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Belmore Park Zone Substation and Commercial Development

Project Environmental Assessment

December 2008

Prepared for

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Certification of Environmental Assessment Report

Submission of Environmental Assessment

Prepared under the Environmental Planning and Assessment Act 1979

Environmental assessment prepared by:

Name	Julian Ardas
Qualifications	BSc (Hons) Applied Economic Geography UNSW 1986, Master of Urban & Regional Planning USyd 1993.
Address	PlanCom Consulting Pty Ltd Suite 13, 12A Springfield Mall Potts Point NSW 2011
In respect of	Belmore Park Zone Substation and stub tunnel/132kV cable connection from the site to the City South Cable Tunnel located beneath Campbell Street Haymarket – (Application Number: MP08-0075)

Project to which Part 3A applies

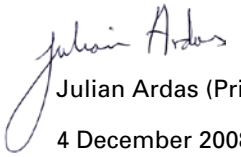
Applicant name	Craig Moody
Applicant address	EnergyAustralia Pty Ltd 570 George Street SYDNEY NSW 2000
Land to be developed	430-450 Pitt St, Sydney (cnr Pitt / Hay & Campbell Sts) Lot 1/DP 844119, Lot 1/DP 1109323 & Lot 2/DP 1109323
Proposed development	Infrastructure for electricity distribution

Environmental assessment An environmental assessment is attached

Certificate

I certify that I have prepared the contents of this document and to the best of my knowledge:

- it is in accordance with the requirements of Part 3A;
- it contains all available information that is relevant to the environmental assessment of the development to which it relates; and
- the information contained in the document is neither false nor misleading.

Signature 

Name Julian Ardas (Principal, PlanCom Consulting Pty Ltd)

Date 4 December 2008

Abbreviations and Glossary

Term	Definition
Adit	An almost horizontal entrance to a tunnel
ABGR	Australian Building Greenhouse Rating
AER	Australian Energy Regulator
AHD	Australian Height Datum
ANZECC	Australian and New Zealand Environment Conservation Council
ARPANSA	Australian Radiation Protection and Nuclear Safety Agency
Belmore Park Zone Substation	Belmore Park Zone Substation Project – an element of the Sydney CityGrid Project
Belmore Park Site	The proposed site for the Belmore Park Zone Substation development including commercial component.
Boreholes	Holes drilled into the earth, to enable building construction or geological testing
BS	British Standard
Bulk Supply Point (BSP)	A vital step in the transmission of electricity is decreasing the transmission line voltage using transformers. This is performed at a large substation called a Bulk Supply Point owned and operated in NSW by TransGrid.
Busbar	A system of conductors in a substation on which power is concentrated for distribution.
Capacitor	An electrical device consisting of two conducting surfaces separated by an insulator. Capacitors have the ability to store electric charge
CBD	Central Business District
Centrifugal Fan	Centrifugal fans operate on the principle of "throwing" air away from the blade tips. This design is most often used for aeration applications where high airflow rates and high static pressures are required.
CEMP	Construction Environmental Management Plan

Term	Definition
Circuit breaker	A switch with the ability to break the flow of electric current. Often used when a circuit becomes overloaded or otherwise abnormally stressed
City East Zone Substation	City East Zone Substation – an element of the Sydney CityGrid Project
CSCT	City South Cable Tunnel
CSCT stub tunnel	A section of tunnel (approximately 12 metres) to connect the existing CSCT with the new Belmore Park Zone Substation.
CTMP	Construction Traffic Management Plan
DECC	Department of Environment and Climate Change
DM&P	Demand Management and Planning
DWE	Department of Water and Energy
Easement	A right given to a third party to use the portion of property for certain purposes.
Electric fields	Electric fields are produced by voltage and increase in strength as the voltage increases. The electric field strength is measured in units of volts per metre (V/m).
Environmental Assessment	Generally, this term means the process of examining the environmental benefits and consequences of projects in advance of decision making. The term is also has a specific meaning under Part 3A of the Environmental Planning & Assessment Act 1979 being the form of an environmental assessment conducted in regard to a Major Infrastructure Project.
EMF	Electric and magnetic fields (see electric fields and magnetic fields).
EAR	Environmental Assessment Report
EP&A Act	NSW *Environmental Planning and Assessment Act 1979*
ESAA	Energy Supply Association of Australia

Term	Definition
ESD	Ecologically sustainable development. This is broadly defined as: using, conserving and enhancing the community's resources so that the ecological processes, on which life depends, are maintained and the total quality of life, now and in the future, can be increased.
ESR	Eastern Suburbs Railway
Feeder	Three individual electrical transmission cables (phases) bundled together to make up a feeder.
FSR	Floor Space Ratio
GIS	Gas Insulated Switchgear
GIT	Gas Insulated Transformer, insulated by SF_6 gas (see SF_6).
GFA	Gross Floor Area
Hz	Hertz (one hertz is defined as one cycle per second)
INP	Industrial Noise Policy
Isopleth	(i.e. noise impact) A general term for a line, on a map or chart, along which all points have a constant or equal value of a given variable (eg. Isobars on a weather map).
kV	Kilovolts, or one thousand volts. A volt is a measure of the potential difference across a conductor when a current of one ampere dissipates one watt of power.
Licence conditions	Design, Reliability and Performance Licence Conditions for Distribution Network Service Providers (1 December 2007 – NSW Minister for Energy).
Magnetic field	Magnetic fields result from the flow of current through wires or electrical devices and increase in strength as the current increases. Magnetic fields are measured in gauss (G) or tesla (T).
mG	Milligauss

Term	Definition
Muffler	A device to suppress noise emissions from noisy equipment or machinery. For example, a muffler for a rock breaker suppresses sound waves vibrating 200 to 2,000 times a second – the loudest and most objectionable ones created by rock drills.
MVA	A measure of apparent power. One MVA is equivalent to one million Volt Amperes.
n-2 licence conditions	'Design, Reliability & Performance Licensing Conditions' by the Minister for Energy for the Sydney CBD signed December 2007. 'n' is designing the network elements for no credible contingencies; "n-1' is designing for a single credible contingency (normally involving an outage of one line or one item of electrical apparatus within a substation) and 'n-2' is designing for two credible contingencies (normally involving an outage of two lines or two items of electrical apparatus within a substation)
NHMRC	National Health and Medical Research Council
OEMP	Operational Environmental Management Plan
PM10	Particulate matter with an aerodynamic diameter of less than 10 micrometres. Also referred to as fine particulate matter.
Pneumatic hammer	A hammer driven by compressed air
Project	Belmore Park Zone Substation Project including commercial development
Proponent	EnergyAustralia
Preferred Project Report	A report prepared by the Proponent following consideration of all submissions if there are any proposed changes to the Project. The Preferred Project Report is then exhibited on the Department of Planning's website.
Prudent avoidance	Taking reasonable steps to minimise or avoid risk of exposure to magnetic fields by specific design configurations and at a modest cost.

Term	Definition
Prudent investment	Investment which is the most economically cost-effective option to address limitations on the network to meet responsible customer and community expectations (and to meet appropriate network service standards). Investment may be asset or non-asset based.
Reliability	An outcome based measure of the effectiveness of various network management and investment strategies in terms of their ability to provide continuous electricity supply to customers.
RBL	Rating Background Noise Level
RL	Reduced Level
Roadheader	Mechanical excavating machines that have a large rotating cutting head mounted on a moveable boom.
Rockbolts	A bar, that is inserted into pre-drilled holes in rock for the purpose of securing potentially loose rock.
Sandstone	A sedimentary rock, formed by the compression and cementing of sand and other sediments over a long period of time. The majority of the Sydney Basin is underlain by sandstone.
Security	The level of back up capability able to be provided by the network. Supply security is a measure of the ability to provide back up electricity supply during stated credible contingency events.
SCADA	Supervisory Control and Data Acquisition
SEPP	State Environmental Planning Policy
SF_6	Sulphur Hexafluoride, a colourless, odourless and non-flammable gas at standard conditions. SF_6 has good insulating properties and is used by the electrical industry as a gaseous dielectric medium for high voltage circuit breakers, switchgear and other electrical equipment.
Shaft	A long, narrow, often vertical passage sunk into the earth, or a duct or conduit for the passage of air (as for ventilation or heating). Often used to access a tunnel from the ground surface.

Term	Definition
Spoil conveyor	A belt or bucket type conveyor to remove broken rock from the cutting face of a tunnel boring machine, and transport to a spoil handling facility.
SREP	Sydney Regional Environmental Plan
State-owned Corporation	A company or corporation specified in Schedule 1 of the *State-owned Corporations Act 1989* in which the major share holder is the NSW Government.
Strata	A horizontal layer of material, especially one of several parallel layers arranged one on top of another. Sandstone is often formed of numerous layers of sediment compressed together to form the rock mass.
STS	A sub-transmission substation – generally 132kV to 33kV (with transformers). A part of the electricity network confined to given area, mainly including the ends of the sub-transmission and distribution network, electrical switchgear, control gear, and one or more transformers.
Stub tunnel	A short section of tunnel which links to a main tunnel
STSS	A sub-transmission switching station containing switchgear, generally 132kV without transformers. An STSS is generally the first stage in the construction of a BSP.
Sub-transmission network	Those parts of the electricity network (including power lines and towers, cables and substations as the case may be) that transfer electricity from the regional bulk supply points supplying areas of consumption to individual zone substations, operating at voltages between 132kV and 33kV inclusive, that may also fulfil a transmission role by operating parallel to and providing support to the higher voltage transmission network.

Term	Definition
Submissions Report	A report prepared by the Proponent that provides responses to the submissions received following exhibition of the Environmental Assessments.
Substation	An electrical facility which serves as a control and transfer point on an electrical transmission and distribution system. Substations route and control electrical power flow, transform voltage levels, and serve as delivery points to individual customers.
SWL	By convention, SPL has been adopted as the acronym for the Sound Pressure Levels. As power is often measured in watts, SWL has been adopted as the acronym for Sound Power Levels.
Sydney CityGrid Project	New and/or refurbished substations in the Sydney CBD and a tunnel network for 132kV cables. Belmore Park Zone Substation is the first component of the Sydney CityGrid Project.
TMP	Traffic Management Plan
Transformer	An item of electrical equipment that generally transforms a higher voltage to a lower voltage
TransGrid	A State-owned corporation responsible for the 550kV and 330kV transmission network in NSW.
VENM	Virgin Excavated Natural Material
Zone Substation	A zone substation at 132kV/11kV or 33kV/11kV supplying the 11kV distribution network (with transformers)

Executive Summary

Introduction

The Belmore Park Zone Substation Project is one of a number of discrete projects forming part of the wider Sydney CityGrid Project, which is being undertaken to meet the expected electricity needs of the Sydney CBD and inner suburbs.

In providing network services, EnergyAustralia must comply with its obligations as an electricity distributor, including under its distribution licence conditions, which set parameters around how electricity is to be supplied. EnergyAustralia's strategy for the Sydney CBD network area is in accordance with these requirements and is based on a holistic approach to network planning, taking into account the relevant capacity planning criteria, asset replacement requirements, network reliability standards and anticipated longer term network needs. It seeks to meet the forecast network needs in a cost effective manner, while facilitating prudent longer term network investment decisions.

EnergyAustralia's major strategic development decisions for the Sydney CBD area arise from the need to replace infrastructure which is due for retirement and to meet enhanced network security requirements under EnergyAustralia's distribution licence conditions which came into effect on 1 December 2007.

On 11 February 2008 the Minister for Planning declared that EnergyAustralia's Sydney CityGrid Project be a project to which Part 3A of the *Environmental Planning and Assessment Act 1979* (EP&A Act) applies.

A Concept Environmental Assessment Report (EAR) under Part 3A of the EP&A Act has been prepared for the Sydney CityGrid Project, and is being exhibited concurrently with this Environmental Assessment.

The Belmore Park Zone Substation is the first component of a number of discrete projects of the Sydney CityGrid Project.

This Environmental Assessment Report (EAR):

- supports a Project Application for the Belmore Park Zone Substation Project under Section 75E of the EP&A Act; and
- provides a description of the Project including identification of the likely environmental impacts and the proposed mitigation measures.

This summary provides an overview of the EAR prepared to assess the potential environmental impacts of the Project.

This EAR has been prepared by Plancom Consulting Pty Ltd, on behalf of the Proponent, EnergyAustralia.

The proposed Project

The Project includes the following elements:

1. Belmore Park Zone Substation, encompassing commercial/retail development (at the corner of Pitt, Hay and Campbell Streets).
2. A 12-metre stub tunnel connection from the existing City South Cable Tunnel (nominally 20 metres below Campbell Street) to the Belmore Park Zone Substation.

Structure of this EAR

Based on requirements from the Director-General of the Department of Planning, the outcomes of the community consultation process and the results of technical investigations undertaken to date, this Environmental Assessment has identified, analysed and addressed the key issues associated with the proposed development. The EAR includes the following Chapters:

- **Chapters 1 and 2** provide an introduction to the Project and the environmental assessment, including a description of the background and the need and justification for the Project;
- **Chapter 3** provides an assessment of the alternatives considered during the development and assessment of the Project;
- **Chapters 4** provides a detailed description of the Project;
- **Chapters 5 and 6** provide an analysis of the applicable statutory planning process, and an overview of

the community and stakeholder consultation activities carried out (or to be carried out) as a part of the planning approval process;

- **Chapter 7** provides an overview of the existing land use and environmental conditions within the study area;
- **Chapters 8 to 15** assess the potential impacts of the Project on the biophysical and socio-economic environments and identify mitigation measures proposed to address these impacts; and
- **Chapters 16 and 17** summarise the mitigation measures and safeguards into a draft Statement of Commitments for the Project and provide a conclusion for the Environmental Assessment.

A glossary of terms is provided at the front of this EAR.

Appendices to this document also provide information relevant to the Environmental Assessment.

Stakeholder issues

EnergyAustralia has been working with key stakeholders and the community for more than a year in relation to the Project. Key issues that have been raised, which are addressed in this EAR, include:

- traffic impacts during construction;
- electric and magnetic fields (EMF);
- vibration;
- noise;
- visual amenity;
- heritage and archaeology;
- spoil and waste management; and
- risks and hazards;

EnergyAustralia has commenced a comprehensive stakeholder engagement program, which would continue throughout the planning and construction phases of the Project.

Draft Statement of Commitments

During the assessment of key issues and general environmental aspects numerous mitigation measures and safeguards were recommended. These measures and safeguards would inform the Department of Planning during the assessment of the Project.

How can I comment?

This EAR is placed on public exhibition for a minimum period of 30 days in accordance with the requirements of the EP&A Act. During this period, the report will be available for perusal at selected locations. The report will also be available on EnergyAustralia's website at **www.energyaustralia.com.au/citygrid** and on the Department of Planning's website at **www.planning.nsw.gov.au.** A limited number of copies are available through EnergyAustralia by calling 1800 214 193.

Written submissions from organisations and the general community are invited and should be addressed to:

The Director
Major Infrastructure Assessment
Department of Planning
GPO Box 39
SYDNEY NSW 2001

What happens next?

The next steps are as follows:

- Exhibition of the EAR for the Project for a minimum of 30 days and invitation for public submissions.
- EnergyAustralia prepares a Submissions Report and, if required, a Preferred Project Report and final statement of commitments.
- The Director General of the Department of Planning provides an Assessment Report to the Minister for Planning, who then determines the Project and, if approved, sets conditions and/or further approvals required.

1 Introduction

1.1 Background

During the next decade, EnergyAustralia must replace critical infrastructure in the Sydney CBD which is due for retirement and comply with new licence requirements for operation of its substations and transmission feeders. The new licence requirements specify that all city zone substations and transmission feeders must achieve "N-2" capacity by 2014. That is, they must be able to supply the full electricity demand with any two transformers or feeders out of service.

EnergyAustralia has developed an integrated strategy to reconstruct or refurbish its existing electricity infrastructure, while maintaining sufficient spare capacity to ensure an ongoing and reliable electricity supply. This strategy is known as the Sydney CityGrid Project, of which the Belmore Park Zone Substation Project (the Project) is a key component.

1.2 Purpose of this Environmental Assessment Report

This Environmental Assessment Report (EAR) assesses the environmental impacts of the proposed Belmore Park Zone Substation Project in accordance with the requirements of the *NSW Environmental Planning and Assessment Act 1979* (EP&A Act) and the *Environmental Planning and Assessment Regulation 2000* (EP&A Regulation).

EnergyAustralia consulted with the Director-General of the Department of Planning to obtain the requirements for the form and content of this EAR. These requirements are included in **Volume 2**, **Appendix A**.

The following information is provided in this EAR:

- a description of the need for the Project and its objectives;
- alternatives considered in selection of the preferred option;
- a detailed description of the components of the Project, the associated works and operation;
- assessment and description of the key interactions of the Project with the existing environment, and assessment of the potential for the Project to result in adverse impacts on the environment;
- detailed measures to avoid or mitigate the potential environmental impacts of the Project;
- a Statement of Commitments by EnergyAustralia relating to the construction and operation of the Project;
- the likely impacts and benefits of the Project; and
- justification for the Project, including consideration of the principles of ecologically sustainable development.

This EAR seeks to present the above information to the public, relevant authorities and decision-makers, in a way that assists these parties to understand the Project, its effect on the environment and the consequences of proceeding, or not proceeding with the Project.

This EAR has been prepared with consideration of existing reports, conceptual design work, specialist impact assessment studies, and consultation with the community and Project stakeholders.

A consolidated list of the source documents and references used in preparing this EAR is included at the end of this document. Reference documents are also publicly available on request from EnergyAustralia.

1.3 Objectives of the Project

The Belmore Park Zone Substation is the first component of the Sydney CityGrid Project.

In order to comply with the new 'n-2' licence conditions, EnergyAustralia has determined that substation capacity in the CBD must be increased, particularly in the northern, eastern and southern precincts of the city.

In order to achieve these requirements, new zone substations would need to be constructed in these areas of the CBD, in conjunction with a programme of transferring load from existing CBD zone substations.

The objective of the Project is to increase capacity in the southern precinct of the CBD by constructing a new 132kV / 11kV zone substation as close as possible to the existing City South Zone Substation and 132kV transmission network. Subsequent stages of the Sydney CityGrid Project would address licensing conditions in the north and east of the CBD as well as replacing critical infrastructure due for retirement.

It is proposed to establish the new 132kV/11kV zone substation at the Belmore Park Site, as described further in Sections 2 and 3 of this EAR.

1.4 Overview of the Project

The Project which is the subject of this EAR, is the construction of the proposed Belmore Park Zone Substation including integrated commercial/retail development on or in conjunction with the zone substation. The site of the Project is shown in **Figure 1.1**.

The zone substation would be equipped with five transformers and a multi-section busbar enabling 132kV interconnection between TransGrid's Haymarket Bulk Supply Point (BSP), EnergyAustralia's City South and Rose Bay zone substations and the proposed Riley Street STSS.

The 132kV cables would be installed in the existing City South Cable Tunnel (CSCT), which runs directly beneath Campbell Street. A stub tunnel connection would facilitate access to the CSCT to enable up to eight new feeders to be connected at the substation.

Once complete, the zone substation would act as a central point for the 11kV distribution network in the southern Sydney CBD.

Figure 1.1 Site location plan

1.5 The Proponent

EnergyAustralia is a statutory state-owned corporation owned by the NSW Government. Its distribution network is used to convey electricity from the transmission network operated by TransGrid to end users.

The principal objectives of EnergyAustralia as an energy distributor are prescribed by the NSW *Energy Services Corporations Act 1995*. The principal objectives are:

- to be a successful business;
- to protect the environment;
- to facilitate regional development and decentralisation;
- to operate safe and reliable electricity distribution systems;
- to be an efficient and responsible supplier of electricity; and
- to participate in the wholesale and retail markets for electricity and other forms of energy.

EnergyAustralia is a public authority under the EP&A Act.

1.6 The Planning Approval Process

1.6.1 Application of *Part 3A of the EP&A Act*

By order dated 11 February 2008 made under *Section 75B(1) of the EP&A Act*, the Minister for Planning declared that the development described below is a project to which *Part 3A of the EP&A Act applies*:

'Development by EnergyAustralia for the purposes of upgrading the electricity supply network in the Sydney Central Business District (known as the 'Sydney CityGrid Project'), located within the City of Sydney local government area, and involving:

1. *construction and operation of up to three new zone substations (including, as necessary, the demolition and/or refurbishment of existing zone substations, and the construction and use of commercial and/or retail developments on, adjacent to, or integrated with, the new zone substations);*
2. *the refurbishment and augmentation of existing zone substations;*
3. *replacement of, and upgrades to, EnergyAustralia's existing high voltage cable network;*
4. *the construction and use of tunnels for the installation and operation of high voltage cables and associated cables, and other infrastructure; and*
5. *the construction, operation and use of associated works, including ventilation shafts and access structures, generally in the locations, or following the route, shown on the indicative map prepared by EnergyAustralia dated December 2007 and titled 'Sydney CityGrid Project'.*

(NSW Government Gazette No. 21, page 1168, 22 February 2008)

1.6.2 Approvals process

Part 3A of the EP&A Act outlines the key steps required for the assessment and approval of major infrastructure projects in NSW. The Minister for Planning is the approval authority for all projects assessed under Part 3A.

EnergyAustralia was required to submit a 'Preliminary Environmental Assessment' report to accompany a major project application form. That report, outlined the proposed development and provided a preliminary assessment of its expected impacts.

The Director-General of the Department of Planning issued EnergyAustralia with specific requirements to be addressed as part of the EAR.

This EAR is then lodged with the Department of Planning.

The Director-General, together with other relevant agencies and authorities, has assessed the adequacy of the EAR prior to its public exhibition. The public exhibition period would be at least 30 days. During this time, submissions would be invited from the public and the Director-General would consult relevant public agencies and produce a preliminary set of recommendations, including environmental and mitigation measures.

At the end of the exhibition period, these recommendations would be forwarded to EnergyAustralia, together with any public submissions received. If public submissions are received, EnergyAustralia would respond to issues raised and may modify the proposed development and Statement of Commitments. A Submissions Report may also be prepared.

If any significant modification to the proposed development or Statement of Commitments were made at this stage a Preferred Project Report must be prepared clearly defining the revised proposed development, commitments and environmental impacts. That report would be publicly exhibited for a period of no less than 30 days for community information only (no submissions would be received during this period).

The Department of Planning would evaluate this EAR, the Submissions Report, and any Preferred Project Report, giving consideration to submissions received during the exhibition period.

The Department's draft Assessment Report would be provided to the Director-General, who would consult relevant agencies prior to finalising the Assessment Report, the Conditions of Approval and EnergyAustralia's Statement of Commitments for the management of environmental impacts arising from the proposed development.

The Department of Planning Assessment Report would then be submitted to the Minister for Planning for his consideration when deciding whether or not to approve the proposed development.

The Minister's approval and the Director-General's Assessment Report would be published on the Department of Planning website. The proposed planning approval process is shown in **Figure 1.2**.

A detailed description of the applicable legislation, regulations, and environmental planning instruments is provided in **Chapter 5 – Statutory and Strategic Framework**.

Figure 1.2 Planning approval process

1.6.3 Post-approval activities

Should the Project be approved, EnergyAustralia would notify the local community via a community newsletter distributed to nearby homes and businesses and the project website would be updated with the latest information.

EnergyAustralia would work closely with affected property owners about any potential impacts. Notification letters would be issued to the local community to keep them informed of upcoming activities and key milestones.

Advertisements would be placed in the Sydney Morning Herald and relevant local papers on at least a quarterly basis to keep the wider community informed of the activities.

A toll free 24 hour project hotline and email address would continue to be included on all material issued in relation to the Project.

1.6.4 Other approvals

Part 3A of the EP&A Act removes the need for some separate approvals previously required for activities assessed under Part 4 or Part 5 of the Act. Part 3A consolidates relevant approval requirements and environmental management provisions into a single assessment process, where the Minister's approval incorporates other relevant approvals and permits that would otherwise be required.

Approval would be required under the *Crown Lands Act 1989*. Section 46 of this Act requires a licence to be obtained for the extraction of mineral substances.

EnergyAustralia's contractors may seek a licence under the *Protection of the Environment Operations Act 1997* to discharge waters during construction of the proposed development.

Roads and Traffic Authority consent must be obtained under S.138 of the Roads Act 1993 for works in classified roads; but as a public authority, EnergyAustralia is exempt from the requirement to obtain local council consent for works in non-classified roads, which are vested in councils.

While EnergyAustralia does not intend to obtain or use supplies of sub-surface water from the excavation works required for the project, EnergyAustralia is aware that a licence may be required under Part 5 of the Water Act 1912 for excavations that are capable of obtaining supplies of sub-surface water. The Department of Water and Energy would be consulted in regards to obtaining this licence.

1.7 Structure of this Environmental Assessment

The EAR focuses on the key assessment requirements specified by the Director-General's Requirements. These are summarised in **Table 1.1** together with a reference to where they are addressed in this document (a full copy of the Director-General's Requirements are included in **Volume 2**, **Appendix A**).

Table 1.1 Director-General Requirements and where they are assessed in the EAR

Director-General Requirements	Where addressed in EAR
General Requirements	
Executive Summary	Executive Summary
Detailed description of the Belmore Park Zone Substation Project.	Chapter 4
Assessment of environmental impacts with a focus on the key assessment requirements specified below.	Chapters 8-15
Consideration of relevant guidelines including the Department's draft *Network Electricity Systems and Facilities Guidelines* (2002) and ANZECC 2000 Guidelines for Fresh and Marine Water Quality and associated guidelines under the National Water Quality Management Strategy.	Chapters 5 and 15
Justification for undertaking the project with consideration of the benefits and impacts of the proposal.	Chapter 2
A draft Statement of Commitments detailing measures for environmental mitigation, management and monitoring.	Chapter16
Certification by the author of the EAR that the information is neither false nor misleading.	Certification of EAR

Director-General Requirements	Where addressed in EAR
Key Assessment Requirements	
Project Need & Justification Strategic assessment for the project including justification for the need, scale, scope and location of the project in relation to predicted electricity demand and transmission constraints, alternatives, and the strategic direction of the State and region regarding electricity supply and demand and electricity generation technologies. Strategic planning consideration of the project regarding potential land use conflicts with existing and future land uses including other nearby projects. Identify potential impacts to existing and future road and rail infrastructure and early liaison with relevant governing agencies. An assessment of the potential impacts of the project to influence changes to future land use character in proximity of the site.	Chapter 2 Chapter 3 Chapter 14
Visual Amenity - Assessment of visual impacts including impacts on local and regional views by substations and related infrastructure. A design review process for the new electricity infrastructure. The outcome of the design review process for Belmore Park Substation must be provided in the EAR. The design review process should be based on the principles of the design review competition of Sydney Local Environmental Plan 2005, and include consultation with Sydney City Council. Preliminary visual and design information for the other substations must be included, such as proposed locations, characteristics of the surrounding environment, potential visual impact and design limitations. The EAR must discuss the methodology and scope of the design review process for these project elements.	Chapter 8 Chapter 8 Chapter 8
Traffic & Access – Identify transport routes to and from the construction site and impacts on affected streets and intersections. Consideration of disruption to recreational/business activities and vehicle movements/bus services, including safety impact. Restrictions on access to properties should be identified. Discuss proposed measures/arrangements for minimising impact on these activities.	Chapter 9
Noise & Vibration – assessment of noise and vibration impacts during both construction and operations in accordance with relevant NSW Government and DECC policies.	Chapter 10
Heritage & Archaeology – Assessment of impacts on Aboriginal cultural heritage, in accordance with *Guidelines for Aboriginal Heritage Impact and Community Consultation* to identify any Aboriginal heritage issues. Assessment of potential for the project to impact on known items of non-Aboriginal heritage significance. Consider the likelihood of encountering archaeological material during construction and their management.	Chapter 11
Spoil & Waste Management – Estimate the likely spoil generation and type (including identification of known or potentially contaminated issues), disposal/ recycling sites and management of all types of waste material.	Chapter 12
Hazards & Risk – Screening of potential hazards to determine potential offsite risks, particularly at the substations and any requirement for a Preliminary Hazard Analysis. Identify any contaminated land affected by the project. Details of storage and management of materials, fuels and chemicals must be included. Assessment of risks to human health from Electric and Magnetic Fields with reference to Australian Radiation Protection and Nuclear Safety Agency standards.	Chapter 13
Property (including settlement) – identify all existing nearby land uses and potential impacts during construction and operation. Identify control and mitigation measures.	Chapter 14
General Environmental Risk Analysis – include an environmental risk analysis to identify potential environmental impacts during construction and operation, proposed mitigation measures and potentially significant residual environmental impacts after the application of proposed mitigation measures. Where additional environmental impacts are identified, an appropriately detailed impact assessment of this additional environmental impact must be included in the EAR.	Chapter 15

Director-General Requirements	Where addressed in EAR
Consultation Requirements	
During the preparation of the EAR, you must undertake an appropriate and justified level of consultation with the following parties: City of Sydney Council; Central Sydney Planning Committee; Sydney Harbour Foreshore Authority; (not applicable to this EAR) NSW Department of Environment and Climate Change; Department of Water and Energy; NSW Roads and Traffic Authority; Transport Infrastructure Development Corporation; (not applicable to this EAR) RailCorp; Sydney Water Corporation; NSW Heritage Office; NSW Fire Brigade; TransGrid; Royal Botanic Gardens and Domain Trust; and (not applicable to this EAR) Any other relevant agencies and service providers/utilities Appropriate consultation with the local community should be undertaken. The EAR must identify issues raised by stakeholders during the consultation and how these matters have been addressed in the EAR.	Chapter 6

2 Need for Project

2.1 Sydney CityGrid Project

EnergyAustralia must, in the next decade, upgrade or replace critical infrastructure in the Sydney CBD which is approaching time for retirement and comply with new licence requirements for operation of its substations and transmission feeders. The new licence requirements specify that all city zone substations and transmission feeders must achieve "n-2" capacity by 2014.

EnergyAustralia has developed an integrated replacement strategy, known as the Sydney CityGrid Project, to reconstruct or refurbish its existing electricity distribution infrastructure to meet these requirements. A Concept Application under Part 3A of the EP&A Act has been prepared for the Sydney CityGrid Project, and was submitted to the Department of Planning for approval in April 2008.

