Asset Management Plan

Public Lighting

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Authorisations

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Responsibilities

This document is the responsibility of the Metering Asset Strategy Team, Tasmanian Networks Pty Ltd, ABN 24 167 357 299 (hereafter referred to as "TasNetworks").

Please contact the Metering Asset Strategy Team Leader with any queries or suggestions.

- Implementation All TasNetworks staff and contractors.
- Compliance All group managers.

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Record of revisions

Section number	Details
	New Document
	Update for R19

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1 Purpose

The purpose of this document is to describe for public lighting and related assets:

- TasNetworks' approach to asset management, as reflected through its legislative and regulatory obligations and strategic plans;
- The key projects and programs underpinning its activities;
- Forecast CAPEX and OPEX, including the basis upon which these forecasts are derived.

2 Scope

This document covers public lighting assets:

- Luminaires: apparatus which distributes, filters or transforms the light transmitted from one or more lamps which includes, except for the lamps themselves, all the parts necessary for fixing and protecting the lamp and, where necessary, circuit auxiliaries together with the means for connecting them to the electrical supply, as defined in AS/NZS 1158;
- Lamps: the light source in a luminaire, as defined in AS/NZS 1158;
- Control equipment: to switch the luminaires on and off at sunset and sunrise respectively;
- Support structures: to hold the luminaire at the correct height and angle and to provide safe support, insulation and clearance from the ground, vegetation and building infrastructures; specifically public lighting columns and wide based poles. Wide based pole replacement programs are managed as part of this asset management plan. The Structures Thread manages dual-purpose structures supporting luminaires, other electrical infrastructure and the inspection programs of all support structures; and
- Underground wiring systems are underground electrical circuits that connect the luminaires to the lighting schemes connection point (point of supply). In general, the Underground Asset Management Plan documents the TasNetworks requirements for managing underground wiring systems.

3 Strategic Alignment and Objectives

This asset management plan has been developed to align with both TasNetworks' Asset Management Policy and Strategic Objectives.

It is part of a suite of documentation that supports the achievement of TasNetworks strategic performance objectives and, in turn, its mission. The asset management plans identifies the issues and strategies relating to network system assets and detail the specific activities that need to be undertaken to address the identified issues.

Figure 1 represents TasNetworks documents that support the asset management framework. The diagram highlights the existence of, and interdependence between, the Plan, Do, Check, Act components of good asset management practice.

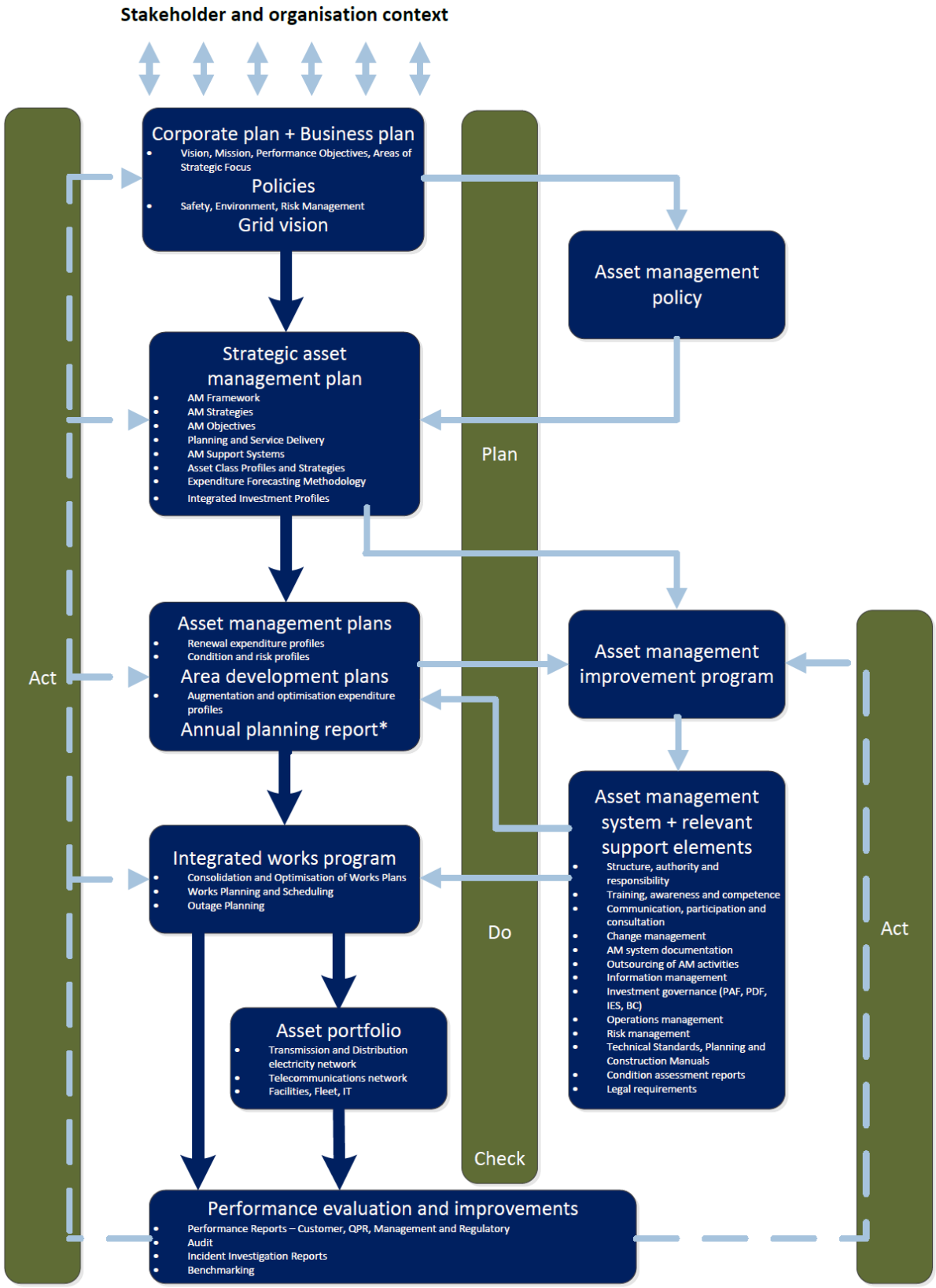
The management objectives for public lighting are to

- Minimise the cost of asset management to a sustainable level;
- No significant safety or environmental incidents;
- Maintain risk such that the residual risk level for all asset risks is 'As Low As Reasonably Practicable' taking into consideration any expressed or implied duty of care;

- Achieve compliance with relevant legislative, regulatory and statutory requirements;
- Establish performance measures, targets and reporting framework for asset management; and
- Have a formal, documented management framework in place for asset management that includes mechanisms for review and continual improvement.

This asset management plan describes the asset management strategies and programs developed to manage the public lighting, with the aim of achieving these objectives.

Figure 1: TasNetworks Asset Management Documentation Framework



* The Annual Planning Report (APR) is a requirement of sections 5.12.2 and 5.13.2 of the National Electricity Rules (NER) and also satisfies a licence obligation to publish a Tasmanian Annual Planning Statement (TAPS). The APR is a compilation of information from the Area Development Plans and the Asset Management Plans.

4 Asset Support Systems

4.1 Systems

TasNetworks maintains an asset management information system (AMIS) that contains detailed information relating to the connection asset populations. AMIS is a combination of people processes and technology applied to provide the essential outputs for effective asset management.

TasNetworks maintains records of public lighting assets through the information received from completed service orders to install, maintain and remove public lighting equipment. The equipment details and attributes are recorded within the Market Data Management System (MDMS).

Recorded information includes:

- NMI/location/geographical details/site/access details/customer
- Equipment attributes and ratings
- Age of asset and components, installed/maintained/removed date
- Billing data (consumption/reading dates)

A number of systems are used to support public lighting services:

- Market Data Management System - Gentrack
- Service Order management - Brave suite
- Task scheduler – TVD
- Spatial Data Warehouse
- GIS – G Tech

TasNetworks is in the process of migrating from a WASP management system to a SAP management system. The transition to the new system is scheduled to occur in February 2018.

4.2 Asset Information

The public lighting data used for this asset management plan supports the TasNetworks billing processes and is considered accurate and complete. TasNetworks completes data validation checks to identify and resolve asset data errors as part of its continual improvement processes.

All data is actuals with the exception of luminaire age, which uses a mix of estimated manufactured year for existing luminaires and actual manufactured year for new assets.

Asset information collected for public lighting register is:

- Pole ID
- Energised date (initial installation)
- Connection type
- Luminaire type
- Lamp type and nominal rating.
- Asset billing rate
- Support type (pole type)
- Bracket type and length

- Street
- Suburb
- Local Council

5 Description of the Assets

The public lighting asset family consists of various combinations of equipment to provide a lit environment for the safe movement of vehicular and pedestrian traffic during hours of darkness and to discourage illegal acts.

