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Global Switch Sydney 2
Data Centre

273 Pyrmont Street, Ultimo

Major Project Application No. 08_0222

Preferred Project Report

August 2010

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issue register

Date of Issue	Reason for Issue	Prepared by	Checked by	Signed
30th June 2010	Draft Report to Architects	L Ryan	L Ryan	
6th July 2010	1st Draft Report to client	L Ryan	M Ryan	
July 2010	Final draft to client	L Ryan	L Ryan	
27 Aug 2010	Final draft to client	L Ryan	L Ryan	
30 Aug 2010	Final Issue to DOP	L Ryan	M Ryan	

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contents

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1 Introduction & Background

In March 2010, the Environmental Assessment Report and accompanying documentation in support of Major Project Application No. 08_0222 was submitted to the NSW Department of Planning for assessment under Part 3A of the Environmental Planning and Assessment Act, 1979.

The Major Project Application was lodged on behalf of Global Switch Property (Australia**)** Pty Ltd in support of the erection of a data storage centre at 273 Pyrmont Street, Ultimo. The proposal will be an extension to Global Switch's existing data centre known as Global Switch Sydney 1 (GSS1) which currently occupies the adjoining former Government Printing Office (GPO) site at 400 Harris Street, Ultimo. This project is a response to the increasing demand for secure data storage capacity and IT infrastructure management facilities within the City of Sydney.

The new multi-storey data centre to be known as Global Switch Sydney 2, is designed to maximise the efficiency across the two adjoining data centre sites in terms of power and energy consumption.

Following the public exhibition of the Major Project Application, which concluded on 7th May 2010, the Department of Planning has invited Global Switch to respond to the submissions received from government authorities, the general public and interested parties. Accordingly, the purpose of this Preferred Project Report (PPR) is to:-

- Comprehensively address the issues raised in the submissions including reference to additional investigative data where relevant to clarify certain matters;
- Explain minor modifications to the project; and
- Provide a revised Statement of Commitments based on additional data and drawings provided.

This report is structured as follows:-

- Section 2 – describes the current proposal as exhibited with details of minor entry canopy modifications proposed to the Pyrmont Street elevation.
- Section 3 – details supporting documentation
- Section 4 - summarises the key issues raised in the submissions and provides a tabled response. This section also provides supplementary information with more detailed responses and explanation of minor modifications. To clarify certain matters, supplementary drawings and reports are referenced.
- Section 5 - outlines the final Statement of Commitments for the project.

2 Summary of Preferred Project

Global Switch Sydney 1 located at 400 Harris Street, Ultimo, has been providing highly resilient data centre space to leading national and international organisations and institutions for the past eight (8) years. To meet the increasing demands of a fast-growing IT industry, Global Switch is proposing to extend the Ultimo site by building a new wing, Global Switch Sydney 2 (GSS2), on the vacant parcel of land which lies directly east of the existing building. The vacant site is bounded to the north by the Western Distributor, to the east by Pyrmont Street and to the south by Quarry Street.

GSS2 will comprise a purpose built six (6) storey data centre building above three (3) basement levels, comprising a total Gross Floor Area (GFA) of approximately 22,285 m² in addition to 15,227 m² plant area. A total of 12 car spaces will be provided at grade on the northern boundary of the site. All vehicular access will be directly off Pyrmont Street.

The project application will also include:-

- installation of all ancillary plant and equipment required to make the building operational;
- direct internal linkages to Global Switch Sydney 1 building;
- implementation of new landscaping works, streetscape upgrades and street tree planting works; and
- erection of corporate building signage.

Following consideration of submissions, the only modification warranted to the design is a minor change to the entry canopy over the pedestrian entrance from Pyrmont Street. The modification is described in more detail with accompanying diagrams in Section 4.2.1 of this report.

In line with the rapid global trend towards climate change awareness and action, Global Switch is committed to creating the world's premium ultra energy efficient data centre, the aim being to substantially minimise power consumption and reliance on grid generated power supply. The resultant building will significantly reduce greenhouse emissions and will have an extremely low carbon footprint compared to similar facilities around the world.

3 Supporting Documentation

In order to adequately respond to suggestions and concerns raised during the public exhibition phase, Global Switch have engaged their specialist consultant team to undertake further investigations in order to provide informed responses on key issues.

This Preferred Project Report should be read in conjunction with the Environmental Assessment Report dated March 2010 and associated documentation as exhibited by the Department of Planning as well as the following supplementary information appendixed to this report.

Documents	Prepared By	Appendix
Amended Architectural Plans	DEM (Aust) Pty Ltd	6.1
Amended entry canopy design – Pyrmont Street	DEM (Aust) Pty Ltd	6.2
Elevational Shadow Diagrams	DEM (Aust) Pty Ltd	6.3
View Loss Analysis - Bullecourt	DEM (Aust) Pty Ltd	6.4
Environmental Noise Criteria Report	Aurecon	6.5
Response to DECCW requests for information regarding Air Quality – Ref. 2117107ARevA/LT_2686	Parsons Brinckerhoff Aust. Pty Ltd	6.6
Community Consultation Services Letter	Id Planning	6.7

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4 Submission Issues and Responses

The Major Project Application was publicly exhibited from 7th April 2010 to 7th May 2010. By letter dated 20th May 2010, the Department of Planning advised that pursuant to Section 75H (6) of the EPA Act, the proponent (Global Switch) is required to review the submissions and provide a response to the matters raised. The following submissions were received:-

- Sydney City Council
- Department of Environment Climate Change and Water
- SRDAC/RTA
- Department of Transport and Infrastructure (Railcorp)
- Pyrmont Action Group
- 7 public submissions

The following table summarises the complete range of issues raised with a corresponding response from the proponent. Matters which require detailed clarification or commentary are addressed in more detail in Section 4.2 of this report. The results of additional investigation relating to noise assessment and air quality are attached at Appendix 6.5 and 6.6 of this report.

4.1 Schedule of Issues and Responses

ISSUES	RESPONSE
SYDNEY CITY COUNCIL	
1.0 Tri-generation	
1.1 The tri-generation system should be designed to integrate with and form part of the City's Decentralised Energy Master Plan.	The facility is being designed with a connection to Energy Australia's network. This connection both stabilises the gas engines, and allows transfer of energy to the grid if required. We note that some regulatory hurdles exist, such as NEMMCOs requirements for energy sale. This would allow provision for connection to other facilities within the City of Sydney. The heat produced by the electricity generation process will be used to dive absorption chillers to provide cooling to the facility. As such there would only be low grade heat available from the condenser water system, therefore no external piping connections are planned.
1.2 A water recycling system should also be incorporated for the cooling towers and details of the potable water saved provided.	Section 8.2.3 'Water Efficiencies' of Appendix 9.10 of EAR 'Engineering Responses to DGRs'. Tertiary copied below. **On-site recovery** Rainwater is to be harvested from the roof structure and fed into the existing building services for site irrigation and toilet flushing. Initial feasibility assessments have determined that rainwater capture and reuse options would provide very limited benefit to building services

	systems due to the disparity between cooling tower usage and rainwater availability. Options for tertiary water treatment and sewer mining are being investigated with relevant authorities, however feasibility of this option is subject to further design investigations. The tank locations are shown on architectural site plans, with relevant controls located within designated plant rooms. This will allow the building manager to monitor the usage, rainwater levels and possible reuse volumes that have been captured at the site. Control systems and monitoring functions are subject to further detailed design. **Specification of Fixtures** Potable water usage for the site will be attributed to showers, basins in toilet areas, WC's, urinals, kitchen sinks and some external works for irrigation. The on-site rainwater tank has been sized to meet the demand for toilet flushing with allowances for external landscaping and irrigation. To reduce the overall demand attributed from these uses, fixtures are to be specified to achieve a minimum 4 WELS rating or better where feasible for the proposed use. Each basin fitting is to include automatic shut-off to further reduce potable water demand.
1.3 Detail the capacity of the tri-generation plant, including heat fired absorption chillers, annual electricity and heat production and reductions in C02 equivalent emissions, including savings from not using electric air conditioning and greenhouse gas refrigerants.	9×4.3MW gas engines, each with a 4.3MW 2-stage absorption chiller. Annual electricity consumption of the site at full load is approximately 260GWh. The trigeneration plant consumes approximately 50GWh less than an all electric facility, which would consume 310GWh. This equates to a saving of about 180Mt of CO2 per annum. Refer to Section 1 'General' & Section 2 'Electrical' of Appendix 9.10 of EAR 'Engineering Responses to DGRs'.
1.4 A proposal should also be put in place to enable the existing Global Switch building to be connected to and be served by the city-wide tri-generation system in the future.	The facility is being designed with a connection to Energy Australia's network. This connection both stabilises the gas engines, and allows transfer of energy to the grid if required. We note that some regulatory hurdles exist, such as NEMMCOs requirements for energy sale. This would allow provision for connection to other facilities within the City of Sydney. The heat produced by the electricity generation process will be used to dive absorption chillers to provide cooling to the facility. As such there would only be low grade heat available from the condenser water system, therefore no external piping connections are planned.
2.0 Urban Design	
2.1 Further design refinement should be undertaken to provide a clear address and entry to Pyrmont Street.	The awning over the pedestrian entry to the building has been refined to further accentuate the Pyrmont Street entry point. Refer to details in Section 4.2.1 of this report and additional architectural drawings at Appendix 6.1 and 6.2.

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2.2 The overshadowing impacts on the elevations of Bullecourt is required to demonstrate that solar access is still achievable for a minimum of 2 hours to 70% of the façade. It should be noted that reducing the height of the building adjacent to Bullecourt may not improve the overshadowing impacts.	Additional shadow diagrams are provided with this submission as Appendix 6.3 and demonstrate that solar access is still achievable for a minimum of 2 hours to 70% of the northern façade of the Bullecourt building
3.0 Heritage	
3.1 The stone from bedrock to be excavated is likely to be good source of material for heritage repair work and replacements. Council has a standard sandstone recycling condition which is rightly and readily applicable to this circumstance.	Global Switch accept this condition
4.0 Air Quality	
4.1 Consideration of impacts of air pollution and offensive odour at the nearest residential receptors. Sensitive receptors have been identified and are not limited to: •4 storey apartments on Quarry Street; •6 storey apartments on Quarry Street; •10 storey Goldsborough apartments; •6 storey Goldsborough apartments; •Bristol Arms Hotel on Quarry Street, and •Various 2 storey commercial properties on Harris and Quarry Streets.	The sensitive receptors included as part of the air quality technical paper were the closest properties to the proposed Global Switch 2 development. These receptors are considered to be those most likely to be affected and to the greatest extent by emissions from the Global Switch 2 tri-gen units. 10 receptor locations were included in total at heights ranging from 1.5 metres to 40 metres. The sensitive receptor locations are situated directly to the north, south and west of the proposed development. There are no immediate receptors to the east of the proposed development. It is acknowledged there are sensitive receptors located further from the proposed development. However, at these locations, emissions are likely to be lower than those adopted for the assessment due to atmospheric dispersion and were therefore not considered. The PB *Air Quality and Greenhouse Gas Impact Assessment* Report (2117107A/PR_5158A), Appendix 9.11 of the EAR, presents the results on the dispersion modelling assessment (Table 7-1) which indicates compliance with the DECCW referenced impact assessment criterion (IAC) for NO_x (as NO_2). This criterion is an environmental protection standard which consists of quantifiable characteristics of the environment against which environmental quality can be assessed. The IAC is an ambient air criterion in that it refers to the external air environment. The assessment criteria against which the predicted NO_x (as NO_2) has been compared is applicable to residents on the Quarry Street with open balconies and open terraces at the Goldsborough apartments.
4.2 The air quality data that was input to the model was taken from 2006 and may be not representative of current conditions. • Would this data have been representative of the impact of the Western Distributor? • Has the baseline air quality of the area been sufficiently characterised to have re-assurance that AQ standards will not be breached and air	1. It is considered that the 2006 data at Rozelle air monitoring station is representative of the impact of the Western Distributor. The Rozelle monitoring station is located in an urban / suburban environment dominated by traffic emissions. Air monitoring data on the DECCW website is only available up to 2007 and therefore the adopted 2006 data is considered best available. 2. The 2006 Rozelle air quality data is considered to adequately characterise the existing air

quality deteriorate? • Does the model consider open space, roof terraces and openable windows? • Have different operational scenarios been considered by the assessment i.e. if only one tri-generation plant fails how many diesel fired generators are required to operate and what is the cumulative effect of this? And • The assessment has not mentioned approvals already granted for tri-and co-generation plant and if there would be any cumulative effects from other approved locations?	environment. DECCW have reviewed the original report and have provided comments (2117107A/PR_5158RevA). PB has responded to DECCW's comments in an additional report (2117107A-LT_2415). The response presents dispersion modelling results which show that air quality standards will not be exceeded and there would be no adverse impact on the receiving environment. 3. The 2006 Rozelle air quality data indicates that with the exception of two exceedances (24 hour PM_{10} in November and maximum 4 hour O_3 levels in February) are within air quality standards which represent acceptable air quality. The predicted NO_x (as NO_2) contemporaneous assessment (PB report 2117107A/PR_5158RevA) indicates compliance with the air quality standard. Based on the predicted results, it is not considered that the air quality in the vicinity of the proposed development is likely to deteriorate. 4. The predicted concentrations refer to pollutant levels in the ambient environment. This essentially means pollutant concentrations in the external air environment which incorporates open space and roof terraces. 5. An additional report (2117107ARevA/LT_2686) , attached as Appendix 6.6, has been issued to DECCW and considers 4 different operational scenarios, the results of which are presented in Table 4 and 6 of this report and compared to the 1 hour ambient air quality standard for NO_x (as NO_2). The assessment has referred to all known major air pollution sources in the immediate area of the proposed development. We are aware of co / tri generation approvals granted for Star City and another commercial building in Pyrmont. Through the Sustainable Sydney 2030 Strategy, there are plans to reduce the city's carbon dioxide emissions by 70% using co and tri-generation technology. These include, but not limited to, the Ian Thorpe Aquatic Centre, Powerhouse Museum, Prince Alfred Park Pool (currently being re-built) and Sydney City Hall. It is important to point out that all tri-generation units proposed for this development will be fitted with abatement technology to ensure emissions are below DECCW criteria and that there will be no adverse impact on the receiving environment.
5.0 Noise Impact	
5.1 Further assessment requested to ensure that adequate assessment of cumulative noise from the cooling towers and that the offensive noise criteria as included in the City of Sydney's noise criteria can be met at the nearest residential and commercial receptors.	Based on the discussion with DECCW on 9/6/10, DECCW were happy with the quantitative SoundPLAN model to be developed during the detailed design stage of the project. This requirement is incorporated into the Statement of Commitments.
6.0 Cooling Towers	
6.1 It is recommended that due to the proposal for 57 cooling towers on the roof-top in close proximity to	All cooling towers will be provided with water treatment plant complying with AS 3666 to inhibit the growth of

residential receptors, that the application is referred to NSW Health for risk assessment of legionella risk.	water-borne micro-organisms. This will then form an integral component of Global Switch's thorough maintenance regime. We note that as the operation of this facility is of a critical nature to Global Switch, the maintenance regime will be extremely thorough and the cooling tower installation will be an integral part of the overall maintenance procedures
7.0 Construction Impacts	
7.1 A noise management plan produced by a suitably qualified person shall be submitted to Council for approval prior to any work being commenced and complied with during any construction works.	Global Switch accept this condition
7.2 Use of appliance of a highly intrusive nature – A separate approval must be granted from the Principal Certifying Authority prior to the operation on site of any Category A appliances (such as pile – drivers and hydraulic hammers), or equipment not listed in Groups B,C,D,E or F of Schedule 1 of the City of Sydney Code of Practice for Construction hours/Noise 1992 and Australian Standard 2436-1981 "Guide to Noise Control on Construction, Maintenance and Demolition Sites."	It is requested that this condition be deleted as the site falls outside the CBD area governed by the policy –City of Sydney Code of Practice for Construction hours/Noise 1992. Global Switch believes that the condition imposed by Council in Point 7.3 below will suffice.
7.3 Hours of work and noise – outside CBD (a) work on the proposed development must only be carried out between hours of 7.30am and 5.30pm Mondays to Fridays inclusive, and 7.30am to 3.30pm on Saturdays, with safety inspections being permitted at 7.00am on work days, and no work must be carried out on Sundays or public holidays. (b) All work, including demolition, excavation and building work must comply with the *City of Sydney Building Sites Noise Code* and Australian Standard 2436-1981 "Guide to Noise Control on Construction, Maintenance and Demolition Sites".	Global Switch accept this condition
7.4 Erosion & Sediment Control – More than 2,500m^2	
Prior to commencement of any works on site, including, but not limited to demolition, excavation or construction work a Soil and Water Management Plan (SWMP) must be submitted to and be approved by the Principal Certifying Authority.	Global Switch accept this condition
8.0 Public Domain	
8.1 Details of finishes for public domain upgrade to be approved by Council prior to issue of Construction Certificate	Global Switch accept this condition
8.2 Conditions relating to the following are suggested to be placed on any consent: •Public Domain Plan •Alignment Levels •Footpath Damage Bank Guarantee	Global Switch accept this condition

•Stormwater & Drainage – Major Development •Paving Materials	
9.0 Traffic	
9.1 Conditions relating to the following are recommended: •Associated Roadway Costs •Bicycle Facilities •Bicycle Parking •Car Parking Spaces and Dimensions •Cost of Signposting •Loading within Site •Loading/Parking kept Clear •Location of Accessible Car Parking Spaces •Location of Driveways •Security Gates •Service Vehicle Size Limit •Service Vehicles •Signs at Egress •Traffic Works •Vehicle Footway Crossing •Vehicle Access •Construction Traffic Management Plan •Access Driveways to be constructed •Loading & Unloading during Construction •No Obstruction of Public Way •Use of Mobile Cranes •Accessible Parking Space	Global Switch accept this condition
PUBLIC SUBMISSIONS	
10.0 PYRMONT ACTION GROUP	
10.1 Eastern Elevation (near Western Distributor) – Developer to consult with adjacent landowners on eastern side of the site to improve the area by use of a lighter, brighter façade material, installation of street lighting to improve pedestrian safety, and landscaping. Under the Freeway illuminated sculpture recommended.	The northern façade of the proposed building incorporates a large area of glass and metallic cladding which will reflect a significant amount of light towards the walkway. The walkway which is beneath the roadway, will be between 4.5 to 8 metres away from the proposed building and as such will be difficult to illuminate from the side of the building without creating sources of glare. The suggestion to erect an illuminated sculpture on the RTA land is considered not feasible as the proponent cannot erect structures on land owned by the RTA. It is also highly likely that any such public sculpture would be subject to vandalism due to its concealed location.
10.2 Streetscape – recommend that native species indigenous to the Pyrmont/Ultimo area be used instead of hybrids	The species of trees specified in the proposal meets the specific guidelines of Sydney City Council as described in Section 4.9.1 of the EAR
10.3 Street activation – solution sought to activate street frontage e.g. isolate ground floor street frontage from secure part of the building to enable Pyrmont Street to be more than a long stretch of blank façade. At very least a kiosk to cater for employees	Global Switch considers retail or commercial uses at street level are neither viable nor consistent with the building's function. This view is also shared by the Sydney City Council in their submission. The new building entry and colonnade treatment along Pyrmont Street will

and passers-by could be built along the footpath, possibly at the SW end of the building.	provide significant additional pedestrian activation, and the large glazed entry lobby which covers 10.0 metres of frontage together with proposed security and building lighting to the street level colonnade and new street lighting will enhance passive surveillance, safety and security of pedestrians and building users alike. (refer Section 4.2.1 for entry detail)
10.4 Parking – developer urged to increase the parking from 12 to 24 to cater for regular visitors to the building.	Parking has been provided commensurate with the number of employees who will be permanently employed on site.
10.5 Tri Grid Generation – request Global Switch monitor C02 and other emissions from the power plant and information on all emissions be made available to the community.	An Operational Environmental Management Plan will be put in place establishing operational guidelines that ensure emissions are within air quality goals, and will include requirements for the installation of continuous on-line emissions monitoring system, and annual extractive monitoring by the operator and the regulatory authority.
10.6 Security – facility poses a target for terrorism and therefore threatens the security of local residents and businesses. We have identified an alternative site in Pyrmont– the Davey Flour Mill site in Jones Street, which would be suitable.	Global Switch considers there will be no increased risk of an attack of terrorism as a direct result of its operations. Access to the facility will be highly controlled with appropriate site security in place. It is important to note that in 10 years of operation of GSS1, there have been no incidents and no reason for this to change with the expansion of GSS2. Global Switch already own the subject site and it is rich in connectivity as demonstrated by the carriers located in the adjoining GSS1. Purchase of an alternative site is not feasible nor in the interests of Global Switch as it is imperative that the facility be physically and operationally linked to GSS1 which adjoins.
11.0 Occupant – 40 Ada Place	
11.1 Global Switch's reason for not having more parking is not satisfactory	Parking has been provided commensurate with the number of employees who will be permanently employed on site.
11.2 Walkway to Darling Harbour along Global Switch Building 1 which is soon to be 2 –resulting in a dark tunnel which is unsafe.	The northern façade of the proposed building incorporates a large area of glass and metallic cladding which will reflect a significant amount of light towards the walkway. The walkway which is beneath the roadway, will be between 4.5 to 8 metres away from the proposed building and as such will be difficult to illuminate from the side of the building without creating sources of glare.
11.3 Request a lift from Pyrmont Street to the walkway above, to help locals and tourists.	This is outside the scope of this project.
12.0 Owners Apartment B804/444	
12.1 Visual link from Goldsborough Mort Building to Bullecourt Development should be maintained.	This is addressed in Section 6.1.2 of the EAR
12.2 Global Switch 2 proposal will completely overshadow the courtyard area.	The shadow diagrams submitted as Appendix 9.5 of the EAR confirm that solar access to the Bullecourt courtyard

	will be unaffected throughout the year, except for a minor increase in shadow at the northern end but only around midday in mid winter. Additional elevational shadow diagrams confirming this are attached at Appendix 6.3.
12.3 The proposal increases the height and also sits directly on the Quarry St boundary well beyond the current DGR.	The proposal sits comfortably within its urban context and responds positively to its surrounding neighbours. Issues of height, setback and design responses to the DGRs were comprehensively addressed in Sections 4.5.2, 4.5.3 and 6.1.2 of the EAR. These arguments are reiterated in Section 4.2.3 of this report.
12.4 Global Switch letterbox drop in the distribution area including Bullecourt dated 22/12/09. This was never received at my apartment and I have serious doubt as to whether others in the Bullecourt complex received this letter.	Letters were dropped personally in the area by the community consultation consultant, namely an Id Planning Director – except where boxes were inaccessible or indicated no Junk Mail. Id Planning can confirm that copies of the letter were posted at the complex entrance as well. Refer Appendix 6.7 for attached copy of correspondence from Id Planning outlining the process and detailed actions undertaken as part of the project specific consultation process.
13.0 Building Management Australia - 444 Harris Street	
13.1 Shadow diagrams do not reflect the true representation of the affect on the neighbouring Bullecourt complex.	Detailed survey information for the northern end of the Bullecourt building was used to generate a CAD model on which the shadow diagrams are based.
13.2 No details were given on the noise generated from the power generator and the effect on adjoining developments.	Acoustic impacts are presented in Section 6.12 of the EAR with detailed assessment provided in Appendix 9.9 of the EAR. Further acoustic analysis is provided in Appendix 6.5 of this report.
13.3 There was no community consultation.	The consultation process undertaken for the project is outlined in Section 1.6 and 6.9 of the EAR. Consultation was conducted with neighbouring properties and community groups in the area. Consultation activities included a letterbox drop in December 2009, another letterbox drop in February 2010 and displays in March 2010 at the Ian Thorpe Aquatic Centre and the Ultimo Community Centre. A briefing of the Pyrmont Action Group and Ultimo Village Voice was held in March 2010 to clarify issues and provide further information. A number of email and phone inquiries were received and responded to as a result of the above activities. Details of the Community Consultation Plan adopted and carried out for the project are contained in Appendix 9.8 'Community Consultation Process' in the EAR. Refer Appendix 6.7 for attached copy of correspondence from Id Planning outlining the process and detailed actions undertaken as part of the project specific consultation process.
14.0 Occupant – 818/444 Harris Street	
14.1 Objections to proposed height of new building; loss of city view and overshadowing	Overshadowing is addressed in Section 6.1.3 of the EAR. Additional elevational shadow diagrams are presented in Appendix 6.3 of this report which indicates that there is a very minor increase in shadow on the northern facade of the building at 444 Harris Street, which occurs only in mid-

	winter around 11am. Only one window is affected and that window is only partially overshadowed. 444 Harris Street is the western building of the Bullecourt development and some northern apartments on the top level have limited city views over the northern end of 287 Pyrmont Street (the eastern Bullecourt apartment block) down Quarry Street. The south eastern corner of the proposed Global Switch building is set back between 7 and 8 metres from the Quarry street boundary to mitigate loss of these views. Refer to Section 4.2.2 of this report for discussion on view loss and Appendix 6.4 for view loss diagrams.
14.2 When Global Switch on Harris Street was redeveloped, I understood there was an agreement to use the bottom floor on Harris St for shops, with a walk through to Pyrmont Street. This did not happen.	The original DA consent for Global Switch 1 did have a small area of street level space off Harris Street set aside for retail uses. Despite several attempts to lease and many years left vacant, the retail space off Harris Street proved unviable due to its isolated location and the lack of passing trade along this section of Harris Street. In line with the original consent provisions and in an attempt to further activate the existing Harris Street streetscape, Global Switch recently installed a major public artwork piece within the glazed frontage to the building. Whilst, the notion of a through site building link from Harris to Pyrmont Street was originally flagged in the Master Plan Strategy (MPS) for the site, there was no formal requirement for creation of a through site link as part of the original GS1 consent. Operationally a through-site link is not feasible due to the high security nature of the premises and the need for both buildings to be operationally connected. Also the through site link envisaged in the MPS was originally based on an assumption that GSS1 and GSS2 would be developed as commercial buildings with a far greater level of external interaction and street activity. This is now not the case. A public linkage through the site is no longer appropriate or desirable as the existing and proposed Global Switch buildings must operate with minimal interaction with the outside world and the lack of activity surrounding any such link would make it unsafe for pedestrians.
14.3 Concerned about how much car parking the complex will provide for a building of this size. Current car park may suffice for it's current use, but what would happen if this building was to change hands in the future?	Parking has been provided commensurate with the proposed use and the number of employees who will be permanently employed on site. GSS2 is a unique purpose built data storage facility totally unlike a commercial building fitout, therefore future adaptation or conversion to commercial premises is not feasible
15.0 Occupant – P917/287 Pyrmont Street	
15.1 I did not receive any letter from the proponent relating to this development. The selected area of consultation is only limited to the small surrounding area. It is clear that many residents did not receive any notice of community consultation.	Consultation was conducted with neighbouring properties and community groups in the area. Consultation activities included a letterbox drop in December 2009, another letterbox drop in February 2010 and displays in March 2010 at the Ian Thorpe Aquatic Centre and the Ultimo Community Centre. A briefing of the Pyrmont Action Group and Ultimo Village Voice was held in March 2010 to clarify issues and provide further information. A number of email and phone inquiries were received and responded to as a result of the above activities.

	Details of the Community Consultation Plan adopted and carried out for the project are contained in Appendix 9.8 'Community Consultation Process' in the EAR. Refer Appendix 6.7 for attached copy of correspondence from Id Planning outlining the process and detailed actions undertaken as part of the project specific consultation process.
15.2 The development proposal has exceeded the planning controls. This has caused significant problems in view impacts and overshadowing impacts. Bullecourt will have northern vistas impacted.	The EAR has adequately addressed relevant planning controls in Sections 4 and 6. A response to the shadowing issues is addressed in Section 6.1.3 of the EAR as well as supplementary shadow data at Appendix 6.3 of this report. In respect to view impacts, a comprehensive view analysis was undertaken in Section 6.2 of the EAR. Further view impacts on Bullecourt are also discussed in Section 4.2.2 of this report.
15.3 A north-south link through Global Switch should be incorporated to connect to Bullecourt.	This is addressed in Section 6.1.2 of the EAR. Sydney City Council in their submission note that they consider this link no longer necessary.
15.4 Appropriately designed retail or commercial suites facing the street level may assist with passive surveillance along Pyrmont Street and Quarry Street, especially for pedestrians at night.	Global Switch considers retail or commercial uses at street level are neither viable nor consistent with the building's function. This view is also shared by the Sydney City Council in their submission. The new building entry and colonnade treatment along Pyrmont Street will provide significant additional pedestrian activation, and the large glazed entry lobby which covers 10.0 metres of frontage together with proposed security and building lighting to the street level colonnade and new street lighting will enhance passive surveillance, safety and security of pedestrians and building users alike. (refer Section 4.2.1 for entry detail)
15.5 The development will increase shadows into the Bullecourt central courtyard and affect residential apartments facing north. An elevational shadow analysis should be prepared to determine the impact to north facing units.	The shadow diagrams submitted as Appendix 9.5 of the EAR confirm that solar access to the Bullecourt courtyard will be unaffected throughout the year, except for a minor increase in shadow at the northern end but only around midday in mid winter. Additional elevational shadow diagrams are presented as Appendix 6.3 and indicate that the only additional overshadowing on the northern facade of the building at 287 Pyrmont Road will occur in mid- winter between midday and 3pm. Only apartments on the four lower floors are affected. All these windows still receive full sun from 9am till noon.
15.6 The existing on-street parking network is over-utilised and unless Global Switch proposes a maximum of 12 people within the building at any one time, it is difficult to understand how such a large commercial site can operate with only 12 people.	Parking has been provided commensurate with the number of employees who will be permanently employed on site and the proposed highly specialised use of the building. GSS2 is a unique purpose built data storage facility, totally unlike a commercial building fitout or commercial business in terms of its workforce numbers.
16.0 Occupant– B206/444 Harris Street	

16.1 Did not receive any letter from the proponent relating to this development.	Two letterbox drops were conducted personally by an Id Planning Director and Consultant in the area – except where boxes were inaccessible or indicated no Junk Mail. Id Planning can confirm that copies of the letter were pasted at the complex entrance as well to draw attention to the development as well as invite residents to view the displays. Details of the Community Consultation Plan adopted and carried out for the project are contained in Appendix 9.8 'Community Consultation Process' in the EAR. Refer Appendix 6.7 for attached copy of correspondence from id Planning outlining the process and detailed actions undertaken as part of the project specific consultation process.
16.2 Northern vistas from Bullecourt impacted.	444 Harris Street is the western building of the Bullecourt development and some northern apartments on the top level have limited city views over the northern end of 287 Pyrmont Street (the eastern Bullecourt apartment block) down Quarry Street. The south eastern corner of the proposed Global Switch building is set back between 7 and 8 metres from the Quarry street boundary to mitigate loss of these views. Refer to Section 4.2.2 of this report for discussion on view loss and Appendix 6.4 for view loss diagrams.
16.3 Request for street activation. Pyrmont Street will still feel insecure for pedestrians at night without any passive surveillance.	The new building entry and colonnade treatment along Pyrmont Street will provide significant additional pedestrian activation, and the large glazed entry lobby which covers 10.0 metres of frontage together with proposed security and building lighting to the street level colonnade and new street lighting will enhance passive surveillance, safety and security of pedestrians and building users alike. (refer Section 4.2.1 for entry detail)
16.4 The development will increase shadows into the Bullecourt central courtyard and affect residential apartments facing north. An elevational shadow analysis should be prepared by the proponent.	The shadow diagrams submitted as Appendix 9.5 of the EAR confirm that solar access to the Bullecourt courtyard will be unaffected throughout the year, except for a minor increase in shadow at the northern end but only around midday in mid winter. As requested, additional elevational shadow diagrams confirming this are attached at Appendix 6.3.
16.5 The magnitude that the development proposal has exceeded the planning controls. This has caused significant problems in view of impacts and overshadowing impacts.	The EAR has adequately addressed relevant planning controls in Sections 4 and 6. A response to the shadowing issues is addressed in Section 6.1.3 of the EAR. The shadow diagrams submitted as Appendix 9.5 of the EAR confirm that solar access to the Bullecourt courtyard will be unaffected throughout the year, except for a minor increase in shadow at the northern end but only around midday in mid winter. Additional elevational shadow diagrams confirming this are attached at Appendix 6.3. In respect to view impacts, a comprehensive view analysis was undertaken in Section 6.2 of the EAR. Further view impacts on Bullecourt are also discussed in Section 4.2.2 of this report.

