SOLAR LIGHT REFLECTIVITY STUDY

INTERCONTINENTAL HOTEL REFURBISHMENT, SYDNEY

WD237-03F03(REV2)- SR REPORT

AUGUST 4, 2020

Prepared for:

Mulpha Hotel Sydney Trust

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DOCUMENT CONTROL

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July 16, 2020	Initial.	0	JW	SWR	AB
July 29, 2020	Revised GFA.	1	AB	SWR	AB
August 4, 2020	Revised GFA.	2	AB	SWR	AB

EXECUTIVE SUMMARY

This report presents the results of a detailed study for the effect of potential solar glare from the proposed refurbishment of the Intercontinental Hotel, Sydney. This study identifies any possible adverse reflected solar glare conditions affecting motorists, pedestrians and to occupants of neighbouring buildings. If necessary, recommendations are made to mitigate any potentially adverse effects. This study assesses compliance with the controls for solar glare from the Planning Secretary's Environmental Assessment Requirements (SEAR).

The results of the study indicate that, to avoid any adverse glare to motorists and pedestrians on the surrounding streets, occupants of neighbouring buildings, and to comply with the abovementioned planning control requirements, all glazing used on the external façade of the refurbishment should have a maximum normal specular reflectance of visible light of 20%.

It should be noted that the most reflective surface on the façade of a building is the glazing. Reflected solar glare from concrete, brickwork, timber, etc. is negligible (i.e. less than 1% normal specular reflectance) and hence will not cause any adverse solar glare effects. Note also that, for any painted or powder-coated metallic surfaces on the exterior façade of the refurbishment, the maximum normal specular reflectance of visible light for those types of surfaces is in the range of 1% to 5%, which is well within the abovementioned limit.

Hence, with the incorporation of the abovementioned recommendation, the results of this study indicate that the refurbishment of the Intercontinental Hotel will not cause adverse solar glare to motorists or pedestrians in the surrounding area, or to occupants of neighbouring buildings, and will comply with the planning controls regarding reflectivity from the Planning Secretary's Environmental Assessment Requirements (SEAR).

CONTENTS

1 INTRODUCTION

1.1 Description of the Site

The site comprises two allotments containing the Intercontinental Hotel (incorporating the former NSW Treasury Building) at 115-119 Macquarie Street. The legal description of the site is:

- Lot 40 DP 41315; and
- Lot 4 DP 785393,

The site (115-119 Macquarie Street) contains two interconnected buildings that comprise:

- The 32-storey Intercontinental Hotel tower, which is located on the corner of Phillip and Bridge Streets set above a podium.
- The State Heritage listed former NSW Treasury Building, which is located on the corner of Macquarie and Bridge Streets.

Immediately to the north of the site (99-113 Macquarie Street) is a seven-storey commercial building known as Transport House, which is locally heritage listed. This site was part of the SSD 7693 Concept approval. Works relating to this portion of the Concept SSDA site will be progressed via a separate planning approval/application. The building is separated from the Treasury Buildings by a narrow laneway, known as Macquarie Lane.

Figure 1: Aerial Image of the Site Location

1.2 Description of the Proposal

The proposal is a Stage 2 (Detailed) SSDA that seeks approval for:

- Various refurbishments to the Intercontinental Hotel tower.
- Alterations to the roof of the Intercontinental Hotel, including expansion of the club lounge and terrace – in compliance with the approved envelope under SSD 7693 (the Concept approval).

The proposed land use is 'tourist and visitor accommodation' (including ancillary uses), consistent with the existing use and what was considered/approved under the Concept approval.

From a staging perspective, no works will be undertaken to Transport House due to its sensitivity and requirement for more consideration, including a competitive design process.

The proposal would increase the GFA of the Intercontinental Hotel tower by 250sqm. The proposal also provides a maximum height of building of RL 114.55 (consistent with the envelope approved under the Concept approval).

This study assesses compliance with the controls for reflectivity of the Planning Secretary's Environmental Assessment Requirements (SEAR) issued for the State Significant Development (SSD). Item 5 states:

Assess the environmental and residential amenity impacts associated with the proposal, including solar access, acoustic impacts, visual privacy, overshadowing, servicing requirements (including waste management, loading zones, mechanical plant), lighting impacts, air quality, odour and dust emissions, and wind impacts.

2 GLARE OBSERVED BY MOTORISTS

2.1 Methodology

The reflectivity analysis of the refurbishment has been carried out using the technique published by Hassall (1991). The limiting veiling luminance of 500 cd/m^2 for the comfort of motorists, as suggested in Hassall (1991), has been adopted as a basis of assessing the glare impact from the refurbishment.

The various critical glazed aspects of the refurbishment were determined and are shown in Figure 2. Solar charts for each of these critical glazed aspects are presented in Appendix B, and these are used to derive the check zones which are shown in Figure 3. The solar chart of each critical aspect is determined from the standard sun chart of the region, provided in Appendix C (Phillips, 1992), using the method detailed in Hassall (1991). The check zones highlight the areas that are potentially affected by solar reflections from each critical glazed aspect. It should be noted that the check zones shown in Figure 3 do not take into account the effect of overshadowing by neighbouring buildings or the shielding effect of any existing trees or other obstructions. These effects are examined in the detailed analysis described in Section 2.2 of this report.

Study point locations are selected within the check zone areas where motorists are facing the general direction of the refurbishment (within ±10° of the direct sight-line). These are shown in Figure 3, and summarised in Table 1. The viewpoint of motorists at each study point location is assessed using either photographs from a calibrated camera, or images generated from a 3D computer model of the local area. A scaled glare protractor has been superimposed over each viewpoint image. Views from the study point locations are presented in Appendix A of this report. A scaled glare protractor has been superimposed over each viewpoint image.

The glare protractor is used to assess the amount of glare likely to be caused and to provide a direct comparison with the criterion of 500 cd/m^2. Alternatively, the glare protractor can be used to determine the maximum acceptable reflectivity index of the façade material of the refurbishment for the glare to be within the criterion of 500 cd/m^2, to ensure that solar glare will not cause discomfort or threaten the safety of motorists and hence to enable the proposed refurbishment to comply with the relevant planning control requirements regarding solar light reflectivity.

