STATEMENT OF ENVIRONMENTAL EFFECTS

ACCOMPANYING A DEVELOPMENT APPLICATION

Network Support Sub-station development

Unit 2, 15 Huntsmore Road, Minto – Lot 238, DP260481
MINTO, NSW 2566

October 2013

FOR SUBMISSION TO:

CAMPBELLTOWN CITY COUNCIL

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SKM

Contents

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1. Introduction

1.1. Overview

NovaPower proposes to develop a Network Support Sub-station (NSS) within an existing warehouse building located at 15 Huntsmore Road, Minto. The purpose of the NSS is to supply auxiliary power to the electricity grid during periods of peak load. The electricity is generated on-site by combusting gas obtained from the gas distribution network. The process is known as 'embedded generation' and can be a cost effective way of providing additional network capacity when this is required for very short peaks. NovaPower has contracted with Endeavour Energy to provide network capacity subject to receipt of the necessary development approvals.

Novapower has engaged Sinclair Knight Merz (SKM) to prepare this Statement of Environmental Effects (SEE) in support of a Development Application (DA) for the proposed NSS.

1.2. Proposal Identification

Name and location of proposed activity	Network Support Sub-station (NSS) Lot 238, DP260481 (Unit 2) 15 Huntsmore Road, Minto, NSW 2566
Applicant	NovaPower
Council Area	Campbelltown City Council
Description of Proposal	Construction and operation of four (4) x 2 Megawatt(MW) gas generators housed within an existing industrial building. Includes four heat exchangers and two switching stations to the rear of the site. Generators would be connected to the Minto Zone Sub Station via underground cabling for peak electricity supply.

1.3. Purpose of this Statement

This SEE has been prepared by SKM on behalf of NovaPower. The purpose of this SEE is to describe the proposal, to document the likely impacts of the proposal on the environment and to detail management and mitigation measures to be implemented. This information would provide Campbelltown City Council with the relevant information necessary to assess and determine the subject application in accordance with the *Environmental Planning and Assessment Act* 1979 (EP&A Act) and the *Environmental Planning and Assessment Regulation* 2000. The proposed development would also require an approval under the Protection of the Environment Operations (POEO) Act and is integrated development. This SEE also provides information to satisfy that approval requirement.

2. Proposal Identification and Description

2.1. Proposal Identification

Location site details of proposed works	Network Support Sub-station (NSS) Lot 238, DP260481 (Unit 2) 15 Huntsmore Road, Minto, NSW 2566
Applicant	NovaPower
Council Area and Zoning	Campbelltown City Council
Source of funding	NovaPower / Energy Power Systems
Description of Proposal	Construction and operation of four (4) x 2 Megawatt(MW) gas generators housed within an existing industrial building. Includes four heat exchangers and two switching stations to the rear of the site. Generators would be connected to the Minto Zone Sub Station via underground cabling for peak electricity supply.

2.2. Location and Site Details

The Minto NSS is proposed to be located at No.15 Huntsmore Road, Minto within an industrial area adjacent to the main railway line (refer to **Figure 1**). The surrounding industrial area is characterised by large industrial complexes, many industrial buildings/warehouses, some industrial processing / manufacturing (e.g. glass manufacturing), frequent heavy truck movements, a busy 24/7 passenger and freight railway line and a large transport and logistics operation.

- Figure 1 Lot 238, DP260481 – Unit 2

Lot 238, DP260481 is a generally flat block approximately 6,800 m^2 in size and occupied by two industrial warehouse type units (Unit 1 to the north and Unit 2 to the south). The site subdivision was determined by Council in December 2012 (DA No. 530/2012/DA-S). The proposed development will involve modifications only to land of Unit 2 and direct surrounds. The site survey and plans are provided in **Section 9**.

2.3. Current Use

The existing warehouse (Unit 2) has a floor area of 1,085 m^2 and was previously used for the storage of copper wiring (**Photo 1**). The site is currently vacant.

The building comprises a pre-fabricated concrete tilt-up panel for the western wall, with a steel frame and steel cladding for the other walls and a concrete slab floor. Two roller doors are located on the eastern side of the building. PVC panels are present in the roof which act as skylights. The overall dimensions of the building are 22m wide by 50m long and 10.8m high (at the highest point, slightly pitched roof)..

- Photo 1 Inside Unit 2 (western wall on the right)

The yard in front of the unit is grassed, with established trees growing alongside the building (refer to **Photo 3**). A concrete pavement lies to the east of Unit 2 (the backyard), and is currently used for parking (approximately 6 marked spaces) and storage of materials. The land between the concrete pavement and the railway corridor is grassed (**Photo 4**). A drainage line is located on the RailCorp side, directly next to the fence (**Photo 5**).

Photo 2: Unit 1 on the left and Unit 2 on the right

Photo 3: Unit 1 in the foreground and Unit 2 in the background

(note panoramic lens will cause some distortion)

Photo 4: Unit 2 backyard

Photo 5: Drainage between rail corridor and Unit 2

Photo 6: View to east of Unit 2 car park: Shipping containers and factory can be seen in the background.

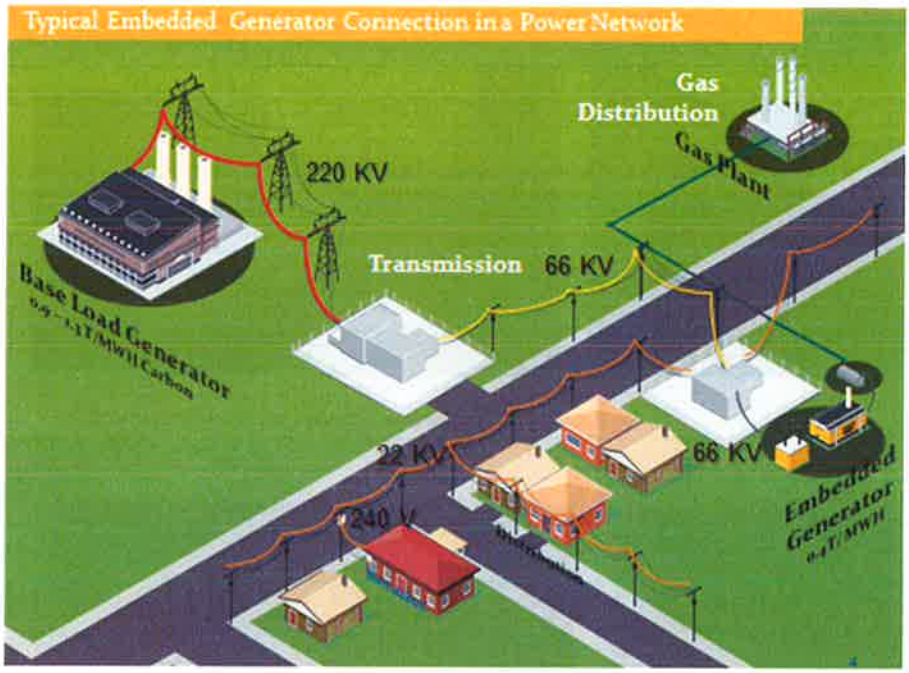
Photo 7: Power lines, train tracks and existing boundary to East of car park.

2.4. Proposed use

NovaPower proposes the provision of a Network Support Sub-station (NSS) to supply auxiliary power to the electricity grid during periods of peak load. This process is known as 'embedded generation' and can be a cost effective way of providing additional network capacity when this is required for very short peaks.

A conceptual diagram of a typical development and associated connections to electricity and gas infrastructure is provided in **Figure 2**.

- Figure 2 Typical embedded generator connection in a power network



It is proposed to locate the four gas fired engine generators and associated transformers and switch room inside the existing building, with heat exchangers and switching cubicles located to the rear of the plot. The development will obtain gas from the local gas distributor (Jemena) and return electricity to the existing grid (the Minto Zone substation operated by Endeavour Energy is located adjacent to the lot). **Figure 3** presents an overall layout of the building and the location of external structures. Further details on the elements of the development are provided below. The construction and operational phases of the development are described in **Sections 2.5** and **2.6.** Further details of proposed equipment are provided in **Appendix F.**

- Figure 3 Proposed site layout

The following elements are proposed on site. (See **Appendix F** and site plans in **Section 9** for further detail):

Equipment to be installed within the existing building:

- Generators
  - Four (4) x 2MW CAT G3520E gas engine generators giving a total generating capacity of 8 megawatts-equivalent (MW). The generators will each be housed in a self-contained 'generator canopy' dimensioned 13m long x 5m high x 3.8m wide. The generator cooling system uses CAT ELC Coolant (20 litres in volume) (this is contained within the canopy).
- Transformers
  - Four (4) x 500mVA electricity transformers will be housed within in fire proof enclosures at the rear (northern) end of the building.
- Switch room
  - A switch room measuring 4.5m wide by 13m long will be installed inside the building.
- Air circulation
  - Openings will be required to reduce heat build-up and remove exhaust fumes from engines during operation. In order to supplement the existing weather louvres on the western building facade, it is proposed that the glass entrance on southern end of building will also be replaced with weather louvres. See **Section 2.1** for further detail.

Equipment and structures to be installed within site boundary but external to the existing building:

- Heat exchangers
    - Four (4) x remote horizontal heat exchangers (radiator fans) to be located adjacent to the eastern façade of the building. The radiator dimensions (including support structures) are to be 6m long x 4m high x 2.4m wide. The structures will be placed on concrete footings and plinths in the existing car park / storage area. These fixtures can be decommissioned and removed at the end of their operation.
- Switching stations
    - Two (2) x Switching cubicles are to be provided (in the northeast corner of the car park. The station dimensions are 0.8m long x 1m high x 0.8m wide. A 2m x 2m footprint is allowed for each switching station on the plans.
- External connections
    - The development will connect to an existing 22kV line to the Endeavour Energy substation from the switching stations to the south of the site via underground cable. Connections are all located within the Unit 2 land.
    - Jemena will construct a gas pipeline to the development. A new gas meter will be located on the property.
    - Gas pressure into the site from Jemena's meter will be approximately 70 kPa, around the same pressure as other existing industrial infrastructure
- Security fencing
    - A new fence with double gate is proposed to improve security to the rear of the site and the equipment located within it. This would run from the northeast corner of the existing building to the railway boundary fence. It is proposed that it would be constructed of plastic coated chain mesh.

Capital construction costs for the proposed development are estimated at approximately $8 million.

2.1. Construction

The construction phase duration is expected to be approximately 3 months. This will be followed by two weeks of testing and commissioning. The construction activities are described briefly in the text below and accompanied by **Photos 8 to 15**.

Earth works will be undertaken to install the underground conduit and earth grid. This will involve cutting the existing slab located at the northern end of the car park, excavating trenches, installing conduits and coring for earth grid installation. The site will be reinstated to its former condition following completion of these works.

Concrete footings and plinths will be provided to support the external radiators and associated equipment. This will comprise four structural slab placements of approximately 0.032mD x 0.4mW x 0.4mL.

The western façade of the warehouse currently has two glass entrances (one at the north end and one at the south end. It is proposed that the existing glass entrance on southern end of building be removed and weather louvres similar to those existing be installed to provide additional exhaust capacity. The northern entrance will not be modified. The existing building will be supplemented with acoustic treatment as required to meet statutory noise requirements (refer to **Appendix B**). A fire rated switch room also will be provided within the building as described above.

Generators and associated items (gas line, radiators, cable tray and cabling) will be installed using cranes and forklifts as required. Switchgear (11KV) will be installed and assembled.

Installation of the externally located switching cabinets will be supported by excavation, slab and footing placement, cabinet installation. The site would be re-instated to its former condition.

Photo 8: Western elevation. Weather louvres seen at low level along the facade to be used for machine ventilation.

Photo 9: Western elevation. Existing glass entrance on southern end of building to be removed and weather louvres similar to those existing to be installed.

Photo 10: Western elevation. No changes proposed.

Photo 11: Southern Elevation. No changes proposed.

Photo 12: Northern elevation. Photo taken from common driveway on Huntsmore Road footpath. No changes proposed for this side of the building.

Photo 13: Northern elevation. Photo taken from common driveway at rear of property. No changes proposed for this side of the building. New fence to be erected from north eastern corner of building.

Photo 14: Eastern Elevation. Radiators to be installed in the foreground of this image, pumps to be installed under radiators, cooling pipework running from the building to the radiators.

Photo 15: Eastern Elevation. Switching Stations to be installed in the foreground of this image, new fence to be installed on the right.

2.2. Operation

The development would operate at times of 'peak demand', rather than as 'base load'. This would be typically during summer loading periods - late afternoon and evening periods (4pm to 11pm). However, the NSS may operate at any time of day due to the potential need for network support.

Predominantly the site will be un-manned with full automatic operation only requiring attendance in the event of an alarm or plant failure outside of scheduled monthly maintenance.

Maintenance activities will generally be oil and fluid changes and top ups, general running of equipment to ensure correct operation, and point to point testing to confirm control operation. All fluids required for maintenance will be brought onto site as required in the volumes required – typically around 20 litres of coolant and oil every 3 months. All used fluids from maintenance will be transported off site and disposed of correctly with disposal certificates obtained.

3. Statutory Position

3.1. Relevant Environmental Planning Instruments

The *Environmental Planning and Assessment Act 1979* (EP&A Act) provides for environmental planning instruments (EPIs) to be made at local, regional and state level. EPIs provide the basis for determining whether development requires consent and in turn determines what environmental assessment process is necessary. EPIs categorise development in one of three ways:

- Permissible without development consent;
- Permissible only with development consent; and
- Prohibited.

Where development consent is required, the development would be considered under Part 4 of the EP&A Act, with local council as the consent authority.

The following sections outline the permissibility of the proposed works and the relevant State and Local EPIs.

3.1.1. Project characterisation

The development has been categorised as an 'electricity generating works' in the same meaning as the dictionary provided in the Department of Planning and Infrastructure's Standard Planning Instrument. Electricity generating works means a building or place used for the purpose of making or generating electricity.

3.1.2. Permissibility

The development would be located entirely within the Campbelltown local government area (LGA) and the *Campbelltown (Urban Area) Local Environmental Plan 2002* (Campbelltown (Urban Area) LEP) would apply. The proposed site is located on land zoned 4(a) General Industry.

In this zoning the proposed development would be neither exempt nor prohibited under the Campbelltown (Urban Area) LEP. It is not an activity permissible without consent and hence would fall into the category of permissible with consent.

In addition, Section 34(1) of the *State Environmental Planning Policy (Infrastructure) 2007* (Infrastructure SEPP), indicates that development for the purpose of electricity generating works may be carried out by any person with consent on any land in a prescribed industrial zone (which includes the land zone General Industry).

The development is therefore considered as permissible with consent.

3.1.3. State Significant Development

Section 8(1)(a) of *State Environmental Planning Policy (State and Regional Development) 2011* (State and Regional Development SEPP) could potentially apply to this development, as it is not permissible without development consent under Part 4 of the *Environmental Planning and Assessment Act 1979*.

Schedules 1 and 2 of the State and Regional Development SEPP list developments that are considered to be State significant development. For State significant development the consent authority is generally the Minister for Planning though this can be delegated to the Planning Assessment Commission.

The proposed development is not considered to be State significant development as:

- It does not have a capital investment value of more than $30 million (clause 20(a), Schedule 1).
- It is not listed in Schedule 2 as an identified site.

3.1.4. Joint Regional Planning Panel

Schedule 4A of the *Environmental Planning and Assessment Act (1979)* classifies the development for which regional panels may be authorised to exercise consent authority functions of councils. The proposed development would fall under clause 6 of Schedule 4A as follows:

- Private infrastructure and community facilities over $5 million - electricity generating works

The development application therefore will need to be referred by Campbelltown Council to the Sydney West Joint Regional Planning Panel for review and determination.

3.1.5. Designated development

Part 1 of Schedule 3 of the *Environmental Planning and Assessment Regulation 2000* (EP&A Regulation) lists criteria that define projects as being designated development. Designated development requires the preparation of a comprehensive Environmental Impact Statement and prescribed public exhibition requirements. As per Clause 18(1)(c) of the EP&A Regulation, the proposed development would not be considered as designated development as:

- It does not have associated water storage facilities.
- It does not release any water from the generating station into a natural waterbody.
- It does not supply hydroelectric power.
- It does not supply more than 30 megawatts of electrical power from energy sources (the development will supply a maximum of 12 megawatts of electrical power).

3.1.6. Integrated development

Integrated development refers to development other than complying development or State significant development that requires development consent as well as one or more approvals listed in Section 91 of the EP&A Act. The development is considered to be integrated development as it would require an approval under the *Protection of the Environment Operations (POEO) Act 1997*.

Clause 17 of Schedule 1 of the POEO Act sets the schedule premise trigger for electricity generation as 3 megajoules of fuel per second for metropolitan electricity works (internal combustion engines). The proposed development, comprising 8MW and burning 23 megajoules of fuel per second would therefore be considered a scheduled premise.

Implications of this include:

- Requirement to seek approval from the Environment Protection Authority (EPA) as part of the development application process. Unanimous approval is required from Council and the EPA for the development to proceed.
- Triggering the advertised development process as it also falls under the nominated integrated development category (further discussed in Section 3.1.7).
- Requirement to apply for an environmental protection licence (EPL). The EPL is likely to contain conditions with respect to emission standards and possible requirements for monitoring and reporting of pollution. The EPL will also have licence fees attached and in the case of NO_x, load based licence (LBL) fees will apply, on the basis of the mass load of NO_x emitted per annum.

Discussions have been held with the EPA to discuss the method and approach to the air quality and noise assessments. Technical reports have been prepared and are included in this SEE.

3.1.7. Advertised development

Advertised development refers to development that is not designated development or State significant development and is identified as advertised development under clause 5(1)(b) of the EP&A Regulation, any environmental planning instrument or development control plan.

This development is considered to be advertised development, as it fulfils the criteria of:

- Requiring an approval under a provision of the POEO Act (refer to Section 3.1.6).

3.1.8. State Environmental Planning Policy (Infrastructure) 2008

The Infrastructure SEPP 2008 refers to guidelines which must be taken into account where development is proposed in, or adjacent to, specific roads and railway corridors under clauses 85, 86, 87, 102 and 103. This is addressed by the *Development near rail corridors and busy roads – Interim guideline (NSW)* (see below).

For certain development near rail corridors, the Infrastructure SEPP also prescribes a requirement for concurrence from the rail authority, including specific matters that it must take into account before deciding whether to provide concurrence. According to Clause 86 this includes any development (other than development to which clause 88 of the Infrastructure SEPP applies) that involves the penetration of the ground to a depth of at least 2m below ground level (existing) on land that is in or within 25m of a rail corridor. The proposed works do not trigger the requirement.

3.1.8.1. Development near rail corridors and busy roads – Interim guideline (NSW Guidelines)

The potential impact of adjacent development on roads and railways are addressed in Sections 5 (Safety and Design Issues) and 6 (Excavation, earthworks and other construction related issues) of the guidelines.

With respect to electrolysis, Section 5.2 of the guideline would be relevant due to the proximity of electrical generation and transmission to the rail corridor. The guideline provides typical measures to prevent or minimise the effects of 'stray current' electrolysis from electrified railway including:

- *All low voltage supplies using isolating transformers, local electricity distributor neutral and earthing systems should not enter the rail corridor.*

As per the letter provided in **Appendix F**, EPSA will meet the above requirements through directly separating the earthing system by more than 20m from the rail corridor. The NSS Earthing system will not be bonded to the rail earthing system, and no bond will be put onto the NSS Installation fencing adjoining the railway. It is stated that the NSS Earthing System will therefore not interfere or intermix with the Rail Corridor Earthing.

Section 5.8 of the Guideline would also be relevant with respect to lighting, external finishes and design requirements. The Guideline recommends the use of non-reflective walls, and additional landscaping and screenings as additional line-of-sight measures. It also requires that all outdoor lighting should adhere to AS 4282-1997 Control of Obtrusive Effects of Outdoor Lighting to avoid temporary blinding effects.

3.1.9. State Environmental Planning Policy No 33 - Hazardous and Offensive Development

State Environmental Planning Policy No.33 Hazardous and Offensive Development (SEPP 33) requires the preparation of a Preliminary Hazard Analysis (PHA) where a development may be potentially hazardous. In addition, categories of industry within Schedule 3 of the *Environmental Planning and Assessment Regulation 2000* may present the potential for significant environmental impact, As per the guidelines, consent authorities may need to seek further information from applicants in order to form a view as to whether or not SEPP 33 would apply.

Preliminary discussions with the Major Hazards Unit of the Department of Planning and Infrastructure have indicated that the development is unlikely to be a potentially hazardous or offensive industry and therefore would not trigger the need for a PHA. However the Department also indicated that it would be prudent to address any potential hazards and risks in the Development Application and that the ultimate decision on whether or not a PHA is required would ultimately reside with the consent authority - in this case Campbelltown City Council. Further assessment of potential hazards and risks has been undertaken at the DA stage and it is not anticipated to trigger SEPP 33.

3.1.10. Greater Metropolitan Regional Environmental Plan No 2 - Georges River Catchment

The Greater Metropolitan Regional Environmental Plan No 2 – Georges River Catchment may apply to the development, as it is located within an industrial zone within the Campbelltown local government area. Should this plan be applicable, the potential cumulative impact of any industrial uses on water quality within the Catchment would need to be considered as part of the Development Application, as detailed in clause 9 of the plan. The proposed development is not predicted to have an impact on water quality.

3.2. Other state legislation

Other major state legislation that can often apply to industrial type development is listed below – none of which are expected to apply to this proposal.

- *Fisheries Management Act 1994* – The development does not involve aquaculture (s144) or dredging/reclamation (s201) or affect marine vegetation (s205) or the passage of fish (s219).
- *Heritage Act 1977* (s58) – No heritage items have been recorded within the project site (of local or State significance).
- *National Parks and Wildlife Act 1974* – A basic search of the Aboriginal Heritage Information Management System was undertaken on 12 March 2013 for the proposed site (and a 200 metre buffer). The search identified no Aboriginal sites or places recorded in or near Lot 238 DP260481.
- *Roads Act 1993* – The development would not affect a public road.
- *Rural Fires Act 1997* – The development is not located on bush fire prone.
- *Water Management Act 2000* – The development would not require a water use approval (s89) or a water management work approval (s90). In addition, the development would not require an aquifer interference approval. The development is located more than 200 metres from a watercourse and therefore would not require a controlled activity approval (s90).

3.3. Interim Nitrogen Oxide Policy for Cogeneration in Sydney and the Illawarra

The proposed Minto power station will use internal combustion engines (ICE) for electricity generation. These engines are commonly used in cogeneration and trigeneration applications and while it is not proposed to use the engines in these modes at Minto, the EPA have indicated that their *Interim Nitrogen Oxide Policy for Cogeneration in Sydney and the Illawarra, 2011* (EPA, 2011) would apply to the Minto NSS. One of the concepts introduced in the interim policy is best available techniques (BAT) emission performance.

A NO_X emission standard of 250 mg/m^3 applies to all natural gas fired reciprocating internal combustion engines with a capacity to burn less than 7 MJ/s in the Sydney and Wollongong Metropolitan Area and Wollondilly Local Government Area. Noting that this project is greater than 7 MJ/s but is not a cogeneration/trigeneration plant and will operate at a reduced capacity factor compared with a typical cogeneration/trigeneration plant, a project specific BAT assessment has been undertaken to assess the cost effectiveness of NO_X emission controls. The BAT assessment report is included within **Appendix A**.

Section 3.1.6 provides a discussion on the application of the POEO Act to the project with respect to emissions.

Further detail on air quality regulatory requirements relevant to the project has been provided in **Appendix A**.

4. Matters for Consideration

Section 79C(1) of the EP&A Act details those factors that must be taken into account when consideration is being given to the likely impact of an activity on the environment. Those factors have been addressed and summarised in **Table 4-1**.

Table 4-1 Matters for Consideration under the EP&A Act

Factor (NSW Legislation)	Comments
79C(1) Matters for consideration – general	
In determining a development application, a consent authority is to take into consideration such of the following matters that are of relevance to the development, the subject of the development application:	
(a) the provisions of	
(i) any environmental planning instrument	The requirements of environmental planning instruments are addressed in **Sections 3 and 4** of this SEE.
(ii) any proposed instrument that is or has been the subject of public consultation under this Act and that has been notified to the consent authority (unless the Director-General has notified the consent authority that the making of the proposed instrument has been deferred indefinitely or has not been approved),	There are no such proposed instruments.
(iii) any development control plan, and	The proposed development has been considered against Campbelltown Development Control Plan 2012.
(iiia) any planning agreement that has been entered into under section 93F, or any draft planning agreement that a developer has offered to enter into under section 93F, and	No such agreements exist.
(iv) the regulations (to the extent that they prescribe matters for the purposes of this paragraph), and.	No regulations apply to the land to which the development application relates.
(v) any coastal zone management plan (within the meaning of the Coastal Protection Act 1979), that apply to the land to which the development application relates,	The site is not located within a coastal zone.
(b) the likely impacts of that development, including environmental impacts on both the natural and built environments, and social and economic impacts in the locality,	Please refer to **Table 6-2** for potential impacts of the proposed development.
(c) the suitability of the site for the development,	The proposed site is currently used as a storage warehouse in a site zoned 4(a) General Industry. The site is located adjacent to an existing substation (owned by Endeavor Energy). The proposed development is considered to be in keeping with the surrounding locality.
(d) any submissions made in accordance with this Act or the regulations,	No submissions have been received, but the consent authority may consider submissions as part of the assessment of the application.
(e) the public interest. Note. See section 75P (2) (a) for circumstances in which determination of development application to be generally consistent with approved concept plan for a project under Part 3A.	This development is considered to be in keeping with the public interest and will not create significant impacts.

Factor (NSW Legislation)	Comments
Note. If a BioBanking statement has been issued in respect of a development under Part 7A of the *Threatened Species Conservation Act 1995*, the consent authority is not required to take into consideration the likely impacts of the development on biodiversity values.	No BioBanking statement has been issued.

5. Compliance with Planning Policy

5.1. Campbelltown City Council Local Environment Plan (LEP)

Campbelltown (Urban Area) LEP 2002 applies to the urban areas within Campbelltown. The plan covers all of the residential areas, industrial areas and town centre areas within the city, and some environmental protection areas.

The objectives of the zone (4(a) General Industry) provided in the Campbelltown LEP (2002) and the compliance of the works with this zone are provided in **Table 5-1.**

Table 5-1 Objectives of the Campbelltown LEP (2002): 4(a) General Industrial zone

Objective	Compliance	Comments
(a) to encourage activities that will contribute to the economic and employment growth of the City of Campbelltown.	Y	The purpose of embedded generation is to feed electricity into the existing electricity infrastructure grid (the National Electricity Market) during times of peak use, thus supporting activity growth in the local area. The construction phase activities of the project will support local employment opportunities. During the operation phase the site will require periodic maintenance.
(b) to allow a range of industrial, storage and allied activities, together with ancillary uses, the opportunity to locate within the City of Campbelltown.	Y	The proposal is for an industrial activity and is in keeping with the area's land use type (4(a) General Industry).
(c) to encourage a high quality standard of development which is aesthetically pleasing, functional and relates sympathetically to nearby and adjoining development.	Y	The proposed works will have a minor long term aesthetic impact as these are predominantly within the existing structure. Existing vegetation will be retained as far as possible. External structures (radiators) are non-permanent structures which can be removed upon decommissioning. A minor alteration is proposed to the western elevation (addition of weather louvre). This is in keeping with the industrial nature of the site. Environmental management procedures including for aesthetic impacts would be put into place during the construction phase of the works.
(d) to protect the viability of the commercial centres in the City of Campbelltown by limiting commercial activities to those associated with permitted industrial, storage and allied development.	Y	The commercial activity is limited to electrical generation and associated operation and maintenance; which complies with this requirement.
(e) to ensure development will not be carried out unless the consent authority is satisfied that the processes to be carried on, the transportation to be involved, or the plant, machinery or materials to be used, do not interfere unreasonably with the amenity of the area.	Y	Air quality and noise assessments have been prepared for the site and have indicated that these will not interfere unreasonably with the amenity of the area. Transport will be generally limited to the construction phase, with maintenance visits during operation.

5.2. Campbelltown City Council Development Control Plan (DCP)

The *Campbelltown (Sustainable Cities) Development Control Plan 2012* is also relevant to the proposed works as it outlines the development controls specific to the site. The following sections of the DCP apply to the proposed development:

- Part 2 Requirements Applying to all Types of Development
- Part 7 Industrial Development

The relevant controls and the compliance of the works in this zone are provided in **Tables 5-2 and 5-3**.

Table 5-2 Development Controls under the Campbelltown DCP – Part 2 Requirements Applying to all Types of Development

Development Control	Objectives	Compliance	Comments
2.2 Site Analysis	• Identify the constraints and opportunities for the development of the site. • Provide an understanding of how the development relates to the site. • Identify the capability and suitability of the site for development.	Yes	The proposed development will involve additions to an existing building. A site analysis is provided with the development application including a site survey showing site contours, existing structures, trees, linkages and easements. Existing and proposed site plans and elevations are also provided. The site analysis and accompanying studies indicate that that the development is appropriate to the site.
2.3 Views and Vistas	• Protect the scenic value of Campbelltown's natural and built environment. • Protect significant views and vistas from and to public places.	Not applicable	The proposed development is in keeping with the area's land use type (4(a) General Industry).
2.4 Sustainable Building Design	• Encourage building design and siting to reduce energy consumption. • Encourage the use of solar power in building design. • Encourage the use of water recycling. • Ensure that residential buildings meet the requirements of BASIX.	Yes / Not applicable	The proposed development reuses an existing building which is an effective use of space. The existing skylights can provide daylight and the majority of the space is unconditioned (apart from the small office). It is not expected to consume a significant volume of water therefore water recycling is not proposed. A ventilation system will be installed to exhaust heat build-up during generator operation.

Development Control	Objectives	Compliance	Comments
2.5 Landscaping	• Maintain and rehabilitate the natural environment and assist in the conservation of Campbelltown's landscape character. • Provide landscaping that compliments the scale of development. • Enhance the appearance of development.	Yes / Not applicable	The existing appearance of the lot will be maintained. Some minor earthworks are proposed for service trenches. External radiators are proposed to the rear of the building. The scale and aesthetics of these temporary structures are in keeping with the site and its surroundings.
2.6 Weed management	• Ensure that weeds within Campbelltown LGA are managed in an ecologically sustainable manner.	Yes	The site is not observed to be occupied by noxious weeds. The development does not involve the construction of a building in non-urban land. Weed control shall be included within the construction environmental management plan.
2.7 Erosion and sediment control	• Ensure that any potential loss of soil from a site and/or into the stormwater system is prevented by means of: • appropriate planning prior to the start of construction works; and • the effective interception, diversion and control of stormwater within the site.	Yes	No significant earthworks are proposed. Minor works are required for the provision of underground conduits and earth grid installation. Spoil will be stored on site and reused for reinstatement of disturbed areas.
2.8 Cut, fill and floor levels.	• Minimise the extent of earthworks associated with development. • Ensure that development appropriately responds to site conditions with proper consideration given to land capability and privacy/amenity of adjoining properties. • Ensure that excavation is minimised and properly retained. • Ensure that adequate freeboard is provided to protect development from overland flows and flooding.	Yes	No cut and fill will occur as the proposed development will not involve the construction of a building. Campbelltown City Council has advised that the property is affected by flooding from a 1% Annual Exceedance Probability (AEP) flood due to overland flow from the local catchment traversing the property. The site complies with the recommended fill and floor level requirements. See **Appendix D** and **Table 6-2** for further details.
2.9 Demolition	• Ensure that demolition is carried out in accordance with the relevant legislation and guidelines. • Ensure that demolition does not have an adverse impact on the environment, • buildings, footpaths and roadways or upon the safety, health and well being of the community.	Not applicable	The development will not involve any demolition.

Development Control	Objectives	Compliance	Comments
2.10 Water cycle and demand management	• Ensure that water cycle management appropriately responds to site and water catchment conditions. • Ensure that Water Sensitive Urban Design (WSUD) principles are incorporated into development. • Retain and reinstate (where appropriate) the natural water course into stormwater management measures. • Ensure that the development is protected from mainstream, local catchment and overland flow aspects of flooding.	Not Applicable	The site will be served by the existing drainage arrangements and will not result in additional flows.
2.11 Indigenous and non-Indigenous heritage	• Ensure that new development takes appropriate account of the significance of heritage items, heritage conservation areas, relics and their settings. • Respect the City's Indigenous and non-Indigenous heritage resource. • Promote the protection or conservation of those resources wherever possible. • To conserve the environmental and cultural heritage of the City in accordance with the principles contained within the Burra Charter.	Not applicable	No heritage items (of local or State significance) have been recorded within the project site.
2.12 Retaining walls	• Ensure that retaining walls visible to a public place are compatible with the character and scale of development within the streetscape and other public domain areas in the locality.	Not applicable	Existing retaining wall will not be affected by the development.
2.13 Security	• Ensure that development incorporates security features in accordance with the principles of Crime Prevention Through Environmental Design (CPTED) to: • minimise opportunities for crime; and • enhance security.	Yes	A new fence with double gate is proposed to improve security to the rear of the site and the equipment located within it. All outdoor lighting shall adhere to AS 4282-1997 Control of Obtrusive Effects of Outdoor Lighting.
2.14 Risk management	• Ensure that hazards of the site are addressed so as to minimise the risk of: • injury to persons/property; • damage to the environment;	Yes	The development does not involve land identified as bushfire prone land however it is located near Pembroke Park which is deemed as being at risk. Trees and vegetation should be managed appropriately to reduce risk. The area is light industrial

Development Control	Objectives	Compliance	Comments
	and • financial loss.		and a preliminary search has not identified any potentially significant contaminant sources in the vicinity. Storage of liquids would be a maximum of 20 litres per generator; well below threshold levels. There is no gas storage on site. In this regard no Preliminary Hazard Analysis is required

Table 5-3 Development Controls under the Campbelltown DCP – Part 7 Industrial Development

Development Control	Compliance	Comments
7.3 Building form and character	Not applicable	No building works. The existing building form and setbacks would remain the same.
7.4 Car parking and access	Yes	The site is accessed via a shared carriageway from Huntsmore Road. The DCP requires 2 spaces for development, plus one space per 35 sqm of office areas, lunch rooms and associated office storage areas; plus one space per 100 sqm of other gross floor area up to 2000 sqm. Under the existing arrangements this would equate to 13 car spaces; 16 are currently provided. During the operation of the site some of these car parking spaces may have no or limited access due to the positioning of the heat exchangers. As the site does not require regular employee parking apart from periodic maintenance it is proposed that the development complies with the requirements. The structures can be removed and the car parking spaces fully accessed upon decommissioning of the generators.
7.5 Landscaping	Not applicable	The landscaping separating the warehouse from Huntsmore Road consists of grassland and 8 gum trees. The grass and trees will be retained as existing. The existing grassland will also be retained to the rear of the site between the car parking area and boundary to the railway line. Fencing with screening is proposed to the heat exchangers to the rear of the site. There would be no net increase in the impervious surface area.
7.6 Outdoor storage areas	Not applicable	No outdoor storage areas are proposed.
7.7 Industrial Waste management	Yes	Operational waste volumes are expected to be less than 30 litres per week. Waste will be stored in 2 wheelie bins within the existing building. The bins will be emptied by the Site Superintendent at a local waste and recycling facility as required (anticipated frequency is once per month).
7.8 Environmental management	Yes	**Liquid Storage:** Small amounts of service fluids (e.g. CAT ELC Coolant (20L) and CAT Engine Oil (20L) will be available within locked storage cabinets within each canopy for emergency top ups. Each cabinet within the canopies will be lockable with signage placed and a register containing safety data sheets. Spill Kits will be provided on site and located within each canopy and switch room. **Air Quality:** An air quality assessment has been conducted in accordance with POEO 1997. No significant impacts are anticipated. See **Section 6** for further details. **Noise:** An environmental noise assessment has been performed against noise limits determined in accordance with the methodology presented in the NSW EPA Industrial Noise Policy. The assessment indicates that with minor acoustic treatment, the noise limits at receptor sites will be met. **Stormwater and drainage:** Liquid waste will be collected and disposed of off - site.

Development Control	Compliance	Comments
		Refer to **Section 6.2** for a summary of the proposed safeguards relating to these environmental management issues.
7.9 Residential Interface	Yes	The nearest residential location is approximately 670m (in a straight line) from the proposed NSS site. The development will not have adverse impacts on the amenity of residential neighbourhoods from traffic, loading, light spill etc. A noise assessment has been undertaken for the NSS operation and has predicted that the activities will fall within the relevant guidelines for acceptable noise levels at residential premises during day, evening and night time.
7.10 Multi Unit Complexes	Not Applicable	The site contains one unit of over 400 sqm LFA.
7.11 Subdivision	Not Applicable	The site was subdivided in December 2012 (DA No. 530/2012/DA-S).

6. Assessment of Environmental Impacts

6.1. Description of the Affected Environment

Table 6-1 describes the environment at and surrounding the site of the proposed works.

- Table 6-1 Description of the surrounding environment

Location	Description
The site of the proposed works.	The proposed works would be located within an industrial area in Minto. The site contains a single storey industrial building which is currently being used as a storage warehouse. The yard in front of the unit is grassed, with established trees growing alongside the building. A concrete pavement lies to the east (the backyard), and is currently used for parking (approximately 6 marked spaces) and storage of materials. The land between the concrete pavement and the railway corridor is grassed.
Surroundings	To the north, west and south of the site, the land comprises general industrial units and warehousing. The surrounding industrial area is characterised by large industrial complexes, many industrial buildings/warehouses, some industrial processing/manufacturing (e.g. glass manufacturing). To the east of the site is a freight railway line running NNW to SSE.

6.2. Assessment of Environmental Impacts

The potential environmental impacts of the proposed activity are assessed in **Table 6-2.**

- Table 6-2 Potential Environmental Impacts

Environmental Issue	Potential Impacts
Noise and vibration	**Location of receivers** The site is surrounded by general industrial units, warehousing and processing plant. The nearest residential location is approximately 670m (in a straight line) to the south west of proposed NSS site. The nearest industrial location is the adjoining property at 16 Huntsmore Road, approximately 12m to the north of the proposed NSS building. **Construction** The construction of the proposed facility would generate some noise from vehicles, equipment and workers. The construction activities may be audible by the adjacent commercial land uses, however would be limited in duration. **Operational** Noise limit criteria have been determined for industrial and residential receptors in accordance with the NSW EPA Industrial Noise Policy. Noise prediction modelling was performed (refer **Appendix B**) to determine the potential acoustic impact of the proposed NSS into the surrounding area against these criteria. The findings were as follows: • The nearest residential location is approximately 670m (in a straight line) from the proposed NSS site. The noise level due to the proposed NSS at this residential property is predicted to be 40 dBA, well below the noise limit criteria of 46 dBA. • The nearest industrial location is the adjoining property at 16 Huntsmore Road, approximately 12m to the north of the proposed NSS building. The noise level due to the proposed NSS at this industrial property is predicted to be 73 dBA with the existing building envelope and the heat exchangers operating in Delta mode. The prediction modelling also shows that with minor acoustic treatment this will reduce the noise level at the nearest industrial location to 70dBA. • From an acoustics impact perspective, it can be concluded that the proposed Network Support Substation is well suited for the proposed location, being surrounded by industrial land uses and having minimal noise impacts.
Traffic and accessibility	**Existing access** The site is accessed via a shared driveway with Unit 1 to Huntsmore Road. The road terminates in a cul-de-sac close to the site, allowing a left turn and manoeuvring as

Environmental Issue	Potential Impacts
	required. Huntsmore Road serves a number of industrial properties and connects to Airds Road which links to the wider road network including Campbelltown Road and Hume motorway. **Construction** Construction vehicles planned on site include: - Company utes (maximum of four) - Unloading facilities – 25t franner, 200t crane, forklift - Backhoe / excavator - Skid steer loader During construction, a limited number of truck movements in and out of the site would be required for the transport of large equipment such as the generators, heat exchangers and associated equipment, and for the excavator and other construction equipment. A crane is likely needed for the installation of the new equipment. These truck movements would be controlled using appropriate traffic management measures. **Operation** The site will generally be unmanned and therefore have minimal operational traffic and access requirements. Operational vehicles will be limited to monthly scheduled maintenance visits and access in the event of an alarm or plant failure. Larger vehicles may be required for delivery of replacement equipment but this is not envisaged. Access will be limited to the rear of the site following the installation of the security fence. A double gate will be incorporated and authority bi-lock supplied. Car parking and vehicle access will be limited due to addition of fence and external equipment. This can be reinstated upon decommissioning of the NSS.
Flora and fauna	**Construction** The works would not require the removal of any existing trees or any excavation within the root zone. No fauna habitat attributes are present at the project site, such as hollow bearing trees. **Operation** No significant effects are anticipated during operation.
Land use	The site is located within a light industrial area and is currently used as a storage warehouse. This land use would not change with the proposed works.
Groundwater	**Construction** Ground excavation will be limited to shallow trenching and is not anticipated to impact on groundwater. **Operation** No significant effects are anticipated during operation.
Water quality	Bow Canal is located about 600 metres west of the site and 5km from the Georges River. **Construction** Erosion and sediment control measures such as silt barriers etc would be installed to minimise potential impacts on water quality. These erosion control measures should be conducted in accordance with the RTA Code of Practice for Water Management (1999).. Ground excavation will be limited to shallow trenching and is not anticipated to impact on sedimentation or storm water. **Operation** CAT ELC coolant and engine oil (20L) will be present on site, these will be stored within each canopy and switch room). Safeguards will be in place to prevent spills (see Table 7.2).
Flooding	Campbelltown Council has advised that the property is affected by flooding from a 1% Annual Exceedance Probability (AEP) flood due to overland flow from the local catchment traversing the property. Minimum fill and floor levels have been provided for the site. Minimum fill and floor levels relevant to the Unit 2 land are 50.10m AHD and 50.40m AHD respectively. The floor level of Unit 2 is 50.92m AHD with a minimum 150mm fall to the adjoining ground level.
Air quality	**Construction**

Environmental Issue	Potential Impacts
	Potential air quality impact from the works at the site would be the generation of fugitive dust during the construction phase. Fugitive dust sources would include vehicle and plant movements, wind erosion from unsealed surfaces, stockpiles, and from excavation works. The nearest receivers being commercial properties, and freight rail corridor, are unlikely to experience adverse dust impacts associated with the works as the dust emissions are expected to be limited. **Operation** An air quality assessment (refer **Appendix A**) has been undertaken to quantify the potential air quality and greenhouse gas emissions that will arise from the proposed NSS. Air dispersion modelling was conducted to predict the potential impacts of the NSS against relevant air quality criteria (as stipulated in the Office of Environment and Heritage method Approved Methods for the Modelling and Assessment of Air Pollutants in NSW (DEC, 2005) and the NSW EPA's Level 1 Screening Procedure Tool for Estimating Ground-Level Ozone Impacts from Stationary Sources in the NSW Greater Metropolitan Region). The findings were as follows: • The estimated annual GHG emissions from the proposed operating regime is 5,124 tonnes of CO2-e per annum with an emission intensity of 0.498 t CO2e/kWh which is approximately 50 % of the NSW grid average intensity. This is below the relevant National Greenhouse and Energy Reporting Act (NGER) 2007 reporting thresholds. • Predicted nitrogen dioxide (NO2) results show that on a 1 hour basis and annual average basis the cumulative impact of the project when added to background NO2 levels are well below relevant air quality criteria: o Hourly basis: the predicted maximum incremental impact due to the NSS is 50 µg/m3, the maximum background level of 101 µg/m3, resulting in a maximum cumulative impact of 151 µg/m3. This is well below the criteria of 246 µg/m3. o Annual basis: the predicted incremental impact due to the NSS is 2 µg/m3, the background level is 22 µg/m3, resulting in a cumulative impact of 24 µg/m3. This is well below the criteria of 62 µg/m3. • Predicted levels of ozone (O3) from the screening level assessment shows maximum incremental impacts for both 1 hour and 4 hour O3 impacts being less than 0.2 ppb against the screening impact level (SIL) of 0.5 ppb and maximum allowable increase of 1 ppb as defined by the screening procedure. As such no detrimental project impacts on ambient O3 concentrations are anticipated and no further detailed assessment is considered necessary.
Visual amenity	The site is located within an area characterised by general industrial land use, road and rail infrastructure. During construction, the presence of equipment and disturbance of the ground would alter the visual amenity of the site. These changes would be short-term in nature and are unlikely to affect any sensitive visual receptors in the area. During operation, the site would be slightly altered in appearance. The key changes that would be visible would be the external equipment to the rear of the site. These would not be very visible from the road.
Aboriginal and Non-Aboriginal Heritage	A search of the OEH State heritage database was carried out on 14 October 2013 to obtain details of any Non-Aboriginal objects, places or other heritage values within one kilometre of the site. No items of local heritage significance were identified. A search of the OEH Aboriginal Heritage Information Management System (AHIMS) was carried out on 23 May 2013 to obtain details of any Aboriginal sites or places within one kilometre of the site. Three Aboriginal sites or places were recorded or declared on or within one kilometre of the site. State not affected because all land impacted has already been significantly disturbed from original condition.
Waste management	**Construction** Refer to Waste Plan (refer **Appendix C**). Waste generated during the construction phase is expected to be low volume (less than $10m^3$) and comprise concrete, plasterboard, metals, bricks, wiring and general waste. General waste is likely to include packaging waste, paper, aluminium cans, food wrapping, bottles and other waste generated by

Environmental Issue	Potential Impacts
	construction personnel. **Operation** It is estimated that less than 50 litres waste will be generated per week during operation. Two wheelie bins will be provided for general and recycling waste storage.
Soils/Contaminated land	The development will not result in significant ground disturbance. A search of the *Office of Environment and Heritage (OEH) Contaminated Land Record* was carried out on the 14 October 2013 to determine if there is contaminated land on or within one kilometre of the site registered under the Contaminated Land Management Act 1997. The search did not indicate any contaminated site registered in the locality. The site is considered to have low acid sulfate soils potential.
Hazards and Risks	Storage of liquids would be a maximum of 20 litres per generator well below threshold levels. Gas will be connected to the site at mains pressure. No Gas storage bottles will be stored on site. In this regard the development is unlikely to be a potentially hazardous or offensive industry and therefore would not trigger the need for a Preliminary Hazard Analysis.

6.3. Main Outcomes of Proposed Works

6.3.1. Summary of Beneficial outcomes

The main benefit of the provision of the NSS is to provide a cost effective way of providing additional network capacity to address peaks in demand. As such the NSS helps the network to continue to be reliable whilst loads build to a point where an additional transformer is required. The electricity generated will also have approximately half the carbon footprint of the grid capacity thanks to use of gas a fuel (as opposed to coal) and to reduced distribution losses.

6.3.2. Summary of Adverse Outcomes

The main adverse outcomes comprise temporary increased noise, air and traffic impacts during construction. It is anticipated that implementation of the proposed safeguards outlined in **Section 7.2** would adequately ameliorate these adverse impacts.

