EnergyAustralia®
We're on it

Sydney CityGrid Project

ENVIRONMENTAL ASSESSMENT FOR STAGE 2A(I) OF THE CITY EAST ZONE SUBSTATION

JULY 2010

Document Control and Approval

EnergyAustralia

Endorsed by: Craig Moody

Title: Executive Manager – Project Development and Approvals

Signed:

Date: 9.7.10.

Endorsed by: Gareth Evans

Title: A/Director – Area Development - CBD and Sydney East

Signed:

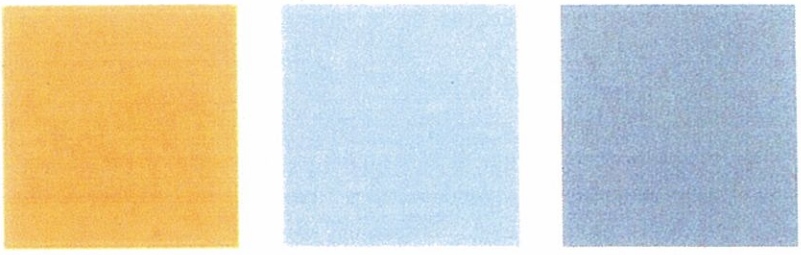
Date: 8/07/10

GHD Pty Ltd

Author: Peter Carson

Signed:

Date: 23 June 2010



Contents

Table Index

Figure Index

Appendices

Certification of the environmental assessment

Submission of Environmental Assessment

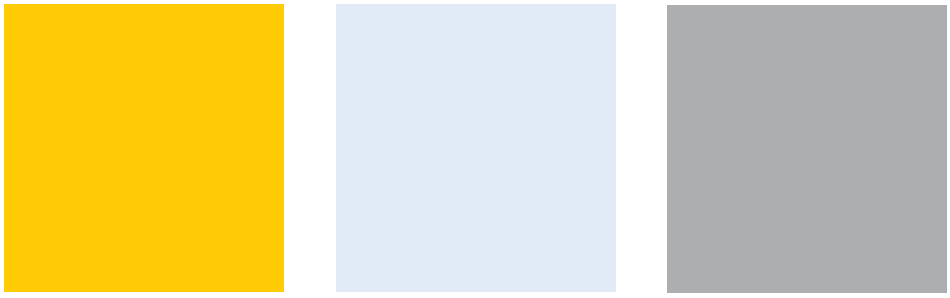
Prepared under Part 3A of the Environmental Planning and Assessment Act 1979

Environmental assessment prepared by:	
Name	Peter Carson
Qualifications	BSc Hons
Address	GHD Pty Ltd Level 15, 133 Castlereagh Street Sydney NSW 2000
In respect of:	Sydney CityGrid Project - City East Zone Substation Stage 2A(i)
Project to which Part 3A applies	
Applicant name	EnergyAustralia
Applicant address	570 George Street Sydney NSW 2000
Land to be developed	As described within the Environmental Assessment
Proposed development	Demolition works, bulk excavation, stub tunnel excavation and construction of the bridging structure of Stage 1 CBD Metro.
Environmental assessment	An environmental assessment is attached that addresses all matters in accordance with Part 3A of the Act
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	Peter Carson
Date	23 June 2010

Glossary and abbreviations

Term	Definition
AHIMS	Aboriginal Heritage Information Management System
Alluvium	Sediment deposited by flowing water, as in a riverbed, flood plain, or delta.
ANZECC	Australian and New Zealand Environment and Conservation Council
ARMCANZ	Agricultural and Resource Management Council of Australia and New Zealand
AS	Australian Standard
Assessment Report	The Assessment Report prepared by the Department of Planning under Part 3A of the EP&A Act, and submitted to the Minister for Planning for decision and conditions of consent.
Belmore Park Zone Substation	Belmore Park Zone Substation Project – an element of the Sydney CityGrid Project.
BS	British Standard
CBD	Central Business District
CECT	City East Cable Tunnel
CEMP	Construction Environmental Management Plan
City East Zone Substation	City East Zone Substation – an element of the Sydney CityGrid Project
CO	Carbon monoxide
CoS	City of Sydney
CSDCP 1996	Central Sydney Development Control Plan 1996
CTMP	Construction Traffic Management Plan
DCP	Development Control Plan
dB(A)	Db means decibel which is a unit for measuring sound. If an "A weighting filter" is used to measure sound the sound level is given in units of dB(A).
DECC	Department of Environment and Climate Change
DECCW	Department of Environment, Climate Change and Water
DIPNR	Department of Infrastructure, Planning and Natural Resources
Dykes	Dykes are geological fault zones, which vary in width from tens of centimetres to several metres, and consist of near vertical rock intrusions. Dykes generally have a significant effect on foundation bearing pressures and, particularly in tunnels, jointed margins may be a source of groundwater inflow.
EMR	Environmental Management Representative
Environmental Assessment	Generally, this term means the process of examining the environmental benefits and consequences of projects in advance of decision making. The term has a specific meaning under the Environmental Planning & Assessment Act 1979 being the form of an environmental assessment required under Part 3A of this Act.

Term	Definition
EP&A Act	NSW Environmental Planning and Assessment Act 1979
EPBC Act	Environment Protection and Biodiversity Conservation Act 1999 (Commonwealth)
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.
Feeder	Three individual electrical transmission cables (phases) bundled together.
FSA	Floor Space Area
FSR	Floor Space Ratio
HDCP 2006	City of Sydney Heritage Development Control Plan 2006
Hz	Hertz (one hertz is defined as one cycle per second)
INP	Industrial Noise Policy
ISEPP	State Environmental Planning Policy (Infrastructure) 2007
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.
L_{A90}	The sound level that exceeds 90% of the sampling period.
L_{Aeq}	Equivalent Continuous Sound Level: The notional sound pressure level which, if maintained constant over a given time, delivers the same amount of acoustic energy at some point as the time-varying sound pressure level would deliver at the same point and over the same period of time.
$L_{A\ (max)}$	The highest measured noise level during the period of measurement.
LEP	Local Environmental Plan
Licence conditions	Design, Reliability and Performance Licence Conditions for Distribution Network Service Providers (1 December 2007 – NSW Minister for Energy)
MCoA	Minister's Conditions of Approval
mg	milligrams
Muffler	A device to suppress noise emissions from noisy equipment or machinery.
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 outages of two lines or two items of electrical apparatus within a substation).



Term	Definition
NES	Matters of National Environmental Significance
NO_X	Nitrogen oxides
OHS	Occupational health and safety
Paleovalley	An ancient rock valley that has been filled with sediments
PBC	Polycyclic biphenols
PM_{10}	Particles less than 10 microns in size
$PM_{2.5}$	Particles less than 2.5 microns in size
POEO	Protection of the Environment Operations Act 1997
pphm	Parts per hundred million
PPV	Peak Particle Velocity
Project	Stage 2A(i) of the City East Zone Substation
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.
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.
REP	Regional Environmental Plan
RBL	Rating Background Noise Level
RL	Relative Level
Roadheader machine	Mechanical excavating machine that has a large rotating cutting head mounted on a moveable boom. They are able to turn tight corners during tunnel construction.
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.
SEPP	State Environmental Planning Policy
SEPP 55	State Environmental Planning Policy 55 – Remediation of Land
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.
SLEP 2005	Sydney Local Environmental Plan 2005

Term	Definition
SMF	Synthetic mineral fibres
SO_2	Sulfur dioxide
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.
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. A STSS is generally the first stage of a BSP.
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	Sound Power Level
Sydney Water	Sydney Water Corporation
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.
Transformer	An item of electrical equipment that generally transforms a higher voltage to a lower voltage.
TSP	Total suspended particles
ug/m^3	Micrograms per cubic metre
VDV	Vibration Dose Value
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 Sydney CityGrid Project is an integrated program of works to upgrade critical electricity infrastructure in Sydney's central business district (CBD). It has been developed by EnergyAustralia to augment and replace infrastructure which is due for retirement in the Sydney CBD and the inner metropolitan area in order to comply with licensing requirements. The requirements specify that all city zone substations and transmission feeders must achieve a 'n-2' capacity which means that they must be able to supply the full electricity demand with any two transformers or feeders out of service.

The Sydney CityGrid Project is based on a holistic approach to network planning that takes into account relevant planning criteria, asset replacement requirements, network reliability standards and anticipated longer term network needs. It seeks to meet network needs in a cost effective manner and facilitate prudent longer term network investment decisions. The project is comprised of a number of discrete but interrelated components, one of which involves construction and operation of a new City East Zone Substation.

The Minister for Planning granted Concept Approval for the Sydney CityGrid Project under Part 3A of the *Environmental Planning and Assessment Act 1979* (EP&A Act) on 20 September 2009. EnergyAustralia is seeking Project Approval for the City East Zone Substation under Part 3A of the EP&A Act in the following stages:

- Stage 2A(i) – involves demolition of the existing building on the site (Kindersley House), and subsurface construction works. This includes a building envelope for the subsequent development at the site; and
- Stage 2A(ii) – involves construction and operation of the City East Zone Substation and the associated commercial tower located above the substation. This involves detailed consideration of the built form of the development at the site and is intended to refine the building envelope presented in Stage 2A(i).

It is estimated that developing the City East Zone Substation in these two stages would reduce the overall construction timeframe by approximately 9 – 12 months.

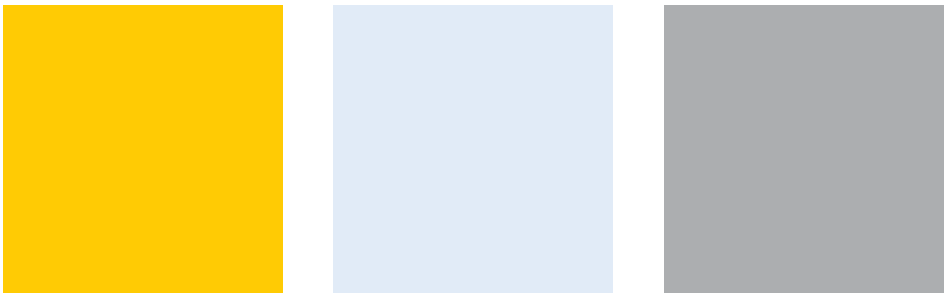
This Environmental Assessment has been prepared as part of an application for Project Approval for Stage 2A(i) of the City East Zone Substation. It addresses the environmental assessment requirements for Stage 2 of the Sydney CityGrid Project which are detailed in Minister's Condition of Approval (MCoA) 3 of the Concept Approval.

This Environmental Assessment has been prepared by GHD Pty Ltd on behalf of EnergyAustralia.

Stage 2A(i) of the City East Zone Substation

Stage 2A(i) of the City East Zone Substation involves the following works:

- Site preparation;
- Demolition of Kindersley House which is the site for the substation. This site occupies 33-35 Bligh Street, and 20-22 and 24-26 O'Connell Street, Sydney, and is subsequently referred to as 33 Bligh Street;
- Bulk excavation for the substation basement;
- Excavation and construction of a shaft and a 150 m section of stub tunnel beneath Bligh Street to the intersection of Bent Street and Bligh Street. The stub tunnel will interface with the City East Cable Tunnel Project which is subject to a separate Environmental Assessment; and
- Construction of a bridging structure over the alignment of the tunnels for the CBD Metro Stage 1, if required.



The primary objective of Stage 2A(i) is to obtain approval to demolish the existing building and undertake subsurface works to facilitate construction of the City East Zone Substation. The secondary objective of Stage 2A(i) is to obtain approval for a building envelope for the subsequent development of the site that would include a substation and a commercial tower above the substation (including proposed stratum subdivision).

Approval to construct and operate the substation and associated commercial tower would be sought as part of a separate Project Application, referred to as Stage 2A(ii). This would involve detailed consideration of the built form of the development and the outcomes of a design review process required by MCoA 3.2 of the Concept Approval would refine the building envelope presented in Stage 2A(i).

Need for the City East Zone Substation

The City East Zone Substation is needed as all stages of the Sydney CityGrid Project are integrated and interdependent. Failure to construct the City East Zone Substation would compromise the ability to achieve the objectives of the overall project. This is reflected in the Concept Approval which specifically permits construction and operation of the new City East Zone Substation in the vicinity of Phillip, Bligh, Bent and O'Connell Streets, Sydney.

Stakeholder issues

EnergyAustralia has consulted with key stakeholders throughout development of the Sydney CityGrid Project and also during development of the design for Stage 2A(i) of the City East Zone Substation. The main issues raised relating to Stage 2A(i) include:

- Noise and vibration during demolition and excavation;
- Impacts on traffic and pedestrian access;
- Impacts on archaeology and built heritage;
- Spoil and waste management;
- The built form of the building envelope for the substation and commercial tower and associated impacts on the surrounding urban environment; and
- Impacts on the existing and future assets, in particular the tunnels for the CBD Metro Stage 1 and the Metro Pitt rail corridor.

A comprehensive stakeholder engagement program has commenced for the Sydney CityGrid Project and will continue throughout planning and construction phases of the discrete projects. Specific consultation activities were undertaken during preparation of this Environmental Assessment for Stage 2A(i) to target the key stakeholders relevant to these works.

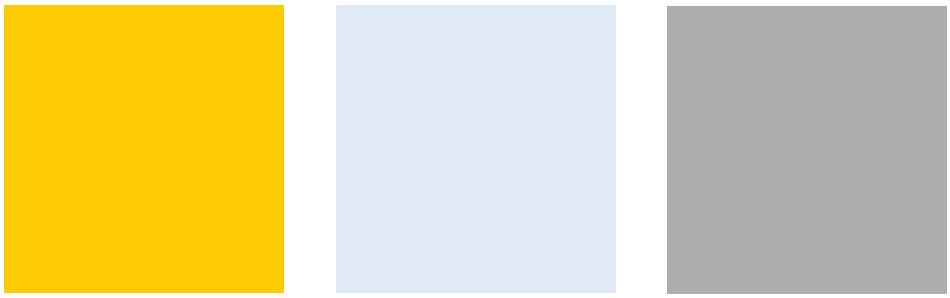
Summary of potential impacts

Noise and vibration

Construction of Stage 2A(i) of the City East Zone Substation would generate noise and vibration associated with the use of a range of plant and machinery, such as rock breakers and a road header, that has the potential to impact on the amenity of the surrounding area. The nearest sensitive receivers are adjacent commercial buildings, and the Radisson Hotel (O'Connell Street) and Wentworth Hotel (Bligh Street).

Noise and vibration associated with tunnelling construction activities under Bligh Street is likely to comply with established noise goals at residences. Works at or above the ground surface would be undertaken between the hours of 7 am – 7 pm Monday to Friday and 7 am – 5 pm on Saturdays.

Daytime excavation noise is predicted to occasionally exceed noise management goals at adjacent commercial properties for excavation activities. The exceedance is primarily due to the use of heavy rock breakers. Accordingly, all reasonable and feasible mitigation measures would be implemented to aim to achieve construction noise goals.



The predicted noise levels for demolition and general construction works comply with the evening and extended Saturday construction noise criterion. Therefore the extended operating hours proposed by EnergyAustralia are appropriate for demolition and general construction works.

Vibration associated with excavation activities is predicted to exceed established human comfort criteria unless mitigation measures are implemented. Vibration monitoring would be conducted at an early stage during excavation to determine the magnitude of vibration levels. Should levels above the established vibration goals be indicated, additional mitigation measures should be implemented. If exceedances are unavoidable on specific occasions, affected landholders should be kept informed of the nature and duration of any identified noise or vibration impact.

Non-indigenous heritage and archaeology

Construction of existing buildings and basements at the site involved excavation to about 4 m below the level of O'Connell Street and 6 m below Bligh Street. This excavation is considered likely to have removed all items of potential archaeological interest with the possible exception of the bases of wells if they were deeper than 4 m in this area. All other structural remains and features relating to the nineteenth century land use of the property would have been removed by previous construction at the site. Based on this assessment, excavation of the basement and construction of the stub tunnel and bridging structure is unlikely to impact on any items of archaeological significance.

The construction compound would encroach on Richard Johnson Square which commemorates the first Christian Worship Service held in the Colony of NSW and the erection of the first Church in 1793 by the colony's first Chaplain, Rev. Richard Johnson. Construction is unlikely to impact on the heritage significance of Richard Johnson Square as the compound would not extend to the monuments or involve excavations below the pavement.

Excavation of the stub tunnel from 33 Bligh Street to the intersection with Bent Street would be carried out by road header at a depth of about 42 m below the ground surface. It would not involve any surface excavation along Bligh Street and therefore would not have any impact on archaeological remains.

There are a number of items of built heritage significance in the vicinity of the site, including the former NSW Club House and Bank of NSW which are adjacent to the site. The building envelope has been developed to reinforce the scale and character of the surrounding urban context and minimise potential impacts on the heritage significance of these items. Further consideration would be given to potential impacts on built heritage during development of the design for Stage 2A(ii) of the City East Zone Substation.

Indigenous heritage

Construction of the existing Kindersley House involved excavation into bedrock and removed the pre-European soil profile and it is highly unlikely that any items of potential significance to Aboriginal communities remain within the site. As such, construction of the project is unlikely to impact on items of potential significance to Aboriginal communities.

Spoil and waste management

It is estimated that 29,300 m^3 of various materials would be generated during demolition of Kindersley House and would require management through reuse/recycling or disposal. This would include wood, metal, drywall, metals, concrete and plastic.

Demolition waste would include small quantities of synthetic mineral fibres (SMF) from some internal walls that would be bagged or wrapped in plastic and handled in accordance with Worksafe Australia's *Synthetic Mineral Fibres – National Standard* and *National Code of Practice.* Demolition waste would contain some structures with lead paint and also fluorescent light fittings containing polycyclic biphenols. All waste materials would be managed in accordance with the DECC (April 2008) *Waste Classification Guidelines.*

Excavation of the substation basement and stub tunnel would generate approximately 48,857 m^3 of insitu material that is primarily sandstone. It is likely that the majority of spoil would be virgin excavated natural material (VENM) comprising Class IV, III and II sandstone. VENM is clean, natural material that is uncontaminated with other waste materials or manufactured chemicals.

Backfill behind existing building walls comprises bricks, sand or sandstone. Backfill material at one location contains asbestos sheeting (fibro). This fill would be excavated and disposed to an appropriately classified and licensed landfill.

As part of the CEMP, a spoil and waste management sub plan would be prepared that would identify how spoil and other waste material would be handled, stockpiled, reused and disposed in accordance the DECC's Waste Classification Guideline (2008).

Traffic and access

It is anticipated that the main traffic impacts would occur at Bligh Street and O'Connell Street associated with trucks removing spoil and demolition waste from the site. This is mainly due to the additional volume of construction traffic which would temporarily increase heavy vehicle movements along these roads.

The volume and intensity of truck movements would vary according to the construction stage. It is anticipated that the additional construction traffic due to the project can be adequately accommodated and managed to maintain acceptable levels of service for the broader CBD. The delivery of materials and equipment and removal of spoil would be spread over the construction period and these vehicle movements would be scheduled to minimise impact on the local community.

Temporary changes to traffic conditions would be required to enable vehicular access from both the Bligh and O'Connell Street frontages. This would involve removal of on-street parking and establishment of work zones for construction vehicles to enable material to be loaded and unloaded. Protective gantries would also be established adjacent to the site hoarding to ensure that safe pedestrian access is maintained. A comprehensive construction traffic management plan would be prepared in consultation with the City of Sydney Council as part of the CEMP to ensure that appropriate traffic management devices are implemented to minimise potential impacts.

The main traffic safety issue would relate to increased heavy vehicle movements along the likely haul routes, the interaction between pedestrian traffic and the need for increased safety measures to safeguard the well being of the road users. It is anticipated that the impact of increase number of vehicle movements would be insignificant in terms of road capacity and measures would be implemented to minimise the impact of truck movements on the existing road users.

Air quality

The main potential impacts on air quality are likely to be related to dust generated during demolition, excavation, tunnelling and materials handling. The amount of dust generated would be dependent on the type of construction activity undertaken and the prevailing weather conditions. A range of management measures would be implemented to minimise the risk of dust impacts on the amenity of surrounding areas.

The construction method has been specifically developed to minimise impacts associated with generation of dust and involves installing scaffolding around the building and encapsulating the scaffolding with chainwire and shadecloth. Removal of hazardous materials would be undertaken in accordance with detailed safety plans that would comply with relevant legislation and occupational health and safety requirements.

Excavation of the basement and construction of the bridging structure would generate dust at the working face and during materials handling. As the depth of the excavation would progressively increase during the course of the works, this would help protect the site from prevailing winds and reduce offsite transport of dust.

The tunnel would be constructed with a road header. The tunnel would be fitted with a mechanical ventilation system to filter air and remove dust particles prior to the air being discharged from the tunnel. The filtration system would be designed to limit dust emissions to acceptable levels and meet the requirements of the *Protection of the Environment Operations (Clean Air) Regulation 2002* (as amended). This would ensure clean air is available to workers within the tunnel and minimise the potential for offsite impacts associated with dust.

Provided that the recommended mitigation measures are implemented, it is considered that potential dust emissions would be negligible and have localised impacts that are likely to comply with DECCW's assessment criteria.

Water quality

Potential surface water impacts would be limited to runoff that may transport sediment off-site and enter the stormwater system that ultimately discharges to Sydney Harbour at Circular Quay and Bennelong Point. There is also the potential for vehicles associated with the project to result in sediment being deposited on adjacent roadways and for this sediment to be transported to the stormwater system. Chemical spills on the construction site may also be transported to the surface water and groundwater systems. Surface water impacts are considered to be minor and would be mitigated by implementing management measures that would be detailed in the CEMP.

Potential impacts associated with groundwater would be related to inflows to the tunnel, shaft, and basement excavation. Surface water from rain and runoff would also accumulate in the excavations. This water would be collected, treated, and pumped to the stormwater system.

The design includes a fully lined 150 m section of stub tunnel to limit the volume of groundwater seepage to 300 litres/100 m/day. The results of groundwater monitoring undertaken for a number of tunnelling projects in the CBD indicate that the groundwater is likely to contain relatively high levels of manganese and iron.

Any groundwater intercepted would be treated and discharged to the stormwater system. During Stage 2A(i), the treatment system would be located on-site and designed such that discharged water complies with the requirement of Section 120 of the POEO Act. As groundwater quality is expected to be similar to that at the City North Zone Substation, the treatment system would be similar to those currently operating to treat groundwater at the City North Zone Substation and Campbell Street Substation. These systems discharge water to Sydney Harbour that complies with water quality objectives developed in accordance with guidelines prepared by the Australian and New Zealand Environment and Conservation Council (ANZECC) and Agriculture and Resource Management Council of Australia.

Management of groundwater that seeps into the tunnel during the operational phase will be detailed in the Environmental Assessment for the City East Cable Tunnel. This is likely to involve connecting the City East Zone Substation and stub tunnel to the groundwater treatment system that would be used for the City East Cable Tunnel.

Built form and urban design

The building envelope incorporates an integrated development for the City East Zone Substation and a commercial tower. The substation would be located in the basement and podium levels, while the commercial component would be a tower above the podium. The podium would distinguish between the two components of the integrated development. The substation podium would have a height of approximately 48 m above O'Connell Street and 42 m above Bligh Street.

The commercial tower would have a height of about 128.5 m above Bligh Street and a floor space area of approximately 28,050 m^2 which equates to a floor space ratio of 13.75:1 based on a total site area of 2040 m^2.

The building envelope has been designed to reinforce the scale and character of the surrounding urban context. This includes consideration of potential impacts on the heritage listed buildings in the adjacent

streetscapes. The commercial tower would be approximately 66.5 m lower than the height of the building that has consent to be constructed on the site (under a separate Development Application through the City of Sydney Council).

In addition to the substation, the basement would include 40 car parking spaces over two levels for the use of the commercial tower. Vehicular access to the substation and car park for the commercial tower would be provided from O'Connell Street. A separate vehicle access to the substation is required to restrict access to authorised personnel only. The basements would also contain facilities that are ancillary to the commercial tower, including a loading dock, bicycle racks, waste disposal and courier parking.

Pedestrian access to the commercial tower would be via a foyer with frontage to Bligh Street.

Preliminary discussions have taken place with the City of Sydney during preparation of this Environmental Assessment relating to the massing and outline of the building envelope. Detailed design of the substation and commercial tower would be undertaken as part of Stage 2A(ii) and would involve a design review process in line with the requirements of MCoA 3.2. This process would involve development of the design in consultation with representatives from EnergyAustralia, City of Sydney, and architectural peers. The outcomes of the design review process would be documented in an Environmental Assessment submitted as part of an application for Project Approval for Stage 2A(ii).

Draft Statement of Commitments

The Environmental Assessment provides EnergyAustralia's commitments for environmental mitigation, management and monitoring. The draft Statement of Commitments includes recommended mitigation measures to reduce and avoid identified impacts. The Statement of Commitments will be finalised following exhibition of the Environmental Assessment.

Exhibition of the Environmental Assessment

This Environmental Assessment 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 written submissions on the Environmental Assessment are able to be provided to the Department of Planning. These submissions must be addressed to:

The Director

Major Infrastructure Assessment

Department of Planning

GPO Box 39

SYDNEY NSW 2001

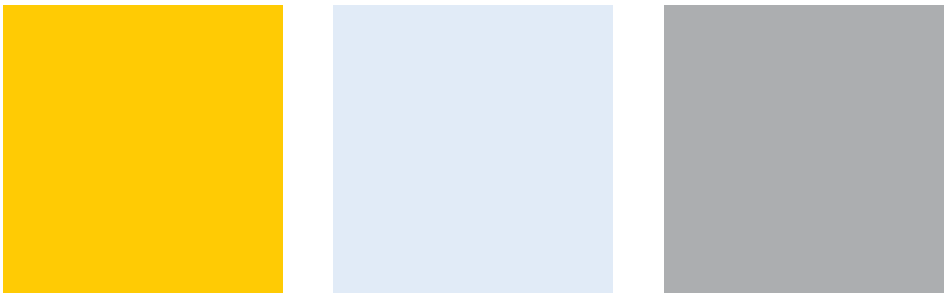
The next steps

EnergyAustralia is seeking approval from the Minister for Planning for the construction of Stage 2A(i) of the City East Zone Substation. The next steps in the process are:

- **Consideration of submissions** that are received by the Director-General of the Department of Planning. EnergyAustralia is then required to prepare and submit:
  - A Submissions Report, which contains responses to issues raised in the submissions, and/or further design development.
  - A Preferred Project Report, outlining any proposed changes to the project to minimise its environmental impacts (if necessary).
  - A revised Statement of Commitments.

- **Determination of the Environmental Assessment.** The Director-General of the Department of Planning provides an assessment report on the Environmental Assessment to the Minister for Planning, who then makes a decision on the project and, if approved, can set Conditions of Approval.

Consultation with the community and stakeholders would continue throughout the construction phase and operational phase of the project.



1. Introduction

The following chapter introduces the Environmental Assessment by providing an overview of the project and its objectives. It also outlines the planning approval process and the approach taken to prepare the Environmental Assessment.

1.1 Background to the project

EnergyAustralia developed the Sydney CityGrid Project as an integrated program of works to upgrade critical electricity infrastructure in Sydney's central business district (CBD). The Sydney CityGrid Project is comprised of a number of discrete but interrelated components, one of which involves construction of a new City East Zone Substation.

Concept Approval for the Sydney CityGrid Project was granted by the Minister for Planning under Part 3A of the *Environmental Planning and Assessment Act 1979* (EP&A Act) on 20 September 2009. The Concept Approval requires further environmental assessment prior to commencement of various stages of the Sydney CityGrid Project, including the City East Zone Substation. As a result, Project Approval is now required to allow construction of the City East Zone Substation to commence.

The City East Zone Substation is an essential component of the overall Sydney CityGrid Project and EnergyAustralia is seeking Project Approval for the substation under Part 3A of the EP&A Act in the following stages:

- Stage 2A(i) – involves demolition of the existing building at the site, 33 Bligh Street (known as Kindersley House), and subsurface construction works. This includes a building envelope for the subsequent development at the site, including proposed stratum subdivision; and
- Stage 2A(ii) – involves construction and operation of the City East Zone Substation and the associated commercial tower located above the substation. This involves detailed consideration of the build form of the development at the site and is intended to refine the building envelope presented in Stage 2A(i).

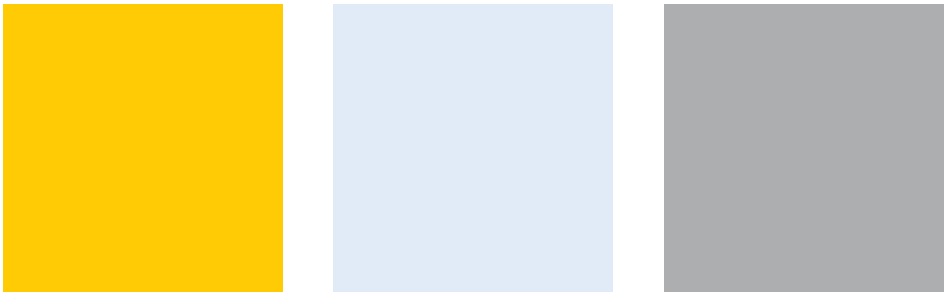
This Environmental Assessment has been prepared as part of an application for Project Approval for Stage 2A(i) of the City East Zone Substation. The Concept Approval includes environmental assessment requirements issued in accordance eith Section 75P(1)(a) that must be addressed by subsequent project applications. This Environmental Assessment addresses those assessment requirements relevant to Stage 2A(i).

1.2 The Sydney CityGrid Project

1.2.1 Overview

During the next decade, EnergyAustralia must replace critical electrical infrastructure within the Sydney CBD that is due for retirement and to comply with new licence requirements for operation of substations and transmission feeders. This licence requirement specifies that all city zone substations and transmission feeders must achieve a 'n-2' capacity which means that 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 construct new infrastructure or refurbish it existing electricity infrastructure, while maintaining sufficient spare capacity to ensure an ongoing and reliable electricity supply. This strategy is referred to as the Sydney CityGrid Project.



The Sydney CityGrid Project would be implemented in the following stages as defined by MCoA 1.3 of the Concept Approval:

- Stage 1 – Belmore Park Substation site
  - Stage 1A – Construction and operation of the Belmore Park Zone Substation and stub tunnel connection from City South Cable Tunnel to Belmore Park Zone Substation;
  - Stage 1B – Commercial/retail development on the corner of Pitt, Campbell and Hay Streets.
- Stage 2 – Remaining works
  - Stage 2A – Construction and operation of the City East Zone Substation in the vicinity of Phillip, Bent, Bligh and O'Connell Streets. *This stage has now been broken down into two discrete components as described in Section 1.1;*
  - Stage 2B – Refurbishment of existing Dalley Street Zone Substation or construction of a new building adjacent to the existing site;
  - Stage 2C – Construction and operation of a sub-transmission switching station (STSS) on a site at the intersection of Riley Street and Albion Street, Surry Hills;
  - Stage 2D – Construction of City East Cable Tunnel between Riley Street STSS and City North Zone Substation with connections to the proposed City East and existing Dalley Street Zone Substations, and a potential services control room adjacent to the Riley Street STSS; and
  - Stage 2E – Extension of the City South Cable Tunnel from Wade Place to Riley Street, Surry Hills.

The indicative location of these components is shown in Figure 1-1.

1.2.2 Objectives of the Sydney CityGrid Project

EnergyAustralia is responsible for one of Australia's largest electricity networks which serves Sydney, the Central Coast and the Hunter region. Between 2008 and 2020, EnergyAustralia is investing about $16 billion in its network to meet increasing electricity demand and further enhance the high levels of supply and reliability. This involves maintaining and replacing existing infrastructure and building additional capacity to support new developments.

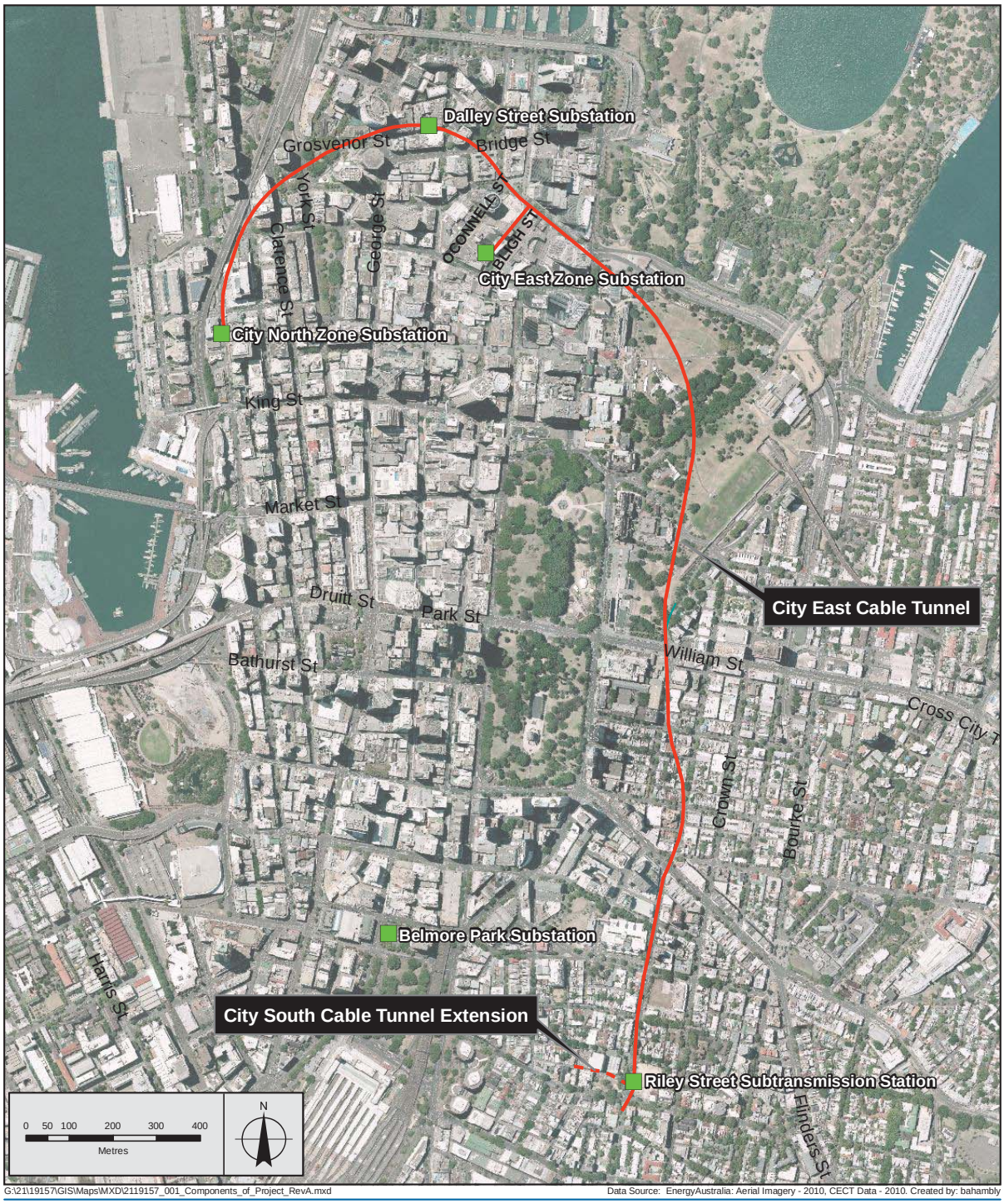
During the next decade, EnergyAustralia must augment and replace infrastructure which is due for retirement in the Sydney CBD and the inner metropolitan area in order to comply with licensing requirements and maintain a safe and reliable supply of electricity to the area. The requirements specify that all CBD substations achieve 'n-2' capacity (Design, Reliability & Performance Licensing Conditions by the Minister for Energy).

EnergyAustralia's strategy to meet the licence requirements in the Sydney CBD is based on a holistic approach to network planning that takes into account relevant planning criteria, asset replacement requirements, network reliability standards and anticipated longer term network needs. It seeks to meet network needs in a cost effective manner and facilitate prudent longer term network investment decisions.

EnergyAustralia, over the next 10 years, needs to construct new, or upgrade and refurbish existing CBD zone substations and replace high voltage cables supplying the substations to:

- Meet 'n-2' licence conditions;
- Cater for future demand and introduce new technologies that are likely to reduce electricity 'losses' by reducing the resistance of the electricity network; and
- Ensure timely replacement of infrastructure which is due for retirement to maintain a reliable supply of electricity for the CBD.

Figure 1-1 Components of the Sydney CityGrid Project



1.2.3 Environmental Assessment of the Sydney CityGrid Project

On 11 February 2008 the Minister for Planning declared the Sydney CityGrid Project to be a project to which Part 3A of the EP&A Act applies. This declaration included:

'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 and 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)

On 9 April 2008, EnergyAustralia submitted to the Department of Planning a Concept Application for the Sydney CityGrid Project and a Project Application for the Belmore Park Zone Substation. The Department of Planning issued environmental assessment requirements in accordance with Section 75P(1) of the EP&A Act.

As required by Part 3A of the EP&A Act, an Environmental Assessment of the Concept Plan was prepared to address the Director-General's environmental assessment requirements. It identified potential impacts and recommended mitigation measures and included a Statement of Commitments that was developed as an integral part of the assessment process in accordance with Part 3A of the EP&A Act. Specific actions identified in the Statement of Commitments focused on issues to be assessed during preparation of subsequent Environmental Assessments as part of applications for Project Approval.

The Concept Environmental Assessment was publicly exhibited between 17 December 2008 and 16 February 2009, during which time the Department of Planning invited public submissions on the Environmental Assessment. Under Section 75(H)6 of the EP&A Act, the Director-General required that EnergyAustralia respond to issues raised in the submissions. EnergyAustralia subsequently submitted a Submissions Response and Preferred Project Report (May 2008) to the Department of Planning.

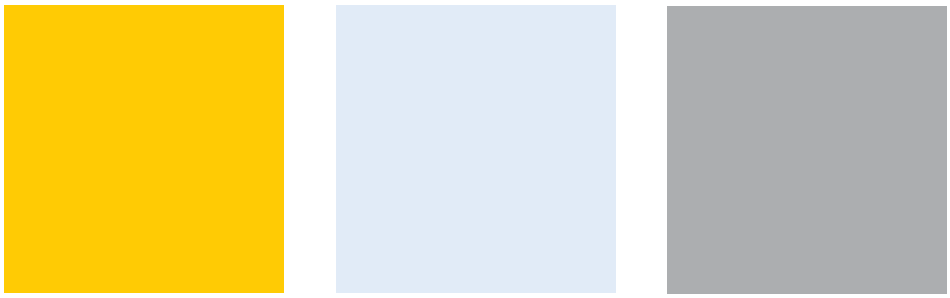
The Minister for Planning granted the following approvals under Part 3A of the EP&A Act for the Sydney CityGrid Project on 20 September 2009:

- Concept Approval for the CityGrid Project; and
- Project Approval for Stage 1 which relates to works at the Belmore Park Zone Substation site.

The Concept Approval defined that additional environmental assessment is required to obtain Project Approval for those components of the project that comprise Stage 2 of the Sydney CityGrid Project.

1.3 Purpose of this Environmental Assessment

The Concept Approval defines Stage 2A of the Sydney CityGrid Project as 'construction and operation of the City East Zone Substation'. Following a number of network supply interruptions in early 2009, EnergyAustralia



committed to completing the Sydney CityGrid Project prior to the system need dates required to meet regulatory licence conditions. The main opportunity identified to reduce the timeframe to deliver the Sydney CityGrid Project involves splitting the development approval and construction of the City East Zone Substation into the following stages:

- **Stage 2A(i)** – Site preparation, demolition of the existing building at 33 Bligh Street Sydney, bulk excavation for the substation basement, excavation and construction of a shaft and a 150 m section of tunnel beneath Bligh Street to the intersection of Bent Street and Bligh Street, and construction of a bridging structure over the alignment of the tunnels for the CBD Metro Stage 1.
- **Stage 2A(ii)** – Construction and operation of the City East Zone Substation and commercial tower.

As detailed in Section 5.2, this approach would allow works to commence on Stage 2A(i) while approval is sought for Stage 2A(ii). This would reduce the duration to deliver the City East Zone Substation by between 9 - 12 months which is a significant consideration given the critical importance of providing a reliable electricity supply to the CBD.

The purpose of this Environmental Assessment is to assess the environmental impacts of Stage 2A(i) of the CityGrid Project in accordance with the requirements of the EP&A Act and the *Environmental Planning and Assessment Regulation 2000.* Pursuant to Section 75P(1)(a) of the EP&A Act, the environmental assessment requirements for the project are defined by Minister's Conditions of Approval (MCoA) 3.1, 3.2 and 3.3 of the Concept Approval. This Environmental Assessment addresses those assessment requirements relevant to Stage 2A(i) of the City East Zone Substation.

1.4 Overview of Stage 2A(i) of the City East Zone Substation Project

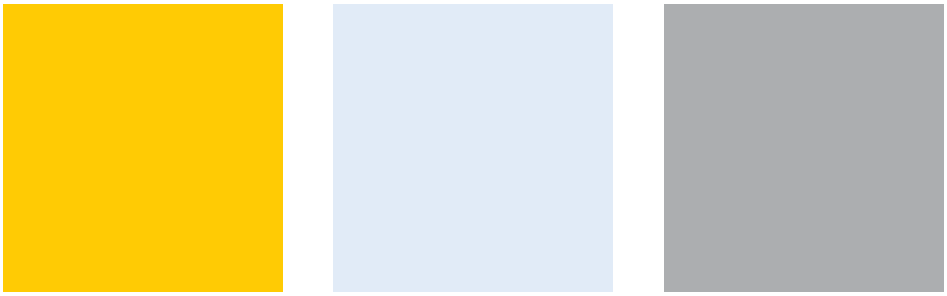
Stage 2A(i) is described in Chapter 6 and involves the following works associated with construction of the City East Zone Substation:

- Site preparation;
- Demolition of the existing building at 33 Bligh Street, Sydney, known as Kindersley House;
- Bulk excavation for the substation basement;
- Excavation and construction of a shaft and a 150 m section of stub tunnel beneath Bligh Street to the intersection of Bent Street and Bligh Street; and
- Construction of a bridging structure over the alignment of the tunnels for the CBD Metro Stage 1, if required.

1.5 Objective of Stage 2A(i) of the City East Zone Substation Project

The primary objective of the Stage 2A(i) works is to initiate the redevelopment of 33 Bligh Street to facilitate construction of the City East Zone Substation. Demolition of the existing building, excavation activities and construction of the CBD Metro Stage 1 bridging structure, if required, would support the implementation of, and bring forward the completion date for, Stage 2A(ii).

The secondary objective of Stage 2A(i) is to obtain approval for a building envelope and proposed stratum subdivision for the City East Zone Substation and commercial tower above the substation. Approval to construct and operate the substation and commercial tower would be sought as part of a separate Project Application, referred to as Stage 2A(ii). This would involve detailed consideration of the built form and would refine the building envelope presented in Stage 2A(i) (refer to Section 6.3).



1.6 Approvals process

Concept Approval has been obtained for the Sydney CityGrid Project and Project Approval is now required for the City East Zone Substation. This Environmental Assessment has been prepared as part of an application for Project Approval and will be publicly exhibited for a period of at least 30 days, during which time submissions are invited to be submitted to the Director-General of the Department of Planning.

