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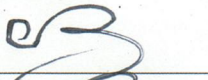
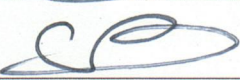


North Sydney Zone Substation Redevelopment Preliminary Environmental Assessment



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The Energy2U Alliance brings partners EnergyAustralia, Leighton Contractors Pty Ltd, AECOM Australia Pty Ltd and PowerServe Pty Ltd together to undertake works for EnergyAustralia's Overflow Infrastructure Project.



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ACRONYMS AND ABBREVIATIONS

ACM	Asbestos-containing materials
AHIMS	Aboriginal Heritage Information Management System
ARI	Annual recurrence interval
ARPANSA	Australian Radiation Protection and Nuclear Safety Agency
AS	Australian Standard
ASS	Acid Sulphate Soils
BCA	Building Code of Australia
CBD	Central Business District
CEMP	Construction Environmental Management Plan
CO	Carbon monoxide
CO ₂	Carbon dioxide
DA	Development Approval
dB	Decibel
DECCW	Department of Environment, Climate Change and Water
DGRs	Director-General's Requirements
DoP	Department of Planning
E2U	Energy2U Alliance
EA	Environmental Assessment
EMF	Electric and Magnetic Fields
EP&A Act	<i>Environmental Planning and Assessment Act 1979</i>
EPBC Act	<i>Environmental Protection and Biodiversity Conservation Act 1999</i>
EPI	Environmental Planning Instrument
ESA	Environmental Site Assessment
ES Act	<i>Electricity Supply Act 1995</i>
ESD	Ecologically Sustainable Development
EWP	Elevated work platform
GHG	Greenhouse gas
GIS	Gas insulated switchgear
ICNG	Interim Construction Noise Guidelines
INP	Industrial Noise Policy
kV	Kilovolts
LEP	Local Environment Plan
LGA	Local Government Area
M&M	Man and material



MVA	Mega Volt Amps
NES	National Environmental Significance
NO _x	Nitrogen oxides
PCB	Polychlorinated biphenyls
PEA	Preliminary Environmental Assessment
POEO Act	<i>Protection of the Environment Operations Act 1997</i>
REF	Review of Environmental Factors
RL	Reduced level
RTA	Roads and Traffic Authority
SAA	Standards Association of Australia
SEE	Statement of Environmental Effects
SEPP	State Environmental Planning Policy
SHR	State Heritage Register
SMF	Synthetic mineral fibre
SO ₂	Sulphur dioxide
STS	Sub Transmission Station
SWMP	Soil and Water Management Plan
TCP	Traffic Control Plan
TMP	Traffic Management Plan
VENM	Virgin excavated natural material
WRAPP	Waste Reduction and Purchasing Policy



EXECUTIVE SUMMARY

Overview

EnergyAustralia proposes to construct, operate and maintain a new North Sydney zone substation, located at 3-11 Ward Street, North Sydney, and decommission and demolish the existing North Sydney zone substation, located on Berry Street, North Sydney.

This project is being delivered by the Energy2U Alliance. The Energy2U Alliance brings together partners from EnergyAustralia, Leighton Contractors Pty Limited, AECOM Pty Limited and PowerServe Australia Pty Limited to undertake works for EnergyAustralia.

A Review of Environmental Factors (REF) has been prepared previously for the project. EnergyAustralia approved the REF on 16th February 2010 and construction commenced on 23rd February 2010. Work completed to date includes the clearing and excavation of the site.

However, since determination of the REF, it has been decided that the project should be classified as a Major Project of regional environmental planning significance and be subject to an assessment under Part 3A of the *Environmental Planning and Assessment Act 1979* (EP&A Act). The Minister for Planning declared the North Sydney zone substation redevelopment to be subject to Part 3A of the EP&A Act on 17th June 2010. This Preliminary Environmental Assessment (PEA) has been prepared for submission to the Department of Planning (DoP) to satisfy the provisions under Part 3A of the EP&A Act.

Description of the Project

Key activities for the construction of a new North Sydney zone substation and demolition of the existing North Sydney zone substation include:

- Construction of a brick-clad substation building (to RL 93.950, which equates to 25 m high above Ward Street and 29 m above Harnett Street at its highest point).
- Installation of an 11 kV switchboard.
- Installation of three 50 MVA 132/11 kV low noise transformers.
- Installation of 1600 Amp 132 kV GIS switchgear.
- Installation of 11 kV metering and earthing equipment associated with each of the transformers.
- Installation of control and protection panels.
- Installation of a cable vault and conduits in Ward Street and conduits in Harnett Street and associated 11 kV cable works.
- Temporary interconnection works between the existing and new substations.
- Decommission and demolish the existing North Sydney (Berry St) zone substation.

Need for the Project

The existing North Sydney zone substation is in excess of 40 years old (becoming operational in 1968) and is therefore nearing the end of its operational life. The majority of the 11 kilovolt (kV) switchgear needs replacing within two years. The 33 kV incoming feeders will require replacement within the next ten years. In addition, Transformer No. 1 is approaching the end of its service life and will require replacement within the next five years.



While the North Sydney zone substation is not forecast to be capacity constrained until after 2015 the Willoughby subtransmission station (STS), which supplies the current North Sydney zone at 33 kV, is currently approaching capacity. As North Sydney is currently supplied from Willoughby STS via five 33 kV feeders, these load issues (particularly during summer) along with the limited capacity, rating and reliability of the subtransmission gas pressure feeders from Willoughby are affecting the performance and capacity of the North Sydney substation.

Issues Prioritisation and Proposed Scope of the Environmental Assessment

This PEA has identified a number of key environmental issues that will be assessed in detail as part of the Environmental Assessment (EA). These issues include:

- Visual amenity
- Noise and vibration
- Electric and magnetic fields
- Hazardous materials
- Traffic and access

Methodologies for the detailed assessment of these issues have also been outlined in this report.

Next Steps

The DoP will issue Director General Requirements (DGRs) for the project following a review of this PEA and liaison with relevant agencies. An EA report would be prepared based on those requirements and submitted to the DoP for adequacy review. Once the EA is deemed to be adequate, the assessment documentation would be exhibited publicly and would be subject to an internal and independent assessment by the DoP. Taking into account the DoP's assessment, the Minister would then determine whether or not to approve the project.



1 INTRODUCTION

EnergyAustralia proposes to undertake a redevelopment of the zone substation in North Sydney. To complete the redevelopment EnergyAustralia would construct, operate and maintain a new North Sydney zone substation and decommission and demolish the existing North Sydney zone substation. The new substation would be constructed directly adjacent to the existing substation.

This project is being delivered by the Energy2U Alliance which brings together partners from EnergyAustralia, Leighton Contractors Pty Limited, AECOM Pty Limited and PowerServe Australia Pty Limited to undertake works for EnergyAustralia.

The Minister for Planning declared the North Sydney zone substation redevelopment to be subject to Part 3A of the EP&A Act on 17th June 2010 (refer to Appendix A). This Preliminary Environmental Assessment (PEA) has been prepared for submission to the Department of Planning (DoP) to satisfy the provisions under Part 3A of the EP&A Act.

1.1 Background

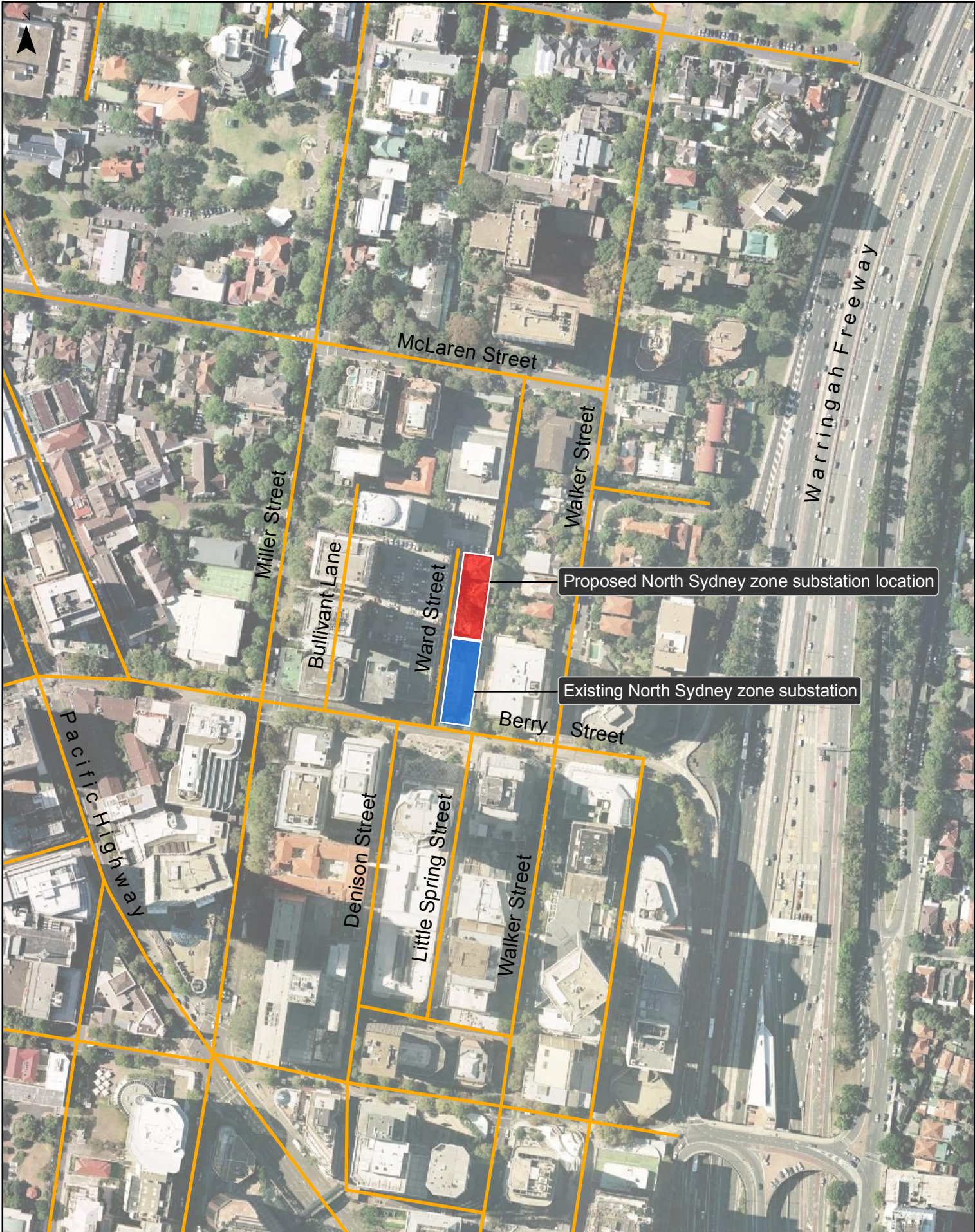
EnergyAustralia is currently in the process of converting the majority of its Sydney metropolitan substations to a 132/11 kilovolt (kV) operation. This would ensure consistency across the network and provide increased capacity and flexibility in the system to maintain a safe and reliable supply of electricity to the Sydney region.

The objective of the project is to establish a new substation to improve electricity supply and reliability for the North Sydney area and, in turn, to ensure electricity supply can meet the needs of future development in the area.

The existing North Sydney zone substation was originally commissioned in 1968. It is presently equipped with four 33 Mega Volt Amp (MVA) transformers and one 27.5 MVA transformer, which are supplied via five 33 kV feeders from Willoughby 132/33 kV Sub Transmission Substation (STS). Much of the equipment and the 33 kV cables are reaching the end of their life and will require replacement over the next few years.

The North Sydney zone substation provides electricity supply to approximately 16,800 customers. The major users are the 3,500 business customers in the North Sydney CBD which include key customers such as the Sydney Harbour Tunnel, Royal Australian Navy (HMAS Waterhen), Sydney Harbour Bridge and Luna Park. Residential customers account for the majority of small customers and include those residing in the North Sydney CBD and surrounding suburbs, including Kirribilli, Milsons Point, Neutral Bay, Lavender Bay, McMahon's Point, Waverton and Wollstonecraft.

These customers are currently supplied by the existing 33/11 kV substation (No. 2473), on the corner of Berry Street and Ward Street, North Sydney. This substation is due to be decommissioned following construction and commissioning of a new 132/11 kV North Sydney zone substation, to be located immediately adjacent, and to the rear of, the existing substation on land that has been acquired by EnergyAustralia in Ward Street (refer to Figure 1-1).





1.2 History

A Review of Environmental Factors (REF) under Part 5 of the EP&A Act has been prepared previously for the project with EnergyAustralia as the determining authority. The REF was approved on 16th February 2010 and construction commenced on 23rd February 2010. Construction work that has been completed to date includes the clearing and excavation of the proposed site for the new substation.

During preparation of the REF, consultation was conducted with the community, relevant stakeholders and government authorities and feedback was received from interested parties. A neighbouring land owner subsequently commenced Land and Environment Court proceedings based on an allegation that EnergyAustralia inadequately complied with Section 111 of the EP&A Act and has not considered the environmental impact associated with the substation redevelopment to the fullest extent possible.

Subsequently it was determined that Project Approval should be sought from the Minister for Planning under Part 3A of the EP&A Act (refer to Section 1.3) and work ceased on site on 21st May 2010. The Part 3A Assessment will allow the regional benefits and significance of the project to be more appropriately weighted and a more rigorous assessment of the potential impacts.

The Minister for Planning declared the North Sydney zone substation redevelopment to be a State significant site due to its regional environmental planning significance on 17th June 2010. As such the project is subject to assessment under Part 3A of the EP&A Act.

As part of the REF process a number of specialist studies have previously been undertaken, including:

- Noise and Vibration Assessment.
- Building Assessment.
- Hazardous Materials Survey.
- Electric and Magnetic Fields (EMF) Report.

These specialist studies have informed this PEA and will be reviewed and updated (as required) as part of the Part 3A approval process.

1.3 Approval Regime

The Minister for Planning declared the proposed North Sydney zone substation redevelopment to be a State significant site on 17th June 2010. The site has been listed under Schedule 3 of *State Environmental Planning Policy 2005 (Major Developments)* (SEPP 2005) and the project is therefore subject to an assessment under Part 3A of the EP&A Act. The State significant site listing is based on the substation redevelopment being a site of regional environmental planning significance for the following reasons:

- The proposal will secure power supply to the North Sydney region in circumstances where the existing supply is at risk due to ageing equipment
- The proposal will secure the reliability of power supply to the North Sydney region
- The proposal will increase the capacity of electricity distribution in the North Sydney area to ensure adequate supply for future development.
- The proposal promotes NSW State Plan targets including Better Transport and Liveable Cities and Supporting Businesses and Jobs initiatives.



1.4 Report Purpose

This PEA has been prepared in accordance with the provisions of Part 3A of the EP&A Act. The purpose of this report is to provide the Minister for Planning with outline information and background environmental data on the site and the proposed project, sufficient to establish the key environmental issues of importance to the project and the level of environmental assessment required for the application. The report will form the basis for input by relevant government agencies, to the requirements for environmental assessment of the project. This PEA is based on a detailed design for the proposed substation redevelopment that has been prepared by the Energy2U Alliance team and informed by a range of specialist reports.

1.5 Study Area

North Sydney is located to the north of the Sydney Central Business District (CBD), across Sydney Harbour. It is a heavily urbanised environment with high density commercial and residential development. The North Sydney zone substation forms part of the Lower North Shore supply area, which extends from Chatswood and Castle Cove in the north, to North Sydney in the south, and Mosman in the east. The supply area of the North Sydney zone substation is described in Section 1.1.

The site will comprise the location of the existing substation as well as the location of the proposed substation. The existing North Sydney zone substation is located on Lots 6, 6A, 7, 7A and 8 in DP 24474. The site for the proposed North Sydney zone substation is located at 3-11 Ward Street, North Sydney and includes Lots 1, 1A, 2, 2A, 4, 4A and 5 in DP 24474, Lot 1 in DP 5933976 and Lot 5A in DP 225770 (refer to Figure 1-1). The site of the proposed substation was previously occupied by three residential dwellings, which were acquired and demolished by EnergyAustralia in 2008. The site of the proposed substation is generally rectangular in shape and has an area of approximately 1200 m².

The site of the proposed substation is located in a mixed use area and is part of the North Sydney CBD. Ward Street is a small cul-de-sac located off Berry Street (a NSW Roads and Traffic Authority (RTA) managed state road), which provides access between the Pacific Highway and the Warringah Freeway. The site also has a small frontage and alternative access to Harnett Street along the northern boundary.

The site is bounded to the west by Ward Street and a multi-level Council owned carpark, which is currently leased to Wilson Parking until 2020. The carpark wraps around the end of Ward Street to adjoin the northern boundary of the study site.

To the east, the site immediately abuts three private properties that accommodate single and double storey buildings at 136-140 Walker Street. These buildings are currently used for residential purposes, however approval has been granted for a proposed 21 storey multi-use (retail and residential) development over two of the properties (development application approval was granted with knowledge of a pending substation redevelopment). One tree on this property would need to be removed in order to create space for the construction scaffolding to be erected.

To the south, the site of the proposed substation is bounded by the existing substation. The site also partially borders a 10-storey commercial building to the south-east, which is located at 76 Berry Street on the corner of Berry and Walker Streets. Two trees in this property would need to be removed to create space for the construction scaffolding to be erected.

The site of the proposed substation has been previously cleared of all buildings and trees and excavation for the new substation has been completed.



1.6 Project Need and Justification

1.6.1 Network Investment Criteria

Network asset investment by EnergyAustralia is generally required to:

- Meet EnergyAustralia's duty of care.
- Connect customers to the supply network.
- Provide a satisfactory standard of supply to customers.

The overall performance of the network is driven by the reliability of individual network components and the redundancy provided by the network to enable maintenance of supply at times when critical parts of the network are out of service (due to maintenance or repair requirements). To maintain acceptable standards of customer service it is necessary to ensure:

- Infrastructure performance (reliability) is maintained at acceptable levels.
- The network design provides adequate security (redundancy).

The reliability performance of equipment and infrastructure is managed through maintenance and replacement of that infrastructure. For EnergyAustralia, the decision to replace infrastructure is based on an assessment of equipment condition and consideration of the strategic replacement needs of the network.

1.6.2 Asset Condition Issues

The existing North Sydney zone substation is over 40 years old and the majority of the 11 kV switchgear need replacing within two years. The 33 kV incoming feeders require replacement within the next ten years. In addition, Transformer No. 1 is approaching the end of its service life and will require replacement within the next five years.

While the North Sydney zone substation is not forecast to be capacity constrained within the present forecast period (until beyond 2015), the Willoughby STS is currently approaching capacity. As North Sydney is currently supplied from Willoughby STS via five 33 kV feeders, these load issues (particularly during summer) along with the limited capacity, rating and reliability of the subtransmission gas pressure feeders from Willoughby are affecting the performance and capacity of the North Sydney substation.

1.7 Report Structure

The structure of the PEA is displayed in Table 1-1.

Table 1-1 – Structure of the PEA

SECTION	DESCRIPTION
Section 1 – Introduction	This section provides the purpose of the report and the background of the project, including a description of the study area and the need for the project.
Section 2 – Project Alternatives	This section describes the alternatives that were considered prior to the selection of the preferred option.
Section 3 – Project Description	This section details the scope of the project, including the timing, physical structures and the construction activities.
Section 4 – Statutory Controls and Approvals Process	This section describes the planning context, including any requisite environmental approvals.
Section 5 – Consultation	This section details the consultation activities undertaken to date and those planned to be undertaken during the Part 3A process.
Section 6 – Preliminary Environmental Assessment	This section presents a preliminary review of the existing environmental conditions at the site, identifies likely potential environmental impacts of the project and presents a methodology for further assessment, where required.
Section 7 – Environmental Risk Analysis and Issue Prioritisation	This section provides an assessment of the environmental risks of the project to assist with the prioritisation of issues for the subsequent Environmental Assessment.
Section 8 – Conclusion	This section summarises the report and presents the main findings of the PEA.



2 PROJECT ALTERNATIVES

2.1 Do Nothing (Maintain Current Supply Infrastructure)

One option would be to refrain from undertaking any further development of the network in the area, excluding routine maintenance. The consequences of EnergyAustralia doing nothing would be that, as years passed, reliability would decrease and capacity would not be sufficient to meet demand.

The 'do-nothing' option was not feasible for the following reasons:

- The majority of the 11 kV switchboard was installed between 1968 and 1974 and the switchboard is near the end of its operational life.
- The age and reliability of the 33 kV feeder cables necessitate the upgrade to 132 kV supply.
- The existing 33 kV feeders are nitrogen gas filled cables are an obsolete technology that have a history of gas leaks and reliability issues. EnergyAustralia has already had major customer outages related to this technology.
- The North Sydney zone substation has limited interconnectivity between adjoining zone substations because of its peninsular location adjacent to Sydney Harbour, which prevents interconnection to the Sydney CBD from being economically viable. This means that a failure of the 11 kV switchboard would produce long power outages for the North Sydney area customers.

2.2 Demand Management

As this project is primarily a replacement and does not involve significant augmentation of the system, demand management was not considered to be a viable option and alternatives were not considered. However, demand management principles are being applied to developments in the North Sydney area.

