Wagga Wagga Street Lighting Strategy

NEXT ENERGY

LIGHTING ANALYSIS & DESIGN

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1 EXECUTIVE SUMMARY

Street lighting is an essential community service that aims to provide pedestrians and vehicles with a safe and comfortable visual environment at night. Street lighting also plays a vital role in reducing crime and the fear of crime and, can have a significant influence on the aesthetics of streetscapes.

Lighting also has adverse environmental consequences that need to be minimised. These include unnecessary energy consumption and consequent greenhouse gas emissions, the need for tree trimming, street clutter, waste light to the night sky, obtrusive light on to resident's properties and glare. Glare in particular can have a negative effective on safety and visual comfort.

Objectives of the Strategy

The objectives of the Wagga Wagga Street Lighting Strategy are to:

- propose appropriate minimum lighting levels and lighting objectives, including luminaire performance, for all of Wagga Wagga's streets and outlying villages, with a particular emphasis on improving lighting for pedestrians on footpaths and on roads at elevated risk of night-time accidents;
- identify a manageable portfolio of technologies and installation approaches to achieve the lighting objectives while minimising costs and adverse environmental impacts; and
- recommend priorities for lighting improvement.

SUMMARY OF BENEFITS

If implemented as described, the proposed Strategy would progressively result in:

- **More Light** - An effective doubling of lighting levels on many currently under-lit residential road footpaths and road surfaces with a priority placed on implementation in those areas at elevated risk of crime
- **Whiter Light** - Widespread deployment of high quality "white light" on residential roads across the LGA and in the commercial and entertainment precinct of Baylis Street
- **Improved Lighting Quality and Compliance with Lighting Standards** - Greatly improved compliance with Australian Standard AS/NZ1158 across the LGA
- **Energy and Greenhouse Savings** - When fully deployed across the current portfolio of lighting, energy and greenhouse gas reductions of an estimated 16% compared to current energy consumption and 40% compared to Country Energy's business-as-usual practices
- **Less Light Pollution** - Significant reductions in light pollution to the night sky, in obtrusive light on to residents' properties and in glare

Scope

The report covers all street lighting in the Wagga Wagga Local Government Area that is owned or paid for by Council. This includes the lighting of about 300km of State, Regional, arterial, collector and local residential roads. Not included are a small number of street lights which are directly paid for by the NSW Roads & Traffic Authority.

Service Provision

Council is responsible for providing street lighting to the community. However, from 1945 onwards, this service has been performed for Council by others. Initially, it was

provided by the Southern Riverina County Council and more recently, by NSW Government-owned electricity corporations. Since 2001, Country Energy, as the regional NSW electricity distributor, has been the street lighting service provider for Council.

Regulation, Codes and Standards

While there is no explicit regulation of street lighting requirements in NSW, the NSW Government implemented a Public Lighting Code in 2006 to help clarify the relationship between suppliers such as Country Energy and councils. Country Energy agreed to implement the Code in 2006 and produced a Street Lighting Management Plan that sets out the basis on which the service is to be delivered.

Unfortunately, as highlighted by Council, REROC and LGSA submissions to a 2007 Department of Water and Energy review, many aspects of the street lighting service in Wagga Wagga do not yet meet the minimum requirements of the NSW Public Lighting Code or deliver on Country Energy's own Street Lighting Management Plan. Deficiencies include a wide range of information provision requirements as well as a delay in fully instituting key maintenance requirements such as regular bulk lamp replacement and night patrols on main roads. Country Energy has proposed a number of strategies to bring their service levels into compliance and while there has been some progress, much remains to be done.

The NSW Public Lighting Code forms a *de facto* service agreement but it does not set lighting requirements. In practice, AS/NZ1158 Lighting for Roads and Public Spaces is widely accepted as the default approach for a local government to follow in discharging its duty of care to maintain a safe roadway for all users. This Strategy is based primarily on AS/NZ1158, recommending appropriate sub-categories of lighting under the Standard for various roads and classes of roads in Wagga.

STREET LIGHTING CONTESTABILITY

Lighting in Wagga Wagga is potentially contestable meaning that Council could take over responsibility for the assets and have another qualified party provide maintenance and replacement services instead of Country Energy.

Unlike many other areas of NSW, the vast bulk of street lighting assets in the Wagga LGA were originally funded by Council and gifted to the utility and its predecessors. Country Energy refers to these as "Tariff Type 2" assets.

Should Council wish to engage other parties to maintain lighting assets, Country Energy has said that "Transfer of ownership to the customer (Tariff Type 3) will be negotiated however there will be no payout of capital required".

While council-owned and managed street lighting is the norm in many parts of the world it is not the norm in Australia. Without local precedent, considerable work would likely be involved for Council in developing an appropriate contract and tendering approach.

Council considered such a course of action in 2005 but deferred any action in the absence of robust inventory.

Community and Council Concerns About Lighting

A range of current community and Council concern about street lighting were highlighted in Wagga's Street Lighting Plan 1998 (Amended 2004) and have been reinforced in recent years by council members, the local MP, local businesses, progress associations and individual residents.

The most frequently raised concerns are about the need for new or improved lighting in various locations and to report lighting outages that have been unattended for some time.

Street Lighting Expenditure

In 2006/07 Wagga Wagga paid Country Energy approximately $688,000 in electricity, network, capital and maintenance charges for the street lights Country Energy owns and maintains on behalf of Council. This represented an 8% increase over charges in the previous year and continues a series of increases that have been consistently in excess of CPI. Charges are projected to continue increasing faster than CPI in the coming years.

Street Lights in the Wagga Wagga LGA

Within Wagga Wagga LGA boundaries, there are approximately 5,683 street lights of which 75% are on residential roads with the rest on main roads. About 98% of the lights are owned and maintained by Country Energy on behalf of Council, with less than 2% being directly owned by Council. The number of street lights appears to have grown by about 2.5% per year over the past decade.

There have been important changes in the mix of lighting in the past decade:

- At least 40% of all lighting has been replaced in the past decade.
- The use of obsolete and poorly performing tubular fluorescent lighting is declining but still makes up 43% of residential road lighting. Importantly, Country Energy is proposing widespread replacement of this lighting over the next few years. It is therefore an opportune time to be considering technology choice.
- Obsolete and poorly performing *low pressure* sodium lighting (eg orange coloured lighting) is still found in large numbers on the key arterial of the Sturt Highway (Edward St) and some other main roads.
- High pressure sodium lighting has been widely deployed on residential roads in Wagga Wagga in the past 10 years. It is now acknowledged that this type of lighting is inappropriate for such situations as the human eye does not respond well to its golden coloured lighting at the low levels found on residential roads. High pressure sodium lighting also has poor colour rendition, with important implications for visual identification where crime is a consideration. The latest version of AS/NZ1158 has derated the performance of high pressure sodium on residential roads by 25% in recognition of these challenges. (In contrast, high pressure sodium is widely accepted as the appropriate choice for the higher lighting levels required on main roads and is recognised as such under AS/NZ1158).

As noted in Wagga's 1998 Street Lighting Plan (Amended 2004), much of the lighting does not comply with the current Australian road lighting Standards, AS/NZ1158, but

nonetheless appears typical of the prevailing practices in regional NSW at the time it was installed. In some cases, however, the lighting appears to be manifestly deficient compared with the risk of accidents and the level of public safety concern.

Street Lighting Inventory

Country Energy provided Council with a number of street lighting inventories and inventory summaries in 2007. However, as per a 2007 Council submission to the NSW Public Lighting Code review, Country Energy has not provided Council with an inventory sufficiently detailed enough to test the legitimacy of bills or to readily identify, quantify and prioritise particular problematic lighting assets for replacement or resolve many basic inquiries about lighting without the need for site visit by Council or Country Energy. A more detailed inventory is understood to be in preparation.

Street Lighting Maintenance

Country Energy is responsible for the maintenance of street lighting. Key aspects of the maintenance regime and their status is as follows:

- **Bulk Lamp Replacement** - Country Energy is progressively implementing BLR but does not appear to have instituted it in the Wagga Wagga area yet. This is confirmed by high spot outage repair rates in Country Energy maintenance data.
- **Night Patrols on Main Roads** – Country Energy has undertaken to fully implement night patrols on main roads by end of Q1 2008.
- **Spot Outage Repairs** – Spot outage repair rates are three times expected levels, probably due to a lack of bulk lamp replacement (see above).
- **Lamp Recycling -** Country Energy has commenced environmentally appropriate lamp recycling in the Riverina.
- **Vegetation Management -** Site visits conducted in Nov 2007 identifying a number of lights enveloped in foliage suggest that Country Energy vegetation management around street lights has not been fully implemented. In addition, Council is responsible for tree trimming to facilitate effective light distribution further away from the lights and site visits in Nov 2007 suggest this is not taking place at present either.
- **Outage Reporting** – Country Energy maintains a 24-hour street lighting outage reporting hotline (13 20 80) and internet outage reporting *(http://www.countryenergy.com.au/internet/cewebpub.nsf/Content/cus_trn_streetlights)*. However, additional promotion of the reporting hotline is needed.

Night-time Motor Vehicle Accidents

As acknowledged in AS/NZ1158 and internationally, street lighting has an important role to play in reducing the risk of night-time vehicle accidents. Analysis of the location of major night-time motor vehicle accident data from 2005-2007 indicates the following:

- **Repeat Phenomena** - 62% of the 120 urban night-time accidents for which location information is available took place at or near locations where more than one accident happened over the 3 year period, 2005-2007.
- **75% of Accidents in or near CBD** - 75% urban night-time accidents took place in the greater Wagga Wagga CBD area bounded by Edward St, Tarcutta St, Kincaid St and the Olympic Hwy.

- **50% of Accidents on Five Key Roads** - Accidents on or near Edward St (Sturt Hwy), Olympic Hwy, Baylis St, Tarcutta St and Kincaid St were responsible for just over 50% of all major night-time vehicle accidents from 2005-2007. Notably, all of the locations where 3 or more accidents took place over the three year period were also on or near these five roads.

Accident data has been used as a key input in setting priorities for lighting upgrades.

Crime and the Fear of Crime

Improved lighting is recognised by Council, the NSW Police Service and AS/NZ1158 as having an important role to play in reducing crime and the fear of crime. While lighting can make an important contribution, all parties recognise that enhanced lighting must be considered as one of a suite of crime prevention measures along with other urban planning, place management and surveillance approaches.

In consulting with the Wagga Wagga Police Local Area Command and Council's Social Planning group, four priority suburbs were identified as being areas at elevated risk of night-time crime categories that might be partly addressed with improved lighting. Those suburbs are Central Wagga (including Baylis / Fitzmaurice area, surrounding commercial / heritage precincts and residential streets behind the railway station), Ashmont, Kooringal and Tolland.

Lighting Strategy & Priorities

Section 5 of this Strategy outlines in detail the status of lighting on particular roads and areas of the LGA. It contains detailed recommendations on lighting types, lighting levels and suggests priorities for upgrades. In summary, the highest priorities were found to be:

Road	Status	Recommended Actions
Sturt Highway	Very high accident rates and very poor current lighting in proportion to traffic volume & accident risk	1) Conduct a detailed lighting review in conjunction with Country Energy and the RTA, developing a new design to AS/NZ1158 V3 2) Seek agreement on a funding and implementation approach for any required additions or modifications beyond those already planned by Country Energy.
Baylis St	High accident rates and poor lighting in proportion to pedestrian volumes, risk of crime and risk of accidents	1) Stage trial of decorative retrofit lighting of at least 4 lighting points 2) Concurrent with trial, investigate opportunities to improve AS/NZ1158 compliance with bracket extension and/or higher Wattage lamps. Consider potential future use of CCTV on Baylis. 3) Investigate opportunities to improve output of existing high level lighting at intersections with Country Energy including longer bracket arms, tree pruning and pole replacement / relocation (including possible co-location with traffic signals)

Residential Roads	Highly variable lighting levels and quality with significant numbers of obsolete and poorly performing tubular fluorescent lights that are to be replaced by Country Energy in the near to medium term	1) Conclude price negotiations with Country Energy on new energy efficient default lighting and agree on implementation schedule for bulk replacement of obsolete tubular fluorescent lighting. Importantly, Council should ask Country Energy to suspend accelerated replacement of obsolete tubular fluorescent lighting until there is agreement on technology choice. 2) Prioritise areas at elevated risk of crime for bulk replacement of obsolete tubular fluorescent lighting 3) Review with Country Energy possible modifications or alternatives to dedicated poles that are set back amongst trees 4) Use GIS data to identify gaps in the residential road lighting network and prioritise additional lights based on gap size and in areas at elevated risk of crime
Pedestrian Crossings	As a separate project, Council is reviewing lighting at 14 lit pedestrian crossings in Wagga Wagga. Four did not appear to meet the minimum requirements of AS/NZ1158.4.	1) Implement improvements called for in current review at four pedestrian crossings 2) Ensure proper aiming of luminaires at all pedestrian crossings

In addition to the actions outlined above, a number of other steps need to be taken by Council with regards to street lighting (See Section 5). Top amongst these is instituting a systematic tree trimming program to allow for effective light distribution.