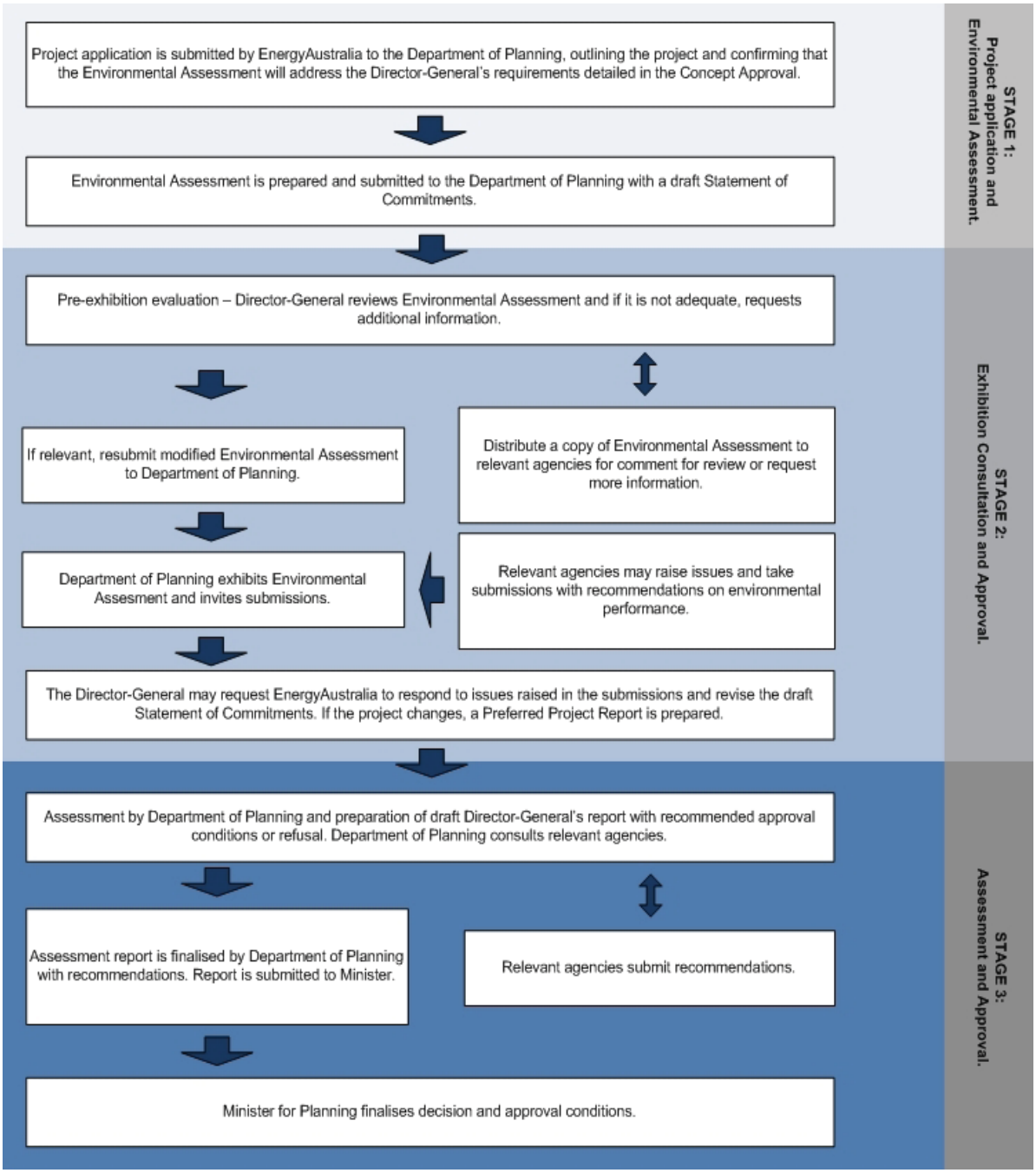
Following the conclusion of the exhibition period, the Director-General may require that EnergyAustralia respond to issues raised in submissions. If required, EnergyAustralia would respond to issues raised and may modify the project and Statement of Commitments. This response would be documented in a Submissions Report that would be submitted to the Director-General.

If significant modifications to the project or Statement of Commitments are made at this stage, a Preferred Project Report would be prepared as part of the Submissions Report to clearly define the revised elements of the project, commitments and environmental impacts.

The Director-General would evaluate this Environmental Assessment, the Submissions Report and any Preferred Project Report, giving consideration to submissions received during the exhibition period. The Director-General would recommend to the Minister whether to grant approval or refuse the Project Application. If the Minister grants approval this may be subject to conditions.

A flowchart of the main steps in the planning approval process is shown in Figure 1-2.

Figure 1-2 Planning approval process for Stage 2A(i) of the City East Zone Substation Project



1.7 Structure of this Environmental Assessment

The following chapters of this Environmental Assessment are structured as follows:

- **Chapter 2** provides a description of the site and its context;
- **Chapter 3** provides an outline of the statutory and strategic framework;
- **Chapter 4** provides information on stakeholder consultation undertaken as part of the City East Zone Substation Project;
- **Chapter 5** provides information on the need and justification of Stage 2A(i) of the City East Zone Substation;
- **Chapter 6** describes Stage 2A(i) of the City East Zone Substation;
- **Chapter 7** outlines consistency of Stage 2A(i) of the City East Zone Substation project with the Concept Approval;
- **Chapters 8 – 16** assess the potential environmental impacts of Stage 2A(i) in accordance with the Director-General's requirements contained within the Concept Approval dated 20 September 2009; and
- **Chapters 17 and 18** conclude the Environmental Assessment by providing information on the management and mitigation of impacts including a draft Statement of Commitments to be implemented to minimise and manage potential environmental impacts.

2. Site location and setting

This Chapter provides a summary of the location of the project.

2.1 Sydney CBD

The objective of the Sydney CityGrid Project is to ensure that Sydney's CBD is provided with a reliable electricity supply in the long term. A reliable electricity supply is essential because Sydney, as Australia's only recognised global city, is the key link between the Australian and global economies. The Sydney CBD is a hub for commercial and financial operations and has a high concentration of business service firms, in particular those associated the financial and stock markets. Provision of a reliable electricity supply is critically important to allow the CBD to function efficiently and effectively.

Sydney's CBD is highly urbanised and the built form is characterised by high rise residential and commercial developments. Land is used for a variety of purposes including residential and commercial use as well as tourist and cultural attractions, and parks and open space, including Hyde Park and the Domain and Royal Botanic Gardens.

Sydney CBD is a popular shopping district with nine retail centres and approximately 600 speciality shops as well as Pitt Street Mall (currently undergoing refurbishment), the Queen Victoria Building, David Jones, and Myer outlets.

A range of cultural attractions are located in the CBD, including the Sydney Opera House, Harbour Bridge, Art Gallery of NSW, Australian Museum, Hyde Park Barracks, Queen Victoria Building, Sydney Town Hall and State Theatre. In addition, Sydney hosts a variety of cultural events including the Sydney Festival, Mardi Gras festival, and Chinese New Year celebrations.

2.2 The site and surrounds

2.2.1 Description of the site

Stage 2A(i) of the City East Zone Substation involves works at 20-22 and 24-26 O'Connell Street and 33 Bligh Street, located in the City of Sydney Local Government Area. The site is legally defined as Lot 1 Deposited Plan 626651 and is rectangular in shape with an approximate site area of 2,040 m^2 (refer to Figure 2-1).

Existing development on the site consists of two commercial buildings, one 17 storey office building constructed in 1960 (20-22 O'Connell Street and 33-35 Bligh Street) and another 13 storey office building constructed in 1983 (24-26 O'Connell Street) and merged with the lower levels of the original building. These buildings are referred to as Kindersley House and were constructed with a concrete frame and glass infill wall structure and provide a total of 45 car park spaces in the basement level car park that is accessible off O'Connell Street. The site has frontage to and pedestrian access from both Bligh and O'Connell Streets.

The site has been the subject of a number of development applications and the City of Sydney Council has granted consent to demolish Kindersley House and erect a commercial tower with ground level retail and basement car parking. This development generally involved:

- A 205 m high commercial building, comprising 26 commercial levels and two ground levels;
- A through site pedestrian link between Bligh and O'Connell Streets;
- A basement car park and service bay that would be accessed from O'Connell Street;
- Basement level changing rooms, lockers, showers and toilets accessible to tenants and authorised visitors; and
- Retail space at Bligh and O'Connell Street levels.

Due to the global financial crisis and changes in market conditions, this ambitious development did not proceed. In 2009 EnergyAustralia purchased the site specifically for the purposes of the City East Zone Substation and potentially to achieve an integrated commercial tower.

2.2.2 Description of land uses surrounding the site

Surrounding land uses are predominantly commercial office towers with active street frontages, retail activities, hotels, restaurants and cafes. The northern boundary of the site is bounded by the former NSW Club House building, the Mulpha building and AFT House. To the south, Cigna House abuts the site as does a 13 storey office building at 50 - 58 Hunter Street. Immediately to the east of the site is Richard Johnson Square, a paved area comprising a historic monument, seating and a small kiosk. To the west of the site is O'Connell Street.

Significant developments within the vicinity of the site include Wales House, the Public Trustee Office, Radisson Hotel Plaza, City Mutual Life Assurance Society Building, Sheraton Wentworth Hotel, Chifley Tower/Square, Macquarie Apartments, ABN Amro/Aurora Place, Noble House, Governor Macquarie Tower, and No. 1 Bligh Street which is currently being constructed.

There are a number of buildings within the immediate vicinity of the site which are heritage listed. These are identified in Chapter 10 and include the former NSW Club House and AFT House which are adjacent to the northern boundary of the site.

The site is in the northern part of the CBD and is accessible to a wide range of commercial, retail, entertainment and cultural services. It is in close proximity to bus and rail services, located 300 m from Wynyard train station and the George Street bus corridor. In addition to the 45 space basement car park, limited on-street metered car parking is available along Bligh, O'Connell and Hunter Streets, and public car parks on Bent and O'Connell Streets.

Figure 2-1 Location map for the City East Zone Substation

G:\21\19157\GIS\Maps\MXD\2119157_003_Location_of_Site_Fig1_RevA.mxd Data Source: Energy Australia: Aerial Imagery - 2010; CECT Data - 2010; Navigate StreetMap: StreetMap - 15/04/2010. Created by: bahambly, qjchung

3. Statutory and strategic framework

This chapter summarises the approval process that applies to the project under Part 3A of the NSW EP&A Act and the permissibility under relevant environmental planning instruments.

3.1 Approval process under the NSW Environmental Planning and Assessment Act, 1979

The *Environmental Planning and Assessment Act 1979* (EP&A Act) forms the statutory framework for planning approval and environmental assessment in NSW. Implementation of the EP&A Act is the responsibility of the Minister for Planning, statutory authorities and local councils.

The EP&A Act contains three schemes that impose requirements for planning approval:

- Part 3A provides for control of 'major projects' that require approval from the Minister for Planning;
- Part 4 provides for control of 'local development' that requires development consent from the local Council; and
- Part 5 provides for control of 'activities' that do not require approval or development consent under Part 3A or Part 4.

The need or otherwise for development consent is set out in environmental planning instruments – State Environmental Planning Policies (SEPPs), Regional Environmental Plans (REPs), or Local Environmental Plans (LEPs).

3.1.1 Application of Part 3A of the EP&A Act 1979

Section 75B(1) of the EP&A Act defines projects to which Part 3A applies and states that:

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

(a) by a State environmental planning policy, or

(b) by order of the Minister published in the Gazette (including by an order that amends such a policy).

The carrying out of particular or a class of development, or development for a program or plan of works or activities, may be so declared.

On 11 February 2008 the Minister for Planning declared that the Sydney CityGrid Project is a project to which Part 3A of the EP&A Act applies. This declaration includes:

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:

- *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);*
- *the refurbishment and augmentation of existing zone substations;*
- *replacement of, and upgrades to, EnergyAustralia's existing high voltage cable network;*
- *the construction and use of tunnels for the installation and operation of high voltage cables and associated cables, and other infrastructure; and*

- *the construction, operation and use of associated works, including ventilation and 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)

As the declaration includes construction of zone substations, the works associated with Stage 2A(i) are subject to approval under Part 3A of the EP&A Act.

Concept Approval of the Sydney CityGrid Project

On the 20 September 2009, the Minister for Planning granted Concept Approval for the CityGrid Project (refer to Appendix A) based on information contained in:

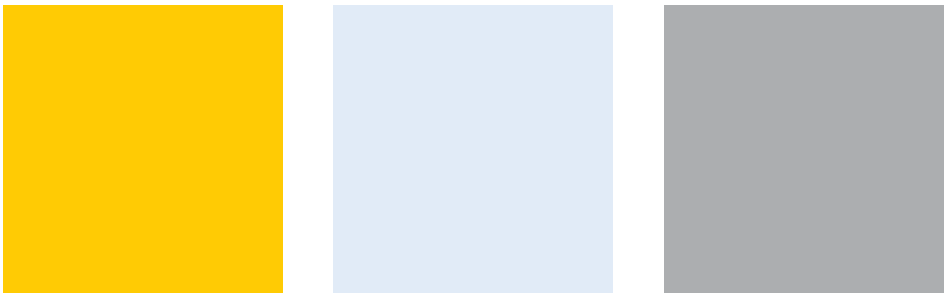
- 08_0075 Major Project Application;
- Sydney CityGrid Project Concept Environmental Assessment Report, prepared by PlanCom Consulting Pty Ltd and dated 8 December 2008; and
- Sydney CityGrid Project Submissions Response & Preferred Project Report, prepared by PlanCom Consulting Pty Ltd and dated May 2009.

For the purposes of the Concept Approval and any Project Approval granted under it, Minister's Condition of Approval (MCoA) 1.3 of the Concept Approval defined the various components of the Sydney CityGrid Project as:

- Stage 1 – Belmore Park Substation site
  - Stage 1A – Construction and operation of the Belmore Park Zone Substation and stub tunnel connection from City South Cable Tunnel to Belmore Park Zone Substation; and
  - Stage 1B – Commercial/ retail development on the corner of Pitt, Campbell and Hay streets, to be integrated with the works comprising Stage 1A.
- Stage 2 –The balance of the works required for the concept plan, other than those defined as Stage 1 works, and comprising:
  - Stage 2A – Construction and operation of the City East Zone Substation in the vicinity of Phillip, Bent, Bligh and O'Connell Streets;
  - Stage 2B – Refurbishment of existing Dalley Street Zone Substation or construction of a new building adjacent to the existing site;
  - Stage 2C – Construction and operation of a sub-transmission switching station (STSS) on a site at the intersection of Riley Street and Albion Street, Surry Hills;
  - Stage 2D – Construction of City East Cable Tunnel between Riley Street STSS and City North Zone Substation with connections to the proposed City East and existing Dalley Street Zone Substations, and a potential services control room adjacent to the Riley Street STSS; and
  - Stage 2E – Extension of the City South Cable Tunnel from Wade Place to Riley Street, Surry Hills.

Minister's Condition of Approval 2.2 requires that the construction and operation of Stage 2 of the Sydney CityGrid Project, including Stage 2A, is subject to further assessment under Part 3A of the EP&A Act. In seeking approval for Stage 2 works, MCoA 2.3 allows EnergyAustralia to submit a Project Application for Stage 2 in its entirety, or submit separate applications for each sub-stage or a combination of sub-stages.

EnergyAustralia proposes to obtain Project Approval for Stage 2A of the Sydney CityGrid Project in two separate but interrelated stages. The works that are the subject of this Environmental Assessment are referred to as Stage 2A(i). A Project Application for these works was submitted to the Director-General of the Department of Planning on 15 May 2010.



3.1.2 Application of other provisions of the EP&A Act

Under Section 75R(3) of the EP&A Act, environmental planning instruments (other than State environmental planning policies) do not apply to or in respect of an approved project. Section 75J(3) states that the Minister may (but is not required to) take into account the provisions of any environmental planning instrument that would not (because of section 75R) apply to the project if approved. As such, it is at the Minister's discretion whether the provisions of the Sydney Local Environmental Plan 2005 are to be taken into account.

3.1.3 Effect of Part 3A of the EP&A Act on approvals under other legislation

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

Section 75U(1) of the EP&A Act specifies certain authorisations which are not required for an 'approved project' under Part 3A, namely:

(a) the concurrence under Part 3 of the Coastal Protection Act 1979 of the Minister administering that Part of the Act,

(b) a permit under section 201, 205 or 219 of the Fisheries Management Act 1994,

(c) an approval under Part 4, or an excavation permit under section 139, of the Heritage Act 1977,

(d) a permit under section 87 or a consent under section 90 of the National Parks and Wildlife Act 1974,

(e) an authorisation referred to in section 12 of the Native Vegetation Act 2003 (or under any Act to be repealed by that Act) to clear native vegetation,

(f) a permit under Part 3A of the Rivers and Foreshores Improvement Act 1948,

(g) a bush fire safety authority under section 100B of the Rural Fires Act 1997,

(h) a water use approval under section 89, a water management work approval under section 90 or an activity approval under section 91 of the Water Management Act 2000.

Section 75A defines 'approved project' as 'a project to the extent that it is approved by the Minister under this Part, but does not include a project for which only approval for a concept plan has been given'. Consequently, these approvals would not be required if the Minister grants Project Approval to carry out the project under Part 3A.

Under Section 75V(1) of the EP&A Act, the following authorisations cannot be refused if necessary for the carrying out of an 'approved project' and are to be substantially consistent with an approval to carry out the project given under Part 3A:

- *An environment protection licence under Chapter 3 of the Protection of the Environment Operations Act 1997; and*
- *A consent under s138 of the Roads Act 1993.*

3.1.4 Director-General's requirements

Pursuant to Section 75P(1)(a) of the EP&A Act, the environmental assessment requirements for the Sydney CityGrid Project are specified in MCoA 3.1, 3.2 and 3.3 of the Concept Approval, dated 20 September 2009. This Environmental Assessment addresses those requirements. Table 3-1 summarises the environmental assessment requirements together with the section of this document that addresses each requirement.

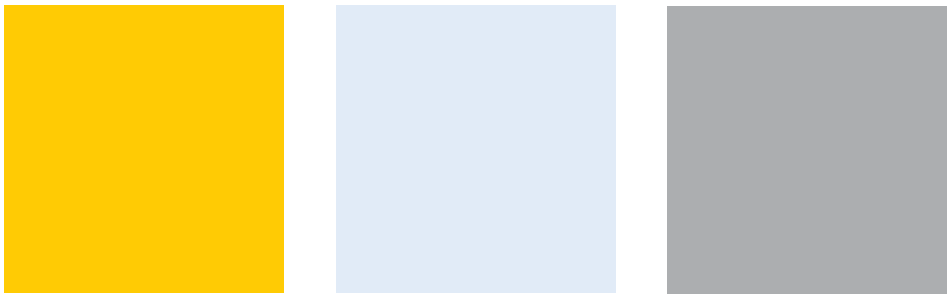


Table 3-1 Summary of Director-General's requirements

Director-General requirements	Document reference
General requirements	
Demonstration that the project is consistent with the Concept Approval	Section 7.2
Detailed description and location of all project components and identification of environmental constraints	Chapter 6
Detailed project specific Statement of Commitments	Section 17.3
Outcome of consultation with RailCorp and Sydney Metro	Section 4.2
Issue-specific requirements	
A project level noise and vibration impact assessment for construction and operation noise prepared in accordance with the NSW Industrial Noise Policy (EPA, 2000), the interim Noise Control Guideline – Construction Site Noise (DECC 2008), the Environment Noise Management – Assessing Vibration: a Technical Guidelines (DECC, 2006) and the Environment Criteria for Road Traffic Noise (EPA 1999). The assessment shall be prepared in consultation with the DECC.	Chapter 9 and Appendix E
A project level **non-indigenous heritage assessment** prepared in consultation with the Heritage Council of NSW.	Chapter 10
An updated **indigenous heritage assessment** informed by the views of the Metropolitan Aboriginal Land Council and any other relevant, readily contactable Aboriginal community.	Chapter 11
An updated **air quality assessment**	Chapter 14
A **greenhouse gas potential assessment** in accordance with the methodology specified in the *National Greenhouse Accounts (NGA) Factors* (DECC, November 2008).	Not applicable to Stage 2A(i) as this requirement relates to operation of the substation.
Detailed information on **water quality impacts**	Chapter 15
An updated **traffic and access assessment**	Chapter 13
Design review process	
A **design review process** for the proposed City East Zone Substation	Section 6.3.6
Consultation with **Sydney Water Corporation**	Section 4.2

3.2 Permissibility of the project under relevant environmental planning instruments

3.2.1 State Environmental Planning Policy (Infrastructure) 2007

State Environmental Planning Policy (Infrastructure) 2007 (ISEPP) aims to assist in the effective delivery of public infrastructure in the State by improving certainty and regulatory efficiency through a consistent planning assessment and approvals regime for public infrastructure and services across NSW. ISEPP provides clear definition of the environmental assessment and approval process for public infrastructure and services facilities.

Clause 41 – Development permitted without consent

Clause 41 of ISEPP 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.

Stage 2A(i) is therefore able to be undertaken without consent as it is for the purpose of an electricity distribution network and would be undertaken by a public authority. As discussed in Section 3.1.1, the project requires approval under Part 3A of the EP&A Act due to the application of the Minister's declaration.

Clause 86 – Excavation in, above or adjacent to rail corridors

As the CBD Metro Stage 1 has been granted approval under Part 3A of the EP&A Act, it is a 'rail corridor' as defined by the ISEPP. Sydney Metro Authority (Sydney Metro) is the rail authority for this rail corridor. Clause 86 relates to development that involves penetration of the ground to a depth of at least 2 m below the existing ground level on land:

- Within or above a rail corridor, or
- Within 25 m (measured horizontally) of a rail corridor, or
- Within 25 m (measured horizontally) of the ground directly above an underground rail corridor.

Stage 2A(i) of the City East Zone Substation is subject to Clause 86 as it would be located above the rail corridor for the CBD Metro Stage 1 and involves excavation to a depth of greater than 2 m below the existing ground surface.

Before determining the project application, the Department of Planning must provide written notice to the Chief Executive of Sydney Metro within seven days of receiving the application and take into consideration:

- Any response to the notice that is received within 21 days after the notice is given, and
- Any guidelines issued by the Director-General for the purposes of this clause and published in the Gazette.

Concurrence of the Chief Executive of Sydney Metro is required prior to consent being granted. When deciding whether to grant concurrence, the Chief Executive is required to take into account:

a) *The potential effects of the development (whether alone or cumulatively with other development or proposed development) on:*

   i. *The safety or structural integrity of existing or proposed rail infrastructure facilities in the rail corridor, and*

   ii. *The safe and effective operation of existing or proposed rail infrastructure facilities in the rail corridor, and*

b) *What measures are proposed, or could reasonably be taken, to avoid or minimise those potential effects.*

As detailed in Section 4.2, EnergyAustralia has consulted extensively with Sydney Metro during development of designs for Stage 2A(i) of the City East Zone Substation. These designs have been specifically developed to incorporate all reasonable measures to minimise potential impacts on the safety, structural integrity, and

operation of future developments within this rail corridor. The substation design incorporates a bridging structure over the alignment of the tunnels for the CBD Metro Project Stage 1. This bridging structure has been designed to ensure that the viability of the CBD Metro Project Stage 1 is not compromised by the presence of the City East Zone Substation and associated commercial tower (refer to Section 6.2.5).

Clause 88 – Development within or adjacent to interim rail corridor

A portion of the site for the City East Zone Substation and the stub tunnel are located within an interim rail corridor as defined by ISEPP. This interim rail corridor is referred to as the 'CBD Rail Link' in ISEPP and is commonly known as the 'Metro Pitt' alignment to distinguish it from another interim rail corridor generally located to the west of George Street. RailCorp is the rail authority for the CBD Rail Link.

Stage 2A(i) of the City East Zone Substation is subject to Clause 88 of ISEPP as it involves development within areas marked 'Zone B' on the rail corridors map and involves penetration at least 2 m below the existing ground level.

Before determining the project application, the Department of Planning must provide written notice to the Chief Executive of RailCorp within seven days of receiving the application and take into account the likely effect of the development on:

(a) The practicability and cost of carrying out rail expansion projects on the land in the future, and

(b) Without limiting paragraph (a), the structural integrity or safety of, or ability to operate, such a project, and

(c) Without limiting paragraph (a), the land acquisition costs and the costs of construction, operation or maintenance of such a project.

As detailed in Section 4.2, EnergyAustralia has consulted extensively with RailCorp during development of designs for Stage 2A(i) of the City East Zone Substation. The design has been specifically developed to incorporate reasonable measures to minimise potential impacts on both the practicality of carrying out rail expansion projects in the interim rail corridor, and the structural integrity and safety of rail expansion projects in the interim rail corridor.

3.2.2 State Environmental Planning Policy No. 55 – Remediation of Land

The aims and objectives of State Environmental Planning Policy 55 – Remediation of Land (SEPP 55) are to provide a statewide approach to remediation of contaminated land and promote remediation of contaminated land to reduce risk of harm.

SEPP 55 applies where consent is required under Part 4 of the EP&A Act for development on potentially contaminated land and/or where remediation works are proposed. SEPP 55 does not apply to the project as it is subject to approval under Part 3A of the EP&A Act, not Part 4. Never-the-less, the principles of SEPP 55 have been considered during preparation of the Environmental Assessment.

Under SEPP 55, a consent authority must not grant development consent unless:

(a) It has considered whether the land is contaminated, and

(b) If the land is contaminated, it is satisfied that the land is suitable in its contaminated state (or will be suitable, after remediation) for the purpose for which the development is proposed to be carried out, and

(c) If the land requires remediation to be made suitable for the purpose for which the development is proposed to be carried out, it is satisfied that the land will be remediated before the land is used for that purpose.

The definition of remediation in Clause 4 of SEPP 55 includes 'removing, dispersing, destroying, reducing, mitigating or containing the contamination of any land'.

The site has been used as commercial building since the 1930s. A stage 1 preliminary contamination assessment undertaken at the site by Urban Environmental for Bovis Lend Lease in 2008 identified the presence of asbestos in fill encountered in one borehole. As detailed in Section 6.2, any contaminated material would be managed in accordance with relevant legislation and guidelines.

3.3 Compliance with local planning instruments

During development of the building envelope, JBA provided Kann Finch with advice regarding compliance with the following City of Sydney planning instruments:

- Sydney Local Environmental Plan 2005 (SLEP 2005);
- Central Sydney Development Control Plan 1996 (CSDCP 1996); and
- City of Sydney Heritage Development Control Plan 2006 (HDCP 2006).

Appendix B contains a table of compliance of the project against the provisions of the relevant statutory planning instruments. As indicated in Section 3.1.2, it is at the Minister's discretion whether the provisions of the Sydney Local Environmental Plan 2005 are to be taken into account. The following section summarises specific aspects and areas of non-compliance that have been identified.

3.3.1 Sydney Local Environmental Plan 2005

The City East Zone Substation and commercial tower is permissible with consent under Clause 37 of the LEP.

Clause 10 – Waiver of certain development standards

A commercial development on the site is permitted with a floor space ratio of 12.5:1 (Clause 54 of the LEP). Approval is sought for a 10% increase to the maximum floor space ratio control under the provision of Clause 10 of the LEP. Clause 10 permits the consent authority to grant a maximum 10% variation to the maximum floor space ratio control if it is satisfied that:

a) all the objectives of the development standard will be fulfilled, and

b) the contravention will not:

i. create an undesirable precedent for other development, or

ii. diminish the overall effect of the development standard for development in the vicinity of the site, and

c) the particular physical attributes of:

i. the site, in terms of location, context, slope, site configuration and the like, and

ii. the proposed development, in terms of urban form, bulk, height, floor space ratio, carparking, and the like, will render the strict application of the development standard unreasonable or unnecessary in the circumstances, and

d) the proposed development will improve or contribute positively to the public domain and would achieve design excellence.

The floor space area is proposed to be varied by 1.25:1 which equates to approximately 2,550 m^2. The consistency of Stage 2A(i) with the qualitative criteria under which a variation to the maximum permissible floor space ratio can be granted under the LEP is discussed below and concludes that it is reasonable that the Minister exercise discretion under Part 3A of the EP&A Act to vary this development standard.

(a) Objectives of development standard

The consistency of Stage 2A(i) with the objectives for the floor space ratio control is detailed in Table 3-2.

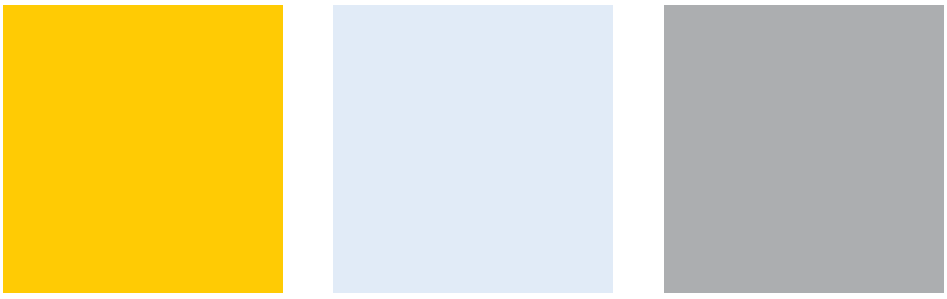
Table 3-2 Objectives for floor space ratio development standard

Objective	Project's consistency
(a) to ensure a degree of equity in relation to development potential for sites of different sizes and for sites located in different parts of Central Sydney, and	The additional floor space area proposed is 2548 m^2 and is within the variation to development standards contemplated.
(b) to ensure that proposals for new buildings are assessed with due regard to the development plan, design excellence, urban design and built form provisions of this plan, and	A design review process is required by the Concept Approval and would be implemented during Stage 2A(ii) to ensure that design excellence is achieved.
(c) to provide a framework for the award and allocation of heritage floor space, and	Consent for the proposed additional floor space area would require the purchase of heritage floor space of an equivalent amount.
(d) to provide sufficient floor space for high quality development for the foreseeable future, and	Stage 2A(i) would provide a building envelope that is able to be refined in Stage 2A(ii) to provide high quality commercial floor space which is predicted to be in demand in the CBD in the medium term.
(e) to encourage the provision of residential and visitor accommodation, and	Not applicable.
(f) to encourage the provision of certain uses and facilities that provide a public benefit, and	As detailed in Chapter 5, construction of the City East Zone Substation is an essential component of EnergyAustralia's long term strategy to provide a reliable electricity supply to the CBD. The project would upgrade of Richard Johnson Square as part of Stage 2A(ii).
(g) to regulate the density of development and generation of vehicular and pedestrian traffic.	Stage 2A(i) complies with the general objectives in relation to the provision of car spaces by meeting the allowable provision for on site parking in accordance with clause 65 of SLEP 2005.

(b) Precedent that will diminish effect of development standard in the vicinity of development

The maximum permitted height of buildings on the site and in the vicinity is 235 m. The proposed building height of 128.5 m above Bligh Street is over 100 m lower than the maximum permissible height. Existing buildings in the vicinity of the site range from 3 - 4 storeys up to approximately 60 storeys. The height and scale of the building envelope would be in context with the surrounding development and be significantly lower than the height of the building the City of Sydney consented to be constructed on the site (205 m).

The proposed variation to the maximum floor space ratio control is consistent with previous approvals granted for the site and as such would not generate a new or undesirable precedent. In light of these precedents, the project is not considered to diminish the overall effectiveness of the floor space ratio development standard.



(c) Physical attributes of the site and development render strict adherence unnecessary

The design of the building envelope has responded to the location and setting of the site. The strict application of the floor space ratio control would constrain the viability of the project and potentially result in a poorer urban design outcome if, as a result, a stand-alone substation was required to be constructed on the site.

The project provides an opportunity to construct an integrated high rise commercial/public infrastructure development within the CBD. There are significantly more engineering, financial and practical constraints associated with the provision of this building than usually involved in the provision of a commercial office building. The successful delivery of the project would demonstrate the possibilities of integrating separate distinct land uses into a combined scheme.

(d) Development will improve or contribute positively to the public domain and would achieve design excellence

Stage 2A(ii) of the City East Zone Substation would positively contribute to the public domain by the upgrading the streetscape in the immediate vicinity of the site, including Richard Johnson Square. The design review process to be undertaken during Stage 2A(ii) would ensure that the final building would exhibit design excellence.

The integration of a commercial office building and substation would benefit the public through the efficient use of land within the CBD land.

Clause 17 – Consent for demolition

Clause 17 of the LEP requires the consent authority to be satisfied that the subject application or an existing approval will deliver the comprehensive redevelopment of the site and that the likely replacement building will not generate any adverse environmental impacts.

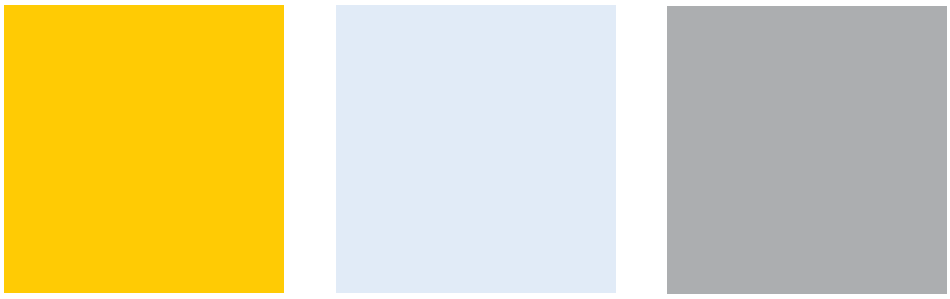
This application seeks consent to demolish the existing building and provides a building envelope for development of a substation and commercial tower on the site. It is considered that sufficient information has been provided to allow consent to be granted as the Environmental Assessment:

- Provides contextual information demonstrating that the building envelope would sit comfortably within the surrounding streetscape;
- Outlines the environmental impacts of the building envelope in terms of overshadowing and wind mitigation;
- Confirms that a design review process during Stage 2A(ii) would ensure that the building would be of a high quality;
- Confirms that the building envelope would be of a lesser scale of other buildings previously approved on the site; and
- Confirms that a public authority is the proponent and that an essential service is required at the site by the end of 2015. Funding for the substation project has been obtained and there is little chance of the site remaining undeveloped once Stage 2A(i) has been completed.

Clause 23 – Development plans

Clause 23 of the Sydney LEP requires the preparation of a Development Plan (Stage 1 Development Application) for any development proposing a height of more than 55 m or on a site greater than 1500 m^2.

Given the project is to be approved under Part 3A of the EP&A Act, there is no requirement for a Development Plan to be prepared. Nevertheless, this Project Application establishes envelopes and parameters for the future development of the site in a manner consistent with a Development Plan. The matters relevant to the making of a Development Plan are discussed below.



a) The suitability of the land for development

The land is considered suitable for the project because the:

- Existing commercial building is of little architectural merit and is at the end of its commercial life;
- Site is not constrained by heritage elements which are required to be retained; and
- Site is of a suitable size to accommodate viable commercial floor plates.

b) Existing and proposed landuse mix

The project involves enabling works that would ultimately replace an existing commercial building with a substation and a higher quality commercial building. It would therefore increase the amount of commercial floor space provided on the site.

c) Heritage issues and streetscape constraints

The site is not identified as a heritage item. It is adjacent to and in close proximity of several heritage items and Richard Johnson Square is identified as a heritage streetscape item. Although part of Richard Johnson Square would be within the construction zone, this would not impact on the monument or gas lamp. Impacts on potential subsurface archaeology are unlikely as it is not intended excavate within Richard Johnson Square.

NBRS + Partners provided advice during development of the design of the building envelope to minimise negative impacts on heritage items in close proximity to the site. One particular feature that has been incorporated is the setback of the building on Bligh Street which allows the greater appreciation of the heritage item at 31 Bligh Street.

d) The location of any tower proposed, having regard to the need to achieve an acceptable relationship with other towers (existing or proposed) on the same site or on neighbouring sites in terms of separation, setbacks, amenity and urban form

The proposed tower form is considered to provide an acceptable urban form because it would:

- Be of a similar scale to the existing Mulpha House at 25 Bligh Street in terms height;
- Be of a lesser height and scale than the building envelope approved on the site under D/2007/1270;
- Provide a suitable side setback to the boundary with 50 - 58 Hunter Street, thereby allowing for the future redevelopment of that site;
- Allow for greater appreciation of the side elevation of the heritage item at 31 Bligh Street; and
- Not generate any unacceptable overshadowing or wind mitigation impacts.

The project does involve variations to the above podium setbacks required by the City of Sydney DCP.

It provides an alternative design element in the form of recessed levels to distinguish between the podium and tower. A waiver to the setback requirements has been previously considered acceptable on the site due to the fact that the proposal provided a high quality urban design and did not generate any adverse visual, overshadowing or wind impacts.

The project, with its reduced setbacks, is considered to be acceptable because:

- A design review process would be undertaken during Stage 2A(ii) to ensure the building form would be of high quality; and
- The building envelope would not generate any adverse environmental impacts such as overshadowing or wind effects.

e) Bulk, massing and modulation of buildings

The bulk and massing of the building envelope is considered to be consistent with neighbouring buildings and would sit comfortably within the city block. The building envelope has been modulated so as to emphasise the verticality of the building. This would be further developed during Stage 2A(ii).

f) Street frontage heights

The project complies with the street frontage heights stipulated by the City of Sydney DCP 1996.

g) Environmental impacts such as sustainable design, overshadowing, wind and reflectivity

The environmental impacts of the building envelope have been assessed and are considered to be acceptable as:

- Shadow diagrams prepared by Kann Finch demonstrate that there would not be adverse overshadowing impacts (refer to Section 16.3);
- The heritage impact assessment prepared by NBRS + Partners demonstrates that the project is acceptable on heritage grounds (refer to Chapter 10);
- There would not be any adverse wind impacts on the surrounding pedestrian environment (refer to Section 16.5); and
- There would not be substantial adverse solar reflectivity impacts, provided relevant requirements are adopted during the detailed design of the building (refer to Section 16.4).

h) The achievement of the principles of ecologically sustainable development

During Stage 2A(ii), features of the building would be refined to respond to the principles of ecologically sustainable development and ensure that the building achieves a minimum five star Green Star rating.

i) Pedestrian, cycle, vehicular and service access, circulation and requirements

Pedestrian access to the commercial tower would be provided via Bligh Street. Due to the location of the substation in the basement and podium levels, it is not possible to provide a through-site connection. This is considered acceptable because:

- The project would provide a substation servicing the Sydney CBD and, as a result of its integration with a commercial tower, some compromises to the regular planning for commercial office buildings needs to be accommodated. In this instance, it is not possible to provide a pedestrian through-site link in addition to the ground plane requirements of the substation;
- The site is located approximately 20 m from the intersection of Hunter Street and as such the loss of the through-site connection would not have a significant impact on the flow of pedestrians through the city; and
- There is an existing link through-site at Norwich House which is just north of the subject site.

Vehicular access to the site would be provided via O'Connell Street. Two entrances are needed to separate access for the commercial tower and substation. Importantly, the unmanned substation would be a secure site and access would be restricted to authorised personnel only (refer to Section 6.3.4).

Bicycle parking and shower facilities would also be provided for future staff within the commercial tower.

j) Impact on, and any proposed improvements to the public domain

As part of the design review process undertaken during Stage 2A(ii), consideration would be given to contributions towards an upgrade of the streetscape in the immediate vicinity of the site, including Richard Johnson Square.

Clause 26 Design Excellence

The Sydney LEP outlines that development consent must not be granted to a new building unless the consent authority has considered whether the proposal exhibits design excellence. In particular the consent authority must consider:

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

MCoA 3.2 of Concept Plan Approval MP08_0075 states that:

A design review process for the proposed City East Zone Substation and Dalley Street Zone Substation shall form part of an environmental assessment. The design review process shall be based on the principles of the design review competition of the Sydney Local Environmental Plan 2005, and include consultation with Council.

As detailed in Section 6.3.6, the design review process would be undertaken during Stage 2A(ii) and would refine the building envelope for which approval is sought as part of Stage 2A(i). The detailed design of the substation and commercial building would be the subject of a similar design review process to that implemented for the Belmore Park Zone Substation. The Environmental Assessment for Stage 2A(ii) would outline how design excellence has been achieved.

In terms of the public domain, Stage 2A(ii) may involve upgrading the streetscape in the immediate vicinity of the site, including Richard Johnson Square.

Both Bligh Street and O'Connell Street are identified as view corridors within the City of Sydney DCP. The building envelope would frame these view corridors by building to the street alignment and would not terminate or block these important view corridors.

Part 5 Car Parking

As detailed in Section 6.3.4, the project complies with onsite parking requirements.

3.3.2 Central Sydney Development Control Plan 1996

Clause 2.3 – Building Setbacks

The City of Sydney DCP 1996 requires weighted average tower setbacks above street frontage heights in certain circumstances. The commercial tower would be built to the front (Bligh Street) and rear (O'Connell Street) boundaries of the site. Delineation of the podium and tower forms would be achieved by developing the tower as a recessed element above the podium.

The primary stated purpose of the setback control is to retain sunlight to the public domain and also to prevent adverse wind impacts on the pedestrian environment.

As demonstrated in Sections 16.3 and 16.5, compliance with the setback control is unnecessary in this case as the building envelope would not have adverse overshadowing or wind impacts on the public domain.

This design response of nil setbacks to Bligh and O'Connell Streets has been previously accepted and approved on the site by the City of Sydney and is considered appropriate in this instance.

Clause 2.5 – Street Frontage Activities

The City of Sydney requires active uses at the ground level of buildings to provide vibrancy and activity within the CBD. Due to the floor space requirements of the substation within the building envelope and occupational health and safety issues associated with the substation, it is not possible to provide retail use at the ground level of the building. Notwithstanding this, activity to Bligh Street would be provided via the commercial lobby on this frontage.

Clause 3.2 – Midblock Connections

The site contains an existing midblock connection, however, due to the floor space requirements of the substation, it is not possible to retain this connection. Although the through-site link is unable to be provided, this is considered to be acceptable as there is ample scope for pedestrian movement within the locality due to the existing connections located within the same city block and the close proximity of the site to the corner with Hunter Street 20 m away.

Clause 3.3 – Vehicular Access

This provision requires that service vehicle access is to be combined with parking access and limited to a maximum of one access point per building. Two vehicular entrances are proposed on the O'Connell Street frontage of the site. As detailed in Section 6.3.4, separate entrances are required for the EnergyAustralia vehicles and the commercial tenants. These crossings are not located on streets which are identified in Figure 3.5 of the DCP as being streets where new crossings are restricted or not preferred.

Two entrances are required to provide safe access to the commercial tenants that is separated from vehicles that would service the substation. As the substation would not be staffed, the vehicle entrance to the substation would be less frequently used than the commercial tenant entry.

3.3.3 City of Sydney Heritage Development Control Plan 2006

The heritage impacts have been assessed by NBRS + Partners (refer to Chapter 10 and Appendix F) and are considered to be consistent with the provisions of the City of Sydney Heritage Development Control Plan which relate to the development of sites which are adjacent to heritage items. In particular:

- The project provides a setback on the Bligh Street façade which allows for the greater appreciation of the side elevation of 31 Bligh Street, former NSW Club; and
- The podium street wall heights have been designed to correspond with and respect the heights of the existing heritage buildings on both Bligh and O'Connell Streets.

To ensure that the detailed design contains materials and a form that is appropriate to its sensitive location, a commitment has been made which requires the ongoing design development of the building to be carried out in consultation with an appropriately qualified heritage specialist / architect.

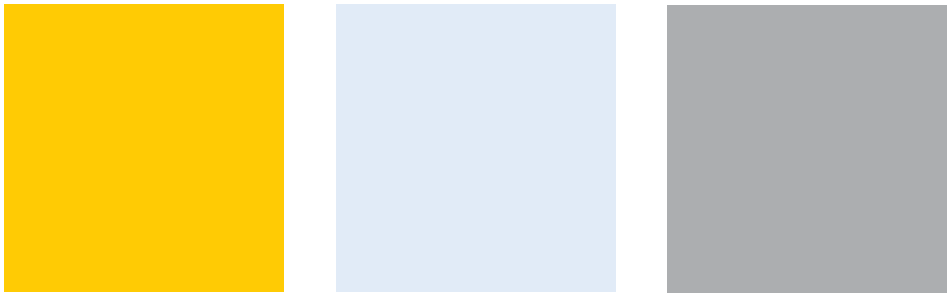
3.4 Other relevant NSW legislation

As indicated in Section 3.1.1, Sections 75U and 75V of the EP&A Act limit approvals that are required under other NSW legislation. The following section outlines additional approvals that may be required.

3.4.1 Protection of the Environment Operations Act 1997

The Protection of the Environment Operations Act 1997 (POEO Act) regulates noise, air, land and water pollution. Environment protection licences are granted by the NSW Department of Environment, Climate Change and Water (DECCW) under the POEO Act for 'scheduled activities', 'scheduled development work' and regulating water pollution.

As the City East Zone Substation project is not a 'scheduled activity' or 'scheduled development work', an environment protection licence would only be required if the project would pollute waters. Under Section 120 of the POEO Act, it is an offence to pollute waters.



As discussed in Chapter 15, there is the potential for Stage 2A(i) of the City East Zone Substation to pollute waters due to the need to dewater the excavations for the basement and stub tunnel and discharge this to the stormwater system. If required, EnergyAustralia's contractors would obtain an environment protection licence for this activity. Section 122 states that it is a defence against proceedings under Part 5.3 of the POEO Act if the pollution was regulated by an environmental protection licence and the conditions of that licence were not contravened.

Under Section 75V(1) of the EP&A Act, an environment protection licence under Chapter 3 of the POEO Act cannot be refused if it is required to carry out an approved project.

3.4.2 Water Act 1912

The project would involve dewatering the basement excavation and stub tunnel. A licence for this activity would be obtained from NSW Office of Water under Part 5 of the *Water Act 1912.*

3.4.3 Roads Act 1993

Works would be required within the Bligh and O'Connell Street road corridors. These streets are non-classified roads and the City of Sydney Council is the relevant road authority. As a public utility, EnergyAustralia is exempt from the requirement under Section 138 of the *Roads Act 1993* to obtain consent from the local council to work within non-classified roads.

No works would be undertaken within classified roads.

3.4.4 Electricity Supply Act 1995

Part 5 of the *NSW Electricity Supply Act 1995* sets out EnergyAustralia's powers relating to acquisition of land, construction of electricity works and powers of entry. These powers allow EnergyAustralia to construct electricity works within public roads, such as Bligh Street, with exemption from approval under the NSW *Local Government Act 1993.*

Under Part 5 of the *Electricity Supply Act 1995,* EnergyAustralia is required to notify the City of Sydney of the works and take into consideration any associated submission.

3.5 Commonwealth legislation

3.5.1 Environmental Protection and Biodiversity Conservation Act 1999

The Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) prescribes the Commonwealth's role in environmental assessment, biodiversity conservation and the management of protected areas and species, populations and communities and heritage items.

