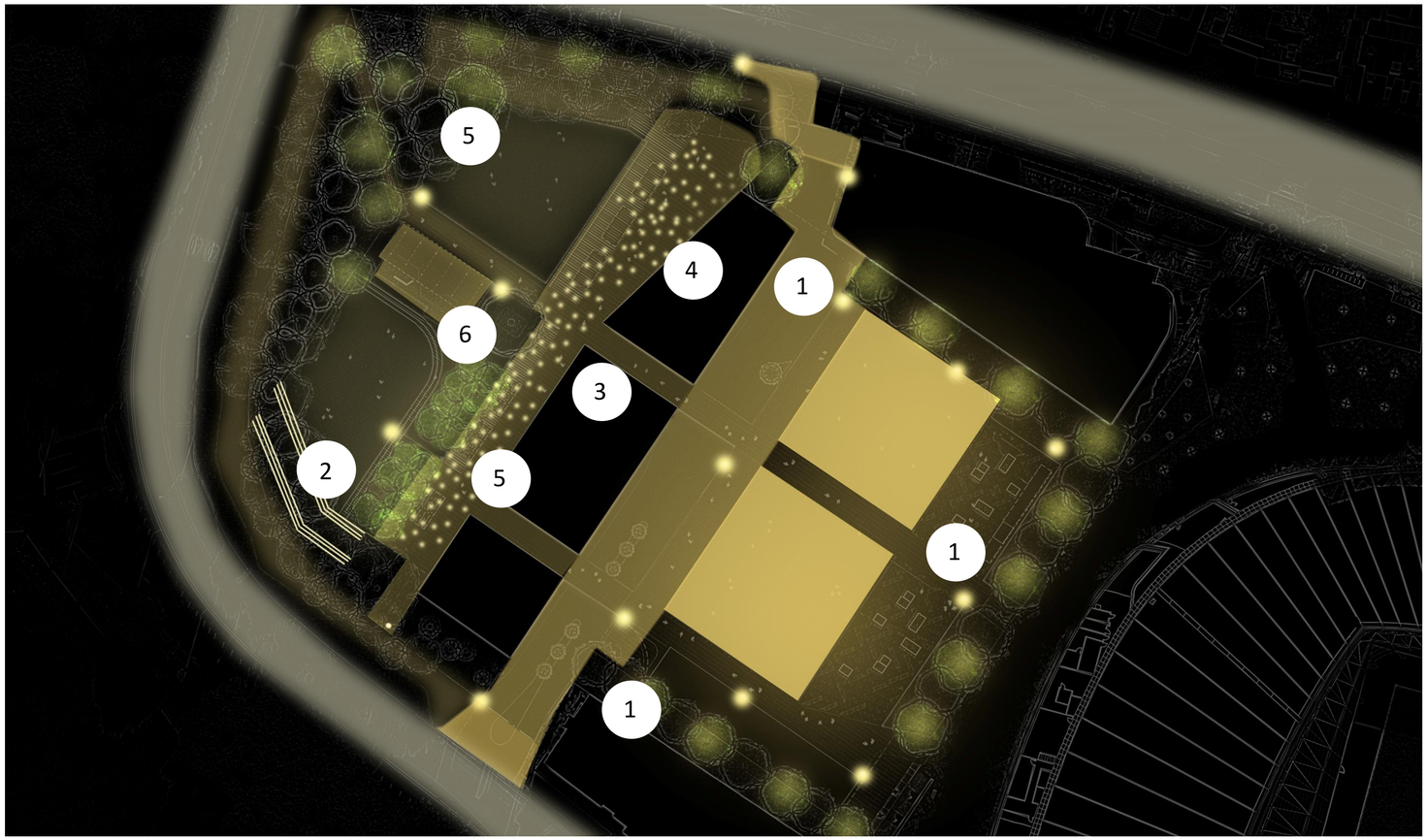

Figure 1: Precinct Village and Car Park Development - Lighting Hierarchy

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Obtrusive Lighting Assessment

Control of Obtrusive effect of outdoor lighting

Light pollution is excessive, misdirected, or obtrusive artificial (usually outdoor) light. Too much light pollution has consequences: it washes out starlight in the night sky, interferes with astronomical research, disrupts ecosystems, has adverse health effects and wastes energy.

The outdoor and carpark lighting will be selected using energy efficient LED's with control shields and lens to control the obtrusive effects of outdoor lighting.
There are no existing residential properties at the immediate site boundaries however the following precautions are recommended:

- Pole top luminaires to have no upward light spill and to have adjustable heads which will be aimed to specific task areas to combat any unwanted light spill, trespass and glare lighting
- Uplighting to trees will be aimed at the tree canopy to minimize upward light spill
- Potential façade lighting to have controlled beam angles and be mounted under awnings to minimize upward light spill
- Low level lighting within furniture for human scale low lighting interventions
- Scene setting, sensor controls and dimmable after curfew hours to further negate potential obtrusive lighting

Lighting designs and models will comply with AS 4282 – Control of Obtrusive Effects of Outdoor lighting. The standard sets out criteria related to the human experience of light and provides criteria for both pre-curfew hours and post curfew hours.