Estimated Cost of the Proposed Strategy

The following initial estimates for the highest priority items in the Strategy are based on the cost of recent lighting installations undertaken in Wagga Wagga by Country Energy or contractors working to Country Energy requirements.

Road	Estimate Capital Cost	Notes
Sturt Highway	$230,000	Based on ~60 new lights being added on existing poles and/or existing lights requiring substantial modification at an average of approximately $3000 per pole plus ~5 additional poles at approximately $10,000 per pole.

Baylis St	$240,000	Based on Country Energy's proposed retrofit decorative luminaire choice at approximate $1500 per pole and $90,000+ for modification of higher level lighting at key intersections.
Residential Roads	$0 capital cost for replacement of existing lights under normal replacement program; ~$700-$1000 per additional light that Council chooses to add	Changes to total operating costs for new lights are the subject of current negotiations involving REROC. Based on initial Country Energy pricing proposals, new energy efficient lights are approximately $20 / light / year more expensive however, this initial pricing proposal appears unsupportably high.
Pedestrian Crossings	$15-30,000	Based on substantial reworking of 4 pedestrian crossings, including some possible pole relocations

2 OBJECTIVES OF THIS STRATEGY

The objectives of this strategy are to establish:

- **Minimum Lighting Levels & Lighting Objectives** – Propose appropriate minimum lighting levels and lighting objectives for all areas of the City of Wagga Wagga and a number of outlying villages so that clear direction can be provided to Wagga Wagga Council staff, Country Energy and developers, as well as those involved in the design of lighting installations and supply of lighting equipment. Wagga Wagga's lighting objectives are to:
  a) illuminate roadways, public and pedestrian areas to a standard that provides a safe and comfortable visual environment for pedestrians and vehicles at night
  b) illuminate public and pedestrian areas to a level that will reduce the risk of crime to people and property
  c) enhance the aesthetic quality of public spaces at night which includes providing light sources that give a natural appearance to people and surroundings, with good colour rendition
  d) use the best available technology for the effective conversion of light to illumination
  e) minimise the potential adverse environmental consequences of public lighting including unnecessary energy consumption, greenhouse gas emissions, tree trimming requirements, street clutter, light pollution to the night sky, obtrusive light on to residents' properties and glare
  f) minimise the total costs to Council and ratepayers
- **Identify a Manageable Portfolio of Technologies** – Propose a portfolio of standard technologies and installation approaches that will meet the Wagga Wagga's lighting objectives in most circumstances while minimising costs and adverse environmental consequences. Importantly, the portfolio of technologies and implementation approach must also be ones that Country Energy, as the service provider, is willing to support unless Council is willing to take on ownership and management of street lighting (see Section 4.3).
- **Recommend Priorities for Improvement** – Recommend the priorities for lighting improvements, both in specific high priority locations and in terms of the specific obsolete technologies to be worked out of the system first.

3 SCOPE

The report covers all street lighting in the Wagga Wagga Local Government Area that is owned or paid for by Council. This includes the lighting of about 300km of State, Regional, arterial, collector and local residential roads.

The vast majority of lighting in the LGA is to be found in the City of Wagga Wagga itself. In addition, a number of villages within the LGA also have road lighting. These

include Uranquinty, Humula, Tarcutta, Ladysmith, Gumly Gumly, Collingullie, Oura, Currawarna and Mangoplah[1].

The report does not address:

- a small number of street lights which are paid for directly the by the NSW Roads & Traffic Authority[2];
- other forms of public lighting in car parks, parks[3], memorials and at Wagga Airport[4];
- privately owned outdoor lighting in private car parks, security lighting, facade lighting and illuminated signage[5]; and
- sports field lighting, where a different lighting standard, AS2560, applies and the City's 10-year improvement strategy is covered in Wagga Wagga City Council Management Plan – Infrastructure - Service Level Analysis 2007/08.

4 BACKGROUND

4.1 A Brief History of Street Lighting in Wagga Wagga

Gas street lighting was first installed in Wagga in about 1876[6]. The first electric street lighting was managed by Council until 1945[7], at which point the assets were transferred to the Southern Riverina Country Council that had been established some years earlier by neighbouring councils. From 1945 to 1995, the County Council had responsibility for providing street lighting services to the City[8].

In 1995, a NSW government-owned corporation, Great Southern Energy, took over the assets and responsibility for lighting from the Southern Riverina Electricity (formerly Southern Riverina County Council)[9]. Great Southern was then merged with other regional NSW electricity distribution utilities in 2001 to form Country Energy[10].

Country Energy provides street lighting services to more than 100 councils, including Wagga Wagga City Council, and has about 130,000 street lights in its portfolio. Reflecting a diverse history of more than two dozen county councils which were ultimately merged to form Country Energy, it is important to note that the corporation manages a wide array of lighting technologies, installation practices, maintenance regimes, asset registers and tariff histories across NSW.

Wagga Wagga City Council encompasses just over 4% of Country Energy's street lighting assets. Council is understood to be amongst the largest street lighting customers of Country Energy.

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[1] *Street Lighting Plan 1998 and site visits of Nov 2007 to Uranquinty, Tarcutta and Mangoplah*
[2] *RTA confirmed account as being a small on 28 Mar 08*
[3] *See WWCC Management Plan 2007/08 describing planned park lighting upgrades*
[4] *In a separate project, Wagga Airport lighting was upgraded to meet CASA standards in 2006/07*
[5] *Council requirements are addressed in the Wagga Wagga Development Control Plan and specific DA requirements. In general, Wagga has required minimisation of obtrusive light on to neighbouring premises with reference to AS4282 – The Control of the Obtrusive Effects of Outdoor Lighting*
[6] *A History of Wagga Wagga, Keith Swan, 1970 p 119*
[7] *Life Lines: Water and Electricity in the Southern Riverina 1938-1988, Nigel Ross, 1988, p31*
[8] *http://www.rwcc.com.au/histdevlp.html*
[9] *Energy Services Corporations Act 1995 Part 3 and Schedule 6*
[10] *Energy Services Corporations (Dissolution of Energy Distributors) Regulation 2001*

4.2 Regulation, Codes & Standards

There is currently no explicit legislative obligation in NSW on either councils or electricity distribution network service providers (DNSPs) such as Country Energy to install, maintain and operate street lighting assets[11].

As acknowledged in Wagga's 1998 Street Lighting Plan, local governments in NSW are responsible for public lighting. This responsibility arises under the NSW Local Government Act 1993 and NSW Roads Act 1993. These acts designate local governments as the road authority for most roads[12]. As the road authority, a duty of care arises for Council to maintain a safe roadway for vehicles and pedestrians. The responsibilities resulting from this duty of care include:

- determining whether public lighting is required;
- determining what level of lighting is required; and
- ensuring that public lighting is installed and maintained to a reasonable standard, whether by the local utility or by some other means.

NSW Public Lighting Code

A NSW Public Lighting Code[13] implemented on 1 January 2006 by the then NSW Department of Energy, Utilities and Sustainability (now Department of Water & Energy) is designed to help clarify the relationship between Public Lighting Service Providers and NSW Councils. It establishes minimum acceptable service levels for DNSPs (eg maintenance standards, lighting choice, management plans and information provision). It does not however, set lighting design requirements for councils. In the absence of current service agreements or meaningful regulation, its adoption was strongly supported by councils and the NSW Local Government and Shires Association (LGSA).

While the NSW Public Lighting Code is not mandatory, Country Energy is understood to have agreed with the then Dept of Energy, Utilities and Sustainability to implement the Code in full prior to its adoption in January 2006.

The NSW Public Lighting Code is currently under review by the Department of Water & Energy. The LGSA and the Riverina Eastern Regional Organisation of Councils (REROC) noted in their submissions to the review that many of the major initiatives in Country Energy's 2006 Street Lighting Management Plan[14], a 2006 document designed to move Country Energy into compliance with the Code, have been only partially delivered or not delivered at all. Further, both Wagga Wagga City Council and REROC noted in their submissions[15] that information from Country Energy on night patrols, bulk lamp replacement programs, spot outage repairs, inventories, consultation regarding standard luminaires and the potential for new technologies was lacking or incomplete.

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[11] *This overview is not intended to constitute legal advice and Council should consider taking legal advice in this area to clarify its obligations*

[12] *The exceptions being higher road classifications such as State & Regional Roads where the RTA may be the road authority but importantly, Council may have assumed some responsibility for lighting on these roads in urban areas in past agreements relating to the Traffic Route Lighting Subsidy Scheme.*

[13] *http://www.deus.nsw.gov.au/publications/NSW%20Public%20Lighting%20Code%20-%20140KB.pdf*

[14] *http://www.countryenergy.com.au/internet/cewebpub.nsf/AttachmentsByTitle/streetlights/$FILE/CEPG1023v1.pdf*

[15] *WWCC Councillors' Briefing October 2007 p23 and attachments*

Country Energy responded to council concerns about Code compliance at a joint regional meeting October 2007 with commitments to address a range of current deficiencies[16]. To date, there has been progress in some areas but much remains to be done.

At present, the NSW Public Lighting Code and Country Energy's Street Lighting Management Plan form the *de facto* service agreement. However, with no mandatory lighting-specific regulation in NSW (or contract between Country Energy and Council), there is no direct recourse for Council or penalty for Country Energy for non-compliance with or failure to adhere to the Code or its own Management Plan.

Standards

In practice, AS/NZ1158 Lighting for Roads and Public Spaces is the only widely accepted and documented lighting standard in Australia. While adoption of AS/NZ1158 is not required by law, its use appears the most common approach for a local government to follow in discharging its duty of care to maintain a safe roadway for all users. Indeed it is unclear how else a local government could demonstrate that it has exercised a reasonable duty of care to maintain a safe roadway in most circumstances.

AS/NZ1158 leaves it up to the local authority to nominate which subcategory of lighting to use in any area based on specific local circumstances such as night time traffic and pedestrian flows, levels of crime and other patterns of use.[17]

One possible alternative approach to AS/NZ1158 may be to undertake explicit public consultation, on-going education and formal adoption of an alternative policy if a differing and lower level of lighting were to be used where, for example, heavy tree canopies create unacceptable challenges in meeting AS/NZ1158 or in semi-rural areas. County Energy addresses such situations in Section 4.2 of its Street Lighting Management Plan[18]:

> *Furthermore, customers should be aware that AS1158 does not appear to explicitly address the lighting of semi-urban roads in rural and regional areas. Typical residential roads in these areas differ from roads in metropolitan areas in that:*
>
> - *There are frequently no footpaths;*
> - *There are often no finished edges to roads;*
> - *Lots are often large, with long gaps between housing common;*
> - *Traffic volumes are much lower; and*
> - *Pedestrian volumes are much lower.*
>
> *There is thus a real question as to whether and how AS1158.3.1 (the particular standard for*
> *residential roads) should be applied in these areas, particularly as it is "applicable to roads on which the visual requirements of pedestrians are dominant". In light of this, Country Energy recommends that councils should consider adopting warrants to explicitly recognise other lighting arrangements where AS1158 may not be applicable.*

[16] *WWCC Councillors' Briefing November 2007 p24*
[17] *AS/NZ1158.3.1 Section 1.2 and Section 2.4 and AS/NZ1158.1.1 Section 1.2*
[18] *http://www.countryenergy.com.au/internet/cewebpub.nsf/AttachmentsByTitle/streetlights/$FILE/CEPG1023v1.pdf*

The legal implications of such an approach require Council consideration.