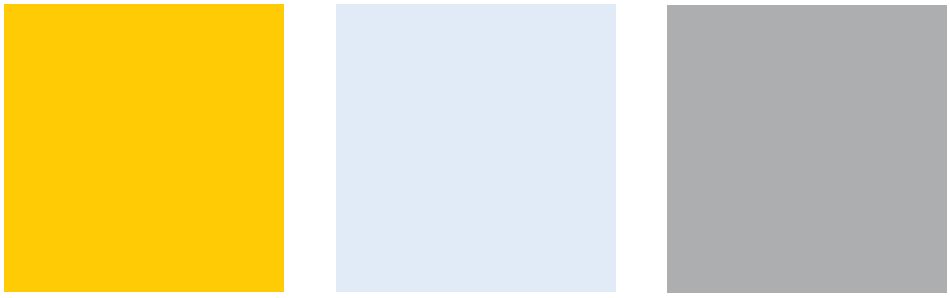
The approval of the Commonwealth Minister of Environment, Heritage, Water and the Arts is required for:

- An action which has, will have or is likely to have a significant impact on "matters of National Environmental Significance" (NES matters). NES matters include:
  - World heritage values of a declared World Heritage property;
  - National Heritage values of a listed National Heritage place;
  - Ecological character of a declared Ramsar wetland;
  - Listed threatened species and ecological communities;
  - Listed migratory species;
  - Commonwealth marine environment; and
  - Nuclear actions.

- An action by the Commonwealth or a Commonwealth agency which has, will have or is likely to have a significant impact on the environment;
- An action on Commonwealth land which has, will have or is likely to have a significant impact on the environment; or
- An action which has, will have, or is likely to have a significant impact on the environment on Commonwealth land, no matter where it is to be carried out.

A search of the EPBC Act protected matters database was undertaken as part of the Environmental Assessment Report for the Concept Plan prepared by PlanCom Consulting Pty Ltd (December 2008). It was considered unlikely that there would be any significant impacts on the protected matters. As such, the Sydney CityGrid Project was not referred to the Commonwealth Minister for the Environment.

As the 2008 search of the protected matters database was undertaken prior to confirmation of the site for the City East Zone Substation, GHD repeated this process in February 2010. The results indicated that there are unlikely to be any protected matters that would be significantly impacted by the project. As a result, Stage 2A(i) has not been referred to the Commonwealth under the EPBC Act.



4. Stakeholder consultation

This chapter provides an overview of the community consultation and stakeholder engagement processes that have been undertaken for the project and outlines the identified issues and how these have been addressed. It also provides details on future and ongoing community consultation for the project.

4.1 Consultation approach

EnergyAustralia is committed to working closely with the community throughout both the planning and construction phases of the City East Zone Substation Project. Community consultation activities related to Stage 2A(i) were undertaken in accordance with a Community Information Plan developed by EnergyAustralia for the Sydney CityGrid Project. The Community Information Plan will be periodically updated during the project to ensure its relevance to particular stages of pre-construction, construction and operation.

4.1.1 Community Information Plan

EnergyAustralia has developed a Community Information Plan to address the requirements of MCoA 4 of the Concept Approval. This plan outlines the community and stakeholder communications and consultation processes that are to be undertaken throughout all stages of the Sydney CityGrid Project. The plan is a dynamic document that would be regularly updated to ensure it addresses issues specific to particular stages of the discrete projects that sit under the overarching Sydney CityGrid Project.

The objectives of the Community Information Plan are:

- To provide a framework through which the community is well informed and any concerns can be addressed;
- To clarify areas of responsibility between EnergyAustralia and its contractors; and
- To meet the MCoA for the Sydney CityGrid Project.

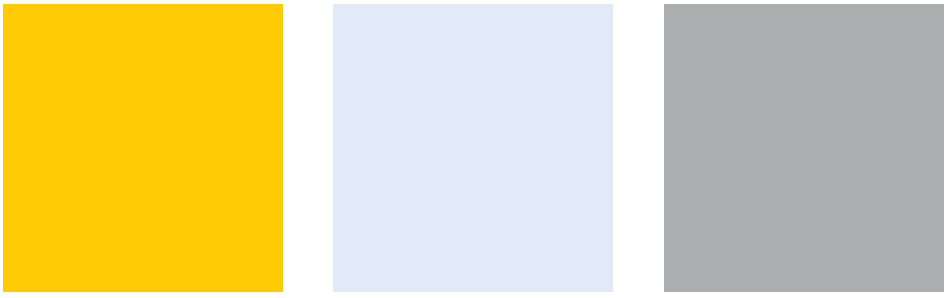
A sub-plan has been developed that specifically relates to consultation associated with Stage 2A of the CityGrid Project.

4.1.2 Consultation techniques

A range of engagement techniques were used to inform the affected community and stakeholders and to identify issues and concerns during preparation of the Environmental Assessment. These activities include meetings with affected landowners and building managers, ongoing liaison with government agencies, distributing community newsletters to properties in the vicinity of the site, and door knocking nearby properties.

The objectives of the community and stakeholder engagement activities were to:

- Identify interested stakeholders and appropriate methods of communication;
- Provide the community with up to date and timely information;
- Provide a direct avenue for feedback to the project team; and
- Find a balance between social and environmental needs to ensure there is equity in the way that the project is delivered.



4.2 Consultation with key stakeholders

Extensive consultation has been undertaken with statutory authorities during development of the Sydney CityGrid Project. The following section summarises issues raised during consultation related to Stage 2A(i) and how these issues have been addressed.

4.2.1 Sydney Metro Authority

As indicated in Section 6.2.5, the alignment of the tunnels for the CBD Metro Stage 1 pass beneath the site. Although the NSW Government has announced that the CBD Metro Stage 1 will not proceed at this time, Stage 2A(i) of the City East Zone Substation has be designed to accommodate the future presence of the CBD Metro Stage 1. This minimises the potential for any interface issues between the City East Zone Substation and Stage 1 of the CBD Metro Project, should it proceed in the future.

EnergyAustralia has liaised closely with Sydney Metro from the outset of the CBD Metro Stage1 project until recently when the NSW Government announced that the project had been deferred. However, a draft stakeholder deed had been prepared between EnergyAustralia and Sydney Metro and separately agreement to compensate EnergyAustralia for the additional costs of building a bridging structure was identified. It is understood that the Sydney Metro entity will no longer exist beyond 30 June 2010, after which time the Department of Transport and Infrastructure will be the nominated stakeholder.

EnergyAustralia will continue its consultation with the Department of Transport and Infrastructure from 1 July 2010 to finalise concurrence of the interface including compensation to EnergyAustralia for the proposed bridging structure.

4.2.2 RailCorp

Consultation with RailCorp has been undertaken during development of the concept design and this involved consultation during preparation of the Concept Environmental Assessment (December 2008) as well as the Environmental Assessments for Stage 2A(i) of the Sydney East Zone Substation, and Stages 2B, 2D and 2E of the Sydney CityGrid Project. RailCorp raised a number of issues that need to be considered during development of the concept design to ensure that the Sydney CityGrid Project does not adversely impact on any existing or proposed assets that include the City Circle and Eastern Suburbs Rail Lines, and the proposed MetroWest and MetroPitt Rail Lines.

RailCorp was provided the opportunity to comment on drawings that define the horizontal and vertical alignment of the Sydney CityGrid Project relative to existing and proposed rail assets. The base of the interim rail corridor for the proposed MetroPitt tunnels is located between about RL - 17.8 and RL - 18.2 where it intersects with the stub tunnel under Bligh Street. The crown of the stub tunnel will be between about RL - 24.4 and RL - 28.0 at this location to provide a separation distance of at least 6.6 m. Issues raised by RailCorp have been addressed during development of the concept design and RailCorp advised that this separation distance is appropriate and is unlikely to constrain future development of the MetroPitt corridor.

RailCorp requested the following information be provided during development of the detailed design:

- Tunnel design criteria;
- An electrolysis report for those areas of the project within 60 m of the existing electrified rail network (or other distance as agreed with RailCorp);
- A services search to identify the presence of any rail services in the immediate vicinity of the project;
- Geotechnical and Structural Reports for components of the project within 25 m of existing rail infrastructure;
- Construction methodologies, risk assessments, Safe Work Method Statements and any monitoring regimes applicable to rail infrastructure;

- Methods to prevent contaminants entering into the rail corridor, including possible stormwater ingress must be taken into account; and
- A dilapidation report identifying the condition of existing infrastructure prior to and after construction of the project.

These items of information are more relevant to subsequent stages of the Sydney CityGrid Project and the only item that is potentially relevant to Stage 2A(i) is the tunnel design criteria. This will be provided to RailCorp during development of the design.

RailCorp also advised that the following noise and vibration issues should be considered:

- Impacts of vibration on existing infrastructure e.g. road/ rail tunnels; and
- Impacts of vibration from rail operations on the project.

EnergyAustralia will continue to consult with RailCorp to address potential issues during development of the detailed design. This will include the opportunity to comment on relevant design information.

4.2.3 Sydney Water Corporation

EnergyAustralia consulted with Sydney Water Corporation (Sydney Water) during development of the concept design for Stage 2A(i) of the City East Zone Substation and a copy of correspondence received during preparation of this Environmental Assessment is provided in Appendix C. Sydney Water's main concerns related to the potential for construction to impact on water and wastewater mains and the State heritage listed Bennelong Stormwater Channel within O'Connell Street adjacent to the site for the City East Zone Substation.

Sydney Water indicated that there is the potential for construction to alter the existing rock stress regime around pipelines and create unfavourable vibrations. The integrity of the ground/rock support in the vicinity of these drainage lines would need to be maintained at all times during construction of the project and any rock bolting must avoid interference with the drainage lines and their trench or tunnel installation. The concept design will be developed to ensure that ground support such as rock anchors will not impact on these drainage lines.

Sydney Water requested that dilapidation assessments be undertaken prior to and at the completion of construction as well as possible condition monitoring during construction. As detailed in the Statement of Commitments in Table 17-1, dilapidation surveys will be conducted as part of the project.

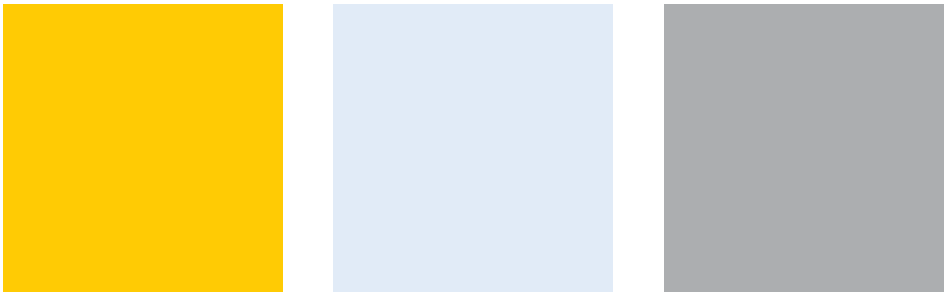
Sydney Water requested that its assets be accurately shown on the final drawings for detailed assessment and that geotechnical information be provided. It was also requested that construction be carried out in a manner that does not compromise the ability to maintain, renew, replace or appropriately enlarge the drainage lines. Works are not permitted within 3 m curtilage around each drainage line, without the appropriate level of heritage approval. Ongoing consultation will be undertaken with Sydney Water during development of the concept design and this will involve providing drawings to Sydney Water showing the location of known services and utilities relative to the excavations to be undertaken for the project.

4.2.4 Department of Environment, Climate Change and Water

DECCW was consulted during preparation of the noise and vibration assessment and the main issues discussed related to confirmation that the investigation should be undertaken in accordance with DECCW guidelines that are listed in MCoA 3.1e. As indicated in Section 9 and Appendix E, the noise and vibration assessment has been prepared in accordance with these guidelines.

4.2.5 Heritage Branch of the Department of Planning

The Heritage Branch of the Department of Planning was briefed regarding the works that are part of Stage 2A(i) of the City East Zone Substation. This involved a discussion of the scope and results of the archaeological and built heritage assessments that have been undertaken (refer to Chapter 10).



As the site has been substantially modified by excavation of the basements for Kindersley House in the 1960s and 1980s, the Heritage Branch indicated that the main issues associated with Stage 2A(i) would be related to the following aspects of built heritage:

- Impact of vibration on heritage listed buildings in the vicinity of the works;
- Impact on view lines to and from the heritage listed buildings in the vicinity of the works;
- The massing of the building envelope should be developed such that it is of an appropriate design and scale and does not overawe the adjacent heritage listed buildings.

Potential impacts on built heritage are assessed in the Statement of Heritage Impact prepared by Noel Bell Ridley Smith + Partners (Appendix F) which is summarised in Chapter 10. Potential impacts associated with vibration are assessed in Chapter 9. The results of these assessments conclude that Stage 2A(i) is unlikely to adversely impact on built heritage.

4.2.6 Metropolitan Local Aboriginal Land Council

A site inspection was undertaken by a representative from the Metropolitan Local Aboriginal Land Council on 19 April 2010. As construction of Kindersley House involved excavation into bedrock, it was considered highly unlikely that the site contains any items of significance to the indigenous community. On this basis, the Metropolitan Local Aboriginal Land Council confirmed that there are no specific issues requiring consideration (refer to Appendix C).

4.2.7 City of Sydney Council

EnergyAustralia met with representatives of the City of Sydney on 5 February 2010 to specifically discuss the staged approach to development of the City East Zone Substation. It was explained that this staged approach is required to minimise the timeframe required to deliver the overall Sydney CityGrid Project (refer to Section 5.2).

EnergyAustalia confirmed that the site at 33 Bligh Street, Sydney, had been purchased and that it would be developed as an integrated substation and commercial tower. EnergyAustralia would be responsible for development of the substation and an agreement would be entered into with Investa to develop the commercial tower.

The City of Sydney raised a number of issues relating to urban design of the integrated City East Zone Substation and commercial tower compared to a commercial tower that was previously approved to be constructed at the site. EnergyAustralia confirmed that a high quality urban design outcome would be achieved and this would involve the following stages:

- Stage 2A(i) would provide the information on the building envelope for the City East Zone Substation and commercial tower; and
- Stage 2A(ii) would involve a design review process in accordance with the requirements of the Concept Approval. This would follow a similar process to that which was implemented for the Belmore Park Substation.

It was agreed that it is important that Stage 2A(i) does not impose significant constraints on the ability for positive design outcomes to be achieved during Stage 2A(ii). It was subsequently agreed that the design review process would commence once the preliminary designs are sufficiently advanced to provide a basis for discussions and this is likely to be mid-2010.

4.2.8 EnergyAustralia interfaces

The main interface between Stage 2A(i) and other works undertaken by EnergyAustralia relates to tunnelling for the City East Cable Tunnel. Stage 2A(i) involves construction of a 150 m long stub tunnel under Bligh Street

from the City East Zone Substation to the City East Cable Tunnel. In this location, the alignment for the City East Cable Tunnel is generally located along Bent Street.

Potential issues associated with this interface are negligible as construction of the stub tunnel would occur well in advance of the City East Cable Tunnel. The tunnel boring machine that would be used to excavate the City East Cable Tunnel would intersect the stub tunnel chamber below the intersection of Bent Street and Bligh Street which is approximately 55 m below ground level.

As works that are part of Stage 2A(i) would be completed prior to commencing works that are subject to Stage 2A(ii), there would not be any issues associated with the interface between the two stages of construction at the site.

4.3 Community consultation

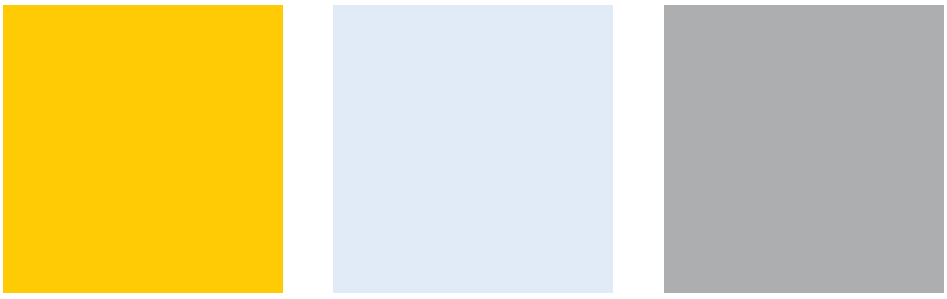
EnergyAustralia recognises the importance of effective communication with the community during the planning, construction and operation phases of a project. Community consultation to this point has involved the following properties:

- High rise towers;
- Radisson Hotel;
- Soffitel Wentworth Hotel;
- Grocon (located at 1 Bligh Street); and
- Adjacent landholders.

A site visit was undertaken to identify any buildings, businesses or organisations adjacent to or in the immediate vicinity of the site that are likely to have specific consultation requirements. Following this, the owners of adjacent and nearby buildings were contacted to arrange face to face meetings between property owners and members of the EnergyAustralia Community Relations team. These meetings aimed to outline the program of works and enabled stakeholders to ask questions and raise any issues or concerns they may have with the project. Meetings were undertaken with the following property owners as indicated in Table 4-1.

Table 4-1 Property owners consulted during the community consultation process

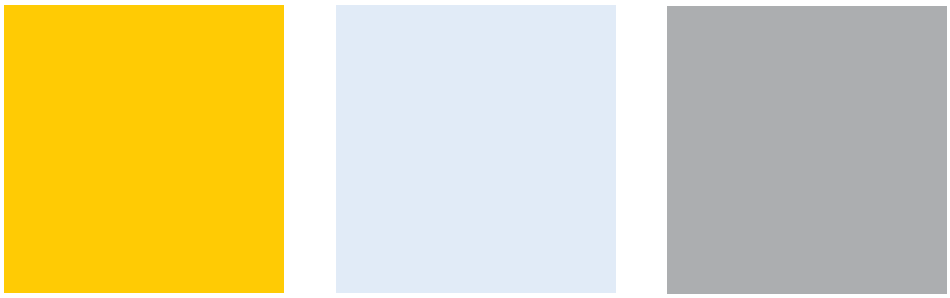
Property owner	Address
Bryant Strata Management	23-25 O'Connell Street
BCS Strata Management	37 Bligh Street
CB Richard Ellis	28-34 O'Connell Street
Coombes Property	44-48 Hunter Street
Strata Plus	16-18 O'Connell Street
Kingsmede	25 Bligh Street
Radisson Plaza Hotel	27 O'Connell Street
The Lowy Institute for International Policy	31 Bligh Street
The Soffitel Wentworth Hotel	61-101 Phillip Street



During these meetings, property owners raised a number of potential issues or impacts associated with construction of the substation and commercial tower. These issues are summarised in Table 4-2, along with the section of the Environmental Assessment that addresses the issues.

Table 4-2 Summary of stakeholder issues

Issue	Where addressed in the Environmental Assessment
Construction noise including concern that noise from demolition, excavation and construction vehicles may disrupt tenants in nearby businesses, customers at nearby restaurants, workers in the neighbouring Lowy Institute and patrons of the Radisson and Sofitel Wentworth Hotels.	Section 9
Parking and access including concern over: ◗ Lack of access to Bligh Street during construction ◗ Loss of on street parking ◗ The Radisson Hotel does not have its own parking facilities	Section 13
Concern regarding construction vehicles impacting upon the flow of traffic in the immediate vicinity of the site.	Section 13
Building owners are concerned that EMF will have a negative impact on tenants or equipment.	Not relevant to Stage 2A(i). This will be addressed in Stage 2A(ii).
Concern over unacceptable levels of reflectivity occurring due to the building design. Negative impact on the visual amenity of the area.	Section 16.4
Concern over disruptions to sleep and general amenity to those living within close proximity of the site, such as those at the Radisson or Sofitel hotels.	Section 9
Concern regarding dust from the demolition and excavation of 33 Bligh Street affecting customers at nearby outdoor seating café's and restaurants.	Section 14
Property agreements should be developed between EnergyAustralia and owners of impacted neighbouring buildings.	Section 17.3
Vibration caused by construction impacting on the sleep of those in the Radisson Hotel and workers at the Lowy Institute.	Section 9
The effect of the building design on wind patterns.	Section 16.5
The Radisson Hotel is concerned regarding electricity supply to their hotel. Previous construction works has caused a failure of a Sydney Water asset which impacted the underground substation in O'Connell Street. The hotel also had concerns with noise and traffic.	Sections 9 and 13



4.4 Exhibition of the Environmental Assessment

The Environmental Assessment will be public exhibited by the Department of Planning for a minimum period of 30 days in accordance with the requirements of the EP&A Act. During this time, a copy of the report will be available for viewing at selected locations and on websites maintained by the Department of Planning and EnergyAustralia.

During the exhibition period, government agencies, interested groups and organisations, and the community would be invited to make written submissions to the Department of Planning in response to the Environmental Assessment.

EnergyAustralia would also undertake community consultation during the exhibition period that is separate to the Department of Planning's formal exhibition process. This would provide the community with additional information and consultation activities would include:

- Distribution of a community newsletter outlining the Department of Planning's public exhibition process and identifying opportunities to respond;
- Letter box drops;
- Further meetings with stakeholders if required;
- Website information; and
- Project information hotline.

4.5 Consultation during construction Stage 2A(i) of the City East Zone Substation Project

As outlined in the Community Information Plan, EnergyAustralia would continue to liaise closely with affected properties and the wider community in Bligh, O'Connell and Hunter Streets to keep them informed of all aspects of construction. Ongoing consultation activities would include:

- A project information line;
- Community newsletters; and
- Notification of specific activities.

5. Project need and justification

This section outlines the need and justification for the project as well as the consequences of not proceeding. While most aspects are applicable to the whole CityGrid Project, specific reference is given to Stage 2A(i).

5.1 Overview of the need for the Sydney CityGrid Project

The need and justification for the Sydney CityGrid Project are described in detail in the Concept Environmental Assessment Report (PlanCom, 2008). In summary, the existing electricity supply infrastructure in the Sydney CBD requires refurbishment, replacement and augmentation to provide a secure supply of electricity to the Sydney CBD that complies with new licensing requirements. The requirements specify that all city zone substations and transmission feeders must achieve a 'n-2' capacity, which means that they must be able to supply the full electricity demand with any two transformers or feeders out of service.

EnergyAustralia developed the Sydney CityGrid Project as an integrated strategy that is the most effective means of rebuilding or refurbishing the existing infrastructure while maintaining sufficient space capacity to ensure an ongoing and reliable electricity supply. The overall objectives of the Sydney CityGrid Project are to:

- Meet and comply with the 'n-2' licence requirements;
- Replace critical infrastructure that is scheduled for retirement;
- Meet the forecast electricity network needs and demands in a cost effective manner;
- Facilitate prudent longer term investment decisions; and
- Provide the flexibility to accommodate future network upgrades.

The potential environmental impacts of the Sydney CityGrid Project were assessed in the 2008 Concept Environmental Assessment Report and Concept Approval was subsequently granted by the Minister for Planning on 20 September 2009. Project Approval was also granted for Stage 1 of the Sydney CityGrid Project relating to construction and operation of the Belmore Park Substation development. As such, it is considered that the need for and justification of the Sydney CityGrid Project have been demonstrated.

The following section outlines the need and justification for Stage 2A(i) within the context of the Sydney CityGrid Project.

5.2 Need and justification for the City East Zone Substation

5.2.1 Need for infrastructure

As detailed in the Concept Environmental Assessment, the existing City East 33kV/11kV zone substation located at Woolloomooloo was commissioned in the 1960s and is approaching the end of its technical life. As it is not feasible to replace the substation at the existing site, a replacement substation is planned for completion by 2016 to cater for the projected growth in load in the CBD and improve reliability standards to comply with the 'n-2' licence conditions.

The new City East Zone Substation is required to allow for the connection of 132kV feeders from the Riley Street STSS to the City North Zone Substation and potentially to the Dalley Street Zone Substation. A number of 11kV feeders would also link the City East Zone Substation to various parts of the northern-eastern Sydney CBD. EnergyAustralia purchased a site at 33 Bligh Street for the purposes of establishing the City East Zone Substation.

The City East Zone Substation is both needed and justified as all stages of the Sydney CityGrid Project are integrated and interdependent. Failure to construct the City East Zone Substation would compromise the

ability to achieve the objectives of the overall project. This is reflected in the Concept Approval and MCoA 1.3 specifically permits construction and operation of the new City East Zone Substation in the vicinity of Phillip, Bligh, Bent and O'Connell Streets, Sydney.

5.2.2 Need for an integrated substation and commercial development

EnergyAustralia was required to purchase sites for the Sydney CityGrid Project to construct essential above ground infrastructure such as the Belmore Park and City East zone substations. Land in the CBD is expensive and purchase of 33 Bligh Street represents a significant proportion of the capital investment cost of the City East Zone Substation.

In terms of building height, the substation would be relatively small in stature (about 40 m) compared to existing buildings in this part of the CBD where building heights are commonly in excess of 100 m. As the site currently features two commercial buildings and has development consent to construct a 205 m commercial tower, an opportunity was identified to develop the site as an integrated substation and commercial tower.

EnergyAustralia and Investa Property Group (a commercial developer) subsequently entered into an agreement to develop the site as an integrated substation and commercial tower. This approach would allow the airspace above the substation to be developed for commercial purposes to reduce the capital cost of the substation and integrate the site into the surrounding urban environment. EnergyAustralia would be responsible for development of the substation while Investa Property Group would be responsible for development of the commercial tower above the substation. The substation and commercial tower would be built in a single construction phase.

The integrated development is therefore needed as it would have the dual benefit of:

- Realising a commercial return on the purchase of the site by developing a commercial tower in the airspace above the substation; and
- Providing a building envelope that is consistent with the built form of the surrounding environment which is characterised by high rise commercial towers.

5.2.3 Need for staged development of the City East Zone Substation

As detailed in Section 3.1, the next step in the approval process under the EP&A Act involves obtaining Project Approval to construct and operate the City East Zone Substation. Following a number of network supply interruptions in early 2009, EnergyAustralia committed to completing the Sydney CityGrid Project prior to the system need dates required to meet regulatory licence conditions. The main opportunity identified to reduce the timeframe required to deliver the Sydney CityGrid Project involves splitting the development approval for the City East Zone Substation into the following stages:

- **Stage 2A(i)** – Site preparation, demolition of the existing building at 33 Bligh Street Sydney, bulk excavation for the substation basement, excavation and construction of a shaft and a 150 m section of tunnel beneath Bligh Street to the intersection of Bent Street and Bligh Street, and construction of a bridging structure over the alignment of the tunnels for the CBD Metro Stage 1, if required; and
- **Stage 2A(ii)** – Construction and operation of the City East Zone Substation and commercial tower.

There is a high degree of certainty regarding the design of those elements included in Stage 2A(i), however, substantial work is required to design the substation and commercial tower and comply with MCoA 3.2 (refer to Section 6.3). Stage 2A(i) has been developed to ensure that it does not constrain the future design of the substation and commercial tower during Stage 2A(ii). A building envelope and proposed stratum subdivision are included as part of Stage 2A(i) to demonstrate that this stage has been developed with sufficient flexibility to allow refinement of the exterior elements during Stage 2A(ii). As such, EnergyAustralia is in a position to seek project approval for Stage 2A(i) prior to Stage 2A(ii), and, importantly, without precluding positive outcomes being achieved during the design of Stage 2A(ii).

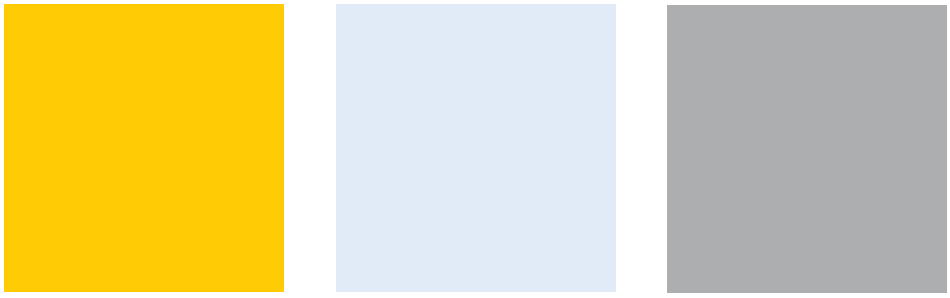
This staged approach would reduce the timeframe to deliver the City East Zone Substation by approximately 9 - 12 months which is a significant consideration given EnergyAustralia's commitment to deliver parts of the Sydney CityGrid Project in advance of the system need date. The reduction in timeframe would be achieved by allowing those aspects included in Stage 2A(i) to proceed while approval is sought for Stage 2A(ii). By implementing this approach, it is anticipated that Stage 2A(i) would be completed immediately prior to works commencing on Stage 2A(ii).

MCoA 3.2 requires that a design review process be implemented for the City East Zone Substation based on the principles of the design review competition in the Sydney Local Environmental Plan 2005.

EnergyAustralia propose to use a similar process to that which was successfully implemented for the Belmore Park Substation and involved representatives of EnergyAustralia, City of Sydney Council, and a panel of architectural peers to critique the design and refine the final built form. The process would commence once the design of the buildings has sufficiently progressed to allow these discussions to occur and the outcomes would be documented in the Environmental Assessment for Stage 2A(ii).

The staged approach to construction and operation of the City East Zone Substation is both needed and justified because:

- It would reduce the timeframe to deliver the other interrelated components of the Sydney CityGrid Project prior to the system need date; and
- Stage 2A(i) would not preclude positive design outcomes occurring resulting from the design review process for Stage 2A(ii).



6. Description of the project

This section describes the components of the project, the proposed construction method and timing, and potential interfaces within and external to the project.

6.1 Overview

As detailed in Section 5.2, Stage 2A of the Sydney CityGrid project has been divided into two stages to reduce the duration required to deliver the City East Zone Substation. Stage 2A(i) is the subject of this Environmental Assessment and involves the following main construction stages:

- Site preparation;
- Demolition of the existing buildings at 33 Bligh Street, Sydney;
- Bulk excavation for the substation basement;
- Excavation and construction of a shaft and a 150 m section of tunnel beneath Bligh Street to the intersection of Bent Street and Bligh Street where it will interface with the City East Cable Tunnel Project. The City East Cable Tunnel is known as Stage 2D of the Sydney CityGrid Project and is subject to a separate Environmental Assessment; and
- Construction of a bridging structure over the alignment of the stub tunnels for the CBD Metro Stage 1, if required.

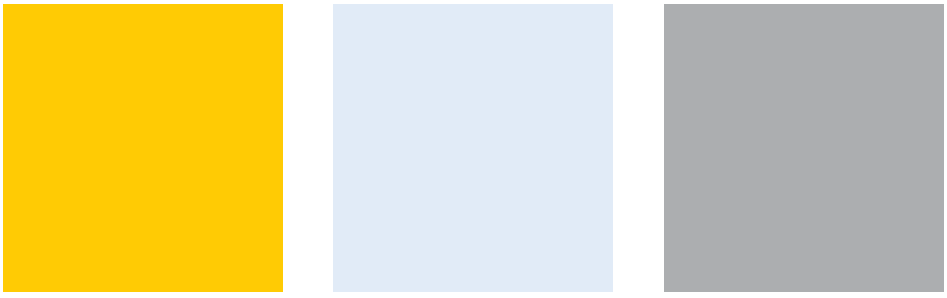
The objective of the staged approach is to allow the Stage 2A(i) works to proceed while the final design details for Stage 2A(ii) are being refined and subsequently approved.

This staged approach to construction of the City East Zone Substation is possible because there is a high degree of certainty regarding the design requirements of the components that form Stage 2A(i) and these have been designed to ensure that there is minimal impact on Stage 2A(ii). The only element of the Stage 2A(i) works that could potentially influence or constrain the design of the substation and tower during Stage 2A(ii) relates to the foundation structure over the tunnels for the CBD Metro Stage 1. A building envelope including proposed stratum subdivision is included as part of Stage 2A(i) to demonstrate that this stage has been developed with sufficient flexibility to accommodate future development as part of Stage 2A(ii), inclusive of the possible presence of the CBD Metro Stage 1.

At this time, it is assumed that the Metro corridor will need to be protected as required by ISEPP and a bridging structure is required over the tunnel alignment. The design of the bridging structure has been developed with sufficient flexibility to minimise potential constraints on the design of the substation and commercial tower in Stage 2A(ii) and will be the subject of a separate agreement with Sydney Metro.

The primary objective of Stage 2A(i) is to obtain approval to demolish the existing building and undertake subsurface works to facilitate construction of the City East Zone Substation. The secondary objective of Stage 2A(i) is to obtain approval for a building envelope for the subsequent development of the site that will include the substation and a commercial tower above the substation.

The following sections outline the works that would be undertaken as part of Stage 2A(i). Although approval for the design of the substation and commercial tower is not sought as part of Stage 2A(i), an indicative description is provided to outline the maximum anticipated building envelope and proposed stratum subdivision. This envelope would be refined during development of the design and associated design review process undertaken as part of the Environmental Assessment for Stage 2A(ii).



6.2 Construction method

The following section outlines an indicative construction method for Stage 2A(i). This method would be refined by the contractor during the detailed design and construction planning phases. The indicative work method described below does not preclude the contractor from using alternative methods provided that the resulting environmental impacts are generally consistent with those described in this Environmental Assessment.

6.2.1 Site establishment

Hoardings

Hoardings or other protective structures would be installed along several site boundaries to provide a safe working environment for construction workers, as well as those in the surrounding area. As indicated in Figure 6-1, this would include hoardings:

- Along the Bligh Street frontage. This would provide overhead protection for pedestrians as well as potentially facilitating site amenities on the first level on top of the hoarding. This hoarding would extend from the site boundary to the edge of Bligh Street and would enclose part of Richard Johnson Square. It would also extend over the existing kiosk within Richard Johnson Square to ensure the safety of the vendor and customers;
- Along the O'Connell Street frontage. This would provide overhead protection for pedestrians as well as potentially facilitating site amenities on the first level on top of the hoarding;
- Adjacent to the rear fire exit for the Mulpha building. The stair well between the Mulpha building and Ashington House serves as fire exit from the Mulpha Building. Overhead hoarding would be installed to provide safe egress from this fire exit at all times.
- Adjacent to the access ramp to 37 Bligh Street. This would provide overhead protection to those accessing 37 Bligh Street;
- Adjacent to the entrance to Ashington House – 44 - 48 Hunter Street car park; and
- Adjacent to the Lowy Institute.

All hoardings would be erected in accordance with the City of Sydney Guidelines for Temporary Protective Structures. The overhead hoardings would be designed to accommodate loads from scaffolding that may be required during demolition of the building.

Installation of the hoardings and associated overhead protection for pedestrians is likely to require remove of street trees along O'Connell Street. The contractor would implement reasonable and feasible measures to refine the construction method to minimise the number of trees to be removed. Any trees removed would be replaced with advanced stock as part of Stage 2A(ii) and the species would be selected in consultation with the City of Sydney Council.

Figure 6-1 Indicative location of hoardings

Site amenities

Site amenities are likely to be provided above the hoardings adjacent to Bligh Street and O'Connell Street and would include first aid rooms, induction rooms, lunch sheds, change rooms and amenities. The location of the site amenities would be selected with due consideration to factors such as clearances required to load/unload trucks.

Dilapidation surveys

Dilapidation surveys of the surrounding buildings and adjoining structures would be completed prior to the commencement of construction. The surveys would provide the basis for stakeholders to assess the extent of any damage that may be attributed to the project.

Service disruptions and disconnections

Permanent services to Kindersley House, such as gas, electricity, water, sewer, electricity and communications would be disconnected prior to commencement of construction. Consultation would be undertaken with relevant service and utility operators to determine whether any existing services need to be relocated. If relocation is required, this would be undertaken in accordance with the requirements of the relevant service provider.

Temporary service and utility connections would be provided for use during construction.

Scaffolding

Heavy duty scaffold would be erected around the external walls to protect adjacent buildings from damage during demolition. The scaffold would be encapsulated by chainwire and shadecloth.

Site access

The site may be accessed from both Bligh and O'Connell Streets. Pedestrian and traffic control devices would be implemented to ensure access and safety is maintained for all road and footpath users.

Class B reinforced gantry hoarding would be erected on both street frontages to provide a secure corridor for pedestrian movement along the footpaths between the site hoarding and the vehicles being loaded or unloaded.

A work zone for construction vehicles would be required for the full length of the Bligh Street frontage. This would utilise the existing parking/traffic lane on the western side of Bligh Street and would maintain the existing traffic lane and parking lane on the eastern side. There may be a requirement to introduce parking restrictions on the eastern lane to maintain traffic flows.

A work zone for construction vehicles would also be required for the full length of the O'Connell Street frontage. This would utilise the existing parking lane on the eastern side of O'Connell Street and would maintain the existing two traffic lanes and parking lane on the western side.

Measures to be implemented to manage impacts associated with changes to traffic and pedestrian conditions would be discussed with the City of Sydney during preparation of the traffic management plan that would be prepared as part of the CEMP.

6.2.2 Demolition of Kindersley House

Demolition of Kindersley House would be undertaken in several stages, the first stage being the removal of any identified hazardous materials, followed by the removal of plant and equipment and then demolition of the structure which would occur on a floor by floor basis. The internal strip-out of the non-structural walls, ceilings, services and finishes would be removed first and the external walls would be left as long as possible to help reduce dust, noise and vibration transfer to neighbouring buildings.

Table 6-1 lists the estimated waste quantities from demolition of Kindersley House. A total of approximately 23,000 tonnes (29,300 m^3) of various materials would require management through reuse/recycling or disposal.

Table 6-1 Estimated demolition waste quantities

Material	Estimated quantity (tonnes)
Wood	4800
Drywall/ gyprock	2300
Metals	1600
Concrete	12,200
Plastics	700
Other	1400
Total	***23,000***

The following sections outline indicative tasks that would be undertaken during demolition of Kindersley House.

Removal of hazardous materials

A hazardous materials audit of Kindersley House was undertaken by Environmental Monitoring Services in 2005 which indicated the presence of the following hazardous materials:

- Synthetic mineral fibres containing asbestos. This was found in materials such as fibrous insulation, fibrous cement pipes, fibrous cement sheeting, vinyl floor tiles, fibrous gaskets, and fibrous putty/sealant;
- Paint containing at least 1% lead was identified on a number of doors, door frames and walls; and
- Polychlorinated biphelols in fluorescent light fittings.

Detailed safety plans would be prepared to ensure that removal of these materials is carried out in accordance with relevant legislation and occupational health and safety requirements. Materials would also be classified and disposed of in accordance with DECC's Waste Classification Guideline (2008).

As synthetic mineral fibres are present in some of the internal walls, workers would wear appropriate personal protective equipment clothing during this task. Synthetic mineral fibres would be wrapped in plastic and disposed of in accordance with Worksafe Australia's Synthetic Mineral Fibres - National Standard and National Code of Practice.

A hazardous material clearance certificate would be obtained prior to demolition commencing.

Internal strip-out

The internal strip out refers to removal of the non-structural components of the building. Before this task commences on each floor, demolition areas would be barricaded and appropriate signs placed at the entry points to the floors to advise that it is a restricted area. The strip-out would commence after services such as water, sewer, communications and electricity have been isolated on the affected floor.

Floor finishes including carpet and underlay, along with ceilings and services such as pipes and cables would be removed. This may involve the use of equipment such as bobcats.

Partition and block walls would be demolished using equipment such as an excavator. A mobile crane set up on the existing hardstand area between the two buildings would be used to lift the bobcats and excavators to the floor being demolished.

Material is likely to be sorted into different stockpiles on floors being demolished depending on whether it is to be recycled, reused, or disposed of at a licensed landfill. A bobcat or small excavator may be used to load material from the building into the existing lift shafts which would be used as a drop zone.

The area at the bottom of the drop zone at ground floor level would be cordoned off to prevent access by unauthorised personnel. From here, the material would be loaded onto trucks and taken off site to land fill or recycling. A mist spray sprinkler would be established over the drop zone area to minimise dust during the dropping of material from the working floor.

Combustible demolition material would be removed from site on a regular basis and would not be stockpiled in large quantities.

Structural demolition

This task would involve demolition of the structural components of the building, including the concrete floors, brick walls and timber framed rooves of the buildings after internal strip-out is complete.

Before commencement of demolition, the area around the floor area to be demolished would be cordoned off and appropriate demolition signs displayed. The area under the floor to be demolished would also be cordoned off to all site personnel and signs would be displayed warning that access to the area is restricted.

The roof cladding and timber frame of small structures on the roof of the building would be removed by workers wearing safety harnesses attached to retractable reels. Access to the roof for the workers to remove the roof cladding and frame would be via the existing stair access. Roof cladding would be stacked on the roof frame prior to being lifted to the ground by crane. The location of the crane would be determined by the contractor during detailed construction planning.

The upper floors and internal brick walls of the buildings would be demolished using equipment such as an excavator, bobcats, sledgehammers and jackhammers. Rubble would be pushed into the lift shaft drop zone. A crane would be used to lift the demolition equipment to the roof of the buildings.

When working near the perimeter boundaries of the site, workers would use the external scaffolding for access and would demolish the perimeter walls back inside the building.

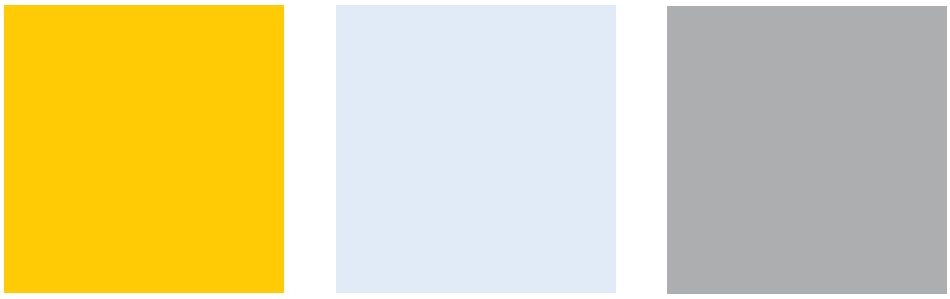
After the excavator has demolished the majority of the slab with the exception of the section of structure it stands on, it would ramp down to the floor below using structural steel ramps. The excavator would then demolish the last structural bay section as it stands on the floor below. The building would be left in a structurally sound condition at the conclusion of each working day with no unstable wall, floor or column left unbraced. This demolition process would be repeated and the perimeter scaffolding removed progressively with the demolition of the building.

The lower two floors of the buildings would be demolished by large excavator working from the ground with either bucket or hydraulic hammer attachment. An excavator would be used to process the materials and load onto trucks for transport to either a recycling yard for reprocessing or to landfill for disposal.

Demolition of buildings near boundaries

Heavy duty scaffold would be erected around the external walls to protect adjacent buildings from damage during demolition. The scaffold would be encapsulated by chain wire and shade cloth and would be progressively removed as the external walls are demolished. The brick external walls, concrete beams and columns would be demolished by excavator with a bucket and hammer attachment. The excavator would use the bucket to pull sections of the brick wall into the building so it can be removed by bobcat.

All faces of adjoining buildings that are exposed would be weatherproofed with a thick plastic and timber batten if the building façade is not found to be weather protected.



Once all above ground structures have been demolished, the large excavator working on the ground would commence demolition of the concrete ground slab with hammer and bucket attachment. The excavator would break sections of the slab with the hammer attachment and then use its bucket attachment to lift and fold the sections of slab.

Structural demolition would not be performed during high winds that may cause dust to spread to the site boundaries. Surrounding roads and pavements would be swept clean on a regular basis to ensure they are free of construction debris. This may involve the use of street sweepers.

On completion of the removal of the ground slab, the site would be cleared of all demolition debris and the machinery removed from site.

Measures would be implemented to suppress dust throughout the demolition process.

Materials handling and access during demolition

Construction would involve the use of cranes, staff and materials hoists, storage of material and the removal of rubbish and debris. The materials handling system would be developed by the contractor during the detailed design phase and would be described in detail in the CEMP.

Access arrangements to the site would be confirmed by the contractor during detailed demolition planning and defined in the CEMP. Access to the site would be provided from Bligh and O'Connell Streets. If it is structurally possible, voids would be created within the building to allow access for vehicles to enter the site and be loaded with demolition waste.

If it is not structurally possible to create the voids to enable onsite loading of waste, vehicles would park adjacent to the site and be loaded using cranes. In this case, protective gantries would be installed over the footpaths to ensure pedestrian access and safety is maintained.

The CEMP would include specific measures to minimise impacts on pedestrian access and safety and may involve traffic controllers to guide / protect pedestrians, alarms, lights and retractable barriers to separate pedestrians from vehicle movements.

6.2.3 Bulk excavation of the substation basement

Following completion of demolition works, bulk excavation would likely commence at the O'Connell Street elevation and would progress in an easterly direction. During excavation, access to the site would be via O'Connell Street and Bligh Street.

Further work will be undertaken during the detailed design phase to ensure that bulk excavation works are designed and performed to minimise the risk of ground movements / settlement. This would involve:

- Geotechnical investigations, interpretation, and modelling, if required, to assess and predict likely horizontal ground movements associated with rock stress relief as bulk excavation proceeds;
- Designing a shoring / retention system around the perimeter of the bulk excavation to ensure that horizontal ground movements are kept within acceptable limits and reduce the risk of damage to adjoining structures;
- Designing a foundation system (e.g. piles and pad footings) that minimises the risk of ground settlement; and
- Designing a bridging structure to span the potential tunnels for the CBD Metro Stage 1, if required, to minimise the risk of structural damage and settlement associated with the tunnel induced ground movements.