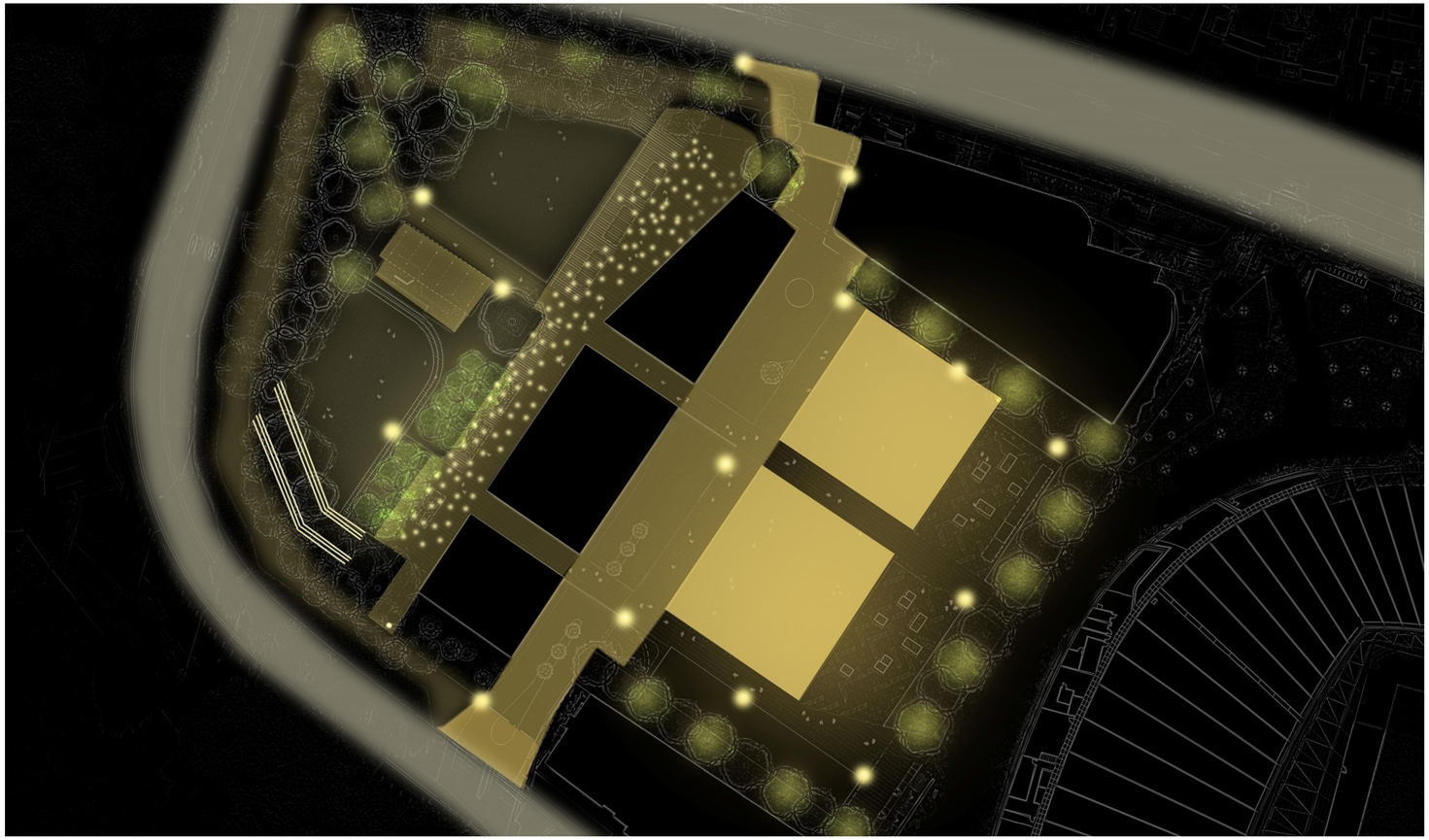

Figure 1: Precinct Village and Car Park Development - Lighting Hierarchy

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Operating Hours **Summary**

1. Event and Activity Types

The Precinct Village is proposed to be curated as a series of distinct, flexible and purpose specific settings for event day patrons and the general public. These inviting public places will offer rich, engaging and shared experiences.

Condition A17 of the SSD 9835 already permits the use of the public domain areas outside the stadium footprint for use by the public for a range of events and activities. These include gathering spaces, organised temporary activities or event days, amenities, circulation purposes and active and passive outdoor recreational activities. The activities and events proposed within the Precinct Village are consistent with those approved under Condition A17.

For the purposes of this Section 4.55(2) modification, the following provides an ***indication*** of how the Precinct Village may be activated on event and non-event days. Consistent with Condition A18, the use of the public domain areas within the Precinct Village on event days will be documented in the Event Management Plan currently under preparation and required to be approved by the Planning Secretary.

Consent for any stand-alone events (particularly on non-event days) that are not captured by Conditions A17 and the Event Management Plan will be subject of a separate future approval.

2. Hours of Operation

The Precinct Village is proposed to be accessible from 8am to 11pm to align with the approved operating hours for the SFS.

The tennis court operating hours are proposed to be the same as the approved operating hours for the Stadium Fitness Facilities.

The car park will be automated, replicating the existing arrangements at the nearby Entertainment Quarter and will be accessible 24 hours a day, 7 days a week.

