Appendix C

Lighting Assessment

Ryde River Walk Masterplan
Pedestrian and Cycleway
Lighting Issues

Introduction

The philosophy for the lighting of the pedestrian paths and cycleways is dependent on the several aspects:

- To what extent are the paths likely to be used at night?
- Does the council want to encourage the use of the paths at night?
- The real and perceived security risk in using the paths
- The potential impact of the lighting on the native flora and fauna
- The potential impact of the lighting on residences that abut the path
- The image of the foreshore from the water
- The affect of the lighting on the night water views
- The desire to identify the presence of the cycleway for its entire length by characteristic lighting

Some of the aspects are conflicting and the relative importance of the aspects may differ for different portions of the route. In a section that has high night pedestrian traffic, near a railway station or bus stop, the path may need to be well lit for safety and security reasons. In other remote or isolated sections there could be a case for not lighting the path at all as it could be construed as encouraging people to use a section of path that has no natural surveillance. Similarly, in isolated paths it may be desirable to have very low level lighting to minimise the impact on the immediate environment.

Standards

There are several standards and guides that have application to the site.
The primary ones are:

a) AS1158.3.1:2005 Lighting for roads and public spaces Part 3.1: Pedestrian area (Category P) lighting- Performance and design requirements
b) Austroads Guide to Traffic Engineering Practice Part 13 Pedestrians
c) Austroads Guide to Traffic Engineering Practice Part 14 Bicycles

These are not mandatory; however they are useful as a guide and could be used as a benchmark if there is some compensation claim against the council.

d) DUAP Crime preventions and the assessment of development applications guidelines.

This falls under the authority of the Environmental Planning and Assessment Act, but may not be applicable to this situation. It has more to say about the process rather than to make specific technical recommendations.

The Austroads documents are general design documents that include some lighting recommendations rather than specific lighting documents. They are also moderately old being published in 1995 and 1995. They draw information from AS1158, but it is from a now superseded edition. They are however still called up on RTA projects.

The Australian Standard A1158.3.1 makes recommendations for a horizontal and vertical illuminance levels and uniformity for a variety of areas based on the criteria of:

a) Amount of night activity or traffic
b) Risk of crime
c) Need to enhance prestige

Where the lighting is predominately for pedestrians there is a vertical illumination requirement as well as a horizontal illumination. The purpose of this is to illuminate people's faces so that a person can identify an approaching person and also make some judgements about their intentions before they are too close. The effect of the vertical illumination requirements is either to reduce the spacing of the light or to increase the glare and spill light in the area.

The other effect of the vertical requirement is that it is virtually impossible to comply using only bollard lighting as the glare would be unacceptable if the vertical illuminance complied.

The standard is not mandatory and there may be valid reasons to depart from it in some areas. The final decision will need to be made by council on the balance of aesthetics, function and risk.

Table 1 compares the recommendations of AS11587.3.1 and the Austroads guides.

The light output of lamps decreases with age. Different lamps depreciate at different rates. This is called lumen depreciation.

When comparing the Austroads guides with AS1158 it should be noted that AS1158 refers to the light output at the end of the lamp life, or the time when the lamp needs to be replaces whereas the Austroads guides refer to average through life. As a result you would expect the Austroads numbers to be around 20% higher than the equivalent area in AS1158.

The Austroads standards tend to be for very high volume spaces and are probably excessive for this application.

General Philosophy

In determining the recommendations the following general philosophies were applied:

a) We have assumed that there is no desire to use the lighting street furniture to mark the river walk route by day and night.

   If this were the case there would have to be a relatively consistent lighting scheme along the entire length. There would be little scope to vary the lighting to react to the local conditions.

   It would also mean that wherever the route went along existing residential streets they would need to have supplementary lighting.