16.6 12 parking spaces for 22,285 m^2 GFA is not acceptable.	Parking has been provided commensurate with the number of employees who will be permanently employed on site, and the proposed use of the building. GSS2 is a unique purpose built data storage facility, totally unlike a commercial building fitout or commercial business in terms of its onsite workforce requirements.
Department of Environment, Climate Change & Water (DECCW)	
17.0 Noise Impacts	
17.1 DECCW recommends the following: • Additional monitoring of background noise levels in order to establish appropriate noise assessment criteria for noise-sensitive receptors that are away from the Western Distributor; • Appropriate consideration of the nose impacts from Global Switch Sydney 1, including to enable appropriate site-wide noise limits to be established if a single licence is to be issued for both Global Switch Sydney 1 and Global Switch Sydney 2; • Consultation with DECCW to ensure that appropriate noise impact assessment has been adopted; and • Quantitative modelling of noise impacts in order to demonstrate that the noise impacts of the proposal are below the applicable noise impact assessment criteria.	• Additional noise monitoring has now been carried out in residential area to the west of Harris Street. The noise monitoring results and subsequent developed noise criteria are outlined in *Environmental noise criteria report* issued by Aurecon on 30 June 2010. The additional testing confirms that the driving project criterion remains Leq 49 dBA for residential receivers adjacent the site at street level and below the Western Distributor height. This will ensure compliance with the remaining assessment criteria including the residences to the west of Harris Street which will be significantly shielded from the development by the existing Global Switch 1 building. • Based on the telephone discussion on 9/6/10 with DECCW, DECCW has not finalised their approach regarding this matter and we are waiting for further guidance from them. • Telephone discussion with DECCW carried out on 9/6/10 to ensure sufficient actions are carried out to progress the development to the next stage. • Based on the discussion with DECCW on 9/6/10, DECCW were happy with the quantitative SoundPLAN model to be developed during the detailed design stage of the project. This requirement will be incorporated into the Statement of Commitments.
18.0 Additional Air Impact Assessment Information Required	
18.1 DECCW recommends that detailed information is provided regarding the proposed control technology to achieve a NOx emission standard of 50mg/m3. This is to include the manufacturer's performance specification for the control technology. If selective catalytic reduction is the proposed control technology, the proponent must provide the level of ammonia slip and an assessment of ammonia impacts at the nearest sensitive receptors.	PB's additional report (2117107ARevA/LT_2686) attached as Appendix 6.6 provides information on the issue of ammonia slip and the assessment of ammonia impacts. Dispersion modelling of ammonia emissions from the SCR's has predicted maximum impacts within the impact assessment criterion.
18.2 It is essential that an air quality impact assessment is completed for the emergency stand-by diesel generators (in accordance with the Approved Methods for the Modelling and Assessment of Air Pollutants in NSW). The emergency stand-by	PB's additional report (2117107ARevA/LT_2686) attached as Appendix 6.6 presents four scenarios to assess the impacts of the tri-gen units and diesel generators on GS2 and GS1. The results are presented in Tables 4 and 6 of this report.

diesel generators on Global Switch Sydney 1 must be included in the assessment and a range of potential modes of operation (i.e. testing each diesel engine individually to all engines operating in the event of gas and electrical network failure) must be considered. If necessary, information regarding proposed controls to ensure compliance with DECCS's Impact assessment criteria at the nearest sensitive receptors must also be provided. DECCW also recommends that information is provided to demonstrate that the emergency stand-by diesel generators will meet the minimum requirements of the Regulation for a scheduled diesel internal combustion engine.	
18.3 DECCW recommends that the air quality impact assessment is revised to incorporate measured meteorological data in CALMET. If measured meteorological data is not used in CALMET, a detailed justification for not using any measured meteorological data should be provided.	PB's additional report issued to the DECCW (2117107A-LT_2415) attached as Appendix 6.6 presents the outcomes of incorporating measured meteorological data in CALMET.
18.4 DECCW recommends that a revised analysis of the TAMP-generated meteorological data is provided to enable a proper comparison to the measured data at Observatory Hill. In particular, TAPM generated 9am and 3pm windroses should be provided. Additionally, an analysis of the CALMET generated data must be presented which demonstrates that it adequately describes the expected meteorological patterns at the site under investigation.	PB's additional report issued to the DECCW (2117107A-LT_2415) attached as Appendix 6.6 presents the outcomes of the DECCW recommendations. TAPM and CALMET generated 9 am and 3 pm wind roses are presented in Enclosure B of this report.
18.5 DECCW recommends that the data presented in Table 4-1 of the report is revised to ensure it is an accurate summary of the 2006 Rozelle air monitoring station data. The proponent should also present the results of the air quality Impact assessment using the NO2 background concentration data recorded at Darling Harbour.	PB's additional report issued to the DECCW (2117107A-LT_2415) attached as Appendix 6.6 has revised the background levels at Rozelle air monitoring station for 2006. As indicated in this report, specific hourly data for NO_2 at the Darling Harbour air monitoring stations is not available from publically accessible information. Maximum hourly NO_2 levels for each 24 hour period, rather than hourly data is all that has been published. This is not of specific use when undertaking a contemporaneous assessment.
DEPARTMENT OF TRANSPORT & INFRASTRUCTURE/RAILCORP	
19.1 The proposed 12 car spaces represent the rate of 1 space per employee which seems excessive in this highly accessible area and relative to car parking provided by other commercial developments in the locality with high rates of trip generation.	The Traffic Report lodged with the EAR (Appendix 9.12) assessed the adequacy of the parking provision and concluded that the onsite parking was adequate and appropriate in the circumstances. Worth noting is the fact that the approved Master Plan for the site allowed on site parking for business premises to be provided up to a maximum of 1 space per 200 sq m. On the basis of a gross floor area of 22,285 sq m for GSS2, this equates to 111 on site spaces, almost 10 times more than now proposed.
19.2 Secure bicycle parking and staff end-of-trip amenities should be provided on site.	This is addressed in Section 5.3 of the Transport, Traffic and Parking Report, Appendix 9.12 of the EAR. Secure bicycle parking is available in the basement of Global Switch 1, and lockers & shower facilities will be incorporated into the amenities provided in the new building.

19.3 Whilst it is acknowledged that the proposed development would upgrade the visual appeal of the site to Pyrmont Street it prevents the opportunity to provide the through site pedestrian link provided in the Master Plan. This is of concern because of the length of the building and the lack of activation along its eastern elevation to Pyrmont Street	The new building entry and colonnade treatment along Pyrmont Street will provide significant additional pedestrian activation, and the large glazed entry lobby which covers 10.0 metres of frontage together with proposed security and building lighting to the street level colonnade and new street lighting will enhance passive surveillance, safety and security of pedestrians and building users alike. (refer Section 4.2.1 for entry detail). Operationally a through-site link is not feasible due to the high security nature of the premises and the need for both buildings to be operationally connected. Also the through site link envisaged in the MPS was originally based on an assumption that GSS1 and GSS2 would be developed as commercial buildings with a far greater level of external interaction and street activity. This is now not the case.
SRDAC/RTA	
20.1 Lot 10 in DP 840467 is affected by proposed easement to drain water and support as shown by brown colour on the attached copy of the DP.	Global Switch will observe the easement restrictions
20.2 The layout of the car parking areas associated with the subject development (including driveways, grades, aisle widths, turning paths, sight distance requirements and parking bay dimensions) should be in accordance with AS 2890.1-2004 and AS 2890.2 – 2002 for heavy vehicles.	Global Switch accept this condition
20.3 The swept path of the longest vehicle (including garbage trucks) entering and exiting the subject site as well as manoeuvrability through the site, shall be in accordance with AUSTROADS. In this regard, a plan shall be submitted to Council for approval, which shows that the proposed development complies with this requirement	Global Switch accept this condition
20.4 All vehicles shall enter and exit the site in a forward direction	Global Switch accept this condition
20.5 The proposed turning areas are to be kept clear of any obstacles at all times	Global Switch accept this condition
20.6 All works/regulatory signposting associated with the proposed development shall be at no cost to the RTA	Global Switch accept this condition
DEPARTMENT OF PLANNING	
21.1 Consideration of further design refinement to provide a clear address and entry to Pyrmont Street	Refer to Section 4.2.1 for further discussion and description of the entry as well as diagrams at Appendix 6.1 & 6.2 of this report.
21.2 Consideration of providing bicycle parking spaces and storage facilities for employees	This is addressed in Section 5.3 of the Transport, Traffic and Parking Report, Appendix 9.12 of the EAR. Secure bicycle parking is available in the basement of Global Switch 1, and lockers & shower facilities will be incorporated into the amenities provided in the new building.

21.3 Consideration of potential impacts associated with a large number of cooling towers	All cooling towers will be provided with water treatment plant complying with AS 3666 to inhibit the growth of water-borne micro-organisms. This will then form an integral component of Global Switch's thorough maintenance regime. We note that as the operation of this facility is of a critical nature to Global Switch, the maintenance regime will be extremely thorough and the cooling tower installation will be an integral part of the overall maintenance procedures. Noise emissions from the cooling towers will be controlled through equipment specification, with preliminary equipment selections incorporating inbuilt intake and outlet attenuators. Additional attenuation will be obtained from the physical barriers between sources and the receiver in the form of architectural features as well as from the building itself. Further more detailed specification of the attenuation measures will be carried out by an Acoustic Engineer in conjunction with the Building Services Engineers during the design development stage of the project when more accurate specification of the required equipment will be known along with the specific sound power emission data and physical size of all of the proposed equipment. A SoundPLAN environmental noise model will be developed to confirm the proposed noise mitigation measures. Refer to the Acoustic report in Appendix 9.9 of the EAR.

4.2 Detailed Responses

Three architectural issues raised in submissions warrant a more detailed response in relation to certain design aspects of the proposal. These matters relate to the building entry design, view loss from Bullecourt residences, and the general visual impact and height of the development.

4.2.1 Pedestrian Entry and Canopy Modifications

Both the Sydney City Council and Department of Planning request that consideration be given to the refinement of the building entry on Pyrmont Street. Justification for the entry design is as follows.

In keeping with the "machine" design aesthetic applied to the overall building, the main entry lobby located on Pyrmont Street has been designed to evoke the imagery of a removable panel within the overall 'encasement' of the machine. It should be noted that unlike a conventional office or commercial building, this lobby entry will function 24 hours a day, seven days a week hence providing a continuous level of street activation and passive surveillance along Pyrmont Street.

The metallic veil located over the lobby entry has been raised to provide the tallest component of the building massing, drawing visual interest and emphasis to this part of the building. The entry has been designed to articulate and provide an easily identified pedestrian access point to the building along Pyrmont Street for staff, visitors and vehicles dropping off or picking up passengers.

A frameless glass facade with patch fittings defines the lobby area at street level providing a sense of transparency which is in contrast to the remaining solid façades at street level. A lightweight horizontal glazed awning is located over the entry providing weather protection and assists in the articulation of the entry location when viewed from the street. The interactive glazed entry frontage to Pyrmont Street is 10.0 meters wide which is commensurate in scale with the largest of residential or commercial buildings.

A vertical blade is introduced to dissect perpendicularly the metallic veil and glazed lobby wall, providing an iconic element when viewed from Pyrmont Street. Building signage and branding is integrated with this building element which is highly visible from the pedestrian realm.

At night, internal lighting spill through the transparent glazed wall of the lobby will assist in visually identifying the entry and will emphasise the sense of transparency around the lobby area. External lighting will be introduced to provide a safe and legible public realm along Pyrmont Street.

The colonnade treatment to the south of the main entry will be finished with high quality materials and detailing and will be well lit at night. This colonnade will also provide all weather pedestrian access from Quarry Street to the main entry. The louvered wall area to the north of the main entry will be finished in high quality aluminium louvered panels and metallic cladding which will be back lit at night to provide desirable light spill to the public footpath as well as providing sculptural patterning on this area of the building façade.

The only design modification that will occur is to the awning canopy over the Pyrmont Street entry. The entry canopy is now amended in order to further accentuate the point of entry by:-

a) Extending the canopy further over the footpath whilst reducing the width of the canopy; and

b) Changing the appearance of the canopy from a flat projection to a gently upswept curved roof element.

The changes to the façade entry are depicted in the diagrams below and at Appendix 6.2.

4.2.2 View Loss to Bullecourt Residences

The new Global Switch 2 building will be screened to a large extent by the existing Global Switch 1 building adjoining to the west, and to a lesser extent by the western distributor to the north. Two apartment buildings known as 'Bullecourt' directly opposite on the southern side of Quarry Street are the only buildings with views considered likely to be affected.

A view loss analysis has been undertaken with illustrative diagrams included at Appendix 6.4.

Bullecourt Western Building - 444 Harris Street

This building which addresses Harris Street has 100 residential apartments which predominantly face west towards Harris Street or east into the central courtyard of the Bullecourt development. Views to the east are obscured by the eastern building of the same development, and views to the north are mostly obscured by Global Switch 1.

A submission received by the occupant of 818/444 Harris Street expressed concern regarding potential view loss (Refer to Section 4.1, Point 14.1).Two apartments on the north-eastern corner of the building on levels 8 & 9 have windows facing north and east. The northern windows directly face the GS1 building, but have city views to the north-east across the GS2 site and down Quarry Street. The east facing windows have a view of the city over the top of the northern end of other Bullecourt building. The proposed development will have minimal effect on the more prominent city views from the eastern windows, but there will be a loss of approximately 50% of the view from the north facing windows (refer to Diagram 1- Appendix 6.4). In essence, Unit 818 has an expanse of window that wraps around the northern and eastern façades. Essentially the predominant views from the eastern façade window towards the highly valued CBD skyline will be unaffected by the GSS2 development. Only views from the most western vantage point of the north facing window will be inhibited to the north. However, this outlook

already has the quality of its views interrupted by the significant presence of the Western Distributor flyover and Global Switch 1. In other respects, the new GSS2 building will not adversely impact on Unit 818 by way of shadowing or overlooking.

Three apartments on the north-eastern corner of the building (levels 5, 6 & 7) with a frontage to Quarry Street have corner windows facing north and east. These windows currently have a view to the north-east across the GS 2 site and down Quarry Street to the Exhibition Centre and the city. The proposed development will obstruct part of the view to the north, but a majority of the view corridor towards the city is maintained (refer to Diagram 2- Appendix 6.4). As stated above, views to the east over the CBD are considered to be the most highly valued compared to north facing views which are partly obscured.

Some other upper level apartments have a small corridor of view across the GSS2 site towards the western distributor, which can be only seen from the outer extremities of their eastern terraces (refer to photo1- Appendix 6.4). Whilst this view will be obscured by the proposed development, these apartments have significant district views to the west (refer to photo 2- Appendix 6.4).

Bullecourt Eastern Building - 287 Pyrmont Street

This building which addresses Pyrmont Street also has 100 residential apartments which predominantly face east towards the CBD or west into the central courtyard of the Bullecourt development.

Six apartments on the north-east corner of the building (levels 3, 4,5,6,8 & 9) have windows facing west and north. The north facing windows currently view directly across the GSS2 site to the Western Distributor and the Goldsborough Mort building, and on the upper levels have vistas of the city to the north-east down Quarry Street. The proposed development will potentially obstruct the view to the north however more than 50% of the valued view corridor towards the city, is maintained (refer to Diagrams 3 & 4- Appendix 6.4).

Six apartments on the south-east corner of the building (levels 3, 4,5,6,8 & 9) have windows facing west and north. The north facing windows currently view directly across the GS 2 site to the western distributor and the Goldsborough Mort building, with vistas of the city to the north-east down Quarry Street for upper level apartments. The proposed development will obstruct the view to the north, but 50% of the view corridor which is the better view towards the city is maintained (refer to Diagram 3- Appendix 6.4).

Seven apartments on the north-east corner of the building (levels 3 to 9) have windows facing east and north. The north facing windows will lose a portion of view corridor across the GS 2 site, but the majority of the view corridor towards the city is maintained (refer to Diagrams 3 & 4- Appendix 6.4).

In summary the anticipated view loss to Bullecourt apartments is considered reasonable given the fact that:-

a) Qualitatively, the apartments will still maintain highly valued views to the east along Quarry Street towards the significant CBD skyline especially the iconic Centrepoint Tower; and

b) Whilst views to the north will be impacted, this outlook is a secondary view for some apartments and the visual quality of its outlook is interrupted by the significant presence of the Western Distributor flyover and Global Switch 1.

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4.2.3 Visual Impact, Bulk and Scale

A number of community submissions expressed concern regarding the broad issue of building height and scale.

The EAR as exhibited demonstrated that the built form and height satisfactorily connects with the surrounding area and the adjoining GSS1 data centre. The building design and site layout is functional and responsive to the specialised requirements of a technical data centre, whilst respecting the dynamic CBD environment in which it sits.

The visual impacts of the proposed building envelope were assessed extensively through a visual analysis in Section 6.2 of the EAR. Bearing in mind the fact that views of the site from the west are fully blocked by the existing GSS1 building and partially from the north by the Western Distributor, the key findings of the visual analysis were as follows:-

- The Pyrmont Bridge Road frontage of the proposed building will align with the Bullecourt Development providing a consistent building setback from Pyrmont Street and a strong line of built form which will reinforce the western edge of Darling Harbour.
- The bulk and scale of GSS2 is comparable to Global Switch Sydney 1 and does not alter the stepping up in height of buildings between the Bullecourt Development to the south and the Goldsbrough Mort building to the north.
- The bulk and scale of the proposed building envelope is comparable to the buildings in the surrounding Darling Harbour precinct.
- From Cockle Bay, the upper levels GSS2 will be visible in the distance above the Western Distributor and the buildings in Darling Harbour; however the proposed building will not exceed the height of the Global Switch Sydney 1 building and the roof of the existing building will remain visible above the proposed building.
- The existing partial views to the Goldsbrough Mort building will be reduced from Pyrmont Street looking north and from within the Bullecourt development.
- The proposed building will be highly visible from the upper levels of high rise buildings on the eastern side of Darling Harbour however the bulk and scale of the proposed building envelope is comparable to surrounding buildings. The Global Switch Sydney 1 roof will also remain visible from these locations.
- GSS2 will have minimal impact on the views from the Tumbalong Park area of Darling Harbour as views to the site are screened by mature trees and the Sydney Exhibition Centre.
- GSS2 will not impact the views from Bathurst Street and Bathurst Street pedestrian bridge link as the Darling Walk Redevelopment complex, currently under construction, will block views to the proposed building.
- The building will reinforce the strong built form on the western edge of the visual catchment of Darling Harbour.

The EAR also extensively addressed the issues of height, building footprint and visual and pedestrian links. In summary, the scale of the project is considered worthy of support on the grounds that:-

- The building envelope reflects the spatial requirements of the building's sophisticated functions, which Global Switch intend to promote as a showcase facility in its global portfolio;
- The GSS2 building will preserve views of the upper levels of GSS1, with a stepping up effect;

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- The proposed new building form will not alter the skyline of the western Darling Harbour escarpment;
- There is a transition in building height maintained between Bullecourt and Goldsbrough Mort developments;
- Whilst operating as a single facility under the one ownership, the GSS1 and GSS2 buildings will read visually as separate, complimentary yet contrasting buildings;
- The provision of a visual and pedestrian link between the two sites is not feasible as the buildings are high security premises, physically and operationally linked. Also, both premises are virtually uninhabited but for technical and plant equipment. A through-site pedestrian link is not considered justified or desirable from a pedestrian safety perspective. As an alternative, Global Switch will upgrade the public domain adjoining the Pyrmont Street frontage thereby enlivening and encouraging pedestrian movement along this currently inactive and underutilized frontage.

Overall, Global Switch Sydney 2 is a landmark building that will visually engage with its prominent CBD surroundings. Whilst not a building that reacts with the outside world in a pedestrian sense, it will be recognised for its high quality and unique form and fabric and will stand as a visual icon on the CBD landscape.

5 Revised Statement of Commitments

The draft Statement of Commitments included in the Environmental Assessment report dated March 2010 outline appropriate mitigation measures that Global Switch will commit to undertake to safeguard against any potential environmental impacts that may result during construction and operational stages of the project.

The commitments have now been revised in response to minor design modifications and subsequent investigations undertaken.

1. Documentation

The development will be undertaken generally in accordance with architectural and landscape drawings prepared by DEM (Aust) Pty Ltd and all documentation appendixed to the Environmental Assessment report dated February 2010 and the Preferred Project Report dated August 2010, listed as follows:

- Architectural Drawing Nos. ar--cv00 revB01, ar—0200 revB01, ar—1200 revB01, ar--1201 revB01, ar--1202 revB01, ar--1203 revB02, ar--1204 revB01, ar--1205 revB01, ar--1206 revB01, ar--1207 revB01, ar--1208 revB01, ar—1209 revB01, ar--1210 revB01, ar--1211 revB01, ar--2100 revB01, ar--2101 revB02, ar--2102 revB01, ar--2103 revB01, ar--2500 revB01, ar—2501 revB02, ar—5000 revB01, ar—5001 revB01, ar—5002 revB01, ar—5003 revB01.
- Landscape Drawings Nos. la--cv00 revA02, la--0201 revA02, la—0501 revA02, la—0502 revA02, la—3301 revA02.
- Landscape Maintenance Strategy dated February 2010.
- Signage Plan ar-5003 prepared by DEM (Aust) Pty Ltd.
- External Finishes Schedule prepared by DEM (Aust) Pty Ltd.
- Part 3A Acoustic Report, Ref: 36148-013-01, dated 29 January 2010 Rev 01
- Engineering Response Report, Ref: 36148/3.8 dated 15 March 2010 Rev 4.
- Air Quality & Greenhouse Gas Impact Assessment dated February 2010 Rev00

- Assessment of Transport, Traffic & Parking Implications Ref 0953 dated February 2010
- Geotechnical Investigation Report Ref: 22706VTrpt dated 23 April 2009.
- BCA Assessment Report No. 1321-15 Rev 02 dated 17 February 2010.
- Construction Management Plan.
- Access Report dated 19 February 2010.
- PB response letter, Ref: 2117107ARevA/LT_2686 dated 26 August 2010.
- AUR Environmental Noise Criteria Report, Ref: 36148-013-01, dated 30 June 2010.

2. Lot Consolidation & Easements

Easements and restrictions as to user affecting Lots 3 and 12 in DP 632526 will be extinguished and relocated, where necessary.

3. Acoustics

All appropriate recommendations and commitments detailed in the Part 3A Acoustic Report prepared by Aurecon, Ref: 36148-013-01, dated 29 January 2010 Rev 01 and updated Environmental Noise Criteria Report prepared by Aurecon, Ref: 36148-013-01, dated 30 June 2010 will be implemented.

A SoundPLAN environmental noise model will be developed during the detailed design stage which consists of:

- A 3D model of the affected area incorporating topography and existing structures
- Identifying and modelling all of the noise emissions from site based on specifications of equipment and operating conditions/scenarios
- Noise propagation to be calculated utilising the ISO 9613-2 method
- Calculate total noise emission from the development site to the affected sensitive receivers
- Develop noise contours showing the extent of noise emissions from site

The results of this model will then be used during the design process to optimise the noise emissions from site through the introduction
of additional noise mitigation measures to ensures compliance with the applicable project specific noise emission criteria.

4. Utilities & Services

All appropriate recommendations and commitments detailed in the Engineering Response to Director General's Requirements Report, Ref 36148/3.8 dated 15 March 2010 Rev 4 will be implemented, in relation to the following services:-

- Electrical
- Telecommunications
- Security
- Mechanical
- Fire
- Hydraulic

5. Emissions

All mitigation and management measures recommended in Section 10.2 of Air Quality & Greenhouse Gas Impact Assessment dated February 2010 Rev00 and updated PB additional

response letter Ref. 2117107ARevA/LT_2686 dated 26 August 2010 to control emissions in the operation phase of the data centre will be implemented.

6. Traffic & Parking

Access, servicing and parking arrangements will be undertaken in accordance with the architectural drawings and Assessment of Transport, Traffic & Parking Implications Report prepared by Transport & Traffic Planning Associates, Ref 0953 dated February 2010.

7. Geotechnical

Recommendations contained within the Geotechnical Investigation Report Ref 22706VTrpt dated 23 April 2009 will be implemented.

In reference to site remediation, the applicant will implement the recommendations contained within Section 6 of Geotechnical Investigation Report Ref 22706VTrpt dated 23 April 2009

8. **Drainage**

A detailed stormwater drainage plan will be prepared to the satisfaction of the Director General to harvest rainwater for re-use, and dispose of excess rainwater to the existing street drainage system.

9. Reflectivity

A reflectivity study to assess the impact of solar reflectivity and glare from materials of the new building façade will be prepared as part of the Construction Certificate.

10. Energy Performance (ESD)

An ESD Performance Report that investigates appropriate benchmarking for data centre facilities, as the application of NABERS Office Energy & NABERS Office Water tools are considered not appropriate for use due to protocol limitations. The report will also reference international guidelines of the U.S. Green Building Council's LEED program. This will be the basis against which the design, construction and ongoing operation phases of the building will be assessed. The elements of sustainability that will be addressed will include:

- Local planning provisions where applicable to the development type
- Energy & water efficiency measures and benchmarks
- Materials & waste minimisation
- Operational monitoring & reporting.

11. Access & Mobility

An Access & Mobility Assessment of the detailed design of the building will be prepared and demonstrate how the proposed development satisfies the following statutory and regulatory guidelines to ensure effective, appropriate and safe use by all people including those with a disability:

- AS 1428.1, AS 1428.2, AS 1428.4, AS 1735.12, AS2890.1.
- Parts D3.2, D3.3, D3.6, D3.8, E3.6, and F2.4 of the Building Code of Australia (BCA)
- Disability Discrimination Act

12. Archaeological & Aboriginal Relics

In the event that archaeological resources are unearthed during any stage of the development, work in the immediate vicinity is to cease and an archaeologist contacted to make an assessment of the

find. Consultation with the Heritage Branch and further assessment may be required prior to works progressing on site. Further research may be required. It should be noted by the Client that further research and an application for an excavation permit would delay construction schedules.

In the event that objects pertaining to the Aboriginal cultural values are unearthed during any stage of the development, works will cease and an archaeologist contacted to make an assessment of the find. Consultation with the Department of Environment, Climate Change and Water may be required prior to works progressing on the site.

13. BCA

All proposed building works will comply with the deemed-to-satisfy provisions of BCA, or will be supported by an alternative solution to demonstrate compliance with the performance requirements of the BCA.

14. Waste Management

A detailed waste management plan will be prepared in accordance with the recommendations of Section 8.2.3 of the Engineering Response to Director General's Requirements Report, 36148/3.8 dated 15 March 2010 Rev 4.

15. Construction & Traffic Management

All measures and recommendations contained within the construction management plan prepared by Global Switch will be implemented in relation to the following services:-

- Public safety, Amenity and Site Security;
- Operating Hours , Noise and Vibration Controls;
- Air and Dust Management;
- Stormwater and Sediment Control;
- Waste and Materials Re-Use; and
- Traffic Management and Materials handling.

Additional mitigation and management measures relating to dust and vehicle emissions as recommended in Section 10.1 of Air Quality & Greenhouse Gas Impact Assessment dated February 2010 Rev00 will be incorporated into the construction management plan.

16. Erosion & Sediment Control

An erosion and sediment control plan will be prepared as part of the Construction Certificate and will be implemented and maintained by the Contractor responsible for carrying out the works.

17. Hours of Operation

Operational –

The Data Centre will operate 24 hours, 7 days per week.

Construction –

The construction hours, including the delivery of materials to and from the site, will be restricted as follows:

- Between 7.00 am and 5.00 pm Mondays to Fridays;
- Between 8.00 am and 1.00 pm Saturdays;
- No work on Sundays and Public Holidays.

