

SMITHFIELD PACKAGE BOILER REINSTATEMENT

SUPPLEMENTARY INFORMATION

May 2015

Background

Visy has applied for a modification under s.75W of its approval (DA 13/94) in relation to its Smithfield pulp and paper mill site to enable it to reinstate backup gas package boilers.

Visy's Response to Submissions was lodged on 24 February 2015.

This Supplementary Information submission includes requested information on an alternative boiler configuration, to be considered for inclusion in the modification approval. In summary, the main environmental impacts of the alternative boiler configuration will be the same as the original proposal.

Visy wishes to proceed with one or other of the configurations but is not in a position to determine which one it will chose at this time. This choice will depend on final equipment cost quotations and delivery commitments from suppliers

Accordingly, approval is sought for both configurations, on the condition that only one may be proceeded with. This will provide Visy with the necessary level of investment certainty; particularly given the time required to obtain final equipment cost quotations and delivery commitments from suppliers.

Scenario 1

The Environmental Assessment dated 13 November 2014 (DA13/94) stated "It is proposed to reinstate three backup boilers (3x20 MW_{th}) to replace the boilers previously approved" (page 1), with the scope of the project described as:

- New boilers: three (3) 20MW_{th} shop assembled integral furnace gas-fired package boilers in suitable buildings complete with associated infrastructure including steam connections and feedwater plant
- New stacks: three (3) each 38m high, with emissions control technologies.

The boilers will be supplied with natural gas from the local AGL supply network.

For the purposes of this Supplementary Information report, this configuration will be referred to as “Scenario 1”.

The relevant details and impacts of Scenario 1 are documented in the Environmental Assessment.

Proposed additional scenario – Scenario 2

Since lodgement of the EA, Visy’s technical team has further examined the merits of installing 2 x 30MW_{th} Boilers, as an alternative to Scenario 1.

The boilers will be supplied with natural gas from the local AGL supply network (as for Scenario 1).

Subject to further technical evaluation, Visy believes a design change from 3 to 2 boilers would have significant advantages in technical and operational terms.

The 2 x 30MW_{th} configuration will be referred to as “Scenario 2”.

A final decision on whether Visy will adopt either Scenario 1 or Scenario 2 must await further commercial and technical analysis, consideration of production and delivery schedules and final capital costs.

To provide the required level of investment certainty, Visy wishes to obtain, by way of this modification approval, the planning permission to proceed with either Scenario (but not both).

Impacts of Scenario 2

In summary, in terms of environmental planning considerations, in comparison with Scenario 1, as described in the EA, adoption of Scenario 2 would:

- not change the purpose, scale or overall physical footprint of the installation
- not change the amount of gas consumed, or volume of flue gases produced
- not change the indicated location or other physical, construction or risk considerations of the modification

Adoption of Scenario 2 would also enable the installation of a single stack – with two converging ducts (one from each boiler) into the single stack – rather than the three stacks required under Scenario 1.

Other benefits with respect to environmental impacts would include:

- a possible small reduction in the Boiler house building width
- the flue gas from each Boiler can be directed into one stack
- reduced number of emissions source points from three to one
- one, lower-height stack being less aesthetically intrusive
- reduced Boiler noise sources from three to two
- less construction - reduced amount of ladders, walkways and piping installation
- shorter installation time
- reduced ongoing repairs and maintenance costs

Comparison of Scenario 1 and Scenario 2

The adoption of Scenario 2 would be likely to have equal or lower overall environmental impacts than would apply to Scenario 1.

Revised Air Quality and Noise assessments have been undertaken to consider the alternative scenario. These assessments are included in this Supplementary Information submission as attachments:

Attachment S-1 – Air Quality Impact Assessment Report (April 2015).

Attachment S-2 – Noise Impact Assessment Report (April 2015).

Figure S-1A and Figure S-1B compare the indicative boiler layout under Scenario 2 with that of Scenario 1. Either of these layouts would be contained within the originally-proposed boiler house described in the EA (See EA Figure 1 for location and EA Figure 2 for indicative layout and profile).

The major change is a reduction from 3 units to 2 units. In addition, Scenario 2 would enable the use of a single, lower-height stack. This is made possible by adoption of a “left-handed” plus “right-handed” boiler configuration, with the respective flue gas ducts converging into the single stack.

Table S-1 provides the information necessary to assess the environmental impacts of Scenario 2 as an alternative to Scenario 1. The table also addresses the Department’s

requirement for achievement of noise levels 10 dB lower than EPL criteria at all residential receptors.

TABLE S-1 - SUMMARY OF IMPACTS OF SCENARIO 2 COMPARED WITH SCENARIO 1

IMPACT / ISSUE	CHANGE FROM SCENARIO 1	REFERENCE / COMMENT
Physical footprint	Slightly reduced boiler house width; Otherwise no change to physical footprint	Refer site diagram in EA (Figure 1)
Air quality	Reduced incremental and cumulative NOx impacts, and well within referenced air quality limits.	See Revised Air Quality assessment (Attachment S-1)
Noise	Achievement of noise levels 10 dB lower than EPL criteria at all residential receptors after implementation of noise control measures.	See Revised Noise assessment, including wind effects (Attachment S-2)
Visual amenity	Lower visual impact (single stack of 30m height, cf. three stacks of 38m height in same location under Scenario 1)	Refer EA visual aspects and photographs (pp 10-13) and EA Figure
Construction	Lower construction intensity (fewer ladders, walkways and piping installation); Shorter installation time.	Refer to further advice on construction conditions (email dated 24/3/15)
Water management	No change	

Revised Air Modelling

The revised air impact assessment (Attachment S-1) found, in summary, that no exceedances to the referenced air quality limits were predicted. The assessment concluded that, given no application of further air emission reduction controls are required, it is to be expected that no air impact issues are associated with the proposal and that the proposal meets the most relevant and applicable air assessment criteria in accordance with the NSW EPA guidelines and is expected to not cause any impact or harm to any of the nearest potentially affected residences.

Revised Noise Modelling

The revised noise assessment (Attachment S-2) was performed with reference to the Department's requested project specific noise levels of 10 dB lower than the criteria specified in the EPL. The assessment found, in summary, that by implementing a lagging/noise enclosure of the fan casings, compliance with the PSNL was predicted at all the receptors.

Greenhouse gas assessment

A Greenhouse gas assessment has been undertaken for the project for each of the alternate boiler configurations. The same quantity of natural gas will be consumed by the boilers under the 3x20 MW_{th} and the 2x30 MW_{th} configurations. However the Scope 2 emissions (due principally to electricity consumption) will differ.

The detailed assessment is included at Attachment S-3. (Please note that, in this report, "Scenario 1" refers to the 2 x 30MW configuration, and "Scenario 2" to the 3 x 20MW configuration).

In summary, the assessment found that the total amount of greenhouse gas emissions (Scope 1, 2 and 3) from the proposed development would be virtually the same for either configuration; that is: approximately 107,737 tonnes CO₂-e per annum for the 2 x 30MW boiler configuration and 107,068 tonnes CO₂-e per annum for the 3 x 20MW configuration. The split in greenhouse gas emissions between Scopes 1, 2 and 3 is assessed to be approximately 78%, 2% and 20%, respectively, for both configurations.

Conclusions

It is concluded that, on the basis of the additional information contained in this Supplementary Information report, including the attached technical assessments, the Department may approve the modification to enable the installation of both boiler configurations, on the condition that only one may be proceeded with under this modification approval.

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... / Attachments

ATTACHMENTS

Attachment S-1 – Air Quality Impact Assessment Report (April 2015).

Attachment S-2 – Noise Impact Assessment Report (April 2015).

Attachment S-3 – Greenhouse Gas Assessment Report (May 2015).

SMITHFIELD PACKAGE BOILER REINSTATEMENT

ATTACHMENT S-1

Air Quality Impact Assessment Report (April 2015)

**AIR QUALITY IMPACT ASSESSMENT
REPORT FOR SMITHFIELD BOILERS REINSTATEMENT
PROJECT
HERBERT PLACE, SMITHFIELD**

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Report No: 141108_02_Air_Rev1_30MW Boilers
April 2015
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Attachments

Attachment 1: Quotation No ABC-150418-1 Design, fabrication, supply and commissioning of 2 off 30 MW packaged water tube boilers and associated auxiliary equipment suitable for limited attended operation
Attachment 2: Supplier Guarantee for NO _x Emissions
Attachment 3: Met File Report
Attachment 4: AERMOD vs AUSPLUME
Attachment 5: AERMOD Input/Output file





1. INTRODUCTION

Benbow Environmental has been engaged by Build Run Repair Pty Ltd on behalf of Visy Paper Smithfield to prepare an air impact assessment for the proposed Boiler House at the site located at 6 Herbert Place, Smithfield. This has been initiated as part of the proposed modification under Section 75W of the Environment Planning and Assessment Act 1979. This air report will form part of the Environmental Assessment.

