ADP Consulting : Engineering

Eden Gardens

Reflectance Impact Report

Project No: SYD0684
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Creating great environments with great people

Project:	Eden Gardens
Location:	307 Lane Cove Road Macquarie Park, NSW 2113
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Project No:	SYD0684
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Executive Summary

This Reflectance Impact Report has been prepared to support the Development Application (DA) of the proposed Eden Gardens development to be located at 307 Land Cove Road, Macquarie Park NSW and outlines the methodology and associated results relating to the material reflectance requirements for the commercial office tower.

The purpose of this report is to determine the material reflectance values of the proposed buildings external façade to avoid façade sunlight reflectivity issues with respect to nearby roads and structures.

This assessment has considered potential glare issues experienced across four observation points surrounding the proposed Eden Gardens development to determine façade reflectivity criteria in accordance with City of Ryde DCP.

To reduce the impact of glare experienced by drivers and pedestrians near the Eden Gardens development, it is recommended that the maximum recommended specular reflectivity requirement for each façade of the commercial tower not exceed the values provided below:

Façade orientation	Maximum Visible Light Reflectivity
North elevation	15%
South elevation	15%
West elevation	13%
East elevation	15%

1. Introduction

1.1 Project Background

ADP consulting has been engaged by Thunderbirds Are Go Pty Ltd to undertake a Reflectance Impact Assessment for the proposed commercial development to be located at 307 Land Cove Road, Macquarie Park.

The purpose of this report is to determine the material reflectance values of the 18-storey commercial tower's external façade to avoid façade sunlight reflectivity issues with respect to nearby roads.

This assessment has considered potential glare issues experienced across four observation points surrounding the proposed Eden Gardens development to determine the façade reflectivity criteria in accordance with the following City of Ryde DCP provisions:

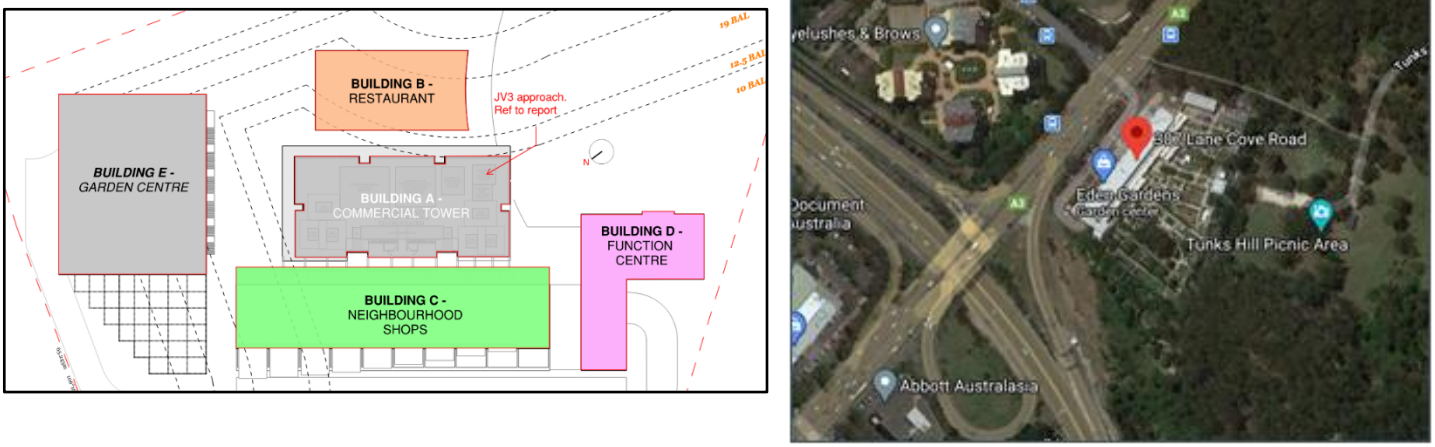
- *New buildings and facades should not result in glare that causes discomfort or threatens safety of pedestrians or drivers*
- *Visible light reflectivity from building materials used on the facades of new buildings should not exceed 20%*
- A *Reflectivity Report that analyses the potential glare from the proposed new development on pedestrians or motorists may be required*

1.2 Site Context

The proposed Eden Garden development is to be comprised of five buildings consisting of a new commercial office tower, restaurant, and Garden Centre with additional extensions proposed to the two existing buildings, creating new spaces for a neighbourhood shops and function centre.