6 Appendices

6.1 Amended Architectural Plans

amendments

no.	date	amendment	by	chk'd
A01	09.12.09	DESIGN AMENDMENTS	SJ	SJ
A02	21.01.10	DESIGN AMENDMENTS	YL	YL
A03	15.02.10	ISSUE FOR CLIENT	YL	YL
B01	22.02.10	DA ISSUE	YL	YL
B02	05.07.10	REVISED ENTRY CANOPY	YL	YL

verified

init	chk'd
SJ	SJ
SJ	SJ

NOTE:
1. FOR SURVEY INFORMATION REFERS TO SURVEY DRWINGS PREPARED BY HARD & FORESTER CONSULTING SURVEYORS.
2. REFER TO LANDSCAPE ARCHITECT'S DRAWING FOR FOOTPATH & PLANTING DETAILS.

north point

dem

planning, urban design, architecture,
landscape architecture, interior design

level 8 15 help street chatswood nsw 2067
p: po box 5036 west chatswood nsw 1515
t: (02) 8966 8000 f: (02) 8966 6111
e: sydney@dem.com.au

project/client

Global Switch Sydney 2 Extension
273 Pyrmont Road
Ultimo NSW 2007

Global Switch Property (Australia)
400 Harris Street
Ultimo NSW 2007

consultant

Aurecon Group
116 Military Road
Neutral bay
NSW 2089

drawing title

ground floor plan

da issue

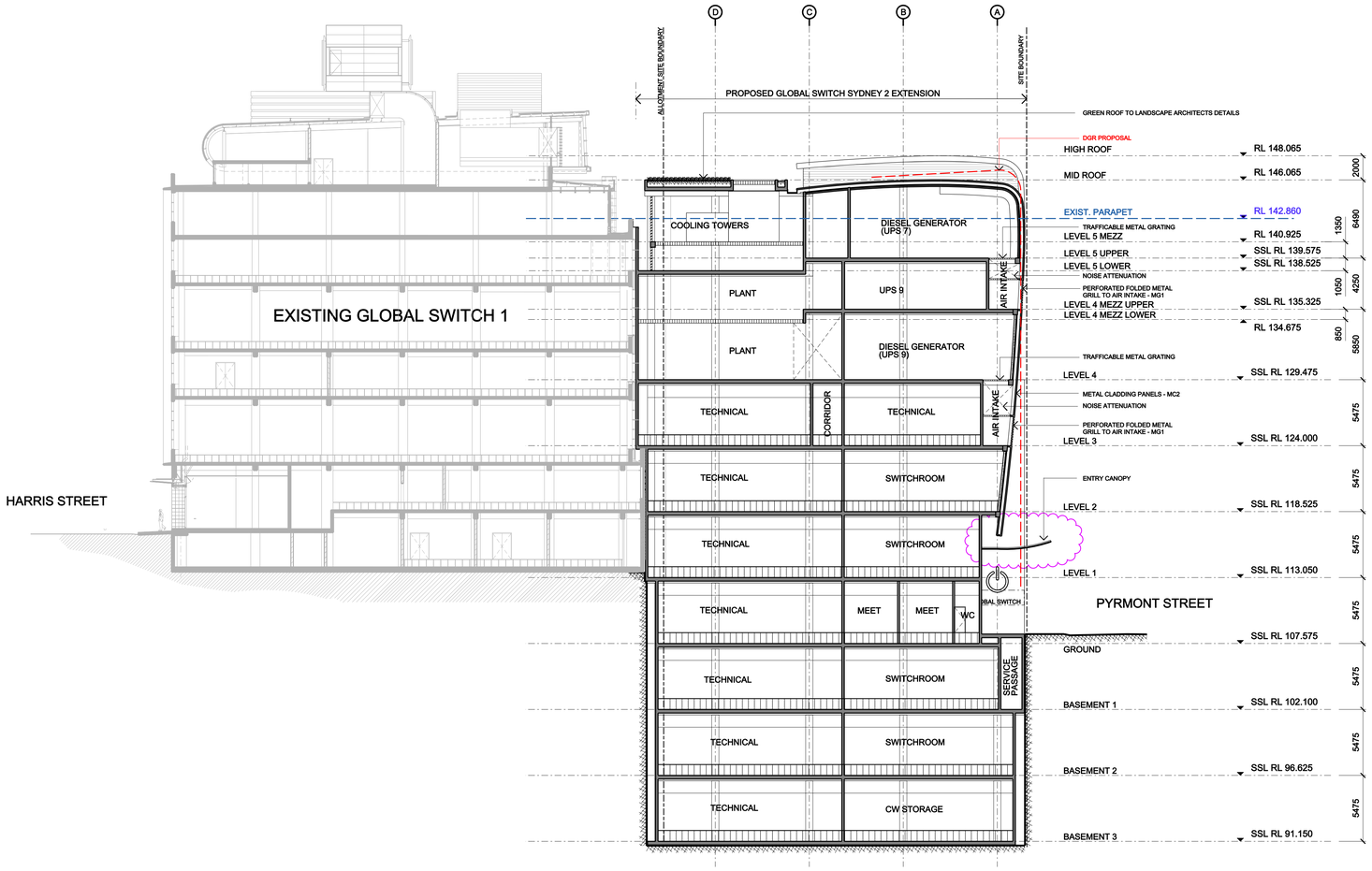
original	scale	drawn	project no.
b1	1:200	dbg	4019-00

drawing no.

ar -- 1203 (Discipline – Zone – Number)

rev no. B02

plotted: 26/08/2010 plotted by: sjenkins file: P:\4019-00-GSSyd2\00Cad\Sheets\ar--1203.dgn



02 SECTION

SCALE 1:200

0 2 4 6 8 10 m 20

amendments				verified	
no.	date	amendment	by	chk'd	init	chk'd
A01	09.12.09	INITIAL ISSUE	DBG	DBG		
A02	15.02.10	ISSUE FOR CLIENT	DBG	DBG		
B01	22.02.10	DA ISSUE	DBG	DBG	SJ	SJ
B02	05.07.10	ENTRY CANOPY SHOWN	DBG	DBG	SJ	SJ

north point

dem

planning, urban design, architecture,
landscape architecture, interior design

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project/client

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400 Harris Street
Ultimo NSW 2007

consultant

Aurecon Group
116 Military Road
Neutral bay
NSW 2089

drawing title

section two

da issue

original	scale	drawn	project no.
b1	1:200	dbg	4019-00

drawing no. — rev no.

ar -- 2101 (Discipline / Zone / Number) — B02

plotted: 26/08/2010 plotted by: sjenkins file: P:\4019-00-GSSyd2\00Cad\Sheets\ar--2101.dgn

amendments					verified	
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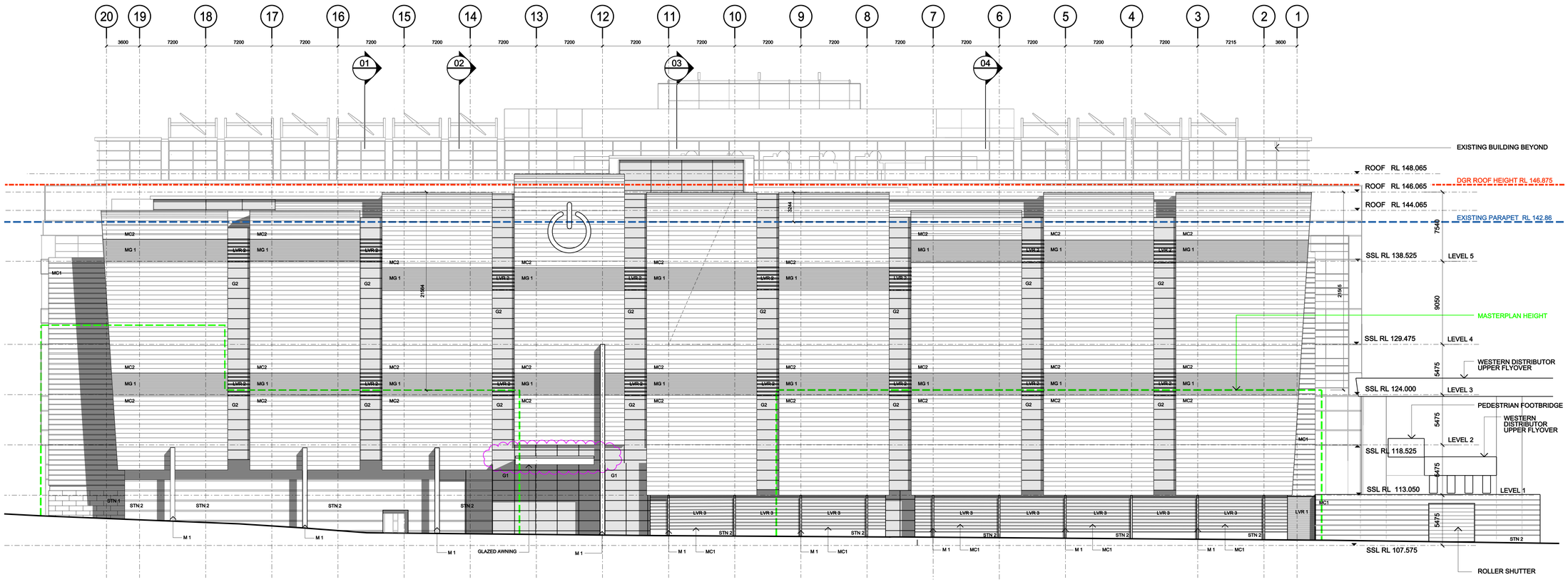
A01	09.12.09	DESIGN DEVELOPMENTS	SJ	SJ		
A02	20.01.10	ENTRY, FACADE AND ROOF AMENDMENTS	SJ	SJ		
A03	15.02.10	ISSUE FOR CLIENT	DBG	DBG		
B01	22.02.10	DA ISSUE	DBG	DBG	SJ	SJ
B02	05.07.10	REVISED ENTRY CANOPY	DBG	DGB	SJ	SJ



MATERIALS

G1 - SHOPFRONT GLAZING
G 2 - COLOURBACK GLASS
LVR 1 - SATIN CHARCOAL LOUVRES
LVR 2 - DECORATIVE HORIZONTAL BLADES
LVR 3 - HORIZONTAL BLADES OVER THE METAL CLADDING MC 1
M1 - SILVER METAL CLAD COLUMNS
MC 1 - SATIN CHARCOAL METAL CLADDING
MC 2 - SILVER METAL CLADDING
MG 1 - PERFORATED FOLDED METAL AIR INTAKE GRILLE
STN 1 - HONED SANDSTONE WITH SS INLAY
STN 2 - HONED BLACK GRANITE

0 2 4 6 8 10 m 20

north point

dem

planning, urban design, architecture,
landscape architecture, interior design

level 8 15 help street chatswood nsw 2067
p: po box 5036 west chatswood nsw 1515
t: (02) 8966 6000 f: (02) 8966 6111
e: sydney@dem.com.au

project/client

Global Switch Sydney 2 Extension
273 Pyrmont Road
Ultimo NSW 2007

Global Switch Property (Australia)
400 Harris Street
Ultimo NSW 2007

consultant

Aurecon Group
116 Military Road
Neutral bay
NSW 2089

drawing title

east elevation

da issue

original	scale	drawn	project no.
b1	1:200	dbg	4019-00

drawing no. **ar -- 2501** (Discipline / Zone / Number)

rev no. B02

plotted: 26/08/2010 plotted by: sjenkins file: P:\4019-00-GSSyd2\00Cad\Sheets\ar--2501.dgn

6.2 Amended Entry Canopy Design

global switch sydney 2 - extension

plotted: 27/08/2010 plotted by: sjenkins

drawing title
Global Switch Sydney 2
perspective 4

date 21-07-10
scale --
dwg no. ar--5304
proj no. 4019-00
rev no. B01

planning, urban design, architecture, landscape architecture, interior design
level 8 15 help street chatswood nsw 2067
t: (02) 8966 6000 f: (02) 8966 6111
e: sydney@dem.com.au

global switch sydney 2 - extension

plotted: 27/09/2010 plotted by: sjenkins

drawing title
Global Switch Sydney 2
perspective 5

date 21-07-10
scale --
dwg no. ar--5305
proj no. 4019-00
rev no. B01

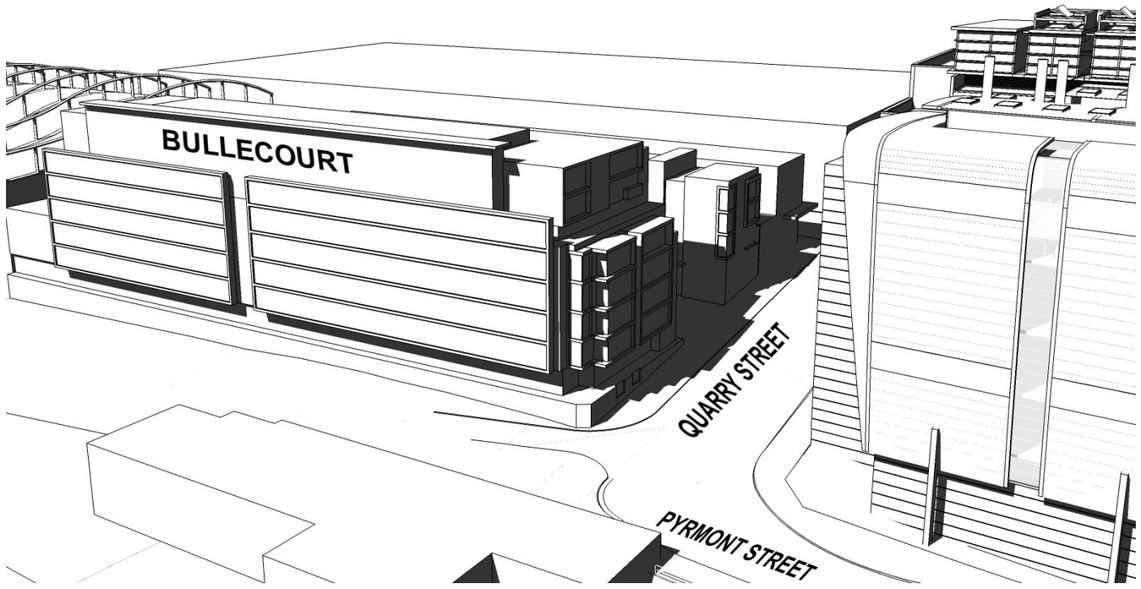
planning, urban design, architecture, landscape architecture, interior design
level 8 15 help street chatswood nsw 2067
t: (02) 8966 6000 f: (02) 8966 6111
e: sydney@dem.com.au

6.3 Elevational Shadow Diagrams

NEW SHADOWS

EXISTING SHADOWS

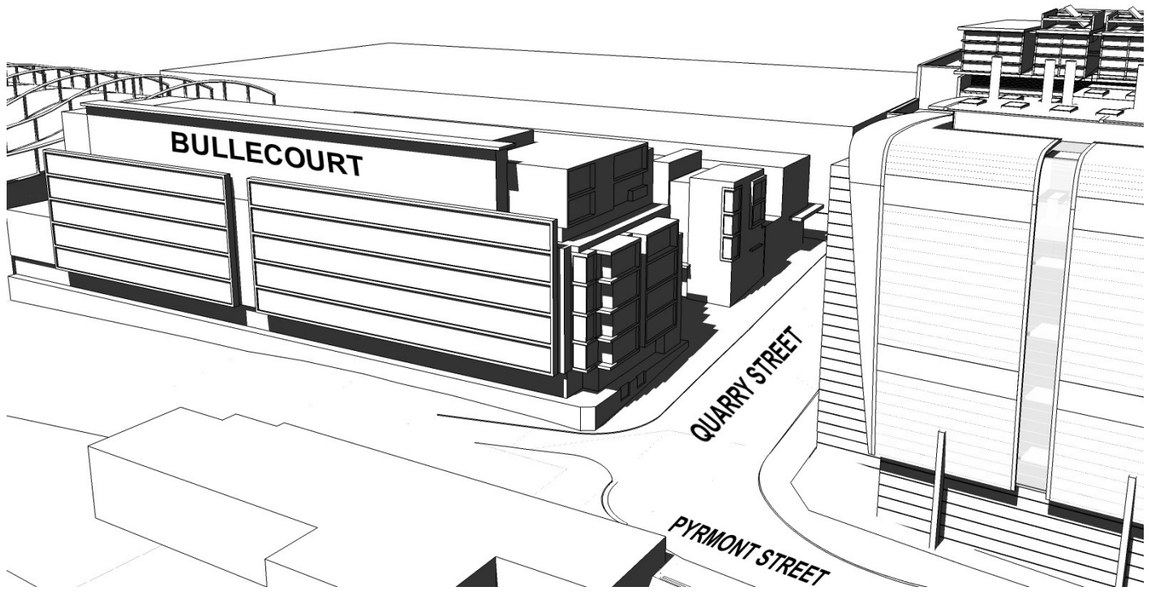
Jan21 9am



NEW SHADOWS

EXISTING SHADOWS

Jan21 10am

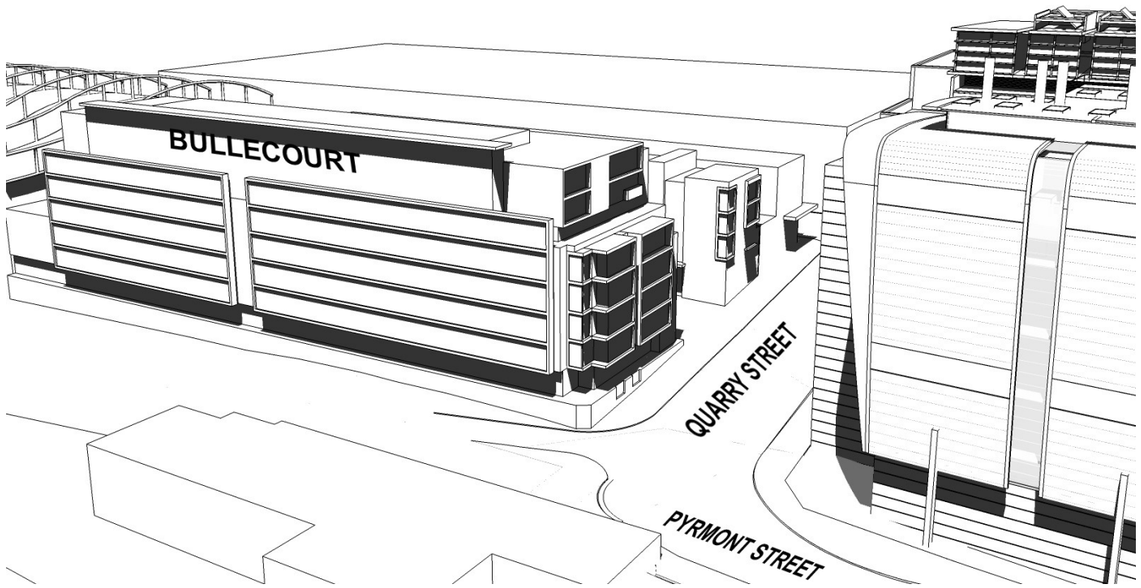


dem

NEW SHADOWS

EXISTING SHADOWS

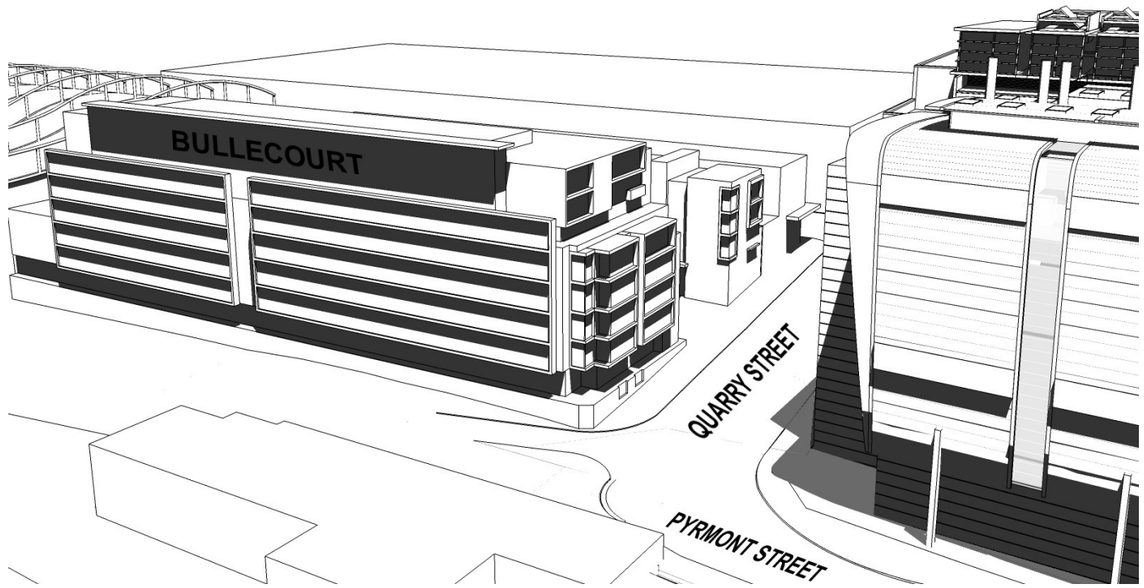
Jan21 11am



NEW SHADOWS

EXISTING SHADOWS

Jan21 12pm



Global Switch Sydney 2

Shadow Diagrams
January 21

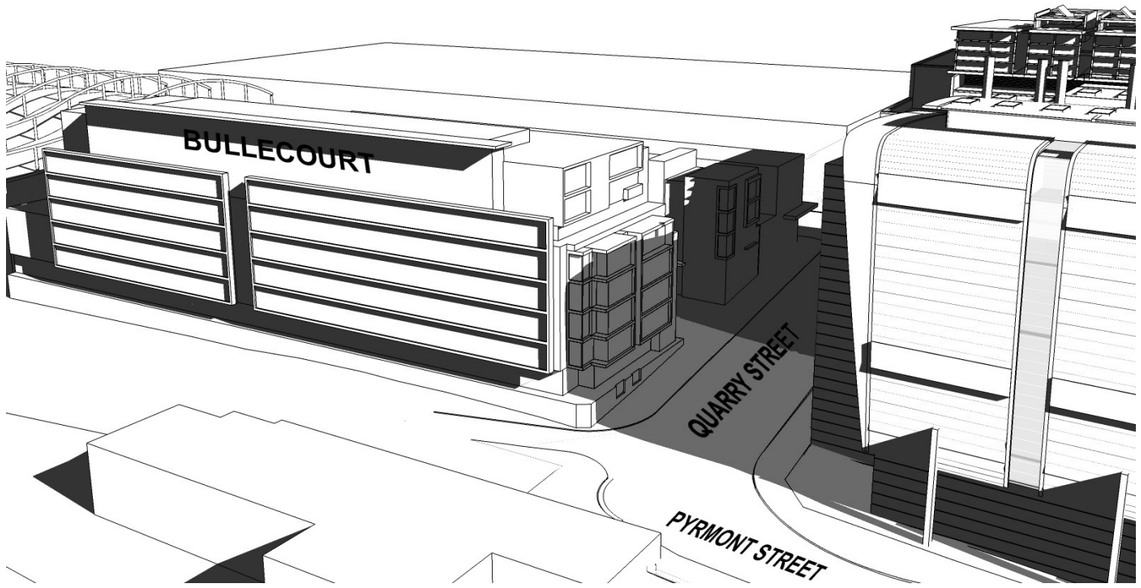
date 27-05-10
scale —
drwg no. arsk5101
proj no. 4019-00
rev no. —

planning, urban design, architecture, landscape architecture, interior design
level 8 15 help street chatswood nsw 2067
t: (02) 8966 6000 f: (02) 8966 6111
e: sydney@dem.com.au

NEW SHADOWS

EXISTING SHADOWS

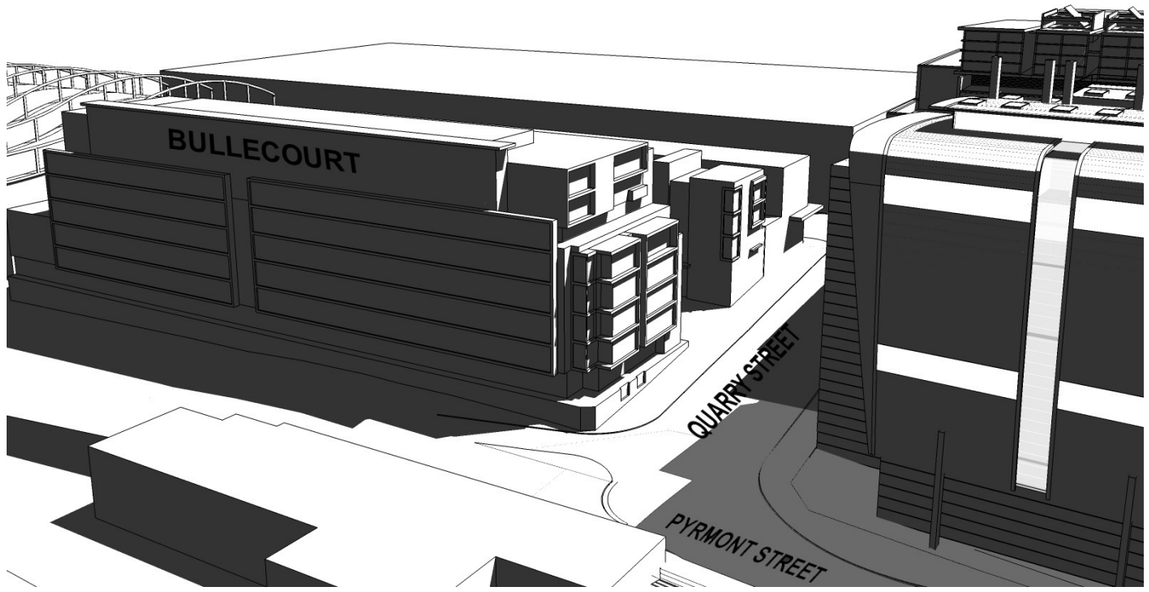
Jan21 1pm



NEW SHADOWS

EXISTING SHADOWS

Jan21 2pm

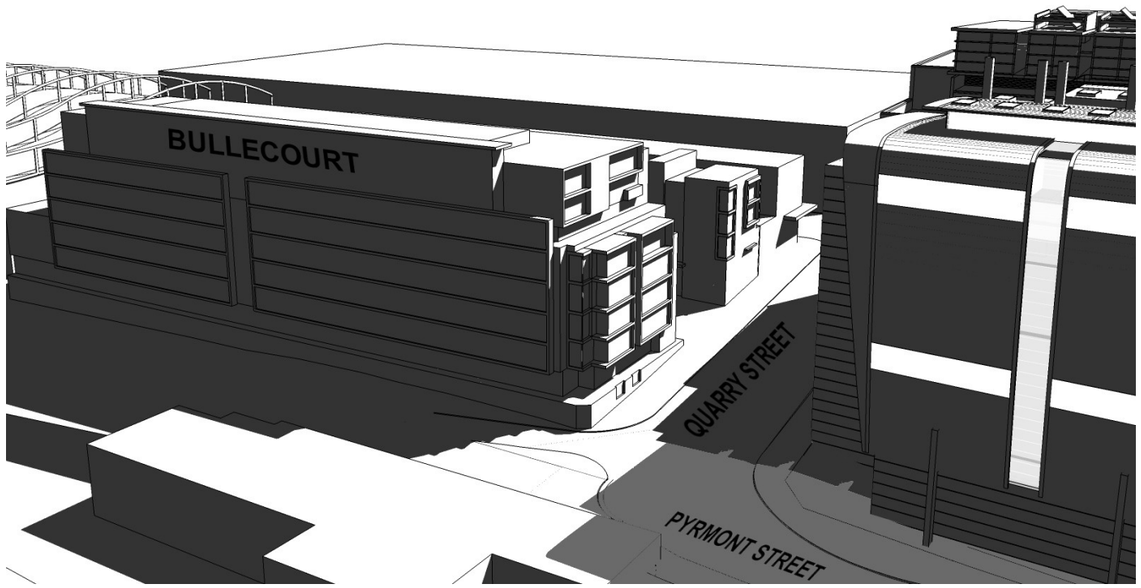


dem

NEW SHADOWS

EXISTING SHADOWS

Jan21 3pm



Global Switch Sydney 2

Shadow Diagrams
January 21

date 27-05-10

scale —

drwg no. arsk5102

proj no. 4019-00

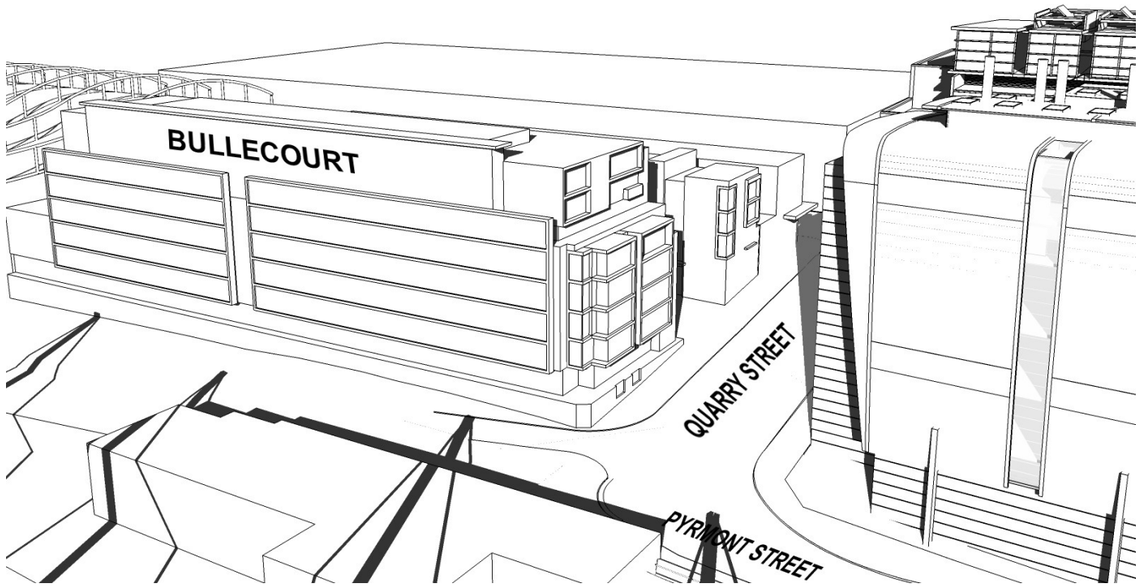
rev no. —

planning, urban design, architecture, landscape architecture, interior design
level 8 15 help street chatswood nsw 2067
t: (02) 8966 6000 f: (02) 8966 6111
e: sydney@dem.com.au

NEW SHADOWS

EXISTING SHADOWS

Jun21 9am



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EXISTING SHADOWS

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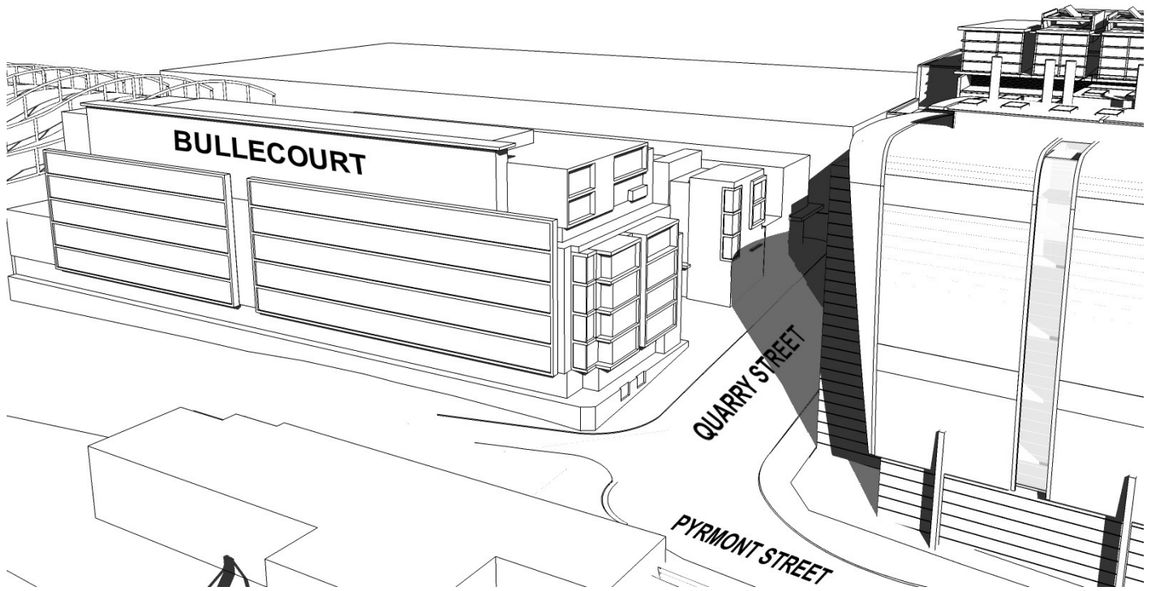

dem

NEW SHADOWS

EXISTING SHADOWS

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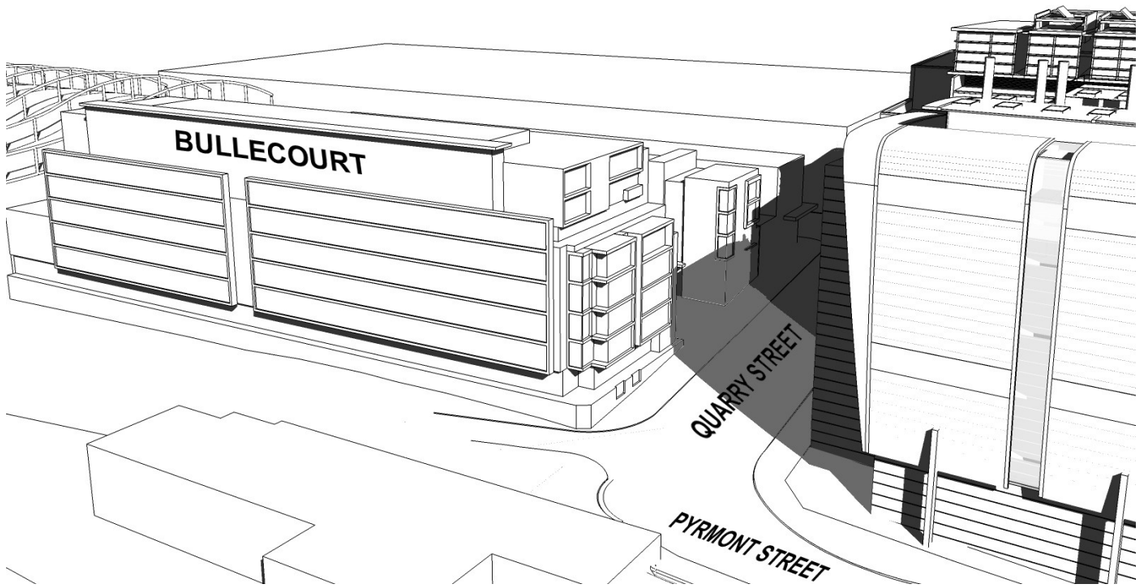