Another standard of relevance is AS4282: 1997 Control of Obtrusive Effects of Outdoor Lighting. This standard aims to ensure that outdoor lighting does not result in excessive and environmentally damaging light being emitted into the night sky (eg upward waste light), onto nearby resident's properties (eg light trespass) or exceeding glare requirements. Control of glare is especially important for older residents as the human eye becomes much more affected by glare with aging. Adherence to this standard by Wagga Wagga City Council would seem appropriate and this Standard has been cited in Council DA conditions in the past.

4.3 Street Lighting Contestability

Lighting in Wagga Wagga is potentially contestable, meaning that Council could take over responsibility for the assets and have another properly qualified party provide maintenance and replacement services instead of Country Energy.

Unlike many other areas of NSW, the vast bulk of street lighting assets in the Wagga LGA were originally funded by council and gifted to the utility and its predecessors. Country Energy refers to these as "Tariff Type 2" assets. Importantly, the assets sit on Country Energy's asset register and Country Energy are responsible for maintenance and the replacement of the assets.

Council is NOT free to stage a tender at present for the maintenance of Country Energy assets or authorise any party to climb Country Energy's poles to add or remove lights. However, should Council wish to engage other parties to maintain lighting assets, Country Energy has said that, "Transfer of ownership to the customer (Tariff Type 3) will be negotiated however there will be no payout of capital required"[19].

While council-owned and managed street lighting is the norm in many parts of the developed world (eg New Zealand, United Kingdom and many parts of North America), it is not the norm in Australia. Without good precedent, considerable work would likely be involved developing an appropriate contract and tendering approach.

Council considered such a course of action in 2005 but deferred any action in the absence of robust inventory[20].

4.4 Wagga Wagga Street Lighting Plan 1998 (and 2004 Amendment)

Wagga Wagga developed a Street Lighting Plan in 1998 that was subsequently amended in 2004[21]. Some key features of the Plan included:

- Acknowledgment of and a focus on improving poor lighting on key main roads (particularly intersections) and in some older areas of the City where tree canopies have been allowed to grow significantly, often enveloping existing lighting;
- Supporting this, the results of a 1996 community survey[22] that found the top community priorities for lighting were:

[19] *Country Energy Street Lighting Management Plan p15*
[20] *http://www.wagga.nsw.gov.au/resources/documents/February_Minutes_2005.pdf*
[21] *http://www.wagga.nsw.gov.au/resources/documents/Street_Lighting_Plan.pdf*
[22] *Street lighting improvements were also called for in the 2003 WWCC Your Place – Your Say survey of community priorities*

  - improvements in lighting on suburban streets with a particular focus on the needs of pedestrians; and
  - improvements in lighting on major arterial roads, particularly at intersections;
- A recognition of 1997 changes in Australian lighting Standards (eg AS/NZ1158) and that most lighting in Wagga did not meet the Standards but, as noted in 2004 amendments, post-1997 lighting in newer suburbs generally had been designed to meet AS/NZ1158;
- The Council's adoption in July 1997 of a resolution recording "….*its desire to upgrade the standard of Street Lighting to the Australian Standard."*[23]*;*
- A map of the LGA outlining lighting standards to be achieved over time on different roads;
- A recognition of the changing nature of the electricity industry; and
- In the amended 2004 Plan, an acknowledgment that capital expenditure on street lighting improvements both before and after the Plan's release had been low and from 1999 onwards, nil in four of five years reported on.

4.5 Community and Council Concerns About Lighting

Current community and Council concern about a variety of street lighting issues in Wagga Wagga and the surrounding villages is evidenced by the issue being frequently raised by:

- Wagga Wagga councillors, particularly in the Policy & Strategy Committee[24]
- Correspondence from the office of the local MP, local businesses, progress associations and individual residents[25]

The most frequently raised concerns about street lighting were:

- Improved / new lighting is needed in a particular location because of concerns about:
  - Poor road delineation and consequent risk of accidents (primarily involving intersections and major roads with higher traffic volumes)
  - Security and safety of pedestrians walking at night, especially senior citizens
  - Security of and safe access to vehicles parked on the street
- Unattended outages or defective lights
- Obtrusive light onto residents' properties (eg light trespass)
- Emerging opportunities for more energy efficient technology

These concerns have been used as input to the Lighting Strategy (see Section 5).

4.6 Current Street Lighting Expenditure

In 2006/07 Wagga Wagga paid Country Energy approximately $688,000 in electricity, network, capital and maintenance charges for the street lights Country Energy owns and maintains on behalf of the City. This represented an 8% increase over charges in the previous year and continues a series of increases that have been consistently

[23] *WWCC July 1997 Council resolution (Para 12 Works) as noted in WWCC Street Lighting Plan 1998*
[24] *WWCC Policy & Strategy Committee Minutes from approximately 2005 onwards containing references to lighting were reviewed*
[25] *Archival correspondence from 2005 onwards was reviewed in the preparation of this Strategy*

in excess of CPI and are projected to continue to be above CPI in the coming years (see table below).

Year	Street Lighting Total On-going Charges	% Change From Previous Year	Additional CAPEX
2003/04	$577,229[26]	18.8%	$20,000 for new lighting at the Thompson and Best St roundabout and $430,000 on Fitzmaurice St streetscape upgrade, a significant portion of which went to lighting
2004/05	$605,000[27]	4.8%	$20,000 for new lighting at corner of Glenfield and Redhill Rd
2005/06	$637,000[28]	5.3%	$21,000 for new lighting at corner of Glenfield and Redhill Rd
2006/07	$688,000[29]	8.0%	$23,000 for lighting improvements at the intersections of Dalman Pkwy/Redhilll Rd and Bourke St/Holbrook Rd
2007/08	*$710,000[30] forecast but likely to be higher based on IPART approved price increase*	6.85%[31] for capital and maintenance charges approved by IPART June 2007	$110,000 allocated for specific street lighting improvements
2008/09		4.54%[32] for capital and maintenance charges forecast by Country Energy	$200,000 allocated for Baylis St lighting upgrade

Street lighting charges and any increases are a blend of several components. For Wagga Wagga City Council the break-down of these charges is approximately as follows:

[26] *WWCC 2004-05 Financial Statements & Street Lighting Plan 1998 (as Amended 2004)*
[27] *WWCC 2004-05 Financial Statements*
[28] *WWCC 2005-06 Financial Statements*
[29] *WWCC 2006-07 Financial Statements*
[30] *WWCC 2006-07 Financial Statements forecast expenditure for current year*
[31] *May 2007 correspondence to WWCC from Country Energy consistent with price increase subsequently approved by IPART 26 June 2007 - http://www.ipart.nsw.gov.au/files/Statement%20of%20Reasons%20for%20Decision%20-%20Country%20Energy%20Public%20Lighting%20Increase%20-%2026%20June%202007.PDF*
[32] *Avg pricing increase forecast in Country Energy submission to IPART April 2007 - http://www.ipart.nsw.gov.au/files/Country%20Energy%20Public%20Lighting%20proposal%20for%202007-2008%20-%20webdoc.PDF*

Cost Component	Proportion of Total Street Lighting Costs[33]	How is Pricing Component Determined?
Capital & maintenance charges	54%	Current Country Energy street lighting charges are approved by IPART[34]. The new Australian Energy Regulator (AER) is progressively taking over responsibility for pricing approval from 1 Jan 2008. A final decision on the regulatory approach for street lighting was outlined by the AER in a Mar 2008[35]
Network charges	28%	Current Country Energy network charges (including those for the distribution of energy to street lighting) are approved by IPART[36]. The new Australian Energy Regulator is progressively taking over responsibility for pricing approval from 1 Jan 2008.
Energy charges	15%	Electricity supply for street lighting is fully contestable and has been for some years. Wagga's current electricity supply contract, entered into in April 2005 with Country Energy, expires 31 May 2008. Note that the past 12 months have seen significant price volatility in the National Electricity Market with large increases in recent contract prices.
Electricity market charges	2%	NEMMCO[37] approved charges as well as pass-through of NSW Greenhouse Gas Abatement obligations and Commonwealth Mandatory Renewable Energy Target obligations
TOTAL	**100%**	

In the 2004/05 Annual Report, Council estimated the total replacement value of street lighting in the WWCC LGA at $10,000,000 and the current approximate depreciated value at $5,000,000. Street lighting thus constituted just under 1.5% of the current value of public works in the WWCC LGA[38] This estimate appears broadly consistent with the number of lights in the Wagga Wagga LGA but, with the current lack of a complete Country Energy street lighting inventory (See Section 4.8), it is not possible at this stage to develop a bottom-up estimate of asset value. Note that items such as long bracket arms on traffic routes and dedicated street lighting poles on all classes of roads can be a bigger driver of asset value than the lights themselves. This type of detail about lighting assets in the LGA is not available to Council at present.

[33] *Based on a review of four Wagga Wagga City Council street lighting bills from 2006/07*
[34] *http://www.ipart.nsw.gov.au/files/Statement%20of%20Reasons%20for%20Decision%20-%20Country%20Energy%20Public%20Lighting%20Increase%20-%2026%20June%202007.PDF*
[35] *http://www.aer.gov.au/content/index.phtml/itemId/717023/fromItemId/717016*
[36] *http://www.ipart.nsw.gov.au/electricity/documents/Country_Energy_Network_Prices_010707.pdf*
[37] *National Electricity Market Management Company – The operator of the National Electricity Market and the system operator of the national grid*
[38] *WWCC 2004-05 Annual Report, Condition of Public Works Section 428(2)(d) p 43*

4.7 Current Lighting Assets

Within the Wagga Wagga LGA's boundaries, there are some 5,683 lights on public roads (see Section 4.8 regarding Country Energy street lighting inventory information). Approximately 98% are owned and maintained by Country Energy on behalf of Council, with less than 2% being directly owned by Council.

A breakdown of lighting by road lighting category is shown below:

Lighting Category	**Country Energy Owned & Maintained**[39]	**City Owned & Maintained**	**TOTAL (%)**
Main Road	1235	~100 low-height decorative poles / luminaires on Baylis St	1335 (23.5%)
Intermediate Road	82	None identified	82 (1.4%)
Residential Road	4254	None identified	4254 (74.9%)
Other	12	None identified	12 (0.2%)
TOTAL	**5583 (98%)**	~100 (2%)	**5683 (100%)**

The ~100 City-owned lights[40] are low-height decorative lighting installed in the shopping precinct of Baylis St in about 1999 as part of a major streetscape renovation (see figure).

Based on a comparison of the current inventory with data in the Street Lighting Plan 1998, the inventory of street lighting in Wagga Wagga is growing by about 2.5% per year on average, or just over 100 lights per year.