7. Implementation Stage

7.1. Management Process

The environmental management measures contained in this SEE and any arising from the Council's/JRPP's determination of the development application would be implemented to ensure that the environment is adequately protected and that adverse impacts are avoided or otherwise substantially ameliorated.

The construction contractor would be required to prepare a specific Construction Environmental Management Plan (CEMP) incorporating environmental mitigation measures for construction works. The CEMP would include:

- Details of environmental controls to be implemented including location and timing;
- Details of statutory requirements including those of any approvals and licences;
- Assignment of responsibility for implementation and monitoring of environmental controls;
- Reporting and emergency procedures;
- Contact details for all site personnel and agency contacts; and
- Corrective action requirements and verification.

7.2. Summary of Proposed Safeguards

Pre-construction and construction safeguards are presented in **Table 7-1**. The recommended safeguards address the potential impacts identified in **Section 6** of this document.

Table 7-1 Proposed safeguards

Potential Impacts	Proposed Safeguards
Pre-Construction	
General	• A Construction Environmental Management Plan (CEMP) would be prepared for the site by the construction contractor. The construction contractor would ensure that all workers are trained in the requirements of the CEMP.
Noise and vibration	• Proposed safeguards for noise and vibration and the hours of construction would be applied in accordance with the conditions of the approval for the development and the construction certificate.
Traffic and accessibility	• A site specific traffic control plan will be prepared prior to construction. • It is anticipated that there will be no significant impacts on road traffic
Soils/contaminated land	• Soil sampling will be conducted and soils classified prior to any offsite disposal • Erosion and sediment control measures such as silt barriers and other appropriate measures would be installed prior to any excavation works.
Water quality	• Erosion and sediment control measures such as silt barriers etc would be installed prior to ground disturbance.
Visual	• All work equipment and material would be contained within the designated boundaries of the work site or work compound. • Work sites would be maintained in an orderly manner, with materials, equipment, stockpiles and wastes kept within designated areas. The spread of stockpiles, waste and materials within the work site boundary would be minimised. • On completion of the works, all construction equipment, materials, and refuse relating to the works (including materials used in erosion and sediment control) would be removed from the work site and any other affected areas.
Construction	
General	• A Construction Environmental Management Plan (CEMP) would be prepared for the site and implemented by the Construction contractor.
Noise and vibration	• Proposed safeguards for noise and vibration and the hours of construction would be applied in accordance with the conditions of the approval for the

Potential Impacts	Proposed Safeguards
	development, the building permit and the construction certificate. • The proposed works would adhere to a CEMP which includes a Construction Noise and Vibration Management Plan (CNVMP). The CNVMP would include, as a minimum, all construction and vibration safeguards and mitigation measures identified in this SEE. Specific mitigation measures would be implemented by the construction contractor in accordance with the updated CNVMP. • Construction activities, particularly noisy activities, would be undertaken during daytime hours where practicable. • Construction plant would be switched off when idle. • Construction plant would be maintained to minimise noise emissions. • Plant or machinery would not be permitted to 'warm-up' before the nominated working hours. • Truck routes to and from the work site would be via major roads where possible. • Mitigation measures would be implemented, consistent with current Environment Protection Authority noise policies, including the NSW EPA Environmental Noise Control Manual (EPA, 1994). • Any noise complaints must be addressed in a timely manner and alternative work methods sought where possible, this may include respite periods. • Acoustic treatment would be provided to reduce noise breakout from the generators.
Flora and fauna	• No flora or fauna affected from this proposal
Traffic and accessibility	• A site specific traffic control plan will be prepared prior to construction. • It is anticipated that there will be no impacts on road traffic with the exception of intermittent traffic control required at the site's crossovers.
Soils	• Nuisance dust would be suppressed with water as required. • Erosion and sediment control measures such as silt barriers etc should be installed to minimise soil loss. • Erosion and sediment control measures would be regularly inspected and maintained. • Disturbed areas would be stabilised as soon as practicable.
Groundwater	• All equipment should be maintained to avoid loss of fuel and chemicals that could enter the groundwater. • Chemicals used during construction and used on site as a part of the operations of the current facility should be stored appropriately to avoid loss.
Water quality	• Erosion and sediment control measures would be regularly inspected and maintained. • Chemicals used during construction and used on site as a part of the operations of the current facility should be stored appropriately to avoid loss. • Disturbed areas would be stabilised as soon as practicable. • Erosion and sediment control measures such as silt barriers etc. would be installed to minimise potential impacts on water quality. These erosion control measures should be conducted in accordance with the RTA Code of Practice for Water Management (1999).
Air quality	• Erodible materials (including spoil, fill and removal waste) would be kept covered during transport to/from the construction site. • The area of soil surface disturbed would be kept to the minimum amount necessary to complete the works. Disturbed areas would be stabilised and restored as soon as practicable. • Work areas would be monitored for dust generation during working hours. • In the event of excessive dust generation, appropriate dust suppression measures would be implemented. These measures would include periodic spraying of exposed surfaces with non-potable water. • All work vehicles and machinery would be maintained and operated in a proper and efficient manner in accordance with the manufacturers' specifications and the requirements of the PEO Act and associated Clean Air Regulation.

Potential Impacts	Proposed Safeguards
	• Work vehicles/machinery would not be left running or idling when not in use
Visual	• On completion of the works, all construction equipment, materials, and refuse relating to the works (including materials used in erosion and sediment control) would be removed from the work site and any other affected areas.
Waste	• The construction contractor would be responsible for implementing a waste management plan that aims to reduce, reuse and recycle waste products. All non-recyclable products would be disposed of to a licensed landfill. • Waste streams would be sorted and separated on-site to maximise re-use and recycling potential. • All re-useable materials and wastes would be securely stored in labelled and appropriate receptacles, in a manner that prevents any pollutants from escaping to the environment, until their re-use or removal from site. • Any bins provided on-site for general garbage would be emptied when 80 per cent full, either by a licensed waste contractor or via delivery to a licensed waste disposal depot. • All recyclable waste generated by the works would be transported to an appropriate, licensed recycling facility. Records of this disposal would be kept for environmental auditing purposes. • All waste generated by the works that cannot be re-used or recycled would be disposed of at an appropriate, licensed waste facility. Records of this disposal would be kept for environmental auditing purposes. • Transport of wastes to recycling or waste disposal facilities would be undertaken by a licensed waste transporter. • At the completion of the construction phase, the work site would be left free of construction debris and other rubbish generated by the works. • Tank material and any contaminated soil would be removed and classified in accordance with the OEH's (formerly DECCW) Guidelines Assessment, Classification and Management of Liquid and Non-liquid Wastes.

8. Conclusion and Recommendations

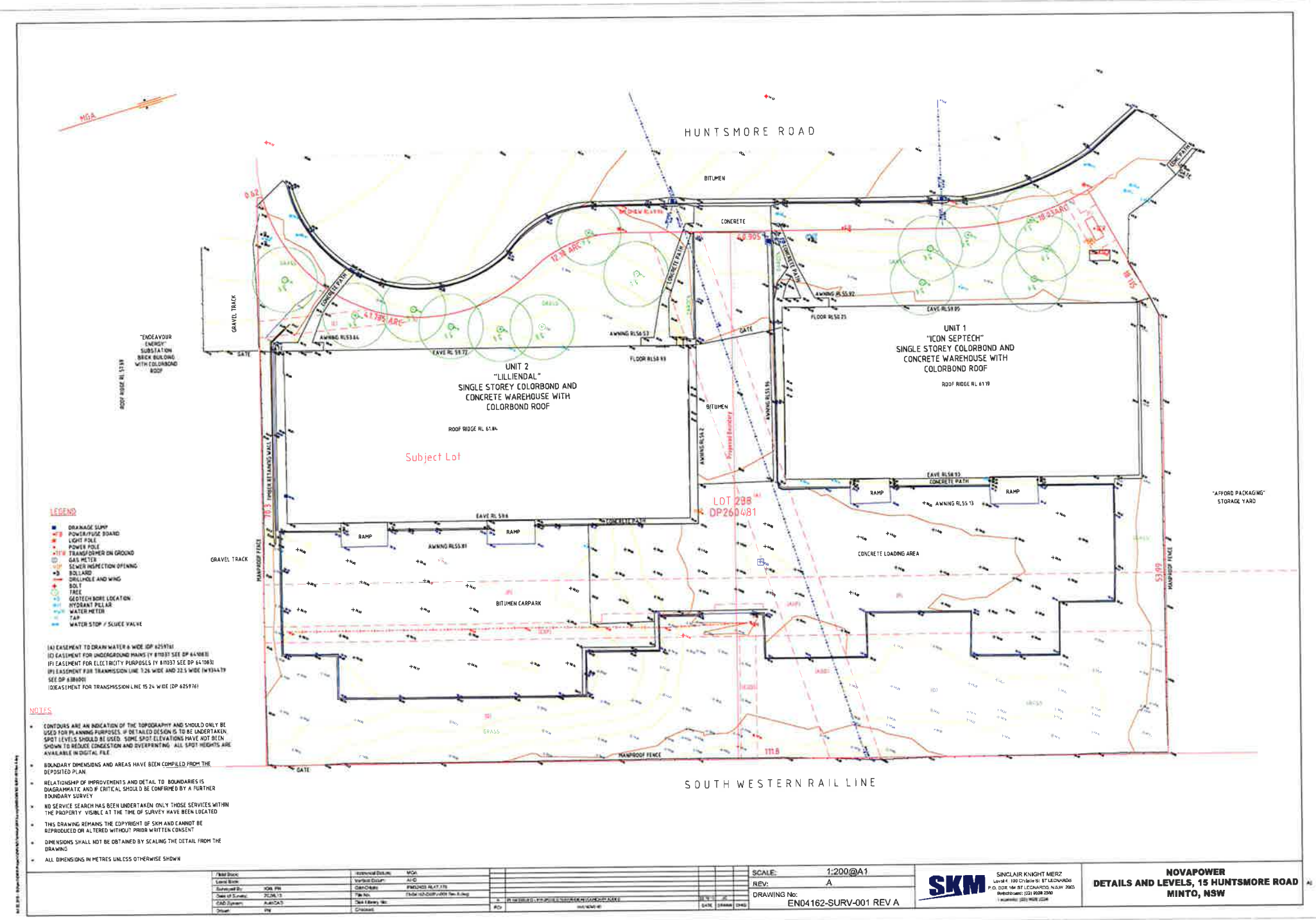
The proposed works would result in minor, short term impacts during construction such as noise, air and traffic impacts. However, these impacts would be minimised through the implementation of the recommended safeguards outlined in **Section 7.2**.

In the long term, the proposal would have a beneficial outcome in terms of providing support to the existing energy network.

9. Referenced Drawings

The following drawings are provided as part of the Development Application submission.

ENO40162_SERV-001 Site Survey Plan
Existing Site Layout
Proposed Site Layout Concept
Southern Elevation (Cross section)
Eastern Elevation A (Existing)
Eastern Elevation B (Proposed equipment in foreground)
Western Elevation (including proposed modifications)



NOTES:

- CONTOURS ARE AN INDICATION OF THE TOPOGRAPHY AND SHOULD ONLY BE USED FOR PLANNING PURPOSES. IF DETAILED DESIGN IS TO BE UNDERTAKEN, SPOT LEVELS SHOULD BE USED. SOME SPOT ELEVATIONS HAVE NOT BEEN SHOWN TO REDUCE CONGESTION AND OVERPRINTING. ALL SPOT HEIGHTS ARE AVAILABLE IN DIGITAL FILE.
- BOUNDARY DIMENSIONS AND AREAS HAVE BEEN COMPILED FROM THE DEPOSITED PLAN.
- RELATIONSHIP OF IMPROVEMENTS AND DETAIL TO BOUNDARIES IS DIAGRAMMATIC AND IF CRITICAL SHOULD BE CONFIRMED BY A FURTHER BOUNDARY SURVEY.
- NO SERVICE SEARCH HAS BEEN UNDERTAKEN ONLY THOSE SERVICES WITHIN THE PROPERTY VISIBLE AT THE TIME OF SURVEY HAVE BEEN LOCATED.
- THIS DRAWING REMAINS THE COPYRIGHT OF SKM AND CANNOT BE REPRODUCED OR ALTERED WITHOUT PRIOR WRITTEN CONSENT.
- DIMENSIONS SHALL NOT BE OBTAINED BY SCALING THE DETAIL FROM THE DRAWING.
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Field Book:	Horizontal Datum: MGA
Level Book:	Vertical Datum: AHD
Surveyed By:	Date Created:
Date of Survey:	File No:
CAD System:	Date Library Up:
Drawn:	Checked:

SCALE: 1:200@A1
REV: A
DRAWING No: EN04162-SURV-001 REV A

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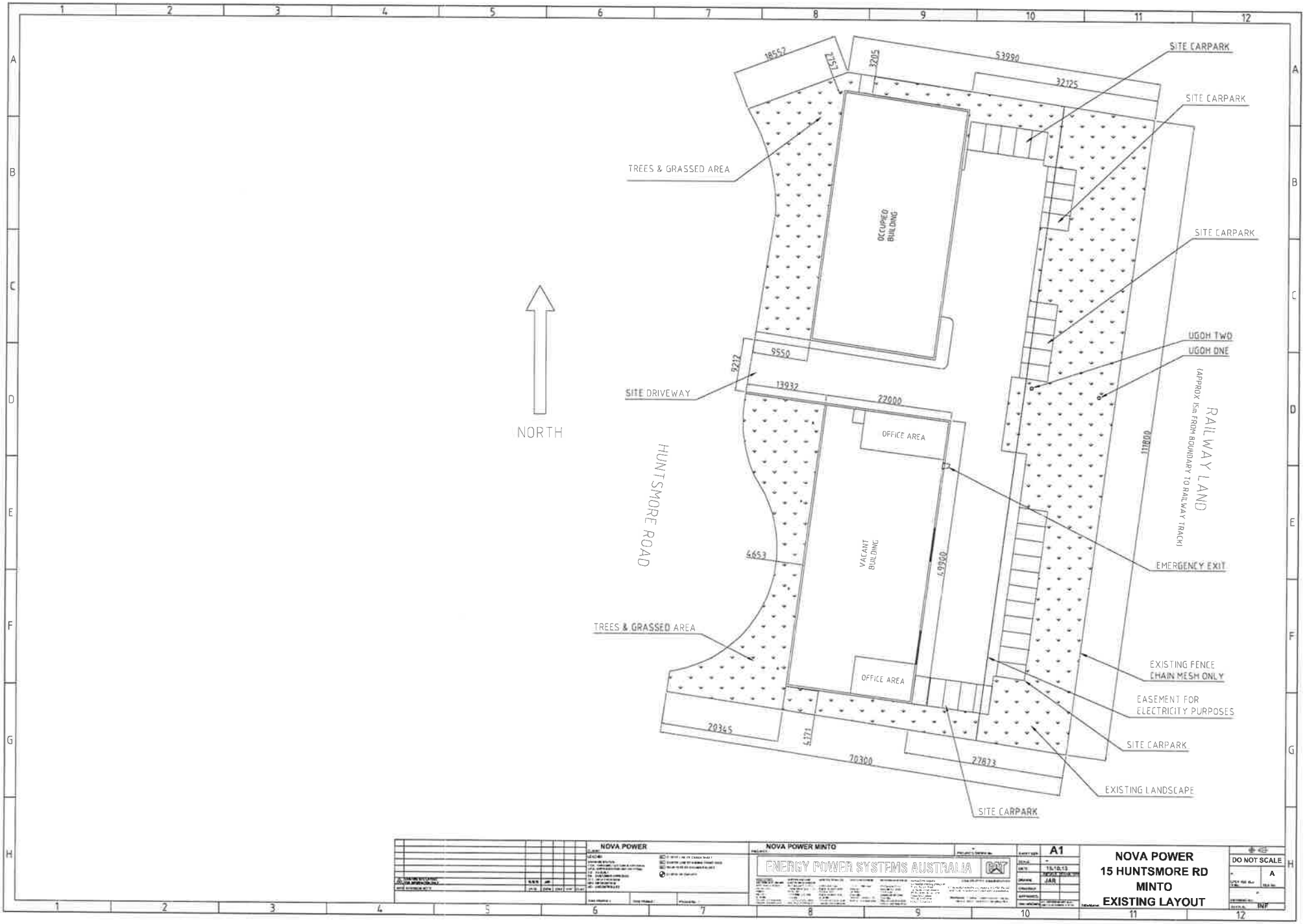
NOVAPOWER
DETAILS AND LEVELS, 15 HUNTSMORE ROAD
MINTO, NSW

A1


SITE CARPARK
SITE CARPARK
SITE CARPARK
TREES & GRASSED AREA
OCCUPIED BUILDING
UGOH TWO
UGOH ONE
SITE DRIVEWAY
NORTH
OFFICE AREA
HUNTSMORE ROAD
RAILWAY LAND
(APPROX 15m FROM BOUNDARY TO RAILWAY TRACK)
VACANT BUILDING
EMERGENCY EXIT
TREES & GRASSED AREA
EXISTING FENCE CHAIN MESH ONLY
OFFICE AREA
EASEMENT FOR ELECTRICITY PURPOSES
SITE CARPARK
EXISTING LANDSCAPE
SITE CARPARK
18557
53990
32125
3205
9550
13932
22000
111800
4653
69360
20345
70300
27873
NOVA POWER
NOVA POWER MINTO
ENERGY POWER SYSTEMS AUSTRALIA
A1
NOVA POWER
15 HUNTSMORE RD
MINTO
EXISTING LAYOUT
DO NOT SCALE

KEY:

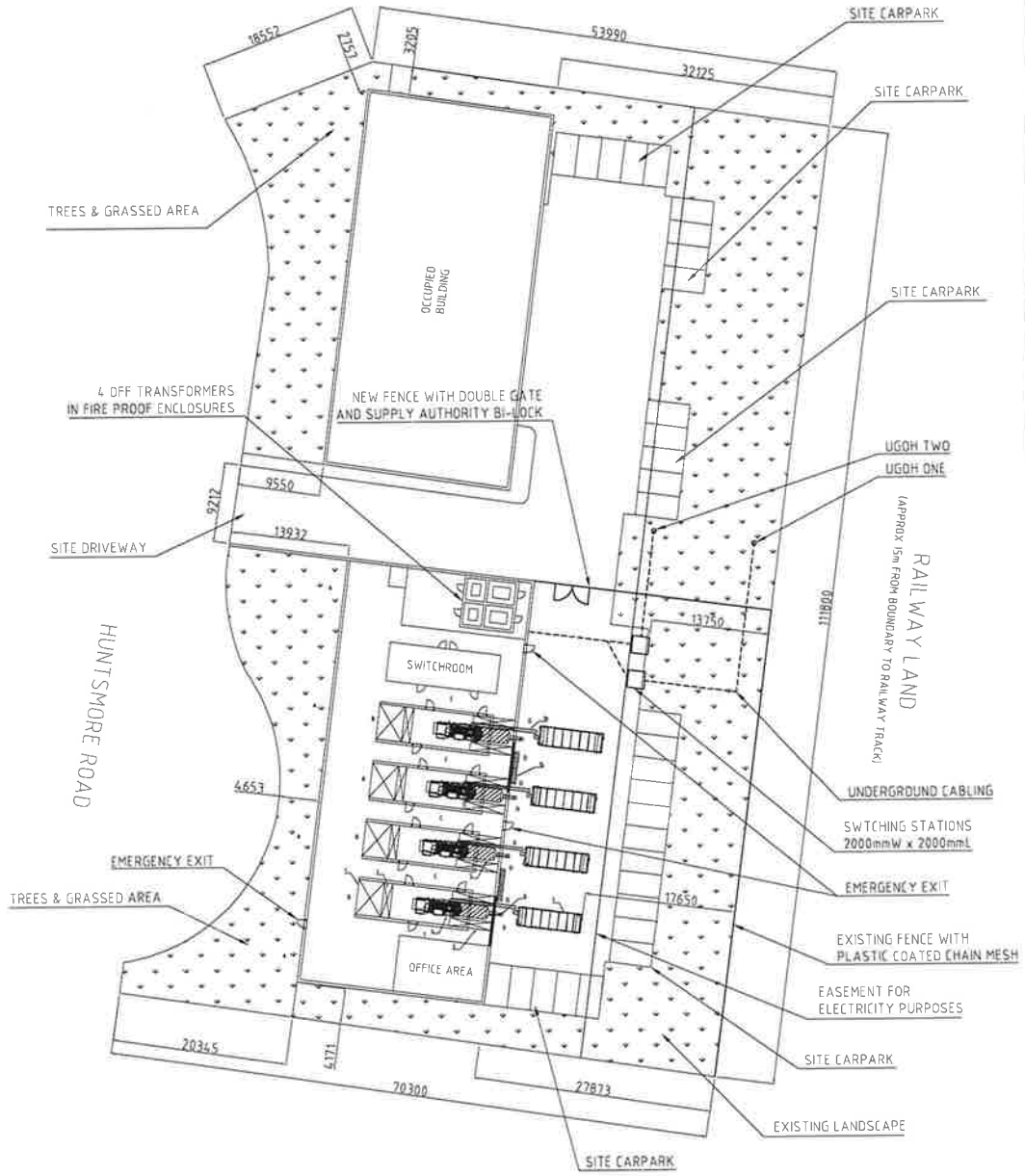
1 INTAKE ATTENUATOR
2 DISCHARGE ATTENUATOR
3 VENT FANS AND PLENUM
4 GENERATOR SET
5 MUFFLER
6 EXHAUST PIPE
7 RADIATOR
8 AUXILIARY GEB
9 WEATHER LOUVRE
10 DISCHARGE PLENUM (NOT USED IN THIS REVISION)
11 DOORWAY
12 VIBRATION ISOLATION MOUNTS
13 COMBUSTION AIR ATTENUATOR
14 COMBUSTION AIR DUCT
15 GAS TRAIN
16 COOLING PIPE WORK (CENTRELINES SHOWN 4 X DN150 PER SET)

ACOUSTIC HOT SPOTS

A 1m FROM OUTSIDE OF INLET LOUVRE
B 1m FROM OUTSIDE OF INLET ATTENUATOR
C 1m FROM OUTSIDE WALL OF GENERATOR CANOPIES
D 1m FROM OUTSIDE OF DISCHARGE ATTENUATOR

MISSING DETAILS

GAS PIPING
OIL TOP UP TANK AND PIPING
CRANK CASE VENTILATION SYSTEM
CABLE TRAY AND OTHER ELECTRICAL AUXILIARIES
SWITCHBOARDS, TRANSFORMERS, ETC



NOVA POWER

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ENERGY POWER SYSTEMS AUSTRALIA

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15.04.13

JAP

NOVA POWER MINTO PLAN LAYOUT

DO NOT SCALE

INF

KEY

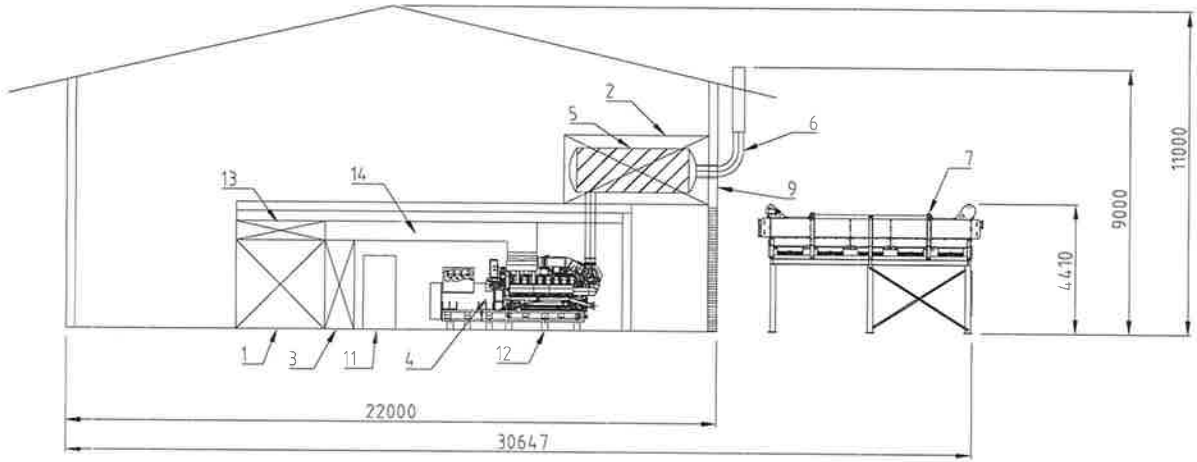
1 INTAKE ATTENUATOR
2 DISCHARGE ATTENUATOR
3 VENT FANS AND PLENUM
4 GENERATOR SET
5 MUFFLER
6 EXHAUST PIPE
7 RADIATOR
8 AUXILIARY GCB
9 WEATHER LOUVRE
10 DISCHARGE PLENUM (NOT UTILISED IN THIS REVISION)
11 DOORWAY
12 VIBRATION ISOLATION MOUNTS
13 COMBUSTION AIR ATTENUATOR
14 COMBUSTION AIR DUCT

ACOUSTIC HOT SPOTS

A 1m FROM OUTSIDE OF INLET LOUVRE
B 1m FROM OUTSIDE OF INLET ATTENUATOR
C 1m FROM OUTSIDE WALL OF GENERATOR CANOPIES
D 1m FROM OUTSIDE OF DISCHARGE ATTENUATOR

MISSING DETAILS

GAS TRAIN AND GAS PIPING
OIL TOP UP TANK AND PIPING
COOLING PIPEWORK
CRANK CASE VENTILATION SYSTEM
CABLE TRAY AND OTHER ELECTRICAL AUXILIARIES
SWITCHBOARDS, TRANSFORMERS, ETC



NOVA POWER

NOVA POWER MINTO

ENERGY POWER SYSTEMS AUSTRALIA

A1

08.10.2013

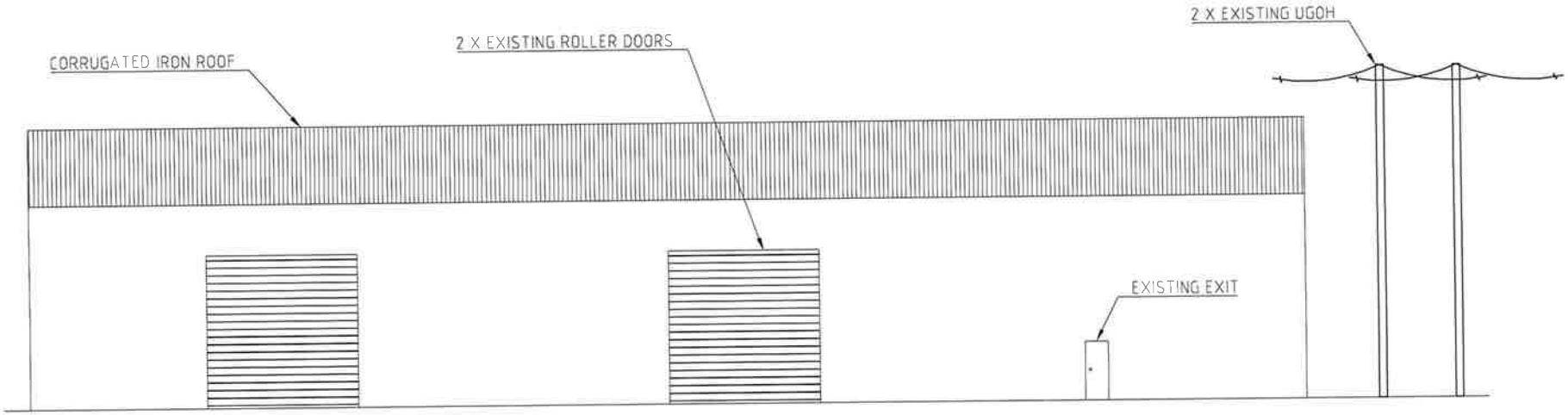
JAR

NOVA POWER
MINTO
SOUTHERN ELEVATION

DO NOT SCALE

A

INF



NOVA POWER

NOVA POWER MINTO

ENERGY POWER SYSTEMS AUSTRALIA

CAT

A1

13.10.2013

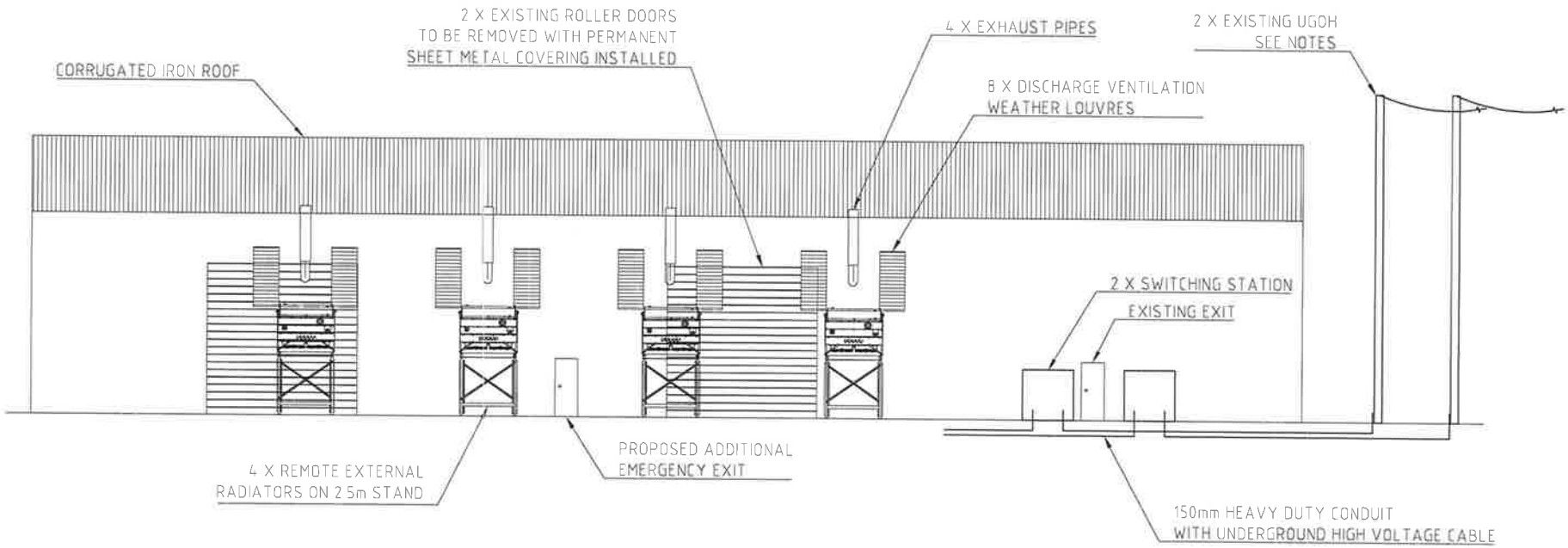
JAR

NOVA POWER
MINTO
EASTERN ELEVATION
SKETCH - EXISTING

DO NOT SCALE

A

INF



NOTES

1. PULL BACK EXISTING UGOH CABLE AND RE-DIVERT INTO SWITCHING STATIONS FROM NEW SWITCHGEAR ROOM
2. RUN NEW CONDUIT AND CABLING FROM NEW SWITCHING STATIONS TO THE EXISTING UGOH AND TERMINATE

NOVA POWER

NOVA POWER MINTO

ENERGY POWER SYSTEMS AUSTRALIA

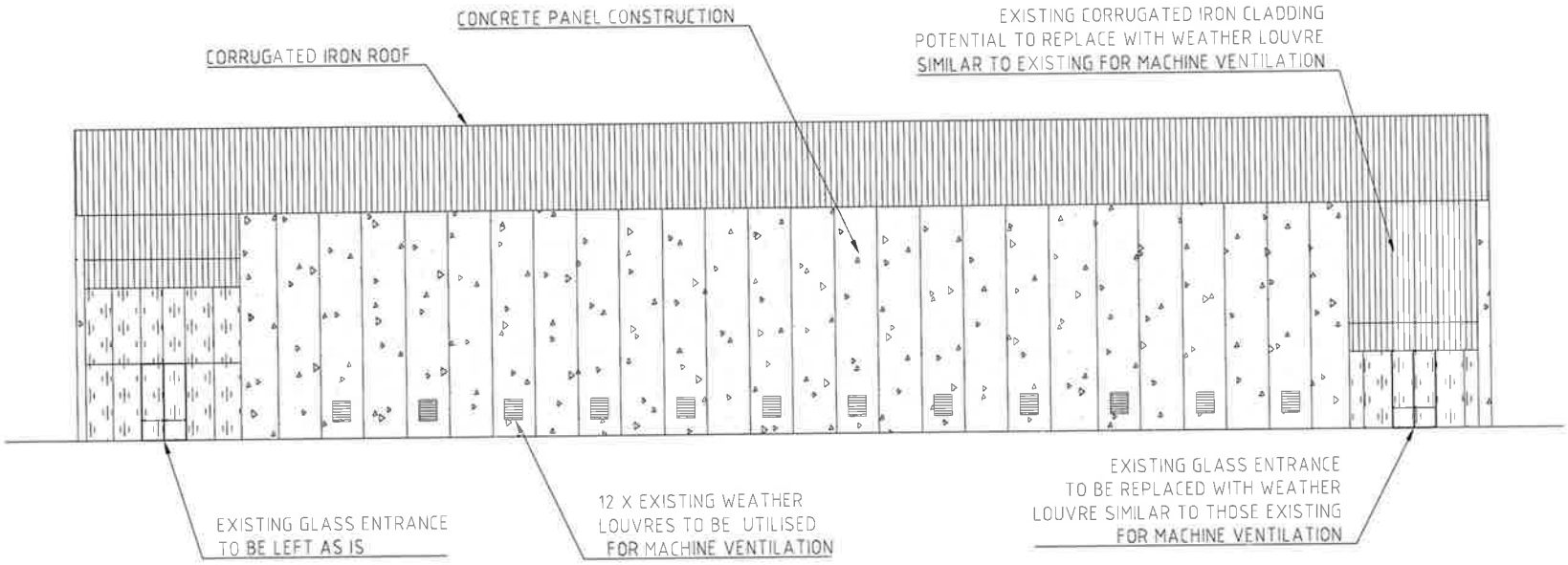
A1

NOVA POWER MINTO EASTERN ELEVATION

DO NOT SCALE

B

INF



NOVA POWER

NOVA POWER MINTO

ENERGY POWER SYSTEMS AUSTRALIA

A1

10.10.2013

NOVA POWER MINTO WESTERN ELEVATION

DO NOT SCALE

A

Appendix A. Air Quality and Greenhouse Gas Assessment

SINCLAIR KNIGHT MERZ
SKM

NovaPower

Minto Network Support Substation

AIR QUALITY AND GREENHOUSE GAS ASSESSMENT

- Rev B
- 27 September 2013

Minto Network Support Substation

AIR QUALITY AND GREENHOUSE GAS ASSESSMENT

- Rev B
- 27 September 2013

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Contents

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Executive Summary

NovaPower Pty Ltd is planning to deploy Network Support Substations (NSS) in locations where there are electricity supply issues during peak periods. Sinclair Knight Merz (SKM) has been engaged by NovaPower to conduct various studies to assess the potential impacts of NSS new generation on the environment. The NSS will consist of 4 x 2MW CAT G3520E gas engine generators and associated plant connected to the Minto Zone Sub Station (ZSS) to operate in a network support mode.

This report focuses on the potential air quality and greenhouse gas impacts related to the proposed NSS at Minto, western Sydney, NSW. The purpose of this assessment is to quantify the potential air quality and greenhouse gas emissions that will arise from the proposed NSS. This report will support requisite applications to approval authorities.

Key findings of this assessment are:

- The proposed site for the Minto NSS is in the middle of an industrial area adjacent to a railway line and appears ideally suited for the proposed purpose.
- Air quality criteria are stipulated in the Office of Environment and Heritage method *Approved Methods for the Modelling and Assessment of Air Pollutants in NSW* (DEC, 2005) and the NSW EPA's *Level 1 Screening Procedure Tool for Estimating Ground-Level Ozone Impacts from Stationary Sources in the NSW Greater Metropolitan Region.* Air dispersion modelling was conducted to predict the potential impacts of the NSS.
- Thresholds for the mandatory reporting of greenhouse gas (GHG) emissions are set in the *National Greenhouse and Energy Reporting Act 2007*. The estimated annual GHG emissions from the proposed operating regime is 5,124 tonnes of $CO_{2\text{-}e}$ per annum with an emission intensity of 0.498 t CO2e/kWh which is approximately 50 % of the NSW grid average intensity. This is below the relevant NGER reporting thresholds.
- Predicted nitrogen dioxide (NO_2) the results show that on a 1 hour basis and annual average basis the cumulative impact of the project when added to background NO_2 levels are well below relevant air quality criteria:
  - Hourly basis: the predicted maximum incremental impact due to the NSS is 50 $\mu g/m^3$, the maximum background level of 101 $\mu g/m^3$, resulting in a maximum cumulative impact of 151 $\mu g/m^3$. This is well below the criteria of 246 $\mu g/m^3$.
  - Annual basis: the predicted incremental impact due to the NSS is 2 $\mu g/m^3$, the background level is 22 $\mu g/m^3$, resulting in a cumulative impact of 24 $\mu g/m^3$. This is well below the criteria of 62 $\mu g/m^3$.
- Predicted levels of ozone (O_3) from the screening level assessment shows maximum incremental impacts for both 1 hour and 4 hour O_3 impacts being less than 0.2 ppb against the screening impact level (SIL) of 0.5 ppb and maximum allowable increase of 1 ppb as defined by the screening procedure. As such no detrimental project impacts on ambient O_3 concentrations are anticipated and no further detailed assessment is considered necessary.

It is concluded that the proposed Minto NSS will not lead to significant air quality or greenhouse gas impacts on the surrounding environment.

1. Introduction

1.1. General Introduction

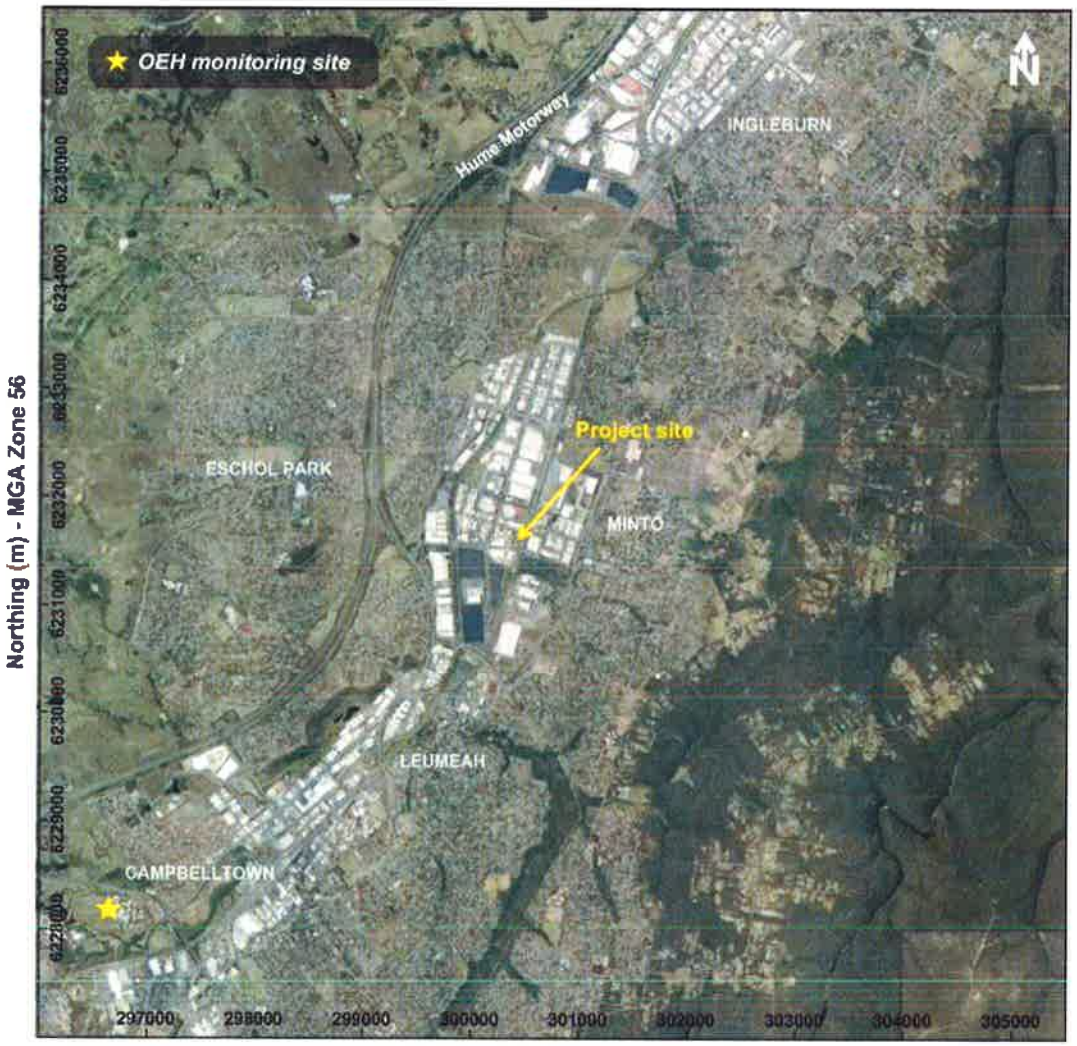
NovaPower propose to install a Network Support Substation (NSS) consisting of 4 x 2MW CAT G3520E gas engine generators at Minto in western Sydney to operate in a network support mode. Energy Power Systems Australia will supply and install the gas engine gensets.

The Minto NSS is proposed to be located at No.15 Huntsmore Road, Minto within an industrial area adjacent to the main railway line. The Minto NSS is intended to be constructed and operated in an existing industrial building. The surrounding industrial area is characterised by large industrial complexes, many industrial buildings/warehouses, some industrial processing/manufacturing (e.g. glass manufacturing), frequent heavy truck movements, a busy 24/7 passenger and freight railway line and a large transport and logistics operation. The NSS would be ideally suited to this area.

The NSS concept is to install four x 2 MW natural-gas fired generators, giving a total generating capacity of 8 megawatts-equivalent (MW). It is anticipated that these gas fired engines will operate at times of peak demand (rather than as "base load") in order to provide improved security of electricity supply. SKM was commissioned by NovaPower to conduct an air quality and greenhouse gas assessment of the potential emissions associated with the proposed NSS.

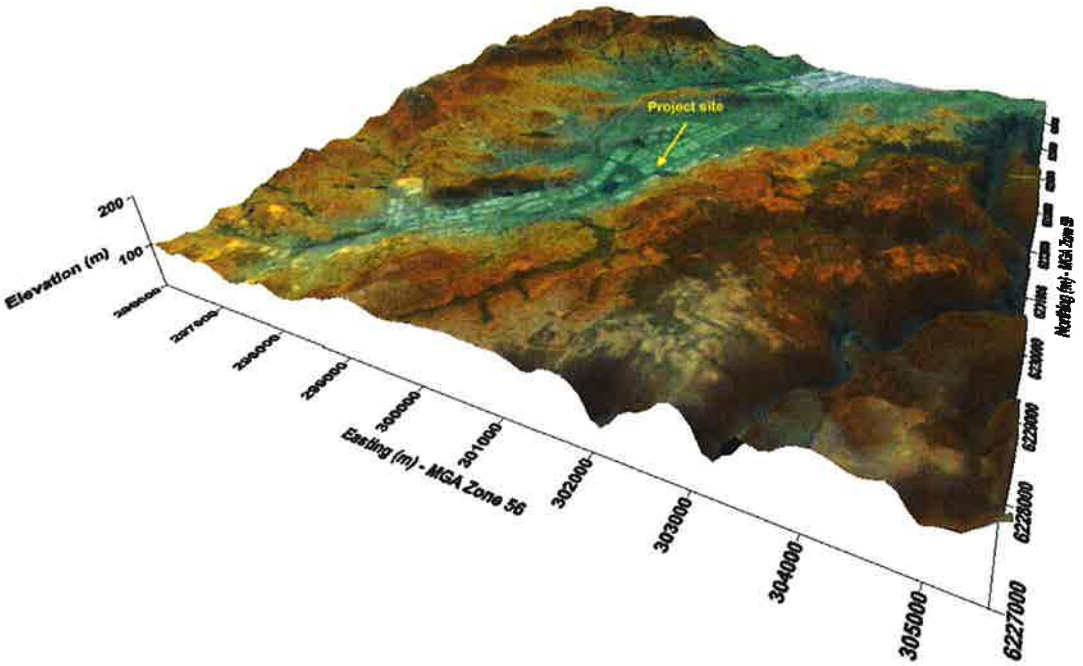
A site location plan is included as **Figure 1**.

- **Figure 1 Site Location Plan**



A 3D image of the terrain of the site and surrounding study area is shown on **Figure 2**.

- **Figure 2 Site Terrain**



1.2. Assessment Objectives

The objective of this assessment is to assess the potential for adverse air quality impacts resulting from the proposed development of the NSS. Specifically this involves a Level 2 air quality assessment in accordance with the *Approved Methods and Guidance for the Modelling and Assessment of Air Pollutants in NSW* (DEC, 2005). The Level 2 assessment is defined as a "refined dispersion modelling assessment using site-specific input data".

Specifically, the project objectives include the following tasks:

- A review of air quality issues associated with the development;
- A description of meteorology and existing air quality;
- Determination of air quality criteria relevant to the project;
- Air dispersion modelling of air pollutants using the CALPUFF (v6.42) model; and
- Assessment of air quality impacts and if necessary identification of any air pollution controls required.

2. Existing Environment

2.1. Existing Air Quality

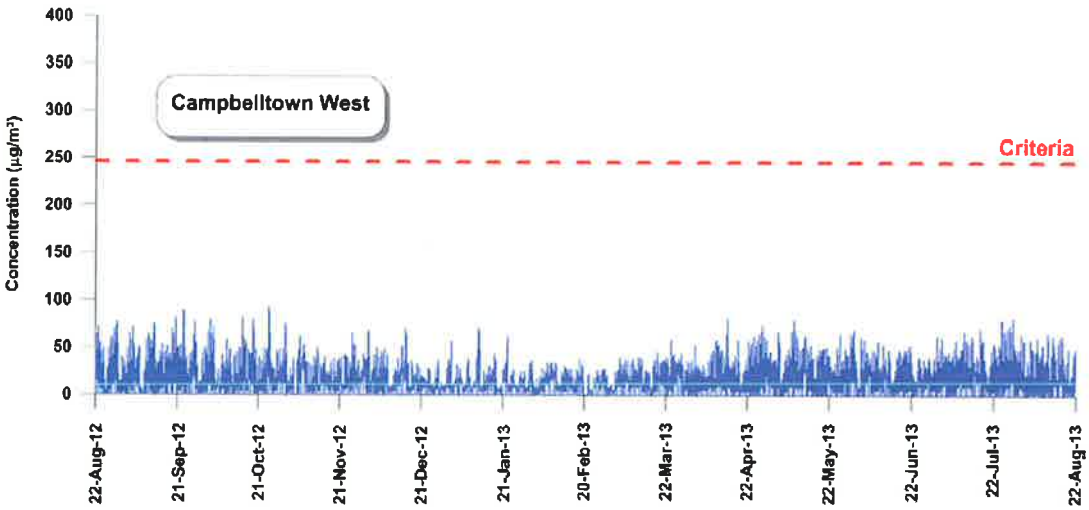
Background air quality for nitrogen dioxide (NO_2) (which is the main air pollutant of interest for the project) has been described using 12 months of ambient air quality data collected by the NSW Office of Environment and Heritage (OEH) at their Campbelltown West site, which is located 5 km to the south-west of the project location (refer to **Figure 1**) between August 2012 and August 2013.

