Solar Light Reflectivity Analysis

for the proposed development located at

33 Cross Street, Double Bay

January 23, 2008

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Sydney • Melbourne • Singapore • Dubai www.windtech.com.au
WINDTECH Consultants Pty Ltd: 19 Willis St, Wolli Creek NSW 2205 Australia ABN 72 050 574 037
T: (61.2) 9567 0722 **F:** (61.2) 9567 0733 **E:** reception@windtech.com.au

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1.0 Introduction

This study is to investigate the potential impact of solar glare from the proposed development located at 33 Cross Street, Double Bay. The analysis takes into consideration potential reflectivity to street level locations and to the surrounding buildings. The site is bounded by Cross Street to the south and adjacent buildings to the north, east and west. An analysis has been undertaken, based on architectural drawings prepared by Architectus Architects, received on January 19, 2009.

The Woollahra Residential Development Control Plan 2003 has no official regulations for solar reflectivity; however general recommendations from other councils are as follows:

- 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 analysis of the subject development has been carried out using the technique published by Mr David N. H. Hassall (1991)[1].

The limiting veiling luminance of 500 candelas per square metre for the comfort of vehicle drivers, 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 drivers, conditions will also be satisfactory for pedestrians. The glare impact onto occupants of neighbouring buildings is also discussed.

A figure showing the site location is presented in Figure 1. The various aspects of the proposal are presented on Figure 2.