   This could have an advantage however where there are alternative routes that are to be encouraged for night usage, however it might then give contradictory guidance by day.

b) If the section of the river walk will be used as a primary route from a station or ferry wharf then the path should be lit to the appropriate category of AS1158.3.1

c) If the river walk passes along a residential street then the lighting of the residential street is considered adequate provided the street is illuminated to at least P4 category.

d) Isolated paths through mangroves or dense foliage where there is little or no opportunity for natural surveillance should either not be lit at all or at most a row of small marker lights. People should be encouraged to go around the area via the streets at night.

e) Parks and paths though paths have not been lit unless there is not a suitable or safer alternative route.

Draft Recommendations

Table 2 divides the River Walk into categories and attempts to allocate some assessment of the design criteria so that a lighting category can be applied. The recommendations are presented or discussion as the final criteria must be a balance between the council's night usage requirements and their risk management policies.

Power Supplies

The proposed walk appears to all be within the EnergyAustralia distribution area. EnergyAustralia's current policy is that all lighting in parks and on paths not associated with roads will require a separate metered power supply unless the load is small enough to fall into the category of a 'special small service'. This generally only covers two or three post-top fittings.

As a result at each of the areas where off road lighting is required there will need to be a freestanding, or pole mounted switchboard to supply the lighting. As this is a metered supply there is also the opportunity to use it to provide power outlets for events and maintenance if required.

With lighting on the streets, unless the lighting uses standard EnergyAustralia fittings and poles the lighting will also need to have a separate metered power supply.

Lighting Equipment

The success of a night environment depends greatly on the quality aspects of the lighting. The major aspects that affect the success of lighting are control of the glare and the colour of the light.

Glare inhibits the ability to see and is dependent on the ratio between the brightness of the lights source and the background. As the night background is effectively black the only means available to control the glare is to reduce the brightness of the background.

Glare from light fittings has a claustrophobic effect as everything beyond the first light fitting is black and there is no distant view. Under these circumstances increases in illuminance does not necessarily increase visibility and in a lot of cases reduces it.

Lighting that has a flat horizontal glass give good glare control and distant vision. This gives the ability to see people in the distance and increases the feeling of security for people using the path. It also reduced the spill light into the sky and surrounding area and increases the efficiency of the lighting.

Figure 1 shows the difference between a flat glass light fitting and a fitting with a louvred lamp.

Figure 1

The Bega '8082' fitting that is currently used by the Council in some of their parks has good glare control. There are many fittings with similar characteristics. The Kim 'Architype' and the Architectural Area Light 'Largent' are typical examples.

Figure 2 shows some examples of typical flat glass pedestrian luminaires. The flat glass distribution is also available in minor streetlights. These are normally referred to as being aeroscreen fittings.

Figure 2

Bega 8082 Kim Architype AAL Largent

Figure 3 – Rexel Optima Aero

The other important aspect of lighting is colour.

Light sources have two principal colour properties; colour appearance, the colour that the light appears and colour rendering, the accuracy with which colours are reproduced.

Colour appearance varies between warm lamps, which look yellowish and cold lamps that look bluish. Warm lamps are generally preferred for public lighting as they tend to create a more comfortable and relaxed atmosphere.

Colour rendering is generally independent of the colour appearance of the lamp and is dependent on the spectral content of the light. If the colour of light is not in the spectrum of the lamp then the light cannot render that colour.

Lamps like high pressure sodium have poor colour rendering and tend to make people look sallow and unwell. People therefore do not enjoy being in this environment. Under good colour rendering light the whole environment looks more interesting.

The other important aspect of colour rendering is that it improves the ability to identify people.

The preferred lamp source should be either metal halide or fluorescent. Metal halide lamps tend to give much better optical control and overall efficiency, but are a more expensive lamp. Fluorescent lamps are less expensive but give much less optical control and their light output is significantly reduced in low ambient temperatures.

Alternative Power

Solar powered lighting gives a potential opportunity to reduce the green house gases and reduce the cost of mains connection in more remote locations.

There are two basic philosophies in solar lighting;
- stand alone units which have a closed loop of solar panel, battery and lamp, and
- grid connected installations where the lights and the solar panels are connected to the grid.