The site is located close to Macquarie Park within the City of Ryde Council boundaries and is located between the Lane Cove Road to the northwest and the Lane Cove National Park stretching out to the southeast.

Figure 1 - Proposed Development Site Plan



1.3 Drivers and Pedestrians Glare Impacts

The glare impacts for both drivers and pedestrians have been assessed in this report due to the likelihood of pedestrian foot traffic from the Metro Stations, and drivers commuting along the M2 Motorway and Lane Cove Road.

1.4 Scope

This Reflectance Impact Report has been authored to determine the commercial towers façade material reflectivity requirements, and documents the modelling benchmarks, assumptions, methodology and results associated relating to the material reflectance requirements of the commercial tower.

1.5 Document References

The reflectivity impact assessment has been prepared in line with the following supporting documentation, standards, controls, and guidelines:

> City of Ryde DCP 2014

> Reflectivity Methodology: Dealing with Rogue Solar Reflections (David Hassell, UNSW, 1991)

> Draft DA Architectural Drawing Package (DKO Architects) issued on 14/10/2020

> DA Architectural Drawing Package (DKO Architects) issued on 17/02/2021

1.6 Limitations

This report is based on the stated methodology to assess the potential reflectivity issues at selected observation points which have been assumed to represent the likely worst-case locations. We have used the methodology developed by David Hassall, a Building Science Consultant to the Faculty of Architecture at the University of New South Wales, and any limitations associated with this approach also apply to this study.

Glare is a complex issue to predict and model accurately as it depends on the position of the sun at any particular moment in a year, the orientation and inclination of the reflective surface, the position of the receptor (observation point) and their susceptibility to glare. For example, drivers subject to glare in their direct line of sight creates a bigger risk than a pedestrian who can avoid looking directly at the building.

2. Methodology

2.1 Observation Points

Observation points have been selected in order to assess potential reflectivity issues generated by the commercial tower. Points 1 to 4 (shown below) relate to viewpoints from cars and their travel direction.

Figure 2 – Observation Points, Critical View Paths, and Proposed Commercial Tower (highlighted in blue)

2.2 Glare and Reflectivity Analysis

Glare is assessed using the methodology in David Hassall's *publication Reflectivity: Dealing with Rogue Solar Reflections (1991).* This methodology defines the process as follows; views from the selected observation points are plotted on a glare protractor, to determine recommended reflectivity to limit reflections to 500cd/m^2 and critical facades are then assessed on a sun path diagram to determine if and when the sun will be reflected.

The methodology uses the concept of a virtual sun which is the reflection of the real sun in a highly reflective surface of infinite size at the same aspect and inclination as the surface being considered. This is done by reflecting the sun path in front of the surface to determine the virtual sun path. Because the surface being considered is not infinite, the surface is also plotted on a stereographic chart from the observation point. If the virtual sun path and the plotted surface coincide then a solar reflection could be seen from that observation point.

3. Reflectivity Assessment

3.1 General

The facades of the commercial tower have been assessed from each observation point identified in Section 2.1. A glare protector is scaled and superimposed over the street view images of the observational points to identify critical views where glare is likely to be experienced.

If it is found that a section of the commercial tower will be within the zone of sensitive vision of a motorist at a selected study point location (the central area of the glare protractor), the glare protractor is used to determine what the maximum normal specular reflectance of visible light should be for external building fabric to ensure that solar glare will not cause discomfort or threaten the safety of motorists or pedestrians.

