

REDFERN STUDENT VILLAGE

**13-23 Gibbons Street, Redfern
Qualitative Light Spill Assessment**

Prepared for:

The Trust Company (Australia) Limited ATF WH Gibbons Trust
c/-Allen Jack + Cottier
79 Myrtle Street
CHIPPENDALE 2008

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BASIS OF REPORT

This report has been prepared by SLR Consulting Australia Pty Ltd with all reasonable skill, care and diligence, and taking account of the timescale and resources allocated to it by agreement with The Trust Company (Australia) Limited ATF WH Gibbons Trust (the Client). Information reported herein is based on the interpretation of data collected, which has been accepted in good faith as being accurate and valid.

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DOCUMENT CONTROL

Reference	Date	Prepared	Checked	Authorised
610.18313-R03-v1.0	13 December 2018	Peter Hayman	Dr Neihad Al-Khalidy	Neihad Al-Khalidy

EXECUTIVE SUMMARY

SLR has been engaged by Gibbons Trust to assess the lighting environment around a proposed development at 13-23 Gibbons Street, Redfern

Due to the nature and use of the building there are areas that may be lit during curfew hours when there are tighter restrictions on light spill from the site. There is the possibility that some adverse light spill may fall on the facades of the nearby dwellings. Those most at risk are current and proposed surrounding residential apartment blocks. Recommendations such as additional shielding and particular lighting designs have been provided to reduce any light spill.

The light survey showed a significant amount of night time lighting in the surrounding area with a number of measurement locations showing illuminance values above the required limits.

Taking all of the above into account it is SLR's view that should the mitigation measures as recommended be implemented and a proper lighting fit out used, the effects of light spill on all potentially affected sensitive receivers should be below 2 lux or 4 lux depending on the use of each property. Also the proposed development should not increase the amount of light spill on sensitive receivers which are already above the limit.

To ensure there is no adverse light spill from the site further light spill model calculations should be conducted once the detail design is progressed.

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1 Introduction

SLR Consulting Australia Pty Ltd (SLR) has been engaged by The Trust Company (Australia) Limited ATF WH Gibbons Trust (Gibbons Trust) to assess the lighting environment around a proposed development at 13-23 Gibbons Street, Redfern. This will involve qualitative study of the lighting systems to be used in the proposed development and their effect on the surrounding area. This will form part of the Development Application to comply to Sears request.

1.1 Site and Surrounds

Figure 1 Aerial Image of Site Location



The proposed site is bounded to the east by the existing BP service station, to the south by Margaret Street and to the west by Gibbons Street, with a future development proposed to the north. Surrounds of the site are predominantly low level buildings, with there being some higher level development close to the site to the north and west. The exiting open landscape area, carpark and train station to the northwest results in some reduced shielding through this region.

1.2 Proposed Development Description

The proposed design consists of the following features:

- One level of basement including gym, movie room, laundry, garbage room and bike storage;
- Ground Floor (Level 1) with common area, retail unit, bike workshop and storage and office space;
- Level 2 and Level 3 with internal and external common areas, student units;
- Level 4 with internal and external common areas, student units;
- Levels 5-18 for student units; and
- Level 18 with common area

Figure 2 Site Plan (Ground Floor)