Stand Alone Solar Lights

With a stand alone unit the amount light and the duration of the light is dependent on the amount of energy that can be collected and stored. A solar lighting installation ideally should have several days of autonomy. That is the battery has sufficient capacity to run the light for several days without charging. This allows for several days of overcast conditions.

The solar collector must also be of sufficient size to fully charge the battery within the charging hours of a typical day. The design criterion therefore becomes a balance between the light output of the fittings and the size of the battery and the solar collector.

If the solar collectors and batteries are undersized then the light will cease to operate part way through the night. If the next day is overcast then there will be no light at all the next night.

Most commercial solar fittings have much smaller lamps than would be used in a conventional fitting, to extend the operating hours of the solar light. As a result the lighting of most solar installations does not meet the recommendations of the Australian Standard AS1158.3.

Although the standard is not mandatory it is not valid to have different criteria for the design of solar lighting to conventional lighting.

In addition, solar panels do not generate if they are partially shaded. If the lights are located in areas where they are shaded for part of the day by trees or buildings then the solar panels need to be increased in size to compensate for the reduced charging time. Most proprietary lights have a single size collector.

The Council's test installation of four fittings at Shepherds Bay was inspected on the evening of 22nd August at 9.00pm. The day had been a sunny day so the lights should have been fully charged. There had been a storm late in the afternoon which would have caused the fittings to come on approximately one hour early.

Of the four fittings only the second from the eastern end was operational.

An illumination of 7 lux was measured directly under the fitting and a vertical illumination of 1 lux was measured 10 metres from the fitting. The ambient illuminance was around 0.3 lux.

It is difficult to know whether the fitting were on full light output or just about to fail as well, but based on the readings the fittings would need to be spaced at around 10 metres to achieve P2 Category lighting and 15 metres to achieve P3. The fittings appeared to be spaced at around 35 metres.

Grid Connected Solar Lighting

With grind connected solar lighting there is no direct relationship between the solar collectors and the fittings. The solar collectors can be on the fittings but can also be mounted totally separately. With this installation the fittings are wired to the mains in the conventional manner, however the solar panels are also connected to the mains via an inverter. There is no battery in this instance as the panels generate into the mains during the day. This energy is resold by Energy Australia as green power. At night the lights draw their power from the grid.

If the panels have the same capacity as the lighting installation then the installation is energy neutral. If the panels have a larger capacity then the installation generates more energy than it uses. In most applications however due to the cost of the panels the installation only generates a portion of the overall energy needs.

This is the system that is used on the lighting towers in the Olympic Boulevard at Homebush Bay.

The advantages of this type of installation is that there is no battery so there will always be light, even if there are successive overcast days. In addition the illumination level is not limited by the panel and battery capacity as the shortfall can be made up from the mains.

The disadvantage is that there is no installation cost saving in the wiring to the fittings to offset the cost of the panels.

Lighting of Artworks

There may be an opportunity to light artworks as part of the overall lighting. The lighting will depend on the nature and the location of the artwork. In general the lighting will again need to be taken from a metered supply.

There is an advantage in lighting iconic artworks in focal locations as it assists people to identify the location. This assists in their orientation and ability to find their way.

It may not be wise to light artworks that are not in prominent locations as it may just attract the attention of vandals and graffiti.