The overall objectives of the Sydney CityGrid Project are primarily to:

- meet the requirements of, and comply with, the new "n-2" licence conditions;
- replace critical infrastrucutre which is approaching time for retirement;
- meet the forecast electricity network needs and demands in a cost-effective manner; and
- facilitate prudent longer term investment decisions and provide future flexibility in regard to network upgrades.

Whilst the Sydney CityGrid Project includes the refurbishment or upgrade of certain electrical assets over the coming decade, the preferred strategy for achieving the longer term objectives detailed above includes the following substation components, which are described further in **Section 2.2**:

- commissioning of a new City North Zone Substation by 2010;
- commissioning of a new Belmore Park Zone Substation by 2013;
- commissioning of a new City East Zone Substation by 2016; and
- transferring of load between new and existing substations.

2.2 Belmore Park Zone Substation

2.2.1 Licence conditions

Essentially, the new 'n-2' licence conditions cannot be applied to existing 132/11kV zone substations without reducing the ratings of those facilities. It is therefore necessary to change the design and operating arrangements of the Sydney CBD supply network to provide additional capacity to meet these conditions.

Modification of the supply and operating arrangements of existing zone substations and sub-transmission feeders is required to provide additional capacity to meet the 'n-2' licence conditions. This can be achieved either by providing standby capacity at each zone substation, or providing load transfer capacity and standby capacity shared between zone substations. Both of these options require a significant reduction in the capacity of existing substations.

EnergyAustralia's forecasts for electricity demand in the CBD area provide details on when the forecast peak load for each CBD substation would exceed that substation's licenced capacity. These details are summarised below in **Table 2.1**:

Table 2.1 CBD zone substation – capacity restrictions

Substation	Year in which licenced capacity would be exceeded	Substation capacity constraint
Dalley Street	2011/12	Transformer
City Central	2012/13	Transformer
City South	2012/13	Transformer
City East	2012/13	Feeder
City North (old)	Post retirement	
City North (new)	Post 2024	

The capacity constraints detailed in **Table 2.1**, coupled with the introduction of the new 'n-2' licence conditions, dictate that it is necessary to provide new capacity equivalent to the capacity reductions required to achieve the new 'n-2' security levels. This fundamental requirement drives the need for:

i. the construction of three new zone substations (City North, City East, and Belmore Park) to provide the additional capacity requirements noted above; and

ii. the transferring of load from the City Central and City South zone substations to alleviate the capacity constraints detailed in **Table 2.1**.

The specific need for the Belmore Park Zone Substation is discussed further below.

2.3 Belmore Park Zone Substation

The need for the construction of three new zone substations in the Sydney CBD is driven by two main requirements, which apply equally to the northern, eastern and southern areas of the CBD:

i. the need to reduce the capacity of existing zone substations to meet the new 'n-2' licence conditions; and

ii. the need to provide new capacity to replace the capacity reductions required to achieve the requirements of the 'n-2' licence conditions;

The Belmore Park Zone Substation is proposed as a means of addressing the capacity issues in the southern CBD precinct, with the City North Zone Substation (currently under construction) and City East Zone Substations proposed to address capacity issues in the northern and eastern CBD precincts respectively.

Apart from the need to increase the overall capacity of the CBD network, whilst reducing the capacity of existing zone substations, the specific requirement for a new zone substation in the southern CBD precinct is also driven by:

- the requirement to de-rate the existing City South Zone Substation to meet the new 'n-2' licence conditions, which would involve substantial 11kV load transfers. As such, it is beneficial and most cost-effective to establish the new zone substation as close as possible to the existing City South Zone Substation, in order to minimise the costs,
- future demand projections, which indicate the potential for increased load density in the southern CBD in the longer term, thus giving rise to the need for a new 132kV / 11kV zone substation in this area. A more detailed discussion of current CBD electricity demand projections can be found in **Chapter 2** of the Sydney CityGrid Concept EAR;
- the need to connect the new zone substation to the existing 132kV network with as little disruption as possible to the general public and business community in the southern CBD.

EnergyAustralia has investigated a number of options for meeting the new 'n-2' licence conditions for the Sydney CBD area, which are described further in **Section 3** of this EAR. EnergyAustralia has also analysed how the different strategies deliver reliability improvements to the wider electricity network.

For the reasons noted above, and after due consideration of alternatives, EnergyAustralia's preferred strategy for meeting the network requirements in the southern CBD precinct is the construction of a new 132kV / 11kV zone substation as close as possible to the existing City South Zone Substation and 132kV transmission network. The proposed site adjacent to Belmore Park has been selected on this basis along with several other benefits that the site provides. These issues are addressed in more detail in subsequent sections of this EAR.

3 Alternatives to the Project

3.1 Do nothing

Demand growth, asset condition and operational issues influence EnergyAustralia's investment decisions. Where there is more than one driver for an investment, EnergyAustralia seeks to implement investment management strategies that address a variety of network needs to ensure that the replacement programmes, demand management initiatives and augmentation projects complement each other as much as possible.

The consequences of not proceeding with the Project would ultimately result in:

- EnergyAustralia being unable to meet 'n-2' licence conditions;
- demand for electricity increasing without sufficient existing supply capabilities; and
- reliability issues in the supply of electricity for the Sydney CBD.

EnergyAustralia therefore considers that this option is not acceptable and, as described in Section 2, has determined that increased capacity is required in the southern CBD area to meet future demand projections and new 'n-2' licence conditions.

3.2 Increasing network capacity

EnergyAustralia has investigated a number of options for increasing network capacity in the southern CBD to meet the requirements of the new 'n-2' licence conditions for the Sydney CBD and demand projections generally. The main options considered are described below.

3.2.1 Refurbishing existing substations

Refurbishing existing substations is not always possible due mainly to the risk and difficulties in operating and maintaining supply and also size and space limitations at existing facilities where the refurbishment works require additional infrastructure to be installed.

In regard to the Belmore Park Zone Substation, an alternative for increasing capacity in the southern CBD is the refurbishment of the existing City South Zone Substation. The capacity constraint at this substation, as detailed in **Table 2.1**, is the number of transformers, which dictates that any increase in capacity must be provided by installing additional transformers at this location. As with all CBD zone substations, it is not possible to provide additional transformers at the City South Zone Substation due to space limitations and other restrictions.

For this reason, EnergyAustralia has discounted this option as a viable one.

3.2.2 11kV load transfers

Initially, in considering the options for achieving the requirements of the new 'n-2' licence conditions, EnergyAustralia investigated whether it may be possible to use 11kV load transfers between CBD zone substations. This option would reduce the amount of new zone substation capacity required to achieve the enhanced security criteria, however the investigations and analysis undertaken to date conclude that it is not feasible to meet the 'n-2' criteria using 11kV interconnection because:

- load transfers cannot be achieved within the required one hour restoration time;
- installation of the required switching devices within existing CBD distribution substations is not feasible; and
- there are insignificant routes available for the number of 11kV cables required to achieve such interconnection.

3.2.3 New zone substations

In light of the issues detailed in **Sections 3.2.1** and **3.2.2**, and in order to provide new capacity equivalent to the capacity reductions required to achieve 'n-2' compliance, EnergyAustralia considers that the only viable option is the construction of new substations in the north, east and south of the CBD.

The Belmore Park Zone Substation is proposed to meet these requirements in the southern precinct of the CBD. The options and alternatives for the substation itself are discussed further below.

3.3 Belmore Park Zone Substation

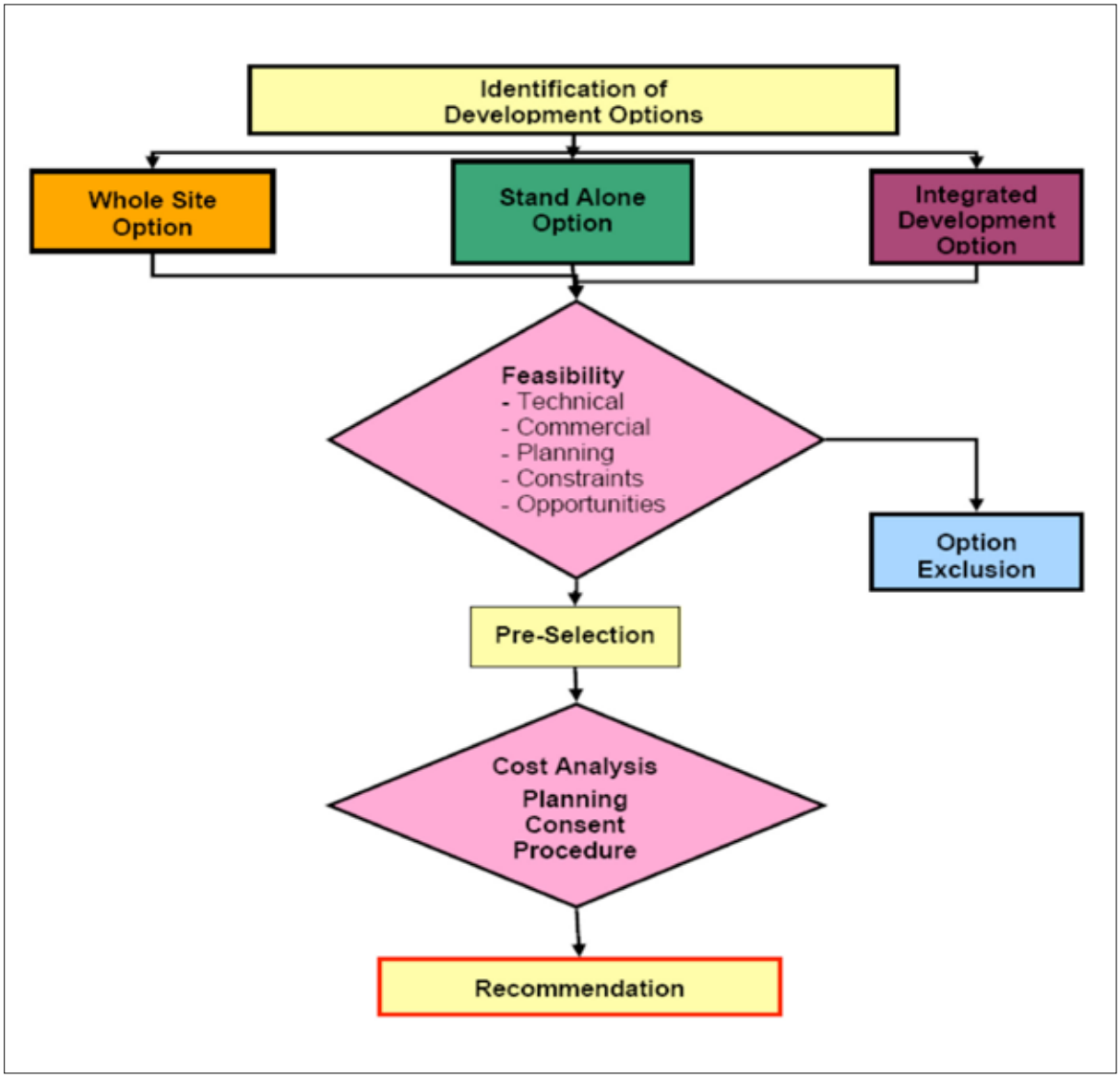
Having determined the requirement for new zone substations in the Sydney CBD, EnergyAustralia had been progressing the investigation of potential sites in the south and the east of the Sydney CBD when an opportunity arose to purchase land opposite Belmore Park. The site is ideally located and offers significant advantages in regard to the wider requirements of the Sydney CityGrid Project, including:

- the site is located at the southern end of the CBD, where land is relatively cheaper than in other parts of the city;
- the site is located adjacent to the existing City South Cable Tunnel (CSCT), which significantly lessens the difficulty, cost, and disruptions (network and community) associated with making the necessary 132kV connections to the substation; and
- the site is close to the existing City South Zone Substation, which reduces the cost and disruptions associated with the 11kV load transfers required at this location to meet the new security criteria.

In light of the benefits noted above, other options were not progressed, and meaningful negotiations took place to secure the site. EnergyAustralia has purchased the Belmore Park Site and has progressed with investigations and options analysis for the development of the site.

In order to maximise the use of the Belmore Park Site, EnergyAustralia commenced investigating options for the development of the site in October 2007.The methodology for these investigations is shown in **Figure 3.1** below:

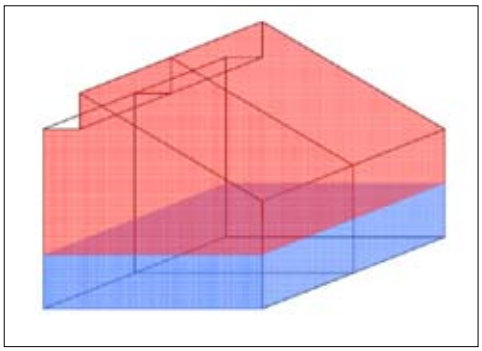
Figure 3.1 Options investigation methodology



EnergyAustralia has carried out investigations and options studies on 11 development options under three broad categories, as follows (see illustrations below):

- **Category 1**: A low rise substation over the entire site with no commercial development (one option);
- **Category 2**: A stand alone substation occupying a portion of the site with the residual land area sold for commercial development (three options); and
- **Category 3**: An integrated development with the substation built on a portion of the site similar to Category 2, but with the commercial development on the residual land area and over the substation, thereby using the available space over the substation (seven options).

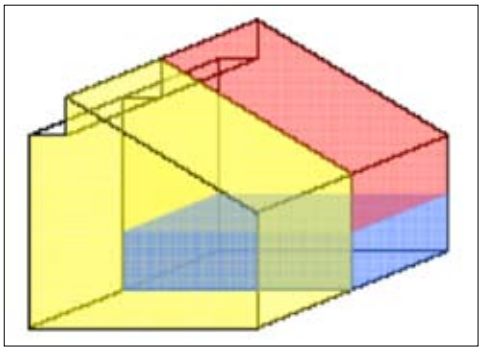
Category 1: Standalone substation



Substation (blue) as 'Whole Site' development covering the full extent of the site.

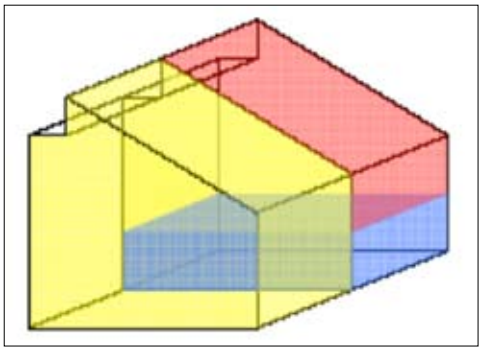
Residual development space (red) remains unutilised.

Category 2: Substation and separate commercial/retail development



Substation (blue) using the eastern part of the site with functional areas on multiple levels. Unutilised space above substation (red) allows for conventional transformer cooling methods. The western part of the site is retained for 'Stand Alone Commercial Development' (yellow).

Category 3: Integrated substation and commercial/retail development



Substation (blue) using the eastern part of the site. Commercial utilisation of all residual development potential (yellow).

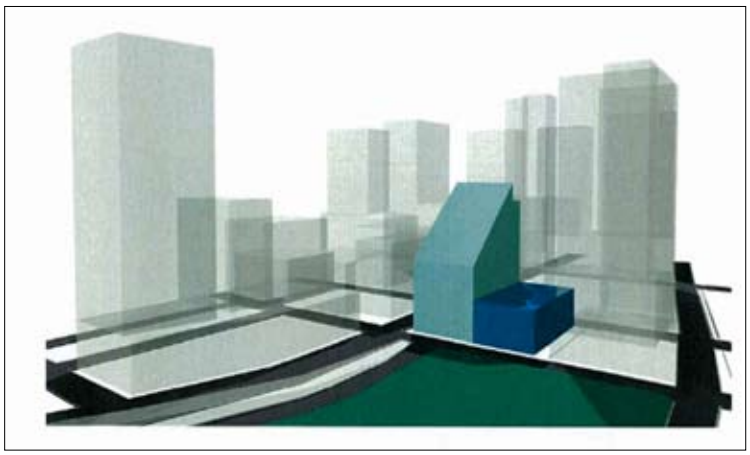
Following the initial options study in October 2007, three options were short-listed for further review, these were:

- **Stand alone substation - Option 1**: Stand alone substation development comprising eight (8) floors in total, including four (4) basement levels, double row of transformers at ground level and air cooling of transformers via shafts to the substation roof;
- **Integrated Substation - Option 2**: Integrated substation development with the substation comprising of seven (7) floors in total including two (2) basement levels, single row of transformers at ground level and sealed radiator cooling of the transformers; and

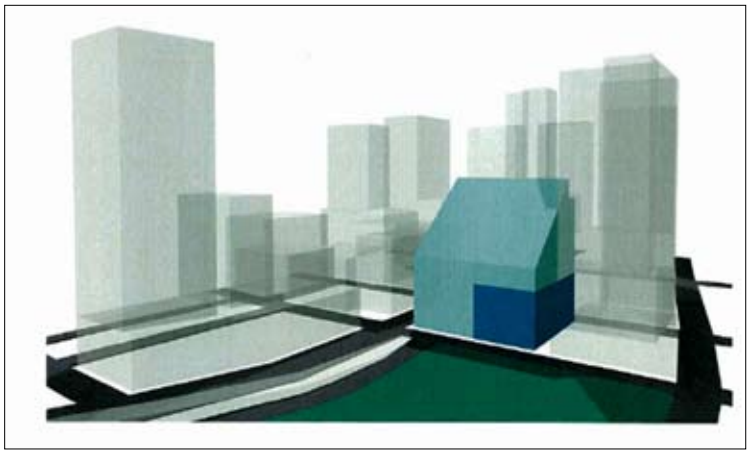
- **Integrated Substation - Option 3**: Integrated substation development with the substation comprising of nine (9) floors including four (4) basement levels, single row of transformers on ground level and sealed radiator cooling of the transformers.

The stand alone and integrated substation options are illustrated in **Figure 3.2** below:

Figure 3.2 Substation options



Option 1:
Separate Commercial /Substation



Options 2 & 3:
Integrated Substation/Commercial Development

Factors against the stand alone option

Residual land value and development return are significant criteria. However a number of other factors were also considered such as:

- the location of the site;
- the impact a standalone substation would have on the surrounding 'built form'; and
- options for development of the remaining footprint.

Thus for reasons of capturing residual land value, developing an acceptable design for the affected community and stakeholders, and to progress with the Project, the integrated substation - Option 2 was chosen as the preferred solution for further consideration and development.

Due to the recent events of the global credit crisis, including the down-turn in the Sydney property market, a developer has not as yet been secured for the entire site development. This issue is compounded by the fact that EnergyAustralia needs to construct the zone substation component by 2012. It is therefore proposed that there would be a two staged construction process. That is:

i) bulk excavation, building works (including temporary treatments and landscaping), electrical fit out and commissioning for the zone substation component only; and

ii) remaining bulk excavation for the site, building works (including final façade details for the commercial

component and the zone substation proper), fit out of the retail and commercial floors.

It is proposed that landscaping treatments would only be adopted if the delay between the completion of the zone substation and commencement of the commercial component is more than 12 months - and this largely depends on developers' requirements.

It is EnergyAustralia's intention to seek expressions of interest (EOI) from developers for the commercial component once conditions of consent have been issued by the Minister for Planning. The EOI would express the intention that the commercial works would dovetail the zone substation construction and that EnergyAustralia would be responsible for the construction of its zone substation component.

It should be noted, however, that approval is being sought for the entire building and reference should also be made to **Section 8.2.3**, as well as the minutes of the design review meetings held with the peer review panel found which can be found in **Volume 2**, **Appendix A**.

4 Description of the Project

4.1 Introduction

The site, which is owned by EnergyAustralia, comprises land with frontages to Pitt, Hay and Campbell Streets Sydney. The site is rectangular in shape and has an area of approximately 3,400m^2. The site is sealed by an asphalt cover for car park use and is currently surrounded by a temporary wire fence.

EnergyAustralia, proposes to construct an integrated development comprising a zone substation and an A grade 4.5 star ABGR/5+ Star Green Star commercial office building of approximately 22,500sqm nett lettable area with ground floor retail and office lobby entry and subterranean parking with approximately 62 car spaces.

A stub tunnel connection would also be required from the existing City South Cable Tunnel (CSCT) which runs beneath the north side of Campbell Street, to the proposed Belmore Park Zone Substation in order to facilitate feeder connection to the substation. The stub tunnel will be approximately 12m in length and nominally about 20m below street level.

One of the primary objectives of this integrated development is for it to be designed to allow for continuous operation and maintenance of the zone substation unimpeded by other activities that may be occurring within the remainder of the development. Other primary objectives include:

- to develop an economically efficient building that responds to the demands of the market place and is capable of being easily leased and sold;
- to comply with all legal obligations and authority requirements /codes associated with the development including the Building Code of Australia (BCA), relevant Australian Standards, *Commonwealth Disability Discrimination Act 1992* and requirements of any consent authority having jurisdiction over the site or development;
- to develop a building that is fit for its intended purpose;
- to develop a building that meets EnergyAustralia's AER and timing objectives;
- to develop a building that is able to minimise operating and ongoing maintenance costs within the context of the capital costs incurred during construction;
- to develop a supportive attitude towards the development within the local community;
- to develop a building that minimises the visual and urban design impact of the zone substation use; and
- to minimise EMF impact on commercial, retail uses and other neighbours.

A summary of the design principles is provided below.

Further details can be found in the documentation provided in **Volume 3**.

4.2 Integrated Belmore Park Zone Substation

The preferred option involves the development of a new 132/11kV 5 transformer zone substation situated on the eastern portion of the site together with an integrated commercial development, generally in accordance with option 2 described in **Section 3.3**.

The proposed zone substation portion of the Project includes the following components as described in **Table 4.1**.

Table 4.1 Substation components

Floor level	Components
Tunnel level	Cable access shaft and stub tunnel connection to the City South Cable Tunnel (CSCT)
Level 1	Cable marshalling floor & water treatment plant
Level 2	11kV & 132kV switchrooms and distribution centre
Level 2A	Void and services area
Level 3	Transformer floor & fire control room, equipping hatch
Mezzanine Level 4	Amenities & low voltage switchroom
Mezzanine Level 5	Control cable floor
Mezzanine Level 6	Control room
Level 7	Mechanical plant room (sealed radiators, etc)
Other elements	Associated civil and drainage works, external & Landscape Works

4.3 Commercial office

The office building portion of the Project includes the following components as described in **Table 4.2**.

Table 4.2 Commercial office components

Floor level	Components
Basement Levels 1,2, 3 & 4	Parking for 62 cars, plant space and a loading dock (basement level 1)
Ground Level	Entrance lobby, retail spaces (approximately 800m² net leasable area (NLA), carpark entry ramp, Plant space
Floor Levels 1-13	Office space (floor plates vary between approximately 1300m² and 2500m² NLA
Floor Level 14	Plant space

4.4 Proposed Project components

For the commercial component of the development, it is to be noted that the 5+ star Green Star and 4.5 star ABGR design intent would result in a more sustainable building judged to represent "Australian Excellence" in building design. Green Star is an environmental rating system for buildings that seeks to reduce the environmental impact, improve occupant heath and productivity and showcase innovation in sustainable building practices.

Presently, less than 30 buildings in Australia have been certified with Green Star ratings of 5 star or more.

4.4.1 Urban design

The proposed design responds to its setting, which comprises the landscaped Belmore Park, neighbouring heritage buildings and city streets.

The building is designed to both integrate with its setting and maintain its identity as a bold, modern addition to the city.

The site offers opportunities to:

- orientate the building to Belmore Park with its mature trees and landscaped setting;
- define a built edge to Belmore Park and encourage greater use and security of the park;
- activate the Hay, Campbell and Pitt Street frontages of the commercial component;
- provide an integrated mid-block pedestrian through site connection (thoroughfare) between Hay and Campbell Streets;
- provide 'A' grade 5+ Star Green Star office accommodation with high quality amenity;

- create an integrated development outcome with the highest quality design overlay to an otherwise functionally driven zone substation; and
- incorporate in the pedestrian thoroughfare on the eastern boundary public environmental art, sculpture or installation.

4.4.2 Architecture and design excellence

The design of the development is guided by the development parameters of the Sydney Local Environmental Plan and Development Control Plan to achieve an appropriate contemporary image for the development.

The architecture would address the following:

- the urban design and context of the precinct;
- ground level design that would actively engage the building form through both retail activity and public domain design;
- best practice principles of Ecologically Sustainable Design (ESD) following the principles of a 5+ star base office building under the Green Star rating scheme and a 4.5 star base building ABGR rating;
- pedestrian through-site connections which would provide linkages from Hay Street across to Campbell Street;
- parking and vehicular access that best addresses traffic and parking implications for the locality;
- reflectivity and wind effects; and
- heritage and archaeological considerations.

4.5 Design description

Overlooking Hay Street the proposed building volume clearly picks up the tree canopy height of adjacent Belmore Park.

The south façade, with its six levels, continues in an angle from the seventh level towards the north where it reaches its highest point at level 14. A continuous band of selected high performance glass covers the north, south and angled roof façade. An atrium located in the centre of the building defines itself through the outside with a different glass tone. Fixed horizontal sunshading elements cover vision panels and substation louvres on the north and south façade.

The western façade facing Pitt Street comprises a glazed curtain wall. Protection of intense sunlight is given by vertical sunshading elements to the west and horizontal elements to the north. The favoured material would be a silver finish to allow for a consistent indirect light spreading deep into the floor spaces inside.

The ground floor façade, comprising the main entrance for the upper floors on Pitt Street and retail space on the north and south perimeters, opens itself up to the urban hub of the area. Floor to ceiling glazing would provide views inside and materials such as black granite to the entry lobby fronting Pitt Street and anodized aluminium give the façade a classic modernist feel. The façade treatments described above are presented in **Volume 3, Appendix E**.

Overall, the building would add to the quality of the area around Belmore Park and Central Station, understanding it as a gateway site for Sydney's CBD.

Figure 4.1 and **Figure 4.2** below illustrate these design principles.

Figure 4.1 Pitt Street view

Figure 4.2 Hay Street view

4.6 Landscape design principles

The landscape design for the Project, prepared by Taylor Brammer Landscape Architects Pty Ltd, provides landscape works to Hay Street, Campbell Street and Pitt Street, to the proposed substation building, a temporary open space component aligning Pitt Street and a through site visual link to the eastern side of the proposed building, between Campbell and Hay Streets..

The overall landscape design aims to provide an appropriate urban open space solution in keeping with the City of Sydney Council requirements and has been achieved through innovative design and the use of robust materials. The resultant landscape plan is designed to create a unique place within the southern precinct of the City of Sydney, which would allow for passive recreation and provide for pedestrian access around the Project.

The main landscape design principal for the Project is to provide a distinctive identity to the Belmore Park integrated development site, to lessen the impact of the new infrastructure and unify the open space components (pedestrian thoroughfare) through material selection and illumination.

The design principles are outlined in **Volume 2, Appendix B**, and summarised as follows:

- an appropriate public domain solution in the spirit of City of Sydney requirements in relation to street tree planting and footpath material selections;
- provide for safe and secure pedestrian amenity through use of lighting schemes consistent with accepted public domain guidelines;
- allow for future development of the site and provide for ease of access to existing and proposed service facilities and infrastructure within the Site; and
- recognition of the use of landscape as a design element to complement the distinctive form of the architecture in its location adjacent to Belmore Park.

The principal design elements of the landscape scheme are:

Visual Through site link (Hay Street and Campbell Street)

A through site visual link to the eastern side of the proposed building, between Campbell and Hay Streets. This approximately 6m wide strip of land will not be accessible to the public. It will consist of a paved access pathway immediately adjacent to the substation with the remainder consisting of landscaped area.

Details of the landscape render through the site link are shown in **Volume 3, Appendix F**. This landscape render will be completed with construction of the substation.

Public footpath landscaping

The site is bounded by Pitt Street, Hay Street and Campbell Street and all landscaping works proposed are in keeping with City of Sydney Council standards as follows:

- footpaths of asphalt to allow for ease of access to existing services;
- street trees to be Flindersias; and
- kerb and guttering to City of Sydney standards.

Temporary landscaping treatment

The intention of the integrated development is for the commercial component to dovetail the substation works. However, as described in **Section 3.3**, there may be a delay between completion of the substation and commencement of the commercial building works. In the event that this occurs, it is proposed that landscaping treatments to the substation would be considered if the delay was is in the order of 12 months or greater.

Indicative landscape treatment for the temporary condition is provided in **Volume 3, Appendix O**.

4.7 Construction of the Project

4.7.1 Overview

A critical consideration is that the zone substation must be operational by 2012 whereas the integrated commercial/retail developments could be developed at a later date, subject to market requirements. In light of these issues, a sequenced construction approach for the site is proposed as follows:

- complete the zone substation component (EnergyAustralia); and
- complete the commercial components, including bulk excavation of the associated carpark and the building components from ground level and above the zone substation (Developer).

4.7.2 Timeframe and Equipment

Table 4.3 below provides an indication of timeframe, activities and machinery to be used during construction.

Table 4.3 Indication of construction timeframe and activities

Construction period	Construction activity	Machinery used
April 2009	Establishment - site sheds, temp power etc	Mobile crane, trucks with work sheds, concrete trucks
May 2009	Site preparation - erect hoarding, service disconnection, site survey, services diversion	Saw cutting concrete, bitumen, backhoe, rigid trucks, concrete truck, traffic control, air compressors, jack hammers
May 2009 – April 2010	Bulk excavation (including construction of the CSCT stub tunnel connection)	Drill rig, trucks to remove spoil, concrete pumps, D7 bulldozer, rock saws, rock hammers, semi trailer trucks to remove spoil, rock anchor drills, shotcrete,
2010 - 2012.	Construction of the building components of the zone substation component.	Crane, scaffolding, concrete pumps, concrete vibrators, concrete delivery trucks, placement of steel reinforcement, builders lift, builders hoist, air compressor, jack hammers, concrete / bitumen saw cutting
2012 - 2013	Bulk excavation of the commercial development component	Drill rig, trucks to remove spoil, concrete pumps, D7 bulldozer, rock saws, rock hammers, semi trailer trucks to remove spoil, rock anchor drills, shotcrete,
2013 - 2014	Construct 13 Level commercial/ retail building.	Crane, scaffolding, concrete pumps, concrete vibrators, concrete delivery trucks, placement of steel reinforcement, builders lift, builders hoist, air compressor, jack hammers, concrete / bitumen saw cutting.