	Event Days	Non-Event Days
Gathering spaces	• Live site for sold out events to encourage general public to enjoy the atmosphere • Merchandise vans and marquees selling event and team merchandise	• Informal gatherings/picnics by families and small groups • Garden style chairs and umbrellas
Organised temporary activities/events	• Pop up bars/tents/marquees • Mobile vans, ball kicking/hitting zone, etc • Marquees including stand up cash bar, cocktail style functions, or more formal sit down style functions involving internal AV and big screens • Accreditation/Media/Volunteer Centre and Ticket Collection facilities	• Markets and stalls (e.g.: farmers market, book fair, etc)
Amenities and circulation purposes	• Cloaking area for concert and event patrons • Queuing/holding area for concerts allowing patrons who wish to arrive early to secure premium positions (e.g.: front of the stage) to enjoy the Precinct • Potential for public announcements/music	• Potential for public announcements/music
Active and passive outdoor recreational activities	• Tennis court use (organised events)	• Tennis court use including personal training sessions for use by Stadium Fitness Facilities members • Children play, sitting & eating, recreation (kicking footy, etc)

Lighting Categories
Compliance targets

Lighting levels below are for sunset till 11.30pm. After 11pm lighting will dim down to match the level of activity within the Precinct. This lower lighting level will comply with Australian Standards AS1158 Lighting for roads and public spaces as outlined in the SSD approval. NOTE: Lux levels are inline with the Australian standards which is inline with the previous SSDA. Different illuminance levels are nominated to provide different hierarchies of light

Area	Lux level
Village Precinct	PA2 14 lux horizontal 4 lux vertical
Gathering Spaces	PA3 7 lux horizontal 2 lux vertical
Entry ways	20% higher than surrounding light levels for wayfinding
North / South Connection Pathways	PP1 10 lux horizontal 1 lux vertical
Eat Street	PP2 7 lux horizontal 0.3 lux vertical
East / West Connection Pathways	PP3 3 lux horizontal 0.1 lux vertical
Themes / decorative	Colour changing scene lighting – RGBW PA2 14 lux horizontal 4 lux vertical
Sports Lighting	Tennis court – Recreation– PPA – 250 lux

