SOLAR LIGHT REFLECTIVITY STUDY

ATLASSIAN YHA CENTRAL STATION PROJECT - STAGE 2: DEVELOPMENT APPLICATION

WE455-02F01(REV0)- SR REPORT

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Prepared for:

Avenor

Level 17, 9 Castlereagh Street, Sydney
NSW 2000

WINDTECH Consultants Pty Ltd
Head Office: 607 Forest Road, Bexley, NSW 2207, Australia
P +61 2 9503 0300 **E** reception@windtechglobal.com **W** www.windtechconsult.com

Sydney | Abu Dhabi | London | Melbourne | Mumbai | New York | Hong Kong | Singapore

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EXECUTIVE SUMMARY

This report presents the results of a detailed study for the effect of potential solar glare from the proposed Atlassian YHA development located at Central Station, 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 State Environmental Planning Policy No. 65 (SEPP65, Part 04 (Designing the Building) for Amenity), which contains the Apartment Design Guide (ADG) and from the City of Sydney Development Control Plan 2012, Section 3.2.7.

A site survey has been undertaken to obtain photographs of the critical sightlines of motorists on the surrounding streets. These photographs are calibrated and are able to be overlaid with a glare meter, which allows the extent, if any, of potential solar glare reflections from the subject development to be determined.

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, the following is recommended:

- The normal specular reflectance of visible light for the glazing of the façade and windows of the 32°, 206° and 296° aspects of the development should be a maximum of 11%.
- All glazing used on the remaining external façade of the development should have a maximum normal specular reflectance of visible light of 20%.

The development benefits from the effective use of sunshade screening devices, and also from the overshadowing provided by the various step-ins and changes in form of the development itself.

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 development, 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.

With the incorporation of these recommendations, the results of this study indicate that the subject development will not cause adverse solar glare to motorists, train drivers or pedestrians in the surrounding area, or to occupants of neighbouring building, and will comply with the planning controls regarding reflectivity from SEPP65 and from the City of Sydney Development Control Plan 2012.

CONTENTS

1 GLARE OBSERVED BY MOTORISTS AND TRAIN DRIVERS

1.1 Methodology

This study assesses compliance with the controls for solar glare from the State Environmental Planning Policy No. 65 (SEPP65, Part 04 (Designing the Building) for Amenity), which contrains the Apartment Design Guide (ADG) and the Sydney Council Development Control Plan 2012, Section 3.2.7.

The reflectivity analysis of the subject development 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 subject development. In meeting this criterion for vehicle motorists and train drivers, conditions will also be satisfactory for pedestrians. The glare impact on occupants of neighbouring buildings is also discussed in this assessment.

The various critical glazed aspects of the development were determined and are shown in Figure 1. 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 2. 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 2 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 1.2 of this report.

Study point locations are selected within the check zone areas where motorists and train drivers are facing the general direction of the subject development (within ±10° of the direct sight-line). These are shown in Figure 2, and summarised in Table 1. Photographs have been taken from the viewpoint of motorists and train drivers at each study point location using a calibrated camera. A scaled glare protractor has been superimposed over each viewpoint image. In addition, viewpoints for the critical sightlines of train drivers departing from Central Station on the railway lines have been generated using a 3D computer model of the development and surrounding area

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 development 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 subject development to comply with the relevant planning control requirements regarding solar light reflectivity.

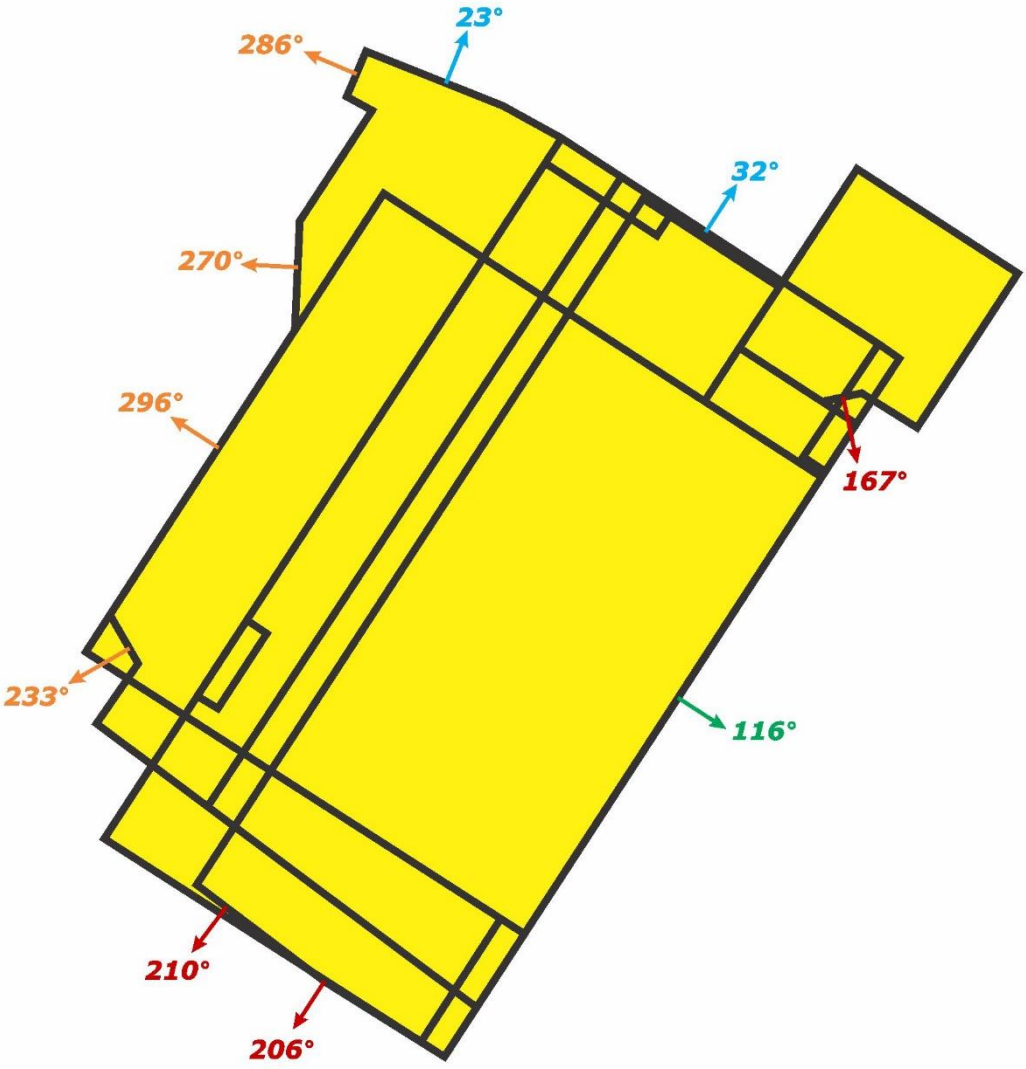


Figure 1: Critical Glazed Aspects of the Development (B01 to Roof level)

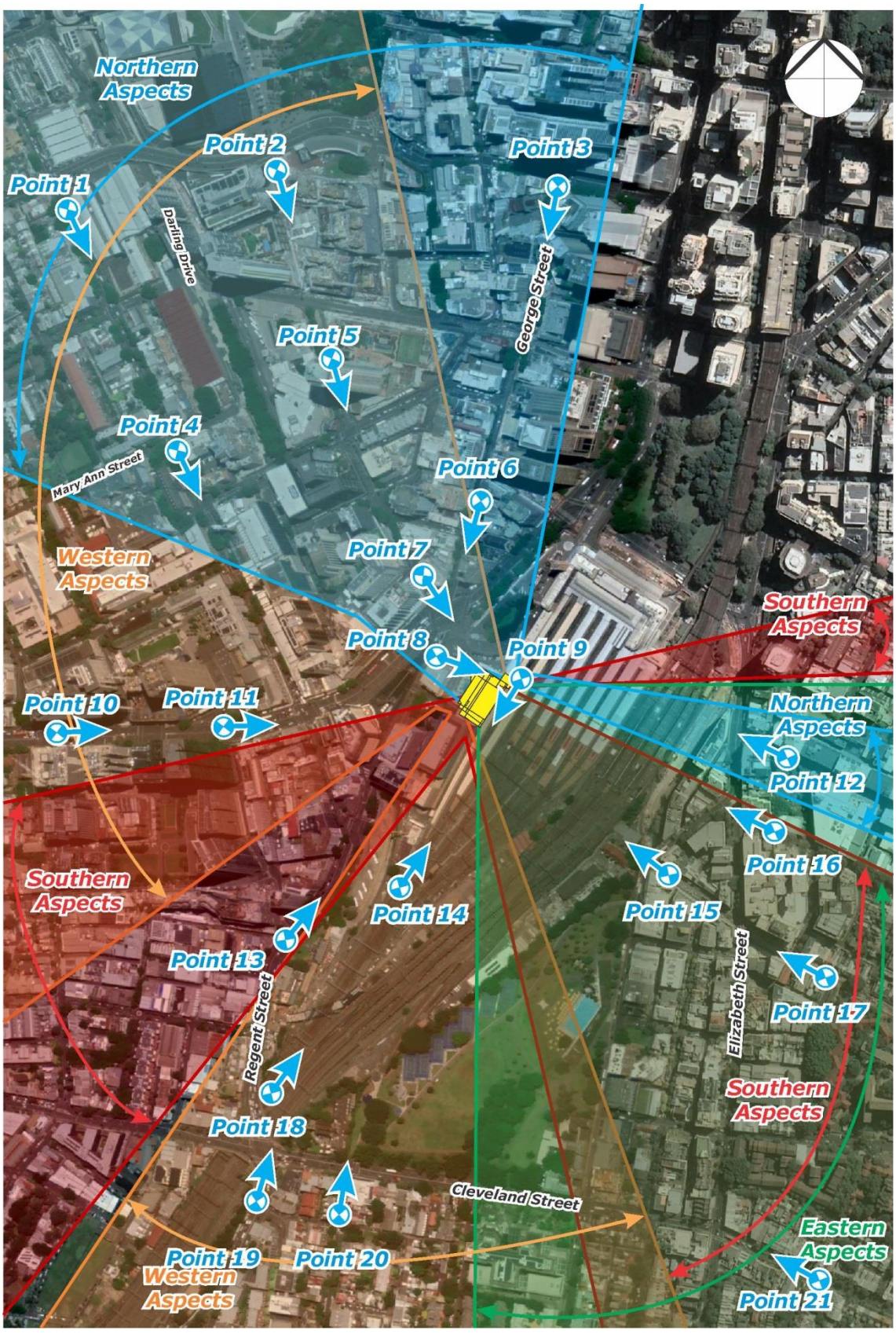


Figure 2: Check Zones and Study Point Locations

(the check zones are the areas where glare could potentially be observed)

Table 1: Aspects of the Development that could reflect Solar Glare to Each Study Point for Motorists and Train Drivers

Study Point	Location and Viewpoint	Aspect(s) of the Development
01	Harris Street – Heading south-east	Northern and western aspects
02	Pier Street – Heading south-east	Northern and western aspects
03	George Street – Heading south	Northern aspects
04	Harris Street – Heading south-east	Northern and western aspects
05	Quay Street – Heading south-west	Northern and western aspects
06	George Street – Heading south-west	Northern aspects
07	Quay Street – Heading south-east	Northern and western aspects
08	Upper Carriage Lane – Heading south-east	Northern and western aspects
09	Railway Platform – Heading south-west	Northern and southern aspects
10	Parramatta Road – Heading east	Western aspects
11	Parramatta Road – Heading east	Western aspects
12	Kippax Street – Heading north-west	Northern aspects
13	Regent Street – Heading north-east	Southern aspects
14	Railway Line – Heading north-east	Western aspects
15	Devonshire Street – Heading north-west	Southern and eastern aspects
16	Cooper Street – Heading north-west	Southern and eastern aspects
17	Devonshire Street – Heading north-west	Southern and eastern aspects
18	Railway Line – Heading north-east	Western aspects
19	Regent Street – Heading north	Western aspects
20	George Street – Heading north	Western aspects
21	Cleveland Street – Heading west	Southern and eastern aspects

1.2 Analysis and Discussion

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

1.2.1 Motorists heading south-east along Harris Street

Points 01 and 04 are located along Harris Street, to the north-west of the development site. These points represent the critical sightlines of drivers heading south-east along Harris Street at this location. A site survey of these points has been undertaken, and photographs showing the typical viewpoint of drivers at each location were obtained using a calibrated camera. The photographs have been scaled to enable the glare meter to be overlaid onto the images, as shown in Appendix A.

An analysis of the viewpoint at Points 01 and 04 indicates that the subject development is not visible at these locations. Therefore, no adverse solar glare will be observed by motorists heading south-east along Harris Street from the façade of subject development.

1.2.2 Motorists heading south-east along Pier Street

Point 02 is located along Pier Street, to the north-west of the development site. This point represents the critical sightlines of drivers heading south-east along Pier Street at this location. A site survey of this point has been undertaken, and photographs showing the typical viewpoint of drivers at this location were obtained using a calibrated camera. The photographs have been scaled to enable the glare meter to be overlaid onto the images, as shown in Appendix A.

An analysis of the viewpoint at Point 2 indicates that the subject development is not visible at this location. Therefore, no adverse solar glare will be observed by motorists heading south-east along Pier Street from the façade of subject development.

1.2.3 Motorists heading south along George Street

Points 03 and 06 are located along George Street, to the north of the development site. These points represent the critical sightlines of drivers heading south along George Street at this location. A site survey of these points have been undertaken, and photographs showing the typical viewpoint of drivers at each location were obtained using a calibrated camera. The photographs have been scaled to enable the glare meter to be overlaid onto the images, as shown in Appendix A.

An analysis of the glare meter overlaid onto the viewpoint images at Point 03 indicates that the view of the proposed development will be visible for the 32° and 296° aspects. However, further analysis indicates that Point 03 lies outside the check zone for the 296° aspect of the development inside the zone of sensitive vision. Furthermore, the visible portion of the 32° aspect does appear within the zone of sensitive vision for motorists. Hence, to mitigate adverse solar glare being observed from the development at Point 03, it is recommended that the

glazing used on the 32° aspect of the development have a maximum specular reflectance of visible light of 11%.

Further analysis indicates that subject development is not visible at Point 06. Therefore, no adverse solar glare will be observed by motorists heading south-east along George Street at this location.

1.2.4 Motorists heading south-east along Quay Street

Points 05 and 07 are located along Harris Street, to the north-west of the development site. These points represent the critical sightlines of drivers heading south-east along Quay Street at these locations. A site survey of these points has been undertaken, and photographs showing the typical viewpoint of drivers at these locations were obtained using a calibrated camera. The photographs have been scaled to enable the glare meter to be overlaid onto the images, as shown in Appendix A.

An analysis of the viewpoint at Points 05 indicates that the view of the proposed development will not be visible within the zone of sensitive vision from this locations. Hence there will be no adverse solar glare observed by motorists heading south George Street at this location.

Further analysis of the viewpoint at Point 07 indicates that parts of the northern and western aspects are visible and within the zone of sensitive vision. Furthermore, the visible portion of the 32° and 296° aspects does appear within the zone of sensitive vision for motorists. Hence, to mitigate adverse solar glare being observed from the development at Point 07, it is recommended that the glazing used on the 32° and 296° aspects of the development have a maximum specular reflectance of visible light of 11%.

1.2.5 Motorists heading south-east along Upper Carriage Lane

Point 08 is located along Upper Carriage Lane, to the north-west of the development site. This point represents the critical sightlines of drivers heading south-east towards the development at this location. A site survey of this point has been undertaken, and photographs showing the typical viewpoint of drivers at this location were obtained using a calibrated camera. The photographs have been scaled to enable the glare meter to be overlaid onto the images, as shown in Appendix A.

An analysis of the viewpoint at Points 05 indicates that the view of the proposed development will not be visible within the zone of sensitive vision from this location. Hence there will be no adverse solar glare observed by motorists heading south-east towards the development along Upper Carriage Lane at this location.

1.2.6 Train Drivers heading south-west along Central Station train line

Point 09 is located along the Central Station train line, to the east of the development. This point represents the critical sightline of train drivers heading south-west along the Central Station train line at this location. A site survey of this point has been undertaken based on a figure obtained from the provided Sketchup model showing the viewpoint of train drivers at this

location. The figure has been scaled to enable the glare meter to be overlaid onto the manually created sketches, as shown in Appendix A.