4.7.3 Construction hours

For both the construction of the substation and commercial components of the Project, works above ground would typically be carried out during the following hours:

- 7 a.m. to 7 p.m. Monday to Friday
- 7 a.m. to 5 p.m. Saturdays
- No work on Sundays or Public Holidays.

The construction of the stub tunnel connection to CSCT, oversize trucks and certain equipment and material deliveries may need to be made outside of standard construction hours from time to time.

4.7.4 Construction workforce

Approximately 50 full time equivalent construction jobs would be generated during the construction phase of the substation component of the Project.

It is envisaged that similar numbers of construction personnel would be utilised for the construction of the commercial component of the Project.

4.8 Operation of the Projects

4.8.1 Electricity transmission

The zone substation and cables would transmit electricity continuously 24 hours per day, 365 days per year except for planned maintenance outages and unexpected events.

The zone substation would be secured against unauthorised access and procedures would be put in place to detail the operations and access protocols for the facility, including an Operational Environmental Management Plan (OEMP).

4.8.2 Commercial and retail activities

Commercial and retail activities would operate during standard trading hours. Retail activities may operate seven days per week.

4.8.3 Maintenance requirements

EnergyAustralia would operate and maintain the Belmore Park Zone Substation in accordance with existing EnergyAustralia procedures. Typical maintenance activities would include the cleaning of mechanical and electrical equipment, air conditioning, hot/cold water systems greasing of the gas blower, checking of SF6 gas pressure, checks of flow relays and wiring, inspection of bushings and on-load tap changing transformers and monitoring of gas density, temperature and oxygen detectors.

The commercial and retail component would be subject to a regular inspection, testing and maintenance regime to ensure compliance with all requisite building regulations. These requirements and procedures would be detailed in the building management statement.

4.8.4 Groundwater management

The operation of the Belmore Park Zone Substation would require a water treatment facility, to treat groundwater, and other flows, prior to discharge to the stormwater system. Inflows to the treatment plant would be treated to the relevant ANZECC 2000 standards prior to discharge.

Groundwater would either be managed on site in a new water treatment plant installed within the building proper, or groundwater may be pumped to the existing CSCT water treatment plant (via the CSCT), which is located at the Campbell Street Zone Substation. The preferred option is to utilise the existing CSCT water treatment facility.

Subject to the final design of the overall building, a separate water treatment plant would most likely be required for the commercial development.

4.8.5 Operational workforce

The substation would be maintained and operated by EnergyAustralia's existing workforce.

The commercial and retail areas once fully occupied would generate a considerable number of jobs. The Property Council of Australia specifies an area of one person per 10m^2 of floor space for commercial use. Based on a Net Lettable Area (NLA) of 19,230m^2 the commercial building has the potential to accommodate in excess of 1,900 workers. The retail area of 780m^2 and building maintenance funcitions would also generate employment. It is estimated that when fully occupied the building could employ between 1,900 – 2,000 people.

4.9 Capital investment value

The estimated cost of the proposed Belmore Park Zone Substation is $85 million, with the proposed commercial development expected to cost in the order of $40 million.

4.10 Potential interfaces

The Project interfaces with several items of existing or proposed infrastructure, which have the potential to be affected by the construction works at the site. These include:

- the Eastern Suburbs Rail (ESR) lines – RailCorp;
- roadways adjacent to the Belmore Park site – Council and RTA;
- proposed building works adjacent to the Belmore Park Site and Central Square tower building;
- existing telecommunications tunnel beneath Pitt Street - Telstra
- Sydney Light Rail – Pyrmont Light Rail Company; and
- existing EnergyAustralia electrical infrastructure.

EnergyAustralia has, and will continue to consult with the owners and/or operators of infrastructure potentially affected by the Project.

In some cases, interface issues have been assessed and finalised with relevant stakeholders and incorporated into the design and/or construction methodologies for the Project. In other cases, consultation with stakeholders will be ongoing during the design and construction phases of the Project.

These issues are discussed further in **Section 6**.

5 Statutory and strategic framework

5.1 NSW planning approval process

On 11 February 2008 the Minister for planning declared the Project to be a project to which Part 3A of the EP&A Act applies.

5.1.1 Part 3A of the EP&A Act 1979

Part 3A of the EP&A Act commenced on 1 August 2005 and consolidates the assessment and approval regime for all major projects that need the approval of the Minister for Planning. Previously these were dealt with under *Parts 4* and *5 of the Act. Part 3A* applies to State government infrastructure projects, developments previously classed as State significant, and other projects, plans or programs declared by the Minister. It provides a separate streamlined and integrated development assessment and approvals regime for major infrastructure and other projects of significance to the State of NSW. Clause 75B states:

'(1) General

This Part applies to the carrying out of development that is declared under this section to be a project to which this Part applies:

- by a State environmental planning policy; or
- by order of the Minister published in the Gazette.'

5.1.2 Environmental planning instruments

Clause 41 of the State Environmental Planning Policy (Infrastructure) 2007, provides that development for the purpose of an electricity transmission or distribution network may be carried out by or on behalf of an electricity supply authority or public authority without development consent on any land.

There are no State Environmental Planning Policies (SEPPs) that substantially govern the carrying out of the Project, and accordingly, no SEPPs have been considered in this application.

No aspect of the Project is therefore prohibited.

5.2 Commonwealth legislation

A search of the Commonwealth Environment Protection and Biodiversity Conservation Act 1999 protected matters (National Environmental Significance) database shows that a number of sites listed on the Register of the National Estate are close to the proposed Project.

The Project is unlikely to result in any significant impact on the protected matters and, as such, the proposal would not need to be referred to the Commonwealth Minister for the Environment pursuant to the Environment Protection and Biodiversity Conservation Act 1999.

5.3 Other planning guidelines

This EAR, and planning activities for the Project generally, have been undertaken with due consideration to the following guidelines, which are referenced throughout the document:

- ANZECC 2000 – Guidelines for Fresh and Marine Water Quality; and
- Planning NSW – Network Electricity Systems and Facilities, draft EIA Guidelines (July 2002).

6 Stakeholder Consultation

6.1 Introduction

Part 3A requires the Director General of the Department of Planning to consult with relevant stakeholders in the preparation of the EAR for the Project. Depending on the nature of further assessments required for the various elements of the project (be it Part 3A or another Part of the EP&A Act), EnergyAustralia would carry out further environmental assessment and community consultation, which may allow, or require, further input prior to the carrying out of aspects of the Project.

6.2 Consultation approach

EnergyAustralia is committed to working closely with the community throughout both the planning and construction phases of the Project. Consultation with the community and other key stakeholders has been underway for more than a year and is ongoing. **Table 6.1** below identifies stakeholders who have already been consulted as part of the planning and environmental assessment process.

Table 6.1 Identified stakeholders

	Participants
Local and state government	Department of Planning City of Sydney Department of Environment and Climate Change Roads and Traffic Authority NSW Heritage Office RailCorp State Transit Sydney Water Corporation TransGrid
Other stakeholders and community groups	Neighbours impacted through construction and new land use Businesses impacted through construction and new land use Telstra Local community and resident groups Environment groups Special interest groups Other potential organisations and utilities
General community	Interested members of the broader community who may wish to make comments through any public exhibition process required.

6.2.1 Approach to stakeholder consultation

EnergyAustralia aims to involve the local community at the planning stage of its infrastructure projects to balance local issues against the wider community's increasing electricity needs and its promise to deliver safe and reliable electricity for customers. In developing projects, EnergyAustralia places a high value on engaging local communities to achieve an outcome that assesses social, environmental, technical and economic needs.

EnergyAustralia is committed to working closely with the community throughout the planning and construction phases of this Project. Consultation with key stakeholders has taken place as detailed in **Section 6.3** below.

A Planning Focus Meeting was held on 28 May 2008. The following government agencies attended:

- RailCorp;
- Ministry of Transport;
- Transport Infrastructure Development Corporation;
- Department of Water and Energy;

- City of Sydney Council;
- Department of Planning;
- Department of Environment and Climate Change;
- Roads and Traffic Authority; and
- Heritage Branch (Department of Planning).

A copy of the minutes of the Planning Focus meeting is included in **Volume 2, Appendix A**.

The issues raised by these government agencies at or subsequent to the Planning Focus Meeting informed the preparation of the Director General's Requirements and the Environmental Assessment.

6.2.2 Outline of consultation activities

Table 6.2 provides a summary of the consultation activities undertaken by EnergyAustralia to date in regard to the Project.

6.3 Key issues raised

6.3.1 Government authorities

The Director General's Requirements (see **Volume 2, Appendix A**) identified the need to consult with a number of Statutory Authorities during the preparation of the Environmental Assessment. A summary of the issues raised during the consultation process for the Project, along with responses or where the issue has been addressed in the EAR is provided in **Table 6.3** below.

Table 6.2 Summary of consultation activities

Stakeholder	Mechanism						
	Personal Meeting	News-letter	Group Meeting	Correspondence	Ad in Local Paper	Ad in Regional Paper	Website
Neighbours to the Belmore Park Site							
Department of Water and Energy							
RailCorp							
Community and environmental groups							
TransGrid							
NSW Fire Brigade							
Broader community							
NSW Department of Environment and Climate Change							
Department of Planning							
NSW Heritage Office							
NSW Roads and Traffic Authority							
Sydney Water Corporation							

Table 6.3 Summary of government authority issues and responses

Government authority	Issues raised	Response or where addressed in EAR
City of Sydney Council & Central Sydney Planning Committee	• To satisfy the requirements of Part 5 Division 2 of the Sydney LEP, it is necessary for the development to go through a competitive process, generally in the form of a design competition. In particular this should apply to the design of Belmore Park, City East and Dalley St Zone Substations.	A design review process has been specified in the Director General's Requirements.
	• Belmore Park Zone Substation should comply with the sun access plane particulars contained in schedule 2 of the Sydney LEP 2005.	Chapters 5 and 8
	• It is recommended that consideration is given to encouraging active uses at ground floor level of Belmore Park Zone Substation through the mid-block connection.	Chapter 5 and 8
NSW Department of Environment & Climate Change	• A comprehensive assessment of the predicted noise and vibration impacts during both construction and operational phases in accordance with the relevant NSW Government and DECC policies should be undertaken.	Chapter 10
	• An assessment of all feasible and reasonable noise and vibration mitigation measures should be undertaken.	Chapter 10
	• A complaints monitoring and handling system for the construction phase of the project should be outlined.	Chapter 16
	• Reference must be made to relevant Water Quality Objectives including identification of environmental values and human uses to be protected or achieved for those waterways.	Section 15.1
	• Erosion and sediment controls during construction and runoff from storage of spoil must be addressed.	Section 15.1
	• Assess, quantify and report on waste and resource management options for the project in the context of: a) Avoidance of unnecessary resource consumption. b) Resource recovery (reuse, reprocessing, recycling and energy recovery). c) Disposal.	Chapter 12
	• Identify and report on proposed measures to assess, classify and manage waste and virgin excavated natural material.	Chapter 12
	• Assess, quantify and report on how the project would satisfy the requirements of the NSW Waste Reduction and Purchasing Policy.	Chapter 12
	• Assess and report on proposed measures to manage excavation spoil to ensure: a) Contaminated spoil is treated and disposed of, using best practices. b) Noise and dust emissions are minimised. c) Uncontaminated spoil is re-used rather than landfilled.	Chapter 16
	• Include a preliminary site contamination investigation including all areas where the project associated construction works are to be undertaken.	Section 7.5
	• Discuss the need for further work to fully assess site contamination and remediate any identified contamination of the site.	Section 7.5
	• An assessment of all potential air emissions including dust must be carried out. This assessment must include an outline of proposed mitigation and management measures.	Section 15.2.2
	• Storage of all materials, fuels and chemicals, including management of runoff, containment and disposal must be considered.	Section 13.3

Government authority	Issues raised	Response or where addressed in EAR
Department of Water & Energy	• The EAR should consider demand management • In-principle support for the CityGrid Project concept application	Section 2.4 Noted
NSW Roads & Traffic Authority	• Discussions held with RTA to review easement issues associated with 11kV works in Hay Street	Consultation is ongoing.
RailCorp	• Discussed likely interfaces with existing and proposed underground assets • Exchanged information for these assets • Set the framework for future liaison and agreements between the parties. • Obtained design information on the Eastern Suburbs Rail Lines; • An electrolysis report may be required for those areas of the proposed works within sixty (60) metres of the existing electrified rail network (or other distance as agreed with RailCorp). • A services search should be carried out to identify the presence of any rail services in the areas under consideration. • The following locations may be impacted by the project and must be considered: - Eastern Suburbs Railway- tunnels near Belmore Park (which would also impact on the existing Metro Light Rail corridor in Hay St. • Where proposed works are to be located within twenty-five (25) metres of existing rail infrastructure, Geotechnical and Structural Reports must be submitted for review. • Construction methodologies, risk assessments, Safe Work Method Statements and any monitoring regimes applicable to rail infrastructure would be required to be submitted for review. • Prevention of contaminants entering into the rail corridor. Including possible stormwater ingress must be taken into account. • A dilapidation report identifying the condition of existing infrastructure prior to and after any works. • Impacts of vibration on existing infrastructure e.g. road/ rail tunnels - vibration monitoring may be required depending on the construction techniques used and relative proximity.	Consultation is ongoing. Chapter 14 Chapters 14 and 16 Chapters 14 and 16
Sydney Water Corporation	• The CityGrid project is subject to the Section 73 process for the tunnel sections and the aboveground urban building development. • Issues that would need to be considered involve the safe clearance to major water assets and the prevention of touch voltages in our metal mains and access covers etc.	Energy Australia would treat the process as though Section 73 applies but with no certificate being issued due to the Project's Part 3A status under the EP&A Act

Government authority	Issues raised	Response or where addressed in EAR
NSW Heritage Office	• All known heritage items under or adjacent to the route of the tunnel and substation sites should be identified and their significance assessed. Statements of Heritage Impact would need to be prepared for all heritage items that are identified on LEPs and the State Heritage Inventory which are within the area affected by the proposal.	Chapter 11
	• Non-Aboriginal heritage items within the area affected by the proposal should be identified by field survey. This should include any buildings, works, relics (including relics underwater), gardens, landscapes, views, trees or places of non-Aboriginal heritage significance. A statement of significance and an assessment of the impact of the proposal on the heritage significance of these items should be undertaken. This assessment should be undertaken in accordance with the guidelines in the NSW Heritage Manual. The field survey and assessment should be undertaken by a qualified practitioner/consultant with historic sites experience.	Chapter 11
	• Any policies/measures to conserve heritage significance or to mitigate against potential impacts must be identified in the Statements of Heritage Impact, baring in mind the different statutory requirements for various types of heritage items (especially the distinction between works and relics).	Chapter 11
	• Impacts on places, items or Aboriginal objects of significance to Aboriginal people must be considered. Where it is likely that the project would impact on Aboriginal heritage, adequate community consultation should take place regarding the assessment of significance, likely impacts and management/mitigation measures.	Chapter 11
	• Aboriginal heritage issues should be identified through a preliminary assessment in accordance with DECC's Guidelines.	Chapter 11
NSW Fire Brigade	• Further information requested as the project progresses into design stage.	Addressed as part of BCA requirements (See **Volume 3, Appendix M**)
TransGrid	• Further information requested as the project progresses into design stage.	Consultation is ongoing through regular joint planning meetings between EnergyAustralia and TransGrid.

6.3.2 Community

EnergyAustralia has begun consultation with the local community in relation to the Belmore Park Zone Substation. Activities undertaken to date include:

- distributing a community newsletter around the Belmore Park Site;
- holding two community information displays in relation to Belmore Park Site;
- advertising in the Sydney Morning Herald and Australian Chinese Daily in relation to Belmore Park Site;
- establishing project information on EnergyAustralia's website;
- answering phone calls and emails about the Belmore Park Site; and
- distributing a notification letter regarding geotechnical work around the Belmore Park Site.

6.4 Environmental Assessment exhibition and making a submission

This EAR is placed on public exhibition for a minimum period of 30 days in accordance with the requirements of the EP&A Regulation. During this period, a copy of the report would be available for perusal at selected

locations. The report will also be available on EnergyAustralia's website at **www.energyaustralia.com.au/citygrid** and on the Department of Planning's website at **www.planning.nsw.gov.au.** A limited number of copies are available through EnergyAustralia by calling 1800 214 193.

Written submissions from organisations and the general community are invited and should be addressed to:

The Director
Major Infrastructure Assessment
Department of Planning
GPO Box 39
SYDNEY NSW 2001

Submissions may contain comments on any aspect of the Project or the Environmental Assessment. As a guide, submissions should include:

- the nature of the respondent's interest in the Project;
- the respondent's opinions on the Project;
- any suggested alternatives or improvements to the Project;
- additional measures that are considered necessary to protect the environment;
- factual errors or omissions in the EAR;
- any additional information that should be considered; and
- any other issues of relevance to the project, the EAR, or the approval process.

All information provided by respondents in their submissions would be collected for the sole purpose of assisting in the assessment of the Project. The information may be used by the relevant staff and consultants of the Department of Planning, and EnergyAustralia during the environmental assessment process, and may be disclosed to appropriate government authorities as required by 75H(5) of the EP&A Act.

Where the respondent indicates that their submission should remain confidential, EnergyAustralia would attempt to ensure that it remains so; however, there may be legislative or legal requirements for its release (for example, under the NSW Freedom of Information Act 1989).

Each respondent would have free access at all times to their submission and may make a correction to their submission in writing to the above address.

EnergyAustralia would collate the submissions at the end of the exhibition period and examine and analyse the issues raised in the submissions. EnergyAustralia would prepare a Submissions Report to address the issued raised in submissions, identify any new information on the proposed development, and any proposed modifications.

In order to ensure that the issues raised in the submissions can be analysed and considered properly, it is advised that submissions:

- include details of the respondent's name, address, and the date;
- list separate points to make the separate issues clear;
- refer each point to the relevant section of the EAR; and
- are as legible as possible.

6.5 Next steps

The next stage of consultation with stakeholders would build on the activities undertaken so far and the proposed actions in the consultation plan for the Project.

The next steps are as follows:

- exhibition of the EAR for the Project for a minimum of 30 days and invitation for the community and stakeholders to make submissions;
- EnergyAustralia prepares Submissions Report and, if required, a Preferred Project Report and final statement of commitments; and
- the Director General of the Department of Planning provides an Assessment Report to the Minister for Planning who then determines the Concept Plan and, if approved, sets conditions for further assessment and/or further approvals required.

7 Existing Environment

7.1 Introduction

The site at 430 – 450 Pitt Street Sydney comprises the western half of the street block bounded by Hay Street to the south, Campbell Street to the north, Castlereagh Street to the east and Pitt Street to the west.

The eastern half of the street block fronting Castlereagh Street, was developed in 1972 and contains a 23 storey commercial tower ("Central Square"). The two separate allotments within the street block were created when the block was subdivided in December 1996. The subject site is currently used as a privately operated open-air commercial car park accommodating approximately 100 vehicles. It is open 24 hours, seven days per week and allows vehicles to enter and exiting via the site's single two-way driveway off Hay Street. The site is regular in shape with an area of 3,429m^2. A photograph of the site taken from the north is shown in **Figure 7.1** below:

Figure 7.1 View of the proposed Belmore Park Zone Substation Site from the north

7.2 Landuse

The subject site has been used as a street level commercial car park for the past 30 years. The entrance to the car park is via Hay Street.

Figures 7.2 and **7.3** illustrate the existing site.

Figure 7.2 View from Campbell St

Figure 7.3 View from Pitt St

Situated at the southern end of the Sydney central business district (CBD), the site is adjacent to Belmore Park and Central Railway Station.

The proximity of Belmore Park's pedestrian routes, light rail line and elevated railway bridge provide good public transport access to the site, whilst also isolating it from the general hub of city activities. The long-standing lack of development also contributes to the relative quiet perspective of the precinct.

The surrounding locality is characterised by a mixture of entertainment (Capitol Theatre), office (Central Square and Sydney Central), retail (ground level shops in Sydney Central, Manning Building and along Pitt Street), commercial (Chamberlain Hotel), hotel (Royal Garden Hotel) and residential (Regis Tower). These uses are in a variety of large scale contemporary buildings (Central Square – 24 storeys, Sydney Central – 31 storeys and Regis Towers – 35 storeys), smaller scale heritage building around 3-6 storeys and the Manning Building, which has recently undergone redevelopment, raising its overall height to eight storeys.

7.3 Socio-economics

EnergyAustralia has an important role in supporting Sydney by providing adequate and efficient energy supplies.

Sydney CBD has an integral role within metropolitan Sydney, Sydney's global arc, the state and, most importantly, as being Australia's only recognised global city. Over the past two decades, Sydney CBD has undergone constant growth, which in turn has seen its population, tourism and its role in the international economy grow.

As a global city, Sydney CBD has Australia's highest population density reaching 8,400 persons per km^2 in 2005. This is expected to grow well into the future with population projections from 2001-2031 showing steady increases (89 percent from 2001 to 2031). The city is working towards an additional 48,000 dwellings (around 87,000 people) and 95,000 jobs (from 370,000 to 465,000) from 2006 to 2030.

Tourism is another key element of Sydney's global status. In 2006, metropolitan Sydney received around 2.6 million international visitors (half of the national total), with around 75 percent of these visitors destined for Sydney CBD. The city also accommodates a diverse population, including a constant inflow and outflow of professionals and other skilled people and receives two-thirds of international business visitors.

Sydney CBD is the primary link between the global and Australian economies. The city generates $70 billion of economic activity (value-added), or nearly nine percent of the total Australian economy. With 30 percent of national employment in financial and business services (accounting, legal, financial, communications and advertising), nearly half of Australia and New Zealand's top 500 companies and more than 60 percent of Asia Pacific's regional headquarters established by multinational companies. Complimenting the high concentration of key businesses and multinationals is the highly skilled and globally mobile workforce based in Sydney.

The Project is located in the Sydney CBD area, and is necessary to provide a secure supply of electricity to support economic activities that allow the city to remain globally competitive. The Project considers a number of stakeholder groups including local residents, visiting tourists, local businesses and global corporations.

7.4 Visual amenity

The Sydney CBD area includes state and locally listed heritage buildings and residential, commercial and recreational uses.

The area surrounding the Belmore Park Site is a mixture of retail, commercial, entertainment and residential land uses. The site is at the south eastern edge of the CBD, in close proximity to Central Railway Station. The elevated railway lines to the east of the site form an implied edge to the city and a boundary to the Surry Hills precinct. Belmore Park to the south of the site is a formal urban green park.

The eastern half of the street block fronting Castlereagh Street, was developed in 1972 and contains a 23 storey commercial tower ("Central Square").

The Belmore Park Site is currently used as a privately operated open-air commercial car park accommodating approximately 100 vehicles. It is open 24 hours, seven days per week and allows vehicles to enter and exit via the site's single two way driveway off Hay Street.

7.5 Geology, hydrogeology, topography and soils

The following information was extracted from the geotechnical assessment report prepared for the Belmore Park Site by Douglas Partners Pty Ltd in April 2008.

Reference to the Sydney 1:100 000 Geological Series Sheet indicates that the site is underlain predominantly by filling over previous swampy alluvial areas which in turn overlies Hawkesbury Sandstone.

Three previous investigations have been carried out on the site:

- Douglas Partners Pty Ltd in May 2005;
- Douglas Partners Pty Ltd in March 1996; and
- Ground Test Pty Limited in November 1968.

The ground profile on the site is generally summarised in **Table 7.1** below:

Table 7.1 Subsurface conditions for Belmore Park Site

Depth to top of stratum	Stratum description
0m	concrete, asphalt or roadbase
0.15 – 0.30m	filling - ripped sandstone, sand, clay, wood, concrete
0.9 - 4.1m	clay - stiff to hard clay or silty clay
3.0 – 5.4m	residual sandy clay - very stiff to hard
4.15 – 5.95m	sandstone - extremely low to low strength sandstone with strength increasing to medium to high strength by 8.5- 9.0 metres depth

Reference to the Acid Sulphate Soil Risk Map (Botany Bay), Edition 2, December 1997, produced by the Department of Land and Water Conservation, indicates that the site lies in an area of no known occurrence of potential acid sulphate soils.

A stage 2 contamination assessment for the Belmore Park Site was conducted by Douglas Partners Pty Ltd in August 2008. On the basis of the investigation, the potential for contamination associated with the soil and groundwater at the site was low. The site was considered suitable for the Project (given that most of the filling is to be removed for the basement excavation) and provided that groundwater is sampled from Bore 103 during the construction stage and verifies the second round of groundwater results for total petroleum hydrocarbons (TPH) and monocyclic aromatic hydrocarbons (benzene, toluene, ethylbenzene and xylene (BTEX)) as being detected below the adopted screening criteria.

7.6 Surface and groundwater

7.6.1 Surface water

The Project is within the catchment area of Sydney Harbour.

The catchment area is highly urbanised with the exception of parklands such as Belmore Park.

Surface water is managed by drainage systems which direct water into Sydney Harbour.

7.6.2 Groundwater

The geotechnical assessment report prepared for the Belmore Park Site by Douglas Partners Pty Ltd in April 2008 found that in the 1996 and 2005 investigations, no free groundwater was observed in the bores during auger drilling while the water flush method used for core drilling did not allow water measurements below.

Two weeks after drilling for the 2008 report, the depth to groundwater in one standpipe was 9.3 metres which approximately coincided with the depth to high strength sandstone. In the 1968 study, some groundwater was noted at about 4 metres depth in and at 1.2 metres depth near Castlereagh Street.

7.7 Traffic

Traffic and transport movements within and around the Sydney CBD and East Sydney area occur using a variety of transportation modes including private vehicles, public bus services, light rail and heavy rail services, pedestrian and cyclist movements. These movements are critical for the transportation of people, goods and services and play an integral role in the prosperity and vitality of the CBD.

The Belmore Park Site is surrounded by established southern CBD development including Capitol Theatre and commercial land uses on the western side of Pitt Street, commercial land uses to the north and east, and

Belmore Park and Central Station to the south. At present, the Project site is used as a commercial car park with approximately 100 parking spaces. It has left-in/left-out access to and from Hay Street.

The site is located adjacent to local streets with direct access to the major road network. This would allow removal of spoil and delivery of construction materials almost exclusively on arterial roads, which are suitable for such purposes.

Access from the local road network is available via Hay Street and Campbell Street east to Elizabeth Street and Campbell Street west to George Street. Hay Street and Campbell Street have underpasses beneath the CityRail network lines travelling north from Central Station with a vehicle height restriction of 3.8 m for the Campbell Street underpass. Access to the major road network is as follows:

- east and west via Hay Street and Elizabeth Street south to Cleveland Street, and south from Cleveland Street onto South Dowling Street and Southern Cross Drive; and
- north via Hay Street, Elizabeth Street, Wentworth Avenue, College Street, Prince Albert Road and Macquarie Street to access Cahill Expressway.

To the south of the site, Hay Street is a two-way road with separated carriageways (central median) in each direction. The eastbound carriageway is shared with the Sydney light rail route, which operates in a one-way clockwise loop crossing over Hay Street at Castlereagh Street (to the east) and from the Central Station ramp back onto Hay Street at Pitt Street, adjacent to the site. Hay Street is closed to traffic west of Pitt Street and becomes a pedestrian thoroughfare and two-way light rail route. Hay Street has a local 50 km/h speed restriction and intersects with Pitt, Castlereagh and Elizabeth Streets at signal-controlled intersections.

To the north of the site, Campbell Street is a two-way, single carriageway road with two travel lanes and adjacent parking lanes. West of Pitt Street, Campbell Street is restricted to one-way westbound flows to connect with George Street. Campbell Street has a local 50 km/h speed restriction and intersects with George, Pitt, Castlereagh and Elizabeth Streets at signal-controlled intersections. There is a right-turn restriction from Wentworth and Elizabeth Streets into Campbell Street and a vehicle height restriction of 3.8 m for the Campbell Street rail underpass.

To the west of the site, Pitt Street is a two-way, single carriageway road with four travel lanes and an adjacent parking lane on its western side. Pitt Street has a local 50 km/h speed restriction and intersects with both Hay and Campbell Streets at signal-controlled intersections.

At present traffic movements from the site of the Belmore Park Zone Substation are limited to the ground level commercial car park occupying the site. The existing 100 space public car park generates 30 – 35 vehicular movements per hour.

7.8 Noise

It is considered that the existing local noise environment is consistent with the land use and zoning for the CBD and surrounds. The noise environment for the area is dominated by road traffic noise.

Unattended environmental noise monitoring was conducted at one location over six days and five nights from Thursday 22 May to Tuesday 27 May 2008, the results of which are detailed in **Figure 10.1**.

Heggies Pty Ltd also undertook a detailed site inspection on 29 May 2008 and identified the potentially most affected noise and vibration-sensitive receivers in the vicinity of the proposed works. A summary of the findings is provided below. Further details are contained in **Volume 2**, **Appendix D**.

The nearest noise and vibration-sensitive receivers to the Belmore Park Site are identified in **Table 7.2**.

Table 7.2 Receivers near Belmore Park Site

Receiver Type	Receiver Address
Residential	420 Pitt Street/36 Campbell Street - Strata Units
	414 Pitt Street - Strata Units
Hotel/Tavern	428 Pitt Street - Chamberlain Hotel
	431 Pitt Street
Commercial	323 Castlereagh Street
	441 Pitt Street

Note: This table is not exhaustive; it gives an indication of the most potentially affected receivers near to the proposed works, as identified during a site inspection. Other nearby receivers in Campbell Street, Pitt Street and other nearby streets should also be considered 'potentially affected' by airborne noise, regenerated noise and vibration due to the proposed works.

7.9 Non-Aboriginal heritage and Aboriginal archaeology

7.9.1 Non-Aboriginal heritage

The following information was extracted from the Belmore Park Site Heritage Impact Statement (HIS) prepared by City Plan Heritage (May 2008). A copy of this report is provided in **Volume 2, Appendix E**.

The subject site is not listed as a heritage item under any statutory instruments, and is not located in an area of special interest or character as outlined in the Sydney LEP 2005.

There are several heritage items located within the vicinity of the site which reflect the various phases of this historic precinct. These items are listed in Schedule 8 of the Sydney LEP (Central Sydney Heritage Items). The Chamberlain Hotel is listed as No. 360 on the Schedule and is located at 420-428 Pitt Street, No. 361 on the Schedule is the Manning Building located at 441-459 Pitt Street, and No. 362 the former Presbyterian Manse at 461 Pitt Street. Hay and Campbell Streets are listed as Heritage Streetscapes, however, the extent of the listing does not extend beyond the corner with Pitt Street. The Pitt Street facades of Manning Building, and 461 Pitt Street, are not part of a listed Heritage Streetscape.