NEW SHADOWS

EXISTING SHADOWS

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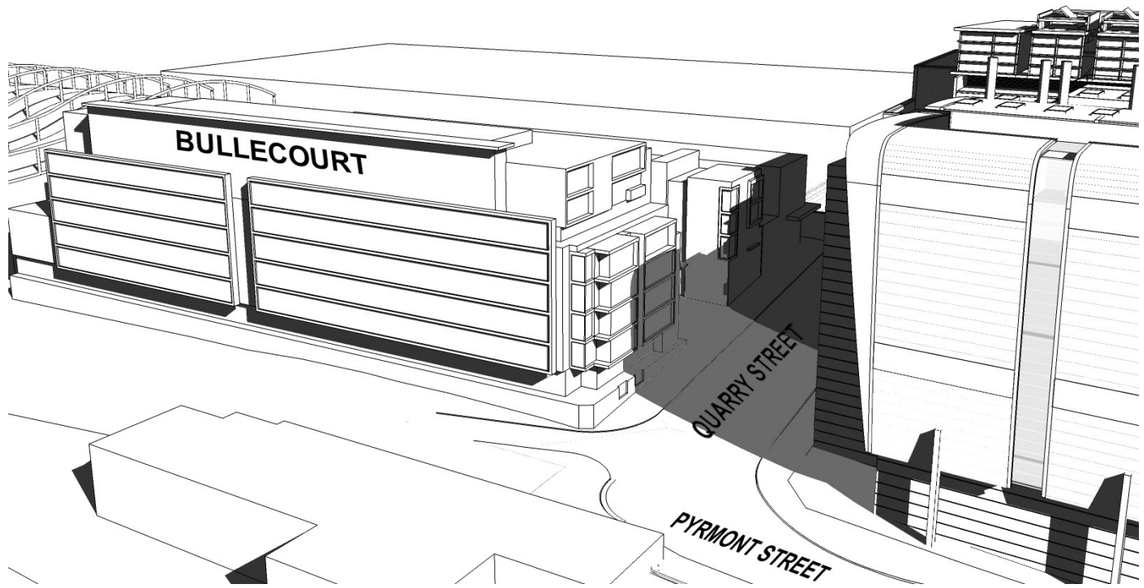


Global Switch Sydney 2

Shadow Diagrams
June 21

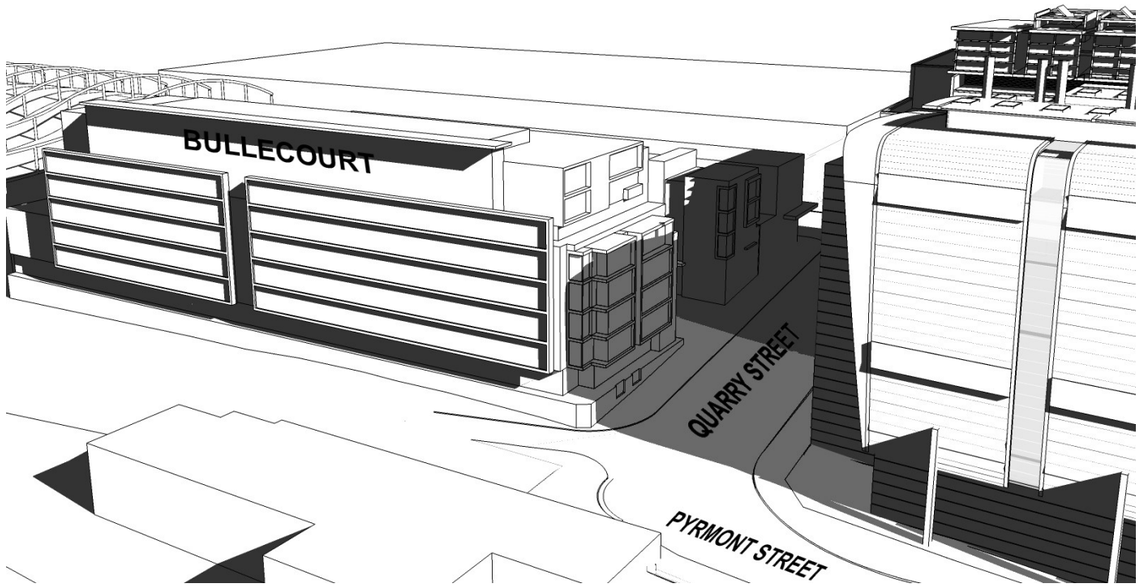
date 27-05-10
scale —
drwg no. arsk5103
proj no. 4019-00
rev no. —

planning, urban design, architecture, landscape architecture, interior design
level 8 15 help street chatswood nsw 2067
t: (02) 8966 6000 f: (02) 8966 6111
e: sydney@dem.com.au

NEW SHADOWS

EXISTING SHADOWS

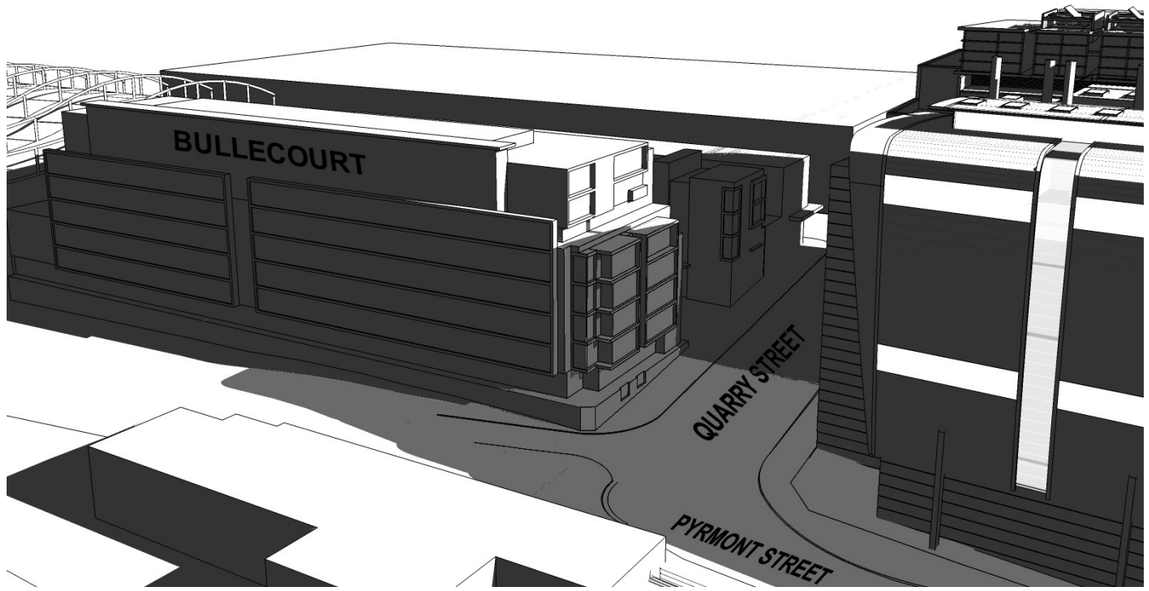
Jun21 1pm



NEW SHADOWS

EXISTING SHADOWS

Jun21 2pm

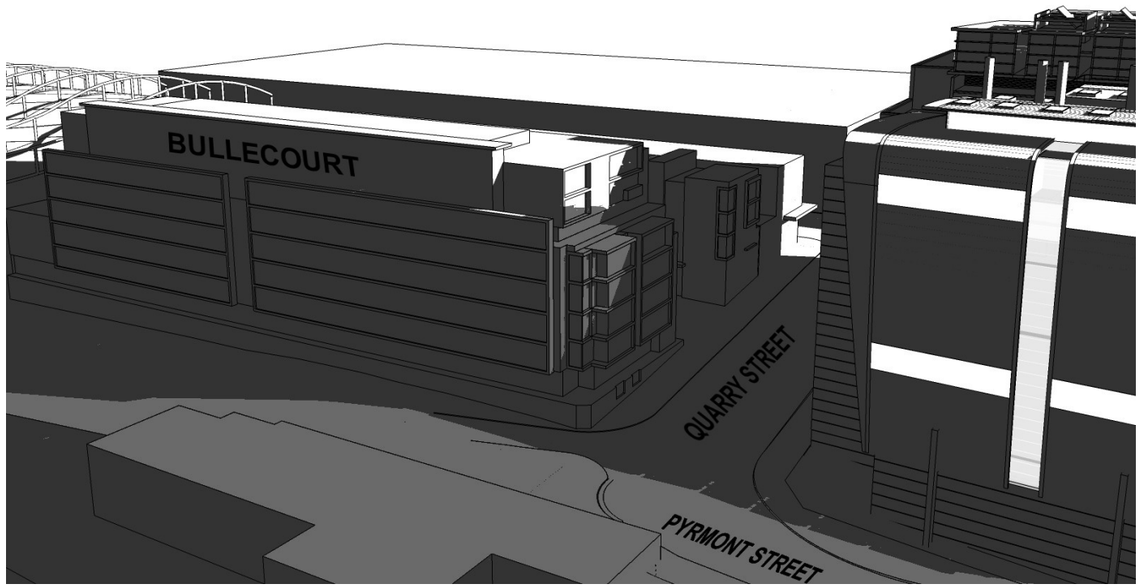


dem

NEW SHADOWS

EXISTING SHADOWS

Jun21 3pm



Global Switch Sydney 2

Shadow Diagrams
June 21

date 27-05-10

scale —

drwg no. arsk5104

proj no. 4019-00

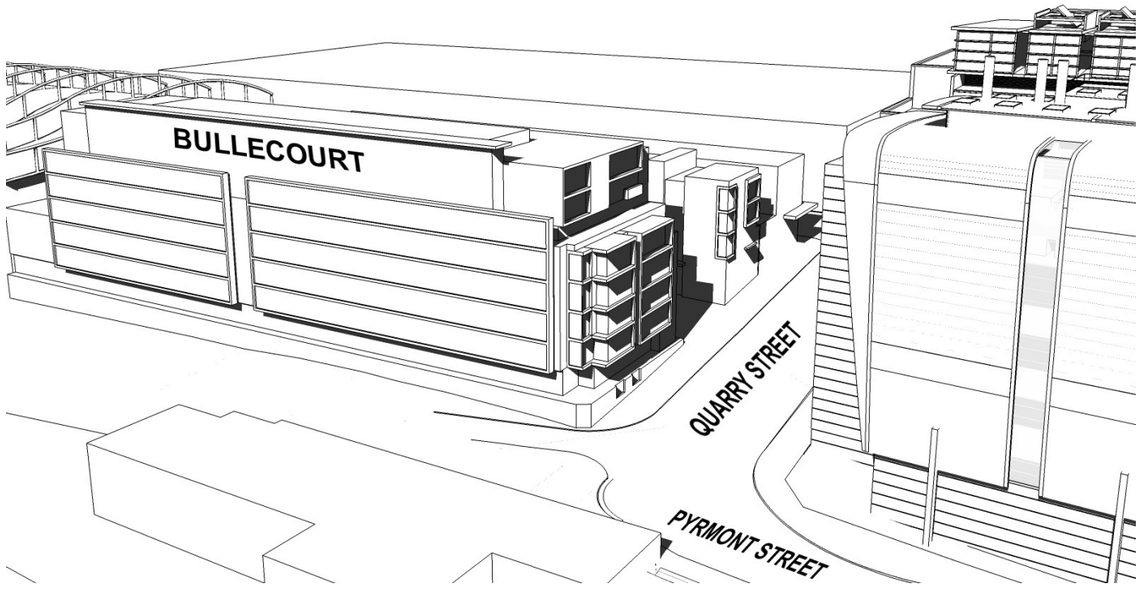
rev no. —

planning, urban design, architecture, landscape architecture, interior design
level 8 15 help street chatswood nsw 2067
t: (02) 8966 6000 f: (02) 8966 6111
e: sydney@dem.com.au

NEW SHADOWS

EXISTING SHADOWS

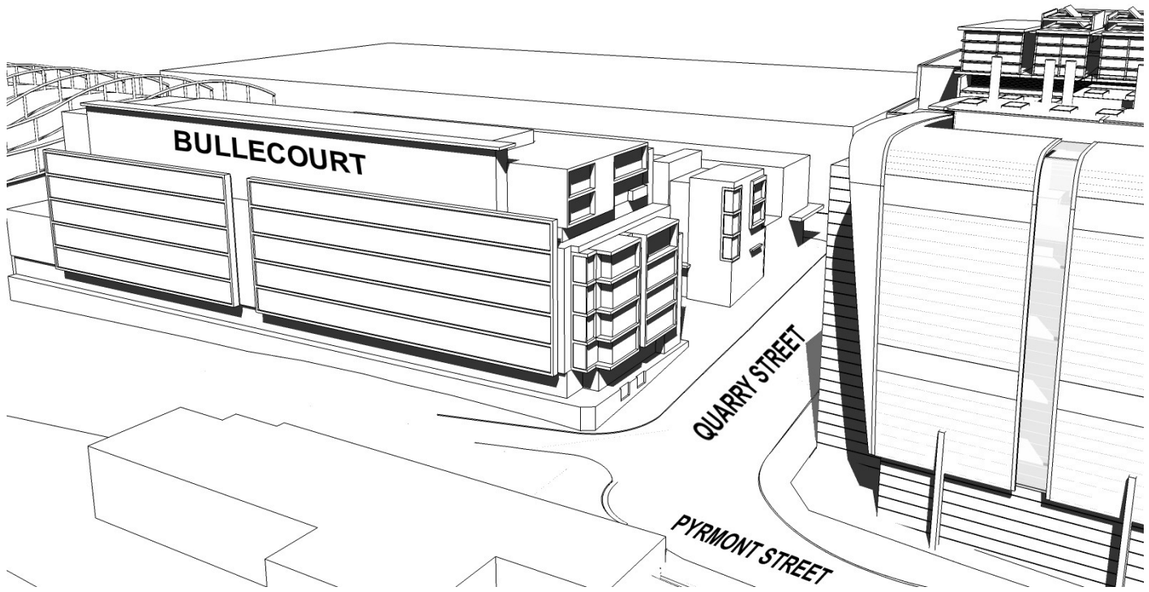
Sep21 9am



NEW SHADOWS

EXISTING SHADOWS

Sep21 10am

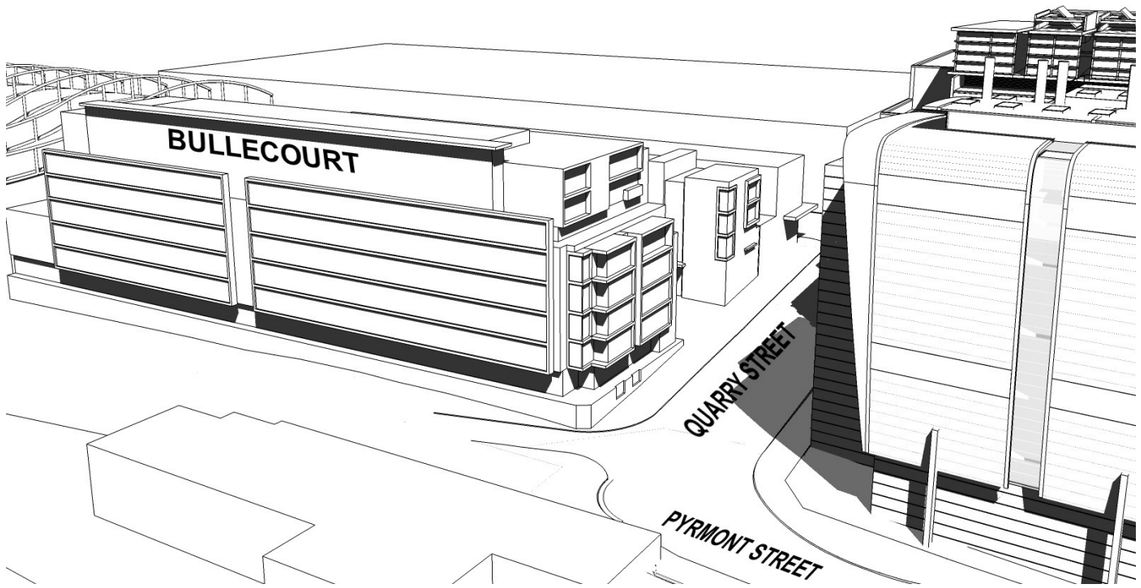


dem

NEW SHADOWS

EXISTING SHADOWS

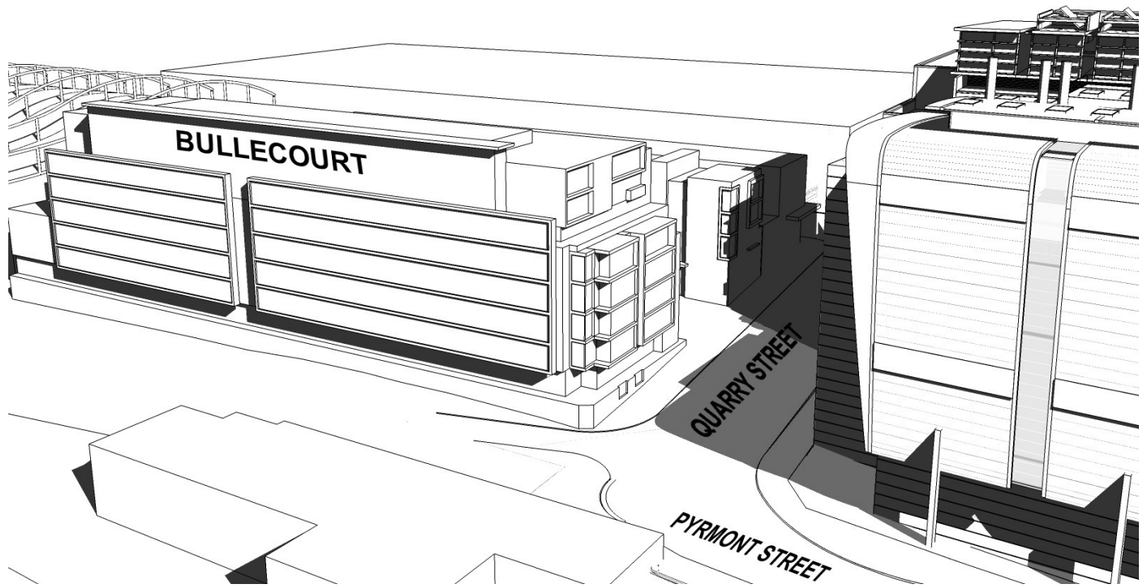
Sep21 11am



NEW SHADOWS

EXISTING SHADOWS

Sep21 12pm



Global Switch Sydney 2

Shadow Diagrams
September 21

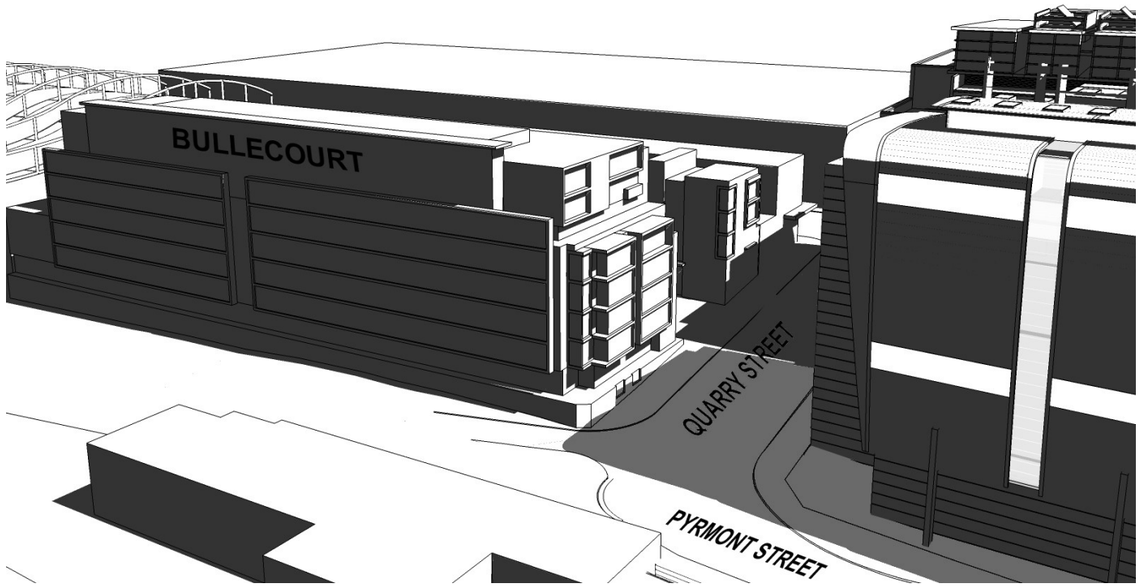
date 27-05-10
scale —
drwg no. arsk5105
proj no. 4019-00
rev no. —

planning, urban design, architecture, landscape architecture, interior design
level 8 15 help street chatswood nsw 2067
t: (02) 8966 6000 f: (02) 8966 6111
e: sydney@dem.com.au

NEW SHADOWS

EXISTING SHADOWS

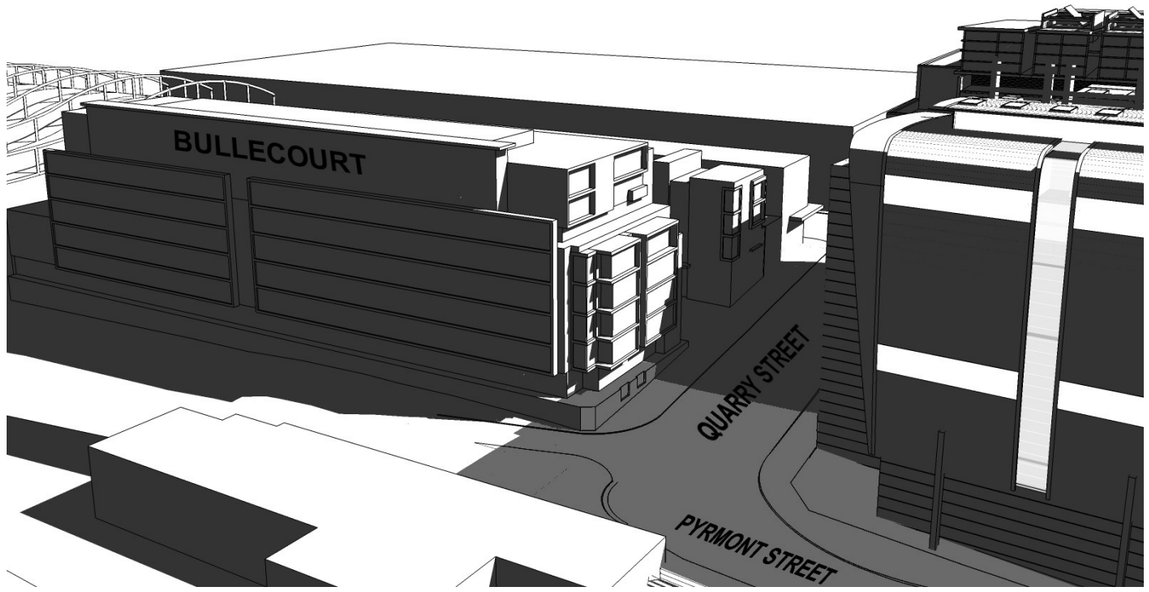
Sep21 1pm



NEW SHADOWS

EXISTING SHADOWS

Sep21 2pm



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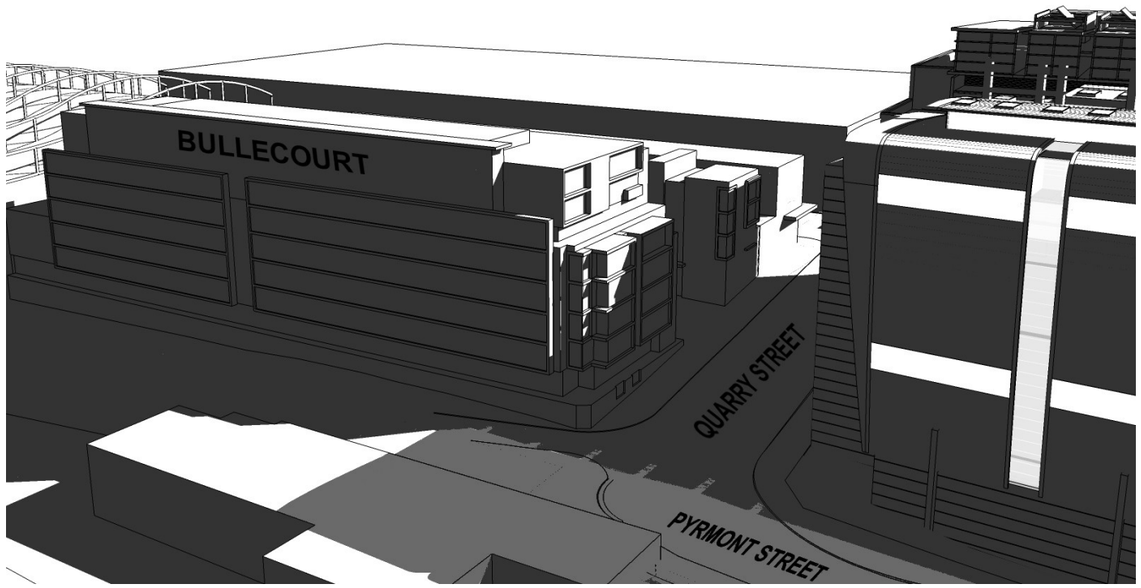
NEW SHADOWS

EXISTING SHADOWS

Sep21 3pm



Global Switch Sydney 2

Shadow Diagrams
September 21

date 27-05-10
scale —
drwg no. arsk5106
proj no. 4019-00
rev no. —

planning, urban design, architecture, landscape architecture, interior design
level 8 15 help street chatswood nsw 2067
t: (02) 8966 6000 f: (02) 8966 6111
e: sydney@dem.com.au

6.4 View Loss Analysis - Bullecourt

dem

Global Switch 2
View Loss Analysis

dem (aust) pty ltd
level 8 15 help street
chatswood australia
t: (02) 8966 6000 f: (02) 8966 6111

August 2010

job no. 4019-00

dem

Introduction

The new Global Switch 2 building will be screened to a large extent by the existing Global Switch 1 building adjoining and to its west, and to a lesser extent by the western distributor to the north. Two apartment buildings known as 'Bullecourt' on the southern side of Quarry Street, directly opposite the proposed development, are the only buildings with views considered likely to be affected.

Bullecourt Western building - 444 Harris Street

This building which addresses Harris Street has 100 residential apartments which predominantly face west towards Harris or east into the central courtyard of the Bullecourt development. Views to the east are obscured by eastern building of the same development, and views to the north are mostly obscured by Global Switch 1.

Two apartments on the north-eastern corner of the building on levels 8 & 9 have windows facing north and east. The northern windows directly face the GS1 building, but have city views to the north-east across the GS2 site and down Quarry Street. The east facing windows have a view of the city over the top of the northern end of other Bullecourt building. The proposed development will have minimal effect on the more prominent city views from the eastern windows, but there will be a loss of approximately 50% of the view from the north facing windows (refer to Diagram 1).

Three apartments on the north-eastern corner of the building (levels 5,6 & 7) with a frontage to Quarry Street have corner windows facing north and east. These windows currently have a view to the north-east across the GS 2 site and down Quarry Street to the Exhibition Centre and the city. The proposed development will obstruct part of the view to the north, but a majority of the view corridor towards the city is maintained (refer to Diagram 2).

Some other upper level apartments have a small corridor of view across the GS 2 site towards the western distributor, which can be only seen from the outer extremities of their eastern terraces (refer to photo1). Whilst this view will be obscured by the proposed development, these apartments have significant district views to the west (refer to photo 2).

Bullecourt Eastern building - 287 Pyrmont Street

This building which addresses Pyrmont Street also has 100 residential apartments which predominantly face east towards the CBD or west into the central courtyard of the Bullecourt development.

Six apartments on the south-east corner of the building (levels 3,4,5,6,8 & 9) have windows facing west and north. The north facing windows currently view directly across the GS 2 site to the western distributor and the Goldsborough Mort building, and on the upper levels have vistas of the city to the north-east down Quarry Street. The proposed development will obstruct the view to the north but more than 50% of the view corridor, which is the better view towards the city, is maintained (refer to Diagrams 3 & 4).

Six apartments on the south-east corner of the building (levels 3,4,5,6,8 & 9) have windows facing west and north. The north facing windows currently view directly across the GS 2 site to the western distributor and the Goldsborough Mort building, with vistas of the city to the north-east down Quarry Street for upper level apartments. The proposed development will potentially obstruct the view to the north, however, 50% of the valued view corridor towards the city is maintained (refer to Diagram 3).

Seven apartments on the north-east corner of the building (levels 3 to 9) have windows facing east and north. The north facing windows will lose a portion of view corridor across the GS 2 site, but the majority of the view corridor towards the city is maintained (refer to Diagrams 3 & 4).

