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Appendix G

Solar reflectivity analysis
Windtech



Solar Light Reflectivity Analysis

for the proposed City East Zone Substation and
Integrated Commercial Development at
33 Bligh Street, Sydney

April 15, 2010

Report Reference No. W788-05F03(rev2)- SR Report

Document Control

Revision Number	Date	Revision History	Prepared By (initials)	Reviewed & Authorised By (initials)
0	06/04/2010	Initial	DYF	AB
1	13/04/2010	Minor updates for revised level names, updated image	AB	
2	15/04/2010	Correct typographical error	AB	

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This document is issued subject to review and authorisation by the Team Leader noted by the initials printed in the last column above. If no initials appear, this document shall be considered as preliminary or draft only and no reliance shall be placed upon it other than for information to be verified later.

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The information contained herein is for the purpose of wind, thermal and or solar effects only. No claims are made and no liability is accepted in respect of design and construction issues falling outside of the scope of this report.

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Appendix A: Glare Overlays from the Various Study Locations

Appendix B: Solar Charts for the Various Aspects of the Proposal

1.0 Introduction

This study is to investigate the potential impact of solar glare from the proposed City East Zone Substation and Integrated Commercial Development at 33 Bligh Street, Sydney. The site is located within the Sydney CBD and is bounded by Bligh Street to the south-east and O'Connell Street to the north-west. An analysis has been undertaken, based on architectural drawings prepared by Kann Finch Group, dated 25 March 2010.

The proposed development consists of an integrated Energy Australia zone substation in the basement, a podium section with a height of approximately 48m above the O'Connell Street ground level, and a rectangular-plan office building above. The overall height of the tower is approximately 130m above the O'Connell Street ground level. Balconies are not proposed for the office tower, and hence the façade of the tower will be flat.

With regards to solar reflectivity, this study addresses the requirement of the October 2003 City of Sydney DCP, which states under Section 4.5: Reflectivity;

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

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)

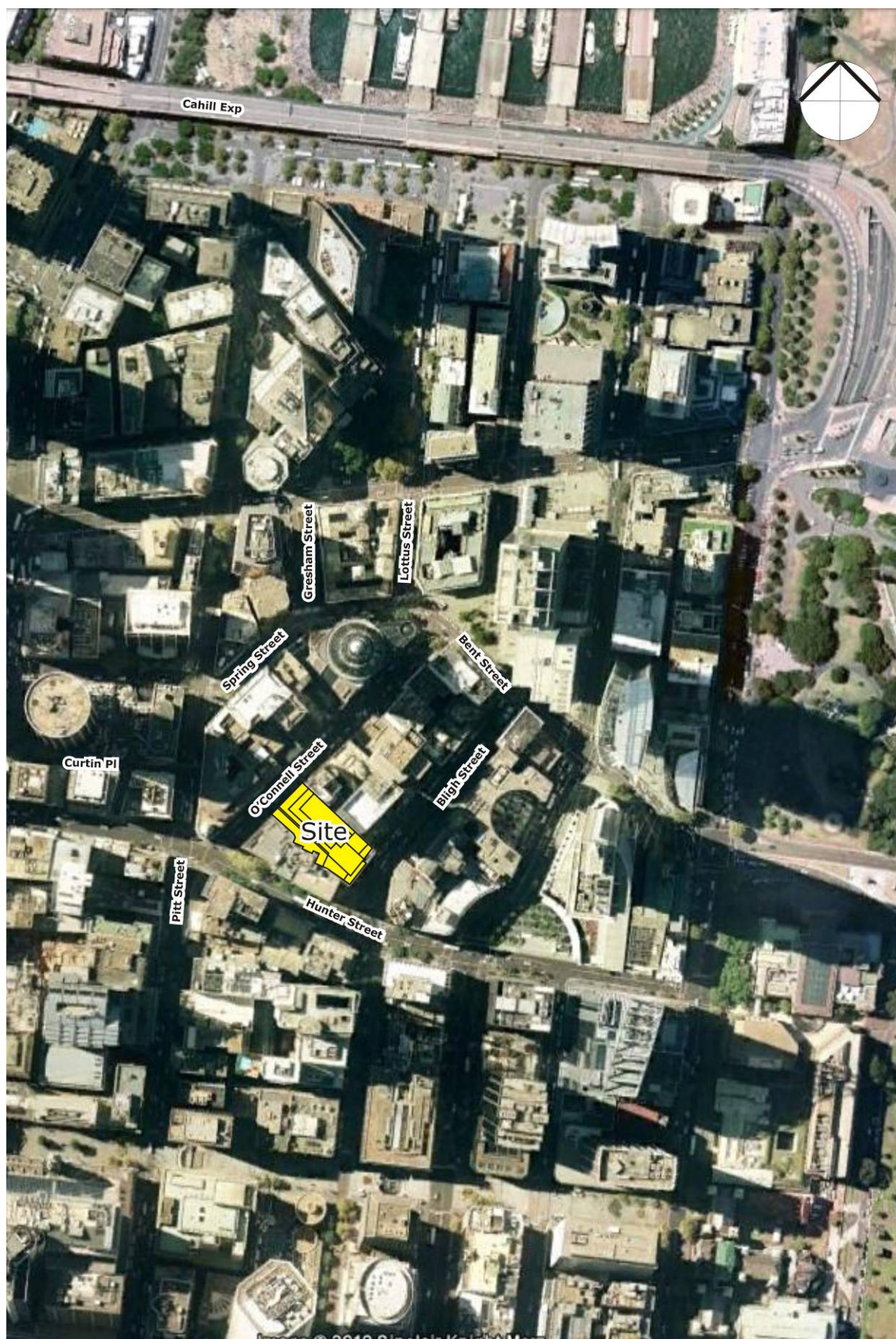


Figure 1: Aerial Image of the Proposed Development Site

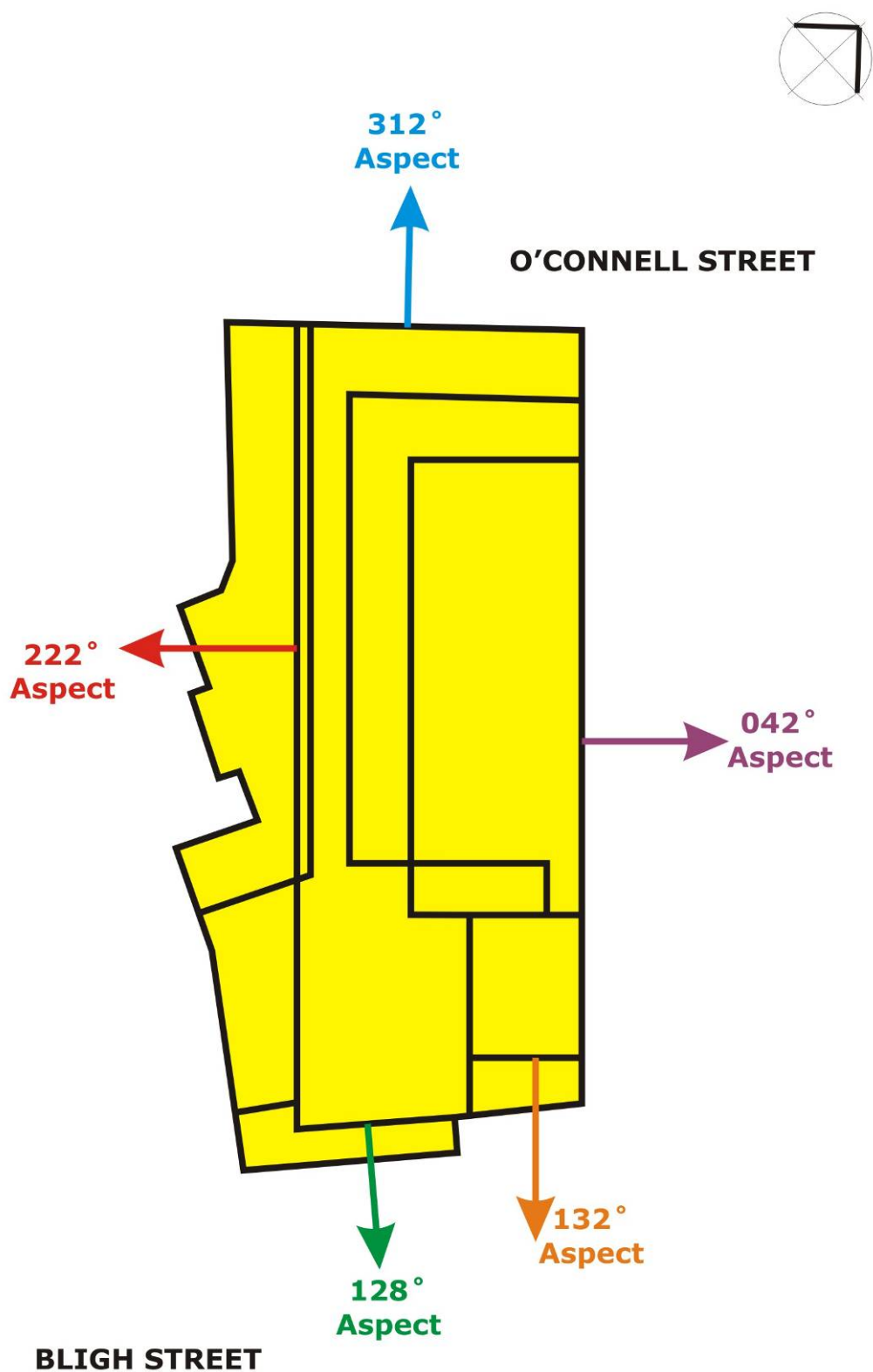


Figure 2: The Critical Aspects of the Proposed Development

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 2.1 and subsequent subsections 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, 8 street level locations have been identified for analysis. These locations are indicated in Figure 3. 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	042° and 312° aspects
Point 2	042° and 312° aspects
Point 3	042° and 312° aspects
Point 4	042° aspect
Point 5	042° aspect
Point 6	042° aspect
Point 7	222° aspect
Point 8	128° and 132° aspects

For each of the study point locations, 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/m².

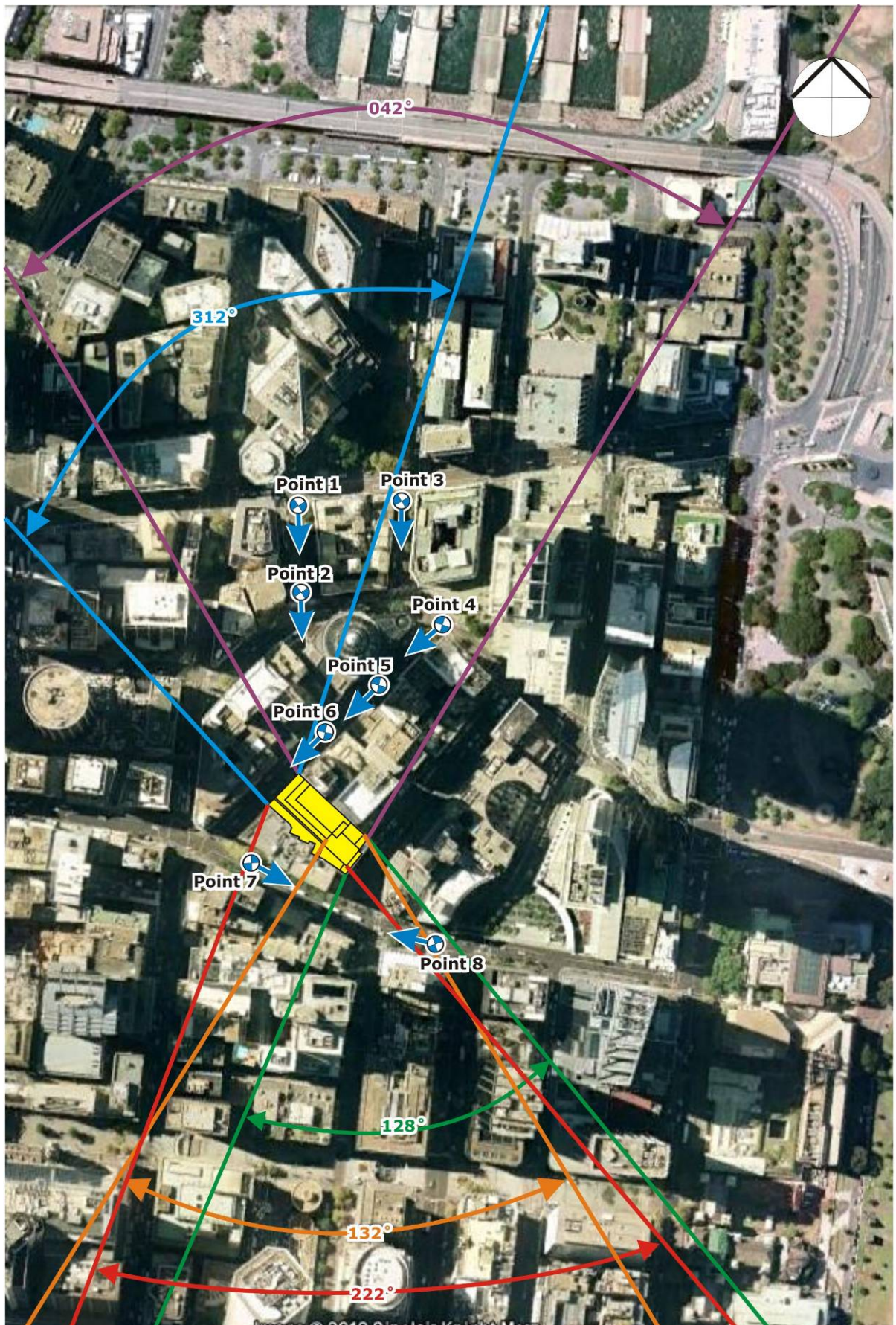


Figure 3: Check Zones and Layout of Study Points

2.1.1 Gresham Street Study Point Locations

Points 1 and 2 are located to the north of the proposed development site, on Gresham Street. These points represent critical sightlines of drivers heading south along Gresham Street. These points are located within the check zones for the 042° and 312° aspects of the proposed development.

