Sunshine Coast Council

Urban Lighting Master Plan

September 2016 - Version 2, Revision 3

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Document prepared by Citelum Australia

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At Citelum, we strive to help metropolitan areas remain attractive and grow sustainably by carefully balancing economic, societal, cultural, and environmental considerations.

We have installed and managed electrical equipment in cities of all sizes, ranging from small villages to major international hubs. You can see our work on display in Mexico City, Madrid, Barcelona, Paris, Santiago, Prague, Venice, Naples, Shanghai, Vientiane, Beijing, Salvador, and Ho Chi Minh City, London, Australia — just to name a few. And we offer the same high level of service to cities of all sizes worldwide. In 2016, Citelum manages more than 2.5 million lighting point for 1000 cities.

About this document

This Urban Lighting Master Plan (ULMP) details the plans and strategies for street lighting only. It sets the overall design intent to deliver a smart, efficient and environmental public lighting network.

Other public lighting asset categories are planned to be addressed at later stages through similar design methodologies:

- Security Lighting around buildings,
- Parks and Garden Lighting,
- Sports Lighting ,
- Public recreation areas,
- Artistic Sculptural Lighting.

Quotes, pictures and testimony reproduced in this document have all received permission from the relevant persons.

Version history

Date	Comment
July 22nd 2016	Submission of ULMP v2
August 17th 2016	Submission of ULMP v2 rev. 1, based on Council's comments
August 31st 2016	Submission of ULMP v2 rev. 2, based on Council's comments
September 26th 2016	Submission of ULMP v2 rev. 3, including modifications on the Sociological Survey

Approval:
Endorsed by the Sunshine Coast Council on 15th Septembre 2016

Document references

Sunshine Coast Planning Scheme 2014 (March 2016 edition)
Sunshine Coast Corporate Plan 2014-2019 (July 2015 edition)
Sunshine Coast Social Strategy 2015 (June edition)
Energy Transition Plan 2010-2020 (December 2010)
Climate Change and Peak Oil Strategy 2010-2020 (2010 edition)
Population and Household Forecasts fact sheet 2011-2026 (October 2015 edition)
UN Single Species Action Plan for the Loggerhead Turtle (UNEP/CMS/COP11/Doc.23.2.2/Rev.1/Annex 2)
Crime Prevention through Environmental Design, Queensland — Part A & B (October 2007 edition)


LOADING
ZONE

Part 1 Introduction

View of Bulcock street at night in Caloundra

Introduction

Executive summary

In late 2011, Sunshine Coast Council (Council) endorsed the Public Lighting Management Plan and approved the calling for expressions of interest for Public Lighting Services (OM11/252).

Public Lighting has been identified as a key service that will help Council deliver strategic objectives relating to climate change and energy, as outlined in Council's Energy Transition Plan (Action 3.8) and the Climate Change and Peak Oil Strategy.

An expression of interest was considered effective to access market opportunities and enable Council to explore and assess alternatives to business as usual, with an end goal of achieving financial savings whilst considering energy efficiency, maintenance, asset management and lighting amenity.

Submissions were received from companies ranging from small local companies to engineering consultants, consortiums based around multinational lighting manufacturers and public lighting management service companies. Contracting models ranged from traditional service delivery models to energy performance contracts.

Objectives

Council entered into a Public Lighting Services Contract (1112021) with Citelum in October 2013. The contract aims at delivering improved public lighting outcomes, including improved energy efficiency and reduced ongoing costs through the use of new technologies.

In addition to those benefits, street lighting also represents a key platform that enables the project economics to potentially provide smart city services to residents and businesses.

Outcomes

Public lighting can be used as the foundation to the introduction of smart technologies that could add value for residents by providing new services, for example traffic flow monitoring, weather monitoring, Closed-Circuit Television (CCTV), parking sensors and Wi-Fi to support other infrastructure and services. The smart city framework provides a real opportunity to increase the operational efficiency of Council's service delivery. There is an opportunity to include broader considerations for lighting of the public realm (for example celebratory public art and feature / ornamental lighting).

The Urban Lighting Masterplan (ULMP) sets the vision for public lighting for Council to support its objective to be the most sustainable region in Australia; vibrant, green and diverse.

Council seeks to implement the ULMP by acquiring the existing street lighting network from the Distribution Network Services Provider (DNSP) and assume responsibility for providing street lighting within the Sunshine Coast Local Government area.

Colour changing lighting in Nambour

Lighting on Mooloolaba Beach boardwalk

Vision

Vibrant

To have the most vibrant public lighting network in Australia, we must incorporate innovation and technology into urban spaces that create new and enhance existing visitor and resident services. We must incorporate smart city technologies that reduce costs and make new services more readily available and we must be able to enhance the urban environment with quality lighting outcomes that improve tourism and lifestyle of residents throughout the region. We must do this in a cost effective way, reducing the financial risk to Council, and also provide guarantees for the performance of the public lighting.

Green

Green by itself means nothing, but when accompanied by a statement to be the most sustainable region in Australia, the public lighting service must not only be energy efficient, but it must consider the way in which public lighting affects the environment.

As highlighted in Council's Climate Change and Peak Oil Strategy, public lighting represents more than 4% of Council's carbon emissions and defining the measures to deliver a smart and efficient public lighting network will help reduce the share of public lighting in Council's carbon emissions.

Where the application of Australian Standards is absent on these measures, it is proposed through a combination of international best practice and model guidelines to propose an environmental lighting overlay plan across the entire region. This overlay will guide property developers, sporting clubs and their associated lighting designers to provide public lighting that is both energy efficient, smart and sensitive to the environment; supporting the region's nesting turtle population and respecting other natural habitats.

Direct benefits will be delivered to citizens, such as reduced light spillage and conditiontion improvements to existing observatories. It will also reinforce the region's smart city objective by encouraging designed outcomes set to the highest levels.

The environmental footprint of the public lighting operations will be measured against the highest standards. Consideration must also be given to what materials are used, how they were made, how long they last and how they can be recycled back into their original form with the least amount of energy. Council's authorised operator will, where possible, purchase its equipment and resources locally thereby assisting the economic development of the region.

Diverse

Diversity recognises that on the Sunshine Coast, there are special public spaces, places to live, places to reconnect with people and the environment and that a public lighting service must respect each area for its unique urban form.

Council's Place Making Charter identifies and protects the Coast's character and identity as a "community of communities" and uses Place Making principles to help retain the unique identity and diversity amongst each of the Coast's centres and communities.

Council's authorised operator will place sustainable development in all of its forms—economic, societal, cultural, and environmental—at the heart of systems and services, in accordance with Council's strategies.

Business as usual

Paying your electricity bill in Australia is a complex transaction. Many different companies are involved in the transaction and they include the following:

- Power Generation Companies;
- Transmission Network Companies;
- Poles and Wires Company (DNSP);
- Energy Retailing Companies.
- Australian Energy Market Operator

Public lighting in Australia to date has been provided by the DNSP. Public lighting services are classified as an essential service and constitute approximately 2% of the energy network provider's total revenue. The business model for the DNSP is recalculated every 5 years by the Australian Energy Regulator (AER), an arm of the Australian Competition and Consumer Commission.

Every 5 years the DNSP must forecast to the AER how much money it is going to spend on replacing, extending and maintaining the public lighting network. Unfortunately, the service, maintenance and ongoing capital charges imposed substantially exceed some of the rates that Council could obtain from a competitive market. It is also difficult

for Council to adopt any technology change or improvement, as the DNSP must recoup their investment.

The existing public lighting network is ageing and Council faces decisions into the future on how the network can be replaced:

1. Allow the DNSP to replace streetlights at regulated costs. In the current AER determination, the allocated capital costs appear to exceed competitive market alternatives. The choice of efficient lighting equipment is limited and the ability for Council to deploy smart city technology is currently not available.
2. Transfer Ownership of streetlights to Council. Council will be the only government authority next to the ACT Government to retain ownership of public lighting. Retaining ownership gives Council control of the asset and therefore the type of lighting it provides for the network and community, and to take advantage of smart city opportunities. With assistance from the Operator, Council wishes to transfer the public lighting assets from the DNSP to Council.

Cost of public lighting

Under existing arrangements, Council's expenditure on public lighting represents 55% of its annual electricity spend. Of that share, more than 84% is spent on network charges which consists of electricity provision charges and street light service charges. Street light service charges alone will cost Council 63% of the total public lighting budget and this involves the provision, construction and maintenance of street lighting assets, so clearly reviewing Council's arrangement for the provision of street light services offers the greatest scope for significant savings.

Following an analysis that highlighted a significant increase in public lighting expenditure over the next few years, Council has identified an opportunity to deliver better public lighting to the community whilst reducing its ongoing cost relating to energy, maintenance and management.

As a result, in September 2011, Council called for expressions of interest for a strategic approach to public lighting management that encompassed:

- Whole of Life Considerations
- Focus on Maintenance
- Focus on Energy Efficiency
- Innovative Services that deliver a lower total cost of ownership to Council
- Transfer the public lighting assets to Council ownership
- Improvement to Lighting Amenity.

The contract with the Operator was signed in October 2013. Its methodology will provide guaranteed savings and those savings can be directed to fund new public lighting and smart infrastructure works.

Council conducted a comprehensive investigation into its public lighting including a physical audit of all public lighting assets, to provide a good understanding of the current network.

As outlined in the Population and Household Forecasts fact sheet 2011-2026, Council forecasts that the population will reach 380,649 people in the Region by 2026, with resultant requirement for increases in the street lighting numbers, which will continue to increase over time. This will also affect both capital and operations costs for public lighting.

Smart City framework & Smart Lighting

Technologies have emerged that allow cities to improve the management of their infrastructure and optimise operational costs of services delivered to the community. On September 15th 2015, Council launched its Smart City Framework (SCF), outlining the services that would benefit from the use of smart technologies.

Public lighting is highlighted in the SCF as a potential major facilitator of the smart network, laying the foundation for other smart city services to be deployed region-wide using the lighting infrastructure.

Improved visual perception

Adopting CPTED design principles, combined with the lighting strategy's recommendations on exceeding the minimum requirements, will allow Council to deliver an improved visual perception of public lighting throughout the Region.

This enables lighting levels and associated energy costs to be kept to a minimum whilst improving public safety and addressing the needs raised by the public during the sociological survey.

Nesting Turtle map

In 2014, the International Convention for Migratory Species (acting under the United Nations Environment Program) endorsed a Single Species Action Plan for the Loggerhead Turtle (South pacific genetic stock).

Delegates from the signatory states visited the Sunshine Coast during their deliberations on the plan, due to the coasts importance as a future refuge for Loggerhead turtle and made a number of recommendations in relation to lighting on the Sunshine Coast.

Sea turtle

Hatchling making for the sea

Most sustainable Region in Australia

Council sets a bold vision for its future; to be the most sustainable region in Australia – vibrant, green and diverse. The objective of the ULMP is to provide Council with an innovative approach to public lighting that will assist in delivering this strategy, through the upgrade of the existing lighting network to the first smart lighting network in Australia.

Smart City Network

With the release of its SCF, Council confirms its position as one of the most innovative Council's in Australia. The SCF outlines the major benefits of deploying smart technologies across a range of services, including public lighting which can represent the foundation of a smart city network.

Whilst the focus of the smart public lighting network upgrade described in the present document will remain on lighting, one major objective is to deliver technologies in line with the SCF, to assist Council in delivering smart city services.

Most efficient public lighting network

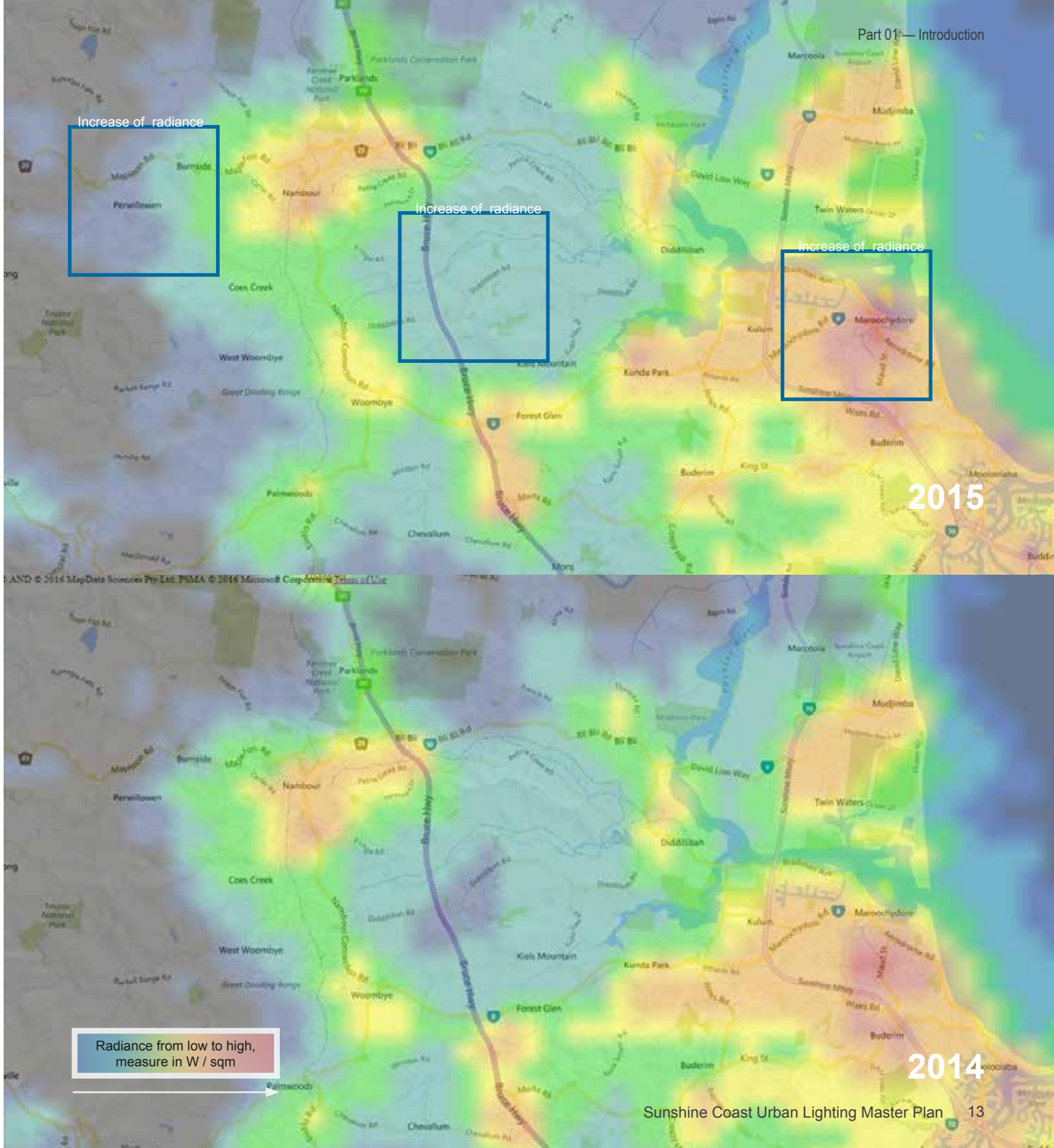
The foundation of the public lighting network upgrade detailed in this document lies in the savings achieved through the use of smart, energy efficient lighting solutions. Firstly through major energy savings and operational costs reduction, and as part of the other benefits outlined in the SCF.

In addition to delivering significant savings, the new public lighting network will improve visibility and safety on the roads, with the use of current lighting technologies compared with the legacy assets.

Mercury vapour lamps account for 60% of the street lights in the region with high pressure sodium lamps being used in a further 37% of the lights. Mercury vapour lamps are now globally obsolete with the EU ban effective from 2015. Upgrading the lamps used to current standard lighting such as LEDs will allow Council to address sustainability and efficiency targets as well as reducing cost.

The ULMP has the potential to reduce environmental impacts in terms of light pollution, carbon emissions and mercury.

The rich ecosystem present on the Sunshine Coast is one of its most important features; it is treasured and protected by Council's vision and environmental policies, and public lighting has to be designed to ensure the preservation of this ecosystem, specifically in relation to the numerous turtle nesting beaches in the region.



Top map: skyglow map 2015, bottom map: skyglow map 2014. The sqaures show a selection of areas displaying increase in the level of skyglow

Source: www.lightpollutionmap.info

History of the Sunshine Coast

The Sunshine Coast region and its natural resources have been an integral component in the continuing spiritual and physical relationship that the aboriginal population have maintained with the district for as many as 20,000 years.

There is a strong connection to the environment throughout the Sunshine Coast, and it is evident in the aboriginal names of the localities and their environmental and historical connection throughout the region.

Whether derived from an indigenous word to describe a possum, a snake, bird or tree, this cultural connection to the environment supports the current vision of Council to be the most sustainable region in Australia – vibrant, green and diverse.

Pictures representing the history of the Sunshine Coast: Aboriginal people, old horse coach and passengers; railroad track pictures; an old picture of Beerwah; old hotel and building; Callistemon-viminalis.

Sociological survey

Public lighting is a service provided by Council to the community. As such, it needs to take into account the comments and concerns of the community, by way of in-field survey.

In February 2014 Citelum conducted an in-field survey seeking comments from the public, businesses and visitors to describe their feelings about public lighting, and how they felt about: successful lighting, locations needing improvement or new lighting, or where lighting is obtrusive.

The survey was conducted on the streets of a few busy areas of the Sunshine Coast, including Maroochydore, Mooloolaba, Caloundra, Nambour, Coolum Beach, Sippy Downs and Beerwah.

Participants were asked the state and suburb of residence as well as the purpose of their visit in the area of the site surveyed, in order to categorise them as local residents or visitors (e.g. visiting for leisure or business).

188 people were interviewed and the outcomes from these interviews are expressed, by locality, in this section.

These are the views of the individuals interviewed and not necessarily that of the local community, the broader region or Sunshine Coast Council. As the survey was undertaken in early 2014 some of the individual observations may now be out of date due to on-going infrastructure development.

Maroochydore

Maroochydore is perceived as being a safe, family orientated neighbourhood. During the in-field survey, Ocean Street Car Parks were mentioned a number of times and, upon investigation, some opportunities to improve the lighting of access ways through to the car parks were indicated.

Key observations

(a) Focus on identifying the river at night. This natural feature is unique to Maroochydore.

(b) Implement lighting at Picnic Point and create a link down through Duporth Avenue towards Ocean Street. This would create a significant night time walk from Picnic Point down through to Cotton Tree Park.

(c) Note the redevelopment of Big Top Shopping Centre will revitalize the surrounding area. There will be a subsequent need to improve lighting in areas connecting the shopping centre to car parks or walking tracks.

(d) Research the refurbishment of Ocean Street and determine whether ancillary lighting improvements will be required.

(e) Further investigate the north and south bank of Cornmeal Creek between Duporth Avenue and Horton Parade. Fix existing lighting and potentially improve lighting type.

(f) Implement new lighting infrastructure over the basketball courts located beside the Cotton Tree Olympic Swimming Pool. Consideration will have to be given to excess noise from night time activity affecting properties fronting the courts.

Mooloolaba & Alexandra Headlands

The Esplanade shops and restaurants are highly regarded amongst residents and tourists. Most people had something good to say about the Esplanade area at night and appreciated how well it was lit.

Key observations

(a) Investigate the lighting along main connector streets into Mooloolaba CBD and upgrade as necessary to ensure safe connections from car parks and inner residential areas.

(b) Repair/upgrade the path lighting between Alexandra Surf Club and Mooloolaba Esplanade.

(c) Improve lighting along the main coastal path between Mooloolaba Surf Club through to the Spit.

(d) Focus on providing appropriate lighting along the boardwalk section of the path, between Mooloolaba Surf Club and Urunga Esplanade.

(e) It must provide a safe environment for pedestrians to enjoy the popular walk in the evening whilst also respecting the adjacent caravan park residents.

(f) Implement small scale lighting improvements along the Mooloolaba beach front area which might allow for the wider

appropriation of the area at night and the utilisation of existing lighting infrastructure.

(g) Implement appropriate lighting in Alexandra Hill Park to allow the park to be used in the evening.

Nambour

Participants suggested that better lighting was required around the access ways to the train station from the car park and, in particular, the underpass. These areas are also currently considered to be unsafe by participants due the lack of lighting.

Key observations

(a) Investigate the prominent access paths to the train station and design appropriate lighting to provide for these paths. Particularly focus on the lighting type for the train station underpass to ensure appropriate crime prevention and safety measures are implemented.

(b) Access through and to Quota Park be upgraded to consider effective lighting and Crime Prevention Through Environmental Design (CPTED) to improve pedestrian safety and perception of safety.

(c) Consider the upgrade of existing lighting in and around Petrie Park. This includes both street lighting and path lighting.

(d) Improve lighting in Quota Park to extend park activities into the evening — this should be considered in conjunction with recommendation (b).

Sippy Downs

The system of lakes running between the shopping complex and Claymore Road was proposed as a site for improved path lighting by the participants.

The overwhelming consensus of the participants was there are no particular places within Sippy Downs that people feel comfortable to call a ‘good lighting example.’

Key observations

(a) Investigate the pedestrian path running through the lakes system between the shopping centre and Claymore Road. Strategically locate new lighting to increase the path usage at night.

(b) Investigate the quality of the current lighting along the path between Varsityview Court and the University of the Sunshine Coast, and between Scholars Drive and the University.

(c) Investigate opportunities to improve lighting on high use pedestrian links

Beerwah

Beerwah was perceived by participants as a quiet, simple, country town.

Although there was not much interest from participants in activating the township at night, there was some desire from the participants to improve lighting around the car parking, particularly near the post office and to improve lighting around public amenities.

Key observations

(a) Investigate current lighting effectiveness at the intersection of Old Gympie Road and Peachester Road. Also consider the proximity of the Beerwah State School and how it might benefit from improved lighting in this area.

Participants to the community consultation

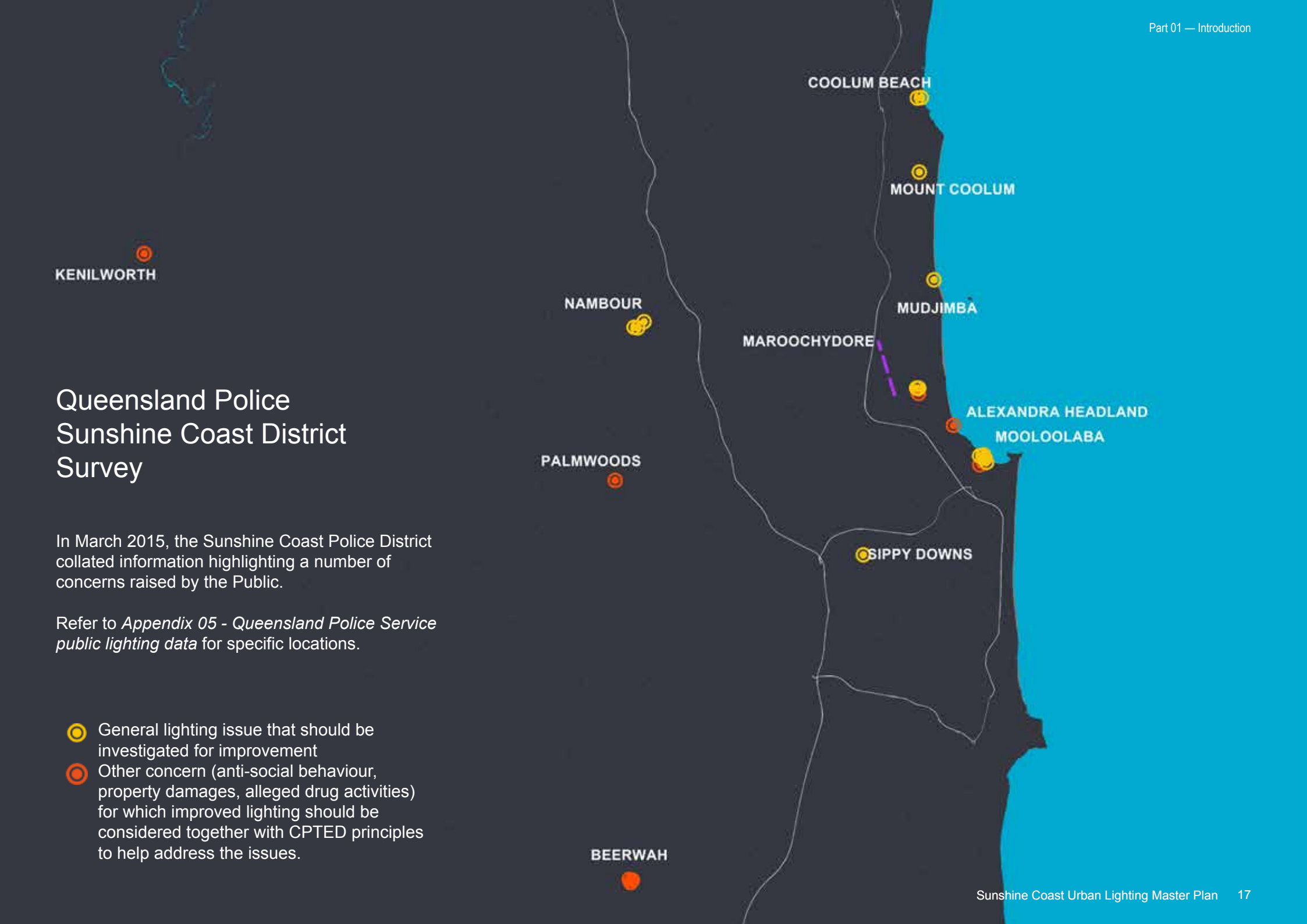
Participants to the community consultation

Participants to the community consultation

Queensland Police Sunshine Coast District Survey

In March 2015, the Sunshine Coast Police District collated information highlighting a number of concerns raised by the Public.

Refer to *Appendix 05 - Queensland Police Service public lighting data* for specific locations.



- General lighting issue that should be investigated for improvement
- Other concern (anti-social behaviour, property damages, alleged drug activities) for which improved lighting should be considered together with CPTED principles to help address the issues.

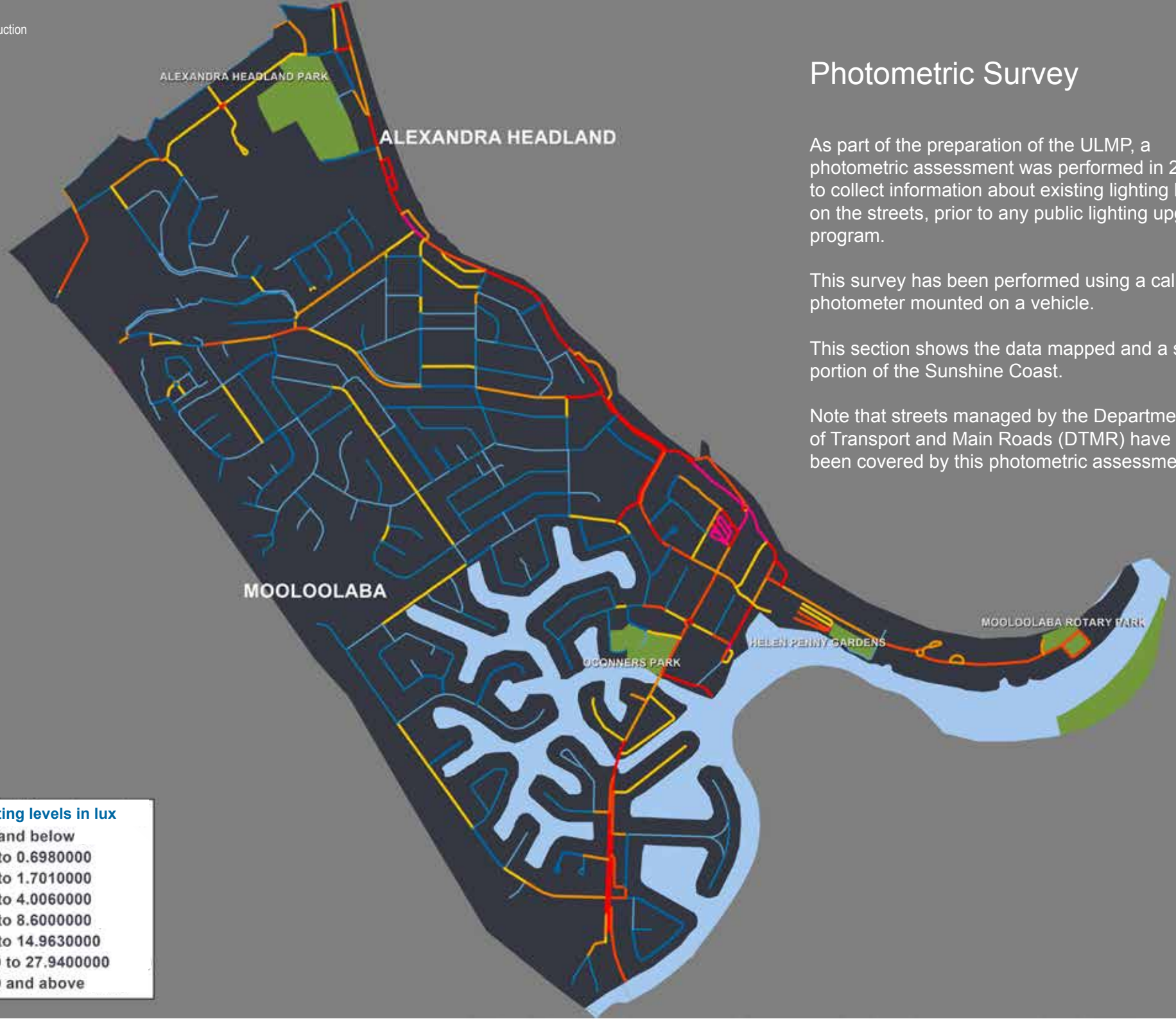
Photometric Survey

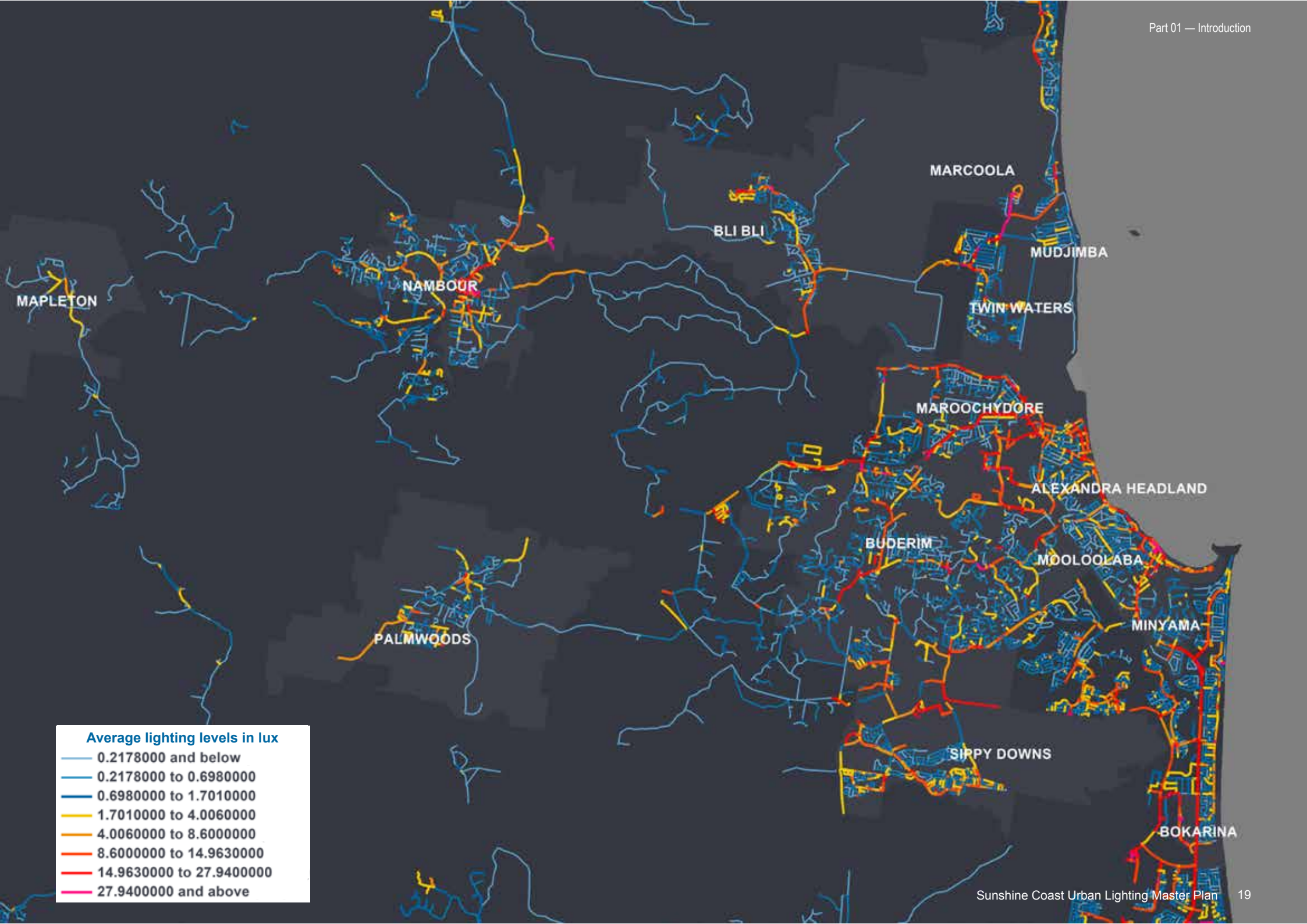
As part of the preparation of the ULMP, a photometric assessment was performed in 2014 to collect information about existing lighting levels on the streets, prior to any public lighting upgrade program.

This survey has been performed using a calibrated photometer mounted on a vehicle.

This section shows the data mapped and a select portion of the Sunshine Coast.

Note that streets managed by the Department of Transport and Main Roads (DTMR) have also been covered by this photometric assessment.




MARCOOLA
BLI BLI
MUDJIMBA
NAMBOUR
MAPLETON
TWIN WATERS
MAROOCHYDORE
ALEXANDRA HEADLAND
BUDERIM
MOOLOOLABA
MINYAMA
PALMWOODS
SIPPY DOWNS
BOKARINA
Average lighting levels in lux
0.2178000 and below
0.2178000 to 0.6980000
0.6980000 to 1.7010000
1.7010000 to 4.0060000
4.0060000 to 8.6000000
8.6000000 to 14.9630000
14.9630000 to 27.9400000
27.9400000 and above

Part 2 Audit Key findings

Council / DTMR
Lighting technologies
Rates
Age
Risks
Transfer of assets

Audit key findings

An audit of public lighting assets on the Sunshine Coast was undertaken between December 2013 and February 2014.

The purpose of the audit was to collect crucial information regarding the quantity, composition and condition of public lighting assets installed on the roads under Council's responsibility. An audit report presenting and analysing the data compiled is available in *Appendix 2 – Audit Report*.

Ownership

Pre-audit selection

The dataset provided by Council for the purpose of the public lighting audit performed in November 2013 contained 34,467 lamps, as it included assets from Noosa Shire and Department of Transport and Main Roads (DTMR). Those assets not within the scope of the audit were removed, based on available asset ownership information and administrative boundaries of the Noosa Shire.

The DTMR assets in the initial dataset were identified to delineate responsibilities within common DNSP ownership in the region.

After removing those assets and performing the audit, the number of assets recorded as of March 2014 was 25,011 lamps, on which the audit report is based. The overall lighting network continues to expand and as such there will exist new assets that have been created since the audit was undertaken. As at 30th June 2016, the overall number of assets is 25,962 – based on data received from energy retailer and Council's customer code.

Council assets on DTMR roads

A methodology has been created to identify physical areas within the region where there is an overlap of Council responsibility and state government responsibility for lighting that area, to liaise with, and transfer responsibility for lighting that area to the appropriate state government department.

To identify assets in those areas, a map of the state controlled roads has been overlaid on the region maps, and assets lighting those roads have been highlighted. It is likely that Council has been paying for maintenance and energy on those assets for as long as they have been installed, although it may not have been Council's responsibility. Identifying those assets and removing them from Council's scope of responsibility represents, potentially, a significant portion of savings compared with Council's business as usual costs.

Due to the complexity of lighting responsibility divisions in such situations, assets identified as representing a potential overlap in responsibility will need to be queried to potentially achieve the savings.

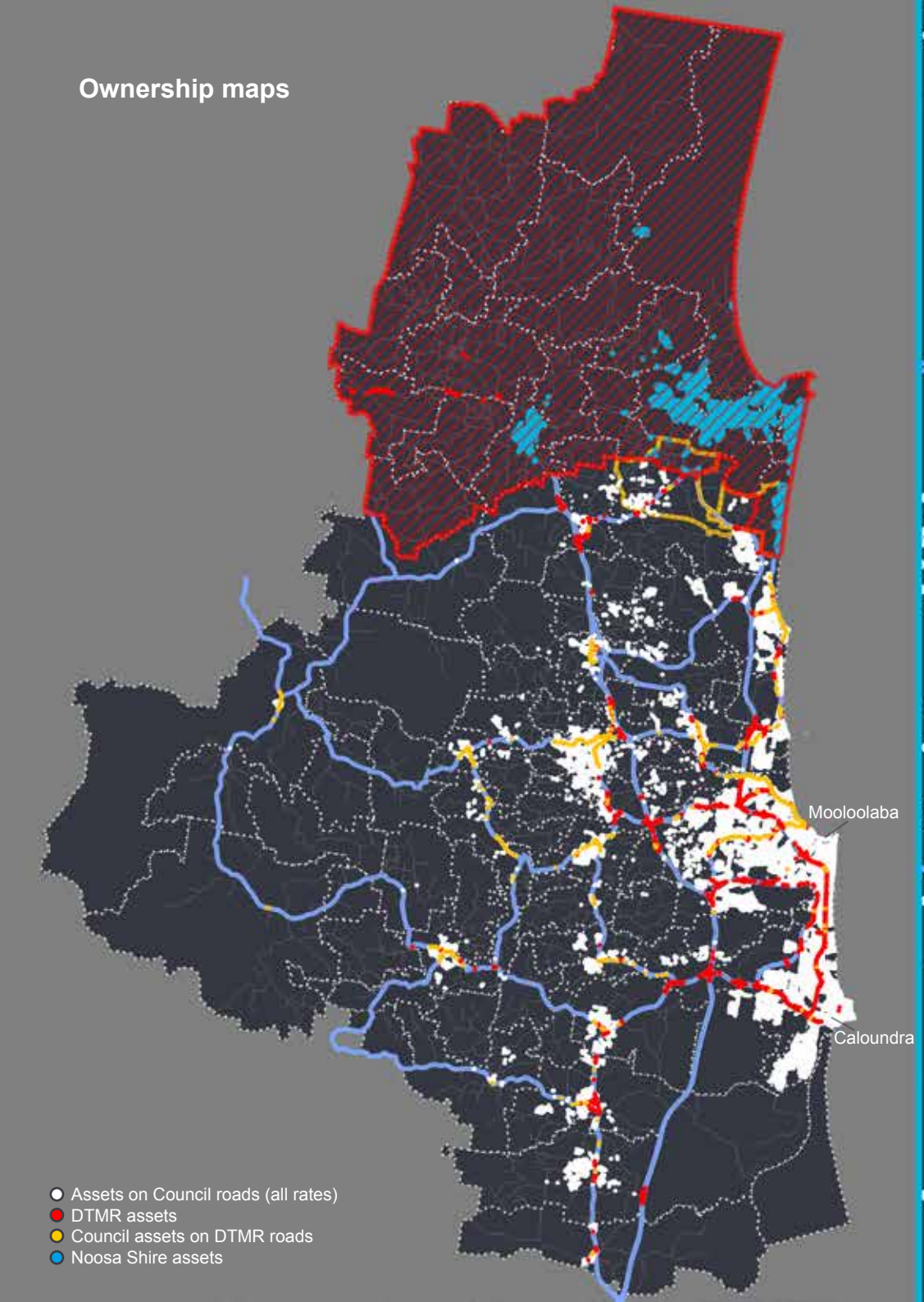
Ownership maps

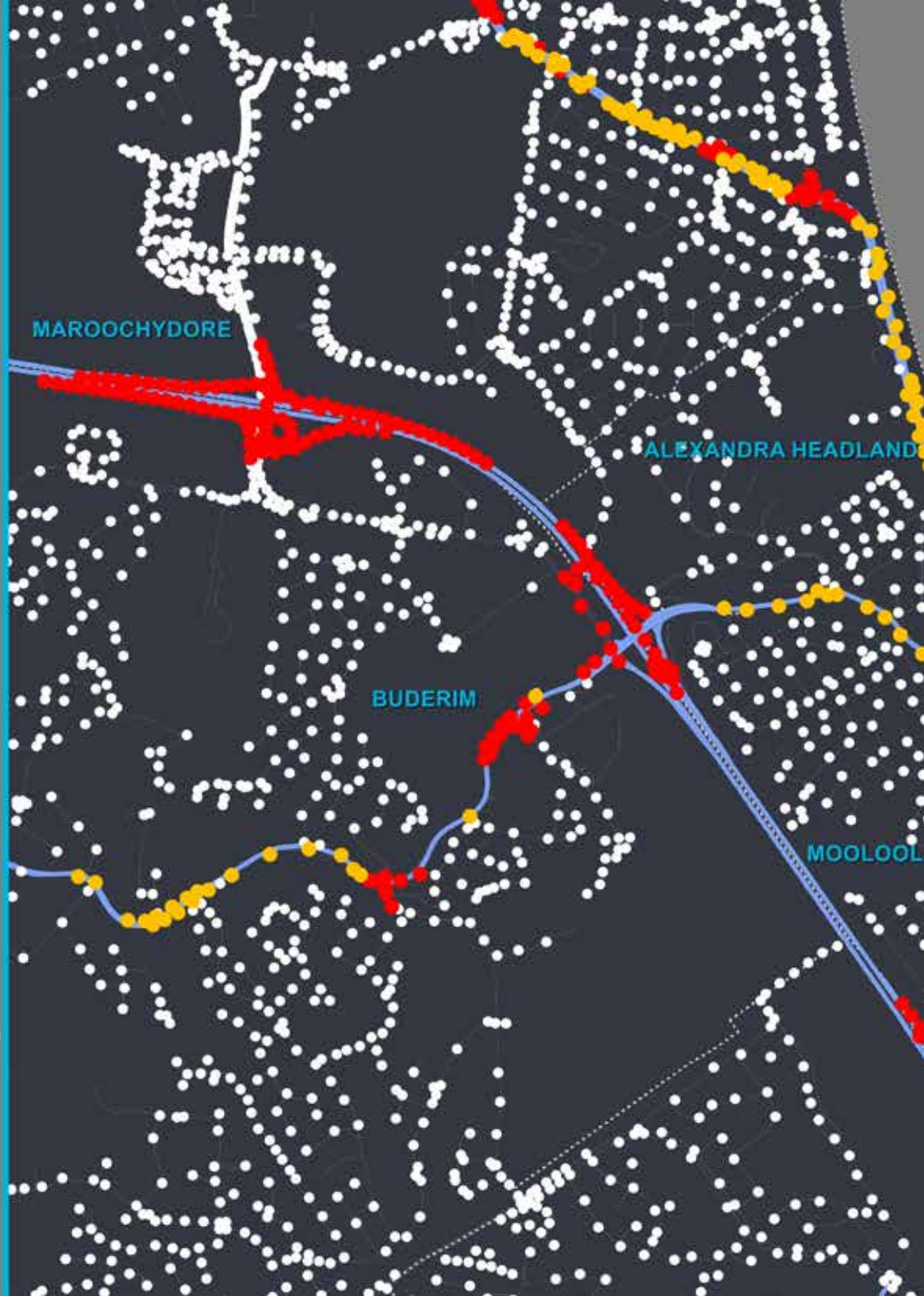
The ownership maps show the different types of assets, as follows:

- Sunshine Coast Council assets, all rates combined;
- DTMR assets (from the dataset provided by Council);
- Assets paid for by Council (maintenance and energy) on DTMR roads;
- Noosa Shire assets in the red shaded area.

The blue lines are the State controlled roads; the red area represents Noosa Shire.

Ownership maps



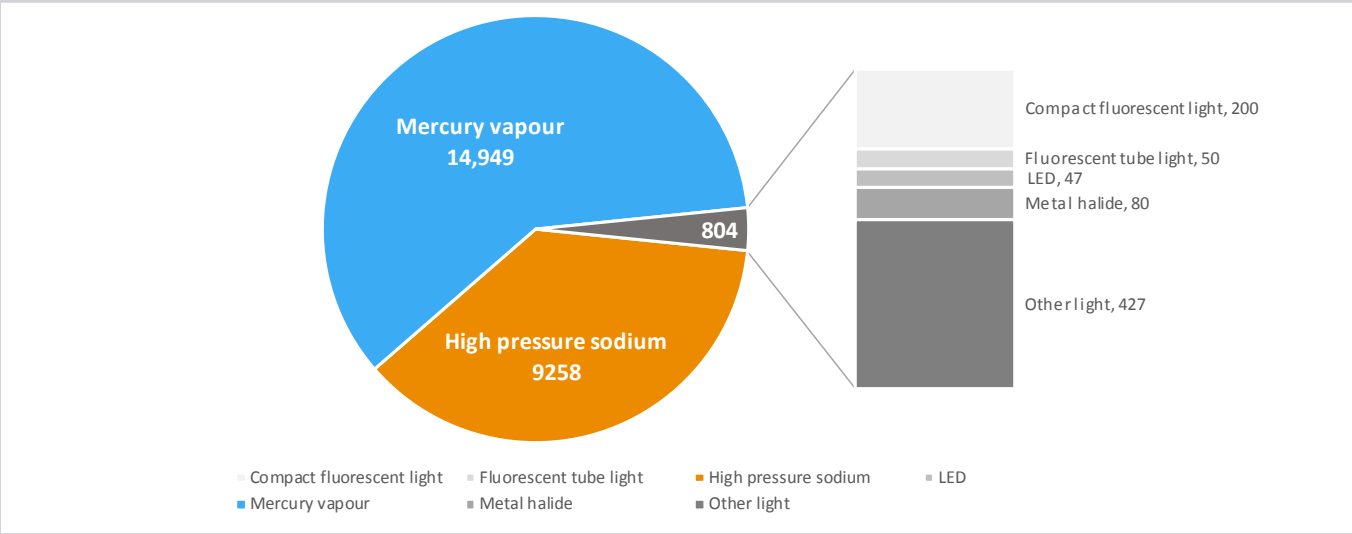


Lighting technologies

Public lighting network composition

Council's public lighting network is composed of two major lighting technologies: mercury vapour lamps (60%) and high pressure sodium lamps (37%).

The small balance of the network is a mixture of other type of lamps, e.g. fluorescent tube lamps, compact fluorescent lamps, metal halides lamps. At the time of the public lighting survey, a total number of 25,011 have been reviewed.



Lamp type	Quantity
Mercury vapour	14,949
High pressure sodium	9258
Other technologies	804

Table 1 - Number of luminaires by lamp technology

Environmental considerations

Mercury vapour lamps

As noted, close to 60% (14,949 lamps) of the current public lighting network is composed of mercury vapour (MV) lamps, a lamp technology now considered inefficient, that has a significant environmental impact and is facing global obsolescence with many countries adopting new, more efficient lighting technologies such as LED.

Spill light & sky glow

A significant portion of the luminaires on the current public lighting network negatively impact on the environment in relation to how the light is emitted from the luminaire. The issues associated with spill lighting are not broadly addressed within the current Standards for road lighting.

Although technology that reduces the impact of spill lighting has been available for some time, current providers of public lighting have not adopted this technology widely, and even relatively recent street lighting design have been featuring equipment and methods that have negative impact. Adverse effects of poorly designed street lighting can result in spill light on abutting properties and "sky glow" – i.e. light reflected upwards, the latter being responsible for the disappearance of stars in the night sky.

This issue can also have a significant impact on the fauna, and more specifically the turtles nesting on the Sunshine Coast. The light spill created by the public lighting can disorientate the hatchlings and nesting adults, leading them away from the sea and towards the roadway.

New lighting technologies – such as warm white LED lighting and smart controls – and appropriate lighting design that considers Standards, vehicle and pedestrian safety as well as the environmental context, will allow the delivery of a more efficient lighting service whilst reducing the impact on the environment.

Contrast, uniformity and colour of light considerations

The second major lighting technology found in the current public network is high pressure sodium (HPS) lamps (9258 lamps, 37%). Out of these 37%, most of them are low and medium wattage lamps (87% of all HPS lamps; lamps up to 150W) and are used in conjunction with MV lamps – i.e. in residential areas, or for roundabouts and

intersections on secondary roads.

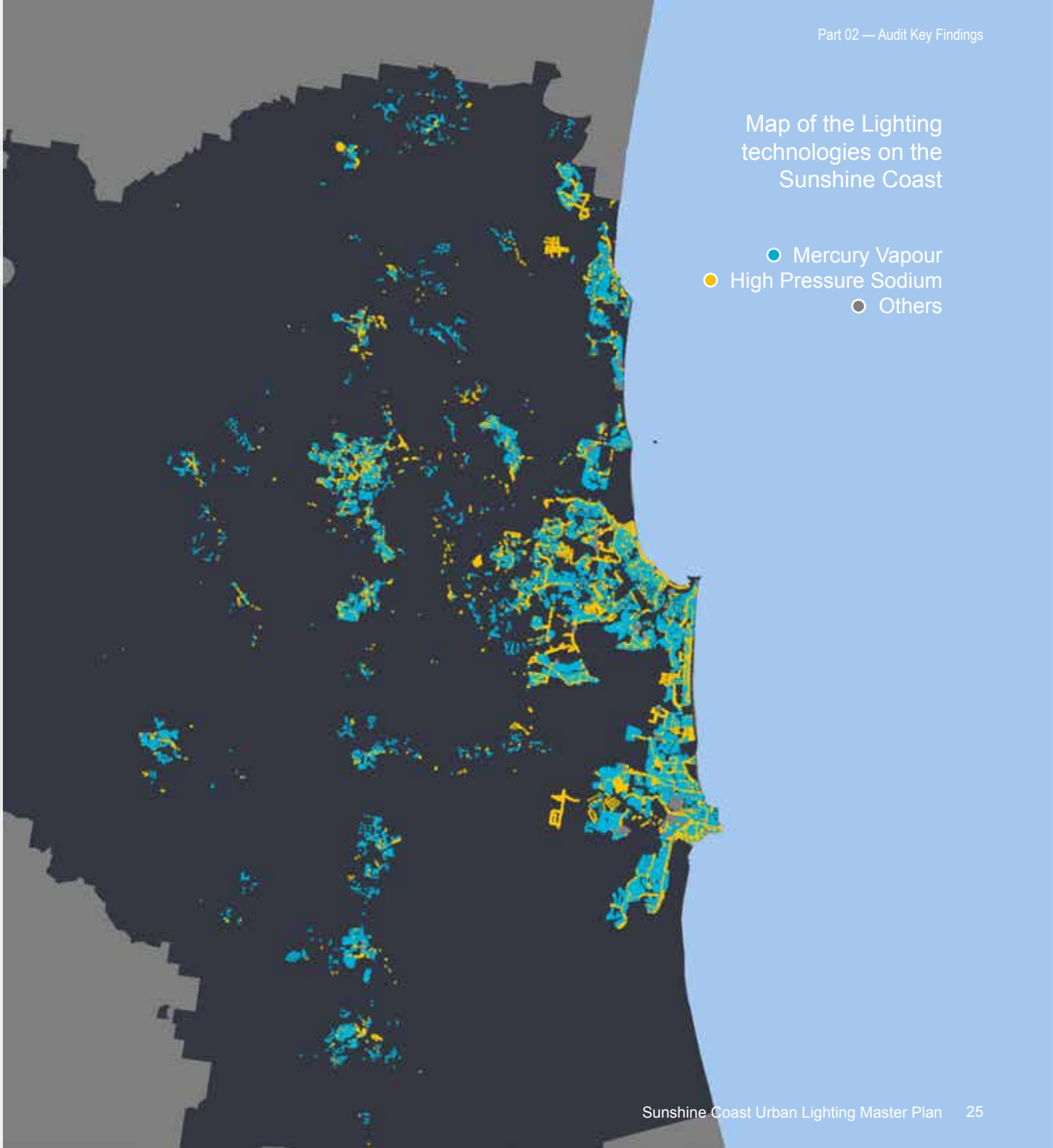
Apart from the significant environmental impacts described in section *Environmental Considerations*, the colour of light (colour temperature measured in Kelvin) across the Sunshine Coast is another aspect of the current public lighting network that can be improved through a well-planned upgrade. There is an inconsistency in the mixed use of MV lamps and HPS lamps next to one another which, all aspects considered (e.g. colour temperature, colour rendering index, lighting levels, spacing between assets), results in a less uniform level of illumination.

The use of consistent lighting technology and colour temperature across the region will improve the quality of light, increase the safety of vehicles and pedestrians through better contrast and uniformity, and provide a more comfortable lighting atmosphere, specifically in residential areas – moving away from an overall blue tone of light to a warmer white colour.

Energy consideration

Currently Council's public lighting network is composed mostly of inefficient lighting technologies.

The significant opportunity for Council to reduce its energy bill and reduce carbon emissions by adopting a plan to upgrade its public lighting network to a more energy efficient one thereby reinforcing Council's vision to be the most sustainable region in Australia.



Rates

Definitions

Rate 1

Rate 1 (non-contributed assets) are public lighting assets supplied, installed, owned and maintained by the Distribution Network Service Provider (DNSP). The rate 1 charge is the highest charge as it includes a capital asset recovery component

Rate 2

Rate 2 (contributed assets) are public lighting assets for which all supply and installation costs are funded by Council and/or property developer, and then ownership is gifted (vested) to the DNSP on completion of the installation.

The DNSP then takes responsibility for the maintenance of the asset. As this type of asset ages and are replaced by the DNSP, the charges revert to non-contributed asset charges.