2.3 Option 1: Upgrade existing 33/11 kV Substation

This option would involve refurbishing and upgrading the existing substation. These works would consist of replacing the 11 kV switchgear, Transformer No. 1, upgrading the oil containment system and providing new 33 kV feeders.

Difficulties would be encountered in undertaking these works, due to constraints associated with maintaining the existing network supply whilst simultaneously completing the upgrade works. In addition, the provision of new 33 kV feeders, rather than 132 kV feeders would limit the potential for a reliable electricity supply and future capacity within the growing North Sydney region. Replacing the 33 kV feeders would not reduce the loading on the Willoughby STS.

2.4 Option 2: Build new 132/11 kV Substation

This option would involve the construction of a new 132/11 kV substation on land adjacent to the existing North Sydney substation. These works would include the installation of new 11 kV switchgear, three 50 MVA 132/11 kV transformers, 1600 Amp 132 kV GIS busbar and 132 kV switchgear. As detailed in Section 3, this option would be undertaken in two stages. This would ensure related network projects that are not part of the scope of this project, but are necessary for the successful conversion of the North Sydney zone substation from 33/11 kV to 132/11 kV, would be complete. These related projects include the redevelopment of the Crows Nest zone substation and the installation of 132 kV cables between Willoughby, Crows Nest and North Sydney substations.



2.5 Preferred Option

The preferred option is Option 2. The benefits of commissioning a new 132/11 kV North Sydney substation would:

- Replace equipment which is approaching time for retirement, while maintaining continued operation of the existing zone substation.
- Facilitate the most economical retirement of the aged 33 kV feeders from Willoughby to North Sydney. The cost of replacement of these feeders contributed to the overall Lower North Shore area strategy, for which several alternative options incurred additional costs and proved less viable than conversion to 132 kV.
- Allow retirement of the 33 kV switchgear at Willoughby STS, associated with the North Sydney 33 kV feeders.
- Bring the North Sydney network into line with the 132/11 kV operation of other metropolitan zone substations.



3 PROJECT DESCRIPTION

3.1 Scope of Works

As outlined in Section 1.2, construction works for the proposed North Sydney zone substation commenced following the approval of an REF when the project was assessed under Part 5 of the EP&A Act. Construction works that were completed include preparatory works such as site clearance and excavation. Construction work has stopped and the project is now subject to approval under Part 3A from the Minister for Planning.

As such, the scope of works associated with the proposed North Sydney zone substation redevelopment would be limited to those works to be undertaken following the initial preparatory works.

The EA will seek approval for the construction of a new North Sydney zone substation (from the excavation phase) and demolition of the existing North Sydney zone substation. The work would be conducted in two stages. The timing of these stages is discussed in Section 3.5.4. Following the construction stages, the substation would move into an operational and maintenance stage.

3.1.1 Stage 1

- Construction of a brick-clad substation building (to RL 93.950, which equates to 25 m high above Ward Street and 29 m above Harnett Street at its highest point).
- Installation of an 11 kV switchboard.
- Installation of three 50 MVA 132/11 kV low noise transformers.
- Installation of 1600 Amp 132 kV gas insulated switchgear (GIS).
- Installation of control and protection panels.
- Installation of auxiliary equipment for the transformers and substation.
- Installation of a cable vault and conduits in Ward Street and conduits in Harnett Street.
- Commissioning of the substation.

3.1.2 Stage 2

- Progressive transfer of the 11 kV feeders and the associated customer load, from the existing to the proposed substation.
- Decommission and demolish the existing North Sydney (Berry Street) zone substation.

Design drawings are contained within Appendix B.



3.2 Design Criteria

The design has been developed to meet the following criteria:

- Adequately accommodate and protect the associated electrical equipment.
- Provide a safe and comfortable working environment for all users.
- Meet the Design Life requirements.
- Be cost effective when assessed on a life cycle cost basis.
- Have an appropriate level of security.
- Be capable of being constructed cost efficiently and within time constraints.
- Have appropriate access for equipment installation, maintenance and replacement particularly with regard to live substations.
- Meet the requirements of the Building Code of Australia (BCA) where appropriate and relevant Standards Association of Australia (SAA) Standards.
- Take into consideration the needs of the local community, local approval authorities and the future development of North Sydney.
- Provide durability and performance of the intended function.
- Provide security against vermin, wildlife, unauthorised entry and fire.
- Facilitate the future development of the proposed substation without disruption of supply from the existing substation.
- Enable access from ground level into the building for all major plant such as transformers and switchgear.
- Meet the requirements of the Occupational Health and Safety Regulation 2001 (NSW).
- Adequately consider the principles of Ecologically Sustainable Development (ESD).

3.3 Building Codes of Australia

Development by the Crown under the EP&A Act is required to be in accordance with the relevant technical provisions of the State's building laws.

The building has been designed to comply with the relevant EnergyAustralia design and performance standards, which generally exceed those of the BCA.

3.4 Physical Structures

3.4.1 *New Substation Building Layout and Structures*

The building layout for the new substation has been determined by the electrical design and EnergyAustralia's requirements and standards. The external building facade has been designed to minimise both the visual and environmental impacts to the surrounding residential and commercial district whilst meeting the needs of EnergyAustralia's electrical network.



The proposed substation would be a brick-clad building, with aluminium finished louvers and a sloped lightweight Colorbond roof. The internal layout of the building would consist of:

- Level 1 – Cable Basement, Oil Containment Tank.
- Level 2 – Transformer Bays and Transformer Roadway from Harnett Street.
- Level 2A – Ward Street access to cable riser.
- Level 3 – Cable Floor, GIS 132 kV Switchroom, Auxiliary Transformer Rooms, Utility Rooms 1 and 2.
- Level 3A – Mezzanine, including 11 kV Switchroom, Control room and Lunch room.
- Level 4 – Roof, with provision for capacitor banks in enclosed roof space.

The new substation building would be positioned directly behind the existing North Sydney zone substation, which fronts Berry Street (until decommissioned and demolished) and would accommodate all the associated electrical installations, transformers, switchrooms, etc within the building. The proposed substation building would occupy the entire vacant site (from boundary to boundary) and would be approximately 55 m long, 20 m wide and 25 m high above Ward Street (29 m above Harnett Street) at its highest point (RL 93.950).

3.4.2 Transformers, Transformer Bays and Transformer Road Way

The substation would include three transformer bays located on Level 2 along the Ward Street side of the building. Each transformer bay would house a 132 kV/11 kV, 50 MVA low noise transformer. The bays would be designed to accommodate transformers with detached radiators. To ensure adequate ventilation and cooling, each bay would comprise both lower and higher level venting solutions. These would include a section of flat, open mesh roof over each transformer (situated approximately 7 m above the Ward Street level) along with a high level vent to the top of the building structure. An 11.5 kV earthing transformer would also be installed within each transformer bund area. Two 11 kV/415 V auxiliary transformers would be housed on Level 3, which would power the zone substation building, including control panels, lights, etc.

Access to the main transformers would be via Harnett Street using the concrete transformer roadway situated on Level 2. General access would also be provided from the transformer roadway. There would be a personnel only access and egress from Ward Street.

3.4.3 Conduits and Underground Cables

The cables and conduits leading to and from the proposed site would be placed underground within Ward and Harnett Streets. There are already underground cables in Berry Street. There is also a possibility of an easement through property located on the eastern boundary of the site to facilitate the installation of cables from Walker Street into the new substation building. Within the proposed substation, the cable floors located on Levels 1 and 3 of the new substation, along with cable risers, would allow for the installation of the required 132 kV, 11 kV and other associated cables.

From the northern cable entry/exit point of the substation cable basement, several new conduits would be installed along Harnett Street. These would include:

- Approximately 16 conduits for 11 kV cables
- Approximately six conduits for 132 kV cables
- Several conduits for communications and protection cables.



Along the western side of the substation in the adjoining Ward Street, numerous new conduits would be installed that would lead to a large cable vault to be constructed at the junction of Berry and Ward Streets. These conduits would include:

- Approximately 30 conduits for 11 kV cables installed in three groups. Connection and jointing of the 11 kV cables from the existing substation to the new substation would occur in the cable vault.
- Approximately three conduits for 132 kV cables which would come from the north via an easement under the council carpark.
- Several conduits for communications and protection cables.

Additional temporary conduits would be placed through the northern wall of the existing substation to provide interim connections to the feeders and transformers during Stage 1 of the project. These would be removed during Stage 2.

After the completion and commissioning of the 132 kV works within the new substation, the incoming 11 kV transformer feeders would be cutover from the existing substation to the new substation in stages.

3.4.4 Cable Vault

A cable vault would be installed at the corner of Ward Street and Berry Street. The cable vault would allow for the required cable connections. It necessitates a hole of approximately 15 m by 10 m by 3 m to be excavated in the roadway at the intersection of Ward and Berry Streets and would require the partial closure of both roads for approximately six months.

3.4.5 Oil Containment

The transformer bays would include bundled foundations to allow for the appropriate treatment of any captured stormwater and any transformer oil spills or leaks. The transformer bays would be individually bundled, and these would be constructed to comply with Australian Standard (AS) 1940 – The Storage and Handling of Flammable and Combustible Liquids and AS3600 – Concrete Structures and AS3735 – Liquid Retaining Structures.

Any fluid that falls within the transformer bays would be directed via gravity to the oil containment tank located in Level 1. This would then be passed through an oil and water separator unit on Level 2A and the water from the separation tank would be released to the stormwater system via the stormwater collection pit located on Level 2.

3.4.6 Stormwater

The proposed stormwater system for the new substation would be designed to cater for a minimum 1 in 10 year Annual Recurrence Interval (ARI) storm event, with overflow provisions to cater for a 1 in 100 year ARI storm event. A system of downpipes would collect the rainwater from the roof gutters and grated drains and convey it by gravity to the stormwater system via a new stormwater pit on Harnett Street. This pit would drain flows along a new stormwater pipe to be installed as part of the works, which would connect to the existing stormwater system.

Given that all site stormwater would be directed to the North Sydney Council's piped stormwater system, no on-site detention system would be required for the site.



3.4.7 Utilities

Existing utilities in the local area are extensive, due to the heavily built up nature of the North Sydney commercial precinct. Existing services include power, water, sewer, gas and telecommunications. Connections to the power, water, sewer and telecommunication services would be required for the zone substation development.

During the conduit installation works required in Ward and Harnett Streets and the vault construction at the Ward and Berry Street intersection, some service relocations would be necessary. The extent of these works would be determined following excavation and review of the exact location of the existing services.

Additional utilities that would need to be relocated include a sewer vent stack on Harnett Street and street lights on the corner of Berry and Ward Streets. Discussions with North Sydney Council and Sydney Water have commenced regarding these works.

3.4.8 Lighting

Lighting would be provided on the external walls at access points of the substation building and on the various levels within the substation, including within the transformer bays, 11kV and GIS 132kV switchrooms, utility rooms, lunch room, control room, etc. These lights would be used during maintenance works, replacement of equipment or for other essential operational purposes.

As the substation would consist of a fully-enclosed structure, the substation is not expected to require continual lighting for security surveillance. If security breaches were to occur, the use of night-time security lighting would need to be reassessed.

3.4.9 Fencing and Signage

As the substation building occupies the entire site, no permanent site fencing would be required. All building access and egress points would be locked, including the Harnett Street driveway and Ward Street fire exits.

Signage would be required for construction and operation of the zone substation. During construction, signage would be displayed in accordance with NSW Occupational Health and Safety Regulations for construction sites.

During operation, various signs would be required, including: "High voltage – Keep Out", "Authorised Personnel Only", "Trespassers will be Prosecuted", "Protective Equipment must be Worn" and the relevant EnergyAustralia logo signs for identification of the substation.

3.4.10 Access and Parking

Any roads, footpaths and other public access areas disturbed during construction works would be reinstated to their pre-construction condition or better (condition reports would be prepared prior to construction within or near these areas).

Once constructed, all site vehicular access and the majority of personnel entry to the substation would be via Harnett Street. Entry to the substation would be restricted via a locked roller door to the transformer roadway. Limited personnel access would also be provided from Ward Street.

No designated parking spaces would be provided, however, several vehicles would be able to park within the substation building on Level 2 along the transformer roadway.



3.4.11 Landscaping

Due to the physical extent of the new substation building, there would be no allowance for landscaping to be undertaken onsite. Supplementary landscaping may be considered to replace the three trees that would be removed from adjoining properties. This would be evaluated during the works period and would be discussed with the affected landowner and/or North Sydney Council.

3.5 Construction Activities

3.5.1 Construction Access

During peak construction, the workforce on-site would be an average of 60 workers per day. Therefore, if all workers were driving to site the estimated maximum traffic generated would equate to 100-120 work trips per day plus an average of 80 delivery vehicle trips per week.

However, given the proximity of the site to both rail and bus transport and the general lack of affordable parking, the majority of the site labour force would use public transport to get to and from the site which would greatly reduce the number of vehicles generated daily. For the few who do have company vehicles for transporting materials and workers to the site, there is a Wilson carpark located immediately adjacent to the site off Ward Street.

During the construction phase, site access would be via Harnett Street and secondary access would be by way of Ward Street. The North Sydney Council carpark within Harnett Street would be utilised during the construction phase for site amenities and material laydown. This would be subject to traffic management plans and agreement with North Sydney Council.

3.5.2 Construction Fencing

The site is currently secured by a 2.4 m high wire mesh and barbed wire fence. As the building construction works proceed, scaffolding would be erected around the entire site. This scaffold would be protected by a security fence, with barricades where necessary. The installation and configuration of some of the scaffolding, fencing and barriers would require permits, agreements or other arrangements with property owners or North Sydney Council and these would be obtained prior to the commencement of construction.

3.5.3 Site compound and Stockpiles

Due to the space limitations of the site, a site compound and amenities area would be incorporated into the B type hoarding structure over the adjacent footpath on Harnett Street. This would be in addition to the Harnett Street council carpark area, noted in Section 3.5.1 above.

Stockpiles would not be needed given that excavation of the site has been completed. Material generated during excavation for the cable vault would be disposed of immediately and not stockpiled on site.

3.5.4 Timing

Stage 1 of the construction works commenced 23rd February 2010 with site preparation and excavation being completed prior to the construction works being halted on 21st May 2010. The remaining works (the subject of this PEA) are expected to be completed by November 2013. The civil and building construction works are anticipated to be completed within 14 months. The remaining construction period would consist of temporary and permanent electrical equipment installation, commissioning of the new substation and decommissioning and demolition of the existing substation.



The installation of the electrical equipment at the new North Sydney zone substation is dependent on the installation of new 132 kV feeders between Willoughby, Crows Nest and North Sydney.

3.5.5 *Work Hours*

Generally work hours would be between 7am and 6pm Monday to Friday and 8am and 4pm on Saturday. Approval from DECCW would be sought to extend work hours on Saturdays as the general construction hours are between 8am and 1pm.

Night works would be required for approximately six months during construction of the cable vault as road works are required within Berry, Ward and possibly Harnett Streets. The RTA require that any part closure of Berry Street occurs at night as this would limit disruptions to the considerable traffic volumes that use Berry Street to access the Warringah Freeway, Harbour crossings and the North Sydney commercial area during the day. Discussions with Council and the RTA have commenced regarding the proposed nature of the road works and the extent of night works that would be permitted. A draft Traffic Management Plan was prepared as part of the draft Construction Environmental Management Plan (CEMP) (refer to Section 6.4)

In addition to the above, works outside the agreed working hours may be undertaken where the following requirements are met:

- Neighbours (and other sensitive receivers) adjacent to the works or the local council have been notified.
- The works are justified on the basis that it is emergency work because of specific constraints that can only be achieved outside these hours.

Additional approval would be sought from DECCW to extend the agreed construction hours.

3.5.6 *Resources and equipment*

Numerous staff would be employed during the construction phase and would include contractors and staff from the Energy2U Alliance.

During construction, the following equipment would be used on site:

- Excavators.
- Rock saws.
- Rock breaker.
- Tower crane.
- Mobile crane.
- Man and material (M & M) hoist.
- Scaffolding.
- Jackhammers.
- Truck mounted borer.
- Mulcher/ chipper.
- Cable trucks.
- Elevated work platforms (EWP).
- Traffic control vehicles and equipment.
- Saw cutting machine with vacuum and transport utility.
- Backhoe.
- Trucks.

- 
- Concrete saws.
 - Cable winch.
 - Concrete trucks and pumps.
 - Directional borer with slurry cart.
 - Whacker rammers.
 - Truck mounted augers.
 - Equipment delivery vehicles, including low loaders.
 - High voltage testing equipment.

3.6 Operation and Maintenance Requirements

Ongoing maintenance requirements during operation would be undertaken by EnergyAustralia field staff and contractors. Periodic maintenance of the substation would be required once it is operational. Regular inspections of the infrastructure would be undertaken to help identify components requiring maintenance.

The site would not accommodate staff or contractors. No regular collection of waste would be required. All wastes generated during the operational phase on site would be minimal and managed on an as required basis.

The building has been designed to be low maintenance. The façade has been selected to reduce the maintenance requirements over the life of the substation.

Likely maintenance activities include:

- Fire detection/ suppression system inspection and maintenance.
- Stormwater and oil containment system inspection and maintenance.
- Façade management, including any graffiti removal.
- Regular operation, testing, maintenance and inspection of electrical equipment.



4 STATUTORY CONTROLS AND APPROVAL PROCESS

The following section addresses the regulatory and statutory context of the proposed project including its definition, land use permissibility and compliance with the relevant Environmental Planning Instruments (EPIs).

4.1 Environmental Planning and Assessment Act 1979

The EP&A Act is the primary piece of legislation regulating land use planning in NSW. It provides the framework for the development of state and local planning instruments which, through their hierarchy, determine the statutory process for environmental impact assessment. Under the EP&A Act there are three distinctive processes, which are:

- Part 3A, which regulates specific types of 'development' and requires an Environmental Assessment report to be prepared and submitted to the Department of Planning for the Minister's approval.
- Part 4, which regulates 'development' and requires a development application accompanied by a Statement of Environmental Effects (SEE) to be submitted to council for development approval.
- Part 5, which regulates 'activities' and requires an REF for determination by the determining authority (i.e. EnergyAustralia).

The project satisfies the definition of development under Part 3A of the EP&A Act.

4.1.1 Environmental Planning Instruments

EPs regulate the permissibility to undertake an activity and the type of assessment process that is required. EPI is the generic term used to describe state environmental planning policies, regional environmental plans and Local Environmental Plans (LEPs). EPs that apply to this development are outlined below.

4.1.2 State Environmental Planning Policies

State Environmental Planning Policy (Major Development) 2005

State Environmental Planning Policy (Major Development) 2005 (SEPP 2005) was gazetted on 25 May 2005. It replaces all existing provisions related to former 'state significant development' in planning instruments, directions and declarations.

The primary aim of SEPP 2005 is:

to identify development of economic, social or environmental significance to the State or regions of the State so as to provide a consistent and comprehensive assessment and decision making process for that development.

Schedule 3 of the SEPP identifies sites that are of State or regional significance. The Minister for Planning declared the proposed North Sydney zone substation redevelopment to be a State significant site on 17th June 2010. The State significant site listing is based on the substation redevelopment being a site of regional environmental planning significance.

Following the State significant site declaration, the proposed North Sydney substation redevelopment has been listed under Schedule 3 of Major Development SEPP 2005 and the proposal is subject to assessment under Part 3A of the EP&A Act. The project has been declared a Major Project, with the Minister being the approval authority.



State Environmental Planning Policy No. 55 – Remediation of Land

State Environmental Planning Policy No. 55 – Remediation of Land (SEPP 55) provides state-wide planning controls for the remediation of contaminated land. The policy states that land must not be developed if it is unsuitable for a proposed use because it is contaminated and requires remediation before land is developed. The policy establishes when consent is required for remediation work. SEPP 55 requires all remediation work to comply with standards and ensures that local councils are notified prior to remediation works being carried out.

The North Sydney site of the proposed substation development is located on land previously determined to be contaminated. Following the removal of the previous dwellings which occupied the site, site investigations and remediation works were undertaken. Further remediation requirements were necessary during the site excavation works. On completion of any additional remediation works (including any that may be required as part of demolition of the existing substation), North Sydney Council would be notified, as required under the provisions of SEPP 55. Contamination is discussed further in Section 6.8.

4.1.3 Local Environmental Plans

The North Sydney zone substation is located within the North Sydney Local Government Area (LGA) and is zoned as Mixed Use under the *North Sydney Local Environmental Plan 2001* (North Sydney LEP). The objectives of this zone are to ensure compatible development between residential, non-residential and open space land uses. Specific objectives relate to building height, building height plane, floor space ratios and the development design and are detailed in Part 3, Division 5 of the LEP. A review of the proposal and its compatibility with local development controls will be considered during preparation of the Environmental Assessment.

4.2 Key Legislation

4.2.1 *Environmental Protection and Biodiversity Conservation Act 1999* (Commonwealth)

The Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) requires the approval of the Commonwealth Minister for the Environment for actions that may have a significant impact on matters of National Environmental Significance (NES). Approval from the Commonwealth is in addition to any approvals under NSW legislation.