There have been some important changes in the lighting mix since 1998 as illustrated in the following detailed breakdown by lighting technology:

[39] *Estimated Wagga Wagga lighting inventory figures are based on the most recent inventory summary available as supplied by Country Energy in December 2007. Notably, no complete item-by-item inventory is yet available to council but has been requested a number of times since 2005 and is understood to be in preparation.*

[40] *No asset inventory has been identified for these lights in Council records. Estimate based on site survey of 20 Nov 07*

Lighting Type	Main Roads	Inter-mediate Roads	Residential Roads	Other	Change since '98	Notes
400W Mercury Vapour	1				-9	Almost eliminated
360W High Pressure Sodium	2				+2	Retrofit lamp
700W Mercury Vapour	2				+2	New
250W Mercury Vapour	3				-32	Almost eliminated
4*40W Tubular Fluorescent	11				-9	Substantially reduced
250W Metal Halide	21				+21	New
220W High Pressure Sodium	22				+22	Retrofit lamp
400W High Pressure Sodium	90				-24	Unexplained reduction
Wagga-owned lights on Baylis	100				+100	New
90/100W Low Pressure Sodium	215				-103	Moderate reduction
150W High Pressure Sodium	336				+245	Mostly new
250W High Pressure Sodium	532				+315	Mostly new
125W Mercury Vapour		10			-2	Largely unchanged
100W High Pressure Sodium		72			+72	New
4*20W Tubular Fluorescent			4		-4	Almost eliminated
20W Tubular Fluorescent			8		0	Few remaining
80W Mercury Vapour			1134		+1013	Almost all new
70W High Pressure Sodium			1303		+1303	All new since '98
40W Tubular Fluorescent			1805		-1742	Substantially reduced
150W Incandescent				2	0	New
400W Metal Halide				2	+2	Floodlighting
100W Incandescent				8	-4	Few remaining
TOTAL	**1335**	**82**	**4254**	**12**	**+1168**	

Key items to note in comparing the 1998 and 2008 inventories of lighting include:

- **Asset Replacement Rate Appears Consistent With Expected Life**
  The introduction of several new lighting types in recent years indicate that at least 2973 new luminaires were installed in the past decade (eg however, there may have been more replacements than this involving replacing like with like). Excluding some 1168 new installations over the period 1998-2008, this demonstrates that AT LEAST 40% of the asset base of 4515 that existed in 1998 has been renewed in the decade since. This is slightly below but broadly consistent with the 20 year average lifespan of street lighting luminaires used by Country Energy in its regulatory submissions.

- **Obsolete Tubular Fluorescent on Residential Roads Declining but Still Substantial** There has been a 50% reduction in obsolete tubular fluorescent lighting found on residential roads (eg TF40, TF4*20 and TF20), however, a substantial population of 1817 such lights remain (eg 43% of residential road lighting). These older and obsolete tubular fluorescent lights do not comply with the minimum requirements of the current Australian Standard, AS/NZ1158, in almost all circumstances and are producing high levels of light pollution to the night sky (eg 30-40% upward waste light). Importantly, Country Energy is proposing widespread replacement of obsolete tubular fluorescent lighting

in conjunction with future Bulk Lamp Replacement (BLR) cycles in the Riverina. This should result in most if not all tubular fluorescent lighting being replaced over the next few years. Agreement on acceptable replacement technology choice for residential roads is therefore vital (see recommendations in Section 5 – Residential Roads).

- **Obsolete Low Pressure Sodium Still Found in Key Locations**
  There has been a 32% reduction in obsolete 90/100W low pressure sodium lighting found on main roads with a moderate population of 215 remaining (eg 15% of total main road lighting). Importantly, these lights, with a distinctly orange appearance, no colour rendition and with mono-chromatic light at a colour appearance that the human eye does not respond well to, are found in large numbers on the key arterial of the Sturt Highway and some other main roads.

- **Significant new population of HPS on residential roads**
  In the past 10 years, 1303 70W high pressure sodium lights have been deployed on residential roads. Unfortunately, it has been acknowledged in recent years that the human eye does not respond well to this golden coloured lighting at the low levels found on residential roads. This is now recognised in AS/NZ1158.3.1 which derates HPS output on residential roads by 25%. Many law enforcement agencies, including the NSW Police Service CPTED Program, have also indicated a preference for white light in preference to yellower light wherever possible.

- **Obsolete Mercury Vapour on Main Roads Almost Gone**
  There has been a 75% reduction in obsolete and inefficient high wattage mercury vapour lighting found on main roads (eg 250W and 400W MW) with only a small residual population of 14 luminaires remaining (eg less than 1% of total main road lighting). This is considerably less than the national average of 30-35% and much less than the 60% found in metropolitan Sydney.

4.8 Street Lighting Inventory & GIS Information

Council has been requesting a detailed street lighting inventory from Country Energy since at least 2005[41]. To date, Country Energy has provided summary inventories[42]

[41] *http://www.wagga.nsw.gov.au/resources/documents/February_Minutes_2005.pdf*
[42] *Country Energy Annual Street Lighting Report for year ending 30 June 2007 – Dated 18 December 2007*

(eg detailing how many of a particular light type there are in total), asset lists[43] (identifying lamp type but with no location information or other asset information) and GIS data[44] indicating where lights are located but having no associated asset information (eg light type, pole type, bracket type, installation date).

In summary, no complete inventory has been supplied detailing the location, type and installation details of each lighting asset. The current lack of complete inventory information appears inconsistent with the NSW Public Lighting Code which, in Section 8.1, requires:

> *A Service Provider must maintain an accurate Public Lighting inventory to record (for each Luminaire that it owns and maintains or has agreed to maintain and manage on a Customer's behalf) the location, type, rated power, date installed (where the Luminaire was installed after the commencement of the Code) and infrastructure required to support the Luminaire and any other information that is required to identify charges and ownership status.*

Section 9.1b of the Code requires Country Energy to provide a current version of the Public Lighting inventory to Council.

Without detailed inventory information it is extremely challenging for Council to:

- reconstruct its bills from the inventory
- test the robustness of the inventory and billing in a variety of ways (eg confirm the existence of particular lights in the inventory, identify potential double-counting / phantom lights or reconcile GIS and inventory data)
- identify where particularly problematic obsolete lighting types are located
- quantify and prioritise replacement programs
- clarify problematic outages or other faults (eg using inventory data to explicitly clarify pole ID thereby speeding up Country Energy response)
- clarify many resident / developer questions about poles / lights at a particular location without the need for a site visit by Council or Country Energy

More broadly, the lack of a detailed inventory with asset details also hinders consideration of future contestability (See Section 4.3).

4.9 Street Lighting Maintenance

Country Energy is responsible for the maintenance of street lighting. As per the NSW Public Lighting Code, Country Energy's own Street Lighting Management Plan[45] and a briefing provided to REROC councils on 23 October 2007 by Country Energy, key aspects of the maintenance regime and their status is as follows:

[43] *Data provided to REROC councils in February 2007 as part of joint regional lighting project*
[44] *As provided by Country Energy to Council 23 October 2007 and subsequently updated*
[45] *http://www.countryenergy.com.au/internet/cewebpub.nsf/AttachmentsByTitle/streetlights/$FILE/CEPG1023v1.pdf*

Maintenance Task	Status
Bulk Lamp Replacement (BLR) every 36 months including cleaning and inspection of luminaires – CEMP Section 5.2 and 5.3	Country Energy is progressively implementing BLR but does not appear to have instituted it in the Wagga area yet. This can be seen from the high levels of resident reported spot outages (1527 in 2006/07[46] or 27%+ of all lights as compared with the expected level of 9-10% with a BLR regime). Country Energy maintenance data appears to exclude any additional outages identified by Country Energy staff or Council and therefore actual spot outage repair rates may be even higher at present. Importantly, BLR is widely acknowledged to be a cost-saving measure for Country Energy and other DNSPs.
Night Patrols on main roads every 6 months – CEMP Section 5.1	Higher outage levels on some main roads as observed during Feb 2007 for REROC[47] and Nov 2007 for WWCC suggest that night patrols are not happening systematically at present. Country Energy has undertaken to fully implement by end of Q1 2008.
Spot Outage Repairs within 8 working days (5 days for groups of lights or pedestrian crossings) or penalty payment is made to reporting party – CEMP Section 5.2	Country Energy has provided reporting on 1527 resident reported spot repairs as well as 87 luminaire replacements in 2006/07[48]. However, the timeframe for completion of any repairs or overall performance reporting has not been provided. Further, Country Energy has acknowledged that the Guaranteed Service Level penalty payment system is not yet operating as required by the Code. Importantly, based on data from other Australian utilities and pricing reviews, Country Energy may be undertaking three times the number of spot repairs as necessary if BLR had been instituted (see BLR above).
Lamp Recycling – CEMP Section 5.2	Country Energy is progressively implementing environmentally appropriate lamp recycling and confirmed at a 23 Oct 07 REROC meeting that this has started in the Riverina.
Vegetation Management within 2m radius of luminaire to facilitate maintenance access and meet safety requirements – CEMP Section 5.4	Site visits conducted in Nov 2007 for WWCC showing a number of lights enveloped in foliage suggest that Country Energy vegetation management around street lights has not been fully implemented.

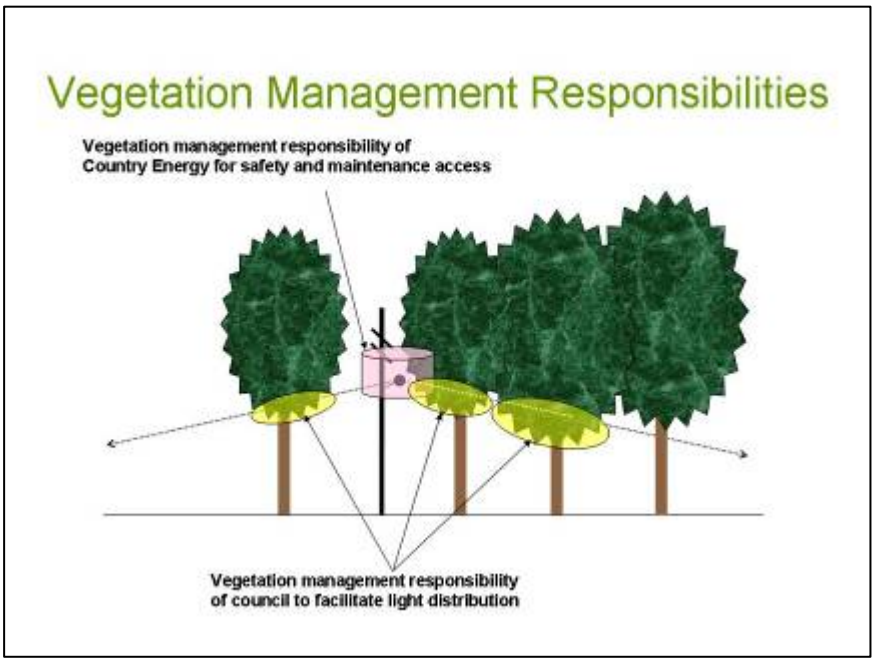
[46] *Wagga Wagga City Council Annual Street Lighting Report 18 Dec 2007*
[47] *Approx 70% of outages observed in Riverina towns (including Wagga) during Feb 2007 surveys were on arterial or sub-arterial main roads*
[48] *ibid*

Additional maintenance items of note are that:

- **Outage Reporting** – Country Energy maintains 24-hour street lighting outage reporting hotline (13 20 80) and internet outage reporting (http://www.countryenergy.com.au/internet/cewebpub.nsf/Content/cus_trn_streetlights). Council records would appear to indicate that reporting of outages directly to Country Energy as intended does not happen on a systematic basis. In practice, residents are often reporting outages to Council or Councillors instead of Country Energy. A series of changes in ownership/branding of the electricity company and the phone number for reporting outages may be important contributors to this difficulty. Improving the promotion of the reporting hotline appears needed.
- **Council Tree Trimming Responsibilities** – Vegetation management is an essential component in maintaining effective lighting levels for all types of public lighting whether on roads or in parks. Lights can only function effectively if there is nothing blocking the distribution of light to the roadway and footpath. As tree canopies mature, they can cause interference with light egress. The need for tree trimming can be minimised with the use of longer bracket arms but there will always need to be trimming to some extent to maintain effective lighting and compliance with AS/NZ1158.

  As per the diagram on page 11 of Country Energy's Street Lighting Management Plan (reproduced on the following page), Country Energy is responsible for trimming vegetation close to the light for maintenance and safety purposes. Additional trimming away from the luminaire to facilitate the distribution of light is the responsibility of council. Importantly, each luminaire is designed to illuminate up to 40m of roadway and footpath on either side of it. It is therefore essential that regular pruning take place to facilitate this.