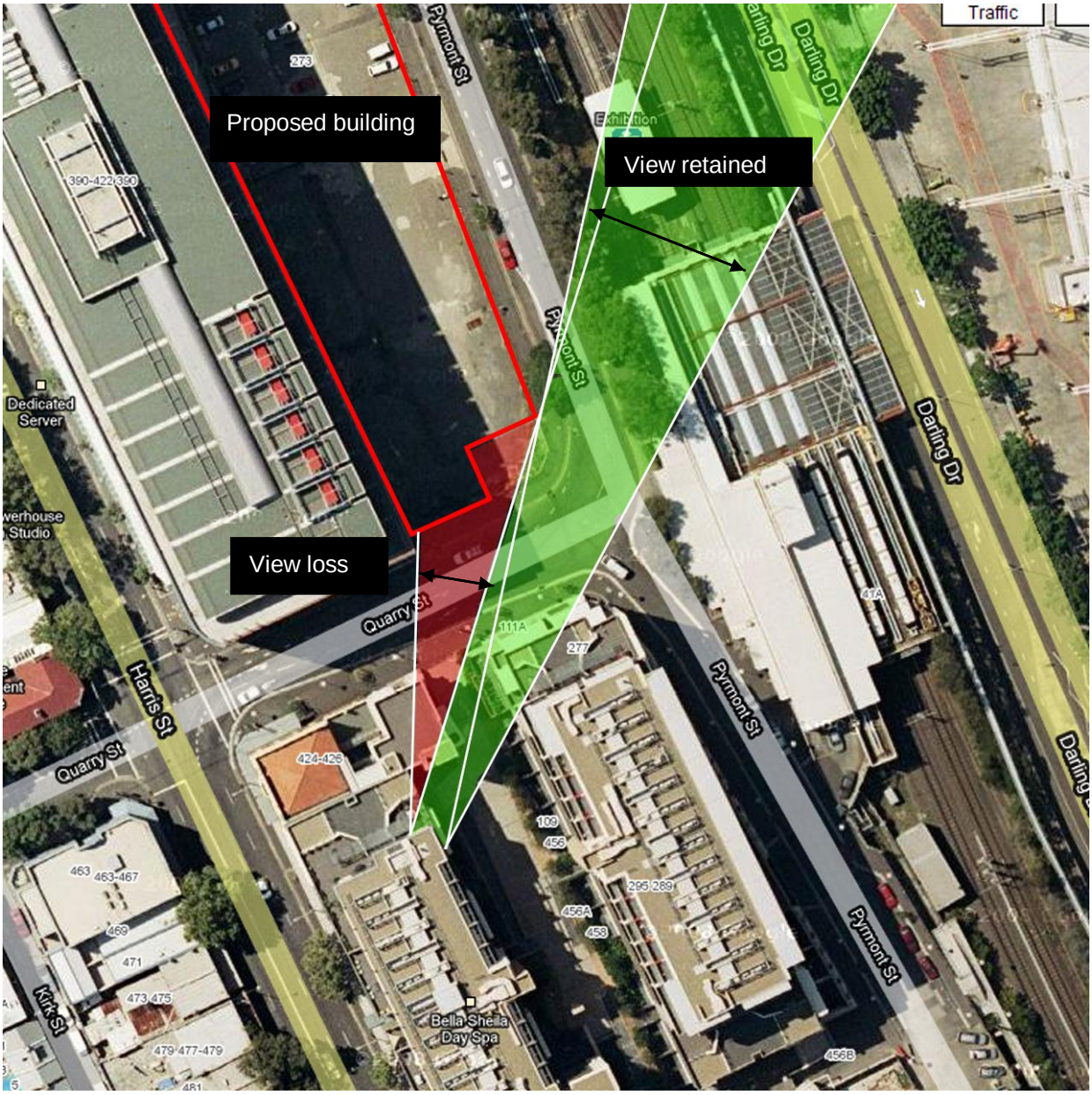


Diagram 1 **Views from north eastern apartment at Level 9 of 444 Harris Street**

Photograph 1

Photograph 2

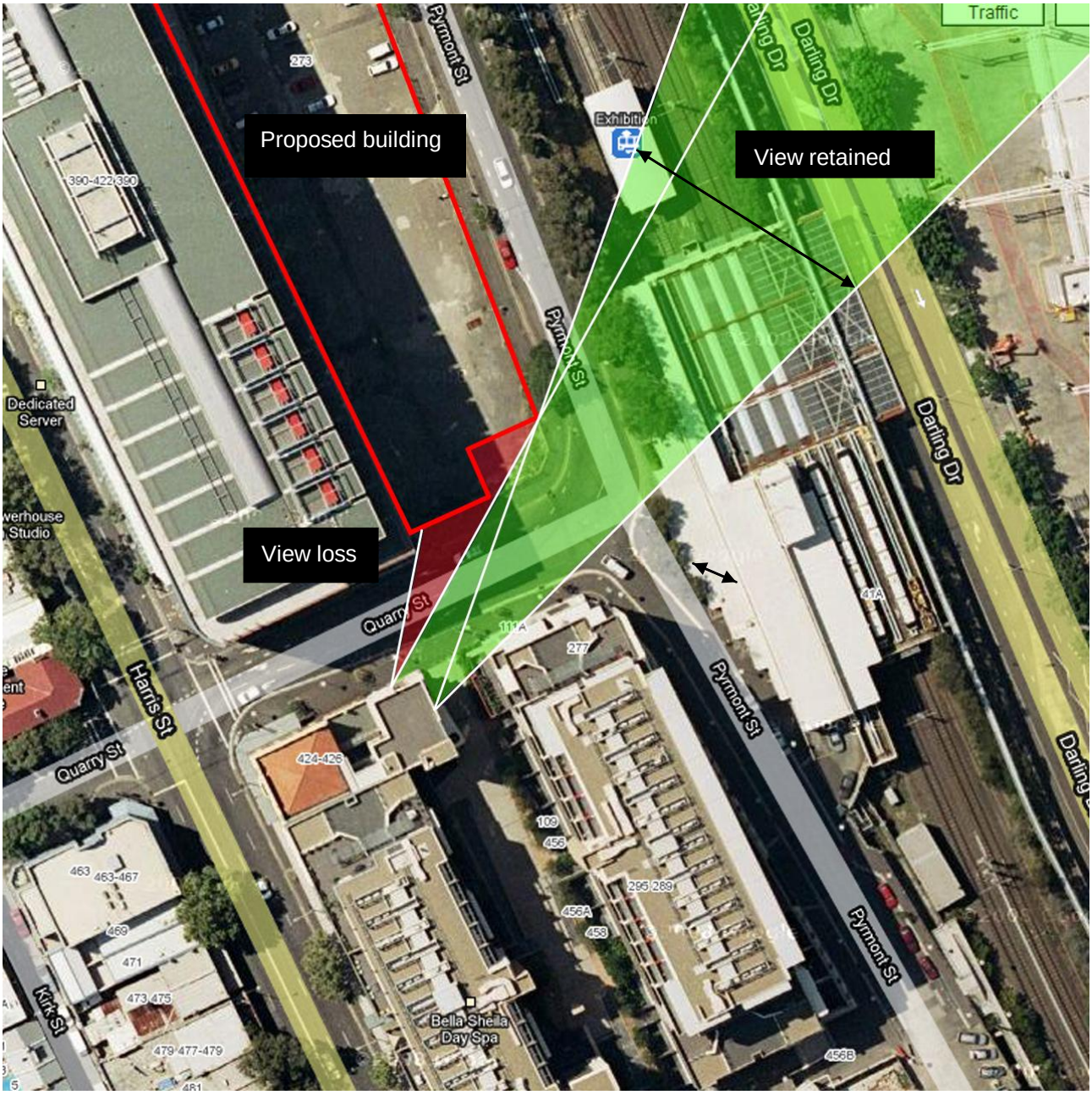


Diagram 2 Views from north-eastern apartments at 444 Harris Street, Pyrmont

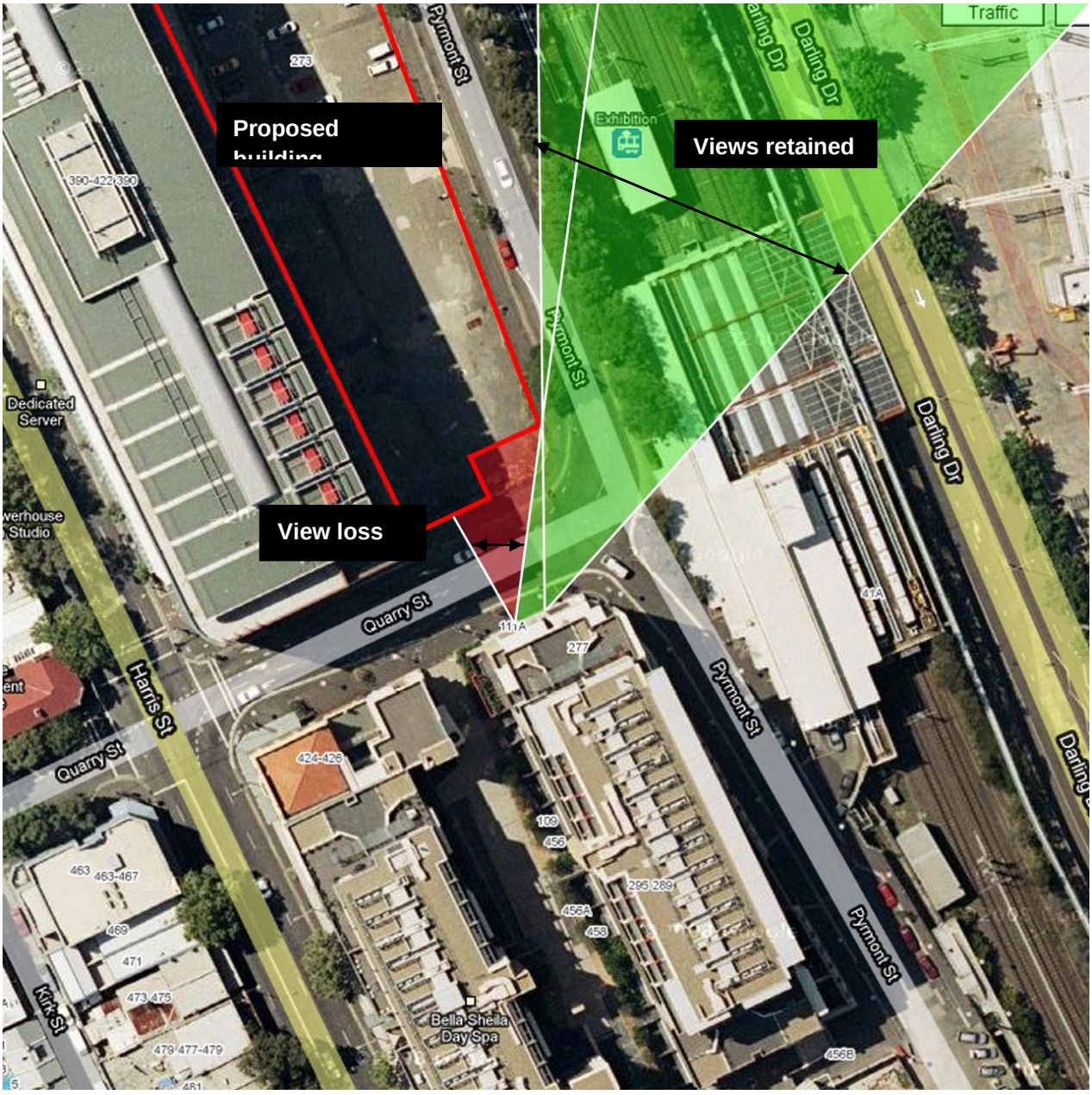


Diagram 3 **Views from north facing apartments at 287 Pyrmont Street**

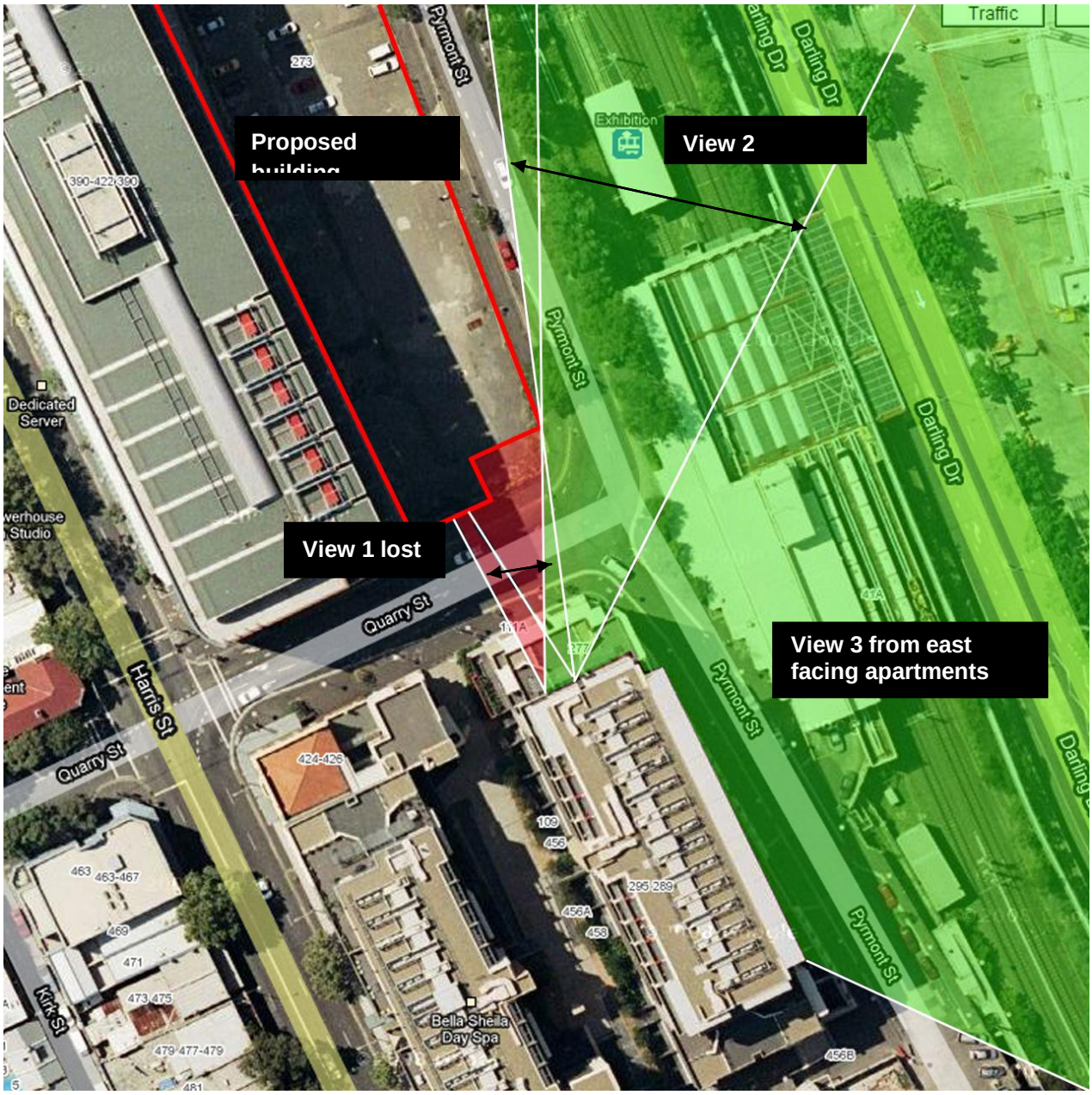


Diagram 4 **Views from north eastern and eastern apartments at 287 Pyrmont**

view **1**

view 2

view 3

Conclusion

In summary the anticipated view loss to Bullecourt apartments is considered reasonable given the fact that:-

a) Qualitatively, the apartments will still maintain highly valued views to the east along Quarry Street towards the significant CBD skyline especially the iconic Centrepoint Tower; and

b) Whilst views to the north will be impacted, this outlook is a secondary view for some apartments and the visual quality of its outlook is interrupted by the significant presence of the Western Distributor flyover and Global Switch 1.

6.5 Environmental Noise Criteria Report

Environmental noise criteria
Global Switch Sydney 2
Global Switch

Report ref:
36148-013-01
30 June 2010
Revision 1

aurecon

Document prepared by:

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Document control

aurecon

Document ID: Acoustic RK100630rk rev1.doc

Rev No	Date	Revision details	Typist	Author	Verifier	Approver
0	29 June 2010	Internal draft	RK	RK		
1	30 June 2010	Client issue	RK	RK	HM	HM

Contents

Executive summary

The proposed Global Switch 2 development at 273 Pyrmont Street, Ultimo NSW, consists of a data centre facility to be constructed adjacent the existing Global Switch 1 data centre. The scope of this report is to summarise all of the environmental noise monitoring that has been carried out including the initial noise survey conducted in December 2009 as well as additional monitoring in June 2010 as per DECCW requests. This report supplements the *Part 3A Acoustic Report* Revision 1 issued on 29 January 2010.

A noise survey was conducted in the vicinity of the proposed site between Friday 4 December 2009 and Friday 11 December 2009 as well as Thursday 17 June 2010 and Thursday 24 June 2010 to determine the existing noise levels in the area. The noise survey consisted of long term noise loggers being setup at three locations, with additional spot measurements being taken at various street level locations.

Based on the noise measurement results the subsequent assessment criteria were developed in accordance with the *NSW Industrial noise policy*.

Type of receiver	Indicative noise amenity area	Time of Day	Assessment criteria ($L_{eq,\ period}$ dBA)	Criterion Type
Residential at West. Dist height or higher	Urban	Day	57	Amenity
		Evening	56	Amenity (existing traffic)
		Night	54	Amenity (existing traffic)
Residential at street level and below West. Dist height	Urban	Day	52	Amenity
		Evening	52	Amenity (existing traffic)
		Night	**49**	Amenity (existing traffic)
Residential west of Harris Street (not on Harris Street)	Urban	Day	53	Intrusive
		Evening	46	Amenity
		Night	37	Amenity
Commercial (When in use)	All	Day	62	Amenity
		Evening	62	Amenity
		Night	62	Amenity

Given the 24 hour proposed operation of the development the driving project criterion is L_{eq} 49 dBA for residential receivers adjacent the site at street level and below the Western Distributor height. This will ensure compliance with the remaining assessment criteria including the residences to the west of Harris Street which will be significantly shielded from the development by the existing Global Switch 1 building.

1. Introduction

1.1 Project Scope

The proposed Global Switch 2 development at 273 Pyrmont Street, Ultimo NSW, consists of a data centre facility to be constructed adjacent the existing Global Switch 1 data centre. The two sites will have linked building services as well as access walkways and will operate as a single facility spread across two buildings.

The scope of this report is to summarise all of the environmental noise monitoring that has been carried out including the initial noise survey conducted in December 2009 as well as additional monitoring in June 2010 as per DECCW requests. This report supplements the *Part 3A Acoustic Report* Revision 1 issued on 29 January 2010, which outlines the development details including expected noise emissions and initial noise mitigation recommendations which will be further developed and specified during the detailed design stage.

1.2 Site description

The proposed site is located at 273 Pyrmont Street, Ultimo NSW in a mixed use zone. The site is bound by the Western Distributor to the north with Goldsbrough Apartments further north, existing Global Switch 1 facility to the west with residential townhouses west of Harris Street, Light rail corridor and Sydney Convention and Exhibition Centre (SCEC) to the east and residential apartments to the south. Figure 1 shows the layout of the site.

The Western Distributor is a high traffic road with daily traffic in excess of 75,000 vehicles peaking during the morning period and remaining constant throughout the day until the evening. It is the major noise source adjacent to the site with a constant traffic hum audible 24 hours a day at the site. At ground level a shielding effect is provided by the elevated overpass, however reflected noise events are clearly distinguished from the Harris Street on-ramp due to the reflection from the underside of the viaduct especially during truck pass-bys. Constant at grade traffic along Harris Street (in excess of 30,000 vehicles daily) as well as intermittent traffic along Pyrmont Street provide other dominant noise sources.

2. References

- *AS 1055:1997 "Acoustics - Description and measurement of environmental noise - General procedures"*
- *NSW Industrial Noise Policy*, EPA (NSW), January 2000
- *Part 3A Acoustic Report* Revision 1*,* Aurecon, 29 January 2010

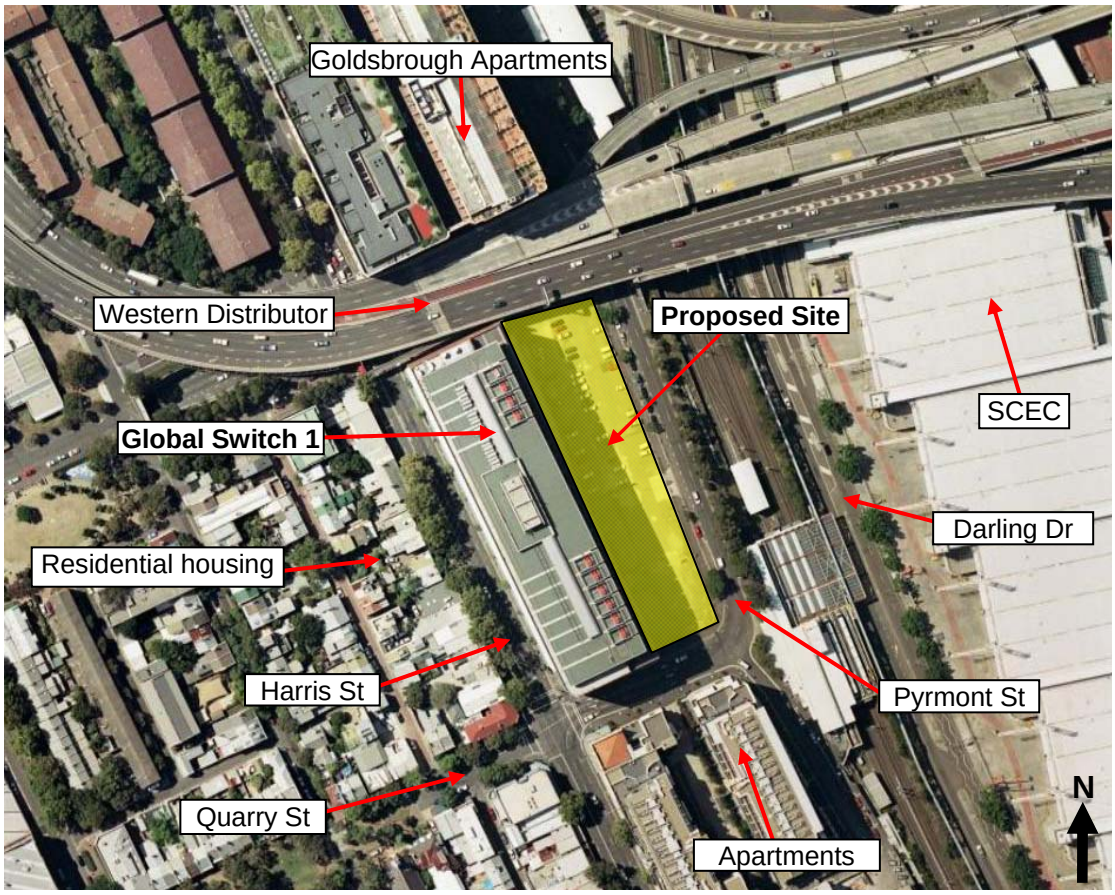


Figure 1 Site layout

3. Noise criteria

3.1 NSW Industrial noise policy

The recommended noise levels emitted from industrial sources are outlined in the *NSW Industrial Noise Policy*. Intrusiveness and amenity criteria are determined based on type of receiver and existing ambient and background noise environment. The **intrusiveness criterion** applies to residential properties and is based on the existing background noise and is summarised by the following equation:

$$L_{Aeq,\ 15\ minute} \leq \text{rating background level} + 5\ dB$$

Note: Rating background level (RBL) being defined as the median value of the measured $L_{A90,\ 15\ minute}$ for the assessment period

The **amenity criterion** is based on the ambient noise level at the receiver. Recommended noise levels from industrial noise sources for the type of receivers encounter during this assessment are shown in Table 1 below.

Table 1 Recommended noise levels from industrial sources

Type of Receiver	Indicative Noise Amenity Area	Time of Day	Recommended L_{Aeq} Noise Level (dBA)	
			Acceptable (ANL)	Recommended Maximum
Residence	Urban	Day	60	65
		Evening	50	55
		Night	45	50
Commercial Premises	All	When in use	65	70
Industrial Premises	All	When in use	70	75

The Acceptable noise level (ANL) from Table 1 is compared to the measured ambient noise level from which amenity criterion is determined by a set of conditions outlined in the Industrial Noise Policy.

The design criterion is taken to be the lower of the intrusive criterion and amenity criterion for residences and amenity criteria for commercial and industrial premises.

Times of day are defined as:

- Day – 7 am to 6 pm (8 am to 6 pm Sundays and public holidays)
- Evening – 6 pm to 10 pm
- Night – 10 pm to 7 am (10 pm to 8 am Sundays and public holidays)

In areas of high road traffic, the noise may be high enough to make an industrial source effectively inaudible even though the L_{eq} noise level from the industrial source may exceed the recommended ANL. In such cases the amenity criterion for noise form the industrial noise becomes:

$$Amenity\ criterion = L_{Aeq,\ (period\ (traffic)} - 10\ dB$$

This criterion may be applied only if all the following apply:

i) Traffic noise is identified as the dominant noise source at the site
ii) The existing traffic noise level is 10 dB or more above the ANL for the area
iii) It is highly unlikely the road traffic noise levels would decrease in the future

Modifying factor correction of +5 dB is applied to a noise source containing tonal characteristic (ie dominant audible pitch) and low frequency noise. Low frequency modifying factor is applied when the following criterion is satisfied:

$$L_{eq}\ dBA - L_{eq}\ dBC \geq 15\ dB$$

Only one of the above modifying factors is applied when a source emits a tonal noise that is within the low frequency range.

4. Noise survey

A noise survey was conducted in the vicinity of the proposed site between Friday 4 December 2009 and Friday 11 December 2009 as well as Thursday 17 June 2010 and Thursday 24 June 2010 to determine the existing noise levels in the area. The noise survey consisted of long term noise loggers being setup at three locations, with additional spot measurements being taken at various street level locations. The locations of the noise measurements are shown in Figure 2 below.

- Site 1 – North west corner of Global Switch 1 roof space
  - corresponds to receivers adjacent and at the height (and above) of the Western Distributor
- Site 2 – Street level (Site 2B is adjacent to Site B on footpath of Pyrmont St)
  - corresponds to all remaining street level receivers around surrounding the development site
- Site 3 – Street level at apartments on corner of Pyrmont and Quarry Streets
- Site 4 – Street level at Goldsbrough Apartments, 243 Pyrmont Street
- Site 5 – Street level on the corner of Harris and Quarry Streets
- Site 6 – First floor of the Lord Wolseley Hotel, 265 Bulwara Road

Both the long term noise logging and spot measurements were carried in accordance with *AS 1055:1997 "Acoustics - Description and measurement of environmental noise - General procedures"*. The noise logger consisted of a Larson Davis LXT Type 1 sound level meters and ARL 316 which were set to 'A' frequency weighting, 'F' time weighting and 15 minute sample intervals at the site.

Spot measurements were carried using a Larson Davis 831 Type 1 sound level meter which was set to 'A' frequency weighting, 'F' time weighting. The measurement period was sufficiently long for the L_{Aeq} to stabilise but generally consisted of 10 to 15 minutes at each location. A Larson Davis CAL200 was utilised to calibrate all sound level meters before and after each measurement. The weather during the noise logging ranged from overcast to sunny periods. Intermittent rain periods occurred during the noise survey, based on BOM measurements (at nearby Observatory Hill) the samples during the rain periods have been excluded. Some noise data during other monitoring periods have been identified to contain extraneous noise which can be identified by excessive L_{Amax} levels and significantly heightened L_{Aeq} levels, hence those samples have also been excluded from analysis.

Results from the noise survey can be seen in Table 2, with Table 3 displaying the spot measurement results. Daily noise logging graphs are shown in Appendix A.

Noise logging at Site 1 shows a very regular daily noise pattern (as shown in Appendix A) associated with the traffic volume along the Western Distributor. The average L_{eq} levels are very consistent even during the weekend period when compared to the weekday levels. The traffic noise peaks at L_{eq} 68 dBA during the morning peak hour and remains at least L_{eq} 66 dBA until the evening hours. No real distinguishable peak is shown during the afternoon rush hour. The traffic noise levels are at their lowest between 3 am and 4 am.

Noise logging at Site 2 encountered a problem with logging only occurring for four days. However upon reviewing of the limited data it can be seen that there is a very regular pattern to the noise levels which is associated with the local traffic conditions. There is quite small variation in the ambient and background noise levels as the noise environment is dominated by the Western Distributor traffic volume. Along with the comparison to the data at Site 1 which also shows the same regular noise pattern, it is concluded that the four days of logging are sufficient to accurately determine the noise environment at street level adjacent to the proposed development site. This is inline with the NSW INP which states that:

"In areas where the background noise levels are affected significantly by nearby road traffic with regular daily pattern, three days' worth of valid data may be sufficient".

Other audible intermittent noise sources at this site consisted of light rail pass and monorail pass-bys, non regular traffic along Pyrmont Street and Darling Drive. During quieter periods at night, small hum from the Global Switch 1 rooftop plant was audible.

Site 3 contained similar noise sources to those observed at Site 2/2B. During one spot monitoring session a loud cricket or cicada was intermittently audible from and adjacent tree. Noise data during those times was discarded as it was not a regular noise sources subject to seasonal variations.

Site 4 noise levels were dominated by the Western Distributor on-ramp from Harris Street, with individual vehicle movements especially from heavy vehicles being very loud due to the reflection effects from the underside of the viaduct. Intermittent traffic along Pyrmont Street added to the ambient noise environment.

Site 5 noise levels were representative of the residential townhouses located on Harris Street. The noise measured was lower than at the other sites due to lower traffic noise exposure.

Site 6 noise logger was setup on Level 1 of the Lord Wolseley Hotel, representing the residential receivers located to the west of Harris Street without direct incident noise from either the Western Distributor or Harris Street. Day time noise levels were dominated by traffic hum from the surrounding main roads (mainly Harris Street and the Western Distributor) as well as some HVAC noise from surrounding buildings. The night time noise environment was significantly quieter than daytime however it was still dominated by indirect traffic noise from the main roads especially semi-regular heavy vehicle noise along Harris Street. Building services noise from surrounding building was also audible. Intermittent noise sources during all times of day included individual car drive-bys and parking activities along Bulwara Road as well as individual pedestrian noise.

Figure 2 Noise survey measurement locations

Table 2 Noise survey results

Location	Time of Day	Results		
		$L_{Aeq, 15min}$ (dBA)	RBL (dBA)	$L_{10, 15min}$ (dBA)
Site 1	Day	67	65	68
	Evening	66	64	67
	Night	64	59	65
Site 2	Day	62	58	64
	Evening	62	57	63
	Night	59	53	61
Site 6*	Day	57	48	57
	Evening	56	46	56
	Night	46	42	48

Note * -2.5 dB façade correction applied to measurements (as per AS 1055) due to microphone placement being within 1 m of an existing reflective facade

Table 3 Noise spot measurement results

Location	Date	Time	L_{eq} (dBA)	L_{max} (dBA)	L_{10} (dBA)	L_{90} (dBA)
Site 1	04/12/2009	09:08	69	81	70	67
Site 3	04/12/2009	09:56	65	81	68	60
Site 2B	04/12/2009	10:23	65	80	68	60
Site 4	04/12/2009	10:39	70	80	73	65
Site 3	09/12/2009	23:50	61	76	64	54
Site 2B	10/12/2009	00:08	61	73	64	54
Site 4	10/12/2009	00:30	64	81	67	56
Site 5	10/12/2009	00:51	66	81	69	50
Site 3	10/12/2009	01:02	61	79	63	52
Site 3	11/12/2009	11:35	64	78	67	59
Site 1	11/12/2009	12:04	69	76	70	67
Site 6*	17/06/2010	15:47	57	76	58	52
Site 6*	22/06/2010	23:40	51	74	48	42
Site 6*	24/06/2010	14:31	56	80	57	49

Note * -2.5 dB façade correction applied to measurements (as per AS 1055) due to microphone placement being within 1 m of an existing reflective façade

5. Assessment criteria

Taking into account the results of the conducted noise survey the assessment criteria have been calculated based on the *NSW Industrial noise policy*. The criteria have been split into four different receiver types associated with different incident noise environments and specific requirements as shown below and in Table 4.