The site survey of these points, shown in Figure A1 and A2 of Appendix A, indicate that the view of the proposed development is obscured by the existing building to the north of the proposed development.

Hence there will be no adverse glare from the 042° and 312° aspects of the proposed development to drivers and pedestrians facing south along Gresham Street at Points 1 and 2.

2.1.2 Loftus Street Study Point Location

Point 3 is located to the north of the proposed development on Loftus Street. This point represents a critical sightline of drivers heading south along Loftus Street at this location. This point is located within the check zones for the 042° and 312° aspects of the proposed development.

The site survey of this point, shown in Figure A3 of Appendix A, indicates that the view of the proposed development is obscured by the existing building north-east of the proposed development.

Hence there will be no adverse glare from the 042° and 312° aspects of the proposed development to drivers and pedestrians facing south along Loftus Street at Point 3.

2.1.3 O'Connell Street Study Point Locations

Points 4, 5 and 6 are located to the north-east of the proposed development site on O'Connell Street. These points represent critical sightlines of drivers heading south-west along O'Connell Street. These points are located within the check zone for the 042° aspect of the proposed development.

The site survey of these points, shown in Figures A4, A5 and A6 of Appendix A, indicates that the 312° aspect of the proposed development fall within the zone of sensitive vision for drivers and pedestrians facing south-west at these locations. However, they are not within the check zone for 042° aspect.

Hence there will be no adverse glare from the 042° aspect to drivers and pedestrians facing south-west along O'Connell Street at Points 4, 5 and 6.

2.1.4 Hunter Street Study Point Location (for east-bound drivers)

Point 7 is located to the west of the proposed development site, on Hunter Street. This point represents a critical sightline of drivers heading east along Hunter Street at this location. This point is located within the check zone for the 222° aspect of the proposed development.

The site survey of this point, shown in Figure A7 of Appendix A, indicates that the view of the proposed development is obscured by the existing building south of the site.

Hence there will be no adverse glare from the 222° aspect to drivers and pedestrians facing east along Hunter Street at Point 7.

2.1.5 Hunter Street Study Point Location (for west-bound drivers)

Point 8 is located to the east of the proposed development, on Hunter Street. This point represents a critical sightline of drivers heading west along Hunter Street at this location. This point is located within the check zone for the 128° and 132° aspects of the proposed development.

The site survey of this point, shown in Figure A8 of Appendix A, indicates that the view of the proposed development is obscured by the existing building south-east of the site.

Hence there will be no adverse glare from the 128° and 132° aspects to drivers and pedestrians facing west along Hunter Street at Point 8

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 City East Zone Substation and Integrated Commercial Development at 33 Bligh Street, Sydney, has been carried out using the technique published by Mr David N. H. Hassall.

The results of the study indicate that to avoid any adverse glare to drivers and pedestrians on the surrounding streets and associated outdoor areas of the proposed development site, and to comply with the October 2003 City of Sydney DCP, Section 4.5, it is recommended that all areas of the façade of the development should have a maximum normal specular reflectivity of visible light of 20 percent. No additional requirement is needed to satisfy the comfort criterion for driver visibility.

With the aforementioned recommendation 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 and other outdoor areas. It is also expected that no adverse glare impacts will result with regards to the occupants of neighbouring buildings if the glazing type(s) selected for the external facades of the development have a normal specular reflectivity of visible light of 20 percent or less. Other highly reflective materials should also be avoided on the façades to avoid adverse glare to the occupants of neighbouring buildings.