The limits in the exhaust stacks of the water tube boilers are set by the Protection of the Environment (Clean Air) Regulation 2010.

This report is a revision of report No. 141108_Air_Rev3 due to a change in the original proposal of the installation and operation of 3 x 20MW boilers to 2 x 30MW boilers. This change would have significant technical, operational and commercial advantages, however it would not change the purpose, nature or scale of the proposal. The gas consumption and flue gases produced would remain the same.

In addition, the two boilers would require installation of only one stack with two converging ducts (one from each boiler) into a single stack, rather than the three stacks proposed in the original application.

Other benefits with respect to environmental impacts would include:

- a possible reduction in the building width;
- the flue gas from each Boiler can be directed into one stack;
- reduced number of emissions source points from three to one;
- one stack being less aesthetically intrusive;
- reduced Boiler noise sources from three to two;
- less construction - reduced amount of ladders, walkways and piping installation;
- shorter installation time;
- less complicated controls and electrical systems; and
- reduced ongoing repairs and maintenance costs.

Correspondence with the NSW Department of Planning (attached), agency submissions that raise issues from the NSW EPA and Holroyd City Council are also addressed in this report.

The operation of the two boilers would be assessed for the scenario of the boilers operating independent of the Marubeni Energy Plant and also operating in conjunction with this Plant. The Marubeni Energy Plant provides steam for the paper recycling plants of Visy Paper.

The selection of the boiler types has been heavily dependent on the need to use low NOx emitting burners.

The manufacturer of the burners selected is recognised as a world leader in the flame technology that results in low concentrations of NOx being generated.

The site is located within the industrial area of Smithfield. The nearest sensitive residential receptors were noted as being approximately 400 metres south of the site boundary.



This assessment has been carried out in accordance with the following relevant guidelines and documents:

- *NSW Environment Protection Authority Industrial Noise Policy (EPA 2000);*
- *Holroyd Development Control Plan 2013 Part D: Industrial Controls;*
- *Protection of the Environment Operations Act, 1997;* and
- *Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales.*

1.1 SCOPE OF WORKS

This assessment has been limited to the following scope of works:

- Conduct a site visit and examine the existing operations;
- Determine the local meteorology and terrain of the site and its contribution to air dispersion of emissions;
- Identify applicable emission rates based on the current guidelines and expectations from NSW EPA and prepare these figures for use in air dispersion modelling;
- Conduct air dispersion modelling to determine currently approved impacts and compare these with the proposed impacts, which will also outline the series of controls approved by the proponent; and
- Prepare a summary report which outlines the methodology and the outcomes of the assessment, including, if necessary, any recommendations that are necessary to achieve compliance with the NSW EPA guidelines.

2. DESCRIPTION OF THE PROPOSAL

In this Section of the report the proposal is described in detail. The specification of the boilers and the burners are presented in Attachment 1. A summary of the type of boilers and the low NOx generating burners is provided.

Figure 2-1 shows the site layout. This plan shows the industrial buildings that form the Visy Paper site.

The proposed location of the boilers has been selected for the following reasons:

- The original location on the eastern side of the Visy Paper plant has inadequate floor space available for the necessary steam generation now required.
- The chosen location is relatively close to the Marubeni Energy Plant and near the steam pipelines that convey the steam to the paper recycling machines (in the Visy Paper Plant). As a consequence, steam can be more readily piped into the boilers to keep these at a semi-operational temperature enabling full steam to be produced within 30 minutes. This has the advantage of the boilers being able to be operational without being on high fire (maximum gas consumption) for a period of an hour or longer.
- The chosen location is ideally placed for noise management.

Figure 2-2 to Figure 2-4 show the layout of the proposed boiler house, the boiler configuration and deaerator.