The main categories are:

- Luminaires and lamps
- Control equipment
- Support structures

5.1 Luminaires and lamps

A luminaire is an apparatus which distributes, filters or transforms the light transmitted from one or more lamps which includes, except for the lamps themselves, all the parts necessary for fixing and protecting the lamp and, where necessary, circuit auxiliaries together with the means for connecting them to the electrical supply.

A lamp is the generic term for the light source in a luminaire. The lamps TasNetworks requires are elliptical, tubular, and fluorescent or compact fluorescent in design; varying in wattages from 24 watt to 400 watt.

The Australian Standard AS/NZS1158 *Lighting for roads and public spaces* classifies luminaires into the following categories:

- Category 'V' - generally referred to as Major Public Lighting, this category is used on roads where the visual requirements of motorists are dominant.
- Category 'P' - generally referred to as Minor Public Lighting, this category is used on roads where the visual requirements of pedestrians are dominant. It is also applicable to outdoor public areas, other than roads, where the visual requirements of pedestrians are dominant, for example outdoor shopping precincts.

The appropriate lighting category for a particular road is a matter for determination by or in consultation with the road or traffic authority concerned.

Appendix B lists the number of both public lights and private contract lights that are billed to customers within Tasmania, together with the details of the types of Minor and Major Public Lighting installed in the system. All new and replacement fittings installed for Minor Public Lighting is currently the 14 W LED. Major Public Lighting new and replacement luminaires are High Pressure Sodium Vapour or Metal Halide.

Based on manufacturer's advice, TasNetworks expects an asset life of 20 years for both major and minor public lighting luminaires that are in current use.

As at July 2017, the average age of public lighting luminaire is given in Table 1.

Table 1: Average age of public lighting luminaires (as at July 2017)

Category of public lighting	Average age
Minor (less than 100 Watts)	10.2 years
Major (greater than or equal to 100 Watts)	10.5 years

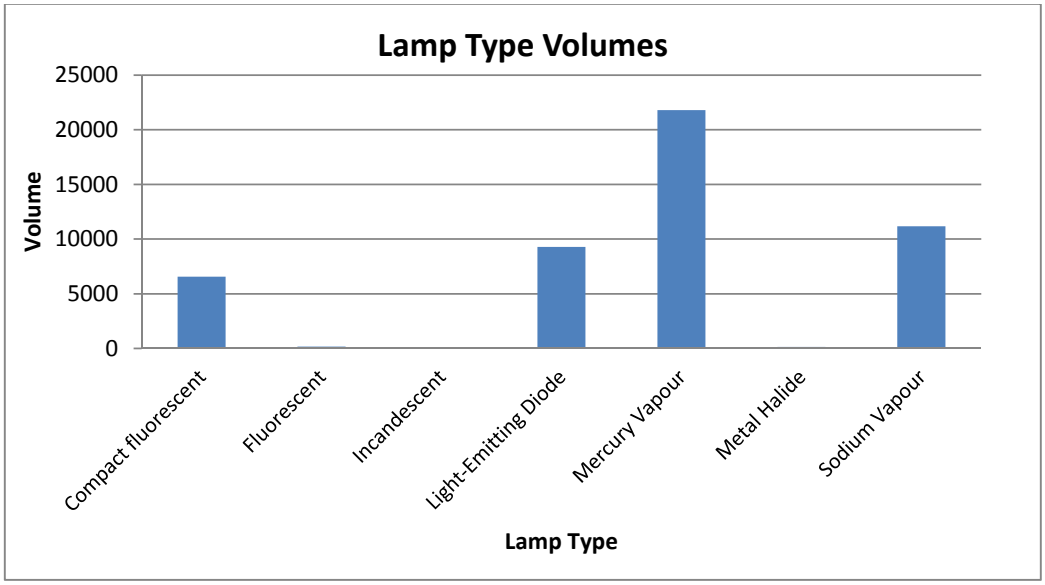
Field crews initially inspect the luminaire when responding to fault reports. Depending on what is wrong with the luminaire, a decision is made by the crew to either repair or replace the fitting. Maintenance is performed on the fitting during the execution of the bulk lamp replacement program as described in section 8.3.1. Luminaires are generally not relocated or altered.

The number of installed luminaires as at July 2017 is shown in Table 2 and illustrated in Figure 2.

Table 2: Number of installed public lighting assets

Lamp type	Nominal Rating Range (Watts)	Number Installed
Compact fluorescent	32 - 42	6,564
Fluorescent	20 - 120	179
Incandescent	60 - 100	51
Light-Emitting Diode	25 - 88	9,283
Mercury Vapour	50 - 400	21,806
Metal Halide	150 - 400	132
Sodium Vapour	70 - 400	11,171
Total		**49,186**

Figure 2: Lamp type volumes

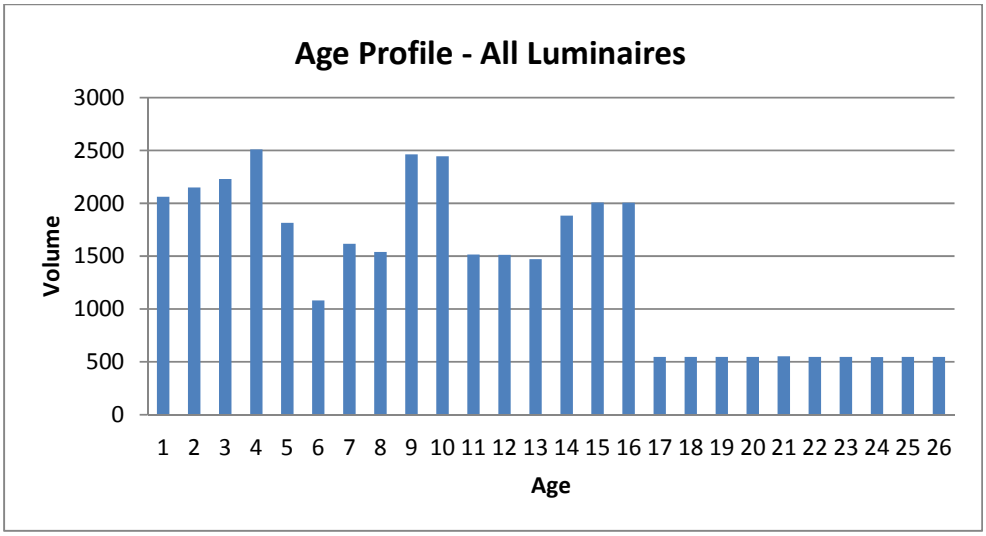


TasNetworks uses estimated data (based on purchasing records for lighting assets) to assign installation dates for luminaires as TasNetworks historically did not record installation dates for

specific public lighting assets. TasNetworks has updated its asset management systems and processes for public lighting to start recording this data from 2013 onwards. The estimated age profile of the total population of the public lighting assets is shown in the Figure 3 below.

A full break down of installed public lighting assets by luminaire type is included in Appendix B.

Figure 3: Age Profile: Public Lights



5.2 Control equipment

Public lighting circuits are connected to the low voltage system for their electrical supply. TasNetworks uses the following three types of control systems to turn public lighting circuits on and off:

- Pilot wire;
- Cascade; and
- Photo-Electric (PE) cell.

Pilot wire and cascade control systems are similar in that they use a control wire to switch dedicated control relays. These relays energise a switch wire that will energise public lighting fittings up to 400 metres in any direction from the relay. As at June 2015, there are approximately 647 control relays in the system.

Photo-Electric (PE) cells are fitted to and control individual luminaires. There are two types of PE cells commonly used by TasNetworks.

The first type is the 'NEMA' PE cell. This type is a twist lock socket base type fitting and is most commonly used for category V / major public fittings (greater than or equal to 100 watt).

The second type is 'D2' PE cell. This type is generally fitted to category P / minor public fittings (less than 100 watt).

Pilot wire and cascade control systems are primarily used in public lighting areas in Hobart, Launceston, Burnie and Devonport. The remainder of the system is individually switched by photoelectric cell. It is planned to retain much of the pilot wire and cascade control system for Major Public Lighting with a transition to PE cell control for Minor Public Lighting throughout the state.

Control systems will be run to failure and only maintained or replaced on this event.

5.3 Support structures

The types of support structures that are used for public lighting are:

- Dedicated wood pole (private);
- Dedicated steel pole (private);
- Dedicated steel pole (TasNetworks surcharge);
- Wide-based steel poles (TasNetworks owned); and
- Dual-purpose poles (excluded from this asset management plan).