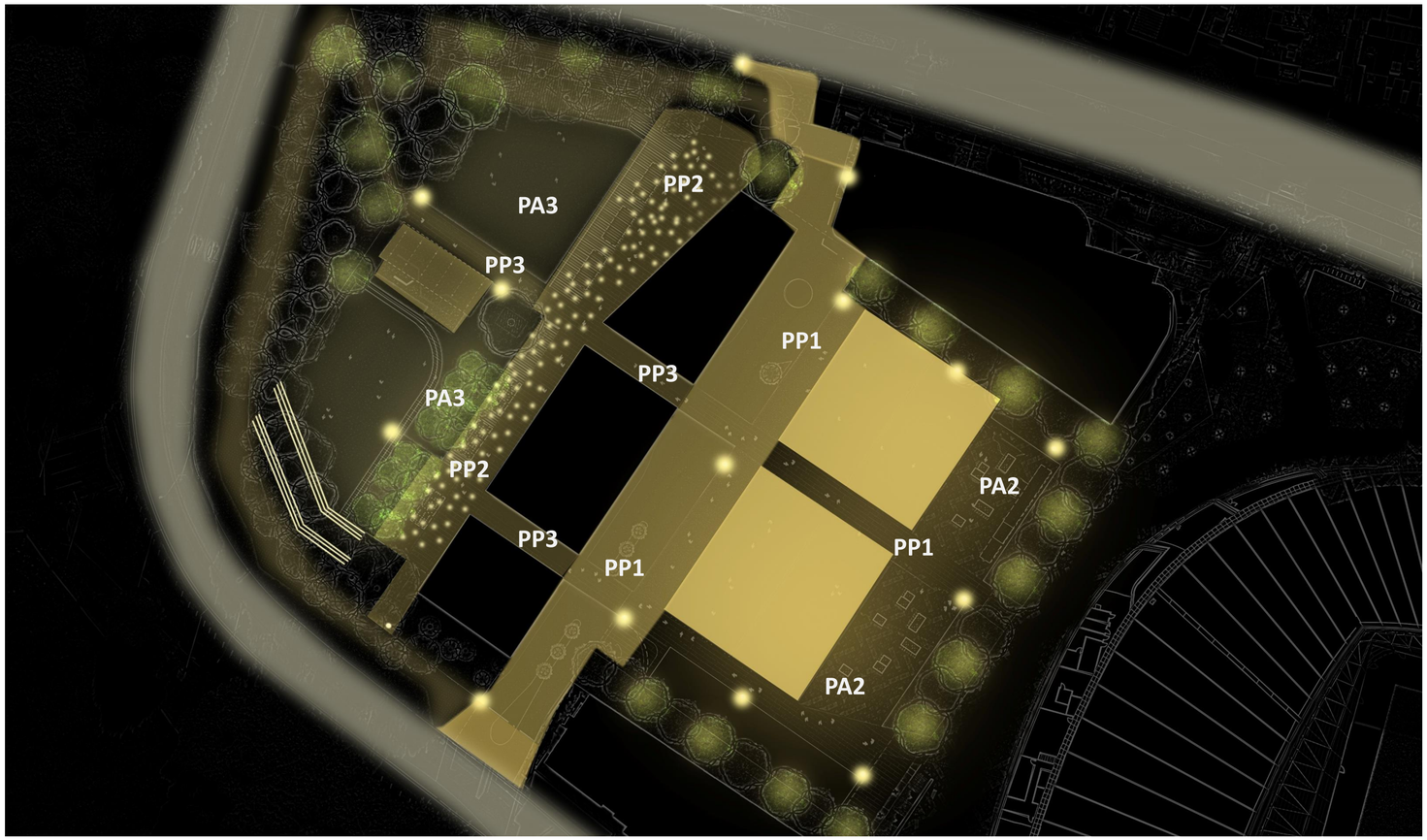

Figure 1: Precinct Village and Car Park Development - Lighting Hierarchy

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Lighting Categories
Scene Setting

Area	Non event mode	Event mode	Themed event mode	After hours mode
Village Precinct	PA2 14 lux horizontal 4 lux vertical	PA2 14lx horizontal 4lux vertical	PA2 14lx horizontal 4lux vertical	PA3 7lx horizontal 2lux vertical
Gathering Spaces	PA3 7 lux horizontal 2 lux vertical	PA3 7 lux horizontal 2 lux vertical	PA3 7 lux horizontal 2 lux vertical	PA3 7 lux horizontal 2 lux vertical
Entry ways	20% higher than surrounding light levels for wayfinding	20% higher than surrounding light levels for wayfinding	20% higher than surrounding light levels for wayfinding	20% higher than surrounding light levels for wayfinding
North / South Connection Pathways	PP1 10 lux horizontal 1 lux vertical	PP1 10lx horizontal 1lux vertical	PP1 10lx horizontal 1lux vertical	PP3 3lx horizontal 0.1lux vertical
Eat Street	PP2 7 lux horizontal 0.3 lux vertical	PP2 7 lux horizontal 0.3 lux vertical	PP2 7 lux horizontal 0.3 lux vertical	PP5 0.85 lux horizontal 0.02 lux vertical
East / West Connection Pathways	PP3 3 lux horizontal 0.1 lux vertical	PP3 3lx horizontal 0.1lux vertical	PP3 3lx horizontal 0.1lux vertical	PP4 1.5 lx horizontal 0.05 lux vertical
Themes / decorative	Colour changing scene lighting – RGBW PA2 14 lux horizontal 4 lux vertical	N/A	Colour changing scene lighting – RGBW PA2 14lx horizontal 4lux vertical	N/A
Sports Lighting	Tennis court – recreation PPA – 250 lux	PA2 14lx horizontal 4lux vertical	PA2 14lx horizontal 4lux vertical	PA3 7lx horizontal 2lux vertical