Figure 2-1: Package boiler site

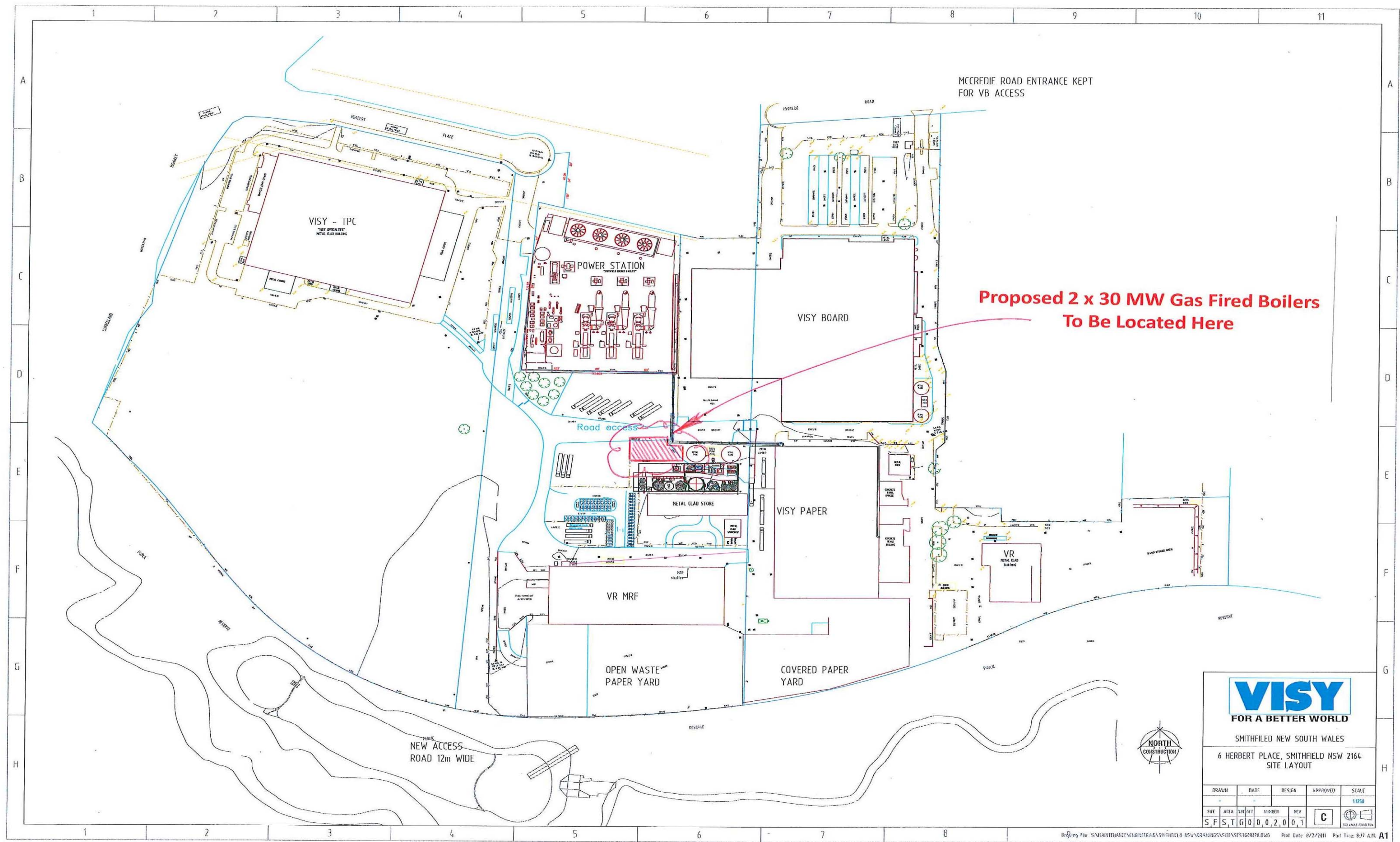


Figure 2-2: 20MW Boiler General Arrangement

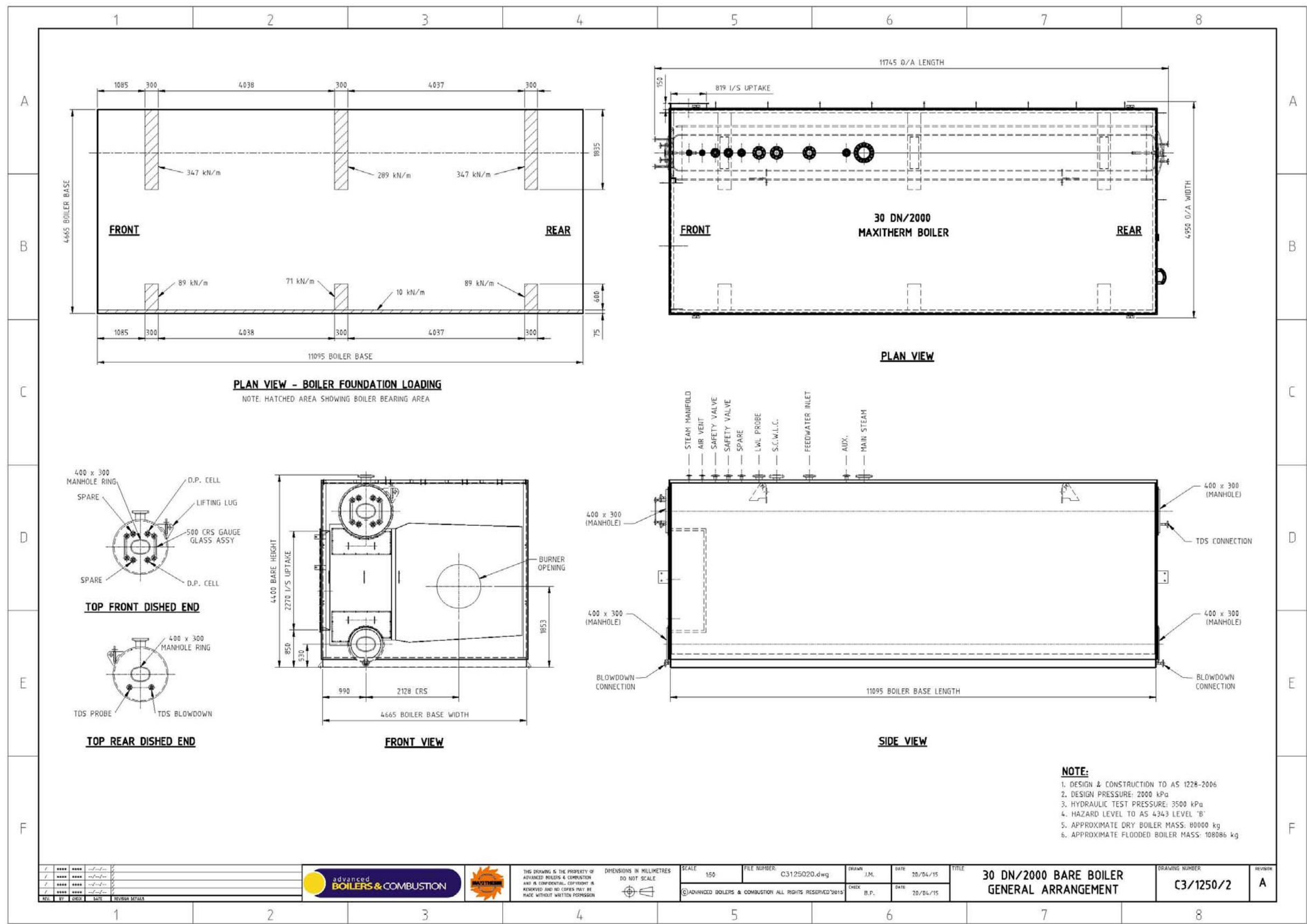
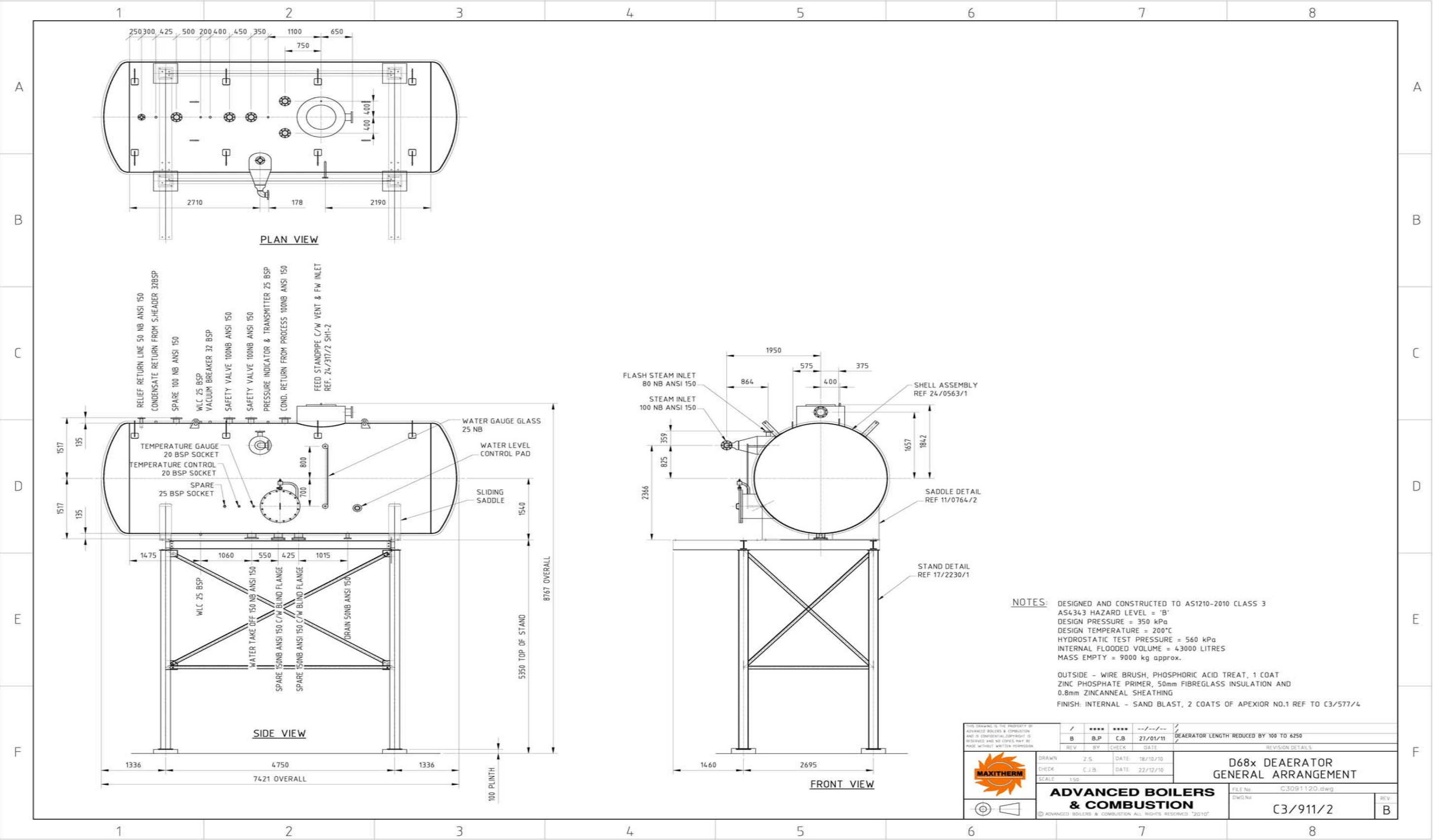


Figure 2-4: C3091120 DA Deaerator



2.1 LAND USE OF THE REGIONAL PROJECT SITE LOCATION

With reference to the Holroyd City Council Local Environmental Plan Land Zoning Map (2012), the Project Site is situated in an industrial area (IN1). The area is bounded by the Prospect Creek waterway, the foreshore of which is a public recreation and environmental conservation areas to the South and other industrial properties to the North, east and west. Just over 500m east of the Project Site and beyond, the area is a low density residential area.

Figure 2-5 shows the various land uses surrounding the location of the subject site.

Figure 2-5: Excerpt of Holroyd City Council Land Use Zoning Map



Source: Holroyd City Council

Available at URL: <http://www.holroyd.nsw.gov.au/wp-content/uploads/downloads/2013/09/LEP2013-Zoning-Map.pdf>

2.2 BOILER DETAILS

The boiler stack would be on the northern side of the boiler house. The stack would be 30 m high with two converging ducts (one from each boiler) into a single stack.

Each boiler has an economiser to capture heat present in the combustion products often referred to as flue gases. The stack temperature at discharge point is 136°C as a result.

The boilers are each of 30 MW capacity. The boilers' design is Maxitherm MDN Series Packaged Steam Boilers. The boilers are the water tube type (as opposed to fire tube).

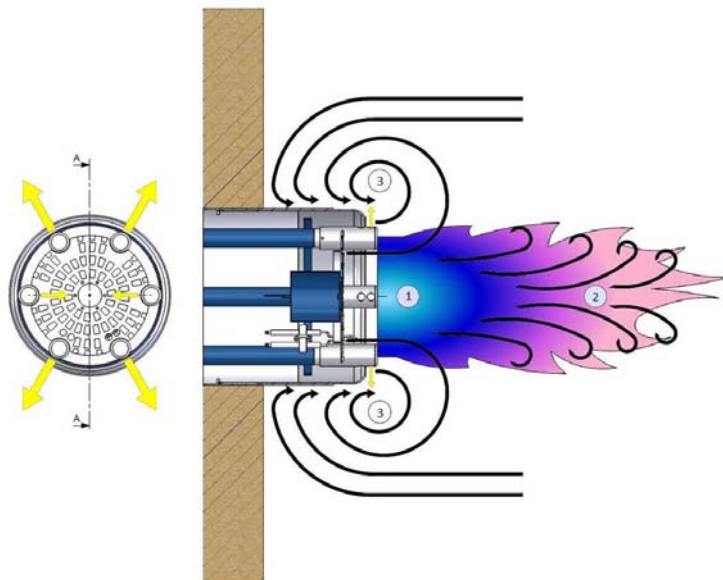
The burner type is a Dunphy BG 8.380 ME which is designed to generate low concentrations of NO_x typically 150–250 mg/m³ at 3% oxygen and well within the requirements of the Protection of the Environment (Clean Air) Regulation 2010. This Regulation sets a concentration for Group 6 plant of 450 mg/m³ at 3% oxygen.