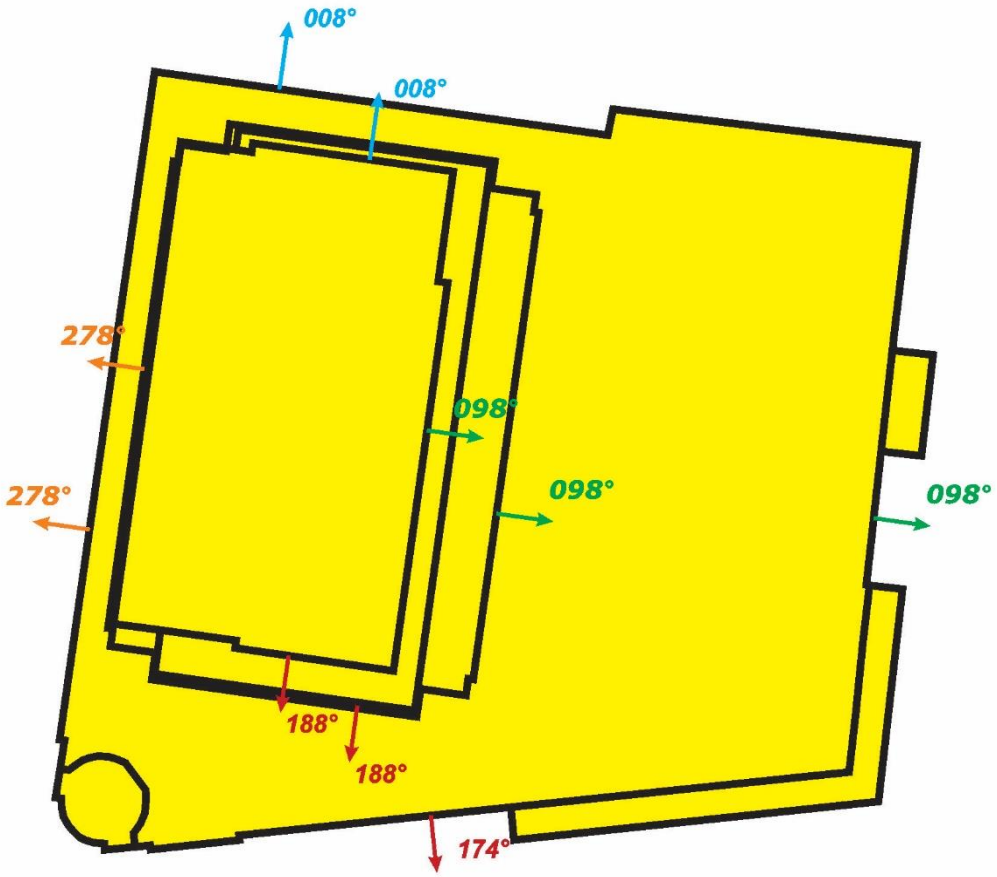

Figure 2: Critical Glazed Aspects of the Refurbishment

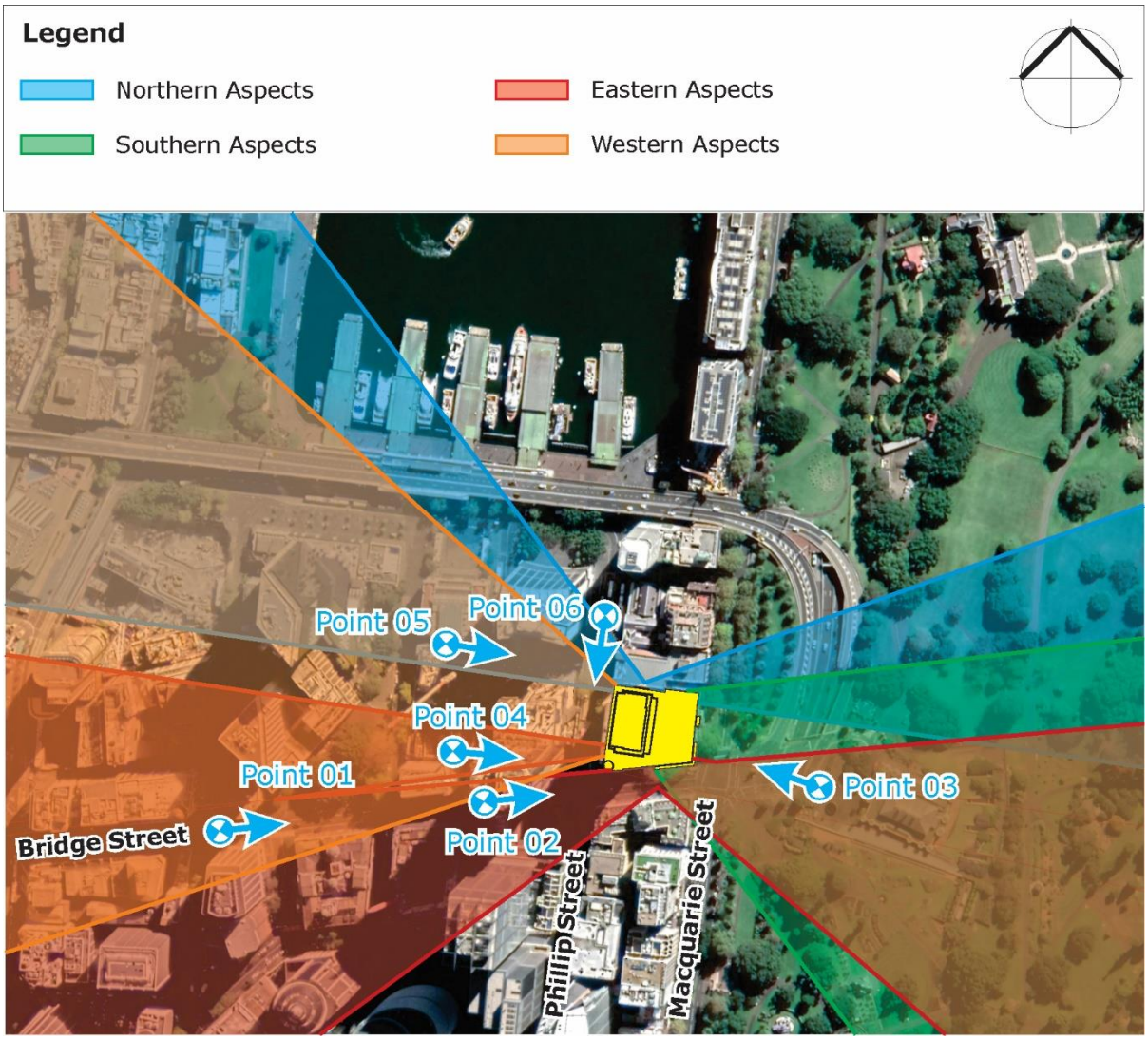

Figure 3: Check Zones and Study Point Locations for Building Aspects (the check zones are the areas where glare could potentially be observed)

Table 1: Aspects of the Refurbishment that could reflect Solar Glare to Each Study Point for Motorists

Study Point	Location and Viewpoint	Aspect(s) of the Refurbishment
01	Bridge Street – heading east	Southern and western aspects
02	Bridge Street – heading east	Southern aspects
03	Conservatorium Road – heading north-west	Southern and eastern aspects
04	Loftus Lane – heading east	Southern and western aspects
05	Custom House Lane – heading east	Northern and western aspects
06	Phillip Street – heading south	Northern Aspect

2.2 Analysis and Discussion

The amount of solar glare observed by motorists from the façade of the refurbishment at each study point location is presented in this section. Treatment options are provided if excessive solar glare conditions are observed.

2.2.1 Motorists heading east along Bridge Street

Points 01 and 02 are located along Bridge Street, to the west of the subject refurbishment. These points represent the critical sightline of motorists heading east along Bridge Street at these locations. Calibrated images of the viewpoint of motorists at these locations have been overlaid with a scaled glare meter, as shown in Appendix A.

An analysis of the viewpoint at Point 01 indicates that the subject refurbishment will not be visible within the zone of sensitive vision of motorists at this location. Hence there will be no adverse solar glare observed by motorists heading east along Bridge Street at Point 01 from the proposed refurbishment.