Appendix A

Analysis of Sight-Lines from the Various Study Locations

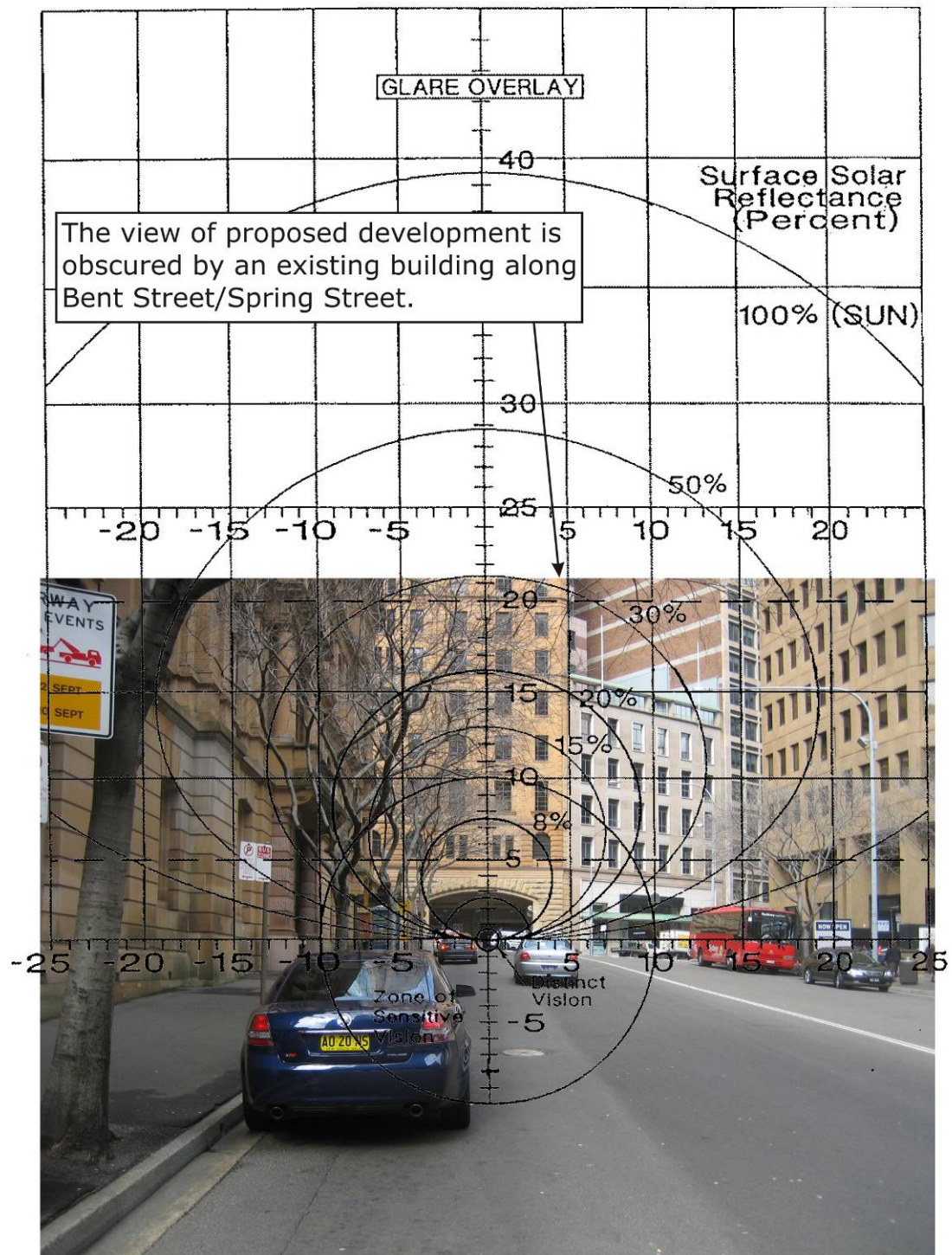


Figure A1: Glare Overlay for Point 1

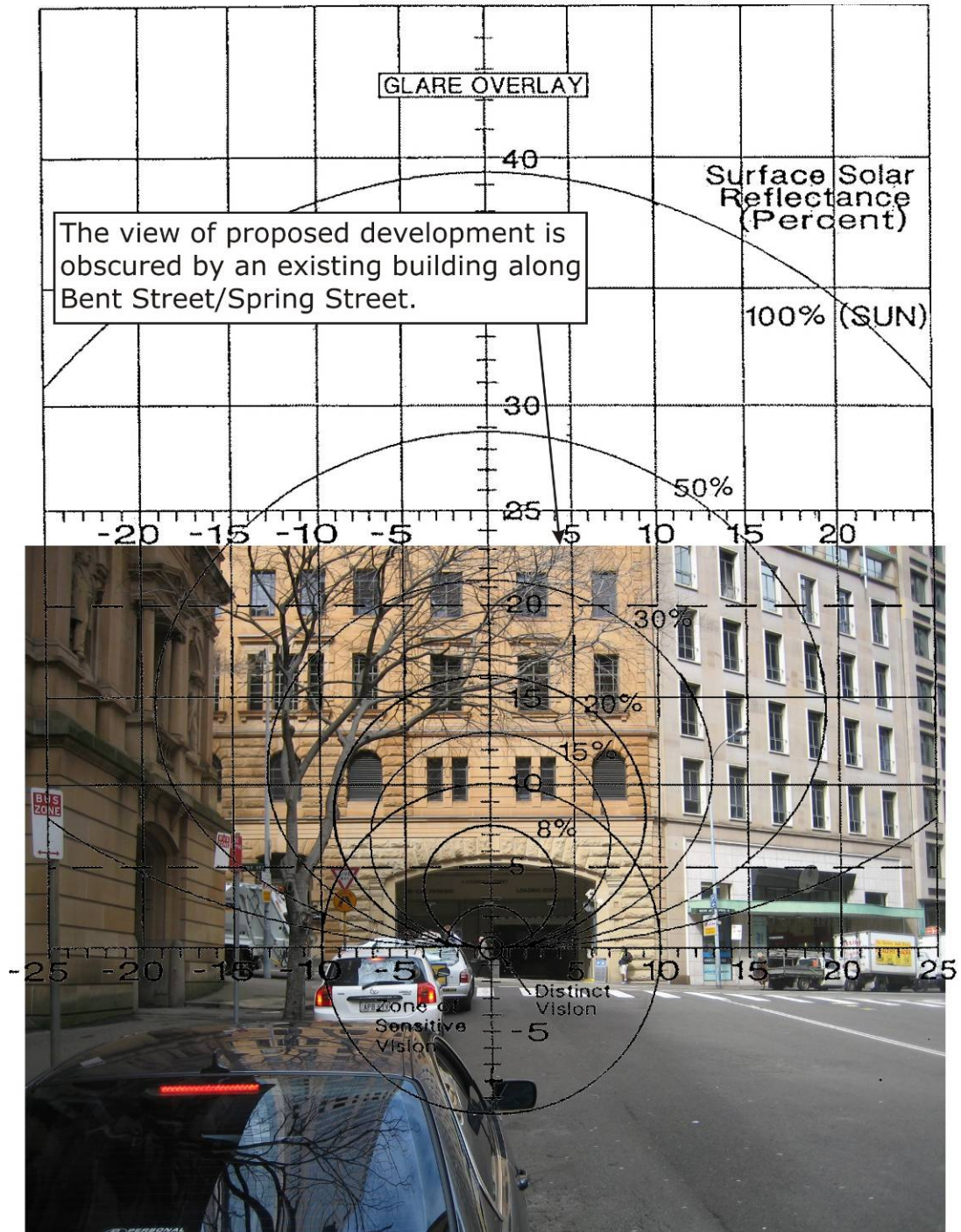


Figure A2: Glare Overlay for Point 2

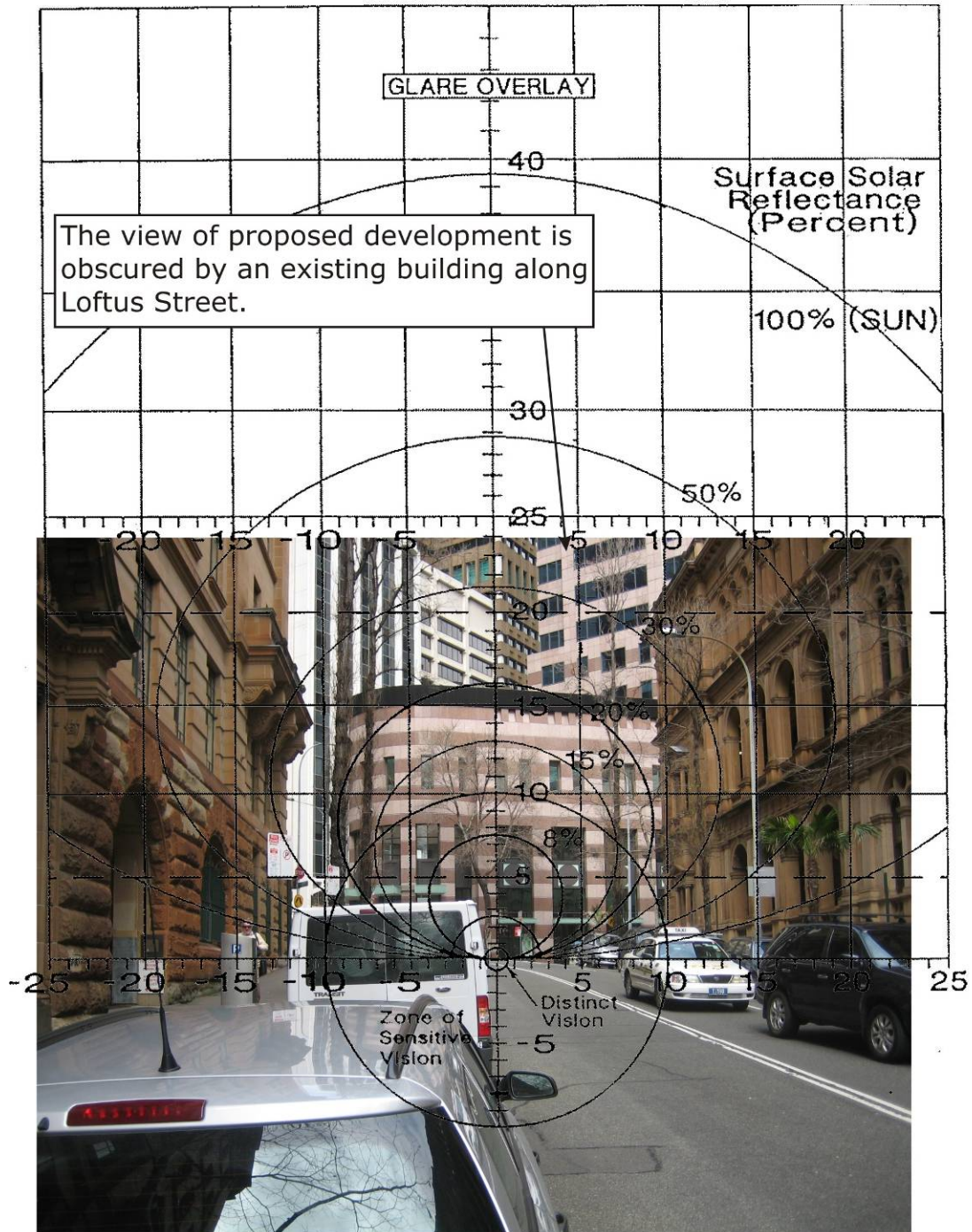


Figure A3: Glare Overlay for Point 3

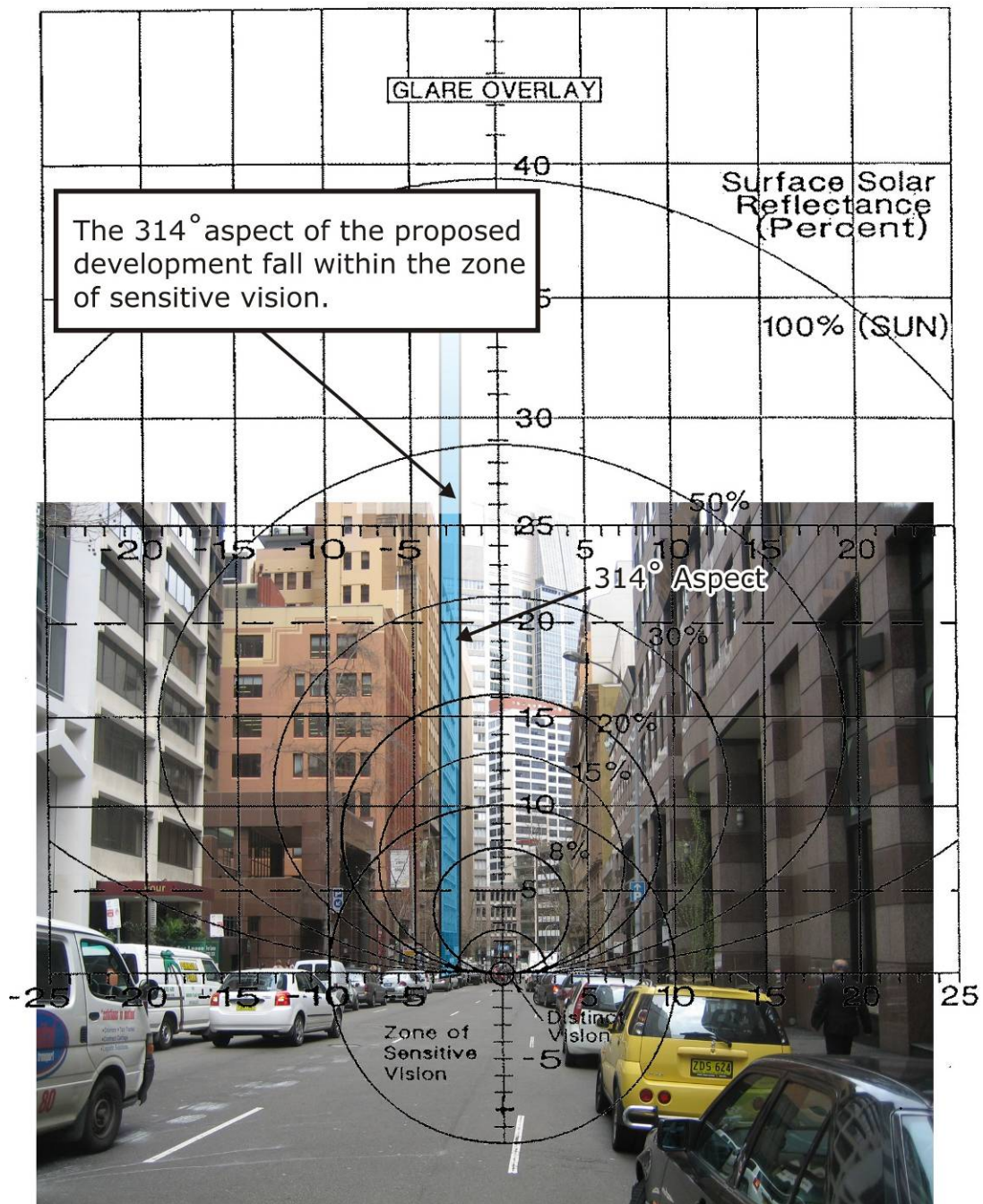


Figure A4: Glare Overlay for Point 4

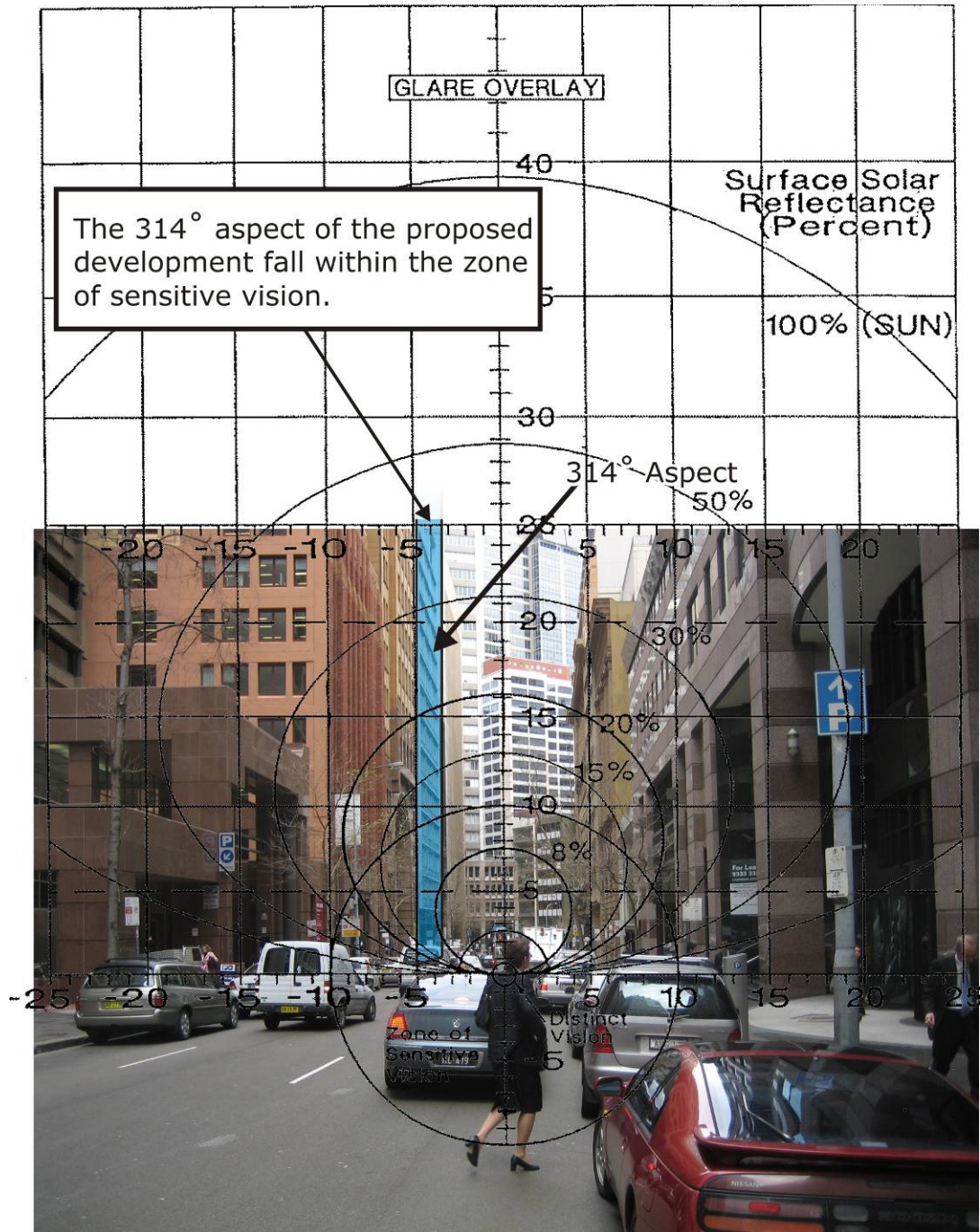


Figure A5: Glare Overlay for Point 5

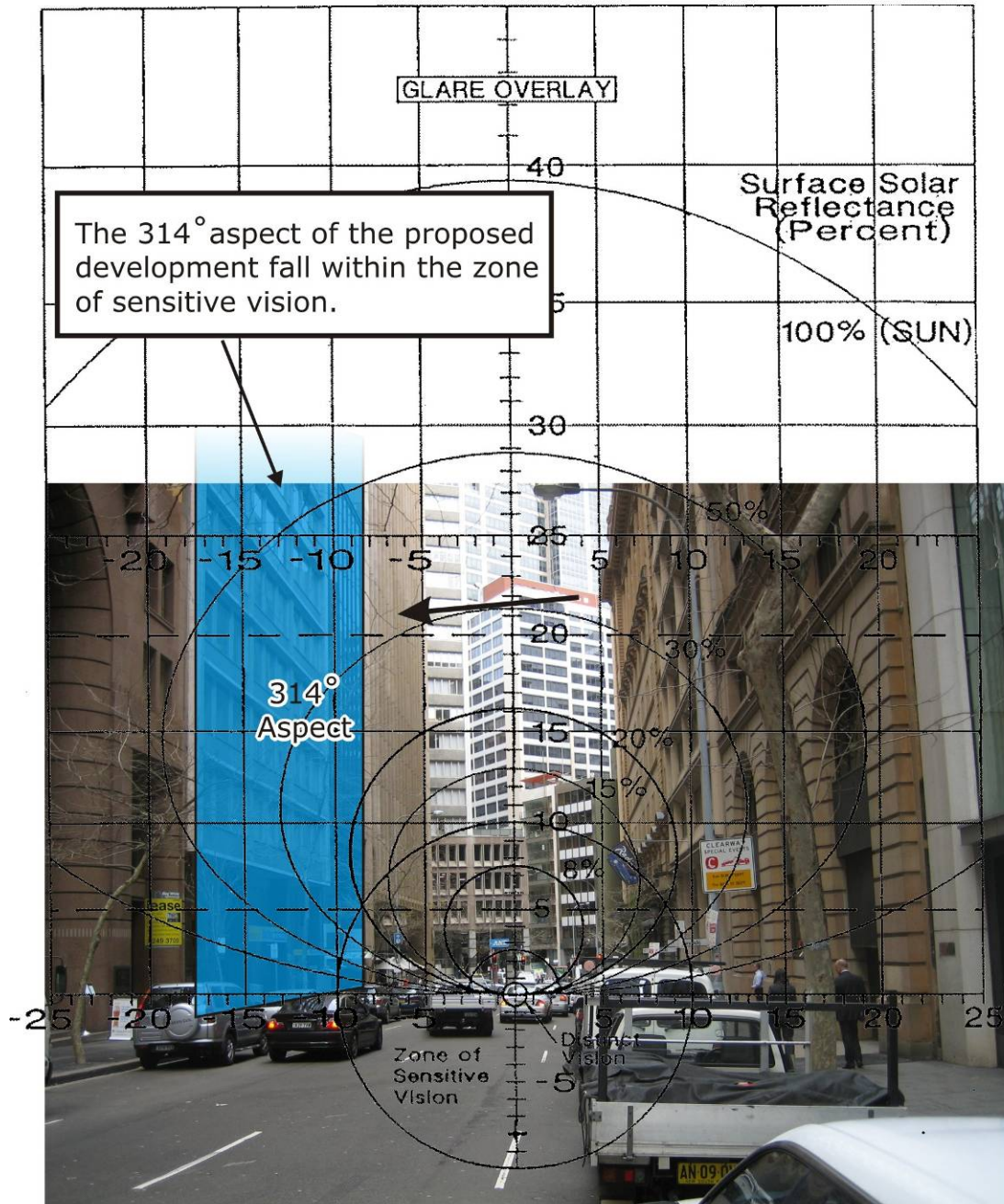


Figure A6: Glare Overlay for Point 6

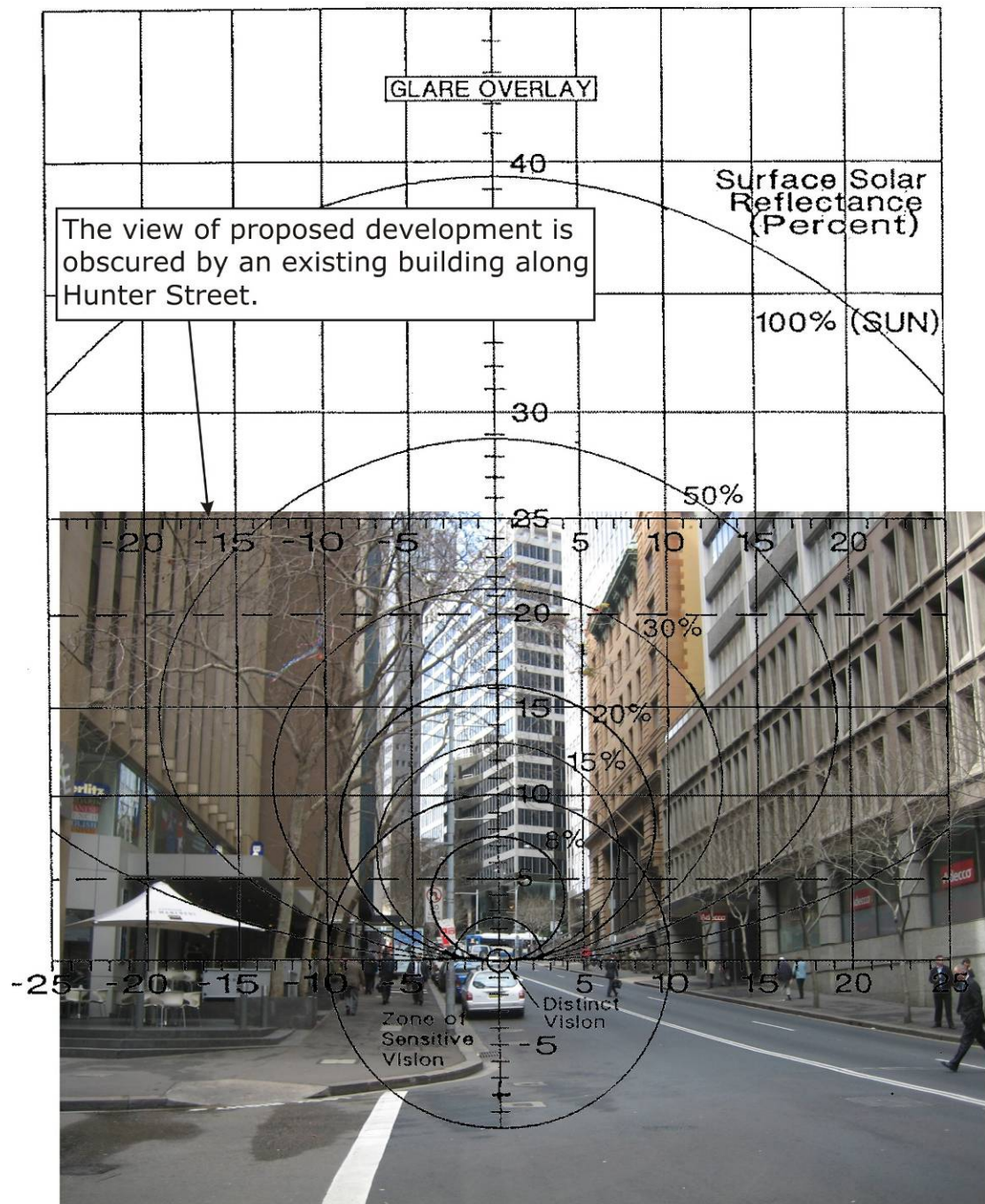


Figure A7: Glare Overlay for Point 7

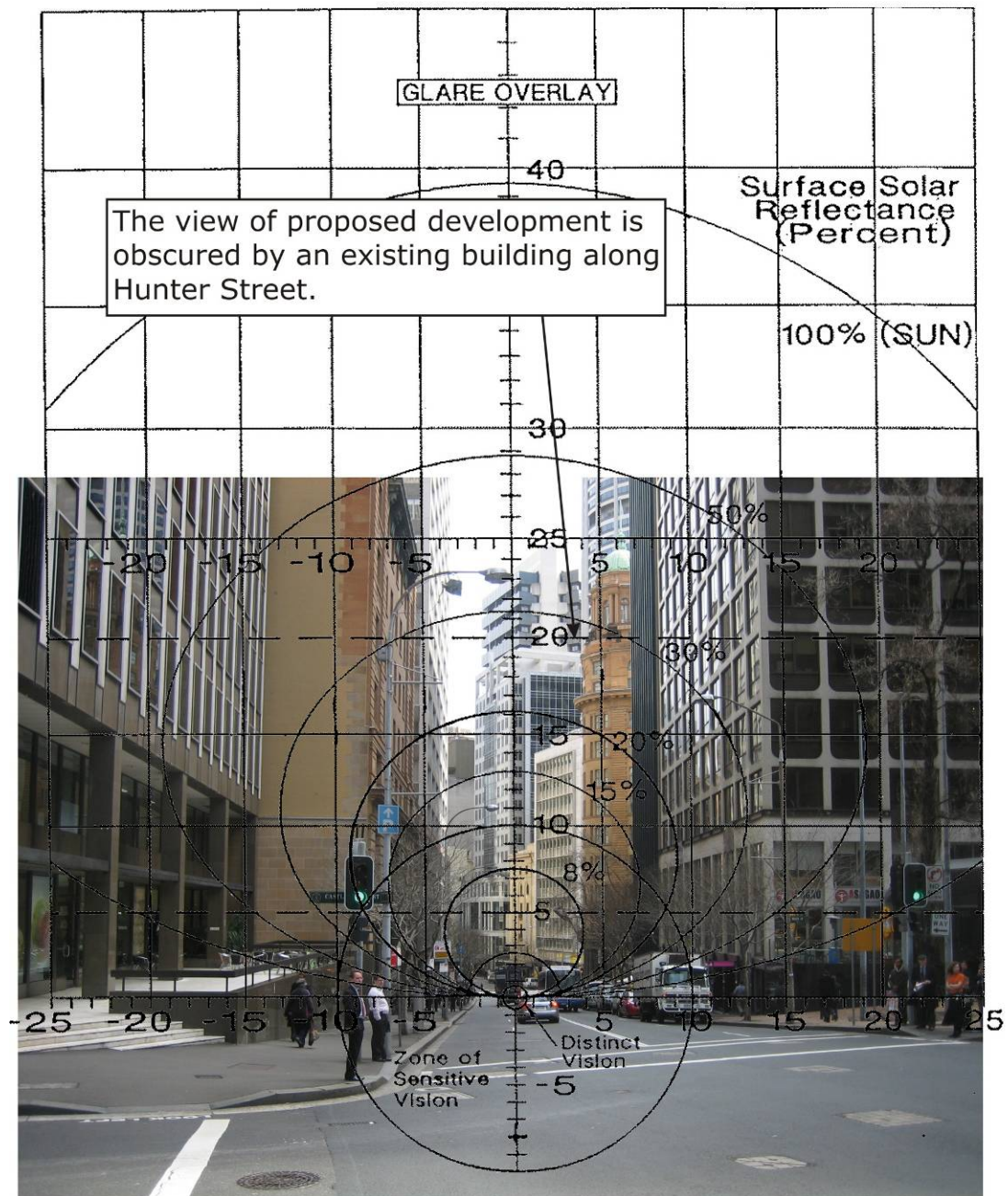


Figure A8: Glare Overlay for Point 8

Appendix B

Solar Charts for the Various Aspects of the Proposal