7.9.2 Aboriginal archaeology

The following Aboriginal Archaeological information was extracted from the Aboriginal Cultural Heritage Assessment by Navin Officer Heritage Consultants. A full copy is provided in **Volume 2, Appendix F**.

Table 7.3 describes the sites nearest to the Belmore Park Zone Substation site.

Table 7.3 Summary of previously identified Aboriginal sites in the vicinity of the Belmore Park Site

Site ID	Site Name	Grid Reference (AGD)	Site Type
2580	Junction Lane	335176.6250601	Open camp site
2629	Broadway 1	333165.6249291	Artefact
2651	William St PAD	334905.6250411	PAD
2652	Ultimo PAD1	334556.6250191	PAD
2663	Mountain Street Ultimo	333406.6249591	Artefact/PAD
2666	Wattle Street PAD1	333256.6249450	PAD
2680	Broadway Picture Theatre PAD1	333256.6249191	PAD
2687	Crown Street PAD1	335056.6250491	PAD

7.10 Air quality

The following information was extracted from the Air Quality Assessment prepared by Pacific Air and Environment (June 2008). A full copy of the report can be found in **Volume 2, Appendix H**.

The NSW DECC operates a comprehensive state-wide air quality monitoring network comprising sites throughout NSW, with particular focus on the main population centres of Sydney, the lower Hunter and the Illawarra. The information provided below is based on monitoring data from that network.

The last exceedance of the carbon monoxide (CO) standard in NSW was recorded in the CBD in 1998, and since 2002, maximum 8-hour concentrations have been half the standard. The Air National Environment Protection Measure (NEPM) standard for CO is no longer exceeded anywhere within the monitoring network in NSW.

The introduction of unleaded petrol in 1985, the progressive reduction of the lead content of petrol and the subsequent ban on lead in petrol from 2002 have reduced ambient concentrations of atmospheric lead in Sydney. Lead levels today are well below the Air NEPM standard of 0.5 micrograms/m^3 (µg/m^3).

In Sydney, the largest source of oxides of nitrogen (NO_X) emissions is on-road vehicles, which contribute over 71% of total NO_X emissions. Current maximum nitrogen dioxide (NO_2) concentrations in NSW are well below both the 1-hour and annual standards.

In Sydney, no exceedances of the 1-hour sulphur dioxide (SO_2) standard have ever been recorded. The maximum 1-hour concentrations are typically less than 20% and less than 30%, respectively, of the standard.

There are many sources of particles in the air, arising from both natural processes and human activity. The dominant source of PM_{10} (fine particulate matter) from human activity in Sydney is industry (37%), but domestic sources and on-road mobile sources make up a greater proportion of PM_{10} emissions in Sydney than

in the rest of NSW. The annual domestic sector contribution to PM_{10} emissions in Sydney comes largely from wood heating (93%). There is a strong seasonality to PM_{10} levels. In Sydney, the majority of exceedances occur in spring and summer (81%).

7.11 Electric and magnetic fields

Electric and magnetic fields (EMF) are found everywhere. They are part of the natural environment and are present in the atmosphere. They are produced wherever electricity or electrical equipment is in use.

The strength of EMF reduces quite rapidly with distance.

Electric fields are shielded by most objects, including trees, buildings and skin and their strength reduces rapidly as you move away from the source. In contrast, magnetic fields pass through most materials. Although electric fields were the primary focus of scientific attention more than 20 years ago, today most interest and research centres on magnetic fields.

EMF is measured in milliGauss (mG). **Table 7.4** provides an indication of the relative levels of EMF experienced on a typical day around our home and those relating to the electricity networks.

EnergyAustralia designs its infrastructure according to the principle of prudent avoidance, which means taking reasonable steps to limit field exposures from new facilities by locating and operating the equipment prudently within Australian health guidelines.

Independent studies would be carried out on the EMF impact for each element of the Project.

Table 7.4 Typical magnetic field measurements around common home electrical appliances and electricity network infrastructure

COMMON EMF SOURCES	RANGE OF MEASUREMENTS (mG)
ELECTRIC STOVE	2-30
PC	2-20
TV	0.2-2
ELECTRIC BLANKET	5-30
HAIR DRYER	10-70
REFRIGERATOR	2-5
TOASTER	2-10
KETTLE	2-10
FAN	0.2-2
SUBSTATION	1-8 (AT SUBSTATION FENCE)
TRANSMISSION LINE: - UNDER LINE - EDGE OF EASEMENT	 10-200 2-50
DISTRIBUTION LINE: - UNDER THE LINE - 10M AWAY	 2-30 0.5-10

Note: Appliance measurements taken at normal user distance (Source: ARPANSA)

8 Visual Amenity & Design

8.1 Introduction

The modern era of electricity substation design sees architects and local communities playing a part in developing projects to meet the needs of electricity users across EnergyAustralia's network.

EnergyAustralia is committed to meeting the challenge of providing new infrastructure in a location that ensures a high quality power supply – often in built up areas – and developing the project in a way that is complementary to the local neighbourhood.

EnergyAustralia actively seeks input from the local community into the exterior design, including architectural features, landscaping, fencing and building materials, ensuring a best possible balance with the technical, environmental and financial limitations of the project.

8.2 Assessment

8.2.1 General

On 10 June 2008, the Department of Planning issued Director General's Requirements for the Belmore Park Project Application.

In particular, and in regard to design considerations associated with the Belmore Park Site, the Director General's Requirements stated:

*"**Visual Amenity Impacts** – the Environmental Assessment must include an assessment of the visual impacts associated with the project, including the impact on local and regional views by the substations and related infrastructure. A design review process for the new electricity infrastructure associated with this infrastructure must form part of the Environmental Assessment. The outcome of this design review process for Belmore Park Substation must be included in the Environmental Assessment. This design review process should be based on the principles of the design review competition of Sydney Local Environmental Plan 2005 and include consultation with Sydney City Council"*

To ensure that the proposed Belmore Park Site is designed to be in keeping with the locality and maintain its identity as a bold, modern addition to the area, the design of the development has been guided by the development parameters of the Central Sydney Local Environment Plan 2005 and the Central Sydney Development Control Plan 1996 to achieve an appropriate contemporary image for the development.

The application of these guidelines, and other planning provisions relevant to the Belmore Park Site are addressed below.

8.2.2 Sydney City Council LEP 2005

Part 5 Urban Form, Design Excellence and Environmental Design is divided into three divisions:

- Division 1 – Urban Form;
- Division 2 – Design Excellence; and
- Division 3 – Environmental Design.

The application of these divisions in relation to the Project is discussed below:

Division 1 - Urban Form

Clauses 22 and 23 require a development plan to be in place before development consent is granted if the building height is greater than 55 metres or the site is greater than 1500m^2. The purpose of the development plan may establish a building envelope, floor space ratio and height appropriate for a site and its context.

Clause 25 sets out the requirements for a development plan to address:

- suitability of land for development;
- proposed land uses and mix;
- heritage issues;
- tower location;
- bulk massing and modulation of building;

- street frontage heights;
- environmental impacts (sustainable design, overshadowing, wind and reflectivity);
- achievement of ESD principles;
- pedestrian, cycle, vehicular and service access requirements; and
- public domain impacts or improvements.

Clause 23(4)(e) provides that the consent authority may waive compliance with the requirement to provide a development plan for any development that the consent authority considers it would be unreasonable or unnecessary to require compliance with those requirements.

Comment

In response to the planning provisions above, EnergyAustralia considers that the requirement for a development plan is unnecessary in this case, as the majority of the matters under Clause 25 (above) are addressed by the Council adopted envelope for the site.

The adopted site envelope (based on Council's sun access plane) addresses matters of:

- *tower location,*
- *bulk massing and modulation of the building,*
- *street frontage heights, and*
- *public domain impacts and improvements:*

With regard to the other matters to be addressed by the development plan it is considered that:

- *matters relating to suitability of the land for development and proposed land use and mix have been satisfied by compliance with the Zone requirements of the LEP;*
- *there are no heritage issues applicable to the subject site; and*
- *environmental impacts, ESD principles and vehicle and pedestrian access have been addressed during the design process, as detailed further below and in Table 8.1.*

Division 2 - Design Excellence

When determining a development application the consent authority will assess whether a new building exhibits 'design excellence'.

Clause 28D requires the consent authority to consider whether a proposed development has been designed as a result of a 'competitive process'.

The Central Sydney DCP provides details of two options available to the applicant to satisfy the requirements of the competitive process. The options are:

- design competition in accordance with the provisions of the LEP and DCP; and
- design alternatives prepared on a competitive basis by different architectural firms.

Clause 12.1.6 of the DCP also allows in exceptional circumstances the option of a different process provided it achieves the aims and objectives of the LEP and facilitates design excellence.

LEP Clause 26(2) states that in considering whether a proposed development exhibits design excellence, the consent authority must have regard to the following matters:

- whether a high standard of architectural design, materials and detailing appropriate to the building type and location will be achieved;
- whether the form and external appearance of the building will improve the quality and amenity of the public realm; and
- whether the new development detrimentally impacts on view corridors identified in the relevant development control plan.

In response to the requirements of LEP Clause 26, and the Director General's Requirements, EnergyAustralia introduced, and has undertaken a design review process aimed at achieving the requirements for design excellence. This process has been successfully used on other major projects and is also considered appropriate to this Project.

The design review process included representatives from EnergyAustralia, City of Sydney Council, the Department of Planning, as well as other selected architectural peers.

The outcomes of the design review process for the Belmore Park Site are detailed below in **Section 8.2.3**.

Division 3 – Environmental Design

When determining a development application the consent authority will assess whether a new building exhibits 'design excellence'.

Clauses 27 requires that the design of the building must have regard to the principles of ecologically sustainable development, based on a "whole of building" approach that considers:

- greenhouse gas reduction;
- embodied energy in materials and building processes;
- building design and orientation;
- passive solar design and daylighting;
- natural ventilation;
- energy efficiency and energy conservation;
- water conservation and grey water re-use;
- waster minimisation and recycling;
- reduction of car dependence; and
- potential for adaptive reuse.

In response to the requirements of LEP Clause 27, best practice principles of Ecologically Sustainable Development, following the principles of the Green star and ABGR rating schemes, have been adopted in the design of the Project. The commercial development building has been designed with the intent of achieving 5+ star Green Star and 4.5 Star base building ABGR ratings.

Green Star is an environmental rating system for buildings that seeks to reduce the environmental impact, improve occupant heath and productivity and showcase innovation in sustainable building practices.

Presently, less than 30 buildings in Australia have been certified with Green Star ratings of 5 star or more. As such, it is considered that the 5+ star Green Star and 4.5 star ABGR design intent would result in a more sustainable building judged to represent "Australian Excellence" in building design, thus meeting the requirements of LEP Clause 27.

In summary, EnergyAustralia considers that the Belmore Park Zone Substation and commercial development have been designed with due consideration to the guidelines and principles of the Sydney Local Environment Plan 2005 and the Central Sydney Development Control Plan 1996 to achieve an appropriate contemporary image for the development

An assessment and summary of compliance against these planning controls is provided in **Table 8.1** below:

Table 8.1 Assessment of City of Sydney Planning Controls

Control	Sydney LEP 2005	Proposed	Compliance
Cl.36 Zoning	City Centre Zone	The proposed substation, office building and ground floor retail uses are permissible under this zoning	Yes
Cl.50 Height of Buildings	Belmore Park Sun Access Plane A1 (25 metres on northern alignment of Hay Street with a vertical angle 32 degrees 30' providing a maximum height on Campbell Street of 60 metres to the ridge).	The proposed building envelope has been designed to comply with the Belmore Park Sun Access Plane A1. (The proposed building has a maximum height of 58.4 metres to the ridge).	Yes
Cl.54 Floor Space Ratios (FSR) Site area – 3,428.9m^2	Base FSR of 8:1 (27,431m^2) up to maximum of 12.5:1 (42,861m^2) for commercial uses.	Proposed FSR of 7:1 (22,525m^2) nominally allocated.	Yes

Cl.65 Car Parking	1 car space per 50m^2 of site area. Based on site area of 3,429m^2 a maximum of 69 spaces is permissible.	62 cars spaces proposed over 3 basement car park levels.	Yes Refer to Section 8.2.3
Cl. 23-27 Urban form, design excellence and environmental Design	Development Plan/Design Excellence provisions are activated as the site area exceeds 1500m^2.	As provided for in the LEP and DCP, it is proposed to achieve design excellence through an alternative Design Review Process.	Yes Refer to Section 8.2.3
Cl.74 Development within the vicinity of a heritage item	An application for development within the vicinity of a heritage item, must take into account the impact of the proposed development on the heritage significance of the item.	The proposed development is in the vicinity of four items listed in Schedule 8 of the Sydney LEP. The HIS prepared by City Plan Heritage has assessed the potential impact of the proposed building on these items. The HIS concludes that the proposed building would not adversely impact on the heritage significance of these buildings.	Yes
Cl.75 Development of Potential Archaeological sites	An archaeological assessment is required which assesses how the proposed development would affect the conservation of the site and any relic known or reasonably likely to be located at the site.	The proposed development would involve the bulk excavation of the subject site. An archaeological assessment has previously been carried out by Casey and Lowe in 1996. The assessment concluded that it was unlikely that any extensive area of intact nineteenth-century remains has survived.	Yes
Cl.81 Referral – rail Corporation of New South Wales	Consent to carrying out development below ground level on land identified as within a Rail Corridor Map requires referral to the Rail Corporation of NSW and consideration of comments received.	The subject site is located within the rail corridor area of Sydney Central Railway as identified on the Rail Corridor map of the Sydney LEP.	Yes The required referral would be made to RailCorp NSW
Control	**Central Sydney DCP 1996**	**Proposed**	**Compliance**
Building to the street alignment **DCP - Cl 2.1.1**	New buildings are to have street frontages built predominantly to the street alignment.	The proposed building is to be built to the street alignment of Pitt, Hay and Campbell Streets.	Yes
Building to the street alignment **DCP - Cl 2.1.2**	Circumstances where building predominantly to the street alignment may be inappropriate include development where; (i) the site is adjacent to a freestanding or setback heritage building. In this case the new building should match the setback of the heritage building. In such circumstances, the heritage impact statement should be prepared.	There are no heritage items contiguous or immediately adjoining the subject site. There are heritage items on the vicinity of the site on the opposite side of the adjoining streets. The HIS prepared by CityPlan Heritage concludes that the proposed setbacks are appropriate in these circumstances.	Yes
Building setbacks **DCP - Cl 2.3**	Front setbacks 8 metres weighted average above 45 metres. Side and rear setbacks at least 3 metres.	To achieve a strong architectural expression no setbacks are provided.	No

Street frontage heights and setbacks for special areas **DCP - Cl 2.4**	Note: The subject site is not located in a designated Special Area.	N/A	N/A
Street frontage activities **DCP - Cl 2.5**	Active frontages at ground level to retail streets and major pedestrian streets.	Pitt Street is classified as a major pedestrian street. An active street frontage of retail uses and the buildings entry lobby is provided on Pitt Street. Additional retail uses are provided on the Corner of Pitt and Campbell and Pitt and Hay Street.	Yes
Building Bulk **DCP - Cl 2.6**	Applies to commercial buildings above a height of 120 metres.	The proposed building is 58.4 metres in height	N/A
Building Exteriors **DCP - Cl 2.7.1**	Adjoining buildings (particularly heritage buildings) are to be considered in the design of new buildings in terms of: (i) building to the street alignment (ii) street frontage heights (ii) setbacks above street frontage heights (iv) façade proportions including horizontal and vertical emphasis (v) the provision of enclosed corners at street intersections.	These matters have been considered in the HIS. The HIS concludes that the proposed building design would not adversely impact on the heritage significance of the adjoining buildings.	Yes
Building Exteriors **DCP - Cl 2.7.2**	Building exteriors are to be designed with regard to the following criteria: (i) the predominantly masonry character and articulation of Central Sydney is to be reinforced, particularly at lower levels of buildings (ii) Materials used (including glass are to be predominantly light in colour (iii) extensive expanses of blank glass or solid wall are to be avoided.	The lower level of the substation portion of the building is to be masonry. The remaining proposed building façade is to be predominantly glazed with external sun controls. Materials to be used are to be predominantly light grey in colour The building façade is predominantly glazed with external sun protection devices.	No Yes No
Views **DCP - Cl 2.8**	The DCP identifies significant views from surrounding streets around the site to be maintained.	The proposed building envelope does not impact on nominated views	Yes
Lanes DCP **DCP - Cl 3.1**	Fig 3.1 in the DCP indicates a new lane to be provided separating the site from the Central Square Tower.	A 6-metre wide lane is proposed in this location. The substation of the proposed building fronts the new lane. It is proposed to include design details to provide visual interest on the lane in compliance with DCP requirements.	Yes
Midblock Connections **DCP - Cl 3.2**	Midblock connections to be provided in nominated locations	Midblock laneway provided on the subject site (see above)	Yes

Vehicle Access and Footpath Crossing **DCP - Cl 3.3**	New vehicle access points not preferred on Pitt Street. One combined service and vehicle access per building.	No vehicle access proposed on Pitt Street. A single combined access on Campbell Street is provided for the office building A single through service access is provided for the Substation with access on Hay Street and exit on Campbell Street.	Yes Yes Yes
Awnings and Colonnades **DCP - Cl 3.5**	Awning required on Pitt Street	Awning provided on Pitt Street.	Yes
Sunlight to public spaces **DCP - Cl 4.1**	Compliance with the Belmore Park Sun Access Plane A1 represents effective compliance with this control	The proposed building envelope complies with the Belmore Park Sun Access Plane. Refer to shadow analysis in **Volume 3, Appendix H**	Yes
Wind Standards **DCP - Cl 4.2**	New developments are to satisfy Council's nominated wind standards.	The Wind Effects Study undertaken by Vipac concludes that the proposed building is not expected to generate wind conditions in excess of Council standards.	Yes
Energy Efficiency **DCP - Cl 4.3**	To provide energy efficient buildings. An Energy Efficiency Report is required.	The proposed building is designed to achieve a 5+ Star Green Star energy rating. Refer to the attached Energy Efficiency Reports in V**olume 3, Appendices K and L**.	Yes
Reflectivity **DCP - Cl 4.5**	To restrict the reflection of sunlight to surrounding areas and buildings.	Intention to comply. A report is to be provided following final material selection at detailed design.	Yes
On Site Parking **DCP - Cl 5.1 – 5.6**	On-site parking in Central Sydney should generally be located below ground so that active uses are maximized at street level. Where any proposed development includes on-site parking, a Traffic and Parking Report is required.	The parking for the building is provided in a basement car park as required by the DCP Traffic and parking compliance matters are addressed in the Traffic Impact Assessment prepared by Traffix in **Volume 2, Appendix C**.	Yes Yes
Design excellence and competitive processes **DCP - Cl 12.1**	Clause 28D of the Sydney LEP requires a proposed development to be designed as a result of a competitive process.	It is proposed to achieve design excellence through the alternative Design Review Process.	Yes Refer Section 8.2.3

Control Section 2 – Vicinity Controls	Central Sydney Heritage DCP 1996	Proposed	Compliance
2.2 Provisions	(1) – Alterations and additions to buildings and structures and new development of sites in the vicinity of heritage items are to be designed to respect and compliment the heritage item in terms of the: a) building envelope; b) proportions; c) materials colours and finishes; d) building and street alignment	These matters have been assessed in the HIS prepared by CityPlan Heritage. The HIS concludes that the proposed building design would not adversely impact on the heritage significance of the adjoining buildings.	Yes
	(2) – Development in the vicinity of the heritage item is to minimise the impact of the setting of the item by: a) providing an adequate area around the building to allow interpretation of the heritage item; b) protecting (where possible) and allowing the interpretation of archaeological features; and c) retaining and respecting significant views to and from the heritage item.	The HIS concludes that the proposed building complies with this clause.	Yes

8.2.3 Design review process

Overview

In line with the Director General's Requirements for the project, EnergyAustralia undertook a design review process aimed at achieving the requirements for design excellence in regard to the visual amenity and design aspects of the Project.

The design review was held on 22 August 2008, and included representatives from EnergyAustralia, City of Sydney Council, the Department of Planning, and other selected architectural peers. The purpose and desired outcomes of the review were:

- to assess the visual impacts of the Project, including impacts on local and regional views;
- to assess the design for the Project as an integrated development, i.e. a new 132kV / 11kV zone substation and a new 'A' grade, 5 Star Green Star commercial development;
- to agree and record that the design exhibits design excellence with regards to the following matters:
  - achieve a high standard of architectural design, materials and detailing appropriate to the building type and location;
  - the form and external appearance of the building would improve the quality of the public domain; and
  - the new development does not detrimentally impact on view corridors identified in the relevant development control plan.

Review process

The design review centered on a presentation of the design to the review panel and an open forum discussion on the following key design and construction aspects:

- architectural treatments;

- urban setting;
- orientation;
- sun access plane;
- through site link; and
- construction sequencing.

Design review outcomes

Overall, the design for the Project was received well with the architectural peers concurring with the overall scale and form of the building; noting that the design had the potential to achieve design excellence, subject to further refinements.

The following outcomes of the design review were noted:

i. Landscaping may provide a better alternative to the proposed through-site link;

   Action: EnergyAustralia reviewed the option and positioning of the through-site link, with an alternate option being to create the through-site link via the retail area of the building. Alternate architectural drawings and updated landscaping plans were developed.

ii. Given the proposed sequencing of the Project, whereby the zone substation would be constructed prior to the commercial development, the architectural peers requested details on the proposed treatment of the standalone substation, so as to assess the visual amenity of the building in the medium to long-term, i.e. the period between the construction of the substation and commercial development;

   Action: EnergyAustralia undertook a review of the architectural treatment of the standalone substation.

iii. It was noted by the architectural peers that further refined drawings including the proposed colour, glass technology and louvres were required before agreement could be reached that the design exhibits 'design excellence'. Comments were also raised regarding the colour of the glass façade and the ESD performance of the building;

   Action: EnergyAustralia undertook to review the architectural treatment of the building, particularly the colour of the glass façade.

iv. Discussions regarding the Green Star rating of the building concluded that the majority of modern buildings aimed for 5 Star rating, and in some cases a 6 Star rating. It was agreed that EnergyAustralia would review the Green Star rating of the building;

   Action: EnergyAustralia reviewed the Green Star rating of the building, with the outcome being that the building design would aim to achieve a 5+ Star rating.

v. It was recommended by the architectural peers that the building atrium be increased in size.

   Action: Following review, EnergyAustralia increased the size of the atrium.

vi. It was recommended that a double storey cantilevered space be considered in the retail area of the building fronting Pitt Street.

   Action: Following review, EnergyAustralia incorporated a double storey space for the cantilevered area.

Conclusions

Following the design review process held on 22 August 2008, EnergyAustralia undertook to review the issues raised by the review panel, and update/amend the design, where relevant, for further assessment.

A final design review took place on 7 October 2008, to assess the design amendments and finalise the review process. It was concluded that with the design amendments incorporated, the Project now exhibited 'design excellence'. The design review meeting minutes have been included in **Volume 2, Appendix A**.

Subsequent to the design review process, the following comments were noted:

Shannon Truloff (Department of Planning):

At this conceptual stage the project has attained design excellence in my opinion. However, the attainment of excellence in the built form outcome will depend largely on a thorough interrogation of façade detailing, ensuring a liveliness in its perception day and night so as not to read as a bland wall adjacent to Belmore Park, but as a Little Jeweled Object with vibrant facades in the city.

Strong landscape plans/sections and visualisations at the EA stage will assist the case should the substation be a stand-alone building for some time.

Peter Poulet (peer review architect):

Subsequent to our Belmore Park Design panel meeting of the 7th of October 2008 at which revisions to the proposal were tabled, I would like to record my support for the amendments to the design as presented.

It was hartening to note the improvements to public amenity provided by the enlarged colonnade and the through site link. The provision of an external public space on the north eastern corner in anticipation of a café is to be applauded.

In particular, response to each façade and elevation will contribute to make a dymanic building in this setting. The mirrored treatment to the Belmore Park elevation is brave and will make for an exciting and dynamic interaction between the construction and the natural environment. The strong form is enhanced by the sun-screening and detailing particular to each elevation. Colour, materials and detail as developed will contribute to a cohesive composition and the building is greatly enhanced by the attention paid to make it more environmentally sustainable.

Richard Johnson (peer review architect):

In general, I strongly support the amendments and refinements made to the design since the first presentation.

The façade materials and detailing indicates a care and invention incorporating ESD principles into the building and a refinement and variety in the scale and detail of the facades that will add significantly to the reading of this building in this important setting.

The building as presented is totally supported, however, its success is greatly reliant on realization of the careful attention to detailing evident in the initial drawings.

Jeremy Swan (City of Sydney):

The overall quality of the design was greatly improved from the original iteration.

Positives include:

- Higher ground floor element and related colonnade.
- Passive external sun control elements on the northern façade.
- Active external sun control louvres on the west and east elevations
- Through site link within the building that relates to an enlarged atrium through the office levels.
- Proposals for temporary green wall treatment of substation if construction is staged.
- Arrangement of ground floor foyer and commercial tenancies.

Negatives include

- The current design (as pointed out by Richard Johnson) will require a high level of detail resolution if it is to succeed.
- The proposed highly reflective glazing to the south elevation has been called 'bold' by one of the jurors. I would call it 'risky'. By its nature, it will not (as intended) reflect the park to anyone standing in close proximity. This elevation requires much more resolution if it is to provide a suitable enclosing façade to Belmore Park (identified as a key node in Sydney 2030). My initial preference is for a materials palette that responds to the prevailing stone, terracotta and brick of this place. If, however, a highly glazed technical façade is used, it needs to enrich its very public context. E.g. incorporate a major artwork or interactive component that relates to the many public uses of Belmore Park and also the nature and function of the substation.

8.2.4 Restrictive covenant on title

On 10 December 1996 Sydney City Council approved the subdivision of the overall site bounded by Pitt, Hay Campbell and Castlereagh Streets into 2 lots. One lot containing the existing Central Square tower building; on the east portion of the site, the second lot representing the remaining balance of the land (the subject site).

A condition of this subdivision consent was the registration of a restrictive covenant on title which, amongst other things restricts the building envelope:

These parameters are shown in **Figures 8.1** and **8.2**.

Figure 8.1 Maximum building envelope prescribed in the covenant on title

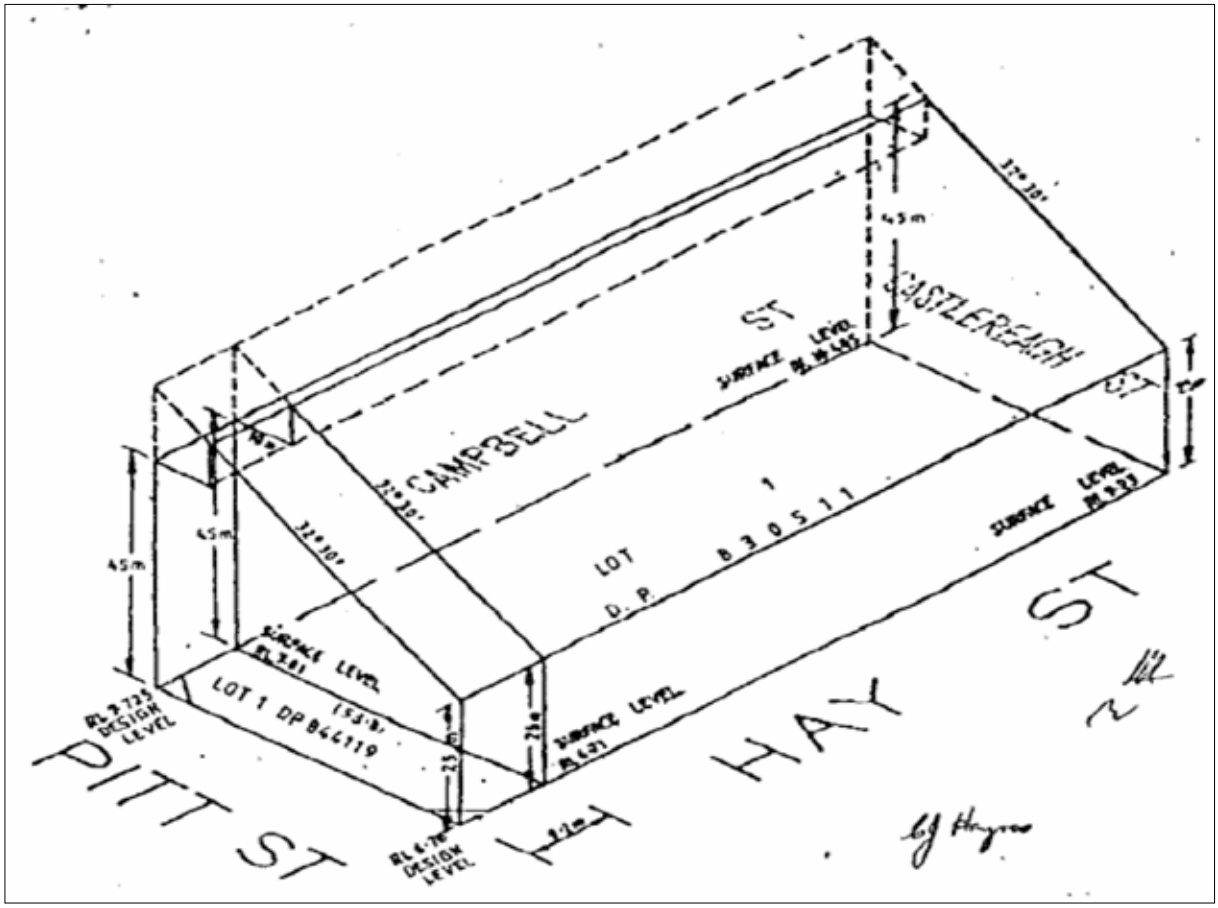
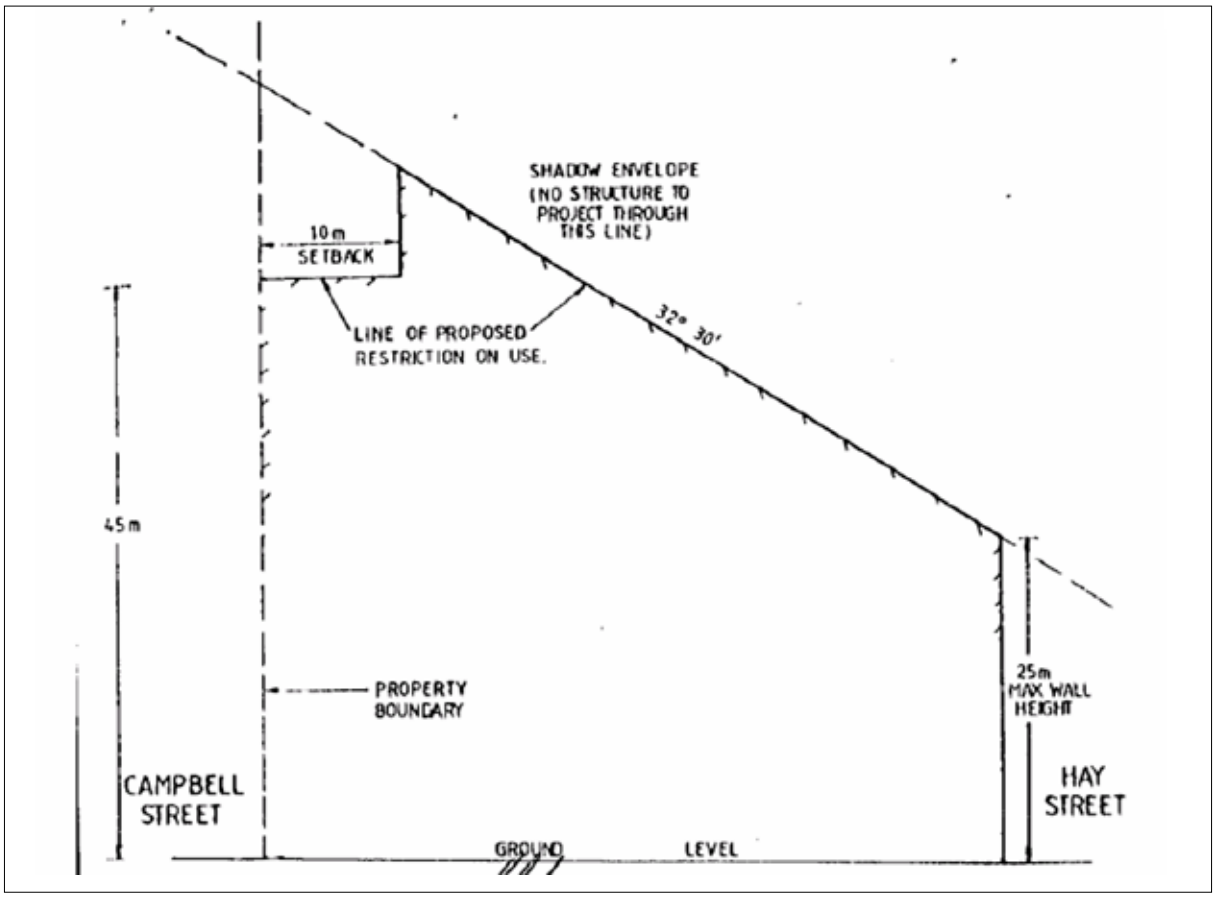


Figure 8.2 Sun access plane prescribed in the covenant on title



The key planning controls contained in the restrictive covenant on site are:

i. Floor Space Ratio (FSR) for the aggregate lots is limited to 10:1 – this allowed a maximum FSR of 8.85:1 (33,268m^2) for the Belmore Park Site.

ii. Building height is restricted to an envelope reflecting Council's Belmore Park Sun Access Plane plus a 10 metre setback above 45 metres on Campbell Street.

iii. The introduction of a 6 metre wide through site link separating the two lots.