The Dunphy burner achieves this low level of NO_x generation using a multi-nozzle system as discussed below in information provided by the burner manufacturer.

There are three primary sources of NO_x in the combustion process; thermal NO_x, fuel NO_x and prompt NO_x.

Prompt NO_x can be ignored in most cases as it is negligible in comparison to the other two forms. Fuel NO_x becomes significant when the fuel has a significant nitrogen content i.e. fuel oil. Thermal NO_x is highly temperature dependant and is the main source of NO_x in many combustion processes and is dominant when burning natural gas. The formation rate is primarily a function of temperature and the residence time of nitrogen at that temperature.

The Dunphy ultra-low NO_x burner mitigates the formation of thermal NO_x through careful burner head design, staged combustion and internal flue gas recirculation.



First of all a sub-stoichiometric combustion zone is created in Zone 1 of the flame envelope keeping flame temperatures low and forming a stable root to the flame. Secondary staged combustion takes place in zone 2 completing the combustion process whilst maintaining low flame temperatures. Bluff body thermodynamics in zone 3 induce inert flue gases back into the core of the flame. This form of internal flue gas re-circulation, slows the combustion process down even further through oxygen reduction thus lowering the flame temperature and resulting NO_x levels.

A Supplier guarantee for NO_x emissions for the proposed 2x30MW boilers is provided as Attachment 2.

For the air assessment the following modelling scenarios will be presented in Section 7 Air Dispersion Modelling:

- The two 30MW boilers operating;
- The Marubeni Energy Plant operating; and
- Both operating conjointly.

2.3 NOX GENERATION

The objective of this section of the report is to compare the NOx mass emission rate from the existing three boilers GT/HRSC located at the Smithfield Investors No1 Pty Ltd site with the proposed boilers to be located nearby.

The Environment Protection Licences of these two sites are Smithfield Investors No. 1 Pty Ltd – EPL #5701. Smithfield Investors P/L is referred to in the report as the Marubeni Energy Plant. Visy Paper Pty Ltd has EPL #4100.

Following the review of the Annual Returns for the Marubeni Energy Plant from 2007 until 2013 and the air emission monitoring conducted for the same period by NATA accredited consultants, a summary of relevant parameters to assist in the comparison exercise is listed below.

Based on the information supplied by the manufacturers, the information presented in Table 2-1 has been compiled.

Table 2-1: New boilers' specifications

Item	Specifications	Conditions
Stack height	30 m	17 m/sec discharge velocity
Stack/flue temperature	136°C = 409°K	
NOx emission rates / concentration	150-250 mg/m ³ @3% O ₂	3% O ₂
Flue mass flow rate	48,470 kg/hr @STP	STP
Flue volume flow rate	59,500 m ³ /hr	Flue gas temperature

Initially, the NOx emission rate at 3% O₂ should be converted to NOx emission rate at 15% O₂. The following formula is used:

$$Cr = Cm \times (20.9 - r) / (20.9 - m)$$

where:

Cr = corrected concentration in a dry gas having a specified reference volume % O₂ = r

Cm = measured concentration in a dry gas having a measured volume % O₂ = m

Hence, the highest NOx emission rate of 250 mg/m³ at 3% O₂ is equivalent to 65.92 mg/m³ at 15% O₂ and the lowest NOx emission rate of 150 mg/m³ at 3% O₂ is equivalent to 49.44 mg/m³ at 15% O₂.

At flue gas temperature, the flue volume flow rate is 59,500 m³/hr. Hence, for the highest NOx emission rate of 65.92 mg/m³ at 15% O₂, the NOx volume flow rate is 59500x65.92 = 3,922,240 mg/hr or 3922.24 g/h or 3.922 kg/h.

Summary of results of air emission monitoring for the Marubeni Plant as reported in the Annual Returns are included in Table 2-2. GT#1–GT#3 refers to each of the gas turbines.

Table 2-2: Summary of results of air emission monitoring and other flue specifications

AR 2007 - 2008	GT #1		GT#2		GT#3	
	Highest	Average	Highest	Average	Highest	Average
NOx concentration g/m ³ O ₂ corrected (ppm)	23	21	19	18	10	9.2
Flue temperature (°K)	364		366		362	
NOx emission rates						
Flue mass flow rate (kg/hr)	550000		540000		550000	
Flue volume flow rate (m ³ /s)	160	120	160	120	160	120
NOx mass						
Velocity (m/s)	21	21	21	21	21	21
Gas density (kg/m ³)	1.31	1.28				
O ₂ (%)	14.8	14.8	14.8	14.7	14.6	14.6
AR 2008 - 2009	GT #1		GT#2		GT#3	
	Highest	Average	Highest	Average	Highest	Average
NOx concentration g/m ³ O ₂ corrected (ppm)	16	14	17	16	15	12
Flue temperature (°K)	369		374		365	
NOx emission rates						
Flue mass flow rate (kg/hr)	560000		530000		540000	
Flue volume flow rate (m ³ /s)	160	120	160	120	160	120
NOx mass						
Velocity (m/s)	22	22	22	22	21	21
Gas density (kg/m ³)	1.31	1.28				
O ₂ (%)	14.5	14.4	14.5	14.5	14.7	14.6
AR 2009 - 2010	GT #1		GT#2		GT#3	
	Highest	Average	Highest	Average	Highest	Average
NOx concentration g/m ³ O ₂ corrected (ppm)	14	13	18	17	12	12
Flue temperature (°K)	368		367		368	
NOx emission rates						
Flue mass flow rate (kg/hr)	540000		540000		530000	
Flue volume flow rate (m ³ /s)	160	120	160	120	160	120
NOx mass						
Velocity (m/s)	22	22	22	22	21	21
Gas density (kg/m ³)	1.31	1.28				
O ₂ (%)	14.6	14.6	14.6	14.6	14.7	14.7

Table 2-2: Summary of results of air emission monitoring and other flue specifications

AR 2010- 2011	GT #1		GT#2		GT#3	
	Highest	Average	Highest	Average	Highest	Average
NOx concentration g/m ³ O ₂ corrected (ppm)	19	13	13	13	11	10
Flue temperature (°K)	370		376		367	
NOx emission rates						
Flue mass flow rate (kg/hr)	560000		540000		560000	
Flue volume flow rate (m ³ /s)	160	120	160	120	160	120
NOx mass						
Velocity (m/s)	22	22	22	22	22	22
Gas density (kg/m ³)	1.30	1.28	1.31	1.27	1.31	1.28
O ₂ (%)	15.6	15.6	14.7	14.7	14.8	14.7
AR 2011- 2012	GT #1		GT#2		GT#3	
	Highest	Average	Highest	Average	Highest	Average
NOx concentration g/m ³ O ₂ corrected (ppm)	13	12	15	14	17	16
Flue temperature (°K)	373		366		370	
NOx emission rates						
Flue mass flow rate (kg/hr)	550000		560000		550000	
Flue volume flow rate (m ³ /s)	160	120	160	120	160	120
NOx mass						
Velocity (m/s)	22	22	22	22	22	22
Gas density (kg/m ³)	1.31	1.28	1.31	1.28	1.31	1.28
O ₂ (%)	14.6	14.6	15.0	14.9	15.0	15.0
AR 2012- 2013	GT #1		GT#2		GT#3	
	Highest	Average	Highest	Average	Highest	Average
NOx concentration g/m ³ O ₂ corrected (ppm)	9.3	8.2	11	9.8	12	11
Flue temperature (°K)	372		367		368	
NOx emission rates						
Flue mass flow rate (kg/hr)						
Flue volume flow rate (m ³ /s)	170	120	160	120	170	120
NOx mass						
Velocity (m/s)	23	23	22	22	23	23
Gas density (kg/m ³)	1.30		1.30		1.30	
O ₂ (%)	14.6	14.6	14.5	14.5	14.5	14.5

For the existing GT/HRSC Unit 1 relevant information is included in Table 2-3.

Table 2-3: GT/HRSC Unit 1 specifications

Item	Measured/Specifications	
	Average of the highest values	Average of the average values (if applicable)
NOx concentration g/m ³ O ₂ corrected (ppm)	15.7	13.5
Flue height (metres)	35	35
Flue temperature (°K)	369.33	
NOx emission rates		
Flue mass flow rate (kg/hr)	552000	552000
Flue volume flow rate (m ³ /s)	161.67	110
NOx mass		
Velocity (m/s)	22	22
Gas density (kg/m ³)	1.31	
O ₂ (%)	14.78	14.77

For the existing GT/HRSC Unit 12 relevant information is included in Table 2-4.