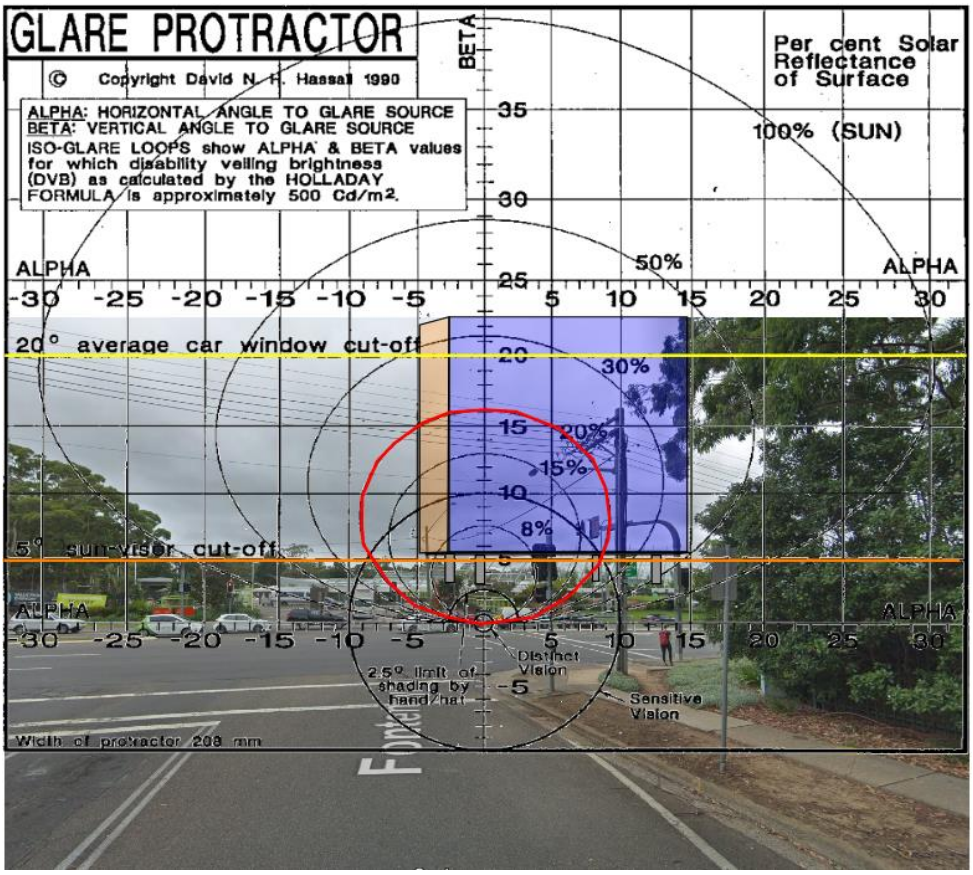
If glare is likely to be experienced from an observation point, a stereograph sun path is then used to determine the time and duration of when glare is experienced.

In each street view image, an outline of the commercial tower (in blue) has been superimposed to convey the size and location of the tower relative to the observation point.

3.2 Observation Point A, Fontenoy Rd: South-East Aspect