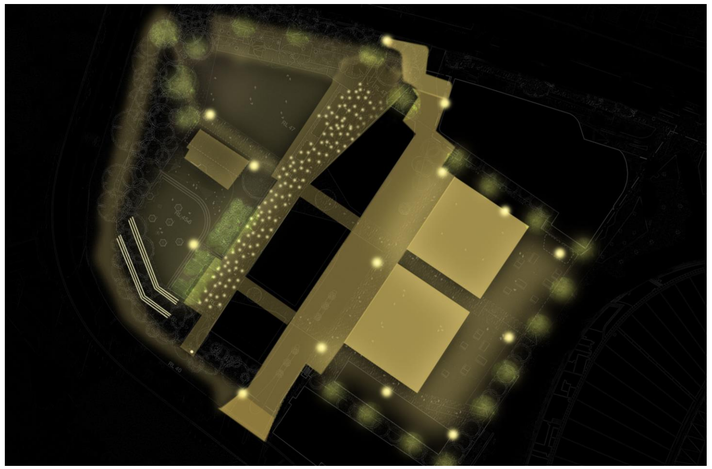

Figure 9: Non Event mode – Sunset to 11.30pm

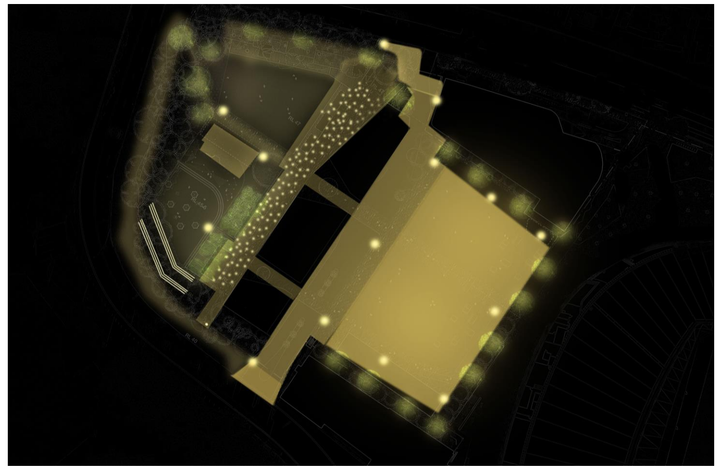

Figure 10: Event mode – Sunset to 11.30pm

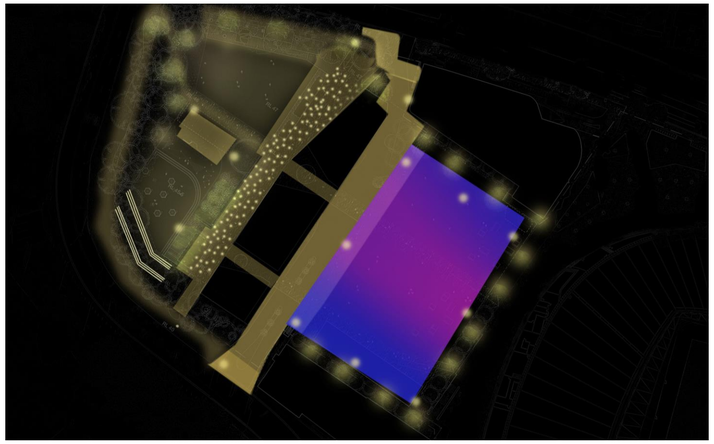

Figure 11: Event mode – Sunset till 11.30pm

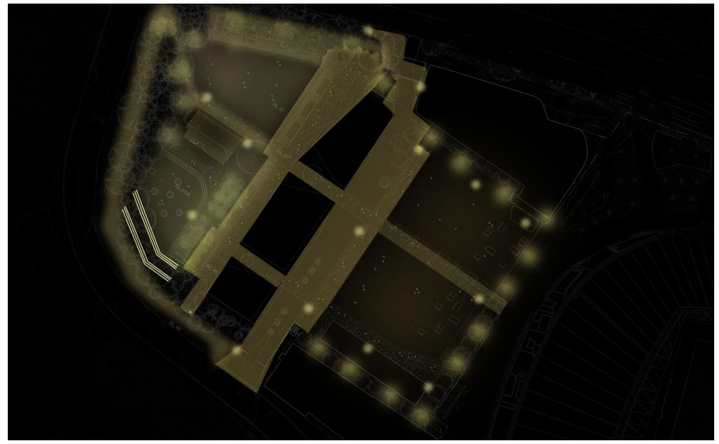

Figure 12: Afterhours mode – 11.30pm onwards

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Lighting Categories
Scene Setting

This approach describes the different activities that we undertake in cities. The purpose is to challenge whether a single lighting state is appropriate throughout the night, or whether it more appropriate to change and adapt our environment to suit the people and functions within a space.

For the Precinct Village and Car Park each of these Shades has a significance. The ‘dusk’, ‘dining out’, ‘cultural events’ & ‘afterhours’ phases are of particular interest given the current intention of food and beverage tenancies to bring people into the Precinct. Furthermore the ‘early risers’ aspect may be important to focus on a considered lighting scheme for an early morning exercise session or commute.

Lighting scenes will be developed with the design team in the next phase of the project to allow for variation throughout the night and year. The scheme will be consistent with the various lighting scenes depicted adjacent.

The lighting control will be managed by the existing Phillips Dynalite lighting control system.

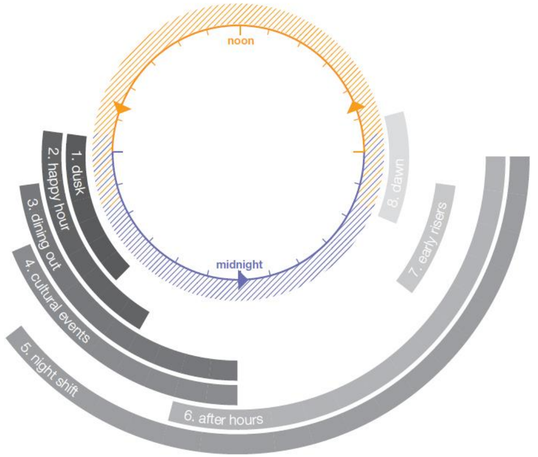

Figure 13: Lighting scene setting timeline

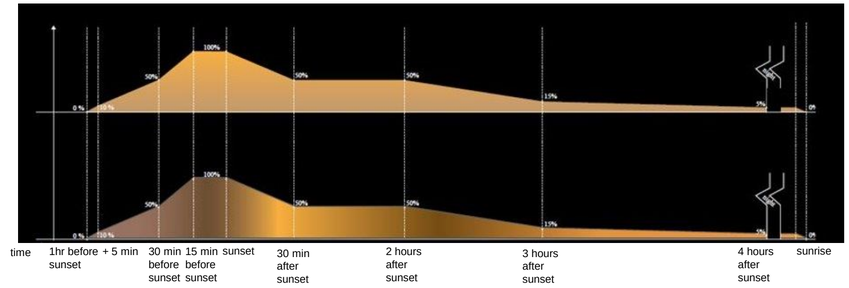

Figure 14: Graph depicting lighting scene setting timeline through the night

Lighting scene to suit different usage through night.

1. Dusk
2. Twilight
3. Dining out
4. Cultural events
5. Night shift
6. After hours
7. Early risers
8. Dawn

Lighting scenes set to reflect different festivals throughout the year.