Summary results are:

- Maximum 1-hour NO_2 - 101 $\mu g/m^3$; and
- Annual average NO_2 - 22 $\mu g/m^3$

Hourly NO_2 data are also shown in **Figure 3**.

- **Figure 3 Campbelltown West hourly NO_2 data (2012-13)**



With respect to ambient ozone (O_3) which is also considered as a secondary pollutant for the assessment the following background concentrations for Western Sydney (refer to Section 4.5) apply:

- Baseline Ozone (1-hr) 116.8 ppb
- Baseline Ozone (4-hr) 98.2 ppb

2.2. Dispersion Meteorology

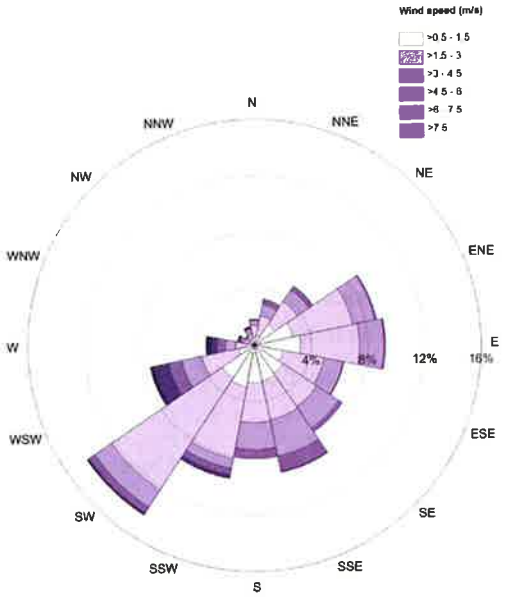
Windroses for the area are shown in **Figure 4** and have been constructed from hourly wind speed and wind direction data collected by the NSW EPA at their Campbelltown West site. Given the close proximity of the EPA site to the project site, these meteorological data would be considered representative of the project location. These data were used in the modelling.

Figure 5 shows the annual wind patterns derived from meteorological modelling with CSIRO's TAPM (The Air Pollution Model). These model runs were undertaken to test whether there were any significant differences in meteorology from year to year, and whether the 2012-13 data from the EPA are representative of other years. It can be seen from this figure that winds in 2011 were predicted to be similar to winds in 2012, suggesting that year to year variation is not significant. These windroses (**Figure 5**) also exhibit similarities to the EPA data from Campbelltown (**Figure 4**), with the prevailing southwesterly winds, although the EPA data show more frequent winds than predicted by TAPM from this direction. This analysis suggests that the 2012-13 EPA data would be representative of the project site, and of long-term meteorological conditions.

- **Figure 4 Campbelltown West windroses (2012-13)**

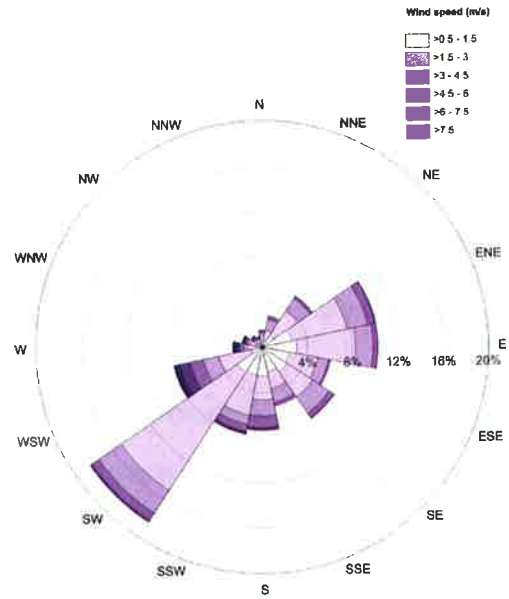
Figure 5 Annual wind patterns derived from meteorological modelling with TAPM

Project site – 2011 by TAPM



Calms = 2.3%

Project site – 2012 by TAPM



Calms = 2.4%

3. Air Quality Criteria

3.1. Overview

Air quality criteria relevant to the project relates to emission standards which refer to maximum emission concentrations at the point of discharge and ambient air quality criteria which refer to impacts within the receiving environment.

The most significant emissions to air from the Project will be:

- Gaseous emissions of oxides of nitrogen (NO_X), due to exhausts associated with the gas engines; and
- Secondary ozone (O_3) impacts.

The following sections refer to emission standards and ambient criteria relating to these pollutants.

3.2. Air Emission Standards

The Protection of the Environment Operations Act 1997 (POEO Act) is the key piece of environment protection legislation administered by the NSW Environment Protection Authority (EPA).

The POEO Act establishes a system of environment protection licensing for 'scheduled' activities with the potential to have a significant impact on the environment. Schedule 1 of the Act lists these scheduled activities, which are licensed by the EPA. Most 'non-scheduled' activities are regulated by local councils and other local authorities.

Section 128 of the POEO Act requires occupiers of non-residential premises to comply with any air emission standards prescribed by regulations. These standards are contained in Part 5 of the Protection of the Environment Operations (Clean Air) Regulation 2010. The standards are in-stack emission limits and are the maximum emissions permissible for an industrial source anywhere in NSW.

3.2.1. Interim Nitrogen Oxide Policy for Cogeneration in Sydney and the Illawarra

The proposed Minto power station will use internal combustion engines (ICE) for electricity generation. These engines are commonly used in cogeneration and trigeneration applications and while it is not proposed to use the engines in these modes at Minto, the EPA have indicated that their *Interim Nitrogen Oxide Policy for Cogeneration in Sydney and the Illawarra, 2011* (EPA, 2011) would apply to the Minto NSS.

EPA, 2011 sets out how emissions from cogeneration proposals are dealt with. One of the concepts introduced in the interim policy is best available techniques (BAT) emission performance.

The interim policy does not define what emission performance is consistent with BAT for cogeneration and tri-generation.

- **BAT** covers all aspects of a proposal including fuel source, technology selection and controls. The concept of BAT is a key principle in the European Union Directive on Integrated Pollution Prevention and Control.
- **Best** available techniques shall mean the most effective and advanced stage in the development of activities and their methods of operation which indicate the practical suitability of particular techniques for providing in principle the basis for emission limit values designed to prevent and, where that is not practicable, generally to reduce emissions and the impact on the environment as a whole. Best shall also mean most effective in achieving a high general level of protection of the environment as a whole.
- **Available** techniques shall mean those developed on a scale which allows implementation in the relevant industrial sector, under economically and technically viable conditions, taking into consideration the costs and advantages, whether or not the techniques are used or produced inside the Member State in question, as long as they are reasonably accessible to the operator.
- **Techniques** shall include both the technology used and the way in which the installation is designed, built, maintained, operated and decommissioned.

The NOx emission standard considered by EPA to be BAT for natural gas fired reciprocating internal combustion engines with a capacity to burn less than 7 mega joules of fuel per second (7 MJ/s) are outlined in **Table 1**. A financial analysis of NOx controls on gas fired reciprocating engines was used to develop the BAT emission standards (Source: *SKM 2009, Department of Environment and Climate Change (NSW) Financial Analysis of NO_X Controls on Gas Fired Reciprocating Engines, Sinclair Knight Merz, June 2009).*

- **Table 1 NOx BAT emission standard for natural gas fired reciprocating internal combustion engines with a capacity to burn less than 7 mega joules of fuel per second (7 MJ/s)**

Activity or plant	Air impurity	Region	Emission standard mg/m^3 *
Any natural gas fired stationary reciprocating internal combustion engine	Nitrogen dioxide (NO2) or nitric oxide (NO) or both, as NO2 equivalent	Sydney and Wollongong Metropolitan Area# and Wollondilly Local Government Area	250

- Reference conditions: Dry, 273 K, 101.3kPa, 5% O_2
- # Defined in the Protection of the Environment Operations (Clean Air) Regulation 2010

A NO_X emission standard of 250 mg/m^3 applies to all natural gas fired reciprocating internal combustion engines with a capacity to burn less than 7 MJ/s in the Sydney and Wollongong

Metropolitan Area and Wollondilly Local Government Area. With respect to cogeneration and trigeneration, controlling NO_X emissions to 250 mg/m^3 has been found to have a minor impact on project financial performance and is unlikely to impact on project viability. The marginal reduction in financial performance is due to the slightly higher fuel consumption[2].

Outside of the Sydney and Wollongong Metropolitan Area and Wollondilly Local Government Area the NO_x emission standard is 450 mg/m^3, as defined in the *Protection of the Environment Operations (Clean Air) Regulation 2010*. A more stringent NO_x emission standard is only needed in the Sydney and Wollongong Metropolitan Area and Wollondilly Local Government Area as air quality in these regions currently exceeds the National Environment Protection Measure for Ambient Air Quality (Air NEPM) goal for ozone.

A NO_x emission standard for natural gas fired reciprocating internal combustion engines with a capacity to burn greater than or equal to 7 mega joules of fuel per second has not been proposed. This will be determined on a case by case basis.

In cogeneration and tri-generation applications, the financial viability of post combustion controls to reduce NO_x emissions to less than 250 mg/m^3 has been shown to improve as the capacity of the engine increases[2]. In cogeneration applications, post combustion controls may be financially viable at approximately 1,000 kW of electrical output (or a capacity to burn approximately 3 mega joules of fuel per second) whereas in tri-generation applications the financially viable minimum size for post combustion controls is likely to be in excess of 10,000 kW of electrical output (or a capacity to burn greater than approximately 30 mega joules of fuel per second).

Noting that this project is greater than 7 MJ/s but is not a cogeneration / trigeneration plant and will operate at a reduced capacity factor compared with a typical cogeneration / trigeneration plant, a project specific BAT assessment has been undertaken to assess the cost effectiveness of NO_X emission controls. The BAT assessment report is included as **Appendix A**.

3.2.2. VOC and CO Emission Standards

Part 5 (Schedule 4) of the Protection of the Environment Operations (Clean Air) Regulation 2010 also includes emission standards for volatile organic compounds (VOCs) and carbon monoxide (CO) as outlined in **Table 2**.

Table 2 VOC / CO Emission Standards

Activity or plant	Air impurity	Emission standard mg/m^3
Any stationary reciprocating internal combustion engine using a gaseous fuel	VOC or CO	40 mg/m^3 VOCs or 125 mg/m^3 CO

3.3. Ambient Air Quality

Ambient air quality criteria are used to assess the potential for ambient air quality to give rise to adverse health or nuisance effects.

The EPA has set air quality assessment criteria as part of their *Approved Methods for the Modelling and Assessment of Air Pollutants in NSW* (DEC, 2005). The relevant air quality assessment criteria are shown in **Table 3**.

Table 3 EPA assessment criteria for NO_2 and O_3

Pollutant	Averaging time and percentile	Criterion	Application
Nitrogen dioxide (NO_2)	Maximum 1-hour average	246 µg/m^3	Cumulative
	Annual average	62 µg/m^3	Cumulative
Ozone (O_3)	Maximum 1-hour average	214 µg/m^3 (0.10 ppm)	Cumulative
	Maximum 4-hour average	171 µg/m^3 (0.08 ppm)	Cumulative

µg/m^3 = micrograms per cubic metre

The EPA air quality assessment criteria relate to the total concentration of air pollutant in the air (that is, cumulative) and not just the contribution from project-specific sources. Therefore, some consideration of background levels needs to be made when using these criteria to assess impacts. Further discussion of background levels in the study area is provided in **Section 2.1**.

4. Air Quality Impact Assessment

4.1. Project Air Quality Issues

The key air quality issue associated with the project is the emission of oxides of nitrogen (NO_X) from the proposed 4 x 2 MW gas engines.

Lean burn gas engine generators can achieve 250mg/Nm3 NOx emissions.

The proposed operating scenario as advised by NovaPower is 2 starts per day at an average of 1.75 hours run time per start, equivalent to 700 starts and 1225 operating hours per year allowing for servicing and maintenance.

4.2. Assessment Methodology

Air dispersion modelling has been used to inform this assessment. This section describes the assessment methodology for modelling the emissions. A "Level 2" air quality assessment has been conducted in accordance with the "*Approved Methods and Guidance for the Modelling and Assessment of Air Pollutants in NSW" (DEC, 2005)*. The Level 2 assessment is a "refined dispersion modelling technique using site-specific input data".

The air dispersion model used for this assessment, CALPUFF, requires information on the meteorological conditions in the modelled region. This information is typically generated by the meteorological pre-processor, CALMET, using surface observation data from local weather stations and upper air data from radiosondes or numerical models, such as the CSIRO's prognostic model known as TAPM (The Air Pollution Model). CALMET also requires information on the local land-use and terrain. The result of a CALMET simulation is a year-long, three-dimensional output of meteorological conditions that can be used as input to the CALPUFF air dispersion model.

Surface meteorological data for the 2012-13 assessment period, from the Campbelltown weather stations, have been used for development of the meteorological wind field. Upper-air temperature, wind speed, wind direction, pressure and height data are also required by the CALMET model. No upper-air observations were acquired close to the area of interest therefore these data were generated by TAPM. The three-dimensional meteorological data from TAPM were used as CALMET's initial guess wind-field, which follows the follows the guidance of TRC (2011).

Key model settings for TAPM are shown in **Table 4**

Table 4 Model settings and inputs for TAPM

Parameter	Value(s)
Model version	4.0.5
Number of grids (spacing)	3 (30 km, 10 km, 3 km, 1km)
Number of grids point	35 x 35 x 25
Year of analysis	22 Aug 2012 to 21 Aug 2013, with one "spin-up" day
Centre of analysis	Project site (34°2' S, 150°50' E)
Meteorological data assimilation	None

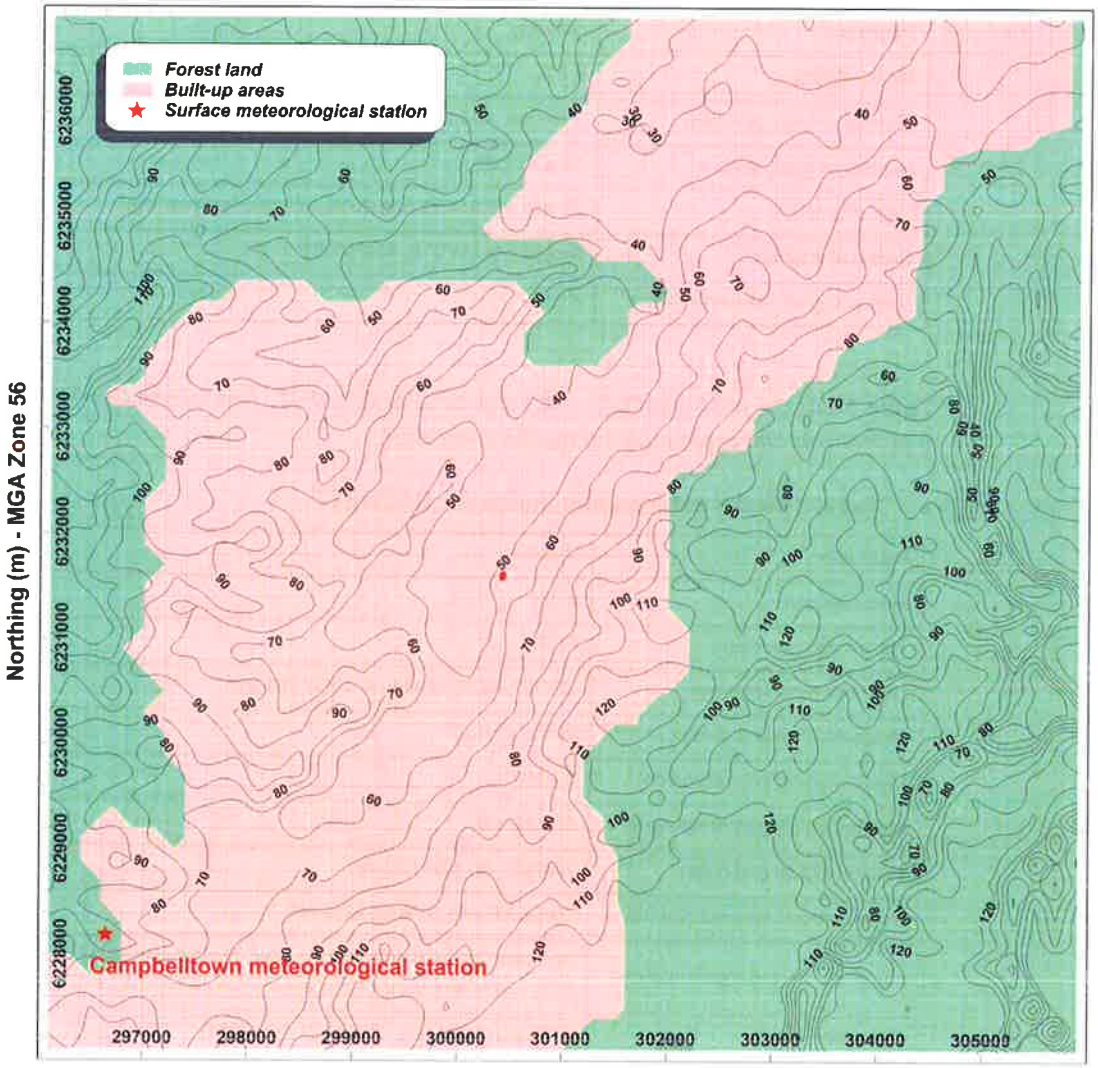
Table 5 lists the model settings and input data for CALMET. This information has been provided so that the user can reproduce the results if required.

Table 5 Model settings and inputs for CALMET

Parameter	Value(s)
Model version	6.334
Terrain data source(s)	SRTM
Land-use data source(s)	USGS and digitized from aerial imagery
Meteorological grid domain	10 km x 10 km
Meteorological grid resolution	0.2 km
Meteorological grid dimensions	50 x 50 x 9
Meteorological grid origin	296000 mE, 6227000 mN
Surface meteorological stations	Campbelltown 296648, 6228191
Upper air meteorological stations	No upper air meteorological stations. The 3-dimensional meteorological output from TAPM was used as the initial guess wind-field for CALMET.
Simulation length	8760 hours (22 Aug 2012 to 21 Aug 2013)

Figure 6 shows the model grid, land-use and terrain, as well as the location of the surface meteorological stations.

- **Figure 6 Model Grid, Land Use and Terraine**



The CALPUFF (version 6.42) air dispersion model was used to predict off-site air pollutant concentrations in the vicinity of Project site.

Inputs required by CALPUFF include:

- Emission source locations and characteristics (for example, stack sources);
- Building locations and heights, where relevant;
- Emission rates of pollutants;
- Topographical data;
- Locations of sensitive receptors; and

- Meteorological conditions.

The dispersion model has used the meteorological information described in Section 2.2 with emission estimates from Section 4.3 to predict ground-level air pollutant and odour concentrations. Local terrain has been included in the modelling (**Figure 2**) and predictions were made across a 10 km by 10 km model domain, with model receptors set at 200 m resolution across all the grid and at 20 m resolution within 200 m of the facility. Building heights and dimensions were included in the model and the PRIME algorithm was used.

For the purposes of presenting the results, plots and tables of ground-level concentrations have been compiled for averaging times that are consistent with the EPA air quality assessment criteria (refer **Table 3**).

4.3. Project Air Emissions

A summary of emission used in the modelling which are based on gas engine specifications provided by EPS are outlined in **Table 6**

- **Table 6 Minto Power Station Emissions Data**

Item	Stack sources			
Stack ID	S1	S2	S3	S4
Easting (m)	300426	300424	300421	300419
Northing (m)	6231616	6231607	6231599	6231590
Height (m)	12.3	12.3	12.3	12.3
Base elevation (m)	52	52	52	52
Stack tip diameter (m)	0.5	0.5	0.5	0.5
Flow rate (Nm3/s)	2.25	2.25	2.25	2.25
Temperature (C)	441	441	441	441
Velocity (m/s)	29.9	29.9	29.9	29.9
Mass emission rates (g/s)				
NOX (as NO2)	0.56	0.56	0.56	0.56
Concentrations (mg/Nm3)				
NOX (as NO2)	250	250	250	250

For the purpose of modelling all NO_x is assumed to be NO_2.

4.4. Air Quality Modelling – NO_2

The results of NO_2 modelling are shown as contour plots in **Figure 6** and **Figure 7**.

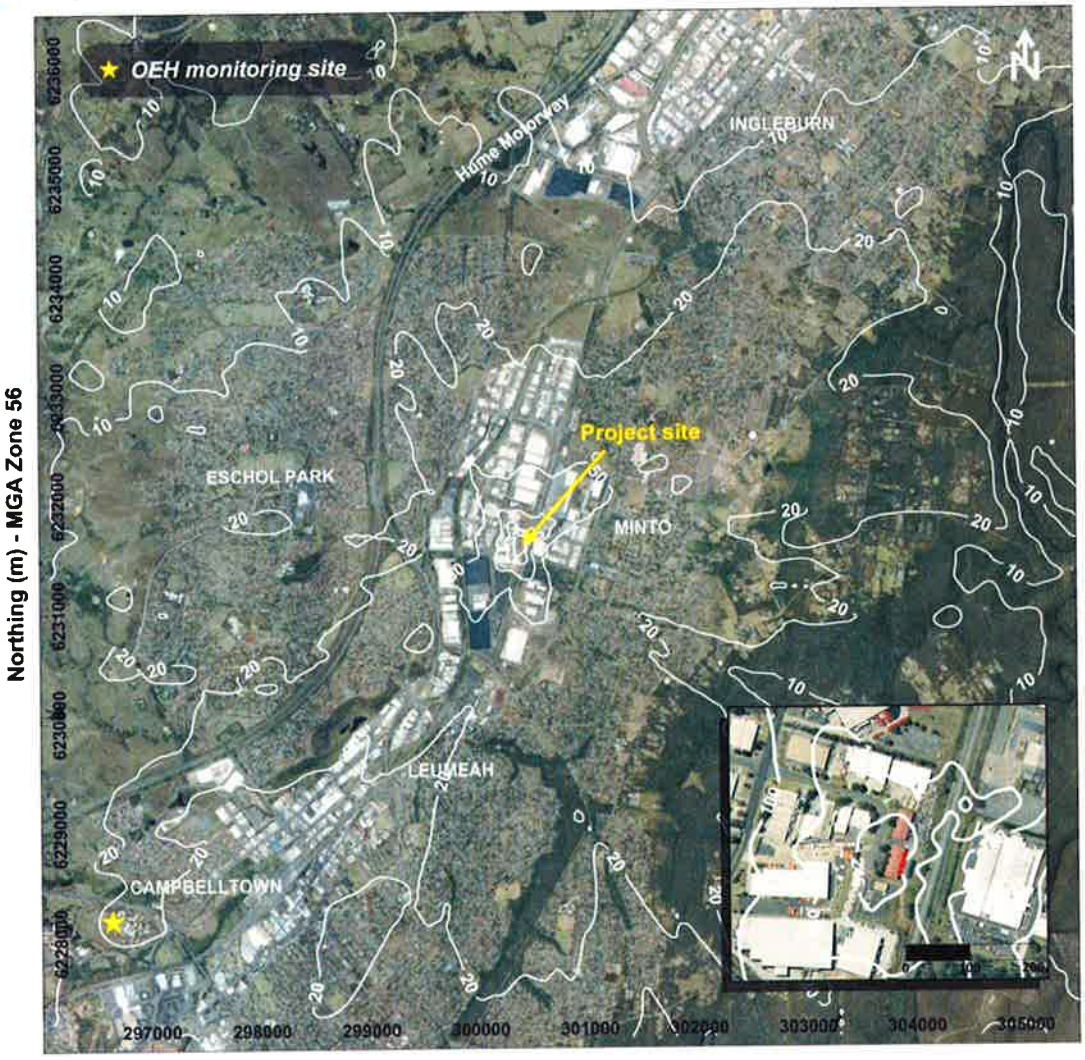
The results show that on a 1 hour basis (refer to Figure 6) the maximum incremental impact within surrounding sensitive receiver areas is at most 50 µg/m^3. When added to a maximum background level of 101 µg/m^3 the cumulative impact at most 151 µg/m^3, and well below the criteria of 246 µg/m^3.

The method of assessing 1-hour maximum NO_2 impacts is considered a worst-case with a number of conservative assumptions being made which are as follows:

- All NO_X is considered to be NO_2 when in reality at the point of emission approximately only 10 % will be NO_2 and the remaining 90 % will be NO. In the immediate are of impact less than 50 % would be NO_2.
- For the purpose of cumulative assessment it is assumed that the worst-case 1 hour impacts from the project are added to the worst-case 1 hour background levels. In reality it is very unlikely that this would occur.

On annual basis (refer to **Figure 7**) the incremental impact within surrounding sensitive receiver areas is at most 2 µg/m^3. When added to a background level of 22 µg/m^3 the cumulative impact is at most 24 µg/m^3, and well below the criteria of 62 µg/m^3.

Figure 7 Predicted 1-hour Maximum NO_2 Concentrations – Project Increment ($\mu g/m^3$)



4.5. O_3 Assessment

A screening assessment of O_3 impacts has been completed in accordance with the EPA's *Level 1 Screening Procedure Tool for Estimating Ground-Level Ozone Impacts from Stationary Sources in the NSW Greater Metropolitan Region*.

Input data for the assessment are outlined in **Table 7**.

- **Table 7 O_3 Assessment Inputs**

Source Region	Sydney West
VOC Input Option	Default VOC Reactivities
CH4 (tonnes/day)	0.000000
CO (tonnes/day)	0.220593
NOx (tonnes/day)	0.194000
VOC (tonnes/day)	2.548000

Emissions data assume continuous operation of the engines on a daily basis. This is a conservative assumption as actual run time will in general be less than 4 hours per day.

Criteria for determining the significance of predicted incremental increase in ambient ozone concentrations comprise primarily the following:

- Evaluation of sources located within ozone attainment areas against a screening impact level (SIL) of 0.5 ppb and against the maximum allowable increment for each region.
- Evaluation of sources located within ozone non-attainment areas against a SIL of 0.5 ppb and against the maximum allowable increment of 1 ppb.

In cases where the maximum ozone increment is below the SIL and/or below the relevant maximum allowable increment, further ozone impact assessment is not required but a best management practice (BMP) determination should be undertaken for the source.

Outputs of the assessment are outlined in **Table 8**

- **Table 8 O_3 Assessment Outputs**

	Results	Units
Source Location	Sydney West	
Baseline Ozone (1-hr)	116.8	ppb
Baseline Ozone (4-hr)	98.2	ppb
Region Classification	Non-attainment	
Maximum Allowable Increment (1-hr)	**1**	**ppb**
Maximum Allowable Increment (4-hr)	**1**	**ppb**
Ozone Standard (1-hr)	100	ppb
Ozone Standard (4-hr)	80	ppb
Emissions		
NOx	0.194	TPD
CO	0.220592699	TPD
VOC	2.548	TPD
Reactivity adjusted VOC (1-hr)	2.548000131	TPD
Reactivity adjusted VOC (4-hr)	2.548000144	TPD
Incremental Ozone Concentrations		
Maximum 1-hr Incremental	**0.13972**	**ppb**
Maximum 4-hr Incremental	**0.19108**	**ppb**
Cumulative Ozone Concentrations		
Maximum 1-hr Cumulative	116.93972	ppb
Maximum 4-hr Cumulative	98.39108	ppb

The output data shows maximum incremental impacts for both 1 hour and 4 hour O_3 impacts being less than 0.2 ppb against the SIL of 0.5 ppb and maximum allowable increase of 1 ppb as defined by the screening procedure.

As such no detrimental project impacts on ambient O_3 concentrations are anticipated and no further detailed assessment is required.

5. Greenhouse Gas Assessment

5.1. Greenhouse Gases

GHGs are found naturally in the atmosphere. They absorb solar radiation, either directly or indirectly through reflection and re-emission from the earth's surface and clouds, and re-emit this as infrared radiation. This re-emission property results in what is known as the 'greenhouse effect', trapping heat within the surface-troposphere system and increases the Earth's average surface temperature (Baede 2007).

The primary GHGs in the atmosphere are water vapour (H2O), carbon dioxide (CO2), nitrous oxide (N2O), methane (CH4) and ozone (O3). Human-made or anthropogenic gases such as sulfur hexafluoride (SF6), hydroflurocarbons (HFCs) and perflurocarbons (PFCs) are increasingly recognised as playing an important role in impacts on climate (Baede 2007).

An increase in the concentrations of GHGs in the atmosphere leads to an increased infrared opacity of the atmosphere, and hence to radiative forcing1 and an increase in the greenhouse effect – sometimes known as the enhanced greenhouse effect. The enhanced greenhouse effect, in turn, influences the state of the climate by changing its properties, which over time leads to climate change (Baede 2007).

The individual properties of GHG species have different effects on radiative forcing, depending on their global warming potential (GWP). The GWPs of the GHGs pertinent to this study are summarised in Table 7. This table shows two datasets: the National Greenhouse Accounts (NGA) Factors, which are derived from the Kyoto Protocol accounting provisions (DCCEE 2011), and the Intergovernmental Panel on Climate Change's Fourth Assessment Report which is provided for context (Forster et al. 2007).

- **Table 9 Global Warming Potential of GHGs Relative to CO_2**

Gas	GWP (NGA Factors)*	GWP (IPCC Fourth Assessment Report)**		
		20-year	100-year	500-year
CO_2	1	1	1	1
CH_4	21	72	25	7.6
N_2O	310	289	298	153

* The GWPs specified by the NGA Factors reference have been used in this assessment.

** The different year values indicate the GWP based on different time integrals with respect to the substance radiative forcing capacity and time-dependant abundance.

[1] 'Radiative forcing' is defined as the change in the net (downward minus upward) irradiance at the tropopause due to a change in an external driver of climate change – e.g. CO_2 concentration (Baede 2007, p. 86)

5.2. GHG Policy

5.2.1. International GHG Reduction Targets & the Kyoto Protocol

On 3 December 2007, Australian Prime Minister Kevin Rudd signed the instrument of ratification of the Kyoto Protocol. As part of this, Australia committed to a number of carbon reduction commitments at the international level which govern the extent of emissions reductions domestically. These targets are:

- A reduction in Australia's emissions to 108 per cent of 1990 levels (or approximately 570Mt p.a.) in the first Kyoto compliance period (2008-2012);
- 60% reduction in emissions against 2000 levels by 2050; and
- 5 to 25% reduction in emissions by 2020. A 5% reduction by 2020 is unconditional with a 25% emission reduction becoming internationally binding should there be commitment from all emitters around the world to restrain atmospheric concentrations of greenhouse gases to 450 parts per million.

5.2.2. The Clean Energy Regulator

The Clean Energy Regulator is the Government body responsible for administering legislation that will reduce carbon emissions and increase the use of clean energy.

The CER administers the Carbon Pricing Mechanism, the National Greenhouse and Energy Reporting (NGER) scheme, the Carbon Farming Initiative and the Renewable Energy Target. The CER's focus is to build a clean energy future for Australia through the effective implementation and administration of these schemes.

5.2.3. The National Greenhouse and Energy Report System

The National Greenhouse and Energy Reporting Act 2007 (NGER Act) introduced a single national framework for reporting and disseminating company information about greenhouse gas emissions, energy production, energy consumption and other information specified under NGER legislation.

The objectives of the NGER Act are to:

- Underpin Australia's emissions trading scheme (carbon pricing mechanism);
- Inform government policy;
- Inform the Australian public;
- Help meet Australia's international reporting obligations;
- Assist Commonwealth, state and territory government programs and activities; and
- Avoid duplication of similar reporting requirements in the states and territories.

In determining requirements for reporting under NGERS there are two types of thresholds to determine which corporations are affected by the NGER Act. As defined in section 13 of the NGER Act, they are:

- Facility thresholds, and
- Corporate group thresholds.

Both the facility and corporate group thresholds have three components:

- A greenhouse gas emissions threshold
- An energy production threshold, and
- An energy consumption threshold.

Corporations must look at each threshold to determine their obligations under the NGER Act. If a corporation meets or exceeds one or more of the thresholds for a reporting year, they must register and report for the first year the threshold is reached. They must then report for each year the corporation remains registered. The NGER reporting thresholds are outlined in **Table 8**

- **Table 10 NGER Reporting Thresholds**

Threshold	GHG (kT CO2-e)	Energy Consumption (TJ)	Energy Production (TJ)
Facility	25	100	100
Corporate	50	200	200

5.2.4. NSW GHG Policy

The NSW Government is assisting the community and economy to adjust to the Australian Government's carbon price. In this context, the Government is working to deliver economically efficient and environmentally effective policies and programs that do not duplicate initiatives of the Australian Government including:

- Understanding NSW emissions sources and trends;
- Providing financial support through the Climate Change Fund ;
- Promoting energy efficiency;
- Promoting clean and renewable energy; and
- Promoting soil carbon sequestration.

The NSW 2021 Plan sets goals and targets that support practical action to tackle climate change including:

- 20% renewable energy by 2020;
- Assistance for businesses and households to realise annual energy savings of 16,000 gigawatt-hours by 2020 compared with 'business as usual' trends;

- Support for 220,000 low-income households to reduce their energy use by up to 20% by June 2014;
- An Increase in the share of commuter trips made by public transport, including increasing the proportion of total journeys to work by public transport in the Sydney Metropolitan Region to 28% by 2016;
- Targets to increase walking and cycling; and
- Planning policy to encourage job growth in centres close to where people live and to provide access by public transport.

5.3. Study Boundaries

It is important to define those aspects of the facility that will be included and excluded from this assessment. As with life cycle studies, GHG assessments are able to follow the cradle-to-grave methodology of investigating the GHG emissions associated with the extraction, manufacturing, production, transportation, use, reuse, recycling and final disposal of a particular product.

The NGA Factors reference manual (2012) has been prepared by the Department of Industry, Innovation, Climate Change, Science, Research and Tertiary Education), and is designed for use by companies and individuals to estimate GHG emissions. The NGA Factors (last updated in July 2012) have been used to calculate GHG emissions in this assessment.

The NGA Factors recognise three types of emission factors.

1) Direct (or point-source) emission factors give the kilograms of carbon dioxide equivalent (CO_2e) emitted per unit of activity at the point of emission release (i.e. fuel use, energy use, manufacturing process activity, mining activity, on-site waste disposal, etc.). These factors are used to calculate **scope 1** emissions.
2) Indirect emission factors are used to calculate scope 2 emissions from the generation of the electricity purchased and consumed by an organisation as kilograms of CO_2e per unit of electricity consumed. **Scope 2** emissions are physically produced by the burning of fuels (coal, natural gas, etc.) at the power station.
3) Various emission factors can be used to calculate **scope 3** emissions. For ease of use, the NGA Factors workbook reports specific 'scope 3 emission factors' for organisations that:
   - burn fossil fuels: to estimate their indirect emissions attributable to the extraction, production and transport of those fuels; or
   - consume purchased electricity: to estimate their indirect emissions from the extraction, production and transport of fuel burned at generation and the indirect emissions attributable to the electricity lost in delivery in the transmission and distribution (T&D) network.

This assessment only considered the GHG emissions associated with the NSS emissions (from the generators). The following activities have been excluded from this assessment, as they are not considered material to the overall emissions from the project over its lifetime:

- Fuel and energy consumption during construction activities (due to the large variability in day to day processes).
- Transport of raw materials to the proposed Minto NSS.
- Travel by personnel outside of sites.
- Transport and disposal of generated waste off-site.

5.4. Greenhouse Gas Emissions

The NGA Factors reference manual (DCCEE 2012) provides the formula presented in **Equation 5-1** to estimate greenhouse gas emissions from gaseous fuel combustion.

- **Equation 5-1**

$$E_{ij} = \frac{Q_i \times EC_i \times EF_{ijoxec}}{1000}$$

Where:
E_{ij} = the emissions as CO_2e (equivalent) tonnes;
Q_i = the quantity of fuel consumed (cubic metres);
EC_i = the energy content of fuel consumed (GJ/m^3);
EF_{ijoxec} = the emissions factor for each gas type (j) for fuel type (i) as kg CO_2e per gigajoule.

The NGA Factors provide emission factors for the consumption of natural gas. These are presented in Table 11

- **Table 11 Emission Factors for the Consumption of Combustibles**

Fuel combusted	Energy Content Factor (GJ/m3)	Emission factor (kg CO2e/GJ)		
		CO2	CH4	N2O
Natural gas distributed in a pipeline	0.00393	51.2	0.1	0.03

The operation of the proposed Minto NSS will rely on the consumption of gas fuel to generate electricity. The proposed CAT G3520 engine fuel consumption rate based on information provided by EPS is presented in **Table 12**. All fuel for this assessment is assumed to be natural gas.

- **Table 12 Genset Fuel Consumption Rate**

Engine Design	100% load (MJ/kWh)	75% load (MJ/kWh)	50% load (MJ/kWh)
G3520	9	9	9

The NSS can be considered as operating on a 'peak' rather than 'base load' basis, thus it is assumed for this assessment that the proposed operating scenario as advised by NovaPower is 2 starts per day at an average of 1.75 hours run time per start, equivalent to 700 starts and 1225 operating hours per year allowing for servicing and maintenance Using this value and the information presented in **Table 9**, **Table 10** and **Equation 5-1** the likely greenhouse gas emissions from operations at assumed 100% load can be estimated (see **Table 13**).

- **Table 13 Estimated Fuel Burn (GJ) and emitted Greenhouse Gas (tonnes CO_2e/annum) by Scenario**

Engine Design	100% load		
	Annual Fuel Burn (GJ/annum)	Total GHG (t CO2e)	GHG Intensity (t CO2e/kWh)
G3520	92610	5124	0.498

5.4.1. Greenhouse Gas Summary

While there are no criteria to compare GHG emissions against, it is worth noting that under the National Greenhouse and Energy Reporting Act 2007 (the NGER Act), facilities emitting 25 kilotonnes (kT) CO_2-e or more (and/or consuming 100 terajoules (TJ) or more) in a year and organizations emitting 50 kT CO_2-e or more (and/or consuming 200 TJ or more) from 2010/2011 financial year onwards are required to register and report GHG.

For the proposed facility, operating at an estimated 1225 hours per year of the year, the NGER reporting threshold will not be triggered.

Should the addition of GHG emissions from the proposed facility to GHG emissions from other operations under the poperational control of NovaPower exceed the 50 kt CO2e or 200 TJ limit then registration and reporting under the NGER Act would be required. This determination is outside the scope of the study.

6. Conclusions

As part of the development of the Minto Network Support Substation, NovaPower proposes to install 4 x 2MW CAT G3520E gas engine generators at an industrial site in Minto, western Sydney to operate in a network support mode. Energy Power Systems Australia will supply and install the gas engine gensets.

The objective of this assessment was to assess the potential for adverse air quality and greenhouse gas impacts resulting from the proposed development of the NSS. Air dispersion modelling was conducted in accordance with "*Approved Methods and Guidance for the Modelling and Assessment of Air Pollutants in NSW" (DEC, 2005)*".

With respect to nitrogen dioxide (NO_2) the results show that on a 1 hour basis and annual average basis the cumulative impact of the project when added to background NO_2 levels are well below relevant air quality criteria:

- Hourly basis: the predicted maximum incremental impact due to the NSS is 50 µg/m^3, the maximum background level of 101 µg/m^3, resulting in a maximum cumulative impact of 151 µg/m^3. This is well below the criteria of 246 µg/m^3.
- Annual basis: the predicted incremental impact due to the NSS is 2 µg/m^3, the background level is 22 µg/m^3, resulting in a cumulative impact of 24 µg/m^3. This is well below the criteria of 62 µg/m^3.

In terms of ozone (O_3) the output from the screening level assessment shows maximum incremental impacts for both 1 hour and 4 hour O_3 impacts being less than 0.2 ppb against the screening impact level (SIL) of 0.5 ppb and maximum allowable increase of 1 ppb as defined by the screening procedure. As such no detrimental project impacts on ambient O_3 concentrations are anticipated and no further detailed assessment is considered necessary.

With respect to GHG emissions the estimated annual GHG emissions from the proposed operating regime is 5,124 tonnes of $CO_{2\text{-}e}$ per annum with an emission intensity of 0.498 t CO2e/kWh which is approximately 50 % of the NSW grid average intensity. This is below the relevant NGER reporting thresholds.

It is concluded that the proposed Minto NSS will not lead to significant air quality or greenhouse gas impacts on the surrounding environment.

Appendix A NO_X BAT Assessment

SINCLAIR KNIGHT MERZ
SKM

NovaPower

Financial Analysis of NO_X Controls on Gas Fired Reciprocating Engines

PEAKING APPLICATIONS

- Final Report
- 19 September 2013

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1. Executive Summary

NovaPower propose to install a 4 x 2MW CAT G3520E gas engine generator plant at Minto in western Sydney to operate in a network support mode. Energy Power Systems will supply and install the gas engine gensets. NovaPower has approached Sinclair Knight Merz (SKM) to undertake an assessment of Best Available Technology (BAT) for NO_X emission control.

Lean burn gas engine generators can achieve 250mg/Nm^3 NO_X emissions. A gas engine generator with a selective catalytic reduction (SCR) system can achieve 50mg/Nm^3 NO_X emissions but adds significant capital and operating costs.

The proposed operating scenario as advised by NovaPower is 2 starts per day at an average of 1.75 hours run time per start, equivalent to 700 starts and 1225 operating hours per year allowing for servicing and maintenance.

The calculated annual NO_X emissions for the 4 x G3520E lean burn gas engine generators operating for 1,225 hours is 9.7 tonne. The calculated annual NO_X emissions for 4 x G3520E standard gas engine generators with an SCR system removing 90% of NO_X emission based on operating for 1,225 hours is 2.7 tonnes.

The results of the financial assessment are summarised in the table below.

	Units	Lean Burn 250mg/Nm^3	SCR 50mg/Nm^3
Project IRR (EBITDA)	[%]	8.2	3.2
Project NPV (EBITDA)	[$]	122,461	-3,525,229

The results of the financial assessment indicate the following findings:

- The project is financially viable with lean burn engines
- The additional capital and operating costs associated with SCR make the project financially unviable.

2. Introduction

2.1. Background

NovaPower proposes to install an 8MW of gas engine generation plant at Minto in western Sydney to operate in a network support mode. Energy Power Systems will supply and install the gas engine gensets.

NovaPower has approached Sinclair Knight Merz (SKM) to undertake an assessment of Best Available Technology (BAT) NO_X emission control – Selective Catalytic Reduction (SCR).

2.2. Scope of Work

The SKM scope of work is as follows:

- Review the NO_X removal efficiency of SCR and the impact of time taken for the catalyst to reach operating temperature
- Undertake an assessment of the financial impacts of SCR NO_X control on NovaPower's proposed Minto project employing a similar approach to a previous SKM study for NSW Department of Environment[1]
- Prepare a report on the findings of the study

[1] *Financial Analysis of NO_X Controls on Gas Fired Reciprocating Engines, May 2009*

3. Plant Configuration

3.1. Gas Engine Generators

Natural gas fired reciprocating engines are proven technology and advances in technology have encouraged recent growth in gas engine installations, particularly in the small high-speed (1500rpm) engines applicable to gas fired peaking applications.

Some of the advantages of gas engines include:

- high electrical efficiency (typically ~40% on a LHV basis);
- fast start up times and ability to load follow with minimal loss of efficiency;
- high pressure gas supply is not required (delivery pressure 15-20kPa);
- proven technology with high reliability;
- relatively low emissions;
- relatively low unit cost;
- small footprint and foundations.

Gas engines for peaking applications are generally high-speed turbocharged units operating in a 4-stroke spark ignition (SI) cycle. Electrical efficiency is typically 40% on a LHV basis, which is significantly higher than similar sized gas turbines.

3.2. NO_X Controls

There are generally three sources of NO_X emissions that result from the firing of fossil fuels. The primary source is the fixation of atmospheric nitrogen in the flame (thermal NO_X) caused by the disassociation of atmospheric oxygen and nitrogen at high temperature (above 1,000°C). A secondary source of NO_X arises from fuel-bound nitrogen (fuel NO_X), and becomes more significant in low quality (lower heating value) fuels. For natural gas the fixation of fuel bound nitrogen can be considered insignificant. Finally, prompt NO_X forms from the oxidation of hydrocarbon radicals near the combustion flame, which generally produces an insignificant amount of NO_X.

Thermal NO_X is a function of the temperature of the flame, the oxygen concentration, and the time the hot gases remain at the high temperature. Called the Zeldovich mechanism, a simple explanation is that thermal NO_X increases exponentially with the temperature of the reaction, linearly with the residence time and as a square root function of the oxygen concentration. Engine manufacturers have the following options available for the control of NO_X:

- Stoichiometric based combustion controls: where the ratio and mixing of air (oxygen) to fuel is controlled to modify the concentration of oxygen in the flame zone;
- Dilution based combustion controls: where the flame temperature of combustion is reduced;
- Post combustion control: where the flue gas is cleaned up following combustion.

For gas fired reciprocating engines the two established technologies for NO_X control are Lean Burn (stoichiometric control) and Selective Catalytic Reduction (post combustion control).

3.2.1. Lean Burn

An effective method for controlling emissions in a gas engine is the lean burn concept. The combustion is considered "lean" when excess air is introduced into the engine along with the fuel. The excess air reduces the temperature of the combustion process and this reduces the amount of NO_X produced compared to a conventional gas engine.

Since the air flow to each of the cylinders in a reciprocating engine is intermittent, low emissions from a gas engine depend heavily on a suitable control system to ensure that the air fuel mixture is maintained within a tight range.

Gas engine manufacturers express the ratio of air to fuel as Lambda, with a Lambda value of 1.0 being stoichiometric combustion. Historically, engine manufacturers have preferred to operate with Lambda values slightly greater than 1.0 as this deters knock (premature combustion) and lowers thermal stresses. However, values significantly higher than 1.0 are now being used for emission reduction (1.7 – 2.0). As Lambda values increase above 1.0 (lean mixture), NO_X emissions decrease, but to the detriment of cycle efficiency.

Lean combustion is relatively unstable and may result in misfiring, so there are several methodologies for ensuring adequate combustion. Some manufacturers ignite a rich mixture in a smaller pre-chamber to provide a high-energy ignition source. Other manufacturers pre-mix air and fuel prior to admission to the cylinder, with control systems continually monitoring engine parameters. Some control systems measure oxygen content directly in the exhaust (using a Lambda probe), whilst others interpolate this result from on-line measurement of other parameters such as power output, boost pressure, fuel temperature and NO_X emissions.

This type of control generally lowers NO_X emissions to 250mg/Nm^3 at 5% O_2, however fuel consumption is typically 2 to 3% higher than for standard engines.

3.2.2. Selective Catalytic Reduction

Selective Catalytic Reduction (SCR) is a process where NO_X is stripped from the exhaust gases following combustion. Very low levels of NO_X emissions are possible, with NO_X removal efficiencies above 90%, but at a substantial cost.