Underpinning and shoring works on the perimeter of the site would commence during initial stages of bulk excavation. These works may require a number of different techniques including but not limited to,

underpinning, rock anchors and temporary shoring. These works are generally programmed to occur concurrently with the bulk earthworks and may encroach on the footpaths of Bligh and O'Connell Streets. Temporary footpath closures or pedestrian diversions may be required for works that encroach on footpaths. In limited situations, temporary shoring works would be required to be undertaken concurrently with perimeter demolition works.

Equipment used in the bulk excavation would include rippers, rock saws, rock hammers and excavators. Rock saws are likely to be used at the perimeter of the excavation. The size of rock hammer and excavator used would be dependent on the task, with larger machinery likely to be used during bulk excavation and smaller machinery during detail excavation.

The bulk excavation for the basement would extend to a depth of approximately RL -13.55, which is approximately 25.9 m below the level of O'Connell Street (RL12.35), and 32.7 m below the level of Bligh Street (RL19.15). As discussed in Section 4.2, extensive consultation has been undertaken with Sydney Metro and it has been agreed that this excavation depth for the substation basement would not adversely impact on the viability of the tunnels for the CBD Metro Stage 1. It has been agreed that 2 m is an appropriate separation distance between the substation bridging structure and the CBD Metro Stage 1 tunnels. The location of the tunnels within the proposed building envelope are shown in Figure 6-5.

Bulk excavation would also involve excavation of cable riser shafts within the Bligh and O'Connell Street road reserves adjacent to the site boundary. This is likely to require temporary partial closure of the footpaths in the immediate vicinity of the works. Following excavation of the cable riser shafts, a temporary surface would be constructed to provide pedestrian access across the excavations.

The dimensions of basement excavation have been developed to utilise the entire footprint of the site. Future refinements to the built form of the substation during Stage 2A(ii) would not alter the basement footprint and the depth of the basement excavation cannot increase because of the CBD Metro Stage 1 tunnel corridor.

Groundwater that seeps into the excavation for the basement and bridging structure would be collected, treated and pumped to the stormwater system. The treatment system would be designed such that discharged water complies with the requirement of Section 120 of the POEO Act.

It is estimated that approximately 43,153 m^3 of in-situ material would be excavated for the basement. This equates to a bulked volume of 72,066 m^3 based on a bulking factor of 1.67. The spoil would be loaded onto trucks and removed from site for reuse and/or disposal at a licensed landfill. The reuse and/or disposal location would be determined by the contractor undertaking the works.

6.2.4 Stub tunnel and associated shaft

A stub tunnel is required beneath Bligh Street to connect the City East Zone Substation with the City East Cable Tunnel which would pass beneath Bent Street. The stub tunnel would be approximately 150 m long and would be excavated using a road header, such as a Mitsui 200 or similar equipment. As indicated in Figure 6-3, the cross sectional dimensions would be about 4 m wide by 4 m high.

Further investigations would be undertaken during development of the detailed design to ensure that the stub tunnel is designed and constructed to minimise the risk of ground settlement and potential settlement induced damage to existing buildings and other above ground and underground infrastructure. This would be achieved by:

- Geotechnical investigations and interpretation of ground conditions along the tunnel alignment that would provide input to the structural design;
- Designing the tunnel as a fully lined "tanked" tunnel to limit the amount of groundwater to 300 litres/100 m/day and to minimise the risk of drawdown of the groundwater table that would be associated with long

term seepage into a "drained tunnel". Reducing the risk of drawdown of the groundwater table also minimises the risk of settlement along the alignment and the associated risk of damage to buildings;

- Selecting vertical alignments to maintain adequate clearance to existing aboveground and underground infrastructure and to provide adequate rock cover to limit tunnel induced ground surface settlement;
- Designing the tunnel lining to withstand expected permanent loads associated with the full range of ground conditions and groundwater levels (e.g. rock and water) pressures; and
- Modelling expected ground settlements due to tunnelling works to prove design inputs and assumptions and confirm that expected ground movements and ground settlement would be within acceptable limits.

The stub tunnel would commence from a shaft extending from the basement of the City East Zone Substation at a depth of about RL - 22.8 and decline to about RL - 34.41 beneath the intersection of Bent Street and Bligh Street (refer to Figure 6-2).

Construction of the shaft and tunnel would generally involve:

- Excavation of the shaft using a rock breaker;
- Excavation of the tunnel using the road header;
- Installation of mesh and rock bolts; and
- Installation of shotcrete on the walls.

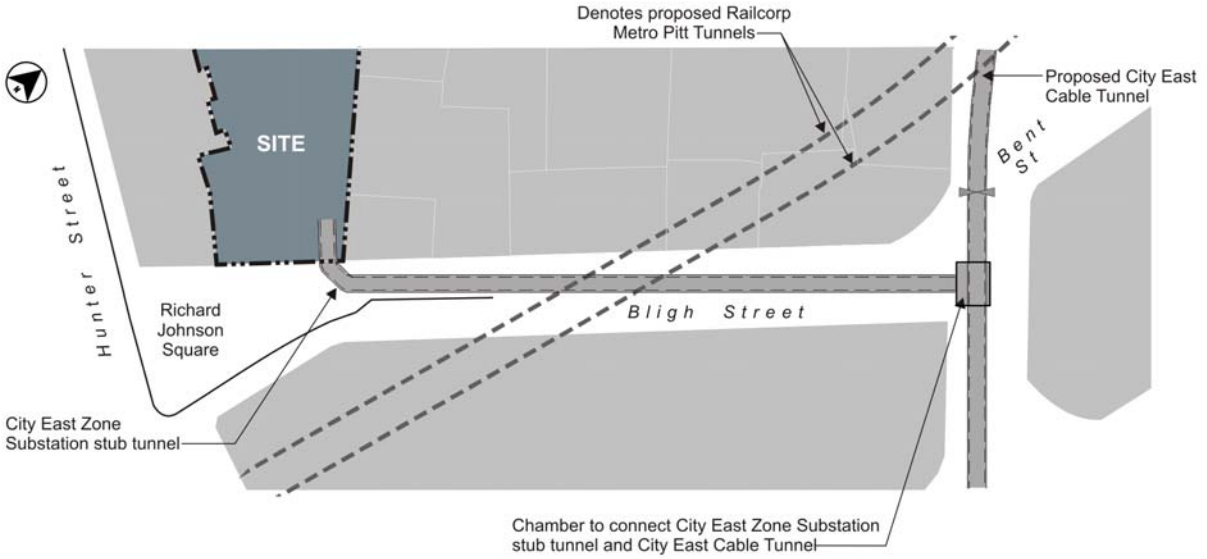
Midway along Bligh Street, the stub tunnel would pass beneath the Metro Pitt corridor that has been reserved for future expansion of the rail network by RailCorp. In this location the stub tunnel would be at a depth of about RL – 27, which is at least 8.6 m below the Metro Pitt tunnels (RL - 17.17 and RL - 18.16). As discussed in Section 4.2, RailCorp has confirmed that this separation distance is adequate and would not compromise the future viability of expansion of the rail network within the Metro Pitt corridor.

It is estimated that approximately 2914 m^3 of in-situ material would be excavated from the shaft and tunnel. This equates to a bulked volume of 4866 m^3 based on a bulking factor of 1.67. This material would be transferred along the tunnel and removed by crane from a shaft within the site. The spoil would be loaded onto trucks and disposed offsite.

Groundwater that seeps into the tunnel during the construction phase would be collected, treated and pumped to the stormwater system. The treatment system would be designed such that discharged water complies with the requirements of Section 120 of the POEO Act.

The design includes a fully lined stub tunnel to limit the volume of groundwater that seeps into the tunnel. Management of any groundwater that seeps into the tunnel during the operational phase will be detailed in the Environmental Assessment for the City East Cable Tunnel. This is likely to involve connecting the City East Zone Substation and stub tunnel to the groundwater treatment system that would be used for the City East Cable Tunnel.

Figure 6-2 Indicative long section of the stub tunnel



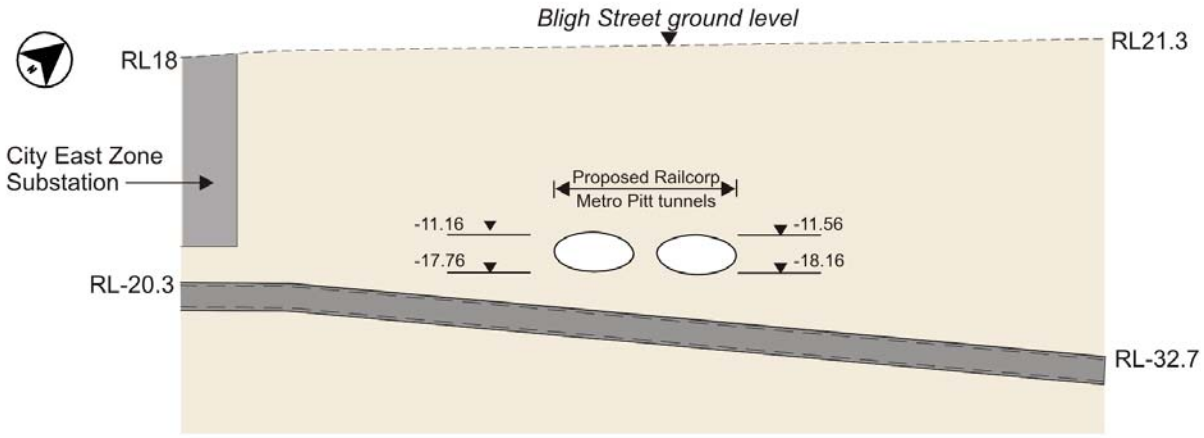
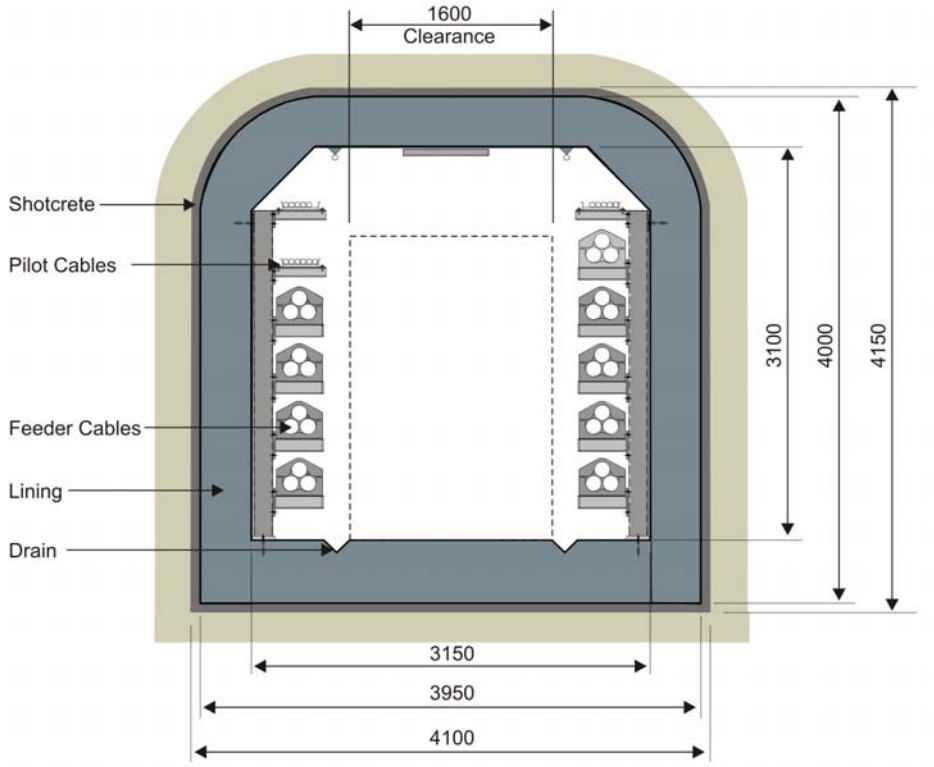


Figure 6-3 Indicative cross section of the stub tunnel



6.2.5 Bridging structure over the tunnels for the proposed CBD Metro Stage 1

As indicated in Figure 6-4 and Figure 6-5, the alignment of the tunnels for the CBD Metro Stage 1 pass beneath the site. Although the NSW Government has announced that the CBD Metro Stage 1 will not proceed at this time, Project Approval has been granted under Part 3A of the EP&A Act and the alignment of the tunnels form part of a rail corridor as defined by ISEPP (refer to Section 3.2.1). It is assumed that the corridor will be retained and the substation and commercial tower must be designed to accommodate the future presence of the CBD Metro Stage 1.

The bridging structure would not be constructed if the NSW Government determines that this rail corridor does not need to be retained. Although this would require changes to the foundation designs, it is unlikely to substantially alter the building envelope. Detailed design investigations may also identify opportunities to raise the basement level of the substation such that a bridging structure is not required.

EnergyAustralia consulted with Sydney Metro as detailed in Section 4.2 and it was agreed in principle that EnergyAustralia would construct a bridging structure over the tunnel alignment to ensure the structural integrity of both the substation and the CBD Metro Stage 1 tunnels is maintained. The bridging structure would ensure that there is a safe and efficient transfer of loads from the substation and commercial tower to the strata below without adversely affecting the corridor.

A concept design for an appropriate support scheme has been undertaken by EnergyAustralia which indicates a solution to transferring the building loads around the corridor is feasible and likely to involve strip spread footings and possibly piles. These footings would be situated above and adjacent to the tunnels to distribute

the tower column loads over and around the CBD Metro Stage 1 tunnel protection zone. The final design of the bridging structure would be determined during the detailed design phase.

It is estimated that approximately 2790 m^3 of in-situ material would be excavated to construct the bridging structure. This equates to a bulked volume of 4659 m^3.

A concept design for the bridging structure indicates that it is possible to accommodate the foundation loads associated with the building envelope outlined in Section 6.3. Future refinements to the built form of the substation and tower during Stage 2A(ii) are unlikely to substantially alter the design of the bridging structure.

Materials handling and vehicle access during bulk excavation and tunnelling

The materials handling system and vehicle access arrangements during bulk excavation and tunnelling would be developed by the contractor during the detailed design phase and would be described in detail in the CEMP. The following section provides an indicative work method.

During the initial stages of bulk excavation, vehicles would access the site to deliver plant and materials and be loaded with spoil prior to transport offsite. As the vehicles would be required to cross footpaths on Bligh and/or O'Connell Streets, a pedestrian management plan would be prepared as part of the CEMP to ensure that potential impacts on pedestrian access and safety are minimised.

As the depth of the excavation increases, it would reach a stage where it is no longer practical to construct ramps to allow trucks to be loaded with spoil within the site boundaries. Once this stage is reached, alternative vehicle access arrangements would need to be implemented and may involve vehicles being loaded and unloaded while parked on Bligh or O'Connell Streets using cranes situated within the site. Class B reinforced gantry hoarding would be erected to provide a secure corridor for pedestrian movement along the footpaths between the site hoarding and the vehicles being loaded or unloaded. A frame to secure the spoil kibble while unloading into trucks and surrounding hoarding would be positioned in the traffic lane adjacent to the site. This land would be occupied using EnergyAustralia's powers under the *Electricity Supply Act 1995.* Parking on the eastern side of Bligh Street may need to be removed and converted to a live traffic lane allowing two lanes to continue to operate. Parking on O'Connell Street adjacent to the site may need to be removed and converted to a works zone or similar if O'Connell Street is used as an access point.

A variation on this system would involve trucks parking adjacent to the site to be loaded / unloaded. A pedestrian path would be established in the street lane adjacent to the site with full protective measure to separate cars from pedestrians and possibly an overhead gantry for additional protection. A pedestrian safety procedure would be implemented as part of the CEMP, which may involve traffic controllers and retractable barriers to separate pedestrians from vehicle movements. This variation would be contingent on loading allowances on the ground next to the basement excavation.

Figure 6-4 Alignment of rail corridors in the vicinity of the site

6.3 Building envelope for the City East Zone Substation and commercial tower

6.3.1 Overview

EnergyAustralia is seeking Project Approval for a building envelope for the substation and commercial tower and proposed stratum subdivision as part of Stage 2A(i), while final design approval to construct and operate these elements would be sought in Stage 2A(ii). As discussed in Section 6.1, the only element of the Stage 2A(i) works that could potentially influence or constrain the design of the substation and tower during Stage 2A(ii) relates to the foundation structure over the tunnels for the CBD Metro Stage 1. The purpose of the building envelope is to demonstrate that the design of Stage 2A(i) is able to accommodate subsequent design development during Stage 2A(ii), inclusive of the possible presence of the tunnels for the CBD Metro Stage 1.

Design of the substation and commercial tower during Stage 2A(ii) would involve a design review process that meets the requirements of MCoA 3.2. This process would be similar to that implemented for the Belmore Park Substation development, which is also part of the Sydney CityGrid Project and involved development of the design in consultation with representatives from EnergyAustralia, City of Sydney, and other selected architectural peers. The outcomes of the design review process would be documented in an Environmental Assessment submitted as part of an application for Project Approval for Stage 2A(ii).

During the design review process for Stage 2A(ii), EnergyAustralia will investigate reasonable and feasible opportunities to refine the substation design to attempt to provide a ground level building line that is set back from the property boundary along the Bligh Street frontage and is generally consistent with the setback of the adjacent former NSW Club House (the Lowy Institute). This process will consider alternative internal layouts for equipment within the substation, however it will not consider options that compromise the operational requirements or its functional role of the substation as part of the overall Sydney CityGrid Project, or unreasonably impact or constrain the development of the commercial tower component. Adjacent building owners will be consulted during this process, including the Lowy Institute.

EnergyAustralia has entered into an agreement with Investa Property Group (Investa) for joint development of the site. EnergyAustralia is responsible for development of the City East Zone Substation and Investa is responsible for development of the commercial tower above the substation. The design of the substation and commercial tower will be coordinated to ensure the two buildings function as an integrated development.

It is intended that construction of the substation and commercial tower would occur as a single phase such that there is no delay between completion of the substation and commencement of the commercial tower. One of the primary objectives of this integrated development is to ensure that the continuous operation and maintenance of the substation is unimpeded by the commercial tower. To accommodate this requirement, the substation will be designed to enable it to be constructed and operated independently of the commercial tower. This approach means that delays to construction of the commercial tower due to unforseen circumstances would not impact on construction and operation of the substation.

The building envelope has been developed to address the following constraints:

- The transformer bays in the substation require vehicle access at street level;
- Based on the area required for the five transformers and associated ancillary plant and equipment within the substation, there is insufficient space to provide active frontages to Bligh or O'Connell Streets that accommodate retail or commercial space; and
- The tunnel corridor for CBD Metro Stage 1 passes beneath the site. The City East Zone Substation Project must be undertaken such that it does not preclude the viability of the CBD Metro Stage 1. This requirement limits the depth of excavation that is able to be undertaken for the City East Substation Project.

The following sections summarise the report prepared by Kann Finch relating to the building envelope which is included in Appendix J.

6.3.2 Built form

As indicated in Figure 6-5, the City East Zone Substation would be located in the basement and podium levels, while the commercial component would be a tower above the podium. The purpose of the podium would be to distinguish between the two components of the integrated development. The substation podium would have a height of approximately 48 m above O'Connell Street and 42 m above Bligh Street. The commercial tower would have a height of about 128.5 m above Bligh Street.

The building envelope has been designed to reinforce the scale and character of the surrounding urban context. This includes consideration of potential impacts on the heritage listed buildings in the adjacent streetscapes.

The commercial tower would be approximately 66.5 m lower than the height of the building that has consent to be constructed on the site, under D/2007/1270.

Conceptual floor plans for the substation and commercial tower are provided in Figure 6-6 and Figure 6-7 respectively. The commercial tower would have a floor space area of approximately 28,050 m^2 which equates to a floor space ratio of 13.75:1 based on a total site area of 2040 m^2.

Figure 6-5 Building cross section

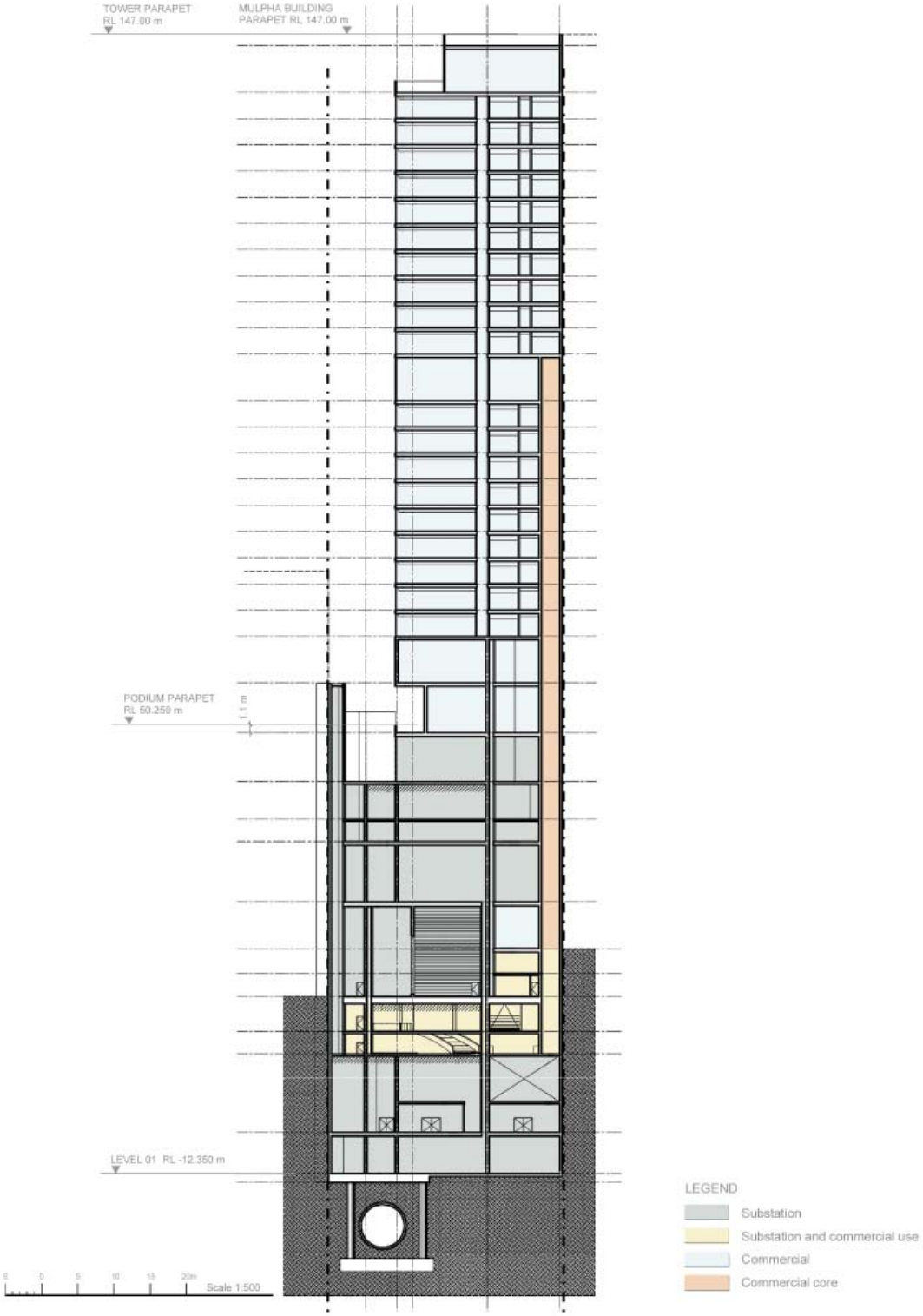


Figure 6-6 Conceptual floor plan for basement level 2 of substation

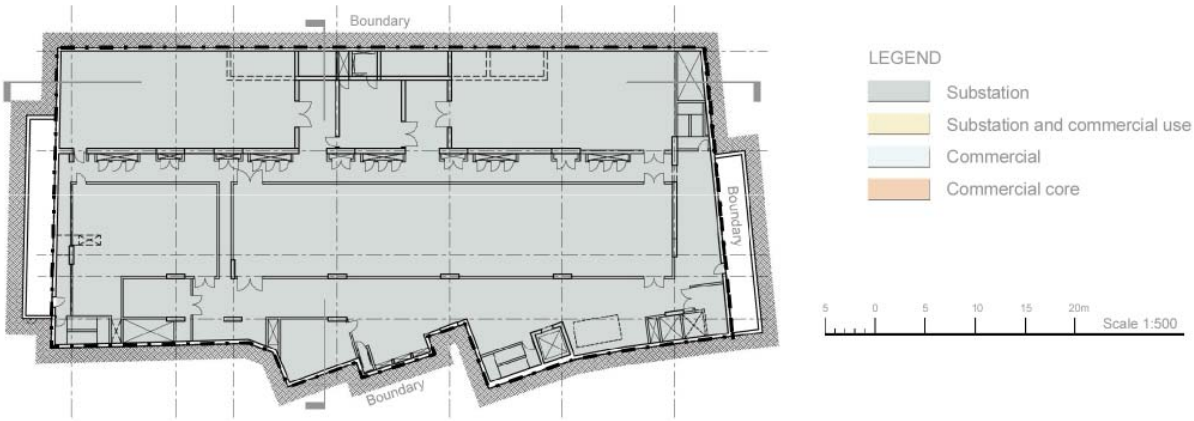


Figure 6-7 Conceptual floor plan for the commercial tower levels 14 – 22

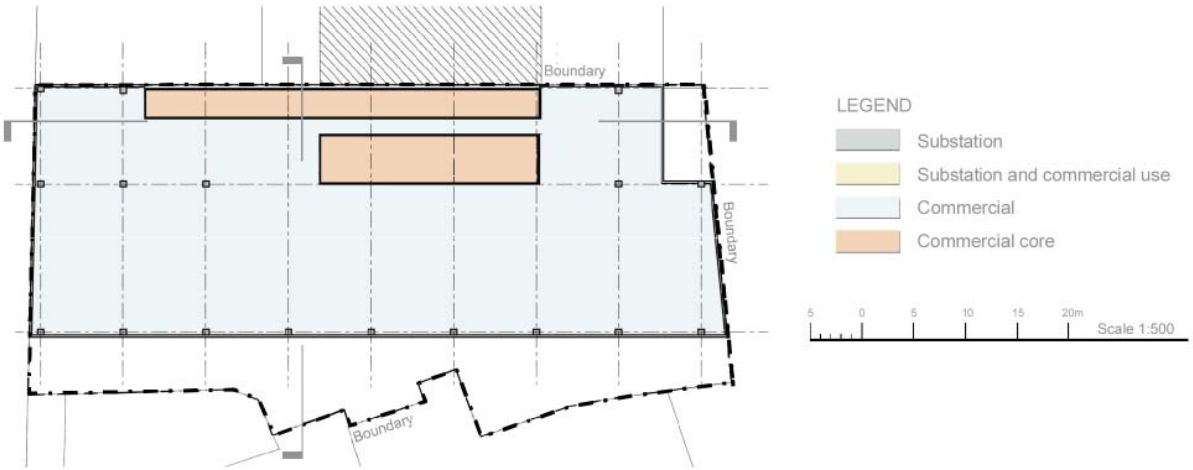
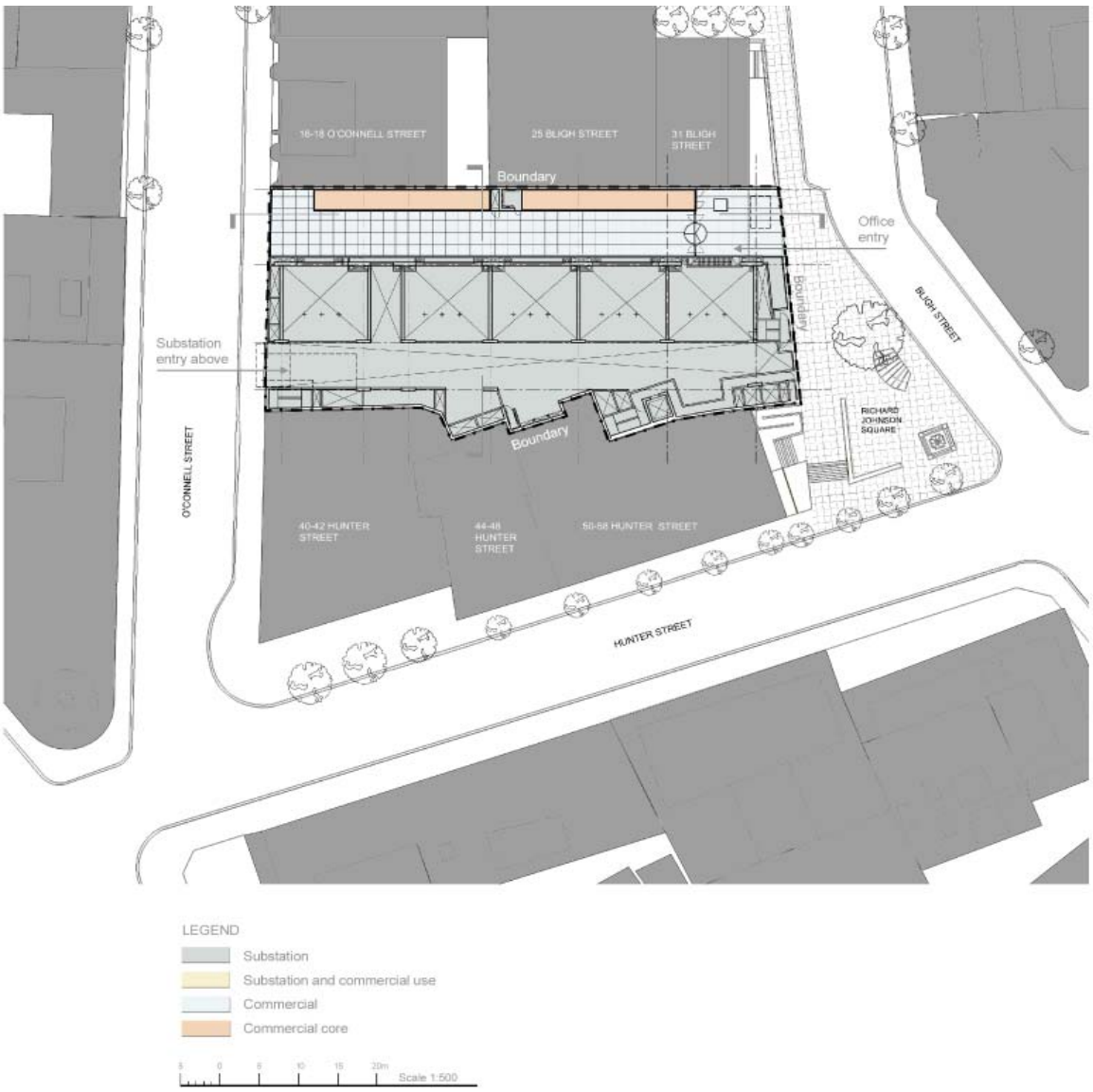


Figure 6-8 Conceptual floor plan for the lobby entrance level to Bligh Street



6.3.3 Street frontages

Bligh Street

When viewed from Bligh Street, the podium and tower would clearly delineate the above ground component of the substation (podium) and the offices above (tower). The podium would define the street frontage and the entry lobby would feature an eight storey high recessed slot. The slot would clearly identify the entrance to the commercial tower and provide views to the southern façade of the adjoining heritage listed building.

The vertical slot would connect to a horizontal recess above the podium wall that marks the transition from the substation to the office tower. The tower would feature a vertical recess on the north-east corner that references the entry slot below. The height of the tower would be in-keeping with the adjoining Mulpha building to the north.

O'Connell Street

The height of the podium level on O'Connell Street is determined by the height of the substation. Due to a difference in level between O'Connell and Bligh Streets, the height of the podium is greater when viewed from O'Connell Street.

The requirement for two separate vehicle access points at ground level provides an opportunity to articulate the façade with oversized openings as a reference to the oversized openings in the adjoining heritage listed buildings. The horizontal slot is carried through from Bligh Street to the O'Connell Street frontage to emphasise the separation of the substation and commercial tower. The tower would be set back from the southern boundary of the site and the height is in-keeping with the adjoining Mulpha building and other towers in the street.

6.3.4 Parking and access

Substation

Vehicle access to the substation would be via O'Connell Street. A separate driveway crossing and entrance is required for exclusive use of the substation to ensure that access is restricted to authorised personnel only. Security control may involve swipe card access.

Vehicular access to the substation would occur infrequently and would primarily be associated with maintenance activities. The driveway crossover to O'Connell Street would be 11 m to permit oversize vehicle access.

A special delivery platform would be used during delivery of the transformers when fitting out of the substation and also subsequent replacement of the transformers approximately every 50 years. This is likely to use a platform carrying an 85 tonne transformer and would require temporary closure of O'Connell Street. A specific traffic control plan would be implemented to manage impacts associated with these events.

A total of five car parking spaces would be provided for exclusive use of EnergyAustralia when accessing the substation.

Commercial tower

Vehicular access to the commercial tower would be provided from O'Connell Street and pedestrian access would be provided from Bligh Street. The driveway would ramp down to Basement Level 4 for access to the loading dock and the first level of car parking. The entrance and ramp would have a width of approximately 4 m which widens to 6 m approximately 20 m into the site. The entrance is located towards the northern end of the site on O'Connell Street and the ramp would be managed by traffic signals to allow two-way traffic and provide priority to vehicles entering the car park. The maximum grade permitted for private car parking AS/NZS 2890.1:2004 – Parking facilities – offstreet parking is 1:4 and all ramps would comply with this requirement. In addition, the initial entry ramp would have a grade of 1:8 to allow truck access to the loading dock.

A roller shutter would provide security control at the property boundary for access to the car park and loading dock out of hours. Swipe card control or other similar means would be used to provide secure access.

Car parking would comply with the City of Sydney's LEP and DCP and includes:

- 40 car parking spaces over two levels for the use of the commercial tower; and
- Eight spaces for couriers and loading.

One of the car parking spaces would be allocated for use by mobility impaired drivers. This would have an adjacent manoeuvring width of 2.4 m and be accessible to lifts.

Two dedicated motorcycle parking spaces would be provided. Bicycle racks would be provided within the commercial tower to assist with sustainable transport initiatives as part of the green star rating scheme.

A loading dock for one medium rigid vehicle and one small rigid vehicle would be provided, along with a series of dedicated loading bays where service and delivery vans can park. A goods lift would be located directly opposite the loading bays to allow access to all levels.

Pedestrian access to the commercial tower would be provided from Bligh Street.

6.3.5 Sustainability

The intention is to achieve a well designed sustainable outcome for the commercial component of the development, meaning the three core aspects of sustainability (economic, social and environmental) are considered. Sustainable design measures would be assessed on cost and effectiveness and these measures would be set against the objective of achieving a Five Star Green Star and Five Star Nabers building.

6.3.6 Design review process during Stage 2A(ii)

The design review process during Stage 2A(ii) would follow the same format that was successfully used for the Belmore Park Substation development which is also part of the Sydney CityGrid Project. This process would address the environmental assessment requirements in MCoA 3.2 by aiming to achieve design excellence.

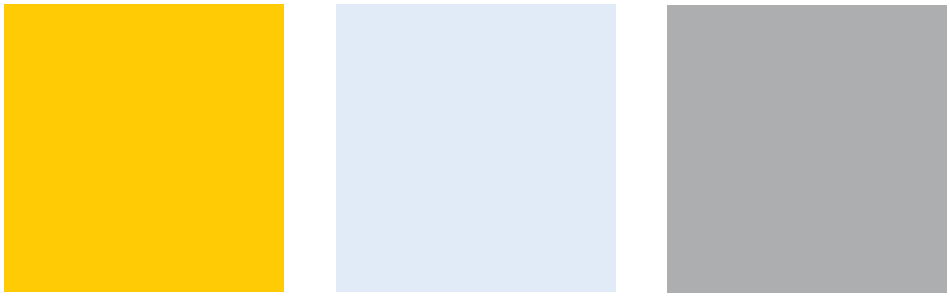
The design review would include representatives from EnergyAustralia, City of Sydney Council, the Department of Planning, and other selected architectural peers. The desired outcome of the review would be to refine the envelope developed as part of Stage 2A(i) and:

- Assess the visual impacts of the project, including impacts on local and regional views;
- Assess the design for the project as an integrated development, i.e. a new 132 kV / 11 kV zone substation and a new commercial development;
- Agree and record that design excellence has been demonstrated by:
  - Achieving a high standard of architectural design, materials and detailing appropriate to the building type and location;
  - Including a form and external appearance that would improve the quality of the public domain, including Richard Johnson Square; and
  - Developing a built form that will not detrimentally impact on relevant view corridors.

The design review process will focus 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; and
- Construction sequencing.

The design review process is likely to commence in mid-2010 and the outcomes would be detailed in the Environmental Assessment for Stage 2A(ii). EnergyAustralia has consulted with the City of Sydney and agreement has been reached that this process is appropriate.



6.4 Timeframe

6.4.1 Construction hours

Construction would generally be carried out during the following hours:

- Monday to Friday 7 am to 7 pm;
- Saturdays 7 am to 5 pm; and
- No work on Sundays or Public Holidays.

Noise intensive activities such as rock breaking would be undertaken during the following hours:

- Monday to Saturday 7 am to 12 pm;
- Monday to Friday 2 pm to 5 pm; and
- At no time on Sundays or public holidays.

The below ground elements of the stub tunnel would be constructed 24 hours per day, however surface works, such as loading spoil into trucks, would be limited to the standard construction hours.

Ancillary activities that may occur outside the standard construction hours include, but may not be limited to, oversize truck movements and deliveries of certain plant and equipment on an occasional basis. Works may also be undertaken outside these hours in the event of a direction from police or other relevant authority for safety reasons, or emergency work to avoid the loss of lives, property and/or to prevent environmental harm.

6.4.2 Duration of construction

Table 6-2 outlines the estimated duration of the Stage 2A(i) works.

Table 6-2 Duration of construction

Task	Duration*
Demolition of the existing building	26 weeks
Bulk excavation	30 weeks
Stub tunnel and shaft excavation	30 weeks
Bridging structure over the Metro tunnels	8 weeks
TOTAL	94 weeks

* to provide a conservative estimate of vehicle movements associated with waste and spoil disposal, these durations are based on works being limited to five days per week.

7. Consistency assessment

7.1 Overview

MCoA 3.1a of the Concept Approval requires a demonstration that the project is consistent with the requirements of the Concept Approval and generally consistent with the scope and intent of the concept outlined in documents listed in Condition 1.1 of the Approval. The following sections demonstrate how Stage 2A(i) of the City East Zone Substation Project is consistent with MCoA 3.1a.

7.2 Consistency with the Concept Approval

On 20 September 2009, the Minister for Planning approved the Concept Plan for the Sydney CityGrid Project subject to compliance with a number of conditions. The following sections demonstrate how the project is consistent with relevant MCoA. There are a number of MCoA that are not relevant to the City East Zone Substation Project, including MCoA 4-6 inclusive which relate to actions that must be completed prior to commencement of construction.

7.2.1 MCoA 1.3 – Staging/scheduling of Concept Plan Components

MCoA 1.3 defines the various components of the Concept Plan and MCoA 1.3b(i) includes 'Stage 2A being the construction and operation of the City East Zone Substation in the vicinity of Phillip, Bent, Bligh and O'Connell Streets'.

Stage 2A(i) of the City East Zone Substation Project is consistent with MCoA 1.3b(i) as the site for the City East Zone Substation is located between Bligh Street and O'Connell Street.

7.2.2 MCoA 2.2 – Stage 2 Development

MCoA 2.2 requires that construction and operation of Stage 2 (including Stages 2A, 2B, 2C, 2D and 2E) are subject to further assessment under Part 3A of the EP&A Act.

As discussed in Section 1.1, EnergyAustralia is seeking approval for the City East Zone Substation in two separate but interrelated stages that are referred to as Stage 2A(i) and Stage 2A(ii). The City East Zone Substation Project is consistent with MCoA 2.2 because approval for both of these stages would be sought under Part 3A of the EP&A Act.

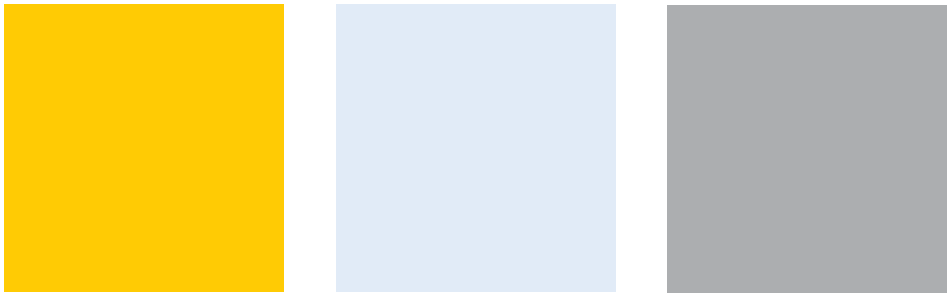
7.2.3 MCoA 2.3 – Stage 2 Development

MCoA allows EnergyAustralia to submit an application for Stage 2 in its entirety or to submit separate applications for each sub-stage (stages 2A, 2B, 2C, 2D and 2E) or any combination of these stages.

The City East Zone Substation Project is consistent with MCoA 2.3 as approval a separate application has been submitted for Stage 2A(i).

7.2.4 MCoA 3.1 – Project Applications and Specific Requirements

Pursuant to Section 75P(1)(a) of the EP&A Act, MCoA 3.1 provides the environmental assessment requirements for project applications for Stage 2, of any sub-stage of Stage 2, or any combination of sub-stages submitted as a single project. These requirements are detailed in Table 3-1 which also includes a cross reference to the section of this Environmental Assessment in which they are addressed. As such, the Environmental Assessment is consistent with MCoA 3.1.



7.2.5 MCoA 3.2 – Project Applications and Specific Requirements

Pursuant to Section 75P(1)(a) of the EP&A Act, MCoA 3.2 provides environmental assessment requirements for any project application for Stage 2A and/or 2B that are additional to those detailed in MCoA 3.1. MCoA 3.2 requires a design review process for the proposed City East Zone Substation or Dalley Street Zone Substation form part of the Environmental Assessment. The outcome of this design review process would form part of the Environmental Assessment. The design review process would be based on the principles of the design review competition of the Sydney Local Environmental Plan 2005 and include consultation with Council.

As detailed in Section 6.1, the design review process was not applied to Stage 2A(i) as this stage relates to enabling works that are primarily at or below the ground surface. As the above ground components of the substation and commercial tower would be designed and assessed during Stage 2A(ii), the design review process would be implemented during this stage and the outcomes would be documented in the Stage 2A(ii) Environmental Assessment.

The City East Zone Substation Project is consistent with MCoA 3.2 as the design review process would be implemented for Stage 2A(ii), and Stage 2A(i) has been specifically designed to minimise the potential constraints on the design developed during Stage 2A(ii).

7.2.6 MCoA 3.3 – Project Applications and Specific Requirements

Pursuant to Section 75P(1)(a) of the EP&A Act, MCoA 3.3 provides environmental assessment requirements for any project application including Stage 2D that are additional to those detailed in MCoA 3.1. MCoA 3.3 requires that EnergyAustralia consult with Sydney Water Corporation when confirming the preferred route for the City East Cable Tunnel to ensure its major sewer assets, stormwater and associated infrastructure (existing or planned) are not located within the selected route. This consultation with Sydney Water Corporation must continue during the detailed design and construction stage to avoid impacts.

Stage 2A(i) involves construction of a 150m section of stub tunnel that forms part of the City East Cable Tunnel as defined by MCoA 1.3b(iv). As discussed in Section 4.2, EnergyAustralia has consulted with Sydney Water Corporation during development of the preferred route for the City East Cable Tunnel. Sydney Water Corporation confirmed that its major sewer assets, stormwater and associated infrastructure (existing or planned) are not located within the alignment for the stub tunnel beneath Bligh Street that forms part of Stage 2A(i). The project is therefore consistent with MCoA 3.3.

7.3 General consistency with the documents specified in the Concept Approval

The project is required to be generally consistent with documents listed in MCoA 1.1, including:

- 08_0075 Major Project Application;
- Sydney CityGrid Project Concept Environmental Assessment Report, prepared by PlanCom Consulting Pty Ltd and dated 8 December 2008; and
- Sydney CityGrid Project Submissions Response & Preferred Project Report, prepared by PlanCom Consulting Pty Ltd and dated May 2009.

Consistency with these documents is discussed below.

7.3.1 08_0075 Major Project Application

Substation location and commercial development

Section 2.5.4 of the Major Project Application contained information relating to the City East Zone Substation and integrated commercial/retail development. It notes that the specific site for the substation had not been confirmed at that time; however, planning and feasibility studies were underway for a substation in an area in

the northern CBD in the general vicinity of Bent Street. It noted that a separate Project Application would be submitted to the Department of Planning at a later date.

Stage 2A(i) of the City East Zone Substation Project is consistent with the Major Project Application as the site for the City East Zone Substation is 33 Bligh Street which is in the vicinity of Bent Street, and the substation would be integrated with a commercial/retail development. Separate Project Applications were submitted to the Department of Planning on 15 May 2010 for Stage 2A(i) and Stage 2A(ii).