An analysis of the glare meter overlaid onto the viewpoint at Point 09 indicates that the view of the proposed development is not be visible within the zone of sensitive vision from this location. Hence, there will be no adverse solar glare observed by train drivers heading south-west departing from Central Station from the proposed development.

1.2.7 Motorists heading east along Parramatta Road

Points 10 and 11 are located along Parramatta Road, to the west of the development site. These points represent the critical sightlines of drivers heading east along Parramatta Road at these locations. A site survey of these points has been undertaken, and photographs showing the typical viewpoint of drivers at these locations were obtained using a calibrated camera. The photographs have been scaled to enable the glare meter to be overlaid onto the images, as shown in Appendix A.

An analysis of the glare meter overlaid onto the viewpoint at Points 10 and 11 indicates that the view of the proposed development will be visible for the 206° and 296° aspects. To ensure that adverse solar glare does not affect motorists or pedestrians heading east along Parramatta Road, it is recommended that the normal specular reflectance of visible light for the glazing used on the façade for the 206° and 296° aspects of the development should be a maximum of 11%.

1.2.8 Motorists heading north-west along Kippax Street

Point 12 is located along Kippax Street, to the east of the development site. This point represents the critical sightlines of drivers heading north-west along Kippax Street at this location. A site survey of this point has been undertaken, and photographs showing the typical viewpoint of drivers at this location were obtained using a calibrated camera. The photographs have been scaled to enable the glare meter to be overlaid onto the images, as shown in Appendix A.

An analysis of the viewpoint at Point 12 indicates that the subject development is not visible at these locations. Therefore, no adverse solar glare will be observed by motorists heading north-west along Kippax Street from the façade of subject development.

1.2.9 Motorists heading north-east along Regent Street

Point 13 is located along Regent Street, to the south-west of the development site. This point represents the critical sightlines of drivers heading north-east along Regent Street at this location. A site survey of this point has been undertaken, and photographs showing the typical viewpoint of drivers at this location were obtained using a calibrated camera. The photographs have been scaled to enable the glare meter to be overlaid onto the images, as shown in Appendix A.

An analysis of the viewpoint at Points 13 indicates that the view of the proposed development will not be visible within the zone of sensitive vision from this location. Hence there will be no adverse solar glare observed by motorists heading south-east towards the development along Regent Street at this location.

1.2.10 Train Drivers heading north-east along Central Station train line

Point 14 and 18 is located along the Central Station train line, to the south-west of the development. These points represent the critical sightline of train drivers heading north-east along the Central Station train line at this location. A site survey of this point has been undertaken based on a figure obtained from the provided Sketchup model showing the viewpoint of train drivers at this location. The figure has been scaled to enable the glare meter to be overlaid onto the manually created sketches, as shown in Appendix A.

An analysis of the glare meter overlaid onto the viewpoint at Points 14 and 18 indicates that the view of the proposed development will be visible for the 116° and 206° aspects. However further analysis indicates that Points 14 and 18 lie outside the check zones for the portions of the 116° and 206° aspects of the development inside the zone of sensitive vision of motorists. Hence there will be no adverse solar glare observed by motorists heading north-east towards Central Station at this location.

1.2.11 Motorists heading north-west along Devonshire Street

Points 15 and 17 are located along Devonshire Street, to the east of the development site. These points represent the critical sightlines of drivers heading north-west along Devonshire Street at these locations. A site survey of these points has been undertaken, and photographs showing the typical viewpoint of drivers at these locations were obtained using a calibrated camera. The photographs have been scaled to enable the glare meter to be overlaid onto the images, as shown in Appendix A.

An analysis of the glare meter overlaid onto the viewpoint at Point 15 indicates that the view of the proposed development will not be visible from this location due to the obstruction from the local densely foliating vegetation. Hence there will be no adverse solar glare observed by motorists heading north-west along Devonshire Street at this location.

Further analysis indicates that the view of the proposed development at Point 17 will not be visible within the zone of sensitive vision from this location. Hence there will be no adverse solar glare observed by motorists heading north-west towards the development along Devonshire Street at this location.

1.2.12 Motorists heading north-west along Cooper Street

Point 16 is located along Cooper Street, to the east of the development site. This point represents the critical sightlines of drivers heading north-west along Cooper Street at this location. A site survey of this point has been undertaken, and photographs showing the typical viewpoint of drivers at this location were obtained using a calibrated camera. The photographs

have been scaled to enable the glare meter to be overlaid onto the images, as shown in Appendix A.

An analysis of the viewpoint at Point 16 indicates that the subject development is not visible at this location. Therefore, no adverse solar glare will be observed by motorists heading north-west along Cooper Street from the façade of subject development.

1.2.13 Motorists heading north along Regent Street

Point 19 is located along Regent Street, to the south-west of the development site. This point represents the critical sightlines of drivers heading north along Regent Street at this location. A site survey of this point has been undertaken, and photographs showing the typical viewpoint of drivers at this location were obtained using a calibrated camera. The photographs have been scaled to enable the glare meter to be overlaid onto the images, as shown in Appendix A.

An analysis of the glare meter overlaid onto the viewpoint at Point 19 indicates that the view of the proposed development will not be visible within the zone of sensitive vision from this location. Hence there will be no adverse solar glare observed by motorists heading north towards the development along Regent Street at this location.

1.2.14 Motorists heading north along George Street

Point 20 is located along George Street, to the south of the development site. This point represents the critical sightlines of drivers heading north along George Street at this location. A site survey of this point has been undertaken, and photographs showing the typical viewpoint of drivers at this location were obtained using a calibrated camera. The photographs have been scaled to enable the glare meter to be overlaid onto the images, as shown in Appendix A.

An analysis of the glare meter overlaid onto the viewpoint at Point 20 indicates that the view of the proposed development will be visible for the 116° and 206° aspects. However further analysis indicates that Point 20 lies outside the check zones for the portions of the 116° and 206° aspects of the development inside the zone of sensitive vision of motorists. Hence there will be no adverse solar glare observed by motorists heading north towards the development along George Street at this location.

1.2.15 Motorists heading west along Cleveland Street

Point 21 is located along Cleveland Street, to the south-east of the development site. This point represents the critical sightlines of drivers heading west along Cleveland Street at this location. A site survey of this point has been undertaken, and photographs showing the typical viewpoint of drivers at this location were obtained using a calibrated camera. The photographs have been scaled to enable the glare meter to be overlaid onto the images, as shown in Appendix A.

An analysis of the viewpoint at Point 21 indicates that the subject development is not visible at this location. Therefore, no adverse solar glare will be observed by motorists heading north-west along Cooper Street from the façade of subject development.

2 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 subject development have a maximum normal specular reflectivity of visible light of 20% to avoid adverse solar glare to pedestrians and occupants of neighbouring buildings.

3 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, and also from the Compressed Fibrecement Cladding proposed for this development, 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.

3.1 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%

3.2 Painted and/or Powder-Coated Metallic Surfaces

In the event that some portions of the external façade of the development feature power-coated or painted metallic surfaces, including the perforated metal screens, metal roof, louvres, etc, which are featured on this development, 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.

4 CONCLUSION

A detailed study for the effect of potential solar glare from the proposed Atlassian YHA Central Station Project, located in Sydney CBD. 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 City of Sydney Development Control Plan 2012, Section 3.2.7.

A site survey has been undertaken to obtain photographs of the critical sightlines of motorists on the surrounding streets. These photographs are calibrated and are able to be overlaid with a glare meter, which allows the extent, if any, of potential solar glare reflections from the subject development to be determined.

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, the following is recommended:

- The normal specular reflectance of visible light for the glazing of the façade and windows of the 32°, 206° and 296° aspects of the development should be a maximum of 11%.
- All glazing used on the remaining external façade of the development should have a maximum normal specular reflectance of visible light of 20%.

The development benefits from the effective use of sunshade screening devices, and also from the overshadowing provided by the various step-ins and changes in form of the development itself.

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 development, 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.

With the incorporation of these recommendations, the results of this study indicate that the subject development will not cause adverse solar glare to pedestrians and motorists in the surrounding area, or to occupants of neighbouring buildings.

5 REFERENCES

City of Sydney Council, 2012 "City of Sydney Development Control Plan 2012".

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.

State Environmental Planning Policy No. 65 (SEPP65), 2015, "Apartment Design Guide", NSW Department of Planning and Environment.