SCR operates by injecting liquid urea/ammonia (NH_3) into the exhaust gas stream in the presence of a catalyst and generally upstream of the waste heat boiler. The NO and NO_2 contained in the exhaust gas stream combine with the urea/ammonia and are reduced to nitrogen (N_2) and water vapour (H_2O), which are common constituents of the atmosphere.

SCR operates with the following chemical reactions, where NH_3 reacts with NO and NO_2, the primary constituents of NO_X, to form inert nitrogen gas.

$$4NO + 4NH_3 + O2 \Rightarrow 4N_2 + 6H_2O$$

$$2NO_2 + 4NH_3 + O_2 \Rightarrow 3N_2 + 6H_2O$$

The catalyst operates in a broad temperature range between 260°C and 550°C which is compatible with gas engine exhaust gas temperatures. Since the SCR system needs to operate at a high temperature, it requires that the exhaust be warmed up, so the SCR system is not available during start-up.

The injection of liquid urea/ammonia (NH_3) into a generator exhaust gas stream and the subsequent chemical reaction do not impact on the exhaust gas temperature or waste heat boiler performance to any significant degree.

SCR adds significant cost to a project, including up-front capital costs and operating costs associated with the ammonia and the catalyst, as well as introducing back pressure which reduces gas engine power output. Since ammonia is generally classified as a hazardous substance, particular care needs to be taken. The disposal of the catalyst is also an issue from an environmental perspective.

Not all the ammonia is used in the NO_X reduction process, and some passes through the catalyst banks and is emitted to atmosphere. This is called ammonia slip, and can cause an environmental problem. Ammonia slip of up to 10ppm can typically occur.

SCR systems are sensitive to sulphur, for two reasons. First, the sulphur reacts with the catalyst, reducing its efficiency. Secondly, the ammonia and sulphur can react, forming ammonia sulphate, which can build up on the components of the waste heat boiler to cause fouling and corrosion.

Gas engines configured with SCR would typically be tuned to achieve NO_X emissions of 500mg/Nm^3, with the SCR system removing approximately 90% of the NO_X emissions to achieve 50mg/Nm^3.

4. NovaPower Minto Project

4.1. Project Description

NovaPower's Minto project will comprise 4 x CAT G3520E natural gas fuelled reciprocating engine generators. The key technical parameters of the CAT G3520E generating set at maximum continuous rating (MCR) are given in **Table 4-1** below.

The G3520E engine configured with standard combustion achieves 500mg/Nm^3 NO_X emissions (dry at reference 5% O_2).

The G3520E engine configured with lean burn combustion achieves 250mg/Nm^3 NO_X emissions (dry at reference 5% O_2) and has a heat rate 3% higher (ie 3% higher fuel consumption).

Table 4-1 CAT G3520E key technical parameters at MCR

Parameter	Units	Standard	Lean Burn
Gross Electrical Output	[kW]	1995	1995
Gross Heat Rate (HHV)	[kJ/kWh]	9,849	10,150
Auxiliary load	[%]	2.5	2.5
Exhaust flow (wet)	[Nm^3/h]	8,744	9,158
Exhaust temperature	[°C]	440	441
NO_X emissions (dry, 5% O_2)	[mg/Nm^3]	500	250

4.2. Operating Profile

The proposed operating scenario as advised by NovaPower is 2 starts per day and an average of 1.75 hours run time per start.

We have made an allowance for servicing and maintenance to arrive at 700 starts and 1225 operating hours per year.

4.3. NO_X Reduction Achievable

The calculated annual NO_X emissions for 4 x G3520E lean burn gas engine generators (250mg/Nm^3) operating for 1,225 hours is 9.7 tonne.

The key technical parameters for a gas engine SCR system are given in **Table 4-2** below.

The optimal operating temperature for the SCR catalyst is approximately 400°C at which typically 90% NO_X removal efficiency is achieved. During engine startup the exhaust gas temperature increases to an operating temperature of 440°C and heats the SCR catalyst. The minimum catalyst operating temperature of 260°C must be achieved before the SCR system is activated. The NO_X removal efficiency increases to a typical value of 90% when the catalyst has reached its

full operating temperature. The SCR startup process is equivalent to approximately 5 minutes of operation with no NO_X removal.

- **Table 4-2 SCR key technical parameters**

Parameter	Units	Value
NO_X removal efficiency	[%]	90
NO_X emissions	[mg/Nm^3]	50
Minimum operating temperature	[°C]	260
Startup time	[min]	5

The calculated annual NO_X emissions for 4 x G3520E standard gas engine generators (500mg/Nm^3) with an SCR system removing 90% of NO_X emission based on operating for 1,225 hours is 2.7 tonnes (allowing for 700 starts).

Comparatively an equivalent capacity cogeneration plant operating baseload for 8000 hours per year would produce 63.5 tonnes per year for lean burn engines or 12.1 tonnes per year for standard engines with SCR.

4.4. Capital Costs

The installed capital cost for the Minto project comprising 4 x G3520C gas engine generators including design, generators/enclosures/cooling systems, switchgear and electrical, SCADA system, electrical connection, natural gas supply and civil works has been estimated by NovaPower's construction contractor Energy Power Systems (EPS) at $7,495,968. This is equivalent to $939/kW installed which is consistent with SKM in-house cost data for similar projects. Note this capital cost is applicable to either standard combustion or lean burn gas engine generators.

The incremental cost of the SCR systems including catalysts, exhaust gas mixing units, reactors, amonia dosing units, amonia storage, continuous emissions monitoring system and control system has been estimated by EPS at $2,643,200 based on budget pricing from an equipment supplier Parratech.

4.5. Operating Costs

The project operating costs are presented in **Table 4-3** below.

The natural gas cost of $4.50/GJ is as advised by NovaPower and is at the low end of the range in our experience.

The gas engine generator operating and maintenance cost is based on SKM in-house data for similar capacity generators. The costs include monthly servicing, scheduled maintenance, spark plug replacement, lube oil consumption and changes, coolant replacement and an allowance for

unscheduled maintenance. Note these operating costs are applicable to either standard combustion or lean burn gas engine generators.

The SCR system operating and maintenance cost is based on budget pricing from equipment suppliers. The costs include urea (ammonia), periodic catalyst replacement and annual servicing.

The network connection standing charge is as advised by NovaPower.

The insurance cost of 0.5% of the capital value of the installed plant is typical for this type of plant.

The rent and other outgoings cost is as advised by NovaPower.

- **Table 4-3 Project operating costs**

Parameter	Units	Value
Natural gas fuel	[$/GJ]	4.50
Genset O&M fixed	[$pa]	44,000
Genset O&M variable	[$/MWh]	6.35
SCR O&M fixed	[$pa]	60,000
SCR O&M variable	[$/MWh]	7.25
Network standing charge	[$pa]	15,000
Insurance	[% of capital]	0.5
Rent and outgoings	[$pa]	100,000

4.6. Revenues

The project operating revenues are presented in **Table 4-4** below.

The export electricity revenue of $75/MWh is as advised by NovaPower based on the price duration curve fitted to the prevailing peak futures price.

The $300/MWh electricity CAP contracts revenue is as advised by NovaPower.

The network support payments are as advised by NovaPower based on an agreement with network service provider Endeavour Energy.

- **Table 4-4 Project operating revenues**

Parameter	Units	Value
Export electricity	[$/MWh]	75.00
CAP contracts 2014	[$pa]	315,000
CAP contracts 2015 onwards	[$pa]	420,000
Network support payments	[$pa]	250,000
Network support duration	[years]	5

5. Financial Assessment

The general financial assumptions are given in **Table 5-1** below. These assumptions are typical based on our experience with small power generation projects.

Table 5-1 Financial assumptions

Item	Value
Project lifetime	20 years
Discount rate	8.0% (nominal)
Depreciation	Straight line
Salvage value	10%

The results of the financial assessment are summarised in **Table 5-2** below and the complete financial model is presented in **Appendix A**.

Table 5-2 Financial assessment

	Units	Lean Burn 250mg/Nm^3	SCR 50mg/Nm^3
Project IRR (EBITDA)	[%]	8.2	3.2
Project NPV (EBITDA)	[$]	122,461	-3,525,229

The results of the financial assessment indicate the following findings:

- The project is financially viable with lean burn engines;
- The additional capital and operating costs associated with SCR make the project financially unviable.

Appendix A Financial Model

A.1 Lean Burn Case

NovaPower Minto Investment Appraisal

Case: *Lean burn*

Year	0 2013-14	1 2014-15	2 2015-16	3 2016-17	4 2017-18	5 2018-19	6 2019-20	7 2020-21	8 2021-22	9 2022-23	10 2023-24	11 2024-25	12 2025-26	13 2026-27	14 2027-28	15 2028-29	16 2029-30	17 2030-31	18 2031-32	19 2032-33	20 2033-34
Revenue ($000)																					
Export electricity		715	751	788	828	869	912	958	1,006	1,056	1,109	1,164	1,223	1,284	1,348	1,415	1,486	1,560	1,638	1,720	1,806
CAP contracts		315	420	441	463	486	511	536	563	591	621	652	684	718	754	792	832	873	917	963	1,011
Network support		250	250	250	250	250	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Revenue ($000)		***1,280***	***1,421***	***1,479***	***1,541***	***1,605***	***1,423***	***1,494***	***1,569***	***1,647***	***1,729***	***1,816***	***1,907***	***2,002***	***2,102***	***2,207***	***2,318***	***2,434***	***2,555***	***2,683***	***2,817***
O&M Costs ($000)																					
Natural gas		446	469	492	517	543	570	598	628	660	693	727	764	802	842	884	928	975	1,023	1,075	1,128
Genset O&M fixed		44	45	46	47	49	50	51	52	54	55	56	58	59	61	62	64	65	67	69	70
variable		82	84	85	87	89	70	72	74	76	78	79	81	83	86	88	90	92	94	97	99
SCR O&M fixed		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
variable		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Network standing charge		15	15	16	16	17	17	17	18	18	19	19	20	20	21	21	22	22	23	23	24
Water		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insurance		37	38	39	40	41	42	43	45	46	47	46	49	50	52	53	54	56	57	58	60
Rent and outgoings		100	103	105	108	110	113	116	119	122	125	128	131	134	138	141	145	148	152	156	160
Residual value																					-750
Total O&M Costs ($000)		***705***	***734***	***764***	***795***	***829***	***862***	***898***	***936***	***975***	***1,016***	***1,058***	***1,103***	***1,150***	***1,198***	***1,249***	***1,303***	***1,358***	***1,417***	***1,478***	***702***
Earnings before interest, tax, deprec, amortisation (EBITDA)	***-7,496***	***575***	***687***	***715***	***745***	***777***	***560***	***596***	***633***	***672***	***714***	***758***	***804***	***853***	***904***	***958***	***1,015***	***1,075***	***1,139***	***1,205***	***2,025***

Project IRR	***8.2%***	***EBITDA***	
Project NPV over 20 year period	***$ 122,451***	***before interest, tax, depreciation & amortisation***	
Simple Payback	***13.0***	***years***	

NovaPower Minto Investment Appraisal

Case: *Lean burn*

FINANCIAL DATA

Capital cost of generator	7,496	$000
Capital cost NOx control	0	$000
Total capital cost	7,496	$000
Discount Rate (nominal)	8.0%	pa
Depreciation Period, years	20	years
Depreciation rate	4.5%	
Salvage Value After 20 Years	750	$000

REVENUES

Export Electricity	tariff	0.0750	$/kWh
	escalation	5.0%	
CAP contracts	2014	315	$000 pa
	2015	420	$000 pa
	escalation	5.0%	
Network support	payment	250	$000 pa
	duration	5	years

NATURAL GAS TARIFFS

Natural Gas	4.50	$/GJ HHV
Escalation	5.0%	pa

PLANT CONFIGURATION

Unit Capacity	1995	kW
Number of Units	4	
NOx Control	Lean burn	

GAS ENGINE PERFORMANCE

Gross Electrical Output	1,995	kWe
Gross Heat Rate (100%, HHV	10,100	kJ/kWh
Energy input (HHV)	5,625	kW
Auxiliary losses	2.5%	
Fuel consumption (per unit)	20.2	GJ/h
(4 units)	99,216	GJ pa

OPERATION & MAINTENANCE

Genset O&M	fixed	44	$000 pa
	variable	8.35	$/MWh
SCR O&M	fixed	60	$000 pa
	variable	7.25	$/MWh
Network standing charge		15	$000 pa
Water		0	$000 pa
Insurance		0.5%	of capital
Rent and outgoings		100	$000 pa
Escalation		2.50%	pa

OPERATING PROFILE

Starts per year	700	
Hours per start	1.75	
Hours per year	1225	

OUTPUT

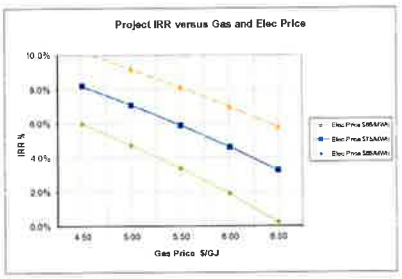
Gross Capacity	7,980	kW
Gross Generation (MCR)	9,775,500	kWh
Net Capacity	7,781	kW
Net Generation	9,531,113	kWh

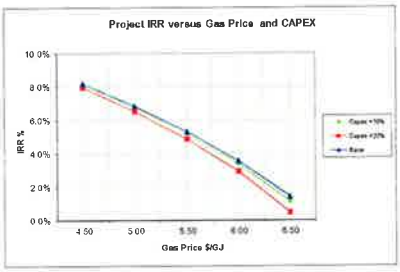
GREENHOUSE EMISSIONS

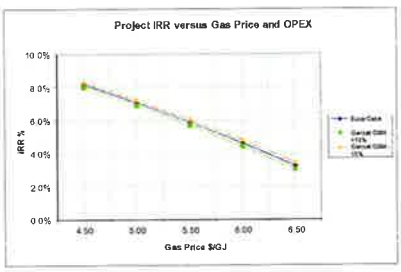
Natural gas		51.3	kg CO2/GJ
Gensets	(4 units)	5,090	t CO2 pa
Grid		0.98	tCO2/MWh
Grid offset	(4 units)	8,387	t CO2 pa

NOx EMISSIONS

Genset NOx emissions	250	mg/Nm3 dry
Genset exhaust mass flow	9,158	Nm3/h wet
	7,940	Nm3/h dry
SCR NOx removal efficiency	90%	
SCR start time	5	minutes
Genset NOx	7.9	kg/h
Genset NOx	9.2	tonne pa
SCR NOx removal	0.0	tonne pa
NOx emissions to air	9.7	tonne pa







A.2 SCR Case

NovaPower Minto Investment Appraisal

Case: *SCR*

Year	0 2013-14	1 2014-15	2 2015-16	3 2016-17	4 2017-18	5 2018-19	6 2019-20	7 2020-21	8 2021-22	9 2022-23	10 2023-24	11 2024-25	12 2025-26	13 2026-27	14 2027-28	15 2028-29	16 2029-30	17 2030-31	18 2031-32	19 2032-33	20 2033-34
Revenue ($000)																					
Export electricity		715	751	788	828	869	912	958	1,006	1,056	1,109	1,164	1,223	1,284	1,348	1,415	1,486	1,560	1,638	1,720	1,806
CAP contracts		315	420	441	463	486	511	536	563	591	621	652	684	718	754	792	832	873	917	963	1,011
Network support		250	250	250	250	250	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Revenue ($000)		***1,280***	***1,421***	***1,479***	***1,541***	***1,605***	***1,423***	***1,494***	***1,569***	***1,647***	***1,729***	***1,816***	***1,907***	***2,002***	***2,102***	***2,207***	***2,318***	***2,434***	***2,555***	***2,683***	***2,817***
O&M Costs ($000)																					
Natural gas		433	455	478	502	527	553	581	610	640	672	706	741	778	817	858	901	946	993	1,043	1,095
Genset O&M fixed		44	46	48	47	49	50	51	52	54	55	56	58	59	61	62	64	65	67	69	70
variable		62	64	65	67	69	70	72	74	76	78	79	81	83	86	88	90	92	94	97	99
SCR O&M fixed		60	62	63	65	66	68	70	71	73	75	77	79	81	83	85	87	89	91	94	96
variable		71	73	74	76	78	80	82	84	86	89	91	93	95	98	100	103	105	108	111	113
Network standing charge		15	15	16	16	17	17	17	18	18	19	19	20	20	21	21	22	22	23	23	24
Water		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insurance		37	38	39	40	41	42	43	45	46	47	48	49	50	52	53	54	56	57	58	60
Rent and outgoings		100	103	105	108	110	113	116	119	122	125	128	131	134	138	141	145	148	152	156	160
Residual value																					-1,014
Total O&M Costs ($000)		***823***	***854***	***887***	***921***	***956***	***994***	***1,032***	***1,073***	***1,115***	***1,158***	***1,204***	***1,252***	***1,302***	***1,354***	***1,408***	***1,465***	***1,524***	***1,586***	***1,650***	***703***
Earnings before interest, tax, deprec, amortisation (EBITDA)	***-10,139***	***457***	***567***	***592***	***620***	***649***	***429***	***462***	***496***	***533***	***571***	***612***	***655***	***700***	***748***	***799***	***853***	***910***	***970***	***1,033***	***2,114***

Project IRR ***3.2%*** ***EBITDA***

Project NPV over 20 year period ***-$3,625,229*** ***before interest, tax, depreciation & amortisation***

Simple Payback ***16.4*** ***years***

NovaPower Minto Investment Appraisal

Case: *SCR*

FINANCIAL DATA

Capital cost of generator	7,490	$000
Capital cost NOx control	2,643	$000
Total capital cost	7,490	$000
Discount Rate (nominal)	8.0%	pa
Depreciation Period, years	20	years
Depreciation rate	4.5%	
Salvage Value After 20 Years	1014	$000

REVENUES

Export Electricity	tariff	0.0750	$/kWh
	escalation	5.0%	
CAP contracts	2014	315	$000 pa
	2015	420	$000 pa
	escalation	5.0%	
Network support	payment	250	$000 pa
	duration	5	years

NATURAL GAS TARIFFS

Natural Gas	4.50	$/GJ HHV
Escalation	5.0%	pa

PLANT CONFIGURATION

Unit Capacity	1995	kW
Number of Units	4	
NOx Control	SCR	

GAS ENGINE PERFORMANCE

Gross Electrical Output	1,995	kWe
Gross Heat Rate (100%, HHV	9,849	kJ/kWh
Energy input (HHV)	5,458	kW
Auxiliary losses	2.5%	
Fuel consumption (per unit)	19.6	GJ/h
(4 units)	96,278	GJ pa

OPERATION & MAINTENANCE

Genset O&M	fixed	44	$000 pa
	variable	6.35	$/MWh
SCR O&M	fixed	60	$000 pa
	variable	7.25	$/MWh
Network standing charge		15	$000 pa
Water		0	$000 pa
Insurance		0.5%	of capital
Rent and outgoings		100	$000 pa
Escalation		2.50%	pa

OPERATING PROFILE

Starts per year	700	
Hours per start	1.75	
Hours per year	1225	

OUTPUT

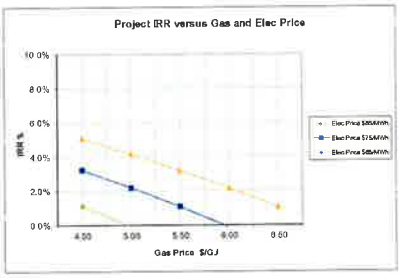
Gross Capacity	7,980	kW
Gross Generation (MCR)	9,775,500	kWh
Net Capacity	7,781	kW
Net Generation	9,531,113	kWh

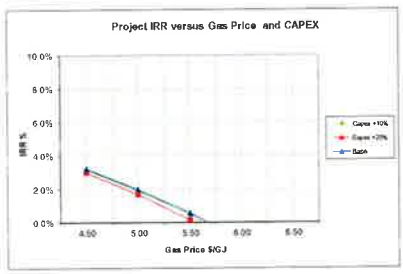
GREENHOUSE EMISSIONS

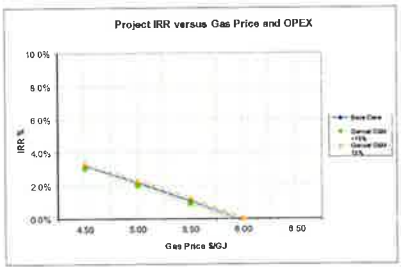
Natural gas		51.3	kg CO2/GJ
Gensets	(4 units)	4,939	t CO2 pa
Grid		0.68	tCO2/MWh
Grid offset	(4 units)	8,387	t CO2 pa

NOx EMISSIONS

Genset NOx emissions	500	mg/Nm3 dry
Genset exhaust mass flow	8,744	Nm3/h wet
	7,581	Nm3/h dry
SCR NOx removal efficiency	90%	
SCR start time	5	minutes
Genset NOx	15.2	kg/h
Genset NOx	18.6	tonne pa
SCR NOx removal	15.8	tonne pa
NOx emissions to air	2.7	tonne pa







Appendix B. Environmental Noise Assessment

Nova Power Pty Ltd - Minto Network Support Sub Station

ENVIRONMENTAL NOISE ASSESSMENT

27 September 2013

SINCLAIR KNIGHT MERZ

SKM

Nova Power Pty Ltd - Minto Network Support Sub Station

Document title:	Environmental Noise Assessment
Document no.	xx
Version:	Rev D
Date:	27 September 2013
Prepared by:	Paul Walsh
Approved by:	Norm Broner
File name:	VW07298_N_NA_RP_Environmental Noise Assessment_Rev C

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Contents

Acoustic Terminology

Term	Description
dB	Sound pressure levels are expressed in decibels as a ratio between the measured sound pressure level and the reference pressure. The reference pressure is $2x10^{-6}$ Pascal.
dB(A)	The A-weighted sound pressure level in decibels, denoted dB(A) is the unit generally used for the measurement of environmental, transportation or industrial noise. The A-weighting scale approximates the sensitivity of the human ear when it is exposed to normal levels and correlates well with subjective perception over a number of different types of sounds. An increase or decrease in sound level of approximately 10 dB corresponds to a subjective doubling or halving in loudness. A change in sound level of 3dB is considered to be just noticeable.
dB(C)	A Sound Pressure Level where the sound is filtered in accordance with the C- weighting scale. The C- weighting scale is relatively flat across the frequency spectrum but with reductions at very high and very low frequencies.
L_{A1}	The A weighted sound pressure level that is exceeded for 1% of the measurement period
L_{A10}	The A weighted sound pressure level that is exceeded for 10% of the measurement period (approximately the average maximum noise level)
L_{A90}	The A weighted sound pressure level that is exceeded for 90% of the measurement period (represents the background noise level)
L_{Aeq}	The equivalent continuous sound level. The steady dBA level which would produce the same A weighted sound energy over a stated period of time as the time varying sound.
$L_{Aeq15\ minute}$	The equivalent continuous sound level. The steady dBA level which would produce the same A weighted sound energy over a stated period of time as the time varying sound over a 15 minute period.
L_{Amax}	Is the maximum a-weighted noise level measured during the measurement period
Rating Background Level (RBL)	The overall single figure background level representing each assessment period (Day / Evening / Night) over the whole monitoring period (as opposed to over each 24 hour period used for the assessment of background level). It is defined as the median value of: • All the day assessment background levels over the monitoring period for the day • All the evening assessment background levels over the monitoring period for the evening • All the night assessment background levels over the monitoring period for the night

Executive summary

NovaPower Pty Ltd is planning to deploy Network Support Substations (NSS) in locations where there are electricity supply issues during peak periods. Sinclair Knight Merz (SKM) has been engaged by NovaPower to conduct various studies to assess the potential impacts of NSS new generation on the environment. The NSS will consist of 4 x 2MW CAT G3520E gas engine generators and associated plant connected to the Minto Zone Sub Station (ZSS) to operate in a network support mode.

This report focuses on the potential noise impacts related to the proposed NSS at Minto, western Sydney, NSW. The purpose of this assessment is to quantify the potential noise emissions that will arise from the proposed NSS and to determine the appropriate EPA NSW noise limits that would apply. This report will support requisite applications to approval authorities.

Background noise monitoring and noise prediction modelling were performed to assess the potential noise impacts of the NSS on the surrounding environment. Noise prediction modelling was undertaken in accordance with the NSW EPA Industrial Noise Policy (INP).

Key findings of this assessment are:

- The proposed site for the Minto NSS is in the middle of an industrial area adjacent to a railway line and appears ideally suited for the proposed purpose.
- Noise limit criteria were determined for residential and industrial premises in accordance with the NSW EPA INP. The noise limit criteria were determined as follows:

Receiver	Receiver type	Time period	Noise limit criteria (dBA)
No. 46 Kimberley Road	Residential	Day	50
		Evening	48
		Night	46

Receiver	Receiver type	Time period	$L_{Aeq,\ 15\ min}$ Amenity noise level criteria, dB(A)
No. 16 Huntsmore Road	Industrial	When in Use	70*

- The nearest residential location is approximately 670m (in a straight line) from the proposed NSS site. The noise level due to the proposed NSS at this residential property is predicted to be 40 dBA, well below the noise limit criteria of 46 dBA.
- The nearest industrial location is the adjoining property at 16 Huntsmore Road, approximately 12m to the north of the proposed NSS building. The noise level due to the proposed NSS at this industrial property is predicted to be 73 dBA with the existing building envelope and the heat exchangers operating in Delta mode. The prediction modelling also shows that minor acoustic treatment will reduce the noise level at the nearest industrial location to 70dBA.

1. Introduction

1.1 Background

NovaPower Pty Ltd is planning to deploy Network Support Substations (NSS) in locations where there are electricity supply issues during peak periods. Sinclair Knight Merz (SKM) has been engaged by NovaPower to conduct various studies to assess the potential impacts of NSS new generation on the environment. The Minto NSS will consist of 4 x 2MW CAT G3520E gas engine generators connected to the Minto Zone Sub Station (ZSS) to operate in a network support mode.

The Minto NSS is proposed to be located at No.15 Huntsmore Road, Minto within an industrial area adjacent to the main railway line. The Minto NSS is intended to be constructed and operated in an existing industrial building. The surrounding industrial area is characterised by large industrial complexes, many industrial buildings/warehouses, some industrial processing/manufacturing (e.g. glass manufacturing), frequent heavy truck movements, a busy 24/7 passenger and freight railway line and a large transport and logistics operation. The NSS would be ideally suited to this area.

The NSS concept is to install four x 2 MW natural-gas fired generators, giving a total generating capacity of 8 megawatts-equivalent (MW). It is anticipated that these gas fired engines will operate at times of peak demand (rather than as "base load") in order to provide improved security of electricity supply. SKM was commissioned by NovaPower to perform an environmental noise assessment of the potential noise emissions associated with the proposed NSS.

The environmental noise assessment included:

- An environmental noise level survey in the surrounding area to determine the noise limits in accordance with the NSW EPA Industrial Noise Policy (INP).
- The derivation of the noise limits and the predicted noise level emissions into the local environment due to the operation of the NSS plant.
- Acoustic modelling of the proposed NSS using the SoundPLAN computer model to predict noise levels in the local community likely from the proposed operation of the NSS plant only, based on noise data from the design work performed for identical NSS plant installed for the Traralgon Network Support Substation (TgNSS) in Victoria.

1.2 Purpose of the assessment

The purpose of this assessment is to:

- Determine appropriate noise limits, in accordance with the NSW EPA INP that would apply around the proposed Minto NSS;
- Quantify the potential noise emissions that would arise from the proposed project.
- Utilise the calculated noise limits and predicted noise levels from the initial plant design to help inform the potential need for refinement of design or noise mitigation measures to meet the noise requirements, if required.

2. Site description

The proposed Minto NSS is to be located in an industrial area of Minto, western Sydney. The NSS is proposed to be located inside an existing industrial building. The overall dimensions of the building are 22 metres wide by 50 metres long and 10.8 metres high (at the highest point, slightly pitched roof).

The existing building construction consists of metal deck walls, partial pre-cast concrete walls and metal deck roof with some PVC panels acting as skylights. Access into the building is via metal roller doors.

Appendix A presents a map of the town planning zoning, the nearest residences and the location of the proposed NSS site.

Figure 2.1 below shows an aerial image of the local area with the location of the unattended noise monitoring measurement position in relation to the proposed NSS site.

Figure 2.1 : Data logger unattended monitoring location with respect to proposed NSS site

2.1 Plant and equipment

The following plant and equipment is proposed for the Minto NSS:

- 4 x Caterpillar G3520EC Gas fired Engine / Generator Set (output approximately 8MW);
- 4 x remote horizontal heat exchangers (radiator fans) to be located externally of the building next to the eastern façade of the building.

It is proposed to locate the 4 x Caterpillar G3520EC Gas fired Engine / Generator Sets inside the existing industrial building on the site, while the heat exchangers will be located external of the building envelope.

Figure 2.2 presents an overall layout of the building and the location of the heat exchangers.

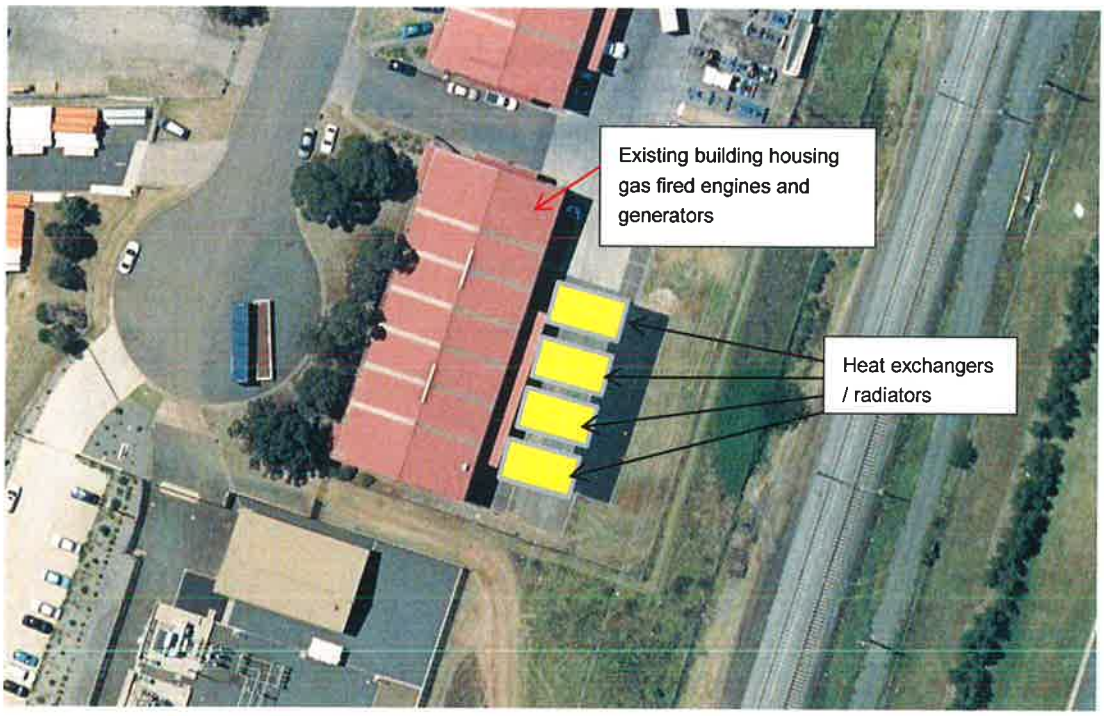


Figure 2.2 : Location of Gas Fired Engines and Heat Exchangers

Aside from the items mentioned above, also included onsite will be an office located within the existing industrial building, which will not generate any noise.

2.2 Operational times

The proposed Network Support Substation will operate at times of 'peak demand', rather than as 'base load'. The concept is to install 4 x 2MW gas fired generators at locations near zone substations that face summer loading issues. It is anticipated that the NSS will typically operate during the late afternoon and evening periods (e.g. 4pm to 11pm), particularly during the summer months. However, it is intended to operate the NSS at any time of day, due to the potential need for network support at any time of day.

3. Environmental Noise Survey

3.1 Measurement location and times

3.1.1 Unattended noise level survey

A 7 day unattended environmental noise level survey was performed from the 8th August to the 15th August, 2013. The location at which the noise level survey was conducted is the closest available noise sensitive receiver and a location that is representative of the current background noise level in the area. The selected location was a residential property at No.46 Kimberley Road and would be the property most likely to be acoustically impacted by the operation of the NSS, if adverse impacts were to occur.

This monitoring location has been assessed by the acoustics engineer as representative of the background noise level conditions, in the area for the nearest dwellings to the west and to the north of the proposed NSS site. The data collected is considered by the acoustics engineer as sufficient for the characterisation of existing noise levels and for the analysis of the potential noise impacts from the proposed NSS.

Figure 2.1 above shows the measurement position in relation to the existing residential buildings and the proposed site.

$L_{A90\ 15\ Minute}$ and $L_{Aeq\ 15\ minute}$ Sound Pressure Levels (SPL's) were recorded continuously over the 7 day measurement period.

The 10 percentile $L_{Aeq\ 15\ minute}$ SPL was determined in accordance with the INP for the day, evening and night time periods over the 7 days.

The Rating Background Level (RBL) was determined in accordance to methodology presented in the INP. The median for each day, evening and night time period was calculated in accordance to INP to determine the Rating Background Level.

3.1.2 Attended noise level measurements

Attended noise level measurements were performed on Thursday 15th August, 2013. Noise level measurements were performed at the following sites to verify the unattended noise level measurements.

- No. 16 Gleneagle Place, Minto – measurement performed 14:05 hrs – 14:20 hrs
- No.15 Huntsmore Road, Minto - measurement performed 14:30 hrs – 14:45 hrs
- No. 21 Harding Place, Minto – measurement performed 15:03 hrs – 15:18 hrs

Figure 3.1 below presents the measurement locations.

Figure 3.1 : Measurement locations of the attended noise level survey

3.2 Instrumentation

3.2.1 Unattended noise level measurements

The unattended noise level monitoring was performed using the following data logger configuration:

- ARL Ngara Data Logger accredited in a NATA accredited laboratory, this instrument is a Type 1 data logger.
- The sound level meter was checked for calibration before and after the noise level survey using a Bruel & Kjaer NATA accredited Acoustic Calibrator, type 4231.

3.2.2 Attended noise level measurements

The attended noise survey measurements were performed using the following instrumentation:

- Bruel & Kjaer NATA accredited Bruel & Kjaer 2250 Hand Held Analyser Integrating Sound Level Meter.
- The sound level meter was checked for calibration before and after the noise surveys using a Bruel & Kjaer NATA accredited Acoustic Calibrator, type 4231.

The noise data was analysed using Bruel & Kjaer software – BZ 5503 – Utility Software for Hand Held Analysers and Noise Explorer type 7815.

3.3 Weather conditions

The weather conditions during the survey were taken from the Bureau of Meteorology data collected at the Campbelltown Weather Station.

This Bureau of Meteorology weather station site is approximately 4 kilometres from the proposed NSS site and has been assessed as the closest weather station to the site.

Table 3.1 : Weather conditions – Recorded at the Bureau of Meteorology - Campbelltown

Date	Day	Temps		Rain	Evap	Sun	Max wind gust			9 am						3 pm					
		Min	Max				Dir	Spd	Time	Temp	RH	Cld	Dir	Spd	MSLP	Temp	RH	Cld	Dir	Spd	MSLP
		°C	°C	mm	mm	hours	km/h		local	°C	%	8th	km/h		hPa	°C	%	8th	km/h		hPa
8	Th	8.1	14.2	6.0			SW	43	11:34	9.1	75		SW	11		12.3	67		SSW	24	
9	Fr	2.2	18.6	0			NW	20	14:20	9.9	66		SSW	7		18.4	36		SW	13	
10	Sa	2.6	22.6	0			W	33	12:07	14.1	46		NW	6		22.3	30		W	11	
11	Su	2.7	21.1	0			NNW	19	12:23	12.6	64		NW	7		20.9	28		NNW	7	
12	Mo	3.7	23.9	0			NNW	76	12:46	11.1	79		N	9		17.7	49		WNW	20	
13	Tu	2.2	20.8	1.4			W	41	09:08	15.6	33		WNW	19		20.3	25		WSW	13	
14	We	1.7	23.1	0			SW	41	23:57	10.4	65		N	9		22.7	22		NW	15	
15	Th	7.0	19.2	0			SW	37	10:11	12.5	39		SW	15		18.1	27		SSW	11	

4. Methodology of determination of noise limits

The INP (EPA 2000) provides a framework for deriving project specific noise limits for particular projects and sets two separate criteria to meet environmental noise objectives:

- accounting for intrusive noise
- protecting the amenity of particular land uses.

The INP requires that if noise from the development under assessment complies with the lower of the amenity or intrusiveness criteria levels, then no acoustical impact would be expected. For a particular project, the more stringent of the intrusive or amenity criteria sets the project-specific noise levels.

Intrusive noise criteria

The intrusive criteria relate to the difference between the noise under assessment and the RBL (or long-term) background noise level. A noise source is considered to be non-intrusive if the $L_{Aeq,15minute}$ level does not exceed the RBL by more than 5 dB(A) for each of the day, evening and night periods, and does not contain tonal, impulsive, or other modifying factors as detailed later in this section.

The 10 percentile $L_{Aeq\ 15\ minute}$ Sound Pressure Level was determined in accordance to the INP for the day, evening and night time periods over the 7 days.

Amenity noise criteria

The amenity criterion is based on the zoning and the land uses of the receiver locations and the extent of the existing industry noise in the area. Once measured, if existing industrial noise in an area approaches the criterion value for the land use in that area, noise levels from a new industry needs to be designed so that the cumulative effect does not produce noise levels that would significantly exceed the criterion. This is achieved by modifying the recommended L_{Aeq} noise level for various relevant land uses in the area, as presented in **Table 4.1**, with an applicable modification factor listed in **Table 4.2.**

For this noise survey the Indicative Noise Amenity Areas assumed are the Urban category for the residential property and Industrial category for the adjacent industrial building.

The INP defines Urban – an area with an acoustical environment that:

- Is dominated by 'urban hum' or industrial source noise
- Has heavy through traffic with characteristically heavy and continuous traffic flows during peak periods
- Is near commercial districts or industrial districts
- Has a combination of the above

The INP defines Industrial – an area defined as an industrial zone on a LEP.

Table 4.1 : Acceptable noise levels (INP, EPA 2000)

Type of receiver	Indicative noise amenity area	Time of day	Recommended L_{Aeq} noise level, dB(A)	
			Acceptable	Recommended maximum
Residence	Rural	Day	50	55
		Evening	45	50
		Night	40	45
	Suburban	Day	55	60
		Evening	45	50
		Night	40	45
	Urban	Day	60	65
		Evening	50	55
		Night	45	50
	Urban/industrial interface – for existing situations only	Day	65	70
		Evening	55	60
		Night	50	55
School classrooms – *Internal	All	Noisiest 1-hour period when in use	35	40
Hospital ward –internal –external	 All All	 Noisiest 1-hour period Noisiest 1-hour period	 35 50	 40 55
Place of worship – internal	All	When in use	40	45
Area specifically reserved for passive recreation (e.g. National Park)	All	When in use	50	55
Active recreation area (e.g. school playground, golf course)	All	When in use	55	50
Commercial premises	All	When in use	65	70
Industrial premises	All	When in use	70	75

An external noise level is often assumed to be equivalent to an 'internal noise level' + 10 dB(A). This assumes lowest façade performance with an open window.

Where the existing noise level from industrial noise sources is close to the acceptable noise level, the noise level from any new source(s) must be controlled to preserve the amenity of an area. If the total noise level from industrial sources already exceeds the acceptable noise level for the area in question the L_{Aeq} noise level from any new source should not be greater than :

- 10 dB below the acceptable noise level if there is a reasonable expectation that the existing levels maybe reduced : or
- 10 dB below the existing level if there is no such reasonable expectation that existing levels will fall (for example, in cases where surrounding areas are fully developed) and no significant changes to land use are expected.

The table 4.2 below sets out the implications for noise from industrial sources.

Table 4.2 : Modification to ANL to account for existing level of industrial noise

Total existing L_{Aeq} noise level from industrial sources, dB(A).	**Maximum L_{Aeq} noise level for noise from new sources alone, dB(A)**
≥ ANL plus 2	If existing noise level is likely to decrease in future: ANL minus 10 If existing noise level is unlikely to decrease in future: existing noise level minus 10.
ANL plus 1	ANL minus 8
ANL	ANL minus 8
ANL minus 1	ANL minus 6
ANL minus 2	ANL minus 4
ANL minus 3	ANL minus 3
ANL minus 4	ANL minus 2
ANL minus 5	ANL minus 2
ANL minus 6	ANL minus 1
<ANL minus 6	ANL

4.1.1 Modifying factors

Where a noise source contains certain characteristics that may cause greater annoyance to receivers such as tonality or low frequency, the INP provides modifying factors that should be applied to the noise source level at the receiver before comparison with the criteria specified in **Table 3.1.**

Tonal noise contains a prominent frequency and incurs a 5 dB correction where the measured or predicted one-third octave band noise level exceeds the level of the adjacent bands by:

- 5 dB or more above a frequency of 400 Hz
- 8 dB or more between 160 and 400 Hz
- 15 dB or more below a frequency of 160 Hz.

Low frequency noise contains major components within the frequency range of 20 Hz to 250 Hz. Where the C-weighted noise level is 15 dB or more, greater than the A-weighted noise level, a 5 dB correction is applicable. Where a noise source emits a tonal and low-frequency noise, only one of the 5 dB corrections should be applied (where the tone is also low frequency).

From section 2.2.3 titled "Assessment in areas of high traffic noise" of the INP it states

'The level of transport noise – road traffic noise in particular – may be high enough to make noise from an industrial source effectively inaudible, even though the L_{Aeq} noise level from that industrial noise source may exceed the recommended acceptable noise level in (table 4.2 above). In such cases, the amenity criterion for noise from the industrial noise becomes the $L_{A\ eq\ period\ traffic}$ minus 10 dB. This amenity criterion replaces the amenity criterion in tables 4.1 and 4.2 above and is used in the same way the amenity criterion is used, that is in conjunction with intrusiveness criterion, to determine the limiting criterion.

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

1) *Traffic noise is identified as the dominant noise source at the site.*
2) *The existing traffic noise level (determined using the procedure outlined in section 3.2) is 10 dB or more above the Acceptance noise level for the area.*
3) *It is highly unlikely the road traffic noise levels will decrease in the future."*

5. Noise survey results

5.1 Unattended noise survey

$L_{Aeq\ 15\ Minute}$ Sound Pressure Levels were recorded continuously over the 7 day measurement period.

Appendix A presents the A weighted time trace plots of the sound pressure level versus time over the duration of the unattended noise measurements.

The 10 percentile $L_{Aeq\ 15\ minute}$ and Rating Background Level (RBL) sound pressure levels were determined in accordance to the INP for the day, evening and night time periods over the 7 days.

The median for each day, evening and night time period was calculated in accordance to INP to determine the Rating Background Level.

Table 5.1 presents the RBL sound pressure level for each day 'Day' period for each measurement day over the unattended noise survey as well the calculated Median.

Table 5.1 : *The RBL (10th Percentile L_{A90}) sound pressure levels for each day 'Day' period*

Time period	A weighted sound pressure level (dBA)
Day time – (07:00 am – 06:00 pm)	**RBL (10th Percentile LA90)**
Thursday 8 August 2013	54.6
Friday 9 August 2013	51.6
Saturday 10 August 2013	51.6
Sunday 11 August 2013	47.2
Monday 12 August 2013	52.4
Tuesday 13 August 2013	52.4
Wednesday 14 August 2013	51.2
Thursday 15 August 2013	51.3
Median	51.6

Table 5.2 presents the RBL sound pressure level for each day 'Evening' period for each measurement day over the unattended noise survey as well the calculated Median.

Table 5.2 : *The RBL (10th Percentile L_{A90}) sound pressure levels for each day 'Evening' period*

Time period	A Weighted Sound Pressure Level (dBA)
Evening time (6:00 pm – 10:00 pm)	**RBL (10th Percentile LA90)**
Thursday 8 August 2013	50.3
Friday 9 August 2013	48.6
Saturday 10 August 2013	49.0
Sunday 11 August 2013	48.6
Monday 12 August 2013	49.3
Tuesday 13 August 2013	51.2
Wednesday 14 August 2013	50.3
Thursday 15 August 2013	
Median	49.3

Table 5.3 presents the RBL sound pressure level for each day 'Night' period for each measurement day over the unattended noise survey as well the calculated Median.

Table 5.3 : *The RBL (10th Percentile L_{A90}) sound pressure levels for each day 'Night' period*

Time period	**A weighted sound pressure level (dBA)**
Night time 6:00 pm – 10:00 pm	**RBL (10th Percentile LA90)**
Thursday 8 August 2013	43.2
Friday 9 August 2013	44.3
Saturday 10 August 2013	43.8
Sunday 11 August 2013	44.1
Monday 12 August 2013	45.9
Tuesday 13 August 2013	47.2
Wednesday 14 August 2013	46.0
Thursday 15 August 2013	
Median	44.3

5.2 Attended noise survey

Table 5.4 below presents the results of attended noise level measurements performed at 3 measurement positions around the proposed NSS site on the 15th August, 2013 to verify the unattended noise levels measurements.

Table 5.4 : Attended noise level measurements and noise source observations.

Receiver Location	Period	Time	Sound pressure levels, dB(A)				Noise sources
			L-Aeq,15min	L-A90,15min	L-Amax	L-A10,15min	
16 Gleneagle Place	Daytime	14:05 – 14:20	56.1	52.2	79.2	60.2	Regular road traffic on Pembroke Road and Ben Lomond Road. Bird noise and occasional localised traffic movements.
15 Huntsmore Road	Daytime	14.30 – 14:45	58.5	53.2	77.9	62.1	Occasional train noise to east. Road traffic noise to south on Ben Lomond Road and to the west on Pembroke Road. Localised traffic movements including a number of light commercial and truck movements on Airds Road and Huntsmore Road. Industrial/Commercial operational noise in the form of bangs, vents and general humming noise from surrounding buildings on Huntsmore Road.
21 Harding Place	Daytime	15:03 – 15:18	55.7	51.9	69.3	60.0	Regular road traffic on Campbeltown Road and Ben Lomond Road. Bird noise,

6. Calculation of noise limit criteria

The INP sets two separate noise criteria to meet environmental noise objectives – residential criteria and industrial criteria.

6.1 Residential property -urban property classification

6.1.1

6.1.2 Intrusive noise level criteria

The intrusive noise level has been based on the measured and calculated background noise levels (RBL) recorded over the unattended 7 day measurement period.

Table 6.1 below presents the calculated Intrusive Noise Level Criteria for the residential property.

Table 6.1 : Calculated intrusive noise level criteria – residential property

Receiver	Receiver type	Time period	Background L_{A90} noise level (RBL), dB(A)	$L_{Aeq,\ 15\ min}$ Intrusiveness criteria, dB(A) (RBL + 5dB)
No. 46 Kimberley Road	Residential	Day	52	57
		Evening	49	54
		Night	44	49

6.1.3 Amenity noise criteria

The property under review at No. 46 Kimberley Road Minto has been assessed as Urban classification.