1. Luna New Year
2. Easter
3. Diwali
4. Cherry Blossom Festival
5. Christmas
6. New Year
7. Sporting events
8. Valentines

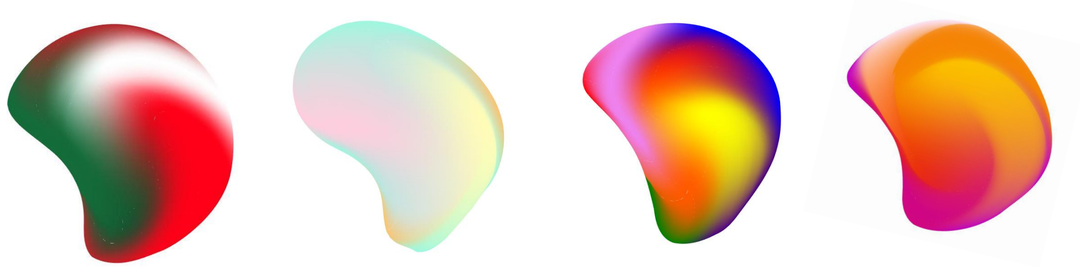

Figure 15: Examples of event scenes to be considered

Concept Design
Precedent images

Figure 16: Source unknown

Figure 17: Source unknown

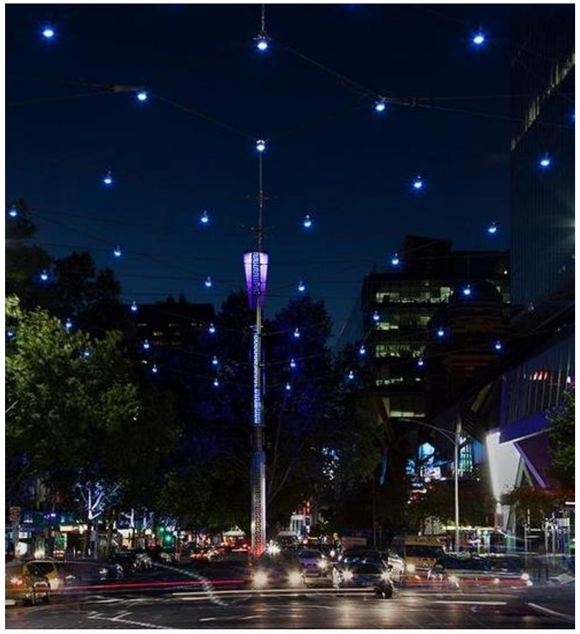

Figure 18: Source unknown

Figure 19: Source unknown

1. Figure 16: Adjustable head lighting to illuminate sports areas
2. Figure 17: Gobo lighting provided by poles to provide sense of play
3. Figure 18: Pole lighting with capability for catenary lighting
4. Figure 19: Zumtobel glowing graphic pole

This concept design aligns with the SFS design

Concept Design
Multipurpose Light Poles

The compliance and pathway lighting will be supplied with multifunctional poles that provide the ability to incorporate WLAN, security solutions, electricity, RGB, projectors, e-mobility charging infrastructure.
These poles will be no higher than 8mtrs in alignment with the poles around the perimeter of the stadium. They will incorporate adjustable shielded spot lighting to illuminate open spaces and footpaths.
The colour temperature will be warm white 3000k to provide a welcoming and warm atmosphere to enhance uses experience.

Control will be via Phillips Dynalite that will allow for scene setting, sensor controls and dimmable after settings fir curfew hours to further negate potential obtrusive lighting.