- Residential at Western Distributor height or higher (Site 1)
- Residential at street level and below Western Distributor height (Site 2)
- Residential west of Harris Street (excluding residences directly on Harris Street) (Site 6)
- Commercial (Site 2)

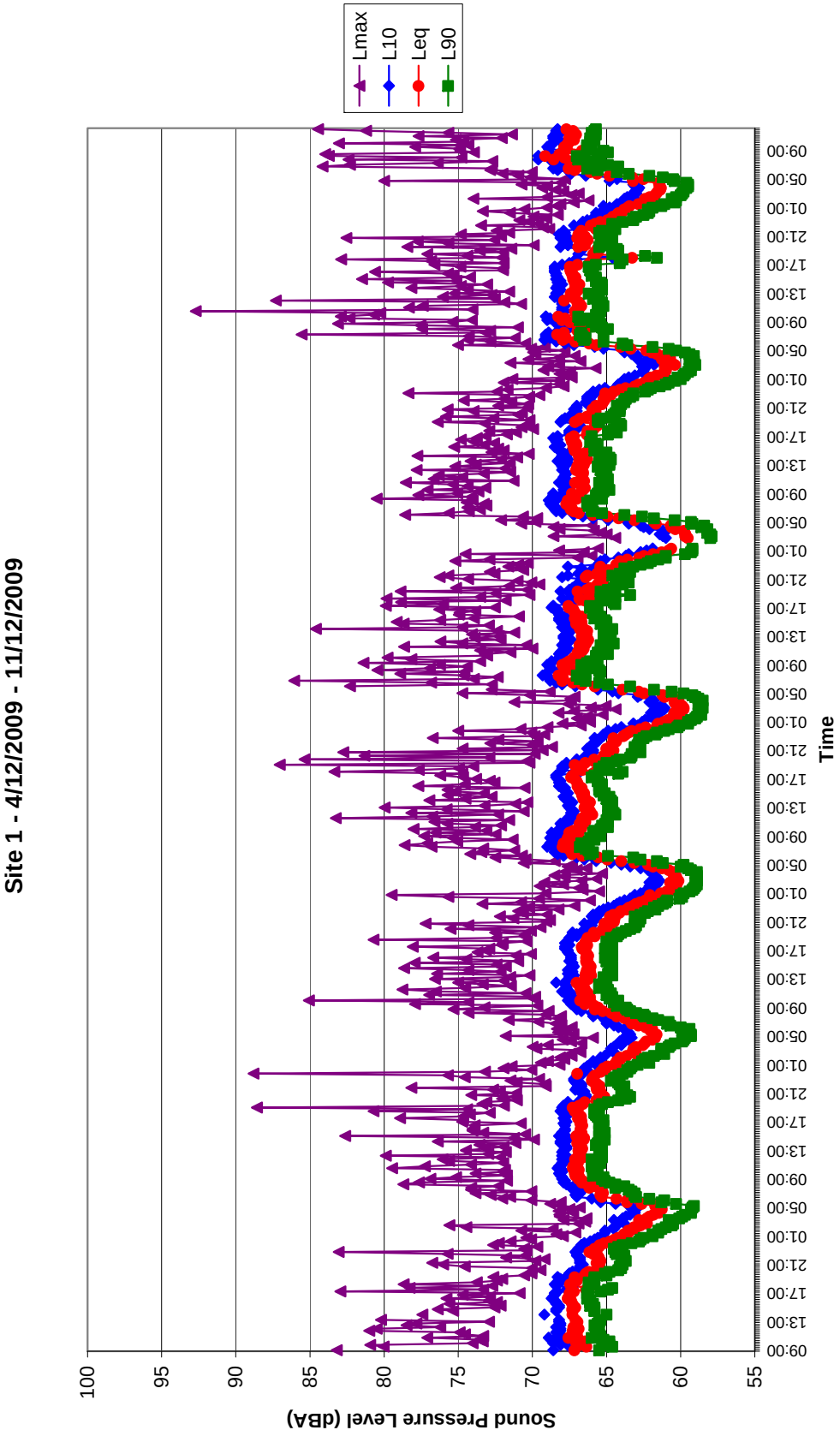
Table 4 Assessment criteria

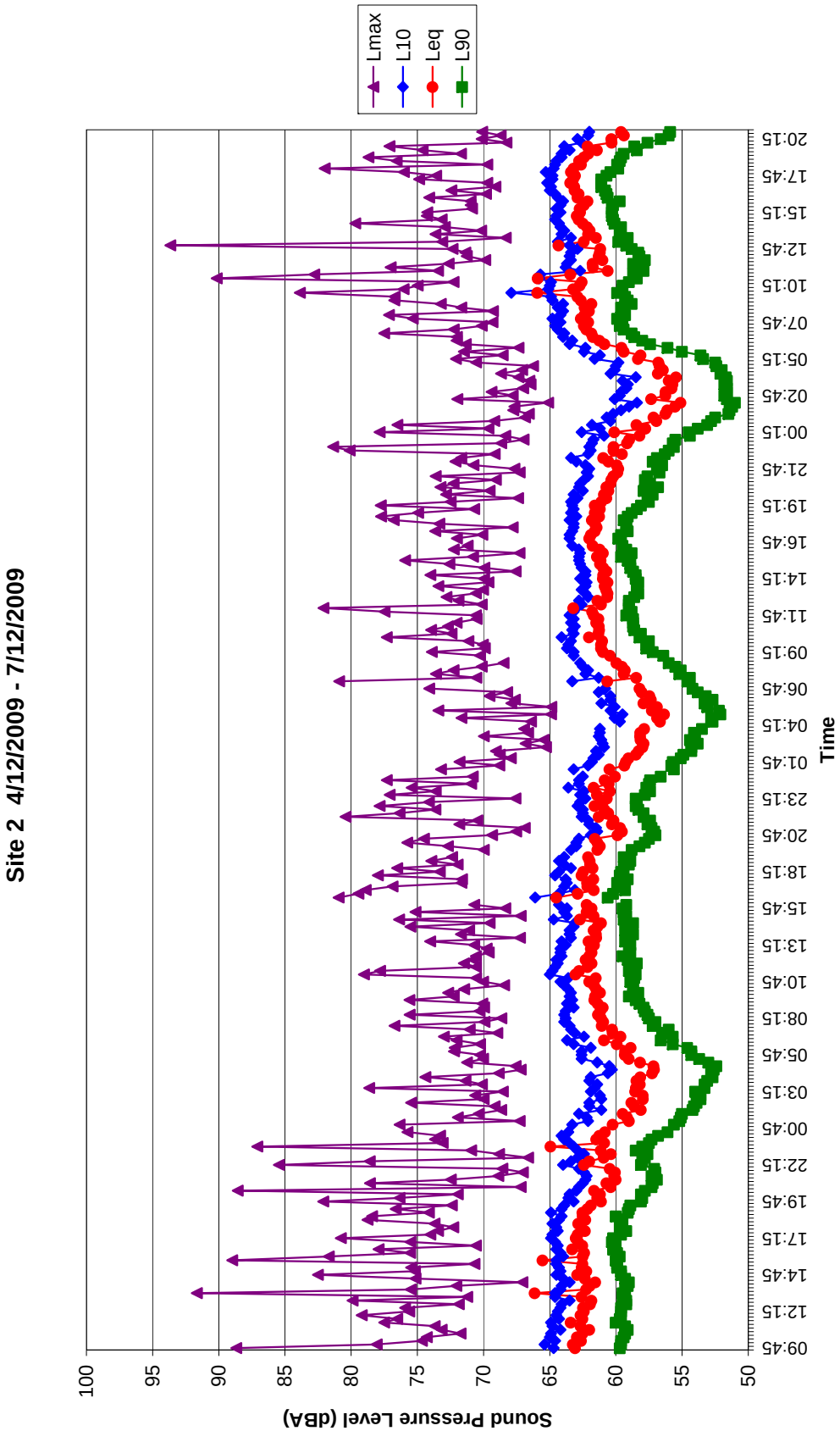
Type of receiver	Indicative noise amenity area	Time of Day	Assessment criteria ($L_{eq,\ period}$ dBA)	Criterion Type
Residential at West. Dist height or higher	Urban	Day	57	Amenity
		Evening	56	Amenity (existing traffic)
		Night	54	Amenity (existing traffic)
Residential at street level and below West. Dist height	Urban	Day	52	Amenity
		Evening	52	Amenity (existing traffic)
		Night	**49**	Amenity (existing traffic)
Residential west of Harris Street (not on Harris Street)	Urban	Day	53	Intrusive
		Evening	46	Amenity
		Night	37	Amenity
Commercial (When in use)	All	Day	62	Amenity
		Evening	62	Amenity
		Night	62	Amenity

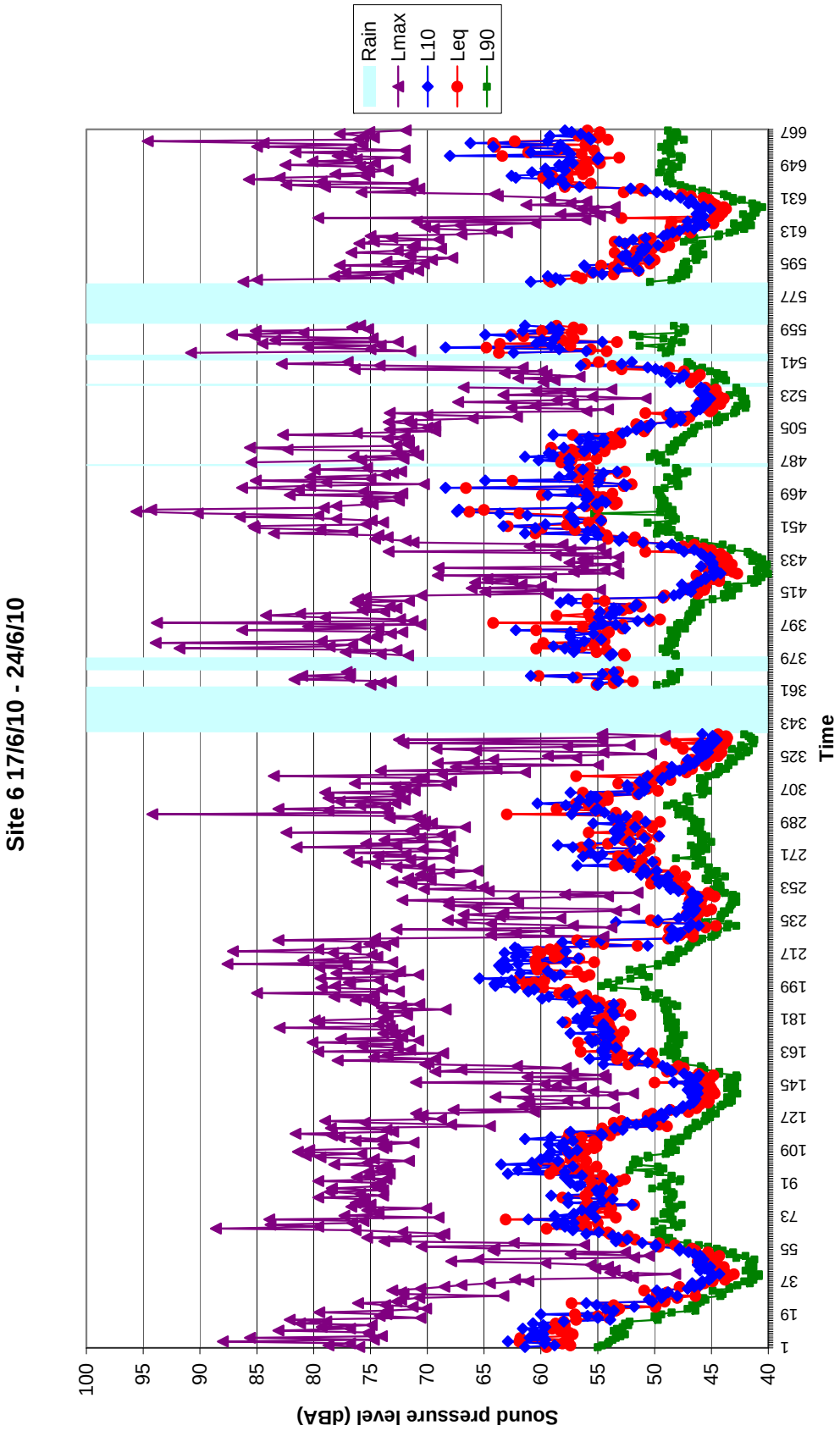
Given the 24 hour proposed operation of the development the driving project criterion is L_{eq} 49 dBA for residential receivers adjacent the site at street level and below the Western Distributor height. This will ensure compliance with the remaining assessment criteria including the residences to the west of Harris Street which will be significantly shielded from the development by the existing Global Switch 1 building.

Appendix A
Noise survey results

Appendix A


Lmax
L10
Leq
L90
Site 1 - 4/12/2009 - 11/12/2009
Sound Pressure Level (dBA)
100
95
90
85
80
75
70
65
60
55
Time
09:00
05:00
01:00
21:00
17:00
13:00


Site 2 4/12/2009 - 7/12/2009
Lmax
L10
Leq
L90
Sound Pressure Level (dBA)
100
95
90
85
80
75
70
65
60
55
50
Time
09:45
12:15
14:45
17:15
19:45
22:15
00:45
03:15
05:45
08:15
10:45
13:15
15:45
18:15
20:45
23:15
01:45
04:15
06:45
09:15
11:45
14:15
16:45
19:15
21:45
00:15
02:45
05:15
07:45
10:15
12:45
15:15
17:45
20:15


Site 6 17/6/10 - 24/6/10
Rain
Lmax
L10
Leq
L90
Sound pressure level (dBA)
100
95
90
85
80
75
70
65
60
55
50
45
40
Time
1
19
37
55
73
91
109
127
145
163
181
199
217
235
253
271
289
307
325
343
361
379
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415
433
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523
541
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595
613
631
649
667

6.6 Air Quality Response

Parsons Brinckerhoff Australia Pty Limited

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Certified to ISO 9001; ISO 14001; AS/NZS 4801

A+ GRI Rating: Sustainability Report 2009

Our reference 2117107ARevA/LT_2686/JC/ks

26 August 2010

David Guth
Property Development Manager
Asia-Pacific
Global Switch
Email: dguth@globalswitch.com.au

Dear David

Response to DECCW queries

Further to the Department of Environment, Climate Change and Water (DECCW) correspondence DOC10/15113 (dated 24 May 2010) and a further request for information following a meeting with DECCW on 12 August 2010, this report addresses the following points:

1. Confirmation of the level of ammonia (NH_3) slip and assessment of ammonia impacts from GS2 tri-generation units in accordance with the *Approved Methods for the Modelling and Assessment of Air Pollutants* DEC 2005

2. Assessment of emission performance of the back-up diesel generators at GS2 and comparison of emission concentrations to the requirements in the POEO (Clean Air) Regulation 2002

3. Assessment of NO_x, TSP, CO and SO_2 impacts during the normal operation of the tri-generation plant at GS2 and the regular testing of the back-up generators at GS1 (Scenarios A, B, C and D as per PB letter 2117107A-LT_2415/harriss:kd of 30 June 2010 and 2117107A/LT_2586/JC/ks).

4. Provide details on the frequency of maximum predicted concentrations (for NO_x only) at the nearest sensitive receptor for the preferred scenario for testing of diesel back-ups on GS2 and GS1.

The following information provides a response to the requested information:

1. Assessment of ammonia impacts and ammonia slip

Best Available Technology (BAT) will be used to control NO_x emissions. It is proposed to utilise Standard Catalytic Reduction (SCR), where ammonia is injected into the gas engine exhaust gas stream to react with the NO_x in the presence of a catalyst.

A potential air quality issue associated with SCR includes emissions of ammonia throughout the lifetime of the catalyst. This is known as ammonia slip. The proposed design criterion aims to maintain the ammonia slip as close as possible to 0 mg/m^3 (at stack conditions). As the catalyst ages, maximum ammonia emissions will remain below a maximum of 3.0 mg/m^3 (at stack conditions) during the catalyst guaranteed life expectancy of 16,000 hours.

An extract from an operation and maintenance manual for a typical SCR is attached in Enclosure A. This provides information on the operation of the SCR.

Air dispersion modelling has been undertaken to assess the impacts of ammonia emissions on the nearest sensitive receptors. Table 1 presents the modelling inputs.

Table 1 Modelling input data for SCR gas engine emission points – ammonia modelling

Parameter	Units	Gas engine emission point[1]	
Stack diameter	metres	0.9	
Release height above roof	metres	2.4	
Number of emission points	-	7[2]	2[2]
Emission temperature	kelvin	433	710
Efflux velocity	m/s	11.6	19.0
Volume flow rate at stack gas conditions	m^3/s	7.38	12.1
Maximum emission concentration at stack gas conditions	mg/m^3	3	
Ammonia mass emission at stack gas conditions	g/s	0.022	0.036
Periods of operation	-	Continuous (24 hours a day)	

Note 1: Based on data provided by Global Switch

Note 2: Locations of gas engine emission point as per PB report 2117107A/PR_5158 (February 2010)

For ease of reporting and as agreed with DECCW, the worse case location has been referenced in the prediction of NH_3 impacts from the GS2 SCR's. Table 2 presents the predicted result.

Table 2 Predicted maximum 1 hour average ammonia concentration

Parameter	Averaging period	Location	Height (m)	Predicted max. 1 hour average (µg/m^3)	Impact assessment criterion (µg/m^3)[1]
NH_3	1 hour	7	40	250.1	330

Note 1: Adopted from the *Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales, 2005*

Table 2 indicates the predicted maximum 1 hour ammonia concentration complies with the impact assessment criterion (IAC) at maximum emission concentration of 3 mg/m^3 from the 9 gas engine units.

2. Emission performance of the back-up diesel generators on GS2 for NO_2, TSP, CO and SO_2

Table 3 presents the emission performance characteristics of proposed back-up generators on GS2.

Table 3 Emission performance characteristics of GS2 diesel generators

Parameter	Units	POEO Standard of concentration[1]	Emission concentration from GS2 diesel generators[2]
Nitrogen dioxide or nitric oxide or both as nitrogen dioxide	mg/m^3	450	567
Solid particles (total)	mg/m^3	50	2.27
Carbon monoxide	mg/m^3	5,880	12.8
Sulphuric acid mist or sulphur dioxide or both as sulphur dioxide	mg/m^3	100	0.81
Temperature	K	-	790
Stack diameter	m	-	0.45
Volume flow at stack conditions	m^3/s	-	7.52

Note 1: POEO refers to Part 4 of the *Protection of the Environment Operation (Clean Air) Regulation 2002*

Note 2: Data expressed at stack conditions

With the exception of NO_x (as NO_2), emissions from the proposed diesel generators will comply with the *Protection of the Environment (Clean Air) Regulation 2002* emission concentration standards.

3. Assessment of NO_x (as NO_2), TSP, CO and SO_2 impacts

Potential NO_x (as NO_2), TSP, CO and SO_2 impacts for the emergency stand-by diesel generators at GS1 and GS2 have been assessed. The following scenarios have been modelled:

- **Scenario A)** – 9 trigen gas engines (continuous operation of GS2) and one single diesel gen set (maintenance and testing of GS2)
- **Scenario B)** – 9 trigen gas engines (continuous operation of GS2) and one single diesel gen set (maintenance and testing of GS1)
- **Scenario C)** – 9 trigen gas engines (continuous operation of GS2) and three diesel gen sets (simulated annual mains failure test of GS1)
- **Scenario D)** – 27 diesel gen sets (GS2) and 18 diesel gen sets (GS1) – network gas or electricity failure
- **Scenario E)** – 9 trigen gas engines (continuous operation of GS2) – assessment of CO impacts only.

Input data

Enclosure A presents the input data used to assess impacts for NO_x, TSP, CO and SO_2 respectively for Scenarios A, B, C, D and E.

Output data

Table 4 presents the output data for NO_x (as NO_2) for Scenarios A, B, C and D respectively.

Table 4 NO_2 predictions (including OLM method) – Scenarios A, B, C and D

Location	Height (m)	Predicted max 1-hr average NO_2	Max impact date & time	Adopted max 1-hr avg. NO_2	Adopted max. 1-hr avg. O_3	Est. of max. 1-hr NO_2 by OLM
Scenario A) – 9 tri-gen gas engines (GS2) and one single diesel gen set (maintenance and testing GS2)						
Receptor 7	40	1,857	29/11/06 @ 0400	14.4	70.6	**267.8**
Scenario B) – 9 tri-gen gas engines (operation of GS2) and one single diesel gen set (maintenance and testing of GS1)						
Receptor 7	40	1,343	29/11/06 @ 0400	14.4	70.6	**216.4**
Scenario C) – 9 tri-gen gas engines (operation of GS2) and three diesel gen sets (simulated annual mains failure test of GS1)						
Receptor 3	4.5	4,674.5	14/4/06 @ 0100	16.4	23.5	**506.4**
Scenario D) – 27 diesel gen sets (GS2) and 18 diesel gen sets (GS1) – network gas or electricity failure						
Receptor 7	40	52,552	29/11/06 @ 0400	14.4	70.6	**5,337**
1 hour NO_2 impact assessment criterion (µg/m^3)						**246**[1]

Note 1: Adopted from the *Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales, 2005*

Table 5 presents the output data for TSP, CO and SO_2 for Scenarios A, B, C and D. Table 9 also presents the predicted maximum 1 hour CO concentration for the operation of the tri-gen gas engines on GS2 only.

Table 5 Predicted maximum impacts for TSP, CO and SO_2 – Scenarios A, B, C, D and E

Parameter	Averaging period	Location	Height (m)	Predicted maximum (µg/m^3)	Impact assessment criterion (µg/m^3)[1]
Scenario A) – 9 tri-gen gas engines (GS2) and one single diesel gen set (maintenance and testing GS2)					
TSP	Annual	7	40	0.017	90
CO	1 hour	7	40	6,424	30,000
SO_2	1 hour	7	40	0.744	570
Scenario B) – 9 tri-gen gas engines (operation of GS2) and one single diesel gen set (maintenance and testing of GS1)					
TSP	Annual	7	40	0.054	90
CO	1 hour	7	40	6,413	30,000
SO_2	1 hour	7	40	1.10	570
Scenario C) – 9 tri-gen gas engines (operation of GS2) and three diesel gen sets (simulated annual mains failure test of GS1)					
TSP	Annual	7	40	0.39	90
CO	1 hour	7	40	2,676	30,000
SO_2	1 hour	3	1.5	3.44	570
Scenario D) – 27 diesel gen sets (GS2) and 18 diesel gen sets (GS1) – network gas or electricity failure					
TSP	Annual	8	15	2.13	90
CO	1 hour	7	40	1,182	30,000
SO_2	1 hour	7	40	74.7	570
Scenario E) – Trigeneration units on GS2 – operational only					
CO	1 hour	7	40	7,043	30,000

Note 1: Adopted from the *Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales, 2005*

4. Frequency of maximum predicted concentrations (for NO_x (as NO_2)) only)

Where an exceedance of the 1 hour NO_2 goal was exceeded further assessment of time based operational frequency of the diesel generators was undertaken. Scenarios A, C and D exceeded the air quality goal and therefore required further modelling refinement. Scenario D required no further assessment as the timing of a gas and electrical network failure would always be an unknown.

The following scenarios were assessed for the frequency testing of the diesel generators on GS1 and GS2 to determine compliance with the 1 hour NO_2 air quality goal.

Scenario A1) – 9 trigen gas engines (continuous operation of GS2) and one single diesel gen set (maintenance and testing of GS2) excluding the hours 0300 to 0600**.**

Scenario C1) - 9 trigen gas engines (continuous operation of GS2) and three diesel gen sets (simulated annual mains failure test of GS1) operating between the hours of 1400 and 1800 only

The results of these assessments are presented in Table 6.

Table 6: NO_2 predictions (including OLM method) – Scenarios A1 and C1

Location	Height (m)	Predicted max 1-hr average NO_2	Max impact date & time	Adopted max 1-hr avg. NO_2	Adopted max. 1-hr avg. O_3	Est. of max. 1-hr NO_2 by OLM
Scenario A1) – 9 tri-gen gas engines (GS2) and one single diesel gen set (maintenance and testing GS2) excluding the hours 0300 to 0600						
Receptor 7	40	1,337	29/11/06 @ 0400	14.4	70.6	**215.7**
Scenario C1) – 9 tri-gen gas engines (operation of GS2) and three diesel gen sets (simulated annual mains failure test of GS1) operating between the hours of 1400 and 1800 only						
Receptor 7	40	1,512	19/12/06 @ 1600	12.3	30.0	**192.3**
1 hour NO_2 impact assessment criterion ($\mu g/m^3$)						**246**

Assumptions

- The diesel generators of GS1 and GS2 are operational for 30 minutes during maintenance and testing (Scenarios A and B only).
- Updated CALMET input data adopted as described under Item 3 of PB letter report 2117107A_LT2415RevA.
- 1 hour maximum NO_2 impacts based on short duration of emergency stand-by diesel generators.
- Background maximum 1 hour NO_2 and O_3 levels (for the date and time that maximum impacts have been predicted) were sourced from NSW DECCW Air Sciences Section (Rozelle station).
- All parameters for the operation of the gas fired tri-gen units on GS2 are consistent with PB report PR_5158.
- Maximum impacts for each pollutant assessed have been referenced only in this report.

Findings

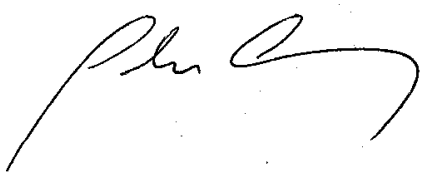
The main conclusions of the modelling assessment are as follows:

- Predicted 1 hour ammonia impacts from operation of the SCR's indicates compliance with the ammonia air quality goal.
- With the exception of NO_x (as NO_2), the emission concentrations from the proposed will comply with the emission standards of concentration as stipulated in Part 4 of the POEO Regulations 2002.
- The maximum predicted impacts of TSP (annual), CO (hourly) and SO_2 (hourly) for Scenarios A, B, C, and D are below their respective air quality goals.
- The maximum 1 hour CO impacts for Scenario E indicates compliance with the 1 hour CO air quality goal.
- The maximum predicted 1 hour NO_2 impacts for Scenario B indicates compliance with the 1 hour NO_2 air quality goal. The emergency GS1 diesel generators can be operated simultaneously to the tri-gens on GS2 at any time of the day (for 30 minutes only in each hour period).
- The maximum predicted 1 hour NO_2 impacts for Scenario A, C and D indicates non-compliance with the 1 hour NO_2 air quality goal. Further assessment for Scenarios A and C were carried out.
- For Scenario A1, compliance has been achieved for 9 trigens operating continuously (GS2) and one single gen set (operational for 30 minutes in each hour during maintenance and testing) excluding the hours 0300 to 0600 (Scenario A1 in Table 10).
- For Scenario C1, compliance can be achieved for the 1 hour NO_2 air quality goal where the 9 trigens on GS2 are operating continuously and the three diesel gen sets are operational between the hours 1400 and 1800 only (Scenario C1 in Table 10)
- The 1 hour NO_2 air quality goal is exceeded for Scenario D. This is a worst case situation where all 27 diesel gen sets on GS2 and 18 diesel gen sets on GS1 are continuously operational due to a gas and electricity failure. This Scenario is extremely unlikely to occur. To put this assertion into perspective, in the last 7.5 years, one grid event has occurred. This was a short duration event that started only four diesel gen groups for a period of 10 minutes only. The gas network in New South Wales (NSW) has never failed.

Closure

PB trusts that this document addresses the remaining DECCW requests discussed at the meeting on 12 August 2010. Due to the predicted 1 hour NO_2 exceedances for Scenarios A, C and D, it is considered that a number of conditions will need to be included within the consent to provide the regulatory authority with confidence that no adverse air quality impacts will be associated with the approval. These are likely to include a restriction on operating hours and compliance with emission standards stipulated in the POEO 2002 Regulations.

Yours sincerely



John Conway
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Parsons Brinckerhoff Australia Pty Limited

Enclosure A: Input data tables for Scenarios A, B, C, D and E
Enclosure B: Extract from SCR operation and maintenance manual
Enclosure C: Sample CALPOST output file

Table 1: Modelling input data for gas engine emission points (GS2) and diesel generator on GS2 – Scenario A

Parameter	Units	Gas engine emission point[1]		Deutz diesel generator[1, 6]
Stack diameter	metres	0.9		0.45
Release height above roof	metres	10.6		8.5
Number of emission points	-	7[2]	2[2]	1
Emission temperature	kelvin	433	710	790
Efflux velocity	m/s	11.6	19.0	47.3
Volume flow rate at stack gas conditions	m^3/s	7.38	12.1	7.52
NO_2 maximum emission concentration at stack gas conditions[3]	mg/m^3	50		567.1
NO_2 mass emission at stack gas conditions	g/s	0.37	0.60	4.26
TSP maximum emission concentration at stack gas conditions[4]	mg/m^3	-		2.27
TSP mass emission at stack gas conditions	g/s	-		0.017
CO maximum emission concentration at stack gas conditions[3]	mg/m^3	240[5]		12.8
CO mass emission at stack gas conditions	g/s	1.77	2.90	0.096
SO_2 maximum emission concentration at stack gas conditions[4]	mg/m^3	-		0.81
SO_2 mass emission at stack gas conditions	g/s	-		6.10e-3
Periods of operation	-	Continuous		30 minutes per month

Note 1: Based on data provided by Global Switch
Note 2: Locations of gas engine emission points as per PB report 2117107A/PR_5158 (February 2010)
Note 3: NO_2 and CO assessed for trigens and diesel generator emissions only
Note 4: TSP and SO_2 assessed for diesel generator emissions and assumes 90% reduction in emissions due to proposed diesel soot filter installed. 10ppm S content assuming a 100% conversion to SO_2.
Note 5: Assumed reduction of 80% due to proposed installation of catalytic convertor
Note 6: Data adopted form Deutz diesel generator specification. It is proposed to install Deutz diesel generators on GS2.

Table 2: Modelling input data for gas engine emission points (GS2) and diesel generators on GS1 – Scenarios B & C

Parameter	Units	Gas engine emission point[1]		Caterpillar Diesel generators[1]	
		Scenarios B and C		Scenario B[5]	Scenario C[5]
Stack diameter	metres	0.9		0.45	
Release height above roof	metres	8.5		1	
Number of emission points	-	7[2]	2[2]	1	3
Emission temperature	kelvin	433	710	790	
Efflux velocity	m/s	11.6	19.0	42.8	
Volume flow rate at stack gas conditions	m^3/s	7.38	12.1	6.80	
NO_2 maximum emission concentration at stack gas conditions[3]	mg/m^3	50		1028.5	
NO_2 mass emission at stack gas conditions	g/s	0.37	0.60	6.99	
TSP maximum emission concentration at stack gas conditions[4]	mg/m^3	-		0.83	
TSP mass emission at stack gas conditions	g/s	-		0.0056	
CO maximum emission concentration at stack gas conditions[3]	mg/m^3	240[6]		14.7	
CO mass emission at stack gas conditions	g/s	1.77	2.90	0.0997	
SO_2 maximum emission concentration at stack gas conditions[4]	mg/m^3	-		0.76	
SO_2 mass emission at stack gas conditions	g/s	-		5.15e-3	
Periods of operation	-	Continuous		30 minutes per month	Continuous

Note 1: Based on data provided by Global Switch
Note 2: Locations of gas engine emission points as per PB report 2117107A/PR_5158 (February 2010)
Note 3: NO_2 and CO assessed for tri-gens and diesel generator emissions only

Note 4: TSP and SO_2 assessed for diesel generator emissions only and assumes 90% reduction in emissions due to diesel soot filter installed. 10ppm S content assuming a 100% conversion to SO_2.
Note 5: Data adopted from Caterpillar diesel generator specification . Worst case NO_2 emission modelled
Note 6: Assumed reduction of 80% due to proposed installation of catalytic convertor

Table 3: Model input data for diesel generators on GS1 & GS2 – Scenario D

Parameter	Units	Deutz diesel generator on GS2[1]	Deutz diesel generators on GS1[1, 2]	Caterpillar diesel generators on GS1[1, 3]
Stack diameter	metres	0.45	0.45	
Release height above roof	metres	8.5	1	
Number of emission points	-	27	12	6
Emission temperature	kelvin	790	790	
Efflux velocity	m/s	47.3	47.3	42.8
Volume flow rate at stack gas conditions	m^3/s	7.52	7.52	6.80
NO_2 maximum emission concentration at stack gas conditions	mg/m^3	567.1	567.1	1028.5
NO_2 mass emission at stack gas conditions	g/s	4.26	4.26	6.99
TSP maximum emission concentration at stack gas conditions[4]	mg/m^3	2.27	2.27	0.83
TSP mass emission at stack gas conditions	g/s	0.017	0.017	0.0056
CO maximum emission concentration at stack gas conditions[4]	mg/m^3	12.8	12.8	14.7
CO mass emission at stack gas conditions	g/s	0.096	0.096	0.0997
SO_2 maximum emission concentration at stack gas conditions[5]	mg/m^3	0.81	0.76	0.76
SO_2 mass emission at stack gas conditions	g/s	6.10e-3	5.70e-3	5.15e-3
Periods of operation	-	Continuous		

Note 1: Based on data provided by Global Switch
Note 2: Data adopted from Deutz diesel generators
Note 3: Data adopted from Caterpillar diesel generators

Note 4: Reduction of 90% emissions due to diesel soot filter installed
Note 5: 10ppm S content assuming a 100% conversion to SO_2.