The measured L_{Aeq} sound pressure levels were dominated by road traffic along Pembrooke Road, Ben Lomond Road and general background roar from the Hume highway. This presents a relatively good representation of the $L_{Aeq\ road\ traffic,}$ therefore making 2.2.3 of the INP applicable.

Table 6.2 below presents the calculated Amenity Noise Level Criteria.

Table 6.2 : Calculated amenity noise level criteria -- residential property

Receiver	Receiver type	Time period	$L_{Aeq\ period\ traffic}$ noise level, dB(A) (Median over 7 days)	$L_{Aeq,\ 15\ min}$ Amenity criteria, dB(A) ($L_{Aeq\ period\ (traffic)}$) – 10*
No. 46 Kimberley Road	Residential	Day	60	50
		Evening	58	48
		Night	56	46

***Calculated in accordance to clause 2.2.3 i.e. $L_{Aeq\ Period\ (traffic)}$ – 10 dB**

6.2 Industrial premise

The Amenity Noise Limit Criteria have been determined for the adjoining industrial buildings located near the proposed NSS site. This is based on absolute criteria rather than from a background noise level.

Table 6.3 below presents the calculated Amenity Noise Level Criteria

Table 6.3 : Calculated amenity noise level criteria – industrial premises

Receiver	Receiver type	Time period	Background L_{A90} noise level (RBL), dB(A)	$L_{Aeq,\ 15\ min}$ Amenity noise level criteria, dB(A)
No. 16 Huntsmore Road	Industrial	When in Use	58.5	70*

***Amenity Noise Limit = Acceptable level – result table 2.2 (<acceptable level noise level minus 6 = acceptable level)**

6.3 Noise limit criteria

6.3.1 Residential property

The resultant Noise Limit criteria are taken as the lowest calculated values of the Intrusive Noise Criteria and the Amenity criteria for the residential property.

Table 6.4 presents the Noise Limit criteria for the nearest noise sensitive residential property (No.46 Kimberley Road, Minto).

Table 6.4 : Calculated noise limit criteria – residential property

Receiver	Receiver type	Time period	Noise limit criteria (dBA)
No. 46 Kimberley Road	Residential	Day	50
		Evening	48
		Night	46

6.3.2 Industrial site

The resultant Noise Limit criteria are taken as the lowest calculated values of the Intrusive Noise Criteria and the Amenity criteria for the residential property.

Table 6.5 presents the Noise Limit criteria for the nearest industrial building to the NSS site.

Table 6.5 : Calculated noise limit criteria – industrial

Receiver	Receiver type	Time period	$L_{Aeq,\ 15\ min}$ Amenity noise level criteria, dB(A)
No. 16 Huntsmore Road	Industrial	When in Use	70*

7. Noise level predictions

Computer modelling was performed to determine the typical noise emissions from the proposed Network Support Substation with the specified generator sets and associated horizontal heat exchangers operating.

The predicted noise levels at the nearest identified sensitive residences were determined using the SoundPLAN 7.1 computer modelling software. This modelling package is accepted and endorsed by numerous agencies nationally and internationally.

The SoundPLAN modelling was performed using the industry standard CONCAWE algorithm noise prediction method. The SoundPLAN computer model has a prediction uncertainty in the order of +/- 3dBA.

The noise model was developed using terrain contours at 10 m intervals and aerial photography to identify the locations of sensitive receivers (confirmed during the site inspection).

7.1 Methodology

7.1.1 Noise sensitive receiver locations

Noise level predictions have been made for existing and possible future noise sensitive receiver locations around the proposed site.

7.1.2 Network Support Substation equipment and site assumptions

To conduct the noise level prediction, the following assumptions were made:

Gas fired generators

- The noise design target for the gas fired generator (inside an acoustic enclosure plus high performance exhaust attenuators) is nominally 70dB (A) at 1m. This data was provided by NovaPower and transferred directly into the prediction modelling program. The associated sound power levels for each source are tabulated in Appendix A.
- The exhaust attenuators are proposed to have the minimum sound power level as presented in Appendix A.

Heat exchangers

- The heat exchanger units are located adjacent to each generator, although outside of the building envelope. Sound pressure levels recorded around a single heat exchanger fan were provided by NovaPower. Third octave sound power levels for each surface, of a theoretical rectangular prism, were calculated based on this data for each operating type and fan speed. The approximate dimensions used to model this theoretical rectangular prism were 1.5m high, 7.3m long and 2.5m wide – see Appendix B for the sound power levels for each scenario.

Two scenarios were modelled for the operation of the heat exchangers:

Scenario 1 – day and evening operation

- **"Delta"** is a high speed scenario where the fans operate at 890 rpm. This is also a 'prevailing' scenario as the noise emission from this scenario is higher than for the "Star" scenario. In the Delta scenario, all 10 heat exchanger fans are operating. This configuration will be used for the day and evening operation only.

Scenario 2 – night time operation

- **"Star"** or a low speed scenario where the fans operate at 690 rpm. This is also a 'best case' scenario as the noise emission from this scenario is lower than the "Delta" scenario. In the Star scenario, a maximum of 8 fans on the heat exchangers will operate. This scenario is to be used for night time operation only.

8. Discussion

8.1 Computer prediction modelling

Computer prediction modelling has been performed to determine the acoustic impact on the local environment due to the operation of the proposed Network Support Substation. This plant is to be housed within the industrial building located at No.15 Huntsmore Road, Minto.

The modelling mainly concentrated on the nearest residential property and the nearest industrial building located to the proposed Network Support Substation.

Prediction modelling was performed to predict the noise level contours into the local environment, using two different versions of the existing industrial building envelope:

- A version where no modifications to the existing building envelope are factored in ("existing building envelope"); and
- A version where some modifications to the existing building envelope are factored in ("modified building envelope"). The "modified building envelope" version consists of internally lining the metal deck walls and roof of the NSS building with 9 mm thick fibro-cement sheeting (FCS) wall board. Note that the western wall of the existing building is constructed of concrete walls.

The following assumptions on the building structure were used when performing the noise level prediction contours for both versions of the building envelope.

- There were no openings in the building envelope. All openings were assumed to be sealed (from photographs of the building it could be seen that there were several gaps in the wall and louvered vents).
- The external windows of the industrial building were sealed closed.
- All doors were closed.
- There was no acoustic insulation on the roof.

It is assumed that openings will be required to reduce heat build up and remove exhaust fumes from engines that would build up within building during operation. If venting is to be incorporated, acoustic louvres will be required as well as exhaust fans fitted with attenuators. It must be noted venting and louvres have not been modelled as the size and required airflows are not known.

8.2 Prediction modelling scenarios and results

Prediction modelling was performed for four scenarios, these being:

- Network Support Substation operating at full load - existing building envelope – heat exchangers operating in 'Delta' Mode
- Network Support Substation operating at full load - existing building envelope – heat exchangers operating in 'Star' Mode
- Network Support Substation operating at full load - modified building envelope – heat exchangers operating in 'Delta' Mode
- Network Support Substation operating at full load - modified building envelope – heat exchangers operating in 'Star' Mode

Table 8.1 presents the predicted noise levels due to the operation of the NSS at the nearest industrial building and the nearest residential property.

Appendix A shows the sound power levels of the components of the generators. It shows that the main noise sources are the enclosure walls and generator exhausts, with the enclosure roofs contributing slightly less to the sound power levels.

Table 8.1 : *Predicted Noise Levels at the nearest Residential and Industrial premises*

Network support substation building envelope	'A' weighted sound pressure level (dBA)			
	Residential property (No.46 Kimberley Road)	Noise limit determined in accordance to INP methodology	Nearest industrial building	Noise limit determined in accordance to INP methodology
Existing building envelope – heat exchangers operating delta	40	46	73	70
Modified building envelope – heat exchangers operating delta	32	46	58	70
Existing building envelope – heat exchangers operating star	39	46	73	70
Modified building envelope – heat exchangers operating star	32	46	57	70

8.3 Predicted noise levels at the nearest residential property

The nearest residential property most likely to be potentially impacted due to the operation of the proposed NSS was determined to be No.40 Kimberley Road, Minto. This property is located approximately 670 metres in a straight line from the NSS site.

From the prediction modelling it can be determined the maximum noise level due to the operation of the Network Support Substation will be 40 dBA and 39 dBA with the existing building configuration and the Delta / Star heat exchanger configuration.

The predicted noise levels meet the NSW EPA Industrial Noise Policy noise limit criteria at this residential location. Through the upgrading of the metal walls and roof, it is predicted the environmental noise levels will be 32 dBA.

8.4 Predicted noise levels at the nearest industrial property

The nearest industrial building is located approximately 12 metres to the north of the proposed NSS site. The prediction modelling shows that the maximum noise level at the nearest industrial building due to the operation of the NSS will be 73 dBA assuming using the existing building (without modifications) and with the heat exchangers in Delta operation. This is slightly above the NSW EPA Industrial Noise Policy noise limit criteria of 70 dBA at this industrial location. The prediction modelling shows that with building modifications (FCS lining throughout the existing building) and with the heat exchangers in Delta operation, the maximum noise level at the nearest industrial building due to the operation of the NSS will be 58 dBA.

The results of the prediction modelling show that with some minor acoustic treatment the acoustic performance of the generators will be able to meet the NSW EPA Industrial Noise Policy noise limit criteria of 70 dBA at this industrial location. Furthermore, verification noise testing will be conducted after commissioning to verify the prediction modelling results.

9. Conclusion

An environmental noise assessment was performed for the proposed NovaPower Network Support Substation at No.15 Huntsmore Road, Minto. Noise limits were determined in accordance with the methodology presented in the NSW EPA Industrial Noise Policy.

Background noise monitoring was performed to determine the existing levels of background noise in the surrounding area. The background monitoring results were used as inputs to noise prediction modelling of the NSS.

Noise prediction modelling was performed to determine the potential acoustic impact of the proposed NSS into the surrounding area. The prediction modelling for the Minto site used noise level data for the gas fired engines and generators (which included noise mitigation treatments) from a previous noise assessment at Traralgon as well as the background monitoring results.

From prediction modelling it was determined that the noise limit criteria would be met at the nearest residential property with the existing building envelope. The prediction modelling also shows that the noise limit criteria would be met at the nearest industrial building with the implementation of minor acoustic treatment. A noise mitigation treatment was presented has presented in this report and applied to the prediction modelling ("modified building envelope"). The prediction modelling shows that the presented treatment is far in excess of what is required to meet the noise limit criteria.

From an acoustics impact perspective, it can be concluded that the proposed Network Support Substation is well suited for the proposed location, being surrounded by industrial land uses and having minimal noise impacts.

Appendix A. Sound power level data of generators used for prediction modelling

Component	Source type	Surface area	'A' weighted sound pressure level (dBA)									
			Octave band centre frequency (Hz)									
			31.5	63	125	250	500	1K	2K	4K	8K	Over all SPL
Gen 1_Enclosure air inlet	Area	8.86		43.8	64.9	44.6	47.4	47.3	45	50	55.1	65.7
Gen 1_Combustion air inlet	Area	3		66.5	69.2	53.3	49.5	35.2	33.7	54.6	47.8	71.3
Gen 1_Encosure W	Area	34.78	63.4	69.1	84.6	71.8	55.4	54.4	47.4	56.7	48	85
Gen 1_Enclosure roof N	Area	11.66	58.7	64.4	79.9	67.1	50.7	49.7	42.7	52	43.3	80.3
Gen 1_Enclosure roof E	Area	2.77	52.4	58.1	73.6	60.8	44.4	43.4	36.4	45.7	37	74
Gen 1_Enclosure roof W	Area	2.74	52.4	58.1	73.6	60.8	44.4	43.4	36.4	45.7	37	74
Gen 1_Enclosure roof S	Area	5.76	55.6	61.3	76.8	64	47.6	46.6	39.6	48.9	40.2	77.2
Gen 1_Enclosure discharge W	Area	1.12		48.8	64.4	42.1	43.9	45.8	40.5	45.5	42.6	64.7
Gen 1_Enclosure discharge E	Area	1.12		48.8	64.4	42.1	43.9	45.8	40.5	45.5	42.6	64.7
Gen 1_Enclosure roof N2	Area	0.39	43.9	49.6	65.1	52.3	35.9	34.9	27.9	37.2	28.5	65.5
Gen 1_Enclosure S	Area	11.89	58.8	64.5	80	67.2	50.8	49.8	42.8	52.1	43.4	80.3
Gen 1_Encosure E	Area	34.78	63.4	69.1	84.6	71.8	55.4	54.4	47.4	56.7	48	85
Gen 1_Com air dis silencer W	Area	6.45		60.1	56.3	54	54	58.7	60	59.1	59.6	67.3
Gen 1_Com air dis silencer Top	Area	6.27		60	56.2	53.9	53.9	58.6	59.9	59	59.5	67.2
Gen 1_Com air dis silencer S	Area	2.18		55.4	51.6	49.3	49.3	54	55.3	54.4	54.9	62.6
Gen 1_Com air dis silencer E	Area	6.45		60.1	56.3	54	54	58.7	60	59.1	59.6	67.3
Gen 1_Com air dis silencer N	Area	2.19		55.4	51.6	49.3	49.3	54	55.3	54.4	54.9	62.7
Gen 1_exhaust	Point			73	69.2	66.9	66.9	71.6	72.9	72	72.5	80.2

Appendix B. Sound power levels for heat exchangers used for prediction modelling

Table B.1 : Sound power level of the heat exchangers - delta configuration

Component	Source type	Surface area	'A' weighted sound pressure level (dBA)									
			Octave band centre frequency (Hz)									
			31.5	63	125	250	500	1K	2K	4K	8K	Over all SPL
Each Side (W & E)	Area	79.7	N/A	48.4	59.4	65.4	69.4	74.4	75.4	71.4	65.4	N/A
Each End (N&S)	Area	76.5	N/A	45.0	56.0	62.0	66.0	71.0	72.0	68.0	62.0	N/A
Roof	Area	88.2	N/A	56.8	67.8	73.8	77.8	82.8	83.8	79.8	73.8	N/A

Table B.2 : Sound power level of the heat exchangers - star configuration

Component	Source type	Surface area	'A' weighted sound pressure level (dBA)									
			Octave band centre frequency (Hz)									
			31.5	63	125	250	500	1K	2K	4K	8K	Over all SPL
Each Side (W & E)	Area	79.7	N/A	46.1	60.1	66.1	67.1	71.1	70.1	65.1	58.1	**75.7**
Each End (N&S)	Area	76.5	N/A	42.7	56.7	62.7	63.7	67.7	66.7	61.7	54.7	**72.4**
Roof	Area	88.2	N/A	53.4	67.4	73.4	74.4	78.4	77.4	72.4	65.4	**83.1**

Appendix C. Predicted noise level contours for 4 generators with heat exchangers operating in Delta mode

Figure C.1 : Predicted noise level contours for 4 generators with heat exchangers operating in Delta mode (existing building envelope)

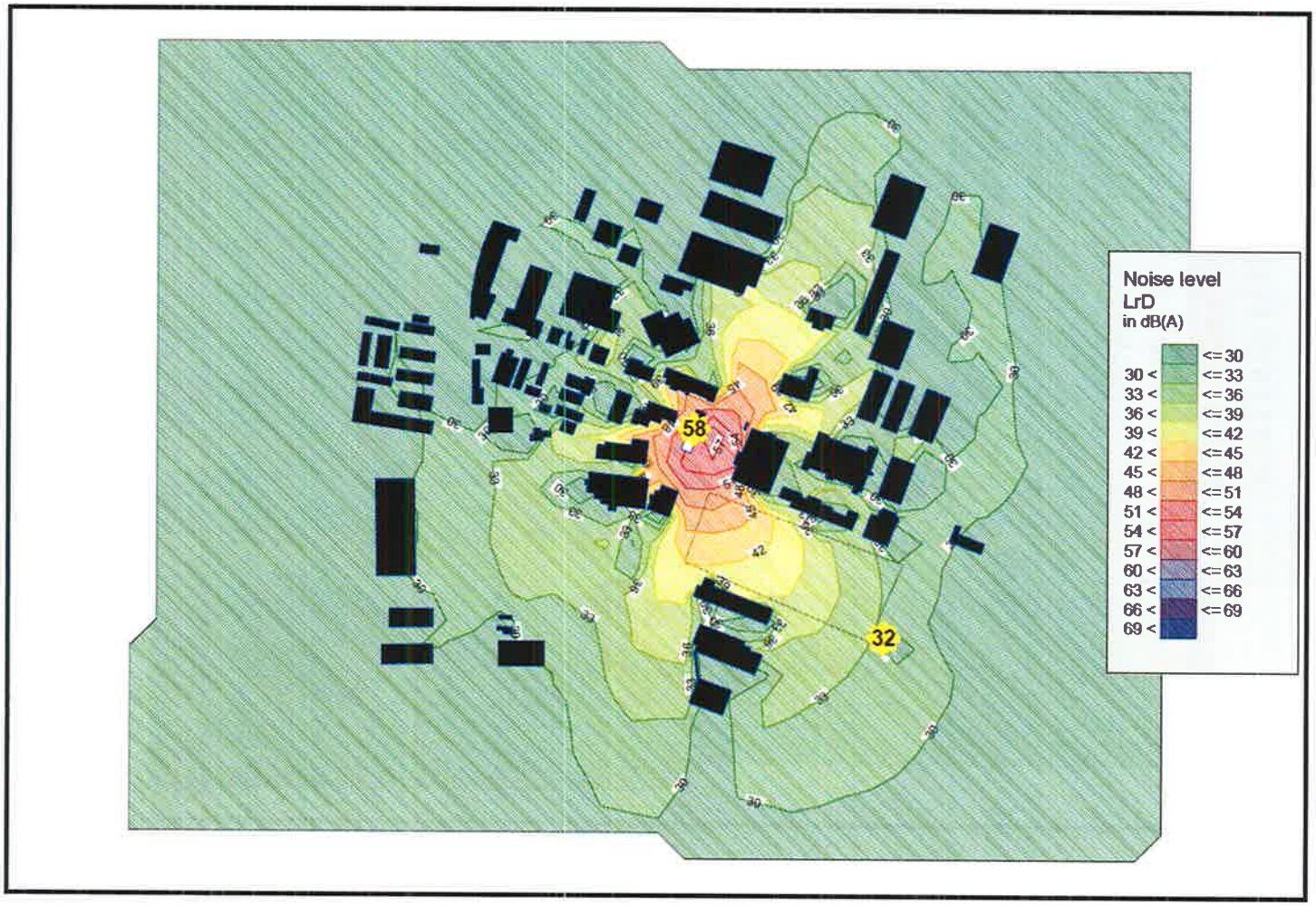


Figure C.2 : Predicted noise level contours for 4 generators with heat exchangers operating in Delta mode (modified building envelope)

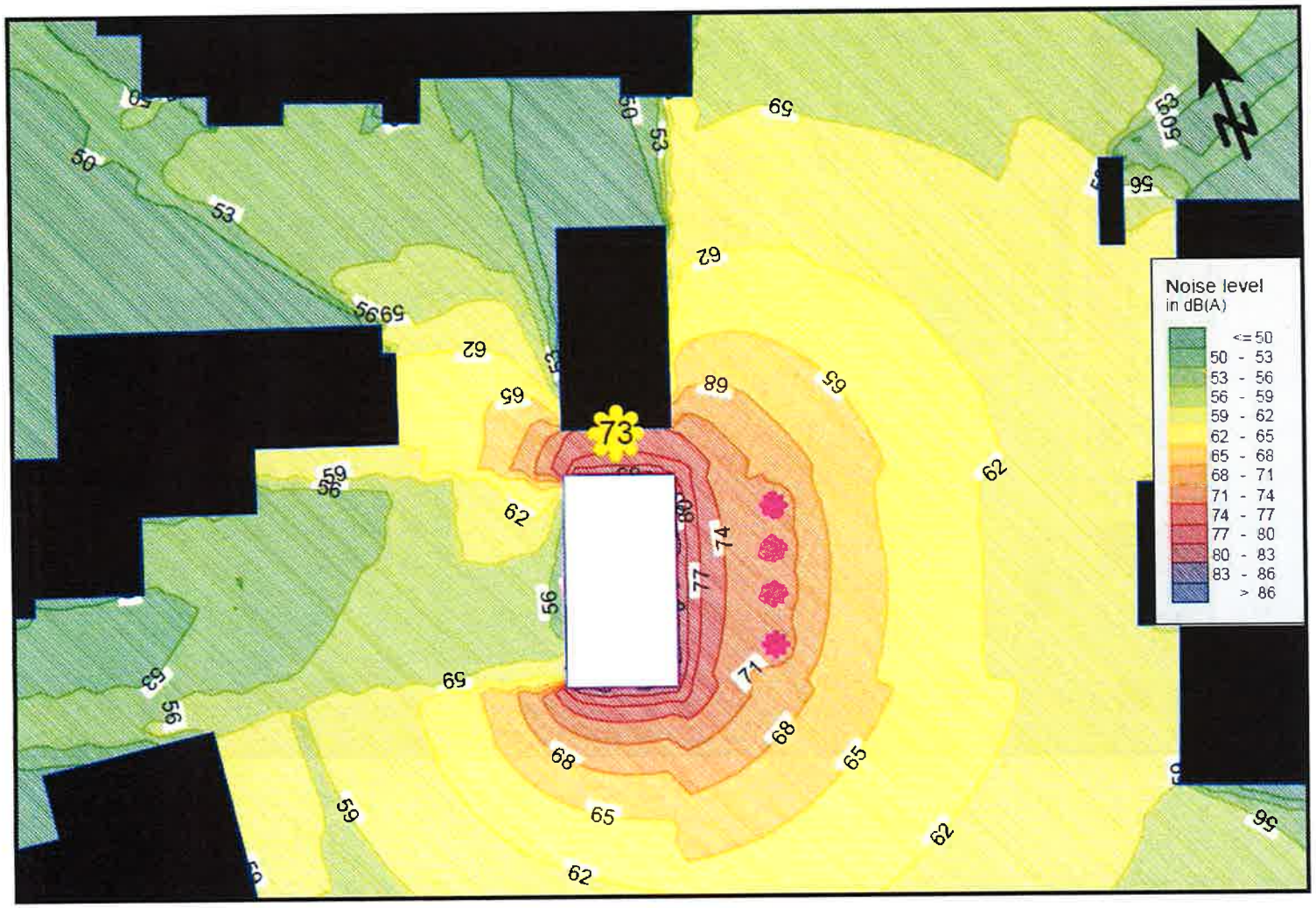


Figure C.3 : Predicted noise level contours for 4 generators with heat exchangers operating in Delta mode (existing building envelope) – zoomed in

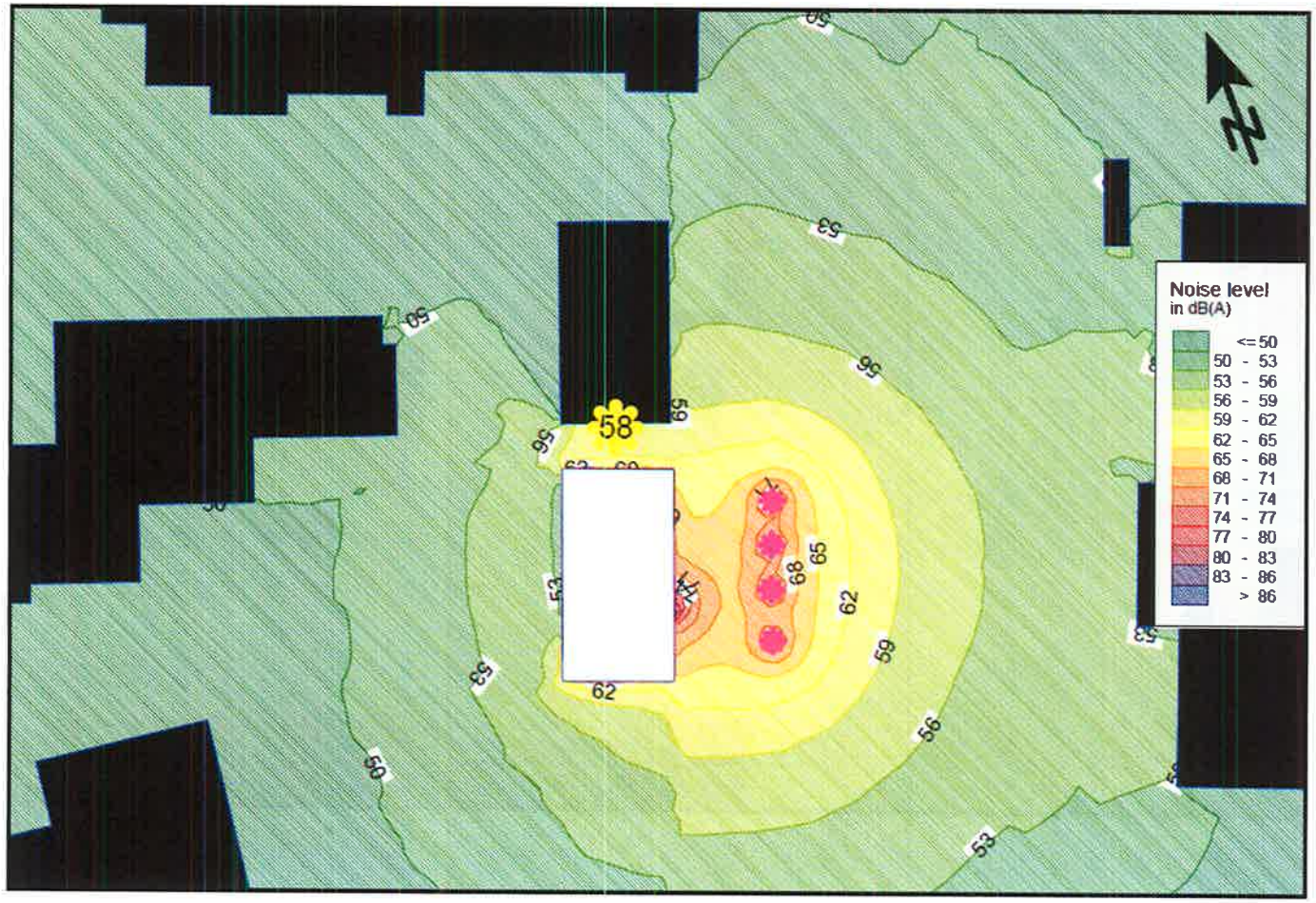


Figure C.4 : Predicted noise level contours for 4 generators with heat exchangers operating in Delta mode (modified building envelope) – zoomed in

Appendix D. Predicted noise level contours for 4 generators with heat exchangers operating in Star mode

Figure D.1 : Predicted noise level contours for generators with heat exchangers operating in Star mode (existing building envelope)

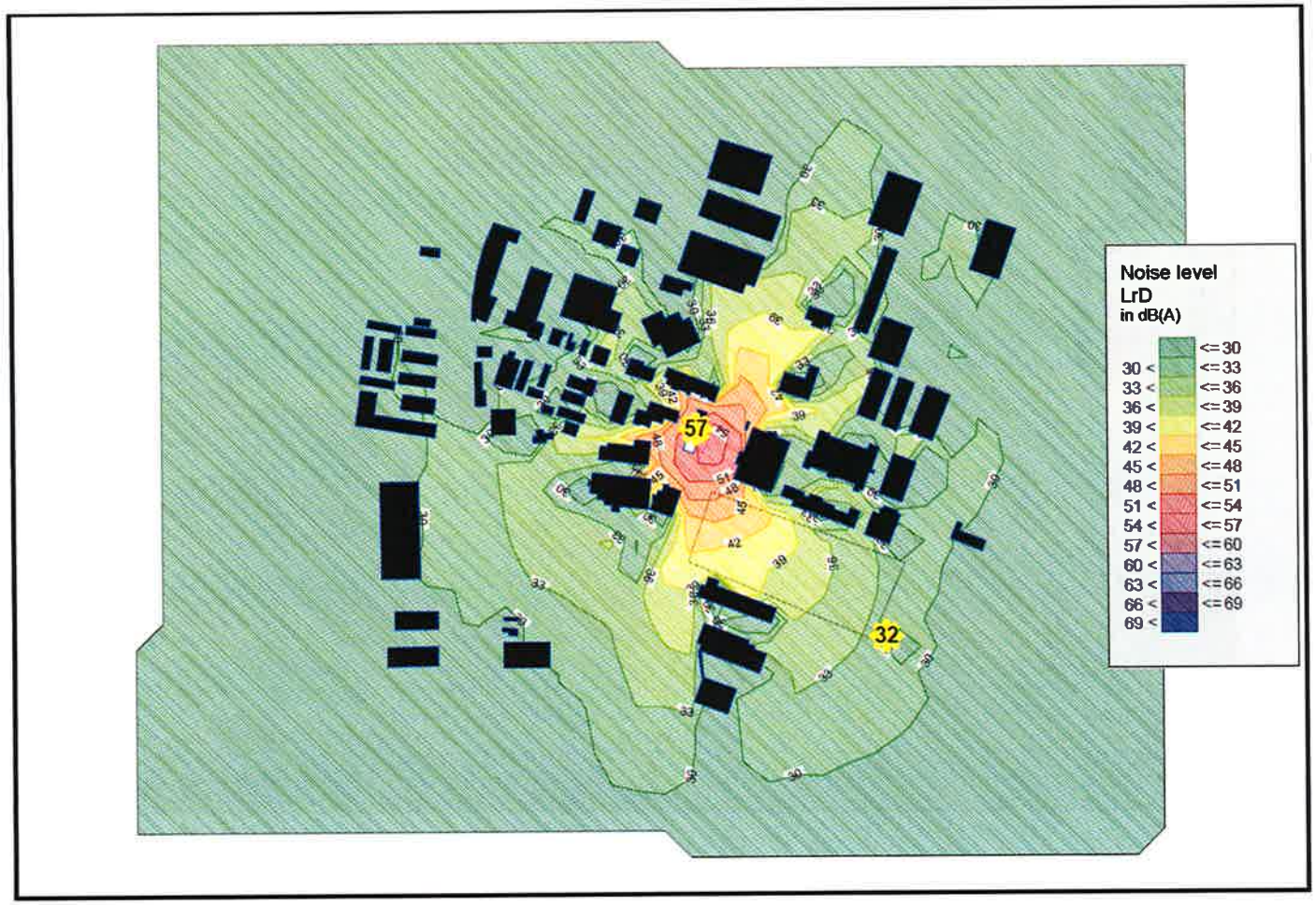


Figure D.2 : Predicted noise level contours for 4 generators with heat exchangers operating in Star mode (modified building envelope)

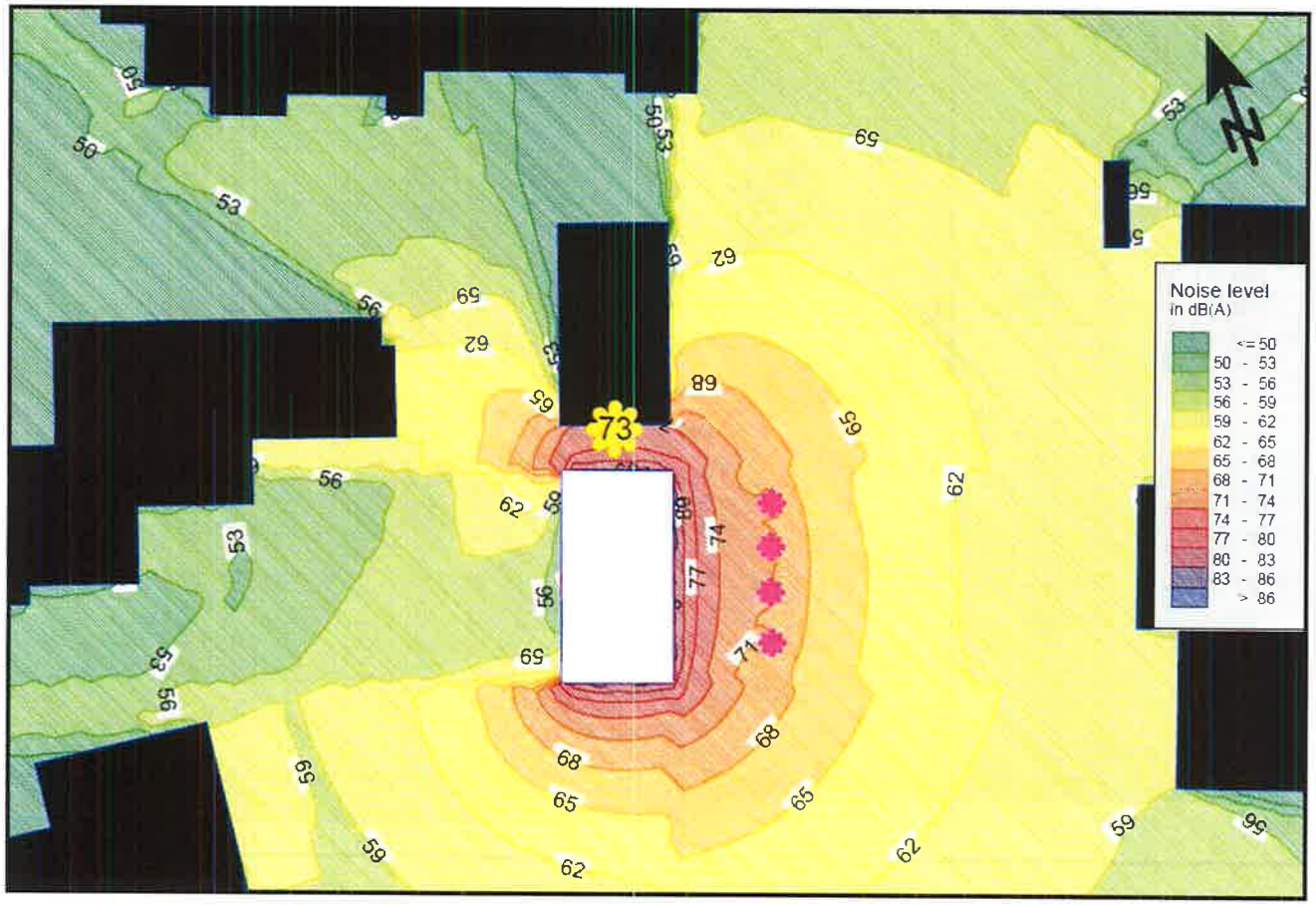


Figure D.3 : Predicted noise level contours for 4 generators with heat exchangers operating in Star mode (existing building envelope) – zoomed in

Figure D.4 : Predicted noise level contours for 4 generators with heat exchangers operating in Star mode (modified building envelope) – zoomed in

Appendix C. Waste Management Plan

campbelltown city council

WASTE AND RECYCLING SERVICES

Waste Management Plan
Demolition, Subdivision, Construction and Ongoing Use of Premises

Privacy Statement

The information requested by Council on this form may constitute personal information under the Privacy and Personal Information Protection Act 1998. Council is allowed to collect the information from you to consider this matter. Supplying this information is voluntary. However if you cannot or do not wish to provide the information, we may not be able to consider the matter. If you need further details, please contact the Privacy Officer, Campbelltown City Council, cnr Queen and Broughton Streets, Campbelltown.

To facilitate waste and recycling management and waste minimisation, Campbelltown City Council requires on-site sorting and storage of waste products pending re-use or collection.

All relevant sections as outlined in the table below must be completed and submitted as an attachment with the Development Application or as required by conditions of development consent.

Development Type	Part A	Part B	Part C	Part D	Part E
Dwelling houses (incl. garden flats and domestic outbuildings)	✓	✓	×	×	✓
Narrow lot dwellings	✓	✓	×	×	✓
Multi dwellings	✓	✓	✓	×	×
Residential apartment buildings	✓	✓	✓	×	×
Mixed use development	✓	✓	✓	✓	×
Building fit out	✓	✓	✓	✓	×
Commercial development	✓	✓	✓	✓	×
Industrial development *	✓	✓	✓	✓	×

Completing this document will assist in identifying the type and volume of waste generated on the subject property at different stages of the development and how these materials will be re-used, recycled or disposed. The information provided in this document (and on the plans) will be assessed against the design requirements of the Campbelltown (Sustainable City) Development Control Plan 2007.

If the space provided in this document is insufficient please provide attachments.

Outline of Proposal

Site Address: LOT 238, DP 260481 (UNIT 2), 15 HUNTSMORE ROAD, MINTO NSW 2566

Applicant Details: NOVAPOWER PTY LTD

Applicant Address: 8-10 BOSCI ROAD, INGLEBURN NSW 2565

Brief Description of the Proposal: CONSTRUCTION AND OPERATION OF FOUR x 2MW GAS GENERATORS (IN EXISTING BUILDING) AND ASSOCIATED EQUIPMENT FOR NETWORK SUPPORT

The details provided in this document are the intentions for managing waste relating to this Proposal.

Signature of Applicant: .....

Date: 24/10/17

PART A

DEMOLITION/SUBDIVISION STAGE				
MATERIALS ON-SITE		**DESTINATION**		
		REUSE AND RECYCLING		**DISPOSAL**
Type of Material	Estimated Volume (m^3)	ON-SITE • Specify proposed reuse or on-site recycling method.	OFF-SITE • Specify relevant licensed facility or contractor.	• Specify contractor of licensed landfill facility.
Excavation Material	3 m^3	• REUSE IN TRENCH - BACKFILL + COMPACTION	• AUSSIE SKIPS TO MONITOR AND REMOVE WASTE • DISPOSAL CERTIFICATION	• REMOVED BY CIVIL CONTRACT • DISPOSAL CERTIFICATION TO BE OBTAINED FROM SUITABLE LANDFILL
Green Waste	0 m^3	N/A	N/A	N/A
Bricks	0 m^3	N/A	N/A	N/A
Concrete	1-2 m^2	N/A	• AUSSIE SKIPS TO MONITOR AND REMOVE WASTE • DISPOSAL CERTIFICATION	• REMOVAL BY CIVIL CONTRACT • DISPOSAL CERTIFICATION TO BE OBTAINED FROM SUITABLE LANDFILL
Timber	0 m^3	N/A	N/A	N/A

(Continued over page)

PART A

DEMOLITION/SUBDIVISION STAGE (continued)				
MATERIALS ON-SITE		**DESTINATION**		
		REUSE AND RECYCLING		**DISPOSAL**
Type of Material	Estimated Volume (m^3)	ON-SITE • Specify proposed reuse or on-site recycling method.	OFF-SITE • Specify relevant licensed facility or contractor.	• Specify contractor of licensed landfill facility.
Plasterboard	1 m^3	N/A	• AUSSIE SKIPS TO MONITOR AND REMOVE WASTE • DISPOSAL CERTIFICATION	• REMOVED BY AUSSIE SKIPS – TO PROVIDE DISPOSAL CERTIFICATION
Metals - please specify	< 1 m^3	• GAL COLOURBOND • MINOR REUSE TO PATCH HOLES	AS ABOVE	AS ABOVE
Hazardous Materials e.g. Asbestos - please specify	0	N/A	N/A	N/A
Other - please specify	< 0.5 m^3	N/A	• ELECTRIC WIRING • SIMMS – RECYCLING	• SIMMS TO PROVIDE CERTIFICATES

NOTE: *Details of site area to be used for on-site separation, treatment and storage of waste, including method of weather protection shall be provided on the plans accompanying the Development Application. All demolition waste dockets must be retained on site to confirm which facility received the material for recycling or disposal.*

PART B

CONSTRUCTION STAGE				
MATERIALS ON-SITE		**DESTINATION**		
		REUSE AND RECYCLING		**DISPOSAL**
Type of Material	Estimated Volume (m^3)	ON-SITE • Specify proposed reuse or on-site recycling method.	OFF-SITE • Specify relevant licensed facility or contractor.	• Specify contractor of licensed landfill facility.
Excavation Material	3 m^3	REUSE IN BACKFILL	AUSSIE SKIPS	AUSSIE SKIPS TO PROVIDE DISPOSAL CERTIFICATE
Green Waste	0 m^3	N/A	N/A	N/A
Bricks	2 m^3	· BUNDING INSTALLATION	AUSSIE SKIPS	AUSSIE SKIPS TO PROVIDE DISPOSAL CERTIFICATE
Concrete	< 5 m^3	FILL IN TRENCH EXCAVATION AND CONCRETE CUT FILL	AS ABOVE	AS ABOVE
Timber	0 m^3	N/A	N/A	N/A

(Continued over page)

PART B

CONSTRUCTION STAGE (continued)				
MATERIALS ON-SITE		**DESTINATION**		
		REUSE AND RECYCLING		**DISPOSAL**
Type of Material	Estimated Volume (m^3)	ON-SITE • Specify proposed reuse or on-site recycling method.	OFF-SITE • Specify relevant licensed facility or contractor.	• Specify contractor of licensed landfill facility.
Plasterboard	$<2 m^3$	SWITCHROOM CONSTRUCTION	AUSSIE SKIPS	AUSSIE SKIPS TO PROVIDE DISPOSAL CERTIFICATE
Metals - please specify	$<1 m^3$	STUD / METAL STUD WALL CONSTRUCTION	AS ABOVE	AS ABOVE
Hazardous Materials e.g. Asbestos - please specify	$0 m^3$	N/A	N/A	N/A
Other - please specify	$2 m^3$	NEW ELECTRICAL WIRING	SIMMS - RECYCLING	SIMMS TO PROVIDE CERTIFICATES

NOTE: *Details of site area to be used for on-site separation, treatment and storage of waste, including method of weather protection shall be provided on the plans accompanying the Development Application. All construction waste dockets must be retained on site to confirm which facility received the material for recycling or disposal.*

PART C

N/A

RESIDENTIAL Waste Management Plan ONGOING – COMMUNAL WASTE STORAGE			
SPACE			
Number of residential units		Number of storeys above natural ground level	
Estimated garbage generation (litres per week) per unit)		Estimated recycling generation (litres per week) per unit	
Describe the equipment and systems used for managing garbage – including location and design of garbage room/area and type/ quantities of bins, maintenance of bins areas movement of bins by staff			
	Please highlight on plans		
Describe the equipment and system used for managing recycling - including location and design of recycling room/area and type, size (volume) and quantities of bins			
	Please highlight on plans		
ACCESS			
Describe arrangements for access by residents to waste facilities	Garbage: Recycling:		
Describe arrangements for access by collection contractors to waste facilities			

(Continued over page)

PART C (continued)

AMENITY	
Describe how noise associated with residents using the bins, and collection contractors emptying the bins will be minimised	
Describe the method of ventilation of waste storage areas	
Describe facilities for washing bins and waste storage areas	
Describe features for preventing ingress of vermin into waste storage areas	
Describe measures for protecting waste equipment from theft or vandalism	
Describe measures protecting the safety of residents when accessing waste storage areas	
Describe measures taken to ensure waste storage areas are aesthetically consistent with the rest of the development	
MANAGEMENT	
Identify each stage of waste transfer between residents' units and loading into the collection vehicle. Who is responsible for each stage of transfer?	
Describe arrangements for ensuring that residents will be aware of how to use the waste management system	

NOTE: *Details of site area to be used for on-site separation, treatment and storage of waste, including method of weather protection shall be provided on the plans accompanying the Development Application*

PART D

COMMERCIAL Waste Management Plan ONGOING – COMMUNAL WASTE STORAGE			
SPACE			
Number of commercial units	1 EXISTING INDUSTRIAL	Number of storeys above natural ground level	1
Estimated garbage generation (litres per week) per unit	<30	Estimated recycling generation (litres per week) per unit	<30
Proposed use of commercial units	ELECTRICITY GENERATION FOR NETWORK SUPPORT. UNMANNED SITE.		
Describe the equipment and systems used for managing garbage – including location and design of garbage room/area and type/ quantities of bins, maintenance of bins areas movement of bins by staff	TWO WHEELIE BINS SITUATED ON SITE WITHIN THE EXISTING BUILDING WHEELIE BINS TO BE EMPTIED BY OPERATIONS STAFF ON A MONTHLY BASIS AND CLEANED AS REQUIRED.		
	Please highlight on plans		
Describe the equipment and system used for managing recycling - including location and design of recycling room/area and type, size (volume) and quantities of bins	AS ABOVE		
	Please highlight on plans		
ACCESS			
Describe arrangements for access by commercial tenants to waste facilities	Garbage: ON SITE BIN ACCESS Recycling: ON SITE BIN ACCESS		
Describe arrangements for access by collection contractors to waste facilities	KEYED ENTRY FOR WASTE REMOVAL CONTRACTOR FOR MONTHLY COLLECTION		

(Continued over page)

PART D (continued)

AMENITY	
Describe how noise associated with commercial tenants using the bins, and collection contractors emptying the bins will be minimised	NO NOISE DISTURBANCE ANTICIPATED AS WASTE REMOVED BY SITE SUPERINTENDANT / CLEANING CONTRACTOR AS PART OF SITE MAINTENANCE DURING BUSINESS HOURS
Describe the method of ventilation of waste storage areas	NATURALLY VENTILATED IN LARGE SPACE.
Describe facilities for washing bins and waste storage areas	ONSITE HOSING FACILITIES WITHIN EXISTING SITE
Describe features for preventing ingress of vermin into waste storage areas	BINS ARE SEALED AND WILL BE COVERED BY LIDS.
Describe measures for protecting waste equipment from theft or vandalism	LOCKED PREMISES
Describe measures protecting the safety of commercial tenants when accessing waste storage areas	BINS ARE EASILY ACCESSIBLE. NO SURROUNDING HAZARDS OR RISKS OTHER THAN GENERAL SITE CONDITIONS.
Describe measures taken to ensure waste storage areas are aesthetically consistent with the rest of the development	INTERNAL WITHIN BUILDING
MANAGEMENT	
Identify each stage of waste transfer between commercial units and loading into the collection vehicle. Who is responsible for each stage of transfer?	SITE STAFF RESPONSIBLE FOR ALL STAGES. WASTE REMOVED AND TRANSPORTED TO LOCAL WASTE AND RECYCLING CENTRE.
Describe arrangements for ensuring that commercial tenants will be aware of how to use the waste management system	ON SITE INSTRUCTIONS POSTED NEAR BINS. INSTRUCTIONS PROVIDED AS PART OF INDUCTION.

NOTE: *Details of site area to be used for on-site separation, treatment and storage of waste, including method of weather protection shall be provided on the plans accompanying the Development Application*

PART E

RESIDENTIAL Waste Management Plan ONGOING – INDIVIDUAL WASTE STORAGE			
SPACE			
Type of development (e.g. single dwelling, town houses)		Number of dwellings in development	
Describe the area where the garbage, recycling and garden organics bins will be stored			
	Please highlight on plans		
ACCESS			
Describe where the waste bins will be placed for collection			
	Please highlight on plans		

NOTE: *Details of site area to be used for on-site separation, treatment and storage of waste, including method of weather protection shall be provided on the plans accompanying the Development Application*

Appendix D. Flood Risk Advice and Stormwater Information

campbelltown
city council

25 July 2013

Vivira Cadungog
P O Box 2147
Dangar NSW 2309

Dear Ms Cadungog

Lot 238 DP 260481 – 15 Huntsmore Street, Minto

Council refers to your stormwater/catchment advice request form received on 19 July 2013 requesting advice regarding possible flood affectation of the above property.