The EPBC Act lists seven matters of NES which must be addressed when assessing the impacts of a project. An assessment of how the project may impact on matters of NES is provided in Table 4-1.

Table 4-1 – Matters of National Environmental Significance

MATTERS OF NES	IMPACT
World Heritage Properties	There are no world heritage properties proximate to the proposed development, or that would potentially be affected by the project.
National Heritage Places	There are no national heritage places proximate to the proposed development, or that would potentially be affected by the project.
Wetlands of International Importance	Towra Point Nature Reserve (Botany Bay, Sydney) is the closest Ramsar wetland of international importance. Towra Point Nature Reserve would not be affected by the project.
Commonwealth listed Threatened Species and Ecological Communities	The project would have no impact on threatened species, populations and ecological communities listed within Commonwealth (or State) legislation.
Commonwealth listed Migratory Species	The project would have no impact on listed migratory species.
Nuclear Action	The project would not result in any nuclear action nor would the activity require any nuclear action to be undertaken.
Commonwealth Marine Areas	There are no Commonwealth marine areas proximate to the proposed development, or that would potentially be affected by the project.

Given that the project would not impact on matters of NES and would not be carried out on Commonwealth land, the EPBC Act is not triggered and approval from the Commonwealth Minister for the Environment is not required.

4.2.2 Electricity Supply Act 1995

The *Electricity Supply Act 1995* (ES Act) establishes a comprehensive wholesale and retail market in electricity, regulates the network operations and wholesale trading and electricity supply in the retail market. The ES Act confers special powers on EnergyAustralia in respect of development and maintenance of electricity infrastructure and sets out the licensing regime. In particular, it allows EnergyAustralia to trim and remove trees, carry out works on public roads and acquire land.

The ES Act also requires that no works (other than routine repairs or maintenance works) may be carried out unless 40 days notice has been given to the local council to make a submission in relation to the project. Any submissions must be considered by EnergyAustralia.



4.2.3 *Heritage Act 1977*

The *Heritage Act 1977* provides for the protection of heritage items of local and state significance. Such items may include places, buildings, works, relics, moveable objects or precincts with historical, scientific, cultural or aesthetic value to the state. Where works are likely to impact upon an item listed on the State Heritage Register (SHR), approval may be required under two sections of the Act:

- Section 60 approval relating to impacts on items listed on the SHR.
- Section 140 approval requiring an excavation permit for activities with potential to excavate or disturb a relic.

Heritage matters are discussed further in Section 6.14.

4.2.4 *Protection of the Environment Operations Act 1997*

The *Protection of the Environment Operations Act 1997* (POEO Act) provides a framework for the licensing of activities that have potential to result in pollution of the environment. The POEO Act is administered by the Department of Environment, Climate Change and Water. An environment protection licence is not required for the proposed works as they do not fall within Schedule 1 of the POEO Act, however, the following restrictions apply:

- The proposed works must not pollute waters.
- Waste from the works must not be wilfully or negligently disposed in a manner that harms or is likely to harm the environment.
- Waste must not be transported to a place that cannot lawfully be used as a waste facility for that waste.
- There must be no litter from workers in or on a public place or an open private place.
- Any environmental incident that involves actual or potential harm to the health or safety of human beings or to ecosystems must be reported to Department of Environment, Climate Change and Water.

During construction, operation and demolition, uncontrolled discharges to surface waters would be managed to prevent pollution to offsite environments. The most suitable management strategy at the North Sydney site would comprise the capture and filtering of sediment laden waters associated with the works through appropriate erosion and sedimentation controls.

The need for a licence is considered unlikely, but would be evaluated when the safeguards and mitigation measures are finalised, as part of the preparation of the Construction Environmental Management Plan (CEMP).

4.2.5 *Roads Act 1993*

The *Roads Act, 1993* (Roads Act) provides for the ownership and management of public roads and also requires the consent of the appropriate roads authority for various works in respect of certain public roads.

Section 138 of the Roads Act requires the consent of the appropriate roads authority for various works in respect of public roads and classified roads. Under the ES Act, EnergyAustralia is exempt from obtaining approval for works involving public roads that are vested in the control of local councils. However, works that require a connection to a classified road must be approved by the RTA.



Berry Street, North Sydney, is a main road under the management of the RTA. Ward and Harnett Streets are local roads under the management of North Sydney Council. Works would involve the excavation of a cable vault within Berry Street, which would require the preparation and approval of a traffic management plan and vehicle management plan to be approved by the RTA.

4.3 Summary of Licenses, Permits and Approvals, and Notifications

A summary of approvals, licenses and permits required for the construction, maintenance and operation of the proposed works is summarised in Table 4-2.

Table 4-2 – License, Permit and Approval Summary

LEGISLATION	AUTHORITY	REQUIREMENT
<i>Electricity Supply Act 1995</i>	Local Council	40 days notice of the proposed works must be given. Written notification was provided on 13th November 2009. North Sydney Council will be notified of the new approval process.
<i>Roads Act 1993</i>	RTA	RTA must give approval for the in-road works on Berry Street that extend into Ward Street. No approval is required for works on Ward and Harnett Streets.



5 CONSULTATION

5.1 Overview

Community consultation helps establish clear channels of communication. It provides an opportunity for various parties to examine social, environmental and economic impacts of projects and work together with the aim of achieving mutually acceptable outcomes.

Community consultation defines the process that is used to seek views or provide information about projects. The term consultation can describe processes ranging from simply delivering information to residents, community information displays, or holding meetings with community representatives designed to actively seek and incorporate feedback from local communities into the project.

Consultation should span the entire project from the initial concept stage through to construction and completion. It is an overarching approach that is only complete when the project has been finalised and commissioned.

The population as a whole is more aware than ever of their social, environmental and economic needs. They want to know about what is planned for their area and how it would impact on them.

Incorporating community consultation as a key business practice is both a necessary and desirable path for EnergyAustralia to take. It must be undertaken in good faith and be transparent in all activities.

EnergyAustralia has in place a policy for community consultation on all major projects. The policy ensures that community concerns and issues are taken into consideration, so that solutions and strategies can be developed jointly with the community and factored into the project design, construction and operation.

5.2 Summary of Consultation to Date

Consultation was undertaken as part of the preparation of the earlier REF. Consultation activities that were conducted as part of this process included:

- Establishment of a free call 1800 number and email address available for people seeking more information.
- Consultation with North Sydney Council through each project phase.
- Distribution of community newsletters to notify the local community of project milestones.
- Site meeting with affected property owners and businesses in January 2010.
- A community information display evening held in November 2009.
- Consultation with relevant authorities including Sydney Water and the RTA.

A summary of submissions provided by authorities and interested stakeholders is presented in Table 5-1.

Table 5-1 – Authority and Stakeholder Submissions

RESPONDENT	ISSUE/S	RESPONSE
Castle Constructions Pty Ltd Letter dated 26/01/10	- No building setback - Overshadowing - Noise - Visual dominance - Emissions	Design Review meeting held 3/02/10 to discuss issues raised. It was determined that there are no feasible setback options considering site constraints and the required design configuration of the substation. Meeting with Castle Constructions held 4/02/10 to discuss issues. Response letter sent 09/02/10 documenting formal response to issues raised.
First Land Corp. Letter dated 27/01/10	- No building setback - Bulk and scale of building - Building façade - Extent of rock excavation - Vibration	Design Review meeting held 3/02/10 to discuss issues raised. It was determined that there are no feasible setback options considering site constraints and required design configuration of the substation. Meeting with First Land Corp held 5/02/10 to discuss issues. Response letter sent 09/02/10 documenting formal response to issues raised.
North Sydney Council Letter dated 28/01/10	- External finishes / façade - Footpath treatments - Working hours - Road works - Stormwater - Work zones - Hoardings - Night works - Carparking	Majority of issues discussed at meeting held with Council's Design Excellence Panel on 1/12/09. Recommended modifications to the façade design incorporated. Response to Traffic Management Plan received on 27/01/10 and recommended modifications to the traffic route map were made. Response letter sent 09/02/10 documenting formal response to submission.
Sydney Water	- Relocation of sewer vent - Connection to stormwater / mains water - Diversion of services	Discussions commenced November 2009 regarding site issues. Notice of requirements received December 2009. These included requirements to engage a Water Services Coordinator to manage and gain approvals for any connections, modification or diversion to Sydney Water services.
RTA	- Road works in Berry Street - Night works	No formal response to date, discussions commenced, however design of cable vault yet to be finalised.



5.3 Consultation Approach for Part 3A Approval Process

Community and stakeholder consultation will continue to be managed throughout the Part 3A approval process and during preconstruction and construction phases of the project. A communications plan for the North Sydney zone substation project has been prepared which facilitates two-way communication between communities and stakeholders and the Alliance team.

Consultation will continue with State and local government to determine potential impacts associated with the project and appropriate mitigation and management measures. Consultation will also continue with the surrounding community and targeted stakeholders such as local businesses and developers.

The purpose of this consultation is to inform the relevant parties of the project scope, proposed investigations, the approvals process and details of the public exhibition period.

Consultation with these targeted stakeholders will also seek to obtain relevant feedback with regards to potential impacts of the project and gain an understanding of their insights and areas of interest and concern, which will be considered in preparation of the Environmental Assessment.

6 PRELIMINARY ENVIRONMENTAL ASSESSMENT

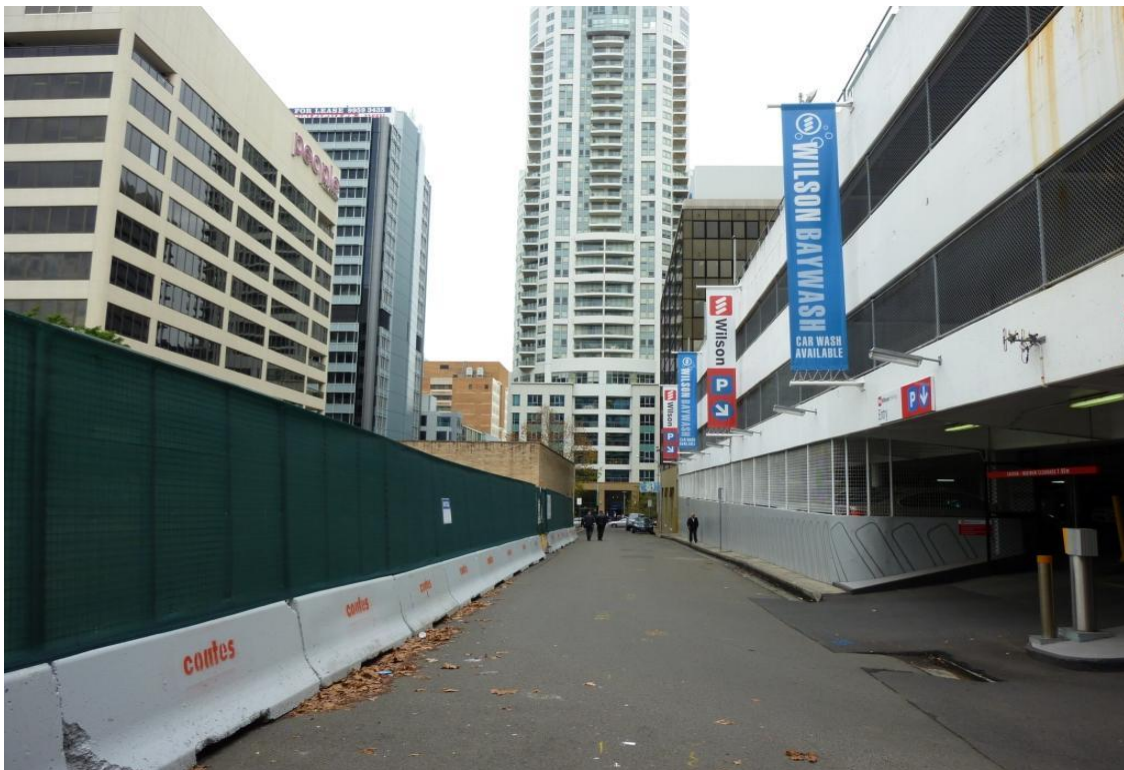
6.1 Visual Amenity

6.1.1 Existing Environment

The site of the proposed substation is located in a mixed use area of the North Sydney CBD. Surrounding land uses, include the existing North Sydney substation, a multi-level carpark, a 10-storey commercial building, residential properties and a proposed 21 storey multi-use development.

The site is located in a narrow, cul-de-sac off Berry Street and has been previously cleared of all buildings, trees and vegetation. It is situated immediately behind the existing substation and no views or scenic areas are associated with the site. Following demolition of the former dwellings in 2008, the site was fenced and stabilised with a grass cover and has since been excavated. Figure 6-1 and Figure 6-2 illustrate the western and southern boundary views of the site.

Figure 6-1 – Western Boundary of the Site



Source: AECOM, 2010

Figure 6-2 – Southern boundary (view of existing substation)



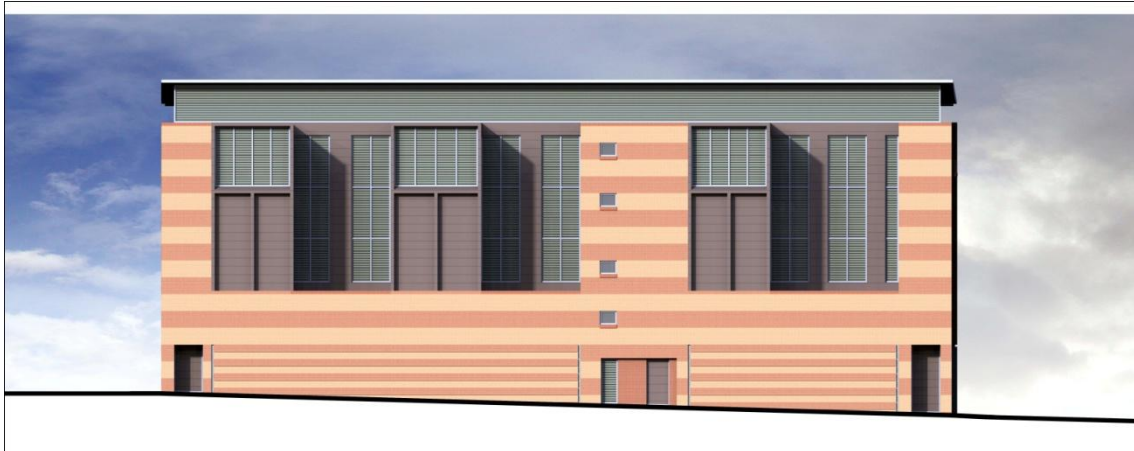
Source: Energy2U Alliance, 2009

Due to the built-up nature of the existing and proposed developments surrounding the site, the visual catchment would be relatively small. The site is bound by multi-level developments that act to restrict the visibility to and from the site.

6.1.2 Potential Impact

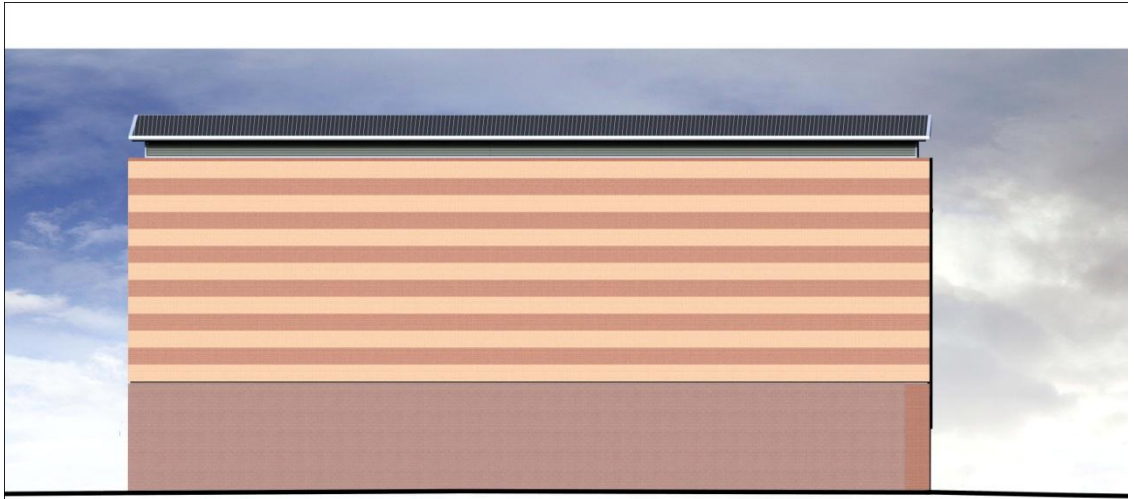
The proposed works involve the construction of an architecturally designed substation building, which would fully enclose all associated electrical equipment. The proposed building would be a long life, low maintenance weather proof structure. It would be brick-clad and feature anodized aluminium finished louvers and an oblique Colorbond roof. Figure 6-3, Figure 6-4, Figure 6-5, Figure 6-6, Figure 6-7, Figure 6-8 and Figure 6-9 display indicative models of the proposed building which will house the new substation.

Figure 6-3 – West Elevation from Ward Street



Source: Energy2U Alliance, 2010

Figure 6-4 – East Elevation, from Rear of Property Boundary



Source: Energy2U Alliance, 2010

Figure 6-5 – North Elevation, from Harnett Street



Source: Energy2U Alliance, 2010

Figure 6-6 – South Elevation, from Existing Substation Site



Source: Energy2U Alliance, 2010

Figure 6-7 – Perspective from Ward and Berry Street, Looking North Down Ward Street



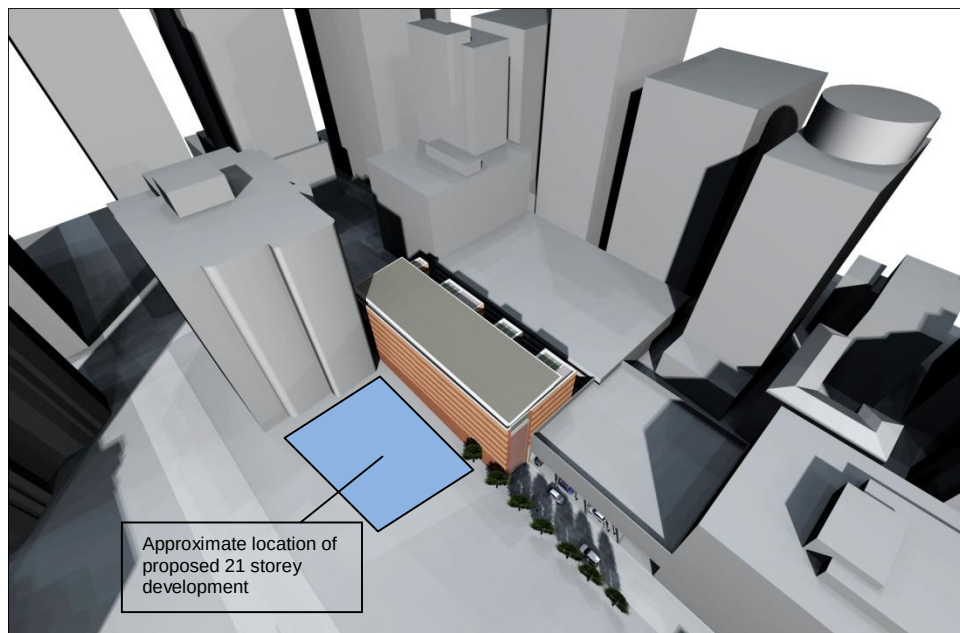
Source: Energy2U Alliance, 2010

Figure 6-8 – Perspective from Harnett Street, Looking South



Source: Energy2U Alliance, 2010

Figure 6-9 – Perspective including Surrounding Properties, Looking South



Source: Energy2U Alliance, 2010

The building, particularly the brick façade, has been designed to complement the Federation building style characteristic to the lower North Shore area and the previous dwellings which occupied the site. Masonry finishes combined with high quality louvered panels and window/opening details generally conform to similar low level developments in the area. To the casual observer or passer-by, the building effectively conceals its function.

The potential visual amenity impacts associated with the project need to be assessed in terms of the impact on the existing visual environment as well as the impact on the proposed developments surrounding the site.

The impact of a development on the existing visual environment is dependent on two key criteria:

- The amount of the project that is visible from surrounding areas i.e. visibility.
- The capacity of the surrounding area to absorb the proposed development i.e. visual absorption capacity.

Once built, the visibility of the proposed North Sydney substation from Berry Street would initially be low as it would be located at the end of Ward Street and Harnett Street which are both no through roads and behind the existing substation. Through traffic would be minimal and few pedestrians would walk these routes. The existing multi-level developments that surround the site to the south east, west and north would look down onto the new substation, however, as all the electrical installations would be fully contained within the building, the substation would not be considered visually intrusive. The building would also be substantially lower in height than the majority of the existing buildings surrounding the site. This will provide an open air space from approximately RL 94.

On completion and commissioning of the new substation, the existing North Sydney substation on Berry Street would be decommissioned and demolished. The removal of the existing substation would result in the proposed substation being visible from Berry Street. Following the demolition the site would be landscaped and fenced, pending a decision on how the property would be utilised.

Shadow drawings were modelled for the proposed development, including various scenarios throughout the year and day (June, September and December at 9am, 12noon and 3pm). These are depicted in Figure 6-10. Due to the nature of the multilevel development around the proposed site and the limited number of storeys associated with the proposed substation, the impacts of overshadowing on surrounding properties are limited.