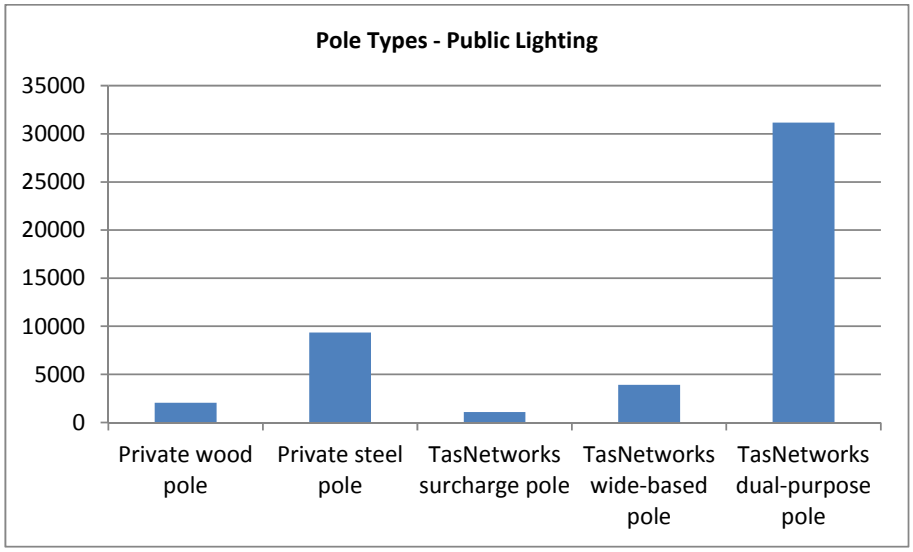
Approximately 65 per cent of public lighting is supported on distribution system poles. The other 35 per cent of public lights are installed on dedicated poles.

TasNetworks is responsible for the installation and maintenance of poles owned by TasNetworks. These poles are usually poles that support overhead electrical distribution assets. Road Authorities (Local Councils and Department of State Growth) are responsible for the installation and maintenance of privately owned poles. These poles are usually poles that are dedicated to support the public light only.

The Structures Thread manages poles owned by TasNetworks.

Figure 4 details the breakdown of poles with public lighting attached.

Figure 4: Pole types with public lighting attached

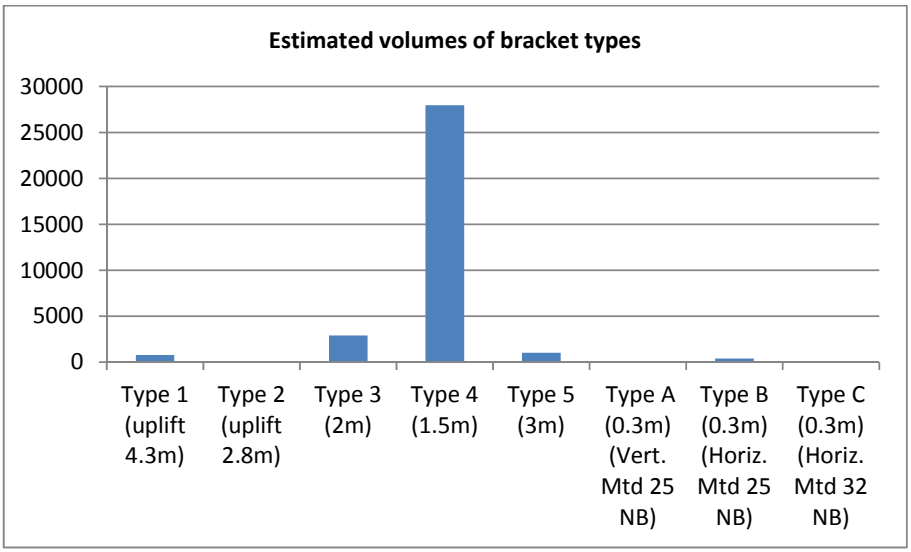


TasNetworks has started recording information on brackets fitted to private wood poles and TasNetworks dual-purpose distribution poles. So far records have been collected from approximately 10,400 poles and this data has been used to estimate the volumes of the different brackets used for public lighting. Table 3 and Figure 5 below shows the estimated volumes of brackets installed.

Table 3: Estimated volumes of bracket types

Bracket type	Number Installed
Type 1 (uplift 4.3m)	760
Type 2 (uplift 2.8m)	60
Type 3 (2m)	2900
Type 4 (1.5m)	27,970
Type 5 (3m)	1,020
Type A (0.3m) (Vert. Mtd 25 NB)	70
Type B (0.3m) (Horiz. Mtd 25 NB)	380
Type C (0.3m) (Horiz. Mtd 32 NB)	50
Total	**33,210**

Figure 5: Estimated volumes of bracket types



6 Standard of Service

6.1 Technical Standards

The following legislative requirements and technical standards dictate the standard of service required by public lighting assets.

Legislation

- Tasmanian Electricity code;
- National Electricity Rules;

Standards and policies

- R040766 TasNetworks Asset Management Policy;
- R209871 TasNetworks – Risk Management Framework;
- R209885 TasNetworks – Risk Appetite Statement;
- R209890 TasNetworks – Risk Metric;

- R207576 Lighting Design & Construction Standard;
- AS/NZS 1158 Lighting for Roads and Public Spaces series; and
- AS/NZS 3000 Wiring Rules

6.2 Performance objectives

TasNetworks objective for public lighting is to operate its public lighting network efficiently and effectively over the economic life in accordance with 'in-service' values specified for 'Category V' and 'Category P' lighting detailed in AS/NZS1158 *Lighting for roads and public spaces* standards.

7 Associated Risk

TasNetworks has developed a Risk Management Framework for the purposes of:

- Demonstrating the commitment and approach to the management of risk – how it is integrated with existing business practices and processes and ensure risk management is not viewed or practiced as an isolated activity;
- Setting a consistent and structured approach for the management of all types of risk; and
- Providing an overview on how to apply the risk management process.

Assessment of the risks associated with the public lighting has been undertaken in accordance with the Risk Management Framework. The risk assessment involves:

- Identification of the individual risks including how and when they might occur
- Risk analysis of the effectiveness of the existing controls, the potential consequences from the risk event and the likelihood of these consequences occurring to arrive at the overall level of risk.
- Risk evaluation where risks are prioritised based on their ratings and whether the risk can be treated) or managed at the current level.

  The likelihood and consequence of risk events occurred are assessed using the following risk rating matrix in figure 6:

Figure 6: Risk Ranking Matrix

		CONSEQUENCE				
LIKELIHOOD		**1 NEGLIGIBLE**	**2 MINOR**	**3 MODERATE**	**4 MAJOR**	**5 SEVERE**
• ≥ 99% probability • Impact occurring now • Could occur within "days to weeks"	**5 ALMOST CERTAIN**	**MEDIUM**	**MEDIUM**	**HIGH**	**VERY HIGH**	**VERY HIGH**
• 50% - 98% probability • Balance of probability will occur • Could occur within "weeks to months"	**4 LIKELY**	**LOW**	**MEDIUM**	**HIGH**	**HIGH**	**VERY HIGH**

• 20% - 49% probability • May occur shortly but a distinct probability it won't • Could occur within "months to years"	**3 POSSIBLE**	**LOW**	**LOW**	**MEDIUM**	**HIGH**	**HIGH**
• 1% - 19% probability • May occur but not anticipated • Could occur in "years to decades"	**2 UNLIKELY**	**LOW**	**LOW**	**MEDIUM**	**MEDIUM**	**HIGH**
• ≤1% probability • Occurrence requires exceptional circumstances • Only occur as a "100 year event"	**1 RARE**	**LOW**	**LOW**	**LOW**	**MEDIUM**	**MEDIUM**

The Risk Management Framework requires that each risk event is assessed against all of the following consequence categories:

- Safety and People
- Financial
- Customer
- Regulatory Compliance
- Network Performance
- Reputation
- Environment and Community

This asset management plan describes the major risks associated with connection assets and the current or proposed treatment plans.

7.1 Minor Luminaires

The majority of minor luminaires are 80 W Mercury Vapour (MV) with a lamp life of approximately 4.5 years. The maintenance cycle of 4 years is designed to reduce the risk of lamp failure. The light output of the oldest MV lights (B2224 fittings) is starting to deteriorate and TasNetworks is actively replacing these lights during the maintenance cycle rather than continuing to maintain them. The current standard for minor luminaires is 14W LED which have a lamp life of approximately 20 years.

7.2 Major Luminaries

Older MV luminaires are starting to exhibit failures of control gear and diffusers along with deteriorating light levels. These lights are being replaced with Sodium Vapour or Metal Halide luminaires rather than continue with ongoing maintenance.

7.3 Control gear

Failures of relays controlling circuits of major lights can result in widespread outages. PE Cells are designed to fail on to reduce this risk.

7.4 Switch wire

As minor lights are upgraded, they are removed from the old switch wire circuits and controlled via individual PE Cell. TasNetworks implemented a program in 2015/16 to audit overhead switch wire to identify assets that are redundant and can be removed or require remedial actions to resolve defects such as low clearances or poor condition.