Table 2-4: GT/HRSC Unit 2 specifications

Item	Measured/Specifications	
	Average of the highest values	Average of the average values (if applicable)
NOx concentration g/m ³ O ₂ corrected (ppm)	15.5	14.6
Flue height (metres)	35	35
Flue temperature (°K)	369.33	
NOx emission rates		
Flue mass flow rate (kg/hr)	542000	542000
Flue volume flow rate (m ³ /s)	160	110
NOx mass		
Velocity (m/s)	21.83	21.83
Gas density (kg/m ³)	1.31	
O ₂ (%)	14.68	14.65

For the existing GT/HRSC Unit 3 relevant information is included in Table 2-5.

Table 2-5: GT/HRSC Unit 3 specifications

Item	Measured/Specifications	
	Average of the highest values	Average of the average values (if applicable)
NOx concentration g/m ³ O ₂ corrected (ppm)	12.8	11.7
Flue height (metres)	35	35
Flue temperature (°K)	366.67	
NOx emission rates		
Flue mass flow rate (kg/hr)	546000	
Flue volume flow rate (m ³ /s)	161.67	110
NOx mass		
Velocity (m/s)	21.67	21.67
Gas density (kg/m ³)	1.31	
O ₂ (%)	14.72	14.68

Following review of all the information available to Benbow Environmental including the above analysis, there are different ways of determining the NOx mass emission rates. However, by relying on the information submitted to the EPA, the following is confirmed:

For the GTs the average NOx mass emission rate is 2.81 kg/hour for each GT or 8.42 kg/hour for the three (3) GTs.

Hence, the existing boilers produce much higher NOx on an hourly basis so it all depends on the number of hours and days these boilers will be used.

The following subsections show the general locality, terrain effects which are very limited, as well the nearest receptors are shown.

2.4 SENSITIVE RECEPTORS

The nearest sensitive receptors are listed in Table 2-6 and their location is shown in Figure 2-6. These receptors are considered to represent the primary receptors likely to be affected by noise emissions associated with the proposed development and were also considered to be the receptors most likely to be affected by air emissions.

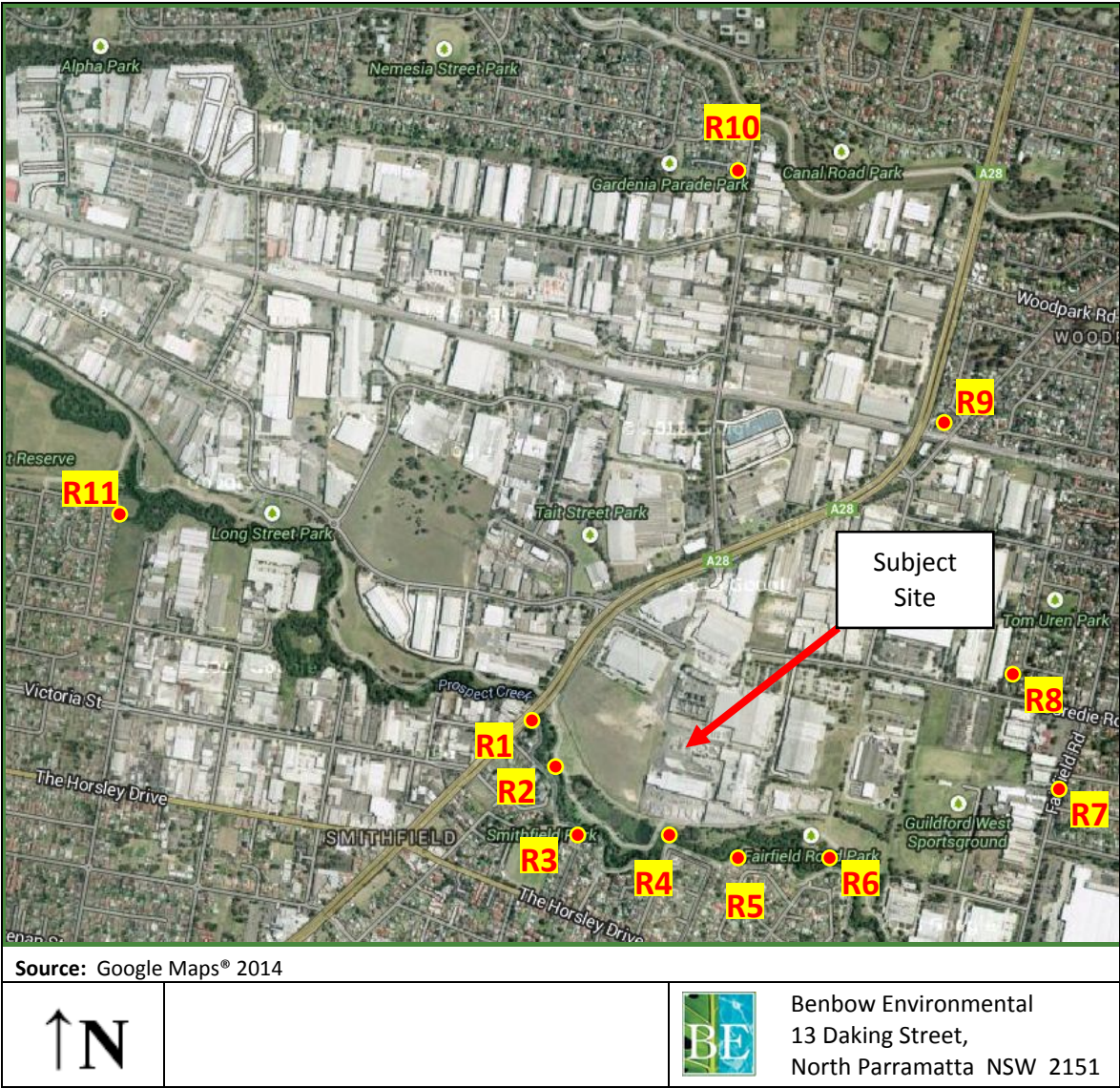


Table 2-6: Nearest Sensitive Receptors

Receptors	Address	Approximate Distance to Proposed Development (m)	Direction	Description
R1	6 Low Street, Smithfield	447	W	Residential
R2	12 Kiola Street, Smithfield	425	WSW	Residential
R3	20 Vineyard Avenue, Smithfield	407	SW	Residential
R4	31 Chisholm Street, Smithfield	310	S	Residential
R5	44 Solo Crescent, Smithfield	336	SSE	Residential
R6	124 Granville Street, Fairfield	494	SE	Residential
R7	126 Fairfield Road, Guilford West	1006	ESE	Residential
R8	127 McCredie Road, Guilford West	848	ENE	Residential
R9	79 Warren Road, Woodpark	1079	NE	Residential
R10	9 Magnolia Street, Greystanes	1564	N	Residential
R11	17 Rhondda Street, Smithfield	1727	NW	Residential



Figure 2-6: Nearest Sensitive Residential Receptors



3. METEOROLOGY AND LOCAL AIR QUALITY

3.1 PROJECT SITE REPRESENTATIVE METEOROLOGICAL DATA

Site specific meteorological data file for input into the AERMOD model was compiled by pDs Consultancy following the EPA, Victoria's draft guidelines: "Construction of input meteorological data files for EPA Victoria's regulatory air pollution model (AERMOD) (Publication No.1550)". A report providing detailed information on how the meteorological file was compiled is provided as Attachment 3

The source of the data used in the compilation includes Olympic Park and Sydney Airport, NSW. The period utilised was 1 January 2012 to 31 January 2012.

3.2 WIND ROSE PLOTS

Wind rose plots show the direction from which the wind is coming with triangles known as "petals". The petals of the plots in the figure summarise wind direction data into 8 compass directions ie. north, north-east, east, south-east, etc.

The length of the triangles, or "petals", indicates the frequency that the wind blows from the direction presented. Longer petals for a given direction indicate a higher frequency of wind from that direction. Each petal is divided into segments, with each segment representing one of the six wind speed classes. Thus, the segments of a petal show what proportion of wind for a given direction falls into each class.

The proportion of time for which wind speed is equal to or less than 0.5 m/s, when speed is negligible, is referred to as calm hours or "calms". Calms are not shown on a wind rose as they have no direction, but the proportion of time that they make up for the period under consideration is noted under each wind rose.

The concentric circles in each wind rose are the axes that denote wind frequencies. In comparing the plots it should be noted that the axis varies between wind roses, although all wind roses are the same size. The frequencies shown in the first quadrant (top-left quarter) of each wind rose are stated beneath the wind rose.

3.3 LOCAL WIND TRENDS

Wind roses developed from the site specific meteorological file are presented in the pDs Consultancy report in Attachment 3.

3.4 TERRAIN AND STRUCTURAL EFFECTS ON DISPERSION

The meteorological condition known as katabatic flow (or katabatic drift) is often identified as the condition under which maximum environmental impacts from primarily ground-based sources are likely to occur. Katabatic flow is simply the movement of cold air down a slope, generally under stable atmospheric conditions. Under such circumstances, dispersion of airborne pollutants is generally slow and the associated impacts can reach their peak.