Rate 3

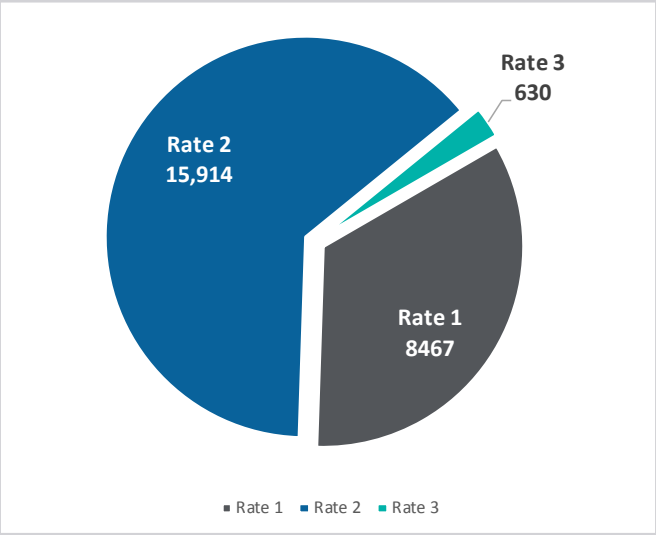
Rate 3 assets are public lighting assets supplied, installed, owned and maintained by Council.

Typical assets

Public lighting assets typically fall under two categories:

- Assets installed on timber poles with overhead wires (see example on Figure 2);
- Assets on dedicated ligting pole, typically with underground cabling (see figures 1 & 3).

Number of rate 1, 2 and 3 assets



Asset type	Quantity
Rate 1	8467
Rate 2	15,914
Rate 3	630

Table 2 - Number of assets by rate type

The values in Table 2 take in consideration a certain number of hypothesis, as described in the full audit report in *Appendix 2 - Audit Report*.

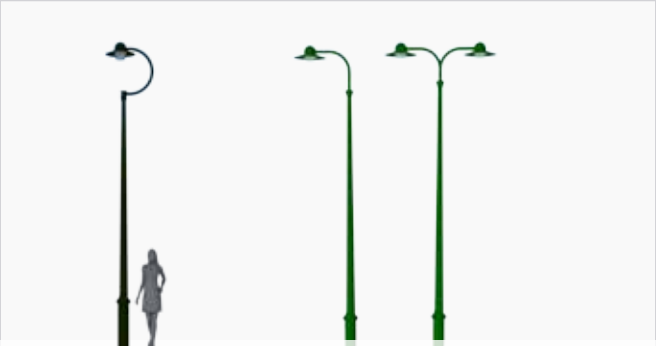


Figure 1 - Illustration of existing estate poles

Figure 2 - Illustration of an asset on a timber pole

Figure 3 - Illustration of a dedicated lighting pole

Age of assets

Background

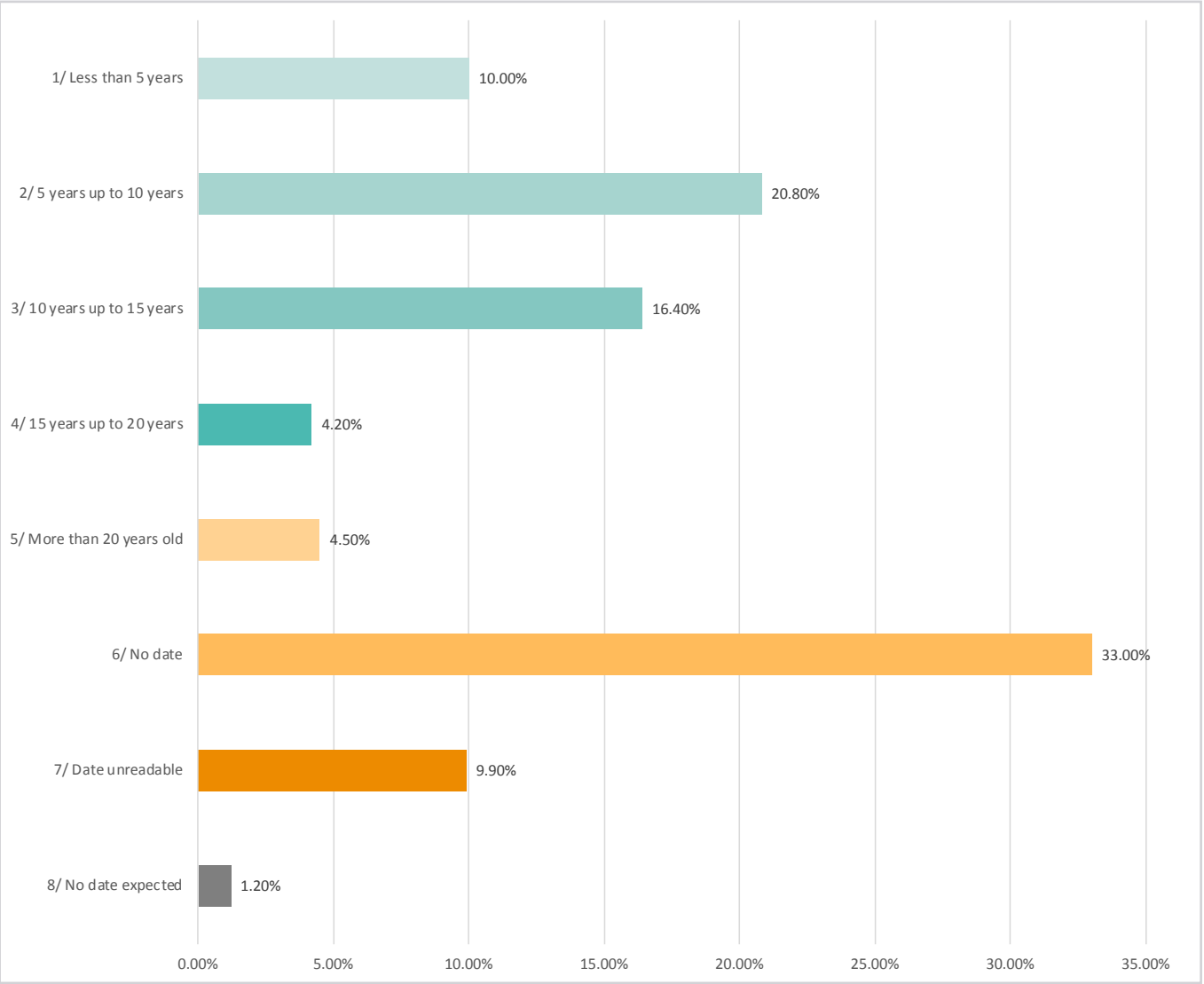
One purpose of the audit was to identify the assets with and without label and, if present, the age of the associated asset, to determine the overall age of the public lighting network and assist in the evaluation of the written down value.

From 1990 onwards, Australian Standards required luminaire manufacturers to mark the outside of the luminaire with indelible paint noting the lamp type and the year in which the luminaire was produced. This identification mark must be visible at ground level.

Distribution of assets by age range

As shown in Table 3, if it is considered that assets without labels have been installed prior to 1990, the number of assets that may be more than 20 years old reaches about 37.5% of the current public lighting network.

For further information, please refer to the full audit report in *Appendix 2 - Audit Report*.



	Less than 5 years	5 years up to 10 years	10 years up to 15 years	15 years up to 20 years	more than 20 years old	No date	Date unreadable	No date expected
Distribution	10.00%	20.80%	16.40%	4.20%	4.50%	33.00%	9.90%	1.20%

Table 3 - Distribution of public lighting assets by age

Risks

This section describes some of the risks that will be addressed or significantly reduced through the adoption of the lighting strategy described in the ULMP.

The management of a public lighting network comes with a certain number of risks (e.g. legal, financial, environmental). While some risks are inherent to public lighting and will not be fully removed through a lighting upgrade, a certain number of risks related to the current composition of the public lighting network, and the current management of this network by the DNSP, has been highlighted during the audit.

Environmental risks

The environmental risks identified in relation to the current public lighting network and its composition are as follows:

1. Impact of material on the environment, and recycling of broken equipment, such as light bulbs;
2. Impact on people;
3. Impact of light on the fauna and flora;
4. Impact of the energy usage;
5. Impact of operating the network on the environment – e.g use of vehicles and equipment.

Financial risks

The financial risks identified in relation to the current public lighting network are as follows:

1. Increased costs over time with Rate 2 assets slowly being transferred to Rate 1 assets due to age;
2. No control over the charging rates paid to the DNSP, which can result in an increase in the cost of management of the public lighting network.
3. No control of the costs for installation of new assets.

Technological risk

Historically, the DNSPs have been selecting and installing lighting technologies without significant competitive pressure. An illustration of this lack of competition and, potentially, Council missing out on innovative and efficient alternatives is the current composition of the public lighting network.

As shown in the detailed audit report, more than 72% of the current public lighting network is composed of luminaires historically provided

Turtle hatchlings

by one single manufacturer through the DNSP. If this approach assists the DNSP with finding components and spares replacements, the benefits are not typically controlled by Council or reflected in the price paid for the management of the public lighting network. In addition, this situation tends to restrict lighting designers from delivering the best results for the public lighting projects using current technologies and methodologies.

The opportunity exists for Council to guide which technology is used to light it's roads.

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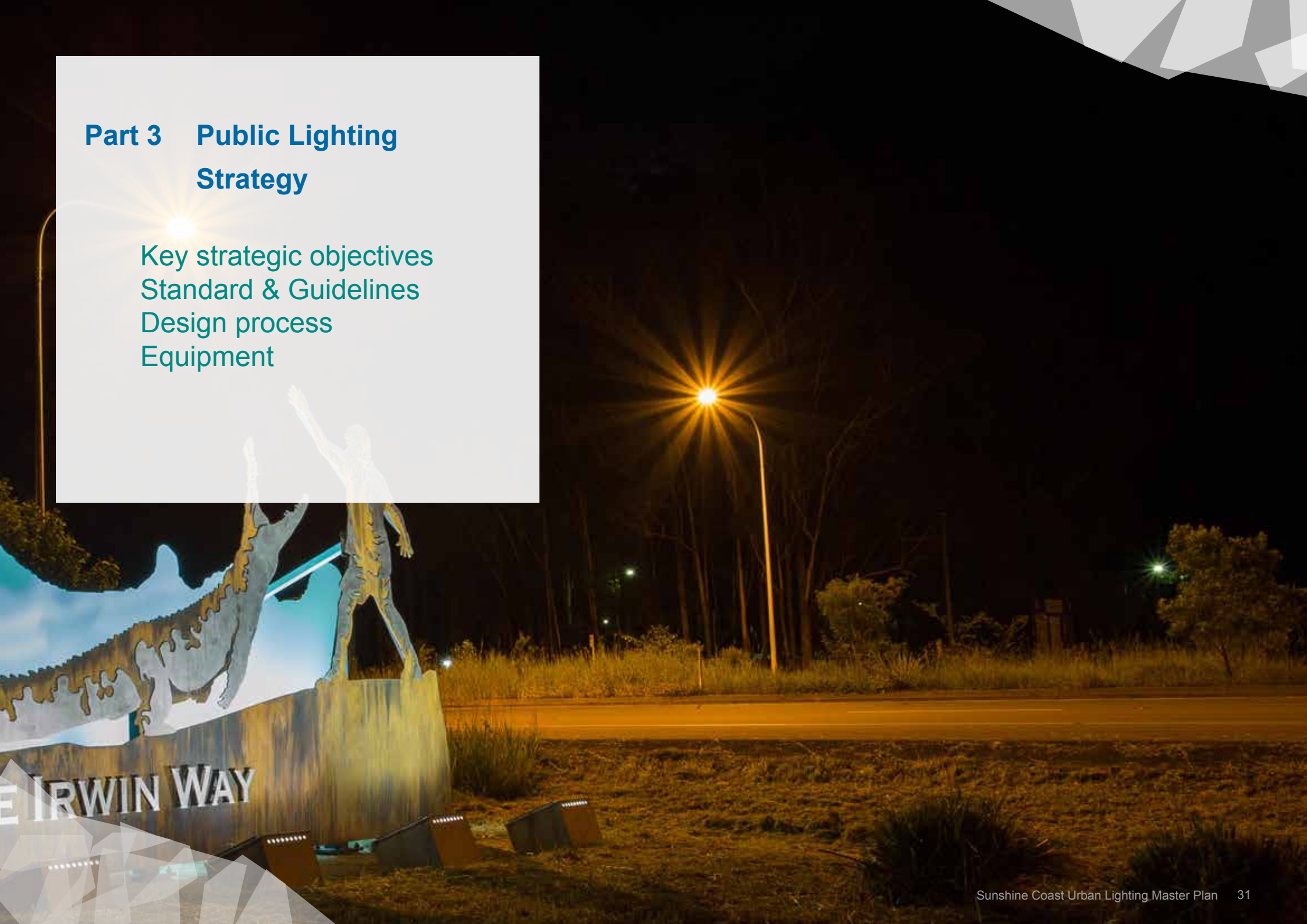
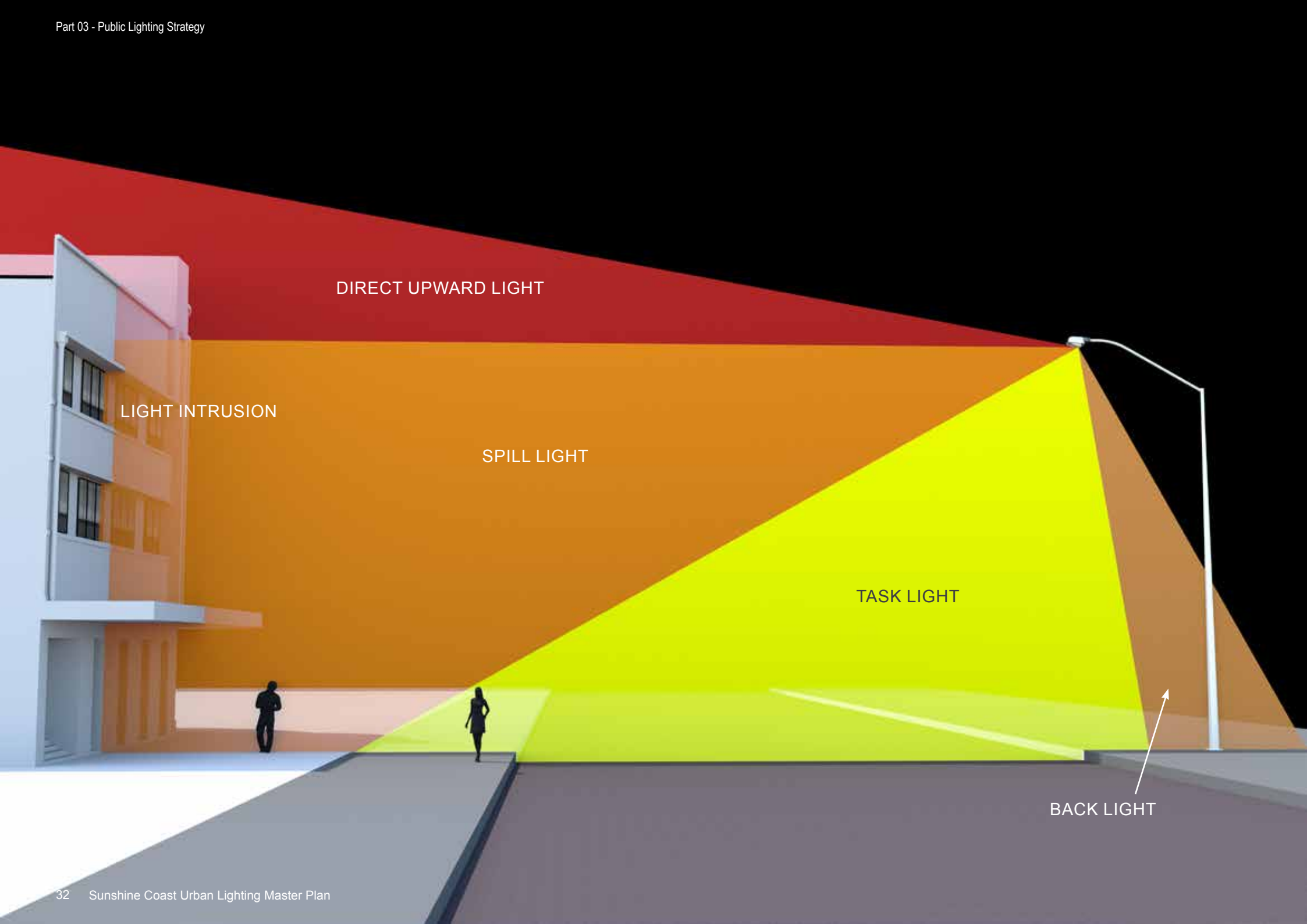
Part 3 Public Lighting Strategy

Key strategic objectives
Standard & Guidelines
Design process
Equipment




DIRECT UPWARD LIGHT
LIGHT INTRUSION
SPILL LIGHT
TASK LIGHT
BACK LIGHT

Public Lighting Strategy

Key strategic objectives

The lighting strategy combines all the information collected through the various inputs noted here:

- Sociological study, performed in 2014 (see Part 1 of ULMP),
- Urban analysis, performed in 2014,
- Public lighting audit, performed in 2013 (see Part 2 of ULMP),
- Lighting design methodology.

This approach intents to provide a range of products adapted to road typology, environment, urban functions and street arrangement.

By inspecting the conditions found on the Sunshine Coast and determining the associated lighting needs based on Australian Standards and International Standard requirements, the strategy will outline different luminaire product options available to Council for the public lighting upgrade, based on consistent design methodology.

Understanding the impact of lighting

Design philosophy

The lighting strategy puts an emphasis on understanding the impact of public lighting on people and on the environment, whilst ensuring that the light delivered is sufficient to provide a safe environment at night for the use of spaces, be it for vehicular use, pedestrian use or both. Sound technical knowledge of lighting and compliance to primarily Australian Standards is required.

Where an Australian Standard is absent on the qualitative outcomes that Council requires, International Standards and guidelines will be adopted to represent the foundation to delivering “sufficient and safe” lighting.

An environmental lighting focus across the region is to be adopted to support Council’s objectives of leading environmental practice.

Circadian rhythm

The circadian rhythm is the humans’ 24-hour biological clock and the biological clock can be altered according to external stimuli such as light and heat. The sociology study carried out on the Sunshine Coast shows that visitors and locals experience feelings of relaxation and connection to the environment. The lighting reinforces those feelings by implementing a specific light colour throughout the region. Special places of interest may implement a different lighting approach than the one described in this proposal due to other requirements for those areas e.g. tourist areas or selected landmarks.

The colour spectrum of white light ranges according to its colour temperature and each colour has the ability to alter feelings of comfort, activation and excitement.

Impact of light on fauna

The Sunshine Coast region’s nesting turtles are seen to be affected by the adverse impact of public lighting. Research suggests that the control of light rather than the colour of the light is particularly more effective in reducing the impact on nesting turtles. The Sunshine Coast region is home to a number of known nesting turtle sites and particular attention is required to ensure that any lighting on the Sunshine Coast minimises this impact.

The selection of luminaires that minimise the impact on nesting turtles involves ensuring that the emission of light close to the horizontal plane is limited, and that the light flux is placed on the road or the pathway to be lit instead of emitting above this horizontal plane.

Other fauna species can be affected by light, and lighting design should always include an environmental consideration.

United Nations Signatory Agreements on Loggerhead Turtles

In 2014, the International Convention for Migratory Species (acting under the United Nations Environment Program) endorsed a Single Species Action Plan for the Loggerhead Turtle, South pacific genetic stock (ref.: UNEP/CMS/COP11/Doc.23.2.2/Rev.1/Annex 2)

Delegates from the signatory states visited the Sunshine Coast during their deliberations on the plan, due to the Coast's importance as a future refuge for Loggerhead turtles and made a number of recommendations (page 32) in relation to lighting on the Sunshine Coast.

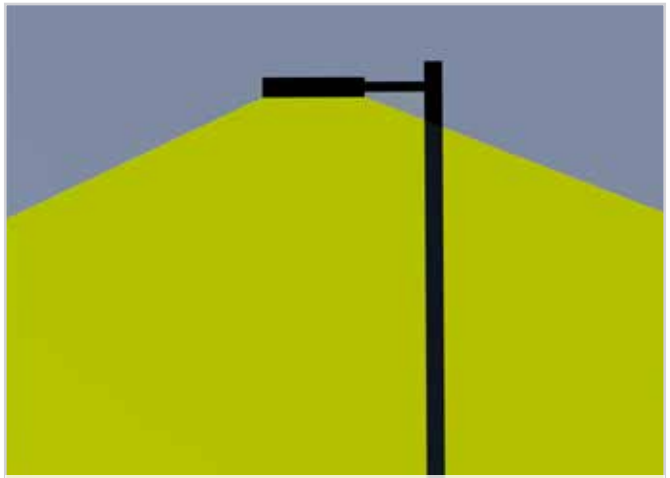


Illustration of a luminaire with controlled luminous flux; the light is emitted below the horizontal plane, reducing sky glow

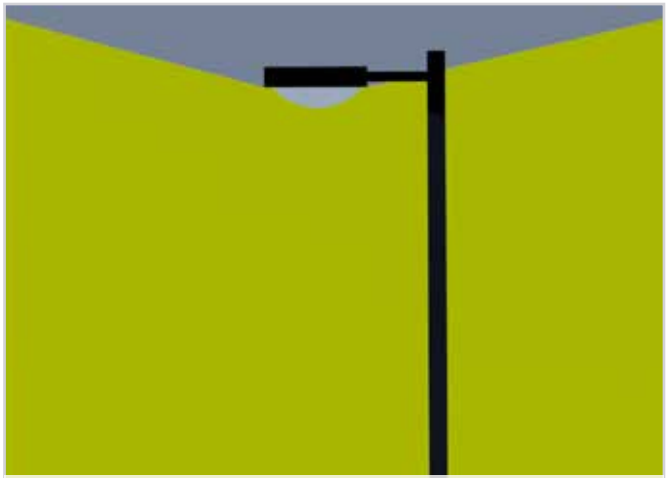


Illustration of a luminaire with important impact on the night sky, with light emitted above the horizontal plane

Objectives of the lighting strategy

Whole life cost

The lighting strategy, including the range of luminaires selected, aims to reduce the whole life cost of public lighting to provide Council with significant savings in operational expenditure, including the use of smart lighting controls.

There is also the opportunity to leverage the network provided by the creation of a smart lighting network to reduce costs of other public services such as waste management, parking services, water and electricity metering and traffic management.

Energy

The lighting upgrade focuses on selecting the right lighting products to deliver the appropriate level of lighting according to Standards at the lowest wattage, thus providing the most energy efficient public lighting network per kilometre of illuminated roadway in Australia. The products suggested in this lighting strategy will be submitted for periodic review as lighting technologies evolve to ensure new subdivisions and new works can take advantage of the latest technology improvements.

In addition to reduced energy consumption related to the selection of energy efficient products, additional energy efficiency can be achieved in conjunction with smart lighting controls. Some strategies include adjusting lighting with the use of occupancy sensing, scheduled dimming for specific areas, and control of public lighting during special events.

Reduced environmental impact

Through the use of the newest lighting and smart control technologies, and with a Standards based approach, the lighting strategy will deliver lighting that has a significantly reduced impact on the environment.

Smart City

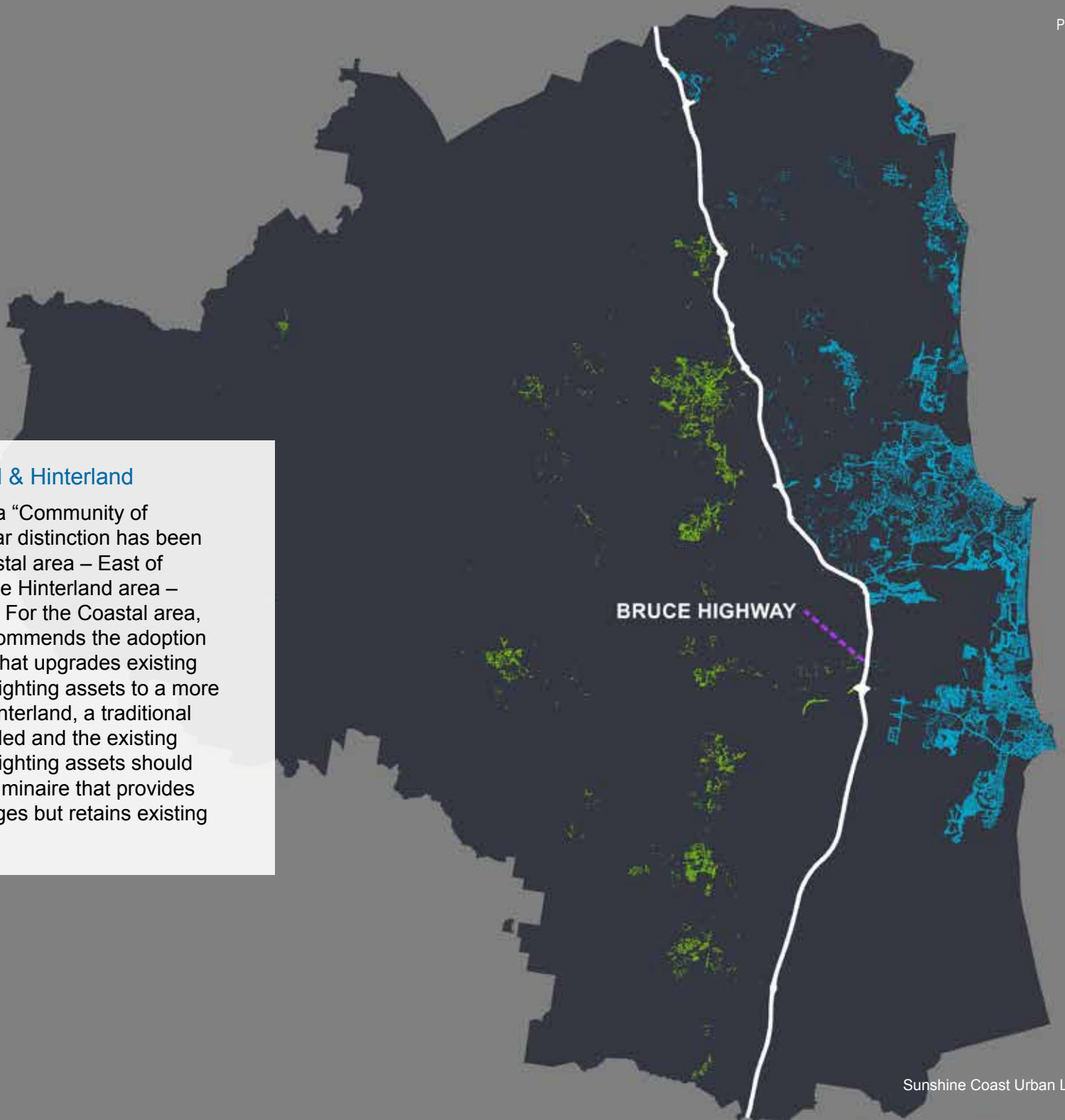
The lighting strategy takes into consideration Council's Smart City Framework (September 2015) to recommend technologies that will allow for the delivery of Smart City services after the public lighting upgrade.

Improvement to lighting standards & Safety

Exceeding the minimum requirements proposed by Australian Standards will improve visibility and perceptions of safety.

Differentiating Coastal & Hinterland

The Sunshine Coast is a “Community of communities” and a clear distinction has been made between the Coastal area – East of Bruce Highway – and the Hinterland area – West of Bruce Highway. For the Coastal area, the lighting strategy recommends the adoption of a transition program that upgrades existing heritage-looking public lighting assets to a more modern look. For the Hinterland, a traditional approach is recommended and the existing heritage-looking public lighting assets should be replaced by a LED luminaire that provides the technology advantages but retains existing aesthetics.



Standards and guidelines

Australian standards

The lighting strategy follows the requirements of Australian Standards and National Electricity Rules, including recommendations on the smart lighting control system.

This is to ensure a safe and compliant delivery of public lighting in the region. When Australian Standards don't provide guidance on specific aspects of street lighting, such as obtrusive lighting, the lighting strategy refers to relevant International Standards and other lighting industry recommendations to be used as design guidelines.

Note, in accordance with Australian Standards, whether an authority, utility, main roads authority or local government authority applies a lighting standard, it is a matter for that body to determine, and that night-time use of the space; vehicle and pedestrian patterns of use need to be considered.

Lighting Standards

ASNZS1158 – Lighting for Roads and Public Spaces

Contained within AS/NZS 1158.3.1-2005 Clause 1.2 is the following statement as to when to apply standards for Road Lighting design:

> *"Subject to the requirements of applicable laws, the choice of whether to install a scheme of road or public space lighting in compliance with this Standard and, if so, which subcategory of lighting is appropriate, rests with the client (usually the applicable local government authority). This decision is typically based on factors such as night-time pedestrian traffic flows and other patterns of use."*

Design guidance is provided for in AS/NZS1158 for assessing lighting categories, however it should be noted that these are minimum requirements and do not necessarily achieve the objectives that Council is trying to achieve by being the most sustainable region in Australia—vibrant, green and diverse.

The patterns of use of a road can be assessed to apply certain dimming regimes, should Council wish, through either an environmental concern such as nesting turtle season or through an economic objective, to systematically reduce further energy costs.

There are two categories of road lighting applicable to Australian Standards:

- Category P – Pedestrian Orientated Lighting Design where the visual requirements of pedestrians are placed as a higher priority. Also areas such public walkways, shopping centres and civic precincts are applied to this lighting. Lighting sub-categories from P1-P12.
- Category V – Vehicle orientated lighting. Lighting sub-categories from V1 to V5

The choosing of a particular road category is important as it defines how the light is displaced throughout the road reserve.

The lighting strategy adopts primarily Category P lighting throughout the region, to put the design focus on pedestrian, and to reinforce city mobility strategies and increasing public transport options.

The application of the "need to enhance prestige" is applied to non-residential public space areas located to those priority commercial areas that Council wishes to improve on.

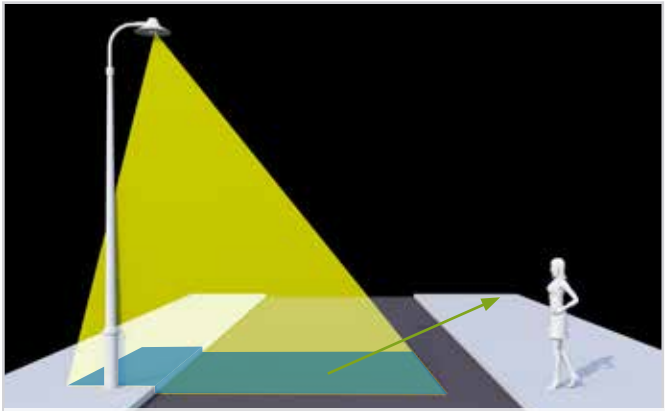
Category V lighting uses a design technique defined as luminance and illuminance in which the primary objective is to view an object on the road so that it creates a silhouette with illuminated road behind the object. The Category V lighting design technique is particularly useful for State controlled roads where the interaction of pedestrians and vehicles is unlikely.


Shops
Mall (P6 / P7 / P8)
Civic Square
(P6 / P7 / P8)
Cul-de-sacs (P3 / P4 / P5)
Footbridge (P9)
Open car park (P11 / P12)
Distributor (V4 / V5)
Collector (P3 / P4)
Cluster housing
Civic Retail Precinct
Transport Interchange
(P6 / P7 / P8)
Shopping Centre
Motorway (V3)
Park
Sports Field
AS2560
BUS TERMINAL
Multi-storey
car park
roof top
P11 / P12
Subway P10
Cycleway / Footpath (P1 / P2 / P3 / P4)
Arterial (V1 / V2 / V3)
Subway P10
Transport Interchange
(P6 / P7 / P8)
Station
Distributor (V4 / V5)
Collector (P3 / P4)
Forecourt with carpark
(P11 / P12)
Sub-Arterial / Principal
(V3 / V4 / V5)
Distributor (V4 / V5)
Collector (P3 / P4)
Office / Industrial units
Industrial Precinct

While limited in comparison to P category, the local road hierarchy incorporates V category roads and requires consideration by Council within existing and future installations.

Category P Lighting uses illuminance based design techniques in which the primary objective is to illuminate a surface in either a horizontal plane or a vertical plane.

This design technique is explained below in the following picture:



The luminaire emits light (yellow cone) resulting in light on the road (blue area; illuminance). The light is then reflected towards the eye of the viewer (green arrow; luminance).

As outlined in Australian Standards, there are three main objectives of public lighting:

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

It should be noted that many of the roads that are located within the Sunshine Coast region under the control of Council fall predominantly into the

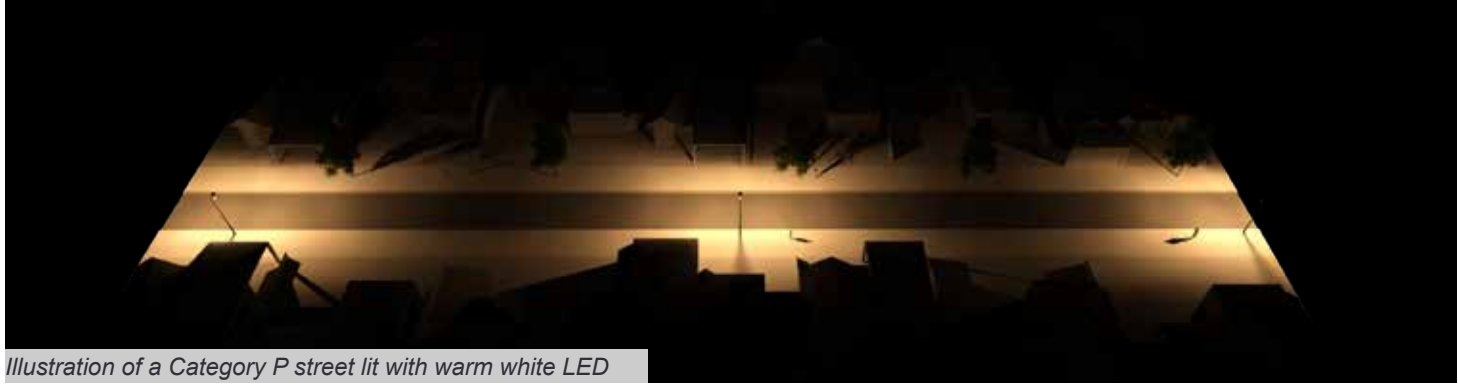


Illustration of a Category P street lit with warm white LED

Category P lighting applications, as there is a prevalent interaction between pedestrians and vehicles.

In accordance with Clause 2.2 of AS/NZS1158:3:1-2005, public lighting is not meant to provide drivers with adequate lighting if there are other motor vehicles present; car headlights are used for this objective. The exceptions to this are where there are high pedestrian and vehicle activity such as public transport interchanges and carparks.

There are a very limited number of roads located in the region under Council's responsibility that could be categorised V category roads.

Category V roads include two design methodologies; luminance based design for long stretches of roadway lighting and illuminance based design for intersections:

- Luminance based design seeks to create a level of luminance or brightness behind an object in order to place the object in silhouette without little consideration to any vertical element.
- The illuminance component of Category V lighting relates to achieve a certain minimum horizontal illuminance standard at intersections

Dimming in accordance with Australian Standards

Undertaking lighting designs in accordance with Australian Standards presupposes assumed maintenance factors and cycles. These factors de-rate the initial lighting output such that the maintained illuminance never falls below the designed levels between cleaning cycles.

An opportunity exists to commission dimming schedule at the time of installation while also meeting the required maintained standards, and adjust over time if necessary.

Obtrusive Lighting Standard – AS4282

As outlined in the *Foreword of Obtrusive Lighting Standard (AS4282)*, the standard does not apply to street lighting. However, as it is a key strategic objective of the region to be the most sustainable, the reduction of spill light, glare and obtrusive lighting is needed to ensure the preservation of local fauna such as nesting turtles and preserve the nocturnal habitat.

It is proposed to include an environmental lighting overlay across the whole region and this overlay follows international guidelines.

Other Standards & Rules

National Electricity Rules – in relation to metering
Introduction

The National Electricity Market (NEM) is a wholesale market for the supply and purchase of electricity, underpinned by an open access regime for use of the interconnected transmission and distribution networks in the participating jurisdictions of the Australian Capital Territory, New South Wales, Queensland, South Australia, Tasmania and Victoria.

Street lighting forms part of the NEM and has previously been provided by Distribution Network Service Providers (DNSP) as an unmetered load. Proposing to dim street lights and obtain the financial benefit for doing so will require the device used for such metering to be certified by the National Measurement Institute (NMI).

There are a number of organisations involved that make up an electricity bill and they are detailed below:

- Financially Responsible Market Participant (FRMP): Retail and generation,
- Local Network Service Provider (LNSP): Transmission and distribution,
- Responsible Person (RP),
- Metering Provider (MP): Provide, install & maintain; accreditation required,
- Metering Data Provider (MDP): Collect, process and transfer data; accreditation required,
- Local Retailer (LR),
- Retailer of Last Resort (ROLR).

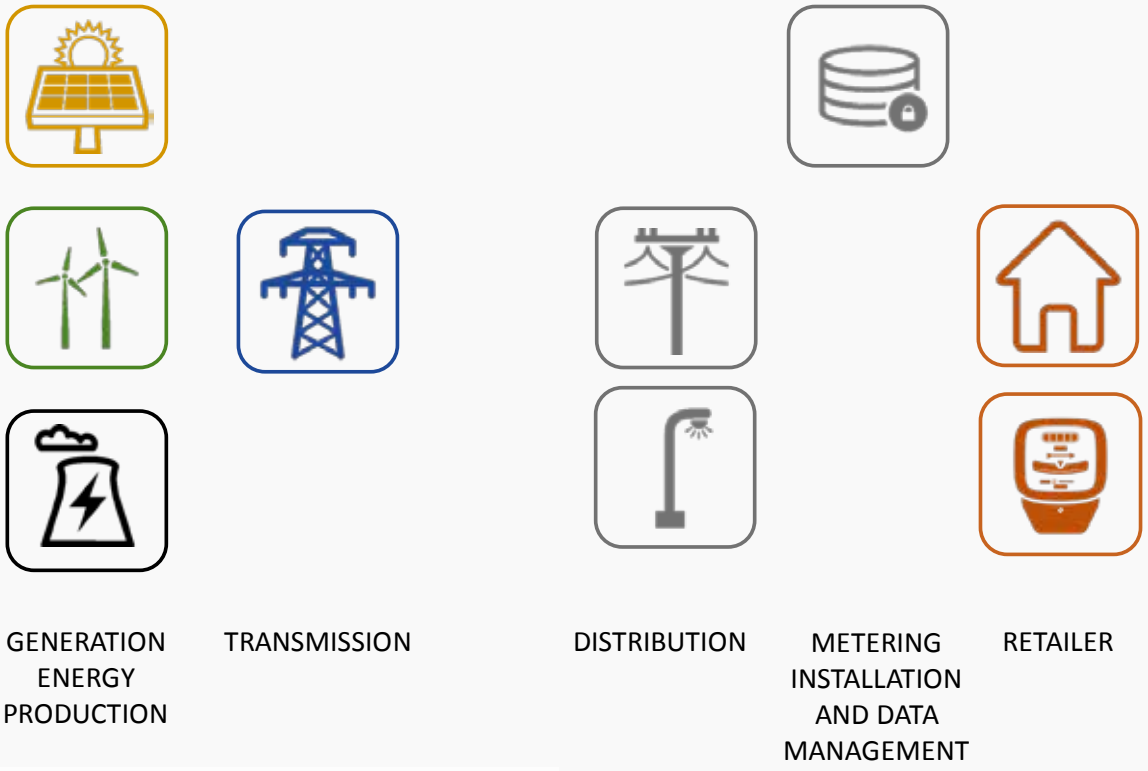


Illustration of the Electricity Market chain

To deploy a smart lighting network that allows single light metering, an MP is required to install equipment recognised by the NMI. The structure of the information collected is then sent to an MDP in accordance with the Australian Energy Market Operator (AEMO) requirements.

Unmetered Energy metering – Type 7 "meter"

There are loads in the NEM where it is not practical or economic to meter on a connection by connection basis, but whose energy consumption can be calculated to a reasonable level of accuracy using an algorithm. Currently in the NEM, these market loads are restricted to street lighting and, in some jurisdictions, traffic signals. Using street lighting as an example, consumption can be determined by utilising the industry agreed load values of the street lights (measured in Watts), the on and off times (for street lighting, this is related to sunset and sunrise times) and the number and types of street lights (in other words the total inventory).

Importantly, although there is no physical meter for a type 7 "metering installation", it is a load for which the energy consumption can be calculated and used for billing and settlement purposes.

Components of a metering installation

The current documentation framework related to metering installation comprises the components showed on Figure 4. This architecture describes a typical metering installation like those installed in dwellings. As shown in Figure 5, two items in the current architecture are questioned when it comes to single light metering device:

1. The energy data storage. Most single light metering devices have local storage, but the storage may have limitations. The data is likely to be transferred to a cloud based platform;
2. The display, which is irrelevant on a single light metering device installed on a luminaire above the road.

As shown on Figure 5, it is expected that current documentation framework will be amended to reflect the advance in technology and cater for single light metering devices.

Accuracy of meters

In accordance with Chapter 7 of the National Electricity Rules, there are accuracy requirements for metering installations as follows:

% Rated Load	Power factor		
	Unity	0.866 lagging	0.5 lagging
	Active	Active	Active
10	2.5%	2.5%	N/A
50	1.5%	1.5%	2.5%
100	1.5%	1.5%	N/A

Table 4 - Type 4 metering installation accuracy requirements

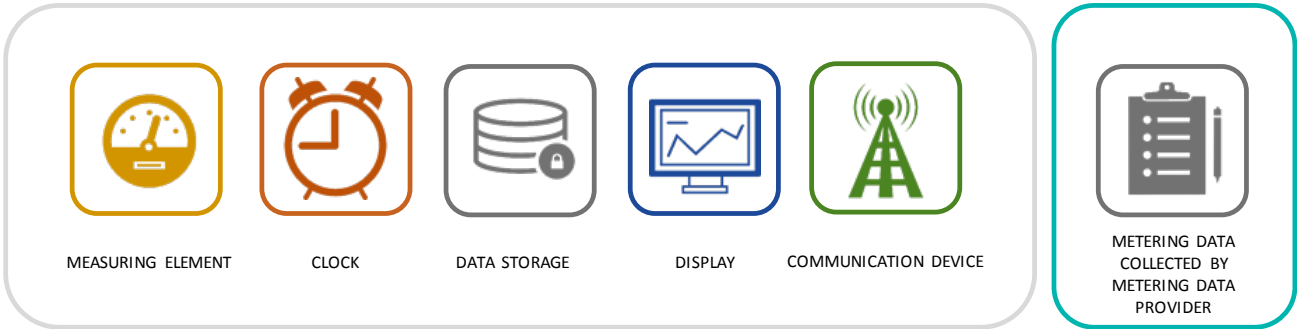


Figure 4 - Current description of a metering installation

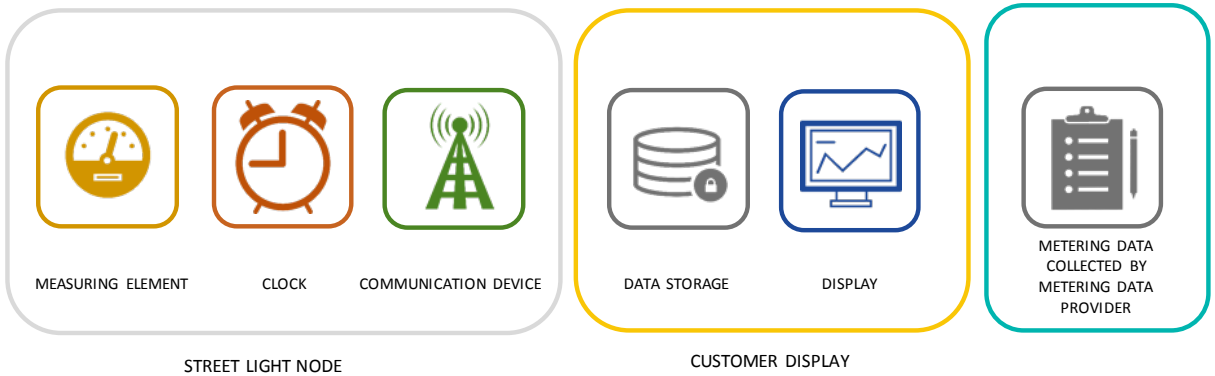


Figure 5 - Suggested description of a single light metering installation

Metering Asset Management Plan (MAMP)

It is required as part of the National Electricity Rules Chapter 7 for the Metering Provider to maintain a Metering Asset Management Plan (MAMP).

AEMO Publish guidelines on maintaining a metering installation. At the basic level an asset plan relating to a Smart City metering installation should include:

- Year of installation,
- Geographic factors, e.g. on the coast or in the mountains,
- Load history, e.g. lightly or heavily loaded,
- Connection to supply, e.g. to overhead lines or via underground cables,
- Any history of refurbishment,
- Environmental weather conditions and installation,
- Any other appropriate characteristics,
- Ability / resources to determine test sample volumes and method (i.e. Variable vs Attributes),
- Ability / resources to test sample volumes,
- Test resources (i.e. internally or externally tested):
- If internal, details of test staff,
- If external, capability of external test body (e.g. NATA accredited).

The requirements for metering asset management history require Council to ensure that the lighting operator deploys a Computerised Maintenance Management System (CMMS) to manage the metering assets in the network in addition to

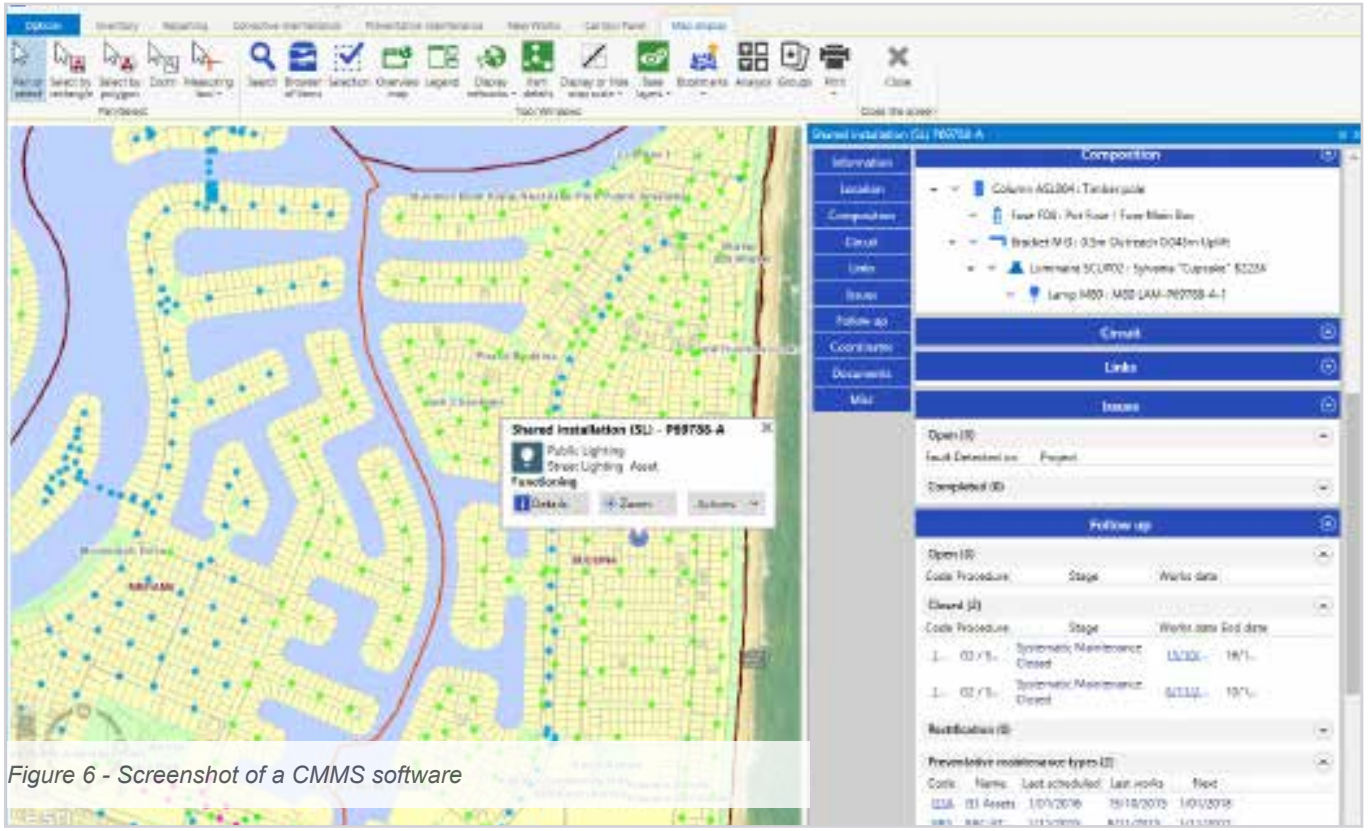


Figure 6 - Screenshot of a CMMS software

the Centralised Management System (CMS) that enables the customer to view the metering installation consumption through the CMS display. installations using existing DNSP design standards as a basis.

International Standards & Guidelines

Australian Standards (AS) have not kept pace with the rapid change in technology and therefore the need to apply international standards as guidelines — where not in contradiction to AS — enables as a minimum, a "standards-based" approach to lighting design.

The use of international standards and guidelines in this lighting strategy assists to enhance the qualitative aspects of the base compliance to the current ASNZS1158.1.3-2005, and provides further guidance to the designer to ensure the objectives of the lighting strategy are met.

United Nations (UN) Environmental Lighting Risk Matrix

In 2014, the United Nations identified that the Sunshine Coast was a future refuge of the loggerhead turtle and made seven lighting recommendations on lighting on the Sunshine Coast — see Table 5.

This Environmental Lighting Matrix further illustrates the importance of including an environmental review of lighting projects on the Sunshine Coast.

Result	Action	Priority	Time Scale
No direct light source visible to the nesting beaches and reduced reflected light illuminating the sky/salt spray above and behind the nesting beaches.	Turn off all lighting at recreational areas within 100 m of the nesting beaches after 8:00 pm until daylight during nesting and hatching season (October to May).	Essential	Immediate
	Prohibit the use of vertical illumination of building, other structures and vegetation using lighting that shines into the sky within 1.5 km of the nesting beaches during the nesting and hatching season	Essential	Immediate
	Fit 25 cm deep vertical shades to all street lights within 1.5 km of the nesting beaches, and possibly others that remain visible from the beach.	High	Short
	Activate lighting required on stairs and access areas for safety purpose with proximity sensors or motion detectors with an associated deactivation of lighting after 10 minutes	Medium	Short
	Explore the feasibility of using lines of road-surface mounted LED lights in place of street lights.	High	Medium
	For buildings visible from nesting beaches, interior lighting should be blocked from shining from the interior of the building towards the respective nesting beaches during the nesting and hatching season.	High	Short
	Continue to investigate new options for lighting that does not have a negative impact on turtle population function	High	Ongoing

Table 5 - United Nations Environmental Lighting Risk Matrix (ref.: UNEP/CMS/COP11/Doc.23.2.2/Rev.1/Annex 2)

EN13201: 2015 – European Standards for Public Lighting

Currently, Australia Standards do not provide any guidance for lighting with a design objective that would allow dimming and proximity, however, as the application of lighting standards is based upon the relative activity of the urban space at night, the likelihood of interaction between vehicles and pedestrians, consideration can be given to dimming public lighting, through an appropriate risk management assessment approach.

Each lighting design includes specific depreciation factors that can allow Council to dim broadly but anything further than these depreciation factors will require a specific risk assessment to be undertaken.

The inclusion of a smart control network could allow Council to deploy different lighting strategies according to the different events such as the Mooloolaba New Year's Eve Fireworks event or other such events in which lighting may assist with designating pedestrians to specific areas, in accordance with Standards and CPTED Guidelines.

In the interim where there are no Australian Standards, this lighting strategy recommends a standards based approach based on EN13201. There are three examples of operational profiles that can be consider:

- Full Power Operation,
- Multi-power Operation,
- Tri-Power Operation.

The full power profile is the current approach to public lighting: 100% power output throughout the night — see Figure 7.

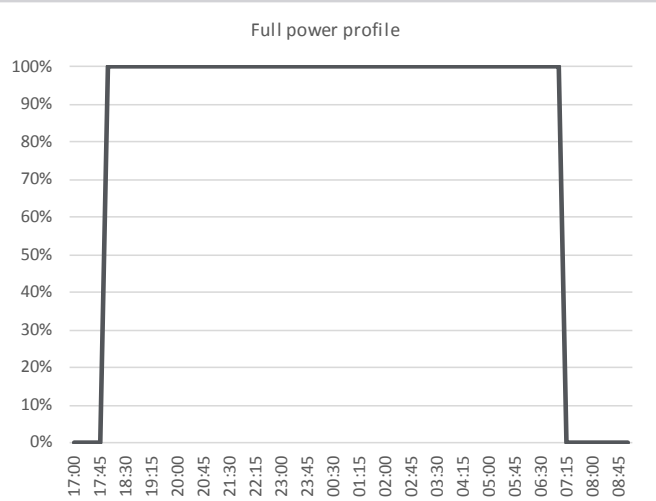


Figure 7 - Full power profile

The multi-power profile — see Figure 8, consists of two or more time periods during the daily course when luminaires are operated at different power associated with different lighting levels.