These issues are discussed further in **Section 8.2.5** below:

8.2.5 Summary of compliance with planning controls

The design of the building components of the project has been guided by the development parameters of the Central Sydney Local Environment Plan 2005 and the Central Sydney Development Control Plan 1996 to achieve an appropriate contemporary image for the development. Other planning controls, such as the restrictive covenant on title, have also been considered in the development of the design. As detailed in **Table 8.1**, the building complies with the relevant planning controls and restrictive covenant on title, with the exception of the following:

- street frontage heights and setbacks;
- building exterior; and
- building height restrictions in the restrictive covenant on site.

Street frontage heights and setbacks

Regarding the height restrictions contained in the restrictive covenant on title, EnergyAustralia understands that this restrictive covenant on title is no longer in force. Notwithstanding, these provisions are also in conflict with Sydney of City Council's DCP controls.

Regarding height and setback controls generally, the DCP requires an 8 metre average setback for the building above 45 metres from the northern street and/or the major pedestrian street. In addition, the DCP also notes that on sites with three street frontages, smaller setbacks may be acceptable on lesser streets.

Comment

The proposed building envelope is controlled by the Belmore Park Sun Access Plane. A review of the building envelope indicates that a small portion of the building (13.4 metres) exceeds a height of 45 metres. In addition, it is noted that the building envelope above 45 metres is relatively shallow, representing the triangulated point of the building with a maximum depth of 20 metres.

In relation to the DCP objectives for setbacks above, it is considered that as a result of the low scale and shape of the proposed building, that the imposition of the DCP setback controls above 45 metres would have no impact on overshadowing, daylight, wind conditions, perceived building height or growing condition of trees.

It is considered that the architectural integrity of the building is best served by allowing a building envelope that is a fully defined shape befitting a lower scale 'building in the round'. Any setback for the upper 'triangulated' top of the building would reduce the clarity of the building form with no discernable environmental or amenity benefits.

Building exterior

The DCP promotes predominantly light colour masonry facades and does not support glazed facades for buildings in the city. It is noted that the DCP was adopted in 1996 and at that time the objection to predominantly glazed facades was a reaction to the poor design quality building outcomes in the city in the early late 1980s and early 1990s.

Comment

Since 1996, City of Sydney Council has approved a number of contemporary buildings with predominantly glazed facades. This shift in thinking recognises the potential for this building typology to exhibit design excellence, while maximising internal building amenity through the introduction of external sun protection devices.

The proposed building reflects best industry practice in contemporary office design, creating an iconic low scale sculptural building form. While the façade is glazed, it is highly articulated through the use of framing and an external passive sun shading system. The combination of glazed façade and external shading system provides maximum internal daylight access for the offices and a highly efficient building 'skin', providing a building capable of achieving a 5 Star – Green Star energy rating.

8.3 Mitigation measures and safeguards

In order to mitigate against adverse visual impacts, EnergyAustralia has undertaken a design review process to achieve design excellence for the Project.

During construction the following mitigation measures/safeguards have been developed:

- where practicable existing street trees on footpath to be retained and protected during construction;
- new tree planting to be in accordance with City of Sydney requirements / standards;
- pavement and lighting upgrade to City of Sydney public domain standards;
- maintenance of built works, and public domain fixtures and fittings; and
- planting establishment.

9 Traffic and Access

9.1 Assessment – Belmore Park Zone Substation

The following information was extracted from the Traffic and Transport Assessment Report prepared by Samsa Consulting. A full copy is found in **Volume 2**, **Appendix C**.

Construction

Construction-related traffic would be generated by a number of construction activities and sources. This includes site establishment, site demobilisation, spoil removal, materials delivery and staff transport. Of these activities, spoil removal is anticipated to generate the bulk of heavy vehicle traffic.

Spoil removal activities from the substation component of the Belmore Park Site would necessitate the removal of approximately 47,250 m^3 over an approximate eight month period. This would generate a peak of 20 spoil truck movements per day.

Other activities would generate approximately one – two deliveries per day.

Staff at the work-site would comprise project management, various trades, and general construction staff. The estimated maximum number of staff required at the site would be approximately 100 staff during peak construction activity periods.

Traffic generation attributable to staff would be largely governed by the availability of parking, which is limited in the southern CBD. This, in combination with plentiful nearby public transport services, would encourage the use of public transport by construction staff and reduce traffic generation.

It is assumed that traffic generation would be influenced by the number of on-site parking spaces at each construction site, ie. staff and visitor vehicle numbers would equate to available parking space numbers. Therefore, based on on-site parking spaces, light vehicle traffic generation would be approximately 10 cars (or 20 trips per day) to and from the Belmore Park Zone Substation site.

Figure 9.1 illustrates the proposed heavy vehicle routes for the Belmore Park Site.

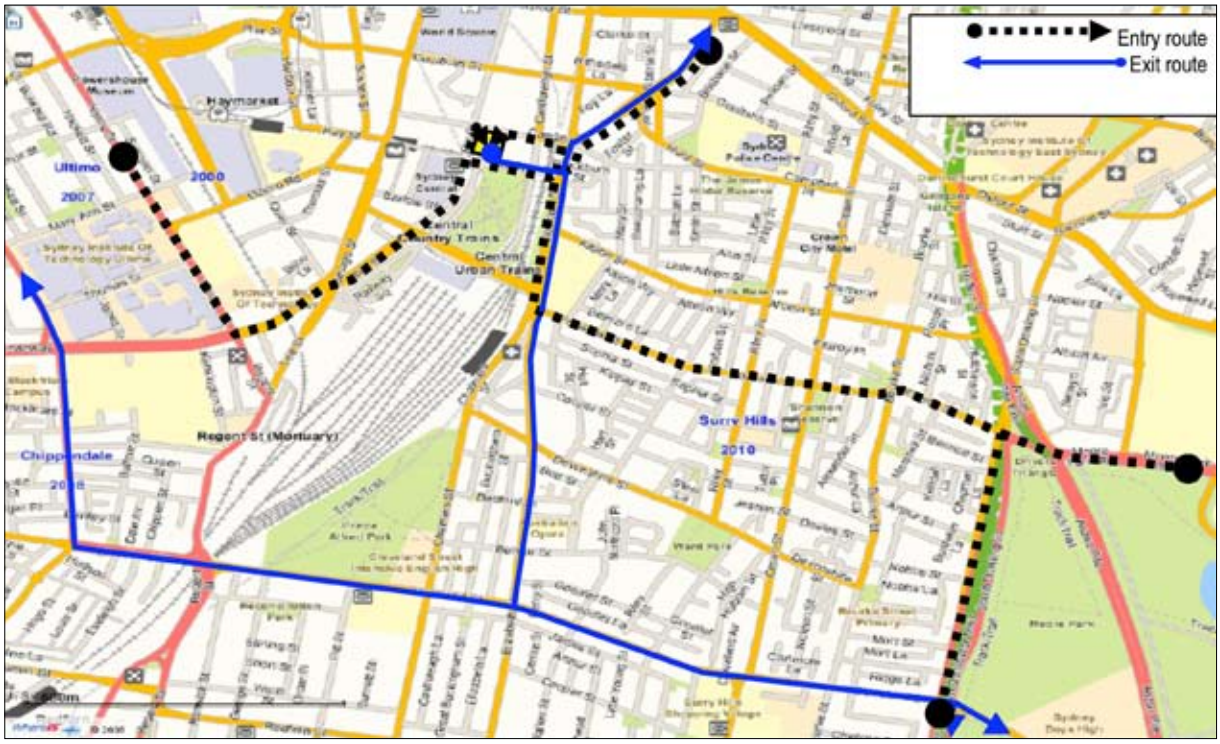
To provide suitable access to the construction site from Campbell and Hay Streets temporary possession of approximately three kerbside parking spaces would be required on each street.

The creation of construction site accesses would require controlled and managed construction vehicle access across adjacent footpaths.

Operations

Operational traffic movements associated with the substation would be minor and limited to regular maintenance inspections and activities. There would be negligible traffic impact on the surrounding road network by maintenance staff and their vehicles.

Figure 9.1 Belmore Park Zone Substation heavy vehicle route



9.2 Assessment – commercial/retail component

The following information was extracted from the Traffic Impact Assessment Report prepared by Traffix Traffic and Transport Planners. A full copy is found in **Volume 2**, **Appendix C**.

Construction

The construction of the commercial component of the Project, to be undertaken once the substation works are complete, is expected to take in the order of 23 months, as follows:

- Bulk excavation -4.5 months;
- Structural works – 9.5 months;
- Façade – 12 months;
- Roofing – 13 months; and
- Fitout – progressively over 18.5 months.

It is envisaged that bulk excavation works for the commercial development will commence shortly after completion of the substation building (in late 2012 or early 2013).

Spoil removal activities associated with this aspect of the Project would necessitate the removal of approximately 23,250m^3 over a period of 4.5 months. This would generate a peak of approximately 22 truck movements per day (11 in, 11 out), with heavy vehicle routes expected to be similar to those shown in **Figure 9.1**.

Building and structural works will commence once bulk excavation activities are complete. Given that the development occupies the full extent of the site, it is envisaged that a work zone would be required along the Campbell Street frontage for deliveries. This is the most appropriate location due to the reduced traffic volumes compared to other frontages and in particular the lack of light rail movements.

It is envisaged that a Class 'B' hoarding would be constructed along all site frontages and minor disruption may occur during construction of the hoarding, however this is expected to occur over a relatively short period.

The main site access is envisaged from Campbell Street for similar reasons to those noted above – namely reduced volumes and the lack of light rail movements. Additional access locations may be required, subject to construction requirements.

During the construction of the building itself, it is estimated that between 10 and 15 truck arrivals would be required per day, which results in a total of up to 30 truck movements per day (15 in, 15 out). Assuming that these movements are evenly distributed throughout the day, results in three movements per hour.

It is envisaged that trucks would access the site from Elizabeth Street and exit via Pitt Street. This effectively results in 15 movements per day at any one intersection which is equivalent to two truck movements per hour. This would have a negligible impact on the performance of the surrounding road network.

Potential road closures would result in altered traffic conditions in the vicinity of the site, however the impact of these closures are expected to be manageable. Consideration of peak on-street traffic conditions should be considered in the planning of these events such that the relative impact would be reduced.

In summary, the traffic impacts associated with the construction of the commercial development would generally be minor. The full nature of the construction activities would be confirmed as part of the construction approval and when the precise nature of these activities is fully developed.

Operation

The commercial/retail development of the Belmore Park Site would generate traffic movements from the use of the proposed basement car parking spaces and deliveries and maintenance activities.

The commercial/retail development is predicted to generate a maximum of 48 vehicles/hr during peak periods, based on application of the RTA's Guideline trip rate for tenant parking of 0.8 trips/space/hr during both the morning and afternoon peak periods. This would result in:

- 38 in, 10 out trips in the AM peak; and
- 10 in, 38 out trips in the PM peak.

Trips at all other times would be less. This compares with 30-35 vehicles/hr for the existing 100 space public car park. Accordingly, the development would generate a net additional 18 vehicles/hr in the AM peak and 13 vehicles/hr in the PM peak period. This equates to a maximum of only one additional vehicle every 3 to 4 minutes. These movements would also be split into both directions along Campbell Street so that an additional vehicle every 6 to 8 minutes would occur at any one intersection. Having regard for this, the additional traffic can be readily accommodated with no change expected in existing levels of service at any intersection.

The following points relevant to operational aspects are noteworthy:

- the site enjoys excellent access to and from the road network and is very well served by public transport;
- full compliance is achieved with Council's LEP 2005, with 62 car spaces proposed compared with a maximum of 69 spaces permitted. The provision of 2 courier spaces is additional and has not been included as general parking;
- the expected peak generation (48 vehicles/hr) is not significantly more than occurs with the existing use of the site as a 100 space public car park, so that external traffic conditions would be essentially unchanged;
- the proposed access arrangements are considered very satisfactory and comply with AS 2890.1 (2004);
- provision is made for disabled parking;
- provision is made for bicycle and motorcycle parking;
- provision is made for entry to the site by a private waste collection service which would be managed as part of the site Waste Management Plan;
- separate provision is made for the infrequent servicing requirements of the substation via a second access driveway; and
- the internal design arrangements comply with AS 2890.1 (2004).

9.3 Mitigation measures and safeguards

During construction the following specific measures are proposed to manage traffic and transport impacts at the Belmore Park Site:

- Construction traffic would be restricted to separate entry and exit accesses with a one-way flow through the site. Entry would be off Campbell Street and exit to Hay Street. This would mitigate and reduce congestion and manoeuvring, particularly by heavy vehicles.
- Advance warning signage to identify the construction site, and warn of construction traffic and changed traffic conditions would be provided on all approaches to the construction site area, eg. Pitt Street (north of Campbell Street and south of Hay Street), Hay Street (west of Castlereagh Street), Campbell Street (west of Castlereagh Street).

- Suitable traffic management and controls (to be detailed by the contractor prior to commencing works) would be maintained at all times during construction to aid heavy vehicles turning into and out from the site on Campbell Street and Hay Street.
- Provide warning and guidance signage and detours for pedestrians along the southern side of Campbell Street and the northern side of Hay Street in the vicinity of site vehicle accesses. In conjunction with this, provide pedestrian management while vehicles are entering and leaving the site. Depending on construction requirements at the site, pedestrian management strategies may also be required along Pitt Street.

A Construction Traffic Management Plan (CTMP) would be prepared prior to the commencement of construction works and incorporated into the construction programme. The CTMP would be prepared in consultation with relevant stakeholders and as part of the Construction Environmental Management Plan (CEMP).

The CTMP sub-plan would detail how impacts of the construction activities would be managed or minimised. It would be consistent with EnergyAustralia's environmental policy, specifications and procedures to ensure compliance with any specific conditions of approval, licence conditions, and any other permits and approvals. The CTMP would include the following elements, consistent with the overall Environmental Management Plan framework:

- copies of approvals, licences and permits to meet statutory requirements;
- details of other voluntary requirements such as codes of practice;
- details of potential environmental impacts and the operational control measures that are to be implemented to comply with statutory requirements and provide environmental protection;
- assignment of responsibilities for planning, approving, implementing, maintaining, assessing and monitoring environmental controls; and
- monitoring required to determine the effectiveness of controls implemented.

Specifically, a detailed CTMP would be developed and incorporated into the construction programme for the proposed Project. The CTMP would include detailed consideration of the following issues:

- identification of designated heavy vehicle routes including the likely number of heavy vehicle movements during the construction period;
- identification of other vehicle access routes, signage and site access arrangements;
- measures to ensure that road network performance would not be affected;
- spoil movement would occur, where practicable, outside background peak traffic periods in order to minimise traffic conflicts;
- measures to address queuing and heavy vehicle site access, including the management and control of construction vehicles to ensure that the impact on traffic flows along adjacent streets is minimised;
- during construction activities, general public access would not be precluded to surrounding land uses including nearby retail, commercial and residential areas. All sites would maintain either existing access or provide suitable alternative temporary access;
- all loading and unloading associated with the construction would occur within the site where possible, or within designated construction zones. If required, an approved construction zone(s) for activities that cannot be accommodated within the site (eg. special loading and unloading during construction or the approved use of cranes in the street) would be established. This would be subject to a separate application and approval by Council / RTA;
- the site would be suitably fenced including the accesses, which would be secured against unauthorised entry; and
- measures to protect pedestrians, cyclists and other motorists in the vicinity of the construction sites.

The CTMP would cover any road and site access civil works, warning and guidance signage, linemarking and management of traffic generating activities. The following assumptions would be incorporated into the CTMP:

- all proposed traffic control measures would be installed and removed in accordance with standard procedures outlined in RTA's "Traffic Control at Work Sites" manual and specified in "AS 1742.3: 2002, Traffic Control Devices for Works on Roads";

- in addition to relevant Australian Standards and RTA guidelines, all traffic management would also conform to Workcover NSW "Code of Practice for Working Near Traffic and Mobile Plant";
- barriers approved by the RTA and/or City of Sydney Council would be provided between the construction sites and trafficable areas. Pedestrian and cycle diversions would be required during the works;
- when working on RTA and/or Council controlled roads, obtaining approval from RTA and/or Council before commencing work;
- site access points would be covered in the CTMP, particularly with respect to the interaction and conflict between construction vehicles and pedestrians / cyclists at site accesses; and
- road dilapidation reports would be prepared, prior to commencement of construction and after construction is complete, for all local roads nominated in the CTMP and likely to be used by construction traffic. Road and footpath damage that may be attributable to construction traffic would be reinstated to a standard at least equivalent to that existing prior to the damage.

Provision would be made within the CTMP for adequate parking of construction and project staff vehicles so that surrounding on-street parking is not adversely affected.

Contractors would be required to monitor and report any road dilapidation, and to maintain roads to the standards required to provide a satisfactory motoring and cycling surface.

10 Noise and vibration

10.1 Assessment

The following information was extracted from the Noise and Vibration Assessments prepared by Heggies Pty Ltd. A full copy of the Belmore Park Zone Substation assessment is found in **Volume 2, Appendix D**

10.1.1 Construction (airborne) noise assessment criteria

The Department of Environment and Climate Change (DECC), forming the Environmental Protection Agency (EPA), published guidelines in its *Environmental Noise Control Manual* (Chapter 171-1) for the control of construction noise.

In summary, the DECC's preferred approach to the control of construction noise involves the following:

- noise level restrictions;
- time restrictions; and
- silencing.

Noise level restrictions

The *Environmental Noise Control Manual* (ENCM) recommends that the LA10 (15minute) (average maximum construction noise levels assessed over a 15 minute period) arising from a construction site and measured within the curtilage of an occupied noise sensitive premises (ie at the boundary or within 30 m of the noise-sensitive premises, whichever is the lesser) should not exceed the levels indicated in **Table 10.1**.

Table 10.1 Recommended DECC noise criteria for construction works

Period of noise exposure	**L_{A10}(15minute) Construction noise goal**
Cumulative noise exposure period not exceeding 4 weeks	L_{A90}(15minute) plus 20 dBA
Cumulative noise exposure period of between 4 weeks and 26 weeks	L_{A90}(15minute) plus 10 dBA
Cumulative noise exposure period longer than 26 weeks	L_{A90}(15minute) plus 5 dBA

Time restrictions

- Monday to Friday: 0700 hours to 1900 hours;
- Saturday: 0700 hours to 1700 hours;
- No work on Sundays or Public Holidays.

Should any construction works be undertaken outside these hours, a separate assessment of their impacts would be carried out once the nature and extent of those works is known and approval would be sought for work outside these hours.

Silencing

All practical measures should be used to silence construction equipment, particularly in instances where extended hours of operation are required.

10.1.2 Regenerated (structure-borne) noise assessment criteria

Whilst regenerated noise was not identified in the Director General's Requirements and input from agencies (see **Volume 2, Appendix A**), there is potential for regenerated noise to be an issue for noise-sensitive receivers near to construction (excavation) sites.

Regenerated noise in buildings is caused by the transmission of ground-borne vibration rather than by the direct transmission of noise through the air. Vibration may be generated by construction equipment and transmitted through the ground into the adjacent building structures. After entering a building, this vibration causes the walls and floors to faintly vibrate and hence to radiate noise (also commonly referred to as 'structure–borne' or 'ground borne' noise).

Structure-borne noise is not usually a significant disturbance to building occupants during daytime periods due to higher ambient noise levels which mask the audibility of structure-borne noise emissions.

Table 10.2 provides a summary of the structure-borne noise objectives that have been applied on recent tunnelling projects in NSW. (Note: this objective would be relevant to the proposed 12 metre stub tunnel connection from the existing CSCT to the Belmore Park Zone Substation.

Table 10.2 Structure-borne noise objectives on recent NSW tunnel projects

Construction project	Structure-borne noise objectives (residential)	
	Daytime	Night-time
Cross-City Tunnel	Vibration objectives only (BS 6472)	L_{A90}(15minute) 40 dBA (6 pm to 10 pm) L_{A90}(15minute) 35 dBA (10 pm to 7 am)
EnergyAustralia 132kV cable tunnels in CBD	Vibration objectives only (BS 6472)	L_{A90}(15minute) 40 dBA (6 pm to 10 pm) L_{A90}(15minute) 35 dBA (10 pm to 7 am)
Lane Cove Tunnel	Vibration objectives only (BS 6472)	L_{A90}(15minute) 40 dBA (6 pm to 10 pm) L_{A90}(15minute) 35 dBA (10 pm to 7 am)
Epping to Chatswood Rail Line	L_{Aeq}(15minute) 45 dBA	L_{A90}(15minute) 40 dBA (6 pm to 7 am) L_{A90}(15minute) 35 dBA > 7 Days (10 pm to 7 am)

On this basis, it is likely for the Project that the same criteria that were applied to the 132kV cable tunnels in Sydney CBD are appropriate, and on this basis, this document adopts these criteria, being:

- daytime: vibration objectives only (BS 6472); and
- night-time: L_{Aeq}(15minute) 40 dBA (6 pm to 10 pm), L_{Aeq}(15minute) 35 dBA (10 pm to 7 am).

10.1.3 Vibration assessment criteria

The effects of vibration in buildings can be divided into two main categories:

- those in which the occupants or users of the building are inconvenienced or possibly disturbed (Human Comfort); and
- those in which the integrity of the building or the structure itself may be prejudiced (structural damage).

The Department of Environment and Climate Change (DECC) requires an assessment of vibration in accordance with (DECC's document), *Assessing Vibration: A Technical Guideline*, (August 2006) specifically **Table 2.2** and **2.4**. These tables (and indeed the whole document) in the DECC *Technical Guideline* only take "human comfort" into account. They provide acceptable values for continuous and impulsive vibration in terms of vibration acceleration (m/s^2) 1 to 80 Hz and also acceptable values for intermittent vibration in terms of Vibration Dose Value (VDV) ($m/s^{1.75}$).

The means by which the criteria set out in the DECC *Technical Guideline* are measured and assessed (acceleration and dose) are not straightforward to measure, and, in the case of acceleration particularly, would impose an onerous burden upon the Project if assessment was required to be undertaken in this manner, with no additional benefit to the community. It is far more practical to assess vibration in terms of Peak Particle Velocity (PPV).

On past, similar projects, Heggies Pty Ltd has determined equivalent vibration criteria consistent with the values in the DECC *Technical Guideline*, but expressed in terms of PPV. The *Technical Guideline* is based upon some of the references set out below in the British Standards (BS 6472).

10.1.4 Construction traffic noise assessment criteria

For traffic operating on public roads to and from construction sites the DECC *"Environmental Criteria for Road Traffic Noise"* 1999 (ECRTN) are appropriate for assessing road traffic noise. The DECC's recommended criteria for collector roads are set out in **Table 10.3**.

Table 10.3 DECC road traffic noise criteria

Development	Day (7.00 am to 10.00 pm)	Night (10.00 pm to 7.00 am)
7. Land use development with potential to create additional traffic on FREEWAYS/ ARTERIAL roads	L_{Aeq}(15hour) 60 dBA	L_{Aeq}(9hour) 55 dBA
8. Land use development with potential to create additional traffic on COLLECTOR roads	L_{Aeq}(1hour) 60 dBA	L_{Aeq}(1hour) 55 dBA
13. Land use development with potential to create additional traffic on LOCAL roads	L_{Aeq}(1hour) 55 dBA	L_{Aeq}(1hour) 50 dBA

Where L_{Aeq} noise levels already exceed the above targets, a 2 dBA increase in the overall traffic noise levels is normally regarded as an alternative target (having investigated the application of all feasible and reasonable noise mitigation) in order to maintain the general acoustic amenity of the area.

It is likely that on the roads immediately adjacent to the site, the community would associate truck movements with the Project. Once the trucks move further from the site, the truck noise may be perceived as part of the general road traffic.

10.1.5 Construction noise

Construction noise goals for airborne noise emission, (when established *in accordance with relevant NSW Government and DECC policies and guidance*) are based on the existing ambient or background noise levels within a given area and an allowable increase due to the temporary nature of construction works.

In some instances, construction noise goals may also be based on the sensitivity of particular building spaces. For example, the acceptable noise level within a factory would be much higher than for a recording studio.

The work site would require construction activities of 26 weeks or greater. Based on the ENCM criteria presented in **Table 10.1**, airborne noise emission from Project construction activities would be assessed for compliance with *relevant NSW Government and DECC policies and guidance* based on a Rating Background Noise Level (RBL) Background (RBL) + 5 dBA criterion for residential receivers.

Specifically, this means that noise from construction activities should be managed such that the LA10 noise level, measured over a period of not less than 15 minutes, should not exceed the background L_{A90} noise level by more than 5 dBA.

For commercial and retail buildings, it is generally accepted that receivers are 5 dBA to 10 dBA less sensitive to construction noise emissions than residential receivers. For commercial and retail receivers such as the outdoor eating areas, restaurants, take away shops, hair salons, and the like, an L_{A10}(15minute) noise objective of Background (RBL) + 10 dBA has conservatively been applied.

Noise monitoring results

The establishment and derivation of airborne noise criteria for residential receivers was undertaken for the Belmore Park Site and the CSCT stub tunnel connection.

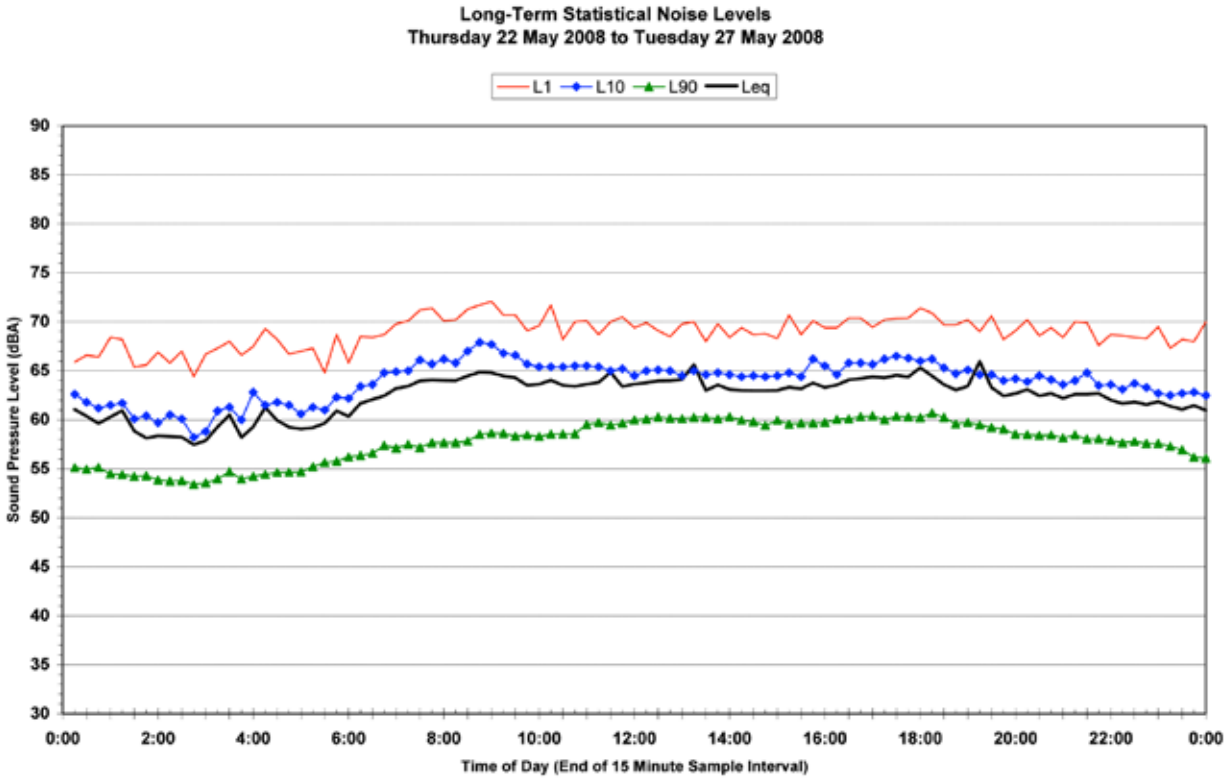
Unattended environmental noise monitoring was conducted at one location over six days and five nights from Thursday 22 May to Tuesday 27 May 2008.