Katabatic flow is unlikely to affect any emissions from the subject Project Site because katabatic flow only affects receptors that are located at a lower terrain elevation compared to the Project Site's elevation. Figure 3-1 and Figure 3-2 shows these elevation differences, highlighted by the exaggerated z-axis image (Figure 3-2). As such, no wind direction-specific katabatic flow would be expected to occur.

Figure 3-1: Two-Dimensional View of the Terrain Elevation

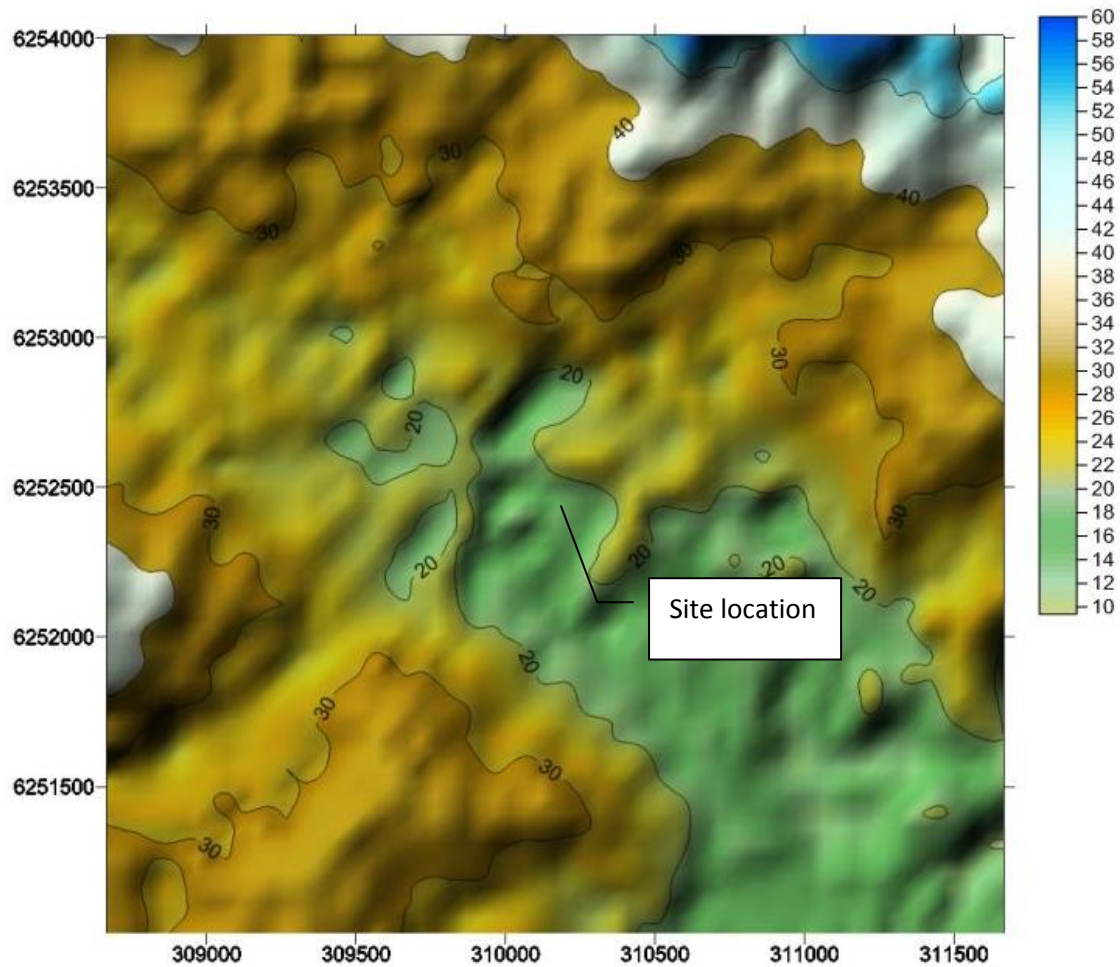
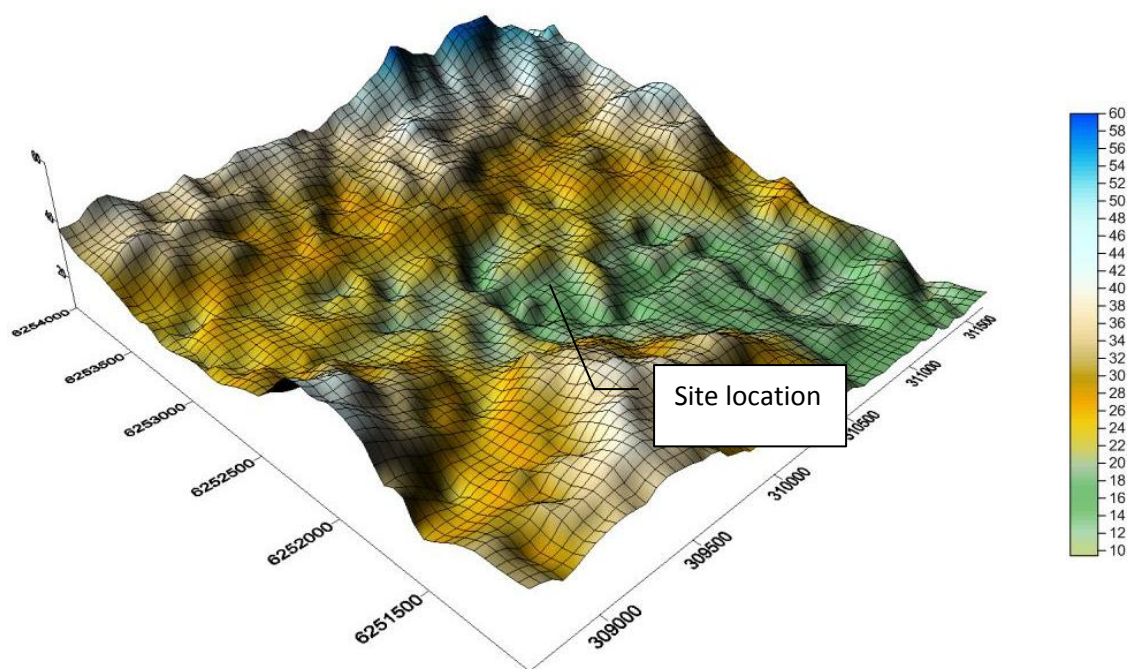


Figure 3-2: Three-Dimensional Terrain Elevation Diagram – Z-Axis Exaggerated by a Factor of 5



3.5 LOCAL AIR QUALITY

Background air quality parameters were obtained from the nearest NSW EPA ambient air monitoring station, which is located at Prospect, NSW. The relevant assessable pollutant parameters available from the monitoring station are NO₂ 1-hour annual maximum and annual average values for 2012, which have been provided below in pphm.

Maximum 1-hour NO ₂ :	5.0 pphm
Annual Average:	1.0 pphm

A table of conversion factors provided on the NSW EPA website is provided as follows. This allows comparison of the above data to that of other sources.

Table 3-1: Conversion factors, courtesy NSW EPA website

Pollutant	Units	Convert to	Multiply by
Ozone	pphm	$\mu\text{g}/\text{m}^3$ (0°C)	21.4
		$\mu\text{g}/\text{m}^3$ (25°C)	19.6
Nitric oxide (NO)	pphm	$\mu\text{g}/\text{m}^3$ (0°C)	13.4
		$\mu\text{g}/\text{m}^3$ (25°C)	12.3
Nitrogen dioxide (NO ₂)	pphm	$\mu\text{g}/\text{m}^3$ (0°C)	20.5
Nitrogen oxides (NO _x)	pphm	$\mu\text{g}/\text{m}^3$ (25°C)	18.8
Sulfur dioxide (SO ₂)	pphm	$\mu\text{g}/\text{m}^3$ (0°C)	28.6
		$\mu\text{g}/\text{m}^3$ (25°C)	26.2
Lead	$\mu\text{g}/\text{m}^3$ (0°C)	$\mu\text{g}/\text{m}^3$ (25°C)	0.92
Carbon monoxide	ppm	mg/m^3 (0°C)	1.25
		mg/m^3 (25°C)	1.15

To convert the data to $\mu\text{g}/\text{m}^3$, we multiply 18.8 to give the following background:

Maximum 1-hour NO₂: **94.0 $\mu\text{g}/\text{m}^3$**
Annual Average NO₂: **18.8 $\mu\text{g}/\text{m}^3$**

4. AIR QUALITY CRITERIA AND GUIDELINES

The air impact assessment applies the air quality criteria and guidelines of the NSW EPA.

The legislative framework is the Protection of the Environment Operations Act 1997. The following therefore applies.