Feeder connections and design options including stub tunnels

The Major Project Application states that the City East CableTunnel would be designed to allow for the connection of five 132 kV feeders at the new City East Zone Substation, emanating from Riley Street STSS. Similarly, the City East connection must also allow for the installation of four 132 kV feeders that would run between the new City East and Dalley Street zone substations. The following three potential options were identified to provide the connections:

- Option A: A shaft, and associated headworks within, or nearby to the substation building, and connection to the tunnel either directly or by stub tunnel between the main CECT alignment and the shaft;
- Option B: Construction of a cable vault near to the substation building and then connection to the CECT alignment via directional drilling or microtunnelling; and
- Option C: Direct connection between the CECT alignment and the substation basement via directional drilling or microtunnelling.

The City East Zone Substation Project is consistent with the Major Project Application as the tunnel connecting the City East Zone Substation and the City East CableTunnel involves a shaft and associated headworks within the substation building, and a stub tunnel connection between the substation and the City East CableTunnel. This is equivalent to Option A outlined in the Major Project Application and would enable four feeders to be installed to connect the City East Zone Substation with the City North and Dalley Street zone substations. Two feeders would link the City East Zone Substation with the City North Zone Substation, and two would link the City East Zone Substation with the Dalley Street Zone Substation.

7.3.2 *Sydney CityGrid Project Concept Environmental Assessment Report,* prepared by PlanCom Consulting Pty Ltd and dated 8 December 2008

A new City East Zone Substation

Section 4.2.6 of the Concept Environmental Assessment states that:

A new City East Zone Substation is also required to be constructed which may include an integrated commercial/retail development. The specific site is still to be confirmed. A detailed Environmental Assessment in support of a separate project approval would be submitted to the Department of Planning at a later date.

The CECT would be designed to allow for the connection of five 132 kV feeders at new City East Zone Substation, emanating from the Riley Street STSS. Similarly, the City East connection must also allow for the installation of the four 132 kV feeders that would run between the new City East Zone Substation and Dalley Street Zone Substation.

Stage 2A(i) of the City East Zone Substation Project is consistent with Section 4.2.6 of the Concept Environmental Assessment as it involves enabling works for a substation integrated with a commercial/retail development and would connect the substation to the City East CableTunnel to allow for installation of 132 kV feeders. As indicated in Section 7.3.1, four feeders would connect to the City East Zone Substation, two linking with the City North Zone Substation and two linking with the Dalley Street Zone Substation.

Substation location and commercial development

Section 3.5 of the Concept Environmental Assessment Report states that:

At present, a preferred location for the new City East Zone Substation has not been identified, however, EnergyAustralia is considering a site in the vicinity of Phillip, Bent Street, Bligh and O'Connell Streets. Sites under consideration are being discussed with potential developers and the final choice is subject to detailed negotiations. Given the high value of land in this part of the CBD an integrated substation/commercial development is being considered. It is expected that within an integrated development most of the substation would be accommodated in the lower and basement floors.

Stage 2A(i) of the City East Zone Substation Project is consistent with Section 3.5 of the Concept Environmental Assessment Report as the selected location for the substation is at 33 Bligh Street which is in the vicinity of Phillip, Bent, Bligh and O'Connell Streets and the substation would be integrated with commercial development.

Stub tunnels

Section 4.2.4 of the Concept Environmental Assessment Report states that the City East Cable Tunnel would include smaller stub tunnels to facilitate connection to substations. This would include stub tunnel connections between the City East Cable Tunnel and the new City East Zone Substation.

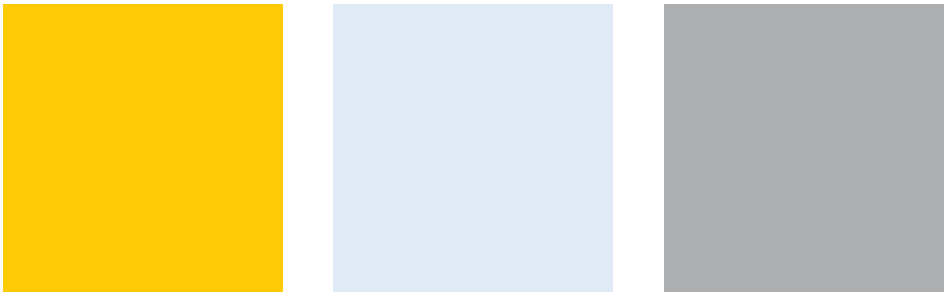
Stage 2A(i) of the City East Zone Substation Project is consistent with Section 4.2.4 of the Concept Environmental Assessment Report as it includes a stub tunnel to connect the City East Zone Substation to the City East Cable Tunnel.

7.3.3 Sydney CityGrid Project Submissions Response & Preferred Project Report, prepared by PlanCom Consulting Pty Ltd and dated May 2009

Section 4.1 of the Submissions Response & Preferred Project Report states that:

Apart from design changes to the Belmore Park Zone Substation and amendments to the proposed staging of the commercial development aspect of that project, there are no other proposed changes to the Sydney CityGrid Project, as detailed in the Project EAR submitted on 17 December 2008.

The Submissions Response & Preferred Project Report did not amend the aspects of the Sydney CityGrid Project described in the Concept Environmental Assessment that are relevant to Stage 2A(i). As Section 7.3.2 indicates that the project is consistent with the Concept Environmental Assessment, it is therefore consistent with the Submissions Response & Preferred Project Report.



8. Environmental risk assessment

8.1 Purpose of the environmental risk analysis

An environmental risk analysis was undertaken to identify key issues for Stage 2A(i) of the City East Zone Substation Project and ensure that they are addressed in this Environmental Assessment. This was based on the same process that was implemented during development of the Concept Environmental Assessment for the Sydney CityGrid Project and the Project Environmental Assessment for the Belmore Park Substation and commercial development. This risk analysis involved reviewing the likely construction methods to identify:

- Potential risks and/ or issues;
- Potential impacts and consequences associated with the risk and/ or issues; and
- Indicative management measures that could be implemented to mitigate potential impacts.

The environmental risk analysis focused on those elements that would be constructed as part of Stage 2A(i). It did not involve detailed consideration of risks associated with construction and operation of the substation and commercial tower as this would be subject to a separate process during preparation of the Environmental Assessment for Stage 2A(ii).

8.2 Results of the environmental risk analysis

A summary of results from the environmental risk analysis is presented in Appendix D. Risks have been separated into 'key' risks to the project and 'other' environmental risks.

The key potential impacts were identified based on the:

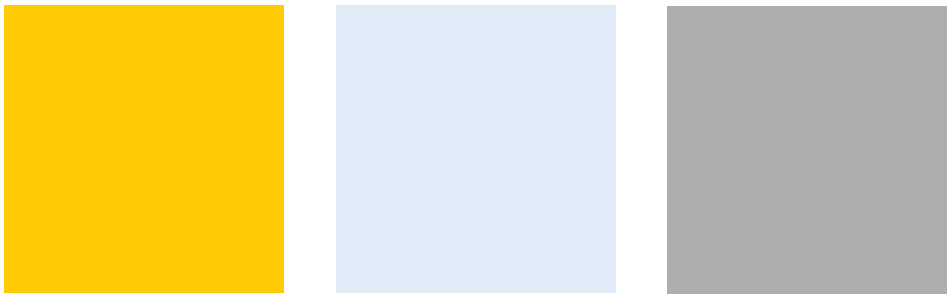
- Characteristics and sensitivity of the receiving environment;
- Potential impacts likely to occur, including their duration, intensity and degree to which they can be mitigated; and
- Level of uncertainty of the anticipated residual impacts.

The key issues are those that are considered to have medium or high adverse environmental impacts, if not effectively mitigated, during the construction phase. They include issues that require investigation to ensure a high degree of certainty that potential risks can be effectively managed. Key issues are assessed in Chapters 9 - 16.

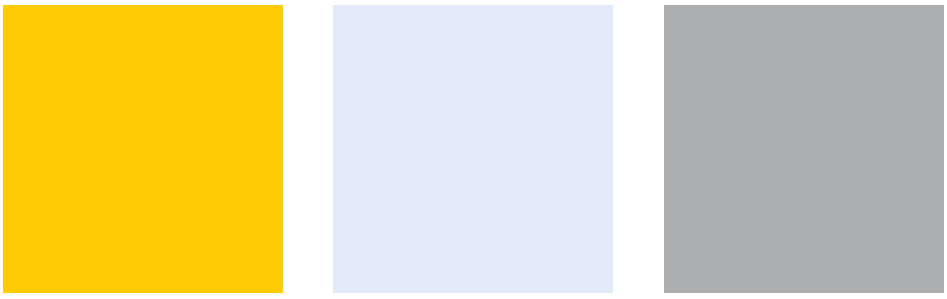
Other environmental risks are those that are considered to have low risks associated with adverse impacts would be managed by implementing the Statement of Commitments.

Based on the results of the environmental risk analysis, the following issues were identified as key issues that require consideration in this Environmental Assessment:

- Noise and vibration associated with demolition and excavation, and the potential for associated offsite impacts on the amenity of the surrounding area and structural integrity of buildings;
- Impacts on existing and proposed underground assets. There is a need for the design to ensure that Stage 2A(i) of the City East Zone Substation does not constrain future development within RailCorp's Metro Pitt Corridor or the corridor for the CBD Metro Stage 1;
- Management of groundwater during excavation of the basement and stub tunnel;
- Management of demolition waste and spoil;



- Traffic impacts, particularly those associated with transport of demolition waste and spoil;
- Air quality impacts associated with dust generated during demolition and excavation;
- Potential impacts on subsurface archaeology during excavation; and
- The need for the building envelope to be capable of being refined during Stage 2A(ii) to accommodate positive outcomes that may be identified during the design review process.



9. Noise and vibration

This chapter provides a summary of the *Sydney CityGrid Project City East Zone Substation Stage 2A(i) Noise and Vibration Impact Assessment* prepared by Wilkinson Murray Pty Limited. The complete report is provided in Appendix E.

9.1 Existing environment

The site is located within Sydney's CBD, a highly urbanised area with built form characterised by high rise residential and commercial developments. Land is used for a variety of purposes including residential and commercial use as well as tourist and cultural attractions, and parks and open space, including Hyde Park and the Domain and Royal Botanic Gardens.

Land uses directly surrounding the site are predominantly commercial office towers with active street frontages, retail activities, hotels, restaurants and cafes. Noise sources in the area are typical of a city environment and associated with traffic, people and construction activities.

9.1.1 Ambient noise levels and surrounding receivers

Long-term ambient noise levels were monitored at two locations surrounding the site, selected to cover the range of environments in the potentially affected areas. The locations are presented in Table 9-1.

Table 9-1 Long term noise monitoring locations

Monitoring site	Address	Relevant noises noted during site visits
A	Bligh Street Sydney	Local traffic and general city noise
B	O'Connell Street	Local traffic and general city noise

Noise monitoring was conducted between Monday, 15 February and Tuesday, 23 February 2010.

Surrounding potentially affected receivers areas are presented in Table 9-2.

Table 9-2 Surrounding receiver areas

Description	Location
Radisson Hotel - O'Connell Street	Immediately to the west of the site at a distance of 20 m
Sofitel Wentworth Hotel – backing on to Bligh Street	To the north east of the site at a distance of 65 m
Commercial properties	Immediately to the north and south of the site
Heritage listed building – Lowy Institute	Immediately to the north of the site

Table 9-3 summarises the monitoring results, for daytime, evening and night time periods as defined in DECCW Interim Construction Noise Guideline (CNG). The summary values are:

- L_{Aeq} (period) – the equivalent continuous L_{Aeq} noise level measured over the assessment period; and
- RBL – Rating Background Level is a measure of typical background noise levels which are used in determining noise criteria.

Weather conditions were suitable for noise measurements during the monitoring period.

Table 9-3 Summary of measured noise levels

Noise logging site	RBL (dBA)				$L_{Aeq,period}$ (dBA)			
	Daytime 7am-6pm	Evening 6-10pm	Night Time 10pm-7am	Saturday 7am-5pm	Daytime 7am-6pm	Evening 6-10pm	Night Time 10pm-7am	Saturday 7am-5pm
A	58	59	56	58	63	64	66	63
B	65	61	59	65	70	67	65	70

9.1.2 Performance criteria

The following sections detail the applicable site specific construction noise and vibration criteria based on the:

- Interim Construction Noise Guideline (DECCW, July 2009), and
- Assessing vibration: a technical guideline (DEC, February 2006).

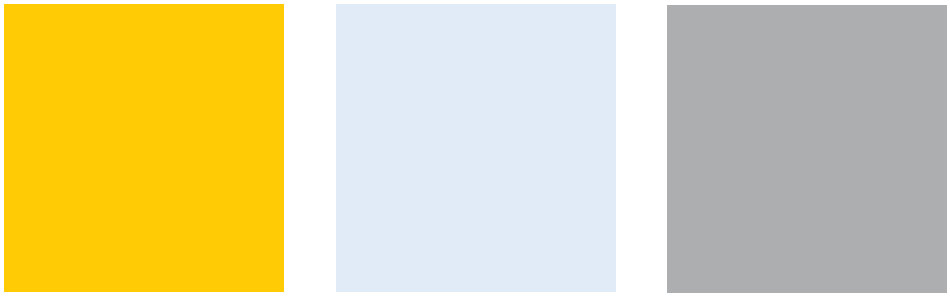
Construction Noise Criteria

DECCW released the *"Interim Construction Noise Guideline"* (CNG) in July 2009. The guideline provides suitable noise goals that assist in assessing the impact of construction noise.

For residences, the basic daytime construction noise goal is that the noise should not exceed the LA_{90} background noise by more than 10 dBA. This is for standard hours: Monday to Friday 7 am to 6 pm, and Saturday 8 am to 1 pm. Outside the standard hours the criterion would be background plus 5 dBA. A more complete description of the guidelines is in Table 9-4.

Table 9-4 Construction noise goals at residences using quantitative assessment

Time of day	Management level LAeq,(15 min)	How to apply
Recommended standard hours: Monday to Friday 7 am to 6 pm Saturday 8 am to 1 pm No work on Sundays or Public Holidays	Noise affected RBL + 10 dBA	◗ The noise affected level represents the point above which there may be some community reaction to noise. ◗ Where the predicted or measured LAeq,(15 min) is greater than the noise affected level, the proponent should apply all feasible and reasonable work practices to minimise noise. ◗ The proponent should also inform all potentially impacted residents of the nature of works to be carried out, the expected noise levels and duration, as well as contact details.
	Highly noise affected 75 dBA	◗ The highly noise affected level represents the point above which there may be strong community reaction to noise. ◗ Where noise is above this level, the proponent should consider very carefully if there is any other feasible and reasonable way to reduce noise to below this level. ◗ If no quieter work method is feasible and reasonable, and the works proceed, the proponent should communicate with the impacted residents by clearly explaining the duration and noise level of the works, and by describing any respite periods that will be provided.
Outside recommended standard hours	Noise affected RBL + 5 dB	A strong justification would typically be required for works outside the recommended standard hours. ◗ The proponent should apply all feasible and reasonable work practices to meet the noise affected level. ◗ Where all feasible and reasonable practices have been applied and noise is more than 5 dB(A) above the noise affected level, the proponent should negotiate with the community.



In addition, the following construction noise management levels L_{Aeq} (15 min) are recommended for other receivers and areas as follows:

- Active recreation areas (such as parks) external L_{Aeq} (15 min) 65 dBA
- Industrial premises: external L_{Aeq} (15 min) 75 dBA
- Offices, retail outlets external L_{Aeq} (15 min) 70 dBA

Based on the above, Table 9-5 presents the applicable noise management levels for construction activities.

Table 9-5 Site specific construction noise management levels

Location	Construction noise management level, L_{Aeq} - dBA				Maximum construction noise level, L_{Aeq} - dBA
	Day	Evening	Night	Saturday (extended)	
Bligh Street	68	64	61	63	75
O'Connell Street	75	66	64	70	75
Commercial Properties	70				75

Construction vibration criteria

Criteria for assessment of the effects of vibration on human comfort are set out in British Standard 6472-1992. Methods and criteria in that Standard are used to set "preferred" and "maximum" vibration levels in the document "Assessing Vibration: A technical guideline" (February 2006) produced by the NSW DEC.

Acceptable values of human exposure to continuous vibration, such as that associated with underground drilling, are dependent on the time of day and the activity taking place in the occupied space (e.g. workshop, office, residence or a vibration-critical area). Guidance on preferred values for continuous vibration is set out in Table 9-6.

Table 9-6 Criteria for exposure to continuous and impulsive vibration

Place	Time	Peak velocity (mm/s)	
		Preferred	Maximum
Critical working areas (e.g. hospital operating theatres precision laboratories)	Day or night-time	0.14	0.28
Residences	Daytime	0.28	0.56
	Night-time	0.20	0.40
Offices	Day or night-time	0.56	1.1
Workshops	Day or night-time	1.1	2.2

In the case of intermittent vibration which is caused by plant such as rock breakers, the criteria are expressed as a Vibration Dose Value (VDV) which is presented in Table 9-7.

Table 9-7 Acceptable vibration dose values for intermittent vibration (m/s $^{1.75}$)

Location	Daytime		Night-time	
	Preferred value	Maximum value	Preferred value	Maximum value
Critical areas	0.10	0.20	0.10	0.20
Residences	0.20	0.40	0.13	0.26
Offices, schools, educational institutions and places of worship	0.40	0.80	0.40	0.80
Workshops	0.80	1.60	0.80	1.60

Calculation of VDV requires knowledge of the number of events in the relevant time period.

Building damage

In terms of the most recent relevant vibration damage objectives, Australian Standard AS 2187: Part 2-2006 "Explosives - Storage and Use - Part 2: Use of Explosives" recommends the frequency dependent guideline values and assessment methods given in BS 7385 Part 2-1993 "Evaluation and measurement for vibration in buildings Part 2" as they "are applicable to Australian conditions".

The British Standard sets guide values for building vibration based on the lowest vibration levels above which damage has been credibly demonstrated. These levels are judged to give a minimum risk of vibration-induced damage, where minimal risk for a named effect is usually taken as a 95% probability of no effect.

The recommended limits (guide values) from BS 7385 for transient vibration to ensure minimal risk of cosmetic damage to residential and industrial buildings are presented numerically in Table 9-8.

Table 9-8 Transient vibration guide values - minimal risk of cosmetic damage

Type of building	Peak component particle velocity in frequency range of predominant pulse	
	4 Hz to 15 Hz	15 Hz and above
Reinforced or framed structures Industrial and heavy commercial buildings	50 mm/s at 4 Hz and above	N/A
Unreinforced or light framed structures Residential or light commercial type buildings	15 mm/s at 4 Hz increasing to 20 mm/s at 15 Hz	20 mm/s at 15 Hz increasing to 50 mm/s at 40 Hz and above

The standard states that the guide values in Table 9-7 relate predominantly to transient vibration which does not give rise to resonant responses in structures, and to low-rise buildings. Where the dynamic loading caused by continuous vibration results in dynamic magnification due to resonance, especially at the lower frequencies where lower guide values apply, then the guide values may need to be reduced by up to 50%.

In addition to the British Standard, in the case of heritage listed buildings at 16-18 O'Connell Street and 31 Bligh Street, guidance for structural damage was derived from the German Standard DIN 4150 -3 "Structural Vibration Part 3 – Effects of Vibration on Structures. Table 9-9 details the guideline values for vibration levels for heritage buildings.

Table 9-9 DIN 4150 recommended PPV vibration levels for heritage listed buildings

Frequency (Hz)	Guideline values for velocity (mm/s)
1 – 10	3
10 – 15	3 - 8
40 – 50	8 - 10

The British Standard notes that a building of historical value should not, unless it is structurally unsound, be assumed to be more sensitive. Surrounding heritage listed buildings should be inspected by a structural engineer. If these buildings are found to be structurally sound there may be scope for increasing vibration criteria to that of residential buildings.

Ground-borne noise

Ground-borne noise refers to noise produced by vibration of floor slabs and other building elements, which radiates noise into the interior of a building. The Interim NSW Construction Noise Guideline addresses ground-borne noise as follows;

Ground-borne noise is noise generated by vibration transmitted through the ground into a structure. Ground-borne noise caused, for example by underground works such as tunnelling, can be more noticeable than airborne noise. The following ground-borne noise levels for residences indicate when management actions should be implemented. These levels recognise the temporary nature of construction and are only applicable when ground-borne noise levels are higher than airborne noise levels. The ground-borne noise levels are for evening and night-time periods only, as the objectives are to protect the amenity and sleep of people when they are at home.

- *Evening (6 pm to 10 pm)* *Internal: L_{Aeq} (15 min) 40 dBA*
- *Night-time (10 pm to 7 am)* *Internal: L_{Aeq} (15 min) 35 dBA*

The internal noise levels are to be assessed at the centre of the most-affected habitable room. For a limited number of discrete, ongoing ground-borne noise events, such as drilling or rock-hammering, LA (max) using a slow response on the sound level meter may be better than LAeq (15 min) in describing the noise impacts.

Traffic noise criteria

The DECC's *Environmental Criteria for Road Traffic Noise* (ECRTN) presents the NSW Government's guidelines for road traffic noise criteria. The policy provides road traffic noise criteria for proposed roads or residential land use developments as well as criteria for other sensitive land uses.

Table 9-10 presents the relevant noise criteria for this project, extracted from the ECRTN.

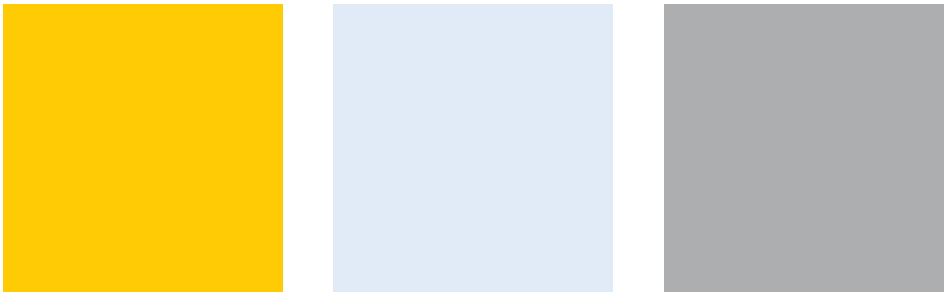


Table 9-10 Traffic noise criteria extracted from the NSW ECRTN

	Criteria		
Type of development	**Day time 7am-10pm**	**Night time 10pm-7am**	**Where criteria are already exceeded**
Land use development with the potential to create additional traffic on existing freeways and arterial roads	$L_{Aeq(15hour)}$ 60dBA	$L_{Aeq(9hour)}$ 55dBA	Where feasible and reasonable, existing noise levels should be reduced to meet the noise criteria via judicious design and construction o the development. Locations, internal layouts, building materials and construction should be chosen so as to minimise noise impacts. In all cases, traffic arising from the development should not lead to an increase in existing noise levels of more than 2dB
Land use development with the potential to create additional traffic on collector road	$L_{Aeq(1hour)}$ 60dBA	$L_{Aeq(1hour)}$ 55dBA	
Land use development with the potential to create additional traffic on local roads	$L_{Aeq(1hour)}$ 55dBA	$L_{Aeq(1hour)}$ 50dBA	

Residences in the vicinity of the site that may be potentially affected by traffic noise, such as the Radisson and Wentworth Hotels, have been assessed with respect to the above criteria.

As the existing traffic noise exceeds the traffic noise criteria and there is no expectation of traffic noise in the area decreasing, the 2dBA allowance goal applies for all roads.

9.1.3 Noise source levels

Construction and demolition of the building

Noise sources that are likely to be associated with the site demolition, excavation and construction of the project are identified in the following sections.

To assess the potential noise and vibration impacts during construction, a number of scenarios and typical equipment were developed and are summarised in Table 9-11.

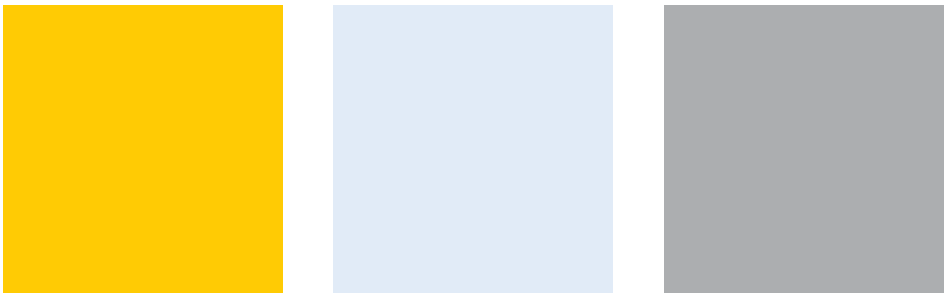
Table 9-11 Construction scenarios

Reference	Scenario	Equipment
1	Demolition	◗ 1x bobcat ◗ 1x jackhammer ◗ 1x dump truck (10 tonne) ◗ 1x concrete saw ◗ 2x bobcat ◗ 1x excavator
2	Excavation	◗ 1x front end loader ◗ 2x dump truck ◗ 2x rock breakers ◗ 1x excavator ◗ 1x mobile crane
3	General construction on site particularly the bridging structure	◗ 1x jack hammer ◗ 1x generator ◗ 1x concrete pump ◗ 2x concrete truck ◗ Hand tools

Typical sound power levels (SWL) of the plant likely to be used during demolition, excavation and construction are identified in Table 9-12. These SWLs have recently been measured at other similar construction sites.

Table 9-12 Typical construction plant sound power levels (SWL)

Plant	SWL, dBA	Sound pressure level at 7 m
Excavator	107	82
Dump trucks	112	87
Rock breaker	122	97
Concrete trucks	112	87
Saws	116	91
Saw cutter	115	90
Small excavators	90	65
Concrete trucks	109	84
Small generators	95	71
Front-end low-loader	112	87



Plant	SWL, dBA	Sound pressure level at 7 m
Compressor	100	75
Bobcat	103	78
Hand tools	90	65
Jackhammer	105	80

Predicted noise levels at receivers are based on 15-minute periods. This equipment has been distributed across the site for the noise predictions.

The major noise source would be the hydraulic rock breaker and Figure 9-1 provides an example of this type of machine.

Figure 9-1 Photograph of a hydraulic rock breaker

Tunnelling construction

Noise from the roadheader is unlikely to be acoustically significant as any noise associated with this equipment is contained by the tunnel walls. Ancillary equipment, including the exhaust fan and dust collector, would generate noise associated with this construction activity.

Typical sound levels of the construction plant likely to be used during construction of the stub tunnel are identified in Table 9-13. These levels have recently been measured at other similar construction sites.

Table 9-13 Typical tunnelling equipment plant sound power levels

Plant	SWL	Sound pressure level at 7m
Excavator with header	112	87
Bogie (dump) truck	112	87
Crane	110	85
Power tools	115	90
Concrete trucks	109	84
Small generators	95	70
Ventilation fan* and dust collector	105	80

*Assumes a silencer on the fan.

Figure 9-2 provides a photograph of a roadheader that is similar to that which would be used to construct the stub tunnel. This removes rock using a controlled "grinding" action that provides close control over the excavated profile of the tunnel roof and upper walls.

This type of machine can safely perform detailed excavations quite close to sensitive structures such as historic buildings, and generates relatively low levels of vibration and regenerated noise. Experience has shown that they can be used on a 24 hour basis to construct tunnels near residences with minimal disturbance to the occupants.

Figure 9-2 Photograph of a roadheader

9.2 Impact assessment

9.2.1 Construction noise assessment

Construction noise

Assessment of likely noise at surrounding commercial and residential receivers has been assessed during demolition, excavation and general construction.

Table 9-14 summarises predicted demolition, excavation and general construction noise levels at residential receivers and commercial premises. Daytime, evening, night time and Saturday construction noise management criteria are also presented in Table 9-14 to gauge compliance when compared to the predicted noise levels. The predicted noise levels are based on equipment noise levels, distance attenuation and shielding from existing building and structures etc, where applicable.

Exceedance of noise criteria of up to 10 dBA is predicted when large rock breakers are used during excavation. These items of plants are significantly louder than other site equipment and compliance with criteria is expected when the large rock breakers are not operating.

During demolition and general construction works, the predicted noise levels comply with the evening and extended Saturday construction noise criterion. Therefore the extended operating hours proposed by EnergyAustralia which involve works between 6 pm – 7 pm Monday to Friday and 1 pm – 5 pm on Saturday are considered appropriate for demolition and general construction works.

Construction noise and vibration impacts would be minimised by implementing the recommended mitigation measures.

Tunnelling noise

Construction airborne noise at surrounding residential receivers was assessed for tunnelling along Bligh Street based on the typical sound power levels presented in Section 9.1.3.

Table 9-15 presents maximum predicted construction noise levels at nearby residences during tunnelling at night. This indicates that acceptable noise levels would occur at these locations. In addition, these hotels have fixed windows and therefore internal noise levels would be further attenuated by this feature.

Table 9-14 Predicted noise levels at receivers

	Predicted	Day			Evening			Night			Saturday (extended)		
Location	**Noise dBA**	**Criteria dBA**	**Exceedance dBA**	**Compliance**	**Criteria dBA**	**Exceedance dBA**	**Compliance**	**Criteria dBA**	**Exceedance dBA**	**Compliance**	**Criteria dBA**	**Exceedance dBA**	**Compliance**
Demolition													
Sofitel Wentworth	45	68	-	Yes	64	-	Yes	61	-	Yes	63	-	Yes
Radisson Hotel	66	75	-	Yes	66	-	Yes	64	2	**No**	70	-	Yes
Lowy Institute	67	70	-	Yes	70	-	Yes	70	-	Yes	70	-	Yes
Southern Commercial	70	70	-	Yes	70	-	Yes	70	-	Yes	70	-	Yes
Commercial across Bligh Street	68	70	-	Yes	70	-	Yes	70	-	Yes	70	-	Yes
Excavation													
Sofitel Wentworth	55	68	-	Yes	64	-	Yes	61	-	Yes	63	-	Yes
Radisson Hotel	76	75	1	**No – marginal**	66	10	**No**	64	12	**No**	70	6	**No**
Lowy Institute	77	70	7	**No**	70	7	**No**	70	7	**No**	70	7	**No**
Southern Commercial	80	70	10	**No**	70	10	**No**	70	10	**No**	70	10	**No**
Commercial across Bligh Street	78	70	8	**No**	70	8	**No**	70	8	**No**	70	8	**No**
General construction													
Sofitel Wentworth	40	68	-	Yes	64	-	Yes	61	-	Yes	63	-	Yes
Radisson Hotel	61	75	-	Yes	66	-	Yes	64	-	Yes	70	-	Yes
Lowy Institute	62	70	-	Yes	70	-	Yes	70	-	Yes	70	-	Yes
Southern Commercial	65	70	-	Yes	70	-	Yes	70	-	Yes	70	-	Yes
Commercial across Bligh Street	63	70	-	Yes	70	-	Yes	70	-	Yes	70	-	Yes

Table 9-15 Predicted noise levels at residences from tunnelling works

Location	Predicted noise level dBA	Night criteria dBA	Exceedence dBA	Compliance
Sofitel Wentworth	44	61	-	Yes
Radisson Hotel	64	64	0	Yes

9.2.2 Construction vibration assessment

The main item of equipment that has potential to generate substantial levels of vibration are rock breakers involved in site excavation and a road header to conduct tunnelling activities under Bligh Street.

Whilst tunnelling equipment (used underground) can generate relatively high airborne noise levels within the tunnels, noise transmission to locations outside the tunnels would be satisfactorily attenuated by the intervening soil or rock.

Operation of roadheaders and rock breakers also generates ground vibration that has the potential to transmit to nearby buildings as audible (regenerated) noise. Regenerated roadheader noise usually has a low frequency "rumbling" character, whereas rock breaker noise can be described as having repetitive impulsive character. Regenerated noise is of potentially greater significance than the accompanying tactile vibration, as it is normally perceptible at a greater distance from the source.

Vibration from rock breakers

The impulsive vibration from large rock breakers can cause audible regenerated noise in buildings up to distances of 50 m to 100 m from an excavation site, depending on ground conditions, type of structure and ambient noise conditions. Levels in the order of 45 dBA to 50 dBA have been measured in the basement of properties 70 m from a large rock breaker operating to remove the lower bench in a tunnel.

Table 9-16 sets out the typical ground vibration levels at various distances from rock breakers operating in hard sandstone such as that found at the site.

Table 9-16 Rock breaker PPV vibration levels (mm/s) at various distances

Operation	PPV vibration level (mm/s) at given distance					
	5 m	10 m	20 m	30 m	40 m	50 m
Heavy rock breaker (eg 1500 kg)	4.5	1.3	0.4	0.2	0.15	0.02
Medium rock breaker (eg 600 kg)	0.2	0.06	0.02	0.01	-	-

Excavation would be conducted using a combination of rippers, rocksaws and rock breakers. The perimeter of the site would be sawn with rocksaws and the remainder of the site would be excavated by rock breakers and rippers.

Vibration from rock breaker operations has the potential to generate perceptible vibration at surrounding properties. Previous measurements indicate that PPV vibration levels from heavy (1500 kg) and medium sized (600 kg) rock breakers would be in the order 4.5 mm/s and 0.2 mm/s at a distance of 5 m from the boundary.

At these levels of vibration, the preferred vibration dose (VDV) of 0.4 mm/s$^{1.75}$ would be exceeded for heavy rock breakers after less than two hours, whilst lighter rock hammers could operate all day without exceeding the VDV. As operation of a large rock breaker over the entire day would exceed the nominated human comfort criteria, they may be used on a rotational basis to provide respite to surrounding receivers.

Structural damage vibration criteria is much higher than human comfort criteria, therefore compliance with the latter ensures that structural damage criteria would be satisfied.

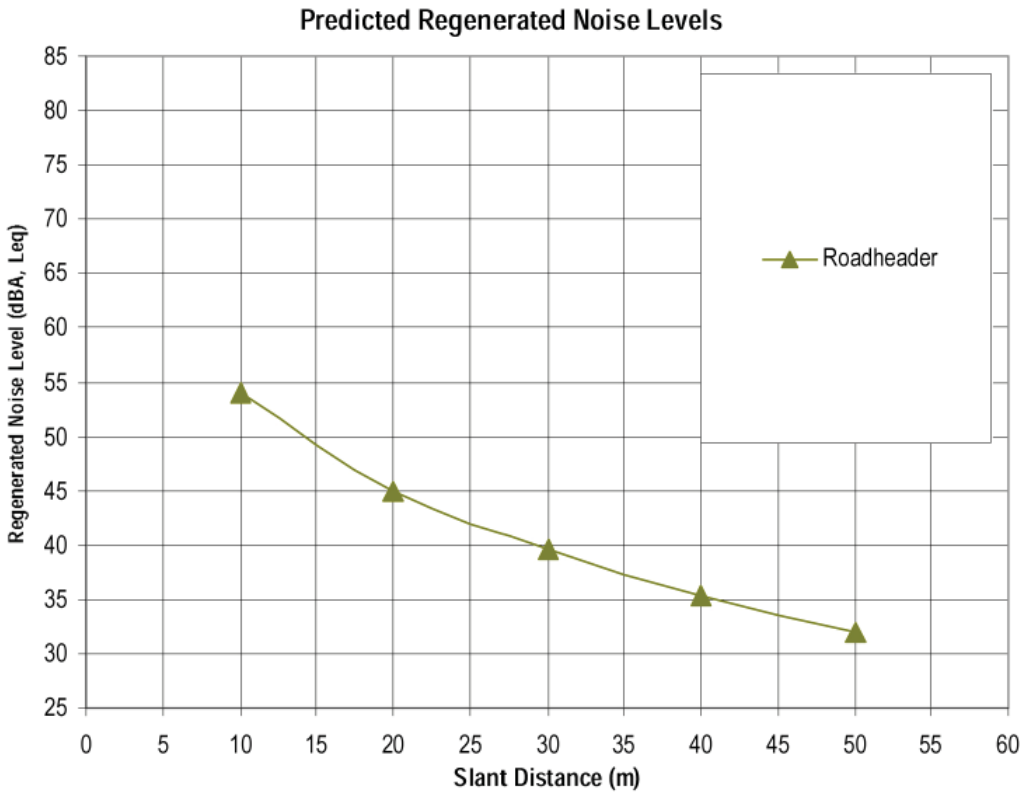
Operation of heavy rock breakers in the vicinity of heritage listed buildings is likely to exceed the criteria for structural damage presented in Table 9-8 and Table 9-9. As indicated in Section 9.1.2, surrounding heritage listed buildings would be inspected by a structural engineer to determine whether they are structurally sound. If the buildings are structurally sound, there may be scope for increasing the vibration criteria for the heritage listed buildings to that of residential buildings.

Vibration from roadheaders

For tunnelling operations, regenerated noise is usually transitory in nature and increases in level as the tunnelling works approach a particular building, reaches a maximum when the works are immediately nearby, and then decreases in level as tunnelling moves on. The rise and fall of the noise level is controlled by the rate of tunnel advance, which typically ranges from 5 m to 10 m per day, depending on ground conditions and excavation methods.

Wilkinson Murray has measured groundborne noise levels from a roadheader similar in size to that likely to be used for the project and the results are summarised in Figure 9-3. These results were used to predict noise in basements of buildings near stub tunnel to be excavated by road header.

Figure 9-3 Predicted regenerated noise from road header



Slant distances from the stub tunnel to buildings in Bligh Street indicate the minimum distance from the head of the tunnel to the basements of commercial properties and the Sofitel Wentworth Hotel is in the order of 30m.

At distances of 30 m, a regenerated noise level of 39 dBA is expected and this would comply with the daytime regenerated noise criterion. In the case of noise levels in the Sofitel Wentworth, the basements of the building are 15 m below ground level and this represents about four levels. Allowing for an attenuation of 2 dBA per level, the noise levels at ground floor of the hotel are predicted to be in the order of 31 dBA which is well below the night time regenerated noise criterion of 35 dBA. Based on this, 24 hour operation of the roadheader would comply with regenerated noise criteria.

Vibration levels associated with ground-borne noise are well below human comfort or structural damage criteria. No adverse impact with respect to perceptible vibration or structural damage at any residences is predicted.

9.2.3 Construction traffic

Construction of Stage 2A(i) of the City East Zone Substation would generate traffic movements and the peak in heavy vehicle movements would be associated with spoil haulage. Transport of equipment to the site would occur during the initial stage involving site preparation works and intermittently in between stages. Approximately 1-2 deliveries per day are estimated. Table 9-17 summarises heavy vehicle movements during the various stages of excavation.

Table 9-17 Heavy vehicle movement attributed to spoil removal

Construction activity/source	Expected spoil generation (bulked volume)	Duration (days)[1]	Truck trips per day[2]	Maximum truck movements per hour[3]
Bulk excavation of basement	72,066 m^3 (158,544 t)	150	192	20
Stub tunnel and shaft excavation	4866 m^3 (10,706 t)	150	13	2
Bridging structure over Metro tunnels	4659 m^3 (10,250 t)	40	47	5

[1] At 5 days per week.

[2] Number of truck trips per day estimated on the basis of 5 m^3 per single unit dump truck and each trip generating one inbound movement and one outbound movement.

[3] Maximum truck trips per hour is based on a 10-hr work day or maximum throughput of one truck movement every 5 minutes.

As discussed in Section 13.2, the average daily traffic through the various road sections in the northern CBD in the vicinity of the site range from 7000 vehicles per day (Castlereagh Street) up to 30,000 vehicles per day (Macquarie Street) and with the Eastern Distributor/South Dowling Street around 60,000 vehicles per day. The peak hour volumes are estimated to range from 500-1,500 vehicles per hour for the local roads and up to 7000 vehicles per hour for Eastern Distributor/South Dowling Street.

In the case of Eastern Distributor, Southern Cross Drive, Anzac Parade, Moore Park Road, M5 East Motorway, Western Distributor, Victoria Road and City West Link the roads can be classified as arterial roads. In the case of

Macquarie Street, Hunter Street, Elizabeth Street, Market Street the roads can be classified as a collector road. Bent Street; Phillip Street, King Street and Bridge Street are classified as local roads.

Analysing the traffic data and the estimated vehicle movements during the construction phase indicates that the 2dB limit on the increase in road traffic noise levels applies. Calculations indicate there would be minor increases in road noise during the peak construction activities of less than 0.4dB.

9.3 Mitigation measures

Without mitigation, noise levels from some construction activities are predicted to exceed the noise management levels nominated in the guidelines at some surrounding receivers. Therefore, noise control measures have been recommended to ensure that noise is reduced where feasible.

A range of possible approaches to reducing the impact of construction noise is described below and would be applied to areas of potential exceedance.

9.3.1 Community liaison and general approaches to mitigation

A community relations program would be implemented to keep the potentially affected community informed of progress of the works, and to advise of any anticipated changes in noise and vibration emissions prior to critical stages of the works. This would involve explaining complaint procedures and response mechanisms. This program would be included in EnergyAustralia's Community Information Plan that has been specifically developed for the Sydney CityGrid Project.

Close liaison would be maintained between the communities surrounding the site and the contractor undertaking the construction works to provide effective feedback in regard to perceived emissions. In this manner, equipment selections and work activities can be coordinated where necessary to minimise disturbance to neighbouring communities, and to ensure prompt response to complaints, should they occur.

9.3.2 Noise and vibration management plan

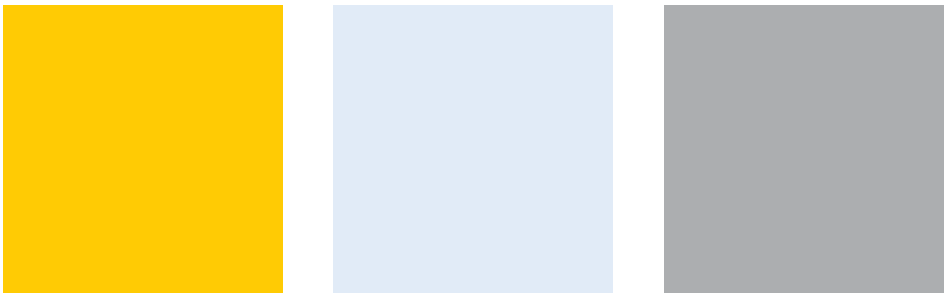
A noise and vibration management plan would be included in the CEMP for the project. The plan would detail the mitigation, monitoring and community liaison measures to be implemented and would be updated to incorporate any additional measures that emerge as the project design evolves and work methodologies become better defined.

Areas that should be addressed in the plan include:

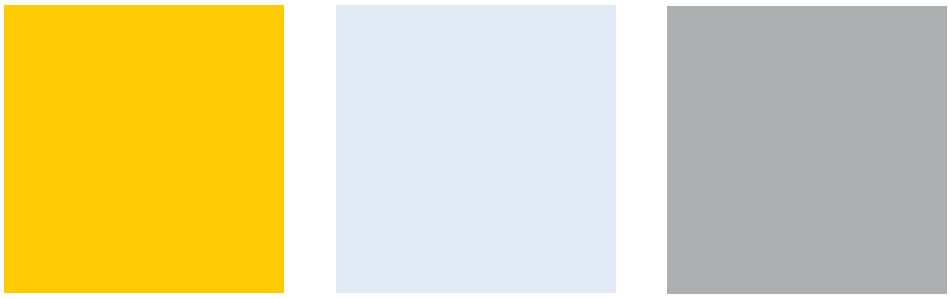
- Noise and vibration monitoring;
- Response to complaints;
- Responsibilities;
- Monitoring of noise emissions from plant items;
- Reporting and record keeping;
- Non compliance and corrective action; and
- Community consultation and complaint handling.

Specific actions to be included in the plan would relate to:

- Plant noise audit – Noise emission levels of all critical items of mobile plant and equipment should be checked for compliance with noise limits appropriate to those items prior to the equipment going into regular service. To this end, testing would be undertaken by the contractor;
- Operator instruction – Operators should be trained in order to raise their awareness of potential noise problems and to increase their use of techniques to minimise noise emission;



- Equipment selection – All fixed plant at the work site would be appropriately selected, and where necessary, fitted with silencers, acoustical enclosures and other noise attenuation measures in order to ensure that the total noise emission from each work site complies with DECCW guidelines;
- Site noise planning – Where practical, the layout and positioning of noise-producing plant and activities on the work site should be optimised to minimise noise emission levels;
- Use rocksaws in preference to rock breakers, where feasible;
- Install a noise barrier between the site and the street frontages with minimum 17 mm thick structural plywood; (the site would be surrounded by hoardings erected in accordance with the City of Sydney Guidelines);
- Consideration to be given to the use smaller rock breakers where practicable. This would involve evaluation of the relative increase in the duration of works that may result from use of smaller machinery;
- Noise intensive activities such as rock breaking would be undertaken during the following hours: Monday to Saturday 7 am to 12 pm and Monday to Friday 2 pm to 5 pm providing a respite period between 12 pm and 2 pm; and
- Install vibration monitors in adjacent commercial building, in particular the Lowy Institute, to ensure that vibration in these buildings do not exceed acceptable levels.



10. Non-indigenous heritage

This chapter provides a summary of the Statement of *Heritage Impact City East Substation and Integrated Commercial Development 33 Bligh Street Sydney* prepared by NBRS+Partners (Appendix F) and a non-indigenous archaeology study undertaken by Casey and Lowe.