The below south-east facing street view from Fontenoy Rd has been identified as a location that may experience high levels of glare from the reflectance of the commercial tower.

Figure 3 – Observation Points A, Fontenoy Rd: South-East Aspect



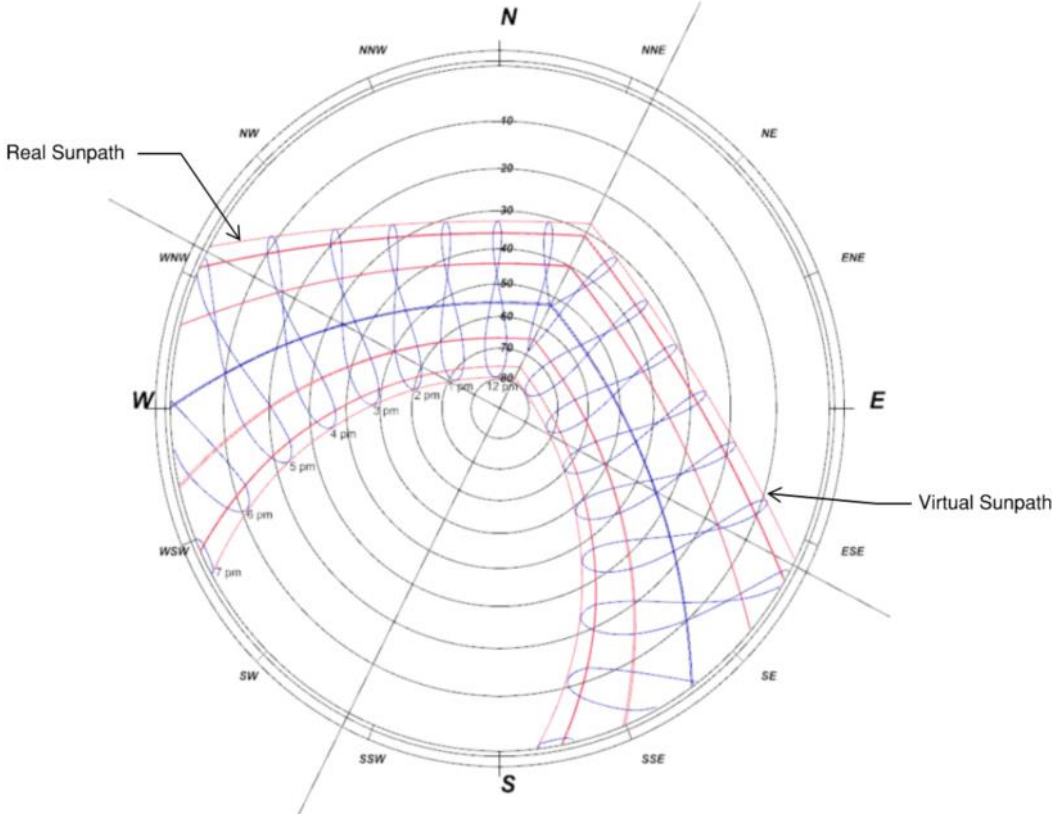
As the west façade of the tower sits below the average car window cut-off threshold (yellow line) and within the range of sensitive vision, a moderate level of glare is likely to be experienced from this observation point.