APPENDIX A GLARE OVERLAYS FOR THE CRITICAL SIGHT-LINES

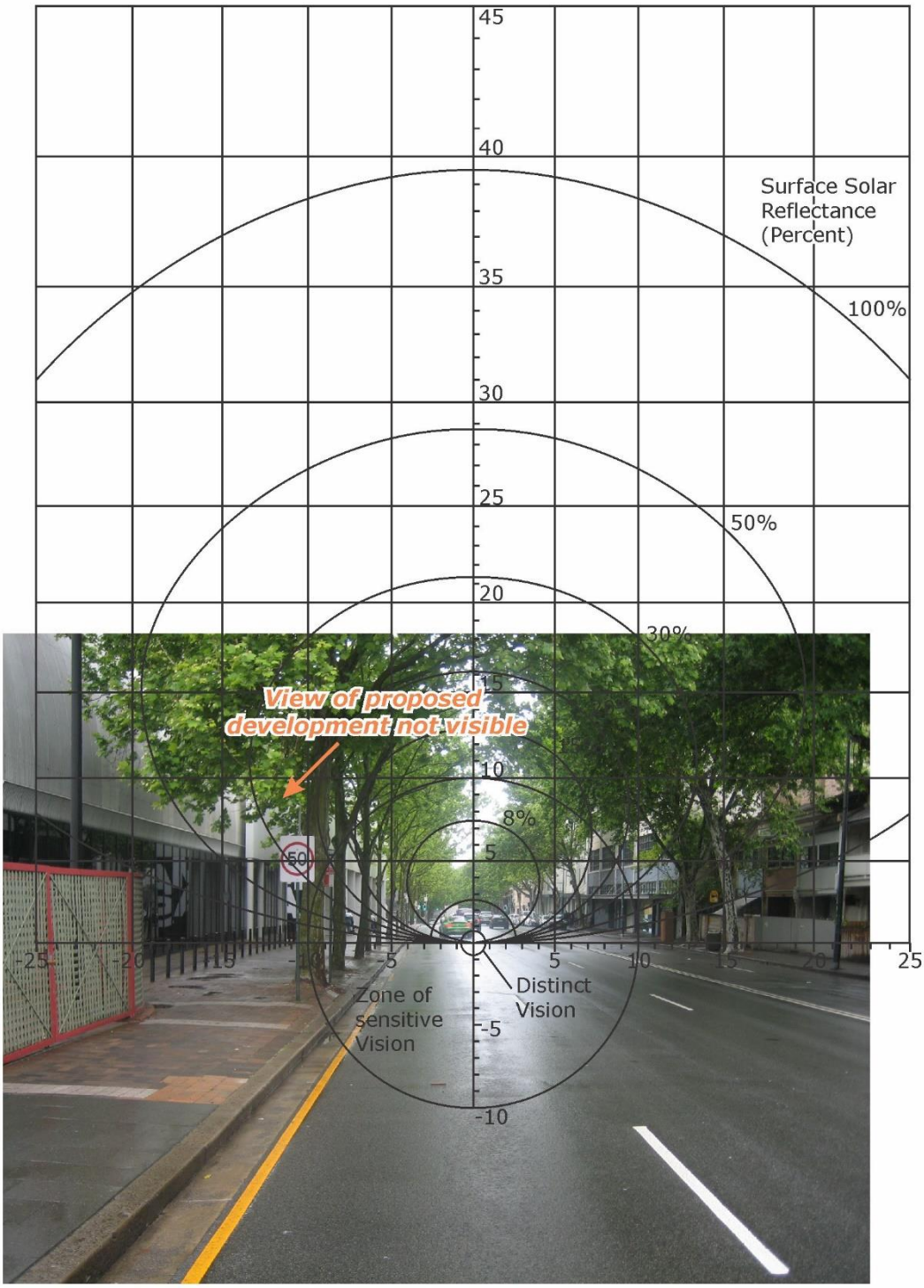


Figure A.1: Glare Overlay of the Viewpoint at Point 01

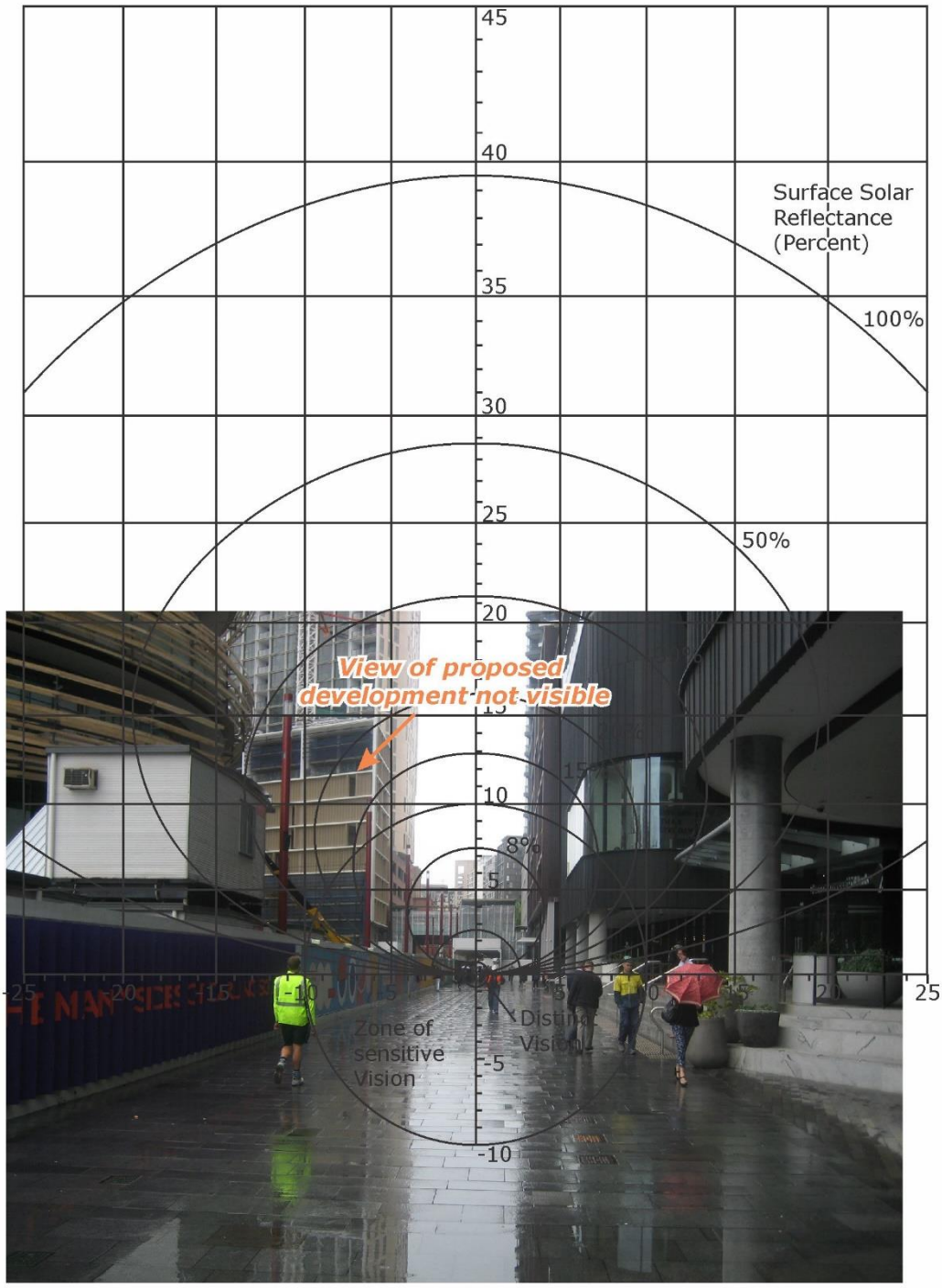


Figure A.2: Glare Overlay of the Viewpoint at Point 02

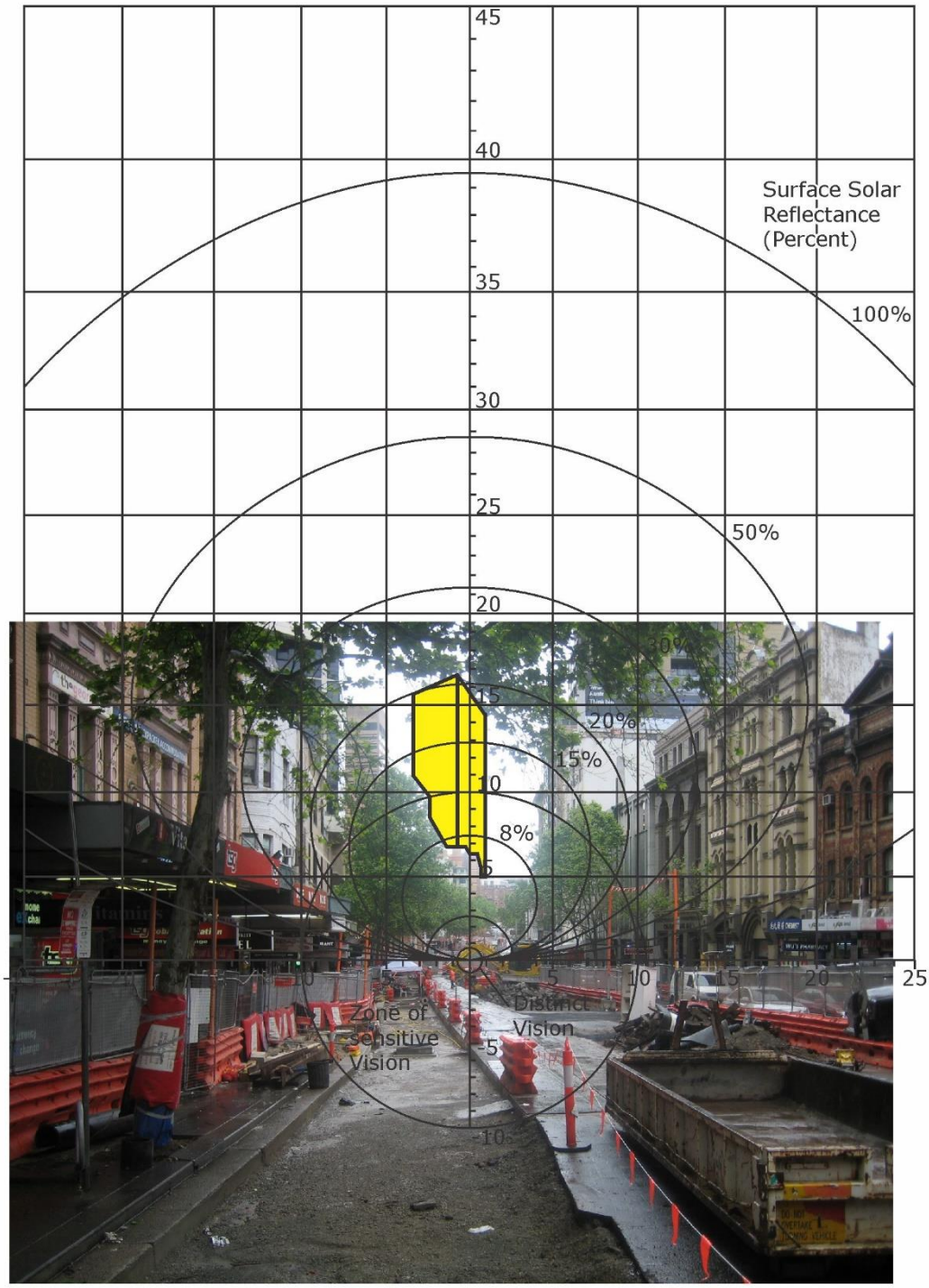


Figure A.3: Glare Overlay of the Viewpoint at Point 03

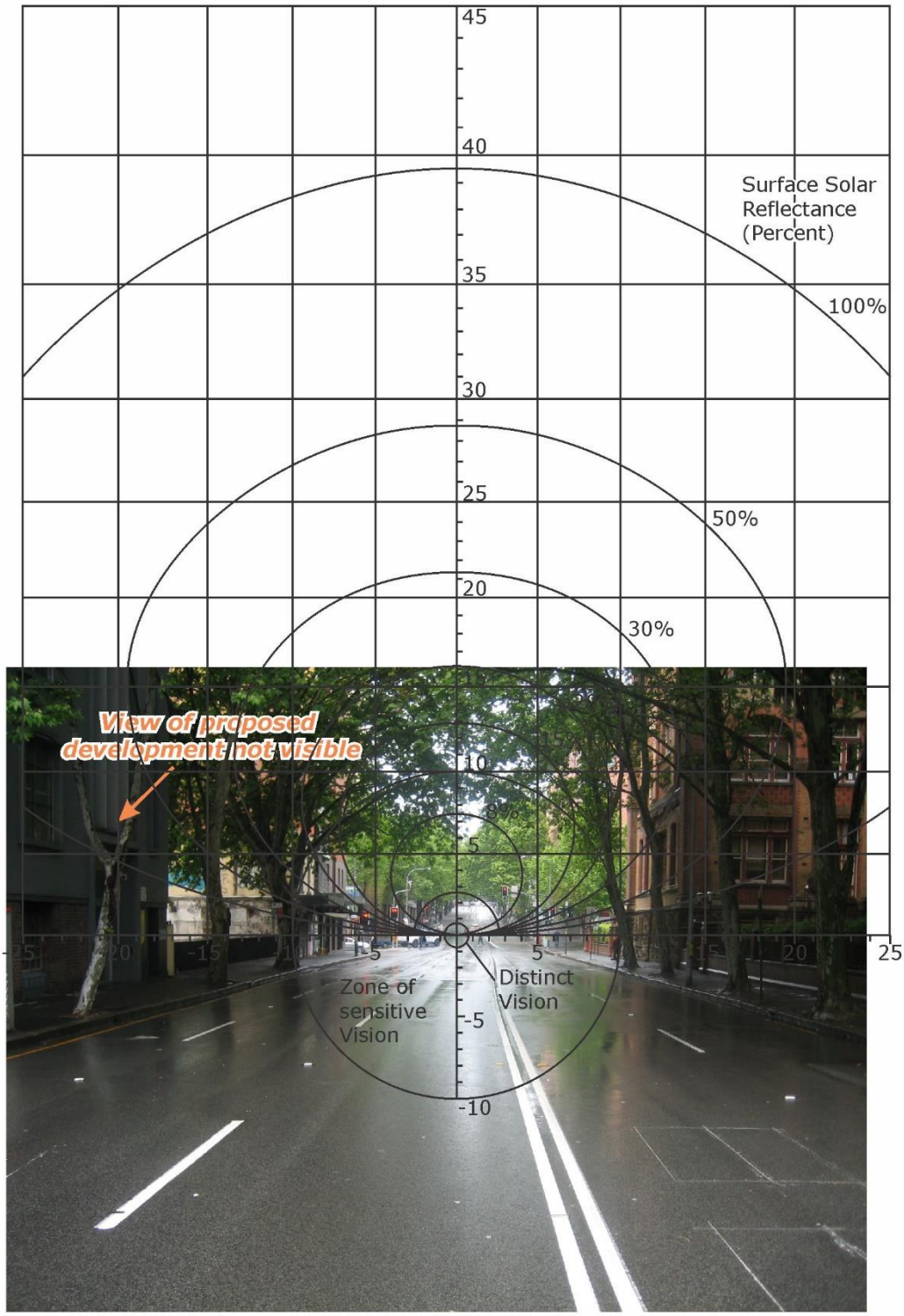


Figure A.4: Glare Overlay of the Viewpoint at Point 04

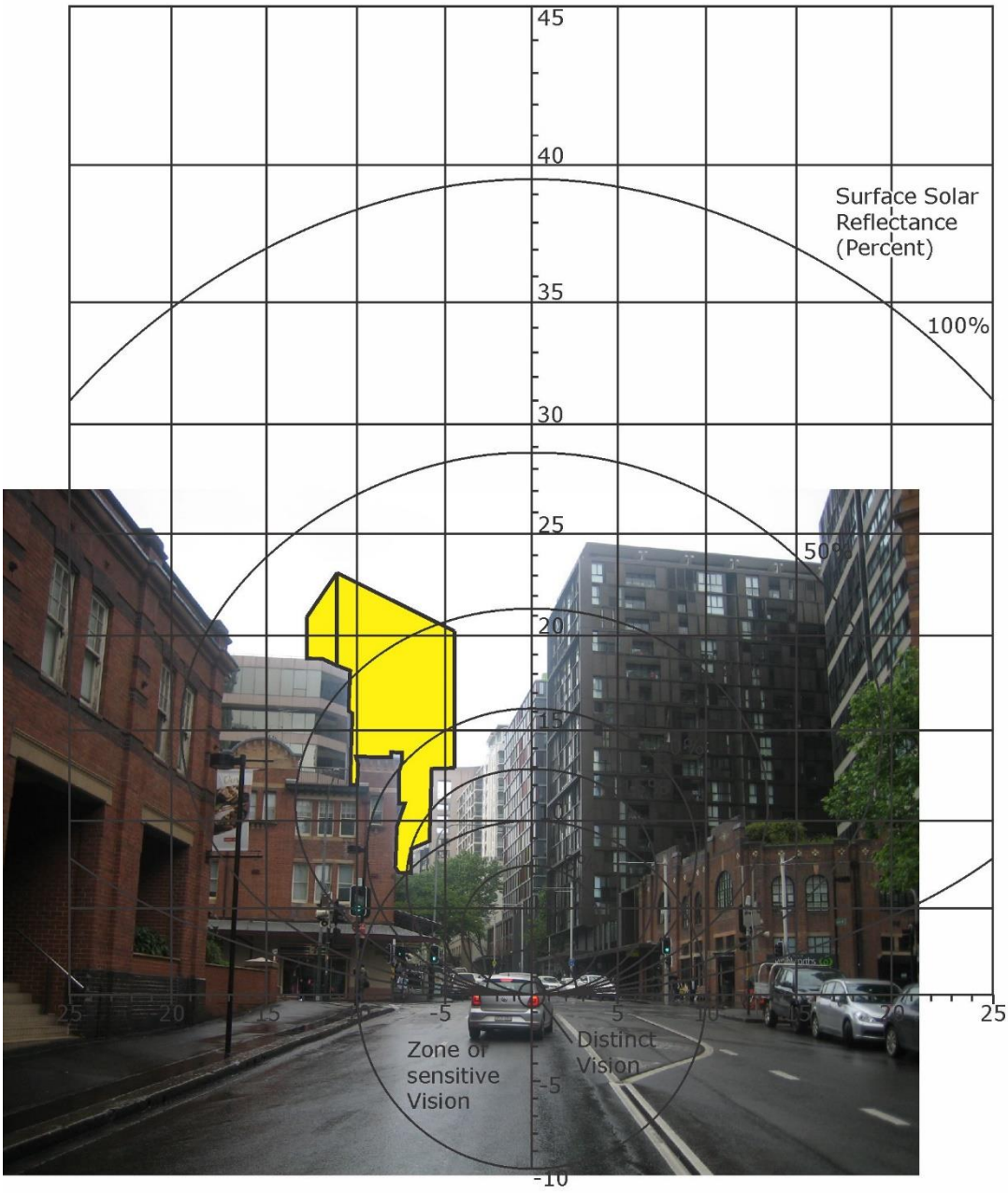


Figure A.5: Glare Overlay of the Viewpoint at Point 05