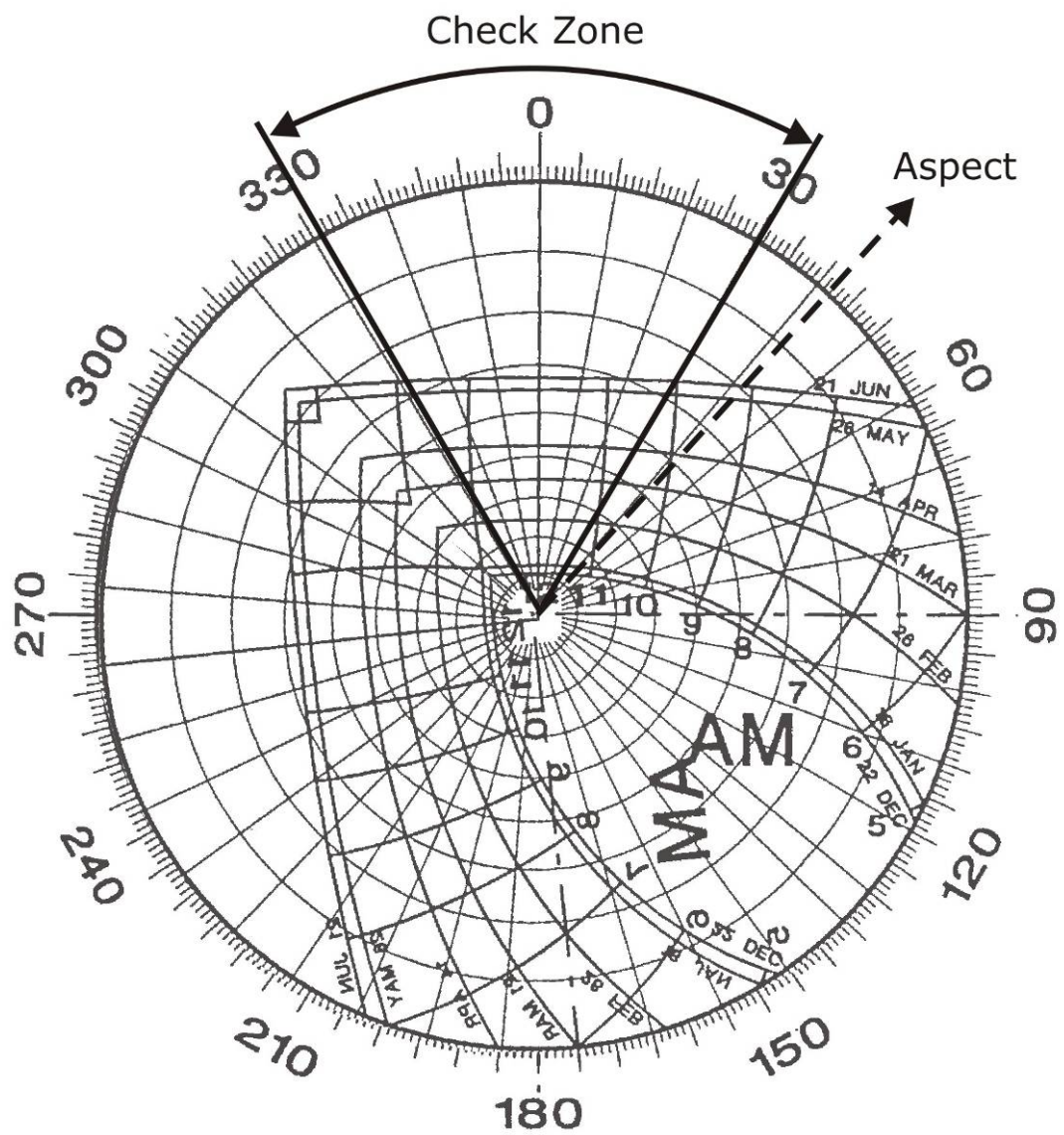


Figure B1: Sun Chart for Aspect 042°

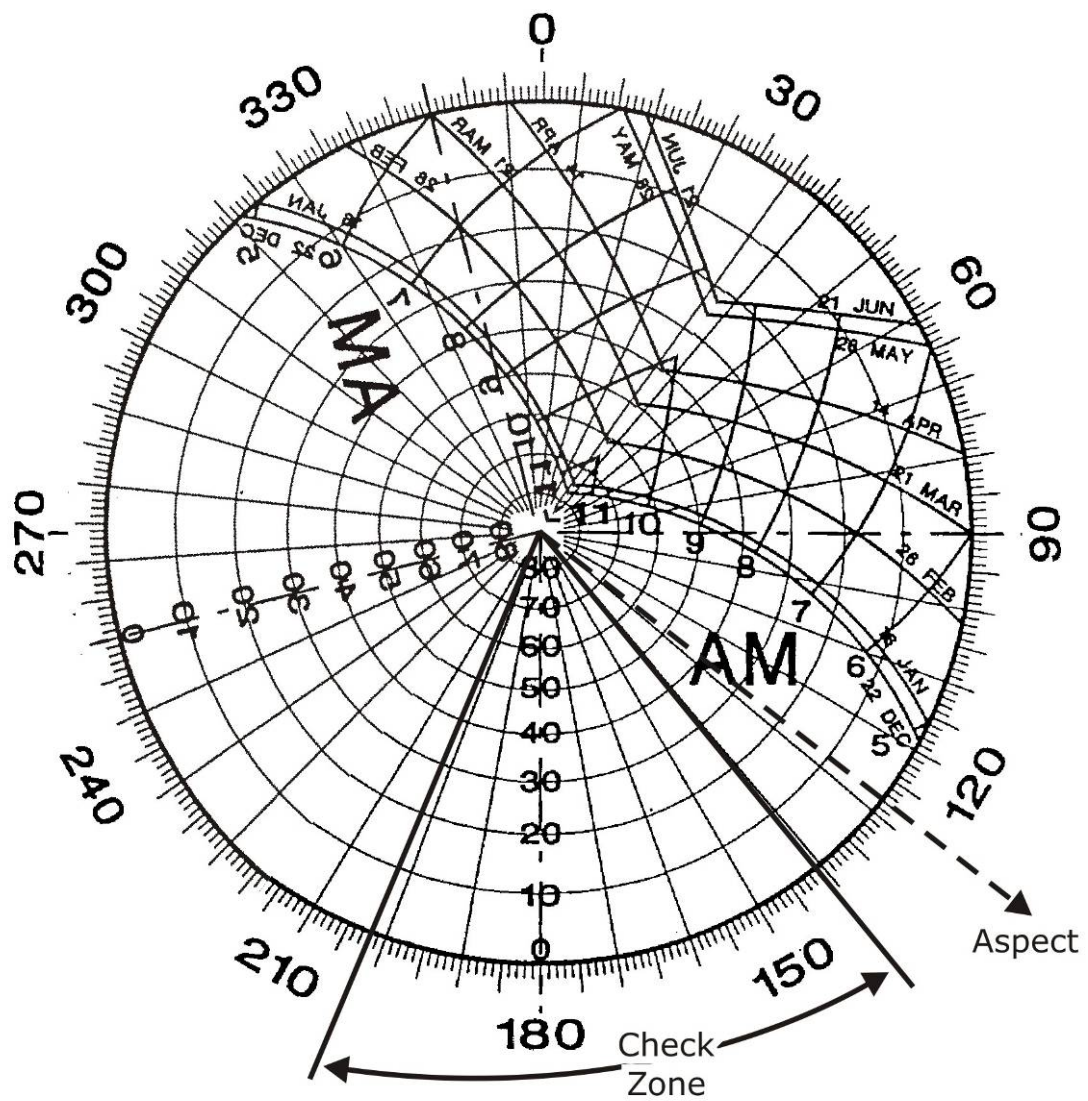


Figure B2: Sun Chart for Aspect 128°

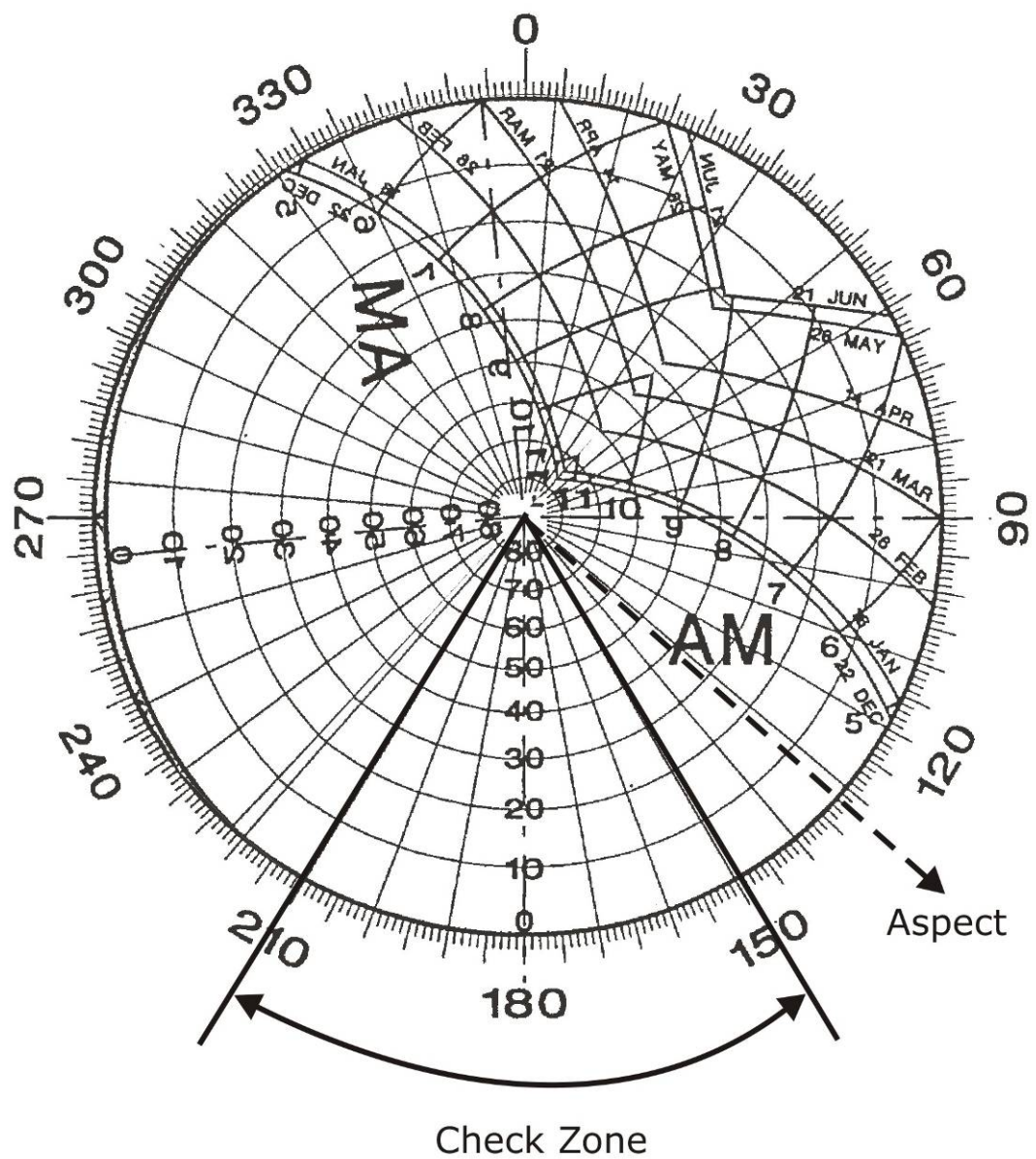


Figure B3: Sun Chart for Aspect 132°

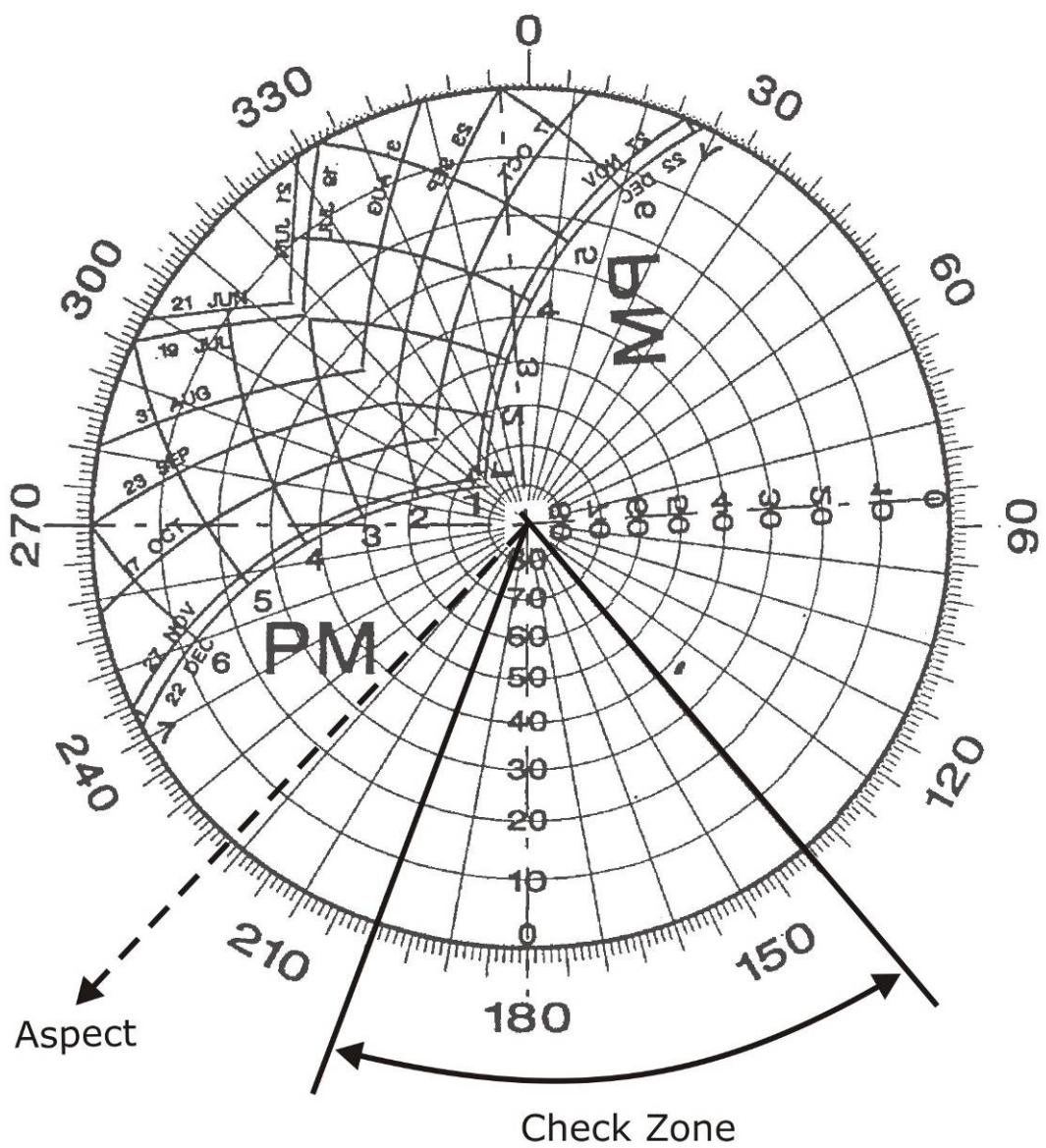
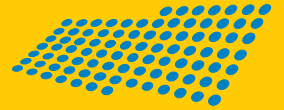


Figure B4: Sun Chart for Aspect 222°





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Appendix H

Pedestrian wind environment statement
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Pedestrian Wind Environment Statement

for the proposed City East Zone Substation and
Integrated Commercial Development at
33 Bligh Street, Sydney

April 15, 2010

Report Reference No. W788-05F02(rev2)- WS Report

Document Control

Revision Number	Date	Revision History	Prepared By (initials)	Reviewed & Authorised By (initials)
0	06/04/2010	Initial	DYF	AB
1	13/04/2010	Minor updates for revised level names, updated image	AB	
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1.0 Introduction

This report is in relation to the proposed City East Zone Substation and Integrated Commercial Development at 33 Bligh Street, Sydney. This report presents an opinion on the likely impact of the proposed development on the local wind environment. The effect of wind activity within and around the proposed development site is examined for the three predominant wind directions for Sydney; i.e. north-east, south and west. The analysis of the wind effects relating to the proposal was carried out in the context of the local wind climate, building morphology and land topography.