10.1 Existing environment

10.1.1 Archaeology

The property is zoned in the City of Sydney's Archaeological Zoning Plan (1992) as having no archaeological potential. This finding usually reflects the presence of basements of sufficient depth to have removed most if not all of the site's archaeological remains. The site is unlikely to contain archaeological remains as excavation of the basements for Kindersley House extended into bedrock to a depth of 4 - 6 m below the existing ground level.

10.1.2 Built heritage

The site is occupied by Kindersley House, a 1960s high-rise development erected to house the Sydney Stock Exchange. The existing building has no identified architectural merit and with the adjoining development to its south, detracts from the overall heritage and streetscape significance of the surrounding precinct.

The surrounding precinct is of heritage significance for historic, aesthetic and social values related to the early Colonial period of development of Sydney and its subsequent development in the late Victorian era and early 20th Century. Whilst not listed as a heritage item, the site it located in close proximity to a number of heritage listed items (either adjoining the site or within the visual catchment). The location of these heritage items is shown in Figure 10-1 and details regarding these items are summarised in Table 10-1.

Figure 10-1 Part heritage map, Sydney LEP 2005 showing heritage items in the vicinity of the subject site (green)

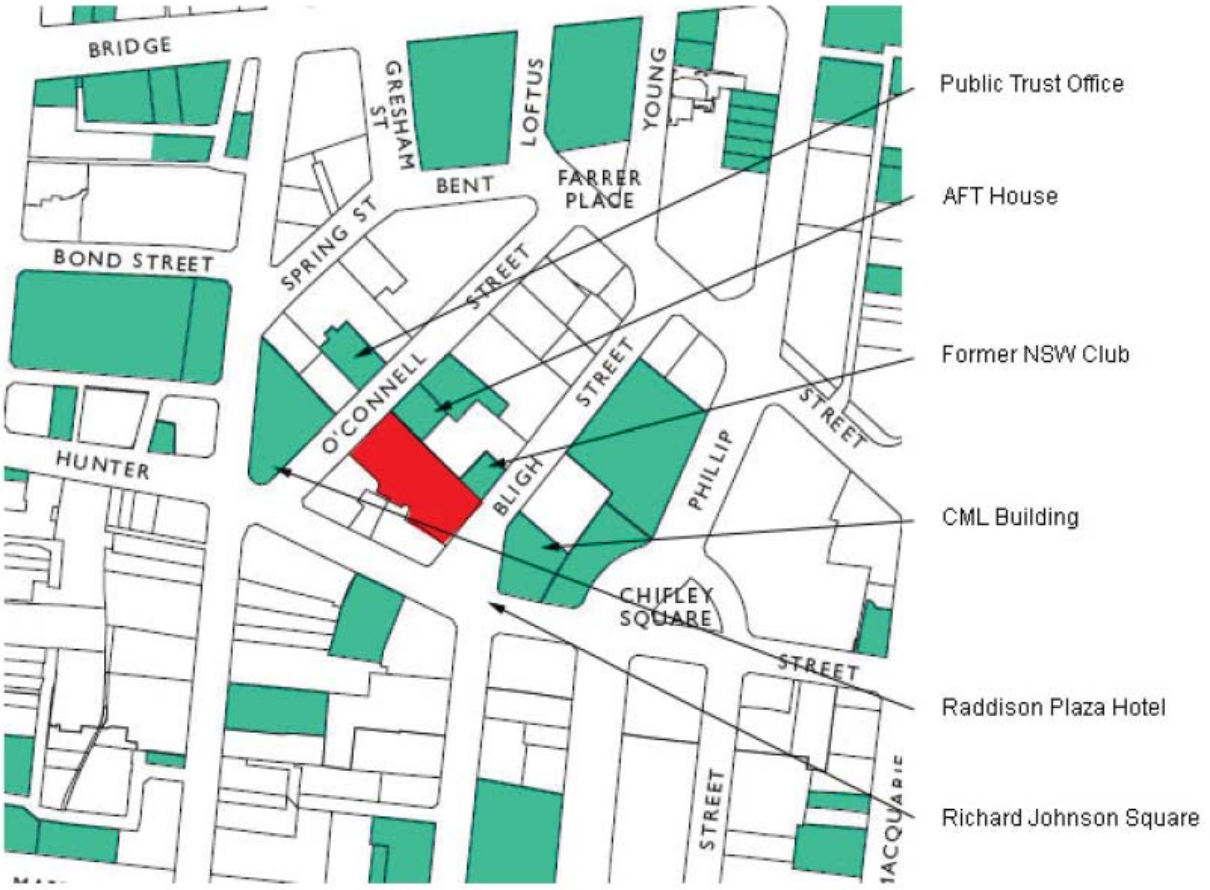


Table 10-1 Heritage items surrounding the site

Heritage item	Address	Listing
Former NSW Club building (now known as the Lowy Institute)	31 Bligh Street	• City of Sydney Heritage Inventory No. 2028 • NSW State Heritage Register • The Register of the National Estate • The National Trust of Australia (NSW)
AFT House (former Delfin House)	16 - 18 O'Connell Street	• City of Sydney Heritage Inventory No. 2026 • The Register of the National Estate • Royal Institute of Architects (NSW Chapter) • The National Trust of Australia (NSW) • The Art Deco Society

Heritage item	Address	Listing
CML building (City Mutual Life Assurance Society Building)	60 - 66 Hunter Street	• City of Sydney Heritage Inventory No. 2013 • The Register of the National Estate • NSW State Heritage Register • Royal Institute of Architects (NSW Chapter) • The National Trust of Australia (NSW) • The Art Deco Society
Public Trust Office	19 - 21 O'Connell Street	• City of Sydney Heritage Inventory No. 2027 • The Art Deco Society
Raddison Plaza Hotel (former Bank NSW)	64 - 66 Pitt Street/ 27 O'Connell Street	• City of Sydney Heritage Inventory No. 2017 • The Register of the National Estate • NSW State Heritage Register • Royal Institute of Architects (NSW Chapter) • The National Trust of Australia (NSW) • The Art Deco Society
Richard Johnson Square	Bligh Street	• City of Sydney Heritage Inventory No. 8079 • The Register of the National Estate • The National Trust of Australia (NSW)

The former NSW Club building and the AFT house are situated directly adjacent to the site, as indicated in Figure 10-1. Further detail of the historical and architectural significance of these two buildings is provided below.

Richard Johnson Square

Richard Johnson Square is located at the intersection of Bligh and Hunter Streets and was created by a street closure. It commemorates the first Christian Worship Service held in the Colony of NSW and the erection of the first Church in 1793 by the colony's first Chaplain, Rev. Richard Johnson.

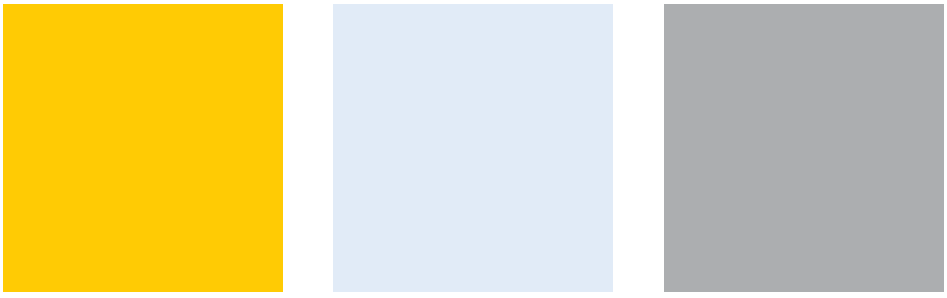
The square includes an elaborate Gothic Revival style monument that was erected in 1925 and a late Victorian light fitting, originally from Martin Place. The Square and its monument are listed as items on The Register of The National Estate and are listed by The National Trust of Australia (NSW).

The design of the Square is simple and allows pedestrian use of a former street intersection and provides a sympathetic scale and setting for the surrounding heritage items.

The former NSW Club building

The former NSW Club building was designed in the Victorian Academic Classical style by architect William Wardell and built by John Fry between 1884 and 1887. The Mansard roof form is a later addition to the original but executed in the same style. The building is listed on the NSW State Heritage Register under the provisions of the NSW Heritage Act 1977 because of an earlier Permanent Conservation Order under the Heritage Act 1977 on the site. It is identified as an item on the Register of The National Estate and is listed by The National Trust of Australia (NSW). The Inventory description for the item states in part:

The NSW Club House is a fine sandstone city building which now stands in isolation as a remnant of Victorian Sydney amid intense office and hotel development. Barclays House Tower is physically connected to the building to the west. The NSW Club House is symmetrically designed, with the exception of the front door which is located to the north. The building features restrained classical decoration, featuring an ashlar



sandstone plinth and slate mansard roof with classically detailed gable windows. The roof gable is a later Edwardian addition made in 1916. The building is divided by string courses at each floor and is topped by a classical cornice with dental detail. The ground floor stonework has recessed joints and the upper stonework is plain ashlar. The windows are in three groups with, curved head with quoins and keystones on the ground floor, pedimented on the first floor, and with smaller curved headed windows on the second floor. The building retains its iron palisade fence and stone base along Bligh Street.

The Statement of Significance identifies the exceptional 'Italian Palazzo' Facade treatment as being highly significant for its streetscape character in Bligh Street.

The heritage and urban design constraints presented by the proximity of this building to the site are:

- The necessity for recognition of the established scale of the former NSW Club building in the design of any new structure on the adjoining site in context in the street;
- A recognition of the dominant existing horizontal divisions of the Club façade;
- Consideration of the proportions of openings and vertical elements in the new work to harmonise with the existing building without imitating or detracting from it; and
- The necessary use of compatible recessive materials and façade detailing to compliment the surrounding established architectural character and to limit any impact on perception of the heritage qualities of the item.

AFT house

The AFT house building was designed in the Inter-War Art Deco style by architect C.Bruce Delit and built by Stuart Brothers between 1939 and 1940. The building is an item on the Register of The National Estate and is listed as a significant 20th century design by the Royal Australian Institute of Architects (NSW Chapter), The National Trust of Australia (NSW) and The Art Deco Society. The inventory description states in part:

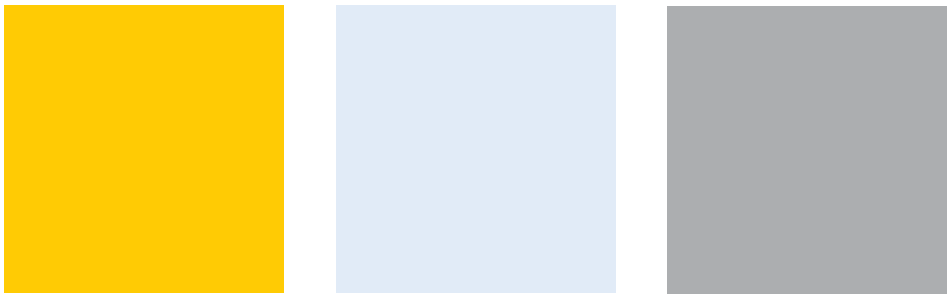
AFT House, originally a banking chamber with offices above, exemplifies the Art Deco style. The facade comprises two zones. The first consists of a decorative archway clad in granite, rising four floors in height, which dominates the streetscape. Above rises an expanse of sandstone. The building features stylised and geometric semiabstract decoration. On bronze doors and carved panels beneath the arch, the architect has allegorized the spirit of the machine age and NSW, 'The Age of Plenty'.

The entrance foyer has travertine clad walls and a marble floor, and retains original metal and glass light fittings and decorative lift doors. The former Egyptian Art Deco banking chamber is monumental. Two stories in height, the chamber retains a vaulted ceiling and rich detailing.

The building is visually linked by design and materials to the adjacent Manufacturers House and fits well into the streetscape. The Statement of Significance identifies the facades style and detail to be of exceptional significance representing a departure from traditional forms and expressing contemporary modern design concepts and building technologies by integrating materials with function and structure. The streetscape contribution of the building to O'Connell Street is considerable.

The heritage and urban design constraints presented by the proximity of this building to the site are:

- A need for recognition of the scale of the base section of the building in the design of any attached section of the new development in relation to the lower portion of AFT House;
- Consideration of the potential for new suitably scaled elements on the south of AFT House to 'book-end' with Manufacturers House to the north;
- The necessity for the use of sympathetic materials on the new development to reduce impact on the heritage item and its visual dominance in the streetscape; and
- Recognition of the balance of vertical and horizontal elements predominating in the adjoining streetscape.



10.2 Impact assessment

10.2.1 Archaeology

Construction of the existing buildings and their basements involved excavation to about 4 m below the level of O'Connell Street and 6 m below Bligh Street. This excavation is considered likely to have removed all items of potential archaeological interest with the possible exception of the bases of wells if they were deeper than 4 m in this area. All other structural remains and features relating to the nineteenth century land use of the property would have been removed by previous construction at the site. Based on this assessment, excavation of the basement and construction of the stub tunnel and bridging structure is unlikely to impact on any items of archaeological significance.

The excavation of the stub tunnel from 33 Bligh Street to the intersection with Bent Street would be carried out by road header at a depth of about 42 m below the ground surface. It would not involve any surface excavation along Bligh Street and therefore would not have any impact on archaeological remains.

The project would use part of Richard Johnson Square as a construction zone, however this would not affect the existing monument or gas light. As this would not involve excavation, it is unlikely to impact on any items of archaeological significance that may be located below ground.

10.2.2 Built heritage

The heritage impact statement was undertaken by NBRS+Partners (Appendix F) based on the guidelines set out by the NSW Heritage Office publication 'Statements of Heritage Impact', 2002. The purpose of the assessment was to consider the significance of the impact of the building envelope on the built heritage of the surrounding area. It concludes that the building envelope minimises potential negative heritage impacts and enhances the heritage significance of the adjacent heritage items. The statement also identified that the following aspects of the project could detrimentally impact on heritage significance:

- The O'Connell Street elevation requires greater modulation than is apparent in the massing studies and could be achieved through the use of a variety of materials, articulation and modulation of the podium. This would be considered during Stage 2(ii) of the City East Zone Substation; and
- The southeastern corner to Bligh Street is a critical corner and presentation to Richard Johnson Square and Hunter Street. During Stage 2A(ii), care should be taken in the articulation of this corner to the substation.

A summary of the assessment of the project against the NSW Heritage Office publication 'Statements of Heritage Impact', 2002 guidelines is provided below.

Demolition of a building or structure

Have all options for retention and adaptive reuse been explored?

The two existing buildings located at 33 Bligh Street and 20-26 O'Connell Street, would be demolished. The buildings date to the 1960s and 1980s, are concrete frame and glass infill construction, and are 17 storey and 13 storey in height respectively. The buildings have little heritage significance and are not listed as heritage items. From a heritage perspective, there is no impediment to their removal.

Can all the significant elements of the heritage item be kept and any new development be located elsewhere on the site?

As the site is not a heritage item, this criteria is irrelevant.

Is demolition essential at this time or can it be postponed in case future circumstances make its retention and conservation more feasible?

The buildings need to be demolished to allow for construction of a new electrical zone substation within the

eastern zone of Sydney CBD to meet existing and future electrical loads, usage and standards. The current infrastructure requires refurbishment, replacement and augmentation to provide a secure supply of electricity to the Sydney CBD that complies with new licensing requirements.

The need to upgrade electrical substations within the Sydney CBD cannot be delayed and development of the City East Zone Substation at this site is an essential component of the Sydney CityGrid Project.

Has the advice of a heritage consultant/specialist been sought? Have the consultant's recommendations been implemented? If not, why not?

NBRS + Partners is an architectural practice which has provided heritage consultancy services for over thirty years. The heritage consultancy has been involved in the design of the building envelope and supports the demolition of the two buildings. NBRS + Partners has advised on design features to minimise negative heritage impact on heritage items in close proximity to the site.

New development adjacent to a heritage item (including additional buildings and dual occupancies)

How is the impact of the new development on the heritage significance of the item or area to be minimised?

There are a variety of street alignments and building heights along the existing streetscapes of Bligh and O'Connell Streets and buildings from a variety of periods and styles. The site is adjacent the four-storey former NSW Club building, located at 31 Bligh Street, and those heritage buildings on O'Connell Street have an overall scale ranging from 10 to 17 levels. The massing study undertaken by Kann Finch acknowledges the need to sensitively address the heritage significance, scale and proportions of these buildings, while constructing a relatively bulky substation. Adverse impacts associated with the bulk would be minimised through careful modulation of the large facade planes, using a rich palette of design articulation. Peer review and an iterative design process with stakeholders and design review panel would form part of Stage 2A(ii) of the City East Zone Substation Project and ensure a high level of design outcome is achieved in conjunction with contributions to the streetscape and heritage significance of adjoining buildings.

The Bank of NSW building and Manufacturing House are heritage listed buildings with façades that are highly articulated. As part of the design review process during Stage 2A(ii), consideration would be given to detailing of the facades and treatments on O'Connell and Bligh Street frontages to minimise negative heritage impacts of bulk and scale on the heritage items in close proximity.

The building envelope would retain the existing street alignment. While this has the potential to negatively impact on the sensitive junction between the new proposed building and the former NSW Club, this negative heritage impact would be minimised by the void created by the proposed entry "slot" on Bligh Street. It also enables the articulation and increases visibility of the southern facade of the former NSW Club. This reduces the negative heritage impact on views and vistas to the heritage listed building and frames the southern facade by providing a scale that is sympathetic to the heritage listed building.

To minimise the visual appearance of height of the building envelope, a 7 m high landscaped sky lobby, located on Level 12 above the substation podium (RL50.25) has been proposed. This would delineate and address the scale of the reduced heights of the heritage listed buildings on both Bligh and O'Connell Streets.

Why is the new development required to be adjacent to a heritage item?

EnergyAustralia undertook a process to select a site for the City East Zone Substation in the vicinity of Phillip, Bent, Bligh and O'Connell Streets. The substation is required to be located as close as possible to the alignment of the City East Cable Tunnel to minimise the extent of infrastructure required to connect these elements. This process identified 33 Bligh Street as the preferred site because it is of a suitable size and the connection to the proposed City East Cable Tunnel could be provided by constructing a short 150 m long stub tunnel. Importantly, there is also development consent to demolish the existing buildings on the site and construct a commercial tower, however this development did not proceed for commercial reasons.

How does the curtilage allowed around the heritage item contribute to the retention of its heritage significance?

The building mass would be set back from the former NSW Club Building by approximately 9m to expose its southern wall and to enable appreciation of its east elevation. This provides the opportunity for the public to appreciate the heritage significance of the fabric and the building's setback from the street alignment.

How does the new development affect views to, and from, the heritage item? What has been done to minimise negative effects?

The building envelope would not interrupt views and vistas to and from the heritage items on O'Connell Street as it maintains the existing street alignment. The setback from the southern facade of No 31 Bligh Street would ensure there is minimal interruption of views and vistas to and from the heritage item and addresses Richard Johnson Square a heritage item.

Is the development sited on any known, or potentially significant archaeological deposits? If so, have alternative sites been considered? Why were they rejected?

As indicated in Section 10.2.1, 33 Bligh Street is unlikely to contain any significant archaeological deposits. Impacts on potential subsurface archaeological deposits within Richard Johnson Square are unlikely as it is not intended to excavate in this area.

Is the new development sympathetic to the heritage item? In what way (e.g. form, siting, proportions, design)?

The O'Connell Street facade would be sited on the existing street alignment which follows that of the adjacent heritage listed buildings. This siting is sympathetic with the significance of the heritage items.

As indicated in Section 16.2, the massing, in particular the height of the podium, sympathetically addresses the heights and proportions of the heritage items in close proximity on Bligh and O'Connell Streets. The proportions and detailing of the building would be further addressed in Stage 2A(ii) of the design process when building materials would be selected and details relating to articulation and modulation of the podium would be developed. Advice would be sought from a heritage consultant during Stage 2A(ii) to ensure that the design is sympathetic to the heritage items.

Will the additions visually dominate the heritage item? How has this been minimised?

While the building envelope would be considerably higher than the heritage items in close proximity, the impact of the contrast in scale has been minimised by articulating the scale of the podium structure, by proposing a sky lobby which is related to the height and scale of the adjacent late-nineteenth and early-twentieth century heritage items.

Will the public, and users of the item, still be able to view and appreciate its significance?

The building envelope would enhance views to the existing heritage items and allow the continued public appreciation of the heritage items located in close proximity.

10.3 Mitigation measures

10.3.1 Archaeology

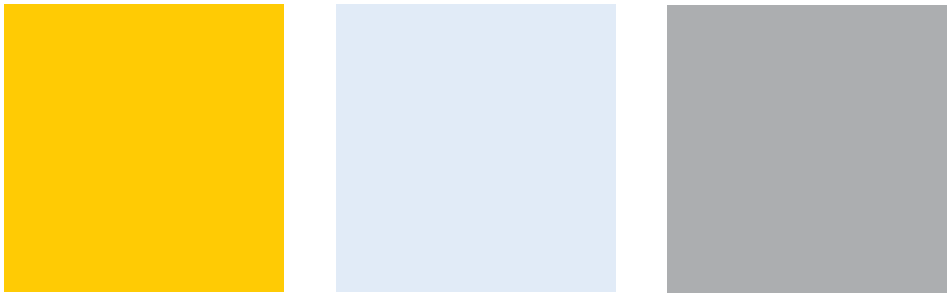
While the works have no identified impact on archaeological remains, the initial bulk excavation of the site may impact on deeper archaeological remains, such as the bases of any wells sunk in the early decades of the use of the property. Wells were often backfilled with artefacts and debris relating to the use and occupation of the adjoin land. To ensure that no deeper archaeological remains are present on the site, it is recommended that the initial bulk excavation be monitored by an experienced historical archaeologist. Monitoring would only be necessary when the basement floor slab is being removed. It should be obvious whether the soil beneath the slab is natural or whether features are present.

If construction planning indicates that subsurface works are required within Richard Johnson Square, further assessment would be undertaken by an appropriately qualified heritage consultant in consultation with the Heritage Branch of the Department of Planning. This would involve development of additional management measures to be implemented.

No archaeological mitigation is necessary for the excavation of the stub tunnel.

10.3.2 Built heritage

The Statement of Heritage Impact concludes that the building envelope would not adversely affect the identified heritage significance of the heritage items in close proximity to the site. Further consideration would be given to potential impacts on built heritage during development of the design for Stage 2A(ii) of the City East Zone Substation as detailed in Section 6.3.6 and this would involve consideration of materials and articulation.



11. Indigenous heritage

11.1 Existing environment

The site for the City East Zone Substation has been substantially modified by previous development works, including construction of the existing commercial buildings. The basement level of the building has been excavated into sandstone bedrock and is approximately four metres below the O'Connell Street frontage and up to six metres below the Bligh Street frontage.

An Aboriginal Cultural Heritage Assessment was undertaken by Navin Officer Heritage Consultants as part of the Concept Environmental Assessment (EnergyAustralia 2008). This involved a search of the Aboriginal Heritage Information Management System (AHIMS) that is maintained by DECCW which identified 16 known Aboriginal sites in the vicinity of the Sydney CityGrid Project. Navin Officer concluded that these results demonstrate 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. Areas with the greatest potential for subsurface archaeological deposits were predicted to be:

- The pre-European foreshore zone, up to 200 m 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 AHIMS search was repeated in 2010 during preparation of this Environmental Assessment and did not identify any additional items in the study area, nor the presence of any known Aboriginal sites at 33 Bligh Street.

11.2 Impact assessment

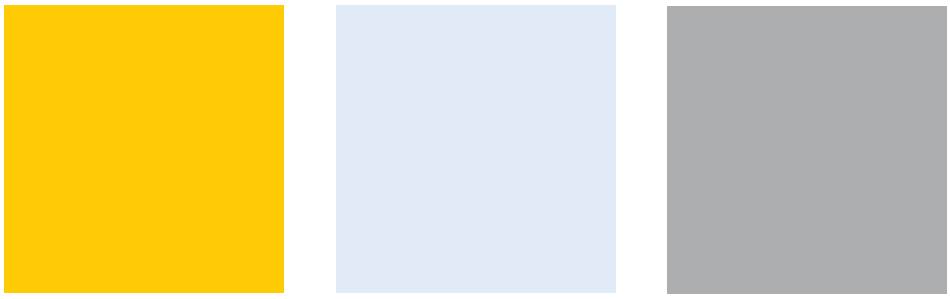
Construction of Kindersley House involved excavation into bedrock and removed the pre-European soil profile and it is highly unlikely that any items of potential significance to Aboriginal communities remain within the site. As such, construction of the project is unlikely to impact on items of potential significance to Aboriginal communities.

A site inspection by a representative from the Metropolitan Land Council was conducted on 19 April 2010. This confirmed that there are unlikely to be any indigenous heritage issues associated with the City East Zone Substation (refer to Chapter 4).

11.3 Mitigation measures

The following mitigation measure would be included in the CEMP to manage potential impacts on items of Aboriginal heritage significance:

- If unexpected Aboriginal object(s) are encountered during construction, all work likely to affect the object(s) would cease immediately and the DECCW informed in accordance with the National Parks and Wildlife Act 1974. The Metropolitan Local Aboriginal Land Council would also be notified. Works would not recommence until written authorisation from DECCW is received.



12. Spoil and waste management

12.1 Impact assessment

Waste would be generated during the following stages of the project:

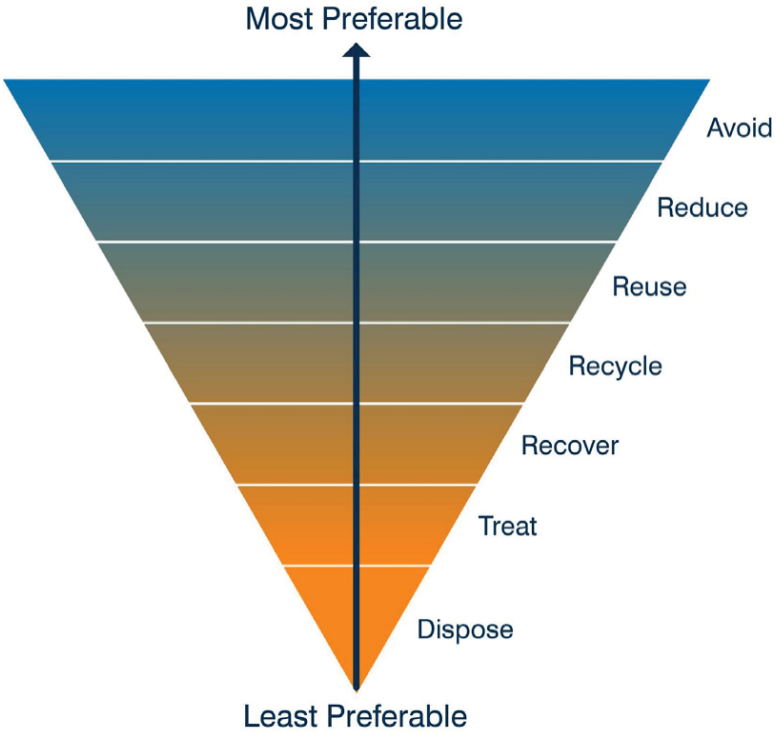
- Site preparation;
- Demolition of Kindersley House;
- Bulk excavation of the basement;
- Excavation of a shaft and a stub tunnel beneath Bligh Street to the intersection of Bent Street and Bligh Street; and
- Construction of a bridging structure above the alignment of the tunnels for the proposed Sydney Metro.

Details of the expected types of waste from each of these sources are provided in the following sections.

12.1.1 Overarching principles for management of waste

The management of all wastes generated from the project (including spoil) would be in accordance with relevant legislation and the principles of the waste management hierarchy as set out in the NSW Waste Avoidance and Resource Recovery Strategy 2007 (refer to Figure 12-1).

Figure 12-1 The waste hierarchy



All waste would also be managed in accordance with NSW DECCW requirements and be classified in accordance with the DECC (April 2008) *Waste Classification Guidelines* prior to disposal.

12.1.2 Demolition of Kindersley House

Demolition of Kindersley House would be undertaken in several stages, the first stage being the removal of any identified hazardous materials, followed by the removal of plant and equipment, and then demolition of the structure which would occur on a floor by floor basis. Waste would be generated at each of the stages of demolition as described in the following sections. Demolition is expected to take six months.

Removal of hazardous materials

A hazardous materials audit of Kindersley House was undertaken by Environmental Monitoring Services (2005) as part of a previous development application for Investa Property Group that involved demolition of the building and redevelopment of the site. The following sections summarise the main findings of this audit.

A hazardous material clearance certificate would be obtained to verify that all hazardous materials have been removed prior to demolition commencing.

Synthetic mineral fibre containing material

Synthetic mineral fibres (SMF) have been identified in some internal walls. Any SMF would be bagged or wrapped in plastic and handled per Worksafe Australia's *Synthetic Mineral Fibres – National Standard and National Code of Practice.* The bagged or wrapped material containing SMF would be classified as 'Special Waste' in accordance with the DECC (April 2008) Waste Classification Guidelines. It would then be disposed of at a facility licensed to accept 'Special Waste'.

Paint containing at least one percent lead

Loose and flaking lead paint on structures would be removed prior to structural demolition works. According to the DECC (April 2008) Waste Classification Guidelines, lead dust with lead levels above 6000 mg/kg would be classified as 'Hazardous Waste', and if lead levels are below 6000 mg/kg but greater than 1500 mg/kg it would be classified as 'Restricted Solid Waste'. Testing would be undertaken to confirm the appropriate classification.

The lead paint (and lead dust) would be disposed at a facility licensed to accept 'Hazardous Waste' or 'Restricted Solid Waste', depending on the outcomes of testing.

Capacitors containing polycyclic biphenols in fluorescent light fittings

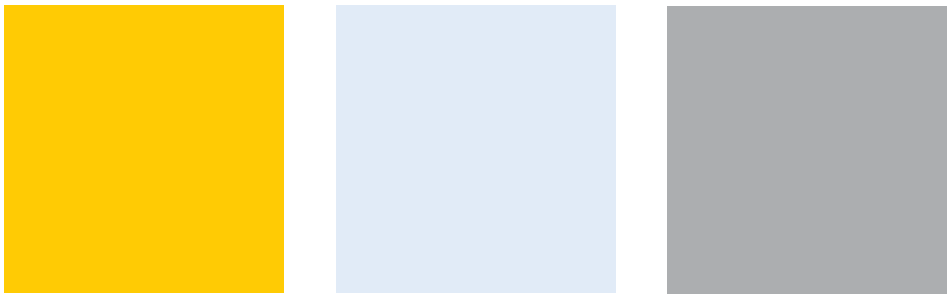
Fluorescent light fittings containing polycyclic biphenols (PCBs) would be removed and stored separately in clearly marked drums prior to disposal by a licensed contractor. A receipt would be issued by the licensed contractor when it takes possession of the drums. This receipt would include details of the date the drums were received, the number of drums received and the weight of the drums. A copy of this receipt would be kept on site until the completion of the demolition works.

The licensed contractor would be required to supply the demolition contractor with specific details of the transit and storage details of the waste from the project and a procedure and location for the eventual incineration of the PCB waste. These details would be kept on the site until the completion of the demolition contract.

Internal stripout

Following removal of hazardous materials, internal-strip out would commence. Waste expected to be generated includes:

- Floor finishes such as carpet and underlay;
- Ceilings and services including pipes and cables; and
- Partition and block walls (gyprock).



Material would be sorted into different stockpiles on each floor being stripped out. Recyclable material such as carpet in good condition, plasterboard, plastic piping and cables would be stockpiled separate to other non-recyclable materials.

Recyclable materials would then be sent for reuse or recycling and non-recyclable materials would be disposed of at a licensed landfill.

Structural demolition

Waste generated from structure demolition works would include:

- Concrete and brick;
- Timber from framed roofs; and
- Roof cladding material.

Most of the waste material generated from structural demolition would be able to be readily recycled. Where possible, the material would be stockpiled separately and sent off site for recycling at licensed facilities.

Demolition of buildings near boundaries

Waste generated from demolition of external walls, concrete beams and columns and the ground slab would be mostly recyclable (concrete and steel reinforcement bars). This, along with scrap metal from the aluminium facades, would be recycled wherever practicable.

Estimated demolition waste volumes

Table 12-1 lists the estimated waste quantities from demolition of Kindersley House. A total of approximately 23,000 tonnes (29,300 m^3) of various materials would require management through reuse/recycling or disposal.

Table 12-1 Estimated demolition waste quantities

Material	Estimated quantity (tonnes)
Wood	4800
Drywall/Gyprock	2300
Metals	1600
Concrete	12,200
Plastics	700
Other	1400
Total	***23,000***

12.1.3 Basement, stub tunnel and shaft excavation and construction of the bridging structure

Spoil volume and classification

Spoil is material removed from ground excavation and would be generated during bulk excavation of the basement, excavation of the shaft and stub tunnel and construction of the bridging structure. The total expected spoil generated from the project would be approximately 48,857 m^3 (in situ).

Geotechnical investigations at the site (PSM May 2008) indicate the subsurface comprises a thick layer of fill overlying weathered sandstone. The backfill behind the walls comprises bricks, sand or sandstone. Backfill material at one location contains asbestos sheeting (fibro).

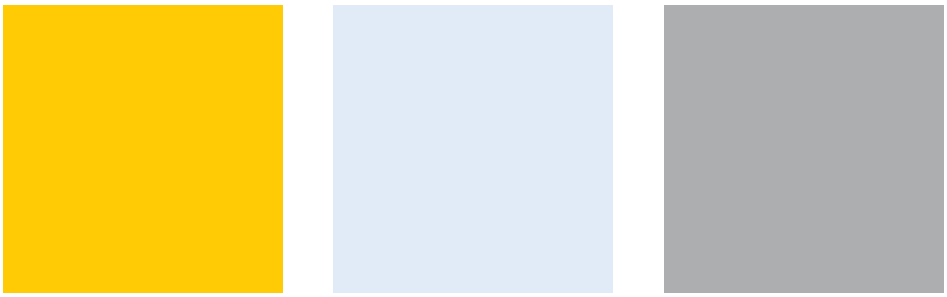


Table 12-2 summarises the inferred subsurface profile from the PSM (May 2008) geotechnical and environmental investigations. Based on this, it is likely that the majority of spoil generated from the project would be virgin excavated natural material (VENM) comprising Class IV, III and II sandstone. VENM is clean, natural material that is uncontaminated with other waste materials or manufactured chemicals. Fill would also be excavated that would not be VENM and would require disposal to an appropriately classified and licensed landfill, though it may be able to be reused at the landfill for remediation or general operational purposes.

Table 12-2 Inferred subsurface profile

Unit	Approximate thickness	Typical description
Fill	0.1 to 1.7 m	Sandy gravels with some clay
Class IV Sandstone	1.0 m	Moderately to highly weathered sandstone
Class III Sandstone	2.0 to 2.7 m	Moderately weathered sandstone
Class II Sandstone	Not known	Slightly weathered sandstone

Potential for contamination

The preliminary contamination assessment report for the site by Urban Environmental Consultants Pty Ltd (May 2008) concludes that the site shows no indication of gross contamination other than asbestos containing materials used as backfill at one location (as mentioned above). On this basis, during demolition and excavation of the basement, the asbestos containing materials would be segregated and disposed to landfill by an excavation contractor that is a certified ASI licensed NSW Work Cover contractor in accordance with NSW Work Cover Guidelines and appropriate health and safety controls.

Spoil material would be classified in accordance with the DECC (April 2008) *Waste Classification Guidelines* prior to offsite disposal or reuse/recycling.

Excavation volumes

Table 12-3 shows the expected quantities of spoil associated with each construction activity/source. The majority of spoil would be generated during bulk excavation of the basement.

Table 12-3 Estimated spoil generation

Construction activity/ source	Expected volume (in situ)
Bulk excavation of basement	43,153 m^3 (94,973 t)
Stub tunnel and shaft excavation	2,914 m^3 (6,411 t)
Bridging structure over Metro tunnels	2,790 m^3 (6,138 t)
TOTAL	48,857 m^3 (107,522 t)

Management approach

The overarching approach to spoil management for the project is based on the principles of the waste hierarchy and includes the objective of maximising reuse and recycling of spoil generated and managing contaminated spoil appropriately to minimse impacts to the environment.

There is limited opportunity to reuse excavated spoil as part of the project, however there are good opportunities for beneficial reuse off-site. For example, spoil can be reused as engineering fill or other construction materials. Spoil can also be beneficially reused for land reclamation or remediation works or for operational purposes at landfills. The least preferred option for off-site management is disposal at landfill. Other disposal options such as dumping at sea were not considered. The spoil management options are summarised in Figure 12-2.

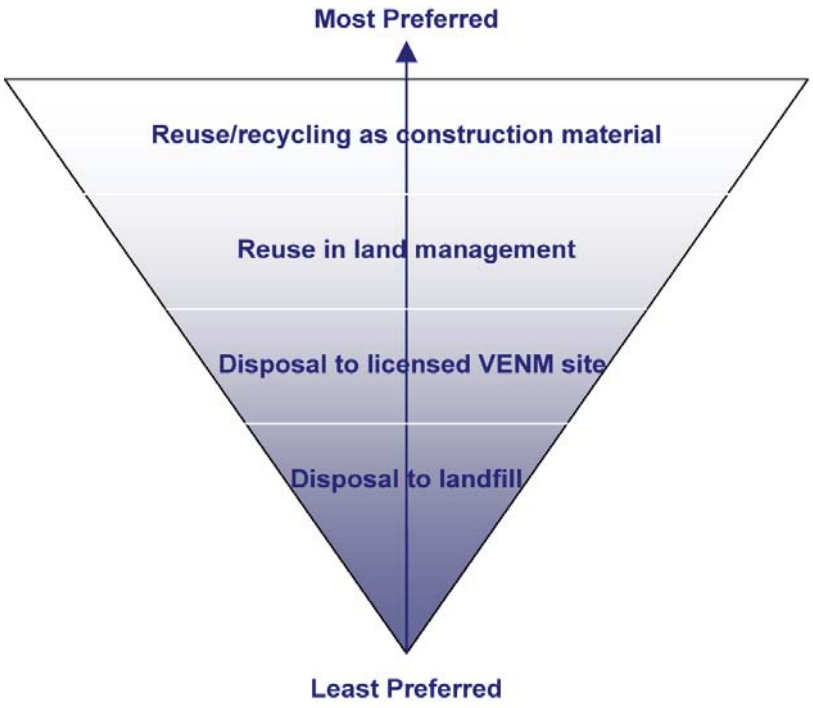


Figure 12-2 Spoil management hierarchy

A spoil and waste management sub-plan would be prepared as part of the CEMP that would identify how spoil and other waste material would be handled, stockpiled, reused and disposed. It would address the principles of the waste hierarchy and relevant health and safety as well as environmental legislation.

Reuse and disposal options

When considering spoil reuse and disposal, the volume of material and timing of spoil generating activities are key to determining feasible options. Small quantities can be utilised on a large number of construction projects or accepted at disposal sites (such as landfills or mining voids), but larger quantities often require special arrangements to be negotiated. The possibility of such arrangements also depends on the timing of other major construction projects requiring fill coinciding with the period when spoil is being generated.

VENM can be accepted and re-used on other construction sites with minimum effort and cost. There are a number of applications for shale and sandstones found in the Sydney region. The technique used to extract the material or the degree of processing largely determines the materials likely reuse application. Hawkesbury sandstone can be used to produce coarse concrete sand or as select earth fill material. Other potential applications are as a lower level pavement material or low grade road base. Some shale types can be used as fill for building sub-base road pavements, other are suited to crushing, grinding and processing to produce clay for vitrified products such as tile, pipes and bricks.

VENM can also be used in beneficial land management. For example, shale materials can be suitable as cover for contaminated land reclamation projects. The opportunities for reuse of spoil materials in beneficial land management can sometimes be limited as appropriate land management projects may not be underway in the vicinity of the VENM generating activities.

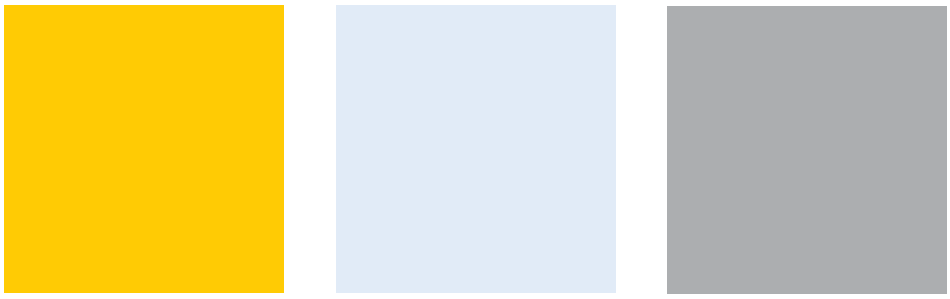
At some 'VENM only' sites in Sydney such as extractive industry voids (disused quarries), VENM can be accepted free of the Section 88 Waste and Environment Levy, so disposal costs are low. While there are a number of extractive industry voids in the Sydney region, not all are potential VENM filling sites and only a few are currently operating as VENM only receival sites. Table 12-4 shows some potential VENM only sites and spoil reuse and recycling sites.

Table 12-4 Potential VENM only and spoil reuse/recycling sites

Name	Location	Materials accepted	Capacity
Eastern Creek / Dial-a-Dump	Eastern Creek	Sandstone and shale	Recently approved 1.6 million tonnes/year
Rocla Sand Quarry	Calga	Sandstone	400,000 m^3, 1500 tonnes/day
Penrith Lakes Development	Penrith	Sandstone	1 million m^3/year for 8-10 years
CSR Schofields Quarry	Schofields	Sandstone and shale	1 million m^3, 500 tonnes/day clay for brick production, requiring 10 per cent sandstone and 50 per cent shale
CSR Cecil Park	Cecil Park	Sandstone and shale	1,000 tonnes/day clay brick production, 10 per cent sandstone and 50 per cent shale
Austral Plant 3	Horsley Park	Shale of appropriate quality	1.5 million m^3, active brickworks
Holt Land Rehabilitiation	Kurnell	Sandstone and shale	VENM only receival site for land rehabilitation of former sand mining areas Capacity not known
Boral Prospect Recycling Plant	Prospect	Sandstone	60,000-70,000 tonnes/year
Badgery's Creek Brick Plant	Badgerys Creek	High quality and particular types of shale	Capacity not specified
Hornsby Quarry	Hornsby	VENM	3-5 million m^3 capacity, but limited filling and not approved.

In August 2009, Hornsby Council resolved to progress actions to fill the Hornsby Quarry pit with VENM, but noted that filling would be limited to that necessary for safety, other operational reasons or where financially viable. Approval to fill Hornsby Quarry has not been obtained.

There are also large clay mining voids in the Horsley Park area that could potentially be filled with VENM, however planning and approval for such sites is not in place at present.



VENM and spoil classified as non-putrescibles waste (i.e. their characteristics do not allow them to be classified as VENM) can be disposed of at Class 2 (non-putrescible) licensed landfills, however doing so would incur the Section 88 Waste and Environment Levy. Disposal of clean spoil material at landfills is not a preferred management option, but can occasionally be necessary to maintain construction progress.

Landfilling of the former Pioneer quarry at Archold Road, Eastern Creek was recently approved by the NSW Department of Planning (as part of an overall project for a materials processing centre and landfill). This site has a capacity of 11 - 15 million m^3 and is expected to be able to accept between 400,000 and 700,000 tonnes per year of non-putrescible waste.

Other non-putrescible landfills within Sydney are shown in Table 12-5.

Table 12-5 Non-putrescible landfills in Sydney

Name	Licensed to	Location
Penrith Waste (Penrith Waste Services)	Penrith Waste Services Pty Ltd	842 Mulgoa Road, Mulgoa 2745
Elizabeth Drive (SITA)	SITA Australia Pty Ltd	1725 Elizabeth Drive, Kemps Creek 2178
Schofields (Hlebar & Draga)	Hlebar, Draga	North Street, Schofields 2762
Kemps Creek (Kari & Ghossayn)	Kari & Ghossayn Pty Ltd	Clifton Avenue, Kemps Creek 2171
Kimbriki (Warringah Council)	Warringah Council	Kimbriki Road, Terry Hills 2084
Kurnell (Breen Holdings)	Breen Holdings Pty Ltd	Captain Cook Drive, Kurnell 2231
Alexandria (Dial-a-Dump)	Alexandria Landfill Pty Ltd	10 Albert Street, St Peters 2044
Brandown	Brandown Pty Ltd	Lot 9 Elizabeth Drive, Kemps Creek 2178
Blacktown (Blacktown Council)	Blacktown Waste Services Pty Ltd	Richmond Road, Marsden Park 2765
Horsley Park (Veolia)	Veolia Environmental Services (Australia) Pty Ltd	Wallgrove Road, Horsley Park 2164
Erskine Park (Enviroguard)	Enviroguard Pty Ltd	Quarry Road off Mamre Road, Erskine Park 2759

It is noted that the Enviroguard landfill at Erskine Park is scheduled to close within the next couple of years.