The equipment used was an Acoustic Research Laboratories (ARL) Environmental Noise Logger Type EL 316 (serial number 16-207-045), fitted with a microphone windshield, deployed on the balcony of Apartment 202 on level 20 of the Meriton Mosaic development (overlooking and with direct line of site to the Belmore Park Site).

Calibration of the logger was checked prior to and following measurements. Drift in calibration did not exceed ±0.5 dBA. All equipment carried appropriate and current NATA (or manufacturer) calibration certificates.

The processed results of the ambient noise survey are presented graphically in **Figure 10.1** and tabulated in **Table 10.4** and **Table 10.5** (noise levels are rounded to the nearest 1 dBA and the median values for each of the 15 minute periods are shown).

Figure 10.1 Long term statistical noise levels receivers near Belmore Park Site



Construction noise goals

The results of the noise monitoring were processed in accordance with the procedures and time periods contained in the DECC's *Industrial Noise Policy, 2000* (INP). The Rating Background Noise Level (RBL) for the defined daytime, evening and night time periods were established. Results are presented in **Table 10.4**.

Table 10.4 Receivers near Belmore Park Site - measured noise levels

Location	Measurement descriptor	Measured noise level - dBA re 20 µPa			
		Daytime 7.00 am - 1.00 pm1	Daytime 7.00 am - 6.00 pm	Evening 6.00 pm - 10.00 pm	Night-time 10.00 pm - 7.00 am
Receivers near to Belmore Park	LA_{eq}[2]	64	64	63	60
	RBL (Background)[3]	61	61	59	54

Note 1: Shown for completeness, used to assess construction noise emissions for Saturday works.

Note 2: The L_{Aeq} is essentially the average sound level. It is defined as the steady sound level that contains the same amount of acoustical energy as a given time-varying sound.

Note 3: The RBL noise level is representative of the average minimum background sound level (in the absence of the source under consideration), or simply the background level.

On this basis, the 'normal construction hours' airborne noise goals (at the nearest residential receiver) for construction activity at the Belmore Park (and CSCT Stub Tunnel) site are as follows:

- Daytime 7.00 am - 6.00 pm L_{A10}66dBA
- Saturday daytime 7.00 am - 1.00 pm L_{A10}66dBA

Should extended work hours be permitted beyond the 'normal construction hours' presented above, the following noise goals apply:

- Evening 6.00 pm - 10.00 pm L_{A10}64dBA
- Night-time 10.00 pm - 7.00 am L_{A10}59dBA

In order to minimise the risk of sleep disturbance during night-time construction activities (should they be permitted), the DECC's ENCM recommends that the $L_{A1(1minute)}$ noise level outside a bedroom window should not exceed the L_{A90} background noise level by more that 15 dBA. The $L_{A1(1minute)}$ noise level may conservatively be estimated by the typical maximum level (L_{Amax}) noise emission.

The L_{Amax} sleep disturbance noise goal for residential receivers near to Belmore Park, based on the background night time noise levels as indicated in **Table 10.5** is:

- Night-time 10.00 pm - 7.00 am L_{AMax}69dBA

Construction traffic noise criteria

In order to assess construction traffic activity associated with the Belmore Park Site and CSCT stub tunnel site works, the logged data was processed to establish the existing road traffic noise levels at nearby receivers during defined time periods. These time periods are defined in the DECC's Environmental Criteria for Road Traffic Noise (ECRTN). The results are presented in **Table 10.5**.

Table 10.5 Measured ambient noise levels corresponding to defined ECRTN periods

Logging Location	Measured noise level - dBA re 20 µPa			
	Daytime		Night-time	
	L_{Aeq}(15 hour)	L_{Aeq}(1 hour day)	L_{Aeq}(9 hour)	L_{Aeq}(1 hour night)
Receivers near to Belmore Park	64	65	60	62

Irrespective of the ECRTN road classification for the streets surrounding the Belmore Park Site, the existing road traffic noise levels at receivers near to the Belmore Park Site already exceed the ECRTN criteria set out in T**able 10.3**.

As such, noise emission from construction-related traffic should be controlled so as not to cause an increase of more than 2 dBA at receivers near to each work site. This would require that the L_{Aeq} noise contribution from the Belmore Park Site construction-related traffic activity is at least 2 dBA below existing L_{Aeq} noise levels.

Based on the very low (in the context of existing road traffic noise) volume of truck numbers the Project would not result in traffic noise increases that exceed 2 dBA at the receivers near to the Belmore Park Site. It is predicted that, at most, construction related traffic activity would result in negligible noise increases of less than 0.1 dBA.

10.1.6 Construction noise and vibration assessment

Construction noise

In order to undertake an assessment of building construction and excavation works, it is necessary to establish a benchmark Sound Power Level (L_{A10} and L_{Amax}) for each plant item likely to be used on site. Based on numerous measurements undertaken on NSW projects of similar scale to the Project, Heggies has determined representative reasonable limiting Sound Power Levels for typically-used plant items, as presented in Table 16, **Volume 2, Appendix D**.

Based on the Sound Power Levels referred to above, a construction noise assessment has been undertaken for the residential receivers in the Meriton Mosaic building overlooking the Belmore Park Site. The nearest receivers with direct line of site to the Belmore Park Site are approximately 40 m from the nearest boundary of the proposed work site.

The results in **Table 10.6** below are indicative of the operation of some of the noisier anticipated plant items working in isolation at the northern boundary of the site, representative of early ground level works when establishing the site and undertaking bulk excavation activities.

Table 10.6 Belmore Park construction noise assessment results

Plant item	Sound pressure, 40 m	
	LAmax[1]	LA10[2]
Concrete saw	**77**	**74**
Excavator hammer	**81**	**75**
Rock-breaker	**83**	**77**
Jackhammer	**72**	66
Excavator (~3 tonne)	49	46
Excavator (~6 tonne)	54	51
Excavator (~10 tonne)	59	56
Excavator (~20 tonne)	64	61
Excavator (~30 tonne)	69	66
Excavator (~40 tonne)	**74**	**71**
Excavator, over 40 t	**77**	**72**
Skidsteer loaders (~1/2 tonne)	66	63
Skidsteer loaders (~1 tonne)	69	66
Dozer (equiv. CAT D8)	**77**	**72**
Dozer (equiv. CAT D9)	**79**	**74**
Dozer (equiv. CAT D10)	**80**	**75**
Backhoe/FE loader	**70**	66
Scraper	69	64
Tractors, tracked (50-100 kW)	**76**	**72**
Grader	69	64
Tracked loader (0 to 50 kW)	**75**	**70**
Tracked loader (200 to 300 kW)	**81**	**76**
Dump truck (~ 15 tonne)	67	62
Dump truck (20 t)	66	61
Dump truck (25 t, 120 kW)	**73**	**68**
Concrete truck	**71**	66
Concrete mixer truck, (24 t)	**75**	**70**
Concrete pump	68	66
Concrete vibrator	64	62
Concrete vibrator, hand held	62	60
Bored piling rig	69	63
Vibratory roller (~10 tonne)	**73**	**70**
Vibratory pile driver	**80**	**74**
Compressor (~ 600 CFM)	59	59
Compressor (~1500 CFM)	64	64
Compressor standard	**70**	70
Compressor super silenced	54	54
Generator	63	62
Lighting tower	39	39
Flood lights	49	49
Cherry picker	61	58
Mobile crane	69	64
Crane, truck mounted (20 t to 60 t)	68	63

Hammer drill	**71**	**68**
Grinder	65	62
Chipping hammer/chisel	**78**	**75**
Impact wrench (12mm cap)	56	53
Electric drill	50	47
Rattle gun, hand held	64	61

Note 1: L_{AMAX} noise levels predicted to exceed the Belmore Park Sleep Disturbance criterion of 69 dBA are shown in Bold

Note 2: L_{A10} noise levels predicted to exceed the Belmore Park Daytime noise criterion of 66 dBA are shown in ***Bold***

A review of **Table 10.6** reveals that approximately 50% of the typical plant items modelled would exceed either the night-time sleep disturbance or daytime noise criteria. This is not atypical for construction activity in populated urban areas.

Due to the possible exceedances identified, it would be necessary to implement all feasible and reasonable construction noise mitigation measures, including erecting hoardings at site boundaries and selecting the smallest and quietest practicable items for each task, whilst maintaining efficiency of operation.

Construction vibration

Safe working distances for typical items of 'above-ground' vibration-intensive plant are listed in **Table 10.7**. These distances are indicative only and can vary depending upon the particular item of plant and geotechnical conditions. For the purpose of this assessment, a 'safe distance' would correspond to the distance at which the maximum vibration level generated by the operation of a subject plant item is predicted not to exceed 2 mm/s.

Table 10.7 Safe working distances for vibration intensive plant items

Item	Rating	Safe working distance	Comments
Rockbreaker	Light (eg Krupp HM 170)	5 metres	Based on a 5 mm/s criterion
	Medium (eg Krupp HM 580)	10 metres	Based on a 5 mm/s criterion
	Heavy (eg Krupp HM 960)	30 metres	Based on a 5 mm/s criterion
Vibratory Hammer (Piling)	12 t Down force	15 metres minimum	Based on a 5 mm/s criterion
Hand held jack hammer	-	1 metre (nominal)	Avoid contact with structure

Note: The safe working distances apply to structural damage of typical buildings and typical geotechnical conditions. They do not address heritage structures or human comfort considerations. Vibration monitoring is recommended to confirm the safe working distances at specific sites.

10.2 Operational noise assessment

10.2.1 Operational noise criteria

DECC's Industrial Noise Policy (INP) provides guidelines for the assessment of noise impacts associated with industrial activities. It aims to balance the need for industrial activity with the desire for quiet within the community. The criteria selected are designed to protect at least 90 per cent of the population living in the vicinity of the industrial noise sources for at least 90 per cent of the time. The INP's objectives are:

- to establish noise criteria that would protect the community from excessive noise;
- to preserve the amenity for specific land uses;
- to use the criteria for deriving project specific land uses; and
- to promote uniform methods to estimate and measure noise impacts, including a procedure for evaluating meteorological effects.

Implementation is achieved by ensuring:

- that noise from any single source does not intrude greatly above the prevailing background noise level. This is known as the intrusive noise criterion; and

- that the background noise level does not exceed the level appropriate for the particular locality and land use. This is known as the amenity criterion.

In order to satisfy the above two requirements, an "Intrusive" and an "Amenity" noise criterion is recommended of which the lower of the two applies.

10.2.2 Intrusiveness criterion

In setting an "Intrusive" noise goal, an estimate of the ambient (background) L_{A90} noise level, termed the Rating Background Level (RBL), needs to be established at the nearest sensitive receivers in the absence of the intruding source.

An "RBL plus 5 dBA" criterion is then applied to the 15-minute L_{Aeq} noise emissions of the noise source in question at the receivers of interest (normally at their property boundary).

10.2.3 Amenity criterion

The "Amenity" noise goal seeks to place a limit on noise emissions according to how the existing industrial/commercial-related noise levels relate to recommended noise levels for the type of area involved, ie rural, suburban, urban, etc.

The resulting amenity criterion placed upon noise emissions of a new facility then depends upon whether existing industrial/commercial-related L_{Aeq}(period) noise levels are lower or higher than the recommended amenity level.

In areas where existing industrial/commercial-related noise levels are already high, the amenity noise goal acts to limit new industrial noise emissions so that the cumulative impact of all industrial/commercial noise emissions does not increase. Conversely, in areas where there is no existing industrial/commercial noise, the amenity noise goal would be set at a level which allows new industrial/commercial noise emissions up to recommended amenity noise levels for the area.

The DECC provides recommended acceptable noise levels for residents located in "Rural", "Suburban", "Urban" and "Urban/Industrial" areas. Consistent with the INP, residences surrounding the subject substation would be considered Urban. The recommended acceptable noise levels are shown in **Table 10.8**.

Table 10.8 Amenity criteria - recommended LAeq noise levels from industrial noise sources

Type of receiver	Indicative noise "Amenity" area	Time of Day	Recommended L_{Aeq} noise level	
			Acceptable	Recommended maximum
Residence	Rural	Day	50 dBA	50 dBA
		Evening	45 dBA	50 dBA
		Night	40 dBA	45 dBA
	Suburban	Day	55 dBA	60 dBA
		Evening	45 dBA	50 dBA
		Night	40 dBA	45 dBA
	Urban	Day	60 dBA	65 dBA
		Evening	50 dBA	55 dBA
		Night	45 dBA	50 dBA
	Urban/Industrial Interface - for existing situations only	Day	65 dBA	70 dBA
		Evening	55 dBA	60 dBA
		Night	50 dBA	55 dBA

For Monday to Saturday, Daytime 0700 hours – 1800 hours; Evening 1800 hours – 2200 hours;

Night-time 2200 hours – 0700 hours

On Sundays and Public Holidays, Daytime 0800 hours - 1800 hours; Evening 1800 hours - 2200 hours;

Night-time 2200 hours - 0800 hours.

The L_{Aeq} index corresponds to the level of noise equivalent to the energy average of noise levels occurring over a measurement period.

For "Urban" areas the daytime, evening and night-time period recommended acceptable noise level are 60 dBA, 50 dBA and 45 dBA respectively.

10.2.4 Modifying factors

In addition, the modifying factors are to be applied if the noise source is low frequency, tonal or intermittent in nature. The modifying factors recommended in the INP for tonal/low frequency noise are presented in **Table 10.9**.

Table 10.9 DECC Modifying factor corrections

Factor	When to apply	Correction 1
Tonal Noise	Level of one-third octave band exceeds the level on both sides by: **-5 dB** or more if the centre frequency of the band containing the tone is above 400 Hz **-8 dB** or more if the centre frequency of the band containing the tone is above 160 to 400 Hz inclusive **-15 dB** or more if the centre frequency of the band containing the tone is below 160 Hz	5 dB[2]
Low frequency noise	Measure/assess C- and A-weighted levels over same time period. Correction to be applied if the difference between the two levels is 15 dB or more	5 dB[2]

Note 1: Corrections to be added to the measured or predicted levels

Noise from operational transformers is identified as being tonal/low frequency, resulting in a 5 dBA correction required to be added to the measured or predicted noise levels.

10.2.5 Emergency diesel generator

The DECC's Environment Noise Control Manual (ENCM) contains a "Noise Control Guideline" for emergency diesel generators, and for night-time specifies that:

"From 10pm to 7am the L_{A10} noise level should not exceed the L_{A90} Background by more than 5 dBA at the residential boundary, and in any event should not exceed 45 dBA at the boundary."

10.2.6 Operational noise goals for residential receivers

Intrusive noise goals

Based on the ambient noise levels at the Meriton Apartments, and the intrusive noise criterion of RBL + 5 dBA at night, the intrusive noise goals are 59 dBA at night, 64 dBA during the evening and 66 dBA during the day.

Amenity noise goals

Given the existing ambient noise levels exceed the recommended acceptable noise levels presented in **Table 10.8**, in accordance with the INP, noise levels from new development are required to be 10 dBA below the existing noise levels. Accordingly, the amenity intrusive noise goals become 50 dBA at night, 53 dBA during the evening and 54 dBA during the day.

The more stringent amenity criteria therefore determines the site specific operational noise goals. Note however that the amenity criteria apply over the whole daytime, evening and night-time periods whilst the intrusive criteria applies over any 15 minute period.

10.2.7 Operational noise goals for commercial receivers

The INP provides amenity criteria for land uses other than residential in **Table 2.1**, and for commercial premises acceptable and maximum LAeq noise levels of 65 dBA and 70 dBA respectively are recommended. Consistent with the INP, the acceptable noise level of 65 dBA has been adopted for commercial receivers.

10.2.8 Operational noise goals for emergency diesel generator

In accordance with the DECC's Noise Control Guideline for emergency diesel generators, as presented in **Section 10.2.5**, the design goal is 45 dBA at the residential boundary.

10.2.9 Operational noise emissions and assessment

Zone substation component

The zone substation component of the development is located on the eastern side of the building comprising five transformers and associated cooling fans.

The Belmore Park Zone Substation computer model was prepared using the SoundPLAN Industrial Module (V6.4), a commercial software system developed by Braunstein and Berndt GmbH in Germany. The software allows the use of various internationally recognised noise prediction algorithms. The CONCAWE method, developed in The Netherlands for the assessment of large industrial plants was used for this model.

The computer model predicts the internal reverberant noise levels within the building, as well as the propagation of noise from external façade elements including louvres, to the receptors. The noise model includes source noise emissions, acoustic shielding from transformer enclosures/blast walls, acoustic shielding from site buildings and other features and the location and height of the potentially most affected and/or representative noise-sensitive receptors.

The Belmore Park Zone Substation would be equipped with its ultimate capacity of five 50MVA 132/11kV transformers, located on the ground floor and cooling radiators and fans located on Level 3.

The environmental noise modelling used the following parameters for the transformers, fans and their respective enclosures. The sound power levels used are as advised by EnergyAustralia for the Project. The building layout, internal walls and external louvres used in the model are based on the Kann Finch Group substation component drawings of 20 June 2008.

- A transformer sound power level of 75 dBA (re 10-12 dBW) was used for each of the five transformers, with an effective noise source height of 4 metres. In addition, the transformers were modeled with a third octave spectrum based on measurements of a 120 MVA transformer previously measured. The spectrum was normalised to an overall A-weighted sound power level of 75 dBA.
- A radiator/fan sound power level of 83 dBA (re 10-12 dBW) was used for each fan, with an effective noise source height of 1 metres.
- A "worst case" scenario of five transformers and four fans operational during the night-time has been modelled (normally three transformers would be operating).
- Acoustic cell blockwork, in accordance with the Kann Finch Group specification ZN 8700, is used on each of the three internal walls facing the five transformers within the building.
- The calculated L_{Aeq} noise levels at the nearest residential boundaries are presented in **Table 10.10**. The results include a 5 dBA penalty for tonality, in accordance with the INP guidelines.

Table 10.10 Computed noise levels without mitigation

Receivers/ addresses	Floor level[1]	Criteria (INP Amenity)			Received noise level - dBA[1]		
		Day	Evening	Night	Transformers only[2]	Fans only	Transformers + fans
Meriton Mosaic 36 Campbell Street	Ground	54	53	50	33	33	37
317-321 Castlereagh Street	1 Floor	54	53	50	32	50	50
428 Pitt Street	2 Floor	65	65	65	33	32	36
431 Pitt Street	Ground	65	65	65	26	27	30
441 Pitt Street	Ground	65	65	65	17	25	25
323 Castlereagh Street	1 Floor	65	65	65	28	56	56

Note1: Noise levels were predicted at all receiver levels, with the floor shown where the highest levels were predicted.

Note 2: A 5 dBA tonal penalty is included in the predicted transformer received noise levels.

The predicted results presented in **Table 10.10** show compliance with the transformers only and also compliance with the transformers and fan operating for daytime, evening and night-time.

The predicted noise levels meet the criterion at 317-321 Castlereagh Street and are well within the criteria at all locations. However, the predicted noise levels do not include any contribution from the Level 14 Plant Room associated with the commercial development. It would therefore be necessary to reduce fan noise levels by typically 3 dBA to ensure that the combined transformer plus fan plus Level 14 Plant Room does not exceed the 50 dBA night-time criterion.

Commercial building component level 14 plant room

Because detailed plant selections are not available for the commercial development at this stage, it is not possible to carry out a detailed examination of the ameliorative measures that may be required to achieve the noise targets.

Plant would be acoustically treated to prevent noise emissions from adversely impacting the surrounding properties. This may include selecting the quietest plant practicable, or treating the plant with enclosures, barriers, duct lining and silencers, etc as required to comply with regulatory sound level requirements.

Experience with similar projects indicates that it would be possible to achieve regulatory requirements with appropriate treatment of the plant. This treatment would be determined as part of the Construction Environmental Management Plan stage. Notwithstanding, a preliminary assessment of noise emissions has been undertaken and is detailed below.

The commercial building plant room is proposed to be located on Level 14 and would indicatively comprise three air-handling units, three chillers, fans, pumps and boilers etc. In addition car park exhaust fan louvres are located at ground level.

At the nearest residential receivers to the north, the combined plant room and substation noise level (from the level 14 plant room, carpark fans and the ground level transformer room and associated radiator room located above) is required to be less than 54 dBA during the daytime, 53 dBA during the evening and 50 dBA during the night-time in order to comply with the INP derived design criteria, as specified in **Sections 10.2.6** and **10.2.7**.

In order to ensure compliance with the criteria, the contribution by the mechanical plant should be set at nominally 3 dBA to 5 dBA below the design criteria. This would ensure that the combined noise from the plant room, carpark fans and the ground level transformer room and associated radiator room would comply.

The noise model was used to provide preliminary information on the maximum radiated A-weighted Sound Power Level (SWL) for the plant room and ground level carpark louvres, by placing sources mid-way along the northern building facades at these two levels. To achieve noise level of 47 dBA (3 dBA below the night-time criterion) at the critical 317 Castlereagh Street receiver, the total radiated SWL is required to be to be 84 dBA (re 10^{-12} dBW) for the plant room and 84 dBA (re 10^{-12} dBW) for the ground floor carpark louvres. (It should be noted that the location of the louvres is not known with respect to pedestrians, and a lower SWL may be required).

Commercial building component emergency generators

The emergency generator is proposed to be located on the Level 14 of the building. The capacity is estimated to be 1,500 kVA and details would be refined during the detailed design phase of the Project.

The nearest receiver is the Meriton Mosaic apartment building, with the design criterion set in **Section 10.2.8** at 45 dBA.

Given that the details of the emergency diesel generator (referred to in **Section 10.2.5**) are yet to be refined, the maximum SWL has been determined to enable compliance with the criterion based on the DECC guidelines. The maximum radiated A-weighted SWL for the generator is specified to be 82 dBA (re 10^{-12} dBW).

10.3 Traffic noise assessment

The following vehicle movements are expected during the construction and operational phases of the project:

- during construction, maximum truck movements are 20 spoil truck and 2 delivery truck movements per day; and
- during operation, a maximum of 48 vehicle movements per hour.

Based on the very low (in the context of existing road traffic noise) volume of truck movements during construction and vehicle movements during operations, the Project would not result in traffic noise increases that exceed 2 dBA at the receivers near to the Belmore Park Site. It is predicted that, at most, construction/ operation related traffic activity would result in noise increases of less than 1 dBA.

10.4 Mitigation measures and safeguards

10.4.1 Construction noise and vibration

A summary of the construction noise and vibration mitigation measures that should be implemented for the works is listed in **Table 10.11**.

Table 10.11 Construction noise and vibration mitigation measures

Item	Description
Site layout	Where possible, plant would be located and orientated to direct noise away from sensitive receivers.
Construction hours	Works would be carried out within standard construction hours, except as permitted by conditions of consent.
Out of hours works	The noisiest construction activities should take place before 10:00 pm wherever feasible, and endeavour to undertake as much preparation work as feasible in the day-time hours.
Deliveries	Deliveries would be carried out within standard construction hours, except as permitted by conditions of consent.
Quietest suitable equipment	Plant and equipment would be selected to minimise noise emission, in-so-far-as possible whilst maintaining efficiency of function. Residential-grade silencers would be fitted and all noise control equipment would be maintained in good order.
Rock Hammering	Works would be carried out within specified rock breaking hours.
Piling	Works must be completed using non-percussive piles. If percussive piles are proposed to be used, approval of the Environmental Management Representative or Director General of the Department of Planning must be obtained following consultation with the DECC.
Reversing alarms	Non-tonal reversing beepers must be fitted and used on all construction vehicles and mobile plant used for any out of hours work. Mobile plant and trucks operating on site for a significant portion of the project would have reversing alarm noise emissions minimised in-so-far-as possible, recognising the need to maintain occupational safety.
Fixed plant	Fixed plant would be provided with noise controls to comply with the NSW Industrial Noise Policy.
PA system	To be used within standard Construction Hours, except in emergency situations.
Noise barriers - general	Where they are effective and reasonable, solid hoardings and/or site sheds would be erected on work site boundaries or around critical work areas on the sites.
Noise monitoring	Noise monitoring would be carried out to determine compliance with airborne construction noise goals; in response to complaints; and to conduct plant noise audits
Vibration buffer zones	General safe working distances for rock breaking and vibratory compaction are described in Table 10.7. Where required monitoring would be carried out to confirm these buffer zones at locations where buildings are closest.
Vibration monitoring	Vibration monitoring would be carried out where vibration intensive activities (eg rockbreaking or vibratory compaction) are required to be carried out within the established buffer zones, or where there is considered to be a risk that levels may exceed the relevant structural damage criteria.
Truck noise (off site)	All trucks regularly used for the Project (eg spoil trucks) are to have mufflers and any other noise control equipment in good working order. Trucking routes would use main roads where feasible.
Educational facility and religious institution consultation	Affected pre-schools, schools, universities and any other affected educational and religious institutions must be consulted in relation to noise mitigation measures. Noise-intensive construction works in the vicinity of affected educational buildings are not to be timetabled during examination periods, unless other arrangements acceptable to the affected institutions are made at no cost to affected institutions.
Community liaison	A programme of community liaison and complaint response would be implemented, including letter-box drops of proposed noisy activities, progress reports, etc.
Training	Site induction training would include a noise awareness component.

These details are summarised in Chapter 16. Further details are contained in **Volume 2, Appendix D**.

10.4.2 Operational noise and vibration

Noise

- The predicted noise meets the criterion at 317-321 Castlereagh Street, and is well within the criteria at all locations. However, the predicted noise levels do not include any contribution from the L14 Plant Room. It would therefore be necessary to reduce fan noise levels by typically 3 dBA to ensure that the combined transformer plus fan plus Level 14 Plant Room does not exceed the 50 dBA night-time criterion
- To reduce noise levels from the four operational fans above the transformers to the receivers located at 317-321 Castlereagh Street, the following noise mitigation options are recommended:
  - use low noise fans for radiator cooling. The fans would have a maximum sound power level (SWL) of 80 dBA. Alternatively, the proposed fans could be used with a speed controller to limit the night-time noise levels to 80 dBA; or
  - provide acoustic absorption to the fan room ceiling. The absorption is required to have a noise reduction co-efficient of 0.6 and cover 60 percent of the ceiling area; or
  - provide standard 300 mm deep acoustic louvres to the eastern plant room wall penetrations.

• In order to ensure compliance with the criteria, the contribution by the mechanical plant should be set at nominally 3 dBA to 5 dBA below the design criteria. This would ensure that the combined noise from the plant room, carpark fans and the ground level transformer room and associated radiator room would comply.

• Given that the details of the diesel generator are yet to be defined, the maximum radiated sound power level (SWL) has been determined to enable compliance with the criterion based on the DECC guidelines. The maximum radiated A-weighted SWL for the generator is specified to be 82 dBA (re 10 12 dBW).

Vibration

- The five transformers are located at the building ground level, on the same elevated (with respect to the building foundation excavation) concrete slab at the adjacent office space in the building. The following control measures are recommended to minimise vibration transmitted into the elevated supporting concrete structure:
  - double neoprene pad isolators would be formed by two layers (nominally 6 mm to 8 mm) ribbed or waffled neoprene, separated by a stainless steel or aluminium plate. The layers would be permanently adhered together;
  - the pads would be 40 to 50 durometer. The pads would be sized so that they are loaded within the manufacturer's range; and
  - a steel top plate equal to the size of the pad would be provided in order to transfer the weight of the supported structure to the pads.

10.5 Conclusion

Potential impacts from environmental noise sources on the acoustic amenity of the proposed zone substation development have been assessed. Refer to **Sections 10.1.6 and 10.2** of this EAR.

In relation to the proposed commercial component it is concluded that:

- a full assessment would be carried out at the detailed design stage, however, the preliminary assessment indicates compliance with the City of Sydney DCP and AS2107 – 2000 would be both possible and practical; and
- treatments would be determined by the Department of Planning as part of the Construction Environmental Management Plan.

11 European Heritage and Aboriginal Archaeology

11.1 Assessment

11.1.1 Non-Aboriginal heritage

The following information was extracted from the Belmore Park Project HIS prepared by City Plan Heritage (May 2008). A copy of this report is provided in **Volume 2**, **Appendix E.**

The subject site is listed under the Central Sydney Archaeological Zoning Plan 1992 as an area of archaeological potential. Therefore a HIS was undertaken in order to assess the likely impact of the Project on the cultural heritage values of the locality and the site's archaeological potential.

A number of studies have been carried out for the subject site between 2002 and 2005 by City Plan Heritage in relation to previous Development Applications for the site. An archaeological assessment was also prepared by the archaeologists Casey & Lowe in 1995.[1] Due to the site's identified archaeological potential an Excavation Permit Application and Archaeological Research Design was prepared by City Plan Heritage in conjunction with Casey & Lowe in 2003.[2] A Revised Archaeological Research Design was prepared by City Plan Heritage in 2005.[3] The Excavation Permit was issued by the Heritage Council of NSW in November 2005 to City Plan Heritage [4] The Permit was for "archaeological testing only", valid for five years.