Figure 6-10 – Shadow Drawings for the Proposed Substation



Source: Energy2U Alliance, 2010

The same criteria would be used to determine the impact of the project on any proposed developments adjacent to the site. Potential visual amenity impacts would be of particular importance for the development located at 136-140 Walker Street. Potential impacts for this development would be associated with the visual bulk of the substation building and potential overshadowing issues that this may create.

6.1.3 Methodology for Assessment

The visual impact assessment prepared for the REF will be reviewed as part of the EA. This assessment will review 3Dimensional imagery and shadow drawings to assess the accuracy and currency of the visual amenity impacts identified and the consistency of the assessment with the DGRs. The additional assessment will focus on visual bulk and overshadowing on the existing visual environment and proposed developments adjacent to the site.

6.2 Noise and Vibration

A Construction and Operational Noise and Vibration Impact Assessment was undertaken as part of the REF and has been used to inform this PEA.

6.2.1 Existing Environment

There are a number of sensitive receivers that are located within close proximity to the site. These include residential buildings and a café on Walker Street, which are located approximately 10 to 15 m from the site. Other residences are located in Berry Street approximately 100 m from the site. There is a commercial building adjacent to the site on the corner of Berry Street and Walker Street.

Given the proximity of these sensitive receivers to the site, background noise levels were monitored for a five day period adjacent to the site. Between 3rd July and 9th of July 2009 an unattended noise logger recorded ambient noise levels at the rear of 136 Walker Street, North Sydney. The logger recorded background noise levels between 51 dB(A) and 57 dB(A) during the day, 49 dB(A) and 52 dB(A) during the evening and 44 dB(A) and 46 dB(A) during the night.

Noise levels were also measured during the night on 14th July at three locations within close proximity to the site. Location A was located 28 m from the end of Ward Street, towards Berry Street and was measured at 2:08am. At this location noise from plant and equipment originating behind the Wilson carpark was clearly audible and trucks and traffic from Berry Street could also be heard. Noise levels between 45 dB(A) and 48 dB(A) were measured. Location B, located at the entrance to the Wilson carpark, was measured at 2:20am. At this location the plant and equipment was shielded by the carpark but distant traffic and a garbage truck idling in Berry Street were audible. Noise levels of approximately 44 dB(A) were measured. Location C was located at the end of Harnett Street adjacent to the northern end of the site. The location was measured at 2:36am and the dominant noises were plant and equipment originating from the People Telecom building (76 Berry Street) and distant traffic. Noise levels between 42 dB(A) and 44 dB(A) were measured at this location.

6.2.2 Potential Impacts

As part of the noise and vibration assessment undertaken, for the REF, project specific criteria were determined for both the construction and operation phases of the substation development based on the background noise monitoring results.

The assessment of the construction and operational noise impacts and vibration impacts was undertaken in accordance with DECCW guidelines.

During Construction

Construction work would include earthworks, concrete pouring, building erection, building demolition and installation of mechanical and electrical equipment including cables. The construction noise goals were determined using the DECCW NSW Interim Construction Noise Guidelines and are presented in Table 6-1.

Table 6-1 – Construction Noise Goals

LOCATION / LEVEL	NOISE LEVELS – dB(A)		
	Day	Evening	Night
RBL/ Log Average	54	51	46
Residential management level LAeq (15 min)	64	56	51
Office management level LAeq	60 (internal) 70 (external)		
Café / Restaurant	55 (internal) 65 (external)		

Construction noise goals would need to be reviewed during the environmental assessment, particularly with regards to the café / restaurant level. It is anticipated that the internal noise level at the café adjacent to the site would be greater than 55 dB(A) even when there is no construction work occurring in the immediate vicinity.

The construction phase would be relatively short term in comparison with the life of the development. Experience on similar projects has shown that occasional exceedences of the above criteria for specific well defined activities are generally acceptable to the community during normal business hours. Exceedences are also likely to occur during night works required on Berry and Ward Street. These night works would be restricted and the program of activity would be scheduled to minimise impacts as much as possible.

During Operation

The noise emission goals during operation of the proposed substation considered the DECCW Industrial Noise Policy (2000). This policy set out two criteria that are used to assess potential off-site noise levels. The first aims to control intrusive short-term noise levels for residences (intrusive criterion), while the second aims to maintain the long term amenity of particular land uses (amenity criterion). The more conservative of the two limits are established as project specific operational noise goals. Details are presented in Table 6-2 below, based on the background noise measurements.

Table 6-2 – Operational Noise Goals

PERIOD	INTRUSIVENESS CRITERIA LAeq (15min) dBA	DECCW ACCEPTABLE AMENITY CRITERIA LAeq (15 min) dBA*	PROJECT SPECIFIC NOISE CRITERIA LAeq (15 min) dBA
Day	59	60	57
Evening	56	50	45
Night	51	45	41

* Under the INP, the monitoring locations would be classified as "Urban"

The substation is proposed to operate on a 24-hour per day, seven days a week basis, operating with three 132/11 kV 50 MVA transformers (consisting of two operational transformers and one stand-by transformer, n – 1 contingency). Of the equipment to be installed at the site, the transformers and proposed capacitor banks are expected to be the only significant noise sources.

The nearest residences are likely to be those within the proposed 21 storey multi-use (residential and commercial) development to the east of the site. Due to the tonality penalty that applies to the development, the equivalent noise level would be 41 dB(A) at peak load times. As detailed in Table 6-2, this level would comply with the project specific night time criteria. In addition, it would be expected that during these periods, the two operational transformers would not be running at 100% capacity.

6.2.3 Methodology for Assessment

The Construction and Operational Noise and Vibration Impact Assessment prepared for the REF will be utilised for the purposes of the Environmental Assessment. The methodology going forward will be to review this existing report for currency and consistency with DGRs and all relevant guidelines. These guidelines include DECCW's *Interim Construction Noise Guidelines* (ICNG), DECCW's *Assessing Vibration: a technical guideline* and DECCW's *Industrial Noise Policy* (INP).



The levels set out in these guidelines will be used to assess the impact of construction noise and any additional assessment required. The review will ensure that all construction and operational noise goals that had previously been established are reasonable and feasible. Noise control and mitigation measures will be revised and updated if necessary.

6.3 Electric and Magnetic Fields

An Electric and Magnetic Fields (EMF) Assessment was carried out as part of the previous REF and has been used to inform this PEA.

6.3.1 Existing Environment

EMF is a natural part of the environment and occurs as the static magnetic field of the earth's magnetic core and varying electric fields during thunderstorms. EMF is also a part of all equipment supplying or using electricity, including household appliances, electrical wiring and distribution and transmission lines.

Existing levels of EMF would be present at the site, given the existence of the current North Sydney zone substation and will be quantified as part of the environmental assessment.

6.3.2 Potential Impacts

The issue of EMF and health effects has been extensively reviewed over the past 30 years by Australian and international inquiries and expert panels established for the purpose of trying to determine whether or not human exposure to EMF is related to adverse health effects. Consistently, a basis for the scientific community to conclude that EMF causes cancer or any other disease has not been found. While the balance of evidence is against there being a risk, the possibility cannot be ruled out.

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

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

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

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

As assessed within the EMF Report prepared by AECOM (2009), various scenarios were modelled to determine the worse case EMF exposure levels at locations around the perimeter of the proposed substation. These locations were classified according to usage type, and included:

- Residential properties along the north – eastern property boundary of the substation.
- Office building along south – eastern property boundary.
- Possible future café-type location at existing substation location on southern boundary.
- Carparking along western and northern boundaries.
- Public footpath along the western and northern perimeter of the substation.

The calculated EMF levels for the identified exposure locations are summarised below in Table 6-3. Several assumptions and approximations were required to model the EMF levels at these locations during operation of the new substation. In addition, several supply conditions were considered, such as normal, contingency and staging current levels.

Table 6-3 – Summary of EMF Levels around Proposed Substation

LOCATION	MAX. CALCULATED (mG)	COMPLIANT	LOCATION
Multi-use development	40	Yes	Multi-use development
Office building	24	Yes	Office building
Existing substation	25	Yes	Existing substation
Carpark	26	Yes	Carpark
Footpath	261	Yes	Footpath

The largest source of EMF at the various property boundaries were determined to be the 11 kV cable terminations in the transformer room and the 12 x 11 kV cables connecting the transformer outputs to the 11 kV switchgear.

The substation will operate well within national and international guideline limits.

6.3.3 Methodology for Assessment

The existing EMF Report would be reviewed for currency and consistency with the DGRs and to ensure that the impact of EMF on the proposed 21 storey multi-use development is assessed. The assessment and management of EMF through the Part 3A approval process will be consistent with the exposure management strategy proposed in the REF. This consists of:

- A preliminary impact assessment to determine the maximum extent to which the public will be exposed to magnetic fields produced by the substation.
- Measurements of the ambient fields from the existing and new zone substation to determine if there are any changes in field levels in the area.
- The definition of “low cost” or “no cost” design measures that can be implemented to mitigate EMF exposure.

The assessment and management strategy will be reviewed by an independent expert and expanded or updated where necessary. Design management measures will be assessed to ensure all appropriate mitigation is implemented.

The assessment and management measures will be consistent with EnergyAustralia's position on EMF which is:

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



6.4 Traffic and Access

6.4.1 Existing Environment

Berry Street links the Pacific Highway to the Warringah Freeway, the Sydney Harbour Bridge (Bradfield Highway) and the Sydney Harbour Tunnel. It is therefore one of the main road thoroughfares between suburbs in Sydney's lower north shore and the CBD. Berry Street is a four lane, one-way road which has a speed limit of 40 km/h due to high pedestrian activity. Berry Street is classified as a state road, meaning that RTA has been delegated control, maintenance and management responsibility over it.

Ward Street (accessed from Berry Street) and Harnett Street (accessed from McLaren Street) are both short, two-way, and relatively narrow cul-de-sacs. Ward Street provides access to the Wilson carpark at 201 Miller Street, along with residential and commercial properties. Both Ward and Harnett Streets are classified as local roads, which are under the care, control and management of North Sydney Council.

North Sydney itself is a residential and commercial hub with high density residential and commercial office buildings. There are approximately 51,000 workers and 62,000 residents in the North Sydney region who travel in to, out of and around the area per day.

The most recent traffic data that is available from the RTA was collected in 2005. This data shows that the Annual Average Daily Traffic (AADT) was 16,517 vehicles per day at the intersection of Berry Street and Miller Street (RTA, 2005). Peak morning traffic movements on the road occur between 7.30am and 9.30am with the afternoon peak volume occurring between 3pm and 6pm. Any impacts to the road network in the region are quickly amplified with the high volumes of traffic which utilise the road network daily.

6.4.2 Potential Impacts

A portion of the road corridor at the intersection of Berry Street and Ward Street would need to be excavated for the construction of the cable vault. It is expected that a 20 m by 13 m excavation would be required for this construction. This would equate to the closure of two lanes in Berry Street and one lane in Ward Street. Due to the high traffic volumes that utilise Berry Street and the potentially significant delays that this work would cause if undertaken during peak periods, night works would be necessary for this aspect of the work.

The road works would be carried out in accordance with RTA requirements, including limiting road occupancy to specific hours and days. Various plans and documents would be prepared and submitted to the RTA including a Road Occupancy Licence, Traffic Management Plan (TMP), and the relevant Traffic Control Plans (TCPs) for specific traffic control measures.

The Energy2U Alliance would employ all measures to ensure that construction would not compromise road capacity or disturb traffic flows. Access to Ward Street would be maintained during day times and access during night works would be by negotiation with Wilson Carpark. Specific mitigation measures would be included within the relevant traffic plans and would include a team of licensed traffic controllers directing and controlling traffic movements, where required. Skid resistant road plates would be placed over the cable vault outside of the permitted working hours to enable traffic to flow unimpeded.



Heavy and light vehicles would need to access the area to transport materials, equipment and people to and from the site. During peak construction, the workforce on-site would be a maximum of 60 workers per day. Therefore, the estimated traffic generated would equate to a maximum of 100-120 work trips per day plus an average of 80 delivery vehicle trips per week. However, given the proximity of the site to both rail and bus transport and the general lack of affordable parking, the majority of the site labour force would use public transport to get to and from the site which would greatly reduce the number of vehicles generated daily. Therefore there may be a small impact on local traffic flow due to higher traffic flow from increased light and heavy delivery vehicles, particularly if these vehicles and trucks were to access the site during morning and afternoon peak periods.

Construction vehicles would enter the site via either Ward Street or Harnett Street. Localised disruptions to traffic on Harnett Street or Ward Street may occur during the construction period as traffic may need to be stopped for short periods of time in order to allow trucks to gain access to the site.

Residents, public authorities and commercial organisations would be notified via a letter box drop of upcoming works, including any road works. Any inconvenience to pedestrians and road users during construction would be minimised by ensuring that there is an alternative route where it is possible and safe to do so.

Once the substation is operational, EnergyAustralia technicians and contractors would access the site when required for maintenance and servicing purposes. During operation, access to the substation would be via a locked roller door accessed from Harnett Street, leading to the concrete transformer roadway on Level 2 of the substation building. No regular deliveries would be expected, however access for maintenance vehicles would be required.

6.4.3 Methodology for Assessment

The traffic assessment presented in the REF will be assessed for currency and consistency with the DGRs. The assessment will be reviewed and updated where necessary to ensure that the number of vehicle movements expected to be generated during the construction of the project has been assessed against the likelihood of the local road network to accommodate these additional movements.

The assessment will consider the length and time of day that traffic on Berry and Ward Street would be disrupted. It will provide details on lane closures and any potential mitigation or traffic management throughout this period. This will include assessing the need for night time work to ensure that work is conducted outside of peak periods.

A draft Traffic Management Plan has been prepared and would be implemented during the construction phase to mitigate the impacts of the project. This would ensure appropriate management of road closures and would minimise the level of disruption to traffic flow, particularly during the morning and afternoon peak periods.

6.5 Air Quality

6.5.1 Existing Environment

Air quality in the vicinity of the site is largely influenced by urban pollution associated with its close proximity to the Sydney and North Sydney CBDs. The main source of air pollution within the local area would be related to vehicle emissions, which are major contributors to photochemical smog and particle pollution. Traffic volumes around the North Sydney area are very high, particularly in the morning and afternoon peak periods, due to the proximity of the Warringah Freeway, the Pacific Highway and other major road corridors.



These adverse air quality impacts would be offset to some degree by the coastal breezes which would filter through Sydney Harbour and the North Sydney area, dispersing and moving pollutants away from the region.

Around the proposed site, there are numerous receivers, including occupants of both residential and commercial properties. However, residential receivers would generally be considered more sensitive. The closest residential receivers to the site include those along the eastern boundary of the site, various properties within Harnett Street and a multi-storey residential complex opposite the entry into Ward Street (fronting Berry Street).

6.5.2 Potential Impacts

Air quality concerns during the construction phase of the proposed development include fugitive dust and construction equipment exhaust emissions. Given that the excavation work has already been completed and the site is devoid of soil, dust emissions during construction are likely to be limited. There would be minor amounts of dust generated from the disturbance of soil for a limited period while the existing substation is demolished.

There would be minimal exhaust emissions from vehicles during the construction phase. Exhaust emissions from construction equipment would likely include nitrogen oxides (NO_x), carbon monoxide (CO), sulphur oxides (SO₂), hydrocarbons and total suspended particulates. All vehicles would be fitted with approved exhaust systems to maintain vehicle exhaust emissions within accepted standards.

Stockpiling at the site would be limited given that the excavation has already been completed. However, during the construction of the cable vault, any stockpiled material would be transported from the site immediately and disposed at an appropriately licensed facility. Any impacts on the air quality would be short term and localised. It is unlikely that the construction works would result in an odour impact.

Once in operation, the substation would have negligible impacts on air quality. Minimal numbers of personnel would be required to attend the site, thus limiting associated vehicle emissions. Every EnergyAustralia substation is subject to regular maintenance and monitoring to ensure site equipment is operating effectively. All vehicle access points would be sealed surfaces, thereby limiting the potential for dust generation.

6.5.3 Methodology for Assessment

A CEMP for the site was prepared prior to excavation. The CEMP contained methods to reduce air quality impacts during the excavation of the site. These methods will be incorporated into the Environmental Assessment and would continue to be implemented during the remainder of the construction of the project.

6.6 Sustainability and Climate Change

6.6.1 Existing Environment

Electricity plays a significant role in the human environment, by enhancing our productivity, comfort, safety, health and economy. As a community we live with the benefits of electricity every day. It has been identified that the existing human environment within the North Sydney area, as well as other regions of the Lower North Shore area, requires maintenance of the quality and reliability of electricity supply to support the community's needs and expectations.



The North Sydney zone substation redevelopment is a project to which Part 3A of the EP&A Act applies due to its regional environmental planning significance. Without upgrading the existing electricity supply infrastructure in the area, there is an increased risk of regional electricity supply interruptions over time, resulting in more frequent interruptions, affecting more people. This would prove to be disruptive to commercial enterprises and to residences throughout the area. If nothing is done, then the existing infrastructure would be likely to limit the commercial growth potential of the region.

There are currently a number of greenhouse gas (GHG) emitting activities that exist within the North Sydney area. North Sydney is a highly trafficked area and is a commercial hub, therefore GHG emitting activities are likely to include vehicular movements, the existing North Sydney zone substation and electricity use of commercial enterprises.

6.6.2 *Potential Impacts*

Potential sustainability and climate change impacts need to be assessed from two perspectives. Firstly the impact of the project on climate change and secondly the impact of climatic changes on the project's infrastructure.

The project's impact on climate change is generally associated with the level of GHG emissions and resource use. GHG emissions are considered based on three "scopes" – scope one (direct emissions), scope two (indirect emissions from the consumption of purchased energy) and scope three (other indirect emissions). In general, the different scopes can be defined, in accordance with the GHG Protocol (WRI and WBCSD, 2004) and ISO 14064-1: Greenhouse Gases Part 1 as:

Scope 1 Emissions

Scope 1 emissions are greenhouse gas emissions produced from sources within the boundary of the project and as a result of that project's activities.

Scope 1 emissions arising from the construction and operation of the new North Sydney substation include those from vehicles and machinery used for materials delivery and handling, waste transport and general construction activities. The major contributor would be the consumption of fuel by transport vehicles.

The 132 kV switchroom would house GIS technology which utilises SF₆, a known greenhouse gas. The quantitative contribution of SF₆ to global warming is below 0.1% with respect to the other man-made greenhouse gases (O'Connell, P. et al, 2000).

There is the potential for unintentional discharge of SF₆ from the GIS. The total amount of SF₆ within the substation would be approximately 664 kg, however the largest compartment would contain approximately 59 kg. If losses were to occur it is likely that they would occur from one compartment only and not all 664 kg would be lost. Gas density meters would be installed on each compartment to detect any drop in pressure. They would send an alarm once the pressure drops below a preset level which would allow action to be taken to rectify the leak.

Installation of the gas density meters and handling of SF₆ in accordance with appropriate guidelines would ensure that losses of SF₆ to the atmosphere are minimised and that there is no impact upon atmospheric greenhouse gas concentrations.

Scope 2 Emissions

Scope 2 emissions are greenhouse gas emissions generated from the production of electricity, heat or steam that a project consumes, but which is physically produced by another facility.



Scope 2 emissions would arise primarily from the consumption of electricity through network losses when the substation is in operation. Electrical losses are an inevitable consequence of the transmission of electricity through the transmission and distribution network, and the energy consumed in these losses must be generated by power stations. This energy is sourced from the Australian electricity market, which is primarily supplied from coal-fired power stations that emit greenhouse gases.

The construction of the new North Sydney zone substation would see the area's existing 33 kV electricity network supplied by a new 132 kV 'supply' in lieu of the 33 kV 'feeders'. The new 'supply' would see the use of higher voltage conductors which would avoid the transformation losses at Willoughby STS. This design is inherently more efficient in transporting electricity than the existing system that relies on multiple circuits of long runs of smaller cross section lower voltage cables than the existing 33 kV system.

The construction of this substation would therefore result in a reduction in the resistance of the electricity network in the area. As a consequence, by reducing system losses, it is expected that in turn there would be a proportionate reduction of greenhouse gas emissions (CO₂) each year.

Scope 3 Emissions

Scope 3 emissions are greenhouse gas emissions generated in the wider economy that are related to a project, which are physically produced by another facility.

The main source of scope 3 emissions related to this project arises from the emissions of greenhouse gases by power stations supplying in the National Electricity Market (which are currently predominantly coal fired) that supply the electricity retailers who sell power to customers in the area supplied by this substation.

While the project in itself would not lead to any direct incentive for users to consume more power, if demand for electricity in the area did rise, this may lead to increases in greenhouse gas emissions, depending on the sources of that electricity.

Since 2003, all electricity retailers in NSW have been governed by licence conditions that require them to reduce greenhouse emissions arising from the energy they sell in NSW. This "Greenhouse Gas Abatement Scheme" is a compulsory legal framework under the ES Act that requires the retailers to take actions to reduce emissions through a range of measures in order to meet a benchmark level set by the NSW government. The benchmark currently applicable is 5% below the Kyoto baseline year of 1990, on a per capita basis. Details of the scheme are available from www.greenhousegas.nsw.gov.au.