Council advises as follows:

1. The property is affected by flooding from a 1% Annual Exceedance Probability (AEP) flood due to overland flow from the local catchment traversing the property.

2. Minimum fill and floor level controls for any development on this property due to a 1% AEP flood from overland flow are as follows:

Location	Min. Fill Level (metres AHD)	Min. Floor Level (metres AHD)
Southern Boundary	**50.10**	**50.40**
Middle of Lot (existing driveway)	**50.10**	**50.40**
Northern Boundary	**49.30**	**49.60**

Intermediate levels may be linearly interpolated.

3. A minimum of 150mm fall must be achieved between the floor level and the adjoining ground level.

4. Any development of this site will require consideration of the controls set out in the "Campbelltown (Sustainable City) Development Control Plan Volume 2 - Engineering Design for Development" (as amended).

5. Upon completion of any development, it will be necessary that a "Work as Executed" plan be provided. A qualified surveyor must certify all information in this plan. The plan must be supplied in an electronic format as some of this information will be used for future inclusion in Council's flood model and asset management database.

   The survey information and format that are required to be submitted will be in accordance with Attachment 1.

6. Council is undertaking the preparation of a number of Flood Studies and Floodplain Risk Management Plans in accordance with the procedures set out in the NSW Floodplain Development Manual 2005. This is a very large task and will be undertaken over a number of years. As these studies are adopted by Council the results will be made available to the public.

7. Development consent and/or construction consent may be required for any development of this property.

8. Please also find attached with this letter the additional stormwater plan as per your stormwater/catchment advice request submitted to Council on 19 July 2013.

Council trusts the above information is of assistance. Should you have any further queries, please contact Cathy Kinsey on (02) 4645 4635.

Yours sincerely

Kevin Lynch
Manager Technical Services

MA

Attachment 1 - "Work as Executed" Plan Requirements

The survey information and format that are required are as follows:

Survey Information

- Finished ground and building floor levels together with building outlines.
- Spot levels every five (5) metres within the site area.
- Where there is a change in finished ground levels that are greater than 0.3.m between adjacent points within the above mentioned 5m grid, intermediate levels will be required.
- A minimum of fifteen (15) site levels.
- If the floor level is uniform throughout, a single level is sufficient.
- Details of all stormwater infrastructure including pipe sizes and types as well as surface and invert levels of all existing and/or new pits/pipes associated with the development.
- All existing and/or new footpaths, kerb and guttering and road pavements to the centre line/s of the adjoining street/s.
- The surface levels of all other infrastructure.

Format

- MGA 94 (Map Grid of Australia 1994) Zone 56 - Coordinate System
- All level information to Australian Height Datum (AHD)

AutoCAD Option

- The "etransmit" (or similar) option in AutoCAD with the transmittal set-up to include as a minimum:

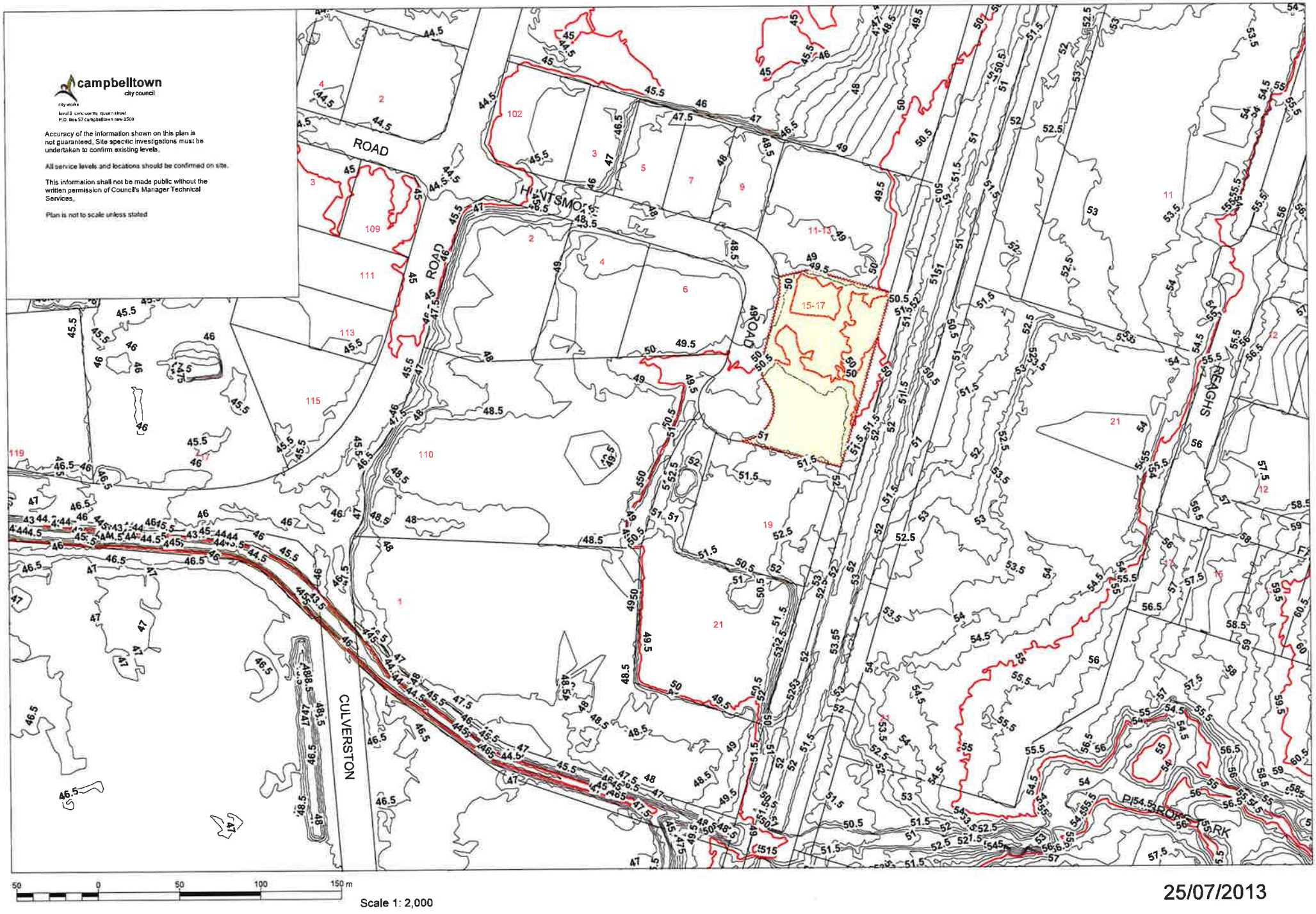
Package Type -	zip
File Format -	AutoCAD 2012 Drawing Format or later
Transmittal Options -	Include fonts
	Include textures from materials
	Include files from data links
	Include photometric web files
	Bind external references
	The drawing is **not** to be password protected.

MapInfo Option

- Council will also accept either MapInfo Native format (i.e. .tab file) or MapInfo mid/mif.

All surveyed points will **also** be required to be submitted in a point format (x,y,z) in either an Excel table or a comma separated text file format.

This information is required before the final occupation certificate or Linen Plan is released.


campbelltown
city council
city works
level 2 civic centre queen street
P.O. Box 57 campbelltown nsw 2560
Accuracy of the information shown on this plan is not guaranteed. Site specific investigations must be undertaken to confirm existing levels.
All service levels and locations should be confirmed on site.
This information shall not be made public without the written permission of Council's Manager Technical Services.
Plan is not to scale unless stated
ROAD
HUNTSMOOR
ROAD
ROAD
15-17
11-13
102
109
111
113
115
119
110
1
2
3
4
5
6
7
9
11
12
19
21
CULVERTON
REACHS
50 0 50 100 150 m
Scale 1: 2,000
25/07/2013

Scale 1: 2,000

25/07/2013

Appendix E. Electrolysis Statement

Energy Power Systems Australia Pty. Ltd.
ABN 80 055 274 514

4 October 2013

Anthony Collins
Novapower

Dear Mr Collins

RE: Correlation between Minto NSS Earthing and the Rail Corridor

With regard to the concern raised with the NSS Installation Earthing system for Minto and the relationship with the Rail Corridor in accordance with the

DEVELOPMENT NEAR
RAIL CORRIDORS AND BUSY ROADS
– INTERIM GUIDELINE
NSW Guidelines
DEVELOPMENT
NEAR BUSY ROADS and RAIL CORRIDORS
NSW Guidelines.

Conditions:

1. All low voltage supplies using isolating transformers, local electricity distributor neutral and earthing systems should not enter the rail corridor.

2. EPSA Meet the above condition outlined within the Guideline through a direct separation of earthing system of more than 20m from the rail corridor.

3. The NSS Earthing system will not be bonded to the rail earthing system. No bond will be put onto the NSS Installation fencing adjoining the railway. All limits will be within property boundary.

In conclusion the NSS Earthing System will not interfere or intermix with the Rail Corridor Earthing.

Yours sincerely,

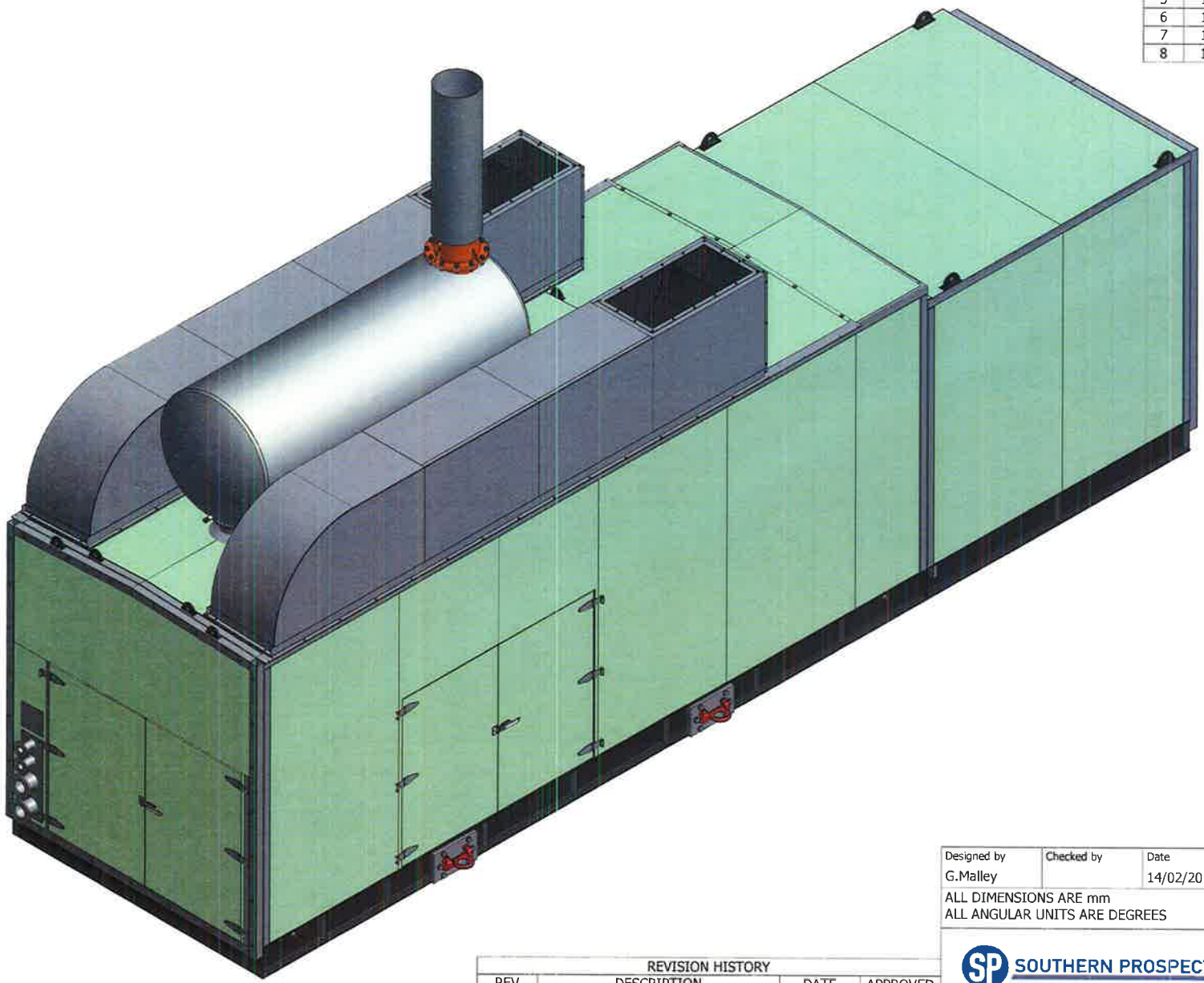
Michael Gardner
Project Manager
Energy Power Systems Australia Pty Ltd (ABN: 80 055 274 514)
8-10 Bosci Road, Ingleburn NSW 2565
Phone: (+61 2) 8796-9266
Fax: (+61 2) 8796-9299
Mobile: (+61) 0428 956 345
Email: michael.gardner@energypower.com.au
Web: http://www.energypower.com.au

Appendix F. Indicative Equipment information

The following typical equipment arrangements are provided for illustrative purposes only.

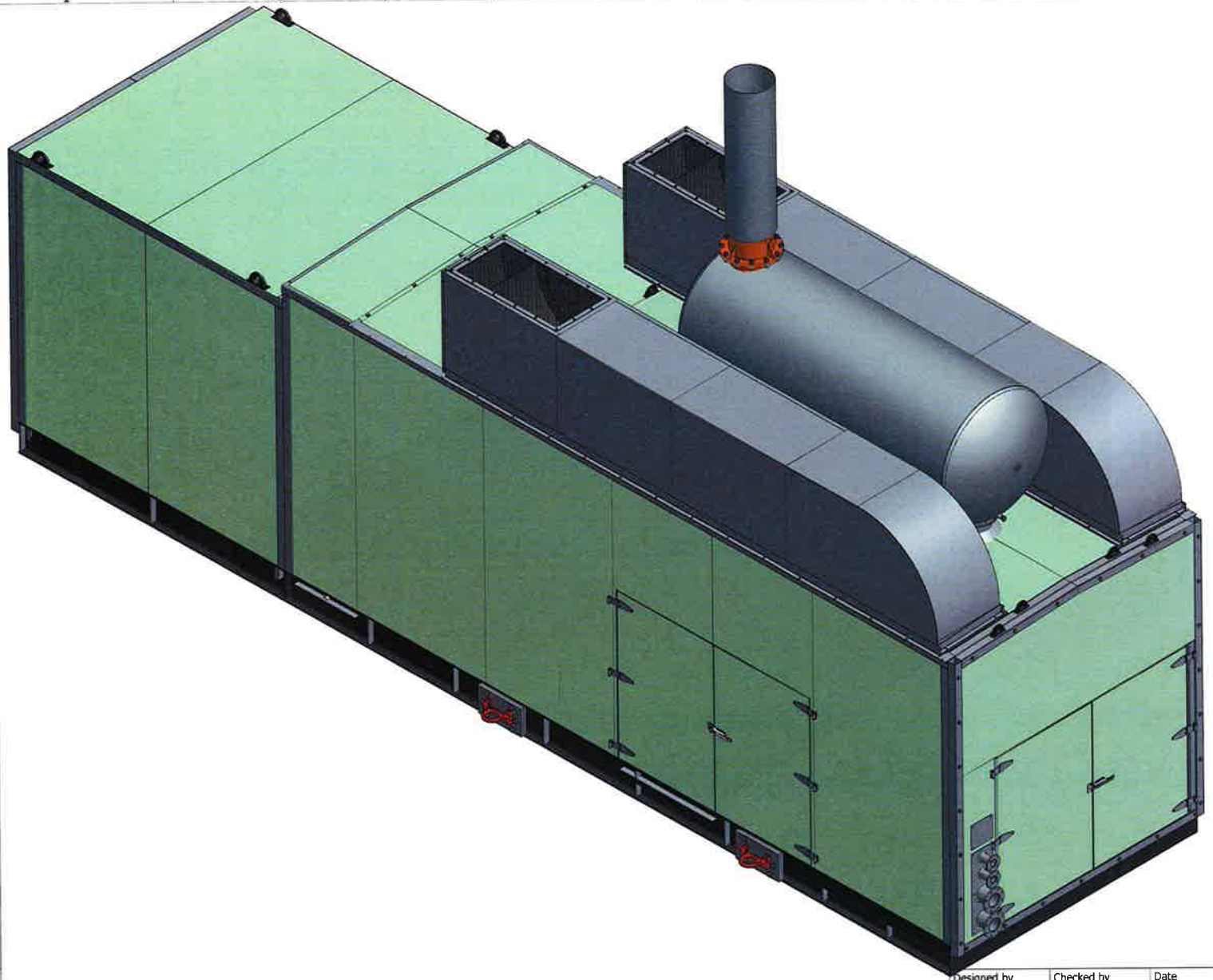
Ref	Equipment	No. Pages
SP000106	2MW Generator	12
11617	Switchroom	5
879-I222C-A	12.5 MVA Transformer	1
5135-001-r4	Remote horizontal radiator	2

PARTS LIST				
ITEM	QTY	PART NUMBER	DESCRIPTION	MASS
1	1	SP 000106	CONTAINER GP-	23138.298 kg
2	1	SP 150005	ENGINE GP-	28867.048 kg
3	1	SP 200003	ELECTRICAL GP-	0.000 kg
4	1	SP 250012	COOLING GP-	213.893 kg
5	1	SP 300002	FUEL GP-	0.000 kg
6	1	SP 350002	LINES GP-	112.581 kg
7	1	SP 450003	TOOLING GP-	0.000 kg
8	1	SP 500002	PLATE AND FILM GP-	0.574 kg

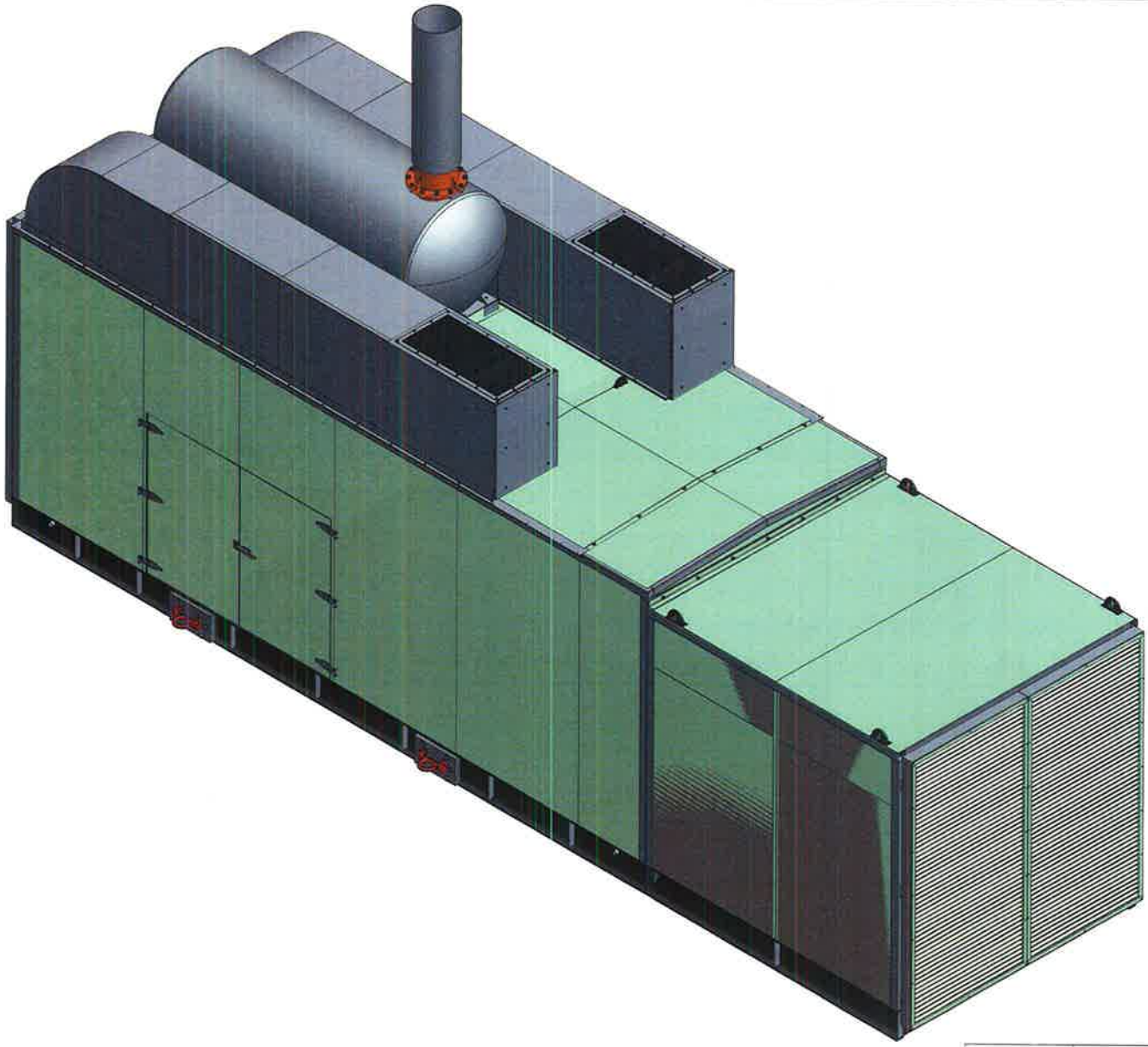


REVISION HISTORY			
REV	DESCRIPTION	DATE	APPROVED
0	FIRST DRAWN		

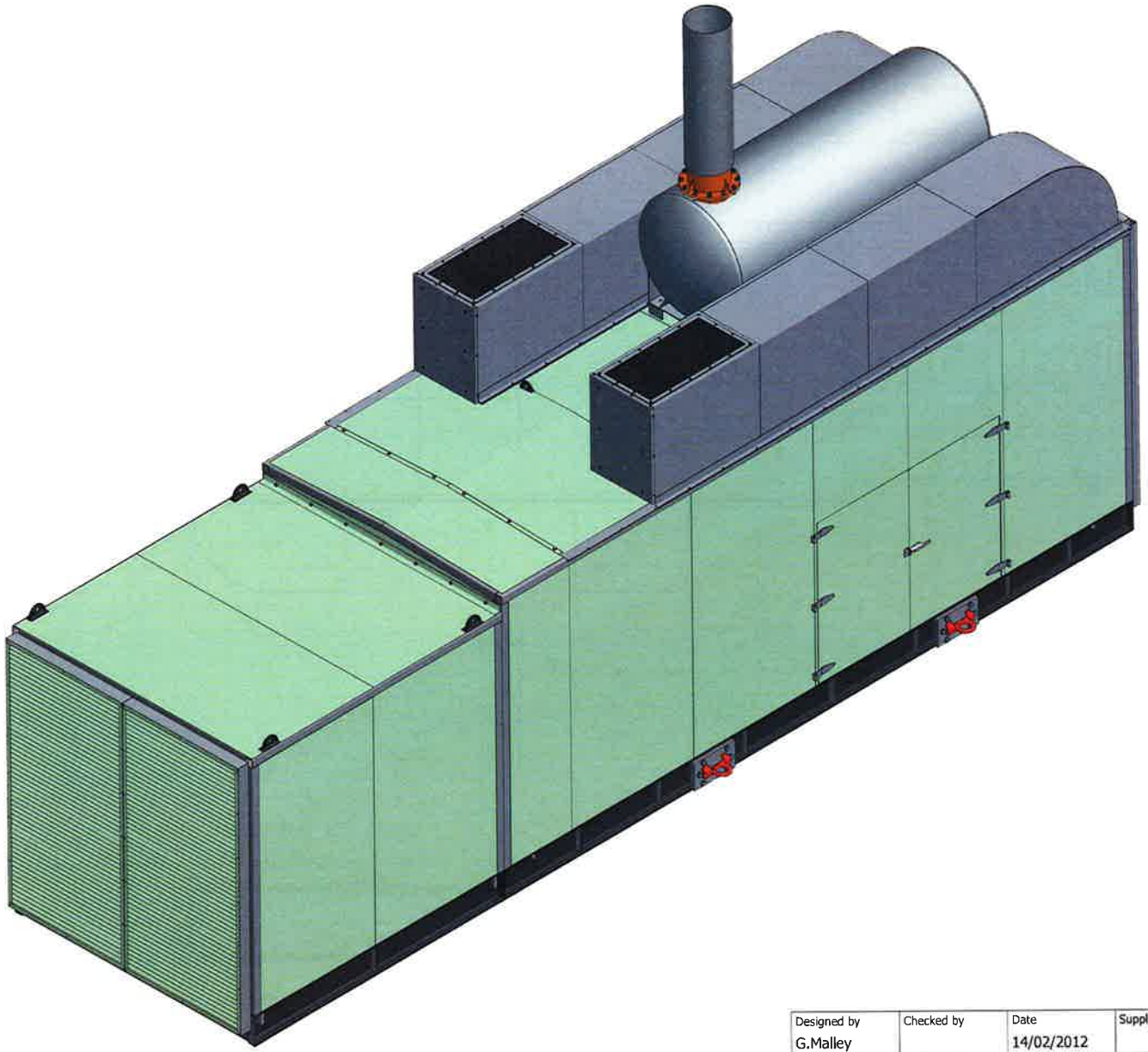
Designed by: G.Malley	Checked by:	Date: 14/02/2012	Supplier:		Material:	Mass: 52332.39 kg
ALL DIMENSIONS ARE mm ALL ANGULAR UNITS ARE DEGREES			Supplier Ref.	Serial	2000 kVA Generator	
SOUTHERN PROSPECT SOUTHERN PROSPECT PTY LTD ABN 91 129 159 218			G3520E GENERATOR AR			
			SP 000106		Revision: 00	Sheet: 1 / 12



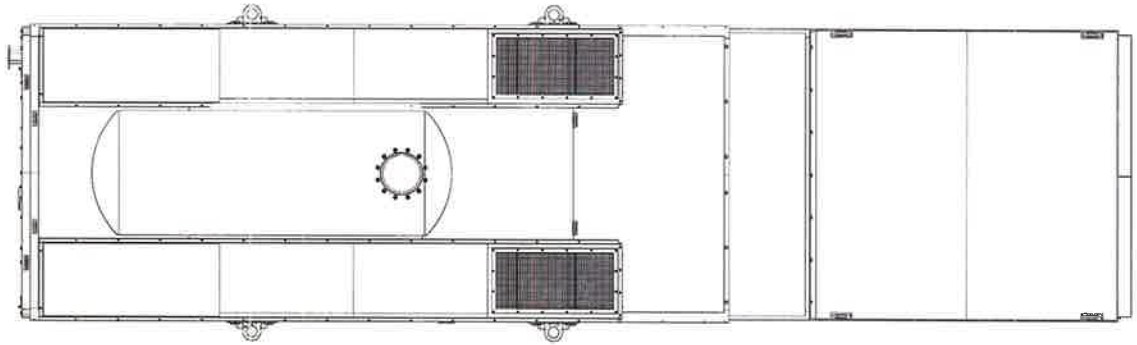
Designed by: G.Malley	Checked by:	Date: 14/02/2012	Supplier:		Material:	Mass: 52332.39 kg
ALL DIMENSIONS ARE mm ALL ANGULAR UNITS ARE DEGREES			Supplier Ref.	Serial	2000 kVA Generator	
SOUTHERN PROSPECT SOUTHERN PROSPECT PTY LTD ABN 91 123 130 218			G3520E GENERATOR AR			
			SP 000106		Revision: 00	Sheet: 2 / 12

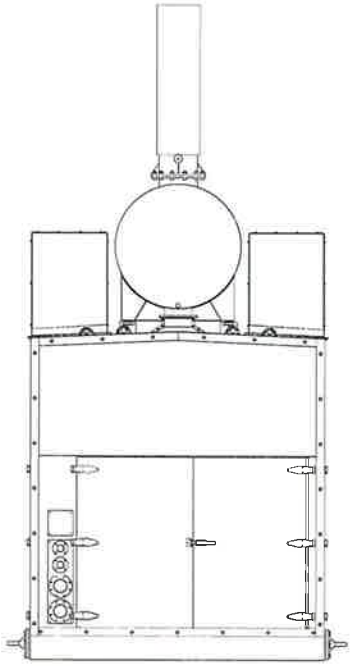


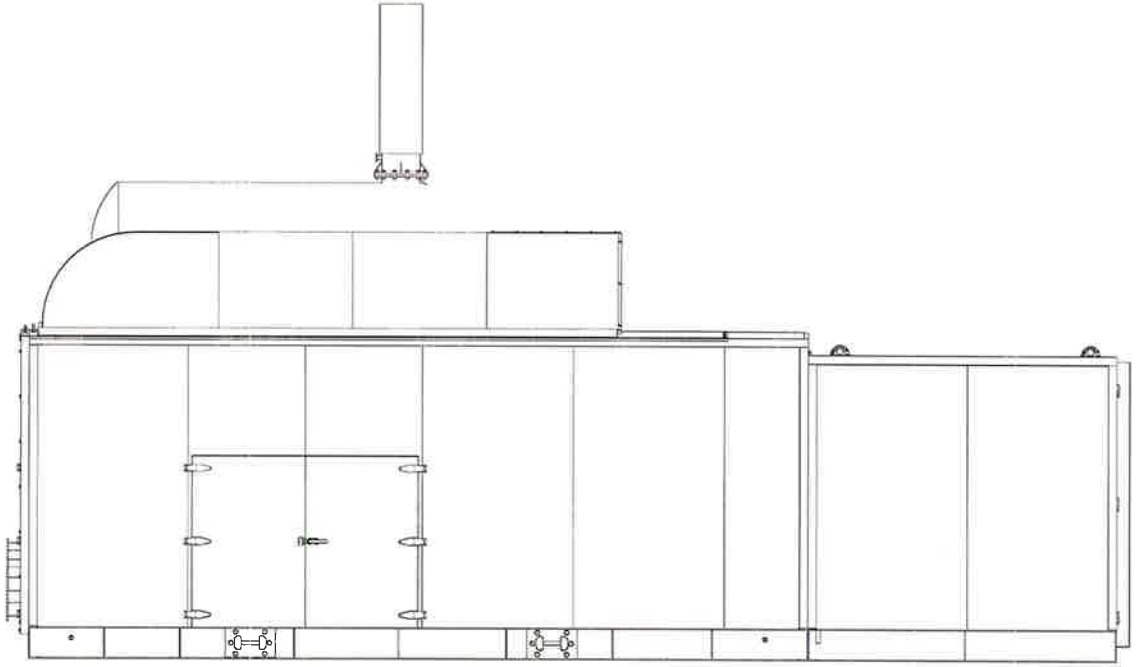
Designed by: G.Malley	Checked by:	Date: 14/02/2012	Supplier:		Material:	Mass: 52332.39 kg
ALL DIMENSIONS ARE mm ALL ANGULAR UNITS ARE DEGREES			Supplier Ref.	Serial	2000 kVA Generator	
SOUTHERN PROSPECT SOUTHERN PROSPECT PTY LTD ABN 01 123 130 218			G3520E GENERATOR AR			
			SP 000106		Revision: 00	Sheet: 3 / 12

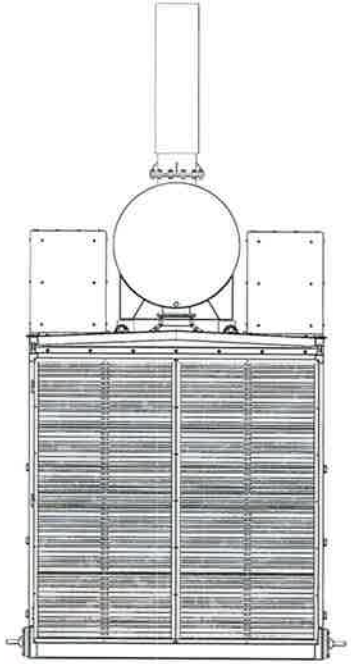


Designed by: G.Malley	Checked by:	Date: 14/02/2012	Supplier:		Material:	Mass: 52332.39 kg
ALL DIMENSIONS ARE mm ALL ANGULAR UNITS ARE DEGREES			Supplier Ref.:	Serial:	2000 kVA Generator	
SOUTHERN PROSPECT SOUTHERN PROSPECT PTY LTD ABN 01 123 130 218			G3520E GENERATOR AR			
			SP 000106		Revision: 00	Sheet: 4 / 12









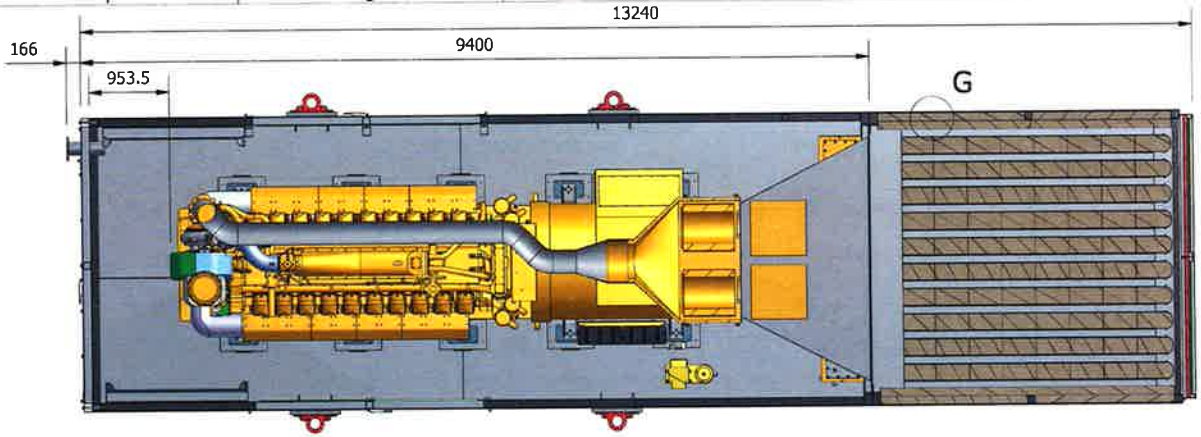
Designed by	Checked by	Date	Supplier		Material	Mass
G.Malley		14/02/2012				52332.39 kg
ALL DIMENSIONS ARE mm ALL ANGULAR UNITS ARE DEGREES			Supplier Ref.	Serial	2000 kVA Generator	

SOUTHERN PROSPECT
SOUTHERN PROSPECT PTY LTD ABN 01 122 130 214

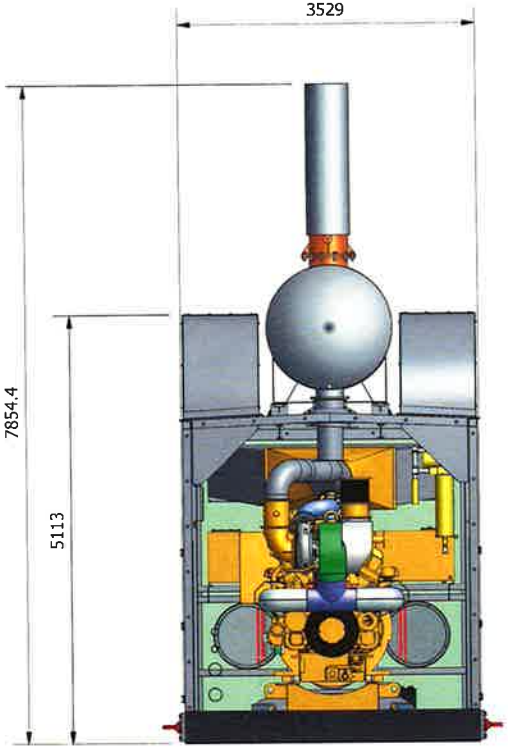
G3520E GENERATOR AR

SP 000106	Revision 00	Sheet 5 / 12

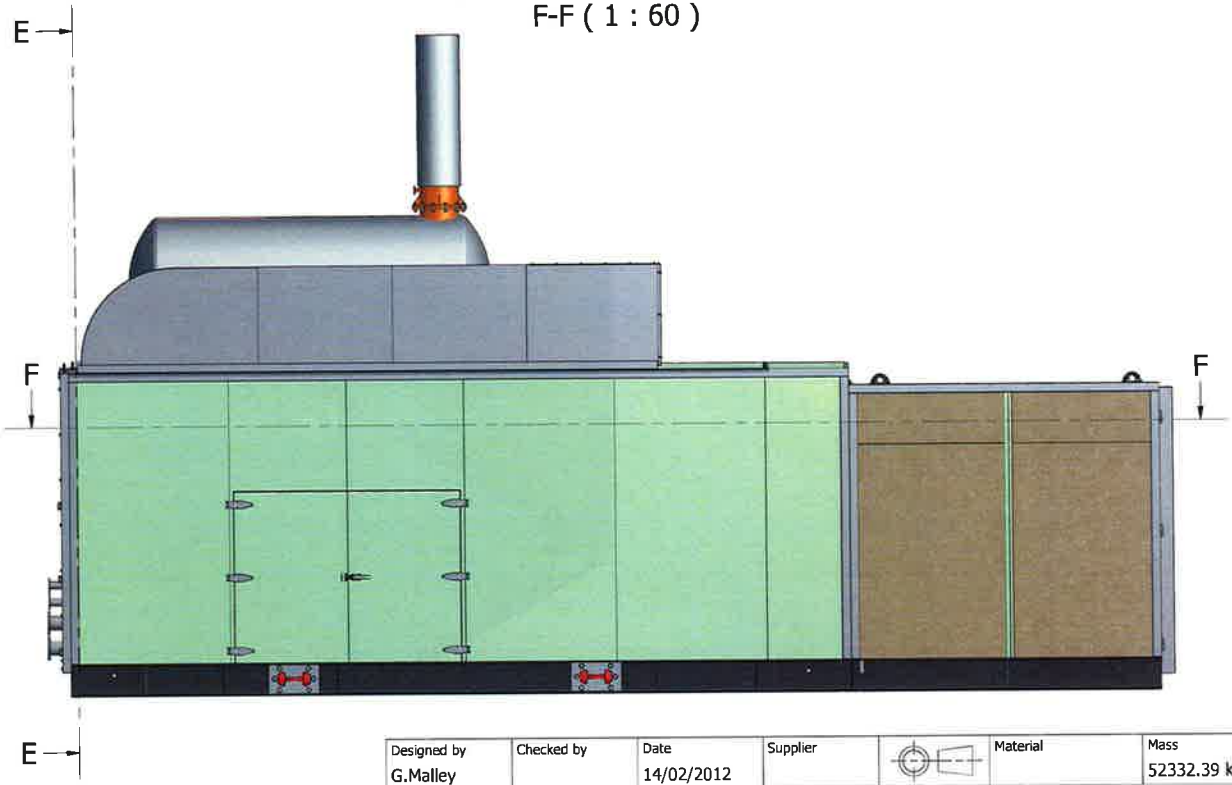
G (1 : 10)
TYP. WALL SECTION



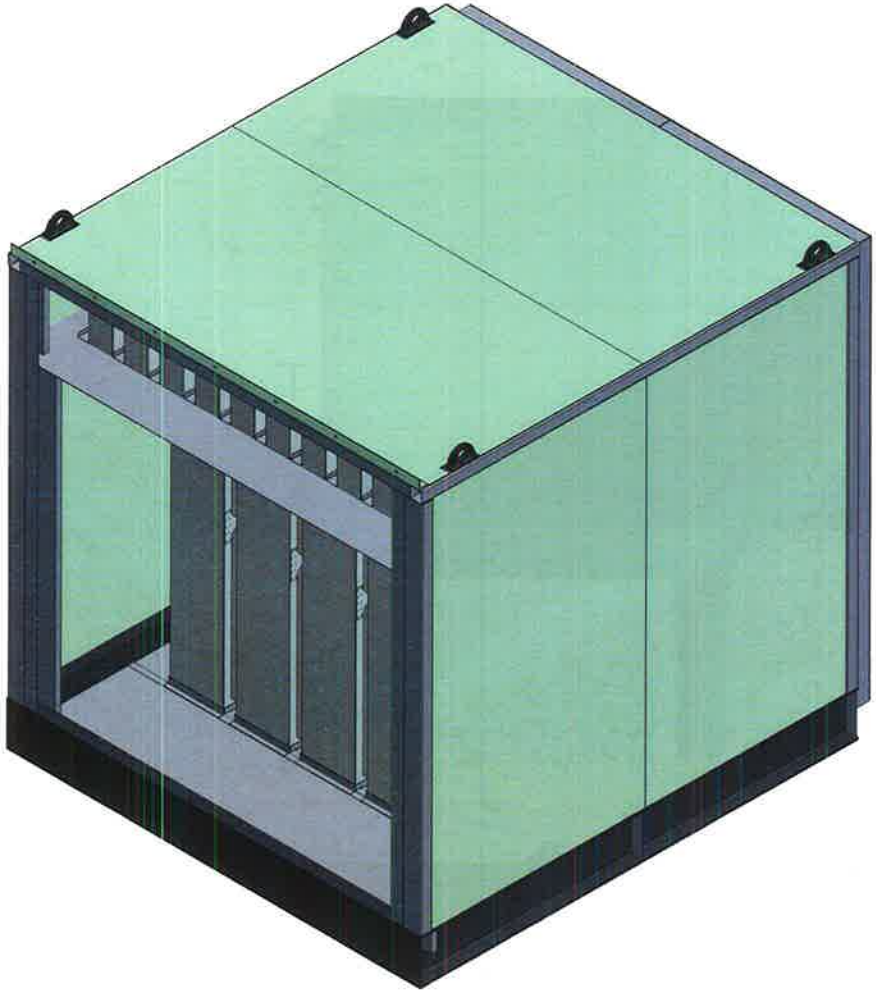
F-F (1 : 60)



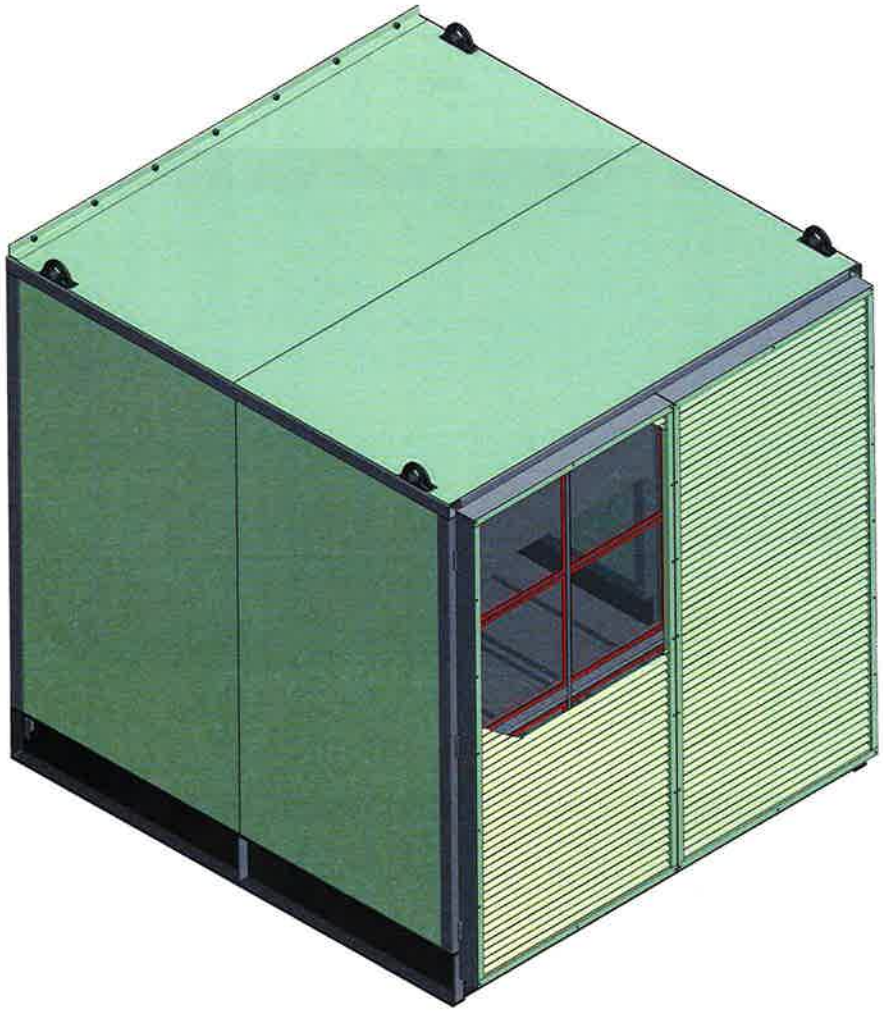
E-E (1 : 60)

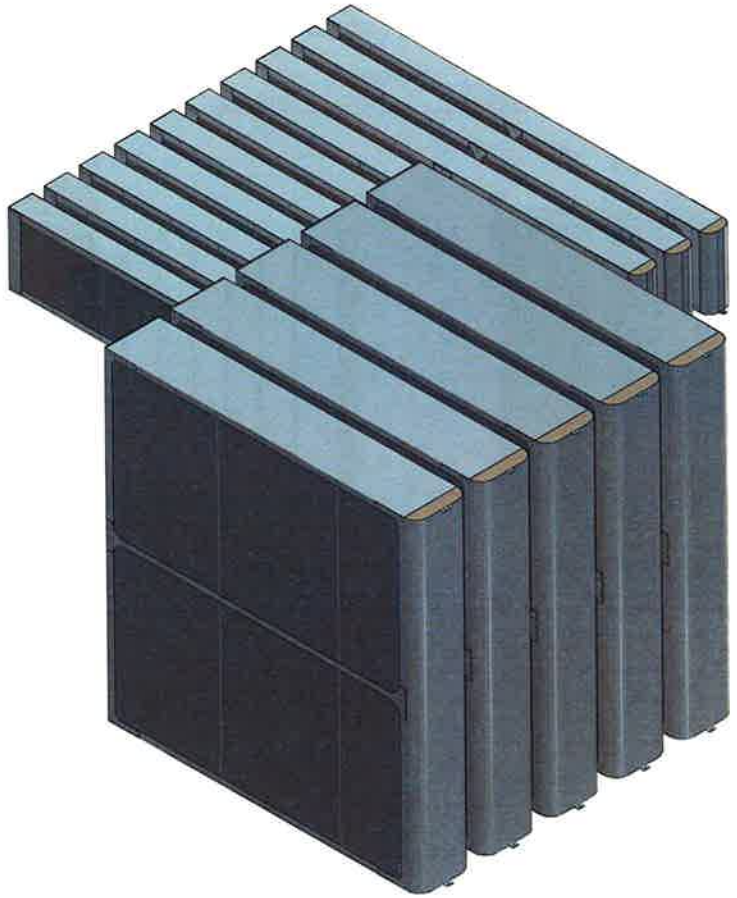


Designed by G.Malley	Checked by	Date 14/02/2012	Supplier		Material	Mass 52332.39 kg
ALL DIMENSIONS ARE mm ALL ANGULAR UNITS ARE DEGREES			Supplier Ref.	Serial	2000 kVA Generator	
SOUTHERN PROSPECT SOUTHERN PROSPECT PTY LTD ABN 91 123 130 218			G3520E GENERATOR AR			
			SP 000106		Revision 00	Sheet 6 / 12