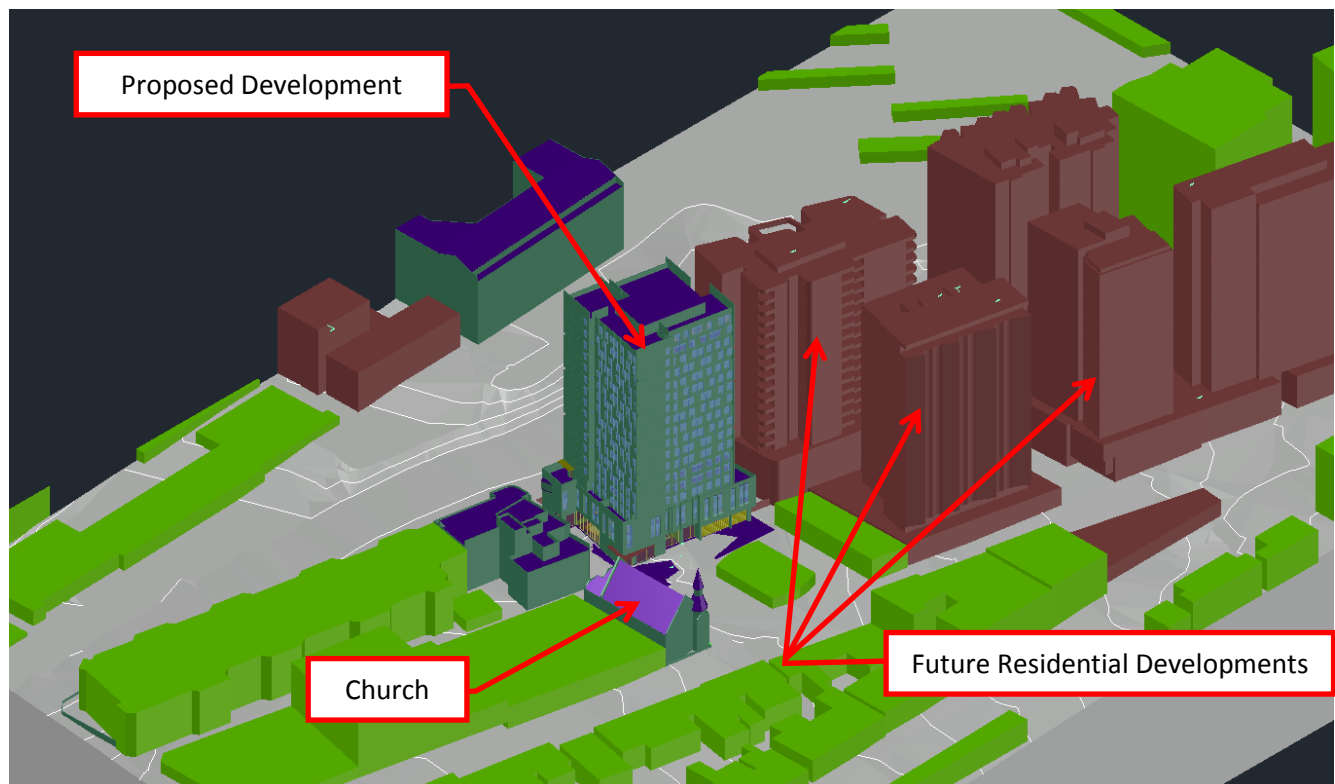
2 Light Spill

2.1 Background

As part of the Development Application, SLR has been asked to qualitatively assess light spill from the proposed development on to the surrounding streetscape. There are a number of areas within the proposed development that are likely to be lit artificially that will be assessed in this report. The site is surrounded by a number of different land uses such as:

- Service station to the east
- St Luke's Presbyterian Church to the south east
- A planned residential tower to the north
- Low level retail buildings to the north and south
- Gibbons Street reserve to the west

Figure 3 3D View of Proposed Development and the Surroundings



2.2 Lighting Terminology

A description of the common terminology used for the lighting study, taken from *AS 4282: Control of the Obtrusive Effects of Outdoor Lighting*, is shown in **Table 1**

Table 1 Lighting Terminology (Consistent with AS4282)

Obtrusive light	Spill light which, because of quantitative, directional or spectral attributes in a given context, gives rise to annoyance, discomfort, distraction or a reduction in the ability to see essential information, eg: traffic lights.
Spill light	Light emitted by a lighting installation which falls outside the boundaries of the property on which the installation is sited.
Residential property	Land upon which a dwelling exist or may be developed, eg: land zoned for residential development.
Dwelling	A building in which people normally reside, especially during the hours of darkness, eg house, hotel, motel, hospital.
Illuminance	The luminous flux arriving at a surface divided by the area of the illuminated surface. Unit: lux(lx); 1 lx = 1 lm/m ²
Luminous intensity	The concentration of luminous flux emitted in a specific direction. Unit: candela (cd).
Luminous flux	The measure of the quantity of light. For a lamp or luminaire it normally refers to the total light emitted irrespective of the directions in which it is distributed. Unit: lumen (lm).
Luminaire	Apparatus which distributes, filters or transforms the light transmitted from one or more lamps and which includes, except for the lamps themselves, all the parts necessary for fixing and protecting the lamps and, where necessary circuit auxiliaries together with the means for connecting them to the electrical supply.
Glare	Condition of vision in which there is a discomfort or a reduction in the ability to see, or both, caused by an unsuitable distribution or range of luminance, or to extreme contrast in the field of vision <ul style="list-style-type: none"> (a) Disability Glare – Glare that impairs the visibility of objects without necessarily causing discomfort. (b) Discomfort Glare – Glare that causes discomfort without necessarily impairing the visibility of objects.