An analysis of the viewpoint at Point 02 indicates that the curved aspect at the south-western corner of the refurbishment, and the southern aspect of the existing façade, will be visible within the zone of sensitive vision. The curved aspect has a relatively small radius of convex curvature and any glare observed will only occur from a very thin vertical strip on the curve at any single point in time. The intensity of any glare observed from Point 02 will be less than 500cd/m^2 since the vertical strip of glare will appear less than 0.5deg of arc, provided that the glazing used on that curved aspect has a maximum normal specular reflectance of 20%. The southern aspect of the existing façade is not part of the proposed refurbishment. Hence, with the incorporation of this recommendation to limit the reflectance of the glazing to 20%, no adverse glare will be observed by motorists heading east along Bridge Street at Point 02 from the proposed refurbishment.

2.2.2 Motorists heading north-west along Conservatorium Road

Point 03 is located along the Conservatorium Road, to the east of the subject refurbishment. This point represents the critical sightline of motorists heading north-west along Conservatorium Road at this location. A calibrated image of the viewpoint of motorists at this location has been overlaid with a scaled glare meter, as shown in Appendix A.

An analysis of the glare meter overlaid onto the viewpoint at Point 03 indicates that the southern and eastern aspects of the existing façade will be within the zone of sensitive vision, however no part of the proposed refurbishment will be visible within the zone of sensitive vision. Hence no adverse glare will be observed by motorists heading north-west along Conservatorium Road at Point 03 from the proposed refurbishment.

2.2.3 Motorists heading east along Loftus Lane

Point 04 is located along Loftus Lane, to the west of the subject refurbishment. This point represents the critical sightline of motorists heading east along Loftus Lane at this location. A

calibrated image of the viewpoint of motorists at this location has been overlaid with a scaled glare meter, as shown in Appendix A.

An analysis of the glare meter overlaid onto the viewpoint at Point 04 indicates that the proposed refurbishment will not be visible at this location. Hence there will be no adverse solar glare observed by motorists heading east along Loftus Lane at Point 04 from the proposed refurbishment.

2.2.4 Motorists heading east along Loftus Lane

Point 05 is located along Custom House Lane, to the West of the subject refurbishment. This point represents the critical sightline of motorists heading east along Custom House Lane at this location. A calibrated image of the viewpoint of motorists at this location has been overlaid with a scaled glare meter, as shown in Appendix A.

An analysis of the glare meter overlaid onto the viewpoint at Point 05 indicates that the proposed refurbishment will not be visible within the zone of sensitive vision of motorists at this location. Hence there will be no adverse solar glare observed by motorists heading east along Custom House Lane at Point 05 from the proposed refurbishment.

2.2.5 Motorists heading south along Phillip Street

Point 06 is located along Phillip Street, to the north of the subject development. This point represents the critical sightline of motorists heading south along Phillip Street at this location. A calibrated image of the viewpoint of motorists at this location has been overlaid with a scaled glare meter, as shown in Appendix A.

An analysis of the glare meter overlaid onto the viewpoint image at Point 06 indicates that the southern aspect of the existing façade of the lower levels of the development is visible within the zone of sensitive vision of motorists at this location. However, further analysis indicates that Point 06 does not lie within the check zone for the southern aspects of the subject development, and hence no solar glare will be observed by motorists heading south along Phillip Street at Point 06 from the proposed refurbishment.

3 GLARE OBSERVED BY PEDESTRIANS AND OCCUPANTS OF NEIGHBOURING BUILDINGS

Our past experience involving more than 250 projects, and also research by Rofail and Dowdle (2004), tends to indicate that buildings which cause a nuisance to pedestrians and occupants of neighbouring buildings are those that have a normal specular reflectivity of visible light greater than 20%. This seems to justify the suggested limit of 20% reflectivity by many local government authorities and state planning bodies. Hence a general recommendation is made that all glazing and other reflective materials used on the façade of the proposed refurbishment have a maximum normal specular reflectivity of visible light of 20% to avoid adverse solar glare to pedestrians and occupants of neighbouring buildings.

4 TYPICAL NORMAL SPECULAR REFLECTANCE OF BUILDING SURFACES

It should be noted that the most reflective surface on the façade of a building is the glazing. Reflected solar glare from concrete, brickwork, timber, etc, is negligible (ie: less than 1% normal specular reflectance) and hence will not cause any adverse solar glare effects. The following sub-sections provide some general reflectance values of more reflective materials used on building facades.

4.1 Glazed Surfaces

A glazing supplier will be able to provide information on the maximum normal specular reflectance of visible light of different types of glazing. Some typical reflectivity values of different types of glazing are listed as follows:

- Clear float glass – typically 5% to 8%
- Low-e solar control glazing – typically 8% to 12%
- Other types of compliant performance glazing – up to 20%

4.2 Painted and/or Powder-Coated Metallic Surfaces

In the event that some portions of the external façade of the refurbishment feature powder-coated or painted metallic surfaces, it is not expected that adverse glare will be observed from those surfaces since the maximum normal specular reflectance of visible light of these types of façade materials range from 1% to 5%. This is well within the maximum limits specified in previous sections of this report.

5 CONCLUSION

A detailed study has been undertaken for the effect of potential solar glare from the proposed refurbishment of the Intercontinental Hotel, Sydney. This study identifies any possible adverse reflected solar glare conditions affecting motorists, pedestrians and to occupants of neighbouring buildings. If necessary, recommendations are made to mitigate any potentially adverse effects. This study assesses compliance with the controls for solar glare from the Planning Secretary's Environmental Assessment Requirements (SEAR).

The results of the study indicate that, to avoid any adverse glare to motorists and pedestrians on the surrounding streets, occupants of neighbouring buildings, and to comply with the abovementioned planning control requirements, all glazing used on the external façade of the refurbishment should have a maximum normal specular reflectance of visible light of 20%.

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Hence, with the incorporation of the abovementioned recommendation, the results of this study indicate that the refurbishment of the Intercontinental Hotel will not cause adverse solar glare to motorists or pedestrians in the surrounding area, or to occupants of neighbouring buildings, and will comply with the planning controls regarding reflectivity from the Planning Secretary's Environmental Assessment Requirements (SEAR).

6 REFERENCES

Hassall, D.N., 1991, "Reflectivity, Dealing with Rogue Solar Reflections", (published by author).

Phillips, R.O., 1992, "Sunshine and Shade in Australasia", Sixth Edition, CSIRO Publishing.

Rofail, A.W., and Dowdle, B., 2004, "Reflectivity Impact on Occupants of Neighbouring Properties", International Conf. on Building Envelope Systems & Technologies, Sydney.