  In practice, the trimming zone along the street or path needs to be in a line from the luminaire at up to 80 degrees from the vertical. In some cases, this angle can be reduced to 70 degrees from the vertical but this requires location-specific consideration. Trimming angles behind and in front of the luminaire need to be sufficient to allow lighting to reach points 1.5m above the edge of the road reserve or path edge (eg 45-55 degrees from the vertical for typical road lighting installations).



4.10 Night-time Motor Vehicle Accidents

As acknowledged by AS/NZ1158[49] and internationally, street lighting has an important role to play in reducing the risk of night-time vehicle accidents. A wide ranging survey of 62 lighting and accident studies from 15 countries shows a 30% average reduction in accidents when lighting is upgraded from a situation with no lighting or poor lighting to lighting meeting the equivalent of the national standard[50].

Based on figures provided by the Wagga Wagga LAC[51], there have been an average of 44 major night-time vehicle accidents per year in the Wagga Wagga LGA in each of the calendar years 2005-2007[52]. There appears to be a progressive annual decline in the number of night-time vehicle accidents each year as evidenced by the following breakdown:

YEAR	**2005**	**2006**	**2007**
# MAJOR NIGHT-TIME VEHICLE ACCIDENTS	56	42	35[2]

The overall likelihood of an accident is greatest in the early evening hours (see table below). However, vehicle volumes during the post-midnight period are a small fraction of the early evening hours. Therefore, on a per vehicle basis, the highest risk period is in the hours between midnight and sunrise. From a lighting perspective, this is significant because of the greater likelihood that road users at this time of night are tired or otherwise impaired and more reliant on public lighting to provide visual guidance (eg there are far fewer other vehicles lighting the roadway and much less spill light from shops, illuminated signage etc).

[49] *AS1158.1.3 Appendix C*
[50] *ibid*
[51] The assistance of the Intelligence Supervisor, Wagga Wagga LAC in compiling this data and assisting with its interpretation is greatly appreciated
[52] Part year data for 2007 but majority included with data covering period to mid-December 2007

TIME OF ACCIDENT	18-21Hr	21-24Hr	00-03Hr	03-06Hr
# MAJOR NIGHT-TIME VEHICLE ACCIDENTS (05-07)	57	27	25	24

Of the 133 major night-time vehicle accidents from 2005-2007, 120 incidents took place in the urban area of Wagga Wagga and have location information sufficient to identify the general location of the accident (eg intersection or nearest intersection). These accidents were sorted, grouped and plotted to identify patterns. Observations are as follows:

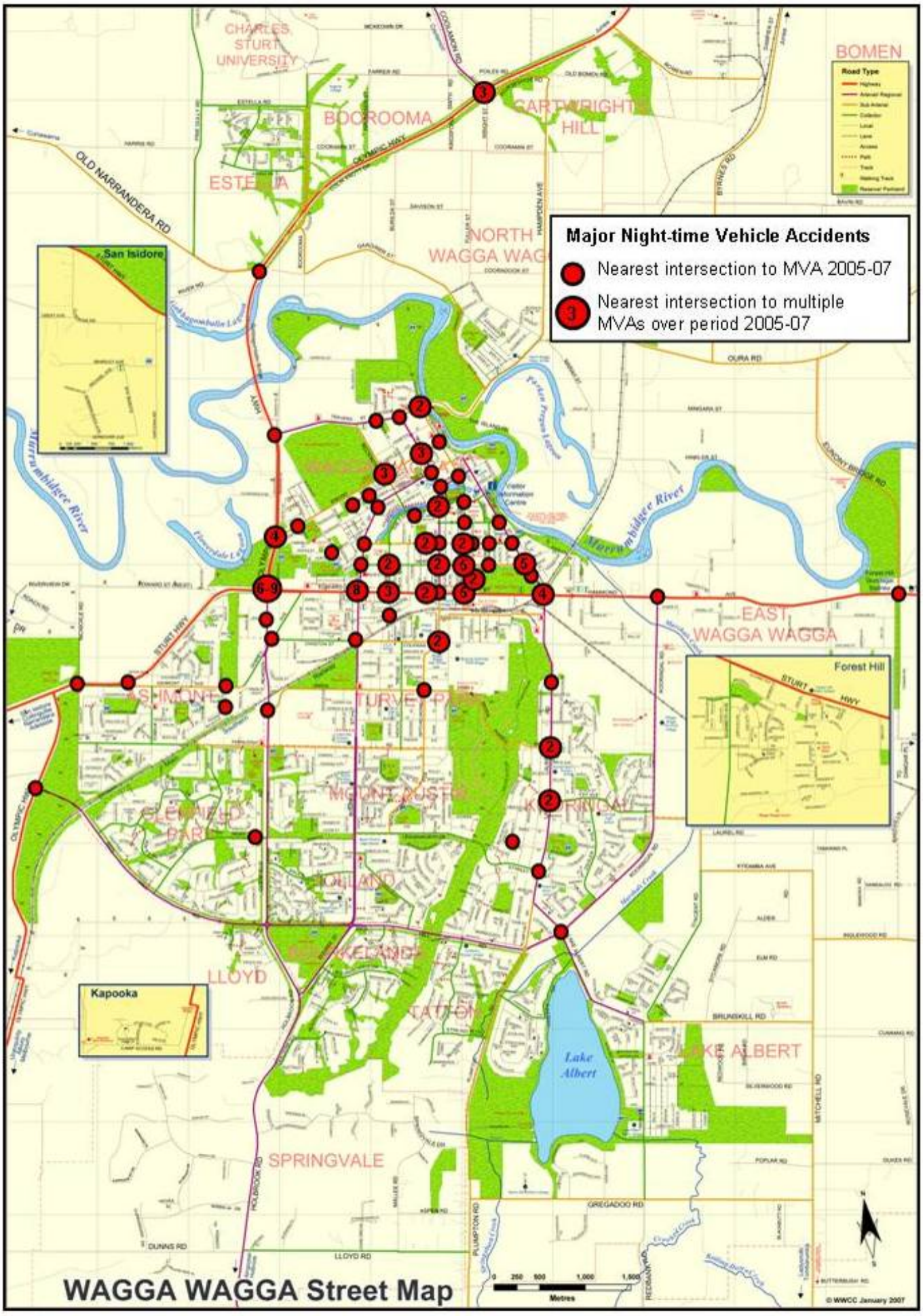
- **Repeat Phenomena** - 62% of the 120 urban night-time accidents for which location information is available took place at or near locations where more than one accident happened over the 3 year period, 2005-2007.
- **75% of Accidents in or near CBD** - 75% of the 120 urban night-time accidents for which location information is available took place in the greater CBD area bounded by Edward St, Tarcutta St, Kincaid St and the Olympic Hwy
- **50% of Accidents on Five Key Roads** - Accidents on Edward St (Sturt Hwy), Olympic Hwy, Baylis St, Tarcutta St and Kincaid St were responsible for just over 50% of all major night-time vehicle accidents from 2005-2007. Notably, all of the locations where 3 or more accidents took place over the 3 year period (2005-2007) were also to be found on these five roads.

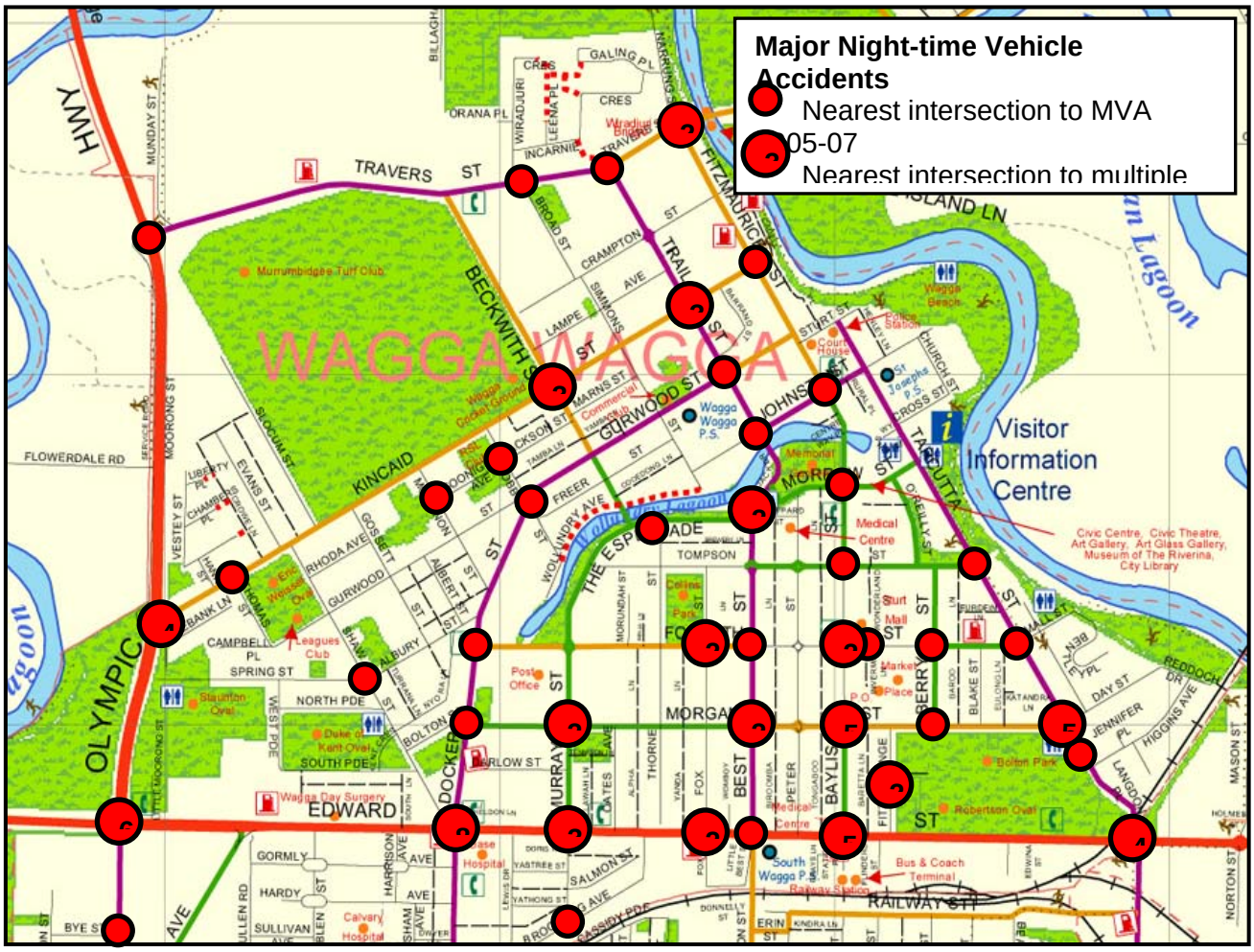
ROAD	NEAREST INTERSECTION	TOTAL ACCIDENTS 05-07
Edward St (Sturt Hwy)	Docker (8) Olympic / Moorong (6-9*) Baylis (5) Tarcutta (4) Murray (3) Fox (2) Best (1) Kooringal (1)	30-33*
Olympic Hwy	Kincaid (4) Coolamon (3) Old Narrandera (1) Travers (1) Red Hill (1)	10
Baylis St	Morgan (5) Forsyth (2) Tompson (1) Morrow (1)	9
Tarcutta St	Morgan (5) Higgins (1) Forsyth (1) Tompson (1)	8
Kincaid St	Beckwith (3) Trail (3) Fitzmaurice (1) Thomas (1)	8

** Three additional accidents with partial location information may also have taken place at or near the intersection of Sturt & Olympic Highways*

The roads with the next highest number of accidents were: Lake Albert (7), Best (5), Trail (5), Fitzmaurice (4), Docker / Gurwood (4), Pearson / Glenfield (3)

Drawings illustrating 2005-2007 major night-time vehicle accident data in the Wagga Wagga urban area and the CBD area follow:


Major Night-time Vehicle Accidents
Nearest intersection to MVA 2005-07
Nearest intersection to multiple MVAs over period 2005-07
CHARLES STURT UNIVERSITY
BOOROOMA
ESTELLA
CARTWRIGHT HILL
BOMEN
NORTH WAGGA WAGGA
EAST WAGGA WAGGA
San Isidore
Forest Hill
Kapooka
OLD NARRANDERA RD
STURT HWY
Murrumbidgee River
Lake Albert
LAKE ALBERT
SPRINGVALE
LLOYD
TATTON
GREGADOO RD
WAGGA WAGGA Street Map
Metres
© WWCC January 2007



4.11 Crime & the Fear of Crime

Improved lighting is recognised by the NSW Police Service[53] and AS/NZ1158 as having an important role to play in reducing crime and the fear of crime. While lighting can make an important contribution, all parties recognise that enhanced lighting must be considered as one of a suite of crime prevention measures along with other urban planning, place management and surveillance approaches.