4.1 PROTECTION OF THE ENVIRONMENT OPERATIONS ACT 1997

The *Protection of the Environment Operations Act 1997* (POEO Act) applies the following definitions relating to air pollution:

***“Air pollution”** means the emission into the air of any air impurity.*

While “air impurity” includes smoke, dust (including fly ash), cinders, solid particles of any kind, gases, fumes, mists odours, and radioactive substances

The following clauses of this Act have most relevance to the Project Site:

- *Clause 124 (Operation of Plant)*

The occupier of any premises who operates any plant in or on those premises in such a manner as to cause air pollution from those premises is guilty of an offence if the air pollution so caused, or any part of the air pollution so caused, is caused by the occupier’s failure:

(a) to maintain the plant in an efficient condition, or

(b) to operate the plant in a proper and efficient manner.

- *Clause 126 (Dealing with Materials)*

(1) The occupier of any premises who deals with materials in or on those premises in such a manner as to cause air pollution from those premises is guilty of an offence if the air pollution so caused, or any part of the air pollution so caused, is caused by the occupiers failure to deal with those materials in a proper and efficient manner.

(2) In this section:

***deal** with materials means process, handle, move, store or dispose of the materials.*

***Materials** includes raw materials, materials in the process of manufacture, manufactured materials, by-products or waste materials.*



- *Clause 127 Proof of causing pollution*

To prove that air pollution was caused from premises within the meaning of Sections 124 – 126, it is sufficient to prove that air pollution was caused on the premises, unless the defendant satisfies the court that the air pollution did not cause air pollution outside the premises.

- *Clause 128 Standards of air impurities not to be exceeded*

(1) The occupier of any premises must not carry on any activity, or operate any plant, in or on the premises in such a manner as to cause or permit the emission at any point specified in or determined in accordance with the regulations of air impurities in excess of:

(a) The standard of concentration and the rate, or

(b) The standard of concentration or the rate.

Prescribed by the regulations in respect of any such activity or any such plant.

(2) Where neither such a standard nor rate has been so prescribed, the occupier of any premises must carry on any activity, or operate any plant, in or on the premises by such practicable means as may be necessary to prevent or minimise air pollution.

The proposed development would be required to meet the requirements of this Act.

4.2 PROTECTION OF ENVIRONMENT OPERATIONS (CLEAN AIR) REGULATION 2010

In accordance with Part 5 of the *Protection of the Environment Operations (Clean Air) Regulation 2010* (herein referred to as the Clean Air Regulation 2010), the activities and plant would belong to Group 6 as it is to be *commenced to be carried on, or to operate, on or after 1 September 2005 as a result of an Environment Protection Licence granted under the POEO Act 1997 pursuant to an application made on or after 1 September 2005.*

Schedule 4 of the Clean Air Regulation 2010 provides standards of concentration for scheduled premises for general activities and plant.

The proposed development would be required to meet the requirements of this Regulation.

Under Schedule 4, any boiler operating on gas, Group 5 or 6, is required to meet an air impurity concentration for nitrogen dioxide (NO₂) or Nitric oxide (NO) or both as NO₂ equivalent of 350 mg/m³ at reference conditions stipulated in Schedule 5, Part 3. These reference conditions are Dry, 273K and 101.3 kPa (273.15K equates to a temperature of 0°C). The boiler burners meet this requirement.

4.3 NSW ENVIRONMENT PROTECTION AUTHORITY GUIDELINES

The document, “*Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales*” (AMMAAP) published by the NSW Environment Protection Authority (NSW EPA) provides guidance on methodology and thresholds that are to be used for the air impact assessment of a proposed development. This air impact assessment has been conducted in accordance with this guideline, and assessable pollutants (along with their corresponding limits) are summarised in Table 4-1.

Table 4-1: Relevant Limits from the Approved Methods for Modelling and Assessment of Air Pollutants in New South Wales (2005)

Pollutant	Averaging Period	Concentration		Source
		pphm	µg/m ³	
Nitrogen Dioxide (NO ₂)	1 hour	12	246	NEPC (1998)
	Annual	3	62	NEPC (1998)
PM ₁₀	24 hours	-	50	NEPC (1998)
	Annual	-	30	EPA (1998)
Total Suspended Particulates (TSP)	Annual	-	90	NHMRC (1996)
		g/m ² /month ^a	g/m ² /month ^b	
Deposited Dust	Annual	2	4	NERDDC (1988)

PM₁₀ and deposited dust are not significant for the operation of these boilers and have not been modelled during construction or operation. As this does not require extensive excavation there would be a very low risk of dust emissions being generated that would contribute to the existing levels of PM₁₀ and deposited dust.

Similarly negligible emissions of PM₁₀, TSP and therefore deposited dust would occur.



5. ASSESSMENT OF AIR QUALITY IMPACTS FROM CONSTRUCTION

Air quality impacts associated with the construction of the building and installation of the boilers are anticipated to be minimal to negligible. The component of the construction works which would involve the release of dust emissions would be the construction of the concrete floor and associated stormwater drainage. Only a small portion of the land would be excavated and therefore minimal dust emissions are expected.

Construction works for a boiler house would typically range between 6 to 8 weeks and the construction and installation of the proposed development is anticipated to occur between 20 to 26 weeks.

Air emissions from the type of construction works to be undertaken are typically very minor and would be sufficiently managed through the existing ISO 14001 certified Environmental Management Plan of the site. Therefore, no further assessment was determined to be required to assess the impacts of the construction phase of the proposal.



6. ASSESSMENT OF AIR QUALITY IMPACTS FROM THE PROPOSED OPERATIONS

6.1 AIR EMISSION SOURCES

The air emission sources are the two stacks of the proposed 30 MW boilers and the three existing stacks of the Marubeni Energy Plant.

The 30 MW stacks would each be 30 m high with a discharge velocity of 15 m/sec and a temperature of the “flue” gases of 136°C.

The detail for the Marubeni Energy Plant stacks is presented in the annual returns provided by the pollution licence holder, Smithfield Investors No. 1 Pty Limited.

6.2 AIR EMISSION FACTORS

The following air emission rates were used:

- Each of the 2 x 30 MW 243 gm/min of NO_x. The total emission rate of NO_x did not change.
- Stack diameter = 1.6 m
- Exit Velocity = 17 m/s
- 100% conversion of the NO_x to NO₂
- Gas turbine stack 1 – 130 g/min of NO_x
 - Stack 2 – 150 g/min of NO_x
 - Stack 3 – 170 g/min of NO_x
- 100% conversion of the NO_x to NO₂

7. AIR DISPERSION MODELLING

7.1 METHODOLOGY

The AERMOD model was used for the quantification of air impacts from the proposed development. The methods used to quantify the impacts through AERMOD have been conducted in accordance with the document *“Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales”* (herein referred to as the AMMAAP) published by the NSW EPA. A justification for using AERMOD instead of Ausplume (version 6.0) is presented in Attachment 4.

The air dispersion modelling was conducted on behalf of Benbow Environmental by pDs Consultancy, Principal Dr Piya Dewundegge. Model output files are provided in Attachment 3.

AERMOD is a steady-state plume model that in Victoria, has replaced AUSPLUME from 1 January 2014. The model was used to estimate the concentration impacts on receptors for each hour of input meteorology. The AERMOD dispersion model was preferred as it provides greater accuracy as discussed in Attachment 4.

Although the terrain of the site is flat to the location of nearest receptors and has gently undulating slopes to the north and north east, the use of AERMOD was preferred because of its reported improved accuracy in the near field.

A site-specific meteorological data was used (described in Section 3.1) in accordance with the AMMAAP guidelines. Contribution from the presence of buildings on and within proximity to the subject Project Site was also accounted for in the AERMOD. Emission rates were estimated using actual emission data as referred to in the previous Section of this report.

7.2 RESULTS OF DISPERSION MODELLING

The following tables (Table 7-1 and Table 7-4) provide a summary of results from the dispersion modelling. An extract of the sample input/output file has been provided in Attachment 5.

Results have been presented for the following scenarios:

Scenario 1 – Visy boilers’ stacks contribution only;

Scenario 2 – Marubeni stacks contribution only; and

Scenario 3 – Cumulative impacts from Visy and Marubeni stacks operating simultaneously.