APPENDIX A GLARE OVERLAYS FOR THE CRITICAL SIGHT-LINES

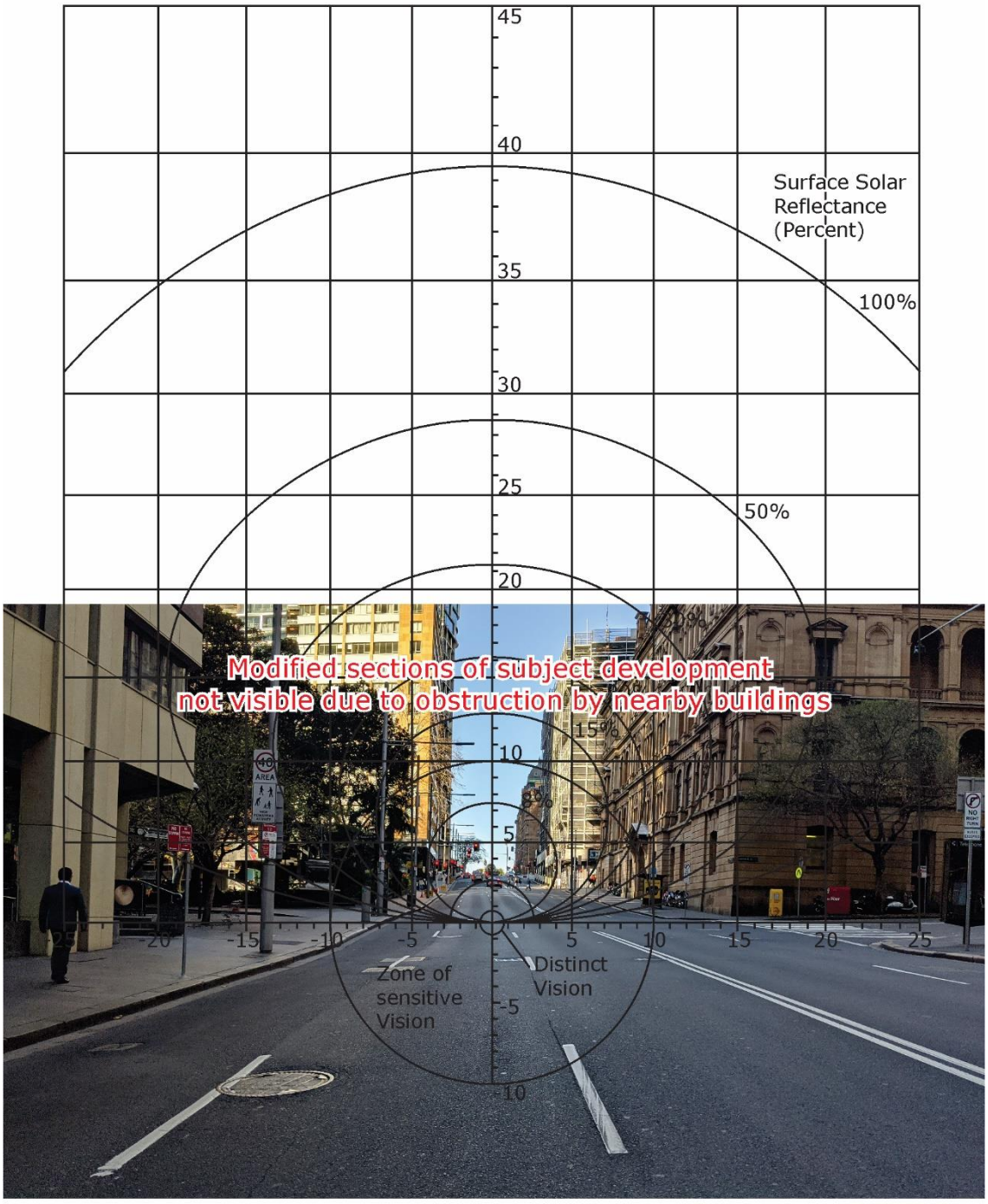

Figure A.1: Glare Overlay of the Viewpoint at Point 01

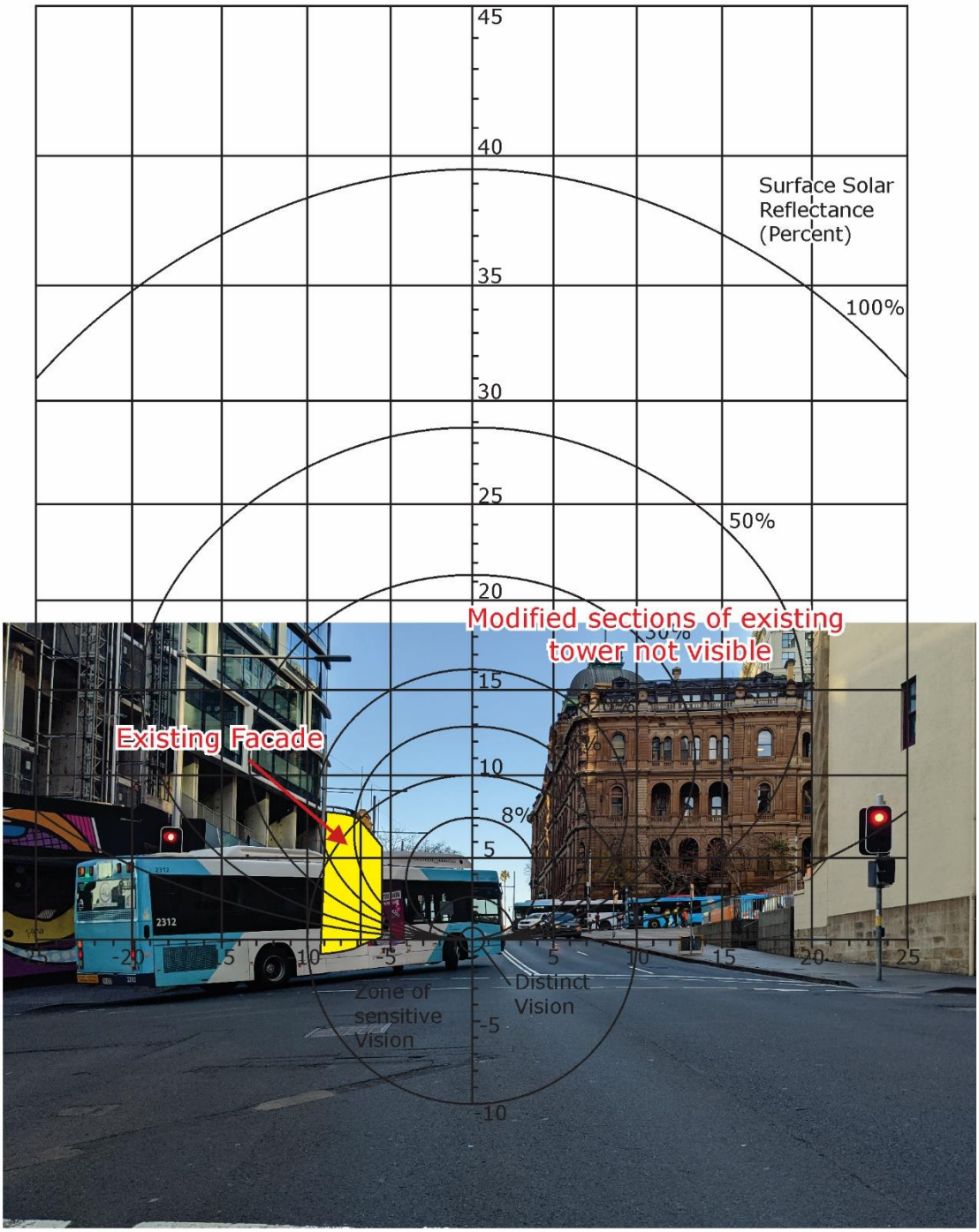

Figure A.2: Glare Overlay of the Viewpoint at Point 02