Perceptions of safety at night (and of the opportunity to commit crime) are influenced by the amount of light and, just as importantly, by the light's distribution, direction, colour and contrast with surrounding areas. Properly locating luminaires with good optical distribution properties is one important way to address these issues. The other is choosing appropriate lamps with good colour rendition to go in these luminaires. In the context of crime prevention, the word colour is synonymous with "white light". Good quality "white light" also has important socio-economic benefits as it makes people feel more comfortable out on to the streets at night.

At present a significant fraction of Country Energy luminaires in the LGA provide poor or moderate colour rendition (eg 57% of all residential road lighting and 90% of all main road lighting). Further, just over one third of all Country Energy lighting in Wagga Wagga can be regarded as having little/no optical control (eg obsolete tubular

[53] *eg under the Safer by Design program and other crime prevention initiatives*

fluorescent lighting on residential roads and obsolete low pressure sodium luminaires).

The Wagga Wagga Local Area Commands (LAC) of the NSW Police Service and the Social Planning group of Wagga Wagga City Council were consulted during preparation of this Strategy. Wagga Wagga City Council's Community Safety and Crime Prevention Plan 2007-2009 was also reviewed.

In summary, four priority suburbs were identified as being areas at elevated risk of night-time crime categories that might benefit from improved lighting:

a) Central Wagga - including Baylis / Fitzmaurice area, surrounding commercial and heritage precincts and residential streets behind the railway station
b) Ashmont
c) Kooringal
d) Tolland

5 LIGHTING STRATEGY

This section is intended to establish a lighting strategy for each major arterial road, for residential roads and for pedestrian crossings in Wagga Wagga. The approaches are designed to provide effective lighting in an efficient manner and on a cost-effective basis throughout Wagga Wagga.

Council has limited funds for street lighting improvements and therefore establishing priorities is vital. The following tables suggest both actions to be taken and priorities for improvement.

Main Roads

Main road lighting is generally to be undertaken using 150W and 250W high pressure sodium lighting consistent with current Country Energy defaults and best practice elsewhere. The following table outlines the lighting status and recommendations for key main roads:

150W / 250 HPS

Road	Status	Recommended Target Lighting Level under AS/NZ1158 and Actions
Sturt Highway	The portion of the Sturt Highway through Wagga Wagga's urban area (Edward St / Hammond Ave) is currently lit with: • a mixture of lighting sources including both obsolete low pressure sodium and more modern high pressure sodium • a mixture of spacings (some clearly excessive), including gaps where lights appear to have been removed • a mixture of mounting heights and bracket arm lengths • a mixture of lighting arrangements (both opposite and staggered) In summary, the lighting does not constitute an integrated lighting scheme and may in fact be contributing to the risk of accidents on the Sturt Highway due to varying uniformity. In addition, the lead-in / lead-out lighting at the major roundabout with the Olympic Highway does not appear to be sufficient. There have been as many as 33 major night-time vehicle accidents on or near this stretch of road in the past two years (about 25% of all night-time MVAs in the urban area). Importantly, Country Energy has indicated that it plans to progressively replace obsolete low pressure sodium lighting at the next lamp or luminaire failure[54]. This should see all these obsolete luminaires replaced over the near to medium term (eg 12-36 months). It is therefore vital that agreement be secured on what replacements are to be made (eg luminaire, bracket length, mounting height) and that additions/modification be considered to effect a compliant design. 	**PRIORITY :** 1 **TARGET LIGHTING LEVEL:** V3 **ACTIONS :** 1) Conduct a detailed lighting review in conjunction with Country Energy and the RTA, developing a new design 2) Seek agreement on a funding and implementation approach for any required additions or modifications beyond planned Country Energy work

[54] *Country Energy letter to REROC 14 May 2007*

Baylis St	Baylis St is currently lit by two forms of lighting: 1) High level (12m+) 250W high pressure sodium roadway lighting owned by Country Energy is found along the length of Baylis at 50-65m spacings in primarily a staggered arrangement. There are 18 dedicated poles and importantly, several of the luminaires on these poles are sitting in the midst of or are substantially blocked by mature tree canopies that appear to have been planted immediately adjacent to existing poles during 1999 streetscape renovations. In several cases, bracket arms have been swung parallel to the roadway in an apparent attempt to avoid damage and interference from trees. However, whether blocked by trees or swung out of the way, the effect is to leave key intersections effectively unlit. This is particularly problematic at the key intersections of Morgan, Forsyth and Tompson. Notably, there have been 8 major night-time vehicle accidents at or near these intersections from 2005-2007. Five of these night-time MVAs were at or near the corner of Morgan and Baylis where lighting is the most obstructed. Unfortunately, the poles appear to be well into the latter half of their lives and unlikely to be able to support longer bracket arms but this should be confirmed with Country Energy. Substantial tree pruning, tree removal,complete relocation of lighting or the use of an alternative type of lighting such as low glare floodlighting using Type 6 luminaires appear to be the only reasonable choices for lighting at these key intersections.  2) Lower height (4-4.5m) 100W metal halide decorative lighting using Bega fittings and owned by Council is found the length of Baylis St shopping precinct on both sides of the road in an opposite arrangement (see photo p15). Spacing varies but is at up to 20m. There are just over 100 of these decorative luminaires. This lighting was installed in 1999 as part of streetscape renovations. Cleaning and maintenance of this lighting has recently been completed substantially improving performance. Council is investigating options for an on-going maintenance regime.	**PRIORITY :** 1 **TARGET LIGHTING LEVEL:** V3 & P2 **ACTIONS :** 1) Stage trial of decorative retrofit lighting involving at least 4 lighting points 2) Concurrent with trial, investigate opportunities to improve AS/NZ1158 compliance with bracket extension and/or higher Wattage lamps. Consideration should also be given to the potential future use of CCTV on Baylis. 3) Investigate opportunities to improve output of existing high level lighting at intersections with Country Energy including longer bracket arms, tree pruning and pole replacement / relocation (including possible co-location with traffic signals)

Baylis St *(cont)*	Country Energy has proposed a trial upgrade of existing lower height lighting on Baylis St by removing each existing Bega fitting and replacing it with twin SLA Nightstar Compact luminaires on each pole using a 70W metal halide lamp in each fitting. Metal halide lighting is the appropriate lamp type for a high profile commercial and entertainment precinct and the luminaire proposed by Country Energy appears to be a reasonable choice given the circumstances. A trial of new lower height lighting should involve at least 4 poles (eg two on each side of the roadway) to get a reasonable perspective of the benefits. Given the high cost of retrofit lighting (likely exceeding $150,000), and SIGNIFICANT problems with existing high level roadway lighting and lack of obvious solutions to rework this existing lighting, careful analysis should be conducted to assess the potential of the new lighting to bring Baylis St pedestrian zones up to AS/NZ1158.3.1 P2 and the potential of the lighting to also contribute to bringing the carriageway up to AS/NZ1158 V3. Note that as part of this analysis, consideration should also be given to the possibility of raising the pole height and outreach to 5.5m in conjunction with installation of the new lights (but careful examination of existing trees and building canopy heights would be required to determine feasibility). Further, careful consideration should also be given to the particular choice of 70W metal halide lamp as performance varies widely by manufacturer and model. A higher Wattage lamp may also merit consideration. This analysis could take place while an initial trial progresses and could be undertaken by either Country Energy or an independent consultant. A proper maintenance regime is essential to keep either existing or proposed new metal halide lights on Baylis St in good order. In summary, Country Energy's current maintenance regime, as per their Street Lighting Management Plan, consists of night patrols every 6 months and bulk lamp replacement every 36 months. Because of the relatively short life of 70W metal halide lamps compared to other lamps used in public lighting, this regime will NOT be sufficient to keep the lighting installation in good order. The optimal maintenance regime for 70W metal halide lamps would require bulk lamp replacement on a cycle of once every 18 months at most and night patrols every 3 months would be preferable. Again, the choice of lamp has a particularly significant impact on the required maintenance regime, with the performance of metal halide lamps varying widely by model and manufacturer.	

Olympic Highway	The portion of the Olympic Highway through Wagga Wagga's urban area is generally unlit except for intersections with key arterial and sub-arterial roads. Notably, significant expansion of Wagga Wagga's northern suburbs has taken place in recent years and further development is planned. This and other broader changes to the interstate highway network are increasing traffic volumes and changing patterns of usage on the portions of the Olympic Highway linking these areas. Lighting the intersections of the Olympic with key Wagga Wagga arterials appears appropriate. Given the changing volumes and pattern of use, the lighting of the key intersections with Coolamon Rd, Old Narrandera Rd, Travers St, Kincaid St, Sturt Highway (Edward St) and Red Hill Rd should be reviewed in conjunction with the RTA. Notably, intersections with Kincaid and Coolamon have been the site of multiple night-time MVAs in recent years and an MVA at the intersection with Old Narrandera Rd is the subject of a current compensation claim.	**PRIORITY :** 2a **TARGET LIGHTING LEVEL:** V3 **ACTIONS :** 1) In conjunction with the RTA, conduct a review of the 6 lit intersections along the Olympic Highway with Wagga's arterial roads. At higher risk intersections, consideration should be given to providing two additional spans of lighting on either side of the intersection (eg lead-in / lead-out lighting).
Tarcutta St	Lighting on Tarcutta is generally newer high pressure sodium and of a reasonable standard though, unlikely to be fully at AS/NZ1158 V3. Of particular concern on Tarcutta is the roundabout intersection with Morgan St. There have been 5 night-time MVAs at or near this roundabout in recent years. While the roundabout is a recent lighting installation, lighting of the approaches should be considered to see if upgrading is required.	**PRIORITY :** 2a **TARGET LIGHTING LEVEL:** V3 **ACTIONS :** 1) As a priority, review lighting in the vicinity of Tarcutta / Morgan St roundabout to see if upgrading of approaches is required

Lake Albert Rd	Lake Albert Rd is both a major north-south arterial for Wagga Wagga and the site of more than 1/3 of the night-time MVAs taking place in all the suburbs south of the Sturt Highway. Lake Albert Rd is currently lit with: • a mixture of lighting sources including obsolete low pressure sodium, obsolete tubular fluorescent and more modern high pressure sodium • a mixture of mounting arrangements (eg some catenary), mounting heights and bracket arm lengths • long gaps in some sections • tree interference (eg in the Plumpton Rd to Kooringal Rd section) In summary, the lighting does not constitute an integrated lighting scheme and may in fact be contributing to the risk of accidents on Lake Albert Rd due to varying uniformity. Importantly, Country Energy has indicated that it plans to progressively replace obsolete low pressure sodium lighting and obsolete tubular fluorescent lighting at the next lamp or luminaire failure[55]. This should see all these obsolete luminaires replaced over the near to medium term (eg 12-36 months). It is therefore vital that agreement be secured on what replacements are to be made (eg luminaire, bracket length, mounting height) and that additions/modification be considered to effect a compliant design.	**PRIORITY :** 2a **TARGET LIGHTING LEVEL:** V3 to Copland, V4 South of Copland **ACTIONS :** 1) Trim trees as needed for light egrees 2) Seek design and quote from Country Energy for upgrade to V3 in conjunction with planned replacements
Kincaid St	Current lighting of Kincaid St includes both single-sided and catenary lighting. In addition to the mix of lighting, there are several unusually long-gaps between lights giving rise to concern about uniformity on this wide road. Kincaid St has exhibited an unusually high number of night-time MVAs (8) over recent years. Reclassification to a target of V4 (from previous target of P3 in 1998 Street Lighting Plan) is recommended because of accident risk.	**PRIORITY :** 2a **TARGET LIGHTING LEVEL:** V4 **ACTIONS :** 1) Seek design and quote from Country Energy for upgrade to V4 in conjunction with planned replacements