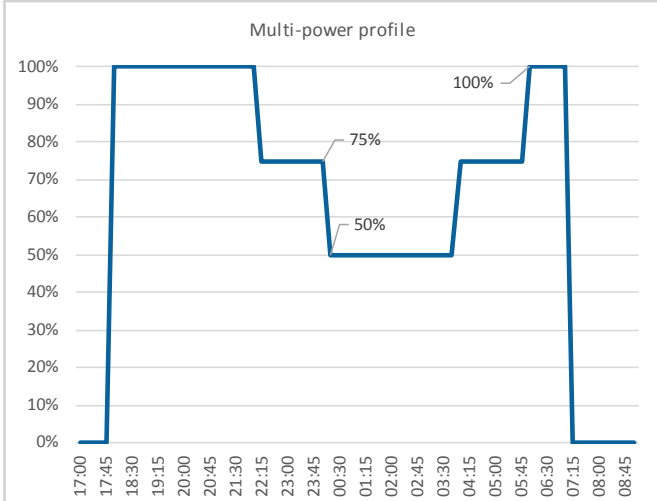


Figure 8 - Multi-power profile

Each of the lighting levels should be derived from the lighting sub-categories according to AS/NZS1158.3.1:2005. The ability to apply a multi-power application relies in precise luminaire choice where one type of streetlight has the ability to comply with two lighting categories such as P4 and P5 or P3 and P4.

If vehicle and/or presence detectors are used to control the lighting system, full power or multi-power operational profiles are truncated by time periods when no traffic is sensed by the associate detectors and luminaires operate at reduced levels. Figure 9 shows an example of tri-power operational profile for lighting control with detectors where at least a minimum lighting level is kept throughout the night time.

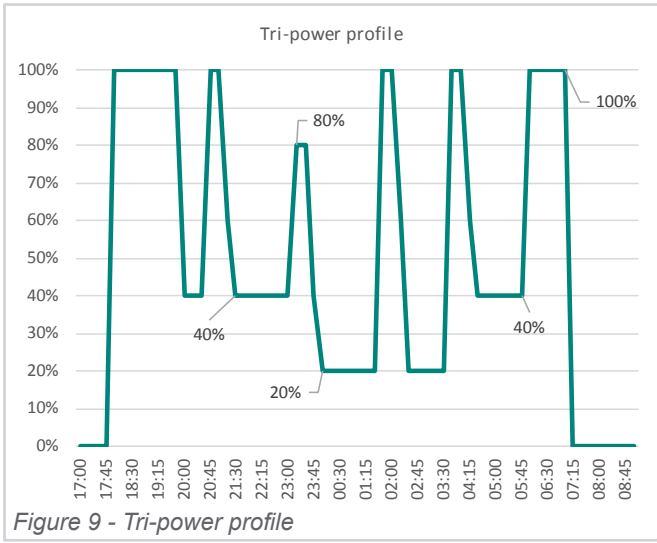


Figure 9 - Tri-power profile

The adoption of different dimming schemes can be applied to different public events to enable the movement of pedestrian traffic guided along designated routes.

Risk management

Before dimming is applied to an urban area, a risk management analysis (see Tables 6 & 7) will need to consider some factors, including:

- Operating hours of businesses in the area,
- Timing of holidays and peak visitor periods,
- Vehicle speed limits,
- Location of footpaths or designated areas,
- Cycle lanes present or not,
- Location of the installation (commercial, industrial, residential),
- Likelihood of vehicle and pedestrian interaction,
- Impact to the safety of the person, or to criminal activity.

Institute of Lighting Professionals (ILP) Guidance Note 1

This Guidance note defines different environmental zones and their level of lighting. The environmental zones are referenced in various lighting documents including British Standards and International Dark Sky Association recommendations. See Table 8 for details.

BS5489:2013 – British Standards

In accordance with lighting design requirements, a light output (lumen) depreciation factor is applied at design stage in addition to a proposed cleaning cycle to the luminaire. ASNZS1158.3.1:2005 Table F1 Appendix F is based upon recommended factors from the BS5489:2003 Standard, which has been updated due to the improvement

		Consequence of an accident				
		Insignificant [1]	Minor [2]	Moderate [3]	Major [4]	Catastrophic [5]
Likelihood	Almost Certain [5]	Moderate (5)	High (10)	High (15)	Catastrophic (20)	Catastrophic (25)
	Likely [4]	Moderate (4)	Moderate (8)	High (12)	Catastrophic (16)	Catastrophic (20)
	Possible [3]	Low (3)	Moderate (6)	Moderate (9)	High (12)	High (15)
	Unlikely [2]	Low (2)	Moderate (4)	Moderate (6)	Moderate (8)	High (10)
	Rare [1]	Low (1)	Low (2)	Low (3)	Low (4)	Moderate (5)

If the residual risk	=	Catastrophic (16+)	then	Dimming or Proximity Switch off should not occur. (Significant)
	=	High (10 – 15)	then	Dimming to defined standards – Multi-power could occur (Significant)
	=	Moderate (5 – 9)	then	Dimming and Proximity can occur
	=	Low (1 – 4)	then	Dimming, Proximity and Switching off can occur

Table 6 - Dimming risk matrix

Consequence	Likelihood
5 - Catastrophic = Fatality, permanent disability, long term widespread impacts, huge financial loss.	5 - Almost Certain = It is almost certain that the risk will occur in most circumstances.
4 - Major = Permanent disability or extensive injuries, medium to long term widespread impact, major financial loss.	4 - Likely = The risk is likely to occur in most circumstances.
3 - Moderate = Lost time injury, reversible medium term local impact, high financial loss	3 - Possible = There is uncertainty that the risk could occur.
2 - Minor = Medical treatment, reversible short – medium term impact to local area, medium financial loss.	2 - Unlikely = The risk could occur at some time but there is confidence that it will not.
1 - Insignificant = First aid, limited impact to minimal area, low financial loss.	1 - Rare = The impact / risk may occur only in exceptional circumstances.

Table 7 - Risk definitions

Zone	Surrounding	Lighting environment	Examples
E0	Protected	Dark	UNESCO Starlight Reserves, IDA Dark Sky parks
E1	Natural	Intrinsically dark	National Parks, Areas of Outstanding Natural Beauty, etc.
E2	Rural	Low district brightness	Village or relatively dark outer suburban locations – General Residential Locations
E3	Suburban	Medium district brightness	Small town centres or suburban locations
E4	Urban	High district brightness	Town/city centres with high levels of night-time activity – Maroochydore CBD, Mooloolaba High night time activity areas

Table 8 - ILP Guidance Note 1, Environmental zone

in lighting technology, has allowed for longer cleaning cycles along with reduced depreciation factors.

Applying the latest updated standard enables Council to reduce costs for cleaning attributed to maintenance and reduce energy costs by requiring less luminaires on installation.

Dark Sky Lighting Guidelines

It is proposed to incorporate the International Dark Sky and Institute Light Professional Environmental Lighting Zones then use the pre-curfew and post curfew lighting recommendations from AS 4282 Obtrusive Lighting Standard.

To demonstrate the region's sustainable leadership, the lighting strategy places an environmental lighting overlay across the region. The effect of this overlay is to limit spill lighting to a minimum and ensure that good lighting design practices are encouraged and the natural environment preserved while also still meeting the required compliance requirements in accordance with Australian Standards.

Objectives of the overlay:

- Permit the use of outdoor lighting that does not exceed the maximum levels specified in IES recommended practices for night-time safety, utility, security, productivity, enjoyment, and commerce;
- Minimize adverse offsite impacts of lighting such as light trespass, and obtrusive light;
- Curtail light pollution, reduce sky-glow and improve the night-time environment for astronomy;
- Help protect the natural environment from the adverse effects of night lighting from gas or electric sources;
- Conserve energy and resources to the greatest extent possible.

The proposed lighting zones are described as follows:

LZ0-E0: No ambient lighting

Areas where the natural environment will be seriously and adversely affected by lighting. Impacts include disturbing the biological cycles of flora and fauna and/or detracting from human enjoyment and appreciation of the natural environment. Human activity is less important in these areas. The vision of human residents and users is adapted to total darkness, and they expect to see little or no lighting. When not needed, lighting should be extinguished.

LZ1-E1: Low ambient lighting

Areas where lighting might adversely affect flora and fauna or disturb the character of the area. The vision of human residents and users is adapted to low light levels. Lighting may be used for safety, security and/or convenience but it is not necessarily uniform or continuous. After curfew or during nesting times for turtles, most lighting should be extinguished or reduced as activity levels decline.

Typical Areas: Nature reserves and known turtle nesting areas

LZ2-E2: Moderate ambient lighting

Areas of human activity where the vision of human residents and users is adapted to moderate light levels. Lighting may typically be used for safety, security and/or convenience but it is not necessarily uniform or continuous. After curfew, lighting may be reduced as activity levels decline in accordance with a detailed risk assessment of each area.

Typical Areas on the Sunshine Coast: Single Dwelling Residential Housing Locations

LZ3-E3: Moderately high ambient lighting

Areas of human activity where the vision of human residents and users is adapted to moderately high light levels. Lighting is generally desired for safety, security and/or convenience and it is often uniform and/or continuous. After curfew, lighting may be reduced in most areas as activity levels decline.

Typical Areas – Apartment style accommodation and low activity commercial areas.

LZ4-E4: High ambient lighting

Areas of human activity where the vision of users is adapted to high light levels. Lighting is generally considered necessary for safety, security and/or convenience.

The Maroochydore CBD, Mooloolaba and other activity areas where it is expected that residents and visitors will congregate at night and where night lighting is required for security, including transit interchange points.

CPTED

In addition to Australian Standards, consideration should be given to *Crime Prevention Through Environmental Design (CPTED) lighting design strategies as detailed in Part A : Essential features of safer places* document.

- How to locate on plan and in height lighting fixtures of particular kinds to ensure appropriate illumination of parts of the public

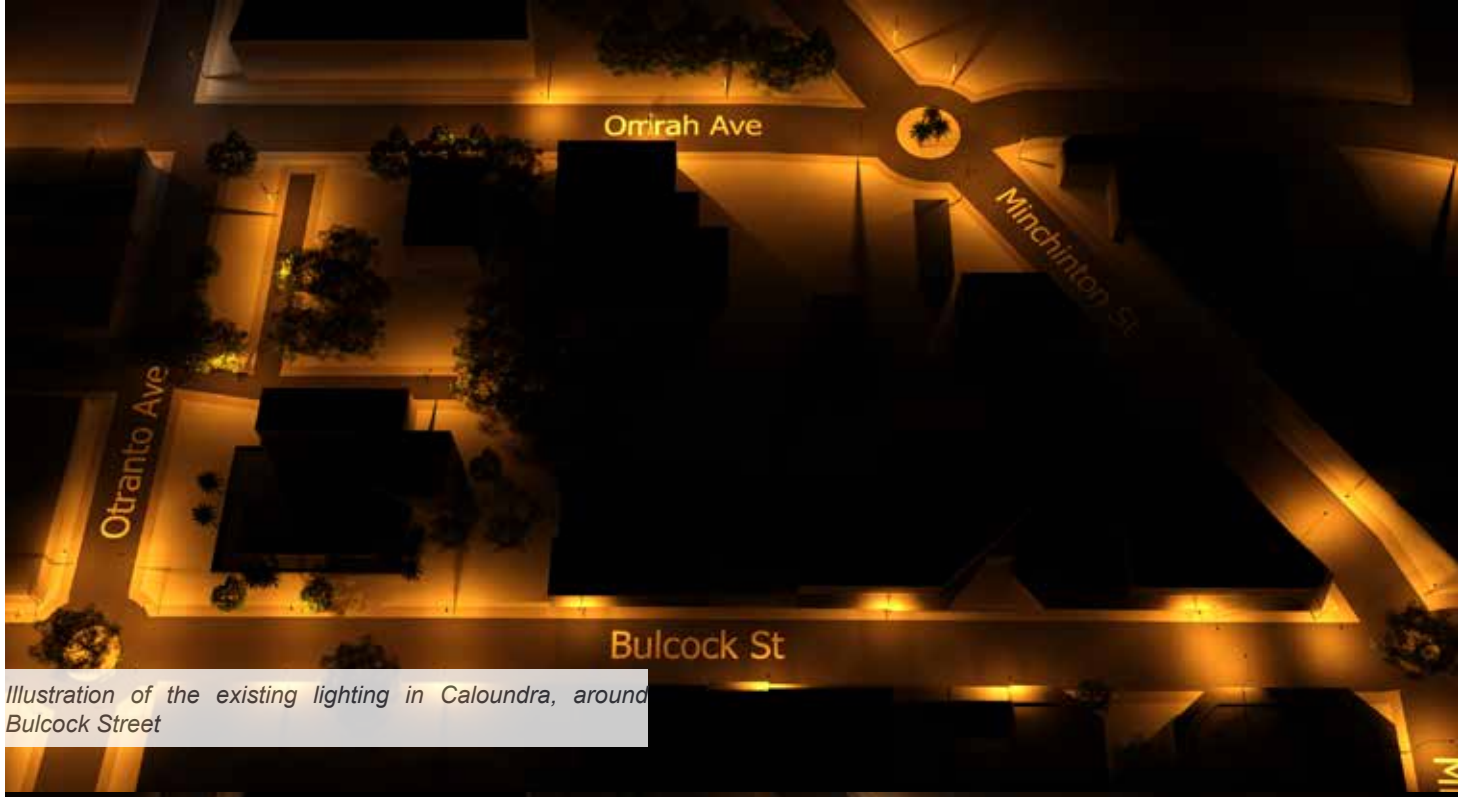


Illustration of the existing lighting in Caloundra, around Bulcock Street

Illustration of the renovated lighting in Caloundra, around Bulcock Street

realm or buildings to facilitate surveillance;

- How to ensure the detail of the lighting design responds to and influences the detail of the built environment design;
- How to respond to the colour and reflectiveness of materials in the design of buildings and the public realm;
- How to use lighting to assist legibility and choices about safe areas and routes, including, in some places, not lighting areas not intended for night-time use;
- How to ensure appropriate levels of lighting in heavily used or vulnerable places such as car parking areas, public toilets, entries to buildings and the like?
- How to support general street lighting in specific places with further fittings;
- How to avoid inappropriate shadowing and inappropriate glare;
- How to meet the requirements of relevant Australian or Australian/New Zealand Standards for lighting roads and public spaces;
- How to avoid light pollution;
- How to ensure vandal resistant light fittings are included as part of a detailed maintenance strategy;
- How to take advantage of opportunities to integrate lighting of the public realm with the design of buildings;
- How to make lighting outcomes as environmentally sustainable as possible (for example, using low-energy fittings, photovoltaic cells to generate power and photoelectric cells rather than time-based switches);
- How to integrate lighting design with landscaping and management processes to ensure vegetation does not inhibit the effectiveness of the lighting;
- How to ensure street names and building identifications are clear at night (for example, by using reflective materials, numbers at kerb level, signage on letter boxes or other structures) and at a scale able to be read from vehicles, particularly emergency vehicles; and
- How to illuminate signage intended to be read at night, including signage that must be accessible to all in the community (and therefore must meet the requirements of Australian Standards for access and mobility).

The beaches around Caloundra are a highly popular spot on the Sunshine Coast, both for visitors and residents. This is an example of a location that may need to enhance prestige, as it is representative of the Sunshine Coast Region and way of life.

Compliance to the lighting strategy

Compliance to the lighting strategy is achieved by meeting all the requirements mentioned in this document and in accordance with Clause 2.10 of ASNZS1158.3.1:2005, including the following:

1. Statement from the installer that the installation accurately implements the final light design
2. The final design documentation includes any changes to the original design made or agreed to by the designer in response to circumstances arising during installation and these changes do not cause non-compliance of the design with the requirements of Clause 2.11.1; and either —
3. The maintenance regime referred to in Appendix E, Item (l) is carried out (refer to AS/NZS 1158.1.3 for details on maintenance); or
4. An alternative maintenance regime is implemented that can be demonstrated to provide a maintenance factor equal to or better than the design value.

Design process

The lighting strategy is based on urban planning information, a sociological study, a strong technical knowledge of lighting and its impact on people and the environment. Combined with a professional lighting design methodology, this strategy allows for the selection of light fittings adapted to various urban functions, road typologies, street arrangement as well as the local ecosystem.

Design principles

Throughout the various activities, research, interviews and engagement, it is proposed to adopt a lighting design philosophy throughout the lighting strategy that places an emphasis on understanding the impact of lighting on people and on the environment, to help Council build the most sustainable public lighting network in Australia.

Circadian Rhythm

As described previously in this lighting strategy, the circadian rhythm is the humans' 24-hour biological clock and it can be affected by light affecting people's daily life. The design process should take into consideration this impact when delivering lighting, to help users maintain a healthy rhythm when moving in lit areas.

Colour temperature

Expressed in degree Kelvin (K) — see Figure 10, the colour spectrum of white light ranges according to its colour temperature and each colour has the ability to alter feelings of comfort, activation and excitement. Some studies have shown that high temperature colours (> 5000K) can have adverse effect on people, environment as well as sky glow.

The lighting strategy recommends the use of 3000K lights as a default light colour, to avoid adverse impact on the region's environment and night sky. Council may consider a different approach for specific areas or use of space.

Impact of light on fauna

The Sunshine Coast region's nesting turtles are particularly affected by the adverse impact of public lighting. The latest research suggests that the control of light rather than the colour of light is particularly more effective in reducing the impact on nesting turtles. The Sunshine Coast region is home to a number of known nesting turtle sites and particular attention is required to ensure that any lighting on the Sunshine Coast minimises this impact.

The selection of luminaires that minimise the

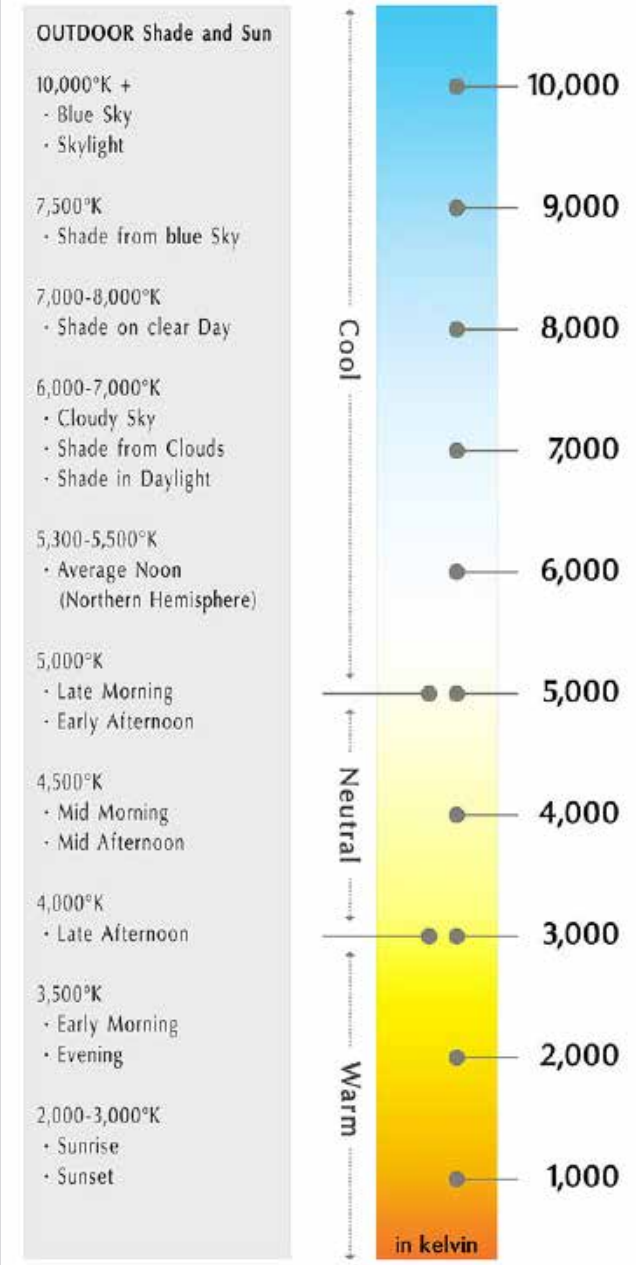


Figure 10 - Colour temperature scale

impact on nesting turtles involves ensuring that the emission of light is below the 90-degree horizontal plane and is placed on the road or the pathway to be lit instead of emitting above this horizontal plane. Other species may be affected by light, and lighting design should, in general, always include an environmental consideration.

Specific strategies

The lighting strategy acknowledges that some locations on the Sunshine Coast may require different light treatment, typically for high activity city centre, prestige or historical sites or holiday and beach spots. For such locations, the lighting needs can be adapted to fit the application and use of space, for example by choosing a different distribution and lighting level.

It should also be noted that the lighting strategy does not include treatment to State Controlled roads within the Sunshine Coast, however, encouragement should occur to enable collaboration between State and Local Government road authorities to achieve a consistent treatment of lighting within the region consistent with the lighting strategy.

CPTED & Safety

Lighting is identified through the Queensland CPTED guidelines as one of the tools that lessen the likelihood of crime within an urban space.

> *Crimes against people and against property occur within the urban environments of cities and towns. The fundamental idea of Crime Prevention Through Environmental Design (CPTED) is that it is possible to use knowledge and creativity to design those built environments in ways that lessen or prevent the incidence of such crime. – Introduction Part CPTED Guideline*

Some of the lighting considerations that should be included are:

- Reducing lighting pollution
- Avoiding inappropriate shadowing and glare

The lighting strategy proposes a range of key tools to assist in reinforcing CPTED design principles:

1. Improvements to the uniformity ratios of lighting levels required by Australian Standards to avoid pooling of light
2. The use of flat lens or “Aeroscreen” luminaires which reduce light pollution
3. Use of 3000K Warm white which reduces perceived glare and aids visibility *(Model predicting discomfort glare caused by LED road lights - 2014 Optical Society of America)*

Road typologies

The Sunshine Coast comprises a range of different road typologies. A road typology is defined by:

- The carriage way width,
- The road reserve,
- The spacing between lighting assets and the
- Mounting height of light fittings.

The road typology is one of the items of information used to determine the road category and sub-category, as per Australian Standards.

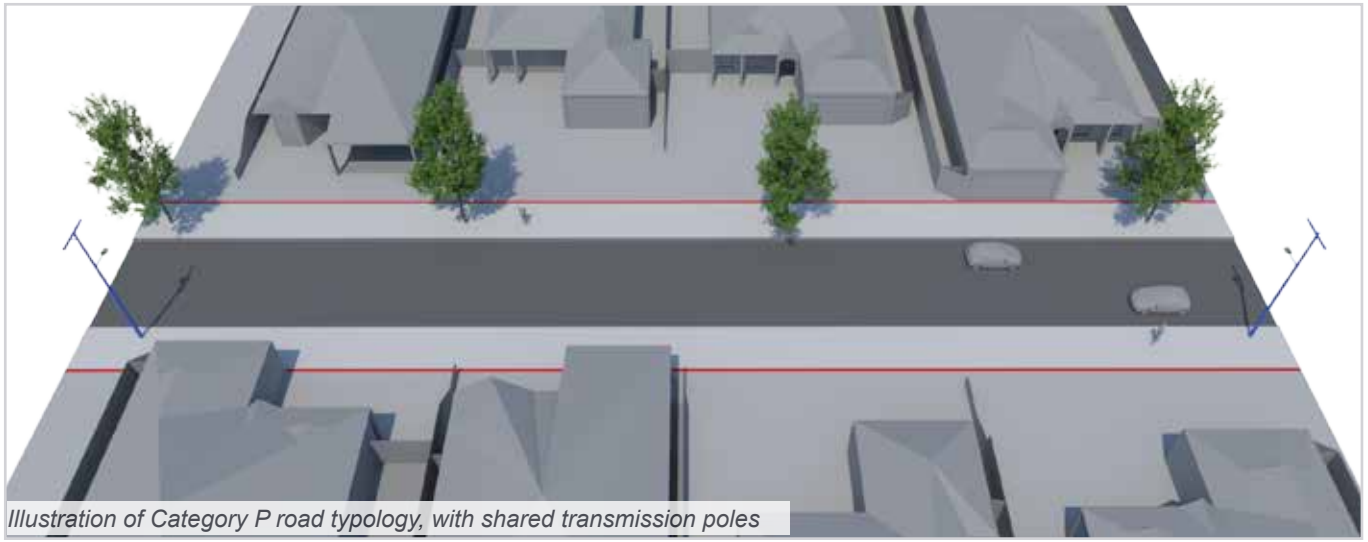


Illustration of Category P road typology, with shared transmission poles

Typology code	Lighting design category (as per Appendix C of ASNZS1158.3.1)	Distance between lighting assets [m]	Mounting height [m]	Carriage way width [m]	Road reserve[m] (Carriage way + median/ footpath)
1	P5	75	7	8	16
2	P4	60	5.5	6	15
3	P4	50	5.5	8	16
4	P5	80	7.5	12.5	24.5
5	P3	55	10.5	8	30
6	P5	75	7	10	20
7	P3	45	7	20	30
8	V3	50	10.5	10 x 2	25

Table 9 - Significant road typologies on the Sunshine Coast

Eight significant road typologies have been identified on the Sunshine Coast, as shown in Table 9:

- Typology 1: found usually in old residential and industrial neighbourhoods where distribution poles are present;
- Typology 2 & 3: Residential estate with slight difference in the size of the road reserve and the distance between poles;
- Typology 4: Similar to typology 1, with a wider road reserve and a longer distance between poles. The mouting height of the luminaires is usually 50cm higher to cover this difference;
- Typology 5: This road acts as a thoroughfare for a higher level of traffic and this is characterised by higher poles installed along a centre median
- Typology 6: Similar to typology 1, with a wider carriage way;
- Typology 7: This road acts as a feeder into larger activity areas and road reserve is large with a mixture of pedestrian, cycling and vehicles.
- Typology 8: This road is characterised by the primary activity of Vehicle use.

Note that the main purpose of identifying typologies is to broadly determine road requirements to better allocate appropriate lighting devices. During construction, detailed lighting design should be undertaken.

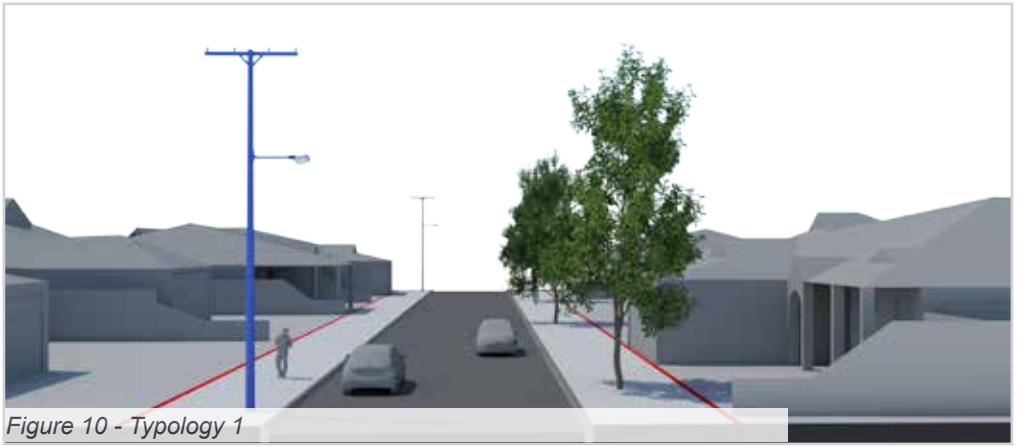


Figure 10 - Typology 1

Figure 11 - Typology 2

Figure 12 - Typology 3

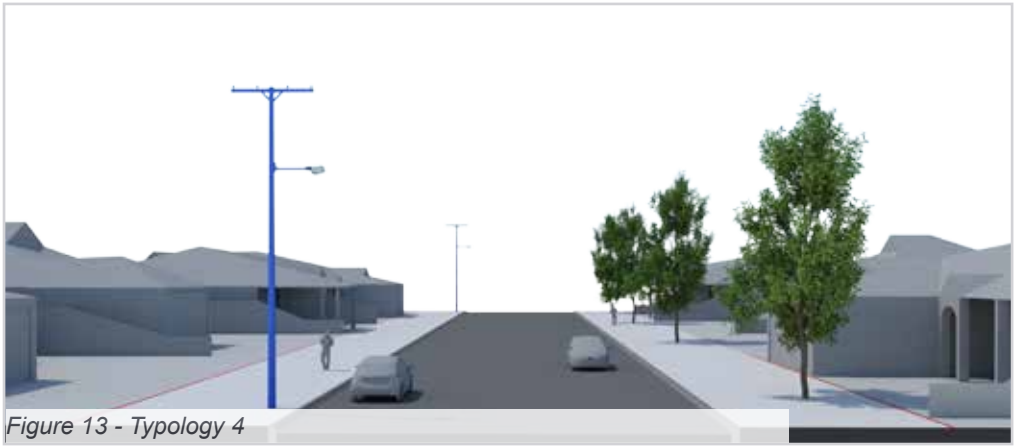


Figure 13 - Typology 4

Figure 14 - Typology 5

Figure 15 - Typology 6

Figure 16 - Typology 7

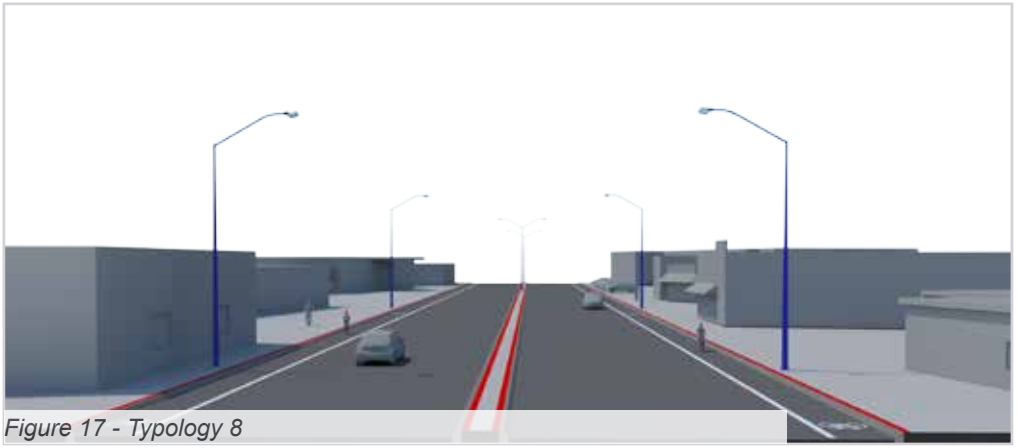


Figure 17 - Typology 8

Design Standards

Once selecting the appropriate design category, it is then necessary to set the lighting technical parameters for that category.

The primary design objective recommended for the Sunshine Coast region is to align lighting standards with future infrastructure plans which focus on public transport and active mobility. These future plans require a primary focus on the person and therefore an adoption primarily of people and pedestrian (Category P) lighting design methods should apply.

In taking into account the existing Council policies, there are other types of applications, as described in Table 11. These design standards are particularly adapted in areas where CCTV plans to be installed.

(1) *To improve the qualitative outcomes of public lighting, it is proposed to exceed the minimum requirements by Standards and adopt an improved uniformity of light ratio. This improved uniformity will aid in achieving a more even spread of light across the road reserve and improve visibility. The lower the value, the better the uniformity. In locations where Council plans to own and manage a road in which the primary activity is vehicle use only, the following design standards apply to Category V.*

For Category V lighting, note that although Australian Standards allow for 3% of Upward Light output Ratio (UWLR), the lighting strategy recommends 0% of UWLR — see Table 12.

Lighting Category	Lighting Technical Parameters for Roads in Local Areas and Pathways				
	Average Illuminance E_h (lx)	Point Horizontal Illuminance E_{Ph} (lx)	AS1158 Illuminance Uniformity Cat U_{E2}	Recommended Illuminance Uniformity Cat U_{E2} (1)	Point Vertical Illuminance E_{Pv} (lx)
P1	7	2	10	< 8.5	2
P2	3.5	0.7	10	< 8.5	0.7
P3	1.75	0.3	10	< 8.5	0.3
P4	0.85	0.14	10	< 8.5	N/A
P5	0.5	0.07	10	< 8.5	N/A

Table 10 - Lighting Technical Parameters for Roads in Local Areas and Pathways

Lighting Category	Lighting Technical Parameters for Public Activity Areas				
	Average Illuminance E_h (lx)	Point Horizontal Illuminance E_{Ph} (lx)	AS1158 Illuminance Uniformity Cat U_{E2}	Recommended Illuminance Uniformity Cat U_{E2} (1)	Point Vertical Illuminance E_{Pv} (lx)
P6	21	7	10	< 8.5	7
P7	14	4	10	< 8.5	4
P8	7	2	10	< 8.5	2

Table 11 - Lighting Technical Parameters for Public Activity Areas

Light Technical Parameters for Category V Lighting								
Cat.	For straight sections, curves and intersections					For intersections and specified locations		All applications
	Average Luminance cd/m²	Overall Uniformity U_o	Longitudinal Uniformity U_L	Threshold Increment TI %	Surround Verge Illuminance E_s	Point Horizontal Illuminance E_{Ph}	Illuminance Uniformity U_{E1}	UWLR
V1	1.5	0.33	0.5	20	50	15	8	0%
V2	1.0	0.33	0.5	20	50	10	8	0%
V3	0.75	0.33	0.5	20	50	7.5	8	0%
V4	0.5	0.33	0.5	20	50	5	8	0%
V5	0.35	0.33	0.5	20	50	3.5	8	0%

Table 12 - Light Technical Parameters for Category V Lighting

Design Guidelines to achieve reduced spill light

As Australian Standards 4282 does not apply to street lighting, Table 13 highlights the maximum levels of spill light and upward light to which public lighting on the Sunshine Coast should be designed, to ensure that lighting is aligned with Council's objectives.

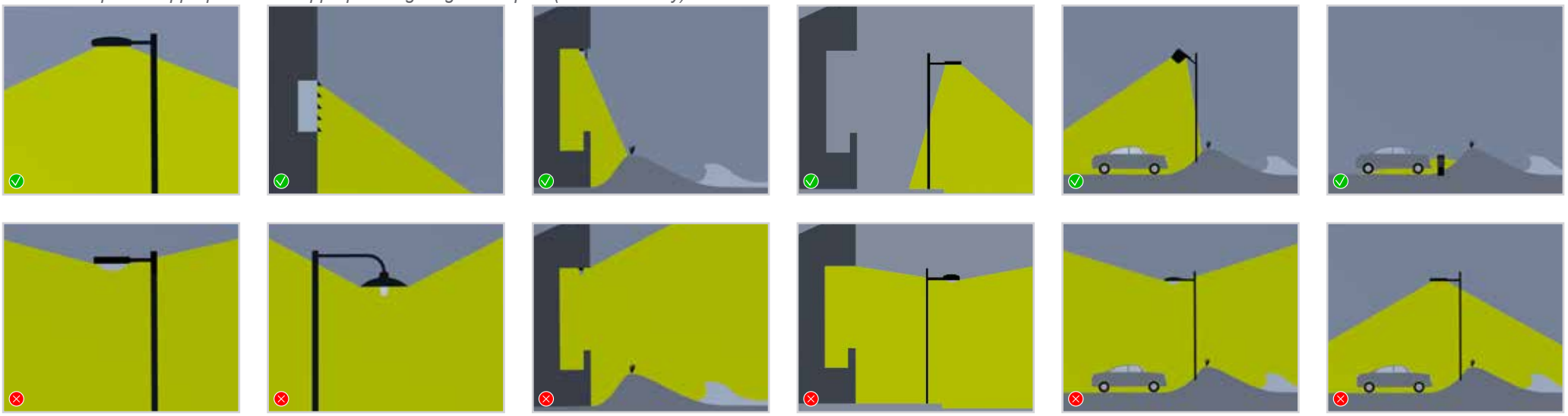
Notes:

1. Australian Standards Table 2.9 limits UWLR – Upward Light Output Ratio for a Type 4 luminaire at 10%. With the development of precise optics for LED Streetlight, it is proposed to reduce the UWLR to a maximum of 0%.
2. This location is at the window of a residential property outside of the Road Reserve in the vertical plane.

Environmental Zone	UWLR Ratio (%)	Light Intrusion into Windows (lx)		Luminaire Intensity (cd)		Building Luminance
		Pre-curfew (up to 11pm)	Post Curfew	Pre-Curfew (up to 11pm)	Post Curfew	Average (cd/m²)
LZ0-E0	0	0	0	0	0	0
LZ1-E1	0	2	0 (1)	AS/NZS1158 Table 2.9	AS/NZS1158 Table 2.9	0
LZ2-E2	0 (Note 1)	2	1 (Note 2)	AS/NZS1158 Table 2.9	AS/NZS1158 Table 2.9	5
LZ3-E3	5	10	2	AS4282	AS4282	10
LZ4-E4	15	25	5	AS4282	AS4282	25

Table 13 - Recommended maximum spill light levels

Some examples of appropriate vs. inappropriate lighting techniques (illustration only)



Geographic strategy

Council's planning documents identify two main geographic areas:

- Coastal area;
- Hinterland area.

This lighting strategy selects different types of equipment for each area, in relation to existing assets identified as Residential estate assets — see Figures 18 & 20.

In addition to these areas, a strategy has been defined for industrial and commercial areas. New Streetscape and Key Activity Areas

Estate pole in Buderim area

Figure 18 - Concept rendering of a renovated estate asset, West of Bruce Highway (Hinterland area)

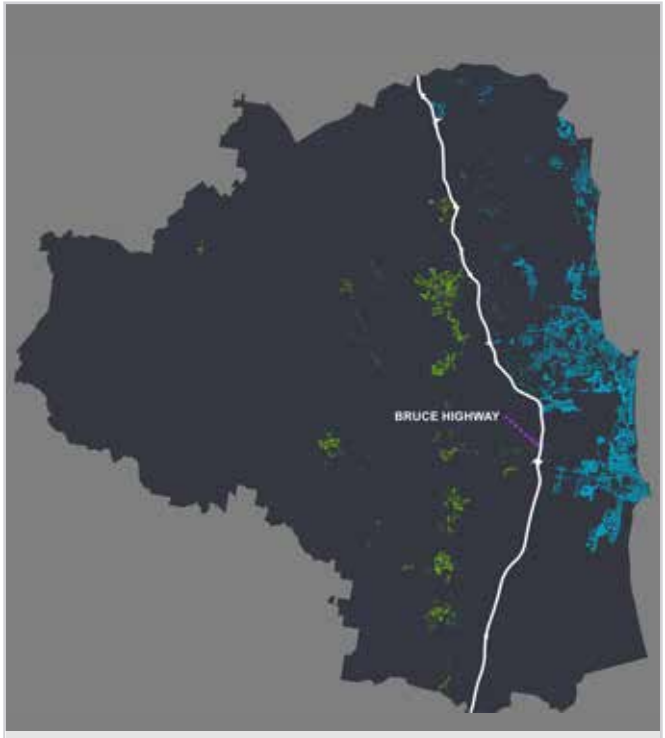


Figure 19 - Map highlighting assets according to their location, East or West of Bruce Highway

Figure 20 - Concept rendering of a renovated estate asset, East of Bruce Highway (Coastal area)

New Streetscape and Key Activity Areas

The Sunshine Coast region has a number of major projects and will have ongoing streetscape improvements in the future.

Each locality within the region will make appropriate treatments such as a main street revitalisation or a major public space project.

These projects need a different approach to the specifications described in this lighting strategy.

Example of a bespoke lighting of a pedestrian area

Strategy

The lighting strategy applied to these areas should represent high quality design outcomes. It is therefore necessary to ensure the lighting in these areas is treated differently than in other areas, while still achieving the overall lighting design outcomes of:

- Reduced glare,
- Reduced spill light,
- Ability to incorporate Smart Controls,
- Improved visual comfort.

To distinguish these principal activity areas, lighting designers engaged should give strong consideration to providing bespoke lighting design outcomes suited to the urban design theme of these areas as instructed by Council.

The need to enhance the “prestige” categorisation of Australian Standards should be strongly considered.

As many of these areas may involve large gatherings of people, consideration should be given to:

- Vertical illumination levels to enable CCTV to work effectively
- Using light to create urban space activation
- Using light to enhance and create night time points of interest and way finding

Consideration should be given to ensuring multiple urban services and associated infrastructure can be harmonised to reduce visual clutter within the road reserve.

These design outcomes combined location specific designed infrastructure will help reinforce the regions approach to high quality outdoor urban spaces.

Example of lighting poles adapted to Key Activity areas

Equipment

Introduction

The luminaires listed in this lighting strategy have been evaluated on industry based standards. Amongst other criteria, the core aspects in Table 14 have been considered to ensure Council achieves its overall lighting strategy.

This section includes recommendations about the different brackets and poles options.

Selection process

The advance of LED technologies and the important environmental and economical aspect that public lighting represents have resulted in a wide variety of products available on the market, and a significant interest for the Sunshine Coast Council public lighting upgrade project.

To evaluate the number of manufacturers that have submitted proposals, a consistent process has been followed to come up with the selection of luminaires listed in this document. The evaluation process will be ongoing and Council will review periodically new products and technologies and consider addition to the lighting strategy.

See Figure 21 for detailed process.

Benefit or outome	Criteria
Available in various light colour (see Figure 10)	3000K
High ingress weather protection rating	IP66
Adaptability to add smart controls	NEMA 7 PIN Socket
Ease of Maintenance	Hinged Access to chamber
Opportunity to dim	Dimmable driver
Protection against voltage surges	10kv Surge Protection
Limit spill light	Adoption of flat lens or “aero-screen” type luminaires

Table 14 - Minimum luminaire requirements

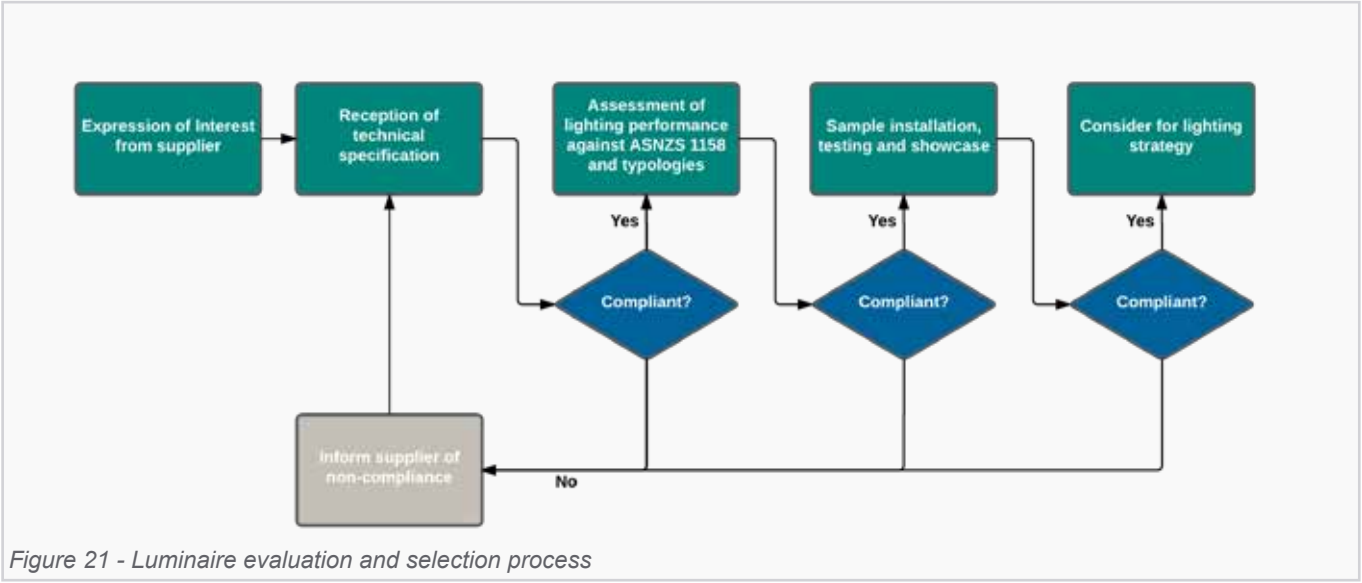


Figure 21 - Luminaire evaluation and selection process

Evaluation

Core criteria

In addition to the criteria detailed in Table 21, the following aspects — illustrated in Figure 23 to 27, have been evaluated:

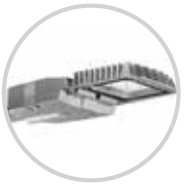
- Performance: rated from 1 to 5, 5 being the best performance;
- Aesthetic: rated from 1 to 5, 5 being the preferred aesthetic outcome based on discussion within Council;
- Price: rated from 1 to 5, 5 being the cheapest luminaire.

Big brother, little brother

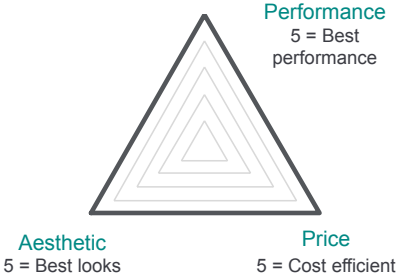
In order to have the option of aesthetic consistency on various types of roads, Council has also been investigating whether each model of luminaire came in a wide range of wattages, from low (“Little brother”) to higher wattage (“Big brother”).

LUMINAIRES
(See *Products* page for details)




Indicative compliance with Sunshine Coast typologies (“o” = compliant, “x” = non-compliant, “-” = doesn’t meet aesthetic strategy)							
Typology 1	o	o	o	o	o	--	-
Typology 2	o	-	-	o	-	o	-
Typology 3	o	-	-	o	-	o	-
Typology 4	x	o	o	x	x	-	-
Typology 5	o	x	x	x	x	-	-
Typology 6	x	o	x	x	x	-	-
Typology 7	o	o	x	x	x	-	-
Typology 8	o	o	-	-	-	-	o
Performance chart reference	Fig. 22	Fig. 23	Fig. 23	Fig. 24	Fig. 25	Fig. 26	Fig. 27



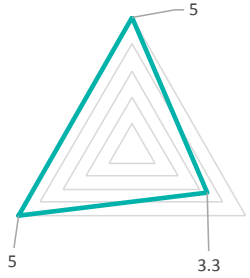


Figure 22

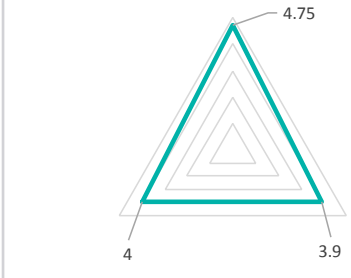


Figure 23

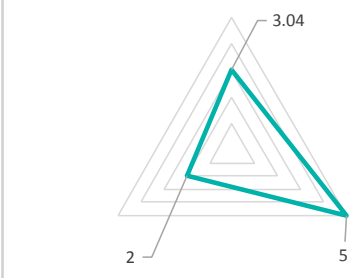


Figure 24

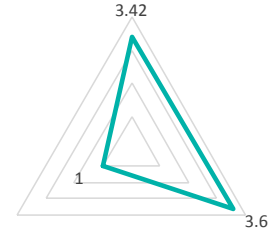


Figure 25

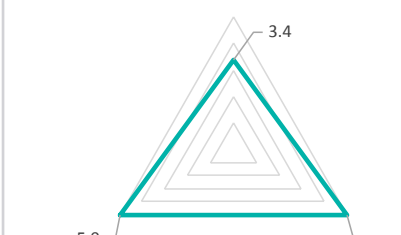


Figure 26

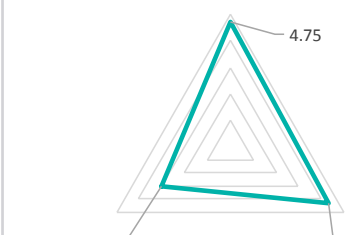


Figure 27

Products

Luminaires

The following luminaires comply with the lighting strategy and the minimum specifications described in the introduction.

LUMINAIRES

	RESIDENTIAL ASSETS	MAJOR ROADS, INDUSTRIAL AND COMMERCIAL (OTHER) ASSETS			
EAST OF BRUCE HIGHWAY	1 	2  LITTLE & BIG BROTHER ✓	3  LITTLE & BIG BROTHER ✗	4  LITTLE & BIG BROTHER ✓	5  LITTLE & BIG BROTHER ✓
	5 	1  LITTLE & BIG BROTHER ✓	6  LITTLE & BIG BROTHER ✗	7  FOR PARKS AND GARDENS	7  FOR PARKS AND GARDENS
WEST OF BRUCE HIGHWAY	8  CONCEPT ONLY	2  LITTLE & BIG BROTHER ✓	3  LITTLE & BIG BROTHER ✗	4  LITTLE & BIG BROTHER ✓	5  LITTLE & BIG BROTHER ✓
	9  LED VERSION	1  LITTLE & BIG BROTHER ✓	10  FOR PARKS AND GARDENS		

1. LRL NXT
2. OrangeTek TerraLED
3. OrangeTek Voyager
4. Philips Greenvision
5. Beka-Schreder LEDlume
6. Betacom GL520
7. WE-EF PFL series
8. OrangeTek Custom luminaire
9. Sylvania Avenue LED [1]
10. WE-EF ASP series

BRACKETS

RESIDENTIAL ASSETS

SEE BRACKETS, OPTION 1

SEE BRACKETS, OPTION 2

SEE BRACKETS, OPTION 3

OTHER ASSETS

GALVANISED BRACKET ON DISTRIBUTION POLE

CURVED GALVANISED BRACKET

GALVANISED BRACKET ON DISTRIBUTION POLE

CURVED GALVANISED BRACKET

POLES

Brackets

East of Bruce Highway (Coastal area)

- Option 1: transition to, or install, an Avenue (as pictured) type bracket or equivalent;
- Option 2: transition to, or install, a bracket to modernise or align with the appearance of the asset within its urban environment.

West of Bruce Highway (Hinterland area)

- Option 3: retain heritage aesthetics of existing brackets.

Poles

The pole strategy focuses on supporting Council's strategy to an improved appearance in amenity. Focus is thus given to those assets located in residential areas with colours — as per Council's Design Palettes.

For other applications, standard galvanised poles can be procured through Council's normal process, adopting existing industry standands.

Notes:

- For brackets and poles, both for transition and new, special care needs to be taken in the selection of the material and the finish types, to ensure that assets have the appropriate longevity based on standards or industry recommendations.
- The selected equipment should have independent RPEQ certification.

Lighting visualisations

These visualisations utilise manufacturers' technical lighting data files (.ies) combined with accurate 3D rendering software, to understand the effects of public lighting on the urban environment.

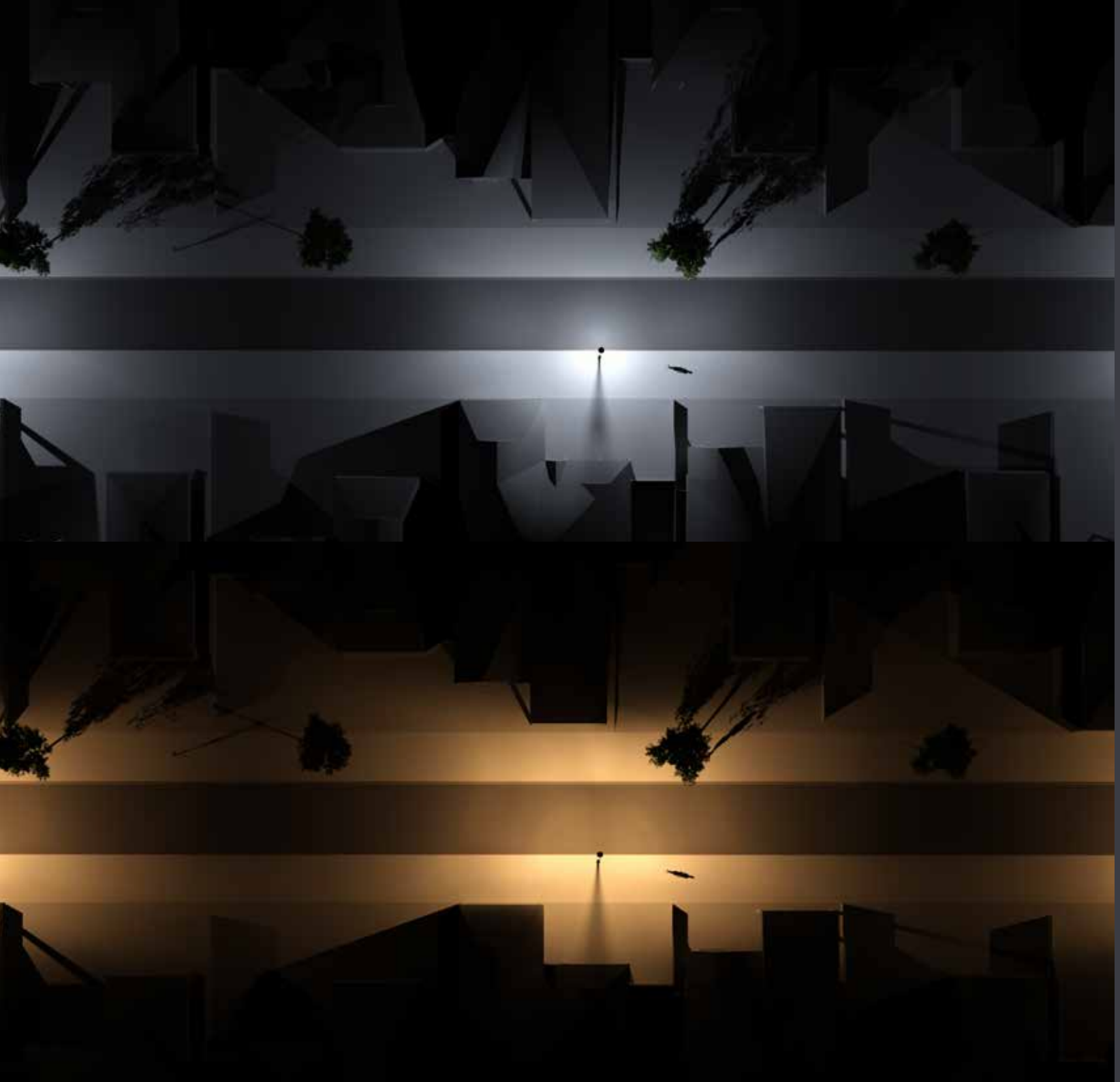
Visualisation of Typology 1

The top picture represents the current challenges with the existing luminaire technologies. It demonstrates uncontrolled lighting with poor uniformity.