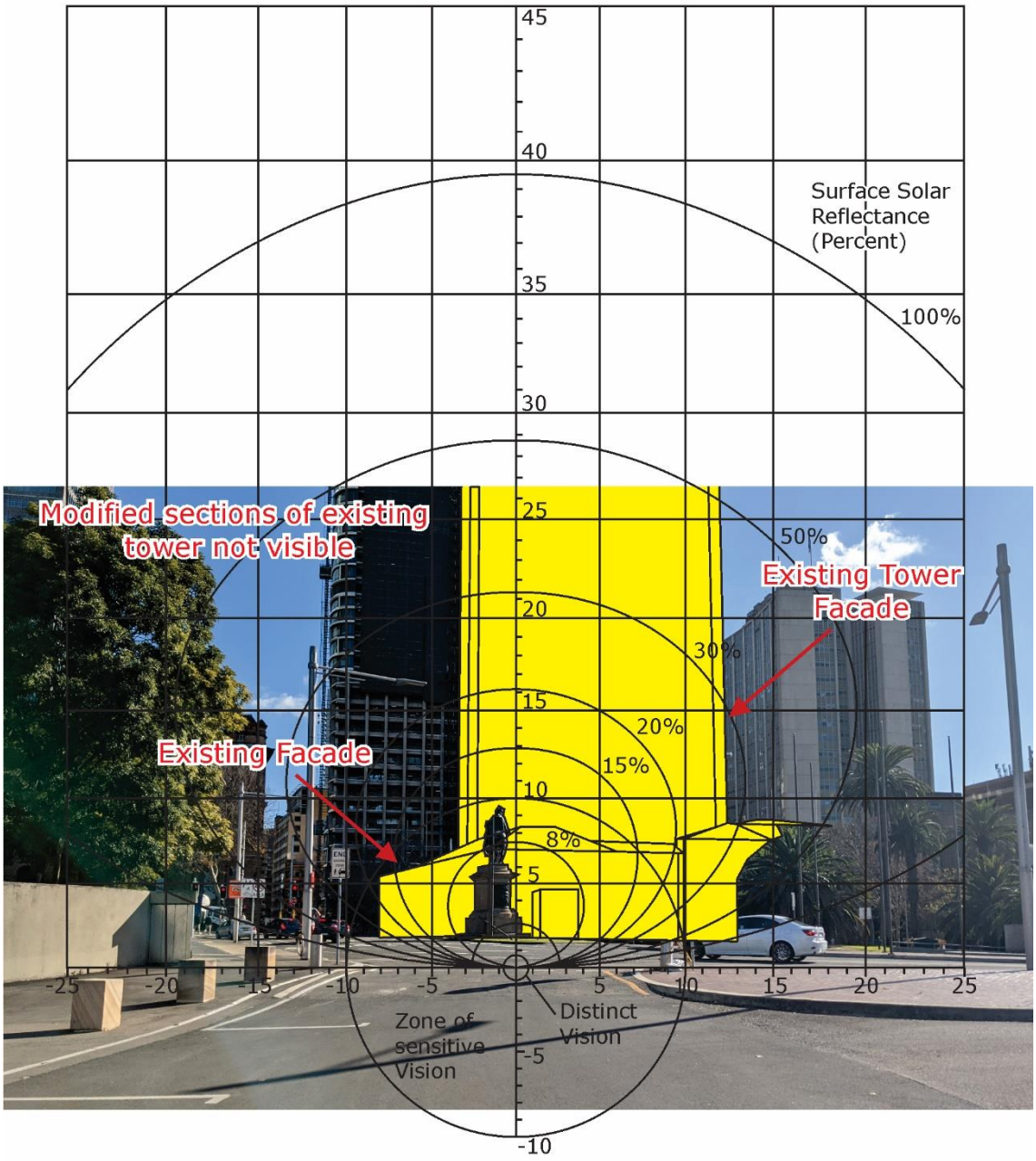

Figure A.3: Glare Overlay of the Viewpoint at Point 03

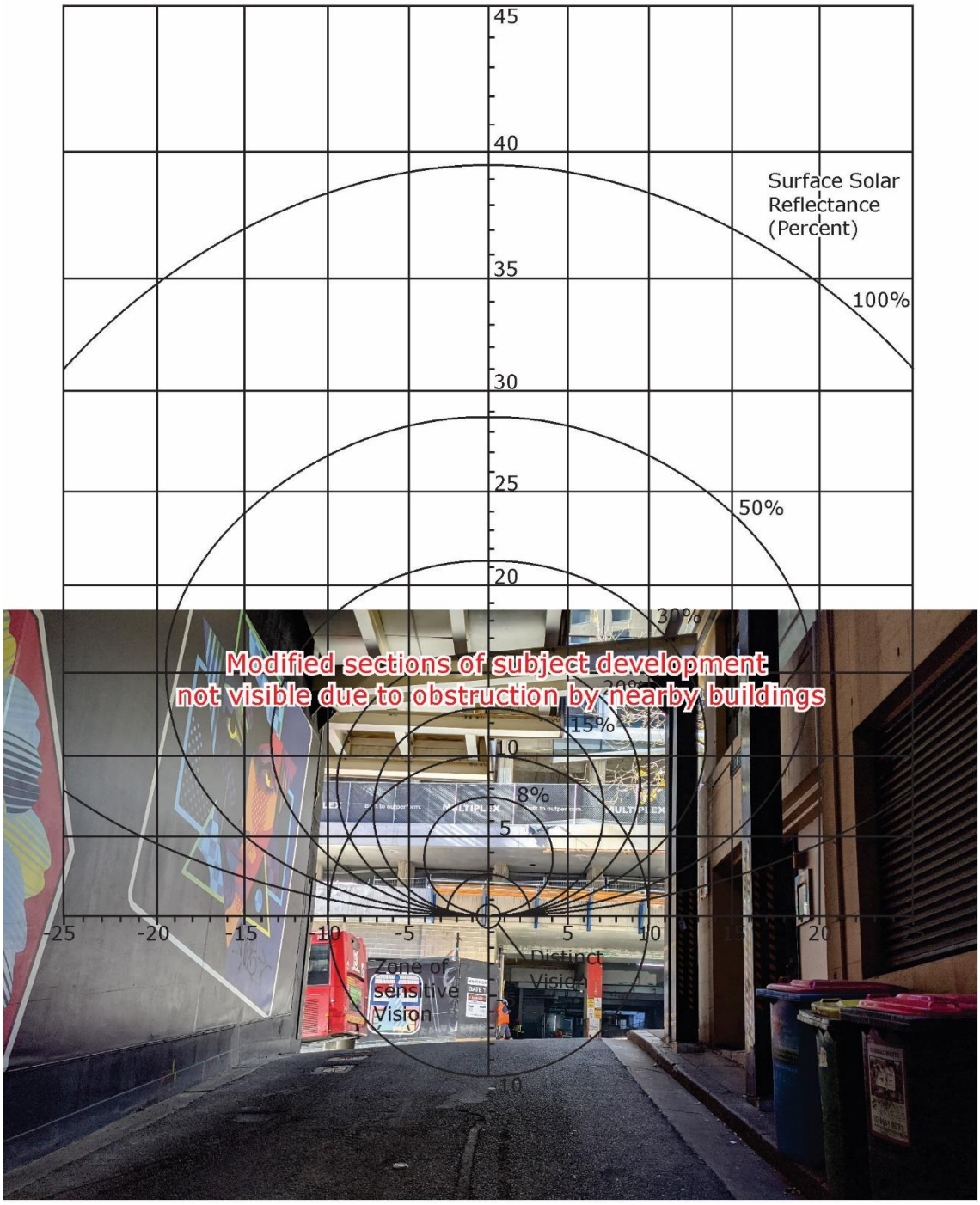

Figure A.4: Glare Overlay of the Viewpoint at Point 04

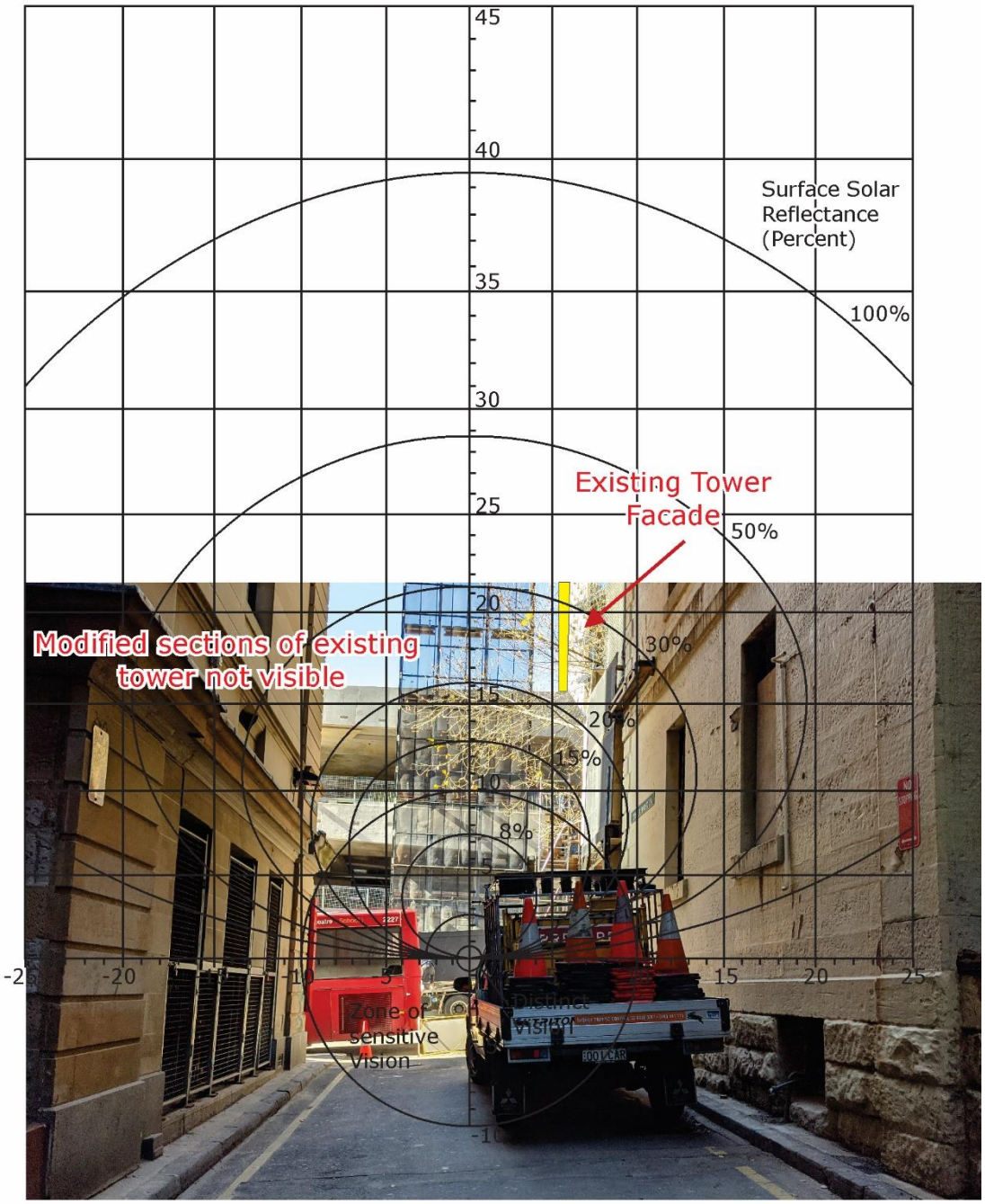