VENM can also be accepted at landfill sites without incurring the s88 Levy provided it is used for operational purposes such as daily cover. However, landfills are restricted to the amount of VENM that they are able to claim a rebate on the s88 Waste and Environment Levy - 20 percent of the total quantity of waste received and landfilled at the site. Often, sufficient material is delivered to these landfills by small operators (such as landscapers and builders), and so there may be limited opportunities to accommodate material from the project.

Typical landfill sites that receive VENM for use as daily cover or onsite engineering works include the WSN landfills at Belrose, Eastern Creek and Lucas Heights, the Glenfield Waste Depot and Enviroguard, Brandown and Penrith Waste landfills.

'Contaminated' spoil management

Spoil material that is contaminated could be disposed of at the SITA landfill at Kemps Creek or at Penrith Waste at Mulgoa. Both these sites are licensed to receive contaminated soils. The SITA landfill is also licensed to receive 'Special Waste' and 'Restricted Waste', which requires special landfilling techniques.

Minimal contaminated spoil material is expected to be generated from the project.

12.1.4 Site amenities (general waste)

Small quantities of general waste and recyclables would be generated from first aid rooms, induction rooms, lunch sheds, change rooms and amenities. Both recycling bins and general garbage bins would be provided for site personnel to source separate recyclables. Recyclables would then be transported offsite for recycling.

12.2 Mitigation measures

As part of the CEMP, a spoil and waste management sub plan would be prepared that would identify how spoil and other waste material would be handled, stockpiled, reused and disposed. It would address the principles of the waste hierarchy and relevant health and safety as well as environmental legislation and would include measures such as:

- Arrangements to reduce the volume of materials brought onto site such as packaging. In addition, required construction materials would be ordered in the correct quantities to minimise waste;
- Reuse or recycling of demolition and excavation materials would be undertaken wherever practicable. Stockpile areas would be allocated for construction and demolition waste to allow separate stockpiling of recyclable and non-recyclable materials. In addition, colour coded and clearly marked containers for different recyclable materials would be provided;
- Records would be kept of all waste volumes and destinations;
- Sites for disposal of surplus spoil would be selected according to the rate of development activity and the volumes of material generated elsewhere; and
- Ongoing training would be provided for construction personnel to ensure correct sorting of waste and recyclable materials and promote the principles of the waste hierarchy. Waste minimisation and management would be included in tool box sessions and site management planning.

13. Traffic and access

13.1 Existing environment

13.1.1 Existing road network

As indicated in Section 2.2, the site has frontages to Bligh and O'Connell Streets. Vehicle access to the basement car parking is provided via O'Connell Street, while pedestrian access is available from both Bligh and O'Connell Streets. Kindersley House also provides direct pedestrian access between Bligh and O'Connell Streets.

Bent Street provides direct access to the Eastern Distributor while Phillip Street, together with Bridge Street, provides direct access from Cahill Expressway. Both the Eastern Distributor and the Cahill Expressway are part of the major road network.

Access through the CBD road network to travel west is available by travelling south via Phillip Street and Elizabeth Street. This connects with King and Market Streets, which are one-way eastbound and westbound respectively, to connect with the City West link.

Bligh Street

Bligh Street is a one-way single carriageway road with on-street parking on both sides. It intersects with Bent Street to the north and Hunter Street to the south and both intersections are signal-controlled. South of the Hunter Street intersection the road becomes Castlereagh Street. On the western side, there is a 'no stopping' restriction at all times, while on the eastern side, there is a 'no parking' restriction during business hours.

A new building, known as No. 1 Bligh Street, is currently being constructed on the corner of Bligh, Bent and O'Connell Streets. There are a range of temporary impacts on the traffic and access arrangements in the immediate vicinity of this site, including loss of some on-street parking spaces, heavy vehicle movements associated with delivery of plant and materials, and provision of hoardings to maintain pedestrian access and safety.

Bent Street

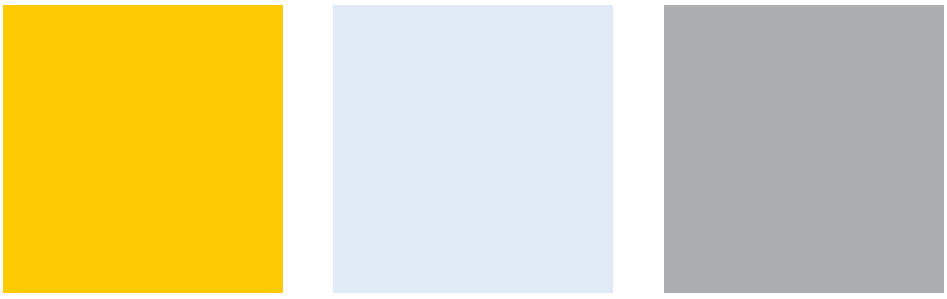
Bent Street is a two-way, undivided road with generally one to two lanes per direction depending on the adjacent on-street parking restrictions. The posted speed limit is 50 km/h. Bent Street intersects with Bligh Street at a signal-controlled intersection. Bent Street provides direct access to the Eastern Distributor.

O'Connell Street

O'Connell Street is a one-way single carriageway with on-street parking on both sides. It intersects with Bent Street on its northern end and Hunter Street on its southern end. The intersection with Hunter Street is signal-controlled.

Phillip Street

Phillip Street is a two-way undivided road with generally one to two lanes per direction depending on the adjacent on-street parking restrictions. The posted speed limit is 50 km/h. Phillip Street connects to Elizabeth Street at the south and provides a north-south connection, together with Bridge Street, to the Cahill Expressway. Phillip Street has limited parking with taxi zones along both sides of the streets as well as a bus zone near Bent Street.



13.1.2 Bus routes

Public transport in the immediate vicinity of the site is restricted to bus routes. Numerous local bus routes service Phillip Street which is an important north-south bus corridor through the Sydney CBD. Bent Street is an important east-west bus corridor between the Eastern Distributor and the CBD.

There are no bus routes or bus stops along Bligh or O'Connell Streets.

The Philip Street - Elizabeth Street corridor, one street block east of Bligh Street is a major bus route for outbound buses from Circular Quay. Bus routes using this corridor include Routes 311, 324, 325, 326, 333, 373, 374, 376, 377, 380, 389, 392, 394, L94, 396, 397, 399. Two additional outbound bus routes originate from Gresham Street and pass near the site. These are bus route 391, passing through Bent Street then to Elizabeth Street, and bus route 327, passing through Pitt Street, then Hunter Street then to Elizabeth Street.

Figure 13-1 shows bus routes in the vicinity of the site.

13.1.3 CityRail stations

The site is in close proximity to two rail stations. Martin Place rail station is located 300 m south of Hunter Street while Circular Quay rail station is located 400 m north Hunter Street.

13.1.4 Bicycle network

Bligh Street is an on-road cycle route in the City of Sydney Council's designated bicycle network. This links the on-road routes along Bent Street towards Castlereagh Street.

Other designated on-road cycle routes in the vicinity of the site include Pitt Street and Macquarie Street which generally run in a north-south orientation.

Designated bicycle routes are shown in Figure 13-2.

Figure 13-1 Bus routes in the vicinity of the site

Figure 13-2 Designated bicycle routes

G:\21\19157\GIS\Maps\MXD\2119157_005_Designated_Bicycle_Route_RevA.mxd Data Source: Energy Australia: Aerial Imagery - 2010, CECT Data - 2010; Navigate StreetMap: StreetMap - 15/04/2010. Created by: bahambly, qjchung

13.2 Impact assessment

13.2.1 Construction

Construction staging and duration

It is anticipated that the construction activities would occur over a period of approximately 94 weeks. Traffic volumes generated by the construction employees and delivery of materials would vary depending on the construction phasing.

The construction stages are detailed in Section 6.2 and generally involve:

- Site preparation;
- Demolition of Kindersley House over a period of about 26 weeks;
- Bulk excavation of the basement over a period of about 30 weeks;
- Construction of a shaft and a stub tunnel beneath Bligh Street to the intersection of Bent Street and Bligh Street over a period of about 30 weeks; and
- Construction of a bridging structure above the alignment of the tunnels for Stage 1 of the CBD Metro Project over a period of about 8 weeks.

Standard hours of construction for the duration of the construction program are anticipated to be between 7 am and 7 pm, Monday to Friday and between 7 am to 5 pm on Saturday. No work shall be generally undertaken on Sundays or Public Holidays. Specific activities such as delivery of oversized plant or equipment or emergency work may be undertaken outside the standard work hours. Subsurface construction activities associated with the stub tunnel would be undertaken 24 hours per day, however this would not include offsite spoil transport.

Construction access

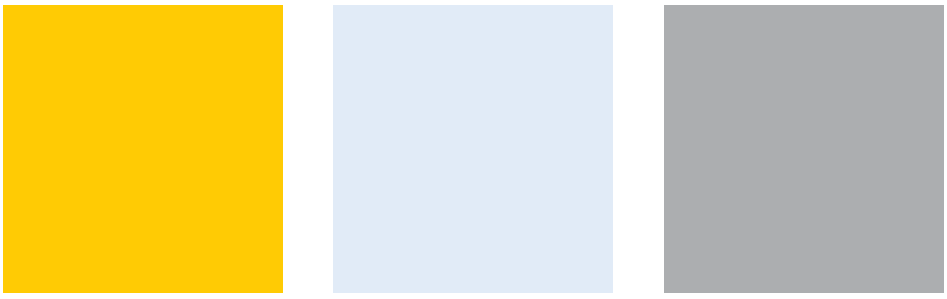
Access to the site would be provided via O'Connell Street and Bligh Street and would include gates at the entrance to the construction site that feature pedestrian safety devices. Where possible, trucks would enter and leave the work zones in a forward direction.

As indicated in Section 6.2, a work zone for construction vehicles would be required adjacent to both street frontages and would require temporary change to traffic conditions. This would utilise the existing parking/ traffic lane on the western side of Bligh Street and would maintain the existing traffic lane and parking lane on the eastern side. There may be a requirement to introduce parking restrictions on the eastern lane to maintain traffic flows. The work zone for construction vehicles along the O'Connell Street frontage would utilise the existing parking lane on the eastern side of O'Connell Street and would maintain the existing two traffic lanes and parking lane on the western side.

Traffic control measures specified in AS1742.3: 2002 Traffic Control Devices for Works on Roads and the RTA's *Traffic Control at Work Sites* would be provided to ensure impacts on road safety are minimised and to warn road users in advance of the change to traffic conditions.

Trucks entering the site would be required to cross footpaths. To protect the safety of pedestrians and other road users it is likely that all truck movements into and out of the site would be controlled by traffic controllers during peak periods, including peak periods for pedestrian movements such as lunch time. These measures would stop pedestrians whenever a truck is crossing the footpaths to access the site.

The kerbs on Bligh and O'Connell Streets would be modified to enable access for construction vehicles.



Traffic generation

Traffic generated during the construction phase would mainly be from equipment and material deliveries, such as:

- Removal of spoil and waste materials;
- Delivery of construction materials;
- Delivery and removal of construction equipment and machinery; and,
- Movement of construction personnel, including contractors, site labour force and specialist supervisory personnel.

Light vehicle traffic

Light vehicle traffic generation would be associated with staff movements as well as visitors to the site. Staff would comprise project management, various trades, and general construction staff. Over the full construction period, the peak construction workforce is estimated to be approximately 100 staff. It is assumed that the traffic generation would be influenced by the lack of available on-site parking spaces. Long-term on-street parking in the vicinity of the site is also very limited while demand is also high. Given the proximity of the site to various public transport services, staff would be encouraged to use public transport to reduce vehicle traffic generation to the site. It is estimated that approximately 10 cars (or 20 trips per day) would be generated. Assuming all light vehicles arrive during the peak hour, this translates to 10 vehicles per hour (inbound in the AM and outbound in the PM).

Heavy vehicle traffic

Heavy vehicle traffic would mainly be generated by activities associated with the removal of spoil and demolition waste for the various stages. Table 13-1 summarises the estimated volume of spoil and waste from the main construction activities and the associated heavy vehicle movements. The majority of spoil would be generated during bulk excavation of the basement. The anticipated number of traffic movements to be generated has been developed based on spoil and demolition waste trucks having a capacity of 5 m^3. There would be a reduction in the number of truck movements if larger capacity trucks are used.

Table 13-1 Heavy vehicle movements attributed to spoil removal

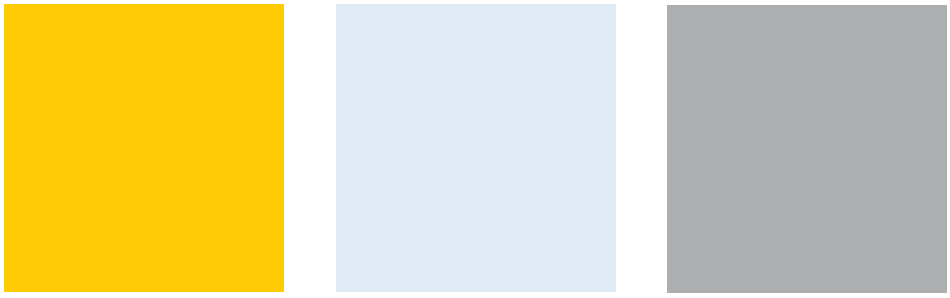
Construction activity/ source	Expected volume [4]	Duration (days)[1]	Truck trips per day [2]	Maximum truck movements per hour [3]
Demolition of Kindersley House	29,300 m^3	130	90	9
Bulk excavation of basement	72,066 m^3 (158,544 t)	150	192	20
Stub tunnel and shaft excavation	4,866 m^3 (10,706 t)	150	13	2
Bridging structure over Metro tunnels	4,659 m^3 (10,250 t)	40	47	5

[1] Based on construction occurring 5 days per week.

[2] Number of truck trips per day estimated on the basis of 5 m3 per single unit dump truck and each trip generating one inbound trip and one outbound trip.

[3] Maximum truck trips per hour is based on a 10-hr work day or maximum throughput of one truck movement every 5 minutes.

[4] In situ volumes have been bulked by a factor of 1.67.



In addition, transport of equipment to the site would require heavy vehicle movements. Equipment would include:

- Earthmoving equipment such as excavators, dozers, backhoes and bobcats;
- Mobile crane;
- Rock saws;
- Rock hammer;
- Road header;
- Concrete, reinforcement, formwork and other deliveries for construction of the bridging structure and stub tunnel; and,
- Progressive removal of equipment and construction equipment.

Majority of the heavy vehicle movements associated with the transport of equipment to the site would occur during the initial stage involving site preparation works and intermittently in between stages. Approximately 1-2 deliveries per day are estimated.

Oversize vehicle movements

Some plant and equipment required for the project would be oversized and transport to the site would be subject to relevant RTA road restrictions. Special arrangements would be made to ensure minimal disruption to traffic and that the appropriate signs and warning devices are in place prior to and during these deliveries which are likely to occur outside standard construction hours to minimise impact on the traffic network.

Proposed heavy vehicle routes

Potential spoil disposal sites have been identified in Section 12 and the final disposal site would be selected by the contractor. Haulage routes to and from the site and the major road network would generally utilize designated heavy vehicles routes where possible.

The proposed routes for the site are outlined below and identified on Figure 13-3.

Departure routes

- To the south: Hunter Street – Macquarie Street – Eastern Distributor – Southern Cross Drive;
- To the east: Hunter Street – Macquarie Street – Eastern Distributor – Moore Park Road/Anzac Parade;
- To/from the west: Hunter Street – Macquarie Street - Eastern Distributor – Southern Cross Drive – M5 East Motorway;
- To the inner west: Hunter Street - Phillip Street – Elizabeth Street – Market Street – Western Distributor – Anzac Bridge – Victoria Road/City West Link;
- To the north: Hunter Street – Macquarie Street – Conservatorium Road – Cahill Expressway.

Arrival routes

- From the south: Southern Cross Drive – Eastern Distributor – Bent Street;
- From the east: Anzac Parade / Moore Park Road – Eastern Distributor – Bent Street;
- From the west: M5 East Motorway – Southern Cross Drive – Easter Distributor – Bent Street;
- From the inner west: Victoria Road / City West Link – Anzac Bridge – Western Distributor – King Street – Elizabeth Street – Phillip Street – Bent Street; and
- From the north: Cahill Expressway – Conservatorium Road – Bridge Street – Phillip Street – Bent Street.

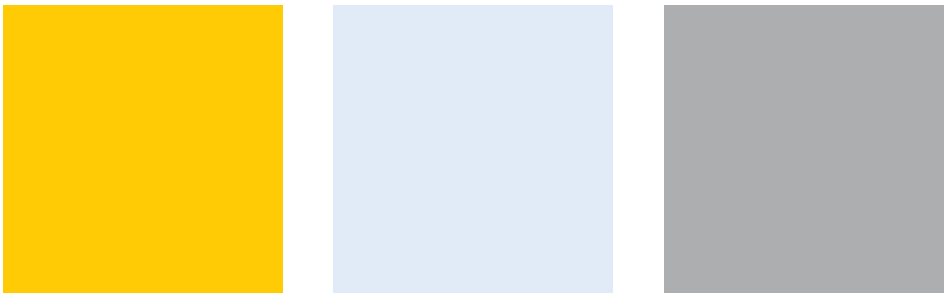
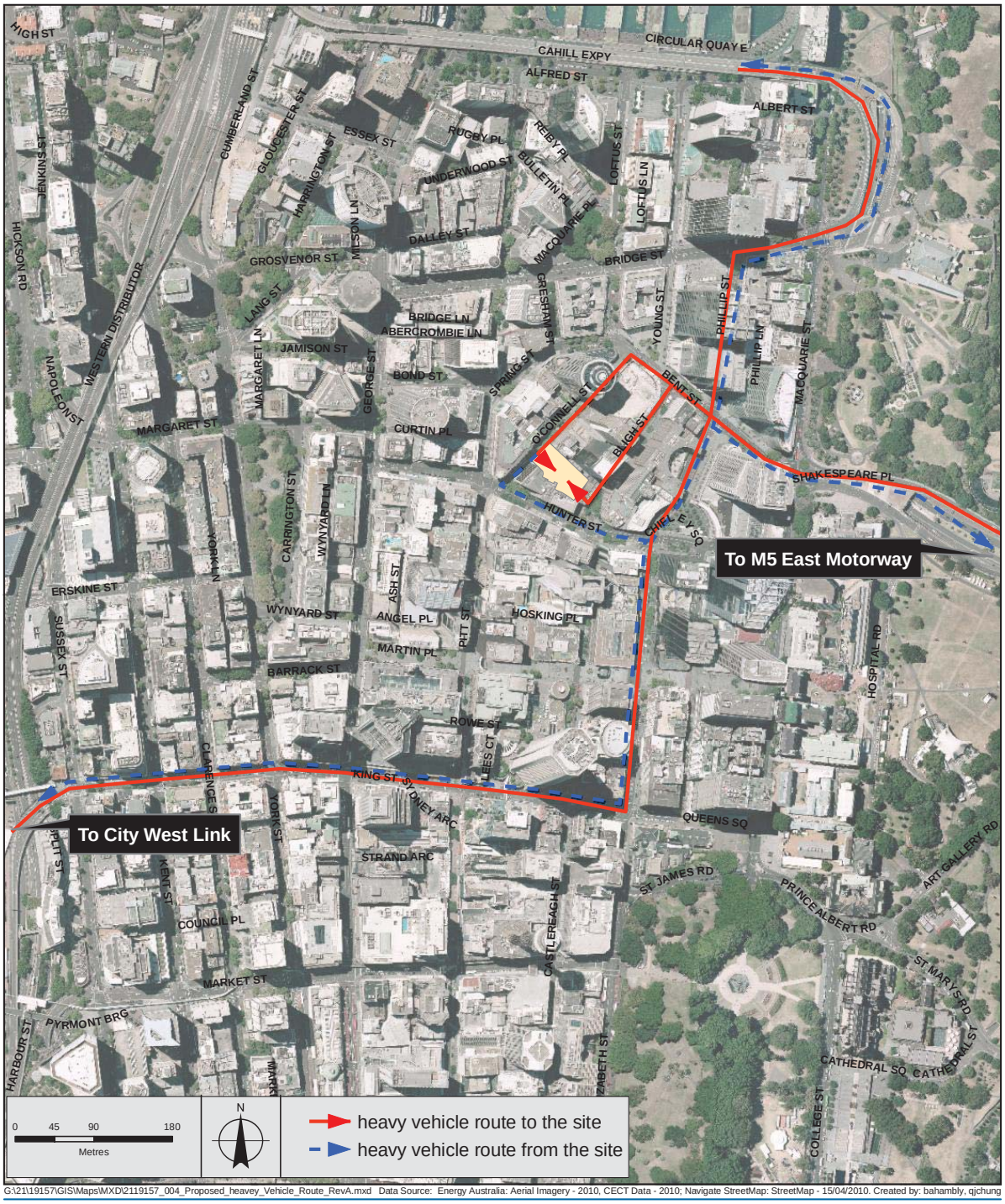


Figure 13-3 Proposed heavy vehicle routes



Distribution of traffic

For the purpose of this assessment, the following distribution is assumed:

- 60% - south, east and west via the Eastern Distributor;
- 20% - north via the Cahill Expressway; and
- 20% - inner west via Western Distribution.

Access to the construction site would require controlled and managed vehicle access. The maximum estimated vehicle movements per day would comprise of 20 light vehicle movements (10 in and 10 out) for staff and visitors, 4 heavy vehicle movements for general deliveries (two in and two out) and 192 heavy vehicle movements (96 in and 96 out) during excavation of the basement. It is further estimated that the likely hourly generation would be a maximum of 24 heavy vehicle movements and 14 light vehicle movements, as shown in Table 13-2.

Table 13-2 Inbound and outbound traffic at key intersections adjacent to the site

	AM Peak		PM Peak	
	Inbound	Outbound	Inbound	Outbound
Light vehicle	10	4	4	10
Heavy vehicles for deliveries	2	2	2	2
Heavy vehicles for spoil disposal	10	10	10	10
Total vehicles	22	16	16	22

The average daily traffic through the various road sections in the northern CBD range from 7000 vehicles per day (Castlereagh Street) up to 30,000 vehicles per day (Macquarie Street). The peak hour volumes are estimated to range from 500 - 1500 vehicles per hour.

It is generally noted that the existing road network currently operates close to capacity during the midday business peak hour and the morning and afternoon peak hours. Previous assessments of the traffic conditions in the CBD have noted little spare capacity and congestion during peak periods.

In comparison, the additional traffic associated with construction represents a minor increase in existing traffic. The likely generation of the Stage 2A(i) constitutes 0.03 - 0.08 % of the existing peak hour traffic on Macquarie Street. This increase is expected to have an insignificant impact on the road sections and intersections in the surrounding areas of the site. Noting that the existing conditions are already close capacity, it is unlikely that Stage 2A(i) would result in a substantial additional adverse traffic impact.

Impact of temporary changes to traffic conditions

Construction work zones would be required along the Bligh and O'Connell Street frontages. This would utilise the existing parking/traffic lane on the western side of Bligh Street and would maintain the existing traffic lane and parking lane on the eastern side. There may be a requirement to introduce parking restrictions on the eastern lane to maintain traffic flows.

A work zone for construction vehicles would also be required for the full length of the O'Connell Street frontage. This would utilise the existing parking lane on the eastern side of O'Connell Street and would maintain the existing two traffic lanes and parking lane on the western side.

Creation of the work zones for construction vehicles would impact on the operation of both Bligh and O'Connell Streets. Measures to be implemented to manage impacts associated with changes to traffic

and pedestrian conditions would be discussed with the City of Sydney during preparation of the traffic management plan that would be prepared as part of the CEMP.

Partial and/or temporary road closures along Bligh Street or O'Connell Street may also be required during some stages of construction to enable heavy vehicle manoeuvres, such as oversize vehicles, and to accommodate construction procedures. Such closures would impact on the existing travel routes and where possible they would be scheduled to minimise impacts on other road users which may involve some movements occurring outside the general construction hours. Detour routes would be identified and appropriate advance notices, and warning signs would be provided to notify motorists of changes to the traffic conditions. An activity specific traffic management plan would be prepared to ensure appropriate measures are implemented.

Consultation would be undertaken with surrounding businesses and management measures would be developed and included in the CEMP to ensure access to these properties are maintained.

Impact on parking

Temporary possession of kerbside parking would be necessary to provide suitable access to the construction site. It is estimated that approximately three parking spaces at each access location on Bligh Street and O'Connell Street would be required. The short term loss of a total of about six parking spaces is considered to be a minor impact.

Impact on bus stops and bus routes

It is unlikely that the temporary changes to traffic conditions associated with the project would directly impact on operation of the nearest bus routes and bus stops which are located along Bent Street and Hunter Street. Where necessary, consultation with the bus service provider and City of Sydney Council at an early stage would assist in identifying appropriate measures to minimise potential disruptions or temporary changes to the bus service.

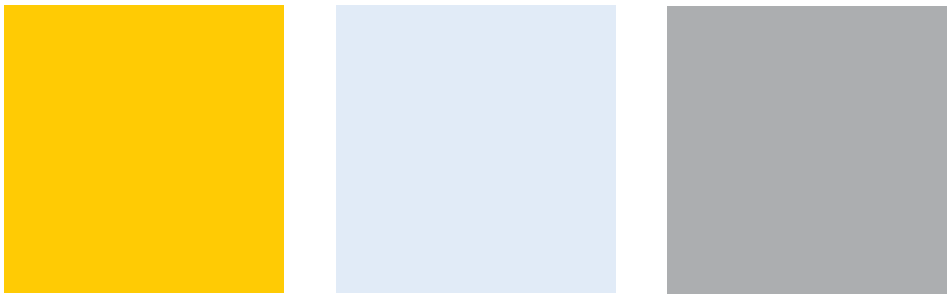
Impact on pedestrians and cyclists

The northern portion of the Sydney CBD has a high level of pedestrian activity and there is the potential for short term delays to pedestrian access along Bligh and O'Connell Streets during vehicle access and/or egress to the site. This short term impact is common to other similar construction activities in the CBD.

The project would use part of the footpath and Richard Johnson Square adjacent to the Bligh Street frontage as a construction zone. While this would alter pedestrian paths, measures would be implemented to ensure that pedestrian access is maintained along Bligh Street and to adjacent buildings. Hoardings installed around the construction zone would include overhead protection to ensure that pedestrian safety along the footpaths is maintained. Where overhead gantries are required, lighting would be installed to ensure a safe pedestrian environment is provided.

Installation of shoring and underpinning around the perimeter of the site is likely to require equipment to operate on the footpaths of Bligh and O'Connell Streets. There would also be temporary changes to pedestrian access during excavation of the cable risers within the footpaths adjacent to the frontages with Bligh and O'Connell Streets. Temporary footpath closures or diversions would be implemented to minimise potential impacts on pedestrian safety during these works.

A pedestrian management plan would be developed as part of the CEMP to minimise potential impacts on pedestrian and cyclist movements. This would detail specific measures to be implemented to minimise impacts on pedestrian safety during activities that occur on the footpaths adjacent to the Bligh and O'Connell Street frontages, as well as vehicle access and egress to the site. Protective gantries would be installed over footpaths adjacent to the site to ensure pedestrian safety is not compromised when cranes are operating above to load and unload materials.



Bligh Street is a designated on-road cycling route. Suitable detours would need to be investigated in detail and mitigation measures implemented to manage pedestrian and cycle movements near and around the site.

Cumulative impacts due to other construction sites in the area

There is the potential for cumulative impacts associated with other construction sites in the vicinity of the site, in particular No. 1 Bligh Street which is being developed by Grocon. Cumulative traffic and access impacts would be related to temporary loss of on-street parking, changes to pedestrian access, and increases in the number of heavy vehicles on the road network. Cumulative impacts would be managed by implementing the mitigation measures which involve consulting with Grocon to identify potential cumulative impacts and opportunities for these to be minimised.

13.2.2 Operation

As indicated in Section 6.3, the building envelope has been designed to comply with the operational access and parking requirements set out in the City of Sydney's LEP and DCP. Separate vehicle accesses are required for the substation and commercial tower to ensure that access to the substation is restricted to authorised personnel only.

Based on a preliminary analysis, it is considered that the small number of vehicle movements associated with operation of the site would have a minor impact on the surrounding road network during peak hour periods. Vehicles would access the site via O'Connell Street and site observations indicate that there is significant spare capacity at the intersections of O'Connell Street with Bent and Bligh Streets. Very infrequent, temporary road closures would be required on O'Connell Street during delivery of transformers and potential traffic and access impacts would be managed by implementing an activity specific traffic control plan.

As the existing building at the site has 43 car parking spaces and a loading dock, it would have very similar traffic movements to the commercial tower. As such, there would be minimal additional impact on traffic conditions compared to when Kindersley House was fully tenanted.

Potential impacts of construction and operation of the City East Zone Substation and commercial tower will be assessed in detail during preparation of the Environmental Assessment for Stage 2A(ii).

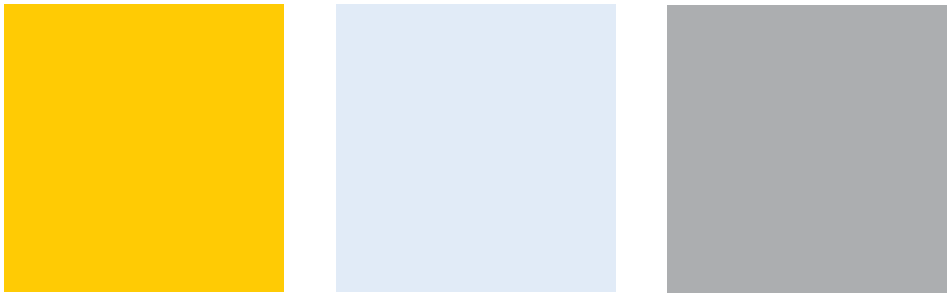
13.3 Mitigation measures

A construction traffic management plan would be prepared in consultation with RTA and City of Sydney Council as part of the CEMP and would include the following measures to manage potential impacts on the traffic and transport network:

- In consultation with RTA and Council, general signposting of Bligh Street and O'Connell Street in the immediate vicinity of the site with appropriate heavy vehicle and construction warning signs;
- If temporary road closures are required, traffic control measures specified in AS1742.3: 2002 Traffic Control Devices for Works on Roads and the RTA's Traffic Control at Work Sites would be detailed in a traffic control plan and subsequently implemented;
- Heavy vehicle routes would be selected to minimise impacts on the road network and vehicle kilometres travelled. Where practicable, this would involve using arterial roads such as the Eastern Distributor in preference to city streets;
- Development of a suitable vehicle detour route, if required for use during specific construction activities;
- Installation of specific warning and safety signs at entrances to the construction site to warn existing road users of entering and exiting construction traffic;

- Preparation of a pedestrian management plan that details measures to be implemented to minimise impacts on pedestrian movement and maintain pedestrian safety. Specific consideration would be given to activities undertaken within Richard Johnson Square, footpaths, emergency access points for adjacent buildings, vehicle access and egress to the site, and the need for protective gantries above footpaths;
- Management of the transportation of construction materials to maximise vehicle loads to therefore minimise vehicle movements;
- Inducting truck and vehicle operators on the requirements of the traffic management plan; and
- An event specific traffic management plan would also be prepared if there are any special events in the CBD that would potentially be impacted by traffic movements associated with the project. The time and duration of these events would be clearly noted and construction delivery processes would be rearranged to cater to the affected days.

Implementation of a community information and awareness program would be an important measure to ensure the surrounding stakeholders are informed of changes to traffic conditions. This awareness program would be initiated prior to construction commencing and during the construction period to ensure that the local business establishments are fully aware of the construction activities with particular regard to construction traffic accessing the site. The awareness program shall identify communication protocols for community feedback on issues relating to construction vehicle driver behaviour and construction related matters.



14. Air quality

14.1 Existing environment

Air quality in the CBD is considered to be typical of a highly developed residential and commercial area and the main emissions that affect quality are related to traffic along major arterial roads, dust, and smoke from bushfires elsewhere in the region on occasion. There are no industrial point sources of air emissions in the vicinity of the site. Pollutants that are potentially harmful to humans include carbon monoxide, ozone, nitrous oxides, sulphur dioxide, and total suspended particles (TSP) (including PM10 – particles less than 10 microns in size). Road traffic is the main source of these pollutants in the vicinity of the site.

The DECCW operates a network of air quality monitoring stations and the two closest to the site are located at Randwick and Rozelle. Monitoring results from these two locations between the year 2000 – 2008 are summarised in Table 14-1 and indicate that air quality generally complied with DECCW's air quality goals. The one hour average ozone goal of 10 parts per hundred million (pphm) was exceeded during three of the years at Randwick and in one year at Rozelle. The PM10 24 hour average goal of 50 micrograms per cubic metre (ug/m3) was exceeded in three years at Rozelle and one year at Randwick.

Table 14-1 Summary of air quality data for the Randwick and Rozelle monitoring stations

	Sulphur dioxide (pphm)		Nitrous oxides (pphm)		Ozone (pphm)		PM_{10} (ug/m^3)		Carbon dioxide (ppm)	
	Randwick	Rozelle	Randwick	Rozelle	Randwick	Rozelle	Randwick	Rozelle	Randwick	Rozelle
DECCW goal	20 (Maximum 1 hour average)		12 (Maximum 1 hour average)		10 (Maximum 1 hour average)		50 (24 hour average)		9 (Maximum 8 hour average)	
2000	2.7	NA	6.6	7.0	8.7	8.0	NA	NA	NA	4.5
2001	3.6	NA	6.5	6.6	11.4	11.5	NA	NA	NA	3.2
2002	2.4	NA	5.4	8.6	13.9	10.0	NA	NA	NA	2.8
2003	3.5	NA	5.5	5.2	7.9	8.3	NA	NA	NA	2.2
2004	2.4	NA	5.7	6.4	11.0	9.4	NA	54.1	NA	2.2
2005	2.5	NA	6.3	5.2	9.6	8.1	NA	46.8	NA	2.1
2006	4.3	NA	6.0	5.7	8.3	9.3	NA	50.3	NA	2.0
2007	3.6	NA	4.5	5.0	9.0	8.8	71.2	54.4	NA	1.8
2008	2.9	NA	4.1	4.0	6.1	5.6	36.3	43.1	NA	1.3

Source: DECCW data from air quality index for Randwick and Rozelle

14.2 Impact assessment

14.2.1 Construction

Potential impacts on air quality during Stage 2A(i) of the City East Zone Substation project are related to dust in general and PM_{10} in particular. DECCW's assessment criteria are a maximum annual increase in deposited dust of 2 g/m^2 per month above background levels. The maximum total dust deposited from any source during a 24 hour period should not exceed 4 g/m^2 over a 12 month period. The PM_{10} 24 hour limit is 50 ug/m^3.

Dust

Dust would be generated during a range of activities associated with demolition of Kindersley House, excavation, tunnelling and materials handling.

Environmental effects of airborne particulate matter (dust) are generally related to the particle size range of the dust. Health effects are associated with fine particles less than 10 micrometres in equivalent aerodynamic diameter, whereas coarser particles (10 - 100 micrometres) are associated with effects on amenity such as visible dust plumes or deposition on surfaces. As a dust plume is transported downwind from a source, the coarser particulates progressively drop-out of the air column to deposit on surfaces (land, buildings, cars etc) downwind of the source, while the finer particulate fractions are retained in the air column longer by turbulent mixing. Wind erosion or dust lift-off can become significant under strong winds (greater than 5 m/s).

The amount of dust generated would be dependent on the type of construction activity undertaken and the prevailing weather conditions. There is a risk that dust may impact on the amenity of the surrounding areas if appropriate controls are not implemented.

Demolition of Kindersley House has the potential to generate dust and Section 6.2 indicates that the construction method has been specifically developed to minimise these impacts. This involves installing scaffolding around the building and encapsulating the scaffolding with chainwire and shadecloth. Removal of hazardous materials would be undertaken in accordance with detailed safety plans that would comply with relevant legislation, occupational health and safety requirements.

Excavation of the basement and construction of the bridging structure would generate dust at the working face and during materials handling. As the depth of the excavation would progressively increase during the course of the works, this would help protect the site from prevailing winds and result in a higher proportion of dust being deposited within the site than if the site was exposed.

To minimise dust impacts associated with operation of the road header, the tunnel would be fitted with a mechanical ventilation system to filter the air and remove dust particles prior to the air being discharged from the tunnel. The filtration system would be designed to limit dust emissions to acceptable levels and meet the requirements of the *Protection of the Environment Operations (Clean Air) Regulation 2002* (as amended). This would ensure clean air is available to workers within the tunnel and minimise the potential for offsite impacts associated with dust.

Spoil would be stockpiled prior being loaded onto trucks and transported offsite. Potential for offsite impacts associated with dust are considered to be minor as the site hoardings would be installed around the perimeter and management measures would be implemented to ensure that dust from stockpiles is minimised.

Provided that the recommended mitigation measures are implemented, it is considered that potential dust emissions would be negligible and have localised impacts that are likely to comply with DECCW's assessment criteria.

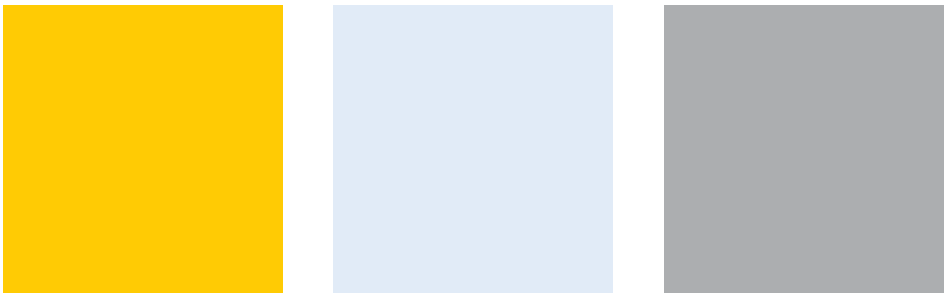
Combustible emissions

Operation of construction plant, equipment and vehicles would generate combustible emissions that contain substances such as oxides of nitrogen (NO_x), fine particulate matter (PM_{10} and $PM_{2.5}$), carbon monoxide (CO) and sulfur dioxide (SO_2). Given the small number of items of plant, equipment and vehicles that would be operating, emissions are considered to be insignificant in comparison to emissions from similar sources in the CBD.

14.3 Mitigation measures

A construction air quality management plan would be prepared as part of the CEMP and would include the following measures to manage potential impacts on air quality:

- Manage and dispose of any hazardous materials such as asbestos in accordance with relevant guidelines, including Code of Practice for the Safe Removal of Asbestos (National Occupational Health and Safety Committee 2002) and Australian Standard AS-2601 1991 – Demolition of Structures;
- During tunnel construction, all air would be ventilated through a filter unit such that discharged air meets the requirements of the *Protection of the Environment Operations (Clean Air) Regulation 2002* (as amended);
- Exposed surface areas would be managed via dust mitigation measures;
- 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 the potential to generate dust, if necessary;
- Water would be used to suppress particles potentially generated during the erection barriers, screens and other ancillary structures;
- 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;
- 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;
- Spoil stockpiles would be damped as necessary;
- Potentially dusty materials would be handled as little as possible;
- 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; and
- Where practicable and feasible, loading and unloading would take place within the site.



15. Water quality

15.1 Existing environment

15.1.1 Surface water

There are no surface water courses in the vicinity of the site and stormwater from the site is directed to the existing stormwater system.

The site is located within the Bennelong drain catchment which has an area of approximately 72 hectares and is bounded by Clarence Street to the west, Bathurst Street to the south, Macquarie Street to the east, and Sydney Harbour to the north.

Sydney's CBD stormwater drainage system consists of a series of drains aligned in a north-south direction within the CBD. Stormwater runoff generally flows in a northerly direction through these stormwater drains until it reaches Alfred Street at Circular Quay. At Alfred Street, the drainage system branches into three outlets, two of which discharge to Circular Quay and the third and largest discharges at Bennelong Point.

Water quality in Sydney Harbour is typical of an urbanised catchment. It is likely that a number of port and non-port related activities including accidental spills and polluted stormwater run off from land combine to affect water quality. This includes sediment in runoff from construction and maintenance activities and litter and other contaminants such as oil from the catchment.

Water quality within Sydney Harbour is heavily influenced by runoff following large rain events. Runoff from urban areas is generally contaminated with sediment, nutrients, hydrocarbons, heavy metals, pathogens, and other toxic, and occasionally persistent chemicals (DEC, 2006). This contamination originates from roads, sewer overflows, spills, industrial activities, building sites and other sources. Water quality is comparatively better during drier periods with reduced volumes of runoff.

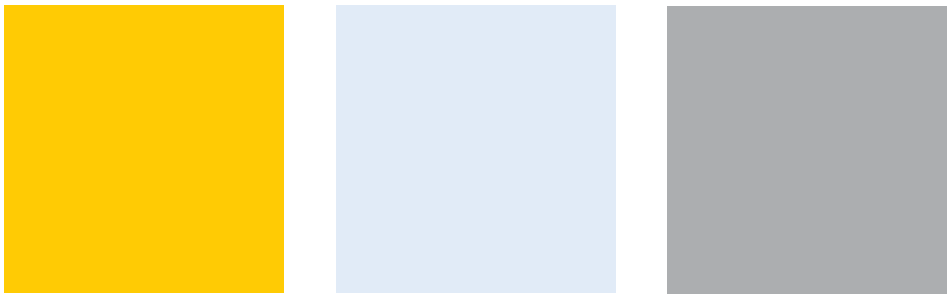
15.1.2 Groundwater

Groundwater monitoring has been undertaken for a number of tunnelling projects in the CBD, including EnergyAustralia's City West Cable Tunnel and City South Cable Tunnel. Groundwater chemical testing was undertaken as part of geotechnical investigations for the City East Cable Tunnel project and is considered to be indicative of groundwater that would be encountered during Stage 2A(i) of the City East Zone Substation. These investigations conclude that the groundwater chemistry is likely to be similar to that recorded during construction of the Cross City Tunnel, City South Cable Tunnel, City West Cable Tunnel, and the City North Zone Substation (PSM, 2009).

Groundwater from the City South Cable Tunnel is treated at the Campbell Street Substation site and groundwater from the City West Cable Tunnel is pumped to and treated at the Campbell Street site. Water from this groundwater treatment plant (GWTP) is then discharged to the stormwater system which ultimately enters Cockle Bay.

A comparison of groundwater quality at these locations was undertaken during development of the treatment system for the City North Zone Substation (KBR, 2007). These results indicate that groundwater quality is very similar being acidic, having relatively high turbidity and TSS values, and having very similar metal concentrations (KBR, 2007).

Water quality objectives were developed by SKM (2005) for the Campbell Street GWTP in accordance with guidelines prepared by the Australian and New Zealand Environment and Conservation Council (ANZECC) and the Agricultural and Resource Management Council of Australia and New Zealand (ARMCANZ). This indicated



that raw groundwater at the City North Zone Substation did not meet the water quality objectives for pH, TSS, colour, turbidity, manganese (total and dissolved), iron (total and dissolved), aluminium and zinc.

The Campbell Street GWTP treats water with very similar characteristics to that at the City North Zone Substation. The discharge from the Campbell Street GWTP does not have unacceptable ecological or amenity impacts for the given water quality objectives. Modelling predicted that for all pollutants except aluminium and copper, the identified trigger levels would be achieved at the point of discharge to Cockle Bay. Aluminium and copper concentrations in Cockle Bay, already above identified trigger levels, would not increase significantly.

Groundwater at the City East Zone Substation is considered to be similar to that at the City North Zone and other tunnelling projects in the CBD. Geotechnical investigations for the City East Cable Tunnel indicate that the groundwater table is expected to be encountered at about RL-7 m (PSM, 2009).

15.2 Impact assessment

15.2.1 Surface water

Potential surface water impacts would be limited to runoff that may transport sediment off-site and enter the stormwater system that ultimately discharges to Sydney Harbour at Circular Quay and Bennelong Point. There is also the potential for vehicles associated with the project to result in sediment being deposited on adjacent roadways and for this sediment to be transported to the stormwater system. Chemical spills on the construction site may be transported to the surface water and groundwater systems. Surface water impacts are considered to be minor and would be mitigated by implementing the recommended management measures.

15.2.2 Groundwater

Groundwater seepage

Groundwater is likely to inflow to excavations that extend below RL-7, including those for the basement, bridging structure, stub tunnel and shaft. There is also the potential for rain and runoff to accumulate in the excavations for the basement and bridging structure. This water would be collected, treated, and pumped to the stormwater system.

A number of near vertical zones of faulting or closely spaced joints have been identified in east Sydney and the CBD. In the vicinity of the site, these include the GPO Fault Zone and Martin Place Joint Swarm which typically contain subparallel, isolated faults and/or joints within the zones themselves. The rock mass either side of these features can also contain some more closely spaced jointing near vertical zones of faulting. These features are typically more conducive to groundwater movement and are likely to be associated with higher groundwater flow rates.

The groundwater table is currently within slightly weathered to fresh Hawkesbury Sandstone bedrock and would be drawn down to the depth of the basement excavation. A licence from NSW Office of Water will be obtained under the *Water Act 1912* for the dewatering. The results of geotechnical investigations indicate that permeability is estimated to be about 0.02 Lugeon, however test values were in the range of 0.01 to 50 Lugeon (PSM, 2009). Based on the results of tunnelling works undertaken in similar geotechnical conditions within the CBD, it is estimated that total seepage of groundwater into the final excavation would be less than 1 L/second.