2.3 Light Spill Criteria

The effect of light spill from outdoor lighting impacting on residents, transport users, transport signalling systems and astronomical observations is governed by the Australian Standard: *AS 4282-1997 Control of the Obtrusive Effect of Outdoor Lighting*.

The obtrusive effects of light spill are due both to an increase in general illuminance that can lead to sleep deprivation, and from the direct view of the light source that can cause glare issues.

The adverse effects of light spill from outdoor lighting are influenced by a number of factors:

- The topology of the area. Light spill is more likely to be perceived as obtrusive if the lighting installation is located higher up than the observer. Lighting installations are usually directed towards the ground and an observer would hence have a direct view of the luminaire.

- The surrounding area. Hills, trees, buildings, fences and general vegetation have a positive effect by shielding the observer from the light installation.
- Pre-existing lighting in the area. Light from a particular light source is seen as less obtrusive if it is located in an area where the lighting levels are already high, eg in cities. The same lighting installation would be seen as far more bothersome in a dark residential area.
- The zoning of the area. A residential area is seen as more sensitive compared to commercial areas where high lighting levels are seen as more acceptable.

Typical illuminance levels for a variety of circumstances are given in **Table 2** for comparison.

Table 2 Typical Illuminance Levels for Various Scenarios

Lighting Scenario	Horizontal Illuminance (lux)
Moonless overcast night	0.0001
Quarter Moon	0.01
Full Moon	0.1
Twilight	10
Indoor office	300
Overcast day	1,000
Indirect sunlight clear day	10,000-20,000
Direct sunlight	100,000-130,000

2.4 Time of Operation

The applicable limits for adverse spill light depend on the time of operation for the lighting installation. Operation taking place during *pre-curfew hours*, between 6am and 11pm (Refer AS 4282-1997), is less likely to give cause to complaints from adjacent residential properties, while a more restrictive limit is applicable to *curfew hours*.

It is possible that lights could be used late at night therefore the limits for curfew hours will be used.

2.5 Requirements

The maximum recommended values of light technical parameters for the control of obtrusive lights are given in **Table 3**.

The vertical illuminance limits for *curfew hours* apply in the plane of the windows of habitable room or dwelling on nearby residential properties. The vertical illuminance criteria for *pre-curfew hours* apply at the boundary of nearby residential properties in a vertical plane parallel to the boundary. Values given are for the direct component of illuminance, ie: no reflected light is taken into account.

Limits for luminous intensity for *curfew hours* apply in directions where views of bright surfaces of luminaires are likely to be troublesome to residents, from positions where such views are likely to be maintained.

Limits for luminous intensity for *pre-curfew* hours apply to each luminaire in the principal plane, for all angles at and above the control direction.

Table 3 Recommended Maximum Values of Light Technical Parameters (AS4282)

Light Technical Parameter	Time of Operation	Commercial Areas	Residential Areas	
			Light Surrounds	Dark Surrounds
Illuminance in vertical plane (E_v)	Pre-curfew hours	25 lx	10 lx	10 lx
	Curfew hours	4 lx	2 lx	1 lx
Luminous Intensity emitted by luminaires (I)	Pre-curfew hours	7,500 cd (for a medium to large area with Level 1 control)	100,000 cd (for a large area with Level 1 control)	100,000 cd (for a large area with Level 1 control)
	Curfew hours	2,500 cd	1,000 cd	500 cd
Threshold Increment (TI)	Limits apply at all time where users of transport systems are subjected to a reduction in the ability to see essential information	20% based on <u>adaption</u> luminance (L) of 10 cd/m ²	20% based on <u>adaption</u> luminance (L) of 10 cd/m ²	20% based on <u>adaption</u> luminance (L) of 10 cd/m ²

The limiting requirement for light spill will vary depending on the use of the surrounding sites. It is likely to be either 2 or 4 lux.