8 Management Plan

8.1 Historical

Historically TasNetworks managed public lighting faults reactively. In 2008 a proactive bulk lamp replacement program (RLBLR) was introduced to manage the operation of the public lighting fleet more effectively and efficiently. However, delivery of the bulk lamp replacement program was delayed during the 2010/11 and 2011/12 financial years due to OPEX reductions across the business and so the full benefits are yet to be fully realised with no appreciable reduction in failure rates of lamps to date.

TasNetworks has negotiated with NBN that TasNetworks no longer funds public light upgrades required to enable the removal of the overhead switch wire from Network assets for the installation of the fibre optic cable.

8.1.1 Failures of luminaires

The diffusers on some older luminaires in particular the Sylvania B2224 have shown degradation from exposure to weather, repeated handling (due to maintenance activities) and ultraviolet light deterioration. There is also evidence of water and insect entry on some luminaires that indicate the seals on these fittings are failing.

8.1.2 Wide-based poles

Wide-based poles were first installed in underground subdivisions in 1974. As well as providing support for minor public lighting, they also provide servicing points for the adjacent house allotments. Pole inspections have indicated that these poles are reaching the end of their life, particularly in areas with corrosive soil or in seaside conditions. A number of incidents have also occurred where the insulation of wiring inside the pole has degraded allowing live parts to make contact with the cover plate of the pole. This has resulted in damage to the cover and allowed public exposure to extraneous live parts. An audit of cable poles with three installed LV cables was carried in the first half of 2013 to determine extent of issues with the insulation. A report (reference 9) was produced outlining findings and recommendations. This has resulted in an increased forecast replacement volume for these assets over the next seven years.

Wide based poles (in terms of pole inspections) are being replaced as required based on asset condition assessments by the TasNetworks pole inspection program (inspection funded by Structures Thread, replacement funded by Public Lighting Thread).

8.1.3 Public lighting columns

This program is for the replacement of steel public lighting columns that have TasNetworks ownership, including 1,089 surcharge poles throughout the state. In general, within the state, municipal councils or road authorities own the public lighting columns. The surcharge poles were assigned TasNetworks ownership during the period of 1974-1981, when CBD areas throughout the

state were being under grounded, due to the inability of the councils to fund the cost of installation. Hydro at the time funded the public lighting columns so that the projects would proceed with an ongoing surcharge arrangement set up with the respective authorities.

Public lighting columns are being replaced as required based on asset condition assessments by the TasNetworks pole inspection program (inspection funded by Structures Thread, replacement funded by the customer).

The replacement of surcharge poles is under the guidance of the road lighting authority as ownership of such poles belongs with the road lighting authority.

8.1.4 Non-compliant TasNetworks-owned public lighting installations

From time to time, inspection, maintenance and other activities identify TasNetworks-owned public lighting installations that are not compliant with either electrical standards or TasNetworks design manuals. An example of this would be electrical cables that are not buried to the correct depth. In the 2010 calendar year, two of these installations were discovered.

8.1.5 Redundant pilot wire/switch wire

As a general rule, no new pilot wire/switch wire is installed in green field installations. The common practice is install LV cabling with individual luminaires controlled by PE cell. The exemption to this rule is if modification to an existing pilot wire/switch wire scheme is required. This ensures all luminaires are controlled by the one control method.

As part of the bulk lamp replacement (BLR) program, all new luminaires installed are controlled directly to the low voltage system (overhead systems only). In some cases this involves removing the connection from the switch wire and re connecting it the low voltage network. The BLR program does not cover the removal of the switch wire.

An audit/removal program was initiated in 2015/16 to identify redundant switch wire that can be removed from the network. Audits ran from 2015/16-2016/17 and removals commencing in 2017/18.

8.1.6 Control relays

The PE cells required for the control relays are not currently covered in the bulk lamp replacement program (which caters for PE cell replacement). This is an issue with preventing premature failure of the lighting. Additional work is required to include control relay PE cells into the BLR program.

8.1.7 Luminaires on Stobie poles

There are currently 1076 locations where luminaires are connected on to steel/concrete (Stobie) poles via the steel outreach arm. A safety risk of such installations has been identified, caused by HV phase to ground faults transferring on to the low voltage MEN network through street lights on HV/LV Stobie poles. A work program ran from 2015/16 to 2016/17 to replace the steel outreach arm with an insulated outreach arm at these locations.

8.2 Strategy

The principal factors influencing asset management strategies are classified as per objectives set out in section 3.

- Minimise the cost of asset management to a sustainable level

  - Ensuring cost effective trade-offs are made between pro-active and reactive maintenance programs
  - Ensuring maintenance activities are managed cost effectively to achieve a reasonable service life from the asset; and
  - Capturing adequate information on the assets to facilitate informed decision making.
- Establish performance measures, targets and reporting framework for asset management
  - Maintain public lighting failure rate within two standard deviations of the long term average.
  - Ensure defects are rectified within the appropriate timeframes required by the Customer Charter.
  - Implement monthly reporting on completed tasks in the annual program of work.
- Managing business operating risks
  - Ensuring all risks are identified and have adequate management plans integrated into the business' practices.
- Achieve compliance with relevant legislative, regulatory and statutory requirements
  - Ensuring adequate monitoring and inspection activities cover legislative compliance requirements and duty of care safety obligations.
  - A list of the legislative, regulations, standards and codes of practice directly relevant to the management of Public Lighting is provided in section 6.

8.2.1 Future Strategy for unmetered

Background

The Australian Government through the Department of the Environment and Energy (DEE), has developed a street lighting roadmap for street lighting and Street Lighting Smart Controls (SLSC). The SLSC Programme is an initiative of the Institute of Public Works Engineering Australasia (IPWEA), a not-for-profit association dedicated to improving public infrastructure for communities across Australia and New Zealand.

The Commonwealth Government has conducted in late 2017 Capital City policy consultation workshops using the Roadmap as the base discussion document to identify inhibitors and consider possible policy reform. A summary of the key findings is expected to be considered during 2018 by COAG.

Tasmanian councils have indicated they would like to leverage the SLSC smart controls to provide "Smart City" functionality. To facilitate this activity would require the councils owning and managing the street lighting assets.

In 2014 two southern Councils approached TasNetworks to replace approximately 5,600 lights with more efficient and less maintenance intensive LED lights and retain ownership of these assets. Then in 2015 six northern Councils approached TasNetworks to replace approximately 9,600 lights with more efficient and less maintenance intensive LED lights and retain ownership of

these assets. Since then six Southern Councils have approached TasNetworks with a request to replace approximately 7,967 lights with LED lights also retaining ownership.

In December 2017 one Council approached TasNetworks to commence negotiations for the transfer of street lighting ownership and perform maintenance on all of the unmetered street lights within their city boundary.

Strategy

There is currently an appetite for the 29 Councils to take ownership of street lighting assets and the associated maintenance.

TasNetworks shall work with the councils to assist in asset ownership transfer and Facilities Access Agreements (FAAs) to allow for councils to own and facilitate maintenance of street lighting assets. This arrangement aligns with TasNetworks strategic plan to "Create value for our customers". TasNetworks shall insure a full cost recovery for the written down value of the assets occurs upon transfer of the assets.

8.2.2 Routine Maintenance

There is a fundamental requirement for TasNetworks to periodically inspect the assets to ensure their physical state and condition does not represent a hazard to the public.

8.2.3 Routine Maintenance versus Non Routine Maintenance

A four-year proactive bulk lamp replacement program has been chosen over a fully reactive corrective maintenance program for the following reasons:

- Most manufacturers of lamps commonly state that the average life of the lamps they manufacture is 20,000 hours, which, for a light on for 12.5 hours per day, gives a life of 1600 (calculated as 20,000/12.5) days or 4.38 (calculated as 1600/365) years. To avoid inefficient fault response or spot replacement costs, lamps should be proactively exchanged before they fail in service.
- To ensure TasNetworks appropriately maintains lighting schemes that have been constructed to the Australian Standard for Public Lighting (AS/NZ1158). The standard stipulates a maximum maintenance cycle of four years for this category of lights. Lights that are not maintained to this standard will have a reduced light output level. A reduced light output level of a public light can increase the risk of accident/injury or incidents affecting members of the public. Any incident of this nature can expose TasNetworks to potential litigation and creates negative public image issues.

8.2.4 Refurbishment

Where public lighting assets are removed from the network in good operating condition due to network or other augmentation works, these assets are assessed for redeployment back into the network where such refurbishment is deemed to be an economic proposition.

8.2.5 Planned Asset Replacement versus Reactive Asset Replacement

Replacement is generally only preferred when this is a more economic proposition compared to on-going maintenance costs over the estimated remaining service life of the public lighting assets.