Figure A.5: Glare Overlay of the Viewpoint at Point 05

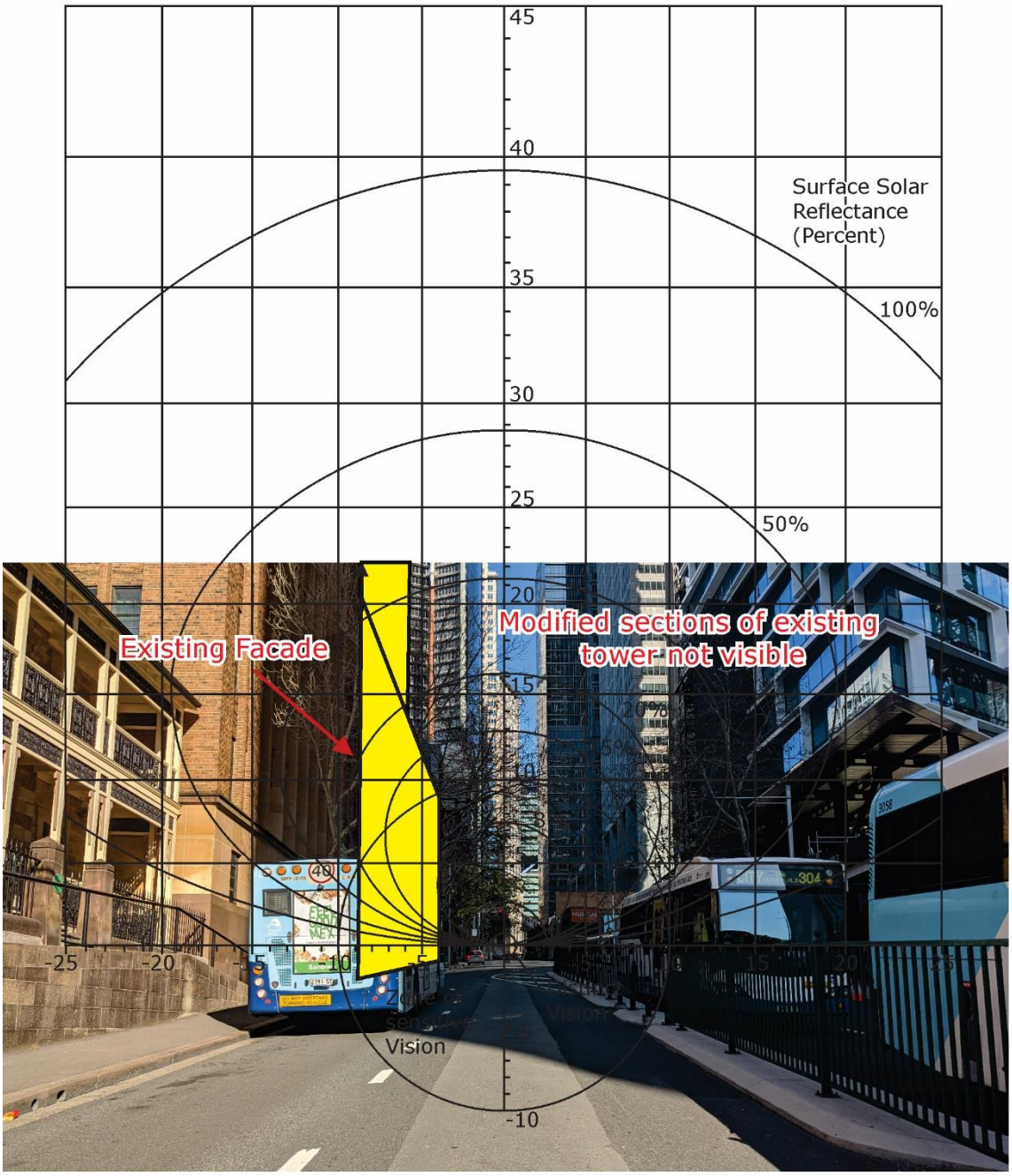

Figure A.6: Glare Overlay of the Viewpoint at Point 06

APPENDIX B SOLAR CHARTS FOR THE VARIOUS CRITICAL ASPECTS

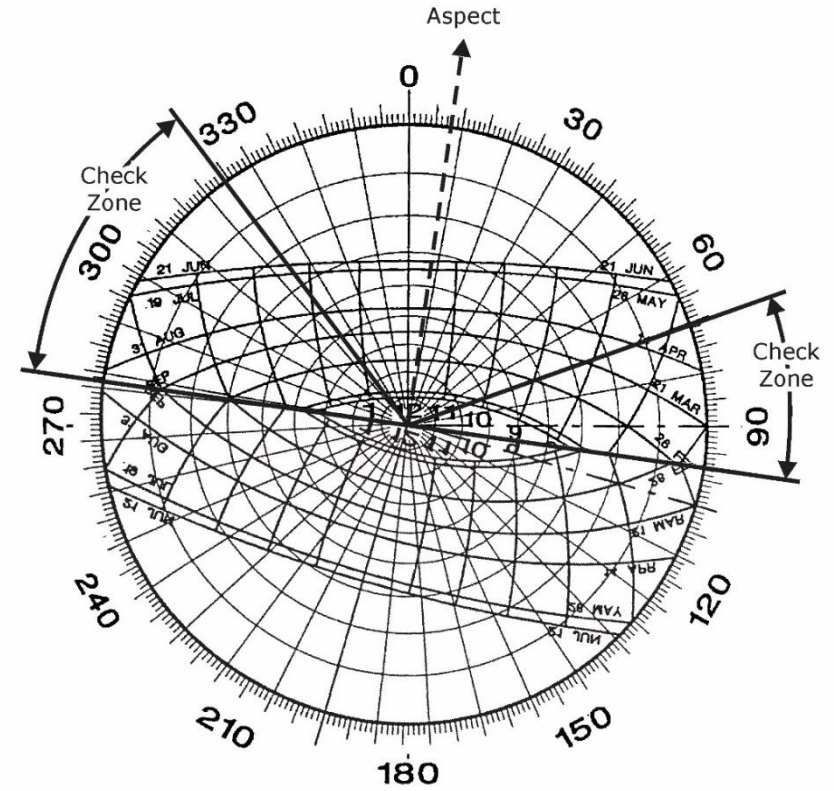