Designed by: G.Malley	Checked by:	Date: 15/02/2012	Supplier:		Material:	Mass: 7381.39 kg
ALL DIMENSIONS ARE mm ALL ANGULAR UNITS ARE DEGREES			Supplier Ref.	Serial	2000 kVA Generator	
SOUTHERN PROSPECT SOUTHERN PROSPECT PTY LTD ABN 91 123 130 218			ATTENUATOR AS.			
			SP 130244		Revision: 00	Sheet: 7 / 12





Designed by: G.Malley	Checked by:	Date: 15/02/2012	Supplier:		Material:	Mass: 7381.39 kg
ALL DIMENSIONS ARE mm ALL ANGULAR UNITS ARE DEGREES			Supplier Ref.	Serial	2000 kVA Generator	
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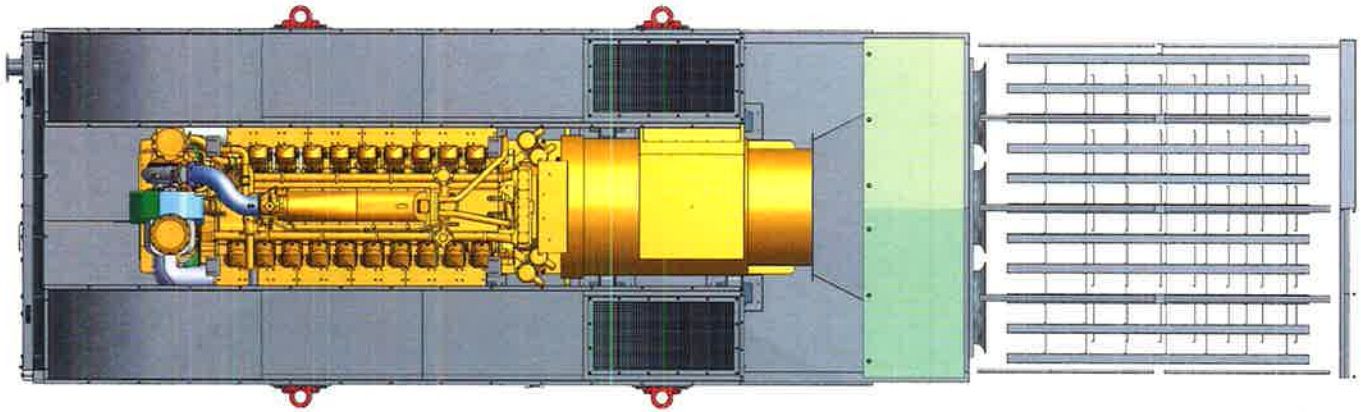
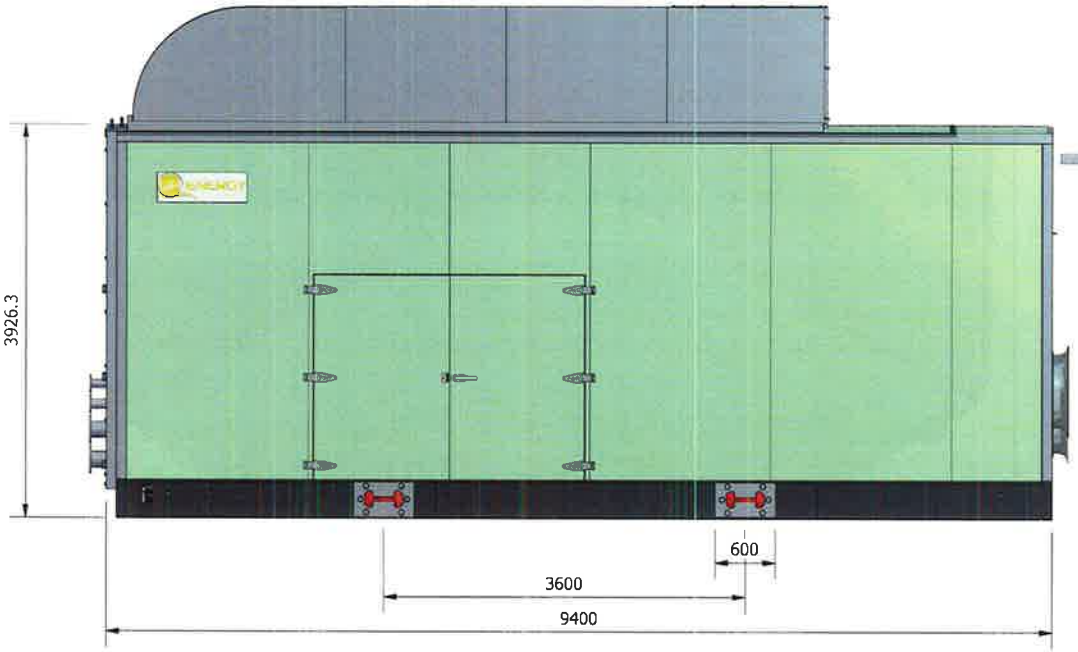
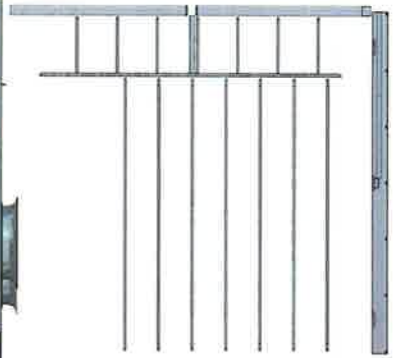
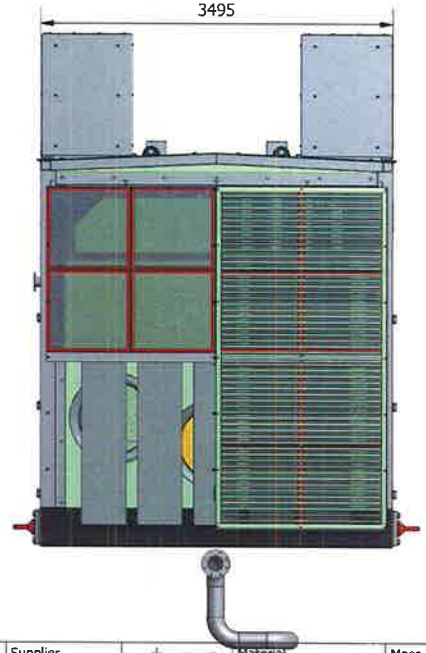
			SP 130244		Revision: 00	Sheet: 8 / 12



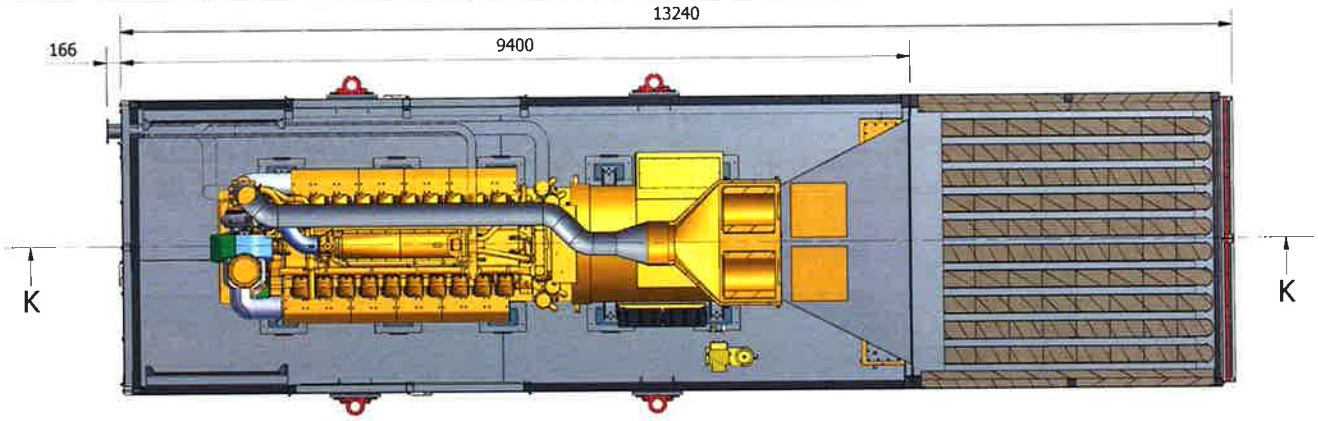
PROPOSED HYD. LEG (1 :30)







Designed by: G.Malley	Checked by:	Date: 14/02/2012	Supplier:		Material:	Mass: 52332.39 kg
ALL DIMENSIONS ARE mm ALL ANGULAR UNITS ARE DEGREES			Supplier Ref.	Serial	2000 kVA Generator	
SOUTHERN PROSPECT SOUTHERN PROSPECT PTY LTD ABN 91 123 130 218			G3520E GENERATOR AR			
			SP 000106		Revision: 00	Sheet: 9 / 12



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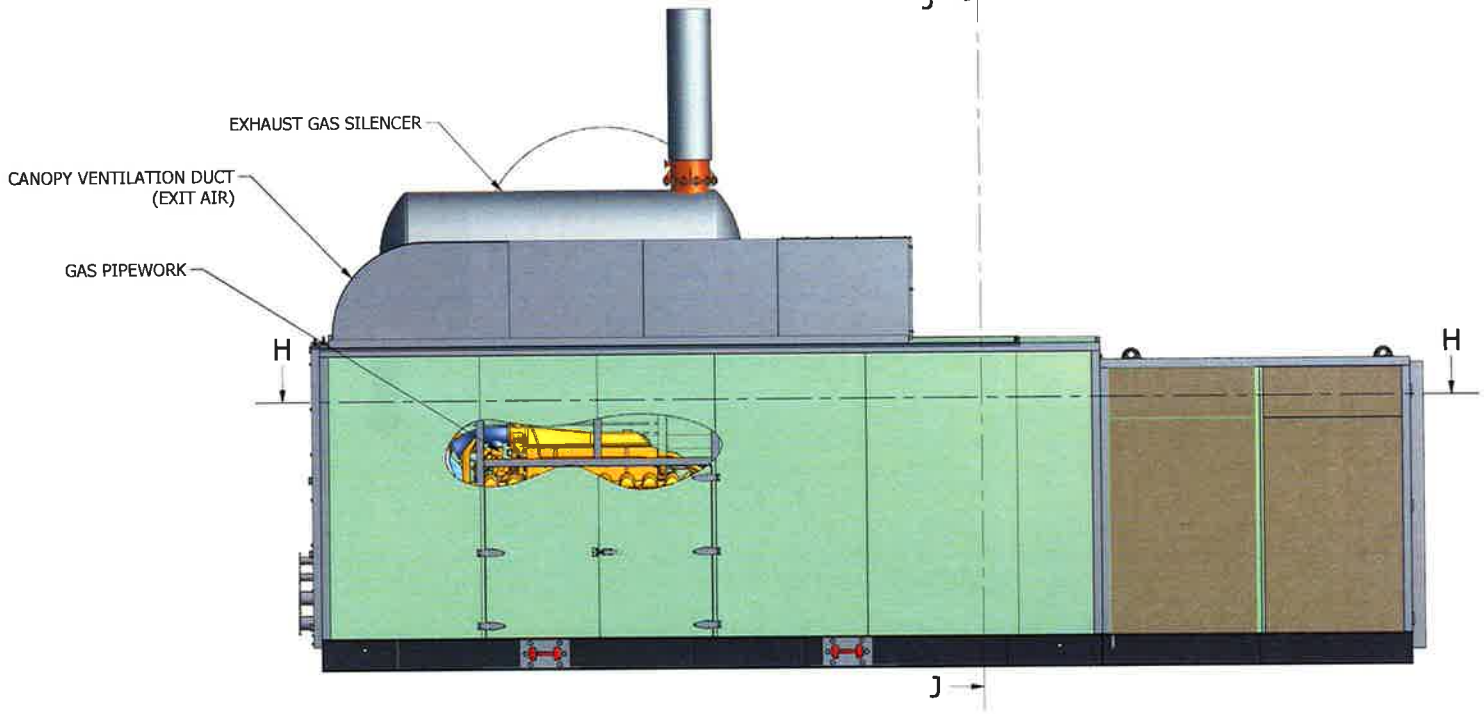
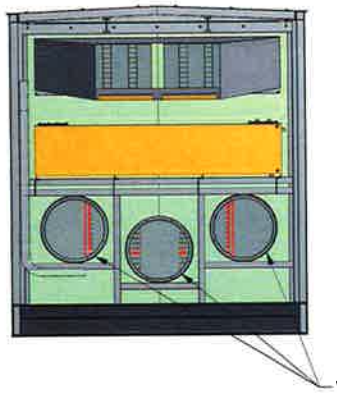
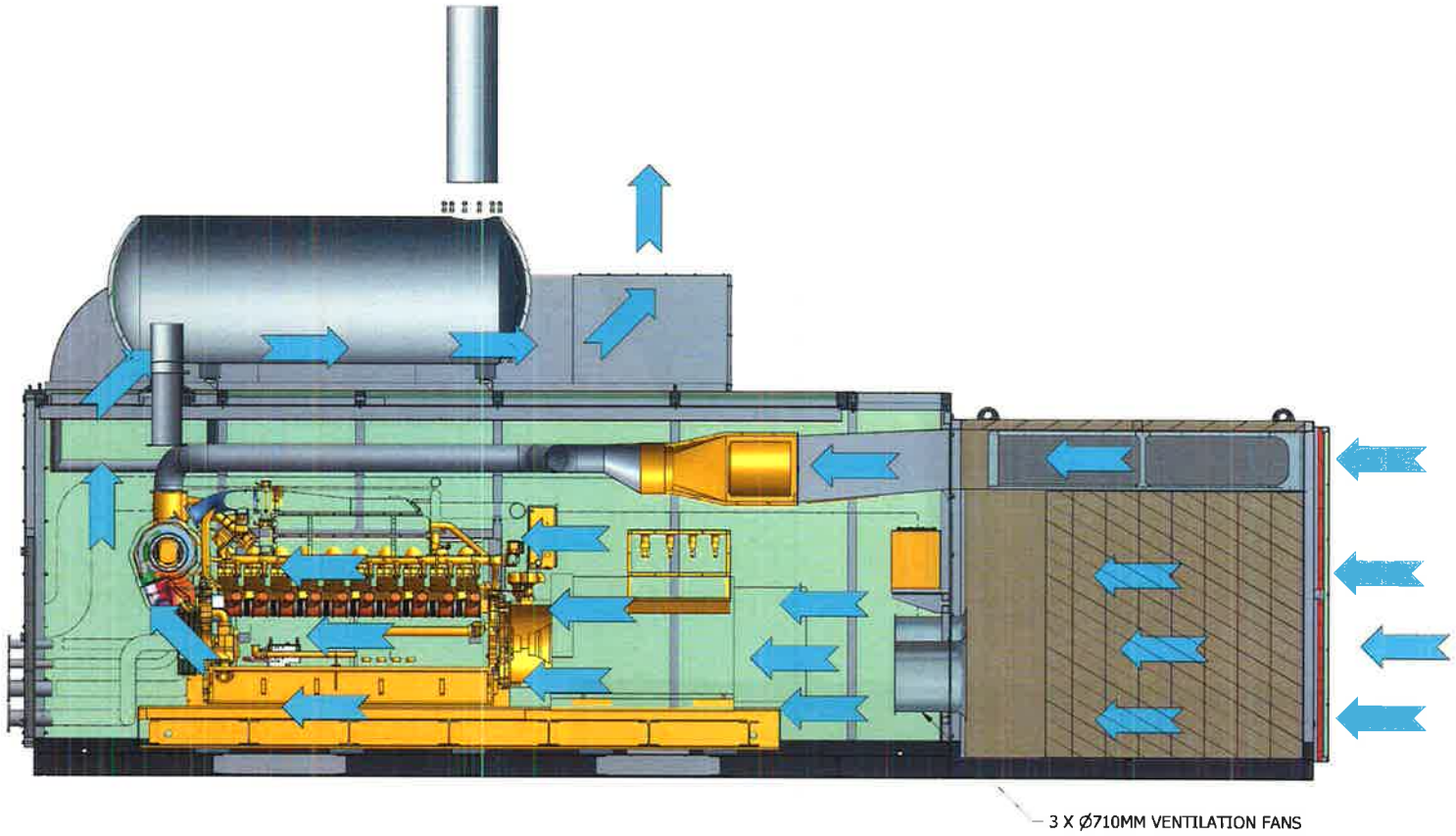




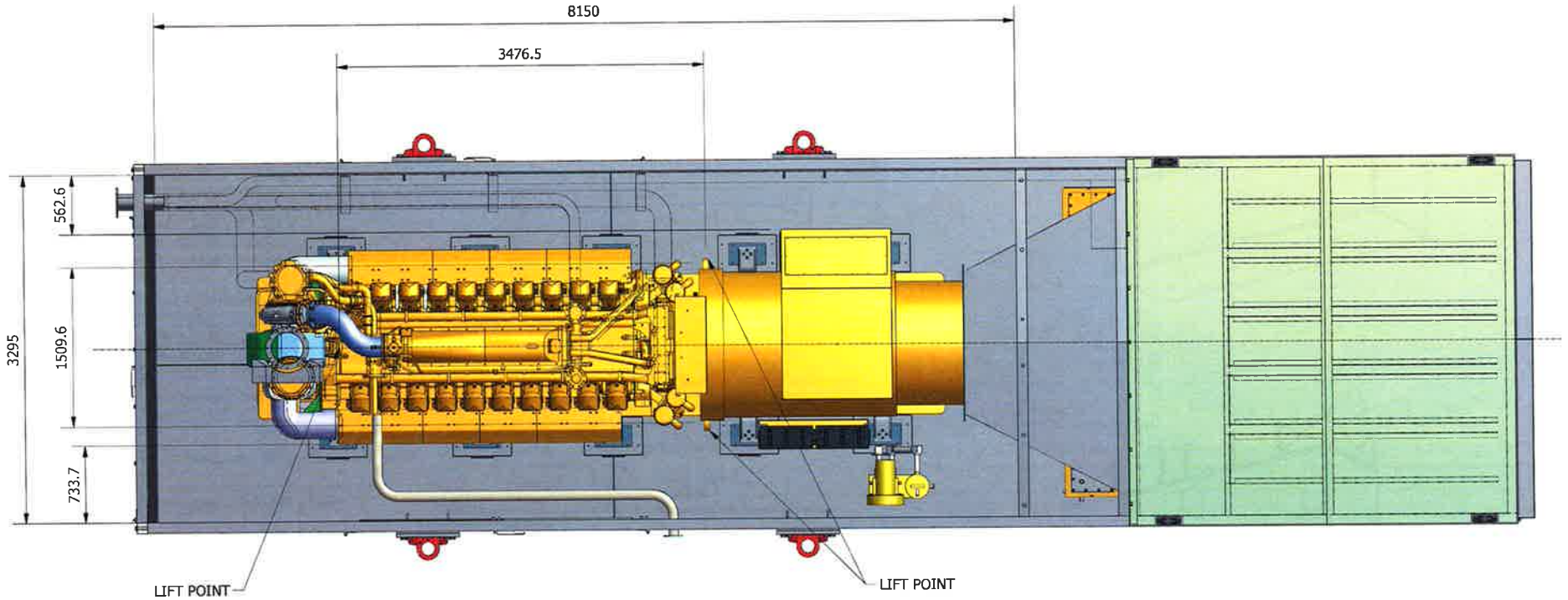
J-J (1 : 60)

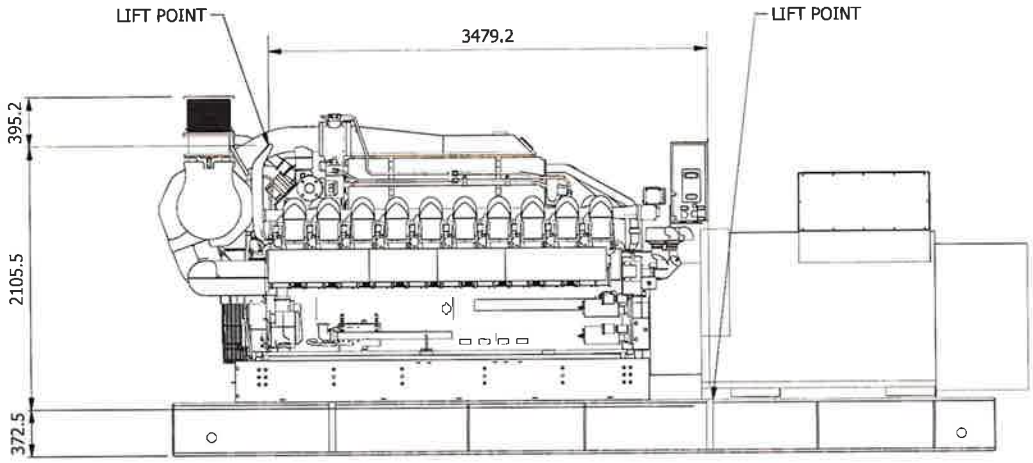
Designed by G.Malley	Checked by	Date 14/02/2012	Supplier		Material	Mass 52332.39 kg
ALL DIMENSIONS ARE mm ALL ANGULAR UNITS ARE DEGREES			Supplier Ref.	Serial	2000 kVA Generator	
SOUTHERN PROSPECT SOUTHERN PROSPECT PTY LTD ABN 91 123 130 218			G3520E GENERATOR AR			
			SP 000106		Revision 00	Sheet 10 / 12



K-K (1 : 50)
CANOPY AIR VENTALATION DIAGRAM

Designed by G.Malley	Checked by	Date 14/02/2012	Supplier		Material	Mass 52332.39 kg
ALL DIMENSIONS ARE mm ALL ANGULAR UNITS ARE DEGREES			Supplier Ref.	Serial	2000 kVA Generator	
SOUTHERN PROSPECT SOUTHERN PROSPECT PTY LTD ABN 91 123 130 218			G3520E GENERATOR AR			
			SP 000106		Revision 00	Sheet 11 / 12





Designed by	Checked by	Date	Supplier		Material	Mass
G.Malley		14/02/2012				52332.39 kg
ALL DIMENSIONS ARE mm ALL ANGULAR UNITS ARE DEGREES			Supplier Ref.	Serial	2000 kVA Generator	

SOUTHERN PROSPECT
SOUTHERN PROSPECT PTY LTD ABN 91 123 130 218

G3520E GENERATOR AR

SP 000106	Revision 00	Sheet 12 / 12

GENERAL NOTES

1. DIMENSIONS SHALL NOT BE OBTAINED BY SCALING THE DRAWINGS. ALL DIMENSIONS ARE IN MILLIMETRES UNO ALL LEVELS (RL) ARE IN METRES.
2. SETTING OUT DIMENSIONS SHOWN ON THE DRAWINGS SHALL BE VERIFIED BY THE CONTRACTOR.
3. DURING CONSTRUCTION, ALL STRUCTURES SHALL BE MAINTAINED IN A SAFE AND STABLE CONDITION AT ALL TIMES. NO PART SHALL BE OVERSTRESSED.
4. THE ABBREVATION "UNO" DENOTES - UNLESS NOTED OTHERWISE.
5. THE ABBREVATION "GA" DENOTES - MEMBER GAUGELINE AS SPECIFIED.
6. THE ABBREVATION "ASI" DENOTES - AUSTRALIAN STEEL INSTITUTE.

STRUCTURAL STEELWORK

1. DESIGN CONFORMS TO AS4100-1998 AND AS1170 WITH ASI GRADE SECTIONS UNO. FABRICATION AND ERECTION SHALL BE CARRIED OUT IN ACCORDANCE WITH THE PROVISIONS OF AS 4100 AND AS 3828, AS APPROPRIATE WHERE NO APPLICABLE PROVISIONS ARE CONTAINED IN AS 4100.

2. MATERIAL

   UNO ALL MATERIAL TO BE MINIMUM GRADES BELOW:
   - GRADE 250 MINIMUM HOT ROLLED PLATES COMPLYING WITH EN 10025 OR AS 3678.
   - GRADE 300 MINIMUM HOT ROLLED UB, UC, PFC COMPLYING WITH BS 4.1 OR AS 3679.1.
   - GRADE 300 MINIMUM EA & UA COMPLYING WITH BS 5950.1 OR AS 3679.1.
   - GRADE 275 & 355 MINIMUM SHS & CHS COMPLYING WITH BS 5950.1 OR AS 1163.

3. WELDING

   TO BE CARRIED OUT IN ACCORDANCE WITH AS 1554.1.
   WELDING CONSUMABLES TO BE E48XX OR W50 UNO.
   ALL WELDS TO BE 6mm CFW CATEGORY SP UNO.
   ALL BUTT WELDS TO BE COMPLETE PENETRATION (CPBW) U.N.O.
   COMPLETE PENETRATION BUTT WELDS (CPBW) TO BE CATEGORY SP UNO.
   INSPECTION TO BE CARRIED OUT TO AS 1554.1.
   ALL GP/SP WELDS TO BE 100% VISUALLY SCANNED U.N.O.
   PROVIDE 3mm SEAL WELD BETWEEN ALL STITCH WELDING UNO.
   WELD PREPARATIONS FOR WELDS TO EXISTING MEMBERS:
   - REMOVE ALL DIRT AND DELETERIOUS MATTER.
   - POWER WIRE BRUSH CLEAN TO AS 1627.2 CLASS 2.

   ALL WELDING SYMBOLS SHALL BE IN ACCORDANCE WITH AS 1101-3-2005.

4. BOLTING

   BOLTS ARE GALVANISED 20mm DIAMETER GRADE 8.8 COMPLYING WITH AS 1252 UNO.
   FOR ALL BOLTED CONNECTIONS IN THE PRE ASSEMBLY MODEL BOLT CATEGORY IS TO BE "TF" COMPLYING WITH AS 4100 UNO.
   FOR ALL BOLTED CONNECTIONS NOT IN THE PRE ASSEMBLY MODEL BOLT CATEGORY IS TO BE "TB" COMPLYING WITH AS 4100 UNO.
   THREADS MAY BE INCLUDED IN SHEAR PLANES.
   MINIMUM CONNECTION SHALL BE TWO BOLTS UNO.
   ALL NON STRUCTURAL BOLTS SUCH AS FOR PURLINS, LADDERS, HANDRAILS TO BE GRADE 4.6 GALVANISED COMPLYING WITH AS 1111 UNO.
   BOLT TYPE AND TIGHTENING PROCEDURE ARE DESIGNATED THUS:
   NUMBER-SIZE-STRENGTH-GRADE-TIGHTENING PROCEDURE
   STRENGTH GRADE 8.8 TO BE GALVANISED HIGH STRENGTH STRUCTURAL BOLTS, NUTS AND WASHERS COMPLYING WITH AS 1252.
   ALL BOLTS TO BE ON MEMBER GAUGELINES (GA) UNO.
   ALL BOLT CENTERS AND EDGE DISTANCES TO BE AS PER AISC STANDARDS UNO.
   TIGHTENING PROCEDURES:
   S - SNUG TIGHT
   TB - BEARING MODE CONNECTION, BOLTS FULLY TENSIONED IN ACCORDANCE WITH AS 4100.
   TF - FRICTION MODE CONNECTION, BOLTS FULLY TENSIONED IN ACCORDANCE WITH AS 4100.
   EXAMPLE 1 :- CONNECTION SHOWN WITHOUT REQUIREMENT MEANS ALL BOLTS M20 8.8/TB
   EXAMPLE 2 :- 4M20 8.8/TB = 4 OFF 20mm DIAMETER METRIC HIGH STRENGTH STRUCTURAL BOLTS FULLY TENSIONED IN A BEARING MODE. FOR BOLTING PROCEDURE 8.8/TF THE CONTACT SURFACES SHALL BE FREE FROM PAINT, GALVANISING OR OTHER APPLIED FINISHES.
   UNO ALL HOLES EXCEPT THOSE IN BASE PLATES SHALL BE 2mm IN DIAMETER LARGER THAN THE SPECIFIED BOLT DIAMETER.

5. CONNECTIONS

   ALL DETAILS, GAUGE LINES ETC. WHERE NOT SPECIFICALLY SHOWN ARE TO BE IN ACCORDANCE WITH ASI STANDARDISED STRUCTURAL CONNECTIONS.
   PLATES TO BE 10mm THICK, EX-STANDARD SQUARE EDGED FLATS UNO.
   ALL SEAL PLATES TO BE 5mm THICK UNO.
   ALL NOTCHES & COPES SHALL HAVE 11mm RADIUS AT INTERNAL CORNERS.
   ALL BASEPLATES TO BE AS PER ASI STANDARD BASE PLATE DETAILS.

6. CORROSION PROTECTION

   ALL STEELWORK IS TO BE PROTECTED UNLESS NOTED OTHERWISE.
   CORROSION PROTECTION SHALL CONFORM TO THE PROJECT SPECIFICATION.

7. SHOP DRAWINGS

   THE STEEL FABRICATOR SHALL PROVIDE THE CLIENT (IF REQUIRED) WITH 2 COPIES OF WORKSHOP DRAWINGS FOR APPROVAL OR OTHERWISE AGREED FOR EACH PROJECT BEFORE FABRICATION IS STARTED. FABRICATOR TO ENSURE THAT NO FABRICATED ITEMS EXCEED SIZE THAT REQUIRES SPECIAL TRANSPORT.

8. PURLINS AND GIRTS

   PURLINS, GIRTS & ACCESSORIES ARE TO BE BLUESCOPE STEEL LYSAGHT OR OTHER SECTIONS APPROVED IN WRITING, COMPLYING WITH AS 1397 AND WITH A MINIMUM GALVANISED COATING OF Z450(450gm/M2).
   CLEAT CONNECTIONS ARE TO BE IN ACCORDANCE WITH ASI STANDARDISED CONNECTIONS AND TO THE MANUFACTURERS RECOMMENDATIONS.
   UNO BOLTING AND BRIDGING TO BE IN ACCORDANCE WITH THE MANUFACTURERS RECOMMENDATIONS.
   FLY BRACING, TIE RODS AND BRIDGING SHALL BE CONNECTED TO PURLIN WEB AND NOT TO FLANGES. ALL NECESSARY HOLES SHALL BE THROUGH MIDDLE THIRD OF WEB.

9. ACCESS AND WALKWAYS

   WALKWAYS, STAIRS, LADDERS, HANDRAILS AND GRATING SHALL COMPLY WITH THE REQUIREMENTS OF AS 1657-1992 - PLATFORMS AND WALKWAYS.
   BUILDING LAYOUT, ACCESS AND EGRESS REQUIREMENTS ARE TO BE IN ACCORDANCE WITH THE BUILDING CODE OF AUSTRALIA. THESE PLANS ARE BASED ON LAYOUTS SUPPLIED BY THE PRINCIPAL. THE PRINCIPAL SHALL ENSURE THAT THE LAYOUT PROVIDED COMPLIES WITH THE RELEVANT REQUIREMENTS OF THE BUILDING CODE OF AUSTRALIA IN REGARDS TO ACCESS, EGRESS, AND EMERGENCY EXITS, INCLUDING BUT NOT LIMITED TO THE WIDTH OF REQUIRED EXITS AND STAIRWAYS.

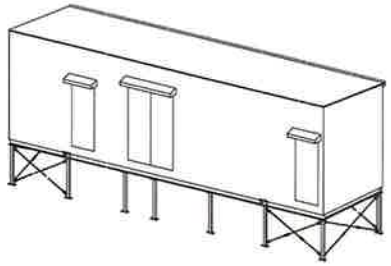
10. TRANSPORT AND LIFTING

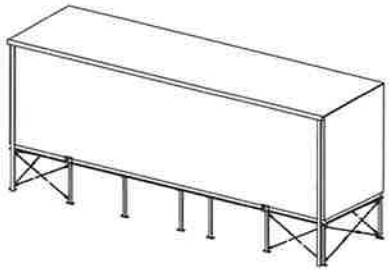
    WELDING TO ALL LIFTING LUGS SHALL BE N.D.T. (NON DESTRUCTIVE TESTED) AS FOLLOWS:-
    - COMPLETE PENETRATION BUTT WELDS = 100% ULTRASONIC
    - PARTIAL PENETRATION BUTT WELDS = 100% MAGNETIC PARTICLE
    - FILLET WELDS = 100% MAGNETIC PARTICLE

    ALL EQUIPMENT IS TO BE ADEQUATELY BRACED DURING TRANSPORT TO RESIST TRANSPORT LOADINGS. (DETAILS BY OTHERS) THE INTEGRITY OF THE EQUIPMENT UNDER EARTHQUAKE LOADING IS TO BE CONFIRMED BY THE MANUFACTURER. (IF APPLICABLE)
    DURING TRANSPORT TO SITE THE BUILDINGS ARE TO BE SUPPORTED IN THE LOCATIONS AS SHOWN ON THE TRANSPORT AND LIFTING PLAN. ADEQUATE RESTRAINT IS TO BE PROVIDED TO ENSURE THAT THE BUILDINGS ARE SECURELY LASHED TO THE TRANSPORT VESSEL. DESIGN OF LASHING, GRILLAGE, AND SUPPORT STRUCTURES BY OTHERS.

MEMBER SCHEDULE		
TAG	TYPE	SIZE
C1	COLUMN	75x75x5.0SHS
B1	BEAM	200UB30
BR1	BRACING	20ROD C/W TURNBUCKLE

DRAWING REGISTER		
DRAWING No.	TITLE	REV
001	Construction Notes	1
002	Floor Plan and Elevations	2
003	Chassis Plan	0
004	Floor Panel Plan	2
005	Lifting Plan and Details	1





CONSTRUCTION ISSUE

REV	DATE	AMENDMENT
1	21/3/12	REVISED DIMENSION, LUG TEXT
0	20/03/12	ISSUED FOR CONSTRUCTION
A	10/01/12	ORIGINAL ISSUE

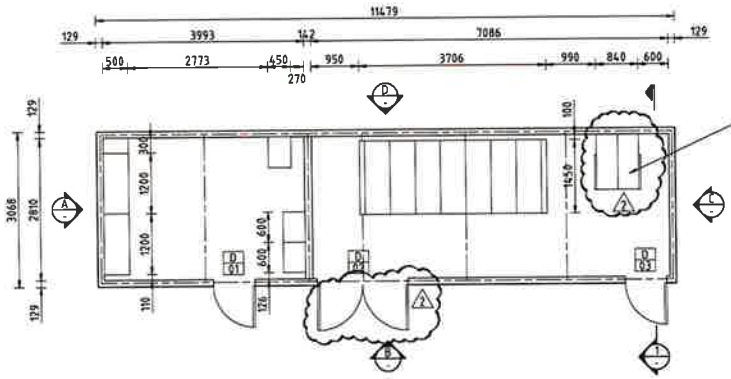
CTB CUSTOM TRANSPORTABLE BUILDINGS
A Member of the Williams River Steel Group

paul clarke & associates pty ltd
Consulting Civil & Structural Engineers
553 East Seaham Road
SEAHAM EAST NSW 2324
Phone: (02) 4988 6111
Fax: (02) 4988 6707
e-mail: mail@pcassoc.com.au

PROJECT	FMX SUBSTATION
LOCATION	10MW PEAKING POWER STATION SEYMOUR VICTORIA
DESIGNER	EATON ELECTRICAL
DRAWN	BGS
CHECKED	S.S.
DESIGN	B.C.
DESIGN CHECKED	P.C.
DATE	10/01/12
SCALE	AS SHOWN
PROJECT APPROVAL	B S CLARKE B Eng MIEAust
TITLE	CONSTRUCTION NOTES
SIZE	A1
JOB NUMBER	11617
SHEET	001
REV	1

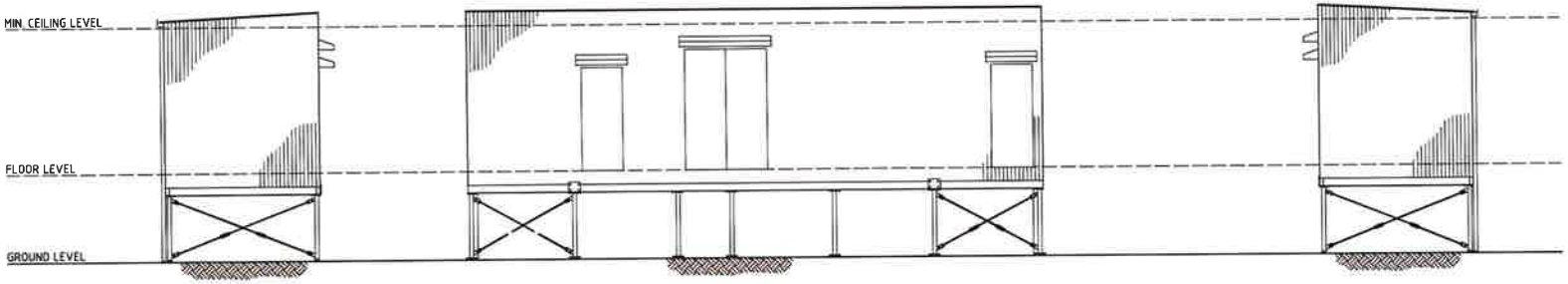
SHEETING DETAILS		
LOCATION	SHEET PROFILE	COLOUR
EXTERNAL ROOF	TRIMDEK	
EXTERNAL WALL	PANELRIB	
INTERNAL	PANELRIB	

DOOR SCHEDULE	
DOOR NUMBER	DOOR DIMENSIONS WIDTH x HEIGHT
D01	820 x 2050
D02	1800 x 2400
D03	820 x 2050
INTERNAL DOOR FRAME SIZES TO BE CONFIRMED WITH DOOR MANUFACTURER PRIOR TO WALL FRAME FABRICATION	



ONLY EQUIPMENT REQUIRING SUB FLOOR SUPPORTS AND FLOOR PENETRATIONS SHOWN ON PLAN. REFER TO CLIENTS GENERAL ARRANGEMENT DRAWING FOR ALL OTHER MISCELLANEOUS EQUIPMENT.

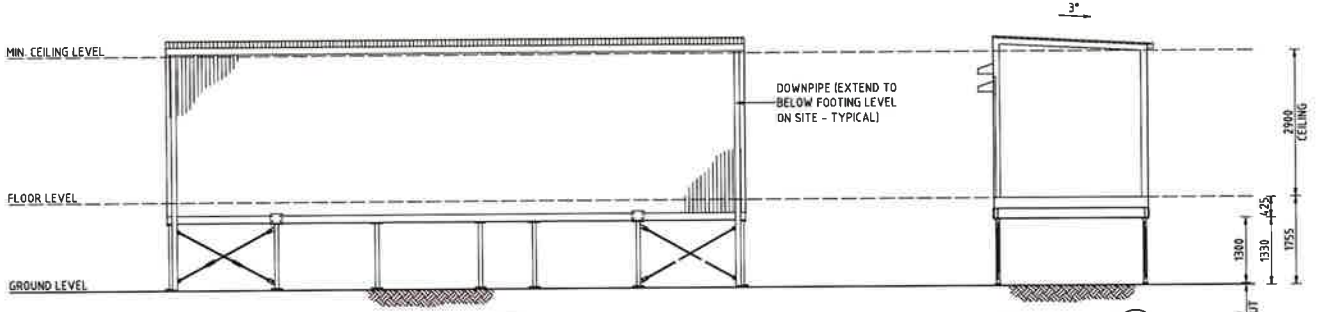
FLOOR PLAN
SCALE 1:50



ELEVATION A SCALE 1:50

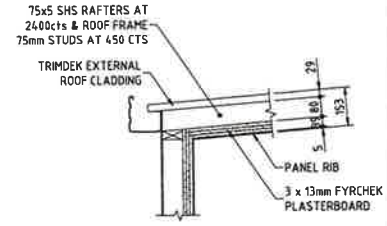
ELEVATION B SCALE 1:50

ELEVATION C SCALE 1:50

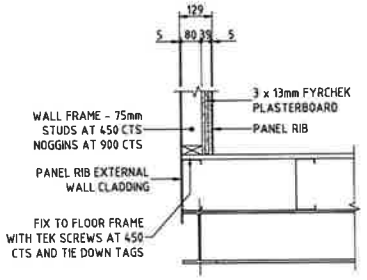


ELEVATION D SCALE 1:50

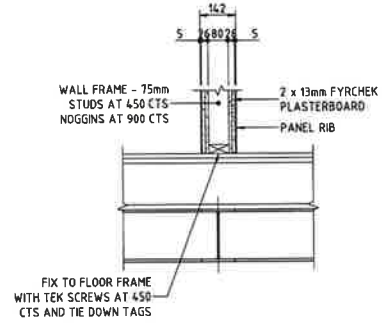
SECTION 1 SCALE 1:50



TYPICAL CEILING / WALL DETAIL
SCALE 1:10



TYPICAL WALL DETAIL
SCALE 1:10



TYPICAL INTERNAL WALL DETAIL
SCALE 1:10

CONSTRUCTION ISSUE

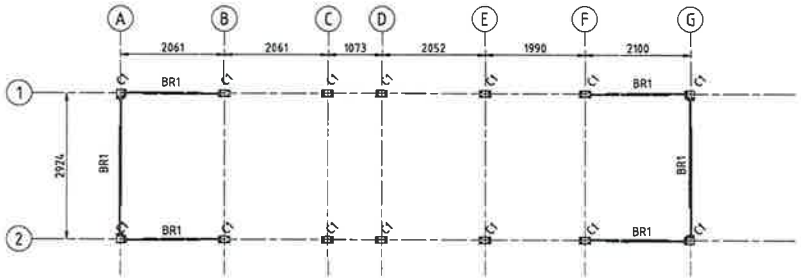
REV	DATE	AMENDMENT
2	20/04/12	REVISED EQUIPMENT LAYOUT & AMEND DOOR SIZE
1	21/3/12	REVISED DIMENSION
0	20/03/12	ISSUED FOR CONSTRUCTION
A	10/01/12	ORIGINAL ISSUE

CTB CUSTOM TRANSPORTABLE BUILDINGS
A Member of the Williams River Steel Group

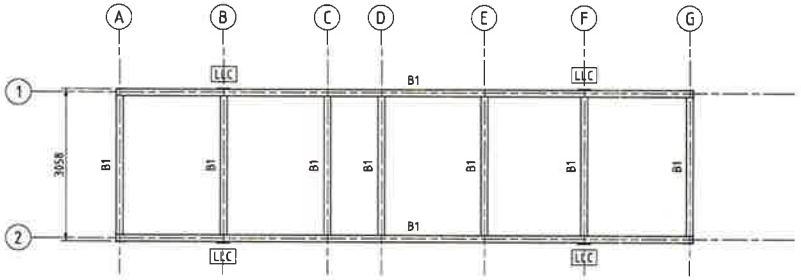
paul clarke & associates pty ltd
Consulting Civil & Structural Engineers
553 East Seaham Road
SEAHAM EAST NSW 2324
Phone: (02) 4988 6111
Fax: (02) 4988 6707
e-mail: mail@pcassoc.com.au

PROJECT	FMX SUBSTATION
LOCATION	10MW PEAKING POWER STATION SEYMOUR VICTORIA
DEVELOPER	EATON ELECTRICAL
DRAWN	BGS
DATE	10/01/12
CHECKED	S.S.
SCALE	AS SHOWN
DESIGN	B.C.
TITLE	FLOOR PLAN AND ELEVATIONS
DESIGN CHECKED	P.C.
SHEET	A1
JOB NUMBER	11617
SHEET	002
REV	2

PROJECT APPROVAL: B.S. CLARKE B Eng MIEAust

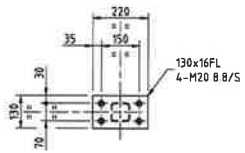


SUPPORT POST PLAN
SCALE 1:50

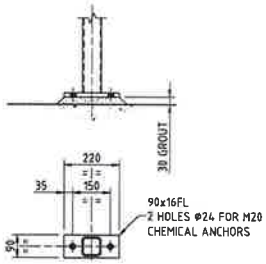


CHASSIS PLAN
SCALE 1:50

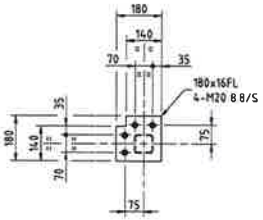
LLC DENOTES LOCATION OF LIFTING LUG CONNECTION PLATE. REFER TO LIFTING LUG CONNECTION PLATE DETAIL ON DRG 005



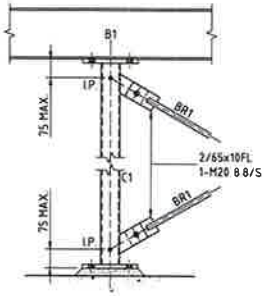
TYPICAL C1 CAP PLATE DETAIL
SCALE 1:10



TYPICAL BASEPLATE DETAIL
SCALE 1:10



TYPICAL C2 CORNER CAP PLATE DETAIL
SCALE 1:10



TYPICAL BRACING DETAIL
SCALE 1:10

CONSTRUCTION ISSUE

REV	DATE	AMENDMENT
0	20/03/12	ISSUED FOR CONSTRUCTION
A	10/01/12	ORIGINAL ISSUE

CTB CUSTOM TRANSPORTABLE BUILDINGS
A Member of the Williams River Steel Group

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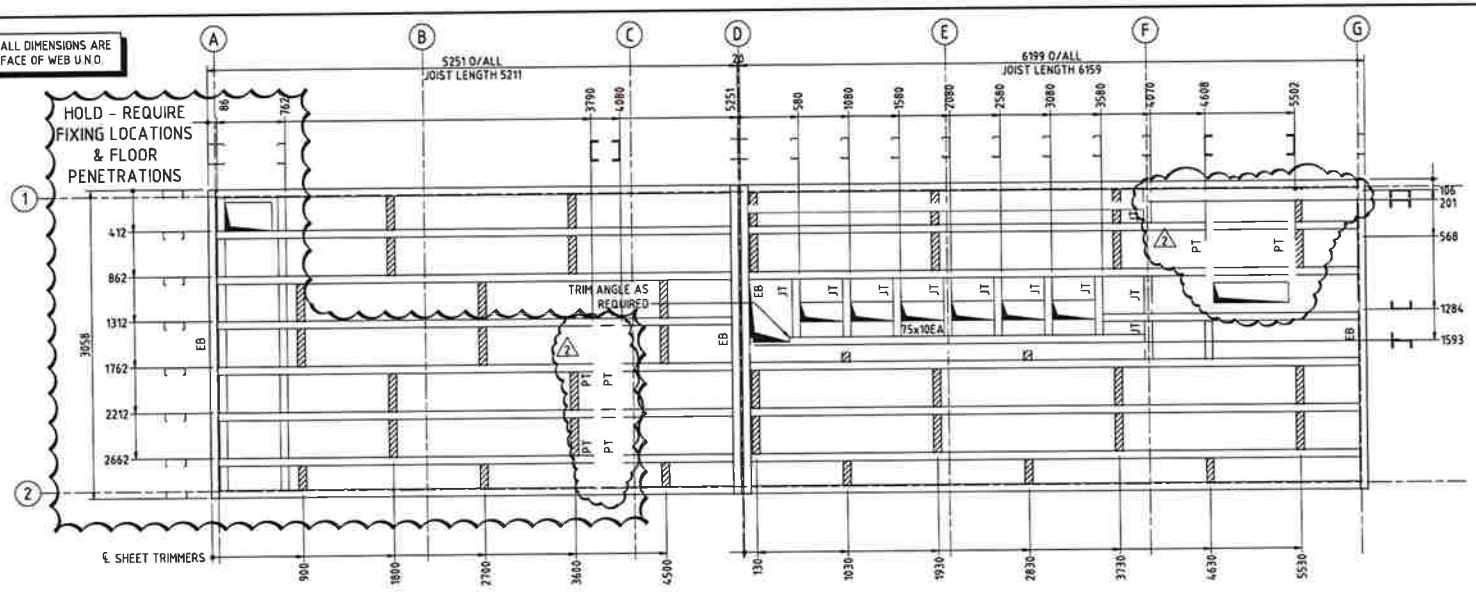
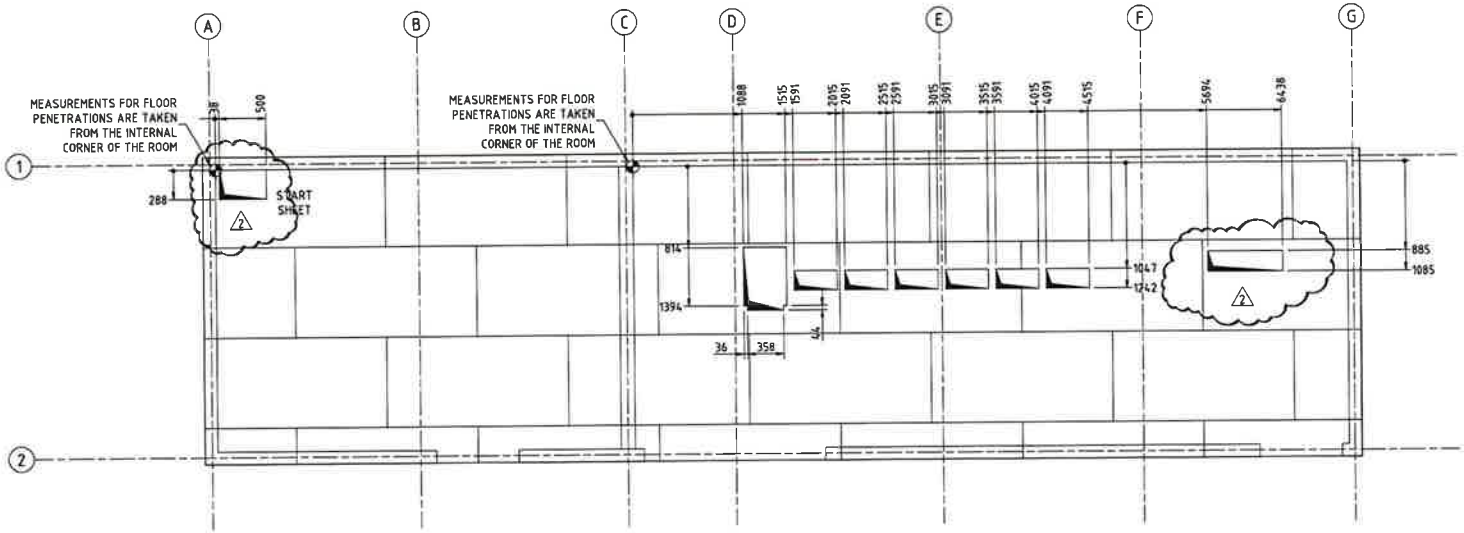
553 East Seaham Road
SEAHAM EAST NSW 2324
Phone: (02) 4988 6111
Fax: (02) 4988 6707
e-mail: mail@pcassoc.com.au

PROJECT	FMX SUBSTATION
LOCATION	10MW PEAKING POWER STATION SEYMOUR VICTORIA
DEVELOPER	EATON ELECTRICAL
DRAWN	BGS
CHECKED	S.S.
DESIGN	B.C
DESIGN CHECKED	P.C
DATE	10/01/12
SCALE	AS SHOWN
PROJECT APPROVAL	B S CLARKE B Eng M IEAust
TITLE	CHASSIS PLAN
SIZE	A1
JOB NUMBER	11617
SHEET	003
REV	0

NOTE:- ALL DIMENSIONS ARE FROM FACE OF WEB U.N.O.