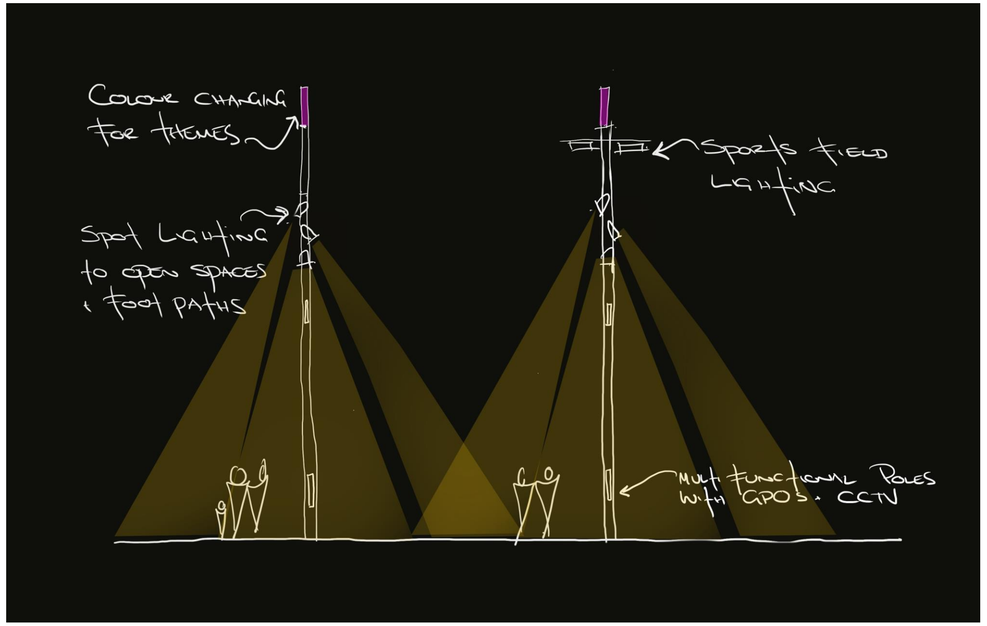

Figure 20: Typical night warm white

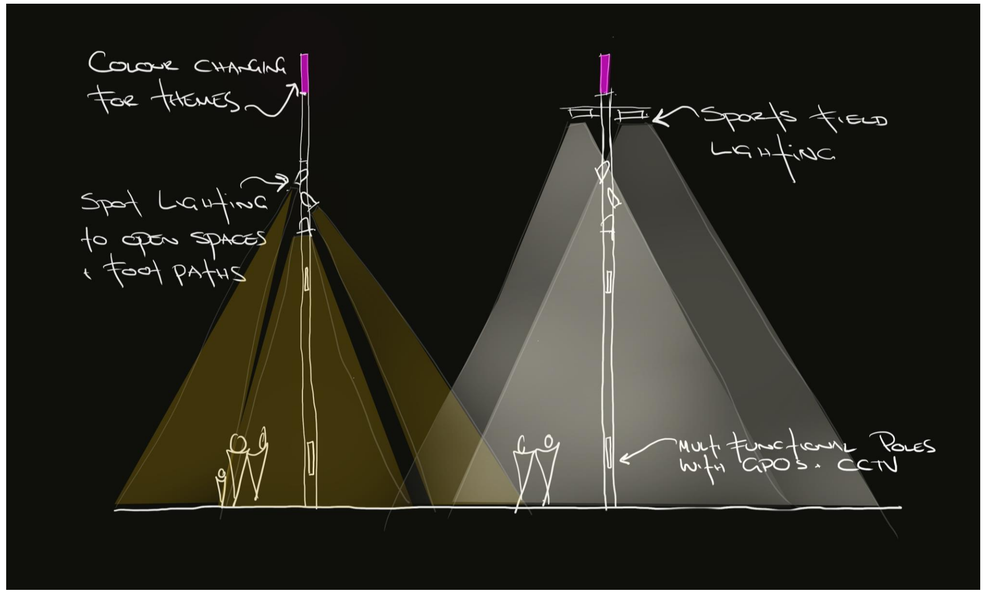

Figure 21: Sports mode - tennis


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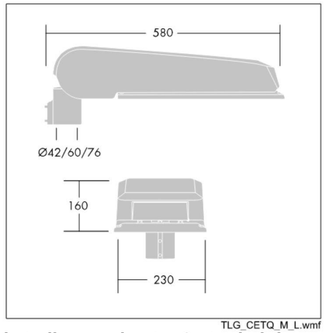

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Figure 22: Zumtobel Pedestrian Pole around stadium perimeter 8mtrs heigh in 4000K

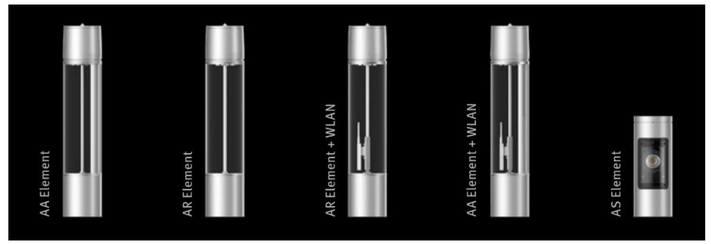

Figure 23: Top element

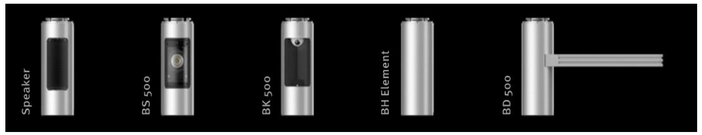

Figure 24: Intermediate element

Figure 25: Bottom element

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Concept Design
Precedent images

1. Figure 26: Uplighting to highlight architectural form of awnings and canopies
2. Figure 27: Edge lighting to hard landscaping
3. Figure 28: Area lighting for carpark and
4. Figure 29: Stand alone catenary style lighting to enhance eat street feel

Figure 26: Source unknown

Figure 27: Source unknown

Figure 28: Source unknown

Figure 29: Source unknown

Lighting Calculations
Functional principles

Lighting renders showing the difference in illuminance levels between PP1 and PP3 lighting categories for pedestrian pathways

Figure 30: Sunset until 11pm - PP1 - 10lx horizontal, 1lux vertical - Uses 26w light fitting with a wide street optic. Luminaires are mounted to 9m high light poles at 10m spacing on both sides of the road. 20 poles used over 100m distance

Figure 31: Afterhours mode or times of low activity within the space - PP3 - 3lx horizontal, 0.1lux vertical - Uses 26w light fitting with a wide street optic. Luminaires are mounted to 9m high light poles at 30m spacing on both sides of the road.8 poles used over 100m distance

Figure 30: Greyscale render – PP1

Figure 31: Greyscale render – PP3

Lighting Calculations
Functional principles

Lighting renders showing the difference in illuminance levels between PP1, PP2 and PP3 lighting categories for pedestrian pathways

Figure 32: PP1 - 10lx horizontal, 1lux vertical
Figure 33: PP2 - 7lx horizontal, 0.3lux vertical
Figure 34: PP3 - 3lx horizontal, 0.1lux vertical