Figure B.1: Sun Chart for the 008° Aspect

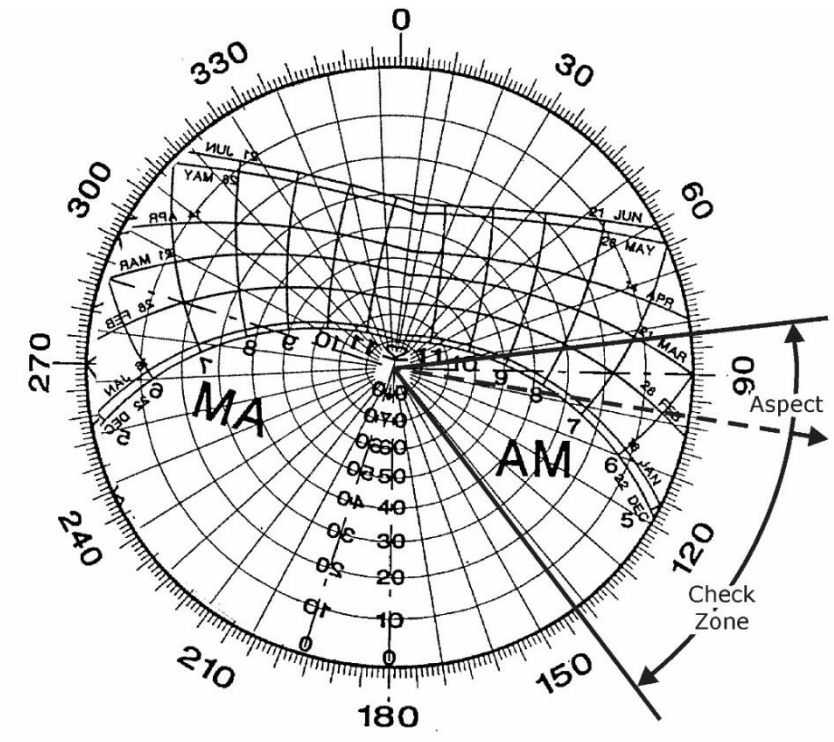

Figure B.2: Sun Chart for the 098° Aspect

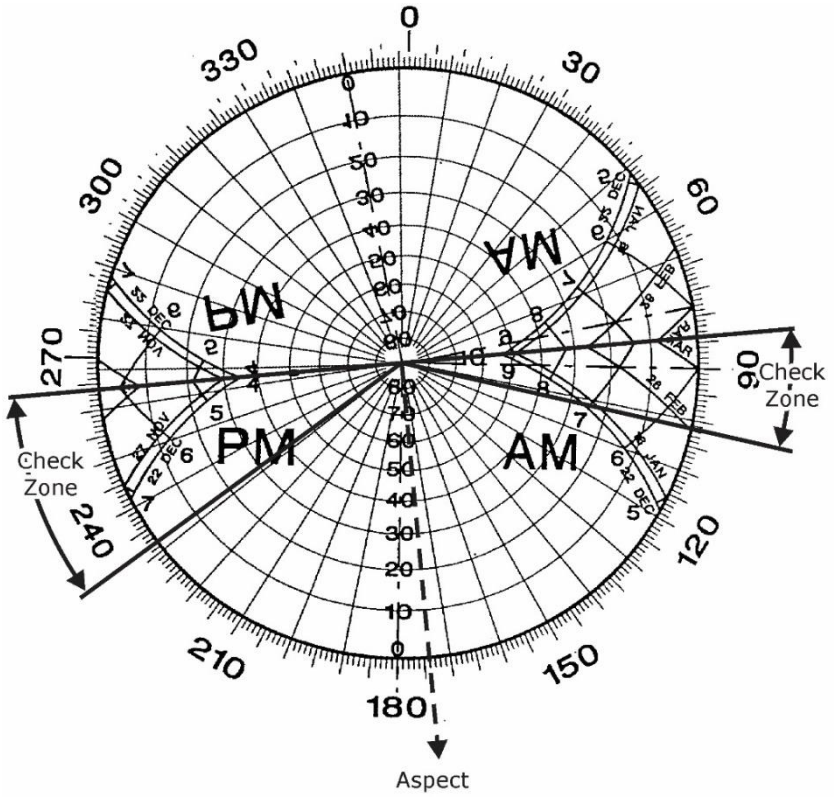

Figure B.3: Sun Chart for the 174° Aspect

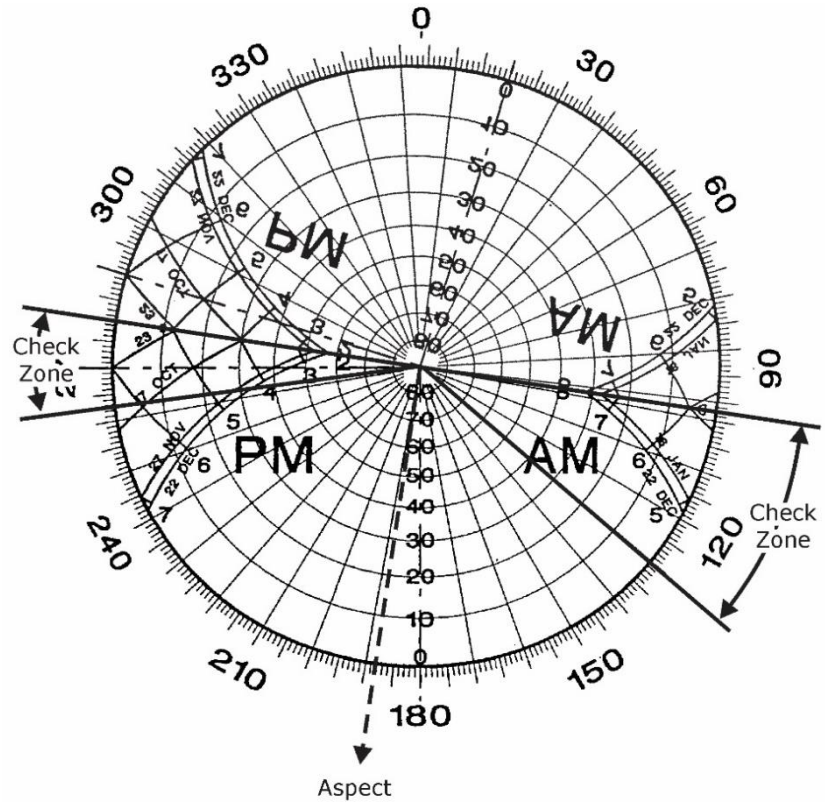