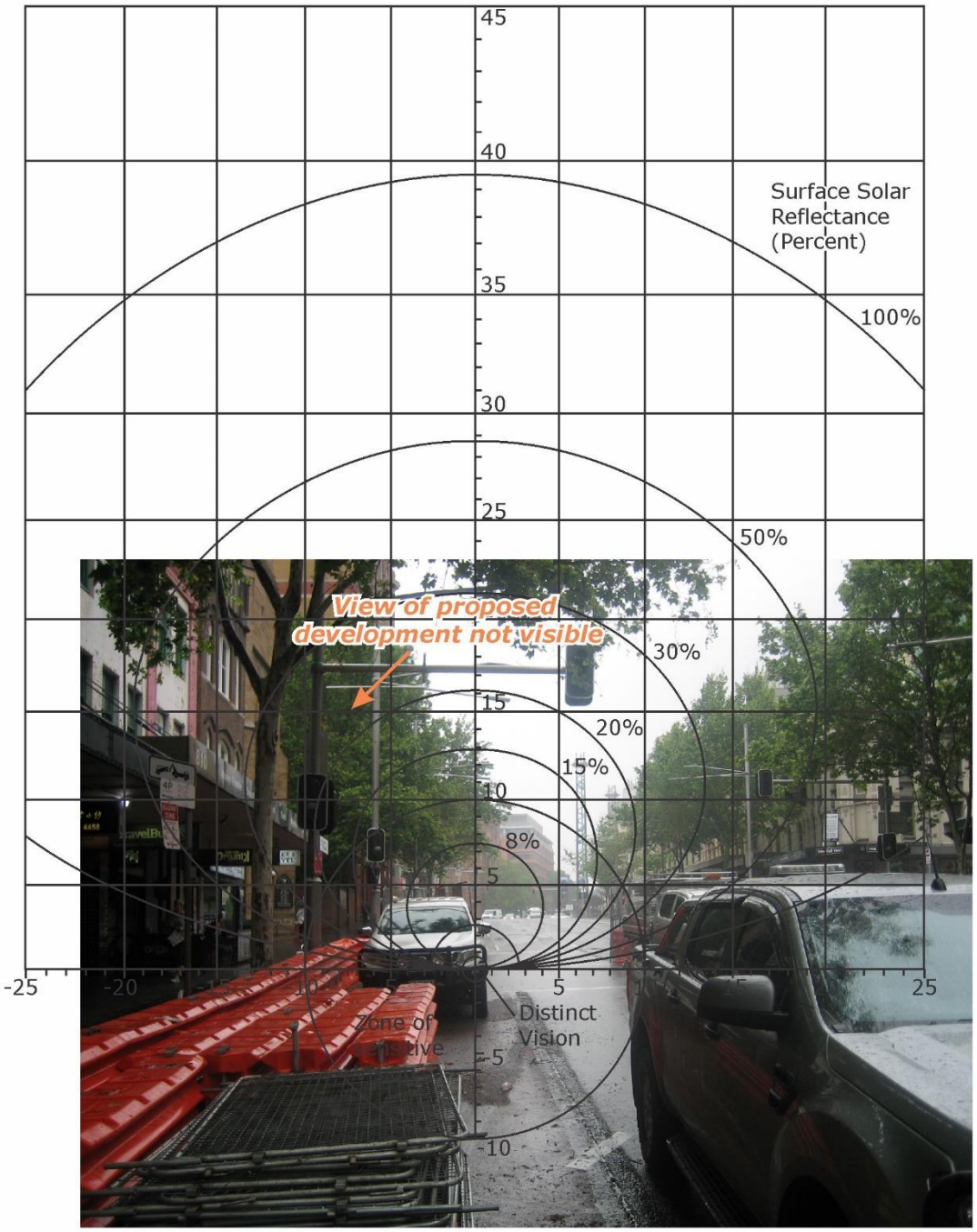


Figure A.6: Glare Overlay of the Viewpoint at Point 06

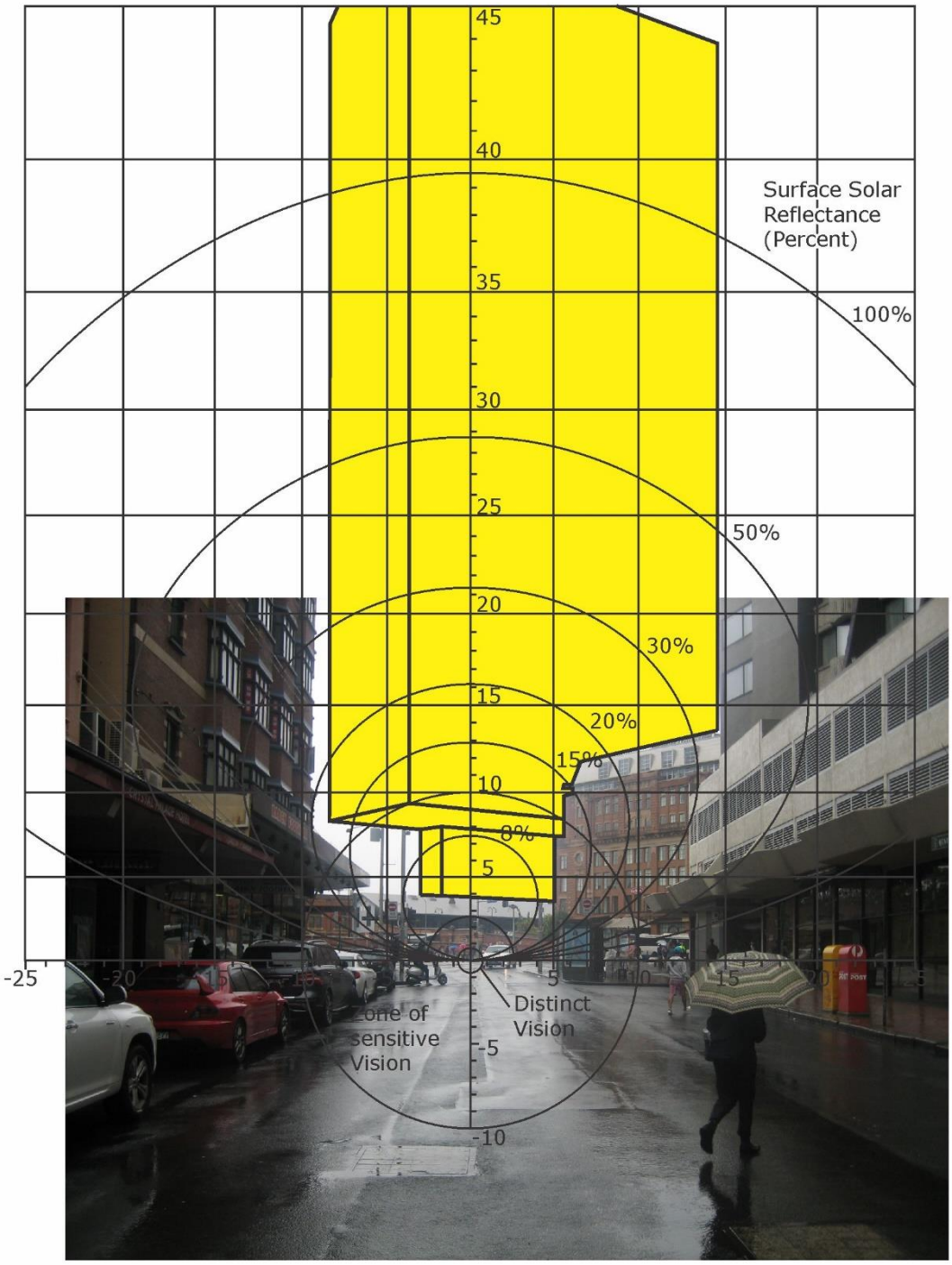


Figure A.7: Glare Overlay of the Viewpoint at Point 07

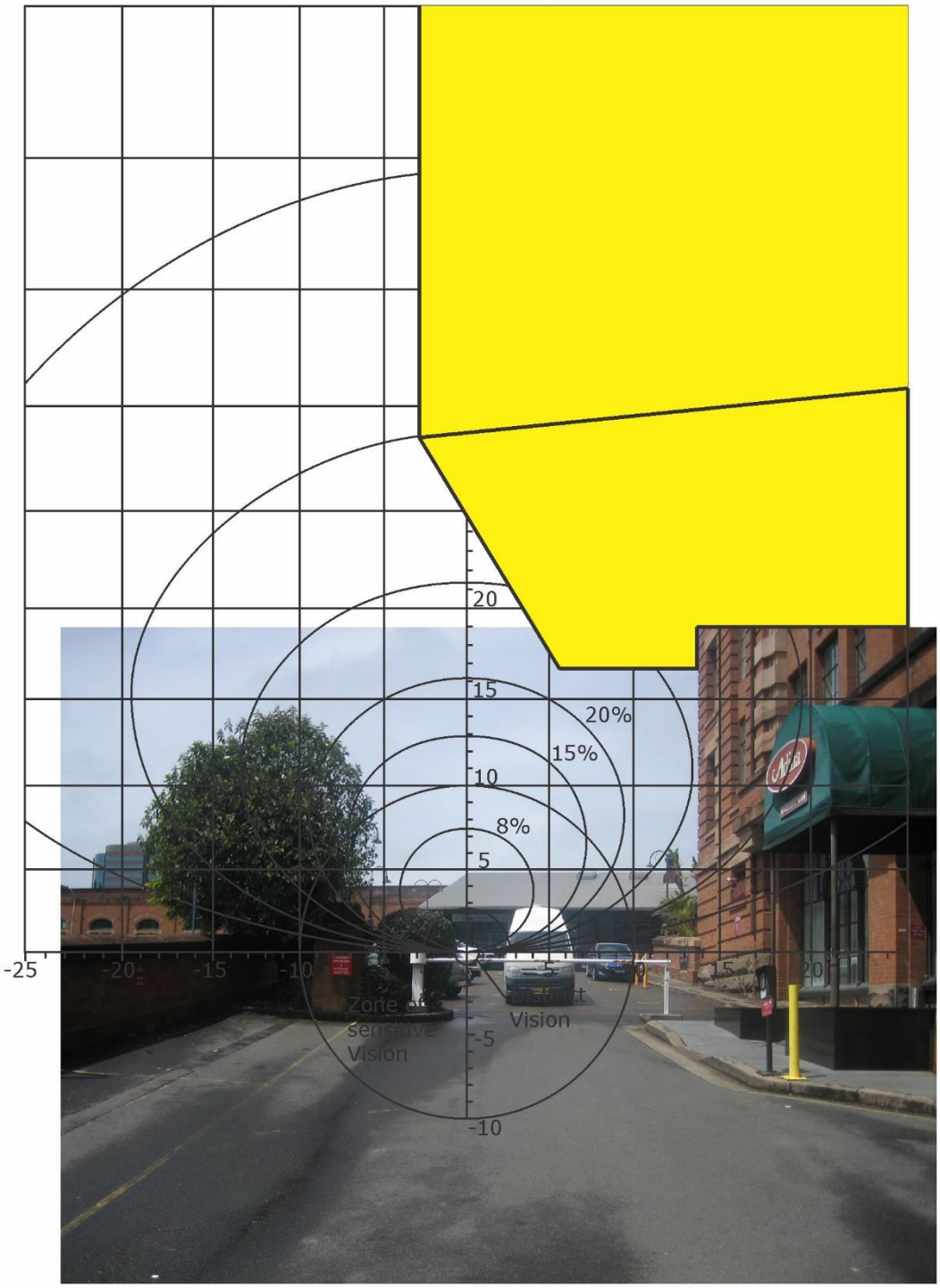


Figure A.8: Glare Overlay of the Viewpoint at Point 08

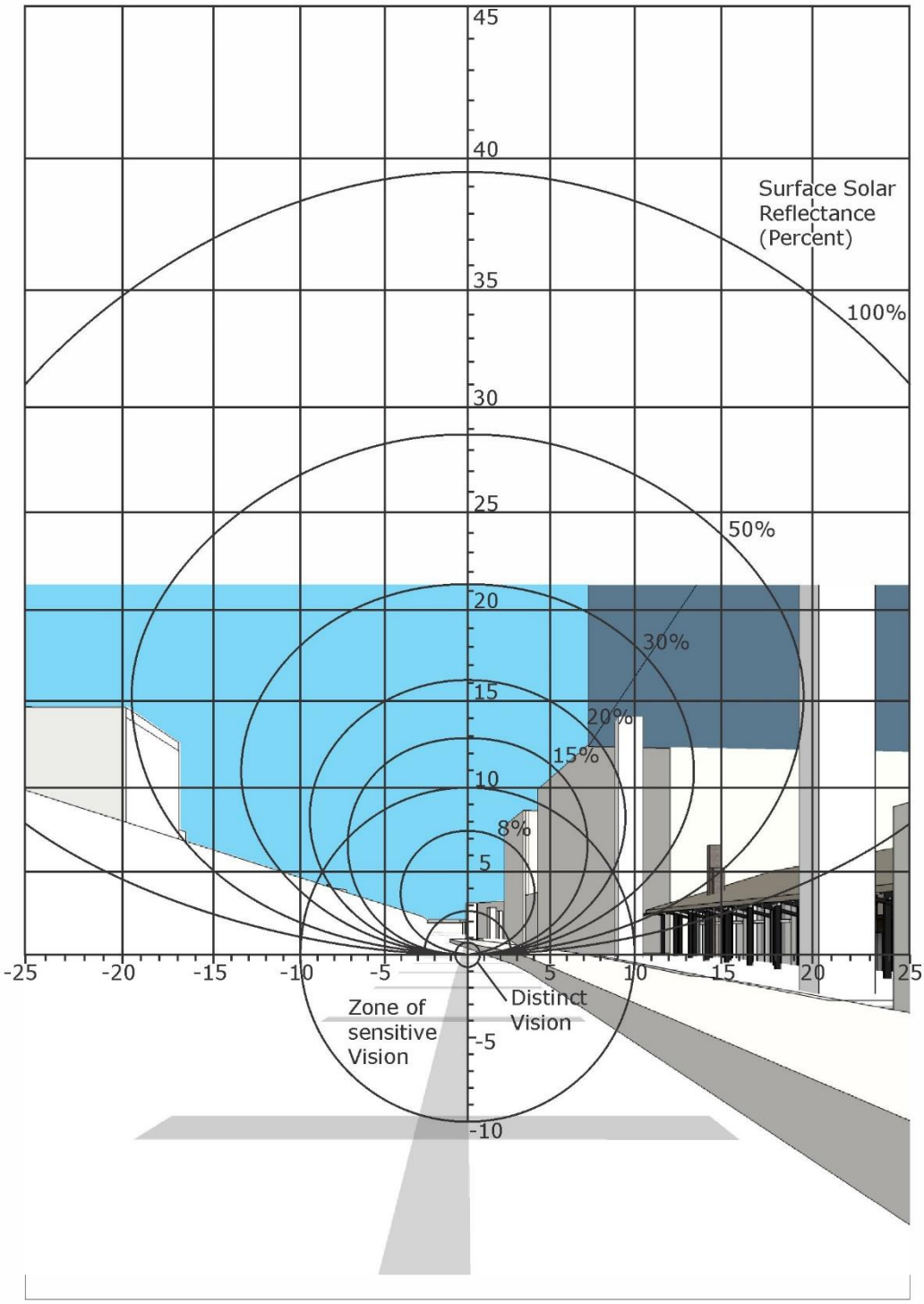


Figure A.9: Glare Overlay of the Viewpoint at Point 09

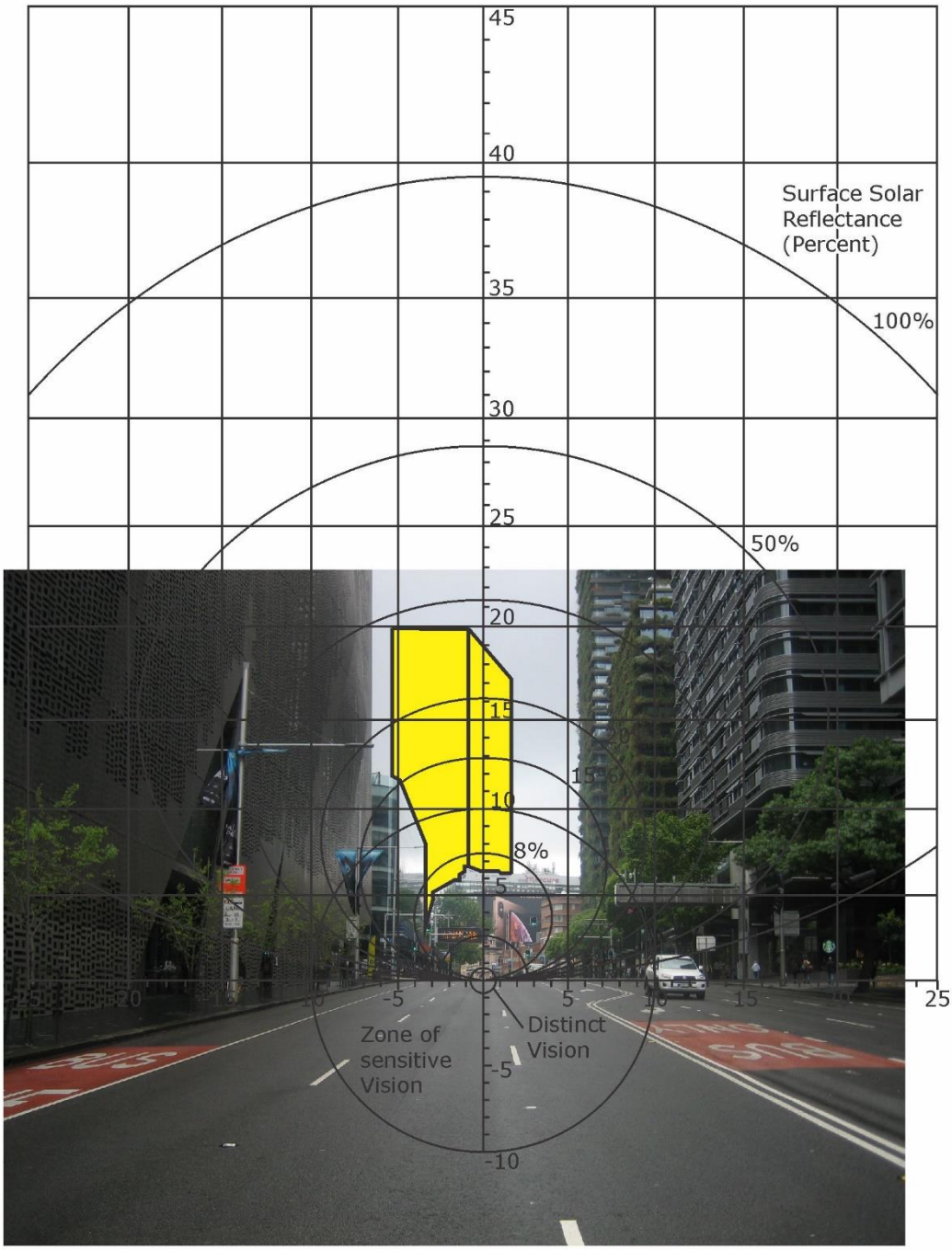


Figure A.10: Glare Overlay of the Viewpoint at Point 10

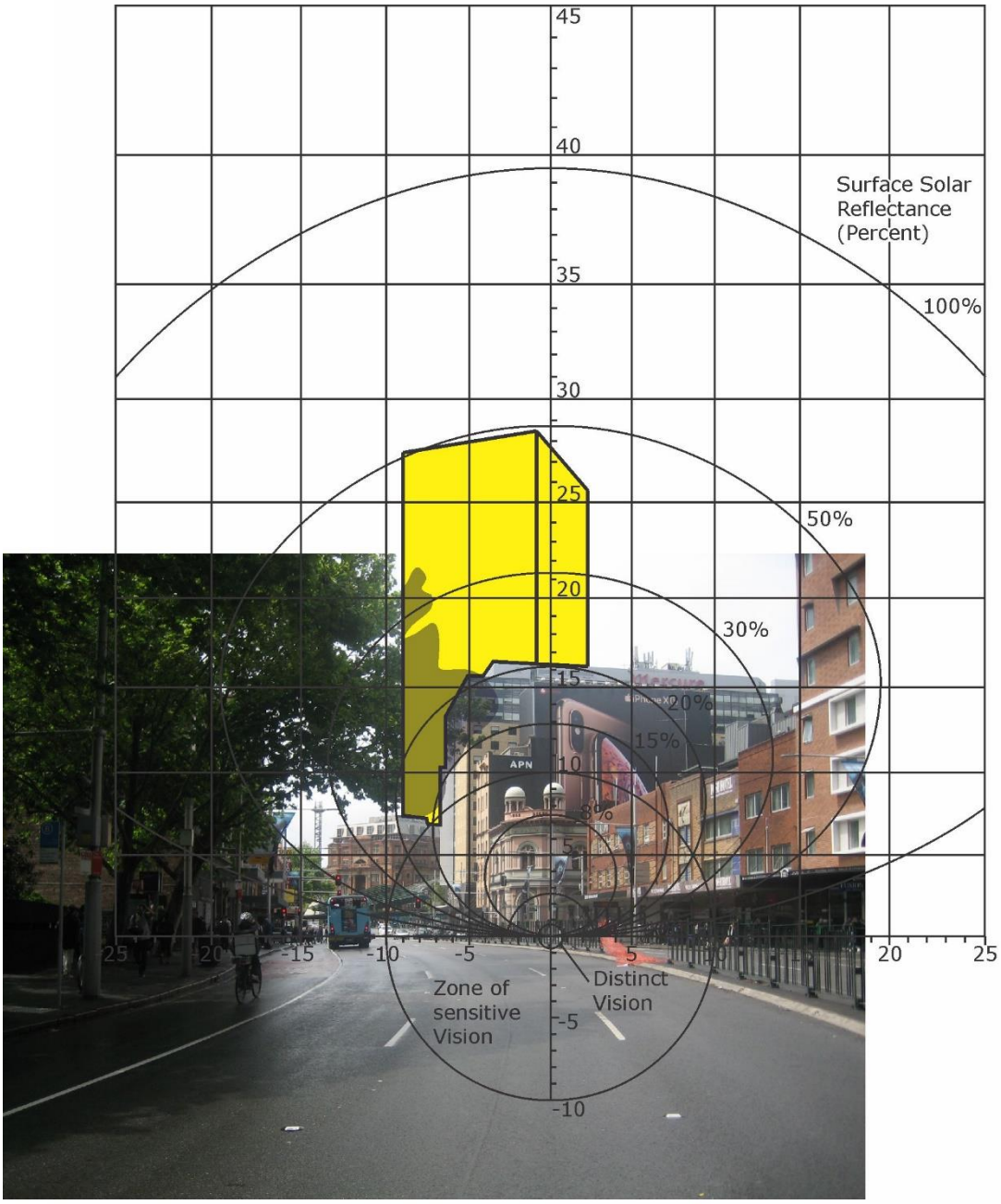