Coordinating the planned bulk replacement of category P light program (RLMIN) in conjunction with the bulk lamp replacement program (RLBLR) realises a more cost effective and efficient

service delivery compared to a reactive replacement program completed as part of the reactive fault response program for the following reasons:

- The work practices are designed to reduce costs by replacing the fitting whilst on site for the lamp replacement thereby removing the need for additional site visits.
- The unit rates for bulk replacement programs are less than for spot replacement as there is less travel time between tasks.

8.2.6 Non Network Solutions

TasNetworks does not currently utilise non-network solutions for public lighting.

8.2.7 Network Augmentation Impacts

TasNetworks' requirements for developing the power transmission system are principally driven by five elements:

1. Demand forecasts;
2. New customer connection requests;
3. New generation requests;
4. Network performance requirements; and
5. National electricity rules (NER) compliance.

The major influence on the management strategies covered by this AMP is due to customer initiated new light installations and replacements due to performance issues.

8.3 Routine Maintenance

8.3.1 Road lighting - bulk lamp replacement program - RLBLR

The aims of the Bulk Lamp Replacement Program are to:

- Maintain the light output levels of all public lights to the standards as set out by AS/NZ1158;
- Maintain the public lighting assets in a manner that is efficient and cost effective; and
- Reduce light failures by replacing the lamps and PE cells in accordance with the manufacturer's specifications.

The bulk lamp replacement program is conducted on a 4-year cycle and includes:

- The replacement of the lamp;
- Replacement of the PE cell (if this is the method of control); (every 8 years)
- A condition assessment of the wiring systems, support brackets and mounting and protective fuses;
- Cleaning of the diffuser.
- Fixing of immediate safety issues; and
- Testing to ensure the luminaire is operating after completion of work.

The program is split into two components:

- Major Public Lighting; and

- Minor Public Lighting.

The lamps that may fail prematurely will be repaired under the Public Lighting Repair and Maintenance work category (RLREM) as described in section 8.3.1.

A four-year maintenance cycle has been factored into the network tariff build up for public lights.

Figures 7 and 8 below show the historical and forecast volumes of tasks for this work category.

Figure 7: Forecast Volumes – RLBLR (Major)

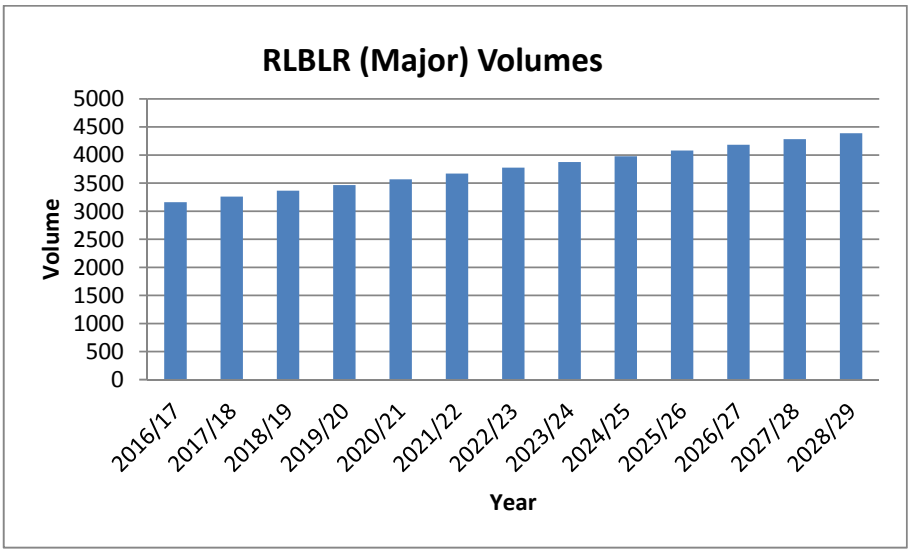
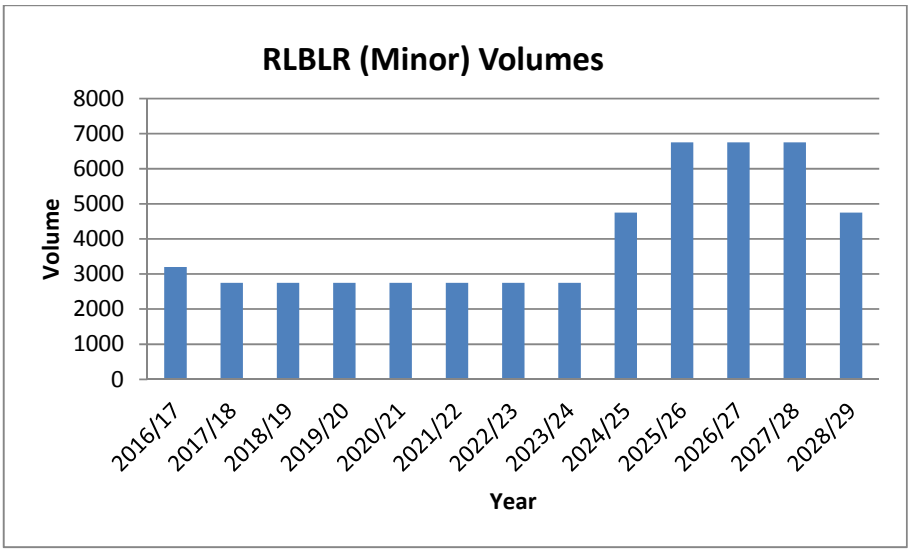


Figure 8: Forecast Volumes – RLBLR (Minor)



8.4 Non Routine Maintenance

8.4.1 Road lighting repair and maintenance - RLREM

The aim of this reactive maintenance regime is to inspect and repair lighting components that have failed. Repairs are initiated by customers contacting TasNetworks' Call Centre, advice from Road Lighting Authorities or TasNetworks-initiated inspections.

When a faulty light is attended, if the fitting is in good condition and serviceable, the faulty component (usually the lamp, PE cell or fuse) will be replaced.

If the fitting is not serviceable, the fitting will be exchanged as part of one of the Reactive Maintenance Replacement Programs (refer sections 8.4.5 and 7.4.6).

TasNetworks Distribution Business has established its customer charter to reflect the requirements of the Tasmanian Electricity Code clause 8.2.3. The clause states 'a distribution network provider must repair or replace an item of public lighting within seven business days of being notified by any person that such repair or replacement is necessary, unless the public lighting provider has contractual or other arrangements with another party'.

Figures 9 and 10 below show the historical and forecast volumes of tasks for this work category.

Figure 9: Historical and Forecast Volumes – RLREM (Major)

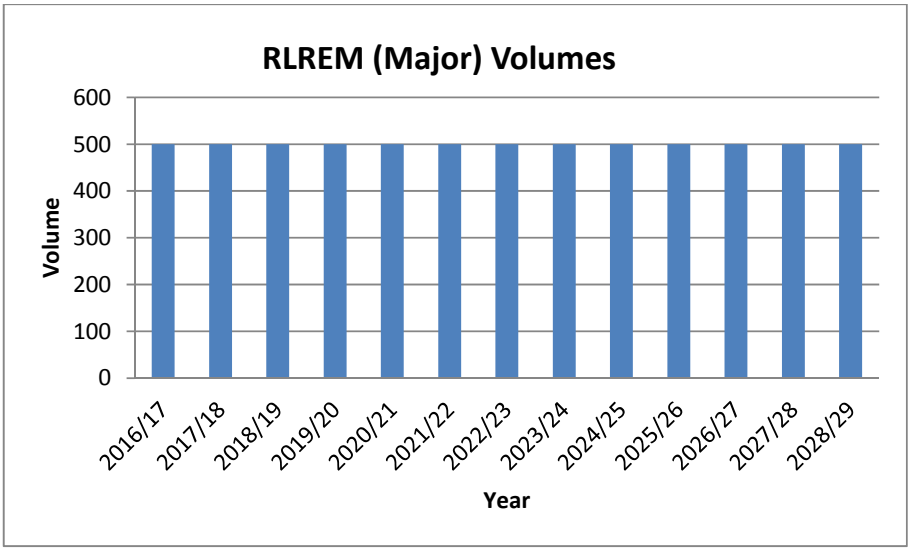
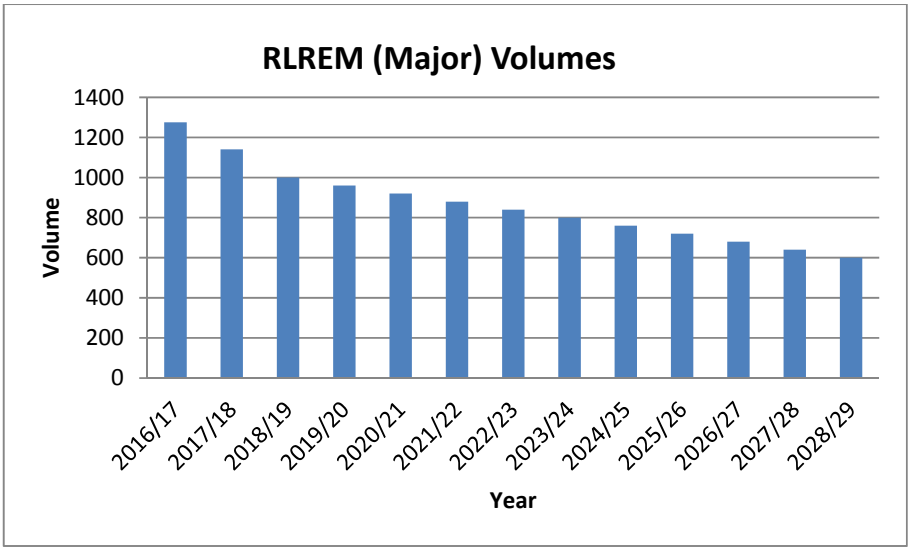


Figure 10: Forecast Volumes – RLREM (Minor)



8.4.2 Road lighting repairs – OH switch wire low clearances - RLREM

This new program is driven from the road lighting inspection – OH switch wire (major and minor) – RLICM programs and will resolve issues relating to low clearances as they are identified by the inspection programs.