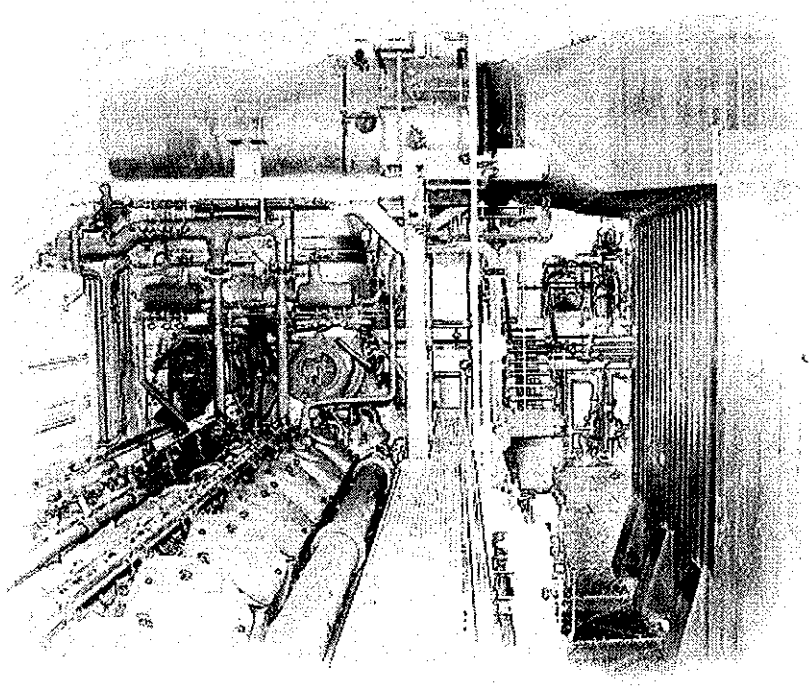
Table 4: Model input data for tri-gen gas engines on GS2 – Scenario E[2]

Parameter	Units	Gas engine emission point	
Number of emission points	-	7[1]	2[1]
CO maximum emission concentration at stack gas conditions	mg/m^3	240	
CO mass emission at stack gas conditions	g/s	1.77	2.90

Note 1: Locations of gas engine emission points as per PB report 2117107A/PR_5158 (February 2010)
Note 2: All other emission characteristics remain unchanged for the tri-gen units

Operation / Installation / Commissioning and maintenance (O&M) – Manual

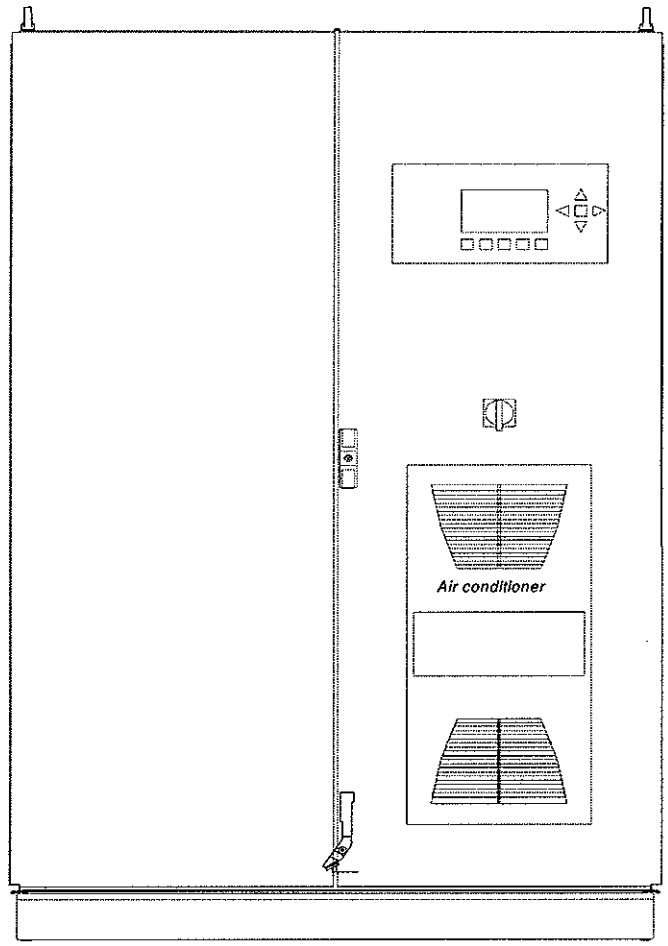
H+H SCR Systems
Stationary Application



Designed and delivered by
H+H Umwelt- und Industriettechnik GmbH
Lindenstrasse 12a, D-55595 Hargesheim

Project no° PN11511a
16.07.2009

7.4. SCR-Cabinet with Analyzer



Characteristics

This device measures the NOx concentration on the outlet side of the catalyzer.
Each engine with operational SCR system will be monitored for 15 minutes (this time is adjustable by SCR control cabinet +0CBC10). The choice which engine will be measured is an automatic process also controlled by the SCR control cabinet.

The main function of the combined control and regulation system of the SCR plant is to keep the NOx emission behind the exhaust gas purification plant below a given nominal value - approx. 80 - 99 % of the admissible emission limit.
For this purpose, the functional relation between the NOx emission, the resulting reducing agent flow and the load of the engine is recorded in the digital control system (PLC) as an operational characteristic (polygon). With this operational

characteristic, a delay-free pre-dosing of the reducing agent is carried out depending on the load.
In addition, a close loop control compares the reducing agent flow measured with the recorded nominal value of the reducing agent need, which depends on the load. Using a digital/analogous transformer, the output of the controller is transformed into an analogous signal (4...20mA).
In the emission measuring system the NO clean gas concentration is continuously recorded as additional control value. Depending on the deviation between the control value and the nominal value, the processor determines the reducing agent volume to be injected into the exhaust gas.
By means of the operational characteristic, a rapid pre-dosing of the reducing agent is possible. Furthermore, the additional loop to control the NO clean gas concentration minimizes the reducing agent consumption by precise dosing at any time of operation and independent from the catalyst age.

The reducing agent dosing system is released

- once the engine is started and
- once the lower limit temperature for the catalyst elements is reached and
- once the limit of minimum request of urea is reached

The technical equipment of the regulation system includes the following control and safety functions:

- Evaluation of the NO signal of the gas analyzer
- Release of urea dosing process after system check
- Pre-dosing of urea by operational characteristic control
- Control of the reducing agent flow
- Precise dosing of urea by NO-control
- Control of all security functions and of operational readiness of supply unit

The switch board permits easy control and operation of the fully automatic plant operation by means of the following equipment

- Menu-Controlled Adjustment of Parameters
  The operational parameters of the plant can be adjusted without modifying the program. This also applies to the assignment of the plant performance, the nominal reducing agent flow and the specific adjustment of the flow control system. In this connection, the display and input is graphically and/or numerically.

- Password Protection for Service Staff
  The parameterized functions are protected by passwords and are only accessible to service staff or authorized operators. On-site program modifications e.g. for parameterising the control system are not required.

- Display Disturbance Message
  All fault or disturbance signals are displayed. In addition collective disturbance messages are announced made by means of a signal lamp.

```
*************************************************************************
*********************************************************
                                          CALPOST  Version 6.223
Level 080924
*************************************************************************
*********************************************************




 Internal Coordinate Transformations by  ---  COORDLIB   Version: 1.99
Level: 070921



  Run Title:
     NOA



 ------------------------------------------------------------------------
--------

 INPUT GROUP: 1 -- General run control parameters
 --------------

      Option to run all periods found
      in the met. file(s)  (METRUN)        Default: 0   ! METRUN =   1  !

          METRUN = 0 - Run period explicitly defined below
          METRUN = 1 - Run all periods in CALPUFF data file(s)

      Starting date:    Year   (ISYR)  --    No default   ! ISYR  =  2006
!
                        Month  (ISMO)  --    No default   ! ISMO  =  0  !
                        Day    (ISDY)  --    No default   ! ISDY  =  0  !
      Starting time:    Hour   (ISHR)  --    No default   ! ISHR  =  0  !
                        Minute (ISMIN) --    No default   ! ISMIN =  0  !
                        Second (ISSEC) --    No default   ! ISSEC =  0  !

      Ending date:      Year   (IEYR)  --    No default   ! IEYR  =  0  !
                        Month  (IEMO)  --    No default   ! IEMO  =  0  !
                        Day    (IEDY)  --    No default   ! IEDY  =  0  !
      Ending time:      Hour   (IEHR)  --    No default   ! IEHR  =  0  !
                        Minute (IEMIN) --    No default   ! IEMIN =  0  !
                        Second (IESEC) --    No default   ! IESEC =  0  !

      (These are only used if METRUN = 0)

      All times are in the base time zone of the CALPUFF simulation.
      CALPUFF Dataset Version 2.1 contains the zone, but earlier versions
      do not, and the zone must be specified here.  The zone is the
      number of hours that must be ADDED to the time to obtain UTC (or
GMT).
      Identify the Base Time Zone for the CALPUFF simulation
                               (BTZONE) -- No default   ! BTZONE = -10.0
!
```

```
      Process every period of data?
                              (NREP) -- Default: 1   ! NREP  =  1  !
       (1 = every period processed,
        2 = every 2nd period processed,
        5 = every 5th period processed, etc.)

 Species & Concentration/Deposition Information
 ----------------------------------------------

       Species to process (ASPEC)       -- No default   ! ASPEC = NOA  !
       (ASPEC = VISIB for visibility processing)

       Layer/deposition code (ILAYER)   -- Default: 1   ! ILAYER =  1  !
         '1'  for CALPUFF concentrations,
         '-1' for dry deposition fluxes,
         '-2' for wet deposition fluxes,
         '-3' for wet+dry deposition fluxes.

       Scaling factors of the form:     -- Defaults:    ! A =  0.0    !
             X(new) = X(old) * A + B         A = 0.0    ! B =  0.0    !
         (NOT applied if A = B = 0.0)        B = 0.0

       Add Hourly Background Concentrations/Fluxes?
                             (LBACK)  -- Default: F   ! LBACK =  F !


       Source of NO2 when ASPEC=NO2 (above) or LVNO2=T (Group 2) may be
       from CALPUFF NO2 concentrations OR from a fraction of CALPUFF NOx
       concentrations.  Specify the fraction of NOx that is treated as
NO2
       either as a constant or as a table of fractions that depend on the
       magnitude of the NOx concentration:
                             (NO2CALC) -- Default: 1   ! NO2CALC =   1
!
          0 =  Use NO2 directly (NO2 must be in file)
          1 =  Specify a single NO2/NOx ratio (RNO2NOX)
          2 =  Specify a table NO2/NOx ratios (TNO2NOX)
               (NOTE: Scaling Factors must NOT be used with NO2CALC=2)

       Single NO2/NOx ratio (0.0 to 1.0) for treating some
       or all NOx as NO2, where [NO2] = [NOX] * RNO2NOX
       (used only if NO2CALC = 1)
                             (RNO2NOX) -- Default: 1.0 ! RNO2NOX = 1.0 !

       Table of NO2/NOx ratios that vary with NOx concentration.
       Provide 14 NOx concentrations (ug/m**3) and the corresponding
       NO2/NOx ratio, with NOx increasing in magnitude.  The ratio used
       for a particular NOx concentration is interpolated from the values
       provided in the table.  The ratio for the smallest tabulated NOx
       concentration (the first) is used for all NOx concentrations less
       than the smallest tabulated value, and the ratio for the largest
       tabulated NOx concentration (the last) is used for all NOx
       concentrations greater than the largest tabulated value.
       (used only if NO2CALC = 2)

        NOx concentration(ug / m3)
                             (CNOX)    -- No default
          ! CNOX = 1.0, 2.0, 3.0, 4.0, 5.0, 6.0, 7.0,
```

```
                  8.0, 9.0, 10.0, 11.0, 12.0, 13.0, 14.0 !

       NO2/NOx ratio for each NOx concentration:
                           (TNO2NOX) -- No default
         ! TNO2NOX = 1.0, 1.0, 1.0, 1.0, 1.0, 1.0, 1.0,
                     1.0, 1.0, 1.0, 1.0, 1.0, 1.0, 1.0 !


 Source information
 ------------------

   Option to process source contributions:
          0 =  Process only total reported contributions
          1 =  Sum all individual source contributions and process
          2 =  Run in TRACEBACK mode to identify source
               contributions at a SINGLE receptor
                           (MSOURCE) -- Default: 0   ! MSOURCE =  0  !


 Plume Model Output Processing Options
 -------------------------------------

   Output from models other than CALPUFF and CALGRID can be written in
   the CONC.DAT format and processed by CALPOST.  Plume models such as
   AERMOD typically do not treat CALM hours, and do not include such
hours
   in multiple-hour averages, with specific rules about how many calm
hours
   can be removed from an average.  This treatment is known as CALM
   PROCESSING.  Calm periods are identified from wind speeds in the
   meteorological data file for the application, which must be identified
   in Input Group 0 as the single-point meteorological data file MET1DAT.
          0 =  Option is not used for CALPUFF/CALGRID output files
          1 =  Apply CALM processing procedures to multiple-hour averages
                          (MCALMPRO) -- Default: 0   ! MCALMPRO =  0  !

   Format of Single-point Met File
          1 =  AERMOD/AERMET SURFACE file
                           (MET1FMT) -- Default: 1   ! MET1FMT =  1  !


 Receptor information
 --------------------

   Gridded receptors processed?    (LG) -- Default: F   ! LG  = F  !
   Discrete receptors processed?   (LD) -- Default: F   ! LD  = T  !
   CTSG Complex terrain receptors processed?
                                  (LCT) -- Default: F   ! LCT = F  !

 --Report results by DISCRETE receptor RING?
   (only used when LD = T)     (LDRING) -- Default: F   ! LDRING = F  !

 --Select range of DISCRETE receptors (only used when LD = T):

   Select ALL DISCRETE receptors by setting NDRECP flag to -1;
                                OR
   Select SPECIFIC DISCRETE receptors by entering a flag (0,1) for each
      0 = discrete receptor not processed
```

```
     1 = discrete receptor processed
  using repeated value notation to select blocks of receptors:
     23*1, 15*0, 12*1
  Flag for all receptors after the last one assigned is set to 0
  (NDRECP) -- Default: -1
                                              ! NDRECP =  -1  !


 --Select range of GRIDDED receptors (only used when LG = T):

       X index of LL corner (IBGRID) -- Default: -1     ! IBGRID = -1  !
           (-1 OR 1 <= IBGRID <= NX)

       Y index of LL corner (JBGRID) -- Default: -1     ! JBGRID = -1  !
           (-1 OR 1 <= JBGRID <= NY)

       X index of UR corner (IEGRID) -- Default: -1     ! IEGRID = -1  !
           (-1 OR 1 <= IEGRID <= NX)

       Y index of UR corner (JEGRID) -- Default: -1     ! JEGRID = -1  !
           (-1 OR 1 <= JEGRID <= NY)

  Note: Entire grid is processed if IBGRID=JBGRID=IEGRID=JEGRID=-1


 --Specific gridded receptors can also be excluded from CALPOST
  processing by filling a processing grid array with 0s and 1s.  If the
  processing flag for receptor index (i,j) is 1 (ON), that receptor
  will be processed if it lies within the range delineated by IBGRID,
  JBGRID,IEGRID,JEGRID and if LG=T. If it is 0 (OFF), it will not be
  processed in the run.  By default, all array values are set to 1 (ON).

  Number of gridded receptor rows provided in Subgroup (1a) to
  identify specific gridded receptors to process
                          (NGONOFF) -- Default: 0      ! NGONOFF =  0
!

 !END!


 --------------
 Subgroup (1a) -- Specific gridded receptors included/excluded
 --------------

    Specific gridded receptors are excluded from CALPOST processing
    by filling a processing grid array with 0s and 1s.  A total of
    NGONOFF lines are read here.  Each line corresponds to one 'row'
    in the sampling grid, starting with the NORTHERNMOST row that
    contains receptors that you wish to exclude, and finishing with
    row 1 to the SOUTH (no intervening rows may be skipped).  Within
    a row, each receptor position is assigned either a 0 or 1,
    starting with the westernmost receptor.
       0 = gridded receptor not processed
       1 = gridded receptor processed

    Repeated value notation may be used to select blocks of receptors:
       23*1, 15*0, 12*1
```

```
     Because all values are initially set to 1, any receptors north of
     the first row entered, or east of the last value provided in a row,
     remain ON.

     (NGXRECP) -- Default: 1


 ---------------------------------------------------------------------------
-------

 INPUT GROUP: 2 -- Visibility Parameters (ASPEC = VISIB)
 --------------

     Test visibility options specified to see
     if they conform to FLAG 2008 configuration?
                          (MVISCHECK) -- Default: 1   ! MVISCHECK =   1
!
          0 =  NO checks are made
          1 =  Technical options must conform to FLAG 2008 visibility
guidance
                ASPEC = VISIB
                LVNO2 = T
                NO2CALC = 1
                RNO2NOX = 1.0
                MVISBK = 8
                M8_MODE = 5

     Some of the data entered for use with the FLAG 2008 configuration
     are specific to the Class I area being evaluated. These values can
     be checked within the CALPOST user interface when the name of the
     Class I area is provided.

     Name of Class I Area (used for QA purposes only)
                           (AREANAME) -- Default: User  ! AREANAME =
USER !

     Particle growth curve f(RH) for hygroscopic species
                               (MFRH) -- Default: 4   ! MFRH   =  4  !

          1 =  IWAQM (1998) f(RH) curve (originally used with MVISBK=1)
          2 =  FLAG (2000) f(RH) tabulation
          3 =  EPA (2003) f(RH) tabulation
          4 =  IMPROVE (2006) f(RH) tabulations for sea salt, and for
small and
               large SULFATE and NITRATE particles;
               Used in Visibility Method 8 (MVISBK = 8 with M8_MODE = 1,
2, or 3)

     Maximum relative humidity (%) used in particle growth curve
                               (RHMAX) -- Default: 98  ! RHMAX  = 98 !

     Modeled species to be included in computing the light extinction
      Include SULFATE?          (LVSO4) -- Default: T   ! LVSO4  = T  !
      Include NITRATE?          (LVNO3) -- Default: T   ! LVNO3  = T  !
      Include ORGANIC CARBON?   (LVOC)  -- Default: T   ! LVOC   = T  !
      Include COARSE PARTICLES? (LVPMC) -- Default: T   ! LVPMC  = T  !
      Include FINE PARTICLES?   (LVPMF) -- Default: T   ! LVPMF  = T  !
      Include ELEMENTAL CARBON? (LVEC)  -- Default: T   ! LVEC   = T  !
```

```
      Include NO2 absorption?   (LVNO2) -- Default: F   ! LVNO2  = T  !
               With Visibility Method 8 -- Default: T
                                        FLAG (2008)

     And, when ranking for TOP-N, TOP-50, and Exceedance tables,
      Include BACKGROUND?       (LVBK)  -- Default: T   ! LVBK   = T  !

     Species name used for particulates in MODEL.DAT file
                    COARSE    (SPECPMC) -- Default: PMC ! SPECPMC = PMC !
                    FINE      (SPECPMF) -- Default: PMF ! SPECPMF = PMF !

 Extinction Efficiency (1/Mm per ug/m**3)
 ---------------------------------------
     MODELED particulate species:
                PM  COARSE      (EEPMC) -- Default: 0.6   ! EEPMC  = 0.6
!
                PM  FINE        (EEPMF) -- Default: 1.0   ! EEPMF  = 1 !
     BACKGROUND particulate species:
                PM  COARSE    (EEPMCBK) -- Default: 0.6   ! EEPMCBK = 0.6
!
     Other species:
               AMMONIUM SULFATE (EESO4) -- Default: 3.0   ! EESO4  = 3 !
               AMMONIUM NITRATE (EENO3) -- Default: 3.0   ! EENO3  = 3 !
               ORGANIC CARBON   (EEOC)  -- Default: 4.0   ! EEOC   = 4 !
               SOIL             (EESOIL)-- Default: 1.0   ! EESOIL = 1 !
               ELEMENTAL CARBON (EEEC)  -- Default: 10.   ! EEEC   = 10 !
               NO2 GAS          (EENO2) -- Default: .1755 ! EENO2  =
0.1755 !
     Visibility Method 8:
               AMMONIUM SULFATE (EESO4S)   Set Internally (small)
               AMMONIUM SULFATE (EESO4L)   Set Internally (large)
               AMMONIUM NITRATE (EENO3S)   Set Internally (small)
               AMMONIUM NITRATE (EENO3L)   Set Internally (large)
               ORGANIC CARBON   (EEOCS)    Set Internally (small)
               ORGANIC CARBON   (EEOCL)    Set Internally (large)
               SEA SALT         (EESALT)   Set Internally

 Background Extinction Computation
 ---------------------------------

     Method used for the 24h-average of percent change of light
extinction:
     Hourly ratio of source light extinction / background light
extinction
     is averaged?              (LAVER) -- Default: F   ! LAVER = F  !


     Method used for background light extinction
                               (MVISBK) -- Default: 8   ! MVISBK =  8  !
                                        FLAG (2008)

          1 =  Supply single light extinction and hygroscopic fraction
               - Hourly F(RH) adjustment applied to hygroscopic
background
                 and modeled sulfate and nitrate
          2 =  Background extinction from speciated PM concentrations (A)
               - Hourly F(RH) adjustment applied to observed and modeled
sulfate
```

```
                and nitrate
             - F(RH) factor is capped at F(RHMAX)
          3 =  Background extinction from speciated PM concentrations (B)
             - Hourly F(RH) adjustment applied to observed and modeled
sulfate
                and nitrate
             - Receptor-hour excluded if RH>RHMAX
             - Receptor-day excluded if fewer than 6 valid receptor-
hours
          4 =  Read hourly transmissometer background extinction
measurements
             - Hourly F(RH) adjustment applied to modeled sulfate and
nitrate
             - Hour excluded if measurement invalid (missing,
interference,
                or large RH)
             - Receptor-hour excluded if RH>RHMAX
             - Receptor-day excluded if fewer than 6 valid receptor-
hours
          5 =  Read hourly nephelometer background extinction
measurements
             - Rayleigh extinction value (BEXTRAY) added to measurement
             - Hourly F(RH) adjustment applied to modeled sulfate and
nitrate
             - Hour excluded if measurement invalid (missing,
interference,
                or large RH)
             - Receptor-hour excluded if RH>RHMAX
             - Receptor-day excluded if fewer than 6 valid receptor-
hours
          6 =  Background extinction from speciated PM concentrations
             - FLAG (2000) monthly RH adjustment factor applied to
observed and
                and modeled sulfate and nitrate
          7 =  Use observed weather or prognostic weather information for
             background extinction during weather events; otherwise,
use Method 2
             - Hourly F(RH) adjustment applied to modeled sulfate and
nitrate
             - F(RH) factor is capped at F(RHMAX)
             - During observed weather events, compute Bext from visual
range
                if using an observed weather data file, or
             - During prognostic weather events, use Bext from the
prognostic
                weather file
             - Use Method 2 for hours without a weather event
          8 =  Background extinction from speciated PM concentrations
using
             the IMPROVE (2006) variable extinction efficiency
formulation
             (MFRH must be set to 4)
             - Split between small and large particle concentrations of
                SULFATES, NITRATES, and ORGANICS is a function of
concentration
                and different extinction efficiencies are used for each
             - Source-induced change in visibility includes the
increase in
```

```
                  extinction of the background aerosol due to the change
in the
                  extinction efficiency that now depends on total
concentration.
                - Fsmall(RH) and Flarge(RH) adjustments for small and
large
                  particles are applied to observed and modeled sulfate
and
                  nitrate concentrations
                - Fsalt(RH) adjustment for sea salt is applied to
background
                  sea salt concentrations
                - F(RH) factors are capped at F(RHMAX)
                - RH for Fsmall(RH), Flarge(RH), and Fsalt(RH) may be
obtained
                  from hourly data as in Method 2 or from the FLAG monthly
RH
                  adjustment factor used for Method 6 where EPA F(RH)
tabulation
                  is used to infer RH, or monthly Fsmall, Flarge, and
Fsalt RH
                  adjustment factors can be directly entered.
                  Furthermore, a monthly RH factor may be applied to
either hourly
                  concentrations or daily concentrations to obtain the 24-
hour
                  extinction.
                  These choices are made using the M8_MODE selection.

     Additional inputs used for MVISBK = 1:
     -------------------------------------
      Background light extinction (1/Mm)
                             (BEXTBK) -- No default   ! BEXTBK = 0 !
      Percentage of particles affected by relative humidity
                             (RHFRAC) -- No default   ! RHFRAC = 0 !

     Additional inputs used for MVISBK = 6,8:
     ---------------------------------------
      Extinction coefficients for hygroscopic species (modeled and
      background) are computed using a monthly RH adjustment factor
      in place of an hourly RH factor (VISB.DAT file is NOT needed).
      Enter the 12 monthly factors here (RHFAC).  Month 1 is January.

      (RHFAC)  -- No default     ! RHFAC = 0, 0, 0, 0,
                                           0, 0, 0, 0,
                                           0, 0, 0, 0 !

     Additional inputs used for MVISBK = 7:
     -------------------------------------
      The weather data file (DATSAV abbreviated space-delimited) that
      is identified as VSRN.DAT may contain data for more than one
      station.  Identify the stations that are needed in the order in
      which they will be used to obtain valid weather and visual range.
      The first station that contains valid data for an hour will be
      used.  Enter up to MXWSTA (set in PARAMS file) integer station IDs
      of up to 6 digits each as variable IDWSTA, and enter the
corresponding
      time zone for each, as variable TZONE (= UTC-LST).
```

```
      A prognostic weather data file with Bext for weather events may be
used
      in place of the observed weather file.  Identify this as the
VSRN.DAT
      file and use a station ID of IDWSTA = 999999, and TZONE = 0.

      NOTE:  TZONE identifies the time zone used in the dataset.  The
             DATSAV abbreviated space-delimited data usually are prepared
             with UTC time rather than local time, so TZONE is typically
             set to zero.

      (IDWSTA)   -- No default   * IDWSTA = 000000 *
      (TZONE)    -- No default   * TZONE =      0. *

     Additional inputs used for MVISBK = 2,3,6,7,8:
     ---------------------------------------------
      Background extinction coefficients are computed from monthly
      CONCENTRATIONS of ammonium sulfate (BKSO4), ammonium nitrate
(BKNO3),
      coarse particulates (BKPMC), organic carbon (BKOC), soil (BKSOIL),
and
      elemental carbon (BKEC).  Month 1 is January.
      (ug/m**3)

      (BKSO4)  -- No default     ! BKSO4 = 0, 0, 0, 0,
                                           0, 0, 0, 0,
                                           0, 0, 0, 0 !
      (BKNO3)  -- No default     ! BKNO3 = 0, 0, 0, 0,
                                           0, 0, 0, 0,
                                           0, 0, 0, 0 !
      (BKPMC)  -- No default     ! BKPMC = 0, 0, 0, 0,
                                           0, 0, 0, 0,
                                           0, 0, 0, 0 !
      (BKOC)   -- No default     ! BKOC  = 0, 0, 0, 0,
                                           0, 0, 0, 0,
                                           0, 0, 0, 0 !
      (BKSOIL) -- No default     ! BKSOIL= 0, 0, 0, 0,
                                           0, 0, 0, 0,
                                           0, 0, 0, 0 !
      (BKEC)   -- No default     ! BKEC  = 0, 0, 0, 0,
                                           0, 0, 0, 0,
                                           0, 0, 0, 0 !

     Additional inputs used for MVISBK = 8:
     --------------------------------------
      Extinction coefficients for hygroscopic species (modeled and
      background) may be computed using hourly RH values and hourly
      modeled concentrations, or using monthly RH values inferred from
      the RHFAC adjustment factors and either hourly or daily modeled
      concentrations, or using monthly RHFSML, RHFLRG, and RHFSEA
adjustment
      factors and either hourly or daily modeled concentrations.

      (M8_MODE) -- Default: 5     ! M8_MODE=  5   !
                   FLAG (2008)

           1 = Use hourly RH values from VISB.DAT file with hourly
```

```
               modeled and monthly background concentrations.
           2 = Use monthly RH from monthly RHFAC and EPA (2003) f(RH)
tabulation
               with hourly modeled and monthly background concentrations.
               (VISB.DAT file is NOT needed).
           3 = Use monthly RH from monthly RHFAC with EPA (2003) f(RH)
tabulation
               with daily modeled and monthly background concentrations.
               (VISB.DAT file is NOT needed).
           4 = Use monthly RHFSML, RHFLRG, and RHFSEA with hourly modeled
               and monthly background concentrations.
               (VISB.DAT file is NOT needed).
           5 = Use monthly RHFSML, RHFLRG, and RHFSEA with daily modeled
               and monthly background concentrations.
               (VISB.DAT file is NOT needed).

      Background extinction coefficients are computed from monthly
      CONCENTRATIONS of sea salt (BKSALT).  Month 1 is January.
      (ug/m**3)

      (BKSALT) -- No default     ! BKSALT= 0, 0, 0, 0,
                                           0, 0, 0, 0,
                                           0, 0, 0, 0 !

      Extinction coefficients for hygroscopic species (modeled and
      background) can be computed using monthly RH adjustment factors
      in place of an hourly RH factor (VISB.DAT file is NOT needed).
      Enter the 12 monthly factors here (RHFSML,RHFLRG,RHFSEA).
      Month 1 is January.  (Used if M8_MODE = 4 or 5)

      Small ammonium sulfate and ammonium nitrate particle sizes
      (RHFSML) -- No default     ! RHFSML= 0, 0, 0, 0,
                                           0, 0, 0, 0,
                                           0, 0, 0, 0 !

      Large ammonium sulfate and ammonium nitrate particle sizes
      (RHFLRG) -- No default     ! RHFLRG= 0, 0, 0, 0,
                                           0, 0, 0, 0,
                                           0, 0, 0, 0 !

      Sea salt particles
      (RHFSEA) -- No default     ! RHFSEA= 0, 0, 0, 0,
                                           0, 0, 0, 0,
                                           0, 0, 0, 0 !

     Additional inputs used for MVISBK = 2,3,5,6,7,8:
     -----------------------------------------------
      Extinction due to Rayleigh scattering is added (1/Mm)
                             (BEXTRAY) -- Default: 10.0 ! BEXTRAY = 10 !

 !END!
 ------------------------------------------------------------------------
-------

 INPUT GROUP: 3 -- Output options
 --------------

 Documentation
```

```
------------

    Documentation records contained in the header of the
    CALPUFF output file may be written to the list file.
    Print documentation image?
                               (LDOC) -- Default: F   !  LDOC = F !

Output Units
------------
    Units for All Output       (IPRTU) -- Default: 1   ! IPRTU =  3   !
                    for            for
                Concentration    Deposition
       1 =         g/m**3         g/m**2/s
       2 =        mg/m**3        mg/m**2/s
       3 =        ug/m**3        ug/m**2/s
       4 =        ng/m**3        ng/m**2/s
       5 =      Odour Units

    Visibility: extinction expressed in 1/Mega-meters (IPRTU is ignored)


Averaging time(s) reported
--------------------------

    1-pd averages           (L1PD) -- Default: T   !   L1PD = F  !
    (pd = averaging period of model output)

    1-hr averages           (L1HR) -- Default: T   !   L1HR = T  !

    3-hr averages           (L3HR) -- Default: T   !   L3HR = F  !

    24-hr averages         (L24HR) -- Default: T   !  L24HR = F  !

    Run-length averages    (LRUNL) -- Default: T   !  LRUNL = F  !

    User-specified averaging time in hours, minutes, seconds
    - results for this averaging time are reported if it is not zero

                           (NAVGH) -- Default: 0   !   NAVGH =  0  !
                           (NAVGM) -- Default: 0   !   NAVGM =  0  !
                           (NAVGS) -- Default: 0   !   NAVGS =  0  !


Types of tabulations reported
-----------------------------

   1) Visibility: daily visibility tabulations are always reported
                  for the selected receptors when ASPEC = VISIB.
                  In addition, any of the other tabulations listed
                  below may be chosen to characterize the light
                  extinction coefficients.
                  [List file or Plot/Analysis File]


   2) Top 50 table for each averaging time selected
      [List file only]
                           (LT50) -- Default: T   !   LT50 = T  !
```

```
3) Top 'N' table for each averaging time selected
   [List file or Plot file]
                      (LTOPN) -- Default: F   !  LTOPN = T  !

     -- Number of 'Top-N' values at each receptor
        selected (NTOP must be <= 4)
                       (NTOP) -- Default: 4   ! NTOP =  2   !

     -- Specific ranks of 'Top-N' values reported
        (NTOP values must be entered)
              (ITOP(4) array) -- Default:     ! ITOP =  1 , 2   !
                                 1,2,3,4


4) Threshold exceedance counts for each receptor and each averaging
   time selected
   [List file or Plot file]
                      (LEXCD) -- Default: F   !  LEXCD = F  !

     -- Identify the threshold for each averaging time by assigning a
        non-negative value (output units).

                               -- Default: -1.0
        Threshold for  1-hr averages   (THRESH1) !  THRESH1 = -1.0  !
        Threshold for  3-hr averages   (THRESH3) !  THRESH3 = -1.0  !
        Threshold for 24-hr averages  (THRESH24) ! THRESH24 = -1.0  !
        Threshold for NAVG-hr averages (THRESHN) !  THRESHN = -1.0  !


     -- Counts for the shortest averaging period selected can be
        tallied daily, and receptors that experience more than NCOUNT
        counts over any NDAY period will be reported.  This type of
        exceedance violation output is triggered only if NDAY > 0.

        Accumulation period(Days)
                        (NDAY) -- Default: 0   !    NDAY =  0  !
        Number of exceedances allowed
                      (NCOUNT) -- Default: 1   !  NCOUNT =  1  !


5) Selected day table(s)

   Echo Option -- Many records are written each averaging period
   selected and output is grouped by day
   [List file or Plot file]
                      (LECHO) -- Default: F   !  LECHO = F  !

   Timeseries Option -- Averages at all selected receptors for
   each selected averaging period are written to timeseries files.
   Each file contains one averaging period, and all receptors are
   written to a single record each averaging time.
   [TSERIES_ASPEC_ttHR_CONC_TSUNAM.DAT files]
                      (LTIME) -- Default: F   !  LTIME = F  !

   Peak Value Option -- Averages at all selected receptors for
   each selected averaging period are screened and the peak value
   each period is written to timeseries files.
   Each file contains one averaging period.
```

```
      [PEAKVAL_ASPEC_ttHR_CONC_TSUNAM.DAT files]
                          (LPEAK) -- Default: F   !  LPEAK = F  !

        -- Days selected for output
                     (IECHO(366)) -- Default: 366*0
           ! IECHO  = 366*0  !
           (366 values must be entered)
```