FLOOR PANEL PLAN
SCALE 1:25



FLOOR SHEET & PENETRATION PLAN
SCALE 1:25

MEMBER SCHEDULE

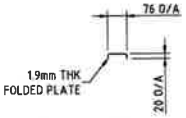
LEGEND	TYPE	SIZE
	SHEET TRIMMER	REFER TO SHEET TRIMMER DETAIL
EB	EDGE BEAM	REFER TO EDGE BEAM DETAIL
JT	JOIST TRIMMER	C20019
PT	PFC TRIMMER	200 PFC
	BEAM	200 PFC

ALL FLOOR JOISTS ARE C20019 AT 450 MAX CTS U.N.O.

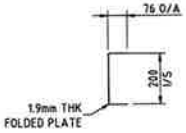
ALL PFC JOISTS ARE TO BE FULLY WELDED TO CHASSIS FRAME USING NOM 4mm CFW PRIOR TO PAINTING.

SHEET LAYOUT BASED ON 1800x900x18 THK F.C. SHEET

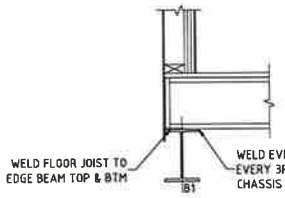
NOTES:
1. FLOOR FRAMING HAS BEEN DESIGNED FOR A UNIFORMLY DISTRIBUTED LIVE LOAD OF 5.0kPa.
2. CARE SHALL BE TAKEN WHEN MOVING OR INSTALLING ELECTRICAL EQUIPMENT TO MINIMISE THE EFFECTS OF POINT LOADING ON THE FLOOR SHEETING.
3. ELECTRICAL EQUIPMENT SHALL NOT BE PRYED OR LEVERED OFF THE FLOOR WHEN MOVING OR SERVICING.
4. ELECTRICAL EQUIPMENT IS TO BE MOVED ONLY USING AN APPROVED SYSTEM OF ROLLERS, OR OTHER MEANS AS APPROVED BY THE DESIGN ENGINEER, TO MINIMISE THE EFFECTS OF CONCENTRATED LOADS ON THE FLOOR SYSTEM.
5. JOINS IN FLOOR JOISTS DUE TO FABRICATION LENGTHS ARE TO BE STAGGERED ALONG THE LENGTH OF THE BUILDING TO ELIMINATE THE INTRODUCTION OF WEAK SPOTS IN THE FLOOR FRAME.
6. REFER TO WORKSHOP DRAWINGS (BY OTHERS) FOR FLOOR JOIST CUTTING LENGTHS AND PUNCHING DETAILS.
7. ALL WALL CAVITIES ARE TO BE ADEQUATELY SEALED BELOW FLOOR LEVEL TO PREVENT VERMIN ACCESS.
8. LOCATION AND SIZE OF CUT-OUTS IN FLOOR FOR CABLE ENTRY ARE TO BE CONFIRMED BY THE ELECTRICAL CONTRACTOR.
9. REFER TO ELECTRICAL LAYOUT FOR EXACT SIZE AND SETOUT OF GLAND PENETRATIONS. CUT-OUT FLOOR PENETRATIONS TO SUIT LOCATION OF FLOOR BEARERS UNDER SWITCHBOARD.



SHEET TRIMMER DETAIL
SCALE 1:10



EDGE BEAM DETAIL (EB)
SCALE 1:10



TYPICAL EDGE BEAM SECTION
SCALE 1:10

CONSTRUCTION ISSUE

REV	DATE	AMENDMENT
2	20/04/12	REVISED EQUIPMENT LAYOUT
1	05/04/12	PENETRATION AND SUPPORT STRUCTURE REVISED
0	20/03/12	ISSUED FOR CONSTRUCTION
A	10/01/12	ORIGINAL ISSUE

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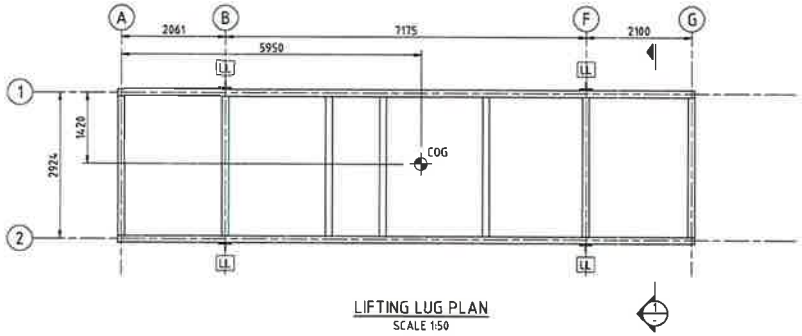
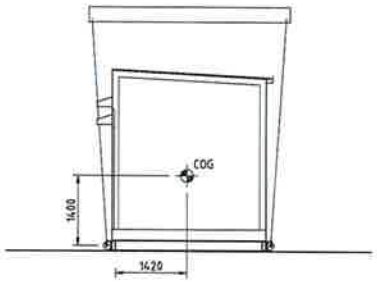
PROJECT	FMX SUBSTATION
LOCATION	10MW PEAKING POWER STATION SEYMOUR VICTORIA
DEVELOPER	EATON ELECTRICAL
DRAWN	BGS
DATE	10/01/12
CHECKED	S.S.
SCALE	AS SHOWN
DESIGN	B.C.
PROJECT APPROVAL	B.S. CLARKE B Eng, MIEAust
DESIGN CHECKED	P.C.
TITLE	FLOOR PANEL PLAN
SHEET	A1
JOB NUMBER	11617
	004
REV	2

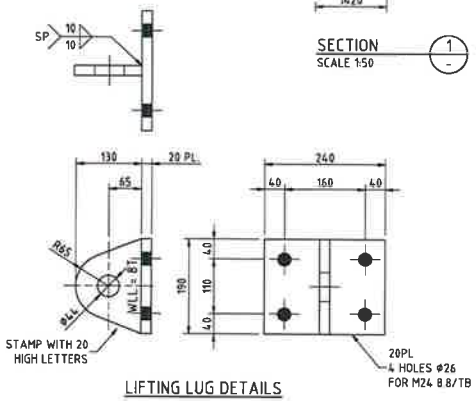


LIFTING LUG PLAN
SCALE 1:50

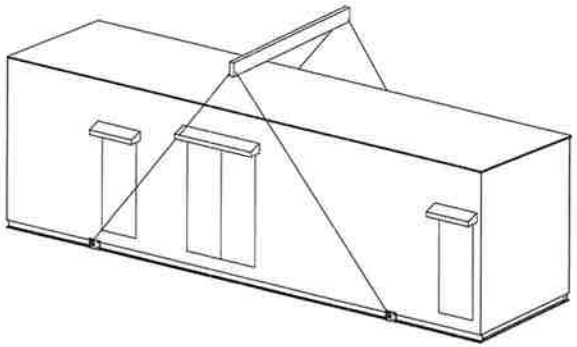
LL DENOTES LOCATION OF LIFTING LUGS, REFER TO LIFTING LUG DETAIL



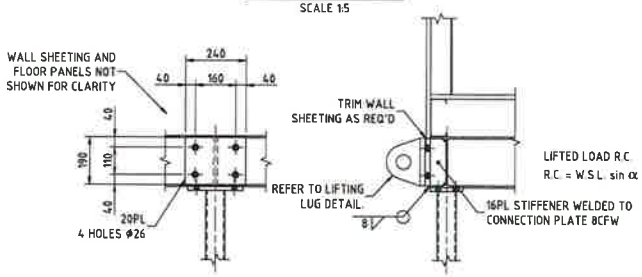
SECTION 1
SCALE 1:50



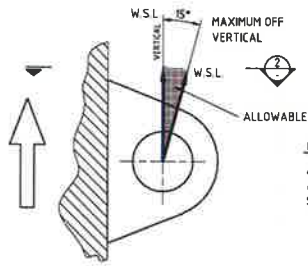
LIFTING LUG DETAILS
SCALE 1:5



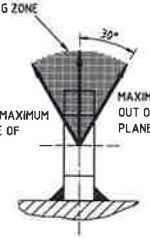
ISOMETRIC VIEW
SCALE 1:50



LIFTING LUG CONNECTION PLATE
SCALE 1:10



SIDE MOUNTED LUG



SECTION 2

LIFTING LUG NOTES:

1. THIS LIFTING DEVICE MEETS THE GENERAL REQUIREMENTS OF AS4991
2. THESE LIFTING DEVICES ARE TASK SPECIFIC AND SHOULD NOT BE USED FOR ANY OTHER PURPOSE
3. THE MAXIMUM LOAD ON ANY LUG SHALL NOT EXCEED THE WLL NOTED
4. THE LIFTING LUG ARRANGEMENT MUST BE PROOF LOADED PRIOR TO USE TO A VALUE OF 200% OF THE MAXIMUM LOAD (ie 2 x WLL)
5. ALL WELDS SHALL BE NON-DESTRUCTIVELY TESTED TO THE FOLLOWING REQUIREMENTS
   - 5.1 FILLET WELDS TO BE 100% MAG PARTICLE TESTED
   - 5.2 PARTIAL PENETRATION BUTT WELDS TO BE 100% MAG PARTICLE TESTED
   - 5.3 FULL PENETRATION BUTT WELDS TO BE 100% MAG PARTICLE TESTED
6. ALL WELDS SHALL BE INSPECTED VISUALLY FOR DEFECTS ON A 3 MONTHLY BASIS WHEN USED CONTINUALLY, AND FULLY INSPECTED USING NDT METHODS DESCRIBED ABOVE ON A 12 MONTHLY BASIS
7. THE DEVICES SHALL BE IMMEDIATELY REMOVED FROM SERVICE SHOULD ANY INDICATION BE FOUND DURING A ROUTINE INSPECTION
8. LOAD INCLINATION SHALL NOT EXCEED MORE THAN 5° FROM VERTICAL
9. R.C. DENOTES RATED VERTICAL LIFT CAPACITY
10. W.S.L. DENOTES MAXIMUM DESIGN WORKING SLING LOAD
11. DESIGN DYNAMIC LIFTING FACTOR = 2.0
12. LUGS TO BE MACHINE FLAME CUT

GENERAL STEELWORK NOTES:

1. ALL STEEL PLATE TO AS3678-250 U.N.O. ALL STEEL SECTIONS TO AS3679-300 U.N.O.
2. FLAME CUT SURFACES ARE TO BE UNIFORM AND CLEAN BEFORE WELDING
3. ALL WELD SYMBOLS ARE TO AS1101 PART 3
4. ALL FILLET WELDS TO BE 6mm CONTINUOUS FILLET U.N.O.
5. ALL BUTT WELDS SHALL BE FULL PENETRATION U.N.O.
6. WELDING, WELD PREPARATION, AND WELD TESTING FOR STRUCTURAL MEMBERS TO BE TO AS1554.1 CATEGORY SP USING E48XX ELECTRODES
7. ALL HOLES TO BE ø25mm U.N.O.
8. HIGH STRENGTH BOLTS TO COMPLY WITH AS1252 U.N.O. TENSIONING TO AS4100
9. ALL NOTCHES IN MEMBERS TO HAVE AN 11mm RADIUS IN CORNERS U.N.O.
10. DIMENSIONS TO MACHINED SURFACES ARE TO BE WITHIN -0.1mm U.N.O.
11. DRAWING TO BE READ IN CONJUNCTION WITH PROJECT SPECIFICATIONS
12. ALL STEELWORK SHALL BE PAINTED ONE SHOP COAT OF APPROVED ZINC RICH PRIMER U.N.O.
13. ALL BOLTS TO BE M24 - 8.8/TB U.N.O.
14. ALL CONNECTION PLATES TO BE 20mm U.N.O.

BUILDING WEIGHT ESTIMATE

BUILDING WT	EQUIPMENT WT	TOTAL WT
13 500kg	7 800kg	21 300kg

1. WEIGHTS SHOWN ARE UNFACTORED LOADS BASED ON INFORMATION SUPPLIED AT TIME OF DESIGN.
2. DUE TO UNCERTAINTIES IN EQUIPMENT WEIGHTS INSTALLED PRIOR TO LIFTING, THE WEIGHTS SHOWN ARE ESTIMATES ONLY AND SHOULD BE CONFIRMED BY WEIGHING THE P.A.M. PRIOR TO LIFTING.
3. WEIGHTS EXCLUDE STAIRWAYS, WALKWAYS, SUPPORT STRUCTURE, AND REMOVABLE LANDINGS.
4. ADEQUATE BRACING IS TO BE INSTALLED TO THE EQUIPMENT TO STABILISE THE EQUIPMENT DURING TRANSPORT AND INSTALLATION (DETAILS BY OTHERS)

SEALED BATTERIES ARE ONLY TO BE INSTALLED ONCE BUILDING HAS BEEN ASSEMBLED ON SITE. BUILDING IS NOT TO BE TRANSPORTED OR LIFTED WITH SEALED BATTERIES INSTALLED

NOTE:
ARROWS INDICATE MAXIMUM ALLOWABLE RANGE OF SLING DIRECTION

CONSTRUCTION ISSUE

REV	DATE	AMENDMENT
1	21/3/12	REVISED LUG CAPACITY LABEL
0	20/03/12	ISSUED FOR CONSTRUCTION
A	10/01/12	ORIGINAL ISSUE

CTB CUSTOM TRANSPORTABLE BUILDINGS
A Member of the Williams River Steel Group

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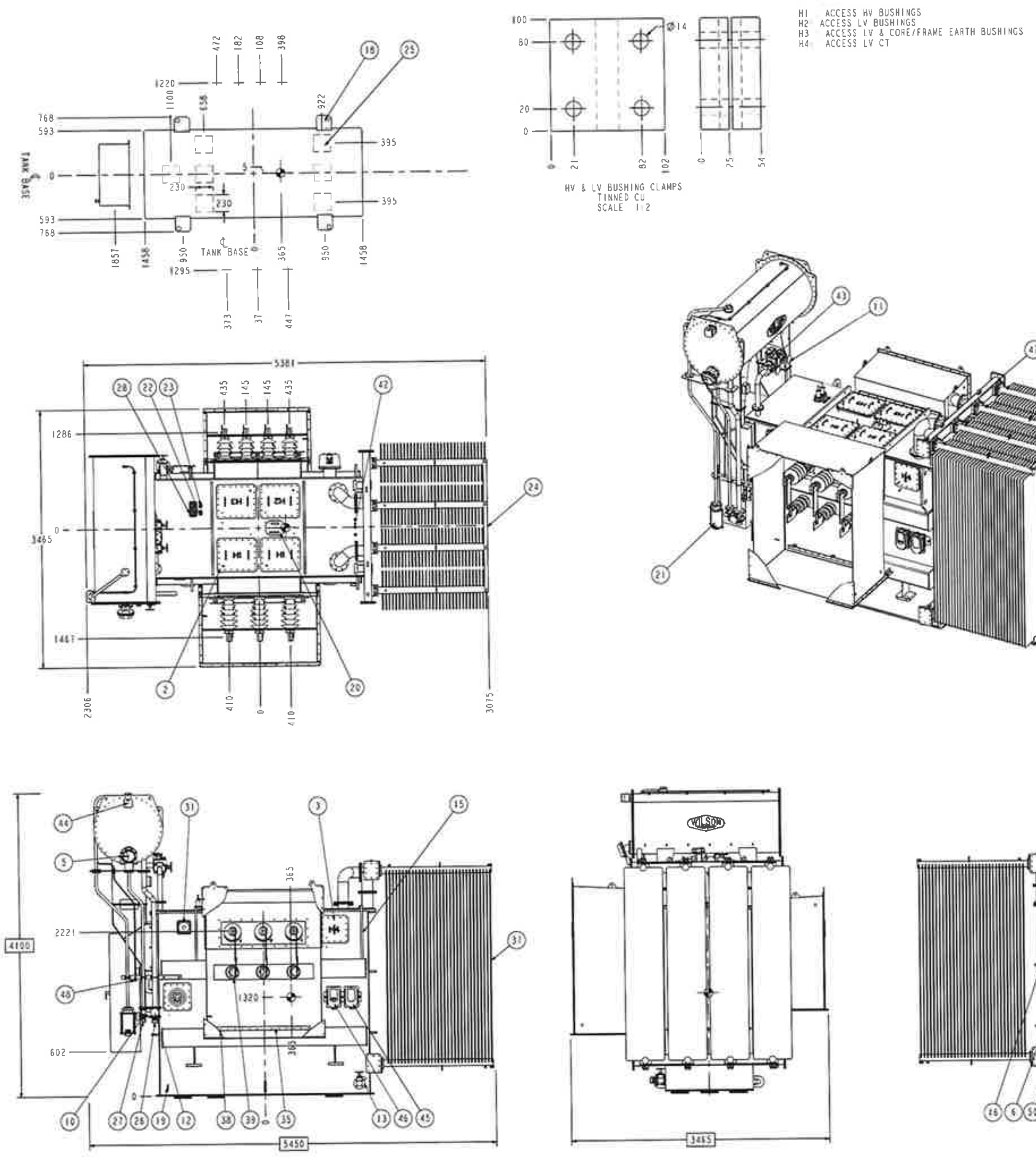
SEAHAM EAST NSW 2324
Phone: (02) 4988 6111
Fax: (02) 4988 6707
e-mail: mail@pcassoc.com.au

PROJECT: FMX SUBSTATION
LOCATION: 10MW PEAKING POWER STATION SEYMOUR VICTORIA
DEVELOPER: EATON ELECTRICAL

DRAWN	BGS
CHECKED	S.S.
DESIGN	B.C
DESIGN CHECKED	P.C
DATE	10/01/12
SCALE	AS SHOWN
PROJECT APPROVAL	B.S. CLARKE B.Eng MIEAust
TITLE	LIFTING PLAN AND DETAILS
SIZE	A1
JOB NUMBER	11617
SHEET	005
REV	1

D:\11617 - 11800\11617-ctb-eaton\pca drawings\005 Lifting Plan and Details 30/04/2012 2:30



ESTIMATED MASSES

CORE & COILS	12800 kg
TANK & FITTINGS	4300 kg
COOLERS (EMPTY)	3100 kg
TOTAL OIL	7000 kg
TOTAL TRFR MASS	27200 kg
TRANSPORT MASS (excluding oil)	21300 kg
TRANSPORT MASS (including oil)	27200 kg
OIL VOLUME	8000 litres

Centre of Gravity in service

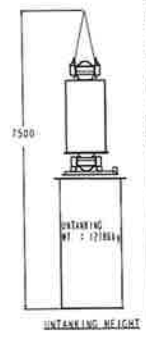
Centre of Gravity in Transport

TRANSPORT DIMENSION / MASS SHOWN AS

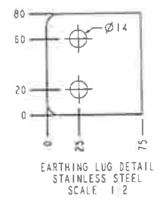
Radiators may be added or subtracted based on test data

TOLERANCE ON DIMENSIONS ±5%

NOTE: ALL STRUCTURAL CONNECTIONS AS4100 4.6/S UNLESS SHOWN OTHERWISE



ITEM	DESCRIPTION	QTY	MAKE	PART NO	BOM
1	CONTROL CUBICLE 1000X800X400 LH HINGED	1		[illegible]	-
2	HANDHOLE ASSEMBLY 430x350 WITH AIRVENT	4		[illegible]	-
3	SHIELDED H-HOLE ASSY 270x270 10mm WALL THK	1		[illegible]	-
4	INTEGRATED MAIN AND OLTC CONSERVATOR	1		[illegible]	-
5	MAGNETIC OIL LEVEL GAUGE LB22	1		[illegible]	-
6	VALVE POSITION PLATE	1		[illegible]	-
7	RATING AND DIAGRAM PLATE	1		[illegible]	-
8	CONSERVATOR SUPPORT	1		[illegible]	-
9	CONSERVATOR SUPPORT	1		[illegible]	-
10	VALVE GATE 25NB D/F TABLE 'D' WITH IND - MAIN CONS. DRAIN	1		[illegible]	-
11	VALVE GATE 50NB D/F TABLE 'D' WITH IND - BUCHHOLZ RELAY ISOLATION			[illegible]	-
12	VALVE GATE 50NB D/F TABLE 'D' WITH IND - MAIN CONS. VACUUM WITH CAMLOCK			[illegible]	-
13	VALVE GATE 50NB D/F TABLE 'D' WITH IND - MAIN TANK DRAIN WITH CAMLOCK			[illegible]	-
14	VALVE GATE 50NB D/F TABLE 'D' WITH IND - FILL/FILTER WITH CAMLOCK			[illegible]	-
15	LIFTING LUG	2	-	[illegible]	[illegible]
16	LIFTING LUG	2	-	[illegible]	[illegible]
17	LASHING LUG	2	-	[illegible]	[illegible]
18	JACKING PAD	4	-	[illegible]	[illegible]
19	LUG EARTH	2		[illegible]	[illegible]
20	PERSONAL FALL ARREST DEVICE & SUPPORT PLATE - UNI-ANCHOR	1		[illegible]	[illegible]
21	BREATHER SILICAGEL DANT 004 (ORANGE GEL)	1	DANT	[illegible]	[illegible]
22	LABEL CORE EARTH	2		[illegible]	[illegible]
23	LABEL FRAME EARTH	2		[illegible]	[illegible]
24	SPACER RADIATORS	6		[illegible]	[illegible]
25	PAD ANTIVIBRATION (BLACK)	[illegible]	GOODYEAR	[illegible]	[illegible]
26	ADAPTOR CAMLOCK 50NB MALE BSP	3		[illegible]	[illegible]
27	ADAPTOR CAMLOCK 25NB MALE BSP	1		[illegible]	[illegible]
28	BUSHING ASSY 11KV 400A WTC - GREY	2	WTC	[illegible]	[illegible]
29	BUSHING 22KV 800A WTC H07 GREY	4	WTC	[illegible]	[illegible]
30	BUSHING 33KV 800A WTC H04 GREY	3	WTC	[illegible]	[illegible]
31	BOX CT SECONDARY ETI SM2-5 12 TERMINALS	1	ETI	[illegible]	[illegible]
32	BUSBAR - EARTH LINK - 50x6.3	2	-	[illegible]	[illegible]
33	BUSBAR - EARTH LINK - 50x6.3	2	-	[illegible]	[illegible]
34	BUSBAR - EARTH LINK - 50x6.3	2	-	[illegible]	[illegible]
35	CABLE EARTH SCREEN BUSBAR	1	-	[illegible]	[illegible]
36	CABLE EARTH SCREEN BUSBAR	1	-	[illegible]	[illegible]
37	RADIATOR 32/2500	4	TIANTONG?	[illegible]	[illegible]
38	INSULATOR 3.3KV	10	-	[illegible]	[illegible]
39	POST INSULATOR SPI 24KV EMC SPI 305 12 12	3	EMC	[illegible]	[illegible]
40	POST INSULATOR SPI 12KV EMC SPI 200 12 12	4	EMC	[illegible]	[illegible]
41	BRAIDED COPPER FLEXIBLE	11	-	[illegible]	[illegible]
42	POCKET THERMOMETER AKM	3	AKM	[illegible]	[illegible]
43	GAS RLY ETI G050 GAS INJ 120 CM/SEC 3 CONT D6-111C	1	ETI	[illegible]	[illegible]
44	SWITCH KOBOLD NKP 1401 (AIRBAG RUPTURE DETECTOR)	1	-	[illegible]	[illegible]
45	INDICATOR WTI 45M 9W CAP	1	AKM	[illegible]	[illegible]
46	INDICATOR OTI 45M 9W CAP	1	AKM	[illegible]	[illegible]
47	VALVE BUTTERFLY 80NB DIN ETI WUP080	8	ETI	[illegible]	[illegible]
48	BALL VALVE 1/2 in	1		[illegible]	[illegible]
49	VENT PRESSURE RELIEF MESSKO 8psi, 0.55bar	1	MESSKO	[illegible]	[illegible]
50	VENT DOWNPIPE, L=1262	1		[illegible]	[illegible]



CUSTOMER
PROJECT
SITE

EPS

REV	DESCRIPTION	RE	AP	DRWN	CHKD	DATE
0	Original Issue	RS	RS	AP		07-08-12

SCALE 1:30 · MASS See Table · BASED ON 819-000

ALL DIMENSIONS ARE IN mm UNLESS OTHERWISE STATED

WILSON TRANSFORMER

TITLE GENERAL ARRANGEMENT
12.5 MVA 22/11 kV ONAN TRANSFORMER

DRAWING NO 819-1222C-A · REV 0 · A1

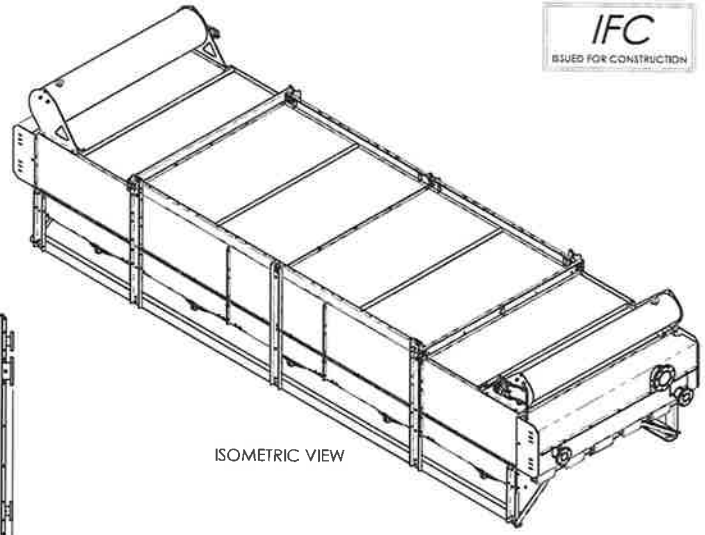
WILSON TRANSFORMER CO PTY LTD ACN 004 216 979

ISO SIZE A1 594X841 · 230-2005C10 <08-04-2009>

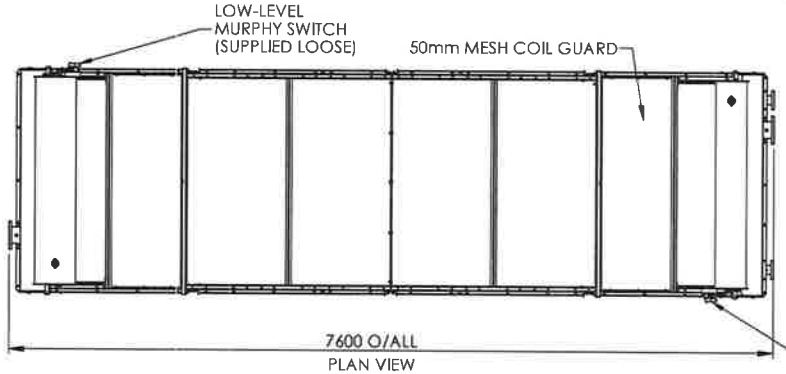
ESTIMATED WEIGHT (Kg): 2488

NOTES:
1. COOLANT CAPACITY: 790. (HT & LT TANKS INCLUSIVE)
2. MASS APPROX:
   DRY - 2488kG
   WET - 3278kG
3. MATERIAL FINISHES:
   STAND, PLENNUM, - HOT DIP GALVANISED TO AS4680:1999
   COILS - GALVANISED STEEL FRAME, COPPER TUBE AND ALUMINIUM FIN HYDROPHILIC COATED,
   EXPANSION TANKS - ABRASIVE BLAST PREPARATION TO AS1627-Part 4, EPOXY ZINC PHOSPHATE
   EP UNIVERSAL PRIMER 1 COAT 75um, FINISH - 2 PACK EPOXY 1 COAT 50um. EUCALYPTUS GREEN

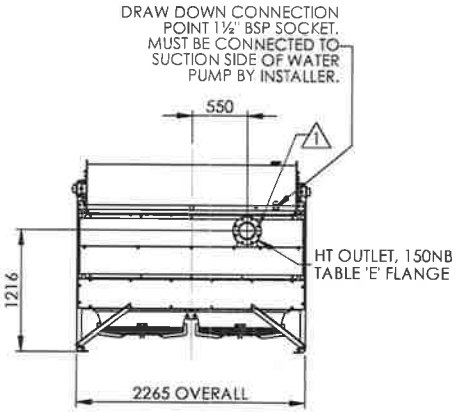
IFC
ISSUED FOR CONSTRUCTION



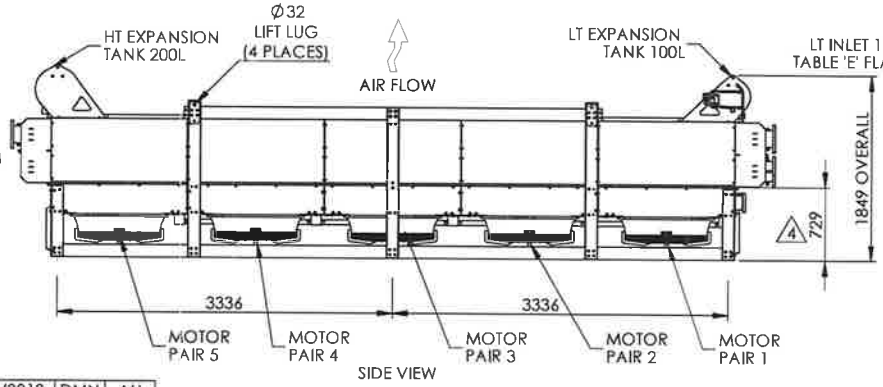
ISOMETRIC VIEW



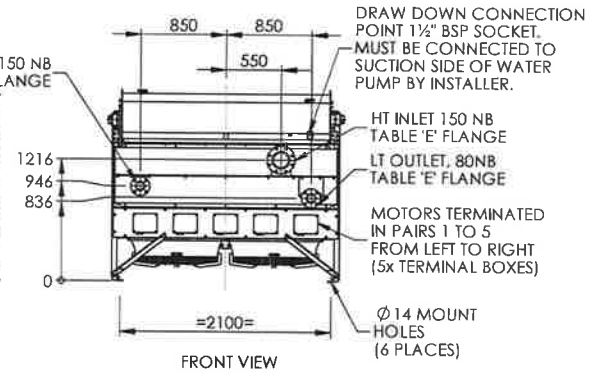
PLAN VIEW



END VIEW



SIDE VIEW



FRONT VIEW

REV	DESCRIPTION	DATE	DRN	APP
4	CORRECTED DIMENSION	8/10/2012	DMN	AH
3	REVISED TITLE BLOCK & DRAWING NUMBER	6/08/2012	DMN	BS
2	REVISED COIL DRAWING	9/07/2012	DMN	MU
1	REVISED OUTLET POSITION & COIL GUARD MESH	2/07/2012	DMN	MU

GENERAL TOLERANCES UNLESS OTHERWISE SPECIFIED
ALL DIMENSIONS IN MILLIMETRES
UNLESS OTHERWISE STATED

LINEAR: 0 DEC PLACE ±5.0
1 DEC PLACE ±0.5
ANGULAR: 0 DEC PLACE ±1.0°
1 DEC PLACE ±0.5°

Material: SEE BOM
Finish: PROJECT SPECIFICATIONS
Original Drawing Size: **A3**
3rd Angle Projection

Scale: 1:50 Sheet: 1 of 2
Drn: JLW Date: 14/02/12
Ckd: MU Date: 14/02/12

AR INDUSTRIAL
20-21 Aruma Street, PO Box 2421
Regency Park, South Australia 5942
Phone: +61 8 8340 7225

Title.
REMOTE HORIZONTAL RADIATOR,
MODEL: HFU-S-6800-10

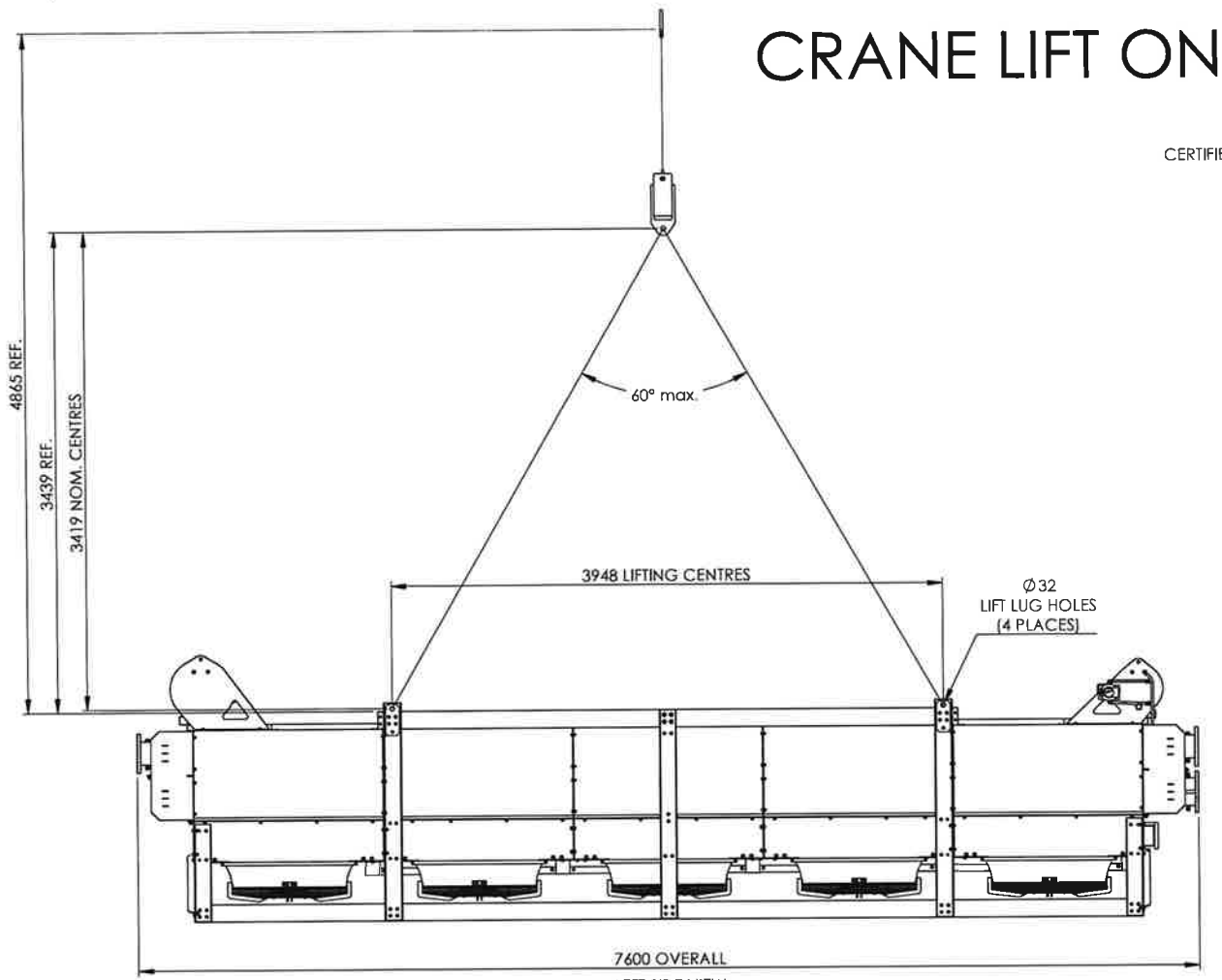
SORT ITEM AY
Quote No. 5135
Job No. 8145
Drawing No.
5135-001-r4

S:\Drawings\5001 to 6000\5135 - AR PEAK LOPPING STN\SW\5135-001

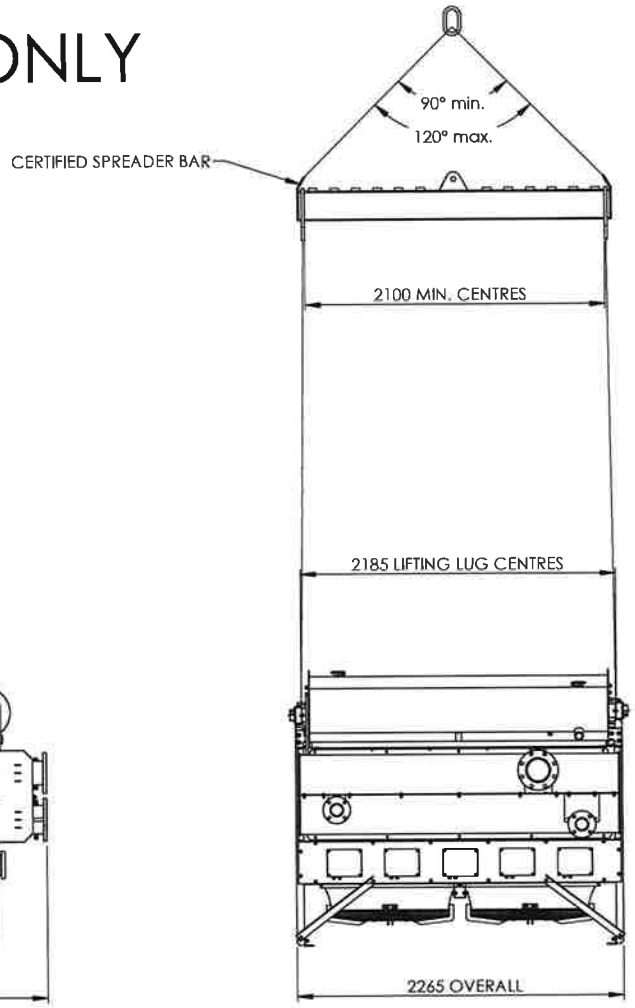
ESTIMATED WEIGHT (Kg): 2488

NOTE:
1. THE 2100 MINIMUM CHAIN CENTRE DISTANCE IN FRONT VIEW AND THE 60°MAXIMUM CHAIN ANGLE IN LEFT SIDE VIEW MUST BE MAINTAINED TO REDUCE LIFTING TORQUE ON RADIATOR LIFTING LUGS AND PREVENT CHAINS FROM FOULING WITH FAN CASES.
2. ENSURE THAT CERTIFIED LIFTING EQUIPMENT IS USED AND RECOMMENDED SAFE WORKING LOAD OF EQUIPMENT IS ADEQUATE TO MEET TOTAL MASS.

CRANE LIFT ONLY



LEFT SIDE VIEW



FRONT VIEW

GENERAL TOLERANCES UNLESS OTHERWISE SPECIFIED ALL DIMENSIONS IN MILIMETRES UNLESS OTHERWISE STATED	Material: SEE BOM			AR INDUSTRIAL	Title: REMOTE HORIZONTAL RADIATOR, MODEL: HFU-S-6800-10
	Finish: PROJECT SPECIFICATIONS				SORT ITEM: AY; Quote No. 5135; Job No. 8145
LINEAR: 0 DEC PLACE ±5.0 1 DEC PLACE ±0.5 ANGULAR: 0 DEC PLACE ±1.0° 1 DEC PLACE ±0.5°	Original Drawing Size: A3	Scale: 1:35	Sheet: 2 of 2	20 -21 Aruma Street, PO Box 2421 Regency Park, South Australia 5942 Phone: +61 8 8340 7225	Drawing No. 5135-001-r4
	3rd Angle Projection	Drn: JLW	Date: 14/02/12		
		Ckd: MU	Date: 14/02/12		

S:\Drawings\5001 to 6000\5135 - AR PEAK LOPPING STN\SW\5135-001

Appendix G. BCA Capability Statement

GROUPDLA

21 October 2013

To the General Manager
Campbelltown City Council
PO Box 57
Campbelltown NSW 2560

Dear Sir/Madam,

Building Code of Australia - Capability Statement
Property: Nova Power, 15 Huntsmore Street, Minto, NSW

This proposed development includes the fitout and use of this existing unit for the installation of a network power station. The previous use of the building was as a storage facility for copper wiring, and its proposed to change this use to a network power station.

The existing building comprises a pre-fabricated concrete tilt-up panel for the western wall, with a steel frame and steel cladding for the other walls and a concrete slab floor. Two roller doors are located on the eastern side of the building. PVC panels are present in the roof which acts as skylights. The overall dimensions of the building are 22m wide by 50m long and 10.8m high (at the highest point, slightly pitched roof).

The purpose of this submission is to advise that we have undertaken a site inspection of the existing building on the 20th August 2013 and a preliminary assessment of the architectural drawings submitted with the Development Application against the provisions of the Building Code of Australia 2013 as per the requirements under Clause 145 of the Environmental Planning & Assessment Regulation 2000.

BCA Assessment:

- Proposed Building Use: Network Substation
- Building Classification: Class 8
- Type of Construction: Type C
- Rise in Storeys: Two (2)
- Floor Area: 1,085m2
- Effective Height: Less than 12m
- Climate Zone: Zone 6

Compliance with the BCA for these specific works will be able to be achieved by compliance with the deemed-to-satisfy (DTS) provisions.

BCA Assessment items

Areas that will be coordinated at the Construction Certificate stage, but will not have a material impact on the DA plans are as follows:

- Location and number of Fire Hose Reels to be installed internally within 4m of the exit doors/new exit doors such that BCA compliance will be achieved
- Exit door latching compliance details for existing doors/ new doors for egress purposes will be provided

These matters are items that will not have a material impact on the DA plans or assessment, as they will be internal and not something that will require the lodgement of a Section 96 amendment once the location and design detail is established.

GROUPDLA

Existing Building - Clause 94 of the Environmental Planning and Assessment Regulation

As the proposed works are for the installation of a substation into an existing warehouse/industrial building the provisions of Clause 143 have been assessed at this stage of the development.

As part of the councils DA assessment process under this clause, the works are to be assessed to determine if the measures contained in the building are inadequate to:

- Protect persons using the building, and to facilitate their egress from the building in fire or
- To restrict the spread of fire from the building to other buildings nearby

An assessment of the existing building was made as part of the audit and preliminary review of the plans for this purpose.

The findings of this assessment are as follows:

Protect persons using the building, and to facilitate their egress from the building in fire

The size of the building is approximately 1,000m2, and the works will involve the use of only the ground floor of the building, based on the current plan this achieves compliance with the Deemed to Satisfy egress travel distances and egress requirements from the building as part of these works, which is an improvement on the current level of fire safety for the building.

Based on the size and rise in storeys fire detection or sprinklers are not required to be installed, and as such the level of fire safety will be compliant with the current version of the BCA in the building.

To restrict the spread of fire from the building to other buildings nearby

The current setbacks from adjoining buildings is such that compliance is achieved and will achieve compliance with the BCA (exceeds 6m to adjoining and 3m to side and rear boundaries), as such BCA compliance is achieved

Conclusion

I wish to confirm that matters pertaining to compliance with the Building Code of Australia (BCA) 2013 will be suitably assessed by our firm as the appointed Certifying Authority prior to the issue of the Construction Certificate in accordance with Clause 98 of the Environmental Planning and Assessment Regulations 2000.

We trust this submission satisfies any concerns of the Consent Authority with compliance of the development with the relevant requirements and provisions of the BCA 2013.

Should you require further assistance or clarification please do not hesitate to contact the undersigned at your convenience.

Yours sincerely

Charles Slack-Smith
Director
BPB Accredited Certifier - Grade A1 (BPB 0378)