Figure A.11: Glare Overlay of the Viewpoint at Point 11

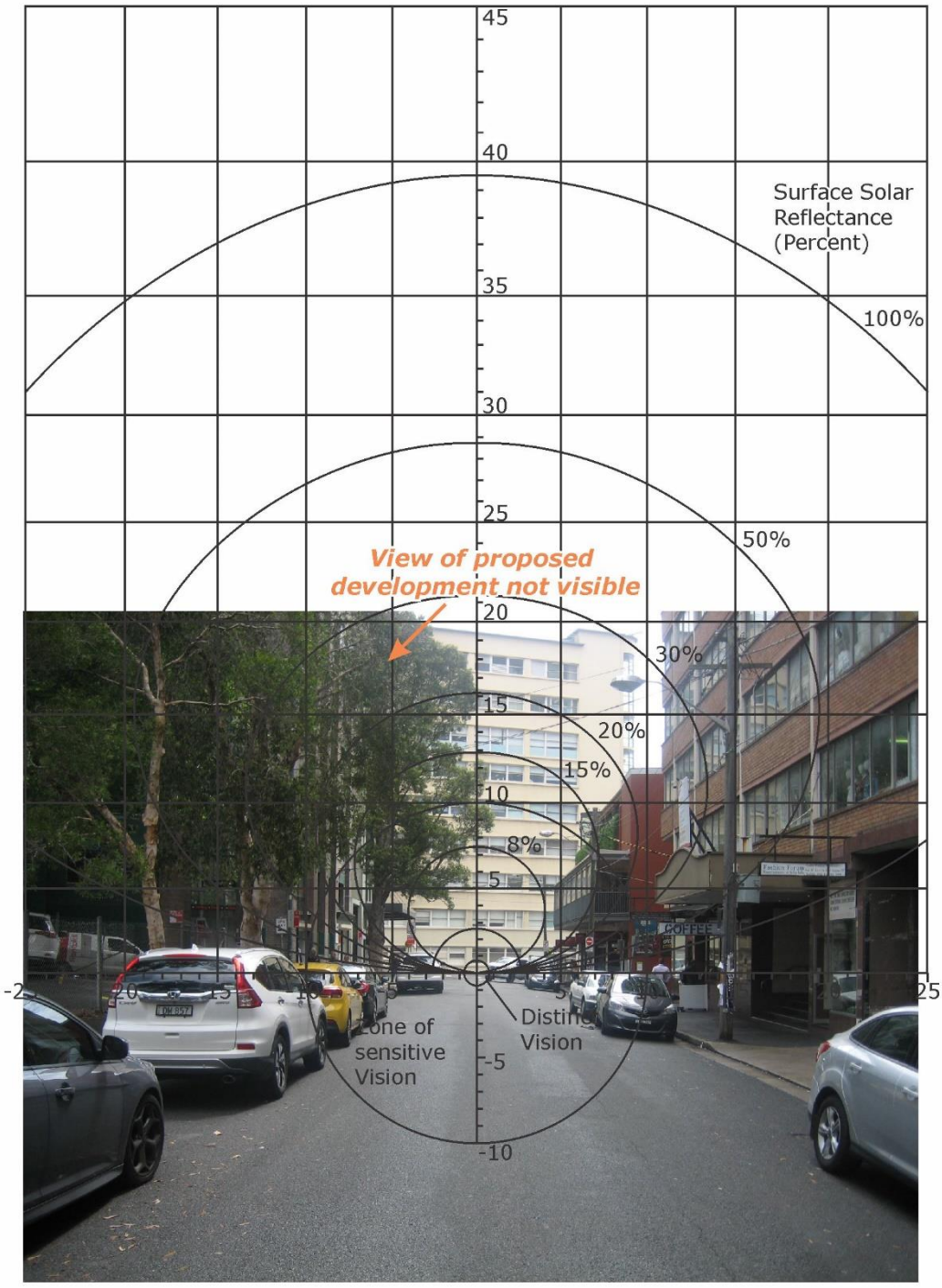


Figure A.12: Glare Overlay of the Viewpoint at Point 12

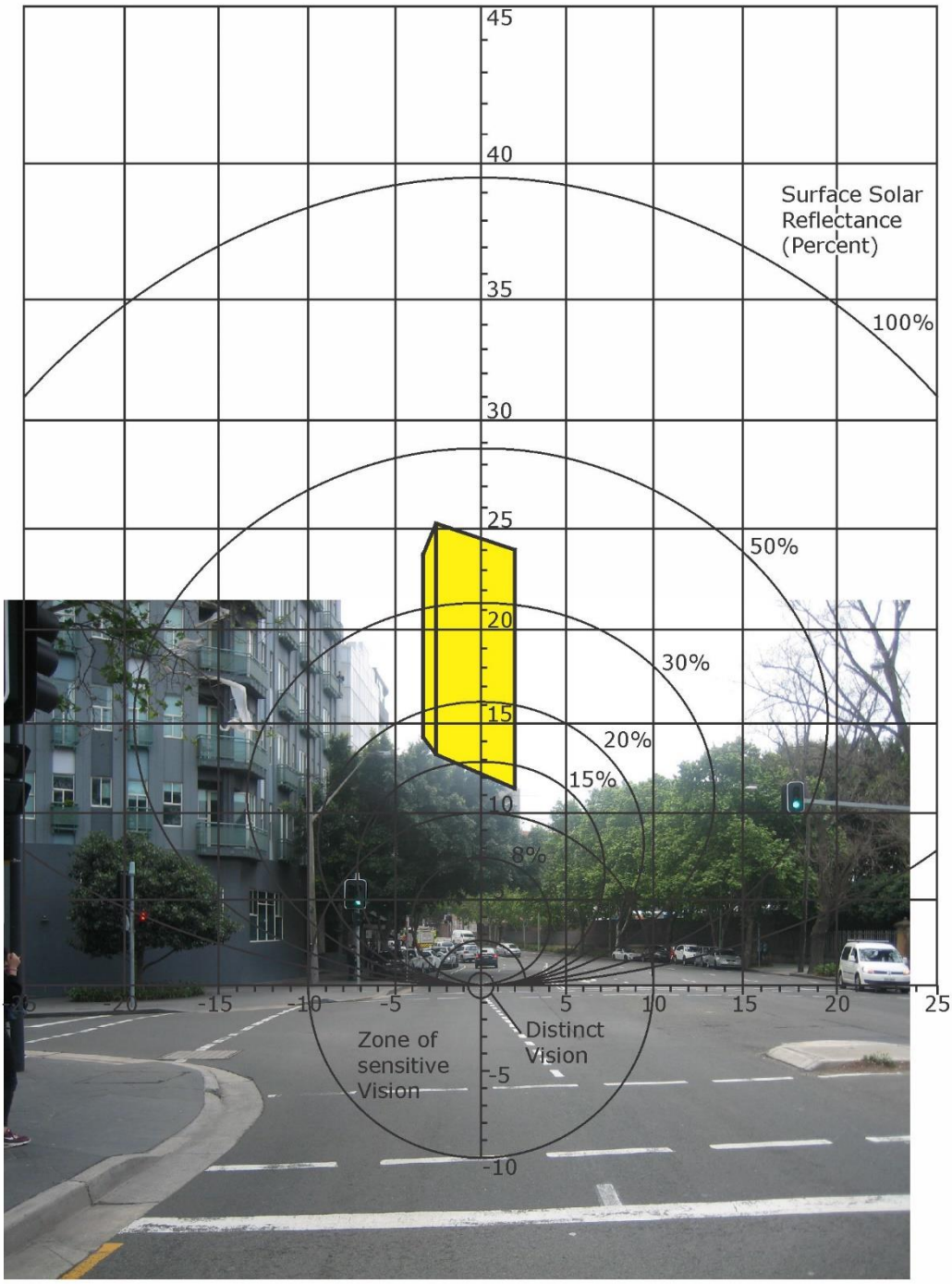


Figure A.13: Glare Overlay of the Viewpoint at Point 13

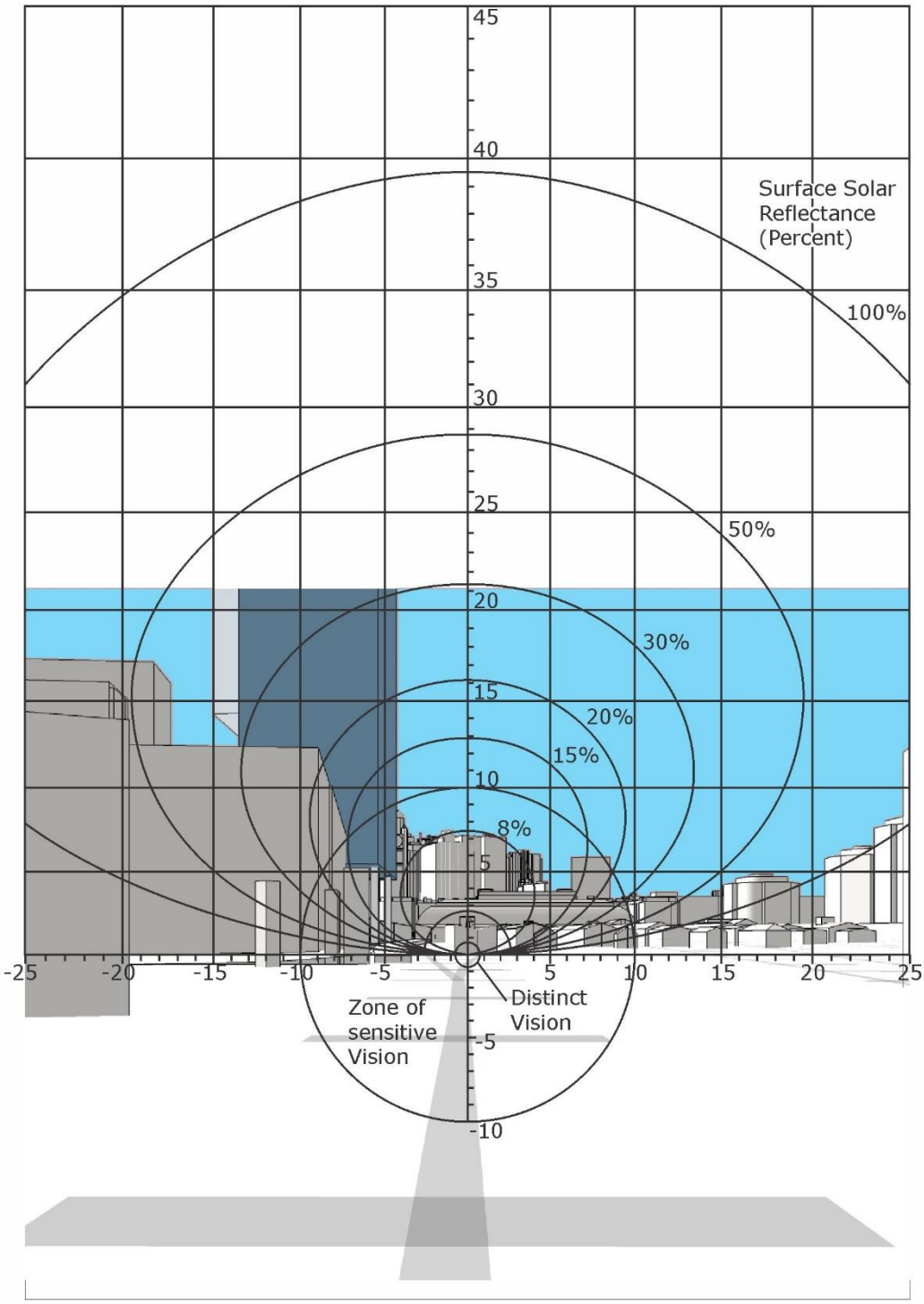


Figure A.14: Glare Overlay of the Viewpoint at Point 14

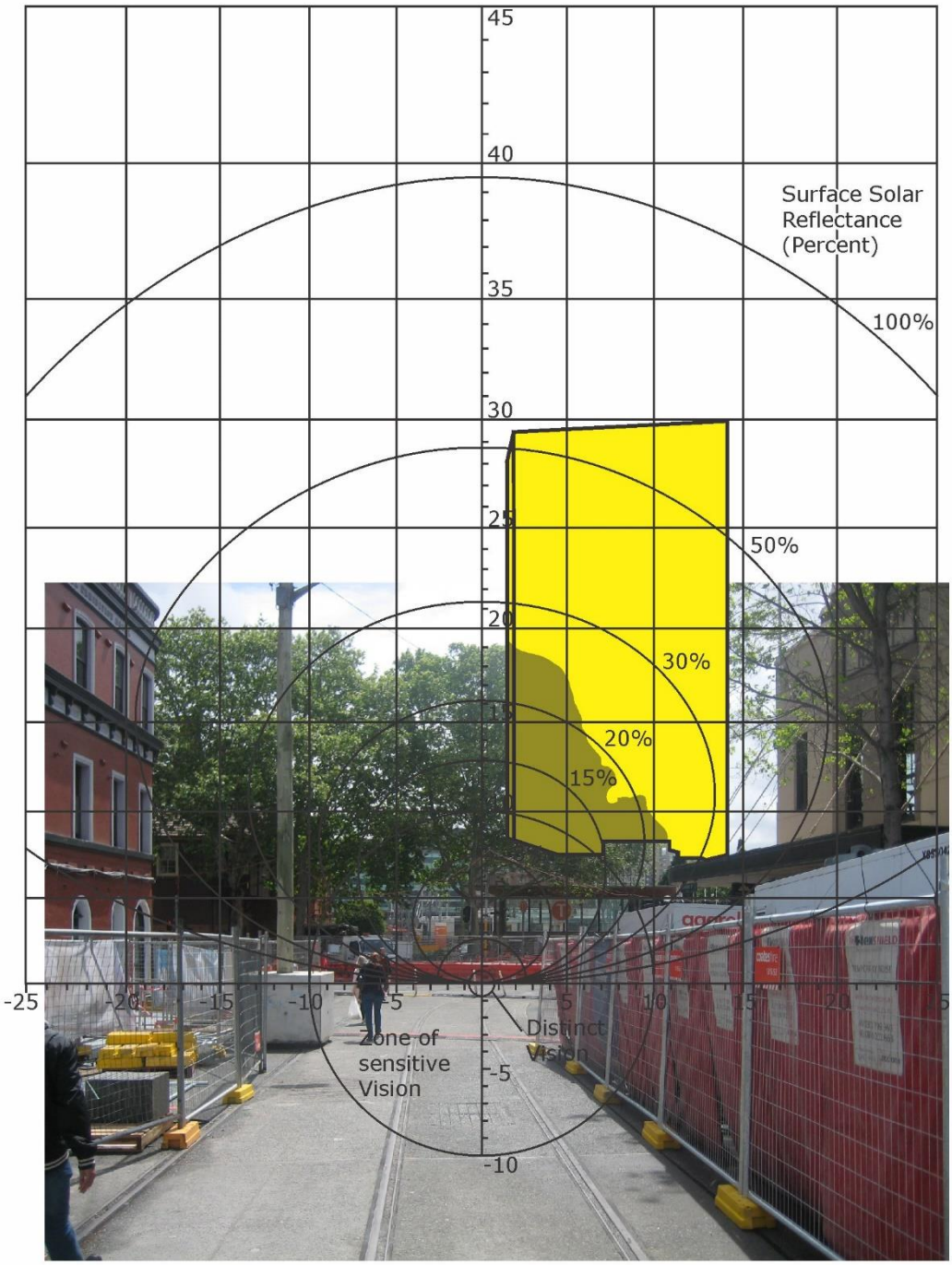


Figure A.15: Glare Overlay of the Viewpoint at Point 15

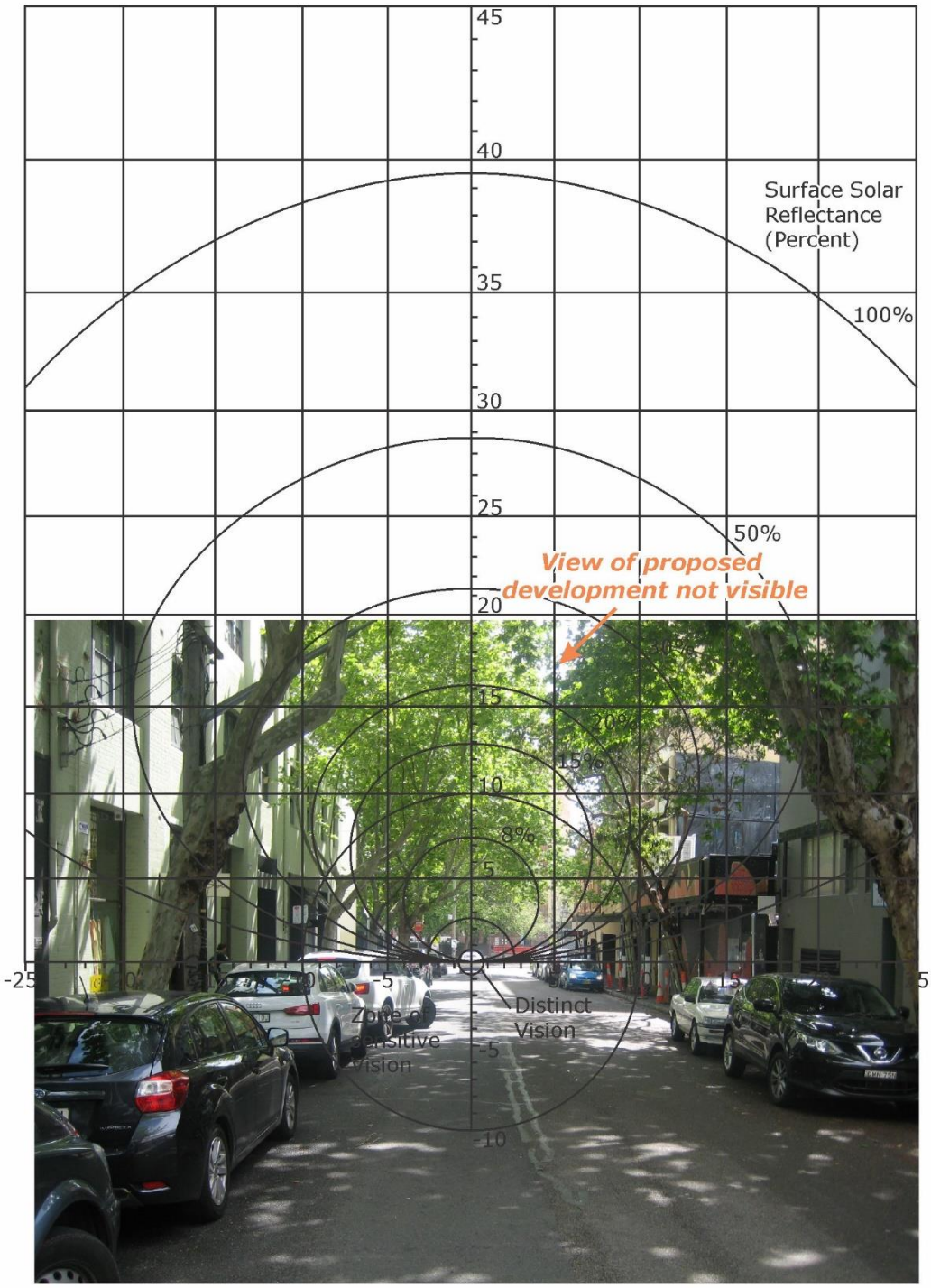


Figure A.16: Glare Overlay of the Viewpoint at Point 16