3.3 Observation Point A: Stereographic Sun Path

As a significant level of glare is experienced at Observational Point A from the commercial tower's west façade, a stereographic sun path is used to determine the time and duration of when glare is experienced.

The below stereographic sun path shows that this observation point will experience glare from the commercial tower during 4-5pm in winter. As reflectivity is only experienced for a short period of time in winter, and the façade-glazing system is proposed to have vertical shade fins, the risk of disabling glare to oncoming drivers is minimal. It is recommended that the west facades external building fabric not exceed a reflectivity value of 13%.

Figure 4 – Observation Points A, Stereographic Sun Path: West



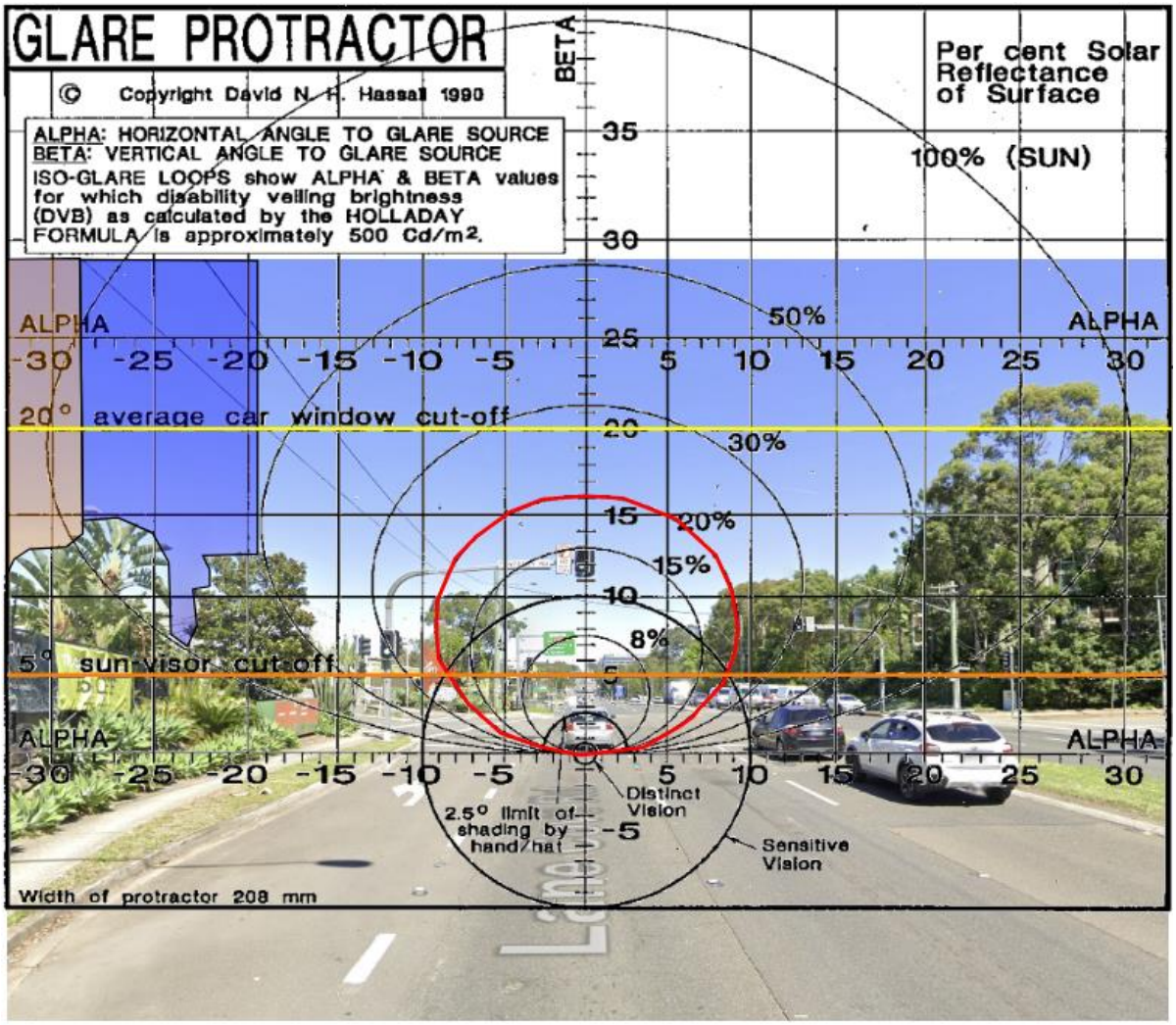
3.4 Observation Point A: Façade Reflectance Requirements