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

Figure 1: Aerial Image of the Proposed Development

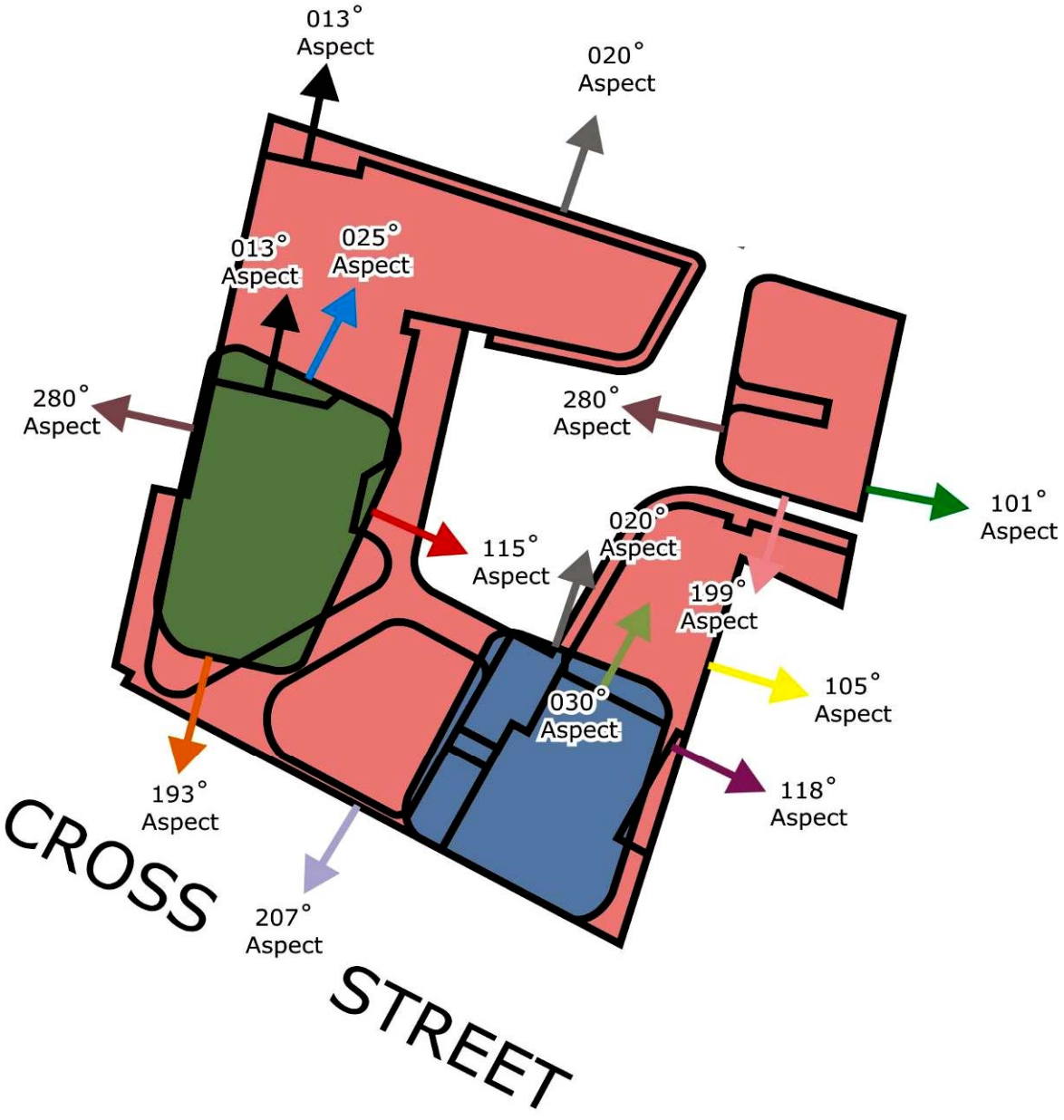

Figure 2: The Critical Aspects of the Development

2.0 Analysis

Solar charts for the various aspects of the development are presented in Appendix B. Check zones for the selected aspects have also been identified based on the data obtained from the solar charts. The check zones highlight the zones that are potentially affected by solar reflections from each aspect. The various check zones for the subject development are described in Figure 3.

It should be noted that the check zones described 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 in the following section of this report.

2.1 Impact onto Drivers and Pedestrians

From the study of the check zones and with consideration of the potential overshadowing effects of neighbouring buildings, 7 street level locations have been identified for analysis. These locations are indicated in Figure 3a to 3b. Table 1 summarises the effect of the various aspects on the selected study locations.

Table 1: Aspects of the Site that affect each of the Study Points

Study Point	Aspects
Point 1	105˚, 115˚, 118˚ and 208˚ aspects
Point 2	101˚, 105˚, 115˚, 118˚, 193˚, 199˚ and 208˚ aspects
Point 3	105˚, 115˚, 118˚, 193˚, 199˚ and 208˚ aspects
Point 4	280˚ aspect
Point 5	013˚, 020˚ and 280˚ aspects
Point 6	013˚, 020˚, 025˚ and 280˚ aspects
Point 7	013˚ aspect

Photographs have been taken from the viewpoint of drivers and pedestrians using a calibrated camera. Views from the study point locations are presented in Appendix A of this report. A scaled glare protractor has been superimposed over each photograph.

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 candelas per square metre. Alternatively, the glare protractor can be used to determine the maximum acceptable reflectivity index for the glare to be within the criterion of 500 candelas/m^2.