3 Qualitative Assessment

3.1 Ground Level

There will likely be lighting fixtures for pedestrian movement around the exterior of the site and light could emanate from the lounge and games areas.

The awning along the south and west sides will help to contain any upward light spill toward the residential apartments to the south. Any required lighting around the main or side entrances could also be placed under the awning. If lighting fixtures are placed and oriented correctly there will be no light spill above the required limits at surrounding sensitive receivers.

3.2 Level 2 Outdoor Common Area

The common area on the north side of the building will require lighting and there is a residential development planned to the north of the site. Lighting fixtures can appear to be more obtrusive when mounted higher up. Lighting in this area should be placed so that it faces away from the building to the north. This will ensure there is no light spill above the required limits.

3.3 Level 3 Outdoor Common Area

Similarly to level 2 the small common area on the north side of the building will also require lighting. Lighting in this area should be placed so that it faces away from the building to the north. This will ensure there is no light spill above the required limits. The larger common outdoor areas on Levels 2 and 4 will most likely be used more frequently and as such the risk of any light spill from this area will be reduced.

3.4 Level 4 Outdoor Common Area

Similarly to the Level 2 outdoor area this area will also require lighting. Again lighting should be placed so that it faces away from any buildings that face this façade. There is also a larger distance to neighbouring buildings on the western side of the site. This will ensure there is no light spill above the required limits.

4 Light Survey

A light survey of the area surrounding the site was conducted on the night of the 19th November 2018. The measurements were taken around the edge of the site and at a number of facades facing the site.

Figure 4 Measurement Locations



Measurements were taken at a height of 1.5 metres above the ground spaced approximately 17 metres apart. A Testo 545 light meter was used for the testing.

Table 4 Illuminance Measurements (Lux)

Position	Horizontal (Lx)	Vertical (Lx)	Location	Features in the Vicinity
1	0	1	West façade of site building	Vegetation (2 storeys high)
2	6	4	West façade of site building	Vegetation (2 storeys high) Street Light
3	2	4	West façade of site building	Vegetation (2 storeys high)
4	0	1	South facade of site building	Residential/ room light (weak)
5	1	4	South façade of site building	Residential/ room light (weak)
6	4	4	South facade of site building	Residential/ room light (weak)
7	4	4	South façade of site building	Residential/ room light (weak)
8	6	14	East facade of site building	Petrol station (~100m northeast)
9	13	30	East façade of site building	Located in front of petrol station
10	6	18	East facade of site building	Petrol station (~100m southeast)
11	39	10	West to Regent St	Light from petrol station
12	5	1	West to Regent St	Commercial lights from opposite street Petrol Station (~100m away)
13	6	8	West to Regent St	Commercial lights from opposite street
14	50	14	East to Regent St,	Streetlight Dim light from commercial buildings
15	9	4	East to Regent St	Dim light from commercial buildings
16	31	21	East to Regent St	Dim light from commercial buildings
17	5	10	South to Margaret St	Fuel Price Board Petrol station (~200-300m away)
18	3	5	South to Margaret St	Petrol station (~200-300m away)
19	2	4	South to Margaret St	Petrol station (~200-300m away)
20	12	5	Intersection between Margaret St and William Lane	Residential/ room light (weak)
21	3	3	South to Margaret St	Residential/ room light (weak)

Position	Horizontal (Lx)	Vertical (Lx)	Location	Features in the Vicinity
22	23	31	South to Margaret St Entrance of residential building opposite site (Figure 4)	Light illuminated from entrance Tree next to entrance
23	1	3	South to Margaret St	Residential/ room light (weak)
24	30	4	West to Gibbons St	Street trees, Gibbons Street Reserve
25	16	3	West to Gibbons St	Street trees, Gibbons Street Reserve
26	1	1	West to Gibbons St	Street trees, Gibbons Street Reserve
27	1	1	West to Gibbons St	Street trees, Gibbons Street Reserve
28	4	2	West to Rosehill St	Gibbons Street Reserve
29	1	0	West to Rosehill St	Gibbons Street Reserve
30	8	4	West to Rosehill St	Gibbons Street Reserve

The horizontal and vertical lux levels are quite variable depending on the location of the measurement. In 11 locations the vertical illuminance exceeds the requirements. There are a number of areas around the site that have significant lighting in the form of streetlights or other commercial lighting such as the fuel price board. With the three lane roads and night time commercial operations of the service station this amount of illuminance is likely in some locations. As the detail design is progressed SLR can provide advice and modelling to ensure the proposed development does not increase light spill at surrounding sensitive receivers above the required limits.