Description	Pedestrian/ Cycle activity	Risk of Crime	Need to enhance prestige	AS1158 Category	AS1158.3.1				Austroads Part 13		Austroads Part 14		
					Average horizontal illuminance **lux**	Point horizontal illuminance (minimum) **lux**	Illuminance (horizontal) uniformity **Max/avg**	Point Vertical Illuminance **lux**	Minimum average illuminance (service) **lux**	Minimum Illuminance (service) **lux**	Minimum average illuminance (service) **lux**	Average Vertical Illumination (service) **lux**	
Local Road or Street	N/A	High	N/A	P1	7	2	10	2	10	2			
	High	Medium	High	P2	3.5	0.7	10	0.7	10	2			
	Medium	Medium	Medium	P3	1.75	0.3	10	N/A	10	2			
	Low	Low	N/A	P4	0.85	0.14	10	N/A	10	2			
	Low	Low	N/A	P5	0.5	0.07	10	N/A	10	2			
Pedestrian and cycle orientated pathways	N/A	High	N/A	P1	7	2	10	2	10	2	5	5	
	High	Medium	High	P2	3.5	0.7	10	0.7	10	2	5	5	
	Medium	Low	Medium	P3	1.75	0.3	10	0.3	10	2	5	5	
	Low	Low	N/A	P4	0.85	0.14	10	N/A	10	2	5	5	
Steps and stairways ramps footbridges Pedestrian ways				P9	7	2	10	2	50	10			
Subways including associated ramps				P10	35	17.5	10	17.5	50	10			
Tunnels <10m											10	10	
Tunnels >10m											20	20	

Table 1 – Composite table of requirements of the standards and guides

TABLE 2 - SECTION BY SECTION ANALYSIS OF THE ROUTE

Item	Description	Pedestrian Activity	Cycle Activity	Risk of Crime	Special considerations	Recommended lighting category	Notes
Precinct 1							
1.1	**Korpie Reserve**	low	low	high	There may be some night traffic if the wharf is used at night	Nil	Note 1
1.2	**Melrose Park**	low	low	high	There may be some night traffic if the wharf is used at night	Nil	Note 1
1.3	**Lanchaster Ave**	low	low	low		P4	Note 2
Precinct 2							
2.1	**Meadowbank Park**	low	low	med	Note 3	P3	
2.2	**Meadowbank Park - Link Path**	low	low	med	Discourage night usage	P3	
2.3	**Charity Point – Ferry Wharf**	med	low	med		P3	
Alternate Route							
2.3a	Charity Point – Railway Link Path	med	low	med		P3	
2.3b	Meadow Crescent	med	low	low		P4	Note 2
2.3c	Bank Street	med	low	low		P4	Note 2
Precinct 3							
3.1	**Railway to Ferry Access Path**	med	med	med	Preferred night route	P3	
3.2	**Meadowbank Wharf to Helene Park**	med	med	med		V4	Already lit as a traffic route

Alternate Route							
3.1a	Railway Road	med	med	low	Preferred night route	V3	Already lit as a traffic route
3.1b	Constitution Road	med	med	low	Preferred night route	V3	Already lit as a traffic route
3.1c	Bowen Street	med	med	low	Preferred night route	P4	Note 2
3.3	**Shepherds Bay**	med	med	med		P3	
3.4	**Shepherds Bay Park**	med	med	med		P3	
3.5	**Loop Road**	med	med	med		P3	
Precinct 4							
4.1	**Waterview Street**	med	med	med	Preferred night route	P4	Note 2
4.1a	Settlers Park	low	low	high	Do not light – discourage night usage	Nil	Note 1
4.2	**Waterview Street**	med	med	low	Path adjacent to the road Preferred night route	P3	
4.2a	Kissing Point Park (West	low	low	high	Do not light – discourage night usage	Nil	Note 1
4.3	**Delange Road**	med	med	low	Path adjacent to the road Preferred night route	P3	
4.4	**Pellisier Pl lane**	low	low	high	Do not light – discourage night usage	Nil	Note 1
4.5	**Kissing Point Park East**	low	low	high	Do not light – discourage night usage	Nil	Note 1
4.6	**Chadwick Street**	low	low	low		P4	Note 2
4.7	**Hoffman Park**	low	low	med	Do not light – discourage night usage	Nil	Note 1
Precinct 5							
5.1	**Pellisier Road**	low	low	low	Preferred night route	P4	Note 2
5.2	**Putney Park**	low	low	high	Do not light – discourage night usage	Nil	Note 1
5.3	**Jetty Road**	low	low	low	Preferred night route	P4	Note 2