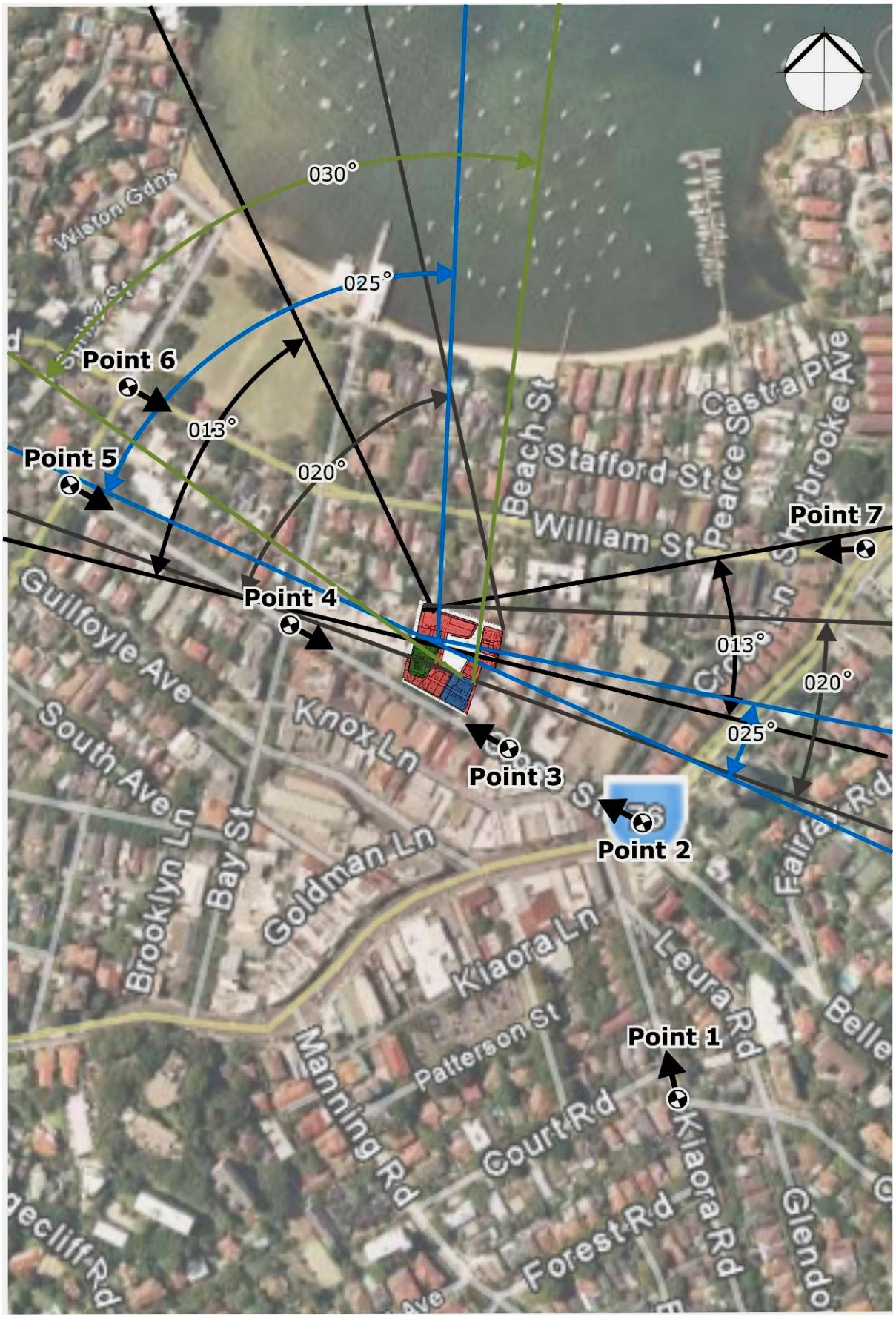

Figure 3a: Check Zones 013˚, 020˚, 025˚, 030˚ and Layout of Study Points

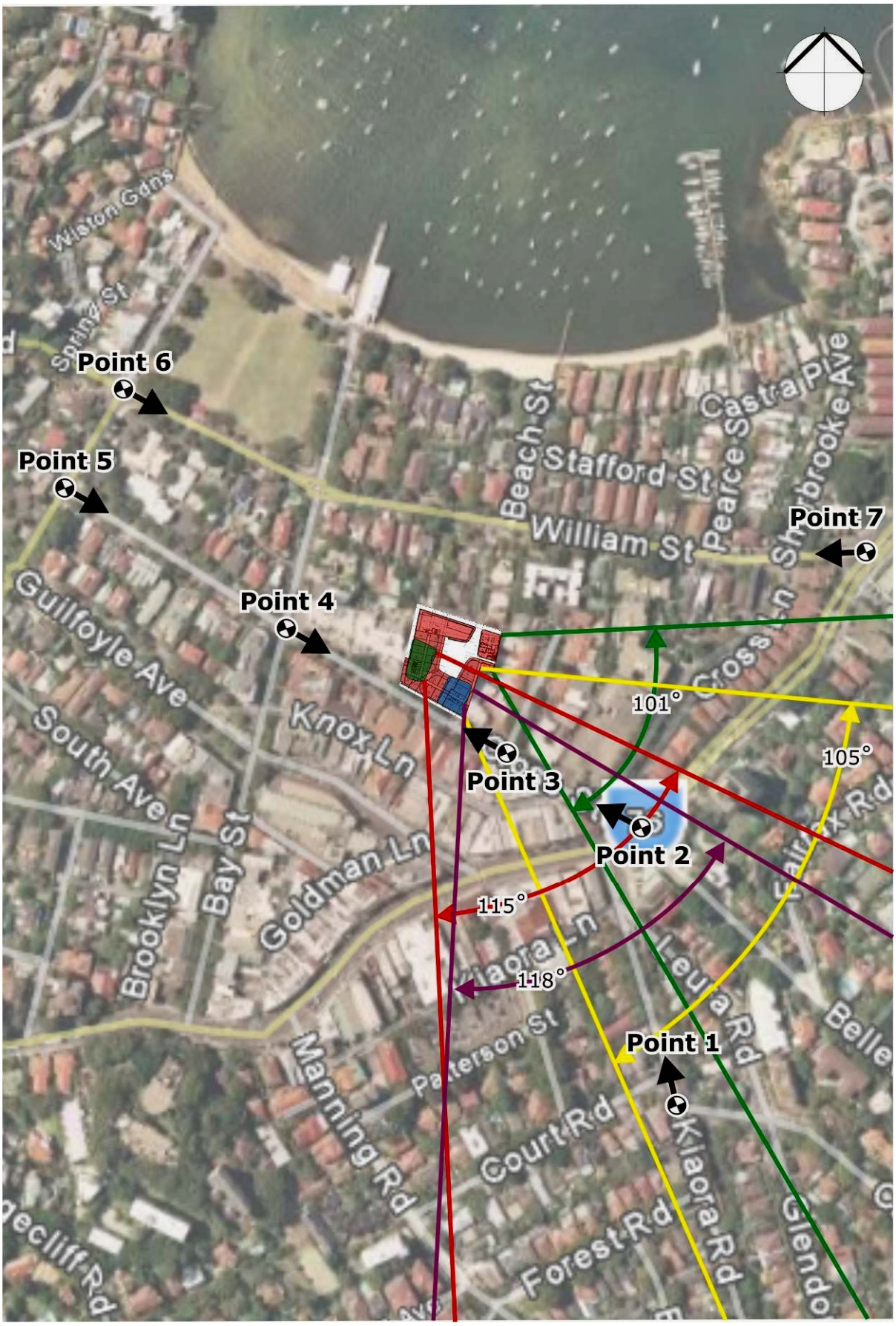

Figure 3b: Check Zones 101˚, 105˚, 115˚, 118˚ and Layout of Study Points

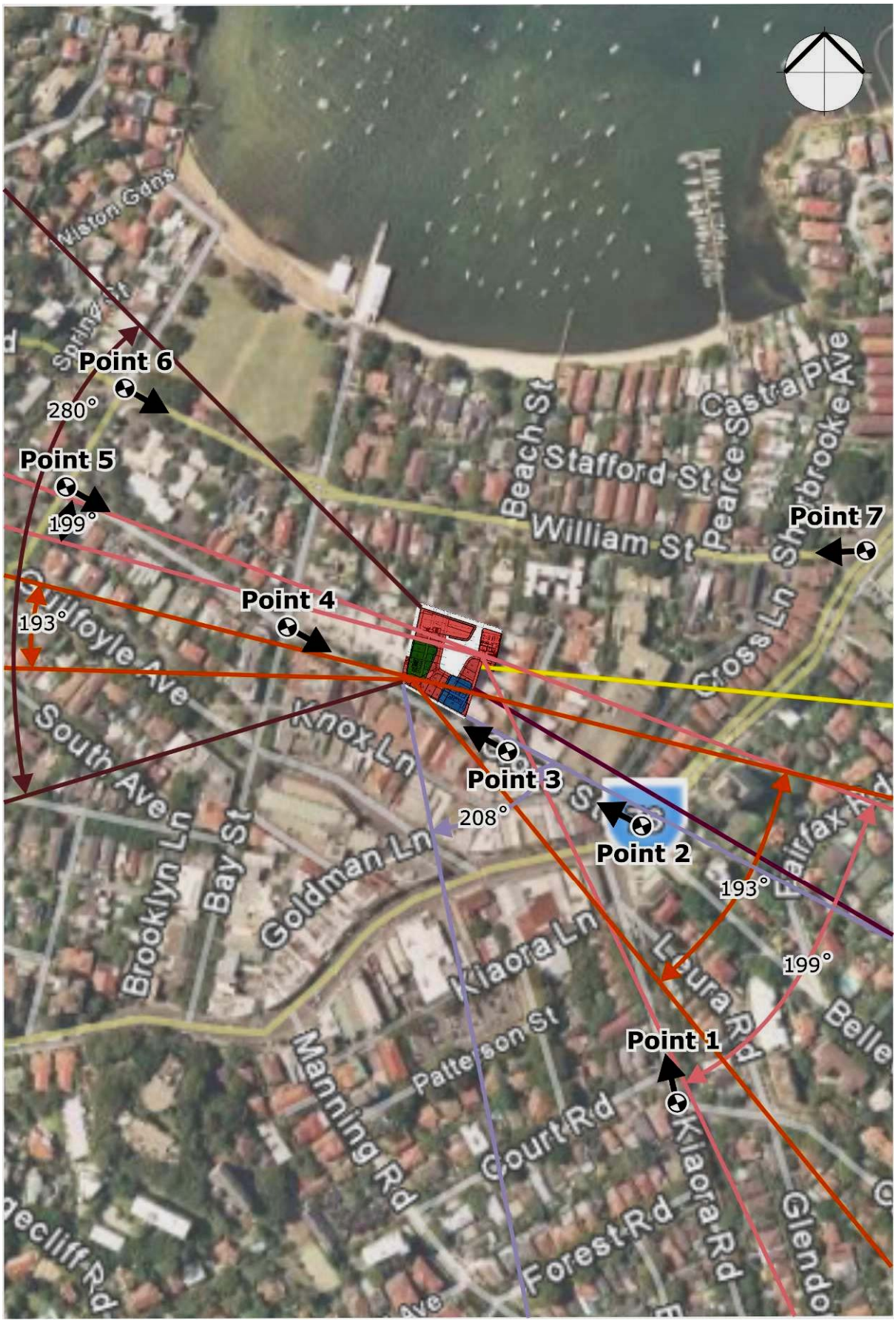

Figure 3c: Check Zones 193˚, 199˚, 208˚, 280˚ and Layout of Study Points

Point 1

Point 1 is located south-east of the proposed development on Kiaora Road. This point represents a critical sightline of drivers heading north-west along Kiaora Road. This point is located within the check zones for the 105˚, 115˚, 118˚ and 208˚ aspects of the proposed development.

The analysis of Point 1, shown in Figure A1 of Appendix A, indicates that the proposed development is obscured by the existing densely foliating trees lining the western side of Kiaora Road.

Hence there will be no adverse glare from the 105˚, 115˚, 118˚ and 208˚ aspects of the proposed development to drivers and pedestrians facing north-west along Kiaora Road at Point 1.

Points 2 and 3

Point 2 and Point 3 are located south-east of the proposed development on Cross Street. These points represent critical sightlines of drivers heading north-west along Cross Street. Point 2 is located within the check zones for the 101˚, 105˚, 115˚, 118˚, 193˚, 199˚ and 208˚ aspects of the proposed development. Point 3 is located within the check zones for the 105˚, 115˚, 118˚, 193˚, 199˚ and 208˚ aspects of the proposed development.