5 Recommendations

The lighting design should aim to mitigate any light spill from the proposed development. In order to achieve the best performance outcome for the building's use while having a minimal impact on the surrounding properties the following recommendations are given.

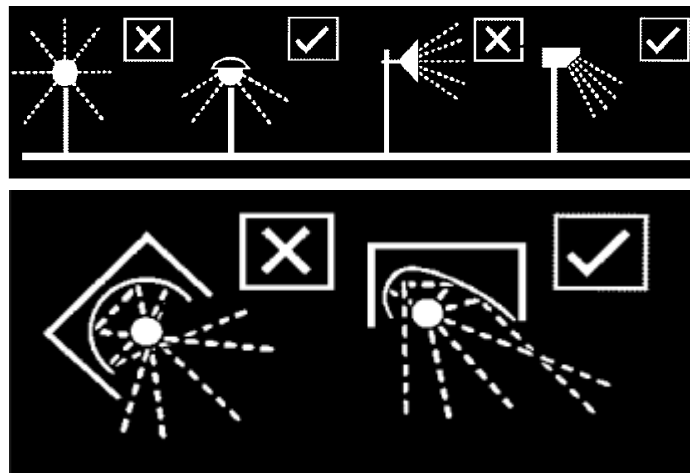
5.1 General Mitigation

The following general mitigation methods should be incorporated into the detail design.

AS4282-1997 Control of the Obtrusive Effect of Outdoor Lighting sets out general principles that should be applied when designing outdoor light to minimise any adverse effect of the light installation.

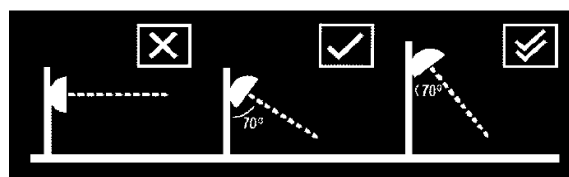
- Direct lights downward as much as possible.
- Use luminaires that are aimed to minimise light spill, e.g. full cut off luminaires where no light is emitted above the horizontal plane. Less spill light mean that more of the light output can be used to illuminate the area and a lower power output can be used. The energy consumption for the fitting can thus be reduced without decreasing the illuminance of the area. Refer **Figure 5**.

Figure 5 Minimise Light Spill



- Do not waste energy and increase light pollution by over-lighting.
- Keep glare to a minimum by keeping the main beam angle less than 70°. Refer **Figure 6**.
- Wherever possible use floodlights with asymmetric beams that permit the front glazing to be kept at or near parallel to the surface being lit

Figure 6 Minimise Glare



- Use floodlights with asymmetric beam where possible.

- Direct the site lighting away from sensitive locations such as residential properties.
- Where possible position site lighting as far away from site boundaries as possible

5.2 Site Specific Recommendations

- Lights should be aimed downward as much as possible and be shielded to prevent light escaping above the horizontal plane or off the site. This is especially important as the outdoor areas could be higher than some surrounding dwellings.
- Lights placed on the outside of the building should be kept as low as possible and correctly aimed to prevent light spilling on to areas where it is not needed.
- Pedestrian lighting should be recessed in to the awning where possible.

5.3 Summary of Recommendations

These recommendations aim to reduce any light spill coming from the site and if implemented correctly during detail design the proposed development should achieve the desired outcome with no more than 2 lux falling on the nearby residential facades during curfew hours and no more than 4 lux at the boundaries of nearby commercial facades during curfew hours.

5.4 Detail Design

This report is based on SLR's past experience and engineering judgement. To ensure there is no adverse light spill from the site further light spill model calculations should be conducted once the detail design is progressed.

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