

# 90-92 BOTANY STREET, CARLTON

## Light Spill Assessment

### Prepared for:

Nasscon Pty Ltd  
1 Australia Street  
HURSTVILLE NSW 2000

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SLR 

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## BASIS OF REPORT

This report has been prepared by SLR Consulting Australia Pty Ltd (SLR) with all reasonable skill, care and diligence, and taking account of the timescale and resources allocated to it by agreement with Nasscon Pty Ltd (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
610.30096-R01-v1.0	4 September 2020	Peter Hayman	Dr Neihad Al-Khalidy	Dr Neihad Al-Khalidy

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## EXECUTIVE SUMMARY

SLR consulting Australia Pty Ltd has been engaged by Elton Consulting Group Pty Ltd on behalf of Nasscon Pty Ltd to assess the lighting environment around proposed redevelopment at 90-92 Botany Road, Carlton with a focus on vehicle movements in and out of the site.

The site currently contains a residential aged care facility which is no longer in operation and a single dwelling on the neighbouring lot to the north. The proposed redevelopment is for a public place of worship on a 12-month trial period, which will involve alterations to the aged care facility and demolition of the single dwelling. The main change from an external point of view will be the demolition of the dwelling and the addition of 16 parking spaces.

The lighting for the site can be classified as follows:

- Lights around the entries to the building.
- Pole lighting for the carpark.
- Lighting will be off outside of the hours of operation.

The hours of operation for the site are stated as 5:30 am till 10:00 pm, meaning there is a small overlap in the morning between the hours of operation and the curfew hours

SLR has qualitatively assessed the light spill from vehicles exiting the site where headlights could impact of the frontages of 89, 91 and 95 Botany Road, and 68 and 70 Xenia Avenue and the following conclusions have been achieved:

### Morning Case:

- It is likely that most vehicles will be entering the site rather than exiting during this time which should not cause an issue due to the shielding provided by the perimeter fences. However, it is still possible that vehicles could exit during this time and there is some risk that headlights could be pointing toward the windows of the dwellings mentioned above. There are several features already present in the design/site that will reduce the light spill emanating from the site:
  - The slope of the site which falls from an elevation of 51.12 metres on the eastern side of the car park to 47.93 metres at the driveway entrance. This slope should mean that headlights are generally pointing down to a greater degree than if the ground was flat.
  - The proposed fences will also have a positive impact by containing light spill to the site in particular for 95 Botany Road.

### Night Case:

- This is not expected to be a problem at night-time as worshipper vehicles are expected to have vacated the site by 10:00 pm. Support staff vehicles will also leave the site by 10:00 pm.

It is SLR's opinion that there could be cases where vehicles exit the site during curfew hours where the headlights will point toward opposite residences, it should be noted that this is also the case for other residential driveways along the street where vehicles could leave the garage or driveway and point their headlights across the street.

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# 1 Introduction

SLR consulting Australia Pty Ltd has been engaged by Elton Consulting Group Pty Ltd on behalf of Nasscon Pty Ltd to assess the lighting environment around proposed redevelopment at 90-92 Botany Road, Carlton with a focus on vehicle movements in and out of the site.

## 1.2 Site and Surrounds

The site is located on the corners of Botany Road, Ethel Lane and Xenia Avenue an approximately 800 metres from Allawah Station.

**Figure 1** Aerial Image of the Site Location



Image: Nearmap (August 2020)

The surrounding area contains the following features.

- To the north is the Sydney Technical High School.
- The immediate surrounds in all other directions are low density dwellings with one of two storeys.