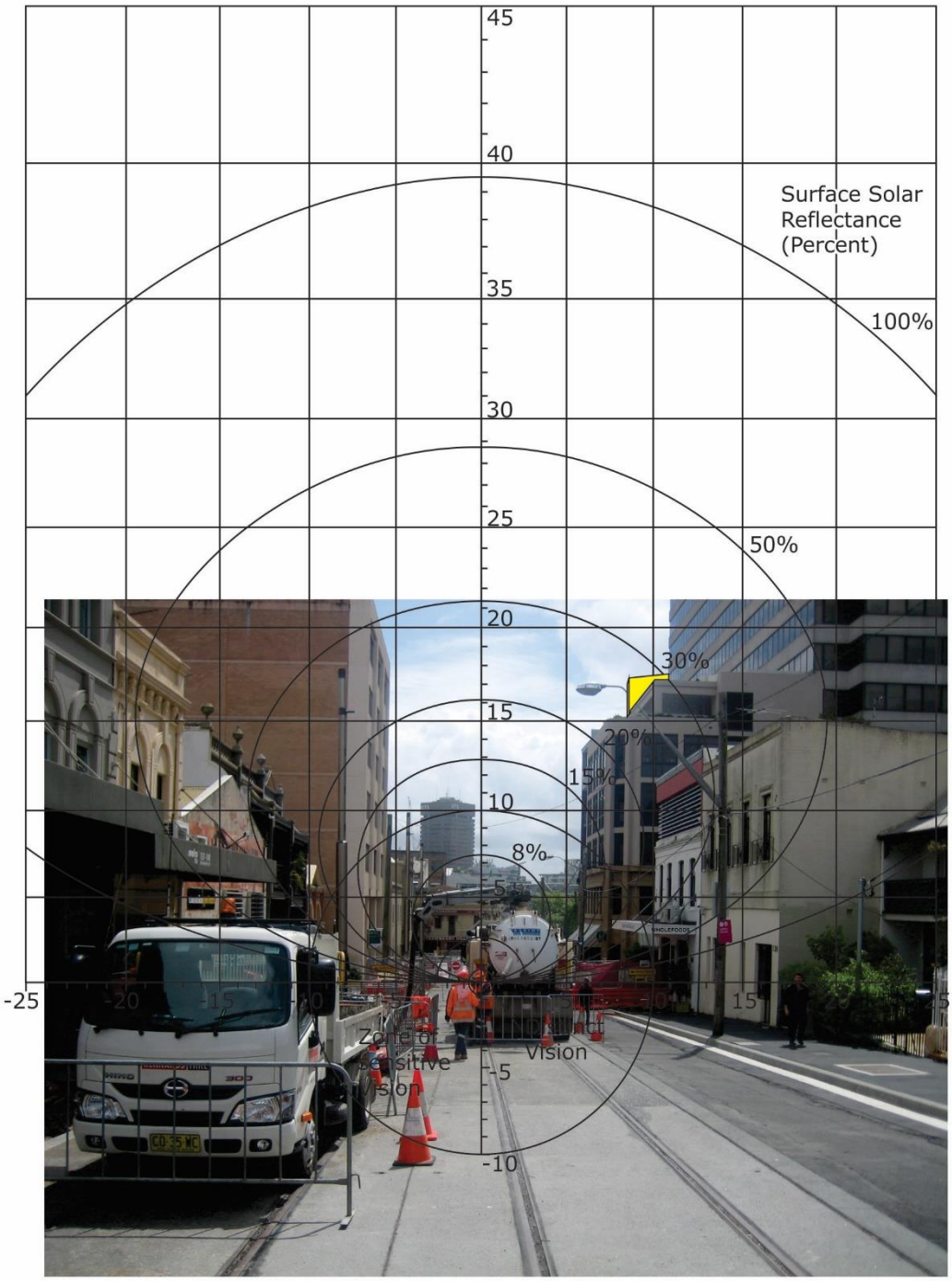


Figure A.17: Glare Overlay of the Viewpoint at Point 17

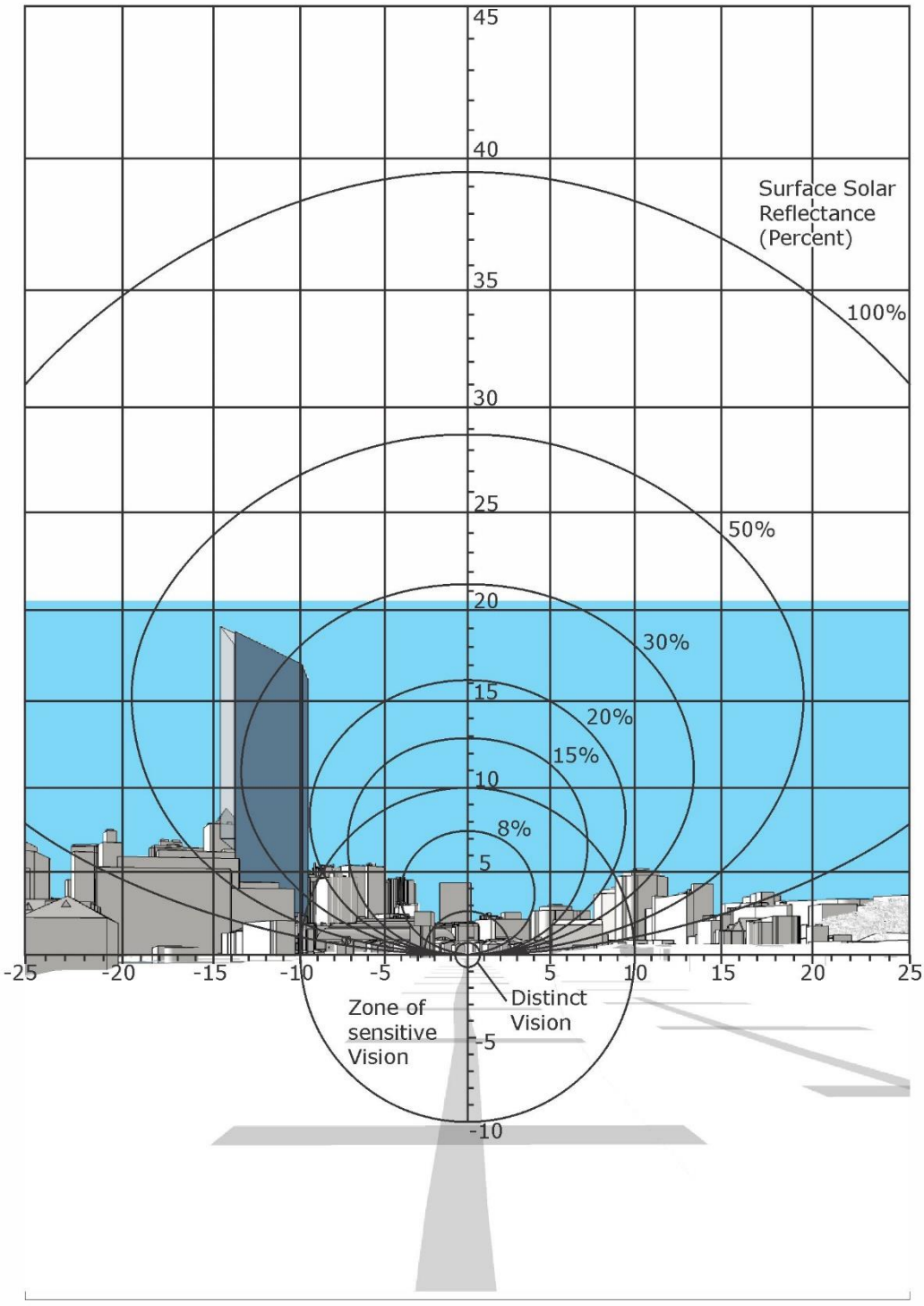


Figure A.18: Glare Overlay of the Viewpoint at Point 18

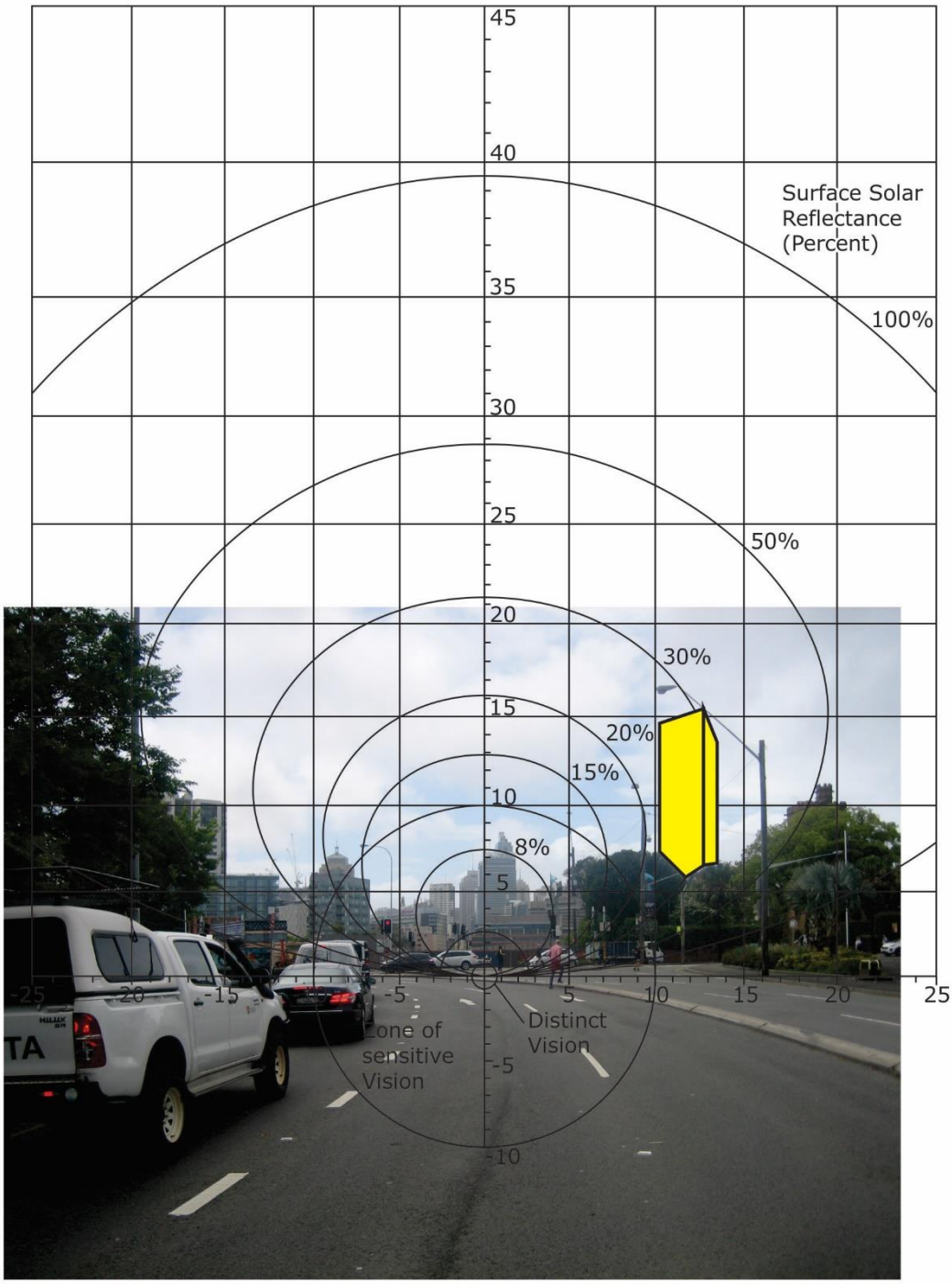


Figure A.19: Glare Overlay of the Viewpoint at Point 19

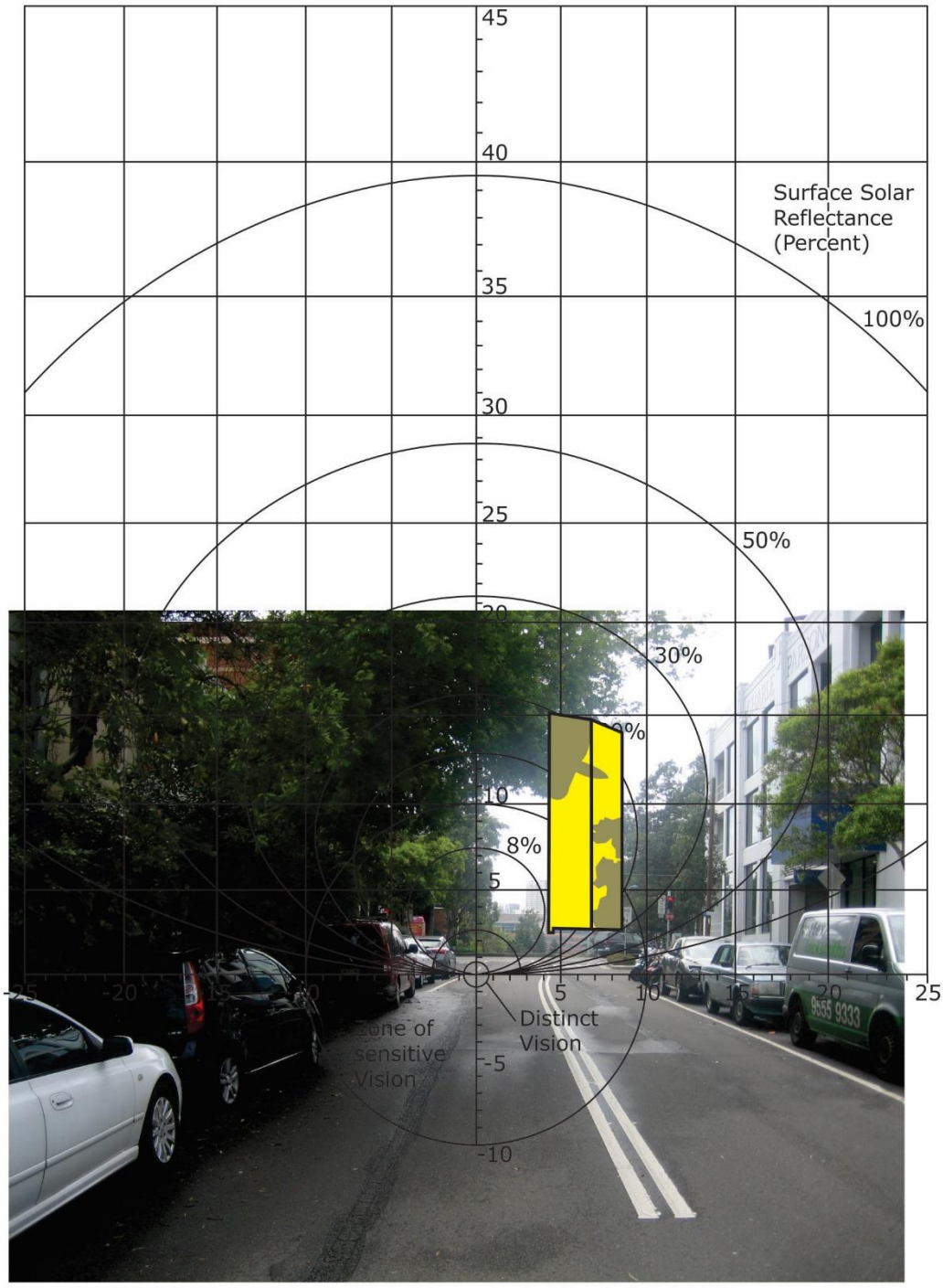


Figure A.20: Glare Overlay of the Viewpoint at Point 20

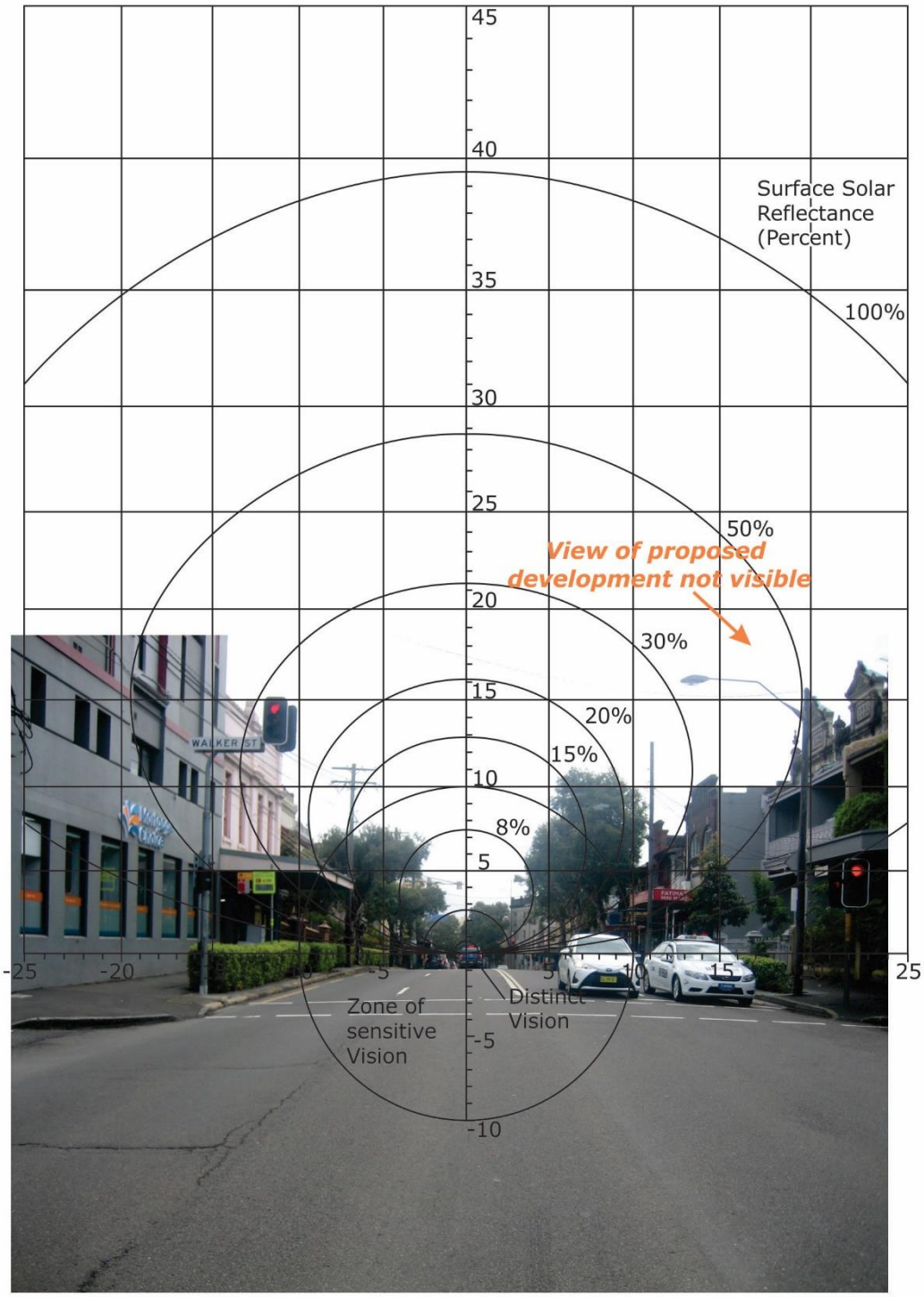


Figure A.21: Glare Overlay of the Viewpoint at Point 21

APPENDIX B SOLAR CHARTS FOR THE VARIOUS CRITICAL ASPECTS