Façade orientation	Maximum Visible Light Reflectivity	Legend
North elevation	15%	Orange
West elevation	13%	Blue

3.5 Observation Point B: Lane Cove Rd: South-West Aspect

The south-west facing street view from Lane Cove Rd experiences minimal glare impacts from the commercial towers north and west facing facades. It is recommended that the north façades building fabric not exceed a reflectivity value of 15%, and the west façade not exceed 13%.

Figure 5 – Observation Points B, Lane Cove Rd: South-West Aspect



As this observational point experiences minimal glare impacts from the commercial tower, it is not necessary to determine the time and duration of glare. Therefore, a stereographic sun path is not required.

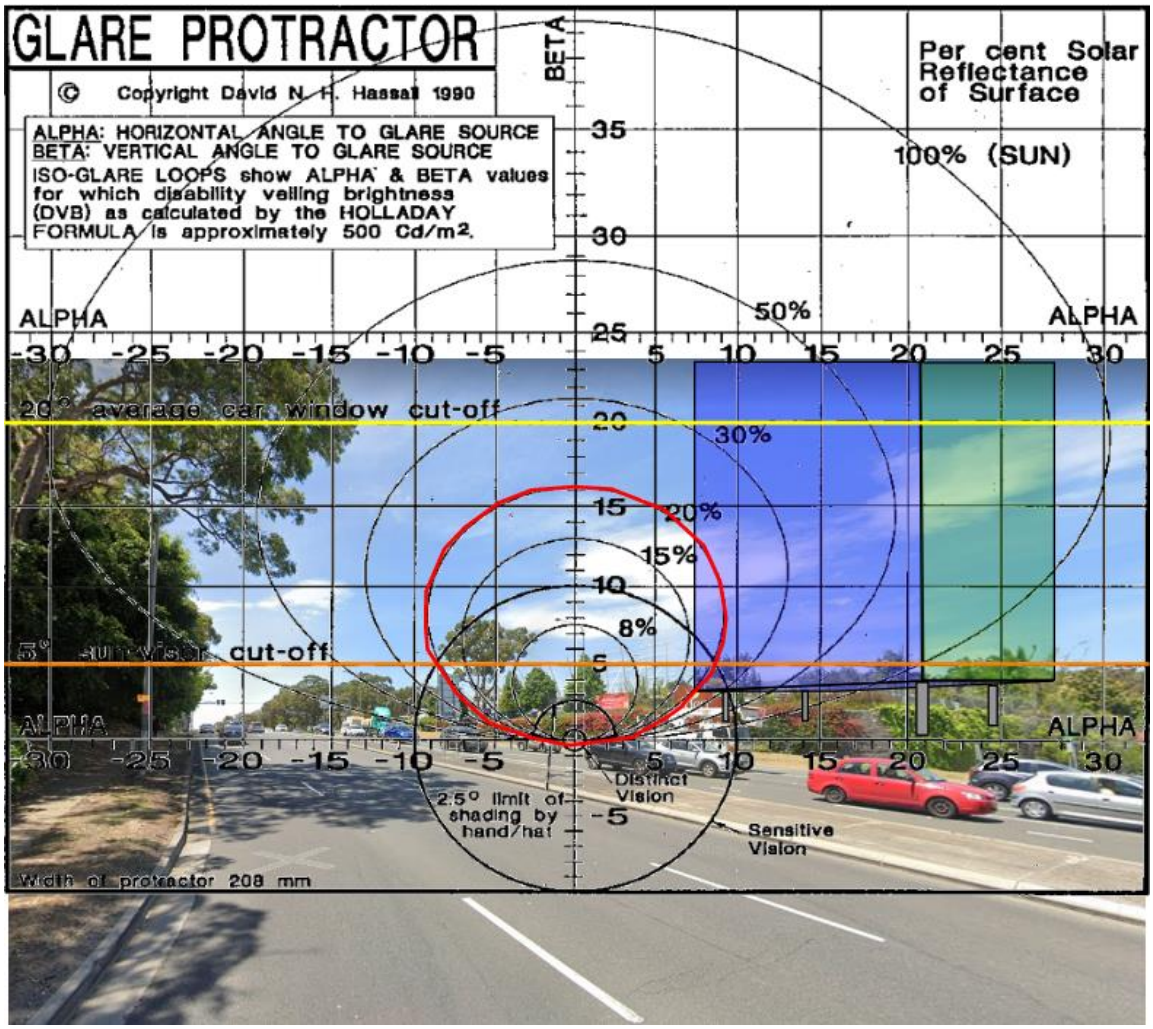
3.6 Observation Point B: Façade Reflectance Requirements

Façade orientation	Maximum Visible Light Reflectivity	Legend
North elevation	15%	Orange
West elevation	13%	Blue

3.7 Observation Point C, Lane Cove Rd: North-East Aspect

The north-east facing street view form Lane Cove Rd experiences moderate glare impacts from the commercial towers west and south facing facades. It is recommended that the south facing facades building fabric not exceed a reflectivity value of 15%, and the west facing façade not exceed 13%.

Figure 6 – Observation Points C, Lane Cove Rd: North-East Aspect



As this observational point experiences minimal glare impacts from the commercial tower, it is not necessary to determine the time and duration of glare. Therefore, a stereographic sun path is not required.