The adverse effects of uncontrolled lighting are highlighted through the before and after comparisons are:

- Spill lighting on abutting properties, creating disturbance for residents;
- Poor uniformity levels, with a succession of bright spots and dark spots, resulting in a poorer visibility for drivers — as the eye adapts slowly to darkness.

In contrast, the bottom picture shows a better uniformity due to well distributed light throughout the area of influence of each luminaire. Light is better controlled as well with limited light reaching abutting properties.



Visualisation of Typology 2

This visualisation shows similar issues to the ones described in Typology 1. In addition, the suggested luminaire used in the bottom picture shows a significantly better distribution of light, illustrated by the higher light level between assets, and a better uniformity

Smart Lighting

Introduction

In 2015, Council launched its Smart City Framework (SCF). Creating a Smart City has many benefits including:

- Lower carbon emissions, traffic congestion and energy use, which benefits both rate payers and the environment
- Improved city services by sharing data, which means less wait times and faster service
- Increased safety and a reduction in crime
- Better operational response and higher asset utilisation
- Attraction of more investment and new business to the area, which also attracts new talent, providing more employment opportunities.

The Smart City uses information and communications technologies to connect people, processes, data and things in ways that make cities more:

Liveable	Workable	Sustainable
A better quality of life	Accelerated economic development	Responsible resource use, in harmony with the environment

A key aspect of 13 value-added services that the SCF outlines as one of the largest macro-economic benefits to the Sunshine Coast Region is Smart Lighting.

Illustration of a Smart City neighbourhood

Strategic street lighting

By taking back control and ownership of the public lighting network, the Sunshine Coast lays the foundation for deploying its Smart City strategy. The use of street lighting as an item of infrastructure rapidly accelerates the strategic intent of the Sunshine Coast as a Smart City region.

The Smart City network in this lighting strategy proposes to use the street lighting network to deploy a mesh network enabling a range of services to be adapted to serve the community.

The strategic intent for the Sunshine Coast region to deploy its Smart City Framework will, in many ways, lead Australia to challenge the existing barriers to entry as the technology mounted on the street lighting network encompasses existing laws and regulations relating to:

- The National Electricity Market;
- Energy Metering;
- Metering data requirements.

Figure 28 — Smart lighting & Smart City

Network

It is important for Council to consider providing a Smart Lighting network that has the ability for other types of applications across a range a communication networking standards for different applications — see Figure 28.

The SCF aims to deliver a range of services and therefore needs to be comprised of a hybrid networking solution that enables the delivery of these services across different industry standards.

The lighting strategy recommends that the Smart City network is based on one or both of:

- 6LoWPAN – For Machine-to-Machine (M2M), car parking, lighting and waste management
- LoRaWan – For environmental sensors

In addition to these core communication protocols, hybrid solutions providing the following technologies would be benefitial to the delivery of the SCF objectives:

- Zigbee – For metering; electricity, water and sensor applications
- WiFi – For general public wireless internet access, digital signage, CCTV applications

Adopting a hybrid solution provides a degree of flexibility that can ensure Council achieves its strategic goals in relation to the SCF and ensures the widest range of options considered for adoption.

6LoWPan

6LoWPAN is an acronym for IPv6 over Low power Wireless Personal Area Networks. It is designed to deliver the smallest, lowest-power and most reduced processing power device.

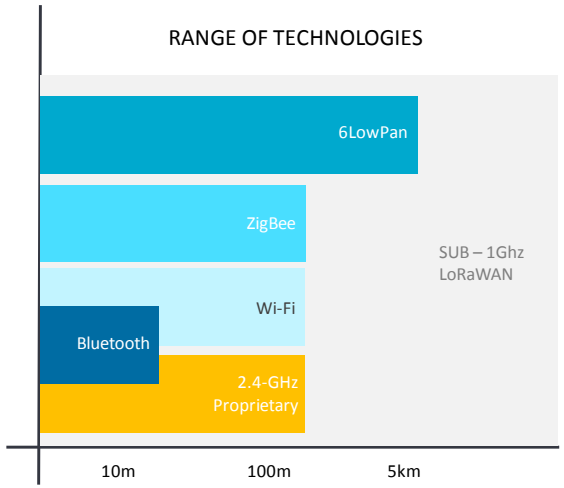
It is really the first wireless connectivity standard that was created for the Internet of Things (IoT). 6LowPan has IPv6 as its only supported Internet Protocol (IP) because it supports a large addressing space and therefore much larger networks and it has in-built support for network auto configuration.

6LoWPAN deployments use both the 2.4-GHz and the 868-MHz/915- MHz ISM bands

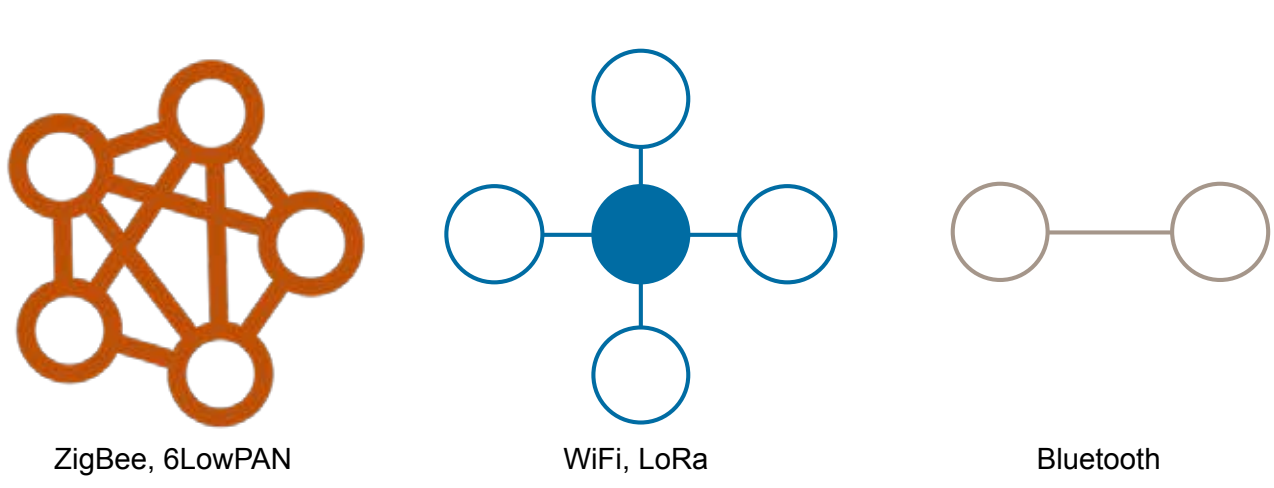
Zigbee ®

Zigbee is named after the dance that bees perform on the way back to their hive, communicating to their fellow bees the location and type of food found. With Zigbee, each node in the network communicates to other nodes in a mesh type arrangement. Zigbee can deliver data rates of up to 250 kBps but is generally used in low-power type applications.

New Zigbee type applications are provided with coin-type battery sensors that can still operate



Communication range of various technologies



Typical network topologies

over very long periods of inactivity and low operation duty cycles.

Built upon the IEEE 802.15.4 standard, Zigbee is based upon a low-power low throughput and low cost technology. It has mainly been used in Smart Meters, home automation and lighting control applications.

To access the IoT, a Zigbee device needs a gateway which also acts as a node in the network.

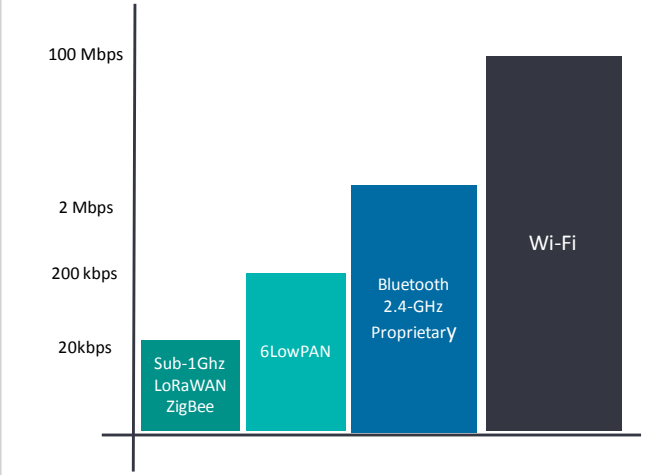
WiFi

Wi-Fi technology, based on the IEEE 802.11 standard, was developed as a wireless replacement for the popular wired IEEE 802.3 Ethernet standard. It was created from day one for Internet connectivity. All smart phones and tablets include WiFi connectivity.

WiFi is commonly installed in public access spaces such as retail shopping malls, airports, coffee shops and retail stores. WiFi networks have a star topology, they are generally used for large data bandwidth (> 100Mbps) and have a higher power consumption.

LoRaWAN™

LoRaWAN is a Low Power Wide Area Network (LPWAN) specification. It is intended for wireless battery operated “Things” in regional, national or global networks, and standards will aim to provide improved and seamless interoperability among devices without the need of complex local installations. This standard is relatively new and business models are still yet to be defined but the technology enables the deployment of low-cost sensors making it suitable for environmental sensors.



Communication throughput of various technologies

Centralised Management System (CMS)

The Centralised Management System (CMS) provides for a range of schedules that can be deployed in accordance with the design guidelines and the appropriate risk management.

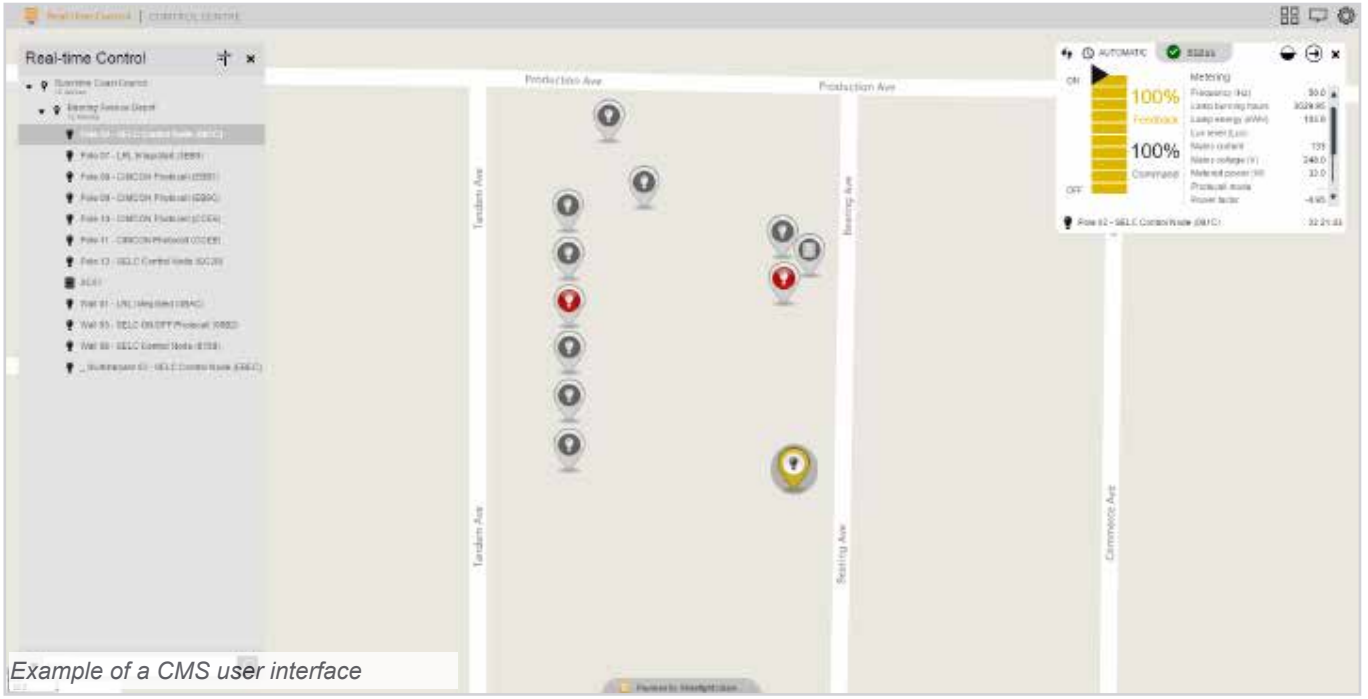
Schedules are the smart lighting features that allow a user to define and commission different lighting schedules to single lights, group of lights or whole controllers. The lighting schedules are a detailed plan of how lights should behave, including:

- When to turn on;
- When to dim and at what level;
- When to turn off.

The main features of a CMS relate to:

- Defect detection & reporting;
- Schedules based dimming, on demand dimming;
- Electrical values measurement;
- Various data collections; temperature, voltage, line current time on/off

In accordance with the National Electricity Rules and AEMO Guidelines, it is necessary to provide a display to customers to enable them to verify the energy consumption of the metering installation. It is also required that the CMS provides critical metering data to the Metering Data Provider to enable a reconciliation of the energy.



Example of a CMS user interface

Example of dashboard of a CMS software


LOADING
ZONE

Part 4 Public Lighting Upgrade Plan

Strategy
Local Plans
Other Plans

Public Lighting Upgrade Plan

Strategy

It is proposed to replace all public lighting luminaires used for Council managed roads with Smart enabled LED luminaires. There are a range of options for Council to consider in the upgrade strategy which intends to balance this “long term regional opportunity”:

- Achieving maximum energy savings,
- Making improvements to the general amenity of public lighting,
- Reducing the lighting spill issues associated with street lighting and its associated negative environmental effects,
- Incorporating technologies that align with and help develop Council’s Smart City Framework,
- Reducing long term costs.

The different options summarised in this section provide for a range of options to consider. It should be noted that the energy savings per option depend on what type of luminaire is used on what type of road against the lighting design standard of that road. Note that information shown in local plans and other plans further in this document are based on Option 1.

Options

The public lighting upgrade plan is considering 6 different options, as shown in Table 16. The estimated cost of the different options is detailed in Appendix 01.

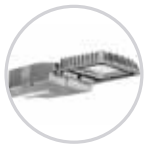
			Option 1	Option 2	Option 3	Option 4	Option 5	Option 6
EAST - COASTAL AREAS	Residential poles							
	Others	Low wattage (< 30W)						
		Medium wattage (< 150W)						
		High wattage (>= 150W)						
WEST - HINTERLAND AREAS	Residential poles							
	Others	Low wattage (< 30W)						
		Medium wattage (< 150W)						
		High wattage (>= 150W)						

Table 16 — Public lighting upgrade options

Energy considerations

One of the foundations of the public lighting upgrade is to provide Council with significant energy savings compared to Business as Usual (BaU). Table 17 shows the various energy aspects of the different scenario compared to BaU.

Energy efficiency measures

To achieve its energy efficiency objectives, Council needs to implement one of the options described below, balancing its environmental and aesthetic requirements for the Region. In addition to this public lighting upgrade, Part 03 of this document intends to serve as a Public Lighting Developer Guideline.

Scenario	Business As Usual	Option 1	Option 2	Option 3	Option 4	Option 5	Option 6
(A) Estimated energy use — Total wattage installed in kW [1]							
Year 1 — 2017 [2]	2616	-	-	-	-	-	-
Year 5 — 2021 [3]	2799	1165	1257	1262	1244	1292	1279
End of Year 20 — 2037 [3]	3609	1502	1621	1627	1604	1665	1649
(B) Estimated energy cost per year (AUD) [4]							
Year 1 — 2017	$548,202	-	-	-	-	-	
Year 5 — 2021 [5]	$638,379	$265,672	$286,718	$287,856	$283,804	$294,632	$291,724
End of Year 20 — 2037	$1,109,723	$461,833	$498,429	$500,394	$493,365	$512,187	$507,119
(C) Estimated energy savings (%) [6]							
Estimated energy savings	0%	48% to 58%	45% to 55%	44% to 54%	45% to 55%	43% to 53%	45% to 55%

Table 17 - Energy use, energy cost estimations and estimated energy savings

General note: all information in Table 17 are estimations and may vary upon final equipment selection, both for luminaires and smart controls.

(1) Installed power is calculated based on the nominal wattage of each light as per AEMO load tables for existing lights. For LED lights, a factor of 10% has been applied to the nominal wattage.

(2) This is considered to be the baseline. Energy performance objectives should be calculated against this value.

(3) Those values include new lighting point growth of 1.7% per year, slightly higher than the population growth for 2016 in Council's Population and Housing Forecasts — 1.6%.

(4) The estimated energy costs rely on the following major parameters:

- Estimated installed power,
- Estimated evolution of the public lighting network,
- An annual increase in energy rates of 4%,
- Peak/off-peak energy rates (7.8/3.89 cent per kWh).

(5) The estimated cost for Options 1 to 6 do not include potential savings related to dimming or considerations relating to a different rate arrangement should Council adopt a single light metering approach.

(6) The estimated energy savings are calculated not against the baseline but against estimated installed wattage, including growth. Those savings do not take into account nominal wattage of smart controls as a supplier has not yet been selected. It is estimated that smart controls will have a downward impact of up to 6% on the savings.

Local plans

The following local plans are based on Part 7 of Sunshine Coast Planning Scheme:

Beerburrum
Beerwah
Blackall Range
Bli Bli
Buderim
Caloundra
Caloundra West
Coolum
Eudlo
Eumundi
Forest Glen / Kunda Park / Tanawha
Glass House Mountains
Golden Beach/Pelican Waters
Kawana Waters
Kenilworth
Landsborough
Maleny
Maroochy North Shore
Maroochydore / Kuluin
Mooloolaba / Alexandra Headland
Mooloolah
Nambour
Palmwoods
Peregian South
Sippy Downs
Woombye
Yandina

Other localities

Some suburbs on the Sunshine Coast are not included in any local plan. They have been listed separately further in this document.

Notes:

1. The maps and numbers presented in the following section are based on the latest public lighting dataset. This dataset is composed of the latest information received from Council on 30th of June 2016 and additional assets found during the initial audit. The total number of lighting points in this dataset is 26,039;
2. The introduction text in each local plan has been extracted from the Sunshine Coast Planning Scheme 2014;
3. Lighting assets that support the identity of a locality — such as Montville — will be retained.


Welcome to...
Beerburrum
South East Queensland Winner
Young Legends Awards 2006
BEERBURRUM

Beerburrum

The township of Beerburrum is mostly residential, characterised by low density developments on larger sized blocks. This large lot size is a key element of the region's open streetscapes and private garden character.

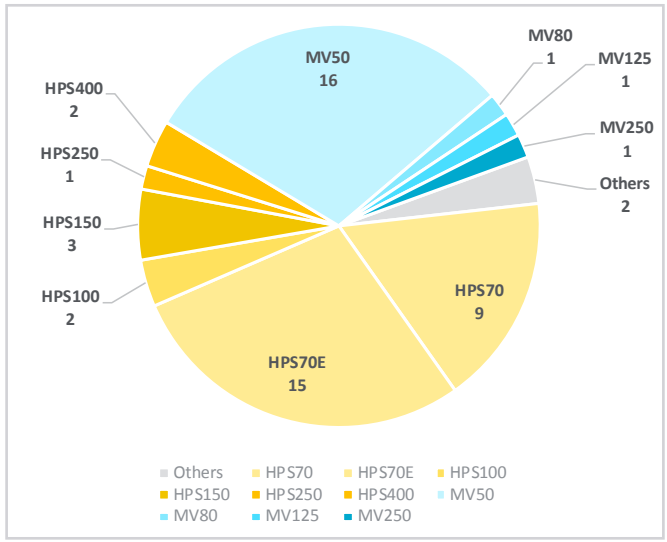
The town centre comprises of a very small number of stores along Beerburrum Road including a general store, motor vehicle repair premises and an agricultural supply store.

The appropriate use of high quality public lighting can enhance the current character and identity of Beerburrum by accentuating the primary streetscape area along Beerburrum Road and create safer more aesthetically pleasing town centre.

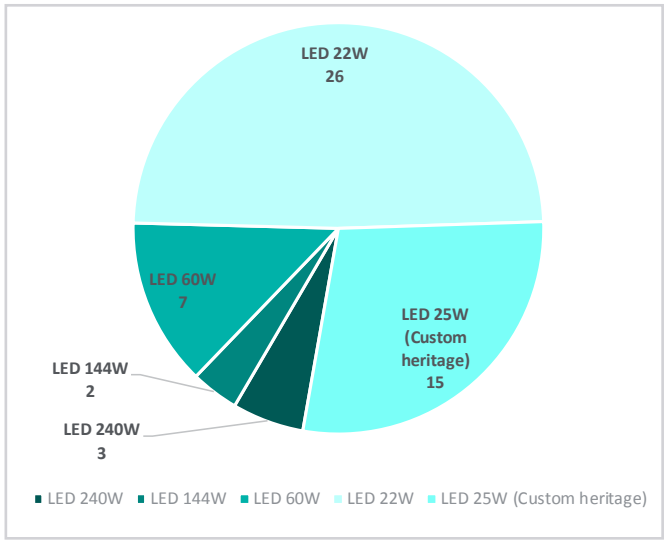
Upgrade material

The upgrade program plans the replacement of the existing lights with 5 different wattages of LED luminaire, with smart contol:

- LED 240W 3 luminaires
- LED 144W 2 luminaires
- LED 60W 7 luminaire
- LED 22W 26 luminaire
- LED 25W (estate) 15 luminaire



Distribution of existing lights by wattage and technology

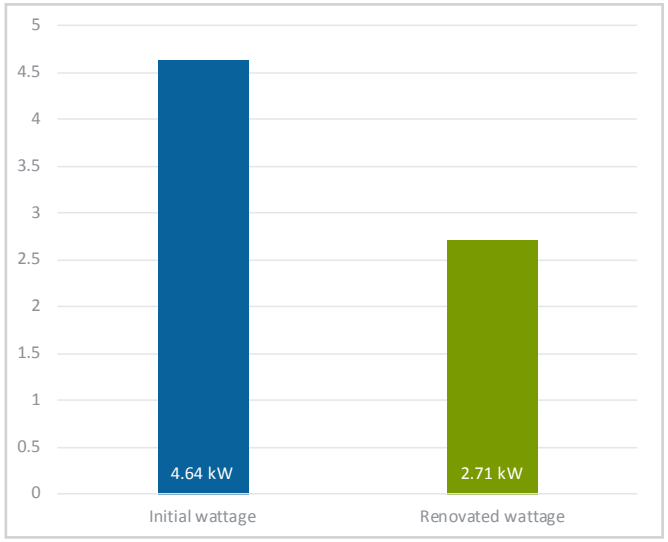


Distribution of renovated lights by wattage and technology

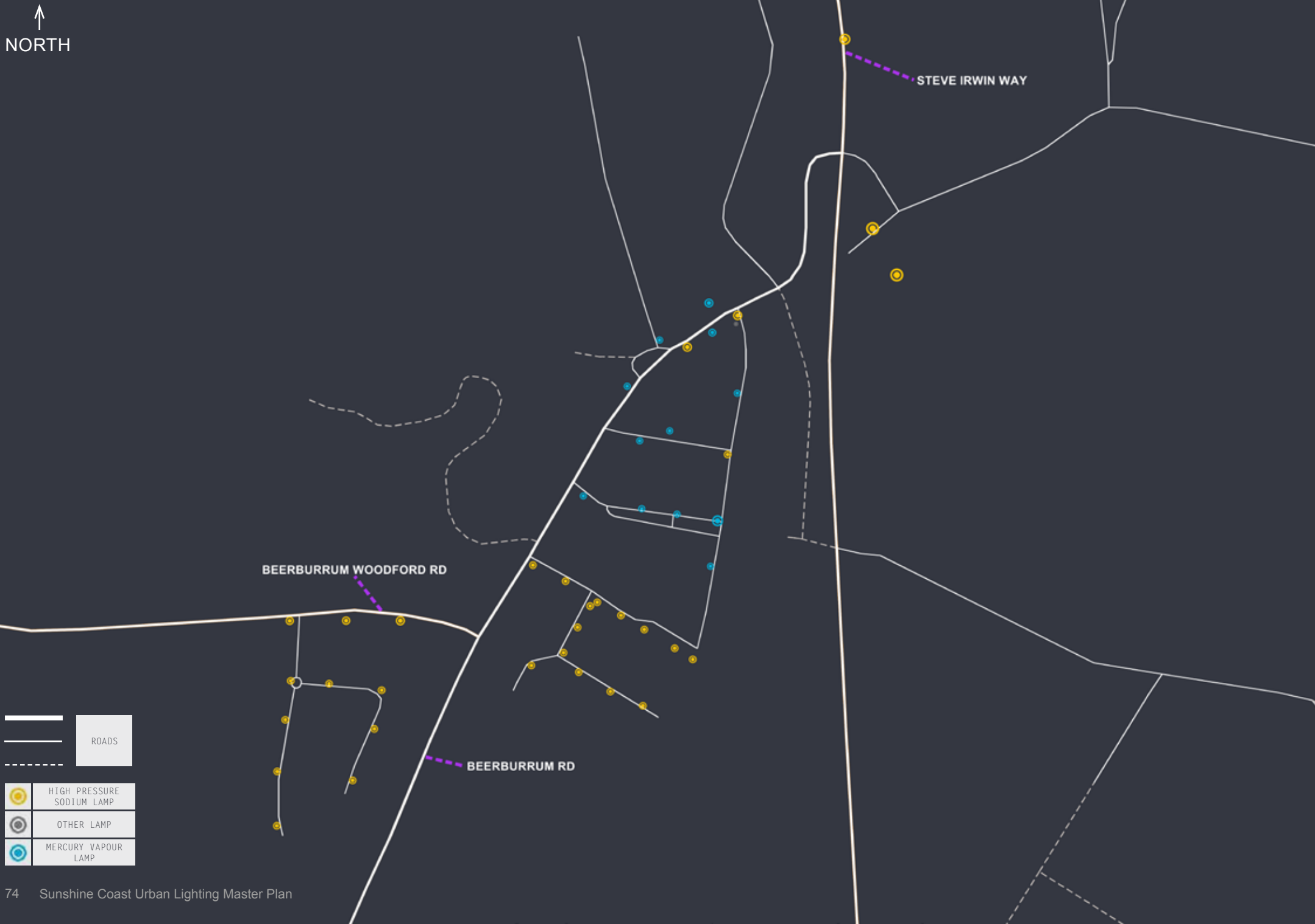
number of lighting points: **53 lights**

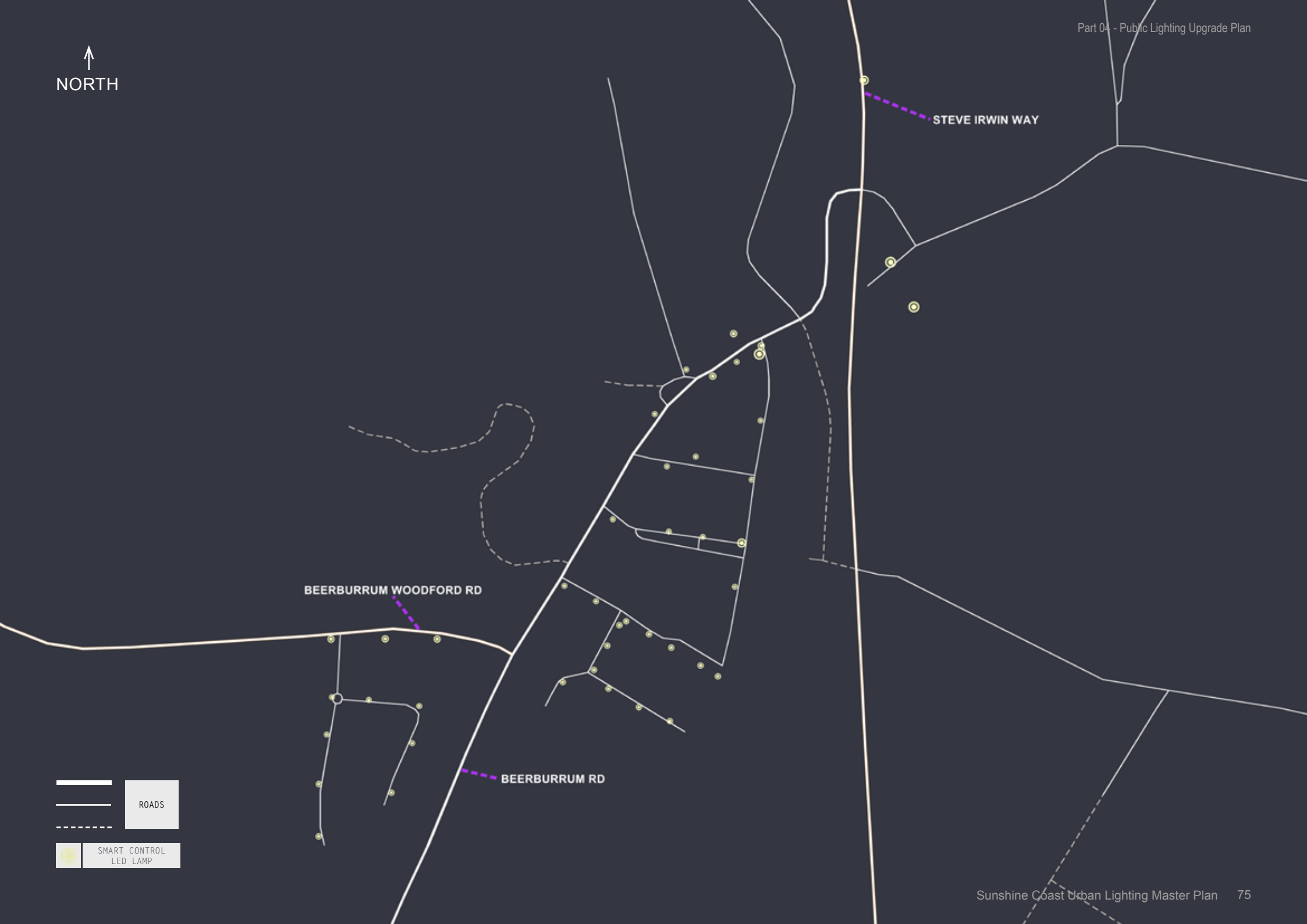
consumption before renovation: **4.64 kW**
consumption after: **2.71 kW**

estimated energy savings: **42%**



Consumption before and after renovation


NORTH
STEVE IRWIN WAY
BEERBURRUM WOODFORD RD
BEERBURRUM RD
ROADS
HIGH PRESSURE SODIUM LAMP
OTHER LAMP
MERCURY VAPOUR LAMP


NORTH
STEVE IRWIN WAY
BEERBURRUM WOODFORD RD
BEERBURRUM RD
ROADS
SMART CONTROL
LED LAMP


NORTH
STEVE IRWIN WAY
ROADS
HIGH PRESSURE SODIUM LAMP
OTHER LAMP
MERCURY VAPOUR LAMP

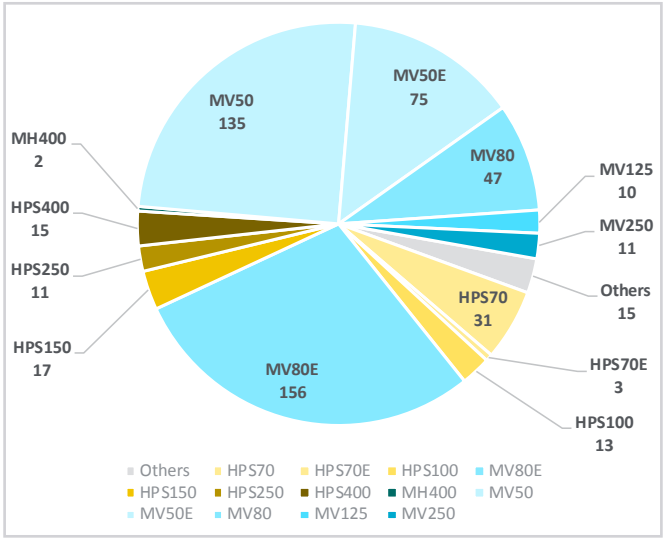

NORTH
STEVE IRWIN WAY
ROADS
SMART CONTROL
LED LAMP

Beerwah

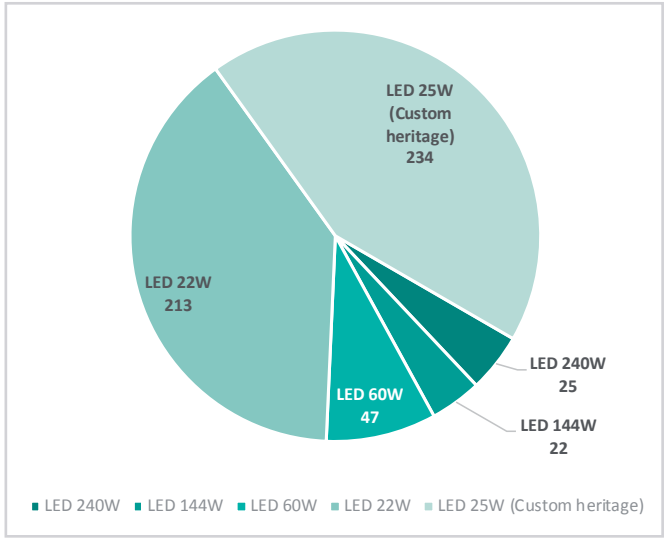
Steve Irwin Way is Beerwah's principal road link, connecting the town with north and south.

The town centre is currently divided into two parts by the North Coast Rail Line with the western side of the rail line focussed on Simpson Street and Peachester Road predominantly supporting retail functions, and the eastern side (north of Mawhinney Street) currently supporting service industry functions.

Public lighting should be proactively developed along main streets such as Simpson Street and Kilcoy Beerwah Road as the Beerwah town centre becomes increasingly urbanised and activated.



Distribution of existing lights by wattage and technology

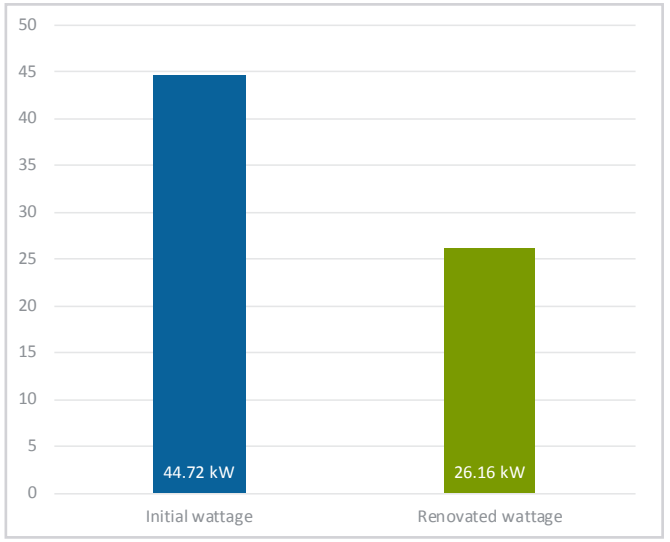


Distribution of renovated lights by wattage and technology

number of lighting points: **541 lights**

consumption before renovation: **44.72 kW**
consumption after: **26.16 kW**

estimated energy savings: **42%**

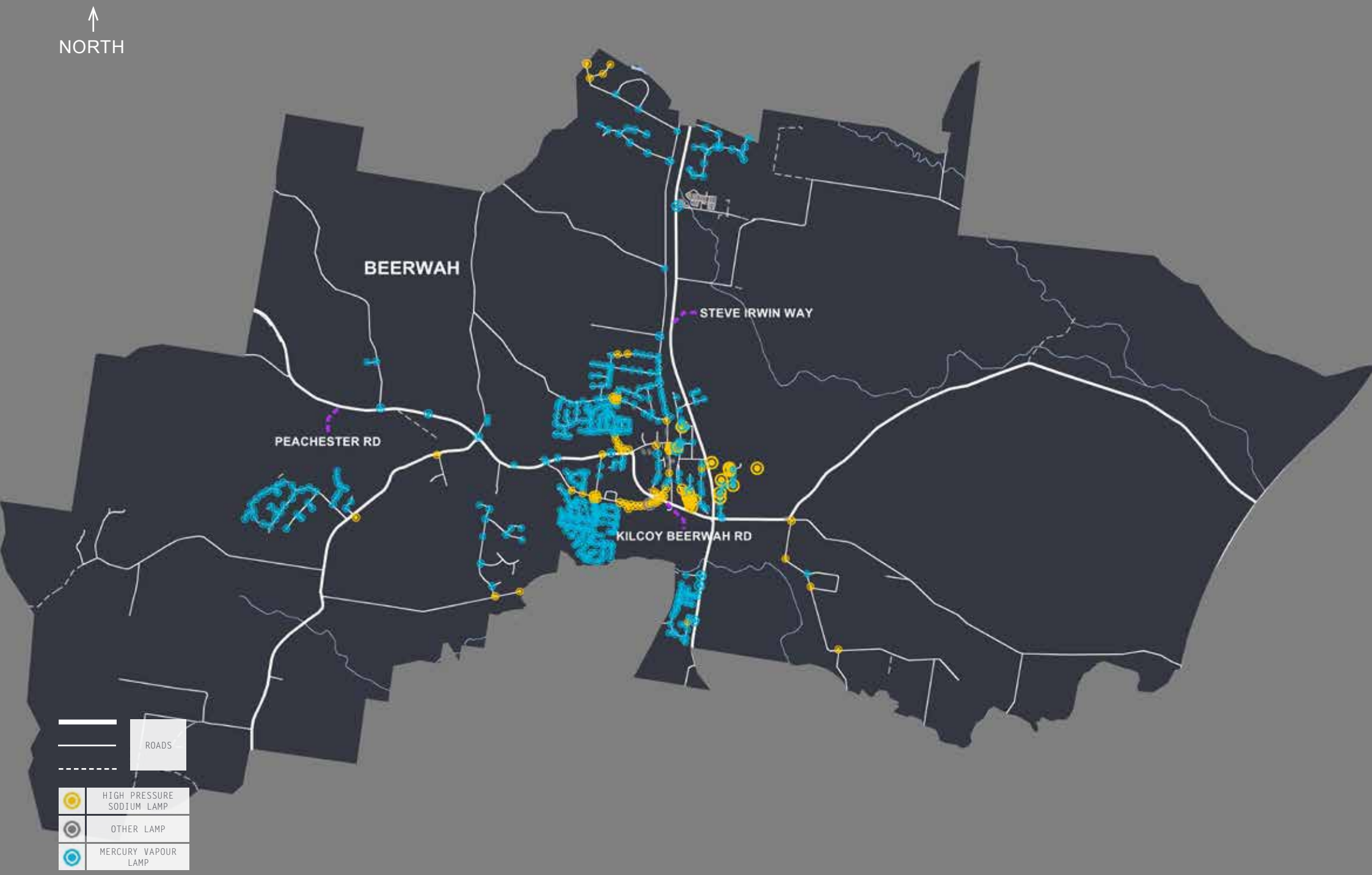


Consumption before and after renovation

Upgrade material

The upgrade program plans the replacement of the existing lights with 5 different wattages of LED luminaire, with smart contol:

- LED 240W — 25 luminaires
- LED 144W — 22 luminaires
- LED 60W — 47 luminaires
- LED 22W — 213 luminaires
- LED 25W (estate) — 234 luminaires


NORTH
BEERWAH
STEVE IRWIN WAY
PEACHESTER RD
KILCOY BEERWAH RD
ROADS
HIGH PRESSURE SODIUM LAMP
OTHER LAMP
MERCURY VAPOUR LAMP


NORTH
BEERWAH
STEVE IRWIN WAY
PEACHESTER RD
KILCOY BEERWAH RD
ROADS
SMART CONTROL
LED LAMP

Blackall Range

The Blackall Range local plan area is located on the Maleny plateau in the central hinterland of the Sunshine Coast and has a land area of approximately 2,505 hectares.

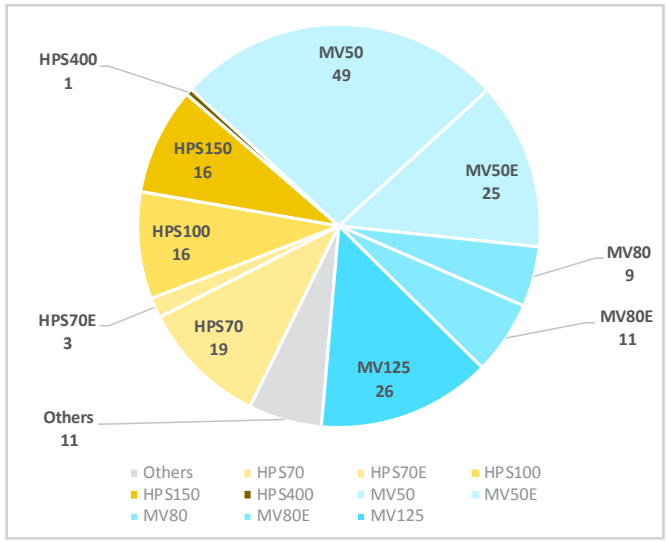
The local plan area includes the small rural villages of Montville and Mapleton, the rural residential community of Flaxton, as well as a number of smaller rural residential estates. The local plan area also includes the rural and natural areas that surround and weave in between these rural villages and rural residential areas.

Lighting can play a significant role in the character and identity of places. A consistent and visually sensitive lighting scheme can enhance the rural village style of Mapleton and Montville by emphasising its historical and natural features.

Upgrade material

The upgrade program plans the replacement of the existing lights with 4 different wattages of LED luminaire, with smart contol:

- LED 240W 4 luminaires
- LED 60W 59 luminaires
- LED 22W 77 luminaires
- LED 25W (estate) 45 luminaires

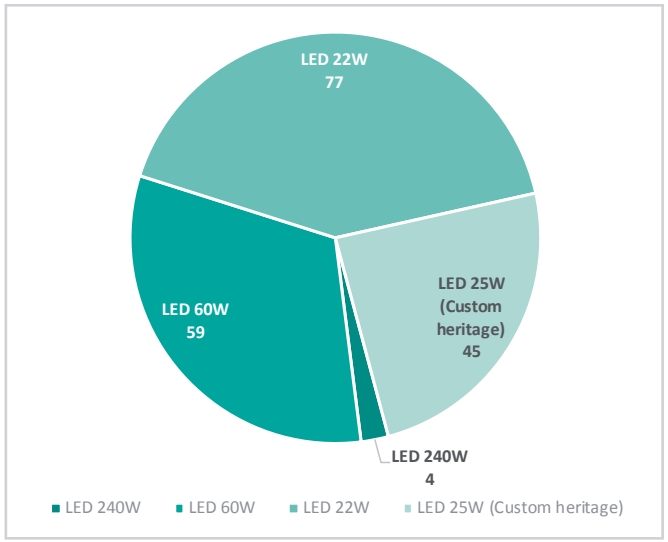


Distribution of existing lights by wattage and technology

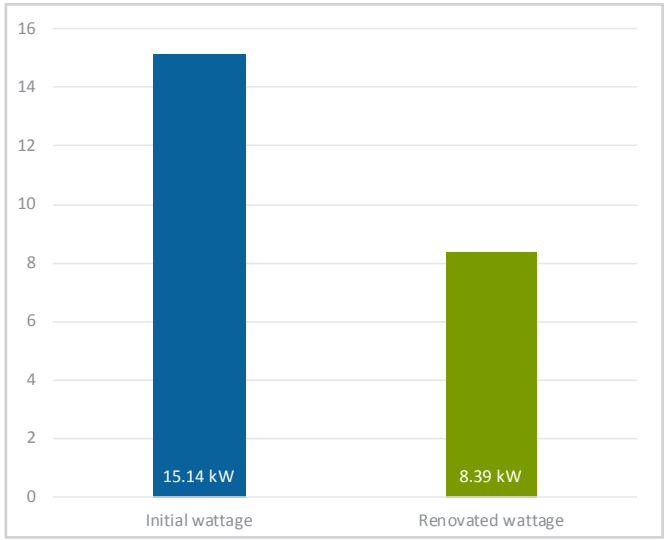
number of lighting points: **186 lights**

consumption before renovation: **15.14 kW**
consumption after: **8.39 kW**

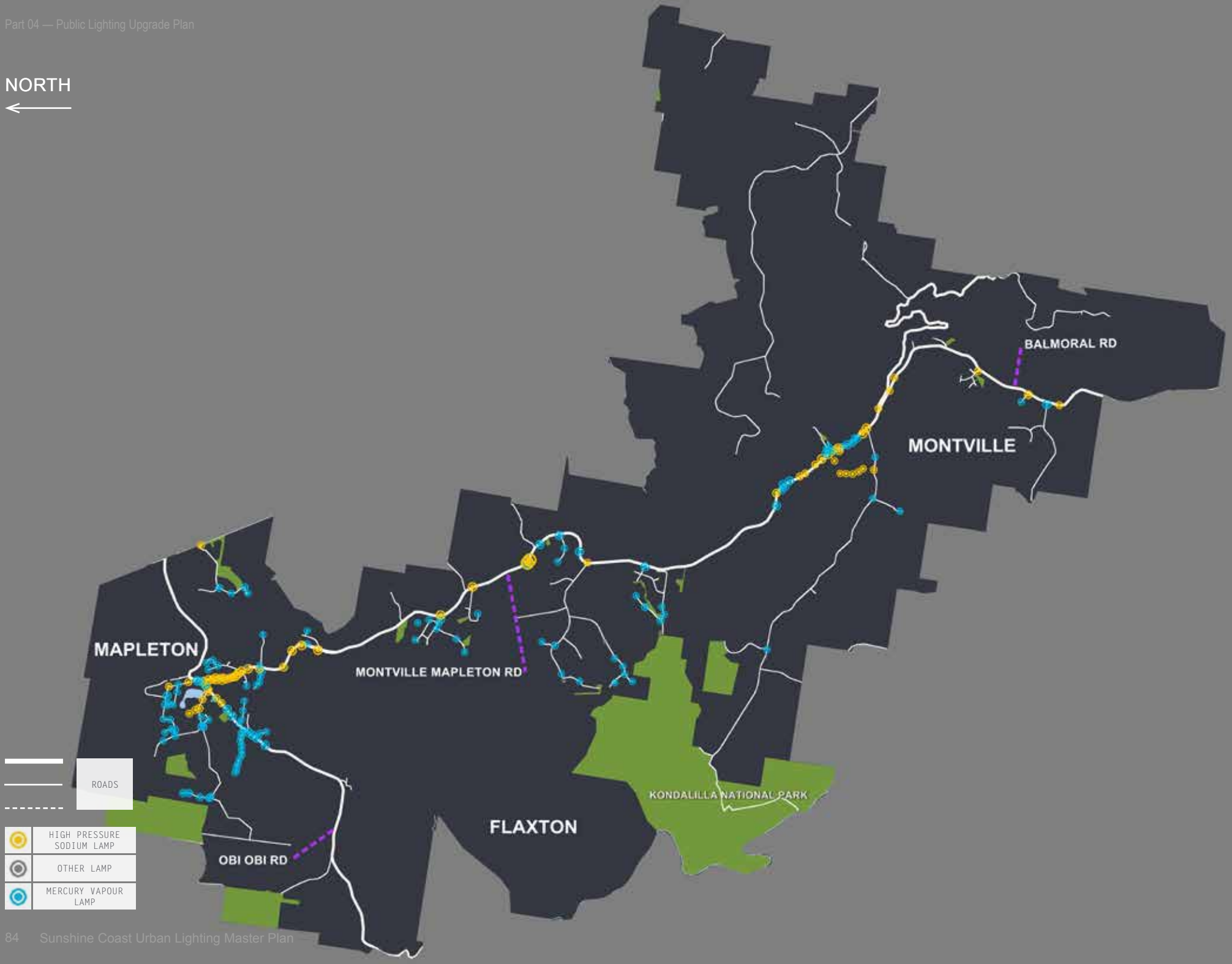
estimated energy savings: **45%**

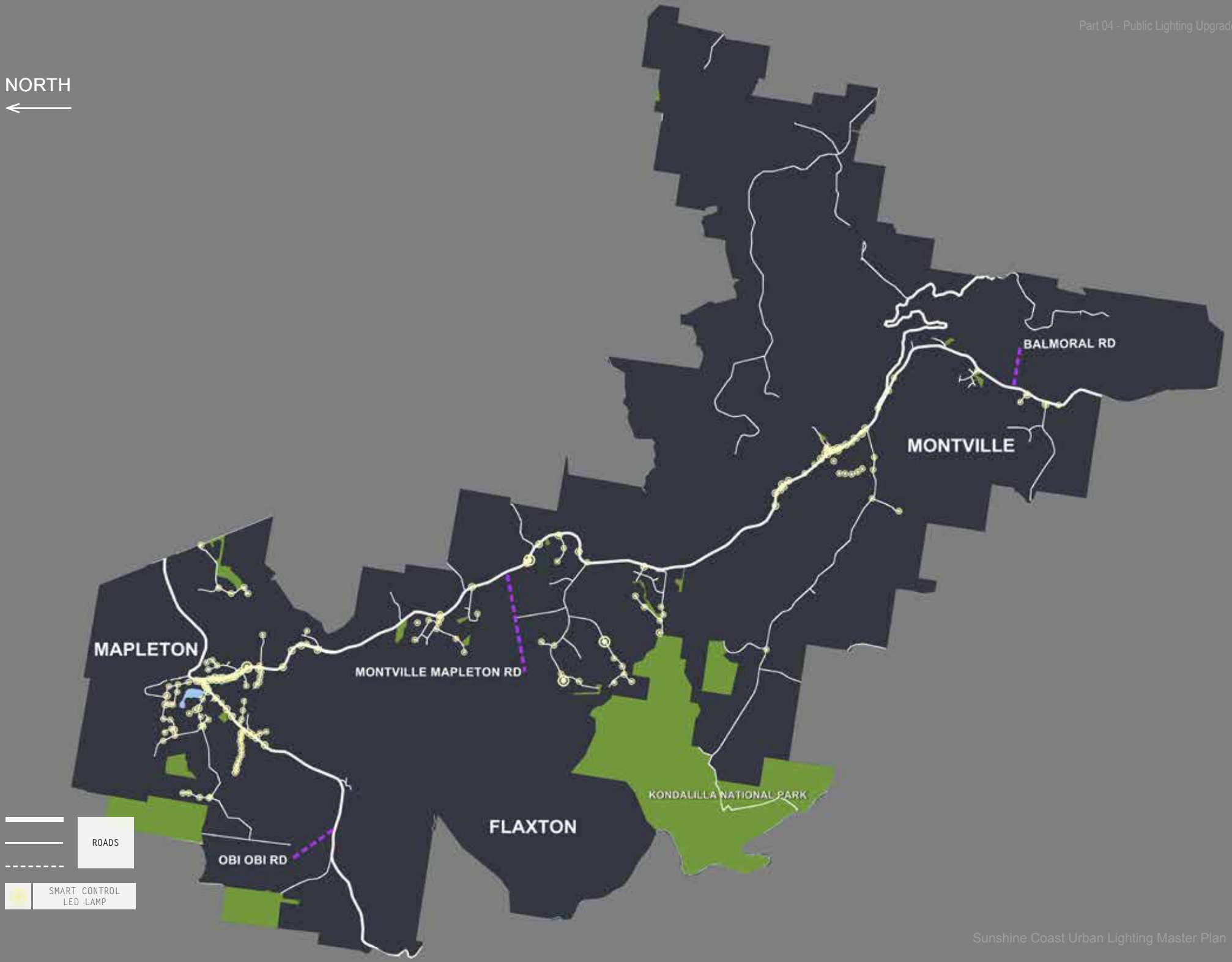


Distribution of renovated lights by wattage and technology



Consumption before and after renovation


NORTH
BALMORAL RD
MONTVILLE
MAPLETON
MONTVILLE MAPLETON RD
KONDALILLA NATIONAL PARK
FLAXTON
OBI OBI RD
ROADS
HIGH PRESSURE SODIUM LAMP
OTHER LAMP
MERCURY VAPOUR LAMP


NORTH
BALMORAL RD
MONTVILLE
MAPLETON
MONTVILLE MAPLETON RD
KONDALILLA NATIONAL PARK
FLAXTON
OBI OBI RD
ROADS
SMART CONTROL
LED LAMP

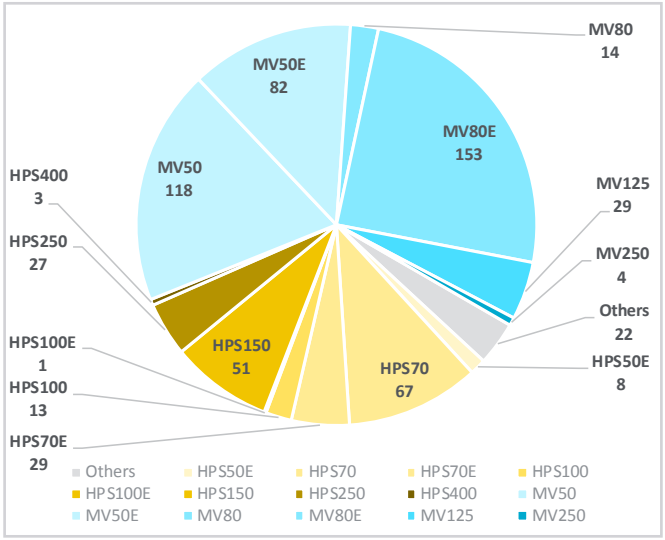

We come
as outfit
ABSOLUT
TOYS

Bli Bli

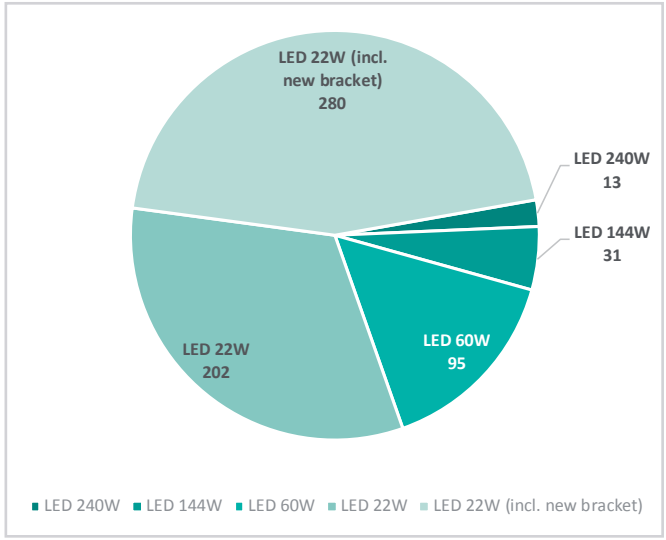
The Bli Bli local plan area is situated between the urban areas of Nambour, Maroochydore and Pacific Paradise in the central part of the Sunshine Coast.