[55] *Country Energy letter to REROC 14 May 2007*

Best / Trail / Edmondson / Mitchelmore / Northcott	Best, Trail, Edmondson, Mitchelmore and Northcott form a key linked north-south arterial. Combined, these roads have experienced at least 13 night-time MVAs over recent years. At present, there is a diverse mix of lighting on these streets including obsolete low pressure sodium on the Edmundson section and obsolete tubular fluorescent in the southern portions. In addition to the mix of lighting, there are several long-gaps between lights and significant tree interference in some areas giving rise to concern about uniformity on this wide road, particularly in the lead-in / lead-out from recently upgraded roundabouts. Importantly, Country Energy has indicated that it plans to progressively replace obsolete low pressure sodium lighting and obsolete tubular fluorescent lighting at the next lamp or luminaire failure[56]. This should see all these obsolete luminaires replaced over the near to medium term (eg 12-36 months). It is therefore vital that agreement be secured on what replacements are to be made (eg luminaire, bracket length, mounting height) and that additions/modification be considered to effect a compliant design.	**PRIORITY :** 2a **TARGET LIGHTING LEVEL:** V3 & V4 **ACTIONS :** 1) Seek design and quote from Country Energy for upgrade to V3 & V4 in conjunction with planned replacements
Docker / Gurwood / Bourke	Docker, Gurwood and Bourke form a key linked north-south arterial. Combined, these roads have experienced at least 5 night-time MVAs over recent years. In addition, there have been 8 night-time MVAs at or near the intersection with the Sturt Highway. At present, there is a diverse mix of lighting on these streets including obsolete low pressure sodium catenary lighting on Bourke south of Fernleigh and high pressure sodium catenary lighting on Gurwood. Long gaps were noted in some areas. Importantly, Country Energy has indicated that it plans to progressively replace obsolete low pressure sodium lighting at the next lamp or luminaire failure[57]. This should see all these obsolete luminaires replaced over the near to medium term (eg 12-36 months). It is therefore vital that agreement be secured on what replacements are to be made (eg luminaire, bracket length, mounting height) and that additions/modification be considered to effect a compliant design.	**PRIORITY :** 2b **TARGET LIGHTING LEVEL:** V3 & V4 **ACTIONS :** 1) Seek design and quote from Country Energy for upgrade to V3 & V4 in conjunction with planned replacements

[56] *ibid*
[57] *Country Energy letter to REROC 14 May 2007*

Pearson / Glenfield	Pearson and Glenfield form a key north-south arterial. Combined, these roads experienced at least 3 night-time MVAs over recent years. In addition, there have been 6-9 night-time MVAs at or near the intersection with the Sturt Highway. At present, the section of road between the Sturt Highway and Dobney is poorly lit in contrast to the section from Dobney to Urana which appears of better standard. South of Urana, on Glenfield there is no street lighting except at intersections and no electricity infrastructure to mount lights on. With a greenspace between Glenfield and nearby housing, there are no driveway entrances to Glenfield and few intersections. None of the reported MVAs in recent years have been in this unlit sections of Glenfield however, the LAC has noted issues with vandalism on this section of road.	**PRIORITY :** 2b (Sturt to Dobney) and 3 elsewhere **TARGET LIGHTING LEVEL:** V3 & V4 **ACTIONS :** 1) Seek design and quote from Country Energy for upgrade Pearson from Sturt to Dobney to V4 in conjunction with any planned replacements 2) Conduct regular review of unlit sections of Glenfield to asses any changes in need for lighting
Travers St	Travers is an important access route to and from the Sturt Highway for residents in Wagga Wagga and North Wagga. This road has experienced at least two night-time MVAs over recent years. In addition, there have been 2 night-time MVAs at or near the intersection with Fitzmaurice. While the lighting at either end of Travers is newer and to a higher standard, the portion of Travers St from Trail St to Beckwith contains long gaps and additional lights appear to be needed.	**PRIORITY :** 2b **TARGET LIGHTING LEVEL:** V4 **ACTIONS :** 1) Progressive upgrade to V4 as lights are replaced

Red Hill Rd	With a greenspace between much of Red Hill and nearby housing, there are no driveway entrances to Red Hill and few intersections. Red Hill Rd primarily is only lit at intersections. Lead-in / lead-out lighting of these currently lit intersections requires attention. The new intersection with the Olympic Hwy is currently unlit and also requires attention. The connection of Red Hill Rd at the west end to the Olympic Highway has created a by-pass route for traffic to go around Wagga. Substantial changes in volume and traffic patterns are therefore possible. While there have been no night-time MVAs reported on Red Hill in recent years, the situation should be reviewed regularly with a view to upgrading intersection lighting as needed and, in the future, installation of a full lighting scheme.	**PRIORITY :** 2b **TARGET LIGHTING LEVEL:** V4 at intersections with regular review **ACTIONS :** 1) Seek design and quote for improved lead-in / lead-out lighting near intersections. 2) Conduct review of changed traffic patterns following connection to Olympic Highway
Kooringal Rd	Kooringal is largely unlit between the Sturt Highway and Simkin where there is no housing and few businesses. There is some lighting near the Sturt Highway and a roundabout at Copland is lit. South of Simkin, where housing begins, the lighting is: • a mixture of sources including obsolete tubular fluorescent, lower wattage high pressure sodium and more powerful high pressure sodium • a mixture of mounting heights and bracket arm lengths • some gaps in the arrangements Importantly, Country Energy has indicated that it plans to progressively replace obsolete tubular fluorescent lighting at the next lamp or luminaire failure[58]. This should see all these obsolete luminaires replaced over the near to medium term (eg 12-36 months). It is therefore vital that agreement be secured on what replacements are to be made (eg high wattage high pressure sodium luminaires on longer bracket arms at consistent mounting heights) and that additions/modification be considered to effect a compliant design.	**PRIORITY :** 3 **TARGET LIGHTING LEVEL:** V4 **ACTIONS :** 1) Seek design and quote from Country Energy for upgrade to V4 in conjunction with planned replacements

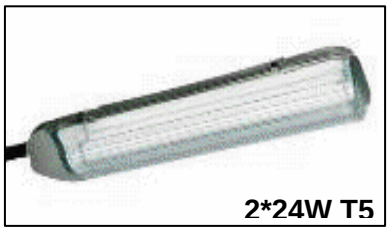
A map of Target AS/NZ1158 Lighting Levels on arterial and sub-arterial roads, consistent with the above table, follows:

[58] *ibid*


Target AS1158 Lighting Levels
V3 Major Arterials
V4 Sub-Arterials
All residential collectors to be P3, new residential roads to be P4 and all existing residential roads with wooden distribution poles to be at least P5
San Isidore
Forest Hill
Kapooka
BOMEN
BOOROOMA
CARTWRIGHT HILL
NORTH WAGGA WAGGA
EAST WAGGA WAGGA
SPRINGVALE
LLOYD
Lake Albert
Murrumbidgee River
OLD NARRANDERA RD
STURT HWY
WAGGA WAGGA Street Map

Residential Roads

Residential road lighting is generally to be undertaken using new energy efficient 2*24W T5 or 42W CFL luminaires, consistent with best practice elsewhere[59]. These luminaires deliver high colour rendition white light and comparable AS/NZ1158 compliance with 55-65% energy and greenhouse savings compared to Country Energy's current Standard Luminaires of 80W mercury vapour and 70W high pressure sodium. More than 9000 T5 luminaires have been deployed by Integral Energy in western Sydney and the Illawarra in recent years with reportedly high levels of reliability and strong council support.



The recommendation to use T5 & CFL lighting is dependent on a successful commercial outcome on pricing for the new lighting with Country Energy which is the subject of on-going discussions involving Council and REROC. An alternative available to council is to take over direct management of the lighting, contracting installation and maintenance work externally

Recognising that tree canopies are maturing in Wagga, consideration should also be given to moving to a 2m bracket are as the default for all residential road lighting installations. This is consistent with a policy adopted in Sydney by EnergyAustralia in 2004 with the support of Councils.

The following table outlines the lighting status and recommendations for key categories of residential roads:

[59] *Note that other technologies considered included mercury vapour, high pressure sodium, metal halide, induction and LED light sources*

Area	Status	Recommended Target Lighting Level under AS/NZ1158 and Recommended Actions
Residential Roads	As noted in Section 4, much of the lighting on residential roads, particularly tubular fluorescent, is obsolete or performs poorly. Importantly, Country Energy has indicated that it plans to progressively replace obsolete tubular fluorescent lighting at the next lamp or luminaire failure[60]. This should see all these obsolete luminaires replaced over the near to medium term (eg 12-36 months). In short, when considered in conjunction with ordinary replacements of other types of residential road lighting, up to 50% of all residential road lighting could be replaced in the next three years by Country Energy. It is therefore vital that agreement be secured on the replacement technology to be used and the installation approach (eg if longer bracket arms are to be used). ***DEDICATED STEET LIGHTNG COLUMNS*** Perhaps 1/3 of Wagga's residential roads, particularly in areas newer than 20-30 years old, are lit from dedicated street lighting columns. The style and type of columns vary but in general, such installations would likely have been designed to meet AS/NZ1158 or would have the potential to meet AS/NZ1158 with a modern luminaire. In some areas, set-backs of dedicated street lighting columns from the curb were substantial and coincident with or behind tree plantings (eg Raye St, Tolland; Sackville Dr, Forest Hill). As canopies have matured, the lights have become substantially blocked by foliage and significant tree trimming may not entirely solve the problem (see picture). Country Energy should be consulted to see if longer bracket arms can be retrofit in such situations at the time of luminaire replacement, otherwise, poles may need to be moved or replaced using ones with greater outreach. 	**PRIORITY :** 1 **TARGET LIGHTING LEVEL:** P4 for new and areas at elevated risk of crime / P5 where existing wooden distributon poles exist **ACTIONS :** 1) Conclude price negotiations with Country Energy on new energy efficient default lighting and agree on implementation schedule for bulk replacement of obsolete tubular fluorescent lighting. Importantly, Council should suspend accelerated replacement of obsolete tubular fluorescent lighting until there is agreement on technology choice. 2) Prioritise areas at elevated risk of crime for bulk replacement of obsolete tubular fluorescent lighting

[60] *Country Energy letter to REROC 14 May 2007*

Residential Roads *(Cont)*	***LIGHTS ON WOODEN POLES*** Somewhat unusually, many of Wagga's residential roads that are lit from existing wooden distribution poles have a light on every pole. This differs markedly from the Australian norm of a light on every second pole. While more costly, it has the potential to give Wagga Wagga better and more even lighting on its residential roads. However, ***AREAS AT ELEVATED RISK OF CRIME*** *Four areas have been identified as being at elevated risk of crime:* • Ashmont • Kooringal • Tolland • Area behind Railway Street (eg Macleay, Collins St and Flinders St) where, because of maturing canopies, longer bracket arms are needed and additional lights are required to bring lighting up to a suitable standard	3) Review with Country Energy possible modifications or alternatives to dedicated poles that are set back amongst trees 4) Use GIS data to identify gaps in the residential road lighting network[61][62] and prioritise additional lights based on gap size and in areas at elevated risk of crime

[61] *Note Kogarah Council and Next Energy development of award winning GIS application to undertake this task*
[62] *Eg September 2007 petition from residents of Lakeside Dr noting long gap in lighting network*