8.4.3 Remove redundant OH Switch wire - RLDEC

This new program is driven from the road lighting inspection – OH switch wire (major and minor) – RLICM programs and will remove switch wore that has been identified as redundant and can be removed from service.

8.4.4 Road light underground system asset repair - RLSAR

This program is mainly driven from the Inspection and Monitoring (RLCIM) program. This program has relatively volumes and associated costs but the impact can be wide spread when a fault occurs.

Asset repairs consist of the rectification of faulty assets caused by cable failures, joint and termination failures, third party damage and other defects identified during inspections.

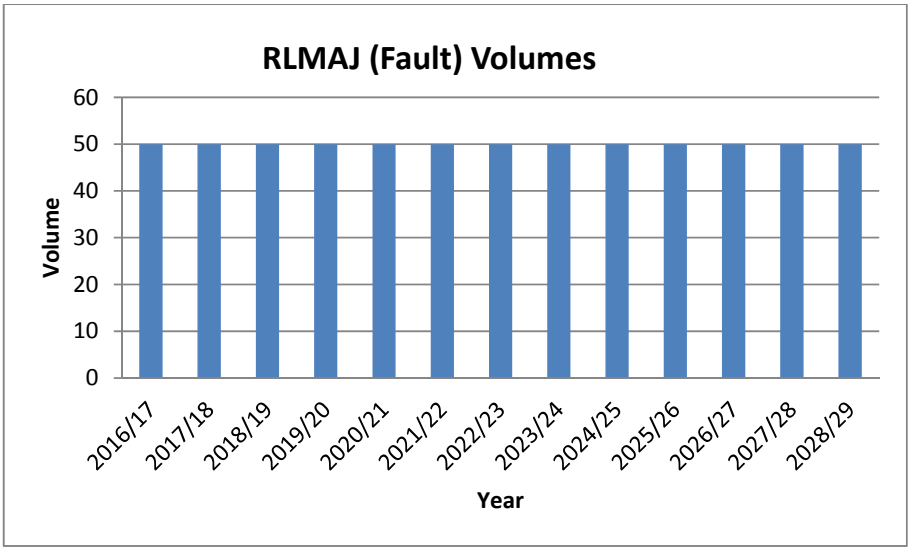
8.4.5 Replace luminaires - major (spot) - RLMAJ

This reactive replacement program caters for the replacement of major luminaires as they fail in service. Failures may occur for a number of reasons such as vandalism, accidents, lightning or asset failures.

The quantities forecast for replacement is based on historical figures.

Figure 11 below shows forecast volumes of tasks for this work category.

Figure 11: Forecast Volumes – RLMAJ (fault)



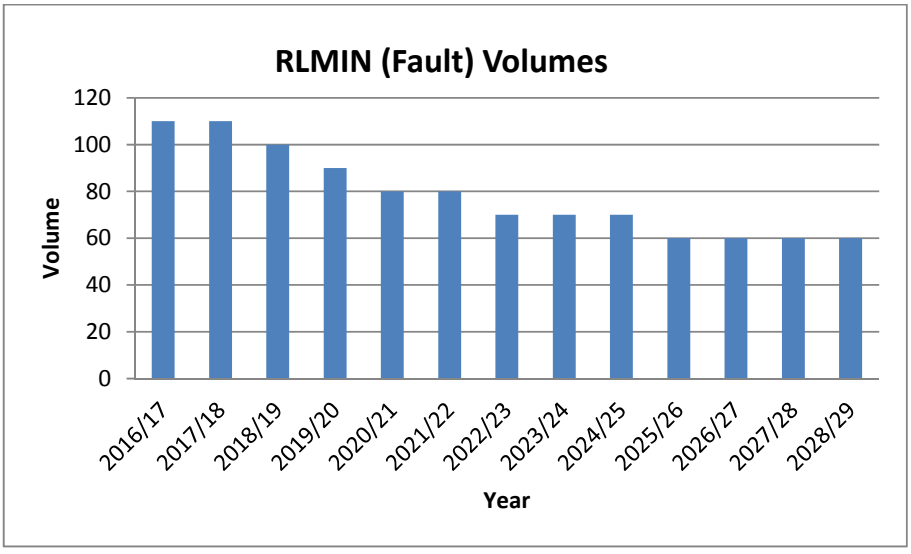
8.4.6 Replace luminaires - minor (urban - spot replacement) - RLMIN

This reactive replacement program caters for the replacement of minor luminaires as they fail in service. Failures may occur for a number of reasons such as vandalism, accidents, lightning or asset failures.

The quantities forecast for replacement is based on historical figures.

Figure 12 below shows the forecast volumes of tasks for this work category.

Figure 12: Forecast Volumes – RLMIN (fault)



8.5 Reliability and Quality Maintained

8.5.1 Road light underground cable inspection and monitoring - RLCIM

Options for the inspection of cable systems are limited due to the fact they are installed underground, but can be undertaken at terminations. Whilst monitoring techniques are available (for both thermal and partial discharge), these systems are generally very expensive and often reserved for only the higher voltage cables (33 kV and above) and key circuits.

This program will be reactively driven, as historically, the occurrences of underground public lighting cable faults are relatively low for this kind of asset.

8.5.2 Inspection road lighting - major routes - RLICM

TasNetworks has a night patrol program for major public lighting to ensure the requirements of AS/NZS 1158.1.2 Section 14.5.2 are met. This requires the minimum service availability of lamps to be 95%.

This program also ensures that all major lighting schemes maintain the 'as designed' illumination levels to provide a safe environment for the public.

Night patrols are also necessary for Major Public Lighting because customers are unable, or it is unsafe for customers, to report faulty lights on major traffic routes.

The patrols are to be performed in the months of April (before the onset of the darker winter months), August (at the end of winter when the lights have longer operating hours per day) and December (before the start of the holiday period).

8.5.3 Road lighting inspection – OH switch wire (major and minor) - RLICM

This new program will inspect overhead switch wire to identify assets that are redundant and can be removed from service or require remedial action to remain in service.

8.6 Regulatory Obligations

Public lights are classified as type 7 meters under chapter 7 of the National Electricity Rules. As such there is a requirement to complete compliance audits to validate consumption data and standing data associated with these assets as this data is used to generate customer billing information. Details of the compliance audit program for public lighting assets are described in the Metering (Regulated) Type 6 Asset Management Plan work category AIMET.

8.7 Replacement

8.7.1 Replace luminaires - major (bulk replacement) - RLMAJ

This program may have a project initiated by a Road Lighting Authority (RLA) due to changes to roads or other infrastructure or be initiated by TasNetworks.

When initiated by TasNetworks, this program targets the replacement of Category V luminaires that are generally in poor condition because of the following reasons:

- Fittings that are identified as damaged beyond reasonable repair due to vandalism, accidents or other external events;

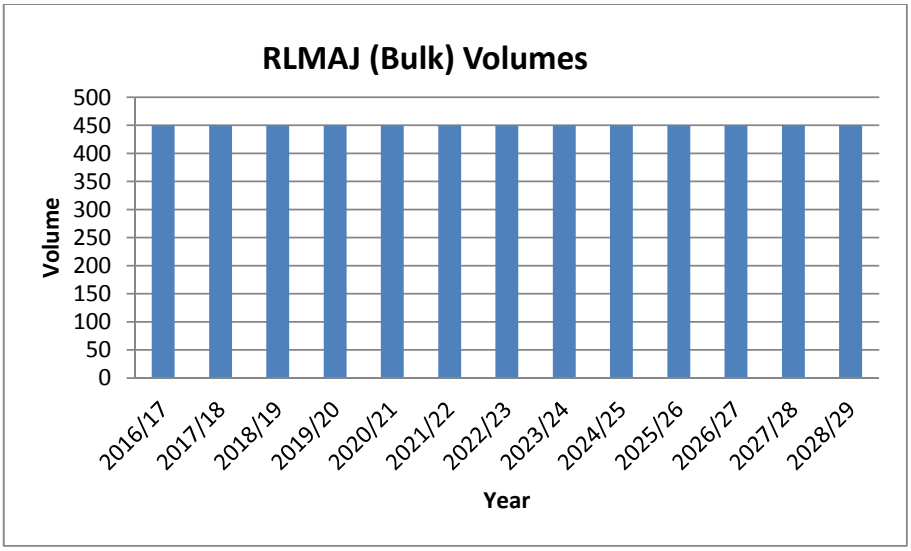
- The diffusers on luminaires have shown deterioration from exposure to weather, repeated handling and / or ultra violet degradation;
- Luminaires have shown evidence of water and insect entry because the seals have deteriorated; or
- The luminaire type has an unacceptable / increasing number of repairs being performed during fault response calls.