All electricity retailers who would utilise the substation to transport electricity to customers are bound by this regulatory framework. The framework provides a robust, market based means to manage scope 3 emissions to the level determined to be appropriate by the NSW government.

It should be noted that any effort to reduce emissions from electricity usage supplied by NSW electricity retailers outside this framework would be accompanied by a reduced requirement on the retailers themselves, and no net reduction would result.

6.6.3 Methodology for Assessment

The assessment of sustainability and climate change impacts presented in the REF will be reviewed for currency and consistency with the DGRs. The climate change and sustainability assessment in the Environmental Assessment will include an inventory of GHG emissions and an analysis of the impact of potential changes to climatic conditions on the infrastructure built through the project.



6.7 Geology and Soils

6.7.1 Existing Environment

The regional geology of the North Sydney area, as interpreted from the geological series map of Sydney (1:100,000 Sheet 9130, 1983), is shown to be underlain by the Middle Triassic age Hawkesbury Sandstone, a medium to coarse grained quartz sandstone with very minor shale and laminate lenses, associated with a braided alluvial channel depositional environment. The Hawkesbury sandstone is likely to be overlain by developed terrains and eroded soils of the GyMEA group, characterised by undulating to rolling rises and low hills of shallow to moderately deep sands and shale lenses with local relief of 20 to 80 m and slopes between 10 to 25%. Limitations of these landscapes are potentially high erosion hazards associated with very low soil fertility.

The site of the proposed substation has currently been excavated to sandstone. No topsoil exists on this portion of the site. Minimal excavation will be required following the demolition of the existing substation and once the site has been re-established.

A review of the North Sydney LGA Acid Sulphate Soil Planning Map (Map 3) indicated that the site is not located in an area of known Acid Sulphate Soils (ASS) risk.

6.7.2 Potential Impacts

The majority of the site has been excavated to an approximate depth of RL 60. Due to the existing slope of the site, this equates to a depth of approximately nine metres below the Ward Street frontage and four and a half metres below the Harnett Street frontage.

The substation building basement slab would consist of concrete founded over sandstone with wall and column footings founded on sandstone.

Given that the excavation of the site has already been completed, potential geotechnical impacts are expected to be limited. Potential impacts arising from the remaining construction works would be associated with the disturbance of soils during the construction of the cable vault and the existing substation demolition works, including:

- Accidental spillages of chemicals/fuel by construction plant and equipment which may leach into underlying groundwater or 'wash-out' into the stormwater system.
- The potential for aeolian (wind) erosion to occur from unsecured stockpiles or soil mounds created during the earthworks or importation of fill material for the cable vault.
- The potential for contaminated soil to be present under the existing substation site.

6.7.3 Methodology for Assessment

An Erosion and Sediment Control Plan was prepared as part of the CEMP prior to the excavation of the site. This Plan enabled the management of soil and geotechnical impacts during the excavation process. These methods will be incorporated into the Environmental Assessment and would continue to be followed during the remainder of the construction of the project.

6.8 Contamination

6.8.1 Existing Environment

Various investigations and assessments were undertaken to assess issues of possible contamination when EnergyAustralia purchased and subsequently demolished the former dwellings on the site of the proposed new substation.



These investigations were undertaken as part of an earlier Development Application by the previous owner and included Stage 1 Preliminary Site Assessment (Coffey 2007), Geotechnical Investigation associated with Existing Retaining Wall (URS 2007), Hazardous Materials Register (Coffey, 2007) and a Sampling, Analysis and Waste Classification Report (Golder Associates 2008).

These investigations revealed various existing and potential minor contamination sources, including a layer of suspect fill over the site at depths ranging between 0.2 to 1.2 m and asbestos and lead contamination within the buildings scheduled for demolition. Soil on the site was also tested and the site was remediated. Demolition and excavation works have already taken place in this portion of the site, therefore, these potential contamination sources no longer exist on the site.

Contamination sources at the site in its current state may be uncovered within the existing Berry Street substation during the decommissioning and demolition works. These risks were assessed in the Building Assessment Report (AECOM, 2009) and the Hazardous Materials Survey Report (AECOM, 2009).

The Building Assessment Report included a Stage 1 Environmental Site Assessment (ESA) and a detailed site inspection. These revealed:

- The proposed site is located approximately 700 m south west of the listed former gasworks located in High Street North Sydney (DECCW Contamination Register). However, the former gasworks site is down hydraulic gradient from existing substation and it would be considered unlikely to have caused contamination onsite
- Oily surface staining was visible beneath the five transformers, both within the gravel pits and on the surrounding concrete. However, no volatile hydrocarbon emissions were detected using a handheld photo ionisation detector.
- Minor tar staining was observed in the cabling room adjacent to the cable joint boxes. This tar was determined to comprise of Emoleum EM2H Joint Box Compound. No volatile hydrocarbon emissions were detected using a handheld photo ionisation detector.

Issues with respect to hazardous materials located within the existing substation site were addressed in the Hazardous Materials Survey Report. This report was limited to visual and non-destructive investigations and indicated that the site may contain asbestos, Polychlorinated Biphenyl (PCBs) and lead based paint hazards. The main potential sources included:

- Asbestos: cable troughing, fire door, electrical equipment (e.g. backing board insulation) and a cable pit.
- PCBs: potentially contaminated oil spilt from the existing transformers prior to PCBs being phased out.
- Lead-based paint: various painted surfaces, including conduits, doors, walls and door frames.

6.8.2 *Potential Impacts*

During the excavation works for the proposed substation, excess soil and rock was stockpiled for laboratory testing and waste classification prior to removing the material offsite to a licensed waste facility. In addition, as the excavation works approached the basement floor slab level, the excavated foundation was thoroughly inspected to verify that the rock surface was clean of any contaminants.



Within the existing substation, the observed oil staining around the transformers would have presumably resulted from the leakage of transformer oils, which may have historically been contaminated with PCBs. None of the five transformers contained scheduled PCBs. While these transformers are banded, any historical spills may pose a risk to soil and groundwater quality, of both on-site and off-site environments, particularly as the highly permeable soils characteristic of the site facilitate the migration of contaminants. In addition, more extensive contamination associated with the seepage of transformer oils over time may exist in collection pits below the transformers. This potential risk should be further considered prior to undertaking any demolition and excavation within these potentially affected areas.

Prior to any demolition works being undertaken, any works within the existing substation would require thorough planning to ensure all OHS requirements are met with regard to the handling of asbestos, PCBs and lead-based paint. This would ensure any hazard specific safety requirements are fully implemented. For asbestos management, this would include ensuring potential asbestos debris is removed only by licensed asbestos removal contractors, any airborne monitoring is undertaken and the appropriate documentation and records are retained.

Following the demolition of the existing substation building, soil testing would be undertaken to ensure no residual soil contamination remained and the site was suitable for future residential and/or commercial usage. Any excavated and/or contaminated spoil would be classified prior to its removal offsite to an appropriately licensed waste facility.

6.8.3 Methodology for Assessment

Given that the excavation of the new substation site has already been completed, further contamination assessment in this portion of the site would not be undertaken.

The contamination assessment of the existing substation site prepared for the REF would be reviewed for currency and consistency with the DGRs. If necessary, the assessment and mitigation measures would be updated.

6.9 Hazardous Materials

A Hazardous Material Survey Report and a Building Assessment Report were prepared as part of the REF in order to determine the potential hazardous materials located inside the existing North Sydney zone substation on Berry Street. These reports have been used to inform this PEA.

6.9.1 Existing Environment

A review of historical aerial photographs has shown that the existing substation site was most likely used for commercial and/or industrial purposes between 1933 and 1964. From 1964 onward the site operated as an electricity substation.

The current existing substation site contains a primary building located on the western boundary of the site, four transformers adjacent to the eastern boundary of the site and one transformer in the north-west corner of the site. Vehicular access is via a driveway through the middle of the site.

6.9.2 Potential Impacts

Potential hazardous materials relating to past or present land uses that may be present on site, include:

- Asbestos-containing materials (ACM),
- Synthetic mineral fibre (SMF),
- Polychlorinated biphenyls (PCB), and

- 
- Lead based paint.

Typical items or activities that potentially contain hazardous materials include:

- Asbestos cement cable troughs,
- Fire doors with presumed asbestos insulation core material,
- Electrical equipment presumed to contain ACM,
- Oil spillages which potentially contain PCBs.

Inappropriate demolition, storage and removal of potentially hazardous materials may lead to ground-borne and water-borne contaminants entering the environment. Without appropriate implementation of risk management measures there would a high potential for health impacts to humans and ecosystems.

6.9.3 Methodology for Assessment

The stage 1 Environmental Site Assessment (ESA) and Hazardous Materials Survey that have been conducted for the REF would be assessed for their currency and consistency with the DGRs.

The Stage 1 ESA will provide a description of the historical and current land use of the site and the location and nature of potential areas of environmental concern.

The Hazardous Materials Survey is a required prior to any demolition taking place to meet obligations under the *NSW Occupational Health and Safety Regulation 2001*. It will require a site inspection provide provision for an asbestos and hazardous construction materials survey report for the demolition site.

6.10 Water Quality and Hydrology

6.10.1 Existing Environment

The suburb of North Sydney lies adjacent to Sydney Harbour and is located within the Middle Harbour catchment area. Given the highly urbanised nature of the North Sydney CBD, surface runoff in the vicinity of the site would be collected via conventional reticulated drainage (i.e. stormwater drains) and discharged to local waterways, including Sydney Harbour.

North Sydney Council maintain six water quality collection and monitoring points, however there is no monitoring point located between the site and where runoff from the site is likely to discharge to Sydney Harbour (North Sydney Council, 2010).

The proposed substation site is located in an area that is not designated as flood prone land.

Based on the geology of the area, regional groundwater would likely be present within the sandstone bedrock. Water perched at the interface between the residual soils and the bedrock could also be present. Based on the nearest surface water body of Lavender Bay and the topography of the site, groundwater would be expected to flow in a southern direction. However, groundwater flow directions within highly modified environments can be complex and may not necessarily flow towards the closest or most obvious water body.

Geotechnical investigations undertaken by AECOM in 2009 showed that no groundwater or seepage was encountered in any boreholes to depths of between 12 m and 18 m below surface.



6.10.2 *Potential Impacts*

The greatest risk to surface and groundwater quality would have occurred during the excavation of the site, however there is still potential that the construction of the new substation, construction of the cable vault and associated cable duct lines and demolition of the existing substation would impact on water quality. Potential impacts may include:

- Discharge of sediment laden runoff into stormwater system and subsequently to local waterways.
- Discharge of contaminant laden runoff during construction of the cable vault and demolition of the existing substation.
- Discharge of contaminant laden runoff from accidental spillage of chemicals and fuels from the operation and maintenance of construction plant and equipment.
- Alteration of existing surface and groundwater flows.

6.10.3 *Methodology for Assessment*

The water quality assessment presented in the REF would be reviewed for currency and consistency with the DGRs. This assessment would be updated where necessary such that the methodology to assess impacts on water quality during construction, demolition and operation of the project would include:

- A description of the local and regional surface water and groundwater regime in the vicinity of the site.
- Collation and analysis of any existing water quality data for the local region.
- An assessment of likely impacts, including the potential for sediment and contaminant laden runoff.
- Identification of appropriate management and mitigation measures.

A Soil and Water Management Plan (SWMP) was prepared as part of CEMP prior to the excavation. This plan enabled the management of stormwater and water quality during the excavation process. These methods will be incorporated into the Environmental Assessment and would continue to be followed during the remainder of the construction of the project.

6.11 **Socio-economic**

6.11.1 *Existing Environment*

Given the age of the existing North Sydney zone substation, EnergyAustralia has a responsibility to carry out work to ensure a continued safe and reliable supply of electricity to residential properties and commercial facilities within the local region.

6.11.2 *Potential Impacts*

Typical concerns raised by the community about new electrical infrastructure include EMF, visual impact, noise and public safety issues. These issues have been individually addressed in Section 5 of this PEA.

Potential social impacts may include the lifestyle and amenity issues associated with overshadowing from the new substation on a small number of apartments of the proposed development at 136-140 Walker Street. Overshadowing is likely to lead to decreased solar access for certain residents occupying apartments on the western side of this proposed development.



The project is unlikely to have any significant adverse impact on the local community or result in social inequity, particularly to the disadvantaged. The project would not result in any change to the surrounding land usages. Interaction between construction of the proposed development and the community would be managed with the use of fencing, signage and proactive community engagement strategies.

6.11.3 Methodology for Assessment

An assessment will be undertaken to determine social impact associated with issues such as overshadowing, solar access, visual amenity, EMF, noise and vibration and public safety.

Community consultation will continue throughout the environmental assessment process to identify any additional socio-economic issues that should be considered. This will also ensure that the Energy2U Alliance is aware of any potential concerns held by the community or other stakeholders and that these can be addressed accordingly.

6.12 Land Use

6.12.1 Existing Environment

The site for the proposed new substation comprises Lots 1, 1A, 2, 2A, 4, 4A and 5 in DP 24474, Lot 1 in DP 5933976 and Lot 5A in DP 225770 and was previously occupied by three residential dwellings, which were acquired and demolished by EnergyAustralia in 2008 in preparation for the substation redevelopment works. The site has remained vacant since this time although excavation for the new substation has taken place. The site is positioned directly behind the existing North Sydney zone substation, which fronts Berry Street and is zoned Special Uses – Substation.

Other surrounding LEP zones, are predominately Mixed Use and Commercial, with the exception of the deferred area, located at 79-81 Berry St (situated opposite the existing substation site), which is subject to the provisions of the largely repealed North Sydney LEP.

6.12.2 Potential Impacts

The proposed development would result in the change of land use from a vacant block, zoned as Mixed Use, to electrical utility services with the construction of a new substation. However, this would not be a major change, considering the proximity of the existing substation on adjacent land.

The substation would not form a community barrier or limit access to existing properties. Positive aspects of the development to the local community include maintenance of the current quality of the electrical supply and a slight increase in capacity for current and future development, the provision of a more reliable power supply, and the development of an architecturally designed substation building, which would be aesthetically superior to the existing Berry Street substation.

The new substation building would generally mask its function, as all electrical equipment would be fully enclosed inside the building.

The locality contains adequate utilities and services for the proposed development. Ambient noise levels are suitable for the development and the site is not considered critical to the water cycle of the catchment area. The proposed development would not result in increased site subjectivity to natural hazards such as flooding, subsidence or bushfires.

6.12.3 Methodology for Assessment

The Environmental Assessment will assess the appropriateness of the proposed land use given the current zoning of the site, the existing land uses adjacent to the site and any proposed land uses adjacent to the site.



6.13 Waste Management

6.13.1 Existing Environment

The Waste Reduction and Purchasing Policy (WRAPP) is a NSW government initiative to which EnergyAustralia and its contractors must adhere. The aim of the policy is to encourage waste reduction, reuse and recycling and the purchase of products with recycled content.

The Energy2U Alliance is required to comply with EnergyAustralia's WRAPP, which requires that where practicable, all attempts must be made to minimise, reuse and recycle building waste. In particular, each of the following issues must be addressed, and the methods for complying with these requirements described:

- Avoiding the generation of waste.
- Separation of generated wastes for re-use or recycling.
- Purchase of low-waste products and products with recycled content, wherever these are technically suitable and cost and performance competitive.
- Selling and reusing excess construction material, where practicable and cost-effective.
- Keeping excavation activities and disturbance of the existing environment to a minimum to avoid the generation of waste.

6.13.2 Potential Impacts

During construction of the new North Sydney zone substation, a range of waste streams would be generated, including:

- General building waste and off-cuts, such as asphalt, cable, timber, paving, roof sheeting, tiles and brickwork.
- Excess concrete.
- General waste e.g. food scraps, packaging, etc.

All non-recyclable or reusable waste would be disposed of off-site at an appropriately licensed waste disposal and/or reuse facility.

Waste would also be generated during the demolition of the existing North Sydney zone substation. There is a high potential that hazardous materials such as asbestos would need to be disposed during this process.

Waste streams created during the operation of the project are expected to be minimal.

6.13.3 Methodology for Assessment

The Environmental Assessment will classify all waste streams likely to be generated during the construction and operation of the new substation and demolition of the existing substation. All waste streams, including potentially hazardous waste materials, would be classified, separated where possible, and disposed in accordance with the NSW Department of Environment, Climate Change and Water's (DECCW) Waste Classification Guidelines (April, 2008).



6.14 Heritage

6.14.1 Existing Environment

Cultural Heritage

Prior to the excavation, there were three houses located on the site of the proposed new substation. An assessment of historic maps showed that the houses were likely to have been built in the early 1900's, prior to 1915. Before the houses were demolished in 2008, a heritage investigation was undertaken. The houses were not exceptional or rare examples of their era. During the demolition process, individual architectural federation features, including windows, doors and fireplaces were salvaged for reuse.

An initial search of the North Sydney Local Environmental Plan 2001 (North Sydney LEP) and the NSW State Heritage Registry showed that there are no items of local or state significance within the immediate vicinity of the site. There are however a number of listed items within the broader North Sydney area.

Aboriginal Heritage

An Aboriginal Heritage Information Management System (AHIMS) search was conducted as part of the REF. This search indicated that there were no known items of Aboriginal heritage significance present on the site.

6.14.2 Potential Impacts

It is unlikely that the project would impact on any items of heritage significance given that there are no sites of cultural heritage significance listed under the North Sydney LEP or the NSW Heritage Act 1977 and no sites of Aboriginal heritage significance were identified through the AHIMS search.

In addition, the site has been excavated to bedrock (sandstone). No items of cultural or Aboriginal heritage significance were found during the excavation and therefore the likelihood of impact to any item of heritage significance during construction would be extremely low.

6.14.3 Methodology for Assessment

The background review undertaken for the REF to identify and examine any of items of national, state and local Aboriginal or non-Aboriginal heritage significance that occur in the local area will be reviewed for currency and consistency with the DGRs. An analysis will be conducted to determine whether the project has the potential to impact the heritage values or any items of heritage significance that occur in proximity to the site or the greater North Sydney area.

A stop-work provision will be provided as part of the environmental assessment to ensure that any item of heritage significance uncovered during the excavation for the cable is appropriately managed.

6.15 Flora and Fauna

6.15.1 Existing Environment

The proposed site is situated within a highly urbanised environment, comprising predominately residential and commercial development. As part of the approval obtained by EnergyAustralia in 2008 to demolish the former residences on the site, all vegetation was cleared from the site. The site was excavated in 2010 and there is currently no vegetation present.



Several trees and shrubs are located on properties and road verges adjacent to the site. Along Harnett Street, several trees and tree limbs overhang the road corridor. These are predominantly common native and ornamental varieties and include *Casuarina sp.*, *Ficus sp.*, *Melaleuca sp.*, *Platanus sp.*, palms, and several other exotic species. Bordering the eastern property boundary of the site, additional *Ficus sp.* and palms are growing, along with several exotic species.

A search of the National Parks and Wildlife Service's Atlas of NSW Wildlife and species listed under the EPBC Act did not identify any flora, fauna, ecological communities or critical habitat in the immediate vicinity of the site.

6.15.2 Potential Impacts

As the site is clear of any trees and/or shrubs, no clearing works would be required on site for the proposed development. Along the eastern property boundary, approximately three trees would need to be removed and two trees would need to be trimmed for safety purposes to enable the perimeter scaffold to be established. These trees are not threatened species and do not contain any viable hollows. Some tree trimming works would also be required to remove overhanging vegetation along Harnett Street, however, these works would be relatively minor. The impact of the project on flora and fauna is therefore considered to be negligible.

6.15.3 Methodology for Assessment

The flora and fauna assessment presented as part of the REF will be reviewed for currency and consistency with the DGRs. Where necessary, the assessment and mitigation measures will be updated.

6.16 Cumulative Impacts

Cumulative impacts may be experienced due to the interaction of elements within the project, or with other existing or proposed developments within the locality. As part of the environmental assessment, the potential impacts associated with the North Sydney zone substation redevelopment would be considered in conjunction with the potential impacts of other surrounding developments that may be constructed in parallel to the project.



7 ENVIRONMENTAL RISK ANALYSIS AND PRIORITISATION OF ISSUES

7.1 Issues Identification

As identified in Section 6 of this report, the environmental issues associated with the North Sydney zone substation redevelopment include:

- Visual impacts
- Noise and vibration
- Electric and magnetic fields
- Traffic and access
- Air quality
- Sustainability and climate change
- Geology and soils
- Contamination
- Hazardous materials
- Water quality and hydrology
- Social and economic
- Land use
- Waste management
- Heritage
- Flora and fauna

7.2 Prioritisation of Issues

7.2.1 Approach

The prioritisation of issues for the project is based on the need to recognise that the higher the potential severity of adverse environmental effects and the greater the consequence of those unmanaged effects, the higher the degree of environmental assessment required.

Table 7-1 provides the issues prioritisation matrix which was used to rank the environmental issues, allocate risk and identify priorities for assessment. Each issue was given a ranking between one and three for the severity of its effects and a ranking between one and three for the perceived consequence of its effects if left unmanaged. These two numbers were then added together to provide a numerical ranking for the issue that was used to categorise it as high, medium or low priority.