Heritage Precinct	Wagga's 1998 Street Lighting Plan correctly identified catenary lighting (see picture below) as one of the only feasible lighting solutions for roads with very large and mature tree canopies such as those found in Wagga's heritage precinct. The roads in this precinct are often very wide (eg 30m road reserve) and, where catenary lighting has been installed, gaps can be very long (eg Nov 07 surveys showed spans of up to 88m on Fox St). In summary: • the use of catenary lighting appears appropriate but additional lights are needed; • tree trimming is urgently needed in many locations to facilitate light egress (eg see picture of lighting on Gurwood)  • council should undertake consultation with the community clarifying that, while lighting can be improved, it is never likely to meet AS/NZ1158 because of the heavy tree canopies and wide roads  • council formally recognise, through this Strategy or other instrument, that its lighting policy in the heritage precinct is to seek feasible lighting improvements but that compliance with AS/NZ1158 is unlikely to be achieved	**PRIORITY :** 2 **TARGET LIGHTING LEVEL:** As close to P5 as feasible **ACTIONS :** 1) Conduct a detailed lighting review of the heritage precinct in conjunction with Country Energy ensuring that the maximum Wattage lamps available for the catenary luminaires are used and identifying opportunities to fill in gaps in current lighting with additional catenary lights. 2) Institute tree trimming to facilitate light egress 3) Following consultation, adopt policy recognising different lighting approach and standard for heritage precinct

Springvale and similar semi-rural areas	In Springvale and surrounding areas of semi-rural estates have evolved largely without street lighting. The typical situation is that: • Roads are unlit except for intersections with main roads • As per Country Energy's Management Plan Section 4.2 describing such situations, there are often no footpaths, finished edges to roads, large lots, very low traffic volumes and few pedestrians at night. As suggested by Country Energy, AS/NZ1158.3.1 does not appear to apply to such situations. There is also a real question as to whether residents in such communities would support higher lighting levels, particularly when many of these houses have been purchased explicitly for their "rural" setting. Council should undertake consultation with these communities and consider adopting a policy explicitly recognising that lighting in its semi-rural periphery is provided on a limited basis in consultation with local residents and that these arrangements differ from urban areas and those recognised under AS/NZ1158.	**PRIORITY :** 3 **TARGET LIGHTING LEVEL:** V4 at intersections with main roads **ACTIONS :** 1) Ensure intersections are adequately lit to at least V4 2) Following consultation, adopt policy recognising different lighting standard for semi-rural areas 3) Review policy as density increases
Villages	As is typical of many rural NSW towns, lighting in the villages surrounding Wagga follows a different pattern than the urban area of Wagga. The typical situation is: • Ad hoc, with some streets lit and others not • Lighting often located at corners, pointing diagonally into intersections • Some lights in the middle of blocks but often not • Long gaps between lights (where there is lighting), often exceeding 120-150m • As per Country Energy's Management Plan Section 4.2 describing such situations, there are often no footpaths, finished edges to roads, large lots, very low traffic volumes and few pedestrians at night. As suggested by Country Energy, AS/NZ1158.3.1 does not appear to apply to such situations. There is also a real question as to whether residents in such communities would support higher lighting levels. Council should undertake consultation with these communities and consider adopting a policy explicitly recognising that lighting in its Villages is provided on a limited basis in consultation with local residents and that these arrangements differ from urban areas and those recognised under AS/NZ1158.	**PRIORITY :** 3 **TARGET LIGHTING LEVEL:** V3 **ACTIONS :** 1) Following consultation, adopt policy recognising different lighting standard for villages

Pedestrian Crossings

The lighting of pedestrian crossings should generally to be undertaken using 150W and 250W high pressure sodium luminaires, consistent with best practice elsewhere.

Pedestrian Crossings	As a separate project, Wagga is current reviewing lighting at 14 lit pedestrian crossings in Wagga. Four do not appear to meet the minimum requirements of AS/NZ1158.4 and recommendations have been made   for modification. In addition, while the other 10 lit pedestrian crossings are potentially compliant, there appear to be several that are misdirected, with notable examples on Baylis St (see pictures below).	**PRIORITY :** 1 **TARGET LIGHTING LEVEL:** AS/NZ1158.4 **ACTIONS:** 1) Implement improvements called for in current review at four pedestrian crossings 2) Ensure proper aiming of luminaires at all pedestrian crossings

Railway Crossings

Note that the minimisation of accident risk at railway crossings, of which effective street lighting is one element, is separately addressed in the Wagga Wagga City Council Railway Crossing Improvements Plan 2001[63].

Other Actions

In addition to the actions outlined above, a number of other steps need to be taken by Council with regards to street lighting:

1) **Energy Supply Contract** – Wagga Wagga's current street lighting electricity supply contract, entered into in April 2005 with Country Energy, expires 31 May 2008. Note that the past 12 months have seen significant price volatility in the National Electricity Market with large increases in recent contract prices.
2) **Tree Trimming –** As mentioned in a number of sections (see Section 4.9), Council responsibilities with regards to tree trimming for effective light distribution need to built into a systematic program.
3) **Traffic Route Lighting Subsidy Scheme** – Like other councils in NSW, Council receives a subsidy from the RTA for lighting on traffic routes. The subsidy payment should be carefully reviewed against the current RTA rules[64] to ensure that it remains appropriate.
4) **Community Education on Outages** – As per Section 4.9, Council and Country Energy need to improve the promotion of the street lighting outage reporting hotline to residents.

[63] *http://www.wagga.nsw.gov.au/resources/documents/Railway_Level_Crossings_Plan.pdf*
[64] *http://www.rta.nsw.gov.au/doingbusinesswithus/trafficfacilities/localcouncils/trafficroutelightsubsidyscheme.html*

5) **Testing Inventory** – As per Section 4.8, when a more detailed inventory of street lighting becomes available from Country Energy, Council should test the robustness of the inventory and accuracy of the billing in a variety of ways (eg confirm the existence of particular lights in the inventory, identify potential double-counting / phantom lights by reconciling GIS and inventory data)

6) **Council-Owned Lighting -** As outlined in the attached Appendix, Council should develop an inventory of council-owned lighting and institute a preventive maintenance regime both to control cost and boost reliability and asset life. This applies not just to lighting of Baylis St (if council continues to own this lighting) but also to council owned lighting in parks, reserves, sporting fields, car parks etc.

7) **New Lighting Installations –** In new subdivisions, future lighting designs should be undertaken in close consultation with landscape architects to ensure that tree plantings and lighting are compatible and will remain so as tree canopies mature.

6 ESTIMATED COST OF THE PROPOSED STRATEGY

The following initial estimates for the highest priority items in the Strategy are based on the cost of recent lighting installations undertaken in Wagga Wagga by Country Energy or contractors working to Country Energy requirements.

Road	Estimate Capital Cost	Notes
Sturt Highway	$230,000	Based on ~60 new lights being added on existing poles and/or existing lights requiring substantial modification at an average of approximately $3000 per pole plus ~5 additional poles at approximately $10,000 per pole.
Baylis St	$240,000	Based on Country Energy's proposed retrofit decorative luminaire choice at approximate $1500 per pole and $90,000+ for modification of higher level lighting at key intersections.
Residential Roads	$0 capital cost for replacement of existing lights under normal replacement program; ~$700-1000 per additional light that Council chooses to add	Changes to total operating costs for new lights are the subject of current negotiations involving REROC. Based on initial Country Energy pricing proposals, new energy efficient lights are approximately $20 / light / year more expensive however, this initial pricing proposal appears unsupportably high.
Pedestrian Crossings	$15-30,000	Based on substantial reworking of 4 pedestrian crossings, including some possible pole relocations

7 SUMMARY OF BENEFITS

If implemented as described, the proposed Strategy would progressively result in:

- **More Light** - An effective doubling of lighting levels on many currently under-lit residential road footpaths and road surfaces with a priority placed on implementation in those areas at elevated risk of crime.
- **Whiter Light** - Widespread deployment of high quality "white light" across the residential roads of the LGA and in the commercial and entertainment precinct of Baylis Street
- **Improved Lighting Quality and Compliance with Lighting Standards** - Greatly improved compliance with Australian Standard AS/NZ1158 across the LGA
- **Energy and Greenhouse Savings** - When fully deployed across the current portfolio of lighting, energy and greenhouse gas reductions of an estimated 16% compared to current energy consumption and 40%[65] compared to Country Energy's business-as-usual practices.
- **Less Light Pollution** - Significant reductions in light pollution to the night sky, in obtrusive light on to residents' properties and in glare

[65] *The key driver of energy efficiency and GHG emissions is the choice of residential road lighting, being 75% of the total portfolio. Country Energy's current default replacement, the 80W mercury vapour uses more than double the energy of newer more energy efficient alternatives.*

Appendix: Suggested Inventory Structure & Maintenance Approach for Wagga Wagga-Owned Lights

Whether it involves street lighting owned by Wagga Wagga City Council or other forms of public lighting (eg in parks, memorials, sport fields, plazas or car parks), it is suggested that Wagga Wagga City Council creates a detailed inventory of public lighting and institutes a planned maintenance regime to both minimise costs and maximise lighting effectiveness. The proposed inventory structure and maintenance approach are described below:

Suggested Inventory Structure

The suggested inventory structure for City-owned lights is as follows:

1. ID Number (All installations should be given a unique ID number and tagged as a City-owned asset)
2. Description of location
3. GPS Location (to accuracy better than 1m and in a format meeting the Wagga's GIS needs)
4. Installed Date (Initial installation or subsequent replacement date)
5. Connection Type (Directly connected to Country Energy network or metered installation)
6. Luminaire Brand
7. Luminaire Model
8. Number of Lamps in Luminaire
9. Lamp Type
10. Lamp Energy Consumption
11. Luminaire Energy Consumption (estimated total consumption including ballast losses)
12. Pole Type / Wall Mounted
13. Pole Height and Luminaire Mounting Height
14. Bracket Length and Luminaire Overhang (kerb to luminaire optical centre)
15. Scheduled Bulk Lamp Replacement Interval
16. Date of Last Inspection, Cleaning and last Bulk Re-lamp
17. Date of Last Photocell Replacement
18. Date of Last Spot Outage/Repair
19. Date of 2nd Last Outage/Repair (eg to flag repeat faults)
20. Comment field suitable for tracking repeated faults, vandalism or other unique circumstances
21. Digital photo of luminaire and support
22. External visual condition assessment of luminaire and pole/bracket/bollard
    - Missing, damaged or defective components
    - Tree or other interference

Suggested Maintenance Approach for City-Owned Lights

To control total lighting maintenance costs, Wagga Wagga should adopt a preventive and predictive maintenance regime for all Council-owned lights. The Council should conduct or contract to have conducted a regular inspection, cleaning and maintenance (including bulk lamp replacement as appropriate) of all lighting.

The inspection, cleaning and maintenance cycle should be driven primarily by the bulk lamp replacement and cleaning requirements for the installations (eg every 12, 24 or 36 months depending on lamp technology and location). The tasks should include the following:

1. Verification of existing inventory data and corrections as needed
2. External visual condition assessment of luminaire and pole/bracket/bollard
    - Missing, damaged or defective components
    - Tree or other interference
    - Verify night-time operation
3. Replace any readily replaceable defective or broken components
4. Determine if current/imminent major repair or replacement is required and record
5. Cleaning of luminaire lens and reflectors and, bulk lamp replacement
6. Photocell replacement (at least every 8 years as per AS/NZ1158)
7. Coat visible corrosion with rust protection and touch-up paint as required
8. Re-coat base of pole with rust protection or paint as appropriate
9. Return recovered components for recycle or appropriate disposal. Note that working lamps removed in BLR may have modest resale value. Failed lamps can be sent to an appropriate recycling facility in Victoria (local agent will collect).

The City may also wish to consider night patrols 2-4 times per year in areas where there are no natural reporting parties (eg using park staff or security personnel). Lamp replacements could then be conducted efficiently in bulk following a patrol.

Acknowledgments

Recognising the multi-faceted nature of lighting, its benefits and its consequences, key stakeholders in the preparation and subsequent consultation on this report are diverse. The authors wish to thank the relevant staff that have contributed to this document from the following organisations:

City of Wagga Wagga

NSW Police Service

Country Energy

REROC