The Bli Bli local plan area remains an attractive residential area comprising a number of urban and rural residential neighbourhoods and a village centre surrounded by a mosaic of farming land and natural areas.

Sensitive well designed lighting can be used to enhance the local centre zone fronting David Low Way to reinforce the vibrant, active streets and public spaces.



Distribution of existing lights by wattage and technology

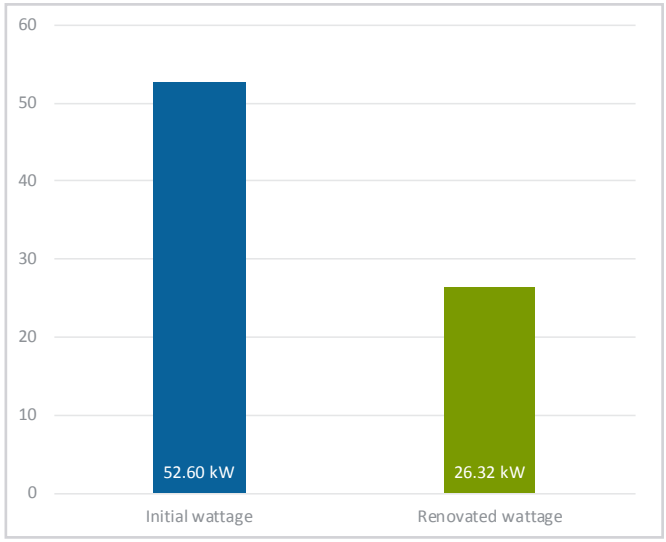


Distribution of renovated lights by wattage and technology

number of lighting points: **621 lights**

consumption before renovation: **52.60 kW**
consumption after: **26.32 kW**

estimated energy savings: **50%**

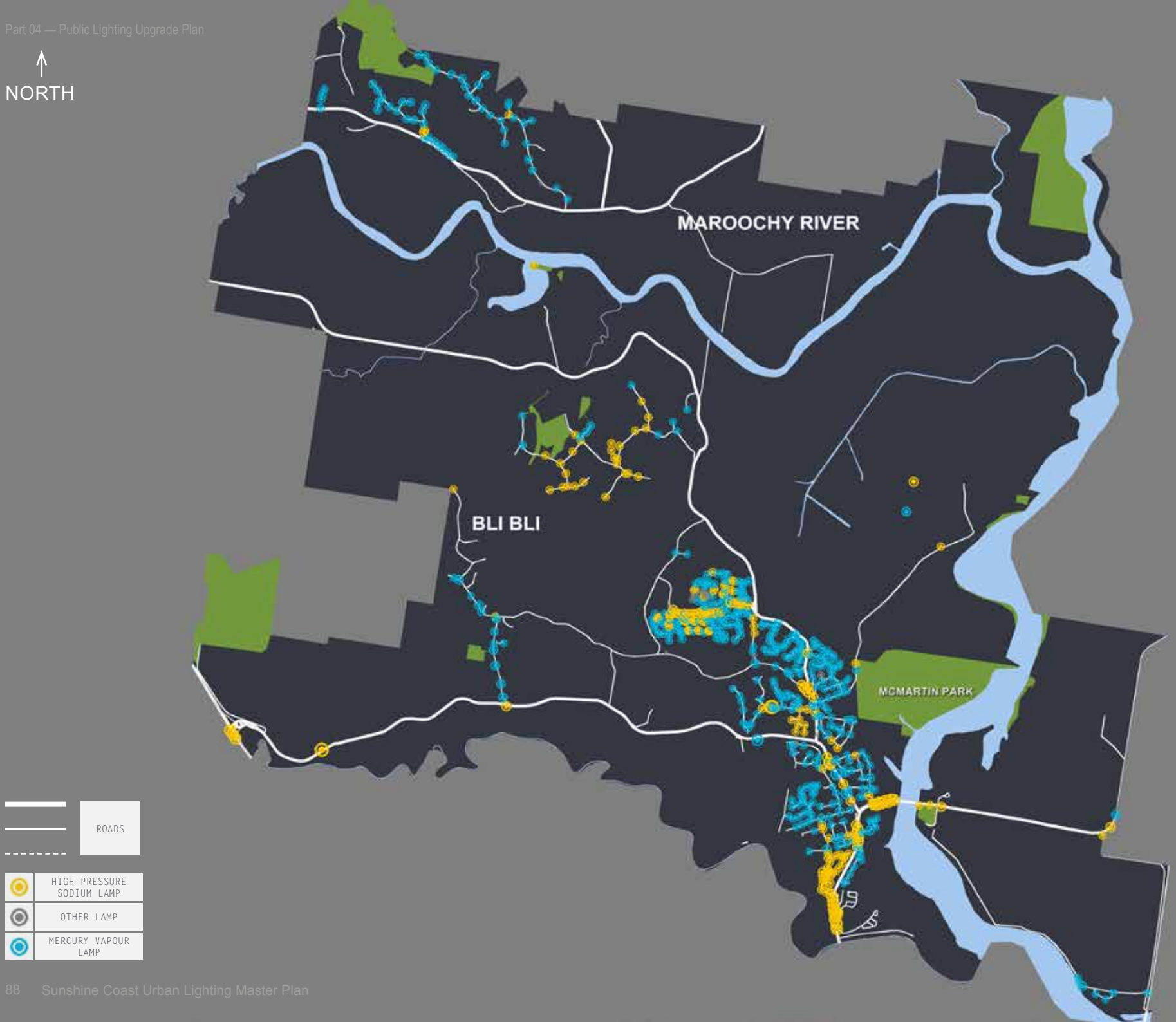


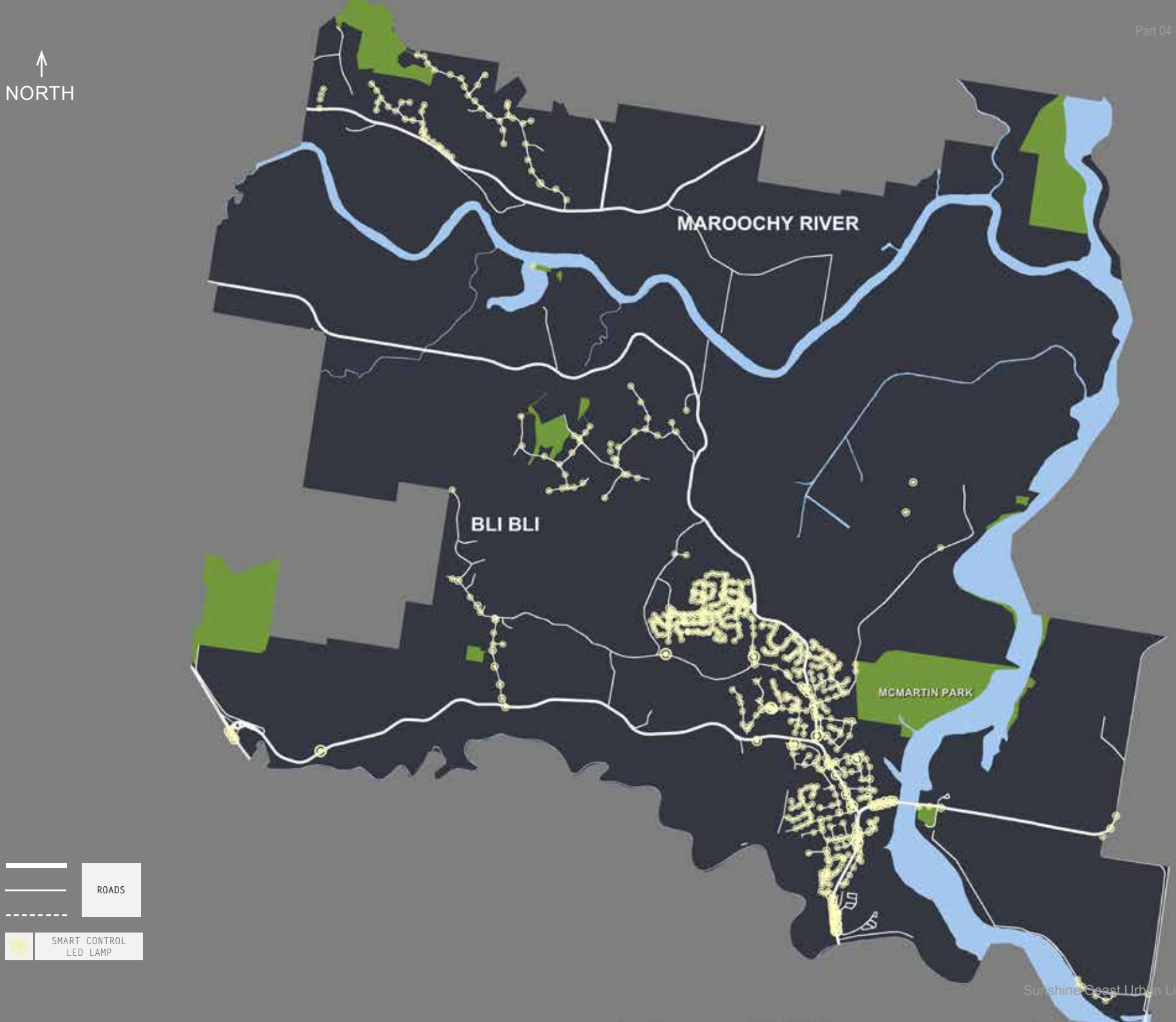
Consumption before and after renovation

Upgrade material

The upgrade program plans the replacement of the existing lights with 5 different wattages of LED luminaire, with smart contol:

- LED 240W — 13 luminaires
- LED 144W — 31 luminaires
- LED 60W — 95 luminaires
- LED 22W — 202 luminaires
- LED 22W (w/ bracket) — 280 luminaires


NORTH
MAROOCHY RIVER
BLI BLI
MCMARTIN PARK
ROADS
HIGH PRESSURE SODIUM LAMP
OTHER LAMP
MERCURY VAPOUR LAMP

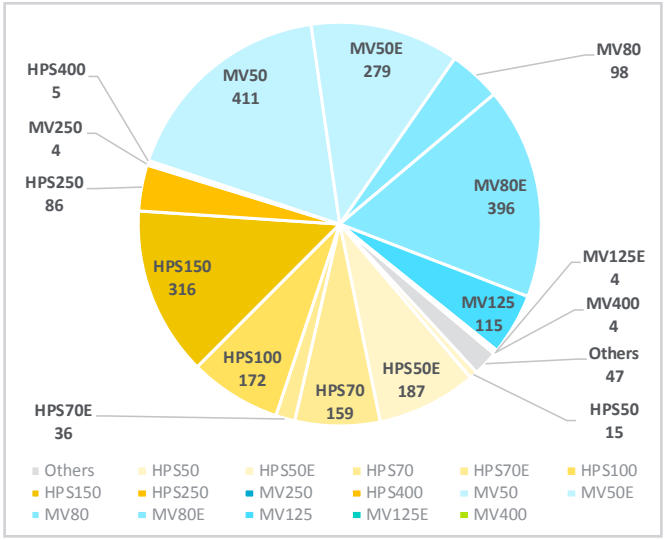

NORTH
MAROOCHY RIVER
BLI BLI
MCMARTIN PARK
ROADS
SMART CONTROL
LED LAMP

Buderim

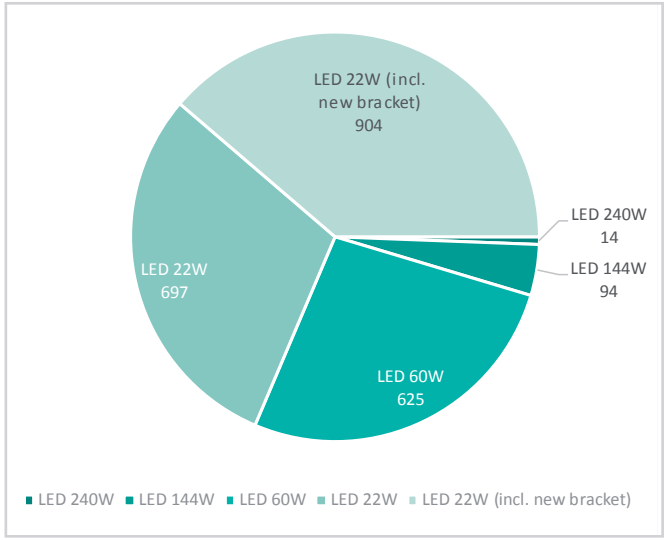
Buderim is a rapidly growing residential area located south-west of Maroochydore along the central Sunshine Coast.

Future plans continue to facilitate Buderim's traditional residential and main street characteristics, while intending to create more walkable neighbourhoods with better connectivity to local centres, community facilities and open spaces.

At Buderim's heart is the commercial and community hub, comprising of shopping and retail options. The town centre has an existing street lighting scheme that helps characterise it against the residential and suburban surroundings



Distribution of existing lights by wattage and technology

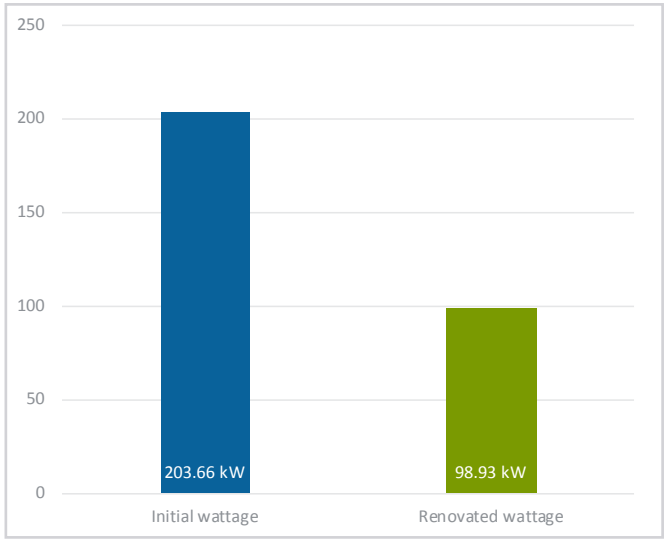


Distribution of renovated lights by wattage and technology

number of lighting points: **2334 lights**

consumption before renovation: **203.66 kW**
consumption after: **98.93 kW**

estimated energy savings: **51%**



Consumption before and after renovation

Upgrade material

The upgrade program plans the replacement of the existing lights with 5 different wattages of LED luminaire, with smart contol:

- LED 240W — 14 luminaires
- LED 144W — 94 luminaires
- LED 60W — 625 luminaires
- LED 22W — 697 luminaires
- LED 22W (w/ bracket) — 904 luminaires


NORTH
BUDERIM FOREST
BUDERIM
BUDERIM RESERVE
MOOLOOLAH RIVER NATIONAL PARK
ROADS
HIGH PRESSURE SODIUM LAMP
OTHER LAMP
MERCURY VAPOUR LAMP

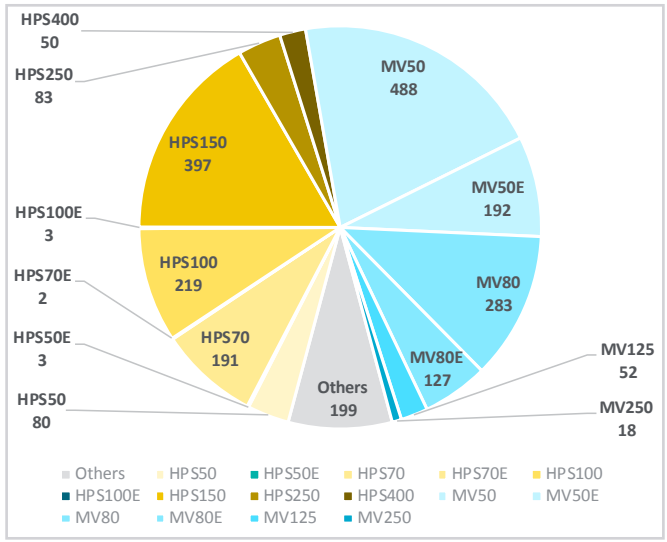

NORTH
BUDERIM FOREST
BUDERIM
BUDERIM RESERVE
MOOLOOLAH RIVER NATIONAL PARK
ROADS
SMART CONTROL
LED LAMP

Caloundra

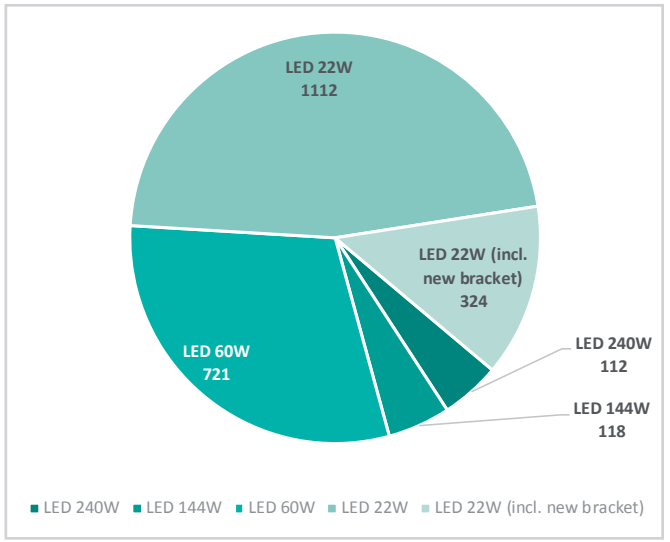
Caloundra is characterised by a family oriented lifestyle and parks, coastal and hinterland views, and pockets of remnant vegetation through the open space and creek corridor system. Caloundra is set to expand its town centre while making Bulcock Street as a feature.

It features a regional activity centre and is the dominant town centre in the southern part of the Sunshine Coast. It is a major employment destination due to its broad range of activities.

As the central test hub to the region's Smart City Framework, the area needs to ensure high quality smart lighting reinforces the area.



Distribution of existing lights by wattage and technology

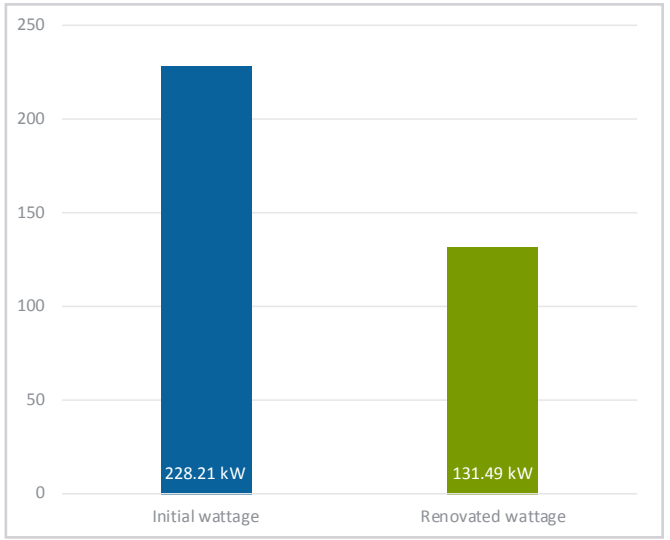


Distribution of renovated lights by wattage and technology

number of lighting points: **2387 lights**

consumption before renovation: **228.21 kW**
consumption after: **131.49 kW**

estimated energy savings: **42%**

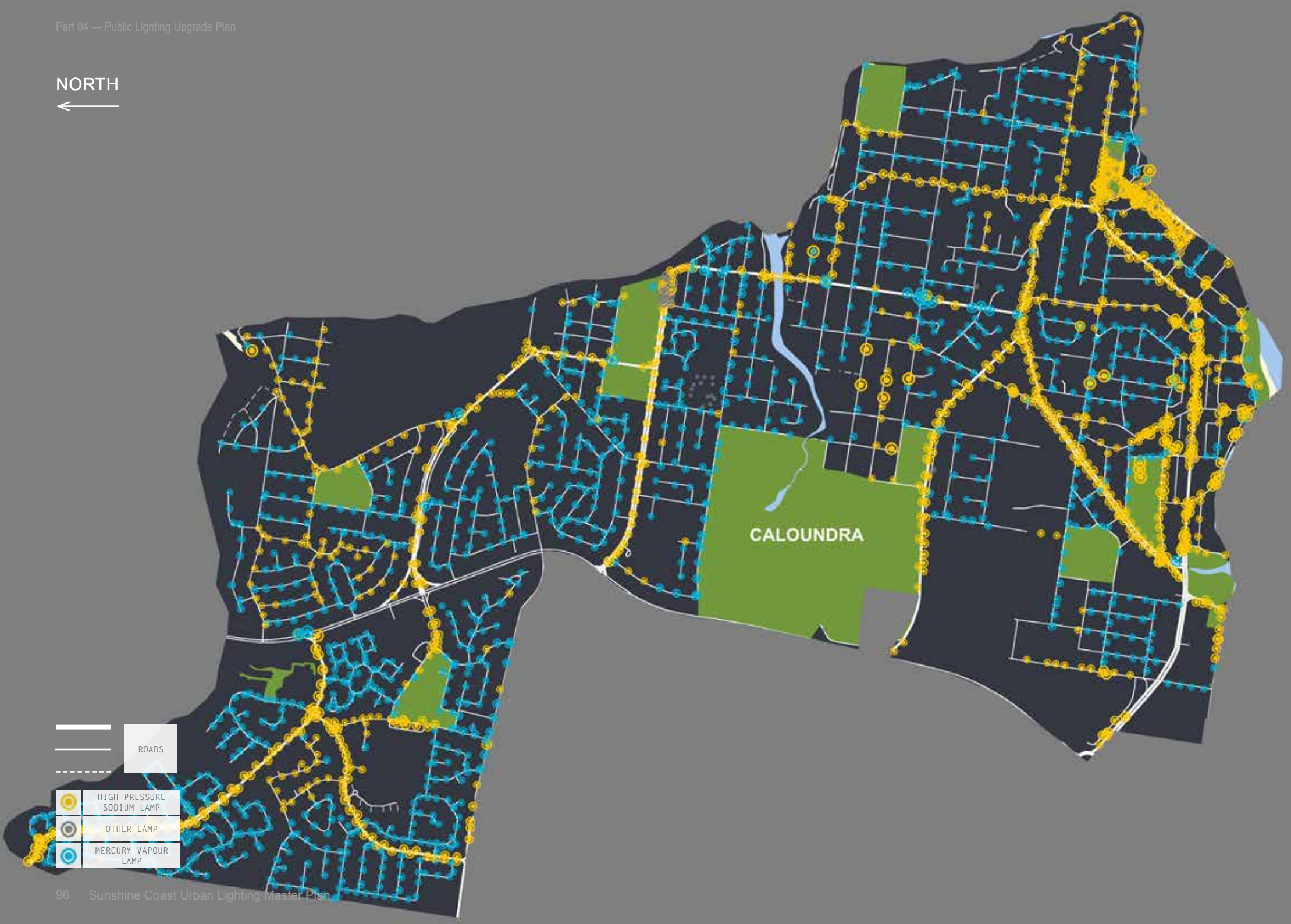


Consumption before and after renovation

Upgrade material

The upgrade program plans the replacement of the existing lights with 5 different wattages of LED luminaire, with smart contol:

- LED 240W — 112 luminaires
- LED 144W — 118 luminaires
- LED 60W — 721 luminaires
- LED 22W — 1112 luminaires
- LED 22W (w/ bracket) — 324 luminaires


NORTH
CALOUNDRA
ROADS
HIGH PRESSURE SODIUM LAMP
OTHER LAMP
MERCURY VAPOUR LAMP

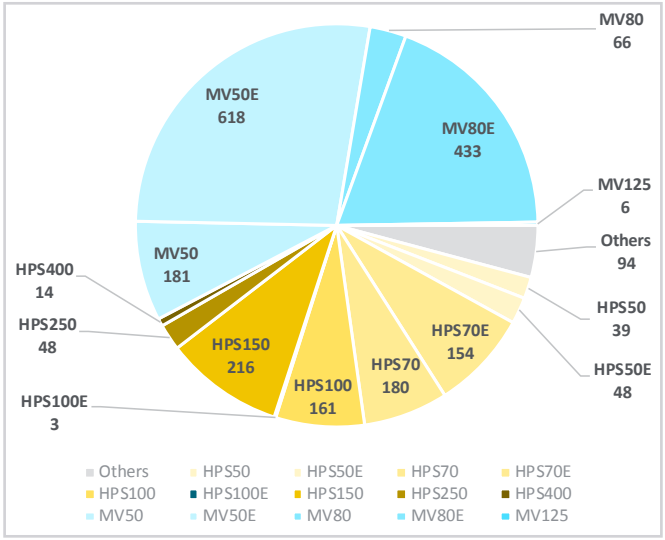

NORTH
CALOUNDRA
ROADS
SMART CONTROL
LED LAMP

Caloundra West

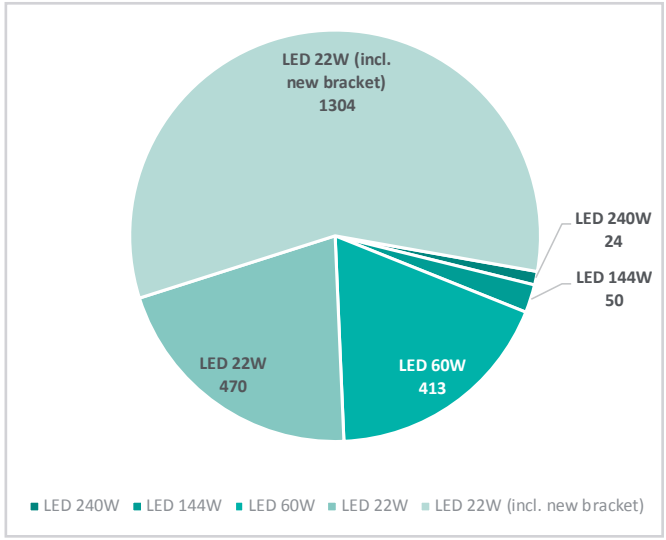
Caloundra West is nestled between the early hinterland township of Little Mountain, the residential suburb of Aroona to the north east, Caloundra to the east, Golden Beach to the south east, Pelican Waters to the south, and the rural and natural setting of Bells Creek to the west.

A large portion of Caloundra West is covered by the Caloundra South Priority Development Area, with construction started on the development already.

Improvement of the public lighting infrastructure on the key pedestrian linkages throughout Bellvista Estate, in order to increase safety and connectivity throughout the community



Distribution of existing lights by wattage and technology

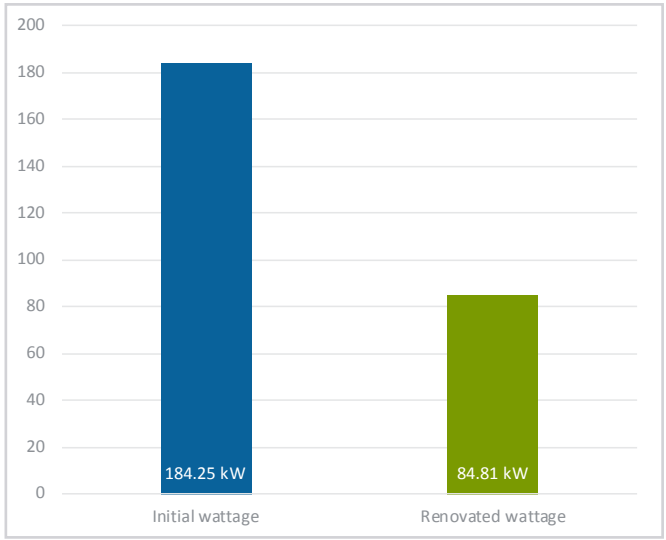


Distribution of renovated lights by wattage and technology

number of lighting points: **2261 lights**

consumption before renovation: **184.25 kW**
consumption after: **84.81 kW**

estimated energy savings: **54%**



Consumption before and after renovation

Upgrade material

The upgrade program plans the replacement of the existing lights with 5 different wattages of LED luminaire, with smart contol:

- LED 240W — 24 luminaires
- LED 144W — 50 luminaires
- LED 60W — 413 luminaires
- LED 22W — 470 luminaires
- LED 22W (w/ bracket) — 1304 luminaires


NORTH
LITTLE MOUNTAIN
AROONA
BELLS CREEK
CALOUNDRA WEST
ROADS
HIGH PRESSURE SODIUM LAMP
OTHER LAMP
MERCURY VAPOUR LAMP

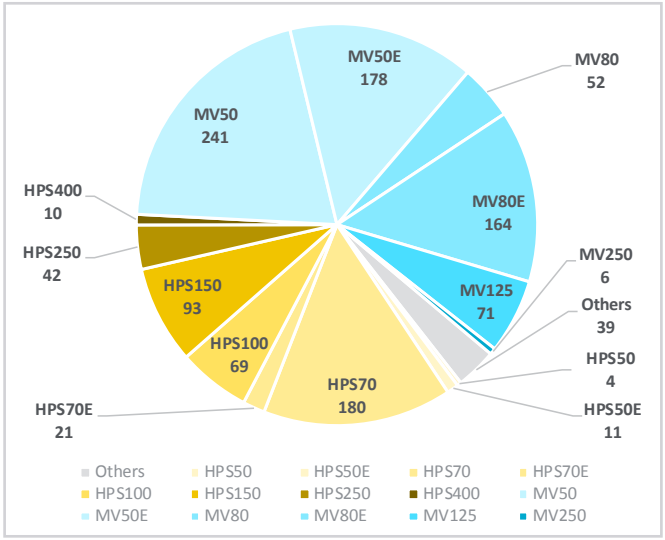

NORTH
LITTLE MOUNTAIN
AROONA
BELLS CREEK
CALOUNDRA WEST
ROADS
SMART CONTROL
LED LAMP

Coolum

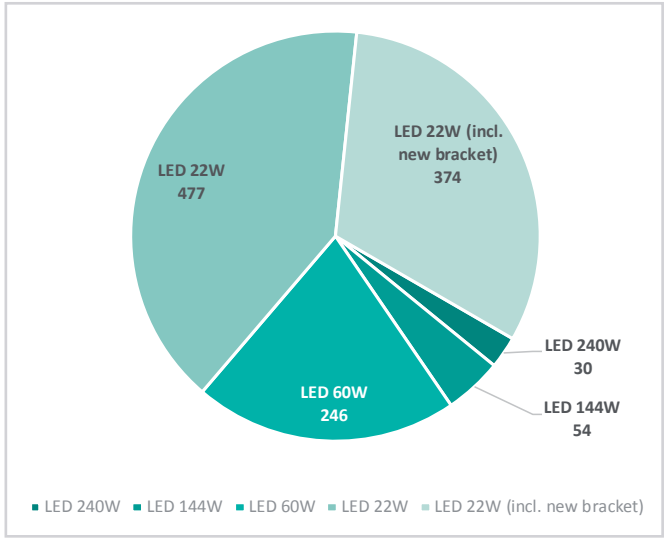
Coolum Beach is a coastal residential township located in the central eastern part of the Sunshine Coast between the coastal communities of Yaroomba, to the south, and Peregian Beach, to the north.

One of the most enjoyed attractions of Coolum Beach is the Esplanade walk along David Low Way between Beach Road and William Street.

Public lighting should be used to help to achieve these streetscape enhancement outcomes, particularly in creating night time visual links between amenities and in the creation of gateways.



Distribution of existing lights by wattage and technology

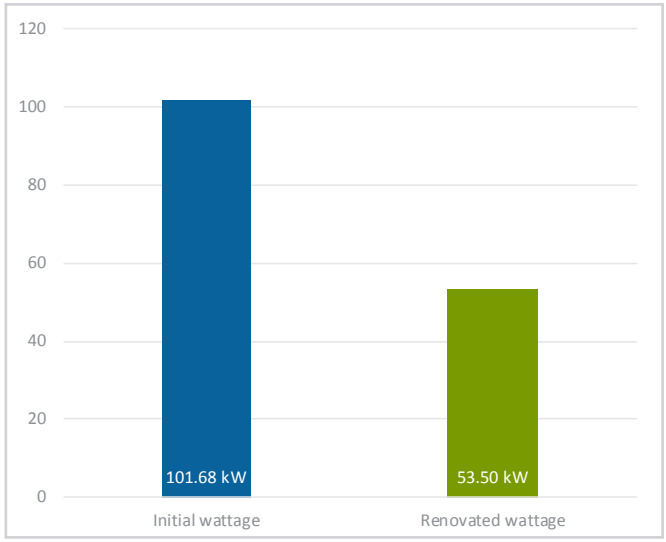


Distribution of renovated lights by wattage and technology

number of lighting points: **1181 lights**

consumption before renovation: **101.68kW**
consumption after: **53.50kW**

estimated energy savings: **47%**

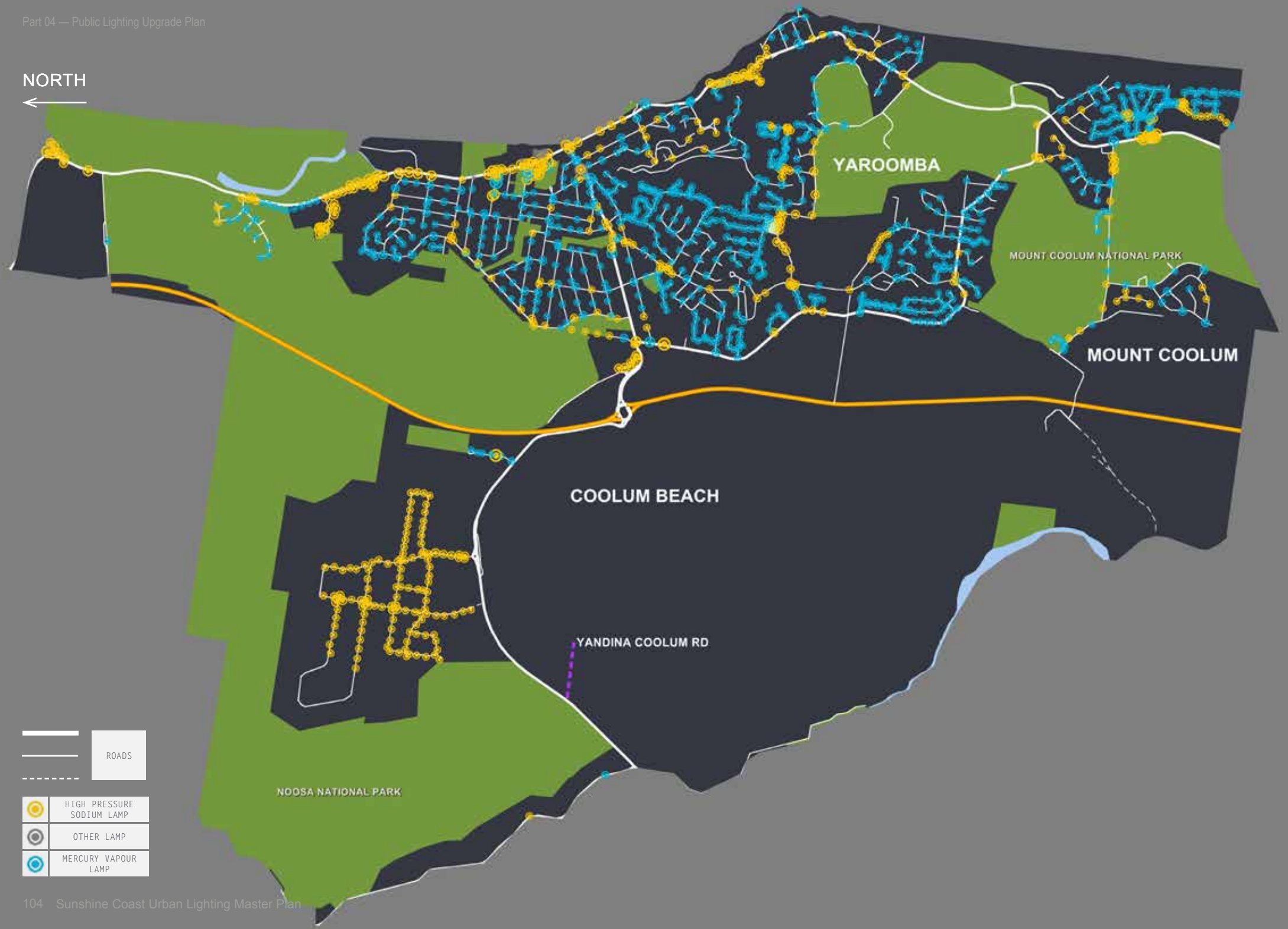


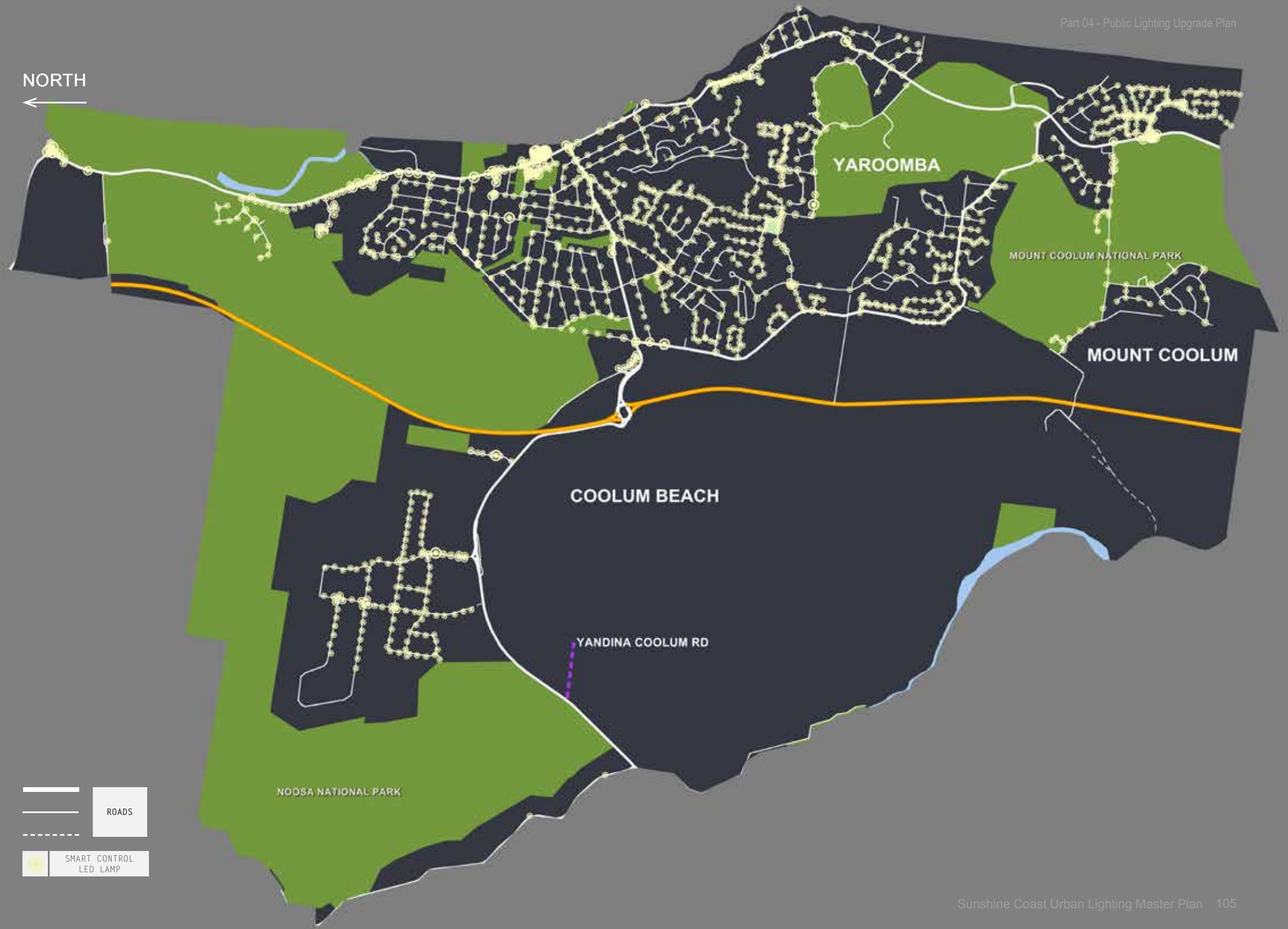
Consumption before and after renovation

Upgrade material

The upgrade program plans the replacement of the existing lights with 5 different wattages of LED luminaire, with smart contol:

- LED 240W 30 luminaires
- LED 144W 54 luminaires
- LED 60W 246 luminaires
- LED 22W 477 luminaires
- LED 22W (w/ bracket) 374 luminaires


NORTH
YAROOMBA
MOUNT COOLUM NATIONAL PARK
MOUNT COOLUM
COOLUM BEACH
YANDINA COOLUM RD
NOOSA NATIONAL PARK
ROADS
HIGH PRESSURE SODIUM LAMP
OTHER LAMP
MERCURY VAPOUR LAMP


NORTH
YAROOMBA
MOUNT COOLUM NATIONAL PARK
MOUNT COOLUM
COOLUM BEACH
YANDINA COOLUM RD
NOOSA NATIONAL PARK
ROADS
SMART CONTROL
LED LAMP


CIRCLE

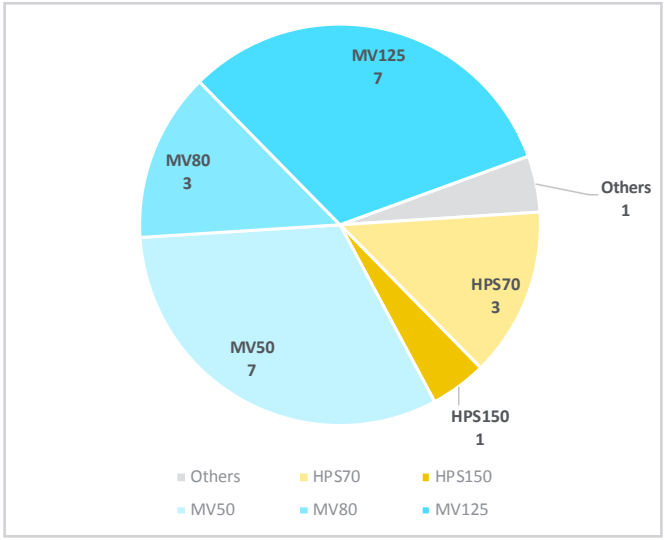
Eudlo

The Eudlo area is located on the North Coast Rail Line in the central part of the Sunshine Coast.

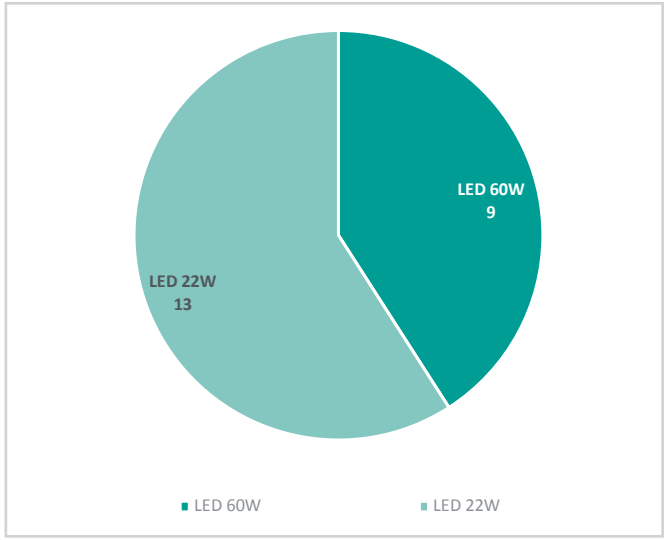
The area comprises of the small rural village of Eudlo and the residential areas immediately to the south and north of the village.

Any development of public lighting in Eudlo must respect the intimate rural character and identity which is related to the past.

The Eudlo Local Plan Code identifies an important gateway/ entry point into Eudlo at the intersection of Rosebed Street and Anzac Road. Public lighting can play a significant role in highlighting and improving this gateway.



Distribution of existing lights by wattage and technology

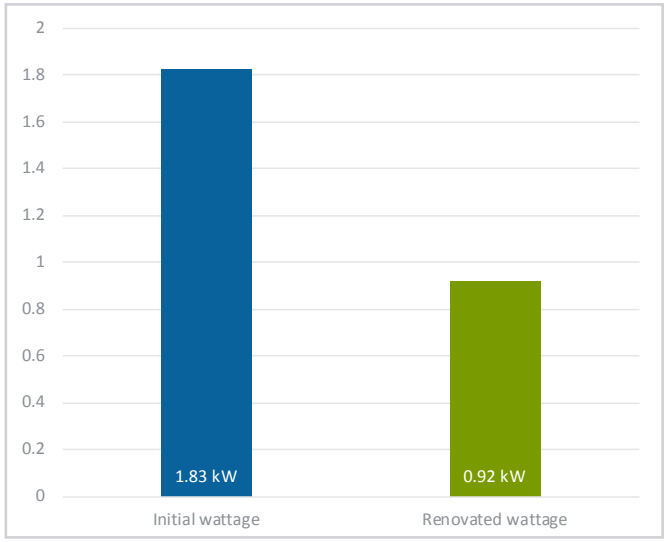


Distribution of renovated lights by wattage and technology

number of lighting points: **22 lights**

consumption before renovation: **1.83 kW**
consumption after: **0.92 kW**

estimated energy savings: **50%**

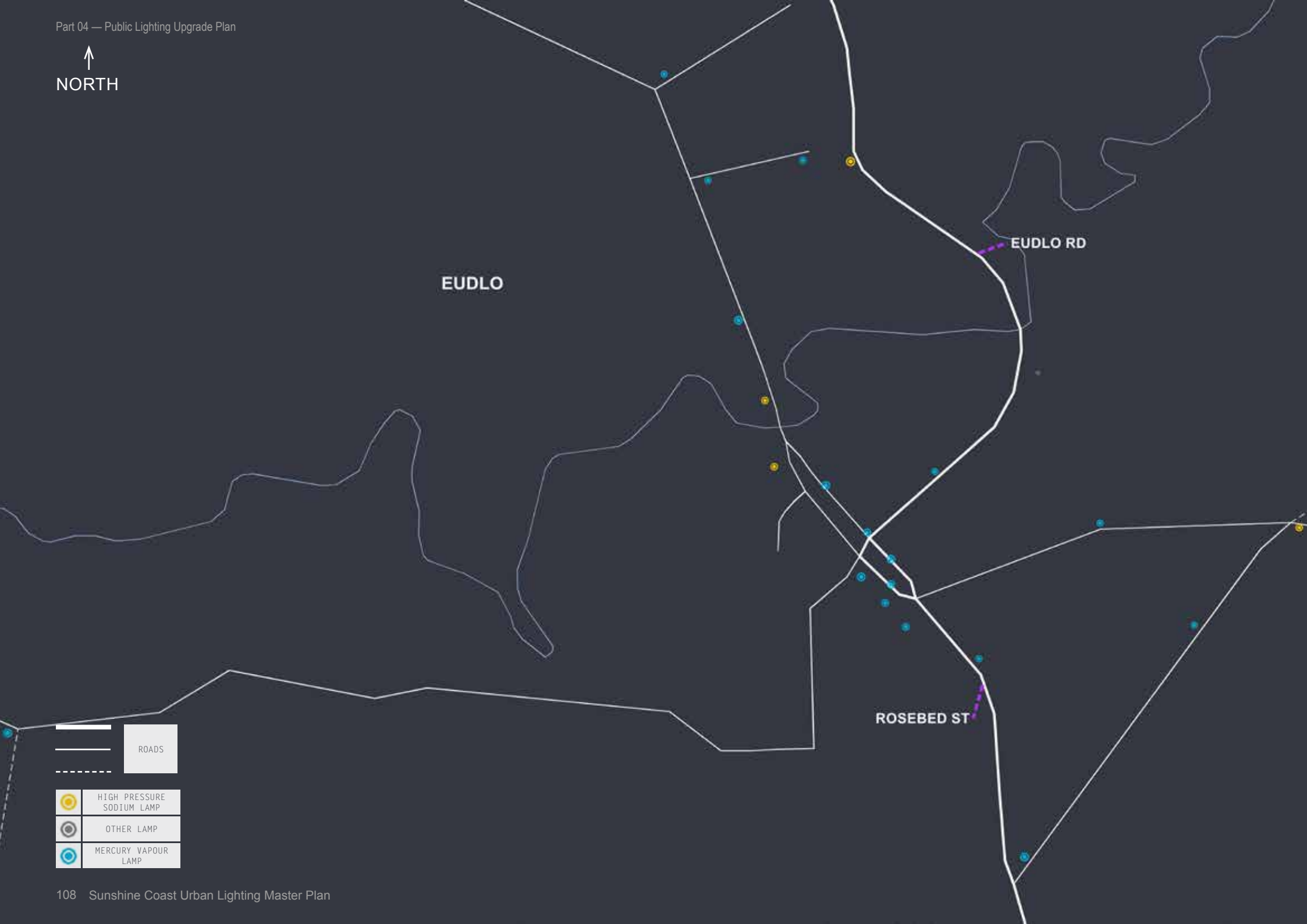


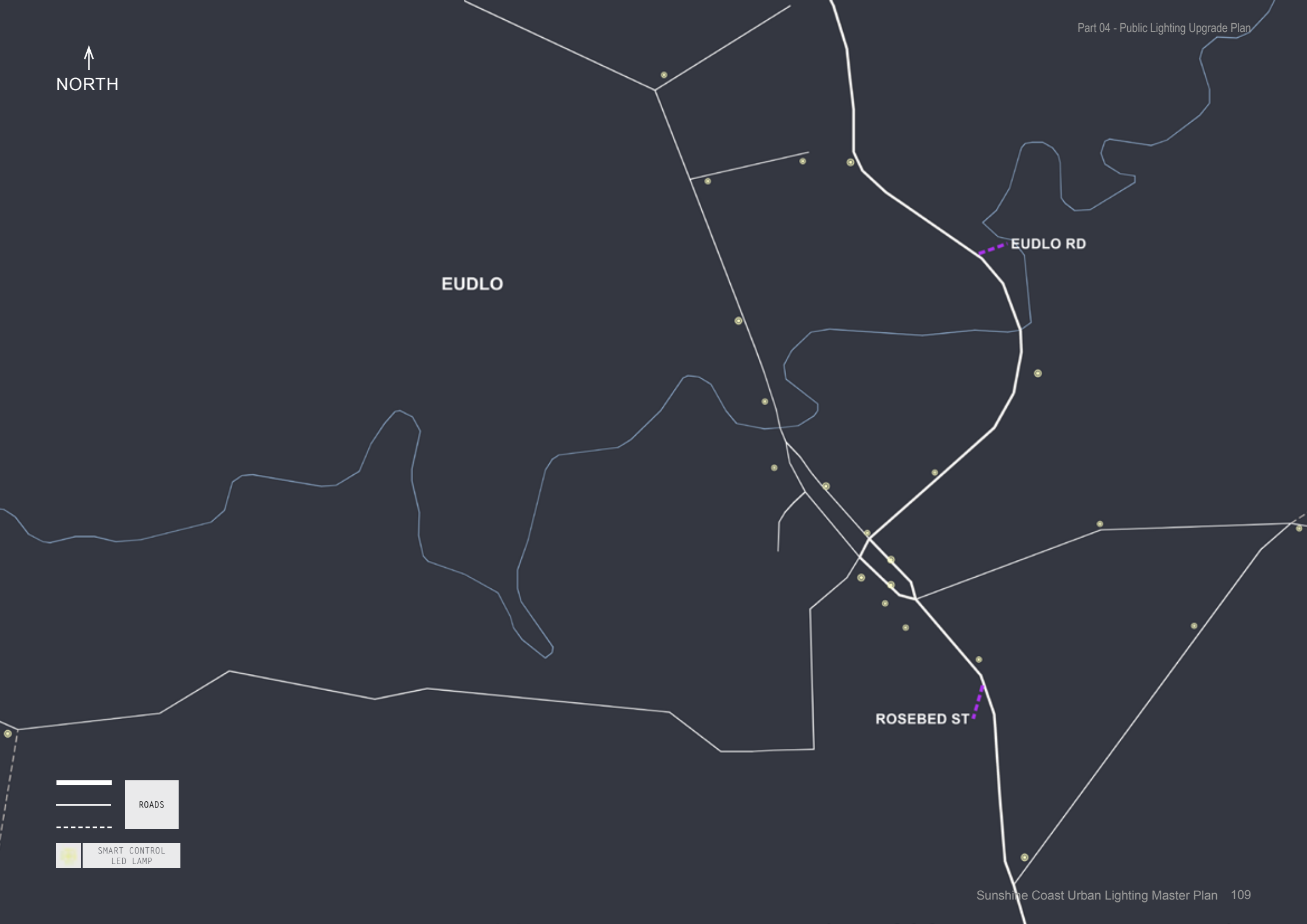
Consumption before and after renovation

Upgrade material

The upgrade program plans the replacement of the existing lights with 2 different wattages of LED luminaire, with smart contol:

- LED 60W 9 luminaires
- LED 22W 13 luminaires


NORTH
EUDLO
EUDLO RD
ROSEBED ST
ROADS
HIGH PRESSURE SODIUM LAMP
OTHER LAMP
MERCURY VAPOUR LAMP


NORTH
EUDLO
EUDLO RD
ROSEBED ST
ROADS
SMART CONTROL
LED LAMP


TAB
POKIES

Eumundi

Eumundi is located within the North Maroochy River Valley in the northern Hinterland of the Sunshine Coast.

The town centre comprises of a mix of commercial buildings along Memorial drive, hosting a range of cafes, hotels and arts and craft stores, as well as a series of attractive public open spaces and permanent market facilities.