## 2 Lighting and Light Spill

### 2.1 Background

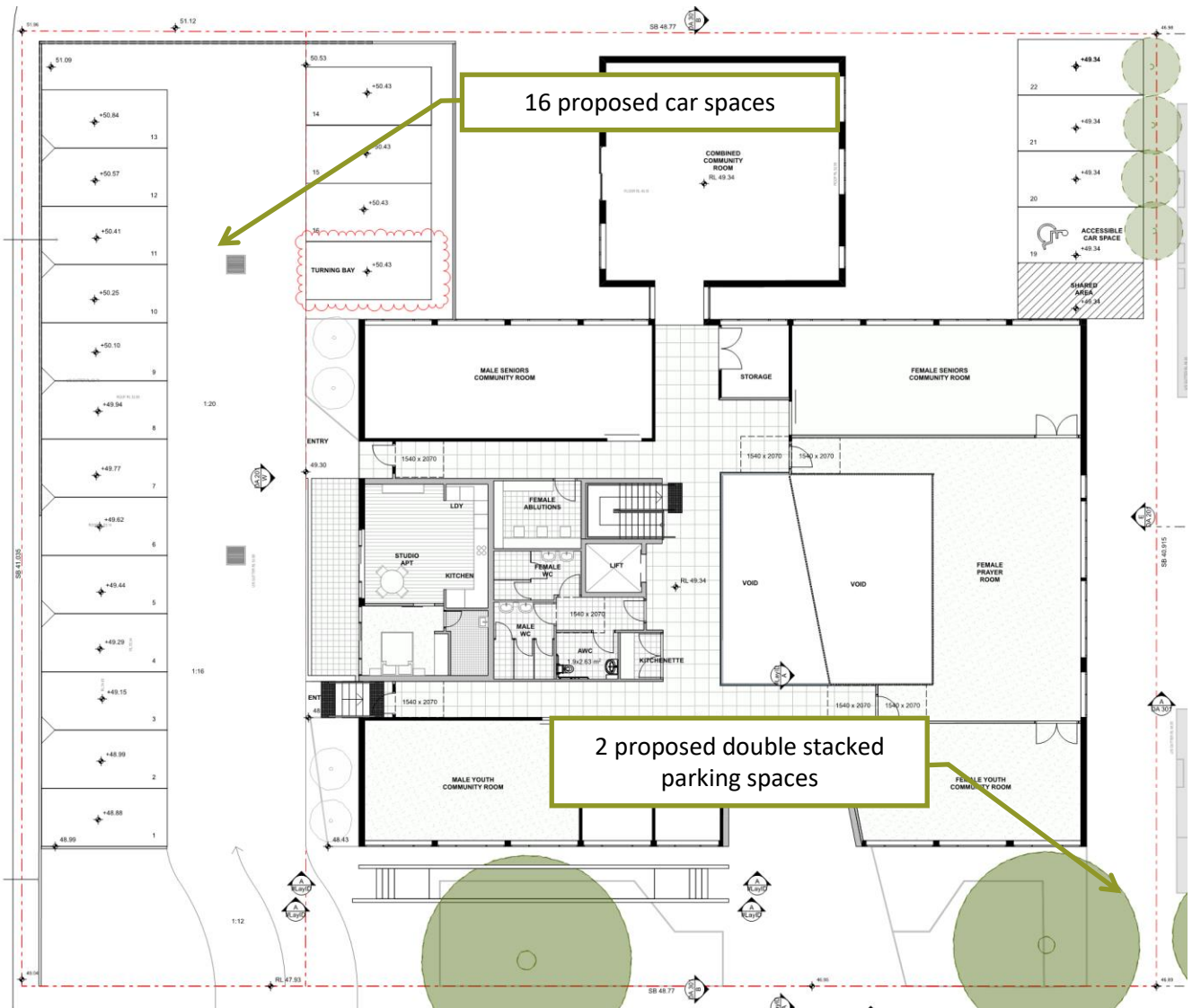
SLR has been asked to SLR have been asked to assess the light spill from the proposed site. The site currently contains a residential aged care facility which is no longer in operation and a single dwelling on the neighbouring lot to the north. The proposed redevelopment is for a public place of worship which will involve alterations to the aged care facility and demolition of the single dwelling.

Figure 2 Existing





Figure 3 Proposed



The main change from an external point of view will be the demolition of the dwelling and the addition of 16 parking spaces in the northern part of the site.

## 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 <sup>2</sup>
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"> <li>(a) Disability Glare – Glare that impairs the visibility of objects without necessarily causing discomfort.</li> <li>(b) Discomfort Glare – Glare that causes discomfort without necessarily impairing the visibility of objects.</li> </ul>

## 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

### 3 Light Spill

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, is less likely to give cause to complaints from adjacent residential properties, while a more restrictive limit is applicable to *curfew hours*.

The hours of operation for the site are stated as 5:30 am till 10:00 pm, meaning there is a small overlap in the morning between the hours of operation and the curfew hours of 11:00 pm and 6:00 am.

#### 3.1 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>ad</u> aption luminance (L) of 10 cd/m <sup>2</sup>	20% based on <u>ad</u> aption luminance (L) of 10 cd/m <sup>2</sup>	20% based on <u>ad</u> aption luminance (L) of 10 cd/m <sup>2</sup>

The commercial area limits apply at the boundary between residential areas and sites with used other than residential, so the 4 Lux limit will apply to light spill emanating from the site during curfew hours. With a limit of 25 Lux outside of curfew hours light spill is not expected to be an issue at other times.