Plot output options

Plot files can be created for the Top-N, Exceedance, and Echo tables selected above. Two formats for these files are available, DATA and GRID. In the DATA format, results at all receptors are listed along with the receptor location [x,y,val1,val2,...]. In the GRID format, results at only gridded receptors are written, using a compact representation. The gridded values are written in rows (x varies), starting with the most southern row of the grid. The GRID format is given the .GRD extension, and includes headers compatible with the SURFER(R) plotting software.

A plotting and analysis file can also be created for the daily peak visibility summary output, in DATA format only.

Generate Plot file output in addition to writing tables to List file?

```
                               (LPLT) -- Default: F   ! LPLT  = F !
```

Use GRID format rather than DATA format, when available?

```
                               (LGRD) -- Default: F   ! LGRD  = F !
```

Auxiliary Output Files (for subsequent analyses)

Visibility

A separate output file may be requested that contains the change in visibility at each selected receptor when ASPEC = VISIB. This file can be processed to construct visibility measures that are not available in CALPOST.

Output file with the visibility change at each receptor?

```
                              (MDVIS) -- Default: 0   ! MDVIS  =  0  !
```

- 0 = Do Not create file
- 1 = Create file of DAILY (24 hour) Delta-Deciview
- 2 = Create file of DAILY (24 hour) Extinction Change (%)
- 3 = Create file of HOURLY Delta-Deciview
- 4 = Create file of HOURLY Extinction Change (%)

Additional Debug Output

Output selected information to List file for debugging?

```
                              (LDEBUG) -- Default: F  ! LDEBUG  = F !

   Output hourly extinction information to REPORT.HRV?
    (Visibility Method 7)
                              (LVEXTHR) -- Default: F  ! LVEXTHR = F !

 !END!

 ------------------------------------------------
 NOTICE: Starting year in control file sets the
         expected century for the simulation.  All
         YY years are converted to YYYY years in
         the range:  1956 2055
 ------------------------------------------------


**********************************************************************
******************************************************
                                            CALPOST  Version 6.223
Level 080924
**********************************************************************
******************************************************




  CALPOST Control File Input Summary -------------------------

     Replace run data with data in Puff file 1=Y:    1
                       Run starting date -- year: 2006
                                            month:    0
                                              day:    0
                                       Julian day:    0
             Time at start of run  -  hour(0-23):    0
                                   -      minute:    0
                                   -      second:    0

                          Run ending date -- year:    0
                                            month:    0
                                              day:    0
                                       Julian day:    0
               Time at end of run  -  hour(0-23):    0
                                   -      minute:    0
                                   -      second:    0


                         Base time zone (Group 1): -10.0

 Every period of data processed -- NREP = 1


  Species & Concentration/Deposition Information
                                         Species: NOA
                          Layer of processed data:    1
    (>0=conc, -1=dry flux, -2=wet flux, -3=wet & dry flux)
                    Multiplicative scaling factor: 0.0000E+00
                          Additive scaling factor: 0.0000E+00
                   Hourly background values used?: F
```

SAMPLER option

Processing method: 0

0= SAMPLER option not used

1= Report total modeled impact (list file)

2= TRACEBACK mode (DAT files)

3= TRACEBACK mode with sampling factor (DAT files)

Source information

Source contribution processing: 0

0= No source contributions

1= Contributions are summed

2= TRACEBACK mode for 1 receptor

3= Reported TOTAL is processed

Receptor information

Gridded receptors processed?: F

Discrete receptors processed?: T

CTSG Complex terrain receptors processed?: F

Discrete Receptors Processed

(All Discrete Receptors are Used)

Visibility Processing is NOT Selected

Output options

Units requested for output: (ug/m**3)

Averaging time(s) selected

User-specified averaging time (hr:mm:ss): 0: 0: 0

1-pd averages: F

1-hr averages: T

3-hr averages: F

24-hr averages: F

User-specified averages: F

Length of run averages: F

Output components selected

Top-50: T

Top-N values at each receptor: T

Exceedance counts at each receptor: F

Output selected information for debugging: F

Echo tables for selected days: F

Time-series for selected days: F

Peak value Time-series for selected days: F

Top "n" table control

Number of "top" values at each receptor: 2

Specific ranks of "top" values reported: 1 2

```
  Plot file option
                            Plot files created:     F

 MAPSPEC:  Species Mapping
   Number of species-levels in file  :  1
   Number of species-levels processed:  2

   Input ID  Processing ID     Name
       1           1          NOA           1

      Visibility Species
             Processing ID     Name
no2gas            2          NO2           1



 IDENTIFICATION OF PROCESSED MODEL FILE ----------

 CALPUFF     6.263       080827

 NOA



 Averaging time for values reported from model:
       1    HOUR

 Number of averaging periods in file from model:
       8760

 Chemical species names for each layer in model:
 NOA           1



 QA Information -- Internal Representation of Data

 CONTENTS OF CONTROL FILE ------------------------
  METRUN              = 1
      (so times in model output file are used)
  isyr,ismo,isdy      = 2006 1 1
  ishr,ismin,issec    = 0 0 0
  ieyr,iemo,iedy      = 2007 1 1
  iehr,iemin,iesec    = 0 0 0
  nper                = 8760
  aspec,ilayer        =NOA          1
  asplv               =NOA           1
  NO2CALC             = 1
     RNO2NOX          = 1.00000000
  MSOURCE             = 0
  MCALMPRO            = 0
  MET1FMT             = 1
  LG,LD,LCT,LDRING    = F T F F
  IBGRID,IEGRID       = -1 -1
  JBGRID,JEGRID       = -1 -1
  NDRECP              =
-1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0
```

```
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
 a,b,LSCALE          = 0.00000000E+00 0.00000000E+00 F
 LBACK               = F
 MVISBK              = 8
 MVISCHECK           = 1
 AREANAME            =USER
 MFRH                = 4
 RHMAX,BEXTRAY       = 98.0000000 10.0000000
 RHFRAC,BEXTBK       = 0.00000000E+00 0.00000000E+00
 LVSO4,LVNO3,LVNO2   = T T T
 LVOC,LVEC           = T T
 LVPMC,LVPMF,LVBK    = T T T
 SPECPMC,SPECPMF     =PMC         PMF
 EEPMC,EEPMF,EEPMCBK = 0.600000024 1.00000000 0.600000024
 EESO4,EENO3,EEOC    = 3.00000000 3.00000000 4.00000000
 EESO4S,EENO3S,EEOCS = 2.20000005 2.40000010 2.79999995
 EESO4L,EENO3L,EEOCL = 4.80000019 5.09999990 6.09999990
 EESOIL,EEEC,EENO2   = 1.00000000 10.0000000 0.175500005
 navg,ntop           = 0 2
 navgh,navgm,navgs   = 0 0 0
 itop = 1 2
 L[1,3,24]HR         = T F F
 LNAVG, LRUNL        = F F
 LT50, LTOPN, LEXCD  = T T F
 LECHO, LTIME, LPEAK = F F F
 THRESH1             = -1.00000000
 THRESH3             = -1.00000000
 THRESH24            = -1.00000000
 THRESHN             = -1.00000000
 LPLT, LGRD          = F F
 MDVIS               = 0
 LDEBUG              = F
 LCTSG               = F

CONTENTS OF HEADER OF MODEL OUTPUT FILE ---------
 model :   CALPUFF     6.263       080827
 msyr,mjsday      = 2006 1
 mshr,mssec       = 0 0
 nsecdt (period)  = 3600
 xbtz             = -10.0000000
 mnper,nszout,mavgpd = 8760 1 1
 xorigkm,yorigkm,nssta =  1674.00012 -900.000061 0
 ielmet,jelmet = 14 14
 delx,dely,nz = 1.00000000 1.00000000 1
 iastar,iastop,jastar,jastop = 1 14 1 14
 isastr,isastp,jsastr,jsastp = 1 14 1 14
 (computed) ngx,ngy  = 14 14
 meshdn,npts,nareas  = 1 10 0
 nlines,nvols        = 0 0
 ndrec,nctrec,LSGRID = 57 0 F

Discrete Receptors (n,x,y,z):
1 1681.34900 -893.437134 17.0000000
2 1681.34900 -893.437134 17.0000000
3 1681.36169 -893.433472 17.0000000
4 1681.36169 -893.433472 17.0000000
5 1681.36926 -893.431335 14.0000000
6 1681.36914 -893.431335 14.0000000
```

```
 7 1681.37769 -893.428955 14.0000000
 8 1681.37817 -893.428955 14.0000000
 9 1681.38806 -893.425659 11.8000002
10 1681.38806 -893.425659 11.8000002
11 1681.38806 -893.425659 11.8000002
12 1681.40479 -893.419983 11.8000002
13 1681.40479 -893.419983 11.8000002
14 1681.40479 -893.419983 11.8000002
15 1681.31238 -893.449768 17.0000000
16 1681.31213 -893.449768 17.0000000
17 1681.32935 -893.444580 17.0000000
18 1681.32935 -893.444580 17.0000000
19 1681.28821 -893.457031 17.0000000
20 1681.28809 -893.457031 17.0000000
21 1681.29541 -893.454773 17.0000000
22 1681.29541 -893.454773 17.0000000
23 1681.30603 -893.430847 17.0000000
24 1681.32214 -893.416443 17.0000000
25 1681.33386 -893.240479 9.00000000
26 1681.33411 -893.240479 9.00000000
27 1681.33411 -893.240051 9.00000000
28 1681.33411 -893.240051 9.00000000
29 1681.33411 -893.240051 9.00000000
30 1681.33411 -893.240051 9.00000000
31 1681.33411 -893.240051 9.00000000
32 1681.33411 -893.240051 9.00000000
33 1681.34412 -893.240051 9.00000000
34 1681.36328 -893.231384 9.00000000
35 1681.36316 -893.231079 9.00000000
36 1681.36316 -893.231079 9.00000000
37 1681.36316 -893.231079 9.00000000
38 1681.36316 -893.231079 9.00000000
39 1681.36316 -893.231079 9.00000000
40 1681.36316 -893.231079 9.00000000
41 1681.36316 -893.231079 9.00000000
42 1681.36316 -893.231079 9.00000000
43 1681.29248 -893.253662 11.6000004
44 1681.29211 -893.254089 11.6000004
45 1681.29211 -893.254089 11.6000004
46 1681.29211 -893.254089 11.6000004
47 1681.31372 -893.245544 11.6000004
48 1681.31409 -893.246033 11.6000004
49 1681.31409 -893.246033 11.6000004
50 1681.31409 -893.246033 11.6000004
51 1681.25793 -893.239075 12.0000000
52 1681.25793 -893.239075 12.0000000
53 1681.25793 -893.239075 12.0000000
54 1681.32104 -893.414551 16.5000000
55 1681.32104 -893.414551 16.5000000
56 1681.28296 -893.293945 16.5000000
57 1681.28296 -893.293945 16.5000000

 Control-file POINT Sources :  10
 EMARB-file POINT Sources   :  0
 Control-file AREA Sources  :  0
 EMARB-file AREA Sources    :  0
 Control-file LINE Sources  :  0
 EMARB-file LINE Sources    :  0
```

```
 Control-file VOLUME Sources:  0
 EMARB-file VOLUME Sources  :  0

 Source Names
D1
G1
G2
G3
G4
G5
G6
G7
G8
G9



 **************    NOTICE    **************
 NDRECP array reset to full range: all 1s


 ------------------------------------------------------------------------
----------------------------------------------------------
          INPUT FILES

 Default Name     Unit No.     File Name and Path
 ------------     --------     ------------------
  CALPOST.INP         5        C:\CALPUFF\MODELL~1\GS\CALPOST1.INP
    MODEL.DAT         4        C:\CALPUFF\MODELL~1\GS\CALPUFF1.CON


 ------------------------------------------------------------------------
----------------------------------------------------------
          OUTPUT FILES

 Default Name     Unit No.     File Name and Path
 ------------     --------     ------------------
  CALPOST.LST         8        CALPOST1.LST

************************************************************************
**********************************************************
                                            CALPOST  Version 6.223
Level 080924
************************************************************************
**********************************************************


                          NOA           1

             TOP-50    1   HOUR AVERAGE  CONCENTRATION VALUES  (ug/m**3)

    STARTING YEAR  DAY TIME(HHMM) RECEPTOR  TYPE   CONCENTRATION
COORDINATES (km)

             2006  333    0400    (  0,  42)  D     1.8570E+03
1681.363  -893.231
```

```
            2006   66    0300    (  0,  42)  D     8.5056E+02
1681.363  -893.231
            2006   49    0300    (  0,  33)  D     8.4593E+02
1681.344  -893.240
            2006  358    0300    (  0,  42)  D     7.9912E+02
1681.363  -893.231
            2006  266    1100    (  0,  42)  D     6.5012E+02
1681.363  -893.231
            2006  333    0400    (  0,  41)  D     6.3622E+02
1681.363  -893.231
            2006  316    2300    (  0,  42)  D     6.3243E+02
1681.363  -893.231
            2006  266    1100    (  0,  33)  D     6.2123E+02
1681.344  -893.240
            2006   83    2100    (  0,  33)  D     6.0408E+02
1681.344  -893.240
            2006  125    2100    (  0,  42)  D     5.6421E+02
1681.363  -893.231
            2006  333    0400    (  0,  33)  D     5.3976E+02
1681.344  -893.240
            2006  345    2200    (  0,  33)  D     5.1987E+02
1681.344  -893.240
            2006  266    1100    (  0,  41)  D     5.1934E+02
1681.363  -893.231
            2006  298    1100    (  0,  42)  D     5.0007E+02
1681.363  -893.231
            2006  357    2100    (  0,  34)  D     4.8924E+02
1681.363  -893.231
            2006  357    2100    (  0,  37)  D     4.8526E+02
1681.363  -893.231
            2006  357    2100    (  0,  36)  D     4.8497E+02
1681.363  -893.231
            2006  357    2100    (  0,  35)  D     4.8490E+02
1681.363  -893.231
            2006  345    2200    (  0,  42)  D     4.8030E+02
1681.363  -893.231
            2006  331    1000    (  0,  42)  D     4.6783E+02
1681.363  -893.231
            2006  357    2100    (  0,  39)  D     4.5119E+02
1681.363  -893.231
            2006  357    2100    (  0,  38)  D     4.4748E+02
1681.363  -893.231
            2006   73    0100    (  0,  33)  D     4.3506E+02
1681.344  -893.240
            2006  357    2000    (  0,  38)  D     4.1788E+02
1681.363  -893.231
            2006  357    2000    (  0,  37)  D     4.1337E+02
1681.363  -893.231
            2006  357    2000    (  0,  36)  D     4.1116E+02
1681.363  -893.231
            2006  357    2000    (  0,  34)  D     4.1115E+02
1681.363  -893.231
            2006  357    2000    (  0,  35)  D     4.1016E+02
1681.363  -893.231
            2006   66    0300    (  0,  41)  D     4.0172E+02
1681.363  -893.231
            2006  266    1100    (  0,  40)  D     3.9999E+02
1681.363  -893.231
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              2006  357    2100    (  0,  26)  D     3.6837E+02
1681.334  -893.240
              2006  333    0300    (  0,  42)  D     3.6813E+02
1681.363  -893.231
              2006  357    2100    (  0,  30)  D     3.6805E+02
1681.334  -893.240
              2006  357    2100    (  0,  29)  D     3.6804E+02
1681.334  -893.240
              2006  357    2100    (  0,  28)  D     3.6804E+02
1681.334  -893.240
              2006  357    2100    (  0,  27)  D     3.6804E+02
1681.334  -893.240
              2006  357    2100    (  0,  25)  D     3.6706E+02
1681.334  -893.240
              2006  336    0300    (  0,  33)  D     3.6653E+02
1681.344  -893.240
              2006   49    0300    (  0,  32)  D     3.6245E+02
1681.334  -893.240
              2006  199    2200    (  0,  42)  D     3.6001E+02
1681.363  -893.231
              2006  291    0500    (  0,  20)  D     3.5913E+02
1681.288  -893.457
              2006  291    0500    (  0,  19)  D     3.5858E+02
1681.288  -893.457
              2006  266    1100    (  0,  32)  D     3.5560E+02
1681.334  -893.240
              2006  357    2000    (  0,  39)  D     3.5507E+02
1681.363  -893.231
              2006  357    1900    (  0,  33)  D     3.5243E+02
1681.344  -893.240
              2006   31    1200    (  0,  42)  D     3.3884E+02
1681.363  -893.231
              2006  291    0500    (  0,  22)  D     3.3722E+02
1681.295  -893.455
              2006  291    0500    (  0,  21)  D     3.3661E+02
1681.295  -893.455
              2006  357    2100    (  0,  40)  D     3.3589E+02
1681.363  -893.231
              2006  357    2100    (  0,  31)  D     3.3137E+02
1681.334  -893.240

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                                            CALPOST  Version 6.223
Level 080924
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                                                      NOA           1

 2 RANKED     1   HOUR AVERAGE  CONCENTRATION VALUES AT EACH DISCRETE
RECEPTOR  (YEAR,DAY,START TIME)   (ug/m**3)

RECEPTOR     COORDINATES (km)             1 RANK                    2
RANK
      1     1681.349  -893.437   2.4555E+02 (2006,173,0300)  2.2284E+02
(2006,171,2200)
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      2     1681.349  -893.437   2.4499E+02 (2006,173,0300)  2.2287E+02
(2006,171,2200)
      3     1681.362  -893.433   2.6123E+02 (2006,173,0300)  2.2587E+02
(2006,171,2200)
      4     1681.362  -893.433   2.6061E+02 (2006,173,0300)  2.2590E+02
(2006,171,2200)
      5     1681.369  -893.431   2.6372E+02 (2006,173,0300)  2.2235E+02
(2006,103,2300)
      6     1681.369  -893.431   2.6300E+02 (2006,173,0300)  2.2204E+02
(2006,103,2300)
      7     1681.378  -893.429   2.7250E+02 (2006,173,0300)  2.4516E+02
(2006,103,2300)
      8     1681.378  -893.429   2.7222E+02 (2006,173,0300)  2.4649E+02
(2006,103,2300)
      9     1681.388  -893.426   2.7643E+02 (2006,173,0300)  2.6657E+02
(2006,103,2300)
     10     1681.388  -893.426   2.7579E+02 (2006,173,0300)  2.6663E+02
(2006,103,2300)
     11     1681.388  -893.426   2.7472E+02 (2006,173,0300)  2.6671E+02
(2006,103,2300)
     12     1681.405  -893.420   2.8852E+02 (2006,173,0300)  2.8114E+02
(2006,103,2300)
     13     1681.405  -893.420   2.8781E+02 (2006,173,0300)  2.8116E+02
(2006,103,2300)
     14     1681.405  -893.420   2.8662E+02 (2006,173,0300)  2.8121E+02
(2006,103,2300)
     15     1681.312  -893.450   3.0998E+02 (2006,022,0500)  2.7280E+02
(2006,022,0300)
     16     1681.312  -893.450   3.1127E+02 (2006,022,0500)  2.7809E+02
(2006,022,0300)
     17     1681.329  -893.445   2.2020E+02 (2006,173,0300)  2.0759E+02
(2006,171,2200)
     18     1681.329  -893.445   2.1973E+02 (2006,173,0300)  2.0762E+02
(2006,171,2200)
     19     1681.288  -893.457   3.5858E+02 (2006,291,0500)  2.7584E+02
(2006,022,0500)
     20     1681.288  -893.457   3.5913E+02 (2006,291,0500)  2.7608E+02
(2006,022,0500)
     21     1681.295  -893.455   3.3661E+02 (2006,291,0500)  2.9189E+02
(2006,022,0500)
     22     1681.295  -893.455   3.3722E+02 (2006,291,0500)  2.9277E+02
(2006,022,0500)
     23     1681.306  -893.431   2.0925E+02 (2006,171,2200)  2.0284E+02
(2006,022,0500)
     24     1681.322  -893.416   2.4165E+02 (2006,171,2200)  2.0922E+02
(2006,173,0300)
     25     1681.334  -893.240   3.6706E+02 (2006,357,2100)  2.7098E+02
(2006,357,2000)
     26     1681.334  -893.240   3.6837E+02 (2006,357,2100)  2.7231E+02
(2006,357,2000)
     27     1681.334  -893.240   3.6804E+02 (2006,357,2100)  2.7154E+02
(2006,357,2000)
     28     1681.334  -893.240   3.6804E+02 (2006,357,2100)  2.7154E+02
(2006,357,2000)
     29     1681.334  -893.240   3.6804E+02 (2006,357,2100)  2.7154E+02
(2006,357,2000)
     30     1681.334  -893.240   3.6805E+02 (2006,357,2100)  2.7154E+02
(2006,357,2000)
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     31     1681.334  -893.240   3.3137E+02 (2006,357,2100)  2.6937E+02
(2006,266,1100)
     32     1681.334  -893.240   3.6245E+02 (2006,049,0300)  3.5560E+02
(2006,266,1100)
     33     1681.344  -893.240   8.4593E+02 (2006,049,0300)  6.2123E+02
(2006,266,1100)
     34     1681.363  -893.231   4.8924E+02 (2006,357,2100)  4.1115E+02
(2006,357,2000)
     35     1681.363  -893.231   4.8490E+02 (2006,357,2100)  4.1016E+02
(2006,357,2000)
     36     1681.363  -893.231   4.8497E+02 (2006,357,2100)  4.1116E+02
(2006,357,2000)
     37     1681.363  -893.231   4.8526E+02 (2006,357,2100)  4.1337E+02
(2006,357,2000)
     38     1681.363  -893.231   4.4748E+02 (2006,357,2100)  4.1788E+02
(2006,357,2000)
     39     1681.363  -893.231   4.5119E+02 (2006,357,2100)  3.5507E+02
(2006,357,2000)
     40     1681.363  -893.231   3.9999E+02 (2006,266,1100)  3.3589E+02
(2006,357,2100)
     41     1681.363  -893.231   6.3622E+02 (2006,333,0400)  5.1934E+02
(2006,266,1100)
     42     1681.363  -893.231   1.8570E+03 (2006,333,0400)  8.5056E+02
(2006,066,0300)
     43     1681.292  -893.254   2.6752E+02 (2006,011,1300)  2.1461E+02
(2006,172,0600)
     44     1681.292  -893.254   2.6626E+02 (2006,011,1300)  2.1430E+02
(2006,172,0600)
     45     1681.292  -893.254   2.6627E+02 (2006,011,1300)  2.2036E+02
(2006,336,0400)
     46     1681.292  -893.254   2.6628E+02 (2006,011,1300)  2.3890E+02
(2006,336,0400)
     47     1681.314  -893.246   2.7562E+02 (2006,011,1300)  2.3082E+02
(2006,172,0600)
     48     1681.314  -893.246   2.7506E+02 (2006,011,1300)  2.3090E+02
(2006,172,0600)
     49     1681.314  -893.246   2.7507E+02 (2006,011,1300)  2.3394E+02
(2006,172,0600)
     50     1681.314  -893.246   2.7509E+02 (2006,011,1300)  2.3725E+02
(2006,172,0600)
     51     1681.258  -893.239   1.9281E+02 (2006,172,0600)  1.7329E+02
(2006,336,0400)
     52     1681.258  -893.239   1.9307E+02 (2006,172,0600)  1.7296E+02
(2006,336,0400)
     53     1681.258  -893.239   1.9351E+02 (2006,172,0600)  1.7240E+02
(2006,336,0400)
     54     1681.321  -893.415   2.4063E+02 (2006,171,2200)  2.0596E+02
(2006,173,0300)
     55     1681.321  -893.415   2.4069E+02 (2006,171,2200)  2.0551E+02
(2006,173,0300)
     56     1681.283  -893.294   2.0249E+02 (2006,173,1600)  1.9127E+02
(2006,126,1300)
     57     1681.283  -893.294   2.0304E+02 (2006,173,1600)  1.9178E+02
(2006,126,1300)

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CALPOST Version 6.223

Level 080924

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SUMMARY SECTION

NOA 1

(ug/m**3)

RECEPTOR FOR RANK	COORDINATES (km) FOR AVERAGE PERIOD		TYPE	PEAK (YEAR,DAY,START TIME)
42	1681.363	-893.231	DISCRETE	1.8570E+03 (2006,333,0400)
RANK 1	1	HOUR		
42	1681.363	-893.231	DISCRETE	8.5056E+02 (2006,066,0300)
RANK 2	1	HOUR		

6.7 Community Consultation Services Letter

id planning
Suite 407, Level 4, 460 Pacific Highway St Leonards NSW 2065
PO Box 1406, Lane Cove NSW 1595
T: 02 9460 8500 F: 02 9460 8533
www.idplanning.com.au
ABN 95 092 969 643

dem
Level 8, 15 Help Street
Chatswood
NSW 1515

13 July 2010

Dear Simon

Re: Community consultation undertaken in relation to the proposed building of a second data centre at 400 Harris Street, Ultimo

Id Planning was engaged by dem to provide community consultation services with the aims of identifying and resolving community issues, and ensuring that there were opportunities for the community to provide their views, comments and feedback in response to the proposal. The consultation period commenced in December 2009 and concluded in early April 2010.

Residents in the vicinity of the site were initially notified by a letter-box drop carried out on the 21st of December, 2009. The letter was delivered to 200 residents in the area bounded by Bellevue, Pyrmont and Harris streets and the Western Distributor.

Id Planning then undertook to exhibit two A3 panels showing an artist's impression of the proposal at appropriate venues in the area. Of the three we approached, the Ultimo Community Centre and the Ian Thorpe Aquatic Centre were helpful and obliging. The third option, Bullecourt Apartments, did not respond to repeated phone calls and email requests. The strata title manager, Tony Forshew was contacted on the 11th of February and again on the 17th, and two telephone messages were left in the interim. His assistant advised that he would respond by the close of business on the 17th, but he did not. This meant that the panels could not be displayed in the foyer of the apartments, and also that there was no access to the individual post boxes of the residents of these apartments. The panels were displayed at the former two centres from the 24th of February until the 5th of March, 2010.

On the 24th of March an Id Planning representative hand-delivered 200 flyers, accompanied by explanatory letters, to the residents, again in the area bounded by Bellevue, Pyrmont and Harris streets, and the Western Distributor.

Community action groups representing the Pyrmont/Ultimo area were identified and were notified about the proposal and display venues, and contact details were given in the event that recipients had questions. Contact was made with groups including the Pyrmont Action Group, the Ultimo Village Voice, and the Pyrmont Community Group. A representative from the Ultimo Village Voice forwarded the notification to the Council of Pyrmont and Ultimo Associations as well.

In response to the notifications, a number of residents, and group representatives, emailed or telephoned Id Planning with questions and comments. Due to the high demand for further consultation, a meeting with representatives from dem was arranged. The briefing took place on the 18th of March from 4.30pm and was attended by representatives from the Pyrmont Action Group and the Ultimo Village Voice, as well as independent community consultants, the proponents, dem and Aurecon. A range of questions and issues were posed by the groups, and these were responded to either at the briefing, or a short while later by an email circulated to all attendees.

In conclusion, we are confident that every reasonable effort was made to notify the greatest number of potentially affected stakeholders possible, and to then meet with their requests, answer their questions and address their problems.

Yours sincerely

Denise Wilson (Director)