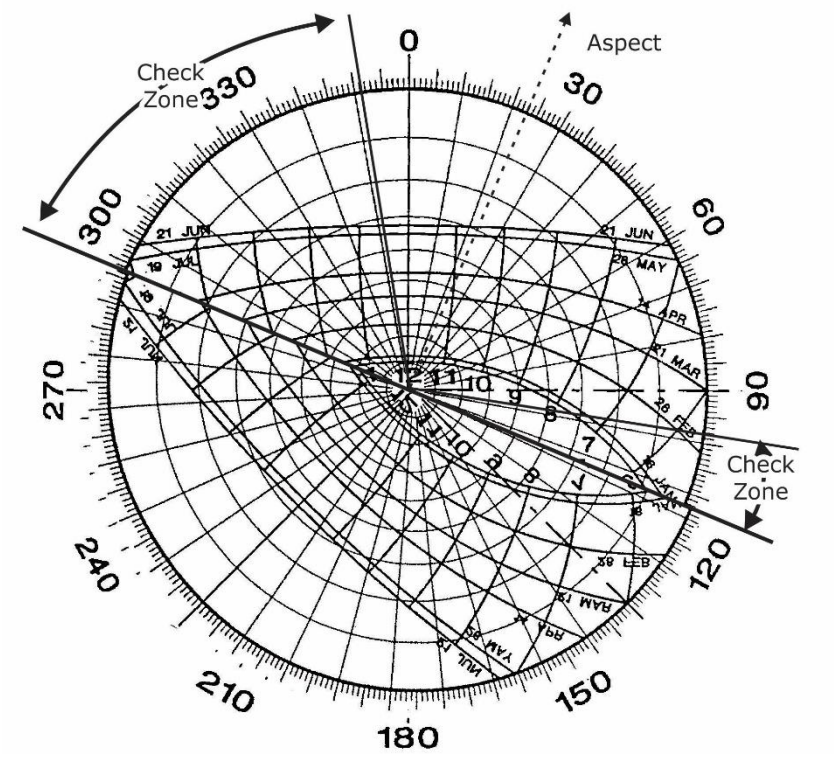


Figure B.1: Sun Chart for the 023° Aspect

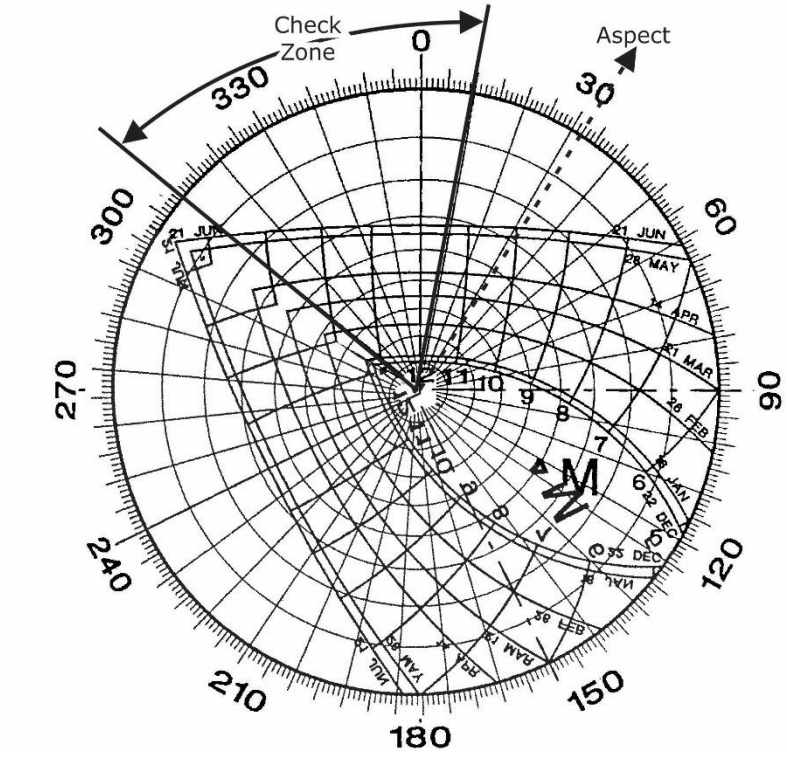


Figure B.2: Sun Chart for the 032° Aspect

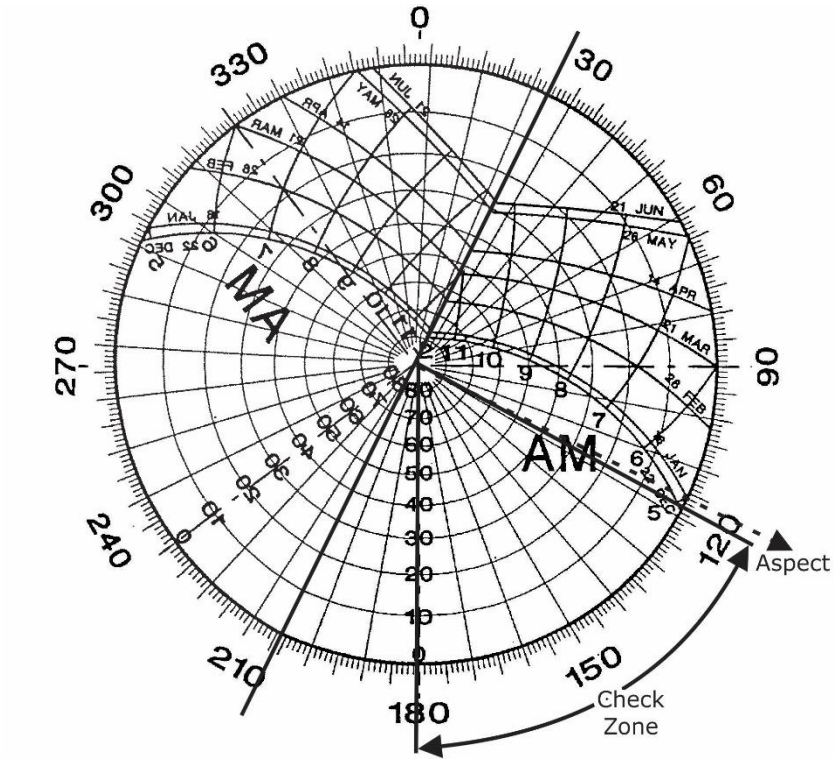


Figure B.3: Sun Chart for the 116° Aspect

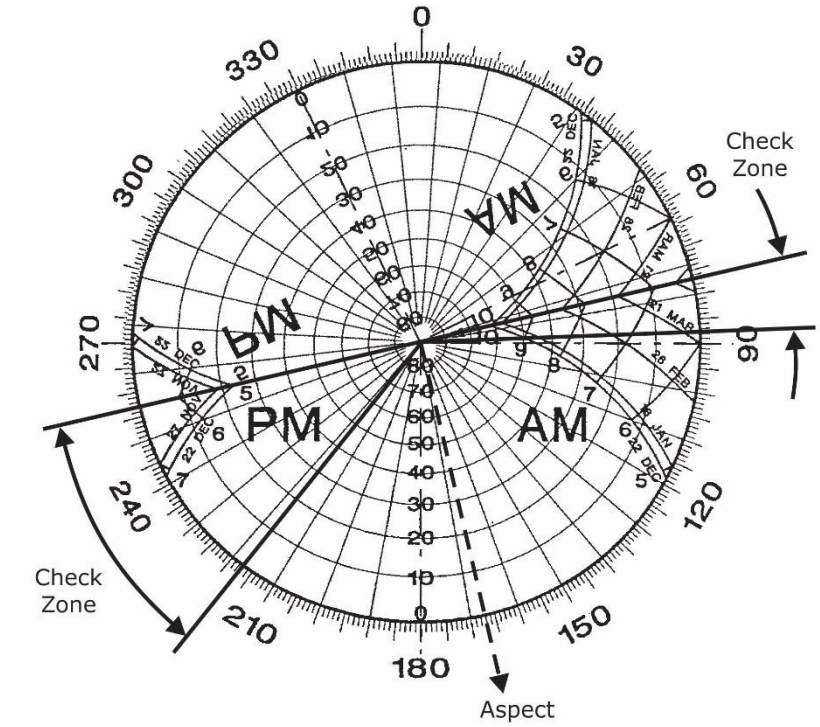


Figure B.4: Sun Chart for the 167° Aspect

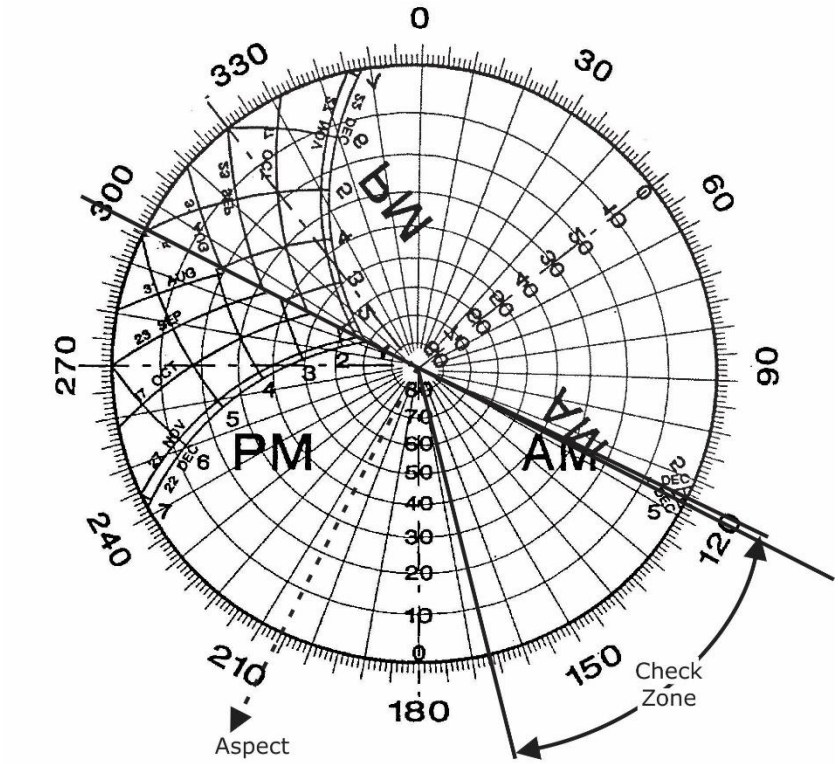


Figure B.5: Sun Chart for the 206° Aspect

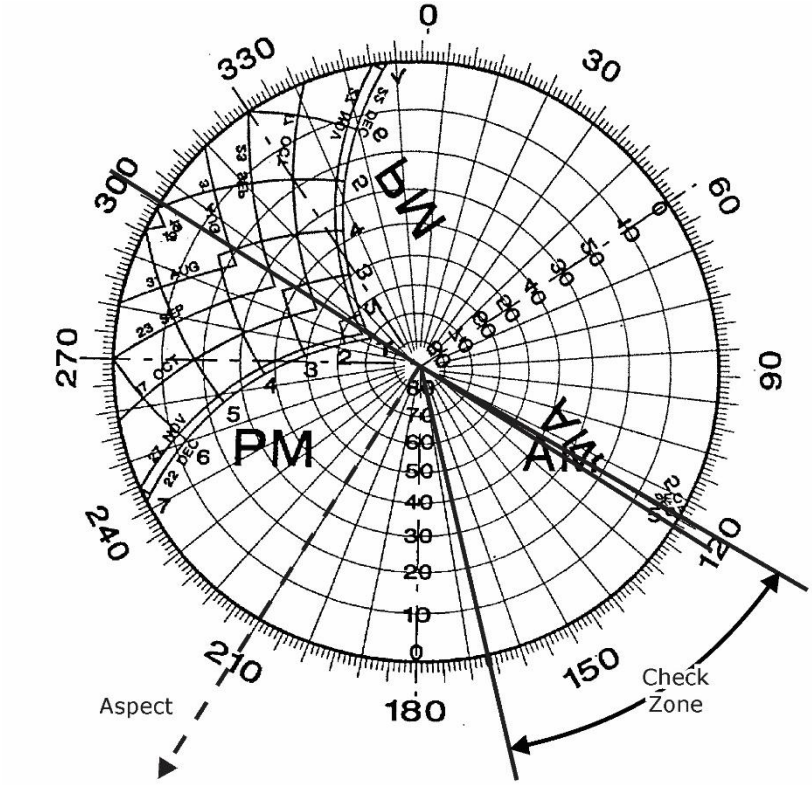


Figure B.6: Sun Chart for the 210° Aspect