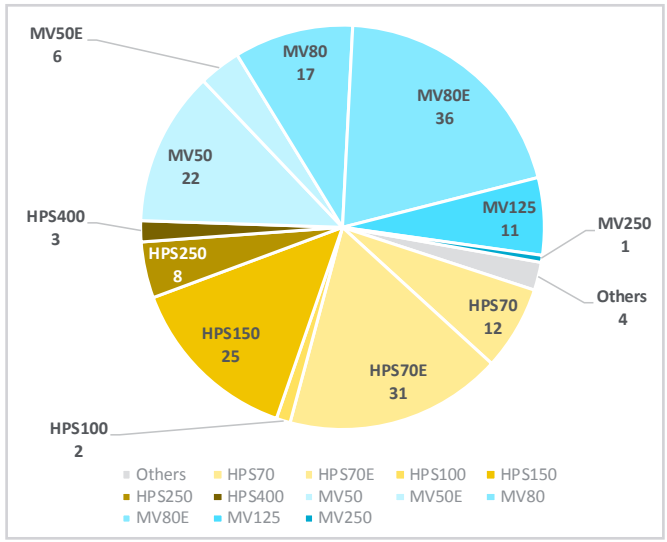
At the town's core, the Eumundi Markets and Eumundi Square both provide a functional shopping landscape, boasting art galleries, farmers produce and informal stalls with shade cloths against a backdrop of mature trees.

High quality lighting needs to be considered along Memorial Drive as it serves as the main vehicle and pedestrian thoroughfare through Eumundi. It is also the focus point for the town's many activities and commercial entities, therefore warranting additional lighting attention.

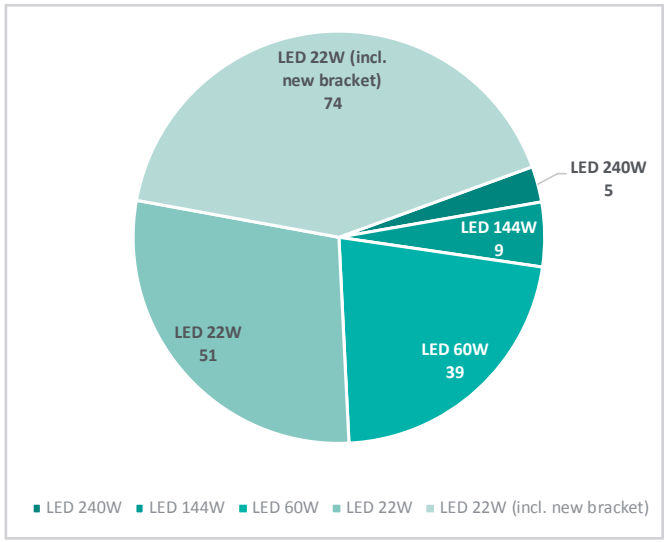
Upgrade material

The upgrade program plans the replacement of the existing lights with 5 different wattages of LED luminaire, with smart contol:

- LED 240W — 5 luminaires
- LED 144W — 9 luminaires
- LED 60W — 39 luminaires
- LED 22W — 51 luminaires
- LED 22W (w/ bracket) — 74 luminaires



Distribution of existing lights by wattage and technology

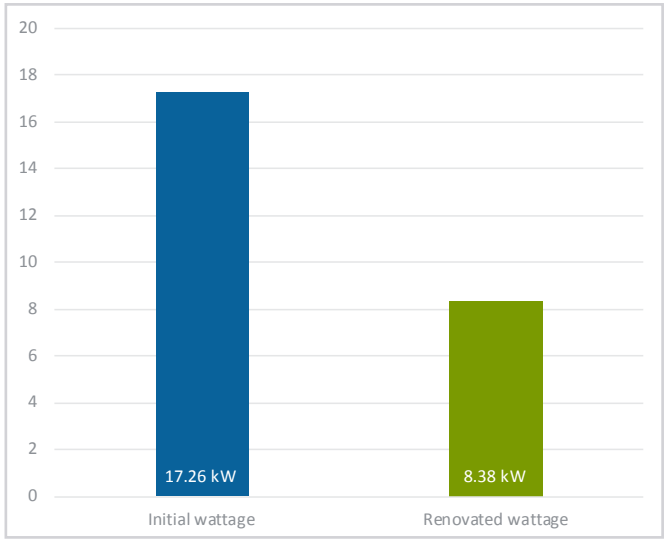


Distribution of renovated lights by wattage and technology

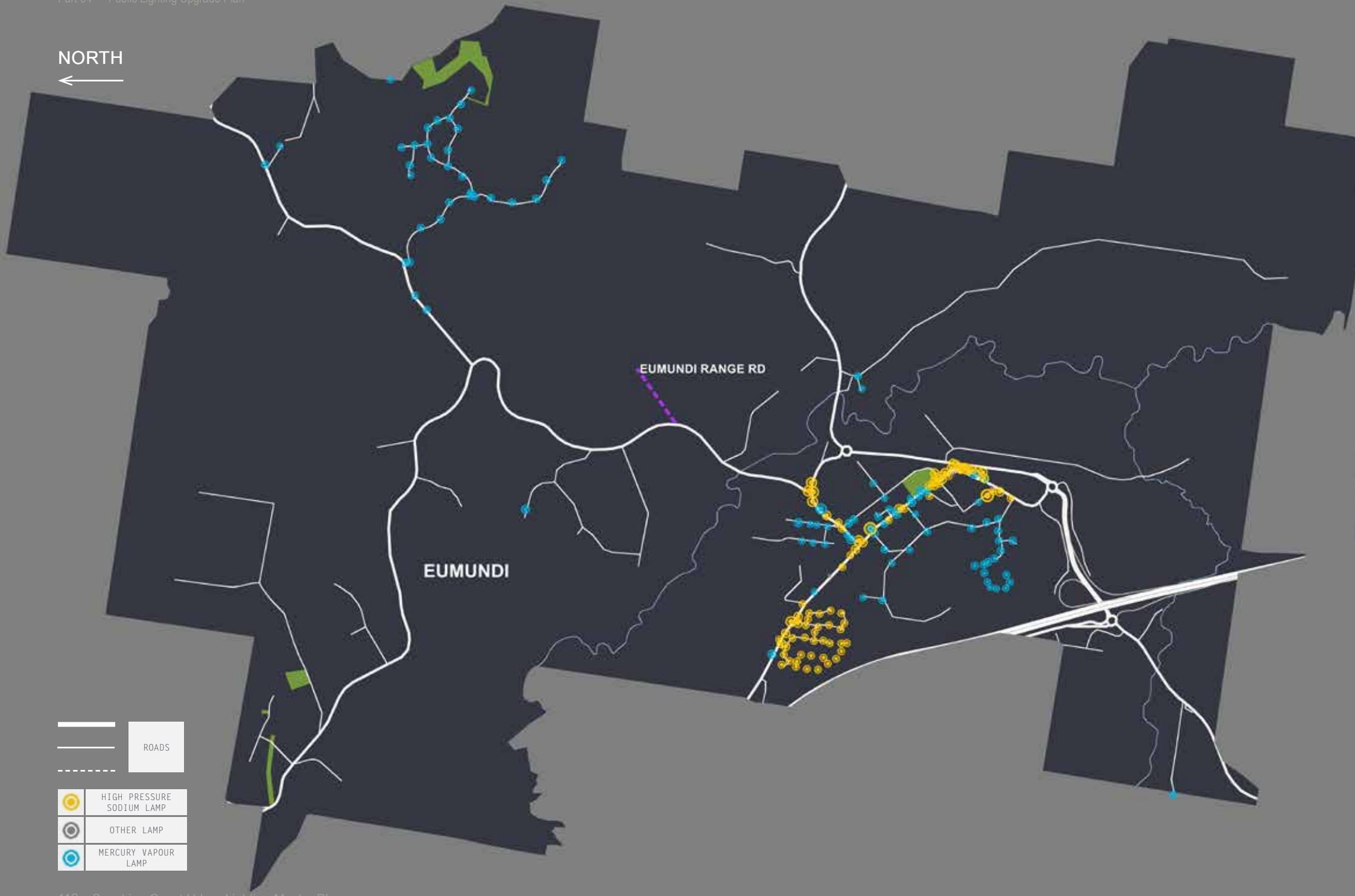
number of lighting points: **178 lights**

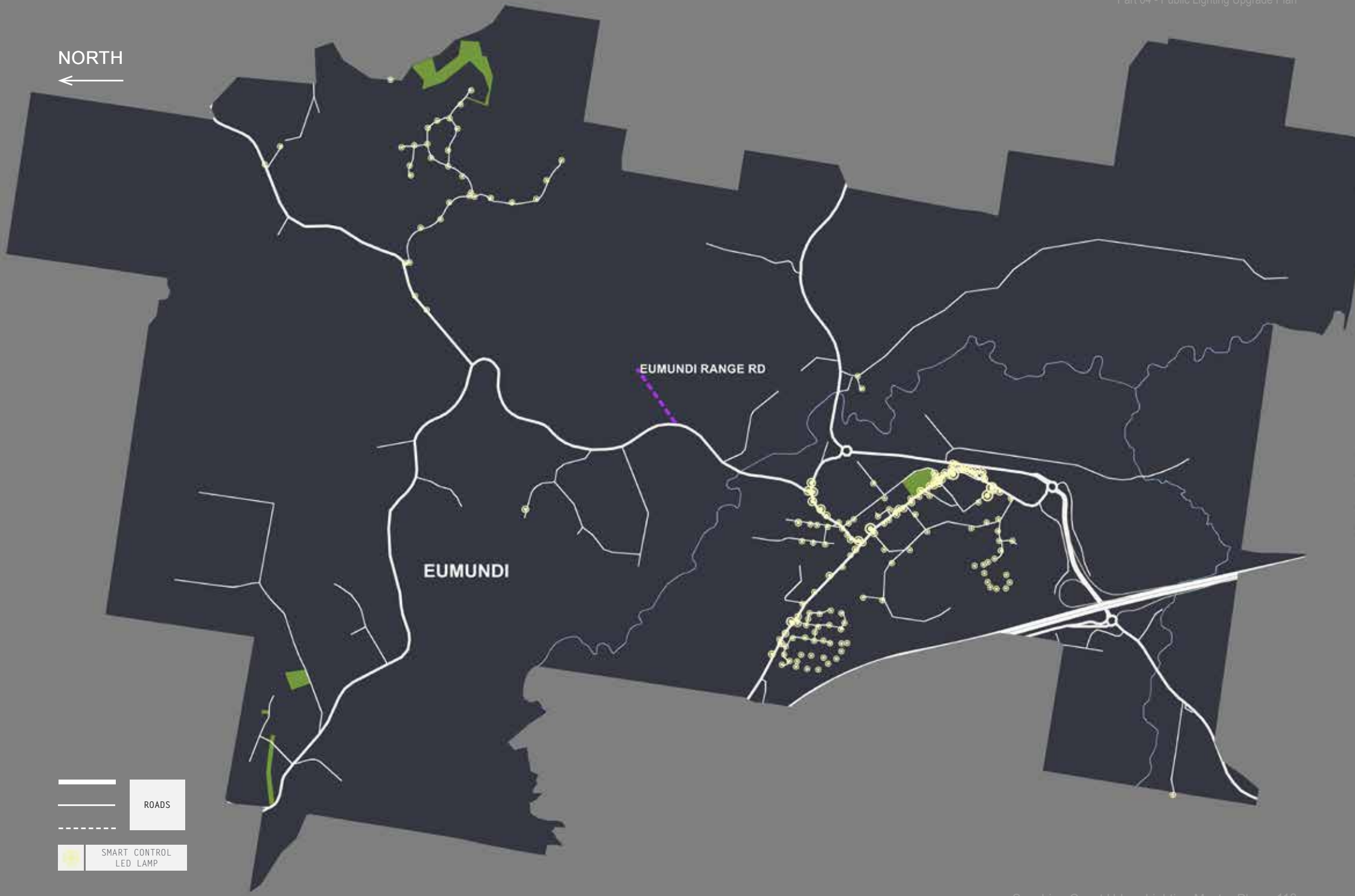
consumption before renovation: **17.26 kW**
consumption after: **8.38 kW**

estimated energy savings: **51%**



Consumption before and after renovation


NORTH
EUMUNDI RANGE RD
EUMUNDI
ROADS
HIGH PRESSURE SODIUM LAMP
OTHER LAMP
MERCURY VAPOUR LAMP


NORTH
EUMUNDI RANGE RD
EUMUNDI
ROADS
SMART CONTROL
LED LAMP


Crunch

Forest Glen, Kunda Park, Tanawha

Located on the foothills and western slopes of Buderim Mountain, the eastern and central parts of the local plan area are characterised by rolling to hilly terrain dissected by numerous ridgelines, creeks and drainage lines.

In contrast, the northern, western and southern parts of the local plan area are relatively flat and form part of the Eudlo Creek and Mountain Creek plains.

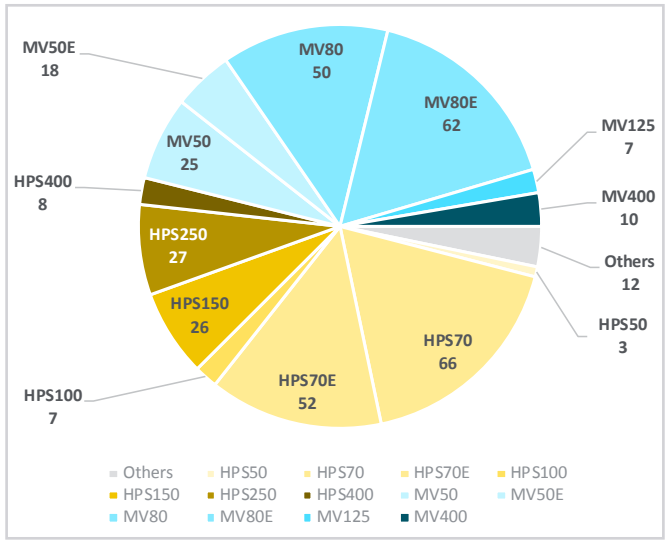
The Forest Glen/Kunda Park/Tanawha local plan area is maintained predominantly as a rural and bushland rural residential area with important industry areas and major community facilities.

Lighting needs to be sensitive to the bushland character of the area.

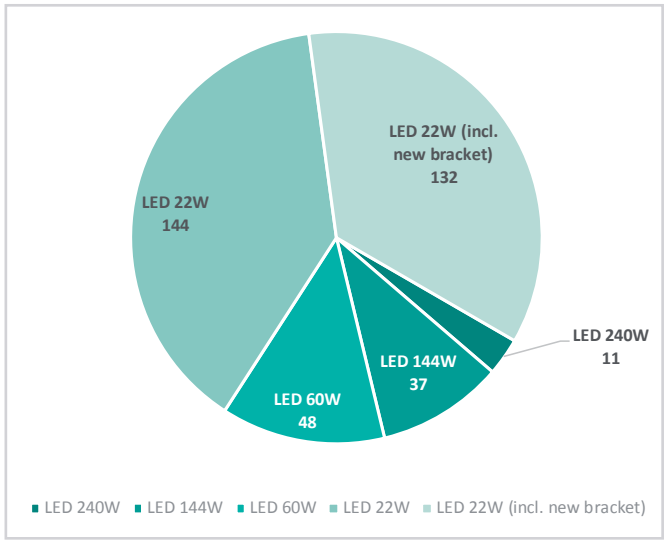
Upgrade material

The upgrade program plans the replacement of the existing lights with 5 different wattages of LED luminaire, with smart contol:

- LED 240W — 11 luminaires
- LED 144W — 37 luminaires
- LED 60W — 48 luminaires
- LED 22W — 144 luminaires
- LED 22W (w/ bracket) — 132 luminaires



Distribution of existing lights by wattage and technology

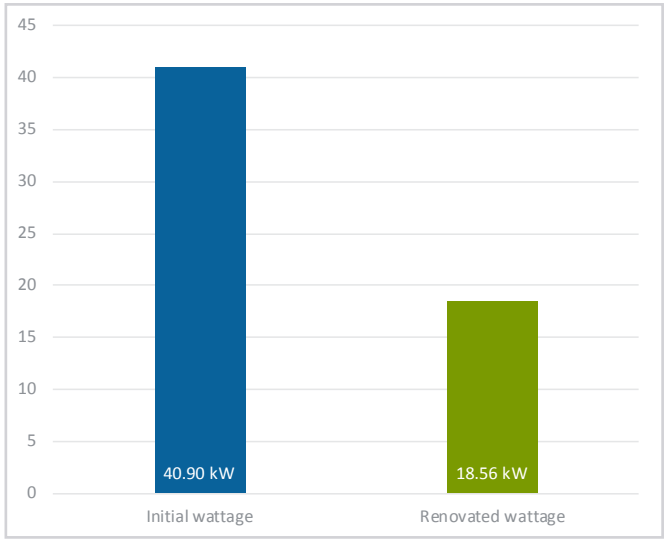


Distribution of renovated lights by wattage and technology

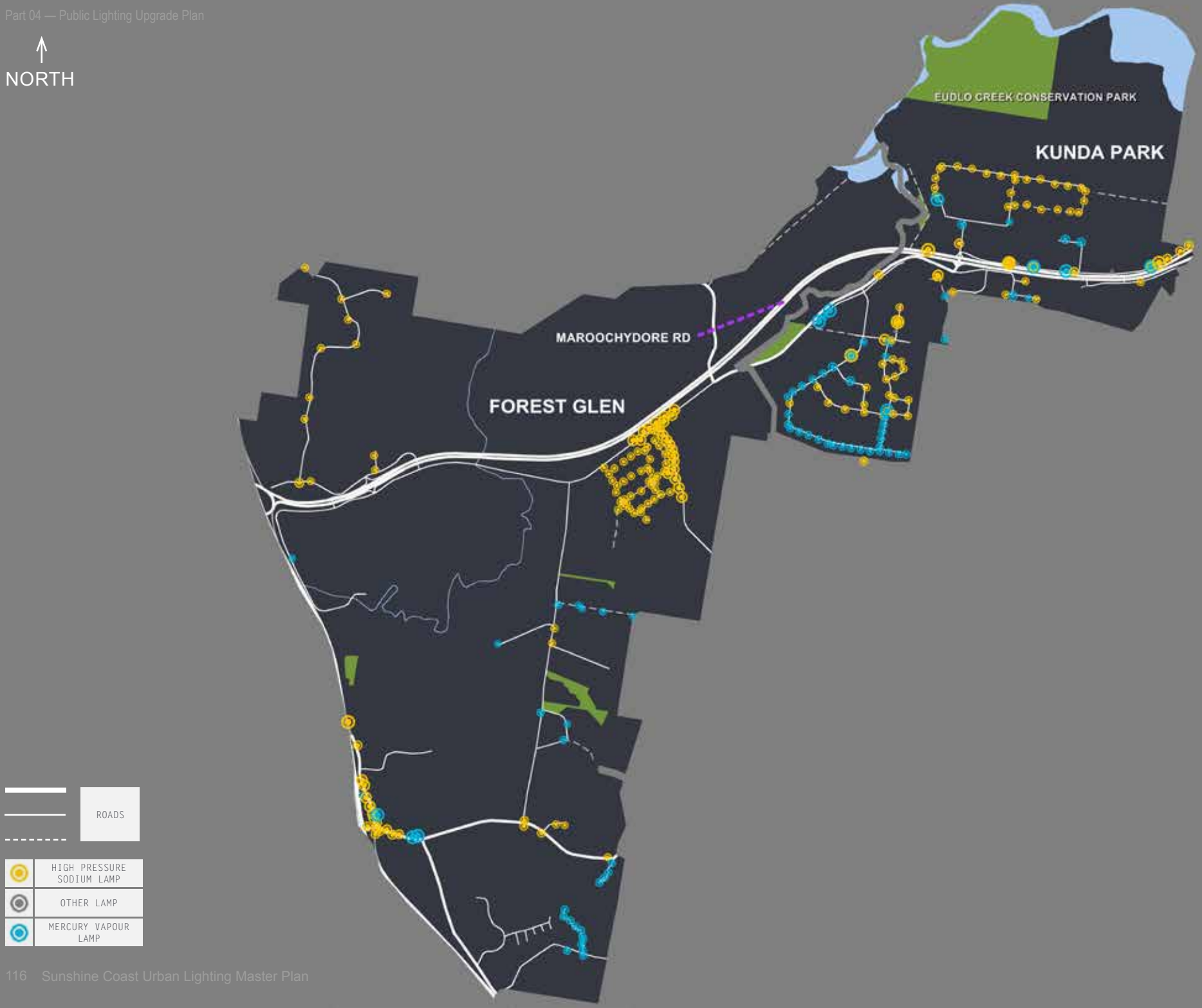
number of lighting points: **373 lights**

consumption before renovation: **40.90 kW**
consumption after: **18.56 kW**

estimated energy savings: **55%**

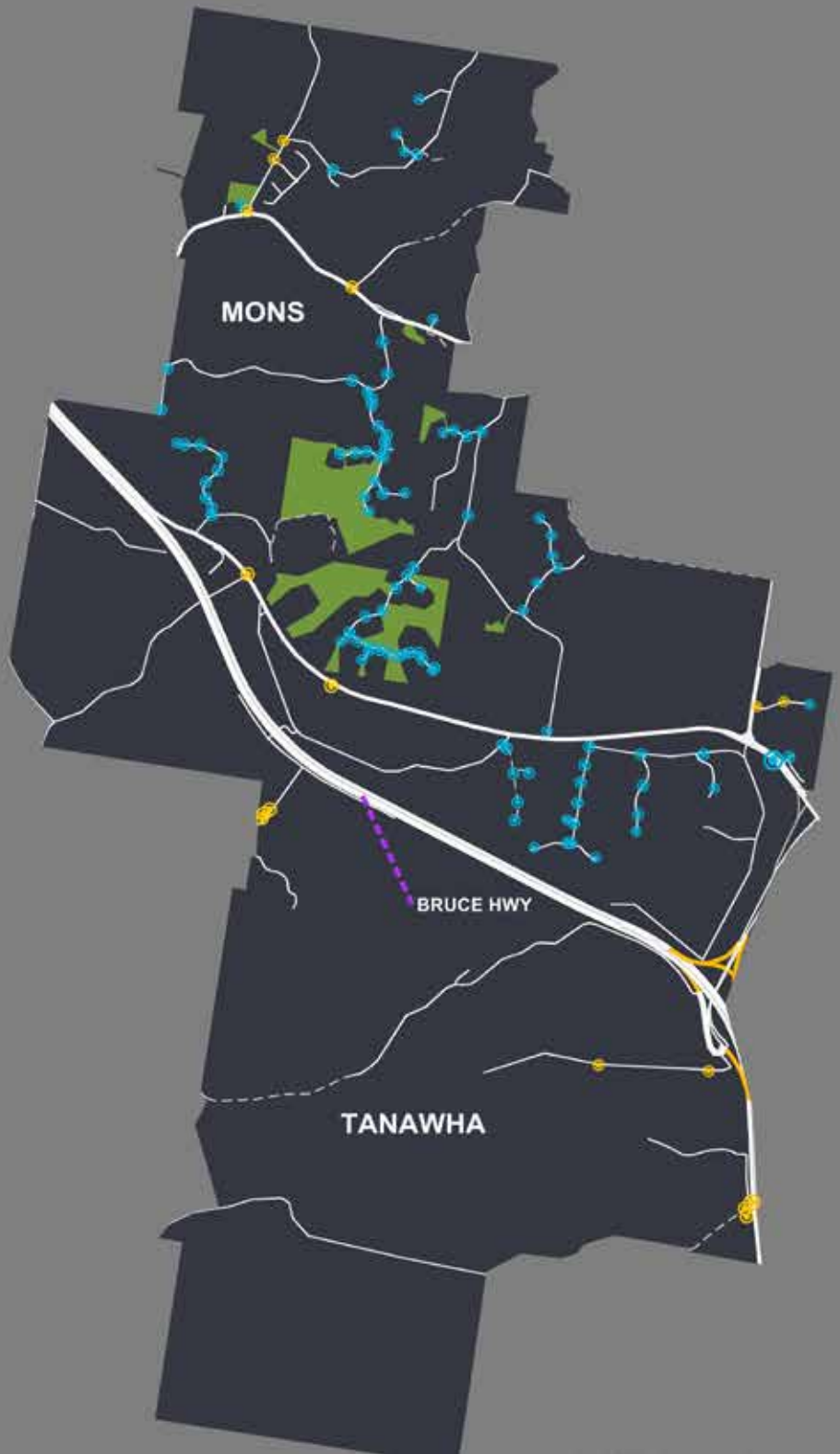


Consumption before and after renovation


NORTH
EUDLO CREEK CONSERVATION PARK
KUNDA PARK
MAROOCHYDORE RD
FOREST GLEN
ROADS
HIGH PRESSURE SODIUM LAMP
OTHER LAMP
MERCURY VAPOUR LAMP


NORTH
EUDLO CREEK CONSERVATION PARK
KUNDA PARK
MAROOCHYDORE RD
FOREST GLEN
ROADS
SMART CONTROL
LED LAMP

NORTH



ROADS

HIGH PRESSURE SODIUM LAMP

OTHER LAMP

MERCURY VAPOUR LAMP

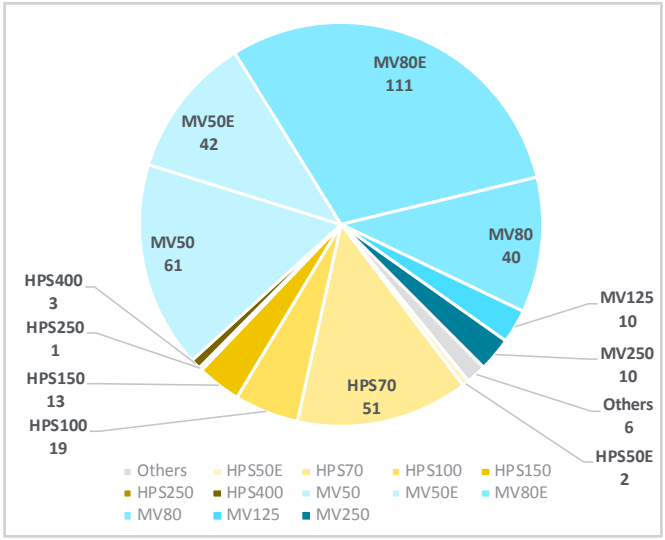

NORTH
MONS
BRUCE HWY
TANAWHA
ROADS
SMART CONTROL
LED LAMP

Glass House Mountains

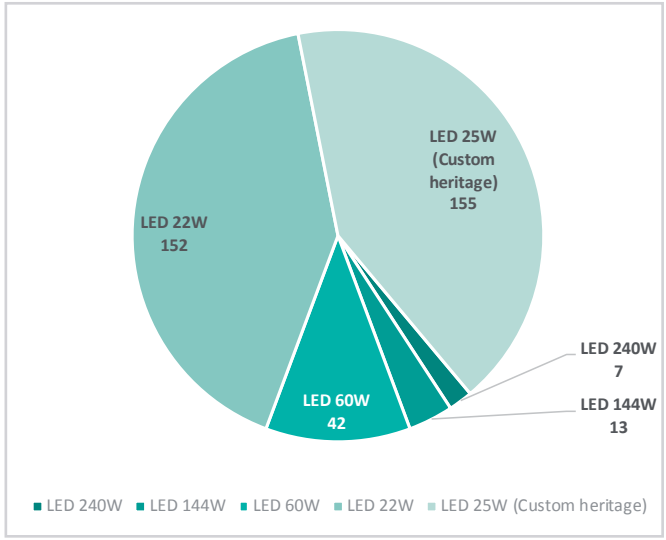
Glass House Mountains is located in the southern hinterland region of the Sunshine Coast.

The area is bound by the Bruce highway to the east, Beerburrum State forest to the south and the Glasshouse Mountains National Park toward the west.

Lighting should be used as a method of visually and physically connecting the Glass House Mountains train station with the local town centre. All lighting should respect the existing Glass House Mountains natural character and identity, and amplify the its relationship with the surrounding mountainous landscape.



Distribution of existing lights by wattage and technology

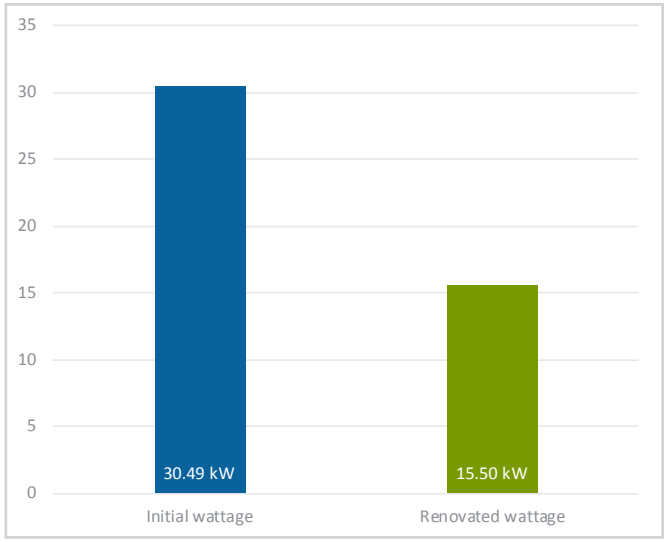


Distribution of renovated lights by wattage and technology

number of lighting points: **369 lights**

consumption before renovation: **30.49 kW**
consumption after: **15.50 kW**

estimated energy savings: **49%**



Consumption before and after renovation

Upgrade material

The upgrade program plans the replacement of the existing lights with 5 different wattages of LED luminaire, with smart contol:

- LED 240W — 7 luminaires
- LED 144W — 13 luminaires
- LED 60W — 42 luminaires
- LED 22W — 152 luminaires
- LED 25W (Estate) — 155 luminaires


NORTH
GLASS HOUSE MOUNTAINS
CLEARVIEW PARK
GLASS HOUSE MOUNTAINS NATIONAL PARK
OLD GYMPIE RD
COONOWRIN RD
COONOWRIN CREEK REHABILITATION AREA
ROADS
HIGH PRESSURE SODIUM LAMP
OTHER LAMP
MERCURY VAPOUR LAMP

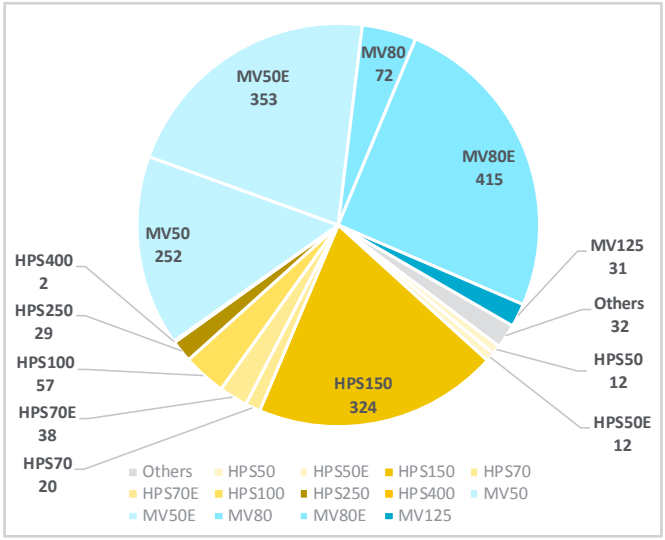

NORTH
GLASS HOUSE MOUNTAINS
CLEARVIEW PARK
GLASS HOUSE MOUNTAINS NATIONAL PARK
OLD GYMPIE RD
COONOWRIN RD
COONOWRIN CREEK REHABILITATION AREA
ROADS
SMART CONTROL
LED LAMP

Golden Beach, Pelican Waters

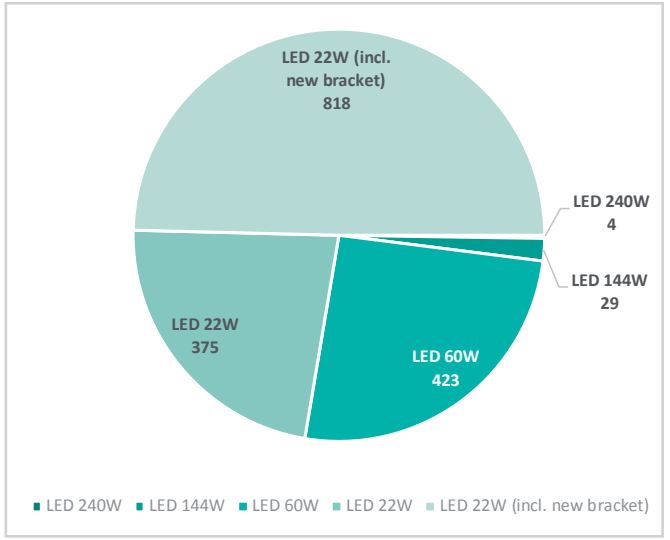
Golden Beach is a long linear community featuring a mix of typically constructed dwellings with artificial canal allotments and higher density constructions along the Esplanade area.

Whilst it is a largely residential area, there are a few notable examples of commercial activity. This activity is contained predominantly on Landsborough Parade, which contains and features the majority of the economic activity.

Public lighting upgrades should be administered to pedestrian links and park facilities in order to ensure adequate provision of access is available, while emphasising the unique coastal streetscape character that is evident in the area.



Distribution of existing lights by wattage and technology

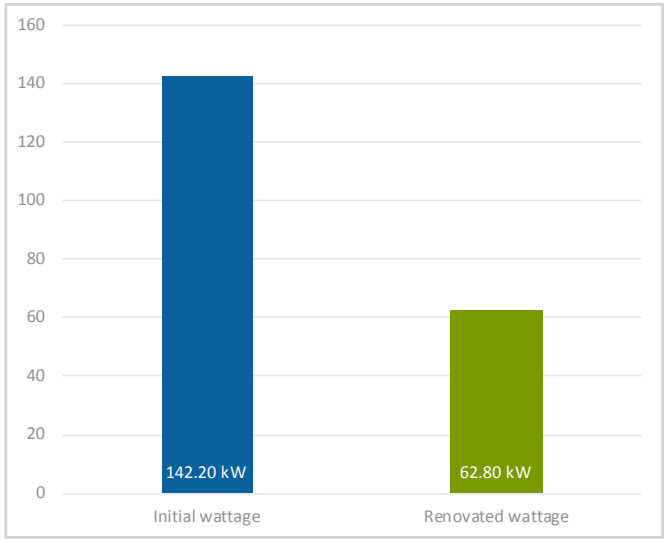


Distribution of renovated lights by wattage and technology

number of lighting points: **1649 lights**

consumption before renovation: **142.20 kW**
consumption after: **62.80 kW**

estimated energy savings: **56%**



Consumption before and after renovation

Upgrade material

The upgrade program plans the replacement of the existing lights with 5 different wattages of LED luminaire, with smart contol:

- LED 240W — 4 luminaires
- LED 144W — 29 luminaires
- LED 60W — 423 luminaires
- LED 22W — 375 luminaires
- LED 22W (w/ bracket) — 818 luminaires


NORTH
GOLDEN BEACH
PELICAN WATERS
ROADS
HIGH PRESSURE SODIUM LAMP
OTHER LAMP
MERCURY VAPOUR LAMP


NORTH
GOLDEN BEACH
PELICAN WATERS
ROADS
SMART CONTROL
LED LAMP

Kawana Waters

A significant part of the local plan area has, and continues to be, developed as part of the Kawana Waters master planned community (Kawana Waters Community Development Area)

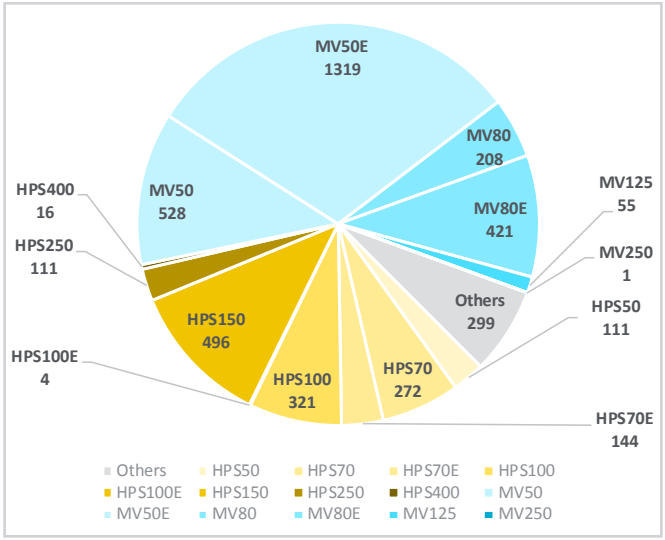
This includes the proposed Kawana Town Centre, Sunshine Coast University Hospital, the Homemaker Centre, the Kawana business village, the Bokarina Beach site and the newer residential areas of Kawana Island, Kawana Forest, Creekside, Birtinya and parts of Parrearra.

The Kawana Waters local plan code contains a series of outcomes that public lighting arrangements must respond and help to accomplish such all new walkways incorporate appropriate public lighting elements to help create a safer more legible environment to travel.

Upgrade material

The upgrade program plans the replacement of the existing lights with 5 different wattages of LED luminaire, with smart contol:

- LED 240W 41 luminaires
- LED 144W 113 luminaires
- LED 60W 952 luminaires
- LED 22W 1140 luminaires
- LED 22W (w/ bracket) 2058 luminaires

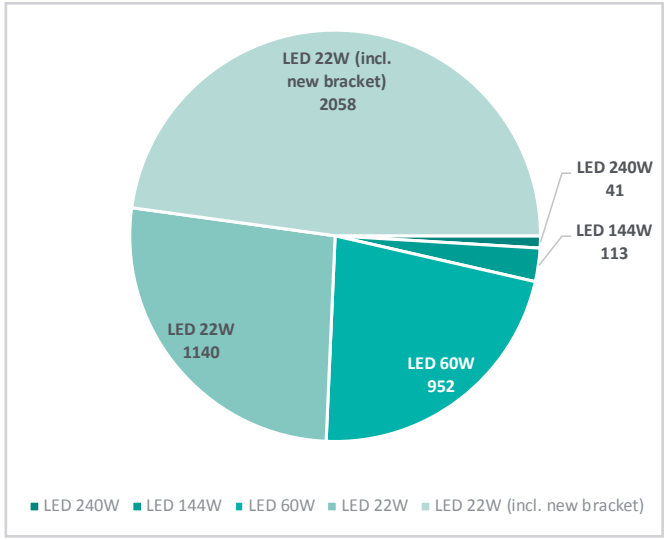


Distribution of existing lights by wattage and technology

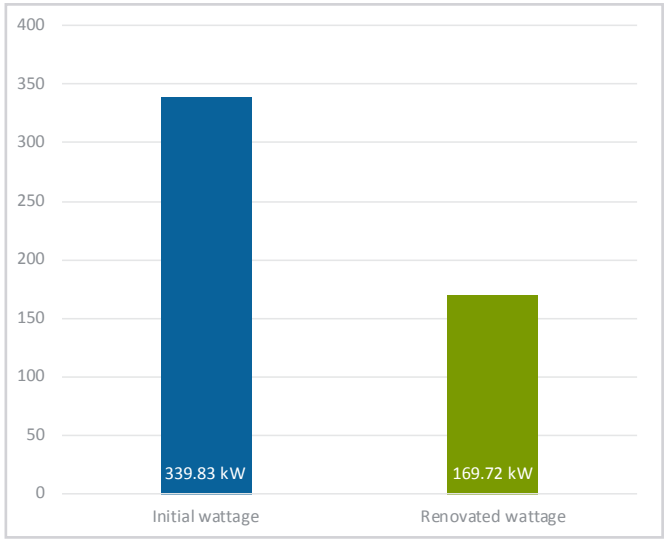
number of lighting points: **4306 lights**

consumption before renovation: **339.83 kW**
consumption after: **169.72 kW**

estimated energy savings: **50%**



Distribution of renovated lights by wattage and technology



Consumption before and after renovation

NORTH

ROADS

HIGH PRESSURE SODIUM LAMP

OTHER LAMP

MERCURY VAPOUR LAMP


NORTH
MINYAMA
BUDDINA
MOUNTAIN CREEK
PARREARRA
ROADS
SMART CONTROL
LED LAMP


NORTH
WARANA
BOKARINA
BIRTINYA
WURTULLA
ROADS
HIGH PRESSURE SODIUM LAMP
OTHER LAMP
MERCURY VAPOUR LAMP


NORTH
WURTULLA
WARANA
BOKARINA
BIRTINYA
ROADS
SMART CONTROL
LED LAMP


NORTH
MERIDAN PLAINS
Corbould Park Racecourse
ROADS
HIGH PRESSURE SODIUM LAMP
OTHER LAMP
MERCURY VAPOUR LAMP


NORTH
MERIDAN PLAINS
Corbould Park Racecourse
ROADS
SMART CONTROL
LED LAMP

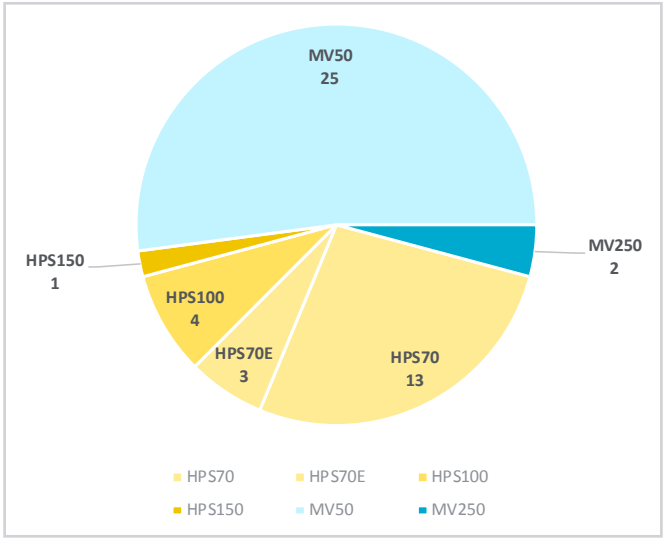

Welcome to
Kenilworth
Heart of the Mary Valley

Kenilworth

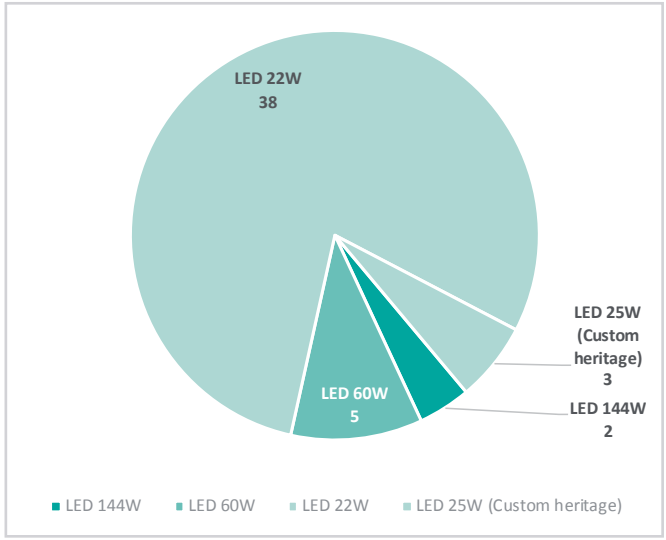
Kenilworth is a small town in the upper Mary Valley area of the Sunshine Coast. The town is located between Mary River and the expansive Conondale National Park.

The town comprises of the traditional main street along Elizabeth Street, the adjacent urban and rural residential areas, as well as rural land immediately surrounding the town.

A consistent and visually sensitive lighting scheme can enhance the rural village style of Kenilworth, and more specifically Elizabeth Street, by emphasising its historical and natural features.



Distribution of existing lights by wattage and technology

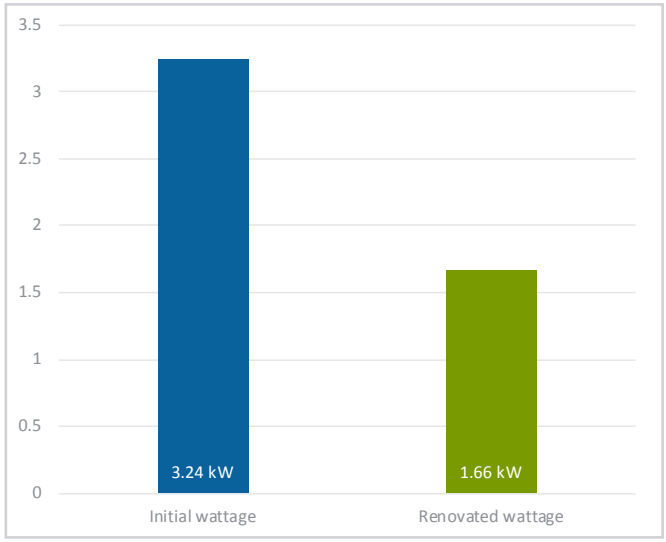


Distribution of renovated lights by wattage and technology

number of lighting points: **48 lights**

consumption before renovation: **3.24 kW**
consumption after: **1.66 kW**

estimated energy savings: **49%**



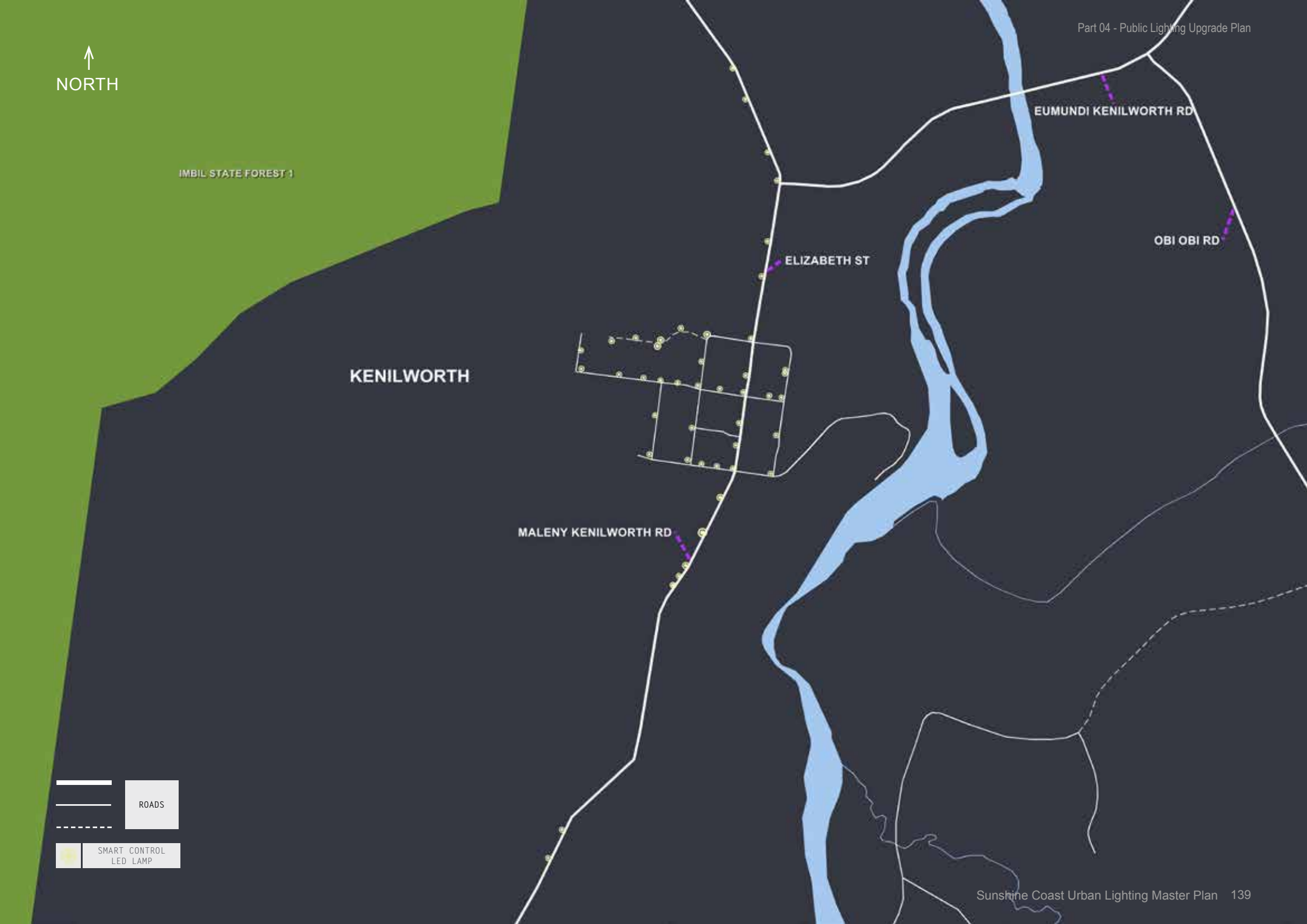
Consumption before and after renovation

Upgrade material

The upgrade program plans the replacement of the existing lights with 4 different wattages of LED luminaire, with smart contol:

- LED 144W — 2 luminaires
- LED 60W — 5 luminaires
- LED 22W — 38 luminaires
- LED 25W (Estate) — 3 luminaires


NORTH
IMBIL STATE FOREST 1
KENILWORTH
EUMUNDI KENILWORTH RD
OBI OBI RD
ELIZABETH ST
MALENY KENILWORTH RD
ROADS
HIGH PRESSURE SODIUM LAMP
OTHER LAMP
MERCURY VAPOUR LAMP


NORTH
IMBIL STATE FOREST 1
KENILWORTH
EUMUNDI KENILWORTH RD
OBI OBI RD
ELIZABETH ST
MALENY KENILWORTH RD
ROADS
SMART CONTROL
LED LAMP


Landsborough
MUSEUM
MUSEUM

Landsborough

Landsborough is a picturesque and historic hinterland town, situated at the southern entrance to the Blackall Range.

The town is located on the North Coast Rail Line between the towns of Beerwah and Mooloolah in the southern hinterland of the Sunshine Coast. The area includes Landsborough's town centre, the surrounding urban area and adjacent rural residential areas to the north, south and west.

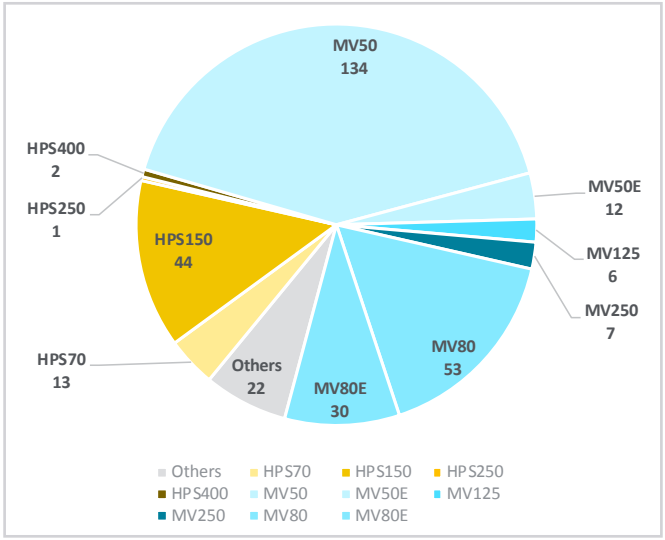
Landsborough functions as an important public transport node, with a bus link from the railway station to the coastal urban area and to Maleny.

Public lighting development must be in keeping with the natural environment, historic and rural character and identity of Landsborough.