The conclusions of this report are drawn from our extensive experience in this field and are based on an examination of the architectural drawings prepared by Kann Finch Group, dated March 25, 2010. No wind tunnel tests have been undertaken for the subject development. As such, this report addresses only the general wind effects and any localised effects that are identifiable by visual inspection. Any recommendations in this report are made only in-principle and are based on our extensive experience in the study of wind environment effects and previous wind tunnel testing results at the site.

2.0 Local Wind Climate

Three principal wind directions potentially affect the development. These winds prevail from the north-east, south and west; Table 1 is a summary of the principal time of occurrence of these winds. This summary is based on data obtained by the Bureau of Meteorology from Sydney Airport between 1939 and 2000. A directional plot of the annual and weekly recurrence winds for the Sydney region is shown in Figure 1. The frequency of occurrence of these winds is also shown in Figure 1.

Table 1: Principal Time of Occurrence of Winds for Sydney

Month	Wind Direction		
	North-Easterly	Southerly	Westerly
January	X	X	
February	X	X	
March	X	X	
April		X	X
May			X
June			X
July			X
August			X
September		X	X
October	X	X	
November	X	X	
December	X	X	

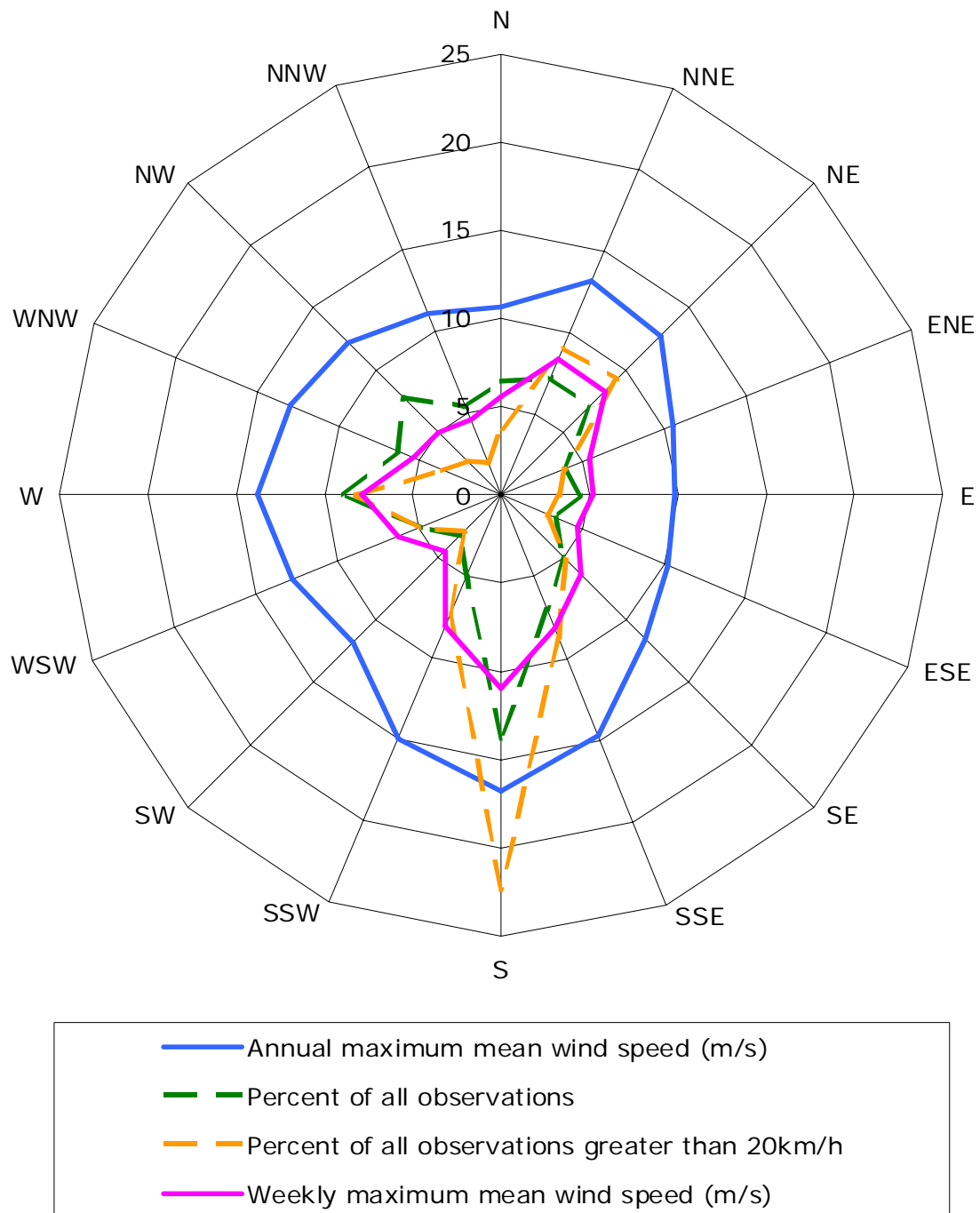


Figure 1: Annual and Weekly Recurrence Mean Wind Speeds, and Frequencies of Occurrence, for the Sydney Region (based on 10 minute mean observations from Kingsford Smith Airport from 1939 to 2008, corrected to open terrain at 10m)

3.0 Wind Effects on People

The acceptability of wind in any area is dependent upon its use. For example, people walking or window-shopping will tolerate higher wind speeds than those seated at an outdoor restaurant.

The following table, developed by Penwarden (1975), is a modified version of the Beaufort Scale, and describes the effects of various wind intensities on people. Note that the applicability column related to wind conditions occurring frequently (exceeded approximately once per week on average). Higher ranges of wind speeds can be tolerated for rarer events.

Table 2: Summary of Wind Effects on People (after Penwarden, 1975)

Type of Winds	Beaufort Number	Gust Speed (m/s)	Effects	Applicability
Calm, light air	1	0 - 1.5	Calm, no noticeable wind	Generally acceptable for Stationary, long exposure activities such as in outdoor restaurants, landscaped gardens and open air theatres.
Light breeze	2	1.6 - 3.3	Wind felt on face	
Gentle breeze	3	3.4 - 5.4	Hair is disturbed, Clothing flaps	
Moderate breeze	4	5.5 - 7.9	Raises dust, dry soil and loose paper - Hair disarranged	Generally acceptable for walking & stationary, short exposure activities such as window shopping, standing or sitting in plazas.
Fresh breeze	5	8.0 - 10.7	Force of wind felt on body	Acceptable as a main pedestrian thoroughfare
Strong breeze	6	10.8 - 13.8	Umbrellas used with difficulty, Hair blown straight, Difficult to walk steadily, Wind noise on ears unpleasant.	Acceptable for areas where there is little pedestrian activity or for fast walking.
Near Gale	7	13.9 - 17.1	Inconvenience felt when walking.	
Gale	8	17.2 - 20.7	Generally impedes progress, Great difficulty with balance.	Unacceptable as a public accessway.
Strong gale	9	20.8 - 24.4	People blown over by gusts.	Completely unacceptable.

4.0 Description and Location of the Proposed Development

The proposed development site is located at 20-26 O'Connell Street and 33-35 Bligh Street, within the Sydney CBD. The site is bounded by the O'Connell Street on the west and Bligh Street on the east. An aerial photograph of the local precinct is given in Figure 2. The local land topography generally rises to the east and south-east of the site. To the north the terrain falls away to Circular Quay. To the north, east and south of the proposed site are predominantly of 12 to 30 storey buildings.

The proposed development consists of an integrated Energy Australia zone substation in the basement, a podium section with a height of approximately 48m above the O'Connell Street ground level, and a rectangular-plan office building above. The overall height of the tower is approximately 130m above the O'Connell Street ground level. Balconies are not proposed for the office tower, and hence the façade of the tower will be flat.

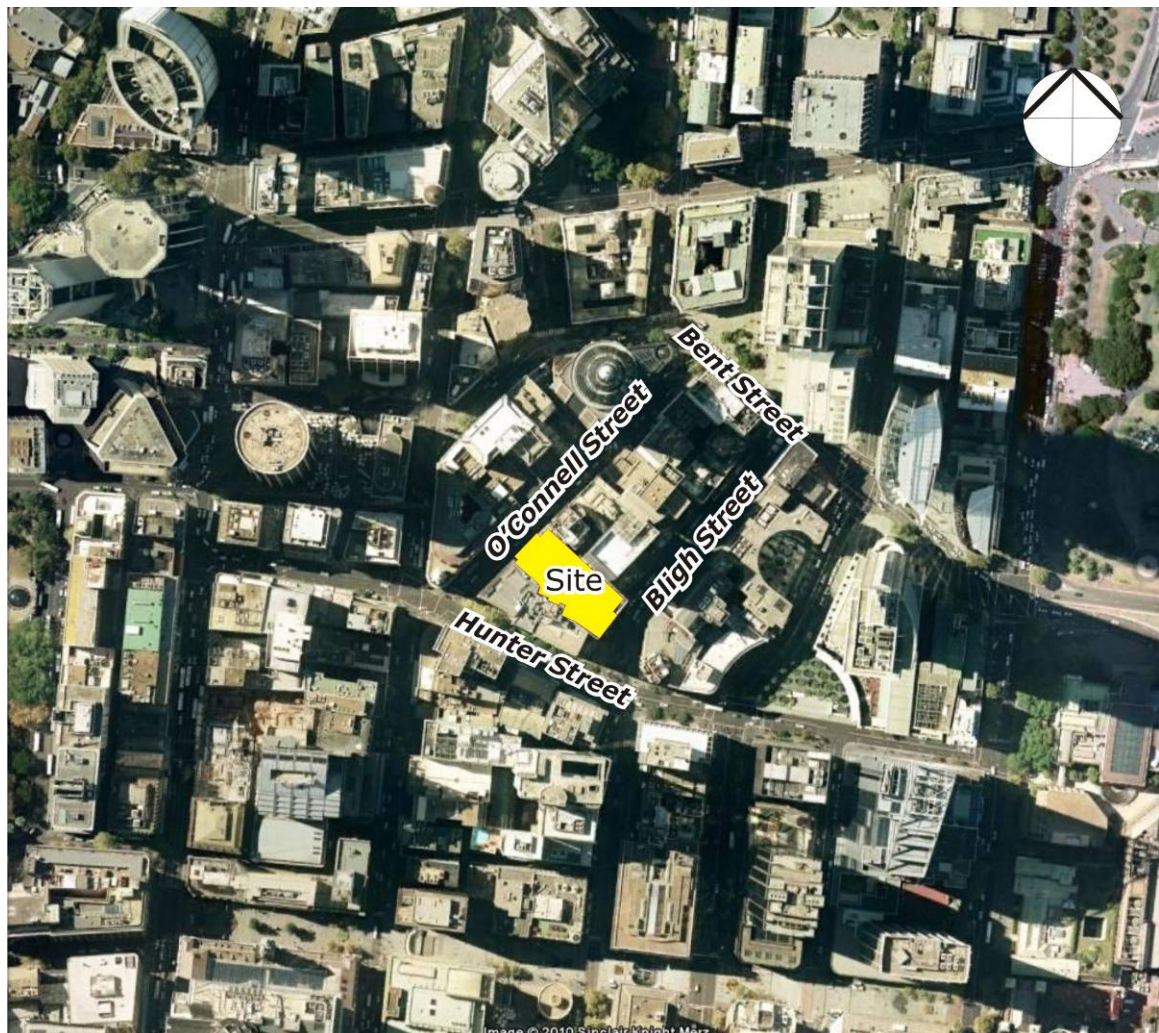


Figure 2: Aerial Image of the Site Location

5.0 Wind Conditions Within and Around the Site

For each of the three predominant wind directions for the Sydney region, the interaction between the wind and the building morphology in the area was considered. Important features taken into account include the distances between the proposed building forms, their overall heights and bulk, as well as the landform. Only the potentially critical wind effects are discussed in this report.

5.1 North-Easterly Winds

The pedestrian pathways along O'Connell Street and Bligh Street are aligned directly to the north-easterly winds. However, the upstream neighbouring buildings along the north-eastern side of Bligh Street are effective in shielding the ground level areas along O'Connell and Bligh Streets from the prevailing north-easterly winds.