Precinct 6							
6.1	**Morrisons Bay Park**	low	low	med	Neither 6.1 or 6.1a have good surveillance at night	P1	Light 6.1 or 6.1a
6.2	**Footbridge and path through the path**	low	low	med	6.2 had relatively good distant surveillance but the centre of the path is a long way from the road	P2	
Alternate Route							
6.1a	Morrisons Bay Park North	low	low	med	Neither 6.1 or 6.1a have good surveillance at night	P1	Light 6.1 or 6.1a. 6.1a is preferable as the insecure length is less and is closer to houses
6.1b	Francis Road	low	low	low	Preferred night route	P4	Note 2
6.1b	Morrison Road	low	low	low	Preferred night route	V3	Already lit as a traffic route
6.4	**Teemer Street**	low	low	low		P4	Note 2
6.5	**Tennyson Road**	low	low	low		P4	Note 2
6.6	**Brett Street**	low	low	low		P4	Note 2
6.7	**Champion Road**	low	low	low		P4	Note 2
6.8	**Morrison Road – footpath**	low	low	low	Path adjacent to the road Preferred night route	P3	
Alternate Route							
6.4a	Bayview St	low	low	low		P4	Note 2
6.4b	Beach Street	low	low	low		P4	Note 2
6.4c	Tennyson Road	low	low	low		P4	Note 2
6.4d	Champion Road	low	low	low		P4	Note 2
6.4e	Bill Mitchell Park	low	low	med	Do not light – discourage night usage	Nil	Note 1

Precinct 7							
7.1	**Western Crescent**	low	low	low	Discourage night usage as it leads to Glades Bay Park which has poor surveillance	P4	Note 2
7.2	**Glades Ave**	low	low	low	Discourage night usage as it leads to Glades Bay Park which has poor surveillance	P4	Note 2
7.3	**York Street**	low	low	low	Discourage night usage as it leads to Glades Bay Park which has poor surveillance	P4	Note 2
7.4	**Ashburn Place**	low	low	low	Discourage night usage as it leads to Glades Bay Park which has poor surveillance	P4	Note 2
7.5	**Glades Bay Park**	low	low	med	Do not light – discourage night usage	Nil	Note 1
Alternate Route							
7.1a	Morrison Road	low	low	low	Preferred night route	V3	Already lit as a traffic route
	Meriton St	low	low	low	Preferred night route	P4	Note 2
7.6	**Meriton St**	low	low	low	Preferred night route	P4	Note 2
7.7	**Ashburn Place**	low	low	low	Preferred night route	P4	Note 2
Alternate Route							
7.5a	Delmar Parade	low	low	low	Discourage night usage as it leads to Glades Bay Park which has poor surveillance	P4	Note 2
7.5b	Shackel Ave	low	low	low	Discourage night usage as it leads to Glades Bay Park which has poor surveillance	P4	Note 2
7.5c	Pile St	low	low	low	Discourage night usage as it leads to Glades Bay Park which has poor surveillance	P4	Note 2
7.5d	Wharf Road	low	low	low	Discourage night usage as it leads to Glades Bay Park which has poor surveillance	P4	Note 2

7.8	**Ashburn Place**	low	low	low	Preferred night route	P4	Note 2
7.9	**Punt Road**	low	low	low	Preferred night route	P4	Note 2

Notes:

1. In areas that are isolated and have poor natural surveillance it may be better not to light the paths as lighting could invite people to use the path at night and create a false sense of security.
2. Where the route follows existing residential streets we have assumed that the standard streetlighting would be adequate.
3. Where the path moves through mangroves and trees it may be possible to mark the path with small ground mounted lights. This will identify the path with the minimum of impact on the night environment, however it will also tend to indicate to people that this is an acceptable route at night even though there will be inadequate illumination and surveillance. This is a matter of risk management.
4. The risk of crime has been based on as assessment of the 'opportunity' rather than an historical assessment past activity.