Figure B.4: Sun Chart for the 188° Aspect

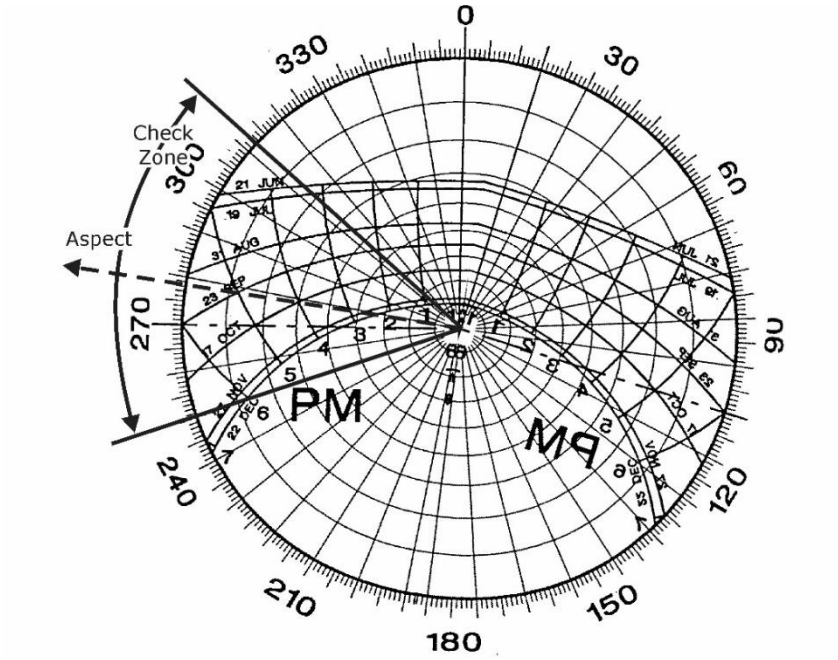

Figure B.5: Sun Chart for the 278° Aspect

APPENDIX C STANDARD SUN CHART FOR THE REGION

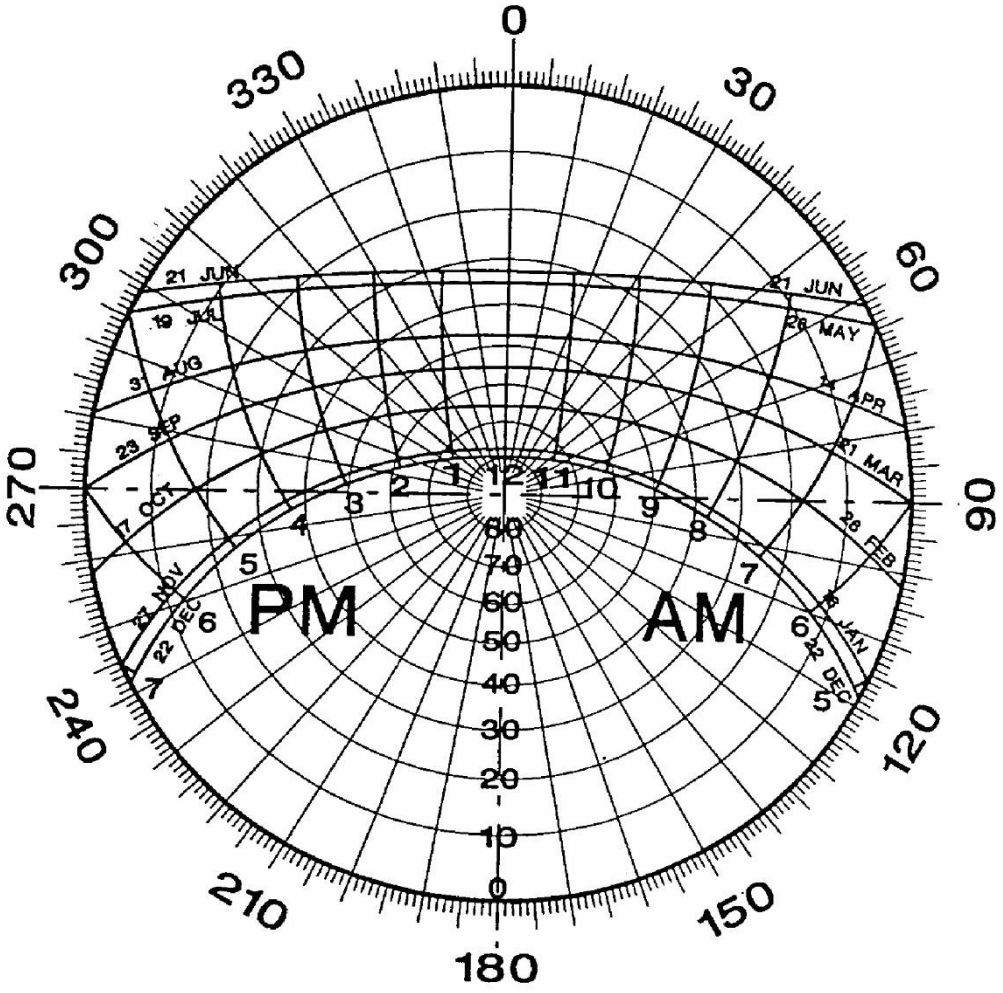

Figure C.1: Standard Sun Chart for the Sydney Region