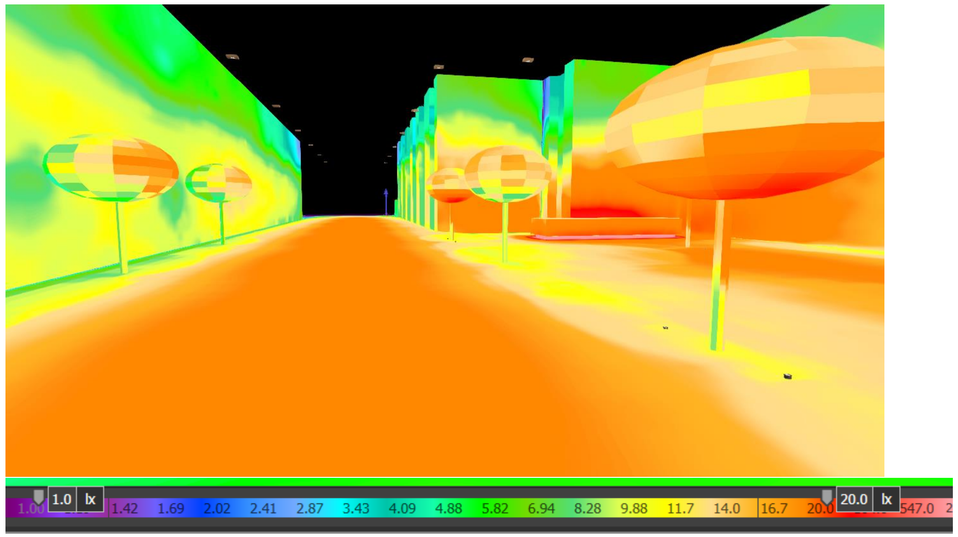

Figure 32: Pseudo colour render – PP1

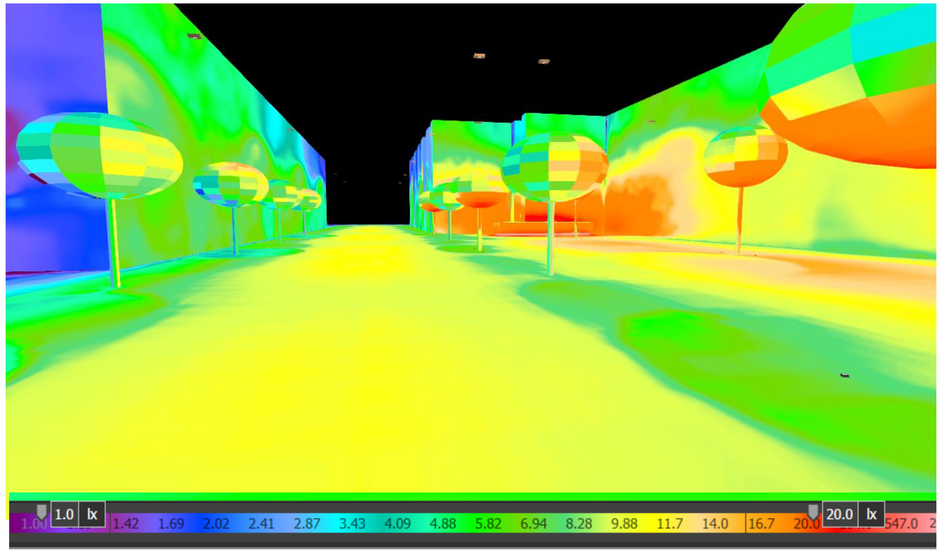

Figure 33: Pseudo colour render – PP2

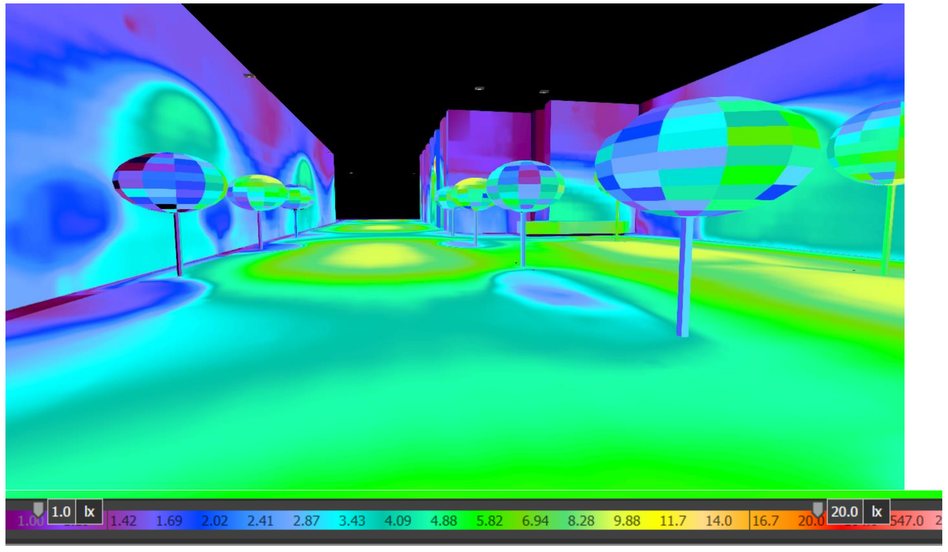

Figure 34: Pseudo colour render – PP3