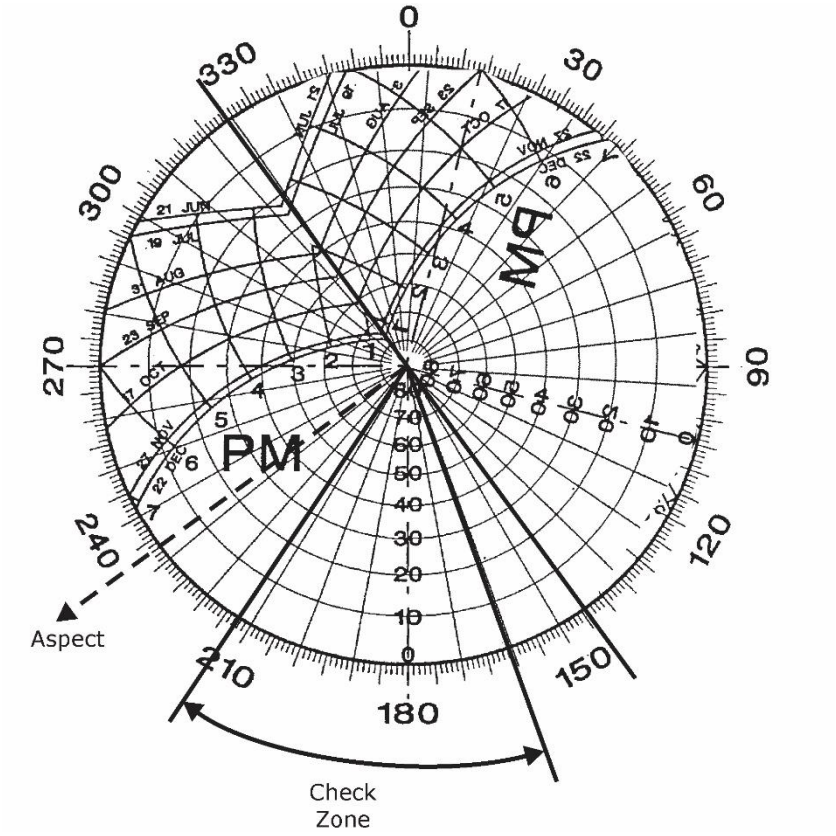


Figure B.7: Sun Chart for the 233° Aspect

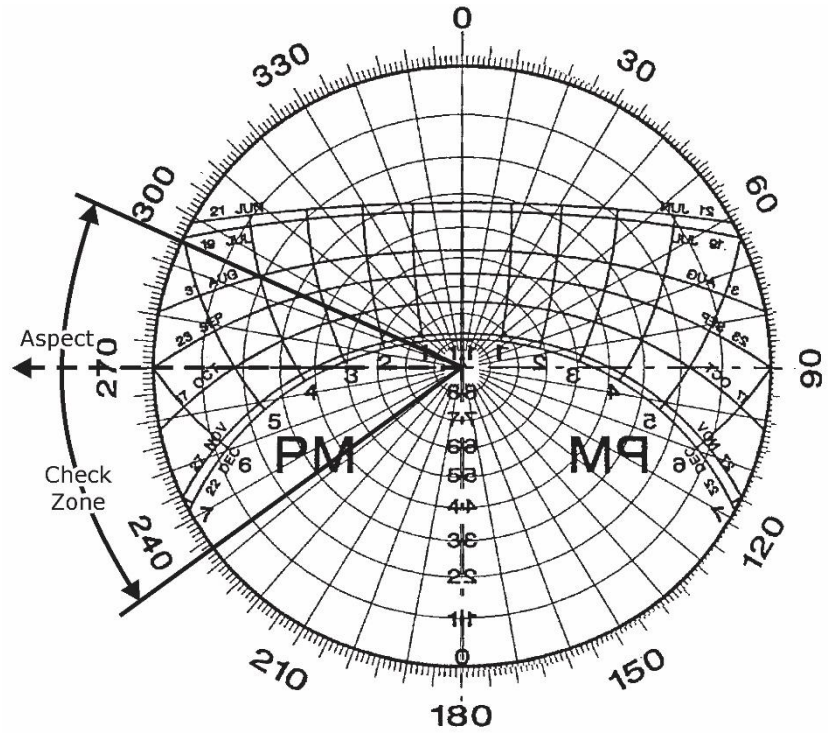


Figure B.8: Sun Chart for the 270° Aspect

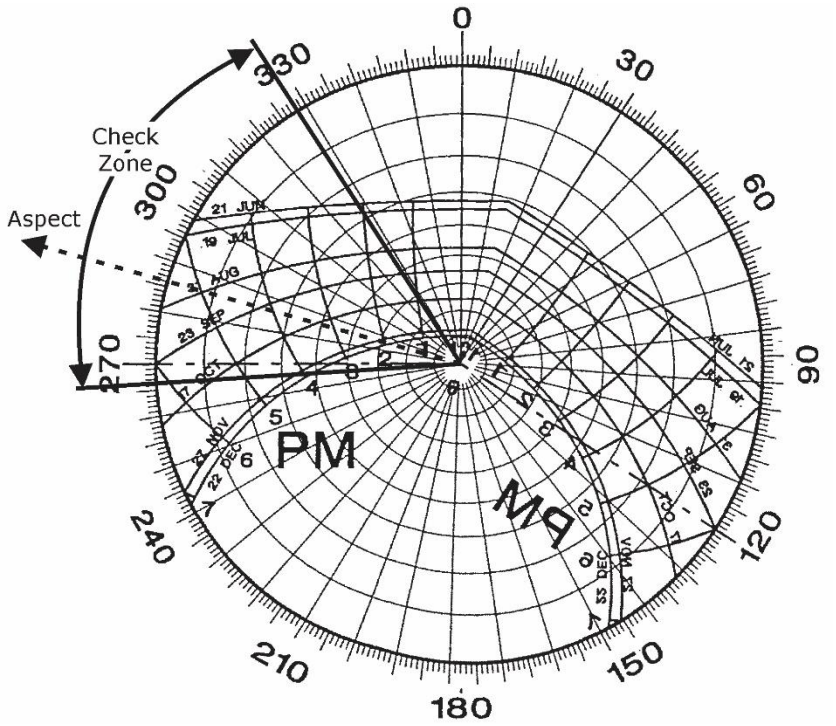
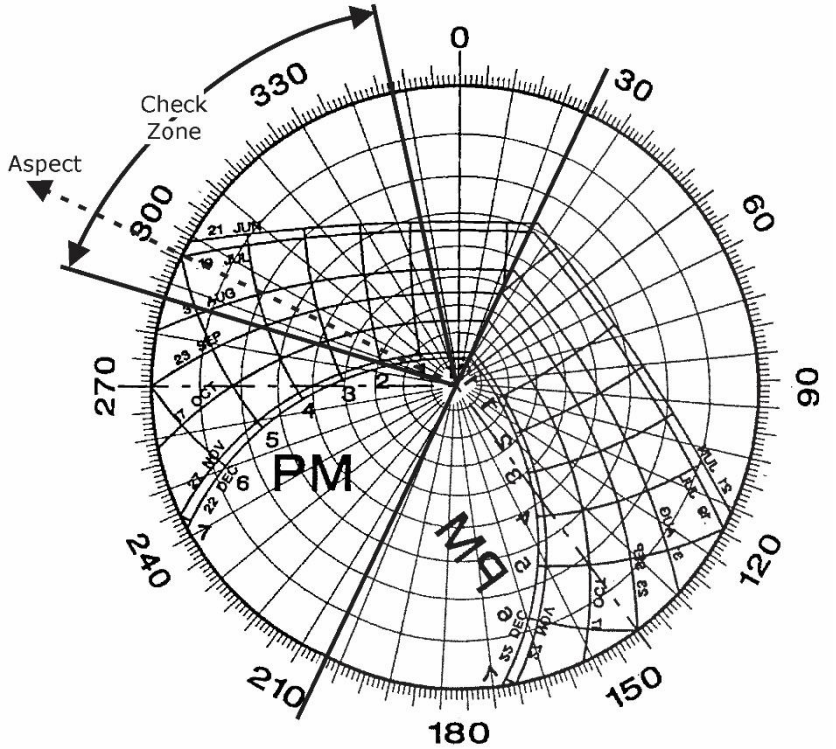


Figure B.9: Sun Chart for the 286° Aspect



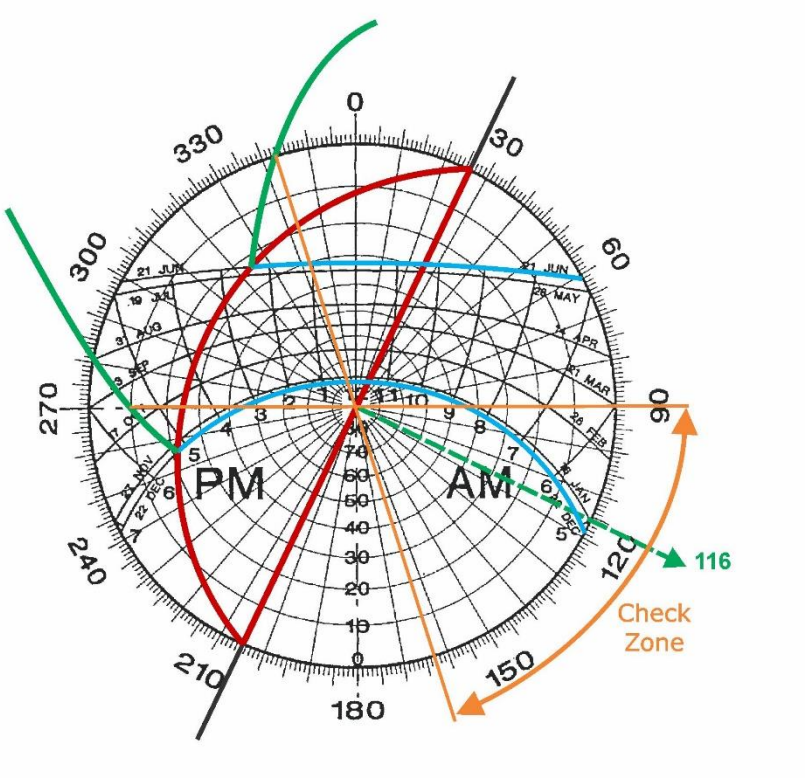


Figure B.10: Sun Chart for the 116° Aspect – Inclination 25°

APPENDIX C STANDARD SUN CHART FOR THE SYDNEY REGION

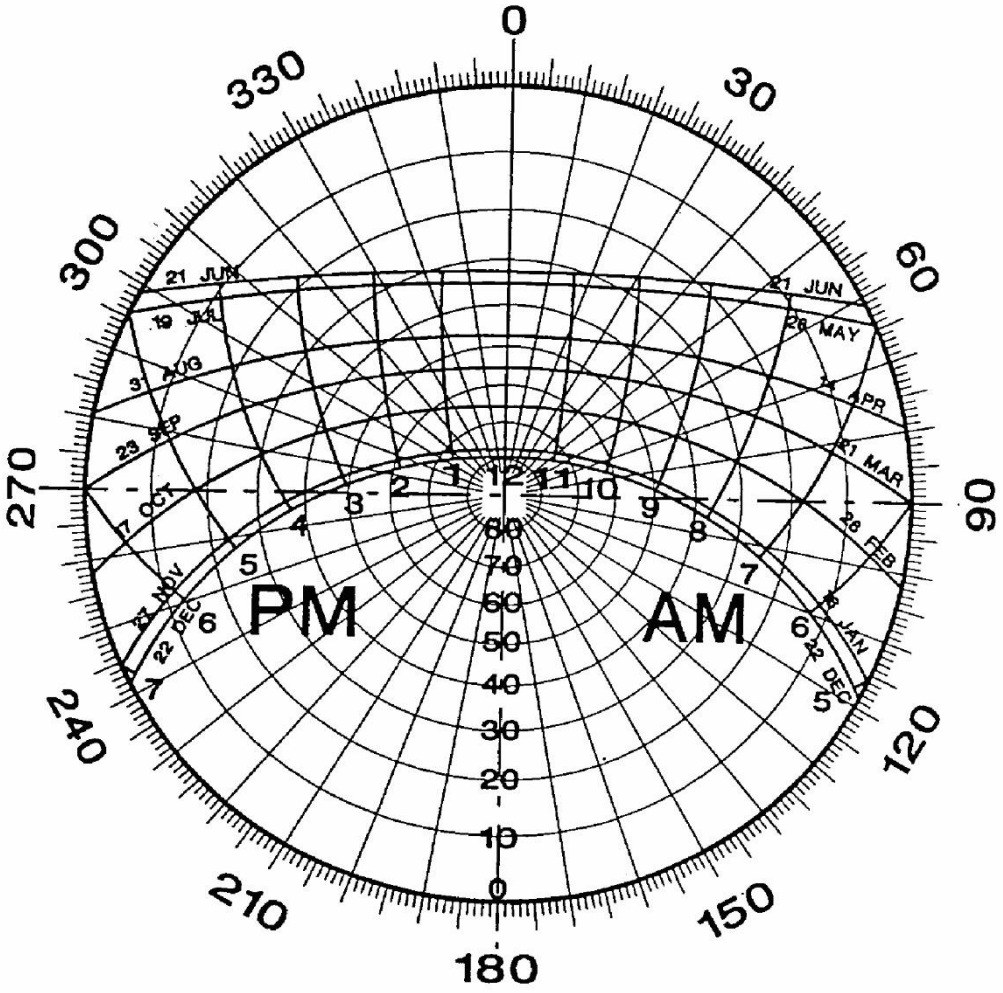


Figure C.1: Standard Sun Chart for the Sydney Region