The subject site has a long history of occupation, stretching back to the early years of European settlement after 1788. The site was developed through successive phases, until the last substantial building on the site – the Hotel Sydney – was demolished in the 1960s. The site has been undeveloped since.

During the early years of settlement, the area in which the subject site is located was outside the limits of Sydney Town, and was known as the "Brickfields". The quarrying of clay and the manufacture of bricks had begun in this area from 1788, having been established by Governor Phillip.

The next phase in the history of the locality, was the use of the area for the Sydney Cattle Markets, transferred here around 1830.

In 1869, a new market complex – "Belmore Markets"- was constructed stretching from Pitt Street to Castlereagh Street, including the area of the subject site. These new markets were owned and operated by the City Council, and comprised the principle fresh produce market for Sydney.

In 1910 the Belmore Market complex was demolished, having been superseded by new markets constructed to the west of George Street. The public market association with the block ceased at this time, and the ensuing phase of development was of a commercial character.

The Hotel Sydney was the product of a "design competition". Council approved the proposal and the hotel opened for business in 1918. The Hotel Sydney was a five-storey building covering the subject site, built to the street front with shops on its three street frontages (ground plans indicate that it had various cellars, but the extent of these is not clear).

The Hotel Sydney was a substantial and distinctive building, designed with regard to the neighbouring developments at Haymarket. The Hotel Sydney was demolished in the 1960s.

The summary of the Statement of Significance of the 2005 Excavation Permit Application and Research Design stated:

"any evidence of brickfield activity would have a high level of heritage significance at a State level. The other phases of site remains would have a low to medium level of heritage significance at a Local level. The significance of remains in all phases is likely to be affected by the extensive disturbance caused by the construction of the Hotel Sydney."

1 Casey & Lowe Associates, 430-450 Pitt Street, Sydney: archaeological assessment, October 1995
2 City Plan Heritage with Casey & Lowe Pty Ltd, Park Central Excavation Permit Application, December 2003
3 City Plan Heritage, Park Central 430-450 Pitt Street, Sydney Archaeological Research Design, June 2005
4 Application No. 2004/S140/039

Due to the site's identified archaeological potential an Excavation Permit Application and Archaeological Research Design was prepared by City Plan Heritage in conjunction with Casey & Lowe in 2003,[5] and revised and submitted to the NSW Heritage Office in 2005.[6] An Excavation Permit was issued by the Heritage Council of NSW in November 2005 to City Plan Heritage.[7] The 2005 Permit Application noted that:

"Archaeological testing of the site undertaken in 1996 showed that the Hotel Sydney has caused major disturbance. It is still possible, however, that there may be evidence of nineteenth-century land-use in the west portion of the site fronting Pitt Street. It is proposed to monitor the bulk excavation of the site in order to identify and record any nineteenth-century features. Where earlier features occur, it is anticipated that they would be contained in undisturbed areas of remnant topsoil. It is not clear, however, whether such areas remain on the site. The recommendation to monitor site works is consistent with the methodology proposed by Casey & Lowe Associates following test excavations in 1996, and advice provided by Tony Lowe during preparation of the current excavation permit application.[8]"

11.1.2 Aboriginal archaeology

The following information was extracted from the Aboriginal Cultural Heritage Assessment by Navin Officer Heritage Consultants (June 2008). A full copy is provided in **Volume 2**, **Appendix F**.

The detection of sixteen Aboriginal sites in the vicinity of the anticipated areas of development impact demonstrates that remnants of Aboriginal archaeological material may survive in limited contexts in the now highly modified environment of the CBD. However, the likelihood that Aboriginal site remnants survive in an undisturbed context is remote.

Given the high degree of landform modification within the intensely urbanised area of Sydney's CBD, the remaining Aboriginal archaeological resource is likely to consist of isolated remnants that are hard to predict at a local level.

Greatest potential for subsurface archaeological deposits can be predicted to occur within:

- the pre-European foreshore zone, up to 200 metres from the former shoreline, especially where the former land surface was lower than the current (artificially elevated) one;
- formerly lower lying areas which have been subsequently filled to provide an elevated building or road platform; and
- where excavation for building foundations or below-ground levels has not removed the pre-European soil profile.

Deposits underlying road carriageways and their adjacent pavements are likely to be highly disturbed due to the construction of the road foundation, former road surfaces and grades, and the intrusion of below ground service trenches for sewer and water pipelines and telecommunication cables. High-rise structures and buildings with basements are also unlikely to overlie sediments with any archaeological potential, due to the high level of disturbance and soil extraction required during construction.

The potential for direct impact to surviving archaeological deposits by the proposed Belmore Park Zone Substation Project is considered to be very limited due to the following:

- below ground works may impact archaeological deposits where excavations are close to the surface and encounter former or current upper soil profile sediments.

11.2 Mitigation measures and safeguards

11.2.1 Non Aboriginal heritage

The Belmore Park Site would be monitored during initial earthworks to determine whether any remains dating to the brickfield period are present.

5 City Plan Heritage with Casey & Lowe Pty Ltd, Park Central Excavation Permit Application, December 2003
6 City Plan Heritage, Park Central 430-450 Pitt Street, Sydney Archaeological Research Design, June 2005
7 Application No. 2004/S140/039
8 City Plan Heritage with Casey & Lowe Pty Ltd, Park Central Excavation Permit Application, 2005, 21

11.2.2 Aboriginal archaeology

It is recommended that:

- no further Aboriginal archaeological investigation is required for the Project;
- the limited potential for remnant and dispersed Aboriginal artefacts to occur would be considered when excavations associated with the proposed tunnel connections and/or extensions for the Project occur. An appropriately trained archaeologist would be available (on call) during excavations to identify Aboriginal Objects and provide advice where necessary;
- In the unlikely event that Aboriginal objects are uncovered by construction or excavation works, it is recommended that the following response strategy be adopted and incorporated into contingency management plans prior to the commencement of works:
  - stop all impactive works or actions which may disturb the area of the find or exposed Aboriginal Object (objects may include: stone artefacts, bones, midden shells and hearth remnants);
  - contact project archaeologist and organise for inspection of site/material;
  - consult with the Department of Conservation and Climate Change, regarding an appropriate course of action;
  - consult with the Metropolitan Local Aboriginal Land Council regarding an appropriate course of action; and
  - carry out any requirements indicated by the DECC and the Metropolitan Local Aboriginal Land Council.
- Three copies of Navin Officer's report (**Volume 2**, **Appendix F**) should be forwarded to the NSW DECC.
- One copy of this report would be forwarded to the Sites Officer of the Metropolitan Local Aboriginal Land Council, PO Box 1103 Strawberry Hills NSW 2012.

12 Spoil and Waste Management

12.1 Introduction

The Project would require bulk excavation of the entire site resulting in approximately 70,500m^3 of excavated material. Bulk excavation of the site would occur in two stages being:

- Bulk excavation of the substation component of the Project in the period April 2009 to December 2009 – totalling 47,250m^3; and
- Bulk excavation of the commercial component of the Project in the period mid 2012 to early 2013 – totalling 23,250m^3;

The following information was extracted from the geotechnical assessment report prepared for the Belmore Park Zone Substation Project by Douglas Partners Pty Ltd in April 2008:

- the development would involve bulk excavation of the entire site to an average depths of approximately 14.5 metres below existing ground level. The shaft connection to the CSCT would extend a further 13 metres below this level. Indications are that at least some of the previous buildings on this site had basements that have been backfilled;
- the building adjacent to the site (Sydney Central) is understood to have two basement levels meaning that the Belmore Park Zone Substation would extend well below it;
- a variety of materials are to be removed during the bulk excavation works, ranging from building rubble filling, stiff clays to extremely low and high strength sandstone;
- removal of filling, overburden soils and highly weathered sandstone would be readily accomplished with conventional earthmoving plant;
- the use of excavator mounted hammers would be required to excavate high strength sandstone. Saws may be required to cut the rock along the boundary;
- efficient removal of spoil material would require consideration of a number of factors, including precautions necessary to avoid overbreak when excavating to boundary lines or close to footings for the adjacent building and sidewall stability of excavation faces;
- major excavation works of the type proposed can not be accomplished without some movement being experienced at the property boundaries. Even though the overburden soils are shored at the boundaries, the release of stresses in rock at depth is generally accompanied by lateral movement, which sometimes can give rise to observed displacement at the boundary;
- NSW DECC guidelines state that all material to be disposed off site should be the subject of a Waste Classification Assessment. At this stage, no attempt was made to classify the material for waste disposal. The material below about four metres appears natural and would generally be classified as virgin excavated natural material (VENM); and
- the intrinsic strength of the stiff to hard clay is probably adequate to permit the sides of excavation to stand vertically without support in the very short term. However, instability would eventually arise due to the filling and to drying and wetting of the exposed clayey faces during construction.

12.2 Mitigation measures and safeguards

Construction

The following mitigation measures and safeguards, which apply to equally to the substation and commercial components of the project, would be developed:

- wherever practicable spoil would be reused as part of the Project;
- sites for the disposal of surplus soil would be selected according to the rate of development activity and the volume of material generated elsewhere;
- spoil that is not VENM would be transported to approved landfill sites and/or off-site recycling depots;
- spoil haulage routes identified in **Chapter 9** would be used;
- testing of the fill material would have to be undertaken prior to it being acceptable for waste disposal purposes;

- as part of the CEMP a Spoil Handling and Management Sub Plan would be prepared which would identify how spoil would be handled, stockpiled, re-used and disposed. It would address the principles of all relevant legislation; and
- all work associated with contaminated spoil, including the preparation of reports, would be carried out in accordance with DECC guidelines and guidelines prepared by the Australian and New Zealand Environment and Conservation Council and the National Health and Medical Research Council.

Waste management and re-use sub plan

As part of the CEMP a detailed Waste Management and Re-use Sub Plan would be prepared. The Sub Plan would be framed using the waste minimisation hierarchy principles of avoid-reduce-reuse-recycle-dispose. The Sub Plan would address the management of wastes during the construction and operation stages respectively. It would be prepared prior to construction and would be consistent with the *Waste Avoidance and Resource Recovery Act 2001*, and DECC's *Environmental Guidelines: Assessment, Classification of Liquid and Non-Liquid Wastes*. It would:

- identify requirements for waste avoidance; reduction; re-use; and recycling.
- provide details of requirements for handling; stockpiling; disposal of wastes (specifically, contaminated soil or water, concrete, demolition material, cleared vegetation, oils, grease, lubricants, sanitary wastes, timber, glass, metal, etc.); and
- identifying any site for final disposal of any material and any remedial works required at the disposal site before acceptance of the material.

Any waste material that is unable to be recycled would be disposed at a landfill licenced by DECC to receive that type of waste.

As part of the Sub Plan, an Action Plan would be prepared to promote the use of recycled materials, including construction and landscape materials. The action plan would detail how the works gives consideration and support to the NSW Government's *Waste Reduction and Purchasing Policy*. The action plan would also include details on measures to implement energy conservation best practice.

Operations

An operational waste management plan was prepared by the Mack Group for the commercial and retail components of the Project. The report was prepared based on the City of Sydney Council's "Code for Waste Handling in Buildings" and the "Policy for Waste Minimisation in New Developments". In summary, the report demonstrated that all waste stores and the waste management system proposed was reviewed and found to meet their requirements. A copy of the report is provided in **Volume 3, Appendix N**.

The substation component of the Project generates limited quantities of waste. EnergyAustralia would engage waste contractors to manage this waste in accordance with its standard operating and procurement procedures.

13 Hazards & Risks

13.1 Assessment

Health, safety, risks and hazards for the Project include:

- security of the cable tunnel and substation;
- likelihood of cable being damaged;
- potential to damage other infrastructure during construction (e.g. water and sewer pipelines);
- identification of other risks/hazards posed by the construction and operation of the cable tunnel and substation;
- description of hazard and emergency management measures for both the construction and operation stages;
- risk to pedestrians on Campbell and Hay Streets in the vicinity of the building from vehicles entering/exiting the building car parks;
- security of the site to avoid vandalism and securing risk to adjoining sites;
- potential for fire events and proposed fire management strategy; and
- potential releases of sulphur hexafluoride into the atmosphere.

As part of the preparation of the EAR a preliminary review of risks and hazards was conducted by EnergyAustralia for the Project.

The results of the preliminary reviews and the security management plan are contained in **Volume 3**, **Appendix G**.

A security management plan would also be prepared for the substation and commercial components.

13.2 Electric and magnetic fields

13.2.1 Introduction to EMF

Electric and magnetic fields (EMF) are part of the natural environment and are present in the earth's core and the atmosphere. EMF is also produced wherever electricity or electrical equipment is in use. Power lines, electrical wiring, household appliances and electrical equipment all produce EMF. EMF is sometimes incorrectly referred to as electromagnetic radiation.

The electric field is proportional to the voltage (which can be considered as the pressure with which electricity is pushed through the wires). The magnetic field is proportional to the current; that is, to the amount of electricity flowing through the wires. Both electric and magnetic fields are also dependent on the source geometry (i.e. conductor heights, cable depths, phase separations and so on).

All fields decrease rapidly as you move away from the source. Generally, the smaller the object or closer the conductors producing the field, the more rapidly the field decreases as you move away from the source.

13.2.2 EMF and health

The issue of EMF and health effects has been extensively reviewed over the past 30 years by Australian and international inquiries and expert panels established for the purpose of trying to determine whether or not human exposure to EMF is related to adverse health effects. Consistently, none has ever found a basis for the scientific community to conclude that EMF causes cancer or any other disease. While the balance of evidence is against there being a risk, the possibility cannot be ruled out.

The relevant Australian regulatory authority, the Australian Radiation Protection and Nuclear Safety Agency (ARPANSA), concludes that *"On balance, the scientific evidence does not indicate that exposure to 50 Hz EMFs found around the home, the office or near power lines is a hazard to human health"* (Australian Radiation Protection and Nuclear Safety Agency 2003).

There are currently no Australian standards regulating exposure to these fields. The National Health and Medical Research Council has issued Interim guidelines on limits of exposure to 50/60 Hz electric and magnetic fields.

These guidelines are aimed at preventing immediate health effects resulting from exposure to these fields. The recommended magnetic field exposure limit for members of the public (24 hour exposure) is 0.1 millitesla (1,000 mG - milligauss) and for occupational exposure (whole working day) is 0.5 millitesla (5,000 mG) (NHMRC 1989).

EnergyAustralia operates its powerlines, substations and other electrical infrastructure well within these interim guideline limits.

In December 2006 ARPANSA released a draft new standard for EMF exposure in Australia. Following public comment this new standard is expected to be finalised and implemented in late 2008.

13.2.3 EnergyAustralia's position on EMF

- Provide balanced, accurate information to our employees and customers, including electric and magnetic field measurements and advice.
- Take reasonable steps to limit field exposures from new facilities by locating and operating our electrical installations prudently within the latest Australian health guidelines.
- Closely monitor engineering and scientific research, overseas policy development and major reviews of scientific, medical and engineering research regarding electric and magnetic fields and health.
- Cooperate fully with any bodies established by governments in Australia to investigate and report about power frequency electric and magnetic fields.

13.2.4 Mitigation measures and safeguards

- EnergyAustralia would take a number of steps to minimise EMF around the proposed Project elements. These measures would be technically reasonable and within the context of prudent avoidance - "*doing whatever can be done at modest cost and without undue inconvenience to avoid the possible risk (to health)*" (Gibbs, 1991).
- Design of the Belmore Park Zone Substation for example has incorporated a number of mitigation measures including fitting all transformers in a single line (single loaded) to minimise the ground floor area and EMF.
- The transmission cables would be located in a concrete lined tunnel at a depth of 20 metres below ground level. The EMF from these cables would be indiscernible from typical background levels.

A report detailing the EMF levels and proposed mitigation measures can be found in **Volume 2**, **Appendix I**.

13.3 Construction and operational risk management

The risks and hazards can be managed through the development of construction phase risk management planning and operation phase risk management planning.

13.3.1 Mitigation measures and safeguards

- EnergyAustralia would identify the services potentially affected by construction activities to determine requirements for diversion, protection and/or support. EnergyAustralia would ensure that existing cathodic protection systems are not adversely affected and that appropriate measures are put in place to minimise stray currents.
- EnergyAustralia's contractors would prepare and implement construction safety sub plans to manage hazardous incidents and public safety during the construction of the Project.
- As part of the Operation Environmental Management Plan (OEMP), EnergyAustralia would assess the risk to pedestrians from vehicles entering and exiting the building carparks, and the appropriate mitigation measures and safeguards required. Such measures may include a flashing light and alarm to warn pedestrians of any vehicles entering/exiting the building carpark.
- EnergyAustralia would prepare and implement Operation Emergency Sub Plans to manage emergency events that may arise in relation to operation of the Project.
- EnergyAustralia would prepare and implement an Operation Security and Crime Management Strategy to prevent unauthorised public ingress or access to relevant components of the Project during its operation, and to minimise the potential for crime in the vicinity of cable infrastructure (for example, vandalism, loitering, illegal dumping etc). The strategies would be generally in accordance with the principles outlined in the former Department of Urban Affairs and Planning publication entitled "Crime Prevention and the Assessment of Development Applications" dated 2001.

14 Property, Land Use and Settlement

14.1 Assessment

The Belmore Park Site has been acquired by EnergyAustralia.

The following material was extracted from a report by Lindsay and Dynan Pty Ltd dated 1 July 2008:

- Douglas Partners' April 2008 report highlights that, like any sizeable excavation in rock, noise and vibration would be caused as excavation proceeds, and recommends that a maximum vibration amplitude of 8mm/sec. be adopted at the foundation level of the adjacent building. Douglas Partners' April 2008 report provides advice on excavation equipment which could be used to achieve the abovementioned vibration amplitude limitation.
- Douglas Partners' report indicates that rock stress relief movements during excavation of the Hawkesbury Sandstone are likely to be of the order of 1mm/metre depth of rock excavation. Their advice indicates that movement is minimal in the corners and bases of the excavation increasing to a maximum of approximately 10 – 15mm at the centre top of the excavated faces. Their report highlights that major excavation work of the type proposed cannot be accomplished without some movement being experienced at the property boundaries.
- Douglas Partners has indicated that this horizontal ground movement tends to reduce by 0.5mm to 1mm per metre away from the excavated faces, highlighting that, in the worst case scenario, 10 metres back from the middle of the excavated face, there may be 5mm to 10mm of lateral movement.
- Douglas Partners has indicated that stress relief movement in the Hawkesbury Sandstone during excavation is likely to result in the footpath, the buried services beneath the footpath, and the adjacent roadway moving as a block. They believe that such movement may cause some cracks to develop in the road and footpath, but do not expect their performance to be significantly affected.
- The Douglas Partners' report discusses the potential effects of stress relief movement in the rock on the railway tunnel. The report discusses noise and vibrations and highlights that, in the past, Railcorp have adopted a vibration limit of 20mm/sec peak particle velocity (ppv) for their tunnels.
- The existing light rail lines are located in Hay Street. Douglas Partners has indicated that they do not anticipate that stress relief movements associated with the site excavations would adversely affect the light rail infrastructure.
- It is proposed that a reinforced concrete soldier pile system would be installed around the perimeter of the excavation. The retention wall would be located within the site boundaries, except in those areas where the wall would step out onto the footpaths along Campbell and Hay Streets to facilitate cable entry/exit to the proposed substation.
- A secondary shoring system, for example light steel sheet piling or similar, may be required to retain the edge of the fill material below the edge of the footpaths. This secondary shoring system, if required, would be installed prior to installation of the soldier pile wall.
- It is proposed that the building be supported on a series of pad footings founded in competent Class II sandstone. Douglas Partners has indicated that settlement would be negligible.

14.2 Mitigation measures and safeguards

The following mitigation measures and safeguards would be developed during the construction phase:

- Foundations of the Sydney Central building should be checked prior to excavation as they may require underpinning if they are not founded on sound, medium or high strength sandstone.
- The use of excavator mounted saws or milling heads can overcome overbreak problems. However, the development of unstable wedges along the lines of excavation can sometimes occur unless appropriate precautions are taken to identify their likely occurrence and to allow for pinning, bolting or anchoring, where necessary, to secure the blocks ahead of the bulk excavation work.
- Regular inspections of the excavation works by an experienced engineering geologist/ geotechnical engineer issues resulting from the bulk excavation works.
- A dilapidation survey of any structure that could be affected would be undertaken.

- It would be necessary to provide temporary support to the sides of excavation during construction, as well as long term support in the form of retaining walls.
- Wherever practical, impacts on potentially affected properties would be avoided or reduced by design measures.
- Settlement monitoring would be undertaken during the construction phase.
- Vibration monitoring may be required in nearby buildings and structures whilst excavation work proceeds. The need for additional vibration monitoring stations is anticipated in the nearby railway tunnels, and would be the subject of further discussions with RailCorp.
- It is proposed to undertake an extensive dilapidation survey of all adjacent footpaths and roadway, which could be affected by stress relief rock movements. The initial survey would be undertaken prior to commencement of construction, a follow-up survey on completion of excavation, and a final survey at the completion of construction.

15 General Environmental Aspects

15.1 Surface & groundwater management

15.1.1 Assessment

The main issues during construction would be:

- the prevention of erosion and containment of any sediment generated to prevent discharge into stormwater systems;
- the potential for chemical spills; and
- stormwater run-off could potentially contain elevated silt loads from tunnel spoil deposited by trucks.

It is expected that groundwater would be intercepted which may contain relatively high levels of manganese and/or iron. Any groundwater intercepted during both the construction and operational stages of the Project would be treated to an accepted level and discharged to stormwater in accordance with ANZECC guidelines. This would be carried out in consultation with DECC, Sydney Water Corporation and/or City of Sydney.

The operation of the Belmore Park Zone Substation would require a water treatment facility, to treat groundwater, and other flows, prior to discharge to the stormwater system. Inflows to the treatment plant would be treated to the relevant ANZECC 2000 standards prior to discharge.

Groundwater would either be managed on site in a new water treatment plant installed within the building proper, or groundwater may be pumped to the existing CSCT water treatment plant (via the CSCT), which is located at the Campbell Street Zone Substation. The preferred option is to utilise the existing CSCT water treatment facility.

Subject to the final design of the overall building, a separate water treatment plant would most likely be required for the commercial development.

During operations the Project is not expected to increase the proportion of impervious surfaces or have a significant impact on the nature of land uses within the catchment.

Geotechnical borehole investigations carried out recently encountered groundwater below the site at depths in excess of 8m. The groundwater table was found to lie within the sandstone bedrock, well below the surface fill and clay material and as such, further lowering of the groundwater table resulting from the excavation is not expected to have any detrimental impact on the surrounding buildings, structures or services. Monitoring of the groundwater table is not planned for the site during excavation and construction of the building.

15.1.2 Mitigation measures and safeguards

Construction

A Soil and Water Management Sub Plan would be prepared as part of the CEMP for the Project. This would detail how soil and surface water and groundwater mitigation measures would be implemented at the various construction stages.

The Sub Plan would be prepared in accordance with the Department of Housing's guideline *Managing Urban Stormwater - Soils and Construction*.

The plan would be developed in consultation with stakeholders to ensure the appropriate mitigating measures and safeguards are incorporated and would be updated as the Project progresses.

The Plan would include identification of any proposed use of existing drainage infrastructure and the means of minimising any adverse impacts, including capacity limitations within the drainage system.

Operation

Water treatment of groundwater would comply with the Australian and New Zealand Environment and Conservation Council (2000) guidelines before discharge into Cockle Bay.

15.2 Greenhouse gas and air quality

The following information was extracted from the Air Quality Assessment prepared by Pacific Air and Environment. A full copy of the report can be found in **Volume 2**, **Appendix H**.

15.2.1 Assessment

Design

Alternative transformer insulation mediums to SF6 Gas were considered by the Proponent, which included traditional mineral oil and FR3 oil (vegetable based biodegradable oil). A risk assessment on the alternatives indicated that for a substation integrated with a commercial development in the CBD, the potential risk of fire precluded the use of mineral oil. While FR3 oil has a much higher flash/ fire point and combustion is not self-propagating, the remaining low fire risk would still require mitigation measures to be designed into the building such as blast walls around the transformers, a fire suppressant deluge system, oil containment tanks and structural strengthening, in order to meet BCA standards. Research into practices in a number of other countries where substations are integrated with commercial developments also indicated the use of SF6 as a preference to other forms of cooling medium.

As stated, the Proponent proposes to follow best practice guidelines to reduce or eliminate any leakage of SF6 gas during installation, operation, maintenance and decommissioning of the transformer and switchgear equipment. The equipment will be procured from a leading Japanese manufacturer which will ensure it is designed and manufactured to minimise leakage during operation.

Capturing of SF6 gas in the very small quantities expected is not considered to be practicable and introduces various OH&S issues due to the displacement of air by the gas. The Proponent proposes to provide a well ventilated environment for the transformers to allow any losses that may occur to be dispersed to atmosphere.

Routine maintenance in concert with monitoring will ensure that leakage rates over the life of the transformers do not increase.

Construction

There is potential for emissions of combustion gases and dust to be generated during construction works, particularly when bulk excavation and spoil handling activities are occurring.

The main pollutants of interest are total suspended particulates (TSP) and particulate matter less than 10 micrometres in aerodynamic diameter (PM10) that may be emitted due to the proposed construction works.

Site preparation, shaft excavations and spoil removal would involve surface earthworks and construction and materials handling activities, which have potential to generate dust emissions. Dust emissions are predicted to be negligible when managed appropriately and would have localised impacts only, if at all.

Combustion emissions, i.e. oxides of nitrogen (NO_X), fine particulate matter (PM_{10} and $PM_{2.5}$), carbon monoxide (CO) and sulfur dioxide (SO_2) from construction vehicles are also likely to be released. Combustion emissions from the proposed Project activities are considered to have insignificant impact on air quality when compared to emissions from existing sources in the area such as motor vehicles on nearby roads.

Emission factors and equations for calculating greenhouse gas emissions from automotive fuel use are provided in the National Greenhouse Accounts (NGA) Factors (2008). The activity data required is the amount of fuels used.

Estimated greenhouse gas emissions from the combustion of diesel in construction equipment for the Project are as follows:

Scope 1 GHG Emissions (t) = Activity (kL) x Energy Content of Fuel (GJ/kL) x EF (kg $CO_{2\text{-}e}$/GJ)/1000 = (88 x 38.6 x 69.5)/1000= 236 tonnes $CO_{2\text{-}e}$

Scope 3 GHG Emissions (t) = Activity (kL) x Energy Content of Fuel (GJ/t) x EF (kg $CO_{2\text{-}e}$/GJ) /1000 = (88 x 38.6 x 5.3)/1000= 18 tonnes $CO_{2\text{-}e}$

Operations – zone substation

For the Belmore Park Zone Substation it is proposed to use sulfur hexafluoride (SF_6) gas which is contained in the gas insulated transformers and other switchgear. It is non-toxic and typically held in relatively small quantities within the switch room.

The switchgear is very reliable equipment and therefore the risk of gas leakage is extremely low. However, should a major leak occur, gas leakage alarms and an appropriately designed ventilation system would ensure the safety of personnel. As the gas is non-toxic, there is no exposure limit.

However, due to its high global warming potential and its long atmospheric lifetime, SF_6 gas is included in the greenhouse gases of the Kyoto protocol.

The Belmore Park Zone Substation would use 5 transformers (each using 1,000 kg SF_6) and 16 gas insulated circuit breakers (each using 120 kg SF_6). Therefore total amount of SF6 in operation on site is 6,920 kg.

Applying the annual leakage rate of 0.005 (i.e. 0.5%) gives:

- an annual loss of SF_6 (kg) = 0.005 x 6,920 kg = 34.6 kg of SF_6; and
- multiplying the 34.6 kg of SF_6 by its global warming potential of 23,900 gives a total annual emission of approximately 827 tonnes of $CO_{2\text{-}e}$.

Emissions of any spills would be calculated using the same emission factors and equations. However, this should not be required if appropriate methods and procedures are followed to eliminate the risk of spills.

Electricity used to power the Belmore Park Zone Substation would be considered as Scope 2 and emissions attributable to upstream energy production are considered as Scope 3, indirect greenhouse gas emissions. Emission factors and equations for calculating greenhouse gas emissions from electricity from the grid are provided in the *National Greenhouse Accounts (NGA) Factors (2008)*. Note that transmission and distribution losses are reported by energy distributors elsewhere as Scope 2 emissions.

The estimated annual electricity consumption for Belmore Park Zone Substation is 14,000 kWh. Therefore, estimated emissions from electricity consumption are as follows:

- Scope 2 Greenhouse Gas Emissions (t $CO_{2\text{-}e}$) = (14,000 x 0.89 / 1000 = 12.5 tonnes per annum; and
- Scope 3 Greenhouse Gas Emissions (t $CO_{2\text{-}e}$) = (14,000 x 0.085 / 1000 = 1.2 tonnes per annum.

Operations – commercial

An Australian Building Greenhouse Rating (ABGR) report was prepared by Waterman AHW Pty Ltd for the commercial building element of the Project. The report found that the building design was heading towards a 4.5 Star ABGR base building rating with the potential to reach 5+ stars plus 20% improvement. The proposed building and building services were considered to be energy efficient. A copy of the report can be found in **Volume 3**, **Appendix L**.

15.2.2 Mitigation measures and safeguards

Construction

As part of the CEMP a Construction Air Quality Management Sub Plan would be prepared. The Site is currently covered by bitumen and includes a number of Plane trees around the perimeter. The following mitigation measures would be observed during site clearance and construction, in order to minimise impacts as much as possible:

Site clearance

- waste or materials for recycling would be removed from site as soon as possible. If stored, techniques to avoid emissions would be employed.
- bag and remove any biological debris or damp down before demolition.