Table 7-1 – Issues Prioritisation Matrix

Severity of Effects	Consequence of Unmanaged Effects		
	3 High	2 Medium	1 Low
1 Low	4 (Medium)	3 (Low)	2 (Low)
2 Medium	5 (High)	4 (Medium)	3 (Low)
3 High	6 (High)	5 (High)	4 (Medium)

7.2.2 Assessment

The prioritisation of environmental issues related to the project is shown in Table 7-2. This assessment aims to allow the prioritisation of issues for assessment and does not consider the application of mitigation measures to manage environmental effects. In all cases, appropriate and proven mitigation measures, chosen based upon the experience of regulators and other similar projects would be used to minimise potential impacts. These measures would be described in detail in the EA.

The allocation of risk is based on the following considerations:

Severity of Risk

Low: localised implications; imperceptible or short term cumulative impacts.
 Medium: regional implications; modest or medium term cumulative impacts.
 High: inter-regional implications; serious or long term cumulative impacts.

Consequence of Unmanaged Effects

Low: minor environmental change; offsets readily available.
 Medium: moderate adverse environmental change; offsets available.
 High: important adverse environmental change; offsets not readily available.

Table 7-2 – Prioritisation Analysis

Issue	Severity	Consequence	Priority	Explanation of risk allocation
Visual Amenity				
Visual impacts such as solar access and overshadowing to existing and proposed surrounding development.	2	3	5 (High)	Permanent, long term impact.
Change to the existing landscape character as a result of the project.	1	1	2 (Low)	The existing landscape is highly urbanised.
Obstruction of views/vistas.	2	2	4 (Medium)	There are a number of tall buildings in the immediate vicinity of the site.

Issue	Severity	Consequence	Priority	Explanation of risk allocation
Noise and Vibration				
Temporary noise and vibration nuisance during the construction and demolition.	2	2	4 (Medium)	The site is in close proximity to a large number of commercial and residential sensitive receivers but the impact will be short term only.
Temporary night-time noise nuisance and disturbance to residential receivers during construction of the cable vault.	2	2	4 (Medium)	The site is in close proximity to a number of sensitive residential receivers where any night-time work would create noise nuisance but the impact is short term only.
Noise and vibration nuisance arising from the operation of the transformers.	1	1	2 (Low)	Once operational, noise and vibration nuisance is expected to be minimal.
Electric and Magnetic Fields				
Health impacts associated with magnetic fields emitted by the new substation.	2	2	4 (Medium)	Based on current evidence, health impacts from magnetic fields are unlikely but cannot be ruled out.
Health impacts associated with electric fields emitted by the new substation.	1	1	2 (Low)	Health impacts associated with electric fields are considered to be negligible.
Traffic and Access				
Closure of Berry Street during the construction of the cable vault.	2	2	4 (Medium)	Berry Street is a heavily utilised thoroughfare between the lower North Shore and the CBD.
Increase in vehicular traffic on local road network during construction and demolition of the new and existing substations.	2	2	4 (Medium)	Potential for localised impacts, particularly in close proximity to the site. Surrounding streets carry regional traffic.

Issue	Severity	Consequence	Priority	Explanation of risk allocation
Increase in vehicular traffic on local road network during operation.	1	1	2 (Low)	There would be few permanent employees at the site following the completion of construction.
Air Quality				
Construction related impacts on air quality such as dust generation and vehicular emissions.	1	1	2 (Low)	Excavation has been completed. Potential for some impacts to still occur during construction.
Release of air-borne contaminants (such as asbestos) during the demolition of the existing substation.	2	2	4 (Medium)	Potential for dispersion of hazardous materials.
Impacts on air quality during operation.	1	1	2 (Low)	Potential for impacts is low.
Climate Change and Greenhouse Gas				
Inefficient use of resources, plant and equipment during construction.	2	2	4 (Medium)	Potential to impact on regional climatic conditions.
Inefficient control of GHG emissions during operation.	2	2	4 (Medium)	Potential to impact on regional climatic conditions.
Impact of climatic change on the project's infrastructure.	2	2	4 (Medium)	Potential for impact to regional electricity supply.
Geology and Soils				
Erosion and sedimentation during construction.	1	1	2 (Low)	Potential to pollute waterways is low given that excavation has already been completed, with the exception of the cable vault and associated cable duct lines.

Issue	Severity	Consequence	Priority	Explanation of risk allocation
Potential geotechnical impacts and changes to the land form.	1	1	2 (Low)	Excavation has previously been completed, with the exception of the cable vault and associated cable duct lines.
Hazardous Materials				
Exposure of surrounding land uses to hazardous materials during demolition of the existing substation.	2	2	4 (Medium)	Potential exposure to hazardous materials.
Exposure of employees to hazardous materials during demolition of the existing substation.	2	2	4 (Medium)	Potential exposure to employees.
Water Quality and Hydrology				
Discharge of sediment laden runoff into stormwater system and subsequently to local waterways.	2	2	4 (Medium)	Potential to pollute waterways is low given that excavation has already been completed, with the exception of the cable vault and associated cable duct lines.
Discharge of contaminant laden runoff during demolition of the existing substation.	2	2	4 (Medium)	Potential to pollute regional waterways and disperse hazardous materials.
Discharge of contaminant laden runoff from accidental spillage of chemicals and fuels from the operation and maintenance of construction plant and equipment.	2	2	4 (Medium)	Potential to pollute regional waterways.

Issue	Severity	Consequence	Priority	Explanation of risk allocation
Alteration of existing surface and groundwater flows.	1	1	2 (Low)	Excavation has previously been undertaken, with the exception of the cable vault and associated cable duct lines. Therefore surface and groundwater flows are unlikely to be altered from current state.
Socio-economic				
Amenity (including traffic, noise and visual) impacts on the surrounding residents.	2	2	4 (Medium)	Permanent, long term visual impacts, noise impacts are temporary, traffic impacts may be regional.
Impacts upon the reliability of electricity supply and community demand for electricity.	1	1	2 (Low)	Positive impact.
Job creation during construction.	1	1	2 (Low)	Positive impact.
Job creation during operation.	1	1	2 (Low)	Positive impact.
Land Use				
Inappropriate use of land.	1	1	2 (Low)	The site is currently zoned as mixed uses.
Inappropriate use of land with surrounding environment.	1	1	2 (Low)	Surrounding environment is highly urbanised, therefore, the proposed façade would fit into this landscape.
Inappropriate use of land with new land uses proposed for the area.	1	1	2 (Low)	Proposed developments would be of a similar land use to existing developments.
Community and stakeholder perceptions of land use implications.	2	2	4 (Medium)	Potential for community and stakeholder concerns with regards to EMF and amenity.

Issue	Severity	Consequence	Priority	Explanation of risk allocation
Contamination				
Potential for contaminated soil and water to be present on the existing substation site.	2	2	4 (Medium)	Potential need to remediate the site.
Heritage				
Impact to any item of cultural heritage significance during construction and demolition.	1	1	2 (Low)	No known items of cultural heritage significance exist on the site.
Impact to any item of Aboriginal heritage significance during construction and demolition.	1	1	2 (Low)	No known items of Aboriginal heritage significance exist on the site.
Flora and Fauna				
Loss of habitat due to clearing, excavation and development.	1	1	2 (Low)	The site has previously been cleared and excavated.
Reduction in biodiversity due to loss of habitat for native species	1	1	2 (Low)	The site has previously been cleared.
Spread of weeds and feral animals	1	1	2 (Low)	The site has previously been cleared of all vegetation.
Impact upon threatened species.	1	1	2 (Low)	The site has previously been cleared, therefore no threatened species exist on the site.
Waste Management				
Potential contamination of land and water due to inappropriate handling and disposal of waste materials.	2	2	4 (Medium)	Potential for inappropriate disposal of hazardous waste.

A summary of the prioritisation of environmental issues, and therefore the focus of the EA for the project is presented in Table 7-3.

Table 7-3 – Prioritisation of Issues Summary

High Priority	Medium Priority	Low Priority
Visual amenity (impacts to existing and proposed surrounding developments)	Visual amenity (obstruction of views) Noise and vibration (temporary construction noise / temporary night-time noise disturbance) Electric and magnetic fields (Magnetic fields) Traffic and access (closure of Berry Street / increased vehicular traffic on local and regional road network during construction) Air Quality (release of air-borne contaminants) Climate change and greenhouse gas (inefficient use of resources and equipment / inefficient control of GHG emissions / impact of climate change on the project's infrastructure) Hazardous materials (exposure of surrounding land uses / exposure of employees to hazardous materials) Water quality and hydrology (contaminant laden runoff) Socio-economic (amenity impacts) Land use (community and stakeholder perceptions) Contamination (presence of contamination on existing substation site) Waste management (inappropriate handling and disposal of waste)	Visual amenity (changes to landscape character) Noise and vibration (operational noise impacts) Electric and magnetic fields (Electric fields) Traffic and access (increased vehicular traffic on local road network during operation) Air Quality (construction related impacts / impacts during operation) Geology and Soils (erosion and sedimentation / geotechnical changes to landform) Water quality and hydrology (sediment laden runoff / alteration of existing flows) Socio-economic (impacts upon electricity supply / job creation during construction / job creation during operation) Land use (inappropriate use of land / inappropriate use of land with surrounding environment / inappropriate use of land with new land uses proposed) Heritage (impacts on items of cultural heritage significance / impacts on items of Aboriginal heritage significance) Flora and fauna (loss of habitat / loss of biodiversity / spread of weeds and feral animals / impact on threatened species)



8 CONCLUSION

This PEA has been prepared to satisfy the provisions of Part 3A of the EP&A Act. The PEA provides an initial assessment and risk appraisal of the environmental, social and economic issues that may be associated with the redevelopment of the North Sydney zone substation which comprises construction and operation of a new substation and demolition of the existing substation.

The key issues that were identified through the preliminary assessment and the qualitative risk assessment were:

- Visual amenity
- Noise and vibration
- Electric and magnetic fields
- Hazardous materials
- Traffic and Access

The Environmental Assessment will assess these key issues in more detail along with any other issues identified within the DGRs or that may arise during detailed assessment of the environmental impacts. . Appropriate mitigation and management measures would be developed in order to minimise the potential environmental impacts.

Other less significant environmental issues (such as waste management, flora and fauna and heritage) would also be addressed as part of the environmental assessment. It would be expected that these impacts could be managed through standard mitigation measures and appropriate levels of community consultation.

DGRs for the project would be issued following the DoP's review of this PEA. An Environmental Assessment Report would be prepared based on those requirements and submitted to the DoP for adequacy review. Once the Environmental Assessment is deemed to be adequate the Environmental Assessment would be exhibited publicly and would be subject to an internal and independent assessment by the DoP. Taking into account the DoP's assessment, the Minister would then determine whether or not to approve the project.



9 REFERENCES

AECOM (2009a) Building Assessment Report – North Sydney Zone Substation 70 Berry Street, North Sydney NSW, prepared for the Energy2U Alliance, Sydney, November 2009

AECOM (2009b) Hazardous Materials Survey Report – North Sydney Zone Substation Berry Street, North Sydney NSW, prepared for the Energy2U Alliance, Sydney, November 2009

DECCW (2008) Waste Classification Guidelines, Sydney, revised December 2009

Energy2U Alliance (2009a) North Sydney Zone Substation – Construction and Operational Noise and Vibration Impact Assessment, Chatswood, November 2009

Energy2U Alliance (2009b) North Sydney Zone Substation – Electric and Magnetic Fields Assessment Report, Chatswood, December 2009

Energy2U Alliance (2010) Review of Environmental Factors – North Sydney Zone Substation Redevelopment, Chatswood, February 2010

NSW RTA (2005) Annual Average Daily Traffic Data,
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North Sydney Council (2010) Water Quality Map,
http://www.northsydney.nsw.gov.au/resources/documents/water_quality_map.pdf, accessed 31/05/2010

O'Connell, P, Heil, F, Henriot, J, Mauthe, G, Morrison, H, Niemeyer, L, Pittroff, M, Probst, R & Taillebois, J.P (2000) SF6 in the Electric Industry, Status 2000, Paper presented in the name of CIGRE Working Group, February 2000

World Resource Institute (WRI) and World Business Council for Sustainable Development (WBSCD) (2004) GHG Protocol – A Corporate Accounting and Reporting Standard, Washington, March 2004



APPENDIX A

Major Project Declaration

**ORDER DECLARING DEVELOPMENT TO BE A PROJECT UNDER PART 3A OF
THE ENVIRONMENTAL PLANNING AND ASSESSMENT ACT 1979**

I, the Minister for Planning, having formed the opinion that the development described in Schedule 1 is of State and regional environmental planning significance, declare that development, pursuant to section 75B of the *Environmental Planning and Assessment Act 1979*, to be a project to which Part 3A of the *Environmental Planning and Assessment Act 1979* applies.



The Hon. Tony Kelly MLC
Minister for Planning

Sydney,

17 JUN 2010²⁰¹⁰

SCHEDULE 1

The construction and operation of a 132/11 kilovolt electrical substation and its component equipment at 3-11 Ward Street, North Sydney, New South Wales, referred to as the North Sydney Zone Substation, including:

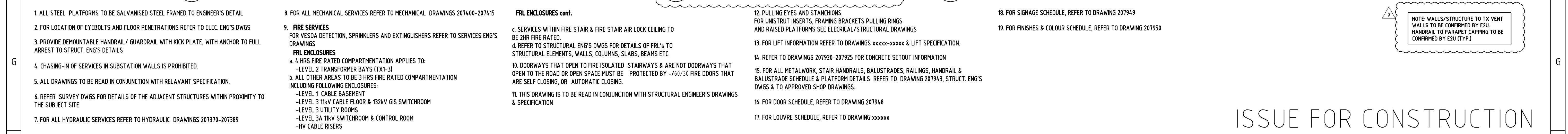
- the installation of 11 kilovolt feeders and cables; a cable vault on the corner of Ward and Berry Streets, North Sydney, and conduits in Ward and Harnett Streets, North Sydney; and
- decommissioning and demolition of the existing North Sydney (Berry Street) zone substation,

but excluding the installation of new 132 kilovolt feeder cables from the Willoughby Sub Transmission Substation to the North Sydney Zone Substation.



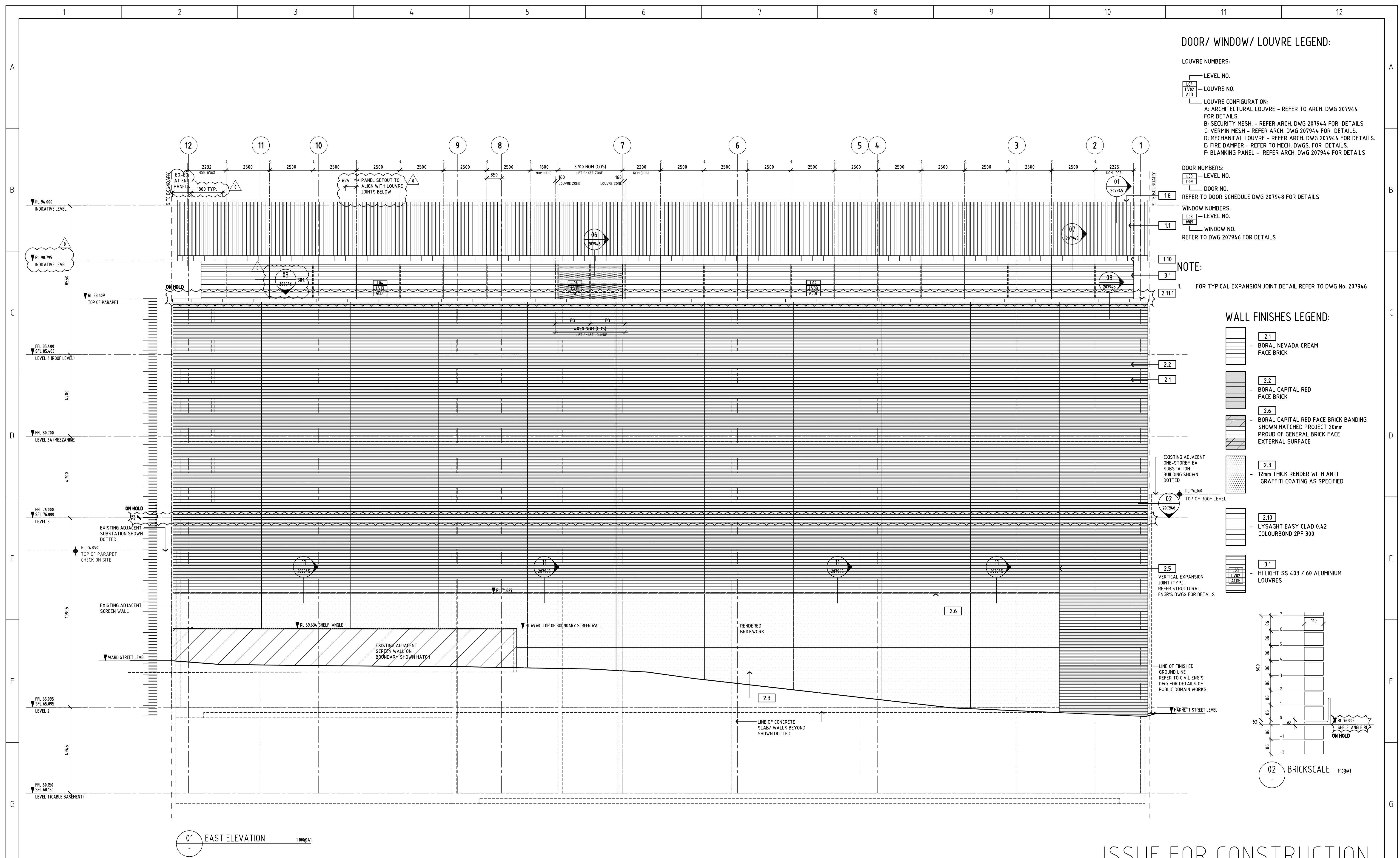
APPENDIX B

Design Drawings



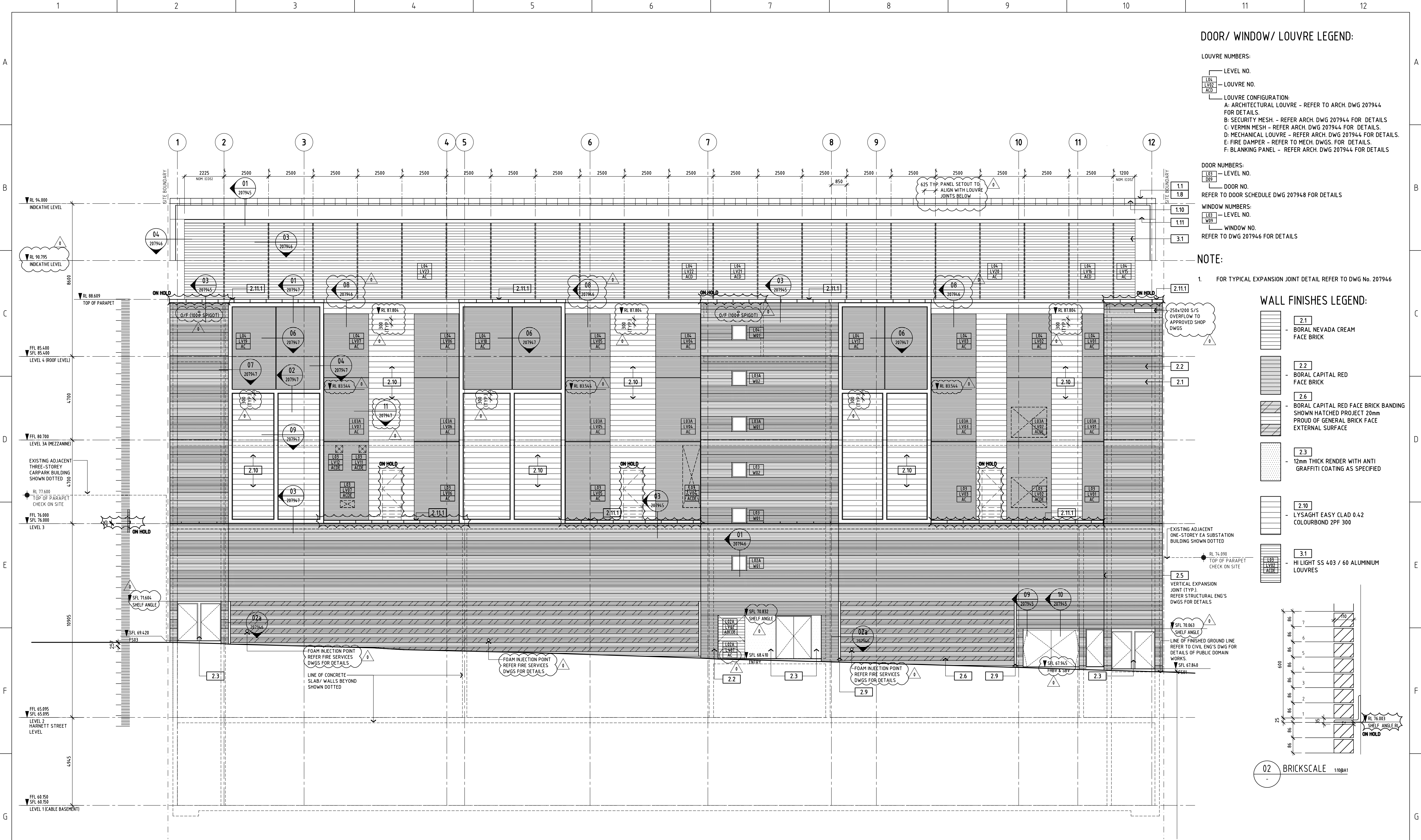
NOTE: WALLS/STRUCTURE TO TX VENT
WALLS TO BE CONFIRMED BY E2U.
HANDRAIL TO PARAPET CAPPING TO BE
CONFIRMED BY E2U (TYP.)