The impact of the proposed development onto the ground level wind conditions around the site is expected to be minimal due to the significant amount of neighbouring buildings and other obstructions for the wind. Hence the ground level wind conditions around the development site, including the adjacent Richard Johnson Square, are expected to be quite similar to the existing site conditions.

The Level 12 outdoor terrace areas of the proposed development are mostly quite well shielded from the prevailing winds by the neighbouring buildings. Downwash effects are not expected to be a concern for these areas since the terrace is setback into the overall building form. Furthermore, the architectural drawings indicate that impermeable balustrades will be used on the perimeter of this area, and this is expected to further enhance wind conditions to the Level 12 terrace areas.

5.2 Southerly Winds

The pedestrian footpath along O'Connell Street is shielded from the southerly winds by the local surrounding buildings. The pedestrian pathway along Bligh Street is aligned directly to the southerly winds coming along Castlereagh Street. However, funneled southerly winds approaching the site from Castlereagh Street are expected to be mitigated by the time they reach the subject development site due to the stagnation created by the neighbouring buildings around the site as they follow the bend around on Bligh Street.

The impact of the proposed development onto the ground level wind conditions around the site is expected to be minimal due to the significant amount of neighbouring buildings and other obstructions for the wind. Hence the ground level wind conditions around the development site, including the adjacent Richard Johnson Square, are expected to be quite similar to the existing site conditions.

The Level 12 outdoor terrace areas of the proposed development are mostly quite well shielded from the prevailing winds by the neighbouring

buildings. Downwash effects are not expected to be a concern for these areas since the terrace is setback into the overall building form. Furthermore, the architectural drawings indicate that impermeable balustrades will be used on the perimeter of this area, and this is expected to further enhance wind conditions to the Level 12 terrace areas.

5.3 Westerly Winds

The pedestrian pathways along O'Connell Street and Bligh Street, and the adjacent Richard Johnson Square, are well shielded from westerly winds by the many neighbouring buildings. The impact of the proposed development onto the ground level wind conditions around the site is expected to be minimal due to the significant amount of neighbouring buildings and other obstructions for the wind. Hence the ground level wind conditions around the development site are expected to be quite similar to the existing site conditions.

The Level 12 outdoor terrace areas of the proposed development are mostly quite well shielded from the prevailing winds by the neighbouring buildings. Downwash effects are not expected to be a concern for these areas since the terrace is setback into the overall building form. Furthermore, the architectural drawings indicate that impermeable balustrades will be used on the perimeter of this area, and this is expected to further enhance wind conditions to the Level 12 terrace areas.

6.0 Conclusions

An analysis of the wind environment impact with respect to the principal wind directions for Sydney has been completed for the proposed City East Zone Substation and Integrated Commercial Development at 33 Bligh Street, Sydney. The conclusions of this report are drawn from our extensive experience in this field and are based on an examination of the architectural drawings prepared by Kann Finch Group, dated March 25, 2010. No wind tunnel tests have been undertaken for the subject development. As such, this report addresses only the general wind effects and any localised effects that are identifiable by visual inspection. Any recommendations in this report are made only in-principle and are based on our extensive experience in the study of wind environment effects.

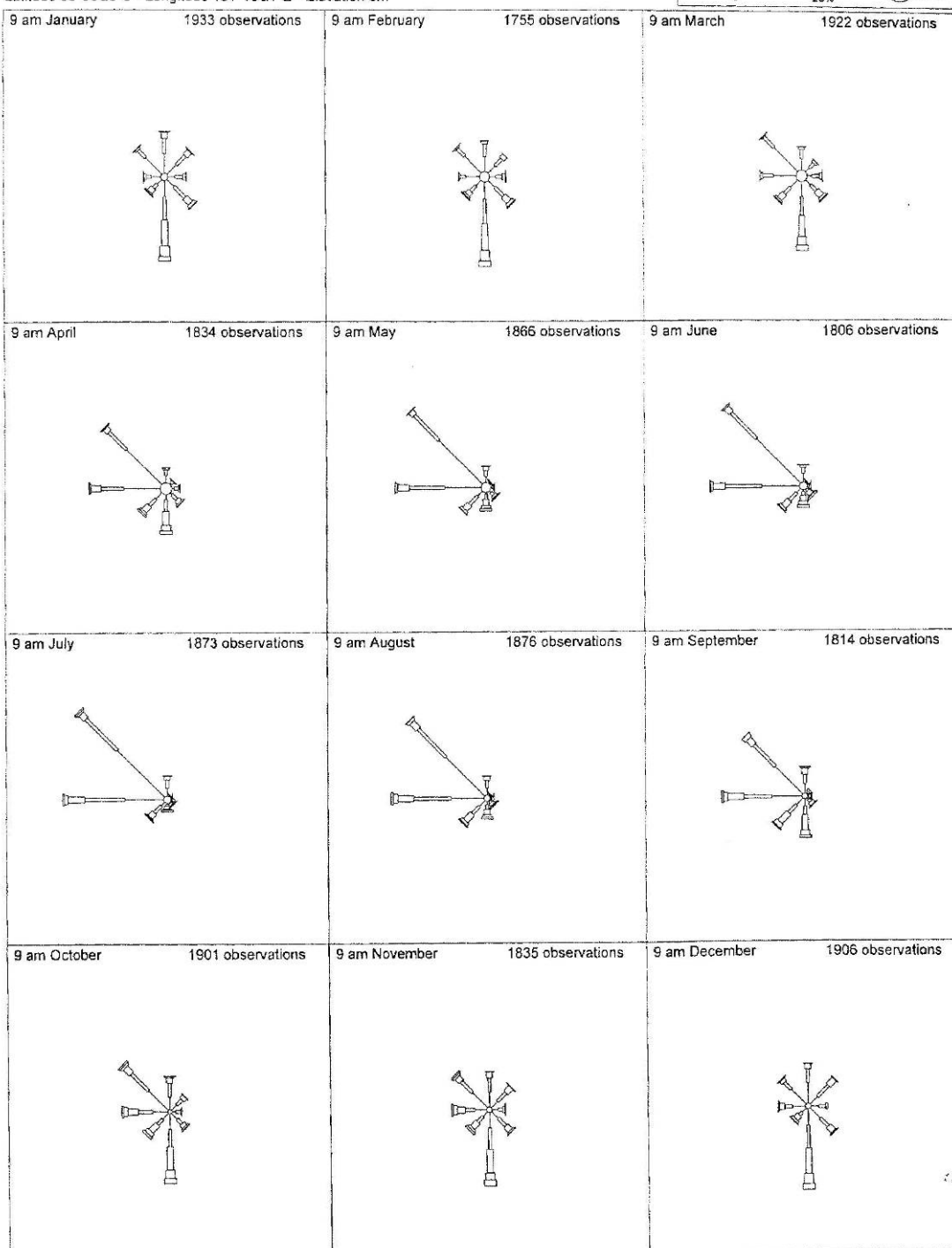
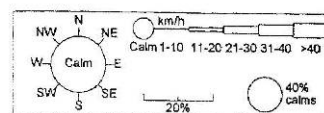
The results of the assessment indicate that no adverse wind conditions are expected for the outdoor trafficable areas associated with the proposed development. Furthermore, it is not expected that the proposed development will create any adverse wind effects for the local surrounding area, including the adjacent Richard Johnson Square. The site benefits from the significant amount of shielding created by the neighbouring buildings. Hence it is expected that wind conditions for all outdoor areas within and around the proposed development site will be acceptable for their intended uses.

Appendix

Wind Roses for Sydney Airport 1939-2000

Wind Roses using available data between 1939 and 2000 for SYDNEY AIRPORT AMO

Site Number 066037 • Locality: SYDNEY AIRPORT • Opened Jan 1929 • Still Open
Latitude 33°56'28"S • Longitude 151°10'21"E • Elevation 6m

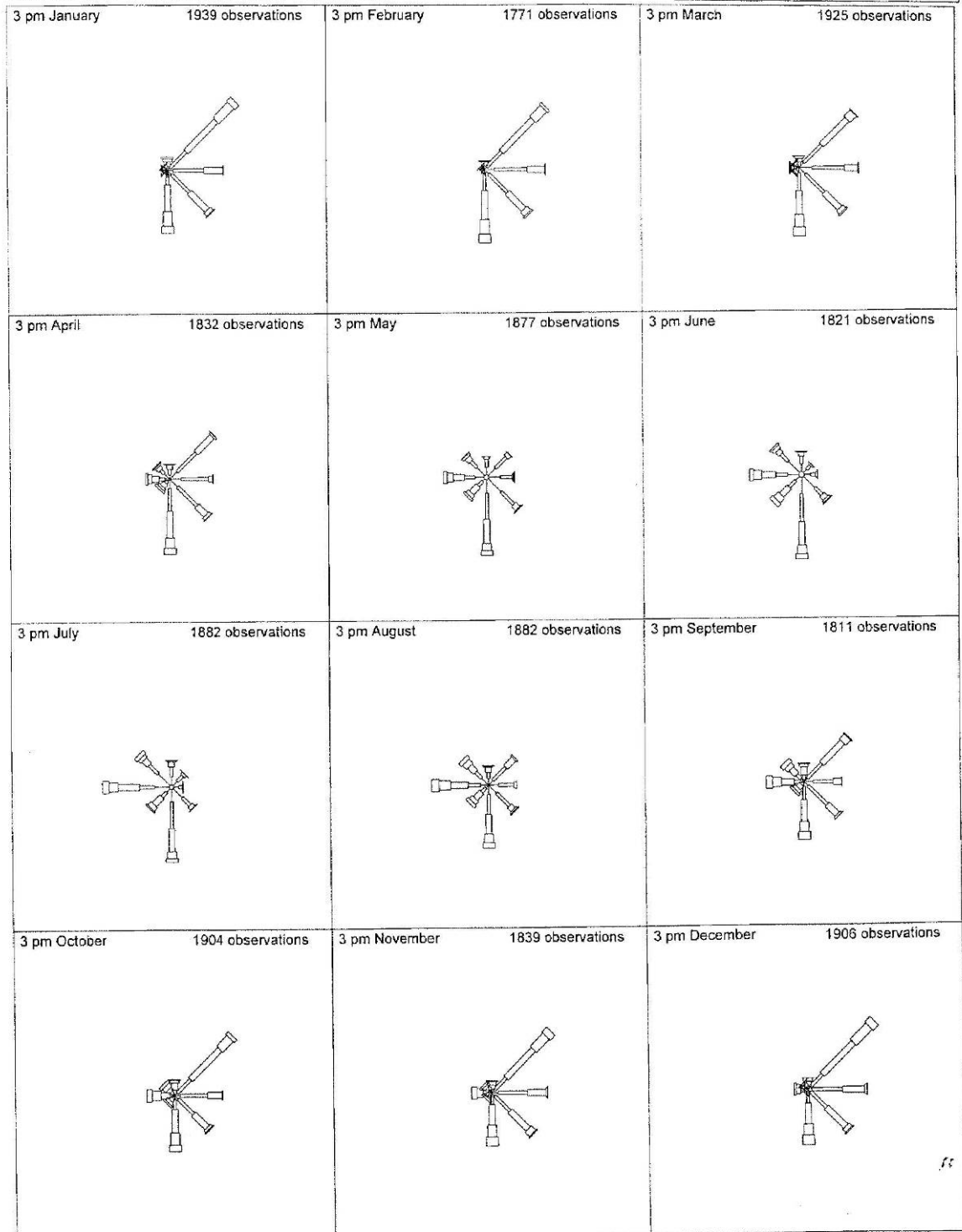
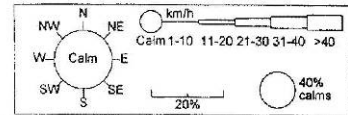


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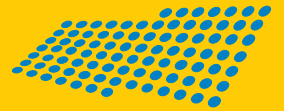
Wind Roses using available data between 1939 and 2000 for SYDNEY AIRPORT AMO

Site Number 066037 • Locality: SYDNEY AIRPORT • Opened Jan 1929 • Still Open
Latitude 33°56'28"S • Longitude 151°10'21"E • Elevation 6m



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Appendix I

Consistency with the Statement of Commitments for the
Sydney CityGrid Concept



Consistency with the Statement of Commitments for the Concept Plan

The following table considers the consistency of the Statement of Commitments in Chapter 17 with those in the Submissions Report and Preferred Project Report for the Concept Plan (2008). The commitments highlighted in blue have been deleted as they are not relevant to this stage of the project, or have been superseded. Commitments highlighted in green are amendments to the original commitments developed that have been developed as an outcome of this Environmental Assessment and are included in the Statement of Commitments in Chapter 17. Chapter 17 also includes new commitments that are additional to those provided in the Submissions Report and Preferred Project Report for the Concept Plan (2008).