The current program aims to replace all the remaining mercury vapour major lights by the end of 2019/20.

This program can be either initiated as a bulk replacement program as a standalone project or incorporated to align with the Bulk Lamp Replacement program. If it is completed with the Bulk Lamp Replacement program then information and guidance on which fitting to maintain or exchange are provided in the Public Light Maintenance Area Rule Base (reference 10).

Figure 13 below shows forecast volumes of tasks for this work category.

Figure 13: Forecast Volumes – RLMAJ (bulk replacement)



8.7.2 Replace luminaires - minor road lighting (bulk replacement) - RLMIN

This program may have a project initiated by a Road Lighting Authority (RLA) due to changes to roads or other infrastructure or be initiated by TasNetworks.

When initiated by TasNetworks this program targets the replacement of Category P luminaires that are generally in poor condition because of the following reasons:

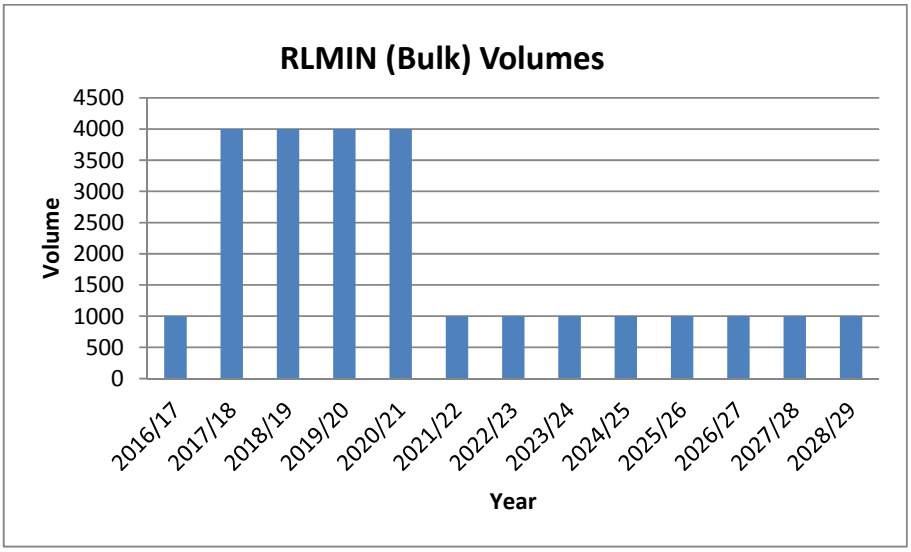
- Fittings that are found to be damaged fittings beyond reasonable repair due to vandalism, accidents or other external events;
- The diffusers on luminaires have shown deterioration from exposure to weather, repeated handling and / or ultra violet degradation;
- Luminaires that have shown evidence of water and insect entry because the seals have deteriorated; or

- The luminaire type has an unacceptable / increasing number of repairs being performed during fault response calls.

Information and guidance on which fitting to maintain or exchange are provided in the Public Light Maintenance Area Rule Base (reference 10).

Figure 14 below shows forecast volumes of tasks for this work category.

Figure 14: Forecast Volumes – RLMIN (bulk replacement)



8.7.3 Replace control relays on pilot & cascade road lighting control systems - RLREL

As part of the National Broadband Network (NBN) roll out in Tasmania, NBNCo is removing the switch wire in order to increase the height available on TasNetworks' poles to run optical fibre. TasNetworks will recycle components of relays removed as part of this project and retrofit to existing relays as they fail.

Whilst the NBN roll out in Tasmania continues, TasNetworks will run its existing fleet of control relays to failure until 2016/17. Relays and cascade control systems will remain for CBD areas and arterial routes. The funding required for this program during the rollout of the NBN is artificially low and will be required to be increased upon completion of the rollout of the NBN.

8.7.4 Road light replace underground cable - RLRUC

Currently TasNetworks considers the non-demand replacement of cables based on their condition.

Based on current performance levels and low failures, TasNetworks is not proposing any proactive cable replacement program.

8.7.5 Replace condemned wide based steel poles - RLWBP

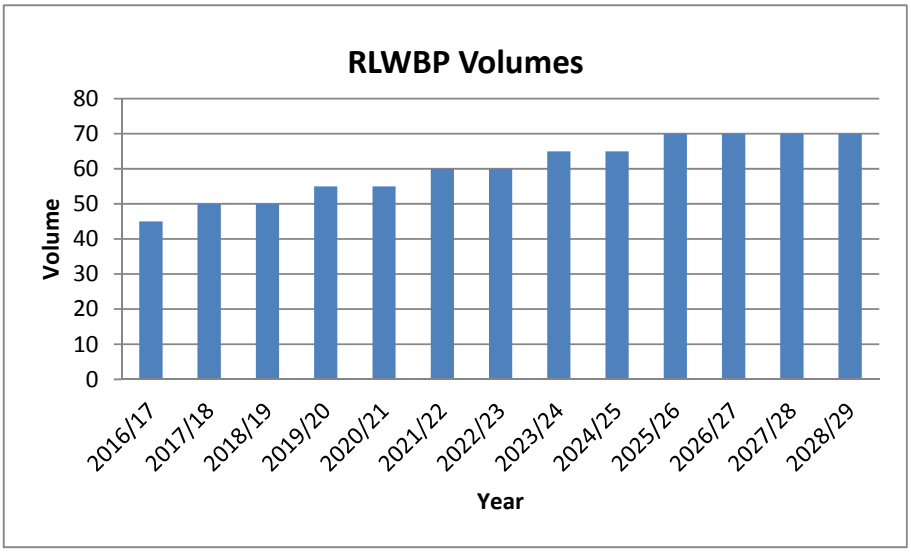
To address the issues outlined in section 8.1.2 TasNetworks has a program to replace wide based poles that are condemned (pole) through condition based assessment.

The wide based columns provide support for minor public lighting within underground subdivisions, as well as providing servicing points of supply for the adjacent house allotments. This type of pole is replaced with a slim line steel public lighting pole and a turret to cater for the

servicing. The capital cost of the new slim line will be negotiated with the relevant municipal council with the expectation that they will meet capital cost.

Figure 15 below shows forecast volumes of tasks for this work category.

Figure 15: Forecast Volumes – RLWBP



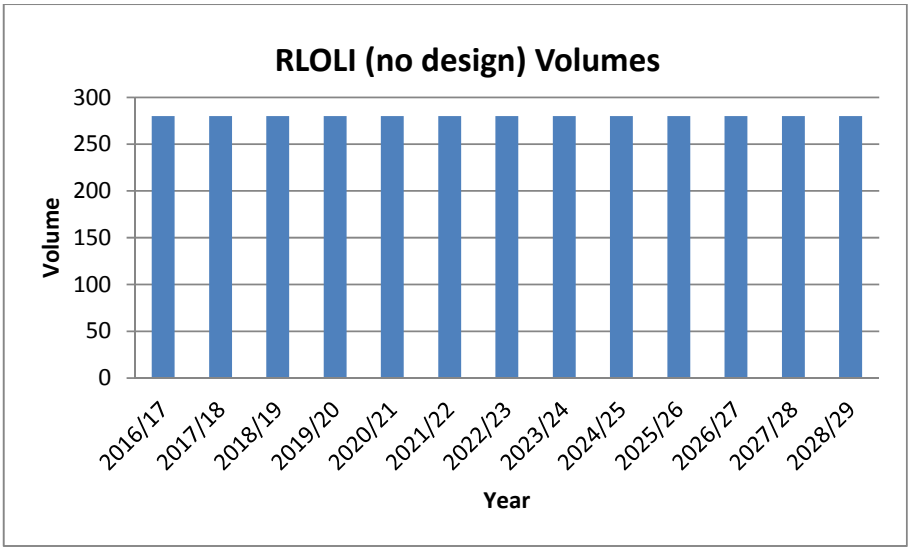
8.8 New installations

8.8.1 Supply OH/UG - new streetlight installation (no design) - RLOLI

This program is for the connection of new streetlights on existing TasNetworks Infrastructure. The light type is nominated by the RLA and compliance with AS/NZ1158 is not a requirement of the installation.