The analysis of Point 2 and Point 3, shown in Figure A2 and A3 respectively of Appendix A, indicates that the proposed development is obscured by the existing densely foliating trees lining the northern and southern sides of Cross Street.

Hence there will be no adverse glare from the aforementioned building aspects of the proposed development to drivers and pedestrians facing north-west along Cross Street at Point 2 and Point 3.

Points 4 and 5

Point 4 and Point 5 are located north-west of the proposed development on Cross Street. These points represent critical sightlines of drivers heading south-east along Cross Street. Point 4 is located within the check zone for the 280˚ aspect of the proposed development. Point 5 is located within the check zones for the 013˚, 020˚ and 280˚ aspects of the proposed development.

The analysis of Point 4 and Point 5, shown in Figure A4 and A5 respectively of Appendix A, indicates that the proposed development is obscured by the existing densely foliating trees lining the northern side of Cross Street.

Hence there will be no adverse glare from the aforementioned building aspects of the proposed development to drivers and pedestrians facing south-east along Cross Street at Point 4 and Point 5.

Point 6

Point 6 is located north-west of the proposed development on William Street. This point represents a critical sightline of drivers heading south-east along William Street. This point is located within the check zones for the 013˚, 020˚, 025˚ and 280˚ aspects.

The analysis of Point 6, shown in Figure A6 of Appendix A, indicates that the proposed development is obscured by the existing densely foliating trees lining the southern side of William Street.

Hence there will be no adverse glare from the 013˚, 020˚, 025˚ and 280˚ aspects of the proposed development to drivers and pedestrians facing south-east along William Street at Point 6.

Point 7

Point 7 is located north-east of the proposed development on William Street. This point represents a critical sightline of drivers heading west along the William Street. This point is located within the check zones for the 013˚ aspect.

The analysis of Point 7, shown in Figure A7 of Appendix A, indicates that the proposed development is obscured by the existing densely foliating trees lining the southern side of William Street.

Hence there will be no adverse glare from the 013˚ aspect of the proposed development to drivers and pedestrians facing north-west along William Street at Point 7.

2.2 Impact onto Occupants of Neighbouring Buildings

More research is required to properly assess what is considered an acceptable level of veiling luminance to occupants of surrounding buildings. Rofail and Dowdle (2004)[2] have highlighted the subjectivity of glare impact to occupants of surrounding buildings as it is highly affected by a number of factors, some of these are listed below:

- the intensity of glare
- duration of glare impact
- the type of use of the building
- the type of glazing used on the neighbouring building (eg. Clear or Tinted)
- shading elements on the façade of the neighbouring building
- level of tolerance by the occupant of the neighbouring building

Our past experience, involving approximately 200 projects, tends to indicate that buildings that tend to cause nuisance to 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. This reflectivity is defined as the level of luminance or normal specular reflectivity of visible light.

Hence, a general recommendation is made that all glazing used on the facades of the development have a normal specular reflectivity of visible light of 20 percent or less to avoid adverse solar glare to occupants of neighbouring buildings.

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

3.0 Conclusion

A reflectivity analysis of the proposed development located at 33 Cross Street, Double Bay has been carried out using the technique published by Mr David N. H. Hassall.

To avoid any adverse glare to drivers and pedestrians on the surrounding streets of the proposed development site, and to comply with the requirements of the City of Sydney DCP October 2003, Section 4.5: *Reflectivity* the following recommendation has been made on the reflectivity properties of the glazing to be used on the facade to satisfy minimum comfort levels for the occupants of the neighbouring buildings;

- All areas of the façade of the development, should have a maximum normal specular reflectivity of visible light of 20 percent.

With these recommendations satisfied, the results of this analysis indicate that the proposed development will not cause adverse solar glare to drivers or pedestrians in any of the surrounding streets, other outdoor areas and the surrounding buildings.