Settlement of buildings due to groundwater drawdown typically only occurs if the water table is within the soil horizon and the buildings are founded within this soil horizon prior to the water table being drawn down. Geotechnical investigations in the vicinity of the site indicate that there is only a shallow depth of soil or fill and the water table is located below this horizon, within the bedrock. Further, buildings in the vicinity of the site are likely to be founded on sandstone. Based on this it is considered unlikely that groundwater drawdown would cause settlement of buildings. The stub tunnel would also be fully lined to exclude groundwater seepage as far as practicable and once complete would not affect groundwater levels.

Groundwater treatment

Groundwater quality is expected to be similar to inflows to the City South Cable Tunnel and City West Cable Tunnel that are collected and treated at EnergyAustralia's Campbell Street GWTP and City North Zone substation sites respectively. Treated water is discharged to stormwater mains that ultimately enter Cockle Bay. The results of treatment systems operated at these locations indicates that groundwater is able to be treated to a level that complies with water quality objectives developed in accordance with guidelines developed by ANZECC and the ARMCANZ.

The water quality objectives for the Campbell Street GWTP were developed to be consistent with the 'high level of protection' trigger values. These were selected because although Cockle Bay is highly disturbed and receives significant pollutant loads from stormwater, sewer, hardstand and roadway runoff, it is an important tourist venue and is connected to Sydney harbour (SKM 2005). Given this, the similar water quality objectives are considered to be application to the City East Zone Substation which would discharge to Sydney Harbour at Bennelong Point.

Potential impacts associated with discharge of treated groundwater are considered to be minor because:

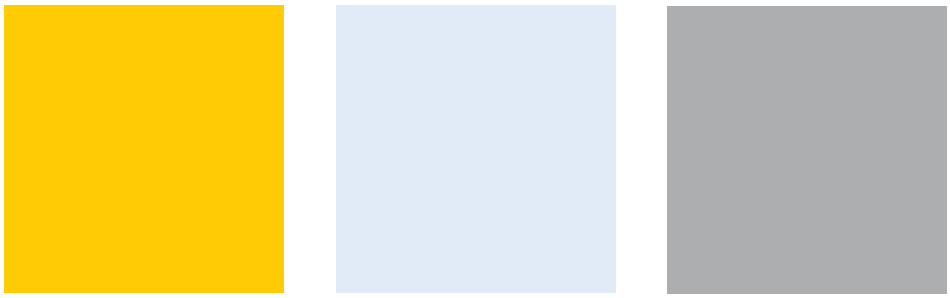
- Groundwater quality is expected to be similar to that encountered in the Cross City Tunnel, City South Cable Tunnel and City West Cable Tunnel;
- Similar treatment systems to those operating at the Campbell Street and City North substation sites would be implemented; and
- These existing treatment systems have proven to comply with relevant water quality objectives.

The design includes a fully lined stub tunnel to limit the volume of groundwater that seeps into the tunnel. Any groundwater intercepted would be treated to an acceptable level and discharged to the stormwater system. This would focus on removal of iron and manganese which are generally in relatively high concentrations in groundwater in the Sydney CBD. This system would also treat surface water that accumulates in the basement excavation. The treatment system would be designed such that discharged water complies with the requirement of Section 120 of the POEO Act.

The groundwater treatment system installed to manage potential impacts associated with Stage 2A(i) would be temporary. The City East Cable Tunnel (Stage 2D of the Sydney CityGrid Project) would include a groundwater treatment system designed to manage all groundwater inflows during operation of the tunnel, stub tunnels and substations that form part of Stage 2 of the Sydney CityGrid Project. During the operational phase, groundwater from Stage 2A(i) is likely to be managed by the permanent treatment system for the City East Cable Tunnel. Once the permanent treatment system has been commissioned, the temporary system would be decommissioned. Further details of the permanent treatment system will be provided in the Environmental Assessment for Stage 2D.

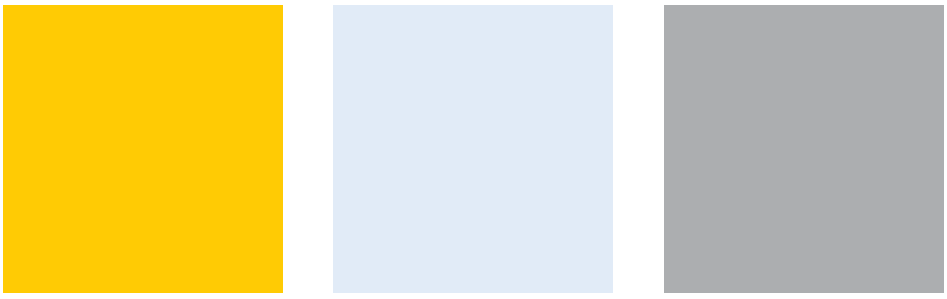
15.3 Mitigation measures

A Water Quality Management Sub-Plan would be prepared as part of the CEMP for the project. The sub-plan would be prepared in accordance with 'Managing Urban Stormwater: Soils and Construction' (Volume 1, 4th Edition, the 'Blue Book', Landcom, 2004) and would detail specific measures to be implemented to manage soil, surface and groundwater impacts during construction. It would be developed in consultation with DECCW to ensure the output from the treatment system is suitable for discharge to the stormwater system and the measures implemented would allow construction to comply with Section 120 of the POEO Act. It would detail the treatment process to be implemented and the associated monitoring program to verify that the treated water meets water quality objectives prepared in accordance with guidelines developed by ANZECC and ARMCANZ.



Additional geotechnical and groundwater investigations would be undertaken and the results would be considered as part of the detailed design process and development of the treatment system.

Consultation with Sydney Water Corporation and/or the City of Sydney would be undertaken to determine whether there are any capacity limitations within the stormwater system that would influence the location of the connection for the water discharged from the treatment system.



16. Built form and urban design

The following section summarises the urban design report prepared by Kann Finch which documents the proposed building envelope. The report is provided in full in Appendix J.

16.1 Site analysis

Existing building

The two commercial buildings on the site are known as Kindersley House and feature:

- A 17 storey concrete frame and glass infill office building constructed in the 1960s that features ground floor shops to both street frontages and basement car parking for 45 cars accessed off O'Connell Street; and
- A 13 storey office building constructed in the 1980s that features a through site arcade between Bligh and O'Connell Street.

Physical characteristics

The site consists of a single allotment with two street frontages. It has a total area of 2040 m^2. The site has a fall of about 6 m from east to west (Bligh to O'Connell Street).

Visibility

The building has a prominent address on Bligh Street due to the open configuration of the junction of Bligh and Hunter Street created by Richard Johnson Square and the relatively low scale of the adjoining heritage listed building to the north. On O'Connell Street, the building is less prominent as it forms part of a streetscape of buildings built to the street alignment.

Views

The site is located in an area of the CBD characterised by tall office buildings. As a result, the majority of views from and to the building are at a higher level.

Solar access and natural light

The solar access analysis located in Appendix A of the Kann Finch report (Appendix J) indicates that the site generally experiences good levels of solar access and natural light above the podium levels of the surrounding buildings.

Pedestrian and vehicular access

The site has two street frontages:

- Bligh Street to the east of the site is one way street. Vehicles travel in a southbound direction and connect to Hunter Street; and
- O'Connell Street to the west is also one way street in a southbound direction that also connects to Hunter Street.

The site is well serviced by public transport modes. These include main bus routes on George Street and Castlereagh Street, Wynyard rail station which is located 280 m to the west of the site, Martin Place rail station and bus routes located 300 m to the south, and Circular Quay ferry train and bus terminal located approximately 400 m to the north.

Both streets include typical CBD footpaths with tree planting. These are two building through site links in this city block. One link is located in 6 O'Connell Street in the middle of the block and the second link is located in Kindersley House.

16.1.1 Urban form analysis

Bligh Street

The street wall along the western side of Bligh Street between Bent and Hunter Street does not have a consistent street wall (podium) or street alignment. The lower scale buildings making upon the southern section of the wall at 33-35 Bligh Street (Kindersley House) and 50-58 Hunter are both office buildings (at 17 storeys and 13 storeys respectively) with no podium. Kindersley House incorporates a colonnade element to shops at ground level and 50-58 Hunter Street has the main building setback behind a raised terraced retail area facing Richard Johnson Square. The middle section of the street is represented by the four storey former NSW Club heritage building at 31 Bligh Street. To the north of this building there is a courtyard entry to the 31 storey Mulpha building that creates a negative element in the street alignment.

The middle northern section of the streetscape is formed by the 23 storey office building at 6 O'Connell Street known as Norwich House. This building incorporates a podium and tower building form with a three storey stone clad podium to the street alignment. This building runs across the city block with a frontage to O'Connell Street and also includes a through site pedestrian link.

The final building in the streetscape is an office tower under construction on the corner of Bligh and Bent Street, known as No. 1 Bligh Street. This is designed as a circular tower that is set back from the street.

O'Connell Street

The street wall on the eastern side of O'Connell Street between Bent and Hunter Street consists of a collection of buildings ranging from 1930s heritage listed office buildings to the office tower on the corner of O'Connell and Bent Street that is currently under construction.

As a result of this variation in building ages and styles, there is no consistent street wall (podium) or building alignment at street level. In addition, the overall scale of buildings ranges from 10 to 27 levels with the taller buildings being in the northern part of the street.

The buildings that make up the southern portion streetscape consist of three office buildings, including the building on the subject site. These buildings include setbacks at street level to the ground floor retail uses in the form of unconnected colonnades. The buildings are built to the street alignment.

The central portion of the streetscape is made up of two 1930s heritage listed office buildings (Bank of NSW and Manufacturing House) with the lower elements of the buildings defined by stonework and oversized entries. These buildings are highly articulated at street level but are generally built to the street alignment.

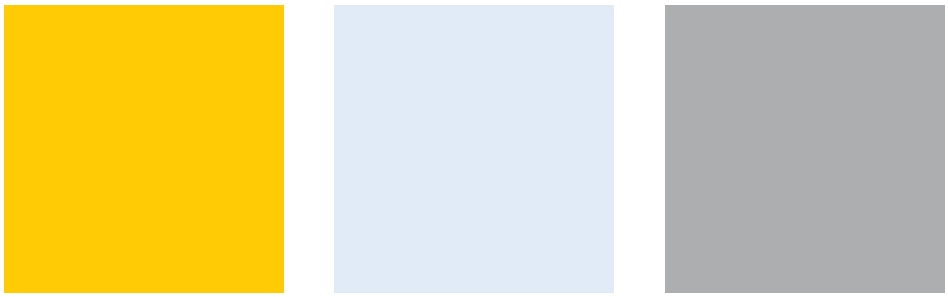
The two buildings that make up the northern potion of the streetscape are taller towers about 27 storeys high. Number 6 O'Connell Street includes a two to three level stone podium framed entry portal element defining the street with the tower setback behind. This structure continues the motif of large openings of the heritage buildings. The final building in the streetscape is No 1 Bligh Street which is currently under construction.

16.2 Massing

The following sections describe how the building envelope has been developed to respond to the surrounding streetscape. It also assesses the impact of the building envelope on the built environment.

16.2.1 Bligh Street

As indicated in Figure 16-1, when viewed from Bligh Street the building envelope incorporates a podium and tower that delineate the uses of the substation and office tower.



The podium is designed to define the existing street alignment of Bligh Street and Richard Johnson Square. The entry lobby to the building is referenced by an eight storey high recessed 'slot'. This slot has the role of defining the building entry and exposing the southern façade of the adjoining heritage building and presenting it to the street as it would have been seen when constructed.

The vertical slot connects above the podium wall to a horizontal recess which marks the transition from substation to office tower. This secondary negative element emphases the eight storey podium and acts as a transitional element between the four storey heritage building and the commercial tower above the substation.

The tower form is articulated by a vertical recess on the north-east corner which references the entry slot below and provides a vertical articulation to the building. This verticality is further emphasised by the towers setback to the southern boundary of the site. The height of the tower is in keeping with the adjoining Mulpha building to the north.

Figure 16-1 Building envelope – Bligh Street frontage

16.2.2 O'Connell Street

The podium element of the building envelope on O'Connell Street is determined by the height of the substation. On the O'Connell Street frontage, the 13 storey height of the podium acts as a transitional element between the smaller heritage listed building at 9 O'Connell Street, the taller heritage listed building and 1970s office building on the corner of O'Connell and Hunter Street.

The requirement for two vehicle openings at ground level and portal window above ground provides an opportunity to articulate the façade with oversized openings as a reference to the oversized 'monumental' openings in the adjoining heritage buildings. The articulation of a street defining podium element is also a reference to the adjoining building.

The motif of the horizontal slot is carried through from Bligh Street to the O'Connell Street façade emphasizing the articulation and separation of the podium and tower building elements.

The tower above is set back from the southern boundary of the site providing articulation and vertical emphasis. The height of the tower references the adjoining Mulpha building and the height of the other taller towers in the street.

Figure 16-2 Building envelope – O'Connell Street frontage

16.3 Overshadowing

Shadow diagrams prepared for the building envelope are included in Appendix A of the Kann Finch report (Appendix J). These diagrams show the shadows from existing buildings in the vicinity of the site and the additional shadows that would be attributed to the building envelope. This indicates that the building envelope would make a minor contribution to shadows cast by existing buildings.

16.4 Solar reflectivity

The following section summarises the assessment by Windtech of the likely impact of solar glare from the building envelope. The complete report is provided in Appendix G. With regards to solar reflectivity, this study addresses the requirement of the October 2003 City of Sydney DCP, which states under Section 4.5: Reflectivity;

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

The reflectivity analysis was carried out using the technique published by Mr David N. H. Hassall (1991).

16.4.1 Impact on drivers and pedestrians

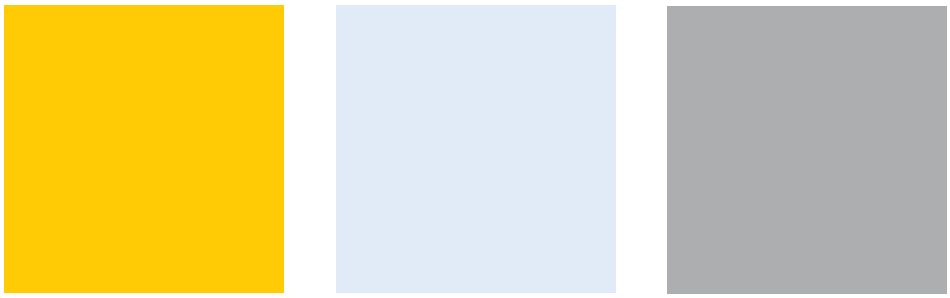
The limiting veiling luminance of 500 candelas per square metre for the comfort of vehicle drivers, suggested in Hassall (1991) was adopted as a basis of assessing the glare impact from the building envelope. In meeting this criterion for vehicle drivers, conditions would also be satisfactory for pedestrians. The assessment considered eight street level locations in the surrounding area and indicates that there would be no adverse glare from building envelope to drivers and pedestrians at these locations. This is primarily due to views to the building envelope being obscured by existing buildings.

16.4.2 Impact on occupants of neighbouring buildings

Further investigation is required during Stage 2A(ii) to assess what is considered to be an acceptable level of veiling luminance to occupants of surrounding buildings. Rofail and Dowdle (2004) have highlighted the subjectivity of glare impact to occupants of surrounding buildings as it is highly affected by a number of factors, including:

- The intensity of glare;
- Duration of glare impact;
- The type of use of the building;
- The type of glazing used on the neighbouring building (eg. clear or tinted);
- Shading elements on the façade of the neighbouring building; and
- Level of tolerance by the occupant of the neighbouring building.

Buildings that tend to cause nuisance to occupants of neighbouring buildings are those that have a normal specular reflectivity of visible light greater than 20%. This reflectivity is defined as the level of luminance or normal specular reflectivity of visible light. Based on this, a general recommendation is made that all glazing used on the facades of the development have a normal specular reflectivity of visible light of 20% or less to avoid adverse solar glare to occupants of neighbouring buildings.



16.5 Wind effects

The following section summarises the assessment by Windtech of the likely impact of the building envelope on the local wind environment. The complete report is provided in Appendix H.

The effect of wind activity within and around the site was examined for the three predominant wind directions for Sydney; north-east, south and west. The analysis of the wind effects was carried out in the context of the local wind climate, building morphology and topography. It was based on data obtained by the Bureau of Meteorology from Sydney Airport between 1939 and 2000.

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

The local topography generally rises to the east and south-east of the site. To the north the terrain falls away to Circular Quay. Buildings generally between12 - 30 storeys high are located to the north, east and south of the site.

The building envelope would contain the City East Zone Substation in the basement and podium section that extends to a height of approximately 48 m and 42 m above the existing ground levels of O'Connell and Bligh Street respectively. A rectangular-plan office building would be above the podium and would achieve an overall height of approximately 128.5 m above the Bligh Street ground level. Balconies are not proposed for the office tower, and hence the façade of the tower would be flat.

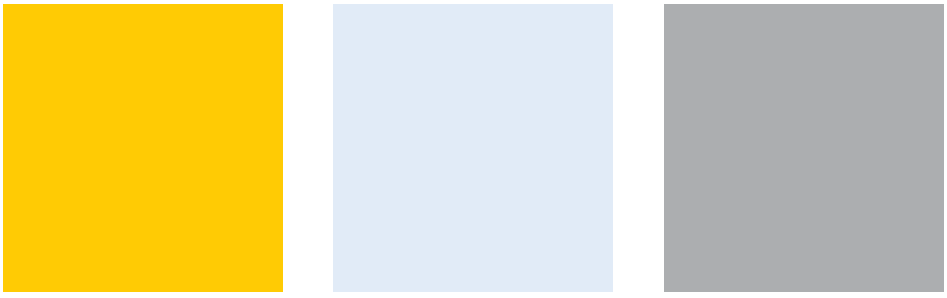
The impact of the building envelope onto the ground level wind conditions around the site is expected to be minimal due to the significant amount of neighbouring buildings and other obstructions for the wind. The ground level wind conditions around the site are expected to be quite similar to the existing site conditions.

The outdoor terrace areas of the building envelope above the podium would be mostly shielded from the prevailing winds by the neighbouring buildings. Downwash effects are not expected to be a concern for these areas because the terrace would be setback into the overall building form. Furthermore, impermeable balustrades are likely to be used on the perimeter of this area and this is expected to further enhance wind conditions terrace areas.

The results of the assessment indicate that no adverse wind conditions are expected for the outdoor trafficable areas associated with the building envelope. It is expected that wind conditions for all outdoor areas within and around the site would be acceptable for their intended uses.

16.6 Mitigation measures

As the building envelope has been developed to integrate into the built form of the surrounding environment, no specific mitigation measures are recommended as part of Stage 2A(i). The Environmental Assessment for Stage 2A(ii) would include a design review process based on the principles of the design review competition of the Sydney Local Environmental Plan 2005. This would involve consideration of façade treatments, including the recommendation all areas of the façade of the development should have a maximum normal specular reflectivity of visible light of 20%.



17. Statement of commitments

17.1 Introduction

This Environmental Assessment has identified a range of measures to avoid, manage, mitigate offset and/or monitor the environmental impacts of the project. These measures are detailed in Chapters 9 - 16 and would be implemented during the pre-construction and construction.

This chapter provides EnergyAustralia's draft Statement of Commitments. This may be revised to respond to issues raised in submissions received by the Department of Planning during exhibition of the Environmental Assessment, or to address potential impacts associated with any changes to the project made following exhibition of the Environmental Assessment. Following approval of the project, the final Statement of Commitments would guide the subsequent phases of the project to reduce environmental impacts. Organisations involved in the design and construction phases would be required to undertake the works in accordance with these commitments.

17.2 Environmental management framework

The environmental management framework during construction of the project would be based on development and implementation of a CEMP by the contractor. This plan would be prepared in accordance with the *Guideline for the Preparation of Environmental Management Plans* (DIPNR, 2004). It would address the compliance obligations set out in the Minister's Conditions of Approval and Statement of Commitments and would be implemented by the contractor and any subcontractors undertaking construction activities.

Implementation of the CEMP would ensure that construction of Stage 2A(i) of the City East Zone Substation complies with relevant environmental legislation; conditions of applicable licences, approvals and permits; and the Environmental Management Systems Guidelines (NSW Government 1998). The CEMP would be endorsed by the appointed project Environmental Management Representative (EMR) prior to approval by the Director-General of the Department of Planning.

The CEMP would include:

- Emergency contact information for key personnel;
- An overview of the project and its objectives;
- Relevant legislative requirements that apply to the project;
- Project scope;
- An outline of the existing environment and conditions;
- Project environmental impacts;
- Licences and permits obtained to meet statutory requirements;
- Roles and responsibilities for all personnel, including responsibilities for planning, approving, implementing, maintaining, assessing and monitoring environmental controls; and
- Implementation requirements and environmental procedures. This would detail the actions to be implemented to address the compliance obligations set out in the Minister's Conditions of Approval and Statement of Commitments, including any requirements for monitoring and/or auditing.

The CEMP would include a number of sub-plans that would detail measures to be implemented to manage specific issues, including but not limited to:

- Noise and vibration;
- Traffic and access;
- Spoil and waste management;
- Surface and groundwater management; and
- Consultation and community engagement.

Compliance with the CEMP would be monitored by implementing a Compliance Tracking Program prepared in accordance with MCoA 5 of the Concept Approval.

17.3 Amendments to the statement of commitments prepared for the Concept Plan

As required by MCoA 3.1c of the Concept Approval, this section provides the project specific commitments for environmental mitigation, management and monitoring. The commitments listed in this section are consistent with the Statement of Commitments prepared for the Sydney CityGrid Concept which are detailed in the Submissions Response and Preferred Project Report (May 2009). The commitments from the Submissions Response and Preferred Project Report have been updated to reflect only those commitments that are relevant to Stage 2A(i) of the City East Zone Substation Project.

The commitments that are not relevant to this stage of the project or have been superseded have been deleted, and the remaining commitments have been retained or amended. New commitments developed as an outcome of this Environmental Assessment have been added. These changes are summarised in Appendix I.

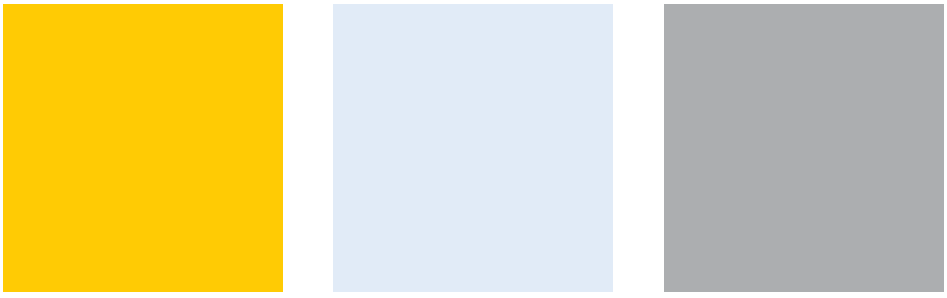
The draft Statement of Commitments are additional to EnergyAustralia's obligations under the Concept Approval.

Table 17-1 Draft Statement of Commitments

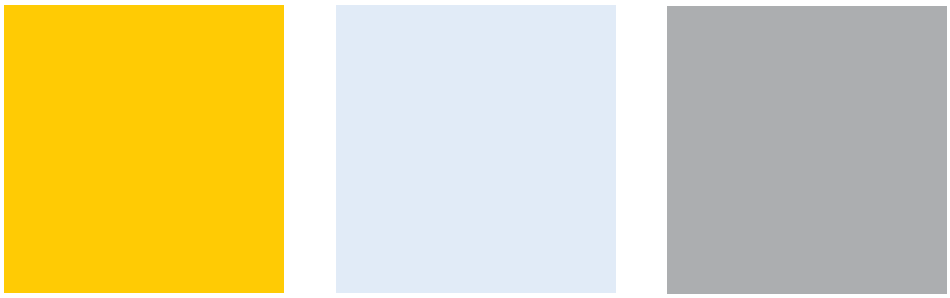
Key Issue	Commitment
Noise and vibration	Construction would generally be carried out during the following hours: • Monday to Friday 7 am to 7 pm • Saturdays 7 am to 5 pm • No work on Sundays or Public Holidays Noise intensive activities such as rock breaking would be undertaken during the following hours: • Monday to Saturday 7 am to 12 pm • Monday to Friday 2 pm to 5 pm • At no time on Sundays or Public Holidays Construction of the stub tunnel is proposed to occur 24 hours per day. Other activities that may occur outside the standard construction hours include, but may not be limited to, oversize truck movements and deliveries of certain plant and equipment on an occasional basis. Works may also be undertaken outside these hours in the event of a direction from police or other relevant authority for safety reasons, or emergency work to avoid the loss of lives, property and/or to prevent environmental harm.

Key Issue	Commitment
Noise and vibration	A noise and vibration management sub-plan would be prepared as part of the CEMP and would: • Identify potentially affected receivers, activities to be carried out, ancillary facilities, and associated sources of noise at each premises; • Quantify the background noise level for the nearest sensitive receivers; • Identity the construction noise, ground-borne noise and vibration objectives; • Provide an assessment of potential and levels during construction against the objectives; • Identify reasonable and feasible mitigation measures to reduce noise and vibration levels where the objectives would be exceeded; • Describe noise and vibration management methods and procedures that would be implemented; • Detail procedures for notifying sensitive receivers of construction activities that are likely to affect their noise and vibration amenity; and • Measures to monitor compliance with noise and vibration objectives and respond to complaints.
	The following general management measures would be included in the noise and vibration management sub-plan: • Where feasible and practicable, only dampened and/or smaller rockhammers would be used; • Where reasonable and feasible, plant and equipment such as excavators, cranes and trucks would be fitted with silencers, low noise mufflers (residential standard), and reversing alarms on vehicles would be replaced with silent measures; • Where possible, plant would be located and orientated to direct noise away from sensitive receivers; • Where possible, deliveries would be carried out within standard construction hours; • Plant and equipment would be selected to minimise noise emission, in-so-far-as possible whilst maintaining efficiency of function. All plant and equipment would be maintained in good order; • 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; and • Solid hoardings and/or site sheds would be erected on work site boundaries to function as noise barriers.
	A dilapidation survey would be undertaken of surrounding buildings, services and structures prior to commencement of construction. This would include inspecting surrounding heritage listed buildings to determine whether they are structurally sound, and if so, whether the vibration criteria for residential buildings should be applied to the heritage listed buildings. A post construction dilapidation survey would also be undertaken. Any damage attributable to the project would be repaired at EnergyAustralia's expense.

Key Issue	Commitment
Non-indigenous heritage	During excavation of the existing basement floor slab, the residual ground surface would be inspected by an archaeologist to identify the potential for the site to contain any items of non-indigenous heritage archaeological significance. Any items non-indigenous heritage significance would be recorded by the archaeologist and managed in consultation with the Heritage Branch of the Department of Planning.
	If construction planning indicates that subsurface works are required within Richard Johnson Square, further assessment would be undertaken by an appropriately qualified heritage consultant in consultation with the Heritage Branch of the Department of Planning. This would involve development of additional management measures to be implemented.
	If any unexpected historical relic(s) are encountered during the course of construction, all work likely to affect the relic(s) would cease immediately and the Heritage Branch of the Department of Planning would be notified in accordance with the *Heritage Act 1977.*
Indigenous heritage	If any unexpected Aboriginal object(s) are encountered during the course of construction, all work likely to affect the object(s) would cease immediately and the DECCW would be informed in accordance with Section 91 of the *National Parks and Wildlife Act 1974.* Consultation would also occur with the Metropolitan Local Aboriginal Land Council regarding an appropriate course of action.
Air quality	A construction air quality management plan would be prepared as part of the CEMP and would include the following measures to manage potential impacts on air quality: • Manage and dispose of any hazardous materials such as asbestos in accordance with relevant guidelines, including Code of Practice for the Safe Removal of Asbestos (National Occupational Health and Safety Committee 2002) and Australian Standard AS-2601 1991 – Demolition of Structures; • During tunnel construction, all air would be ventilated through a filter unit such that discharged air meets the requirements of the *Protection of the Environment Operations (Clean Air) Regulation 2002* (as amended); • Exposed surface areas would be managed via dust mitigation measures; • 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 barriers, screens and other ancillary structures; • 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; • Cutting/grinding of materials on site would be kept to a minimum, but if necessary equipment and techniques to minimise dust would be used;

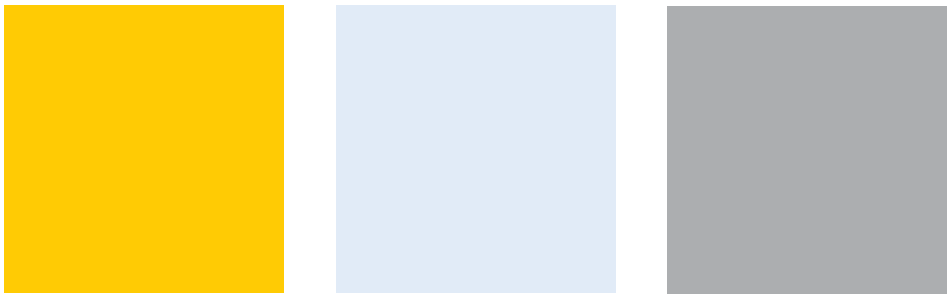


Key Issue	Commitment
Air quality	• Earthworks would be kept damp, as required, especially during dry weather; • Spoil stockpiles would be damped as necessary; • Potentially dusty materials would be handled as little as possible; • Construction plant and vehicles would be well maintained and regularly 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; and • Where practicable and feasible, loading and unloading would take place within the site. The air quality management plan would also: • Establish a protocol to handle dust complaints that includes recording, reporting and appropriate actions for excepted types of complaints; • Include a reactive management program detailing how and when operations are to be modified to minimise the potential for dust emissions, should emissions exceed the relevant criteria; and • Address the monitoring, management and control of air pollutants including gaseous substances generated during construction.
Soil and water	A Water Quality Management Sub-Plan would be prepared as part of the CEMP for the project. The sub-plan would be prepared in accordance with 'Managing Urban Stormwater: Soils and Construction' (Volume 1, 4th Edition, the 'Blue Book', Landcom, 2004) and would detail specific measures to be implemented to manage soil, surface and groundwater impacts during construction. It would identify opportunities for on-site reuse of groundwater and surface water, and include a program for monitoring the effectiveness of the sediment control system.
	The Water Quality Management Sub-Plan would be developed in consultation with DECCW to ensure the output from the treatment system is suitable for discharge to the stormwater system and the measures implemented would allow construction to comply with Section 120 of the POEO Act. It would detail the treatment process to be implemented and the associated monitoring program to verify that the treated water meets water quality objectives developed in accordance with guidelines developed by the Australian and New Zealand Environment and Conservation Council (ANZECC) and the Agricultural and Resource Management Council of Australia and New Zealand (ARMCANZ).
	Consultation with Sydney Water Corporation and/or the City of Sydney would be undertaken to determine whether there are any capacity limitations within the stormwater system that would influence the location of the connection for the water discharged from the treatment system.
Traffic and access	A construction traffic management plan would be prepared in consultation with RTA and City of Sydney Council as part of the CEMP and would include the following measures to manage potential impacts on the traffic and transport network: • General signposting of Bligh Street and O'Connell Street in the immediate vicinity of the site with appropriate heavy vehicle and construction warning signs;

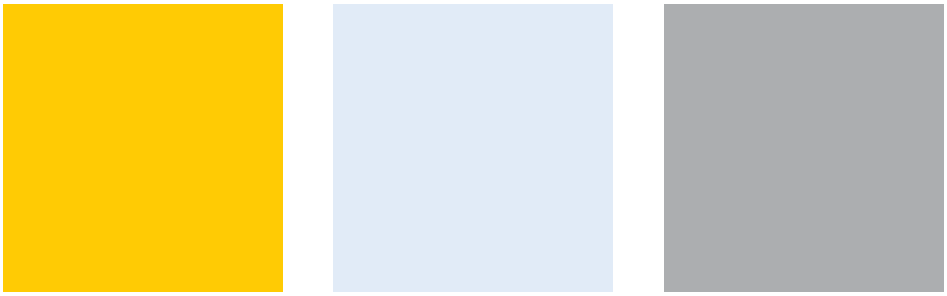


Key Issue	Commitment
	• If temporary road closures are required, traffic control measures specified in *"AS1742.3: 2002 Traffic Control Devices for Works on Roads"* and the RTA's *"Traffic Control at Work Sites"* would be detailed in a traffic control plan and subsequently implemented; • Development of a suitable vehicle detour route, if required during specific construction activities; • Installation of specific warning signs and safety devices at entrances to the construction site to warn existing road users of entering and exiting construction traffic; • Preparation of a pedestrian management plan that details measures to be implemented to minimise impacts on pedestrian movement and maintain pedestrian safety. Specific consideration would be given to activities undertaken within Richard Johnson Square, footpaths, emergency access points to adjacent buildings, vehicle access and egress to the site, and the need for protective gantries above footpaths; • 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; • Consult with Council regarding management measures to be implemented during works that would impact on Council controlled roads, Council would occur priorto work commencing on these roads; • Management of the transportation of construction materials to maximise vehicle loads to therefore minimise vehicle movements; • Inducting truck and vehicle operators on the requirements of the traffic management plan; and • An event specific traffic management plan would also be prepared if there are any special events in the CBD that would potentially be impacted by traffic movements associated with the project. The time and duration of these events would be clearly noted and construction delivery processes would be rearranged to cater to the affected days.
	Prior to the commencement of construction, dilapidation reports would be prepared for sections of Bligh, O'Connell and Hunter Streets in the vicinity of the site that are likely to be used by construction traffic. Any road/ footpath damage, aside from that resulting from normal wear and tear, would be repaired to the pre-existing standard at EnergyAustralia's cost.
	A community information and awareness program would be initiated prior to construction commencing and during the construction period to ensure that the local business establishments in the area are fully aware of the construction activities with particular regard to construction traffic accessing the site. The awareness program would identify communication protocols for community feedback on issues relating to construction vehicle driver behaviour and construction related matters.

Key Issue	Commitment
Storage of dangerous goods	All dangerous goods (as defined by the Australian Dangerous Goods Code) and combustible liquids, would be stored and handled strictly in accordance with: • All relevant Australian Standards; • A minimum bund volume requirement of 110% of the volume of the largest single stored volume within the bund; and • The DECC's *Environment Protection Manual Technical Bulletin Bunding and Spill Management.*
Spoil and waste management	A spoil and waste management sub-plan would be prepared as part of the CEMP and would identify how spoil and other waste material would be handled, stockpiled, reused and disposed. It would address the principles of the waste hierarchy and relevant health and safety as well as environmental legislation and would include measures such as: • All waste would be managed in accordance with DECC's *Waste Classification Guideline* (2008); • Arrangements to reduce the volume of materials being brought onto site such as packaging. In addition, required construction materials would be ordered in the correct quantities to minimise waste; • Reuse or recycling of demolition and excavation materials would be undertaken wherever practicable. Stockpile areas would be allocated for construction and demolition waste to allow separate stockpiling of recyclable and non-recyclable materials. In addition, colour coded and clearly marked containers for different recyclable materials would be provided; • Records would be kept of all waste volumes and destinations; • Sites for disposal of surplus spoil would be selected according to the rate of development activity and the volumes of material generated elsewhere; • Ongoing training would be provided for construction personnel to ensure correct sorting of waste and recyclable materials and promote the principles of the waste hierarchy. Waste minimisation and management would be included in tool box sessions and site management planning; and • Any synthetic mineral fibres would be bagged or wrapped in plastic and handled per Worksafe Australia's *Synthetic Mineral Fibres – National Standard and National Code of Practice.*
Urban design	As required by MCoA 3.2 of the Concept Approval, a design review process would be undertaken as part of the Environmental Assessment for Stage 2A(ii) of the City East Zone Substation. On addition to the items outlined in Section 6.3.6, this would involve consideration of: • Features to be included to ensure the commercial tower would be designed to achieve a minimum 5 Star Green Star rating; • Impact of reflectivity due to the external glazing. As a minimum, the external glazing would have a normal specular reflectivity of visible light of 20% or less to minimise adverse glare impacts; • Impacts on items of built heritage significance. This would involve consultation with an appropriately qualified heritage specialist / architect; and • Upgrade of the adjacent streetscape, including Richard Johnson Square.



Key Issue	Commitment
	During the design review process for Stage 2A(ii), EnergyAustralia will investigate reasonable and feasible opportunities to refine the substation design to attempt to provide a ground level building line that is set back from the property boundary along the Bligh Street frontage and is generally consistent with the setback of the adjacent former NSW Club House (the Lowy Institute). This process will consider alternative internal layouts for equipment within the substation, however it will not consider options that compromise the operational requirements or its functional role of the substation as part of the overall Sydney CityGrid Project, or unreasonably impact or constrain the development of the commercial tower component. Adjacent building owners will be consulted during this process, including the Lowy Institute.
	The contractor would implement reasonable and feasible measures to refine the construction method to minimise the number of street trees to be removed. Any trees removed would be replaced with advanced stock as part of Stage 2A(ii) and the species would be selected in consultation with the City of Sydney Council.
Detailed design investigations	Detailed design of the basement excavation, stub tunnel and bridging structure would be undertaken based on the results of additional geotechnical investigations to minimise potential impacts associated with ground settlement and stability.
	RailCorp and Sydney Metro would continue to be consulted during development of the detailed designs for the basement excavation, stub tunnel and bridging structure to ensure that potential impacts associated with their rail corridors are mitigated to an acceptable level. This would include consideration of the location and impact of associated items such as rock bolts and rock anchors.
	Prior to commencement of construction, property agreements would be developed between EnergyAustralia and owners of impacted neighbouring buildings.
Hazards and risks	EnergyAustralia would identify the services potentially affected by construction activities to determine requirements for diversion, protection and/or support.
	EnergyAustralia's contractors would prepare and implement construction safety sub plans to manage hazardous incidents and public safety during the construction of the project.
Consultation	A Community Information Plan would be prepared in accordance with the requirements of MCoA 4.3 of the Concept Approval. This would set out the community communications and consultation processes to be undertaken during Stage 2A(i) and would include specific consultation regarding issues such as: • Noise and vibration; and • Traffic and access.
Cumulative impacts	EnergyAustralia would endeavor to ensure that cumulative impacts can be avoided through precise management of projects and communication with other authorities. This would involve consultation with organizations constructing other projects in the immediate vicinity of the City East Zone Substation, such as No. 1 Bligh Street, to identify potential cumulative impacts and opportunities to minimize these impacts.



18. Conclusion

This Environmental Assessment has been prepared in accordance with the requirements of Part 3A of the EP&A Act and addresses the Director-General's requirements provided in MCoA 3 of the Concept Approval.

The existing electricity supply infrastructure in the Sydney CBD requires refurbishment, replacement and augmentation to provide a secure supply of electricity to the Sydney CBD that complies with the 'n-2' licence conditions. EnergyAustralia developed the Sydney CityGrid Project as an integrated strategy that is the most effective means of rebuilding or refurbishing the existing infrastructure while maintaining sufficient space and capacity to ensure an ongoing and reliable electricity supply.

The existing City East 33 kV/11 kV zone substation located at Woolloomooloo was commissioned in the 1960s and is approaching the end of its technical life. A new City East Zone Substation is required to replace the Woolloomooloo substation to cater for the projected growth in load in the CBD and improve reliability standards to comply with the 'n-2' licence conditions.

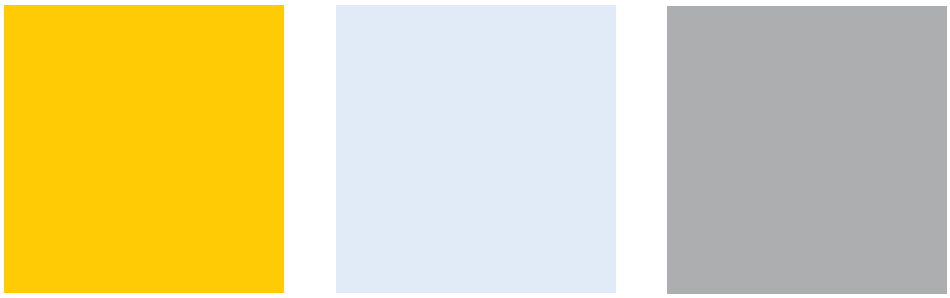
The City East Zone Substation is both needed and justified as all stages of the Sydney CityGrid Project are integrated and interdependent. Failure to construct the City East Zone Substation would compromise the ability to achieve the objectives of the overall project.

Following a number of network supply interruptions in early 2009, EnergyAustralia committed to completing the Sydney CityGrid Project prior to the system need dates required to meet regulatory licence conditions. The main opportunity identified to reduce the timeframe required to deliver the Sydney CityGrid Project involves splitting the development approval for the City East Zone Substation into two stages. This staged approach would reduce the timeframe to deliver the City East Zone Substation by approximately 9 - 12 months which is a significant consideration given EnergyAustralia's commitment to deliver parts of the Sydney CityGrid Project in advance of the system need date. The reduction in timeframe would be achieved by allowing those aspects included in Stage 2A(i) to proceed while approval is sought for Stage 2A(ii). By implementing this approach, it is anticipated that Stage 2A(i) would be completed immediately prior to works commencing on Stage 2A(ii).

Key environmental issues have been progressively evaluated and assessed during development of the design and preparation of the Environmental Assessment. This has involved extensive consultation with government agencies and stakeholders that would have a role in constructing and operating the project. The outcomes of consultation have also informed development of the Statement of Commitments that would be implemented to manage potential adverse impacts and enhance benefits during the construction and operational phases. The Statement of Commitments would reduce the duration, extent and severity of potential impacts.

While the project has the potential to result in some residual adverse impacts, these need to be balanced against the substantial positive impacts that would result from the overall Sydney CityGrid Project. The benefits of the project substantially outweigh adverse impacts.

It is concluded that Stage 2A(i) of the City East Zone Substation is unlikely to result in significant environmental impacts provided the draft Statement of Commitments are implemented.



19. References

Coffey, 2006, Preliminary advice regarding operational groundwater seepage into City North, communication prepared by Coffey Geotechnics Pty Ltd dated 13 November 2006

Department of Environment and Conservation (DEC) 2006, *Assessing Vibration: A Technical Guideline,* viewed 4 November 2009,

Department of Environment and Climate Change (DECC) 2000, *NSW Industrial Noise Policy,* Department of Environment and Climate Change, Sydney.

Department of Environment and Climate Change (DECC) 2008, *Waste Classification Guideline,* Department of Environment and Conservation, Sydney.

Department of Environment, Climate Change and Water (DECCW) 2009, I*nterim Construction Noise Guidelines,* Department of Environment and Climate Change, Sydney.

Department of Infrastructure Planning and Natural Resources (DIPNR) 2004, *Guideline for the Preparation of Environmental Management Plans.*

EnergyAustralia 2009, *Submissions Response and Preferred Project Report,* May 2009.

Environmental Monitoring Services 2005, *Hazardous materials audit of Kindersley House.*

Environmental Protection Authority 2000, *NSW Industrial Noise Policy.*

Environmental Protection Authority 1999, *Environment Criteria for Road Traffic Noise,* Chatswood: EPA, Sydney.

Environmental Protection Authority 1997, *Environment protection manual for authorised officers: bunding and spill management,* technical bulletin.

Hassall, D 1991, Reflectivity, Dealing with Rogue Solar Reflections, Hassall, D, Sydney.

KBR, 2007, City North Zone Substation, Assessment of operational discharge of treated groundwater to Cockle Bay, September 2007

National Occupational Health and Safety Commission 2005, *Code of practice for the safe removal of asbestos,* 2nd Edition, April 2005, Commonwealth Government of Australia, Canberra.

National Occupational Health and Safety Commission 1990, *Synthetic Mineral Fibres – National Standard and National Code of Practice,* May 1990, Commonwealth Government of Australia, Canberra.

NSW Government 1998, *Environmental Management Systems Guidelines,* November 1998, Sydney.

PlanCom Consulting Pty Ltd 2009, *Preferred Project Report,* May 2009, Potts Point, NSW.

Pells Sullivan Meynink Pty Limited (PSM) 2008, Geotechnical investigations, May 2008, Sydney.

Pells Sullivan Meynink Pty Limited (PSM) 2009, City East Cable Tunnel – Interpretation of geotechnical and Hydrological Conditions, 14 January 2009, Sydney.

Rofail and Dowdle 2004, Reflective impact on occupants of neighbouring properties, Windtech Consultants Pty Ltd, Sydney.

SKM, 2005, EnergyAustralia Sydney CBD Tunnel – Assessment ot operational discharge of tunnel water into Cockle Bay, report prepared by Sinclair Knight Merz dated 30 May 2005.

Urban Environmental Consultants Pty Ltd 2008, *Preliminary contamination assessment report,* May 2008, Sydney.

Document Control and Approval

EnergyAustralia

Endorsed by: Craig Moody

Title: Executive Manager – Project Development and Approvals

Signed:

Date: 9.7.10.

Endorsed by: Gareth Evans

Title: A/Director – Area Development - CBD and Sydney East

Signed:

Date: 8/07/10

GHD Pty Ltd

Author: Peter Carson

Signed:

Date: 23 June 2010