### 3.2 Assessment

SLR has made the following assumptions about the lighting for the site:

- There will be lights around the entries to the building.
- There will be pole lighting for the carpark.
- Lighting will be off outside of the hours of operation.

The acoustic report for the site recommended the fence height shown in the figure below. This will also have a positive impact by containing light spill to the site in particular light coming from vehicle headlights

Figure 4 Mitigation Measures



If the exterior lighting is well designed with features such as keeping area lighting as low as possible and using full cut off luminaires it can reasonable be expected there will be no obtrusive light spill above the requirements an any of the surrounding residential dwellings.

SLR has been asked to specifically look at the case of vehicles exiting the site where headlights could impact the frontages of 89, 91 and 95 Botany Road, 68 and 70 Xenia Avenue, and the side of 1 Ethel Lane. This is not expected to be a problem in the evening as vehicles could be expected to have vacated the site before 10:00 pm.

The morning case where the site will be operational during the curfew hours of 5:30-6:00 am will need a closer analysis. It is likely that most vehicles will be entering the site rather than exiting during this time which should not cause an issue due to the shielding provided by the perimeter fences. However, it is still possible that vehicles could exit during this time and there is some risk that headlights could be pointing toward the windows of the dwellings mentioned above.

One mitigating factor is the slope of the site which falls from an elevation of 51.12 metres on the eastern side of the car park to 47.93 metres at the driveway entrance. This slope should mean that headlights are generally pointing down to a greater degree than if the ground was flat.

Vehicle movements from the existing parking areas in the south east and south west corners of the site are expected to be low risk as they already occur.

It is SLR's opinion that there could be cases where vehicles exit the site during curfew hours where the headlights will point toward opposite residences, similarly it should be noted that this case would also occur with other residential driveways along the street where vehicles could leave the garage or driveway and point their headlights across the street. If this event does occur it would have a relatively short duration and likely to only be noticed from late April till August months when the surrounding environment will be darker.

SLR could conduct further testing to determine the amount of light reaching the windows of a neighbouring dwelling as a vehicle exits the driveway if deemed to be necessary. In SLR's assessment of the available information, light from occasional vehicle movements would be of low impact and short duration if an event were to occur. The dawn commencement time and typical prayer duration of 20 minutes means that the overlap period between the curfew and operational hours is less likely to see a vehicle exit event.

Further testing or modelling of the conclusions of this qualitative analysis would be undertaken as part of the detailed design stages of the development if required.

## 4 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.

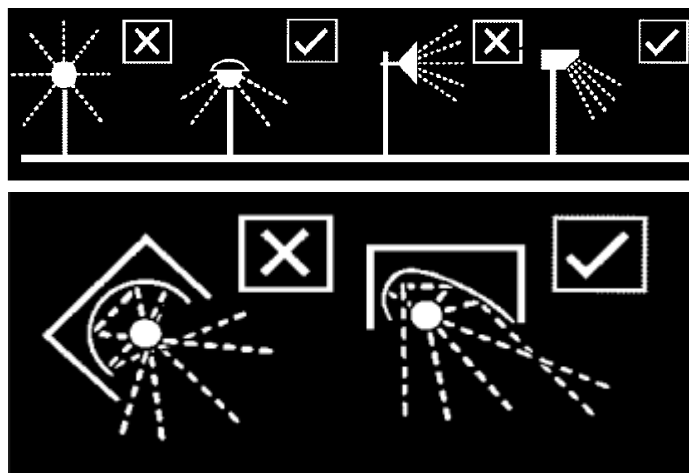
### 4.1 General Mitigation

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

*AS4282 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.

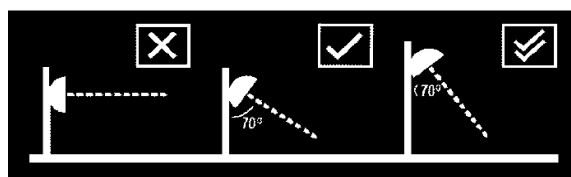
- Direct lights downward as much as possible.
- Use luminaires that are aimed to minimise light spill, e.g. full cut off luminaires where no light is emitted above the horizontal plane. Less spill light means that more of the light output can be used to illuminate the area and a lower power output can 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 or aim lighting in toward the middle of the site

## 4.2 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 for the carpark area lighting.
- 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.
- Lighting should be recessed into awnings or eaves where possible.
- The site slope through the car park should be maintained as much as possible.



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