[illegible]



ISSUE FOR CONSTRUCTION

[illegible]



DOOR/ WINDOW/ LOUVRE LEGEND:

- LOUVRE NUMBERS:
- LEVEL NO.
 - LOUVRE NO.
 - LOUVRE CONFIGURATION:
 - A: ARCHITECTURAL LOUVRE - REFER ARCH. DWG 207944 FOR DETAILS.
 - B: SECURITY MESH - REFER ARCH. DWG 207944 FOR DETAILS.
 - C: VERMIN MESH - REFER ARCH. DWG 207944 FOR DETAILS.
 - D: MECHANICAL LOUVRE - REFER ARCH. DWG 207944 FOR DETAILS.
 - E: FIRE DAMPER - REFER TO MECH. DWGS. FOR DETAILS.
 - F: BLANKING PANEL - REFER ARCH. DWG 207944 FOR DETAILS.

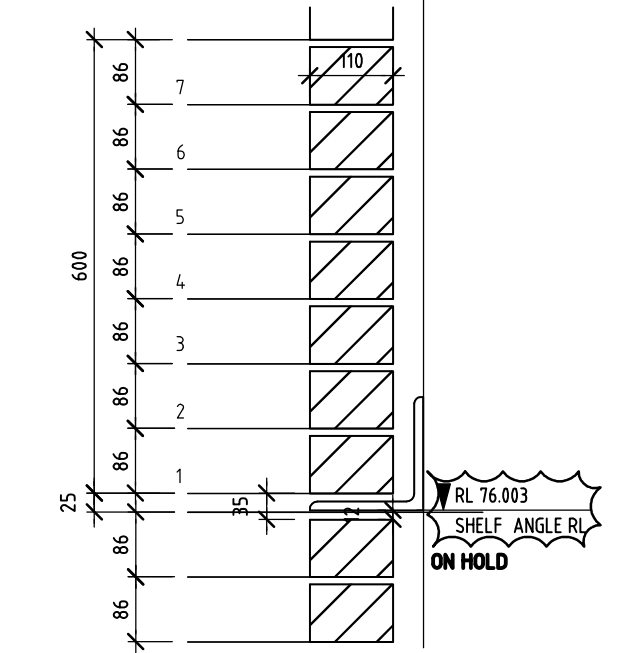
- DOOR NUMBERS:
- LEVEL NO.
 - DOOR NO.
 - REFER TO DOOR SCHEDULE DWG 207948 FOR DETAILS
- WINDOW NUMBERS:
- LEVEL NO.
 - WINDOW NO.
 - REFER TO DWG 207946 FOR DETAILS

NOTE:

1. FOR TYPICAL EXPANSION JOINT DETAIL REFER TO DWG No. 207946

WALL FINISHES LEGEND:

- 2.1 BORAL NEVADA CREAM FACE BRICK
- 2.2 BORAL CAPITAL RED FACE BRICK
- 2.6 BORAL CAPITAL RED FACE BRICK BANDING SHOWN HATCHED PROJECT 20mm PROUD OF GENERAL BRICK FACE EXTERNAL SURFACE
- 2.3 12mm THICK RENDER WITH ANTI GRAFFITI COATING AS SPECIFIED
- 2.10 LYSAGHT EASY CLAD 0.42 COLOURBOND 2PF 300
- 3.1 HI LIGHT SS 403 / 60 ALUMINIUM LOUVRES



01 WEST ELEVATION
(ALONG WARD STREET LEVEL)
1:100@A1

ISSUE FOR CONSTRUCTION

CAD DRAWING DO NOT MANUALLY AMEND	AMENDMENTS FOR EA REVIEW AND COMMENT DWN: MT CHKD: WF DATE: 15.12.09	APP'D by: SD FOR CO-ORDINATION DWN: BR CHKD: BR DATE: 18.03.10	ISSUED FOR EA REVIEW DWN: BR CHKD: BR DATE: 21.04.10	APP'D by: SD FOR CONSTRUCTION DWN: BR CHKD: BR DATE: 30.04.10	Kann Finch Group Architecture Facility Planning Interior Design Urban Planning Kann Finch Pty Limited A.C.N. 002 170 747 50 Carrington Street, Sydney NSW Australia Tel 02 9299 4111 Fax 02 9299 1481 Nominated Architect: T. De Waal NSW ARB Reg No 4940	energy2U Alliance	EnergyAustralia DESIGN AND ENGINEERING BRANCH 24 CAMPBELL ST SYDNEY, NSW 2000	SCALE	1:100	ENERGY 2U ALLIANCE NORTH SYDNEY SUBSTATION ARCHITECTURAL WEST ELEVATION	DRAWING No 207930	SHEET 1	AMD 0	SIZE A1
								DESIGNED	-					
								DRAWN	MT					
								CHECKED	WF					
								APPROVED	SD					
DATE	04.09.09													
PRJTRK No.	-													
PROJECT NUMBER	60100174													

LIST OF DOORS LEVEL 1				
DOOR No.	ROOM	LEAF SIZE (mm)	DOOR TYPE	STRUCT. OPENING
D01	FS01	970x2060	C	1050X2100
D02	S02	970x2060	C	1050X2100
D03	FS03	970x2060	C	1050X2100
D04	FS03	970x2060	C	1050X2100
D05	FIRE PUMP ROOM	2000X2060	E	2126X2100

GENERAL NOTES:

1. ALL STEEL PLATFORMS TO BE GALVANISED STEEL FRAMED TO ENGINEER'S DETAIL
2. FOR LOCATION OF EYEBOLTS AND FLOOR PENETRATIONS REFER TO ELEC. ENG'S DWGS
3. PROVIDE DEMOUNTABLE HANDRAIL/ GUARDRAIL WITH KICK PLATE, WITH ANCHOR TO FULL ARREST TO STRUCT. ENG'S DETAILS
4. CHASING-IN OF SERVICES IN SUBSTATION WALLS IS PROHIBITED.
5. ALL DRAWINGS TO BE READ IN CONJUNCTION WITH RELAVANT SPECIFICATION.
6. REFER SURVEY DWGS FOR DETAILS OF THE ADJACENT STRUCTURES WITHIN PROXIMITY TO THE SUBJECT SITE.
7. FOR ALL HYDRAULIC SERVICES REFER TO HYDRAULIC DRAWINGS
8. FOR ALL MECHANICAL SERVICES REFER TO MECHANICAL DRAWINGS
9. **FIRE SERVICES**
FOR VESDA DETECTION, SPRINKLERS AND EXTINGUISHERS REFER TO SERVICES ENG'S DRAWINGS
10. **FRL ENCLOSURES**
a. 4 HRS FIRE RATED COMPARTMENTATION APPLIES TO:
-LEVEL 2 TRANSFORMER BAYS (TX1-3)

- b. ALL OTHER AREAS TO BE 3 HRS FIRE RATED COMPARTMENTATION INCLUDING FOLLOWING ENCLOSURES:
-LEVEL 1 CABLE BASEMENT
-LEVEL 3 11kV CABLE FLOOR & 132kV GIS SWITCHROOM
-LEVEL 3 UTILITY ROOMS
-LEVEL 3A 11kV SWITCHROOM & CONTROL ROOM
-HV CABLE RISERS
c. SERVICES WITHIN FIRE STAIR & FIRE STAIR AIR LOCK CEILING TO BE 2HR FIRE RATED.
d. REFER TO STRUCTURAL ENG'S DWGS FOR DETAILS OF FRL'S TO STRUCTURAL ELEMENTS, WALLS, COLUMNS, SLABS, BEAMS ETC.
11. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH STRUCTURAL ENGINEER'S DRAWINGS & SPECIFICATION
12. PULLING EYES AND STANCHIONS
FOR UNISTRUT INSERTS, FRAMING BRACKETS PULLING RINGS AND RAISED PLATFORMS SEE ELECTRICAL/STRUCTURAL DRAWINGS
13. FOR LIFT INFORMATION REFER TO DRAWINGS & LIFT SPECIFICATION.
14. REFER TO DRAWINGS 207920-207925 FOR CONCRETE SETOUT INFORMATION

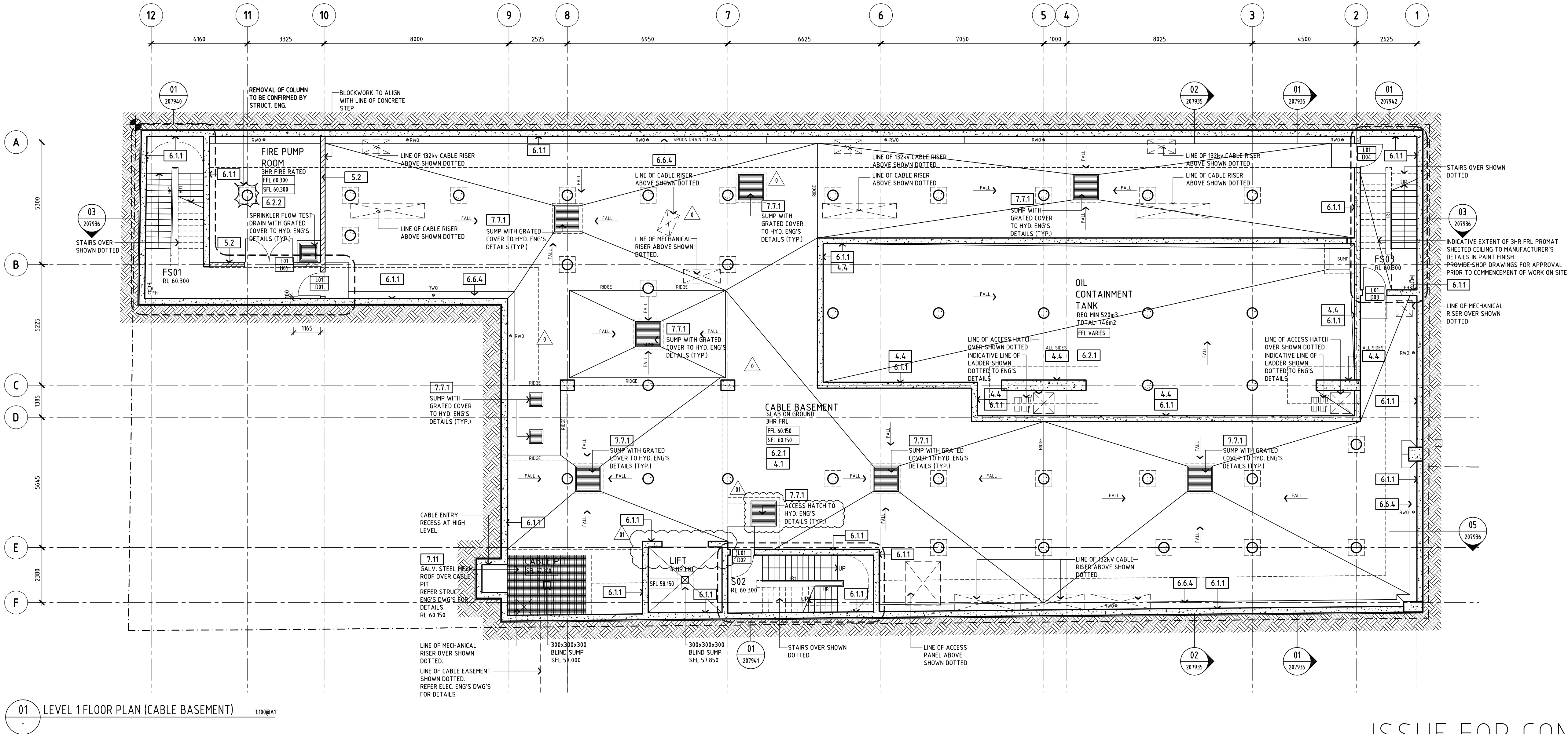
15. FOR ALL METALWORK, STAIR HANDRAILS, BALUSTRADES, RAILINGS, HANDRAIL & BALUSTRADE SCHEDULE & PLATFORM DETAILS REFER TO DRAWING 207943, STRUCT. ENG'S DWGS & TO APPROVED SHOP DRAWINGS.
16. FOR DOOR SCHEDULE, REFER TO DRAWING 207948
17. FOR LOUVRE SCHEDULE, REFER TO DRAWING 207944
18. FOR SIGNAGE SCHEDULE, REFER TO DRAWING 207949
19. FOR FINISHES & COLOUR SCHEDULE, REFER TO DRAWING 207950
20. SPECIAL HAZARDS
FOR OIL CONTAINMENT OVERFLOW SEE ENGINEERS DRAWINGS BE AWARE OF THE POSSIBLE REQUIREMENT FOR A WATER TREATMENT PLANT FOR CONTAMINATED GROUND WATER SEEPING FROM THE EXCAVATION. THIS IS PENDING THE RESULT OF GROUNDWATER INVESTIGATION TO BE UNDERTAKEN DURING THE EXCAVATION CONTRACT.
21. WATERPROOFING TYPE WPM 4 TO OIL CONTAINMENT TANK (OCT) INTERNAL WALL WATERPROOFING AS PER TECHNICAL SPECIFICATION SECTION 7-PART 2, OCT WATERPROOFING TECHNICAL & APPLICATION SPECIFICATION
22. ALL BLOCKWORK SETOUT TO ALIGN WITH CONCRETE COLUMNS, WALLS, SLAB EDGE & CONCRETE HOBS UNLESS OTHERWISE DIMENSIONED.

DOOR/ WINDOW/ LOUVRE LEGEND:

- DOOR NUMBERS:
LEVEL NO.
LOUVRE NO.
DOOR NO.
WINDOW NO.
- LOUVRE CONFIGURATION:
A: ARCHITECTURAL LOUVRE - REFER TO ARCH. DWG 207944 FOR DETAILS.
B: SECURITY MESH - REFER ARCH. DWG 207944 FOR DETAILS.
C: VERMIN MESH - REFER ARCH. DWG 207944 FOR DETAILS.
D: MECHANICAL LOUVRE - REFER ARCH. DWG 207944 FOR DETAILS.
E: FIRE DAMPER - REFER TO MECH. DWGS. FOR DETAILS.
F: BLANKING PANEL - REFER ARCH. DWG 207944 FOR DETAILS
- REFER TO DOOR SCHEDULE DWG 207948 FOR DETAILS
- WINDOW NUMBERS:
LEVEL NO.
WINDOW NO.
REFER TO DWG 207946 FOR DETAILS

LEGEND:

- B PAINTED BOLLARD-150Ø, 1.5m HIGH (TO APPROVED SHOP DWGS)
- BS BLIND SUMP
- EX EXHAUST
- FFL FINISHED FLOOR LEVEL
- FH FIRE HYDRANT
- FW FLOOR WASTE
- H HYDRAULIC
- LO1 LIFT No.01
- PB TRANSFORMER PULLING BLOCK
- RA RETURN AIR
- R01 RAMP No.01
- RW0 RAINWATER OUTLET
- SA SUPPLY AIR
- SC STEEL COLUMN
- FS01 STAIR No.01
- SFL STRUCTURAL FLOOR LEVEL
- SW STORMWATER
- SWO STORMWATER OUTLET DRAIN
- TWL TOP OF WALL LEVEL
- WPM1 WATERPROOF MEMBRANE TYPE



ISSUE FOR CONSTRUCTION

CAD DRAWING. DO NOT MANUALLY AMEND	AMENDMENTS				KannFinch Group Kann Finch Pty Limited 50 Carrington Street, Sydney NSW Australia Nominated Architect: T. De Waal NSW ARB Reg No 4940	energy2U Alliance Architecture Facility Planning Interior Design Urban Planning	 EnergyAustralia [®] DESIGN AND ENGINEERING BRANCH 24 CAMPBELL ST SYDNEY, NSW 2000	SCALE AS SHOWN		ENERGY2U ALLIANCE NORTH SYDNEY SUBSTATION ARCHITECTURAL GENERAL ARRANGEMENT LEVEL 1				
	30% SUBMISSION							DESIGNED	-					
	DWN: MF CHKD: WF DATE: 04.09.09							DRAWN	MT					
	APP'D by: WF							CHECKED	WF					
	FINAL TOC SUBMISSION							APPROVED	SD					
	DWN: BR CHKD: WF DATE: 09.10.09							DATE	04.09.09	DRAWING No 207910	SHEET 1	AMD 01	SIZE A1	
	REV. TO SUIT ENG'S COMMENTS							PRJTRK No.	-					
	APP'D by: SD							PROJECT NUMBER	60100174					
	DWG NO PREVIOUSLY ISSUED AS AR-0002 FOR EA REVIEW AND COMMENT													
	DWN: BR CHKD: WF DATE: 15.12.09													
APP'D by: SD														
REVISED TO SUIT E2U CO-ORDINATION														
DWN: BR CHKD: WF DATE: 23.02.10														
APP'D by: SD														
ISSUE FOR CONSTRUCTION														
DWN: BR CHKD: BR DATE: 15.04.10														
APP'D by: SD														
REV. FOR CONSTRUCTION														
DWN: BR CHKD: BR DATE: 30.04.10														
APP'D by: SD														

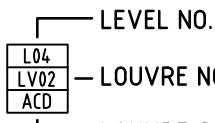
LIST OF DOORS LEVEL 2				
DOOR No.	ROOM	LEAF SIZE (mm)	DOOR TYPE	STRUCT. OPENING
D01	FS01	970x2060	C	1050X2100
D02	S02	970x2060	C	1050X2100
D03	FS03	970x2060	C	1050X2100
D04	11kV CABLE RISER 2	970x2060	C	1050X2100
D05	11kV CABLE RISER 1	970x2060	C	1050X2100
D06	DELETED			
D07	ESCAPE CORRIDOR	970x2060	C	1050X2100
D08	11kV CABLE RISER 3	2000x2020	E	2126X2100
D09	11kV CABLE RISER 3	2000x2020	E	2126X2100
D10	TX1	E2U		
D11	TX1	E2U		
D12	TX1	E2U		
D13	TX 2	E2U		
D14	TX 2	E2U		
D15	TX 2/3	E2U		
D16	TX 3	E2U		
D17	TX 3	E2U		
D18	132kv CABLE RISER	2545x2060	F	2625 WIDE
D19	132kv CABLE RISER	2670x2060	F	2750 WIDE
D20	132kv CABLE RISER	2545x2060	F	2625 WIDE
D21	EX. SUBST'N ACCESS	820x2060	C	900X2100

GENERAL NOTES:

- ALL STEEL PLATFORMS TO BE GALVANISED STEEL FRAMED TO ENGINEER'S DETAIL
- FOR LOCATION OF EYEBOLTS AND FLOOR PENETRATIONS REFER TO ELEC. ENG'S DWGS
- PROVIDE DEMOUNTABLE HANDRAIL/ GUARDRAIL WITH KICK PLATE, WITH ANCHOR TO FULL ARREST TO STRUCT. ENG'S DETAILS
- CHASING-IN OF SERVICES IN SUBSTATION WALLS IS PROHIBITED.
- ALL DRAWINGS TO BE READ IN CONJUNCTION WITH RELAVANT SPECIFICATION.
- REFER SURVEY DWGS FOR DETAILS OF THE ADJACENT STRUCTURES WITHIN PROXIMITY TO THE SUBJECT SITE.
- FOR ALL HYDRAULIC SERVICES REFER TO HYDRAULIC DRAWINGS
- FOR ALL MECHANICAL SERVICES REFER TO MECHANICAL DRAWINGS
- FIRE SERVICES**
FOR VESDA DETECTION, SPRINKLERS AND EXTINGUISHERS REFER TO SERVICES ENG'S DRAWINGS
- FRL ENCLOSURES**
a. 4 HRS FIRE RATED COMPARTMENTATION APPLIES TO:
-LEVEL 2 TRANSFORMER BAYS (TX1-3)
- b. ALL OTHER AREAS TO BE 3 HRS FIRE RATED COMPARTMENTATION INCLUDING FOLLOWING ENCLOSURES:
-LEVEL 1 CABLE BASEMENT
-LEVEL 3 11kV CABLE FLOOR & 132kV GIS SWITCHROOM
-LEVEL 3 UTILITY ROOMS
-LEVEL 3A 11kV SWITCHROOM & CONTROL ROOM
-HV CABLE RISERS
c. SERVICES WITHIN FIRE STAIR & FIRE STAIR AIR LOCK CEILING TO BE 2HR FIRE RATED.
d. REFER TO STRUCTURAL ENG'S DWGS FOR DETAILS OF FRL'S TO STRUCTURAL ELEMENTS, WALLS, COLUMNS, SLABS, BEAMS ETC.
- DOORWAYS THAT OPEN TO FIRE ISOLATED STAIRWAYS & ARE NOT DOORWAYS THAT OPEN TO THE ROAD OR OPEN SPACE MUST BE PROTECTED BY -160/30 FIRE DOORS THAT ARE SELF CLOSING, OR AUTOMATIC CLOSING.
- THIS DRAWING IS TO BE READ IN CONJUNCTION WITH STRUCTURAL ENGINEER'S DRAWINGS & SPECIFICATION
- PULLING EYES AND STANCHIONS
FOR UNISTRUT INSERTS, FRAMING BRACKETS PULLING RINGS AND RAISED PLATFORMS SEE ELECTRICAL/STRUCTURAL DRAWINGS
- FOR LIFT INFORMATION REFER TO DRAWINGS & LIFT SPECIFICATION.
- REFER TO DRAWINGS 207920-207925 FOR CONCRETE SETOUT INFORMATION

DOOR/ WINDOW/ LOUVRE LEGEND:

LOUVRE NUMBERS:



LEVEL NO.