Key issue	Commitment	Consistency
Visual amenity	<p>Riley Street STSS and Services Control Room/ City East Zone Substation /Dalley Street Zone Substation</p> <p>A similar design review process as that conducted for Belmore Park Zone Substation would apply to Stage 2A(ii) of the City East Zone Substation. new buildings forming part of the Project. The design review process would therefore apply to the following Project components and would need to be conducted during the preparation of future Project Approval EARs:</p> <ul style="list-style-type: none">▶ Riley Street STSS and Services Control Room (preferred location);▶ City East Zone Substation; and▶ Dalley Street Zone Substation refurbishment or replacement.	<p>Text in blue deleted to maintain consistency with the scope of this Environmental Assessment.</p> <p>The SoC in Chapter 17 is consistent with the intent of the original SoC as the design review process would be conducted during preparation of the Environmental Assessment for the building that would contain the new City East Zone Substation.</p>



Key issue	Commitment	Consistency
	<p>Riley Street STSS and Services Control Room /City East Zone Substation/Dalley Street Zone Substation</p> <p>During the preparation of the future Project Approval EARs for the Stage 2A(ii) of the City East Zone Substation, the following investigations would be undertaken:</p> <ul style="list-style-type: none">develop options for the location and orientation of the design within the site to achieve best outcome for urban frontage;review exterior materials and facade design in association with the design of the overall site development and building design; andreview public domain impacts / design for streetscape.	<p>Text in blue deleted to maintain consistency with the scope of this Environmental Assessment.</p> <p>The SoC in Chapter 17 is consistent with the intent of the original SoC as issues related to urban design would be assessed during preparation of the Environmental Assessment for the building that would contain the new City East Zone Substation.</p>
	<p>Services Control Room</p> <p>In the event of this alternative location being adopted, the following investigations would be undertaken during the preparation of a future Project Approval EAR:</p> <ul style="list-style-type: none">develop options for the location and orientation of the Services Control Room facility within the local area and the Cook and Phillip Park / The Domain site to achieve preferred location with the least visual and physical intrusion;review shaft design;review Services Control Room facility exterior materials and design to determine appropriateness for location;review any potential impacts on trees; andreview public domain design / proposals for areas of the park or street that are impacted by works.	<p>This commitment has been deleted as it is not relevant to Stage 2A(i) of the City East Zone Substation.</p>



Key issue	Commitment	Consistency
	<p>Other Surface Works</p> <p>During the preparation of future Project Approval EARs the following investigations would be undertaken:</p> <ul style="list-style-type: none">▶ develop refined understanding of local construction impacts;▶ review construction proposals;▶ review any potential impacts on trees;▶ review public domain design / proposals for areas of the parks or streets that are impacted by works; and▶ determine any disruption to pedestrian or traffic movements in the construction period or in the long term, and period of construction on site.	<p>Commitment deleted as it relates to the scope of investigations that would be undertaken for subsequent stages of the Sydney CityGrid Project. These issues have been considered during preparation of this Environmental Assessment.</p>



Key issue	Commitment	Consistency
Traffic and access	<p>Riley Street STSS and Services Control Room/City East Zone Substation/Surry Hills STS/Dalley Street Zone Substation /Alternative Services Control Room</p> <p>During the preparation of future Project Approval EARs for the above Project elements the following investigations would be undertaken:</p> <ul style="list-style-type: none">▸ assessment of site access and potential spoil disposal routes for heavy vehicles to/from the work site during construction;▸ assessment of impacts on parking, public transport, pedestrian and cyclist access in the vicinity of the work site during both construction and operation phases;▸ obtaining traffic flow data along key sections of the road network in the vicinity of each of the construction work sites and along surrounding spoil and delivery routes during construction;▸ assessment of traffic generation impacts on the surrounding road network's traffic flows during both construction and operation phases;▸ development of possible traffic and transport mitigation measures for both construction and operation phases, including the impacts of any road closure; and▸ construction phase mitigation measures and safeguards for these Project elements have been developed and are found in Volume 2, Appendix C of the EAR. However, they would be further refined during the preparation of the Project Approval EARs.	<p>This commitment relates to the scope of investigations to be undertaken during preparation of future Environmental Assessments. It has been deleted as the commitment has been met during preparation of this Environmental Assessment.</p>



Key issue	Commitment	Consistency
Noise and vibration	<p>Riley Street STSS and Services Control Room & CECT/City East Zone Substation/CSCT Extension/Dalley Street Zone Substation/Alternative Services Control Room</p> <p>During the preparation of future Project Approval EARs for the above Project elements the following investigations would be undertaken:</p> <ul style="list-style-type: none">▶ undertake a noise survey;▶ derive construction noise emission criteria in accordance with the principles set out in Volume 2, Appendix D of the EAR;▶ conduct a detailed construction noise assessment;▶ assess the need for required noise controls during the construction stage;▶ an operational noise and vibration assessment would be conducted for the Substations and STSS generally following the methodology used to assess the Belmore Park Zone Substation; and▶ the noise and vibration assessment would be refined for the Project Approval EAR for each work site and tunnel alignment. Site-specific regenerated noise and vibration rules can be established following early works, the results of which may require increased buffer distances to be allowed, or, alternatively, may permit a smaller buffer distance where closer-to-surface tunnelling works are preferable (and the regenerated noise and vibration impacts are proven to be less than anticipated at this Concept EA stage).	<p>This commitment relates to the scope of investigations to be undertaken during preparation of future Environmental Assessments. It has been deleted as the commitment has been met during preparation of this Environmental Assessment.</p>



Key issue	Commitment	Consistency
	<p>Riley Street STSS, Services Control Room & CECT</p> <p>It is recommended that a week-long unattended noise survey is undertaken in up to four locations around the work site. The most suitable locations for the survey appear to be:</p> <ul style="list-style-type: none"> ▶ east of work site - rear of strata units at 329 Crown Street; ▶ north of work site - front of terrace house at 82 Ann Street; ▶ west of work site - front of townhouse at 299 Riley Street; and ▶ south of work site - mid/upper floor balcony of a residential unit in 300 Riley St/ 127 Albion Street facing Albion Street. 	<p>This commitment has been deleted as it does not relate to the City East Zone Substation</p>
	<p>CSCT Extension</p> <p>Based on Heggies Pty Ltd review of the site, it is recommended that a week-long unattended noise survey is undertaken in Little Albion Street, Surry Hills. The most suitable location for the survey appears to be any of the terraced houses at 14-22 Little Albion Street.</p>	<p>This commitment has been deleted as it does not relate to the City East Zone Substation</p>
<p>European heritage & Aboriginal archaeology</p>	<p>Riley Street STSS, Dalley Street and City East Zone Substations</p> <p>During the preparation of future Project Approval EARs for the above Project elements, the following investigations would be undertaken:</p> <ul style="list-style-type: none"> ▶ the archaeological potential and significance of the Dalley Street and City East zone substation sites should be reassessed once the exact study areas and nature of impacts are known. This would require additional historical research; and ▶ The Dalley Street and City East zone substation sites are likely to require archaeological testing to determine the nature and integrity of archaeological remains. If substantive remains are identified these would need to be subject to a detailed archaeological recording program. 	<p>This commitment relates to the scope of investigations to be undertaken during preparation of future Environmental Assessments. It has been deleted as the commitment has been met during preparation of this Environmental Assessment.</p> <p>Archaeological testing was not undertaken as part of this Environmental Assessment because was not possible to access areas below the basement of the existing building.</p>



Key issue	Commitment	Consistency
	<p>Alternative Services Control Room</p> <p>During the preparation of future Project Approval EARs for the above Project elements, the following investigation would be undertaken:</p> <ul style="list-style-type: none"> the nature of possible remains in the Cook and Phillip Park area should be revisited once the location of the control room is known. 	<p>Commitment deleted as it does not relate to the City East Zone Substation</p>
Spoil and Waste Management	<p>A number of mitigation measures and safeguards have been developed and would be further investigated during the preparation of future Project Approval EARs:</p> <ul style="list-style-type: none"> wherever practicable spoil would be reused as part of the Project; sites for the disposal of surplus soil would be selected according to the rate of development activity and the volume of material generated elsewhere; spoil that is not VENM would be transported to approved landfill sites and/or off-site recycling depots; spoil haulage routes identified in Chapter 13 of the Environmental Assessment would be used; and as part of the CEMP a Spoil and Waste Management sub-plan would be prepared which would identify how spoil would be handled, stockpiled, re-used and disposed. It would address the principles of all relevant legislation. 	<p>This commitment has been refined to reflect the outcome of additional investigations undertaken as part of this Environmental Assessment.</p> <p>Text in blue has been deleted to reflect and the remainder of the text revised the nature of the works that would be undertaken as part of Stage 2A(i).</p> <p>The corresponding commitment in Chapter 17 is consistent with the intent of the original commitment as it would ensure that spoil and waste is appropriately managed, managed in accordance with DECC (2008) Waste Classification Guidelines and specific measures would be defined in the Spoil and Waste Management sub-plan that would be part of the CEMP.</p>
Air Quality and Greenhouse Gas Emissions	<p>During the preparation of further Project Application EARs, detailed assessment of air quality impacts and greenhouse gas emissions would be undertaken. These assessments would also include the investigation and recommendation of mitigation measures to be adopted during the construction and operation of the Project.</p>	<p>This commitment relates to the scope of investigations to be undertaken during preparation of future Environmental Assessments. It has been deleted as the commitment has been met during preparation of this Environmental Assessment.</p> <p>A greenhouse gas emission assessment will be undertaken in accordance with MCoA 3.1(i). As this MCoA relates to the emissions associated with SF6 from transformers, the assessment will be prepared as part of the Environmental Assessment for Stage 2A(ii) of the City East Zone Substation.</p>



Key issue	Commitment	Consistency
Hazards and Risks	A number of mitigation measures and safeguards have been developed for construction and operational risk management and EMF and would be further investigated during the preparation of future Project Approval EARs.	<p>This commitment relates to the scope of investigations to be undertaken during preparation of future Environmental Assessments. It has been deleted as the commitment has been met during preparation of this Environmental Assessment. This involved undertaking a risk assessment workshop to identify risks relevant to Stage 2A(i), and progressively evaluating risks based on the outcome of specialist investigations that are presented in the Environmental Assessment. This is considered to be consistent with the original commitment.</p> <p>Operational risks and EMF and not relevant to Stage 2A(i).</p>
Soil and Water /Groundwater Quality	<p>A number of mitigation measures and safeguards have been developed and would be further investigated during the preparation of future Project Approval EARs:</p> <ul style="list-style-type: none"> assessment of water quality objectives to be achieved and likely construction treatment facilities required prior to discharging waters to the receiving waters; assessment of water quality monitoring regimes to be adopted during construction and required emergency management plans to address key issues such as tunnel flooding and unexpected discharge of contaminated waters; and assessing a means of minimising the entry of surface water and groundwater to the tunnel and the means of disposal of any such water entering the tunnel including identification of any proposed use of existing drainage infrastructure and the means of minimising any adverse impacts. 	<p>This commitment relates to the scope of investigations to be undertaken during preparation of future Environmental Assessments. It has been deleted as the commitment has been met during preparation of this Environmental Assessment.</p> <p>Chapter 17 outlines additional commitments that have been developed to minimise and manage the impacts associated with Stage 2A(i), including the treatment of surface and groundwater prior to discharge from the site. This is considered to be consistent with the intent of the original commitment.</p>
Property, Land use and Settlement	Further investigations and design are required to assess the risks of settlement in potential areas of groundwater drawdown. It is proposed to prepare a detailed assessment of these issues in future EARs required for the Project, develop mitigation measures and outline construction phase management sub-plans.	This commitment has been refined to reflect that further investigation would be undertaken during the detailed design Stage 2A(i) based on the results of additional geotechnical investigations to minimise potential impacts associated with ground settlement and stability. This is considered to be consistent with the intent of the original commitment.



Key issue	Commitment	Consistency
Consultation and Stakeholder Liaison	<ul style="list-style-type: none"> ▶ EnergyAustralia would continue liaison with all affected stakeholders and receivers. In particular, stakeholder deeds would be put in place with key Government agencies and top tier infrastructure owners / operators. These would include, for example, but not necessarily be limited to: <ul style="list-style-type: none"> ▪ RTA / CCM; ▪ City of Sydney Council; ▪ RailCorp; ▪ Sydney Metro; ▪ Minister of Transport; ▪ TransGrid; ▪ Royal Botanic Gardens and The Domain Trust; and ▪ Sydney Light Rail. ▶ EnergyAustralia would continue with public consultation during the detailed design, construction and operational stages of the Project. Consultation with business and residents would consist typically of discussions, newsletters and community information sessions. 	Commitment retained.
Cumulative impacts	EnergyAustralia would endeavour to ensure that cumulative impacts can be avoided through precise management of projects and communication with other authorities.	This commitment has been retained.