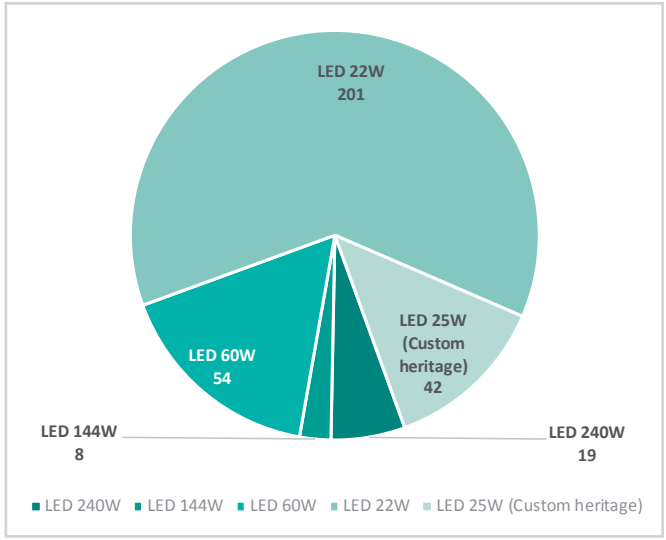
Upgrade material

The upgrade program plans the replacement of the existing lights with 5 different wattages of LED luminaire, with smart contol:

- LED 240W — 19 luminaires
- LED 144W — 8 luminaires
- LED 60W — 54 luminaires
- LED 22W — 201 luminaires
- LED 25W (Estate) — 42 luminaires



Distribution of existing lights by wattage and technology

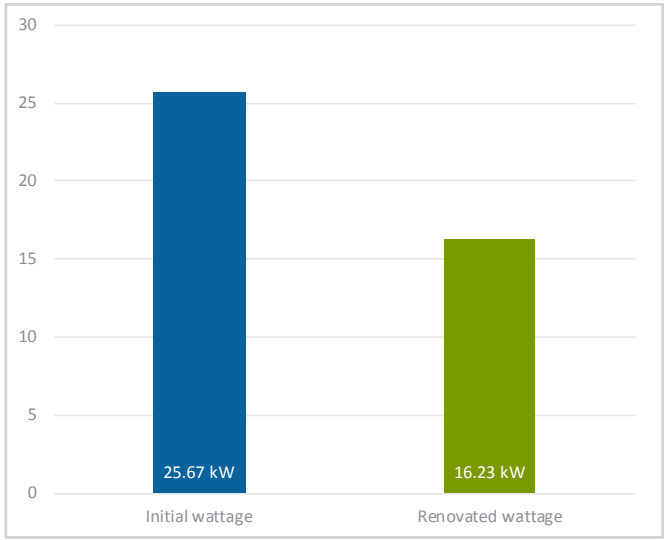


Distribution of renovated lights by wattage and technology

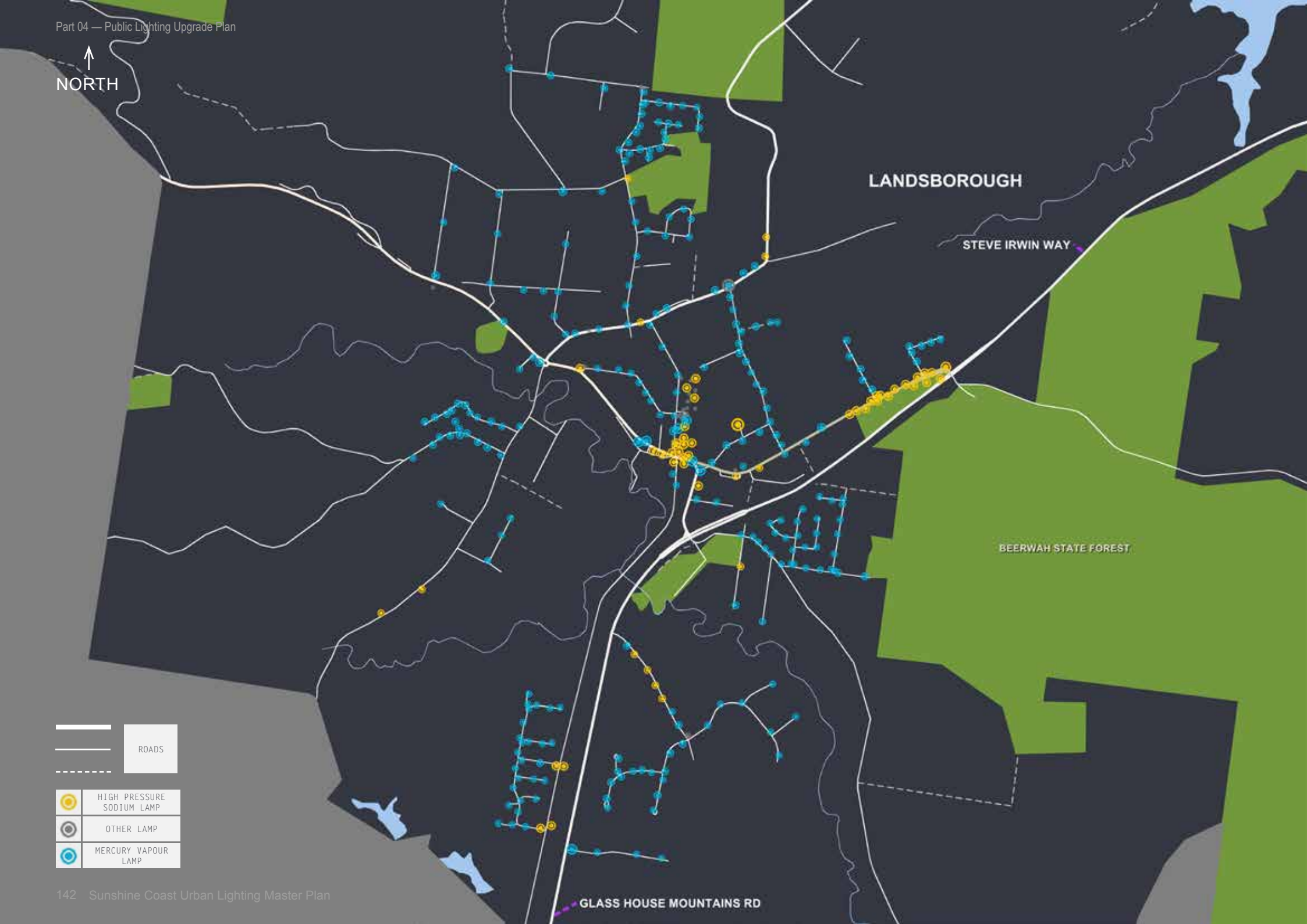
number of lighting points: **324 lights**

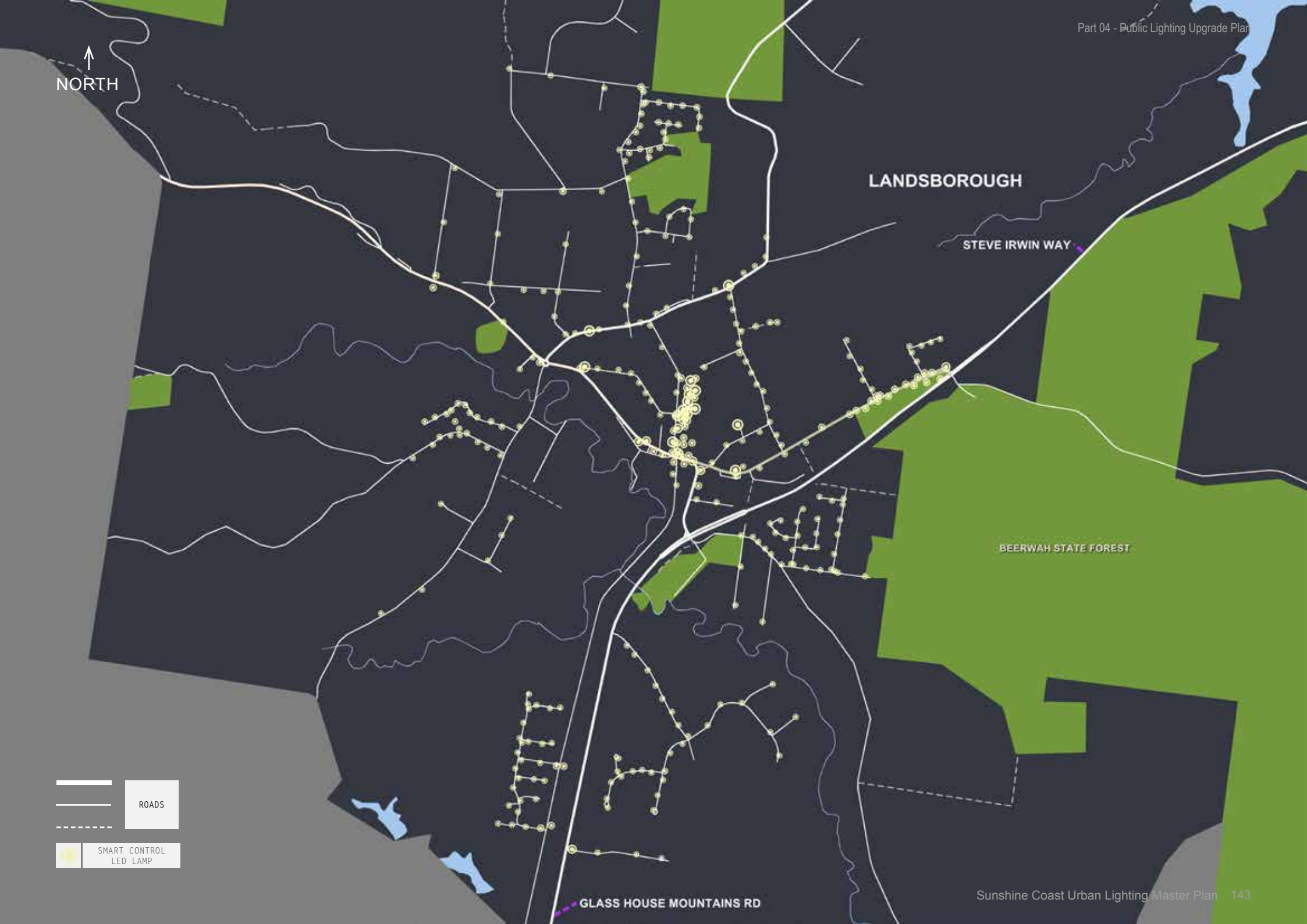
consumption before renovation: **25.67kW**
consumption after: **16.23kW**

estimated energy savings: **37%**



Consumption before and after renovation


NORTH
LANDSBOROUGH
STEVE IRWIN WAY
BEERWAH STATE FOREST
GLASS HOUSE MOUNTAINS RD
ROADS
HIGH PRESSURE SODIUM LAMP
OTHER LAMP
MERCURY VAPOUR LAMP


NORTH
LANDSBOROUGH
STEVE IRWIN WAY
BEERWAH STATE FOREST
GLASS HOUSE MOUNTAINS RD
ROADS
SMART CONTROL
LED LAMP

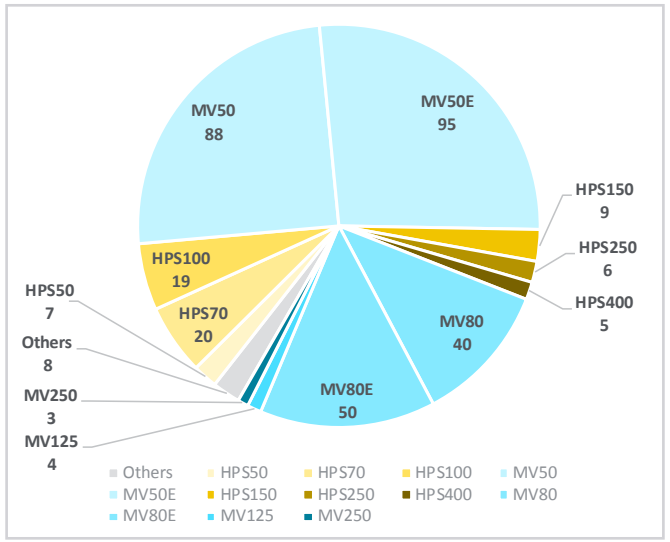
Maleny

Maleny is located in the south western part of the Sunshine Coast on the Maleny Plateau, which forms part of the Blackall Range.

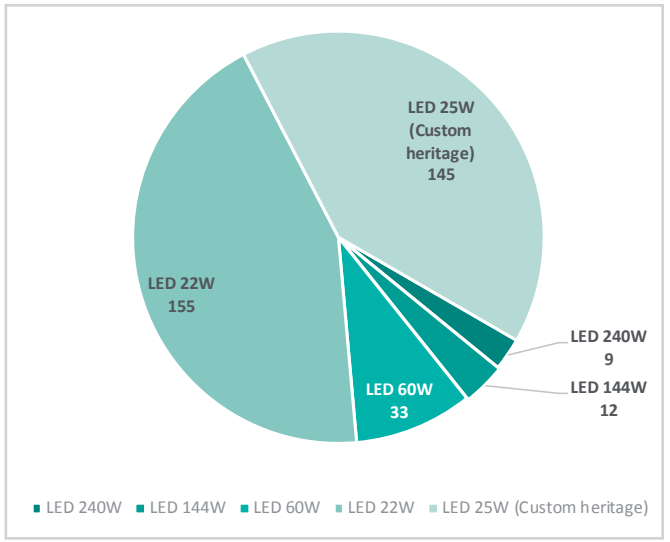
The site includes Maleny's town centre focused around Maple Street-Bunya Street, and surrounding urban and rural residential areas which spread out from the main street.

Public lighting should be consistent but minimal along Maple Street-Bunya Street so as not to detract from the rural characteristics of Maleny.

Lighting should also help navigate pedestrians to significant connections and landmarks particularly at gateways and through block connections.



Distribution of existing lights by wattage and technology

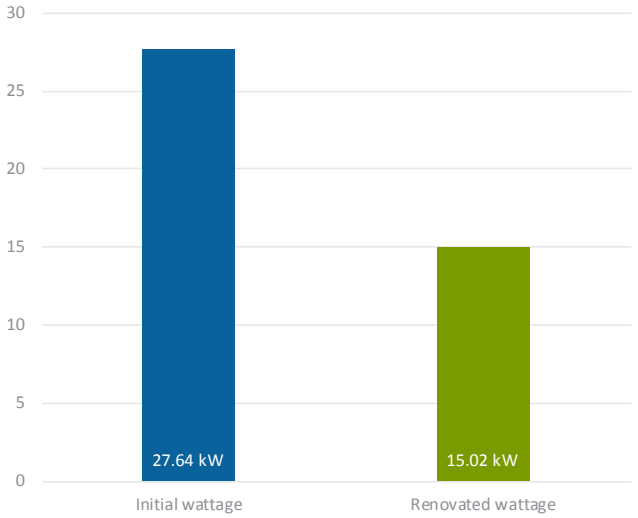


Distribution of renovated lights by wattage and technology

number of lighting points: **354 lights**

consumption before renovation: **27.64 kW**
consumption after: **15.02 kW**

estimated energy savings: **46%**

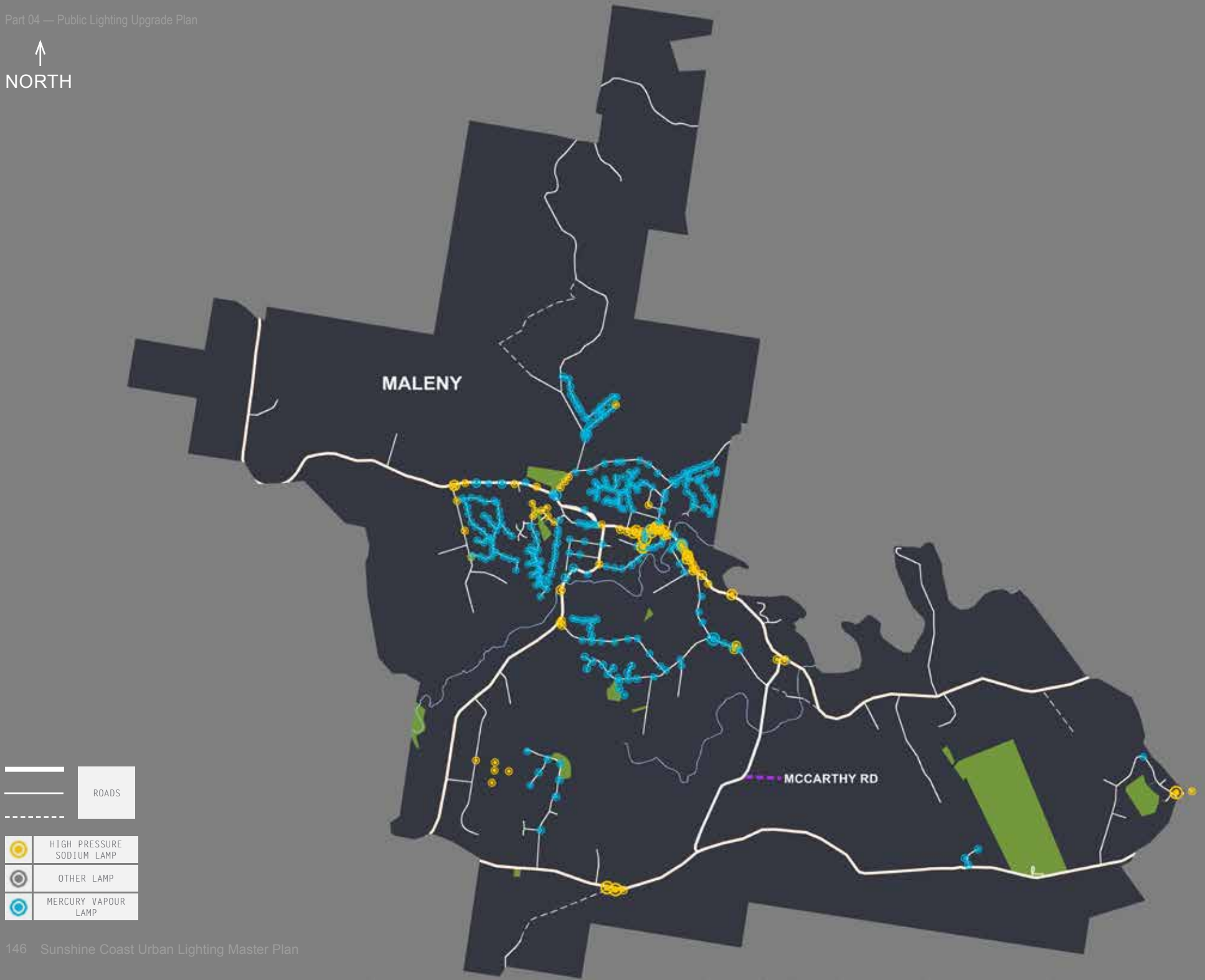


Consumption before and after renovation

Upgrade material

The upgrade program plans the replacement of the existing lights with 5 different wattages of LED luminaire, with smart contol:

- LED 240W — 9 luminaires
- LED 144W — 12 luminaires
- LED 60W — 33 luminaires
- LED 22W — 155 luminaires
- LED 25W (Estate) — 145 luminaires


NORTH
MALENY
MCCARTHY RD
ROADS
HIGH PRESSURE SODIUM LAMP
OTHER LAMP
MERCURY VAPOUR LAMP


NORTH
MALENY
MCCARTHY RD
ROADS
SMART CONTROL
LED LAMP

Maroochy North Shore

The Maroochy North Shore local plan area is to remain a predominantly low density coastal urban area comprising a number of beachside residential communities and the Sunshine Coast Airport as well as significant tourist and sport and recreation facilities.

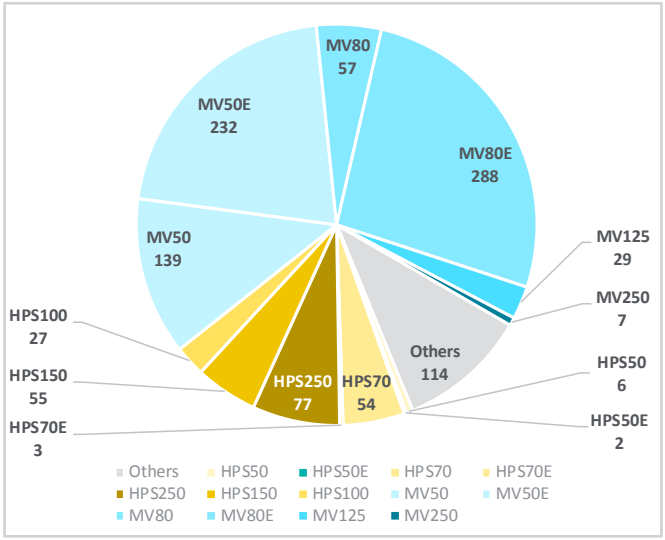
The Tourist accommodation zone in South Marcoola has been identified as a priority pedestrian area due to the higher population densities in the high rise hotels and apartments.

Public lighting should be used strategically in the area to provide attractive pedestrian connectivity between David Low Way, accommodation and the beach. Lighting around the area should also ensure minimal upward lighting to reinforce the safety of approaching aircraft.

Upgrade material

The upgrade program plans the replacement of the existing lights with 5 different wattages of LED luminaire, with smart contol:

- LED 240W — 18 luminaires
- LED 144W — 90 luminaires
- LED 60W — 132 luminaires
- LED 22W — 322 luminaires
- LED 22W (w/ bracket) — 528 luminaires

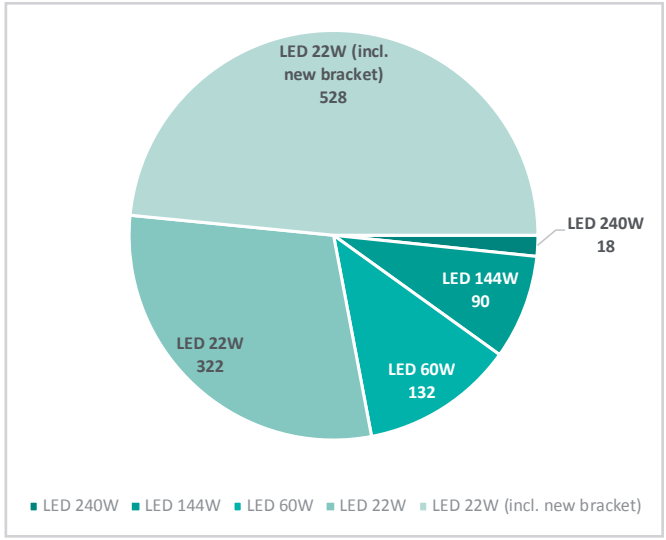


Distribution of existing lights by wattage and technology

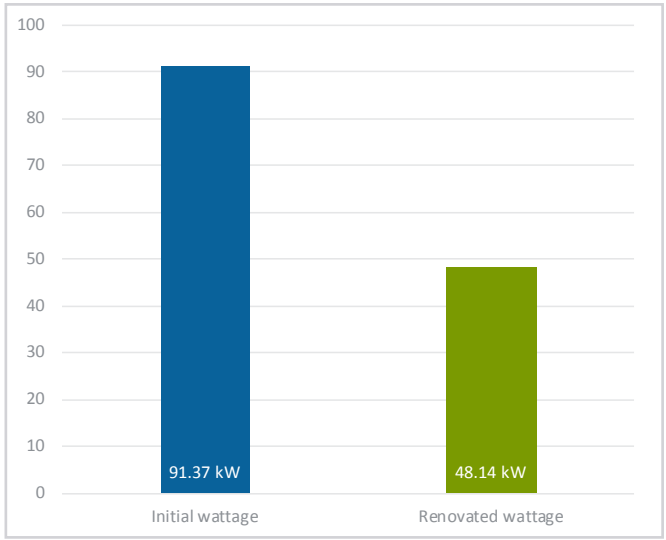
number of lighting points: **1090 lights**

consumption before renovation: **91.37 kW**
consumption after: **48.14 kW**

estimated energy savings: **47%**



Distribution of renovated lights by wattage and technology



Consumption before and after renovation


NORTH
MUDJIMBA
TWIN WATERS
Sunshine Coast Airport
MOUNT COOLUM NATIONAL PARK
PACIFIC PARADISE
MARCOOLA
ROADS
HIGH PRESSURE SODIUM LAMP
OTHER LAMP
MERCURY VAPOUR LAMP


NORTH
MUDJIMBA
TWIN WATERS
Sunshine Coast Airport
MOUNT COOLUM NATIONAL PARK
PACIFIC PARADISE
MARCOOLA
ROADS
SMART CONTROL
LED LAMP

Maroochydore, Kuilin

Maroochydore's future is set to involve significant urban renewal which is implemented through the Maroochydore Principal Regional Activity Centre Master Planned Area and the Maroochydore CBD.

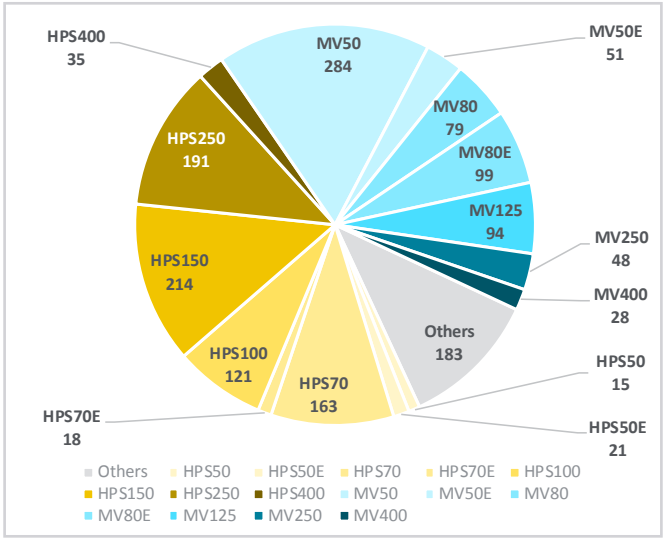
Public lighting plays a large role in identifying boulevards and gateways at night. The local plan code map specifies a Primary Landscape Treatment Area, Boulevard Treatment Area, and Gateways/Entry Points. Areas identified for primary landscape treatment include Bradman Avenue between Buna Street and Thomas Street, The Esplanade, Kings Street, Sixth Avenue between Kingsford Smith Parade and Aerodrome Road.

Improve consultation between State and Local Government is required to ensure public lighting on State controlled roads is consistent with the proposed lighting themes of the Maroochydore CBD and improvements to public lighting through the lighting strategy.

Upgrade material

The upgrade program plans the replacement of the existing lights with 5 different wattages of LED luminaire, with smart contol:

- LED 240W 75 luminaires
- LED 144W 301 luminaires
- LED 60W 476 luminaires
- LED 22W 601 luminaires
- LED 22W (w/ bracket) 191 luminaires

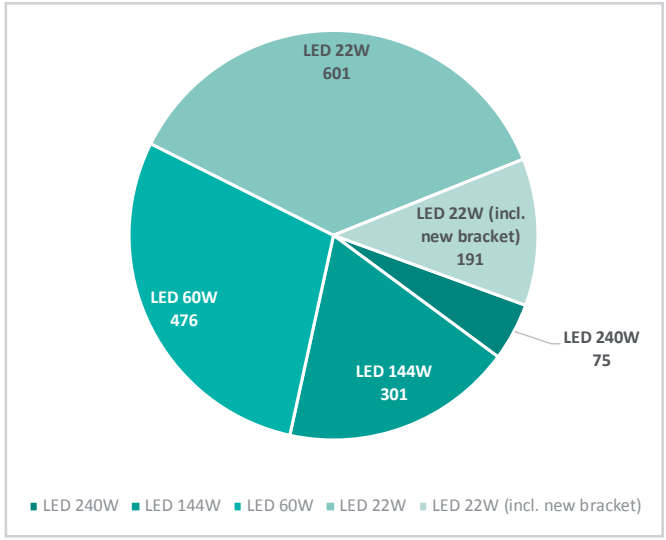


Distribution of existing lights by wattage and technology

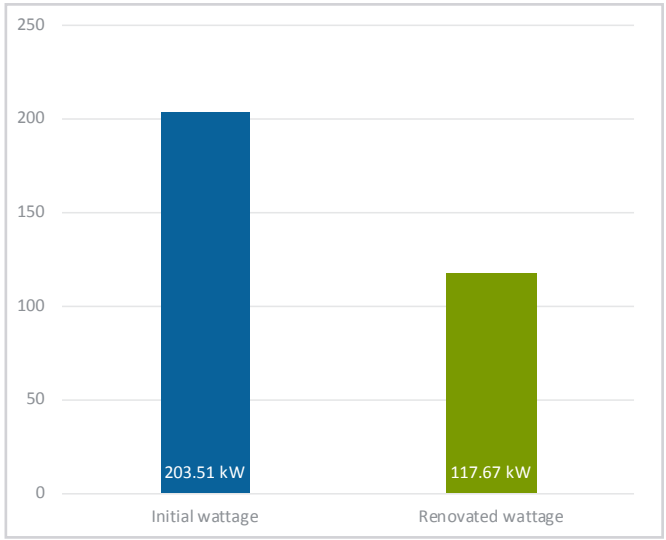
number of lighting points: **1644 lights**

consumption before renovation: **203.51 kW**
consumption after: **117.67 kW**

estimated energy savings: **42%**



Distribution of renovated lights by wattage and technology



Consumption before and after renovation


NORTH
MAROOCHY RIVER CONSERVATION PARK
POWEL PARK
KULUIN
KUSKOPP PARK
MAROOCHYDORE
ROADS
HIGH PRESSURE SODIUM LAMP
OTHER LAMP
MERCURY VAPOUR LAMP


NORTH
MAROOCHY RIVER CONSERVATION PARK
POWEL PARK
KULUIN
KUSKOPF PARK
MAROOCHYDORE
ROADS
SMART CONTROL
LED LAMP

Mooloolaba, Alexandra Headlands

Mooloolaba is a coastal suburb and popular holiday destination between Alexandra Headlands and Point Cartwright, approximately three kilometres south east of the larger Maroochydore urban centre.

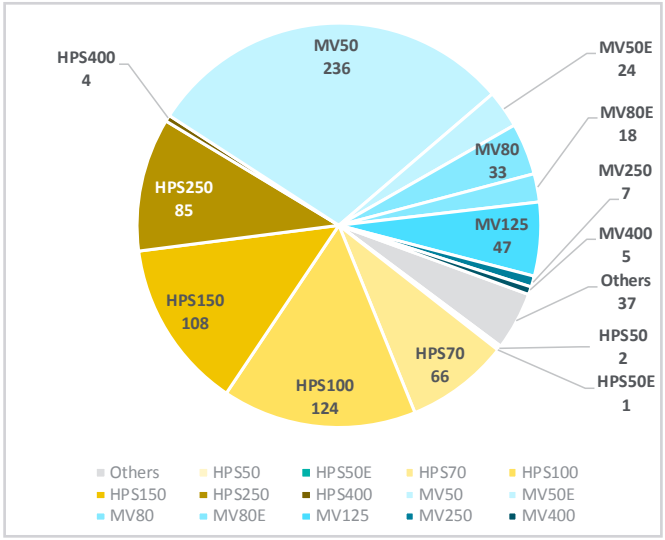
The suburb is defined by its beautiful beaches, foreshore parklands, popular commercial and tourist spaces, as well as a series of canals weaving throughout a number of residential streets.

The Mooloolaba Foreshore area is part of a revitalisation and undergoing design phase. The lighting proposed in the foreshore area should be consistent with the overall strategic intent of the regions lighting strategy but ensure that lighting is of high quality and enhances its location as an activity centre by connecting pedestrians and users at night that reinforce the vibrancy of the area.

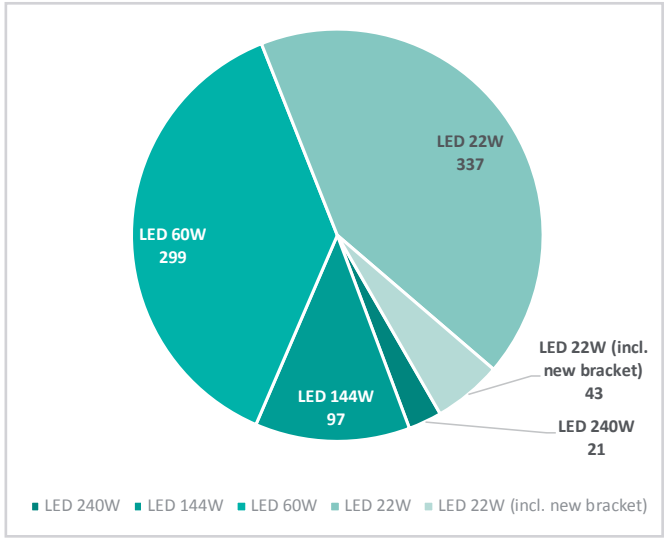
Upgrade material

The upgrade program plans the replacement of the existing lights with 5 different wattages of LED luminaire, with smart contol:

- LED 240W — 21 luminaires
- LED 144W — 97 luminaires
- LED 60W — 299 luminaires
- LED 22W — 337 luminaires
- LED 22W (w/ bracket) — 43 luminaires



Distribution of existing lights by wattage and technology

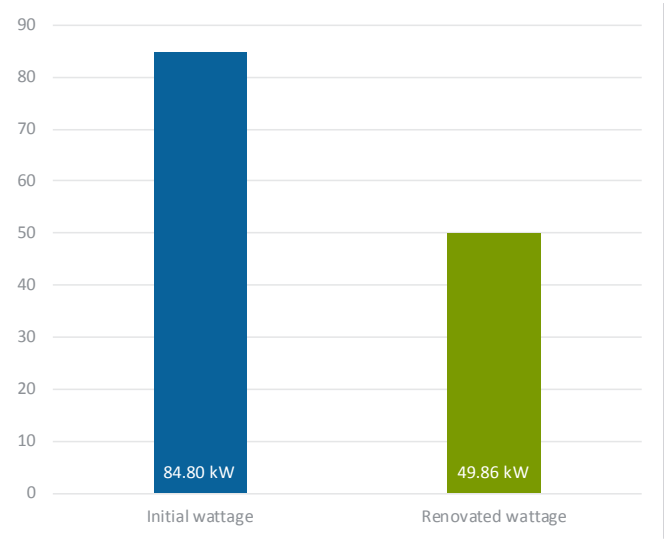


Distribution of renovated lights by wattage and technology

number of lighting points: **797 lights**

consumption before renovation: **84.80 kW**
consumption after: **49.86 kW**

estimated energy savings: **41%**



Consumption before and after renovation


NORTH
ALEXANDRA HEADLAND
MOOLOOLABA
ROADS
HIGH PRESSURE SODIUM LAMP
OTHER LAMP
MERCURY VAPOUR LAMP

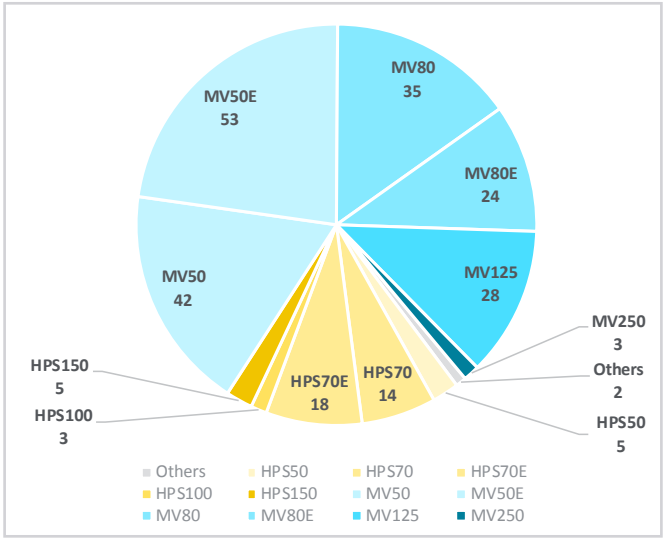

NORTH
ALEXANDRA HEADLAND
MOOLOOLABA
ROADS
SMART CONTROL
LED LAMP

Mooloolah Valley

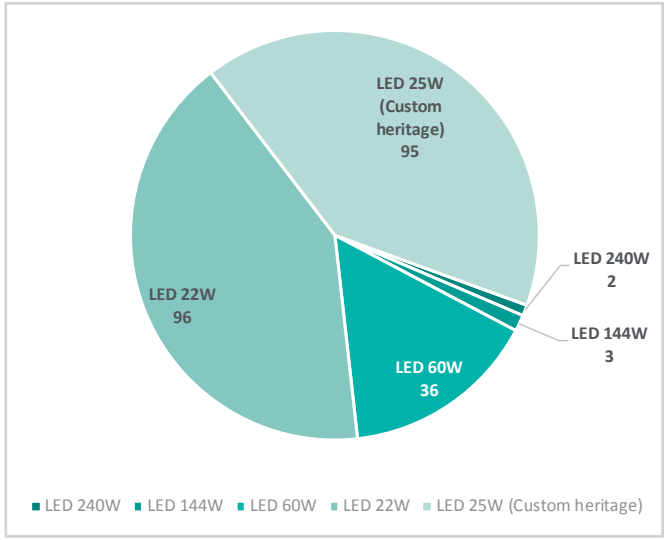
Mooloolah Valley is a highly vegetated, rural, hinterland town located in the Mooloolah district of the Sunshine Coast.

The town's attractive heritage character is linked to the unique visual and physical connection to the Blackall Ranges. The retail and commercial functions of Mooloolah centre may expand and be enhanced, the town centre remains compact and focused on the western side of the railway.

Provide lighting for the pedestrian crossing near the intersection of Bray Road and Jones Street. This connects the key local retail and commercial enterprises with the adjacent Martin Rungert Park, the Village Green, and public toilets.



Distribution of existing lights by wattage and technology

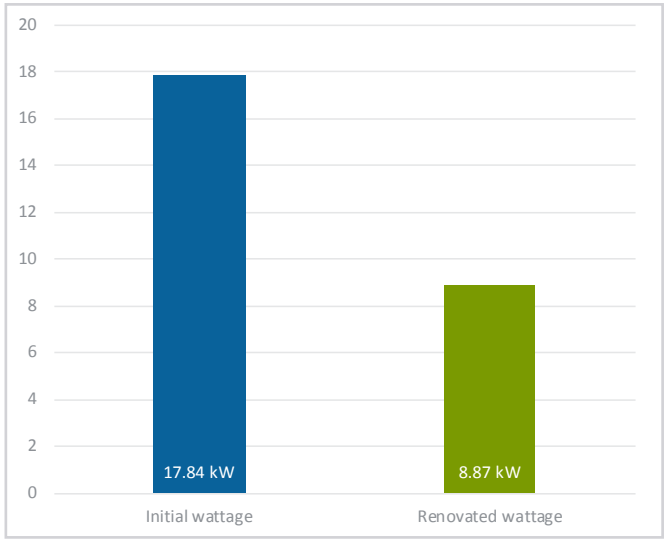


Distribution of renovated lights by wattage and technology

number of lighting points: **232 lights**

consumption before renovation: **17.84 kW**
consumption after: **8.87 kW**

estimated energy savings: **50%**

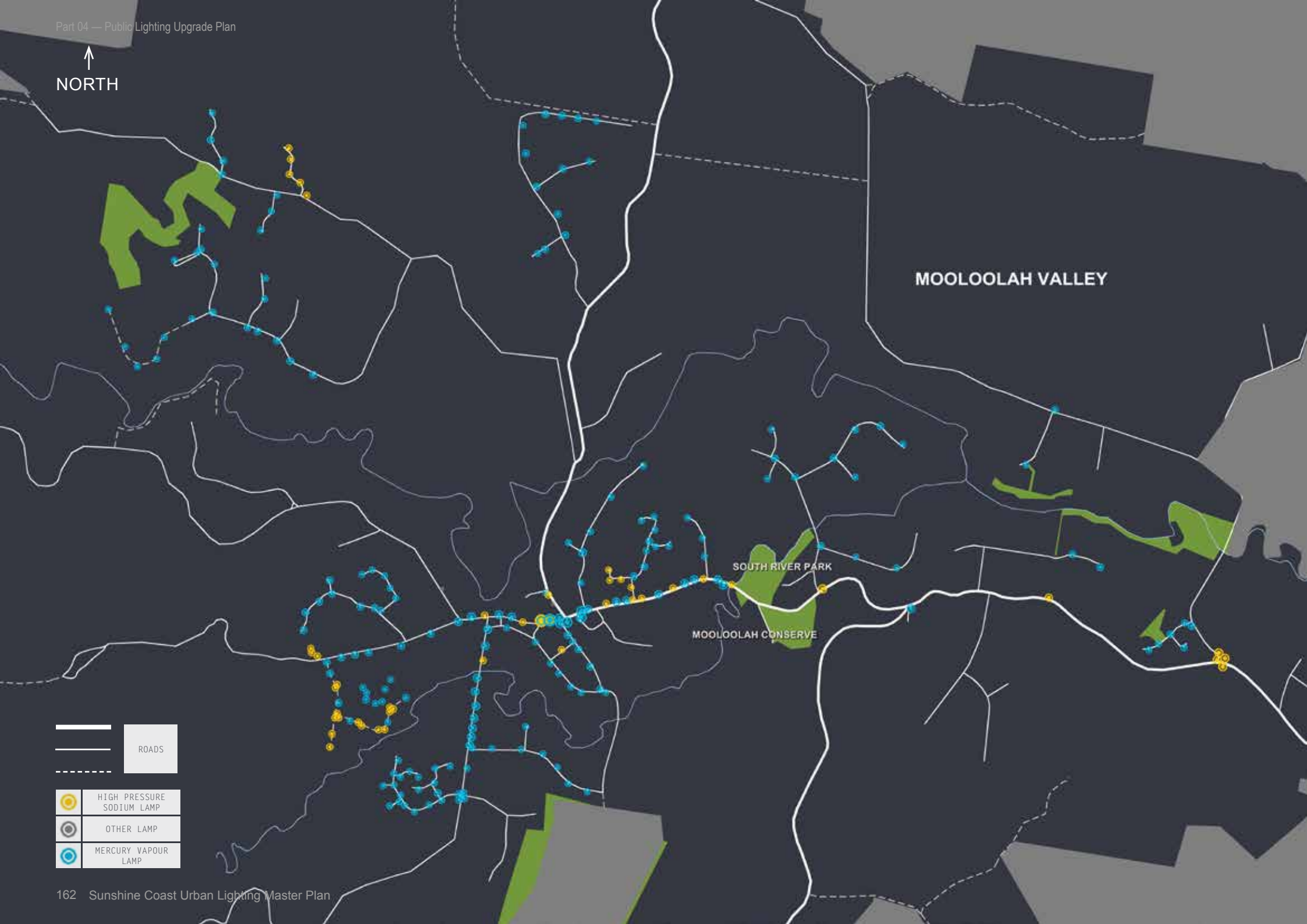


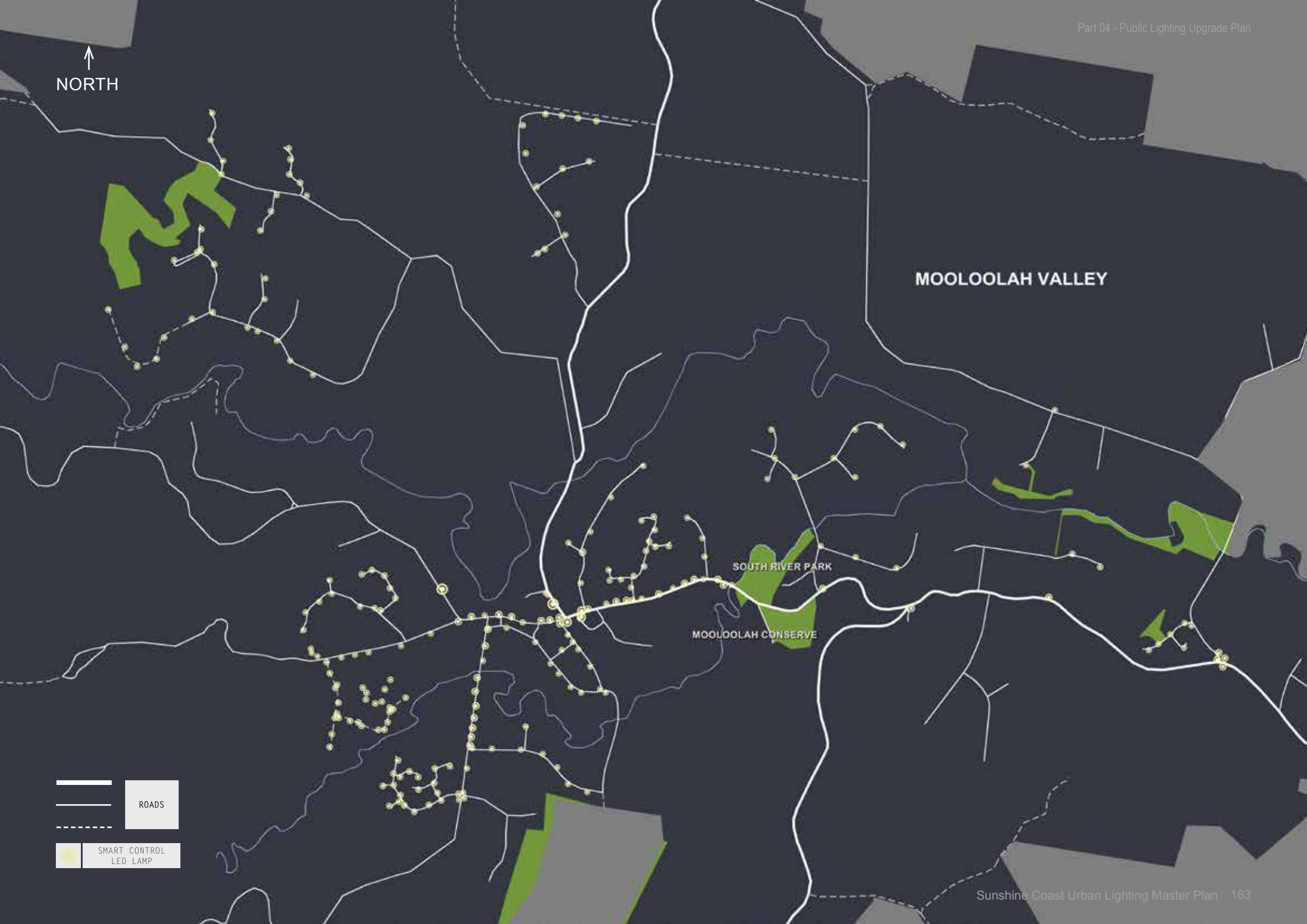
Consumption before and after renovation

Upgrade material

The upgrade program plans the replacement of the existing lights with 5 different wattages of LED luminaire, with smart contol:

- LED 240W — 2 luminaires
- LED 144W — 3 luminaires
- LED 60W — 36 luminaires
- LED 22W — 96 luminaires
- LED 25W (Estate) — 95 luminaires


NORTH
MOOLOOLAH VALLEY
SOUTH RIVER PARK
MOOLOOLAH CONSERVE
ROADS
HIGH PRESSURE SODIUM LAMP
OTHER LAMP
MERCURY VAPOUR LAMP


NORTH
MOOLOOLAH VALLEY
SOUTH RIVER PARK
MOOLOOLAH CONSERVE
ROADS
SMART CONTROL
LED LAMP


& Bistro

Nambour

The Nambour area has a picturesque setting, framed by surrounding hills and hillside vegetation. The local plan area itself is characterised by variable topography with steeper slopes around the margins of the area and undulating land in the central parts.

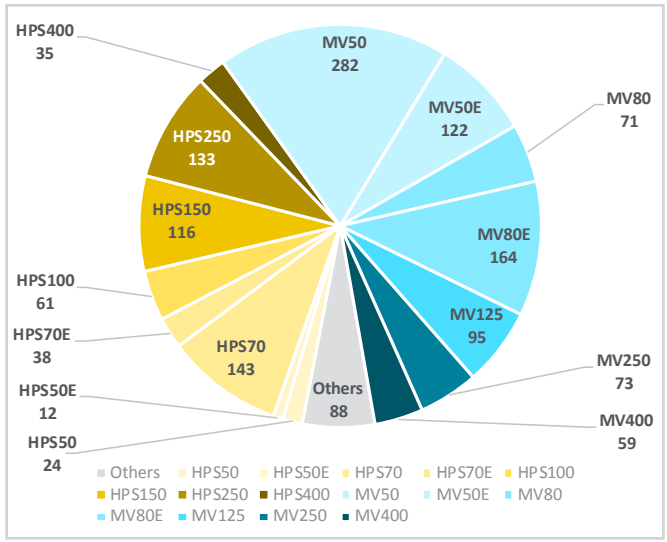
Nambour serves an important role as a major regional activity centre providing higher order retail, employment and service needs of its resident population and surrounding hinterland areas, including the nearby rural towns of Woombye, Palmwoods, Montville, Mapleton and Yandina.

Public lighting must be developed in respect of Nambour's existing unique hinterland identity and creatively celebrate cultural heritage to strengthen the sense of place and identity. Appropriate night time pathways should be developed at the same time as the hospitality precinct is developed that define clear night time routes for pedestrians to traverse safely from public transportation to night time venues.

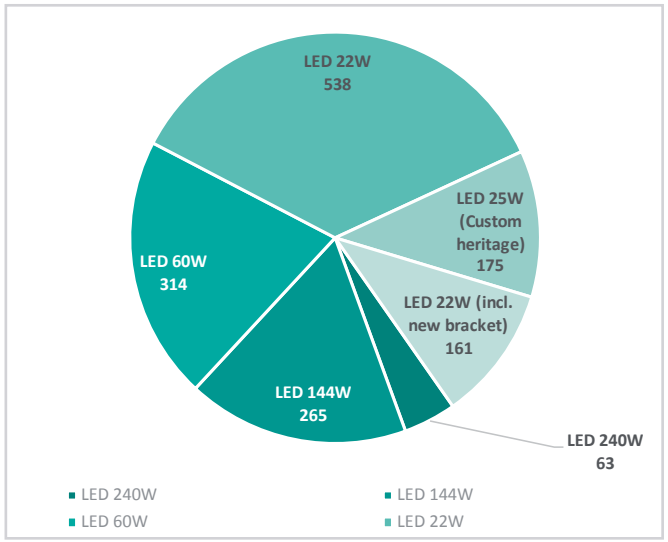
Upgrade material

The upgrade program plans the replacement of the existing lights with 6 different wattages of LED luminaire, with smart contol:

- LED 240W 63 luminaires
- LED 144W 265 luminaires
- LED 60W 314 luminaires
- LED 22W 538 luminaires
- LED 22W (estate) 175 luminaires
- LED 22W (w/ bracket) 161 luminaires



Distribution of existing lights by wattage and technology

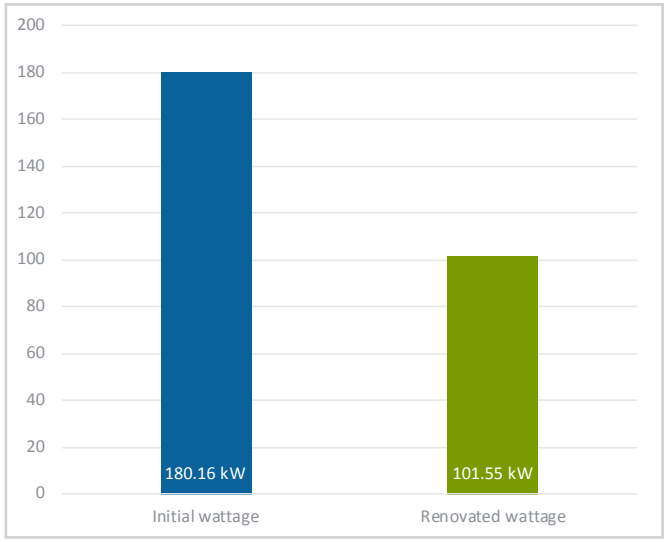


Distribution of renovated lights by wattage and technology

number of lighting points: **1516 lights**

consumption before renovation: **180.16 kW**
consumption after: **101.55 kW**

estimated energy savings: **44%**



Consumption before and after renovation


NORTH
PARKLANDS
HIGHWORTH
BURNSIDE
NAMBOUR
COES CREEK
ROADS
HIGH PRESSURE SODIUM LAMP
OTHER LAMP
MERCURY VAPOUR LAMP


NORTH
PARKLANDS
HIGHWORTH
BURNSIDE
NAMBOUR
COES CREEK
ROADS
SMART CONTROL
LED LAMP


POISON KANDY
Florist & Gifts

Palmwoods

Palmwoods features a main street retail and commercial core, with some light industry distributed throughout the greater area.

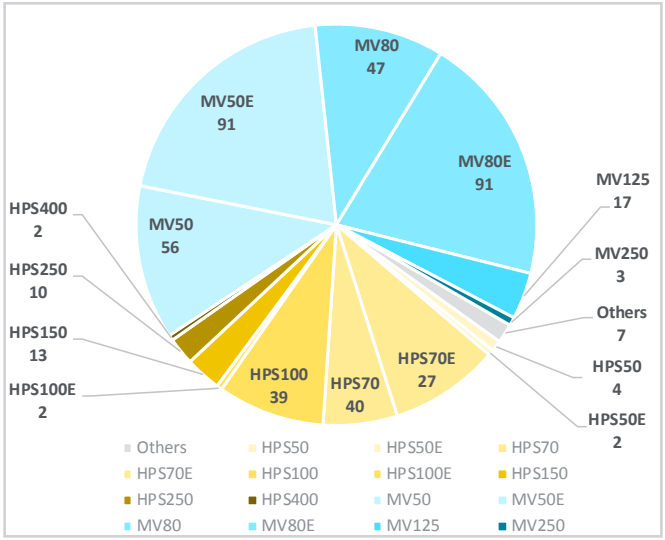
Historical buildings feature throughout Palmwoods, contributing to the sense of character, local heritage values, historical links, and local landmarks.

Ensure that new pedestrian connections between new developments and the existing open space networks are complimented with safe and appropriate lighting infrastructure. Retain and enhance the historical and cultural value of Palmwoods, by incorporating subtle lighting elements which highlight landscape features or historical landmarks, particularly at gateways or entrance points.