Construction

- access to construction sites would be via existing sealed roadways and the surface of trafficked areas within sites shall be sealed with bitumen or gravel;
- wheels of all site plant and vehicles would be cleaned so that material with potential to generate dust is not spread on surrounding roads;
- sealed roads around construction sites would be swept to remove deposited material with potential to generate dust, if necessary;
- water would be used to suppress particles potentially generated during the erection of boundary fences, barriers, screens and other ancillary structures;
- areas of disturbed soils would be minimised during the construction period;
- water may be used to suppress dust emissions during dry windy periods (as required);
- the height from which dust generating material is dropped would be minimised;
- loaded trucks carrying spoil would be covered at all times;

- the cutting/grinding of materials on site would be kept to a minimum, but if necessary equipment and techniques to minimise dust would be used;
- earthworks would be kept damp, as required, especially during dry weather;
- the tunnelling excavation face would be kept damp, as required, to minimise dust generation;
- spoil stockpiles would be damped as necessary;
- longer term spoil stockpiles would be treated with surface binding agents or sealed by seeding with vegetation or covered with secured tarpaulins;
- potentially dusty materials would be handled as little as possible;
- exhaust emissions would not discharge straight at the ground;
- construction plant and vehicles would be well maintained and regularly serviced. Visible smoke from plant would be avoided. Defective plant would not be used;
- engines would be switched off when vehicles are not in use and refuelling areas would be away from areas of public access;
- loading and unloading would take place within the site; and
- all waste would be removed from site and disposed to an appropriately licenced waste facility.

Operation

- any measures to reduce fuel use or improve energy efficiency would reduce emissions of greenhouse gases due to combustion;
- options for mitigating SF_6 gas from the Belmore Park Zone Substation that are within EnergyAustralia's control are focused on best practice monitoring of leakage during operation, maintenance and end of life dismantling procedures;
- methods for improving leak detection monitoring and handling of SF_6 gas during operations and maintenance would also minimise emissions;
- the management of the end of life gas insulated equipment would follow industry best practice guidelines; and
- the electricity distribution network industry via the peak body, Energy Networks Association, is currently developing a Guideline on the Management of SF_6. The guidelines would assist the industry to reduce emissions of SF_6, by ensuring that all aspects of SF_6 management are addressed in a consistent manner by individual utilities such as EnergyAustralia.

15.3 Socio-economics

15.3.1 Assessment

The Project responds to the increased development pressures in Sydney CBD including:

- increased floor space for residential and employment populations; and
- redevelopment or conversion to more intensive land uses and increased floor space.

The land required for the construction of the new substations within the CBD is scarce and of high financial and public/planning value. In order to maximise the appropriate use of such land, minimise negative impacts and complement their CBD surroundings, EnergyAustralia is constructing the new substation such that appropriate commercial and/or retail developments can be integrated into or constructed on or adjacent to the substation. A mixed development of this nature allows for optimum public benefits for the land and best return on residual land value.

The potential impacts of the Project are concentrated around surface works with the exception of the stub tunnel connection to CSCT which is nominally 20 metres below existing ground level. These are outlined below.

Construction

- increases in noise, dust, vehicle emissions and changes to traffic and access conditions;
- the capital costs of the proposed Belmore Park Zone Substation Project, is estimated to be $65 million, whilst the commercial development is expected to cost in the order of $60 million;

- job creation involving 50 construction jobs;
- indirect economic impacts i.e. incomes and employment would be generated;
- construction of the Zone Substation would be undertaken from 2009 until 2012;
- construction of the commercial component would possibly be undertaken from 2012 until 2014;
- increased reliability and supply of electricity;
- changes to the visual amenity;
- the Belmore Park Zone Substation would be designed as an 'A' grade 5 Star Green Star office.

Operation

The substation impacts include:

- increased reliability and supply of electricity for Sydney CBD, indirectly benefiting metropolitan Sydney and beyond; and
- Belmore Park Zone Substation, proposes to use sulphur hexafluoride (SF6) for the transformers and in some supporting switchgear.

The commercial impacts include:

- potential to accommodate between 1,900 – 2,000 workers; and
- potential to further enhance economic activity in the southern area of the CBD.

15.3.2 Mitigation measures and safeguards

The mitigation measures already identified for the Project would generate socio-economic benefits.

Consultation has focused on those stakeholders likely to be directly affected by the Project including local and State government organisations, community groups, major project groups, businesses and the general community. EnergyAustralia has placed a high priority on consultation for the Project and has involved all stakeholders from the outset of the Project and this would continue through construction and operation.

15.4 Cumulative Impacts

15.4.1 Assessment

The construction and operation of other major developments in the Sydney CBD could result in cumulative impacts. Key areas of concern include:

- traffic;
- noise and vibration; and
- property issues.

The timing for the construction of other developments may overlap with the Project, and as such cumulative impacts may occur.

However, any potential construction cumulative impacts would be specifically dependent upon the final location of the proposed development in relation to the Belmore Park Zone Substation site, as well as timing between projects. Specific issues that would need to be considered include but are not necessarily limited to:

- haulage of waste material routes through the city to their final destination;
- total number of truck movements through the city to their final destinations;
- potential noise and vibration impacts from where projects either crossover or where location of tunnel entrances would be finally located;
- impacts on total water usage; and
- impacts on air quality.

15.4.2 Mitigation measures and safeguards

EnergyAustralia would endeavor to ensure that cumulative impacts can be avoided through coordination and consultation with other projects and communication with other authorities.

In general, the development and implementation of the construction and operational environmental management plans in response to the proposed Statement of Commitments and conditions of consent would prevent, avoid, minimise, and manage the various impacts associated with the Project to avoid the potential with any unknown proposals that overlap the Project.

As part of the CEMP, EnergyAustralia would identify significant developments occurring in the vicinity of the Project and sensitive community groups. EnergyAustralia would identify environmental impacts, which have the potential for cumulative effects to be monitored during construction.

15.5 Ecologically sustainable development

The construction and operation impacts of the Project have been considered in regards to ecologically sustainable development (ESD) principles. The ESD principles adopted by this report are those set out in Section 6(2) of the Protection of the Environment Administration Act 1991, Schedule 2 of the Environmental Planning and Assessment Regulation 2000 and Part 1, Section 3A of the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) which includes:

- the integration principle – integration of environmental, social and economic considerations into decision making processes;
- the precautionary principle - lack of scientific certainty is not used as a reason for postponing measures to prevent environmental degradation;
- the intergenerational principle - to support conservation of the environment for the benefit of future generations;
- the biodiversity principle – taking account for and conservation of biological diversity and ecological integrity; and
- The valuation principle – taking account of and improve valuation, pricing and incentive mechanisms to ensure the true cost of activities (environmental, social and economic) is recognised.

Construction

Implementation of a Construction Environmental Management Plan (CEMP) that stipulates strict environmental measures to be adhered to which include but are not necessarily limited to:

- minimising the number of vehicle movements when and where possible from the respective construction sites, and selecting the most effective and efficient transport routes, for example in the hauling of waste material;
- implementation of noise management measures at tunnel adit and construction areas involving surface works;
- implementation of water treatment equipment and adoption of recycling measures to minimise impacts from waste water on the local water system;
- implementation of dust suppression techniques to ensure the local amenity and air quality is relatively unchanged; and
- restrictions for working hours for construction activities involving surface works to minimise impacts to the local community.

These measures have proven to be successful in the construction of previous projects within the Sydney CBD. However, EnergyAustralia would attempt to improve where possible, on the measures previously adopted in order to achieve a higher level of ESD outcomes. This would be achieved by EnergyAustralia reviewing all practices prior and during the construction phase of the Project to ensure that ESD principles are effectively implemented.

Operation

The combined substation and commercial/retail elements of the Project represent an excellent opportunity to utilise land value in the CBD and integrate compatible land uses.

The commercial building has been designed to achieve 5+ star Green Star and 4.5 star ABGR ratings.

16 Statement of Commitments

16.1 Introduction

During the assessment of key issues and general environmental aspect numerous mitigation measures and safeguards were recommended.

These mitigation measures and safeguards were, wherever possible, presented under two categories:

1. construction phase; and
2. operational phase.

16.2 Statement of Commitments

Table 16.1 Draft Statement of Commitments – construction phase

Key Issue	Commitment
Visual amenity & design	The Belmore Park Site is designed to be in keeping with the locality and maintain its identity as a bold, modern addition to the area. The design of the development has been guided by the development parameters of the Central Sydney Local Environment Plan 2005 and the Central Sydney Development Control Plan 1996 to achieve an appropriate contemporary image for the development with the exception of: • street frontage heights and setbacks; • building exterior; and • building height restrictions in the restrictive covenant on site.
Traffic & access	• Construction traffic would be restricted to separate entry and exit accesses with a one-way flow through the site. Entry would be off Campbell Street and exit to Hay Street. This would mitigate and reduce congestion and manoeuvring, particularly by heavy vehicles. • Advance warning signage to identify the construction site, and warn of construction traffic and changed traffic conditions would be provided on all approaches to the construction site area, for example. Pitt Street (north of Campbell Street and south of Hay Street), Hay Street (west of Castlereagh Street), Campbell Street (west of Castlereagh Street). • Suitable traffic management and controls (to be detailed by the contractor prior to commencing works) would be maintained at all times during construction to aid heavy vehicles turning into and out from the site on Campbell Street and Hay Street. • Provide warning and guidance signage and detours for pedestrians along the southern side of Campbell Street and the northern side of Hay Street in the vicinity of site vehicle accesses. In conjunction with this, provide pedestrian management while vehicles are entering and leaving the site. • A Construction Traffic Management Plan (CTMP) would be prepared prior to the commencement of construction works and incorporated into the construction programme. The CTMP would be prepared in consultation with relevant stakeholders and as part of the Construction Environmental Management Plan (CEMP). • The CTMP sub-plan would detail how impacts of the construction activities would be managed or minimised. It would be consistent with EnergyAustralia's environmental policy, specifications and procedures to ensure compliance with any specific conditions of approval, licence conditions, and any other permits and approvals.

Key Issue	Commitment
Traffic & access	• A detailed CTMP would be developed and incorporated into the construction programme for the proposed Project. The CTMP would include detailed consideration of the following issues: - identification of designated heavy vehicle routes including the likely number of heavy vehicle movements during the construction period; - identification of other vehicle access routes, signage and site access arrangements; - measures to ensure that road network performance would not be affected; - spoil movement would occur, where practicable, outside background peak traffic periods in order to minimise traffic conflicts; - measures to address queuing and heavy vehicle site access, including the management and control of construction vehicles to ensure that the impact on traffic flows along adjacent streets is minimised; - during construction activities, general public access would be maintained to surrounding land uses including nearby retail, commercial and residential areas. All sites would maintain either existing access or provide suitable alternative temporary access; - all loading and unloading associated with the construction would occur within the site where possible, or within designated construction zones. If required, an approved construction zone(s) for activities that cannot be accommodated within the site (eg. special loading and unloading during construction or the approved use of cranes in the street) would be established. This would be subject to a separate application and approval by Council / RTA; - the site would be suitably fenced including the accesses, which would be secured against unauthorised entry; and - measures to protect pedestrians, cyclists and other motorists in the vicinity of the construction sites. • The CTMP would cover any road and site access civil works, warning and guidance signage, linemarking and management of traffic generating activities. The following assumptions would be incorporated into the Traffic Management Plan: - all proposed traffic control measures would be installed and removed in accordance with standard procedures outlined in RTA's "Traffic Control at Work Sites" manual and specified in "AS 1742.3: 2002, Traffic Control Devices for Works on Roads"; - in addition to relevant Australian Standards and RTA guidelines, all traffic management would also conform to Workcover NSW "Code of Practice for Working Near Traffic and Mobile Plant"; - barriers approved by the RTA and/or City of Sydney Council would be provided between the construction sites and trafficable areas. Pedestrian and cycle diversions would be required during the works; - when working on RTA and/or Council controlled roads, obtaining approval from RTA and/or Council before commencing work; - site access points would be covered in the CTMP, particularly with respect to the interaction and conflict between construction vehicles and pedestrians / cyclists at site accesses; and - road dilapidation reports would be prepared, prior to commencement of construction and after construction is complete, for all local roads nominated in the CTMP and likely to be used by construction traffic. Road and footpath damage that may be attributable to construction traffic would be reinstated to a standard at least equivalent to that existing prior to the damage. • Provision would be made within the CTMP for adequate parking of construction and project staff vehicles so that surrounding on-street parking is not adversely affected. • Contractors would be required to monitor and report any road dilapidation, and to maintain roads to the standards required to provide a satisfactory motoring and cycling surface.

Key Issue	Commitment
Noise & vibration	• Where possible, plant would be located and orientated to direct noise away from sensitive receivers. • Works would be carried out within standard construction hours, except as permitted by conditions of consent. • The noisiest construction activities should take place before 10:00 pm wherever feasible and where approved, and endeavour to undertake as much preparation work as feasible in the day-time hours. • Deliveries would be carried out within standard construction hours, except as permitted by conditions of consent. • Plant and equipment would be selected to minimise noise emission, in-so-far-as possible whilst maintaining efficiency of function. Residential-grade silencers would be fitted and all noise control equipment would be maintained in good order. • Works would be carried out within specified Rock Breaking Hours. • Works must be completed using non-percussive piles. If percussive piles are proposed to be used, approval of the Environmental Management Representative or Director General of the Department of Planning must be obtained following consultation with the DECC. • Non-tonal reversing beepers must be fitted and used on all construction vehicles and mobile plant used for any out of hours work. • Mobile plant and trucks operating on site for a significant portion of the project would have reversing alarm noise emissions minimised in-so-far-as possible, recognising the need to maintain occupational safety. • General safe working distances for rock breaking and vibratory compaction are described in Table 10.7. Where required monitoring would be carried out to confirm these buffer zones at locations where buildings are closest. • Fixed plant would be provided with noise controls to comply with the NSW Industrial Noise Policy. • PA systems to be used within standard construction hours, except in emergency situations. • Where noise barriers are effective and reasonable, solid hoardings and/or site sheds would be erected on work site boundaries or around critical work areas on the sites. • Noise monitoring would be carried out to determine compliance with airborne construction noise goals; in response to complaints; and to conduct plant noise audits. • General safe working distances for rock breaking and vibratory compaction are described in Table 10.7. Where required monitoring would be carried out to confirm these buffer zones at locations where buildings are closest. • Vibration monitoring would be carried out where vibration intensive activities (eg rockbreaking or vibratory compaction) are required to be carried out within the established buffer zones, or where there is considered to be a risk that levels may exceed the relevant structural damage criteria. • All trucks regularly used for the project (eg spoil trucks) are to have mufflers and any other noise control equipment in good working order. Trucking routes would use main roads where feasible. • Affected pre-schools, schools, universities and any other affected educational and religious institutions must be consulted in relation to noise mitigation measures. • Noise-intensive construction works in the vicinity of affected educational buildings are not to be timetabled during examination periods, unless other arrangements acceptable to the affected institutions are made at no cost to affected institutions. • A programme of community liaison and complaint response would be maintained, including letter-box drops of proposed noisy activities, progress reports, etc. • Site induction training would include a noise awareness component.

Key Issue	Commitment
Noise & vibration	• Attended noise monitoring during relevant periods of construction. To be conducted from receivers near the Belmore Park Substation site at intervals not exceeding 30 actual days worked. • Conduct plant noise audits at intervals not exceeding 60 actual days worked. • Conduct routine vibration monitoring. • Conduct buffer distance vibration testing at the commencement of work with potentially vibration inducing equipment. • Vibration monitoring as required in response to complaints.
European heritage & Aboriginal archaeology	• The Belmore Park Site would be monitored during initial earthworks to determine whether any remains dating to the brickfield period are present. • Monitoring would be conducted by an archaeologist who will be given adequate time to record all relics or features uncovered, and any relics and features uncovered would form part of the interpretation plan for the site. • No further Aboriginal archaeological investigation is required for the Project. • The limited potential for remnant and dispersed Aboriginal artefacts to occur should be considered when excavations associated with the proposed tunnel connections and/or extensions for the proposed project occur. An appropriately trained archaeologist should be available (on call) during excavations to identify Aboriginal Objects and provide advice where necessary. • In the unlikely event that Aboriginal Objects are uncovered by construction or excavation works, it is recommended that the following response strategy be adopted and incorporated into contingency management plans prior to the commencement of works. • Stop all impactive works or actions which may disturb the area of the find or exposed Aboriginal Object (objects may include: stone artefacts, bones, midden shells and hearth remnants). • Contact project archaeologist and organise for inspection of site/material. • Consult with the Department of Conservation and Climate Change, regarding an appropriate course of action. • Consult with the Metropolitan Local Aboriginal Land Council regarding an appropriate course of action. • Carry out any requirements indicated by the DECC and the Metropolitan Local Aboriginal Land Council. • Three copies of Navin Officer's report (Volume 2, Appendix F) should be forwarded to the NSW DECC. • One copy of this report would be forwarded to the Sites Officer of the Metropolitan Local Aboriginal Land Council, PO Box 1103 Strawberry Hills NSW 2012.

Key Issue	Commitment
Spoil & waste management	• Wherever practicable spoil would be reused as part of the Project. • Sites for the disposal of surplus soil would be selected according to the rate of development activity and the volume of material generated elsewhere. • Spoil that is not VENM would be transported to approved landfill sites and/or off-site recycling depots. • Spoil haulage routes identified in Chapter 9 would be used. • Testing of the fill material would have to be undertaken prior to it being acceptable for waste disposal purposes. • As part of the CEMP a Spoil Handling and Management Sub Plan would be prepared which would identify how spoil would be handled, stockpiled, re-used and disposed. It would address the principles of all relevant legislation. • All work associated with contaminated spoil, including the preparation of reports, would be carried out in accordance with DECC guidelines and guidelines prepared by the Australian and New Zealand Environment and Conservation Council and the National Health and Medical Research Council. • As part of the CEMP a detailed Waste Management and Re-use Sub Plan would be prepared. The Sub Plan would be framed using the waste minimisation hierarchy principles of avoid-reduce-reuse-recycle-dispose. The Sub Plan would address the management of wastes during the construction and operation stages respectively. It would be prepared prior to construction and would be consistent with the Waste Avoidance and Resource Recovery Act 2001, and DECC's Environmental Guidelines: Assessment, Classification of Liquid and Non- Liquid Wastes. It would: - identify requirements for waste avoidance; reduction; re-use; and recycling. - provide details of requirements for handling; stockpiling; disposal of wastes (specifically, contaminated soil or water, concrete, demolition material, cleared vegetation, oils, grease, lubricants, sanitary wastes, timber, glass, metal, etc.). - identifying any site for final disposal of any material and any remedial works required at the disposal site before acceptance of the material. - Any waste material that is unable to be recycled would be disposed at a landfill licenced by DECC to receive that type of waste. • As part of the Sub Plan, an Action Plan would be prepared to promote the use of recycled materials, including construction and landscape materials. The Plan would detail how the proposal gives consideration and support to the NSW Government's Waste Reduction and Purchasing Policy. The Plan would also include details on measures to implement energy conservation best practice.
Hazards & risks	• The risks and hazards can be managed through the development of construction phase risk management planning and operation phase risk management planning. • EnergyAustralia would identify the services potentially affected by construction activities to determine requirements for diversion, protection and/or support. EnergyAustralia would ensure that existing cathodic protection systems are not adversely affected and that appropriate measures are put in place to minimise stray currents. • EnergyAustralia's contractor would prepare and implement a Construction Safety Sub Plan to manage hazardous incidents and public safety during the construction of the project.

Key Issue	Commitment
Property, land use and settlement	• Foundations of the Sydney Central building should be checked prior to excavation as they may require underpinning if they are not founded on sound, medium or high strength sandstone. • The use of excavator mounted saws or milling heads can overcome overbreak problems. However, the development of unstable wedges along the lines of excavation sometimes can occur unless appropriate precautions are taken to identify their likely occurrence and to allow for pinning, bolting or anchoring, where necessary, to secure the blocks ahead of the bulk excavation work. • Regular inspections of the excavation works by an experienced engineering geologist/ geotechnical engineer are suggested as a means of greatly reducing the risk of overbreak and other problems resulting from the bulk excavation works. • A dilapidation survey of any structure that could be affected is recommended. • It would be necessary to provide temporary support to the sides of excavation during construction, as well as long term support in the form of retaining walls. • Wherever practical, impacts on potentially affected properties would be avoided or reduced by design measures; • Settlement monitoring would be undertaken during the construction phase. • Vibration monitoring would be required whilst excavation work proceeds, and we would recommend a minimum of four (4) monitoring stations located in nearby buildings and structures. The need for additional vibration monitoring stations is anticipated in the nearby Railcorp railway tunnels. • It is proposed to undertake an extensive dilapidation survey of all adjacent footpaths and roadways which could be affected by stress relief rock movements. The initial survey would be undertaken prior to commencement of construction, a follow-up survey on completion of excavation, and a final survey at the completion of construction.
Surface & groundwater aanagement	• A Soil and Water Management Sub Plan would be prepared as part of the CEMP for the Project. This would detail how soil and surface water and groundwater mitigation measures would be implemented at the various construction stages. • The Sub Plan would be prepared in accordance with the Department of Housing's guideline Managing Urban Stormwater - Soils and Construction. • The plan would be developed in consultation with stakeholders to ensure the appropriate mitigating measures and safeguards are incorporated and would be updated as the Project progresses. • The Plan would include identification of any proposed use of existing drainage infrastructure and the means of minimising any adverse impacts, including capacity limitations within the drainage system.

Key Issue	Commitment
Greenhouse gas & air quality	As part of the CEMP a Construction Air Quality Management Sub Plan would be prepared. The Site is currently covered by bitumen and includes a number of Plane trees around the perimeter. The following mitigation measures should be observed during site clearance and construction, in order to minimise impacts as much as possible: **Site clearance** • Waste or materials for recycling should be removed from site as soon as possible. If stored, techniques to avoid emissions should be employed. • Avoid explosive blasting where possible and consider using appropriate hand or mechanical alternatives. • Bag and remove any biological debris or damp down before demolition. **Construction** • Access to construction sites would be via existing sealed roadways and the surface of trafficked areas within sites shall be sealed with bitumen or gravel. • Wheels of all site plant and vehicles would be cleaned so that material with potential to generate dust is not spread on surrounding roads. • Sealed roads around construction sites would be swept to remove deposited material with potential to generate dust, if necessary. • Water shall be used to suppress particles potentially generated during the erection of boundary fences, barriers, screens and other ancillary structures. • Areas of disturbed soils would be minimised during the construction period. • Water may be used to suppress dust emissions during dry windy periods (as required). • The height from which dust generating material is dropped would be minimised. • Loaded trucks carrying spoil shall be covered at all times. • The cutting/grinding of materials on site shall be kept to a minimum, but if necessary equipment and techniques to minimise dust would be used. • Earthworks would be kept damp, as required, especially during dry weather. • The tunnelling excavation face would be kept damp, as required, to minimise dust generation. • Spoil stockpiles would be damped as necessary. • Longer term spoil stockpiles would be treated with surface binding agents or sealed by seeding with vegetation or covered with secured tarpaulins. • Potentially dusty materials would be handled as little as possible. • Exhaust emissions would not discharge straight at the ground. • Construction plant and vehicles would be well maintained and regularly serviced. Visible smoke from plant should be avoided. Defective plant would not be used. • Engines would be switched off when vehicles are not in use and refuelling areas would be away from areas of public access. • Loading and unloading would take place within the site. • All waste would be removed from site and disposed to an appropriately licenced waste facility.
Cunulative Impacts	EnergyAustralia would endeavor to ensure that cumulative impacts can be avoided through coordination and consultation with other projects and communication with other authorities.

Table 16.2 Draft Statement of Commitments - Operational Phase

Key Issue	Commitment
Noise & vibration	• The predicted noise meets the criterion at 317-321 Castlereagh Street, and are well within the criteria at all other locations. However, the predicted noise levels do not include any contribution from the L14 Plant Room. It would therefore be necessary to reduce fan noise levels by typically 3 dBA to ensure that the combined transformer plus fan plus Level 14 Plant Room does not exceed the 50 dBA night-time criterion. • To reduce noise levels from the four operational fans above the transformers to the receivers located at 317-321 Castlereagh Street, the following noise mitigation options are recommended: - Use low noise fans for the radiator cooling. The fans are to have a maximum sound power level (SWL) of 80 dBA. Alternatively, the proposed fans could be used with a speed controller to limit the night-time noise levels to 80 dBA; or - Provide acoustic absorption to the fan room ceiling. The absorption is required to have a noise reduction co-efficient of 0.6 and cover 60 percent of the ceiling area; or - Provide standard 300 mm deep acoustic louvres to the eastern plant room wall penetrations. • In order to ensure compliance with the criteria, the contribution by the mechanical plant should be set at nominally 3 dBA to 5 dBA below the design criteria. This would ensure that the combined noise from the plant room, carpark fans and the ground level transformer room and associated radiator room would comply. • Given that the details of the diesel generator are yet to be refined, the maximum radiated sound power level (SWL) has been determined to enable compliance with the criterion based on the DECC guidelines. The maximum radiated A-weighted SWL for the generator is specified to be 82 dBA (re 10 12 dBW). • The five transformers are located at the building ground level, on the same elevated (with respect to the building foundation excavation) concrete slab at the adjacent office space in the building. The following control measures are recommended to minimise for vibration transmitted into the elevated supporting concrete structure: - Double neoprene pad isolators shall be formed by two layers (nominally 6 mm to 8 mm) ribbed or waffled neoprene, separated by a stainless steel or aluminium plate. The layers shall be permanently adhered together; - The pads shall be 40 to 50 durometer. The pads shall be sized so that they are loaded within the manufacturer's range; and - A steel top plate equal to the size of the pad shall be provided in order to transfer the weight of the supported structure to the pads.
Hazards & Risks	• EnergyAustralia would prepare and implement an Operation Emergency Sub Plan to manage emergency events that may arise in relation to operation of the project. • EnergyAustralia would prepare and implement an Operation Security and Crime Management Strategy to prevent unauthorised public ingress or access to relevant components of the proposal during its operation, and to minimise the potential for crime in the vicinity of cable infrastructure (e.g. vandalism, loitering, illegal dumping etc). The Strategy would be generally in accordance with the principles outlined in the former Department of Urban Affairs and Planning publication entitled "Crime Prevention and the Assessment of Development Applications" dated 2001.

Key Issue	Commitment
Surface & Groundwater Management	• Water treatment of groundwater would comply with the Australian and New Zealand Environment and Conservation Council (2000) guidelines before discharge into Cockle Bay.
Greenhouse Gas & Air Quality	• Any measures to reduce fuel use or improve energy efficiency would reduce emissions of greenhouse gases due to combustion. • Options for mitigating SF6 gas from the Belmore Park Zone Substation that are within EnergyAustralia's control are focussed on best practice monitoring of leakage during operation, maintenance and end of life dismantling procedures. • Methods for improving leak detection monitoring and handling of SF6 gas during operations and maintenance would also minimise emissions. • The management of the end of life gas insulated equipment should follow industry best practice guidelines. • The electricity distribution network industry via the peak body, Energy Networks Association, is currently developing a Guideline on the Management of SF6. The guidelines would assist the industry to reduce emissions of SF6, by ensuring that all aspects of SF6 management are addressed in a consistent manner by individual utilities such as EnergyAustralia.

16.3 Implementation

Environmental Management Plans (EMP) would be prepared by EnergyAustralia and the selected contractor(s) to manage the construction and operational impacts of the Project. The following EMPs would be prepared:

Construction EMP (CEMP) — the CEMP would detail the environmental protection practices, resources and sequence of activities required to be implemented prior to and during construction of the Project to comply with relevant environmental legislation; conditions of applicable licences, approvals and permits; and the Environmental Management Systems Guidelines (NSW Government 1998). The plan would be endorsed by the project Environmental Management Representative (EMR) prior to approval by the Director-General of the Department of Planning.

Operational EMP (OEMP) — this OEMP would coordinate ongoing monitoring and maintenance requirements for the operational phase of the proposed development. The plan would be prepared and implemented by the operator of the Project, and would include details of statutory and other obligations that the operator would be required to fulfil during operations (including requirements for maintenance, monitoring, auditing and reporting).

16.3.1 Non-compliance and corrective action

Where non compliance with the relevant criteria is identified, the contractor would plan and carry out corrective action with an appropriately qualified and experienced consultant, familiar in the assessment and management of the area of non compliance.

The corrective action may involve supplementary monitoring in order to identify the source of the non-conformance and/or may involve modification of the construction techniques or programme to avoid any recurrence or minimise its adverse effects.

16.3.2 Stakeholder relations

EnergyAustrlia has well developed processes for providing information to the community and other stakeholders during the construction of the Belmore Park Zone Substation to minimise disruption to the community and to ensure people are well informed about the works programme.

These communications will be designed to provide:

- notificaiton of upcoming construciton activities to residences and businesses who may be affected by the works;
- information about how stakeholders can provide feedback about construciton issues;
- updates on the progress of the project and any issues of interest to the community; and
- processes to communicate with stakeholders about key construciton activities and any incidents that occur during works.

16.3.3 Reporting

All monitoring should be reported and incorporated into the contractor's monthly and six-monthly reports to EnergyAustralia. These reports would include the following:

- monitoring locations;
- tabulation of measurement results together with notes identifying the principal emission sources;
- summary of measu rements exceeding the criteria levels, and descriptions of the plant or operations causing these exceedances (if applicable); and
- details of corrective action applicable to criteria exceedances (if applicable), and confirmation of its successful implementation. Where corrective action has not yet been implemented, it may be shown as pending, and the status of its implementation shall be carried forward to following reports.

The results of supplementary monitoring will be reported in full if this monitoring is carried out in response to complaints or exceedances. When supplementary monitoring is carried out to refine techniques, full reporting is not required. The monthly reports should also include the number and nature of any noise or vibration complaints.

17 Conclusion

The Belmore Park Zone Substation Project represents the first component of EnergyAustralia's Sydney CityGrid Project, an integrated replacement strategy to reconstruct or refurbish its existing electricity distribution infrastructure, while maintaining sufficient spare capacity to ensure an ongoing and reliable electricity supply.

EnergyAustralia's area planning identified the need for the new Belmore Park Zone Substation to meet "n-2" licence requirements by 2014.

The integrated development option was chosen as the preferred option for the Project. The preferred option achieves the following outcomes:

- maximises the use of the site;
- creates an exciting development opportunity which revitalises the southern CBD;
- has potential to generate significant employment potential during construction and when the building is fully operational; and
- proposes a commercial development which achieves design excellence and achieve a 4.5 star ABRR and a 5+ star Green Star rating

The environmental assessment of key issues and other general aspects identified numerous mitigation measures and safeguards to minimise potential environmental impacts. These mitigation measures and safeguards would be implemented during Project implementation.

It is concluded that the Project be granted project approval subject to the mitigation measures and safeguards identified in this Project Approval EAR.

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