LOUVRE NO.

LOUVRE CONFIGURATION:

A: ARCHITECTURAL LOUVRE - REFER TO ARCH. DWG 207944 FOR DETAILS.

B: SECURITY MESH - REFER ARCH. DWG 207944 FOR DETAILS.

C: VERMIN MESH - REFER ARCH. DWG 207944 FOR DETAILS.

D: MECHANICAL LOUVRE - REFER ARCH. DWG 207944 FOR DETAILS.

E: FIRE DAMPER - REFER ARCH. DWG 207944 FOR DETAILS.

F: BLANKING PANEL - REFER ARCH. DWG 207944 FOR DETAILS

DOOR NUMBERS:

LEVEL NO.

DOOR NO.

REFER TO DOOR SCHEDULE DWG 207948 FOR DETAILS

WINDOW NUMBERS:

LEVEL NO.

WINDOW NO.

REFER TO DWG 207946 FOR DETAILS

LEGEND:

B

BS

EX

FFL

FH

FW

H

L01

PB

RA

R01

RW0

SA

SC

FS01

SFL

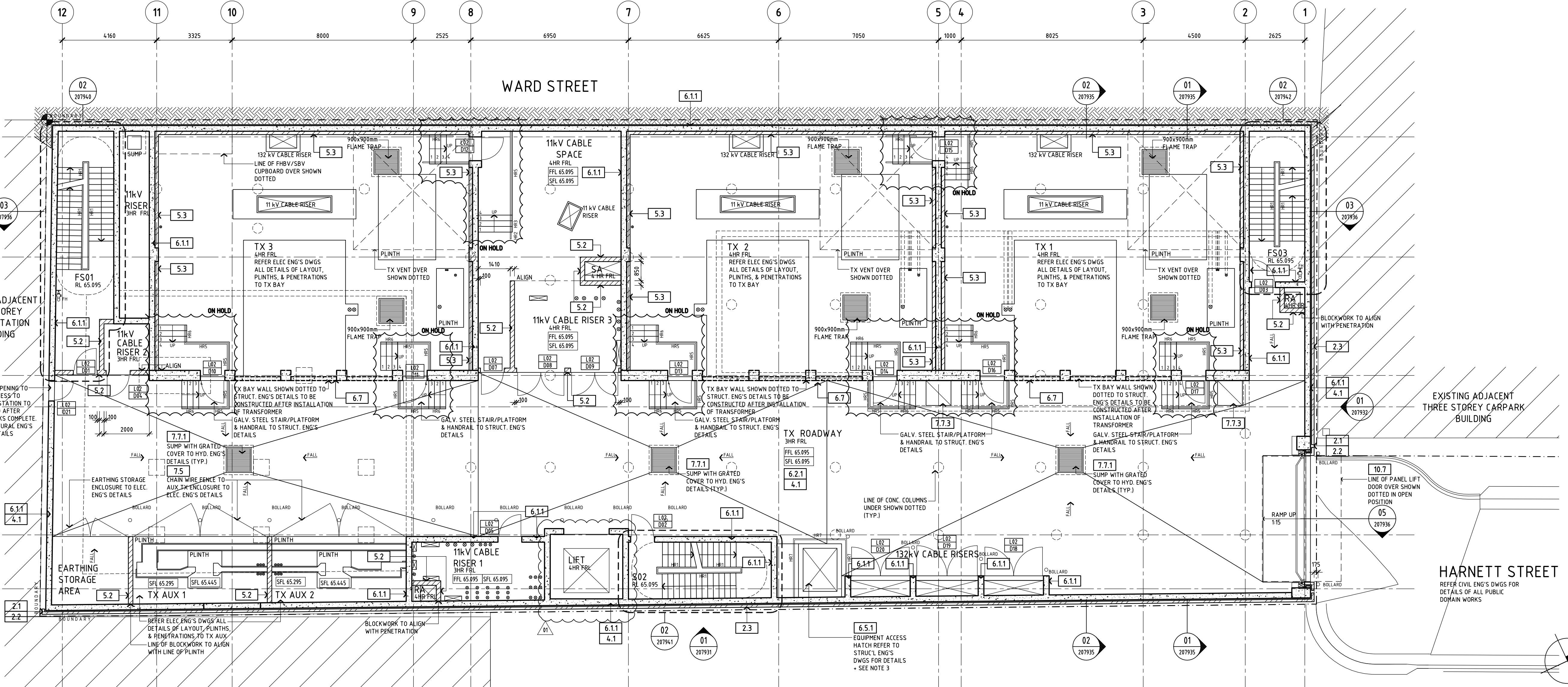
SW

SWO

TWL

WPM1

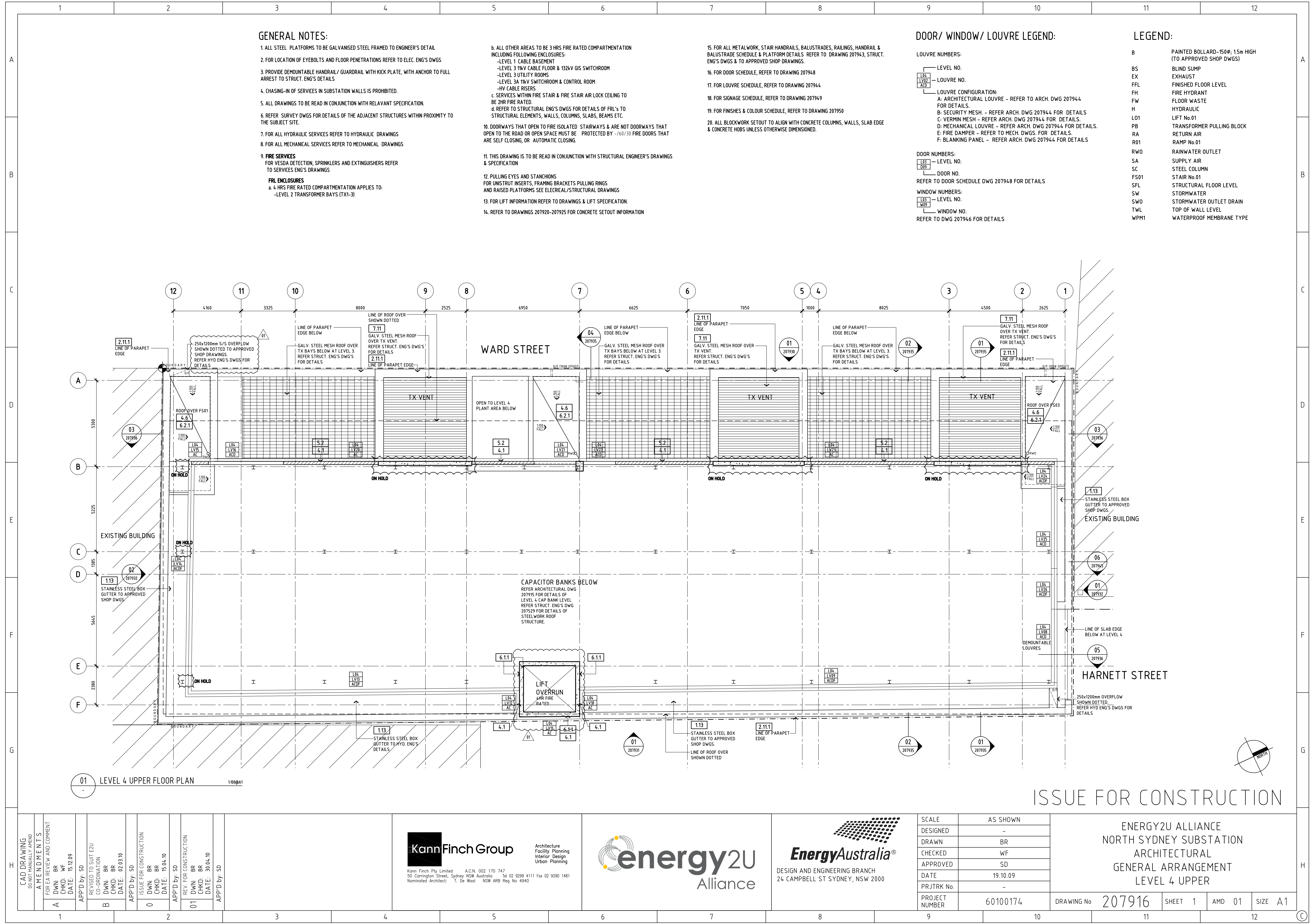
- PAINTED BOLLARD-150Ø; 15m HIGH (TO APPROVED SHOP DWGS)
- BLIND SUMP
- EXHAUST
- FINISHED FLOOR LEVEL
- FIRE HYDRANT
- FLOOR WASTE
- HYDRAULIC
- LIFT No.01
- TRANSFORMER PULLING BLOCK
- RETURN AIR
- RAMP No.01
- RAINWATER OUTLET
- SUPPLY AIR
- STEEL COLUMN
- STAIR No.01
- STRUCTURAL FLOOR LEVEL
- STORMWATER
- STORMWATER OUTLET DRAIN
- TOP OF WALL LEVEL
- WATERPROOF MEMBRANE TYPE

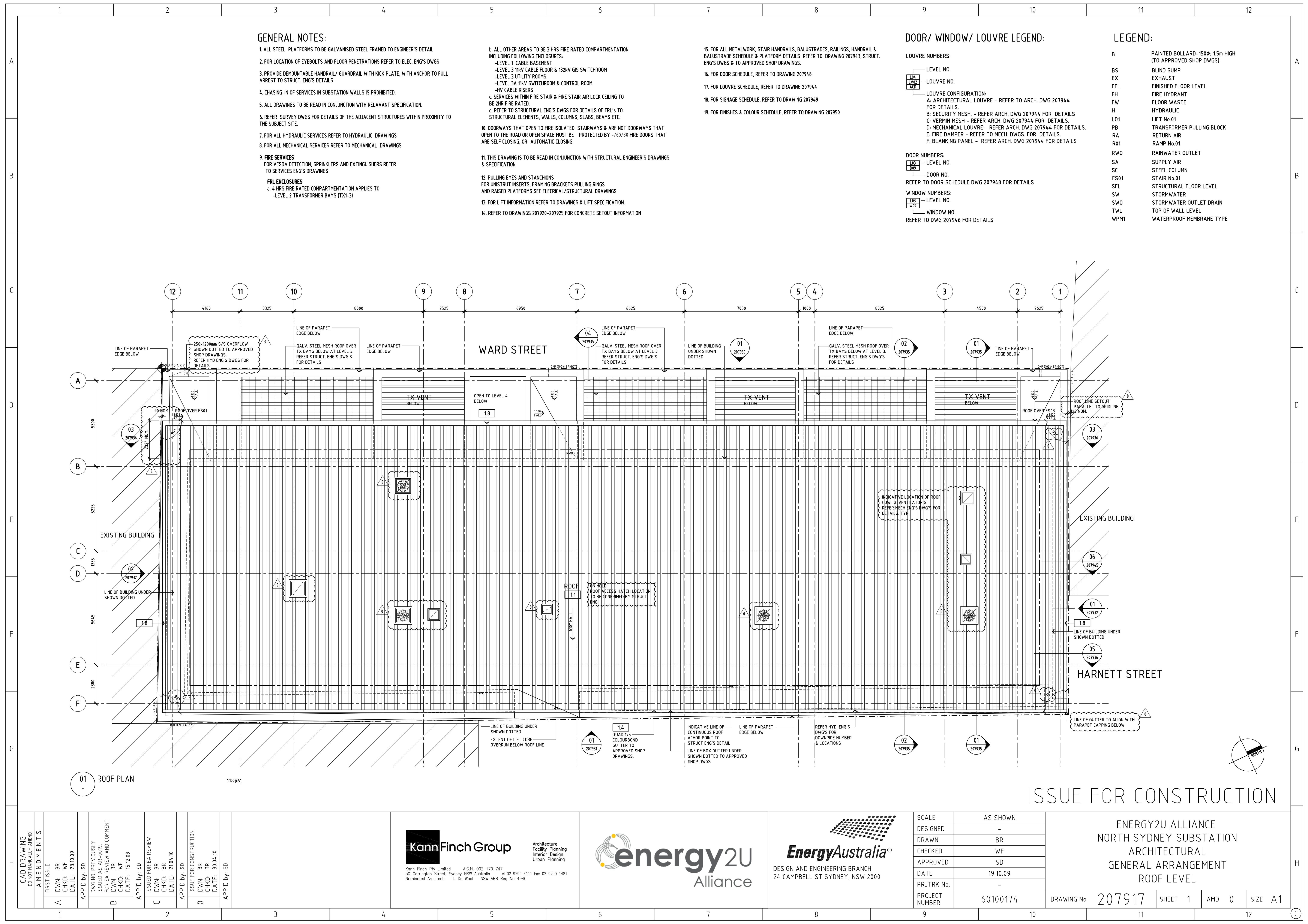


ISSUE FOR CONSTRUCTION

CAD DRAWING DO NOT MANUALLY AMEND		AMENDMENTS		30% SUBMISSION A DWN: MF CHKD: WF DATE: 04.09.09 APP'D by: WF		FINAL TOC SUBMISSION B DWN: BR CHKD: WF DATE: 09.10.09 APP'D by: WF		REV. TO SUIT ENG'S COMMENTS C DWN: BR CHKD: WF DATE: 28.10.09 APP'D by: SD		DWG NO. PREVIOUSLY ISSUED AS AR-0003. FOR EA REVIEW AND COMMENT D DWN: BR CHKD: WF DATE: 15.12.09 APP'D by: SD		REVISED TO SUIT E2U COORDINATION E DWN: BR CHKD: BR DATE: 23.02.10 APP'D by: SD		ISSUE FOR CONSTRUCTION 0 DWN: BR CHKD: BR DATE: 15.04.10 APP'D by: SD		REV. FOR CONSTRUCTION 01 DWN: BR CHKD: BR DATE: 30.04.10 APP'D by: SD																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																												</	
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CAD DRAWING DO NOT MANUALLY AMEND	
A M E N D M E N T S	
A	30% SUBMISSION DWN: MF CHKD: WF DATE: 04.09.09
APP'D by: WF	
B	FINAL TOC SUBMISSION DWN: BR CHKD: WF DATE: 09.10.09
APP'D by: WF	
C	REV. TO SUIT ENG'S COMMENTS DWN: BR CHKD: WF DATE: 28.10.09
APP'D by: SD	
DMG NO PREVIOUSLY ISSUED AS AR-0008 REVISED TO SUIT LAW AND COMMENT DWN: BR CHKD: WF DATE: 15.12.09	
APP'D by: SD	
E	REVISED TO SUIT E2U CO-ORDINATION DWN: BR CHKD: BR DATE: 01.03.10
APP'D by: SD	
0	ISSUE FOR CONSTRUCTION DWN: BR CHKD: BR DATE: 15.04.10
APP'D by: SD	
01	REV. FOR CONSTRUCTION DWN: BR CHKD: BR DATE: 30.04.10





GENERAL NOTES:

1. ALL STEEL PLATFORMS TO BE GALVANISED STEEL FRAMED TO ENGINEER'S DETAIL
2. FOR LOCATION OF EYEBOLTS AND FLOOR PENETRATIONS REFER TO ELEC. ENG'S DWGS
3. PROVIDE DEMOUNTABLE HANDRAIL/ GUARDRAIL WITH KICK PLATE, WITH ANCHOR TO FULL ARREST TO STRUCT. ENG'S DETAILS
4. CHASING-IN OF SERVICES IN SUBSTATION WALLS IS PROHIBITED.
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FOR VESDA DETECTION, SPRINKLERS AND EXTINGUISHERS REFER TO SERVICES ENG'S DRAWINGS
10. DOORWAYS THAT OPEN TO FIRE ISOLATED STAIRWAYS & ARE NOT DOORWAYS THAT OPEN TO THE ROAD OR OPEN SPACE MUST BE PROTECTED BY -/60/30 FIRE DOORS THAT ARE SELF CLOSING, OR AUTOMATIC CLOSING.
11. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH STRUCTURAL ENGINEER'S DRAWINGS & SPECIFICATION
12. PULLING EYES AND STANCHIONS
FOR UNISTRUT INSERTS, FRAMING BRACKETS PULLING RINGS
AND RAISED PLATFORMS SEE ELECTRICAL/STRUCTURAL DRAWINGS
13. FOR LIFT INFORMATION REFER TO DRAWINGS & LIFT SPECIFICATION.
14. REFER TO DRAWINGS 207920-207925 FOR CONCRETE SETOUT INFORMATION

FRL ENCLOSURES

- a. 4 HRS FIRE RATED COMPARTMENTATION APPLIES TO:
-LEVEL 2 TRANSFORMER BAYS (TX1-3)

15. FOR ALL METALWORK, STAIR HANDRAILS, BALUSTRADES, RAILINGS, HANDRAIL & BALUSTRADE SCHEDULE & PLATFORM DETAILS REFER TO DRAWING 207943, STRUCT. ENG'S DWGS & TO APPROVED SHOP DRAWINGS.
16. FOR DOOR SCHEDULE, REFER TO DRAWING 207948
17. FOR LOUVRE SCHEDULE, REFER TO DRAWING 207944
18. FOR SIGNAGE SCHEDULE, REFER TO DRAWING 207949
19. FOR FINISHES & COLOUR SCHEDULE, REFER TO DRAWING 207950

DOOR/ WINDOW/ LOUVRE LEGEND:

LOUVRE NUMBERS:

- LEVEL NO.
LOUVRE NO.

LOUVRE CONFIGURATION:

- A: ARCHITECTURAL LOUVRE - REFER TO ARCH. DWG 207944 FOR DETAILS.
B: SECURITY MESH - REFER ARCH. DWG 207944 FOR DETAILS.
C: VERMIN MESH - REFER ARCH. DWG 207944 FOR DETAILS.
D: MECHANICAL LOUVRE - REFER ARCH. DWG 207944 FOR DETAILS.
E: FIRE DAMPER - REFER TO MECH. DWGS. FOR DETAILS.
F: BLANKING PANEL - REFER ARCH. DWG 207944 FOR DETAILS

DOOR NUMBERS:

- LEVEL NO.
DOOR NO.

REFER TO DOOR SCHEDULE DWG 207948 FOR DETAILS

WINDOW NUMBERS:

- LEVEL NO.
WINDOW NO.

REFER TO DWG 207946 FOR DETAILS

LEGEND:

- B PAINTED BOLLARD-150Ø, 1.5m HIGH (TO APPROVED SHOP DWGS)
BS BLIND SUMP
EX EXHAUST
FFL FINISHED FLOOR LEVEL
FH FIRE HYDRANT
FW FLOOR WASTE
H HYDRAULIC
LO1 LIFT No.01
PB TRANSFORMER PULLING BLOCK
RA RETURN AIR
R01 RAMP No.01
RW0 RAINWATER OUTLET
SA SUPPLY AIR
SC STEEL COLUMN
FS01 STAIR No.01
SFL STRUCTURAL FLOOR LEVEL
SW STORMWATER
SWO STORMWATER OUTLET DRAIN
TWL TOP OF WALL LEVEL
WPM1 WATERPROOF MEMBRANE TYPE

CAD DRAWING	
DO NOT MANUALLY AMEND	
AMENDMENTS	
1	A
2	B
3	C
4	D
5	E
6	F
7	G
8	H
9	I
10	J
11	K
12	L

Kann Finch Group
Architecture
Facility Planning
Interior Design
Urban Planning

Kann Finch Pty Limited A.C.N. 002 170 747
50 Carrington Street, Sydney NSW Australia Tel 02 9299 4111 Fax 02 9299 1481
Nominated Architect: T. De Waal NSW ARB Reg No 4940

energy2U Alliance

EnergyAustralia
DESIGN AND ENGINEERING BRANCH
24 CAMPBELL ST SYDNEY, NSW 2000

SCALE	AS SHOWN
DESIGNED	-
DRAWN	BR
CHECKED	WF
APPROVED	SD
DATE	19.10.09
PRJTRK No.	-
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ENERGY2U ALLIANCE NORTH SYDNEY SUBSTATION ARCHITECTURAL GENERAL ARRANGEMENT ROOF LEVEL			
DRAWING No	207917	SHEET	1
AMD	0	SIZE	A1