Figure 16 below shows forecast volumes of tasks for this work category.

Figure 16: Forecast Volumes – RLOLI



8.8.2 Supply OH/UG - new streetlight installation (design required) - RLOLI

This program is for the design and construction of new public lighting for special projects such as new subdivisions, intersections and road junctions initiated by developers, municipal councils or government authorities.

For new subdivisions, the public light design is undertaken as part of the subdivision's electrical infrastructure design that includes the underground cabling and associated equipment.

8.9 Investment Evaluation

Investment evaluation is undertaken using TasNetworks' investment evaluation tool, see Gated Investment Framework (Reference 7). Investment Evaluation Summaries (IES) are used to provide information in support of a project for inclusion in the Capital Works Program. This information provides a record of the project as it progresses from initiation to finalisation and is required to support a request for funding approval. This IES aims to improve the efficiency and delivery of the capital investment justification and approval process and is a requirement for regulatory and governance purposes

The management strategy for public lighting assets has allowed for specific trade-offs between capital and operational expenditure where improved lighting assets allow for savings in maintenance programs. Specifically, the replacement of 80 W Mercury Vapour lights with 18 W LED lights will enable a shift to a 10-year maintenance cycle compared to the current 4-year cycle. The new LED lights also do not require replacement of the LED driver (lamp) as the driver has the same 20 year life as the luminaire fitting.

8.10 Spares Management

Spare lighting assets are managed as warehouse stock items procured under period based contracts. Average monthly usage volumes are used to forecast orders from suppliers to maintain minimum / maximum stock holdings. Lights removed from service and deemed suitable for reuse are returned to stock following refurbishment.

8.11 Disposal Plan

All removed public lighting assets are returned to the warehouse where they will be assessed to determine if suitable for reuse or disposal. Assets identified for disposal are sorted for either recycling or disposal as hazardous waste where they contain mercury (lamps) or asbestos (control gear).

8.12 Summary of Programs

Table provides a summary of all of the programs described in this asset management plan.

Table 4: Summary of Public Lighting programs

Work Program	Work Category	Project/Program
Alternative Control - Operational Expenditure	Bulk Lamp Replacement (4-year cycle) (RLBLR)	Road lighting - bulk lamp replacement program (major) Road lighting - bulk lamp replacement program (minor)

Work Program	Work Category	Project/Program
	Road Light Underground Cable Inspection and Monitoring (RLCIM)	Road light underground cable inspection and monitoring
	Remove redundant OH Switch wire (RLDEC)	Remove redundant OH Switch wire
	Road Lighting Inspection and Monitoring (RLICM)	Road lighting inspection - major routes Road lighting inspection – OH switch wire (major) Road lighting inspection – OH switch wire (minor)
	Road Lighting Repair and Maintenance (RLREM)	Road lighting repairs – major Road lighting repairs – minor Road lighting repairs – OH switch wire low clearances
	Road Light Underground System Asset Repair (RLSAR)	Road light underground system asset repair
Alternative Control - Capital Expenditure	Replace Major Road Lighting (RLMAJ)	Replace luminaires - major (bulk replacement)
		Replace luminaires - major (spot replacement)
	Replace Minor Road Lighting (RLMIN)	Replace luminaires - minor road lighting (bulk replacement)
		Replace luminaires - minor (spot replacement)
	Install New Road Lighting OH (RLOLI)	Supply OH/UG - new streetlight installation (no design)
		Supply OH/UG - new streetlight installation (design required)
	Replace Relays - RL Control Systems (RLREL)	Replace control relays on pilot and cascade road lighting control systems
	Road Light Replace Underground Cable (RLRUC)	Road light replace underground cable
	Replace condemned wide based steel poles (RLWBP)	Replace condemned wide based steel poles

9 Financial Summary

9.1 Proposed CAPEX and OPEX Expenditure Plan

The capital and operational programs and expenditure identified in this management plan are necessary to manage operational and safety risks and maintain lighting at an acceptable level. All capital expenditure is prioritised expenditure based on current condition data, field failure rates and prudent risk management.

A summary of the forecast for expenditure and volumes for the CAPEX and OPEX program of work can be located at the following link http://reclink/R0000845501

10 Responsibilities

Maintenance and implementation of this management plan is the responsibility of the Secondary Asset Strategy Team Leader.

Approval of this management plan is the responsibility of the Asset Strategy and Performance Leader.

A review of this asset management plan will be conducted every 2.5 years or upon changes to applicable standards, rules, codes or legislation.

11 Related Standards and Documentation

The following documents have been used to either in the development of this management plan, or provide supporting information to it:

1. Asset Management Policy
2. TasNetworks Business Plan 2017/18
3. AS/NZS 1158 Lighting for roads and public spaces
4. AS/NZS 3000 Electrical Installations (known as Australia/New Zealand Wiring Rules)
5. Overhead System Structures Asset Management Plan
6. Metering (Regulated) Type 6 Asset Management Plan
7. Underground System Asset Management Plan
8. Wide Based Pole Audit report 2013 (http://reclink/R0000732952)
9. Lighting Design & Construction Standard (http://reclink/R207576)
10. Public Light Maintenance Area Rule Base (http://reclink/R0000669033)
11. TasNetworks Risk Management Framework (http://Reclink/R0000238142)

12 Appendix A - Summary of Programs and Risk

Description	Work Category	Risk Level	Driver	Expenditure Type	Residual Risk
Bulk lamp replacement (4-year cycle)	RLBLR	Low	Safety / Compliance	OPEX	Low
Road light underground cable inspection and monitoring	RLCIM	Low	Safety / Compliance	OPEX	Low
Remove redundant OH Switch wire	RLDEC	High	Safety	OPEX	Low
Road lighting inspection and monitoring	RLICM	High	Safety	OPEX	Low
Road lighting repair and maintenance	RLREM	High	Safety	OPEX	Low
Road light underground system asset repair	RLSAR	Medium	Safety / Compliance	OPEX	Low
Replace major road lighting	RLMAJ	Medium	Safety	CAPEX	Low
Replace minor road lighting	RLMIN	Medium	Safety	CAPEX	Low
Install new road lighting OH	RLOLI	Medium	Safety / Compliance	CAPEX	Low
Replace relays - RL control systems	RLREL	High	Safety	CAPEX	Low
Road light replace underground cable	RLRUC	Low	Safety / Compliance	CAPEX	Low
Replace condemned wide based steel poles	RLWBP	High	Safety	CAPEX	Medium

13 Appendix B - Public Lighting Population

Table 7: Public lighting asset volumes (as at June 2015)

Lamp type	Luminaire	Nominal Rating	Total Public
Compact Fluorescent	Sylvania Suburban Eco	32	3
	Sylvania Suburban Eco	42	5,804
	B2001	42	16
	Total - Compact Fluorescent		**5,823**
Fluorescent	Other	20	6
	Other	40	46
	Other	80	3
	Other	160	1
	Pierlite Greenstreet	48	40
	Total - Fluorescent		**96**
Incandescent	Other	60	14
	Other	100	7
	Total - Incandescent		**21**
Light-Emitting Diode	Sylvania StreetLED	25	55
	Total - Light-Emitting Diode		**55**
Mercury Vapour	Artcraft Flinders Encounter	80	204
	Artcraft Seaford Contemporary	80	270
	Betacom Gough	80	9,907
	Rexel Bathurst	50	64
	Rexel Bathurst	80	112
	Rexel Optispan	250	122
	Rexel Optispan	400	72
	Rexel Optispec	250	187
	Rexel Optispec	400	154
	Sylvania B2224	80	9,624
	Sylvania Roadstar	250	113
	Sylvania Roadstar	400	17
	Sylvania Suburban	80	4,391
	Sylvania Suburban Eco	80	26
	Unknown	50	126
	Unknown	80	311
	Unknown	125	101

Lamp type	Luminaire	Nominal Rating	Total Public
	Unknown	250	104
	Unknown	400	116
	Total - Mercury Vapour		**26,021**
Metal Halide	Artcraft Seaford Contemporary	150	20
	Sylvania Roadstar	250	24
	Total - Metal Halide		**44**
Sodium Vapour	Rexel Optispan	150	929
	Rexel Optispan	250	1,046
	Rexel Optispan	400	67
	Sylvania Roadstar	150	3,083
	Sylvania Roadstar	250	3,936
	Sylvania Roadstar	400	249
	Sylvania Urban	100	348
	Unknown	70	185
	Unknown	150	158
	Unknown	250	201
	Unknown	400	212
	Total - Sodium Vapour		**10,414**
GRAND TOTAL			**42,475**