Upgrade material

The upgrade program plans the replacement of the existing lights with 5 different wattages of LED luminaire, with smart contol:

- LED 240W — 7 luminaires
- LED 144W — 13 luminaires
- LED 60W — 73 luminaires
- LED 22W — 147 luminaires
- LED 25W (Estate) — 211 luminaires

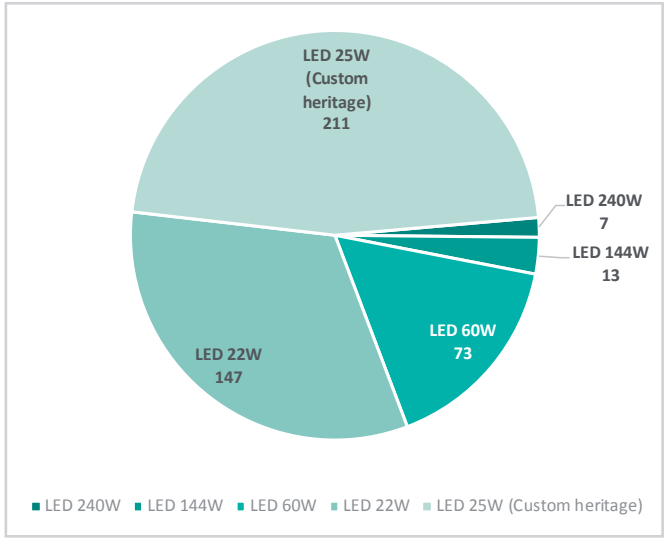


Distribution of existing lights by wattage and technology

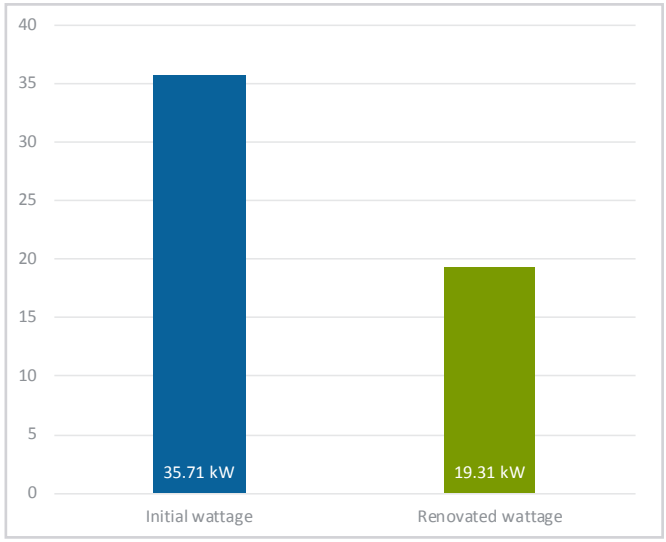
number of lighting points: **451 lights**

consumption before renovation: **35.71 kW**
consumption after: **19.31 kW**

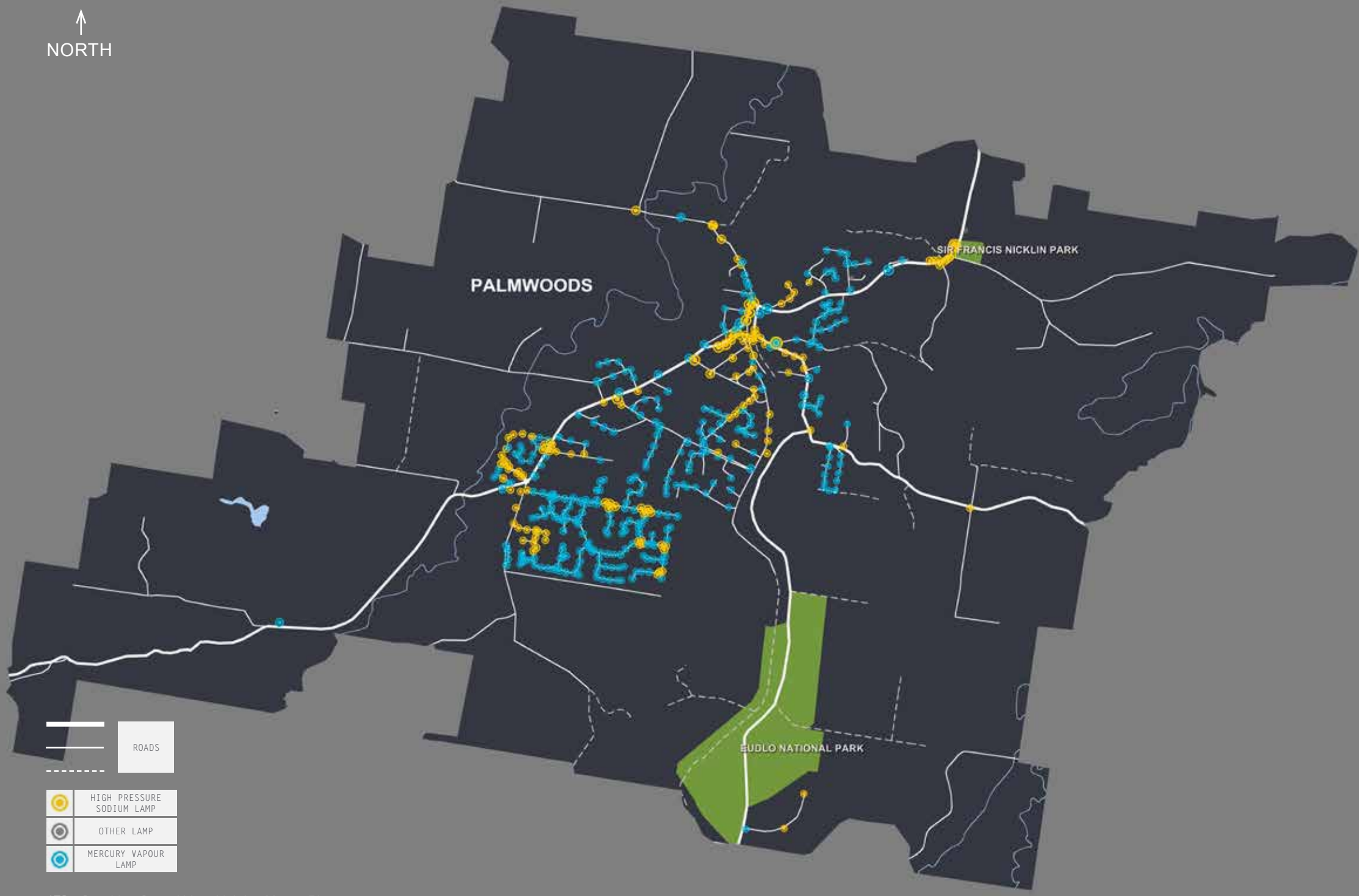
estimated energy savings: **46%**



Distribution of renovated lights by wattage and technology



Consumption before and after renovation


NORTH
PALMWOODS
SIR FRANCIS NICKLIN PARK
BUDLO NATIONAL PARK
ROADS
HIGH PRESSURE SODIUM LAMP
OTHER LAMP
MERCURY VAPOUR LAMP


NORTH
PALMWOODS
SIR FRANCIS NICKLIN PARK
EUDLO NATIONAL PARK
ROADS
SMART CONTROL
LED LAMP


SPIRIT

Perigian South

The Peregian South local plan area is located in the central eastern part of the Sunshine Coast, west of Peregian Beach and immediately west of the Sunshine Motorway.

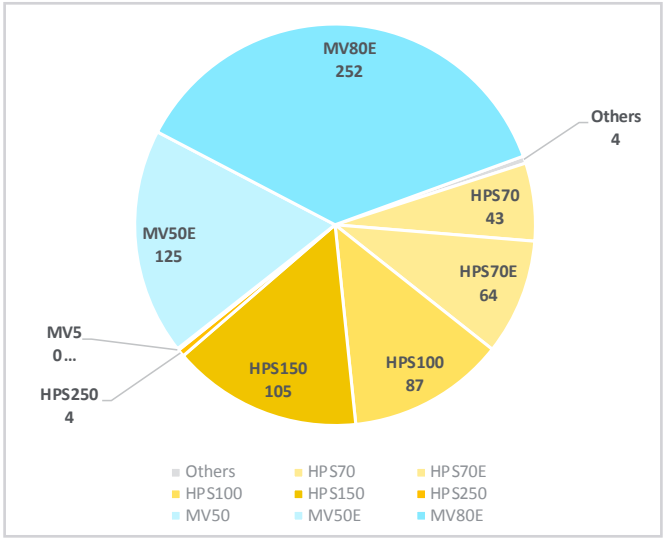
The local plan area includes the emerging communities of Peregian Springs/Coolum Ridges comprising a number of residential neighbourhoods, a local (full service) activity centre, a number of smaller local centres, schools and large areas of open space including the Peregian Springs Golf Course and several environmental parks.

Future development around the local centre zone, on the corner of Peregian Springs Drive and Ridgeview Drive must enhance the streetscape by achieving high quality landscape and shop front outcomes, of which public lighting can play a role in increasing accessibility, safety and highlighting local features.

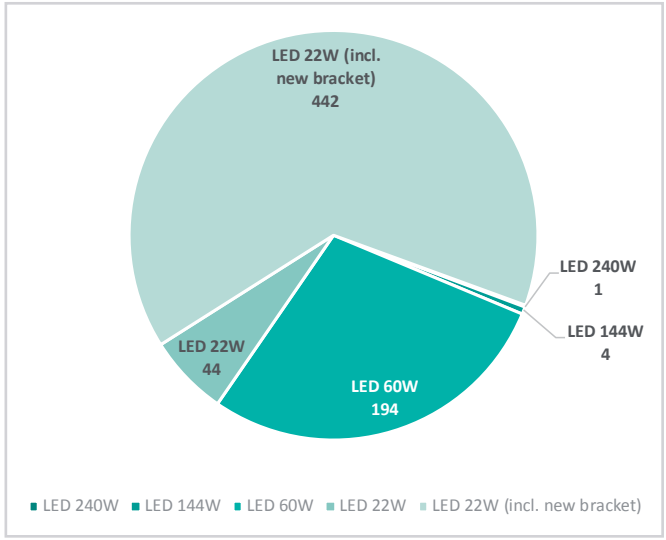
Upgrade material

The upgrade program plans the replacement of the existing lights with 4 different wattages of LED luminaire, with smart contol:

- LED 240W — 1 luminaires
- LED 144W — 4 luminaires
- LED 60W — 194 luminaires
- LED 22W — 44 luminaires
- LED 22W (w/ bracket) — 442 luminaires



Distribution of existing lights by wattage and technology

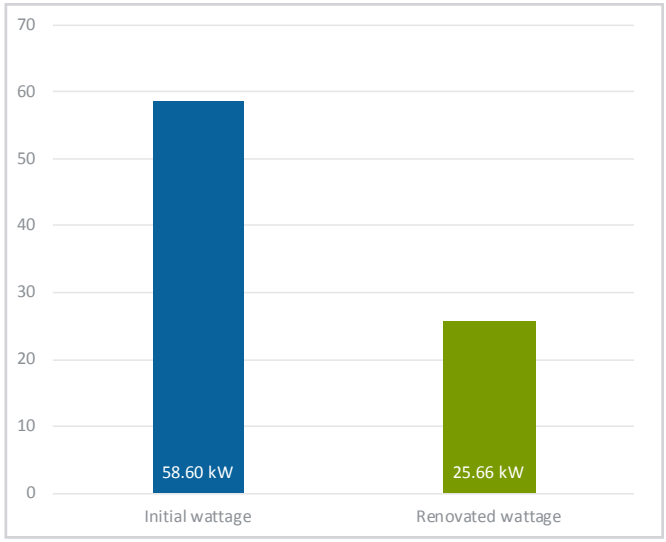


Distribution of renovated lights by wattage and technology

number of lighting points: **685 lights**

consumption before renovation: **58.60 kW**
consumption after: **25.66 kW**

estimated energy savings: **56%**



Consumption before and after renovation

NORTH

ROADS

HIGH PRESSURE SODIUM LAMP

OTHER LAMP

MERCURY VAPOUR LAMP


NORTH
EMU MOUNTAIN RD
PEREGIAN SPRINGS
RIDGEVIEW DR
YARRAN RD
ROADS
SMART CONTROL
LED LAMP

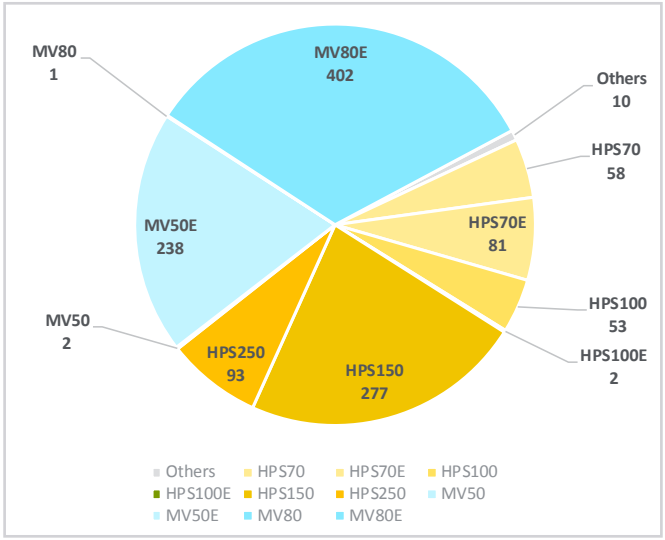

University of the
Sunshine Coast

Sippy Downs

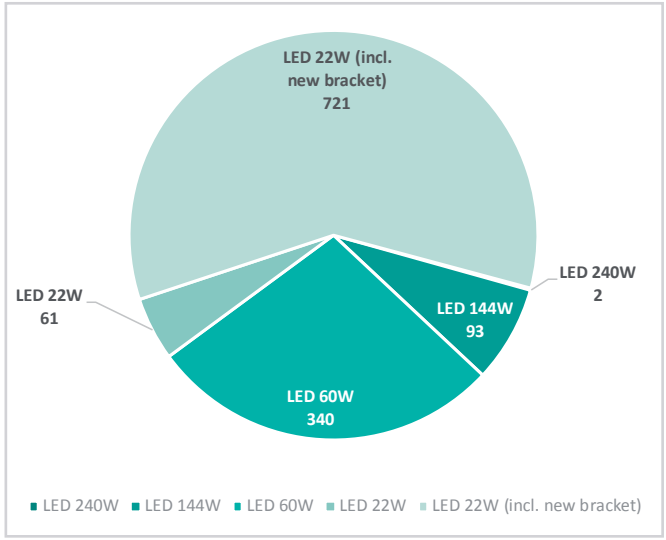
Sippy Downs is directed through the Sunshine Coast Planning Scheme to become a 'major regional activity centre'.

The University of the Sunshine Coast is currently a significant feature of Sippy Downs, and is master planned to be accompanied by an even larger education and research precinct as part of the Business and Technology Precinct.

By allowing higher density dwellings to be constructed near the Town Centre, a greater community presence can be located nearby open space, and provides a form of passive surveillance, which can be assisted by unobtrusive public lighting.



Distribution of existing lights by wattage and technology

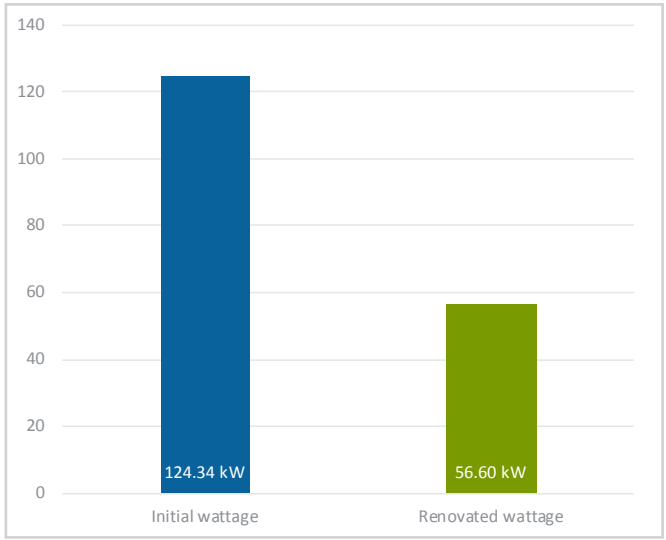


Distribution of renovated lights by wattage and technology

number of lighting points: **1217 lights**

consumption before renovation: **123.34 kW**
consumption after: **56.60 kW**

estimated energy savings: **54%**



Consumption before and after renovation

Upgrade material

The upgrade program plans the replacement of the existing lights with 5 different wattages of LED luminaire, with smart contol:

- LED 240W — 2 luminaires
- LED 144W — 93 luminaires
- LED 60W — 340 luminaires
- LED 22W — 61 luminaires
- LED 22W (w/ bracket) — 721 luminaires


NORTH
SIPPY DOWNS
MOOLOOLAH RIVER NATIONAL PARK
CHANCELLOR PARK
ROADS
HIGH PRESSURE SODIUM LAMP
OTHER LAMP
MERCURY VAPOUR LAMP


NORTH
SIPPY DOWNS
MOOLOOLAH RIVER NATIONAL PARK
CHANCELLOR PARK
ROADS
SMART CONTROL
LED LAMP


WOOMBYE

Woombye

Woombye comprises of a small range of businesses, community, social and recreational facilities that serve the needs of both the immediate residential population and surrounding rural communities.

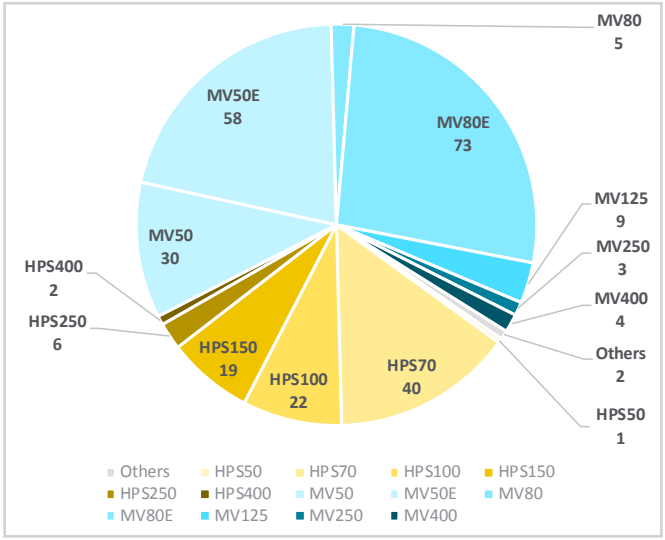
These local conveniences are concentrated along Blackall Street, creating an informal and relaxed town centre. A number of heritage buildings, including the popular Woombye pub, contribute to the overall character and historical values of the town.

A well designed and site specific lighting scheme can complement the prevalent identity of Woombye by accentuating the heritage buildings along Blackall Street, the war memorial and open spaces surrounding the town centre.

Upgrade material

The upgrade program plans the replacement of the existing lights with 5 different wattages of LED luminaire, with smart contol:

- LED 240W — 3 luminaires
- LED 144W — 13 luminaires
- LED 60W — 51 luminaires
- LED 22W — 76 luminaires
- LED 25W (Estate) — 131 luminaires

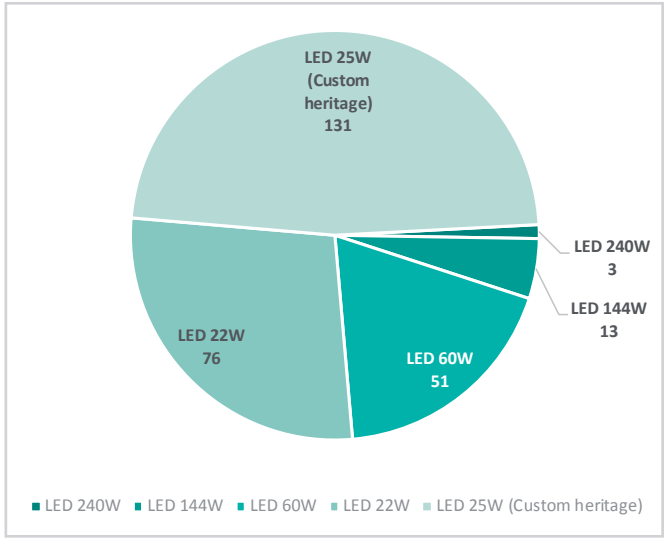


Distribution of existing lights by wattage and technology

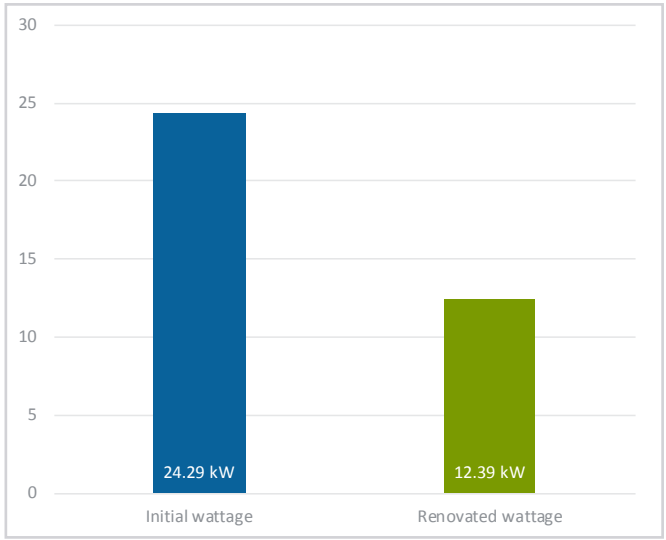
number of lighting points: **274 lights**

consumption before renovation: **24.29 kW**
consumption after: **12.39 kW**

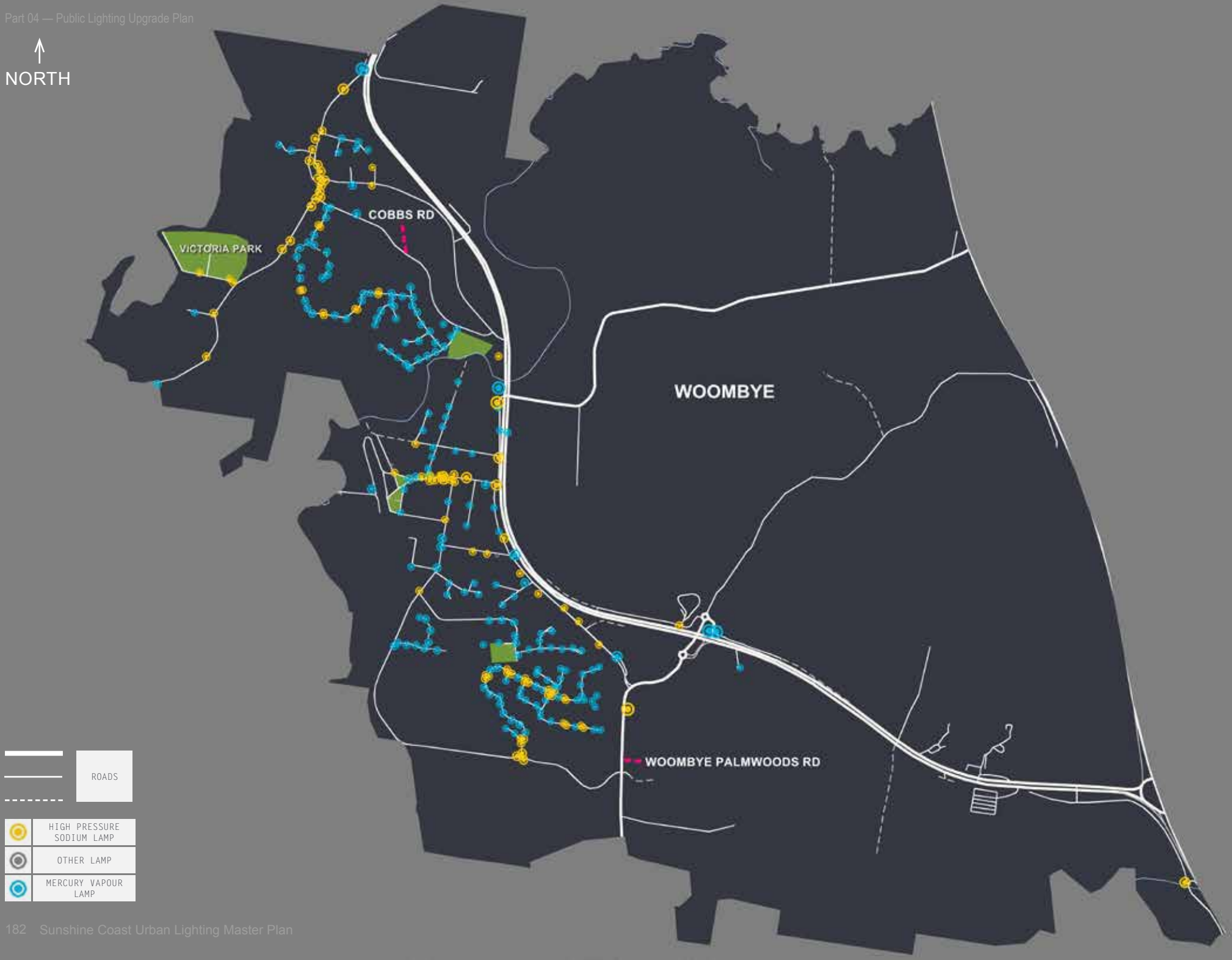
estimated energy savings: **49%**



Distribution of renovated lights by wattage and technology



Consumption before and after renovation


NORTH
COBBS RD
VICTORIA PARK
WOOMBYE
WOOMBYE PALMWOODS RD
ROADS
HIGH PRESSURE SODIUM LAMP
OTHER LAMP
MERCURY VAPOUR LAMP


NORTH
COBBS RD
VICTORIA PARK
WOOMBYE
WOOMBYE PALMWOODS RD
ROADS
SMART CONTROL
LED LAMP


YANDINA HOTEL
STEVENS ST
CONN ST

Yandina

Yandina provides for a large range of uses throughout its extended area. Primarily a residential suburb, the typical housing is of a low density dwelling style.

The older residential areas located in the inner Yandina are characterised by the traditional grid based street layout. The new developments located west of the town centre, are of a higher density and based around a cul-de-sac layout.

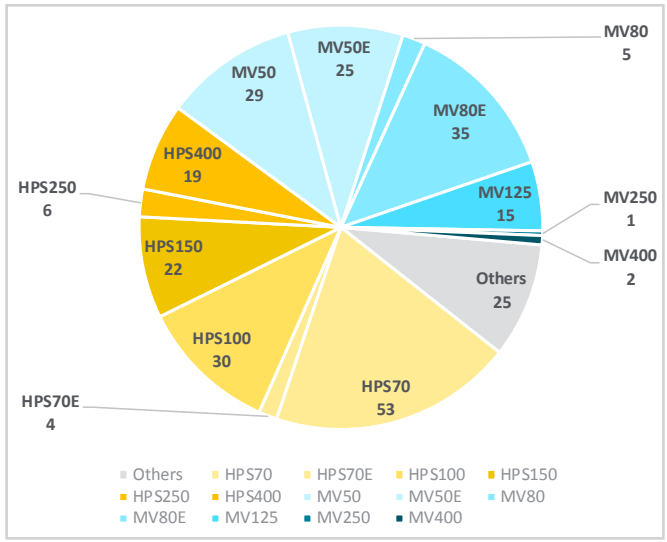
Steven Street is the location of the traditional main street where retail and economic activity is focused. It provides for a number of retail, restaurant and supermarket options.

Public lighting development within the local centre zone should respect the historical character of Yandina.

Upgrade material

The upgrade program plans the replacement of the existing lights with 6 different wattages of LED luminaire, with smart contol:

- LED 240W 25 luminaires
- LED 144W 9 luminaires
- LED 60W 86 luminaires
- LED 22W 87 luminaires
- LED 25W (Estate) 59 luminaires
- LED 22W (w/ bracket) 5 luminaires

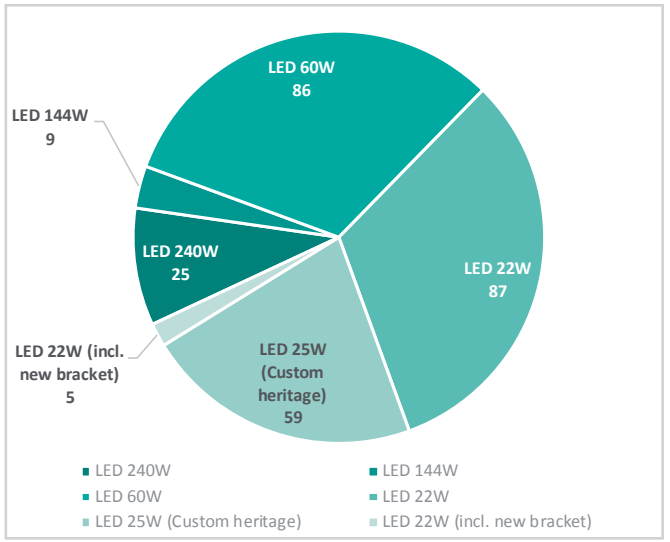


Distribution of existing lights by wattage and technology

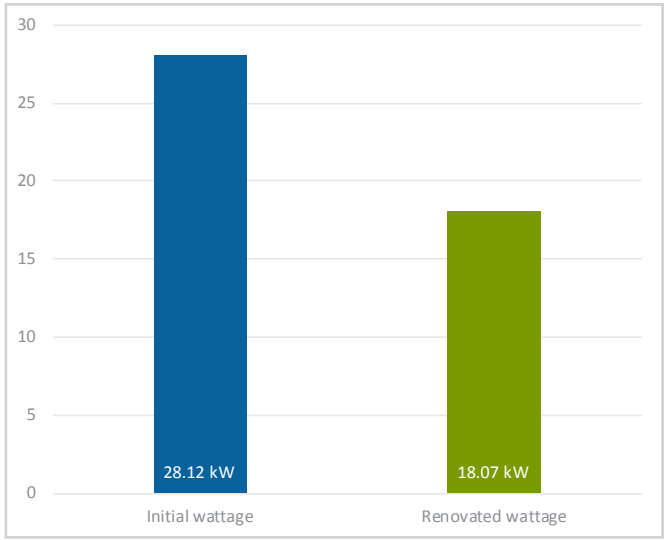
number of lighting points: **271 lights**

consumption before renovation: **28.12 kW**
consumption after: **18.07 kW**

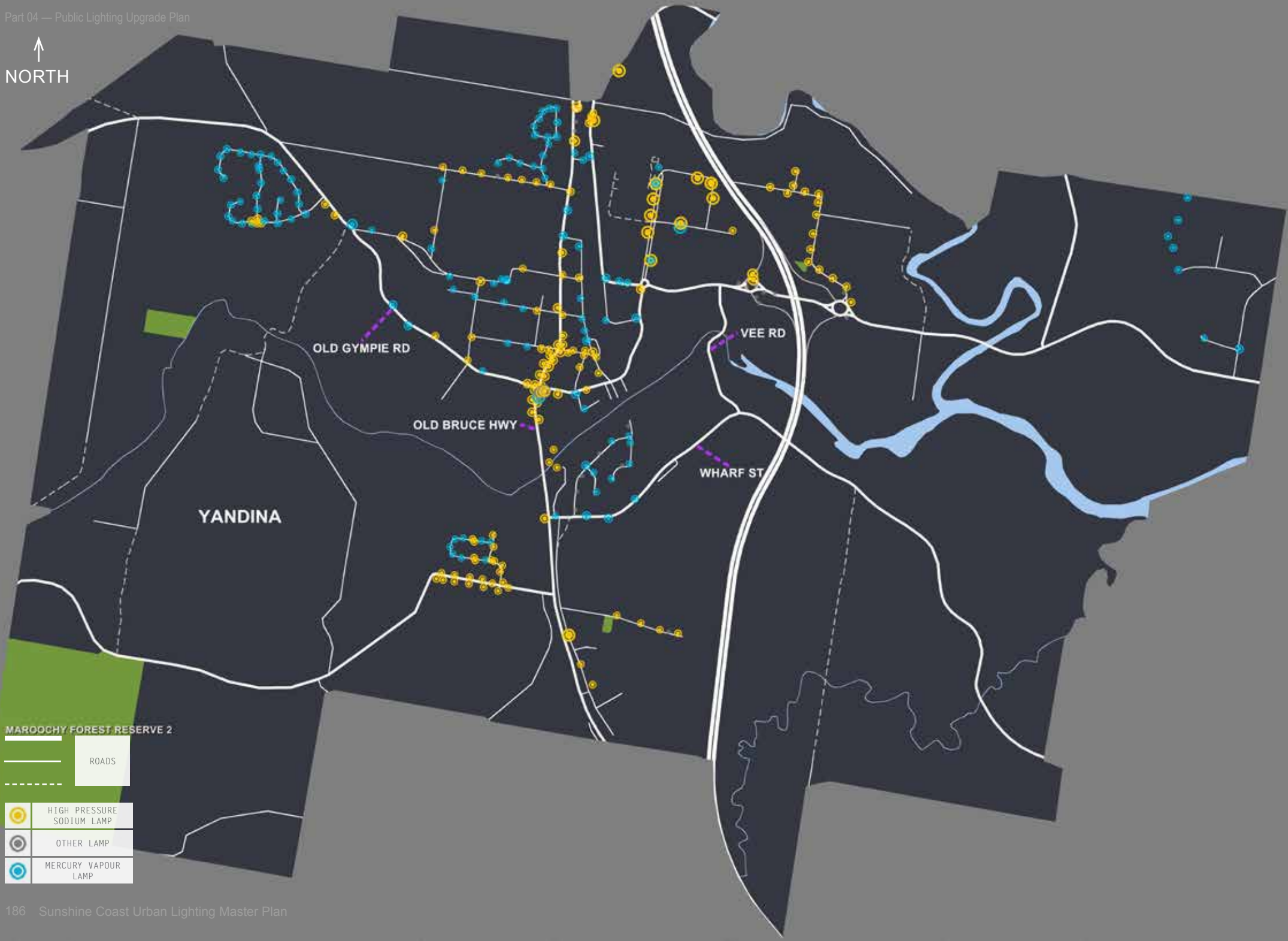
estimated energy savings: **36%**

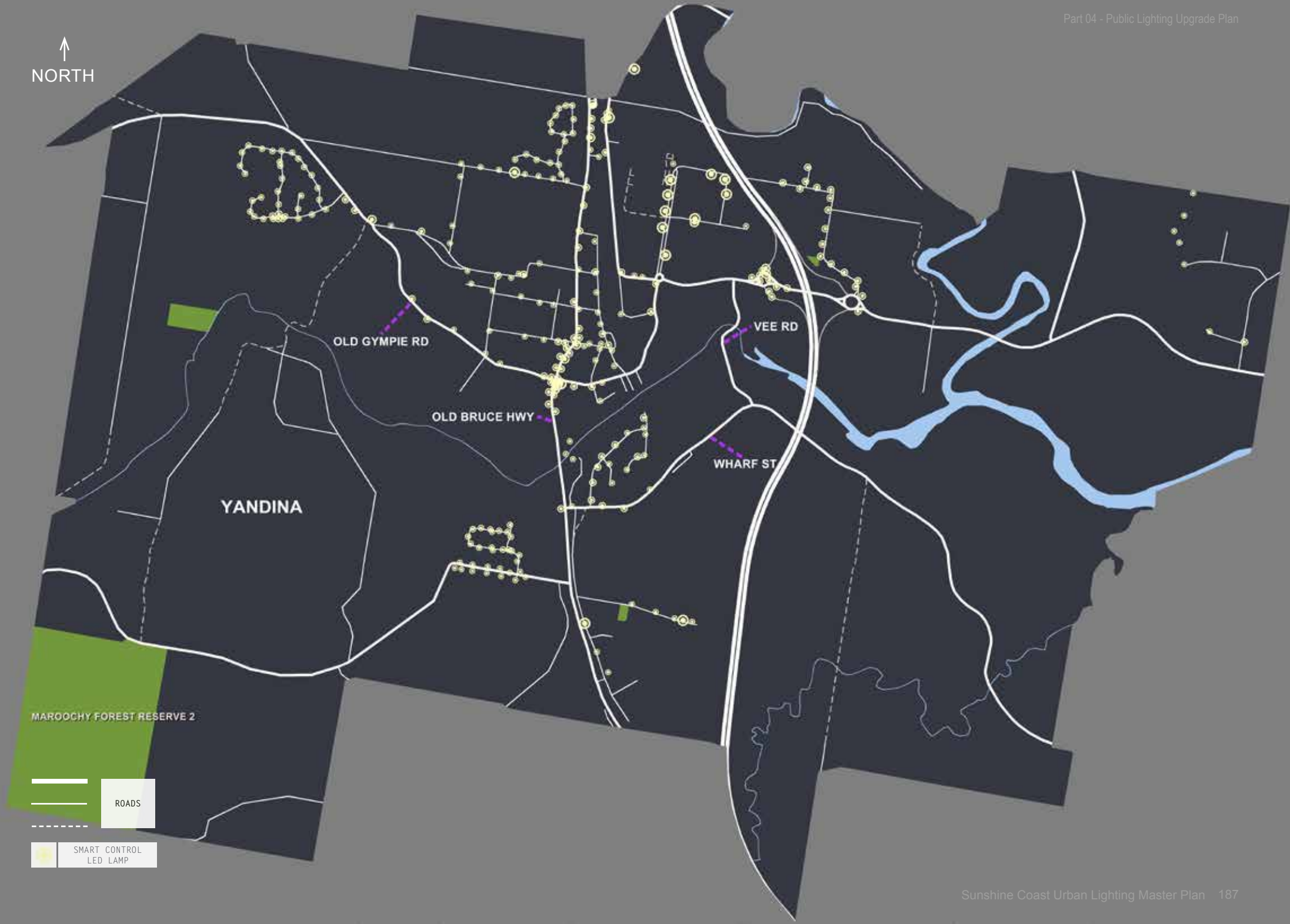


Distribution of renovated lights by wattage and technology



Consumption before and after renovation


NORTH
OLD GYMPIE RD
VEE RD
OLD BRUCE HWY
WHARF ST
YANDINA
MARODCHY FOREST RESERVE 2
ROADS
HIGH PRESSURE SODIUM LAMP
OTHER LAMP
MERCURY VAPOUR LAMP


NORTH
OLD GYMPIE RD
VEE RD
OLD BRUCE HWY
WHARF ST
YANDINA
MAROOCHY FOREST RESERVE 2
ROADS
SMART CONTROL
LED LAMP

Other localities

Suburb	HPS100	HPS150	HPS250	HPS400	HPS50	HPS70	HPS70E	MV125	MV250	MV400	MV50	MV50E	MV80	MV80E	Others	Total
BALMORAL RIDGE											1				0	1
BELLI PARK						1									0	1
BRIDGES															1	1
CAMBROON						1									0	1
CHEVALLUM		7	1			3									1	12
CONONDALE			1					1			1				0	3
COOLOOLABIN		1													1	2
DIDDILLIBAH	4	5			2	3	3	1			4	3	7	10	2	44
DOONAN	8	14			1	14		1			52	8	25	29	2	154
DULONG	2					1					5		5		0	13
EERWAH VALE													1		0	1
GLENVIEW	6	1	1	1		8				2	8	13	1	8	1	50
ILKLEY						1							1		0	2
IMAGE FLAT															1	1
KIELS MOUNTAIN					3	2		2			2	2	2	7	0	20
KULANGOOR								1			1		1	4	0	7
KUREELPA	1		1		1	1					22	1	8	2	0	37
MALENY															1	1
NINDERRY	7	1				4	7	1			4	13		9	1	47
NORTH ARM	1					1		2			1		1		0	6
NORTH MALENY	1	1													0	2
PALMVIEW	2		6		1	4	21				12		5		0	51
PEACHESTER	3					1		1	1		6	13	4	7	1	37
PERWILLOWEN	1					2							1		0	4
ROSEMOUNT	5	18				10		1			5	3	15		2	59
TOWEN MOUNTAIN					2										0	2
VALDORA						1						4	6	17	0	28
VERRIERDALE	2					1		1		2	3		3		1	13
WEST WOOMBYE	1					2			1		3				0	7
WEYBA DOWNS											11	3	1	1	0	16
WITTA								1			1				0	2
YANDINA CREEK					5	6					2	18	6	11	0	48

Table 19 - Initial assets in other localities

Grand total	673

Suburb	LED 22W	LED 22W (incl. new bracket)	LED 25W (Custom heritage)	LED 144W	LED 240W	LED 60W	Total
BALMORAL RIDGE	1						1
BELLI PARK	1						1
BRIDGES						1	1
CAMBROON	1						1
CHEVALLUM	3			1	1	7	12
CONONDALE	1			1		1	3
COOLOOLABIN					1	1	2
DIDDILLIBAH	16	16				12	44
DOONAN	92	37			2	23	154
DULONG	11					2	13
EERWAH VALE	1						1
GLENVIEW	17		21	3	2	7	50
ILKLEY	2						2
IMAGE FLAT						1	1
KIELS MOUNTAIN	9	9				2	20
KULANGOOR	2		4			1	7
KUREELPA	32		3	1		1	37
MALENY					1		1
NINDERRY	8	29				10	47
NORTH ARM	3					3	6
NORTH MALENY						2	2
PALMVIEW	22		21	6		2	51
PERWILLOWEN	3					1	4
PEACHESTER	11		20	1	1	4	37
ROSEMOUNT	30	3			2	24	59
TOWEN MOUNTAIN	2						2
VALDORA	7	21					28
VERRIERDALE	7			2	1	3	13
WEST WOOMBYE	5			1		1	7
WEYBA DOWNS	12	4					16
WITTA	1					1	2
YANDINA CREEK	19	29					48

Grand total	673

Table 20 - Renovation strategy for other localities

Maintenance strategy

Currently breakdowns in the maintenance network are detected by night patrols or concerned citizens.

In order to provide a high quality public lighting service to the community, two main maintenance plans will be established:

- Preventative Maintenance,
- Curative Maintenance.

Throughout the delivery of these two maintenance plans, 3 key targets are identified.

Target 1: Safety at work and Hazard reduction

Because of the inherent danger of working with electricity, both for end users and technicians or other workers working in the vicinity, strict safety standards must be adhered to.

All personnel will be trained and accredited using Registered Training Organisations. Personnel maintaining assets on shared distribution poles will be authorised by the DNSP.

The following courses will be required at a minimum.

Training required before working on the network

- M 581: Individual of a working group
- M 440: Asbestos awareness
- M 441: Working with asbestos
- M103.3: Working with asbestos
- M 103.6: Asbestos conduit removal
- M 428: Underground awareness U UGAW
- M 593: Low voltage switching operator (LVSO)
- M582: Test and Earth HV Apparatus
- M 584: Switching recipient (SR)
- A RR Restricted Recipient
- M 292: Connections to the LV network (polarity)
- U EO M243: Electricity Officer (R)
- UM 340: Working on Energised LV Equipment
- UM486: Traffic Control - (See Traffic Control below)
- Authorised Person (as defined in Electricity Safety Regulation 2013)
- U GCI Generic Contractor Induction R UM001
- U0020 Customer Care for Contractors
- A CONN Testing Connections to LV Distribution Network R
- U OHAW Overhead Safety Awareness R (M320)
- U3200 Elec Aware for Safe Work - Theory
- U3200 Elec Aware for Safe Work - Theory
- U SSAW Substation Safety Awareness
- U OHSV Install, Inspect and Maintain OH Service Lines

Other courses and Accreditations required

- Elevated Work Platform
- Heights / Rescue
- Electrical
- First Aid
- Construction and Site
- Traffic Control
- Vehicles and Machinery
- Data and Telecommunications

All work will be undertaken with the appropriate signage of the works site in accordance with all applicable regulations and personnel will wear the necessary protective equipment.

Target 2: To respect commitments

The inclusion of the two main maintenance plans aim to meet the following targets:

- Guaranteed operational levels at 98% of the lights on at night
- Guaranteed operational levels of 2% of the lights on during the day
- Guaranteed availability of service: 24/7 service

Maintenance regimes

Preventative maintenance

Preventative maintenance is the planned schedule of activities in order to prevent the failure of equipment. General preventative maintenance activities include the following items.

Luminaires

- Ongoing visual inspection of assets
- Cleaning of luminaires from bird fouling, dirt build up, graffiti and corrosion monitoring
- Power monitoring through the centralised Computerised Maintenance Management Systems and Centralised Management System
- Monitoring of terminals connections for tightness oxidization
- Degreasing and cleaning of reflectors and bowls with appropriate cleaning agents at appropriate schedules in accordance with Standards
- Monitoring of illegal electrical connections

Poles and columns

- Verification of the state of poles and columns and recommendation of any eventual renovation work (paintwork, missing accessories etc)
- Verification of earthing; earth straps, connections to metal parts
- Verification and monitoring the required eventual replacement of inspection doors and locks
- Verification of connection, cable tray assembly and fittings of different elements, including related public lighting cables and conduits,
- Testing of electrical equipment, insulation and connections according to Standards,
- Verification of general integrity of poles (e.g. corrosion, bolts, leaning, cracks).

Switchboards

- Verification of mechanical parts; pillar, doors and locks,
- Verification and maintenance of electrical connections,
- Removal of insect build up and dirt,
- Replacement of council owned fuses,
- Verification and testing and calibration of protective devices.

Conditional maintenance

Maintenance work carried out following monitoring activities such as:

- Cleaning of luminaires after a photometric measurement that showed a depreciation in light levels

Predictive maintenance

Maintenance carried out according to the feedback on the state of equipment and after analysis of the state of equipment degradation.

For example:

- The CMS reveals abnormally low power factor on a number of lighting points which may mean LED drivers are not operating correctly,
- Abnormally high current in a luminaire that reveals a loose connection in the luminaire,
- Asset condition monitoring.

Curative maintenance

Curative Maintenance work carried out immediately after faults have been detected on the network. It is proposed to provide a high level of service commitment to locations within the road network of the Sunshine Coast according to the level of risk associated with the asset location:

- Intersections and
- Commercial and Public Activity Areas
- Residential Streets

In the event of a breakdown in equipment for whichever cause, it is necessary to:

- Immediately make the installation safe
- Repair the fault

Emergency intervention

In the case of accident, act of vandalism or other occurrence that involves the lighting installation and creates an immediate threat to public safety, an emergency response is required.

The first objective of teams responding to this type of call is to make the installation electrically safe. A repair will be made in accordance with contractual requirements.

Normal repairs

The Operator will ensure that repairs are carried out within the prescribed timeline as described below from the time of the fault detection by the CMS, a call from a citizen, the council office or emergency services 24 hours 7 days per week.

Repairs will be carried out using new equipment of the same type and quality as those installed.

Excluding emergencies, response times for initial site visit are:

- Category V1 Main Road Intersections and Pedestrian Crossings – within 24 hours
- Category V Roads and Category P Roads, pathways, public activity areas and carparks (Excluding Category P4 and P5 Roads) – within 48 hours
- Category P4 and P5 roads – within 72 hours of the calls service receiving the service call

The asset must be repaired within 48 hours of the initial site visit, unless in the operator's opinion it cannot be repaired within that time frame and Council must be notified in writing, the reason why it cannot be repaired on 48 hours and must nominate a new deadline within which the repair works must be completed.

Electrician operating an elevated Work Platform (EWP)

Training on Elevated Work Platform (EWP)

Target 3: Simplify maintenance

Maintenance personnel

All maintenance personnel will be trained, qualified and authorised to work on those parts of the public lighting network assigned ownership to the Council.
Scheduling of operations will take into account the lifecycle of the different equipment installed.
Expenditure will be optimised mainly due to the anticipating needs in terms of scheduling and labour in order to keep interventions to a minimum:

- Use of a Smart Control CMS Management System
- Instant identification of defective pieces of equipment
- Access to full equipment maintenance history
- Planning for easy, rapid access to equipment when necessary
- Limiting the type of luminaire installed

Whole life cycle costs

The selection of high quality equipment supplied by manufacturers with strong industry engagement reduces the likelihood of curative maintenance and preventative maintenance issues.
There are 3 main items of equipment that will affect the operation of a luminaire:

- LED Module,
- LED Driver,
- Control Node.

Through a detailed analysis of the expected failure rates of equipment, it is possible to forecast the quantities of faults related to each component of the public lighting, estimate the labour required to repair the faults and allow a better operational planning, reducing the whole life cycle costs.

Computerised Maintenance Management System

Purpose

To enable improved transparency and efficient management of the public lighting network, it is proposed to deploy a Computerised Maintenance Management System (CMMS). This system will allow the analysis of operational information relating to public lighting for different stakelholders.

Key features

The CMMS deployed needs to encompass the certain number of features to allow the delivery of the following key benefits, ensuring an optimised maintenance of the public lighting.

Advice

- Full knowledge of all the electrical, lighting and smart control assets,
- Historical record of all events – total traceability to ensure that all faults are rectified and teams are not called back duplicate fault reports,
- Relevant statistics and real indicators,
- Cross referencing of the information.

Increase transparency

- Organising communication between the operator and Council,
- Circulating information.

Reducing costs

- Optimising operations,
- Effective working methods.

Increasing the availability of the equipment

- Rounds to detect faults, optimised as often as necessary,
- Quick and efficient repairs,
- Monitoring and observance of repair times.

Minimising the default rate

- Optimising curative operations,
- Equipping vehicles with CMMS mobile app,
- Simple and rapid procedures,
- Availability of information,
- Developing preventative maintenance,
- Scheduling preventative lamp changing,
- Regular Servicing Inspections,
- Continuous monitoring and regular controls of the condition of installations.

Programme and Monitor the works projects

- Detection of worn-out zones,
- Evaluation of rates of street lighting,
- Administrative follow-up and field control of work undertaken.

Adapt the right equipment

- Detection of problem-area zones,
- History of breakdowns, identification of defective equipment,
- Adaptation of the equipment taking vandalism into consideration.

Contribute to aesthetics

- Identify assets affected by graffiti, paint scratches and material adhered to the structure, such as posters and stickers,
- Adapt the right equipment to conditions on the ground.

Mapping of information

The CMMS solution will use a Geographic Information System (GIS) at its core to record the geographic location of all public lighting assets. The GIS should be based on ArcGIS technology or equivalent, providing a degree of compatibility with Council's current GIS, ArcGIS.

Transfer of information

Export of geographic information

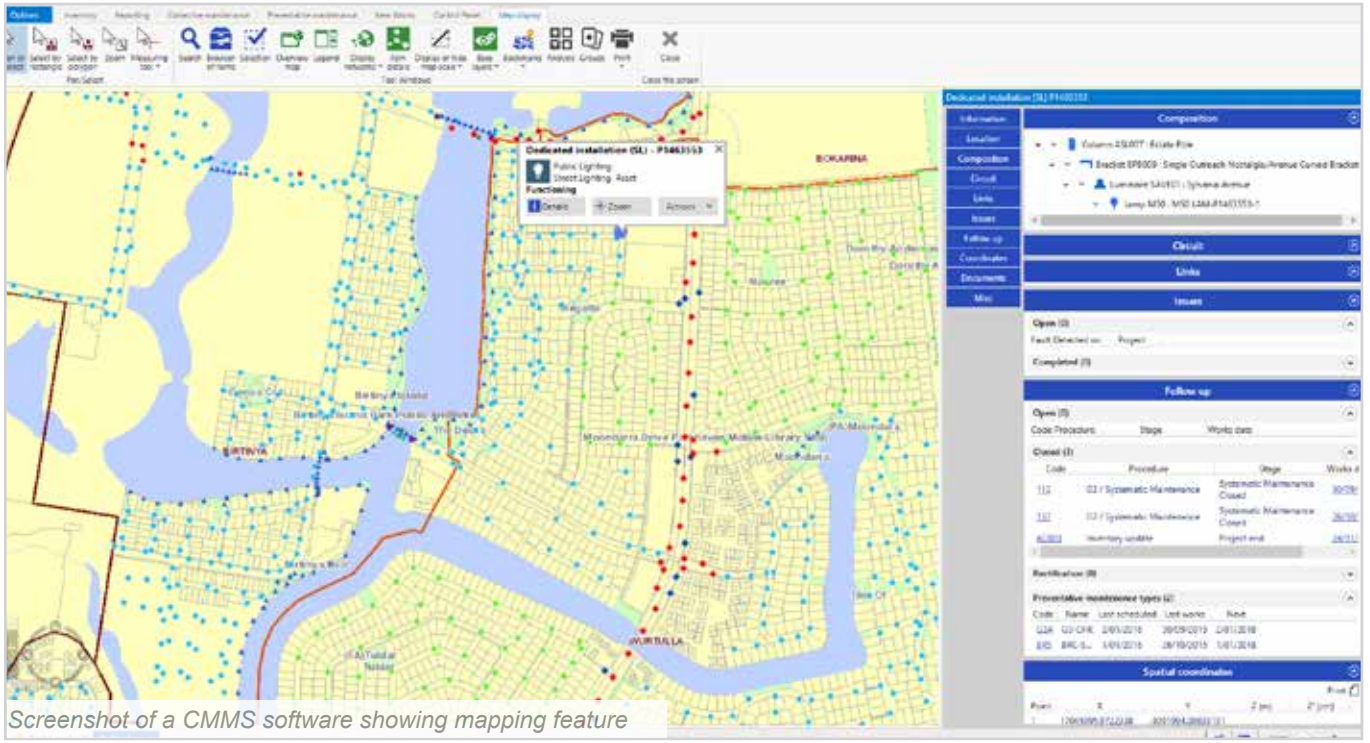
By adopting a CMMS based on a GIS solution, the transfer of information is made through a simple export of the recorded location and asset data in a geographic format.

Export of maintenance history

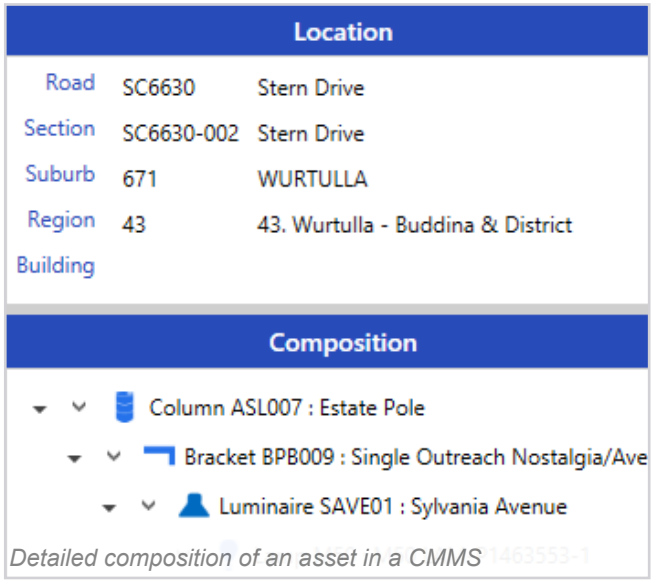
The CMMS will allow for the export of maintenance information in a simplified form such as Comma Separated Values or in Microsoft Excel format. Such format allow to then analyse the data or import it in other system for reporting or other activities.

Reports

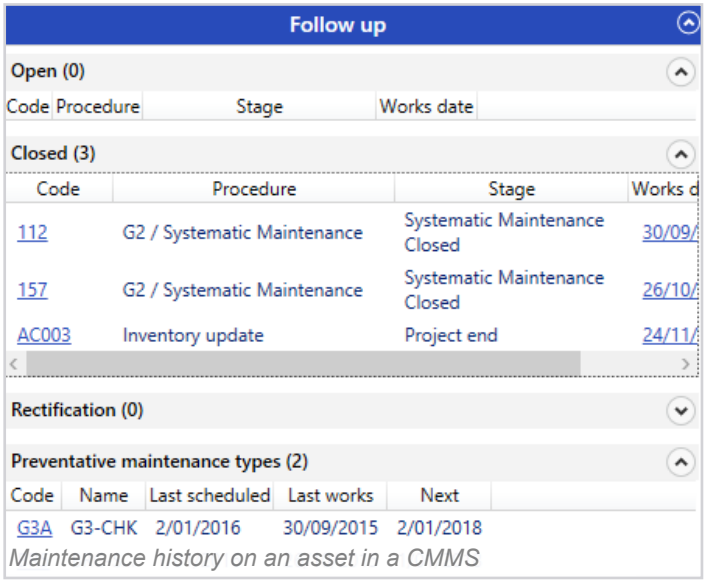
The information can also be extracted and displayed in customised maintenance reports based on different criteria — e.g. date range, specific location, specific type of equipment



Screenshot of a CMMS software showing mapping feature



Detailed composition of an asset in a CMMS



Maintenance history on an asset in a CMMS