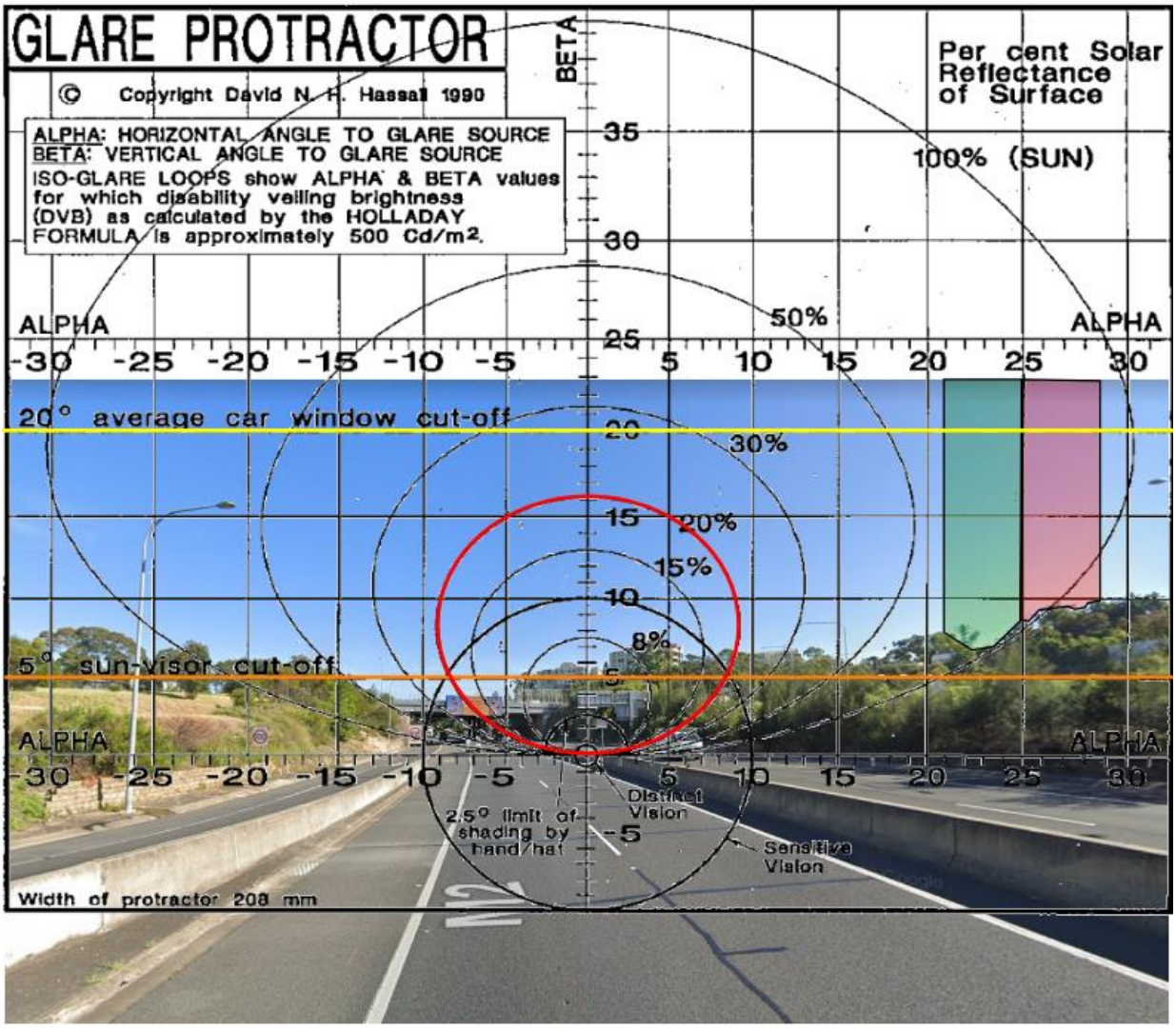
3.8 Observation Point C: Façade Reflectance Requirements

Façade orientation	Maximum Visible Light Reflectivity	Legend
South elevation	15%	Green
West elevation	13%	Blue

3.9 Observation Point D, M2 Motorway: North-West Aspect

The north-west facing street view from the M2 Motorway experiences minimal glare impacts from the commercial towers east and south facades. It is recommended that the building fabric of these facades not exceed a reflectivity value of 15%.

Figure 7 – Observation Points D, M2 Motorway: North-West Aspect



As this observational point experiences minimal glare impacts from the commercial tower, it is not necessary to determine the time and duration of glare. Therefore, a stereographic sun path is not required.

3.10 Observation Point D: Façade Reflectance Requirements

Façade orientation	Maximum Visible Light Reflectivity	Legend
South elevation	15%	Green
East elevation	15%	Red

4. Conclusions and Recommendations

This reflectivity assessment has been carried out to determine the material reflectance values of the commercial towers external façade to avoid façade sunlight reflectivity issues with respect to pedestrians and drivers.

To ensure that the proposed commercial tower does not cause adverse glare, the maximum recommended specular reflectivity requirement for each façade should not exceed the values provided below:

Façade orientation	Maximum Visible Light Reflectivity	Legend
West elevation	13%	Blue
North elevation	15%	Orange
South elevation	15%	Green
East elevation	15%	Red

The western elevation is recommended to have a maximum reflectance of 13%. This is to ensure that the risk of disabling glare for drivers travelling east along Fontenoy Rd is minimal. The north, east, and south elevations are recommended to have a maximum reflectance of 15%.

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