Table 7-1: Scenario 1 – Results for NO_x, 1 hour Averaging Period – Visy Only

Receivers	Incremental Impact (µg/m ³)	Background Air Quality (µg/m ³)	Cumulative Impact (µg/m ³)	Limit (µg/m ³)	Pass (Yes/No)
R1	32.13	94	126.1	246	Yes
R2	32.63		126.6		Yes
R3	32.64		126.6		Yes
R4	39.22		133.2		Yes
R5	38.18		132.2		Yes
R6	26.84		120.8		Yes
R7	13.29		107.3		Yes
R8	14.08		108.1		Yes
R9	12.91		106.9		Yes
R10	16.63		110.6		Yes
R11	17.31		111.3		Yes

Figure 7-1: Contour 1Hr Average NO₂ – Visy Only

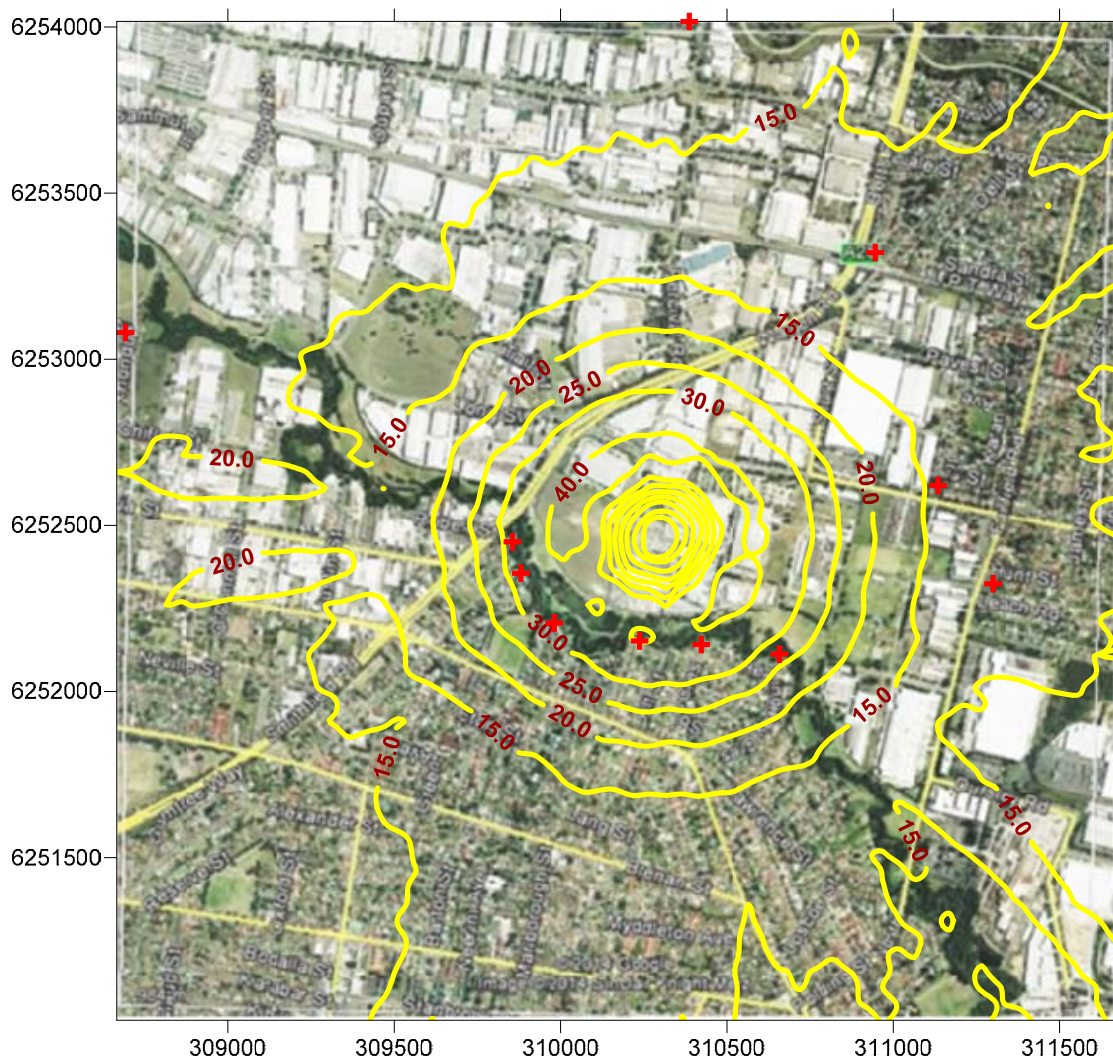


Table 7-2: Scenario 2 – Results for NO_x, 1 hour Averaging Period – Marubeni Only

Receivers	Incremental Impact (µg/m ³)	Background Air Quality (µg/m ³)	Cumulative Impact (µg/m ³)	Limit (µg/m ³)	Pass (Yes/No)
R1	10.79	94	104.8	246	Yes
R2	10.10		104.1		Yes
R3	10.58		104.6		Yes
R4	11.18		105.2		Yes
R5	11.83		105.8		Yes
R6	10.86		104.9		Yes
R7	5.79		99.8		Yes
R8	7.81		101.8		Yes
R9	5.81		99.8		Yes
R10	3.53		97.5		Yes
R11	3.20		97.2		Yes

Figure 7-2: Contour 1Hr Average NO_2 – Marubeni Only

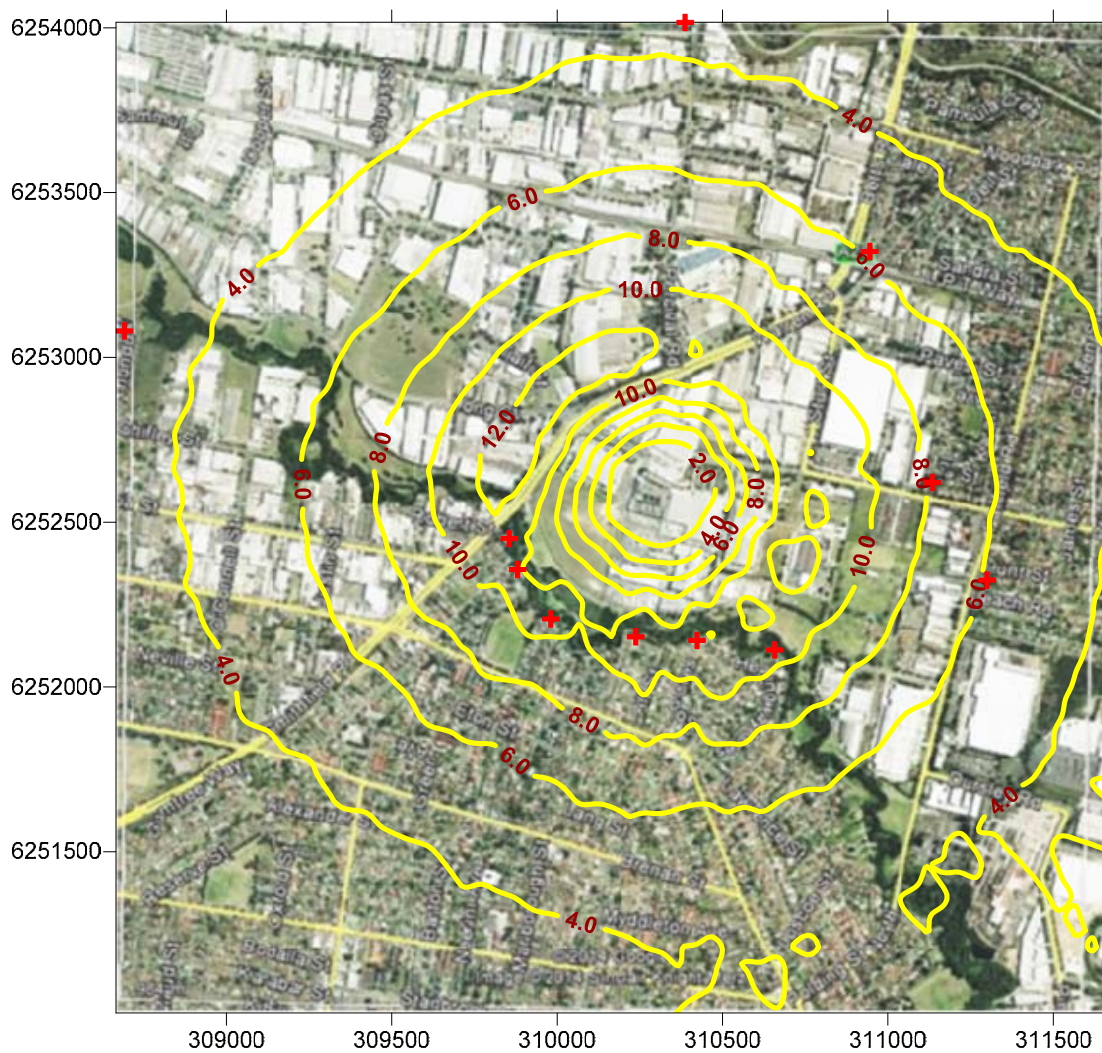


Table 7-3: Scenario 3 - Results for NO_x, 1 hour Averaging Period – Combined Visy and Marubeni

Receivers	Incremental Impact (µg/m ³)	Background Air Quality (µg/m ³)	Cumulative Impact (µg/m ³)	Limit (µg/m ³)	Pass (Yes/No)
R1	37.3	94	131.3	246	Yes
R2	37.8		131.8		Yes
R3	41.3		135.3		Yes
R4	50.8		144.8		Yes
R5	48.1		142.1		Yes
R6	34.6		128.6		Yes
R7	15.1		109.1		Yes
R8	19.6		113.6		Yes
R9	14.4		108.4		Yes
R10	17.1		111.1		Yes
R11	17.6		111.6		Yes

Figure 7-3: Contour 1Hr Average NO₂ – Combined Visy and Marubeni

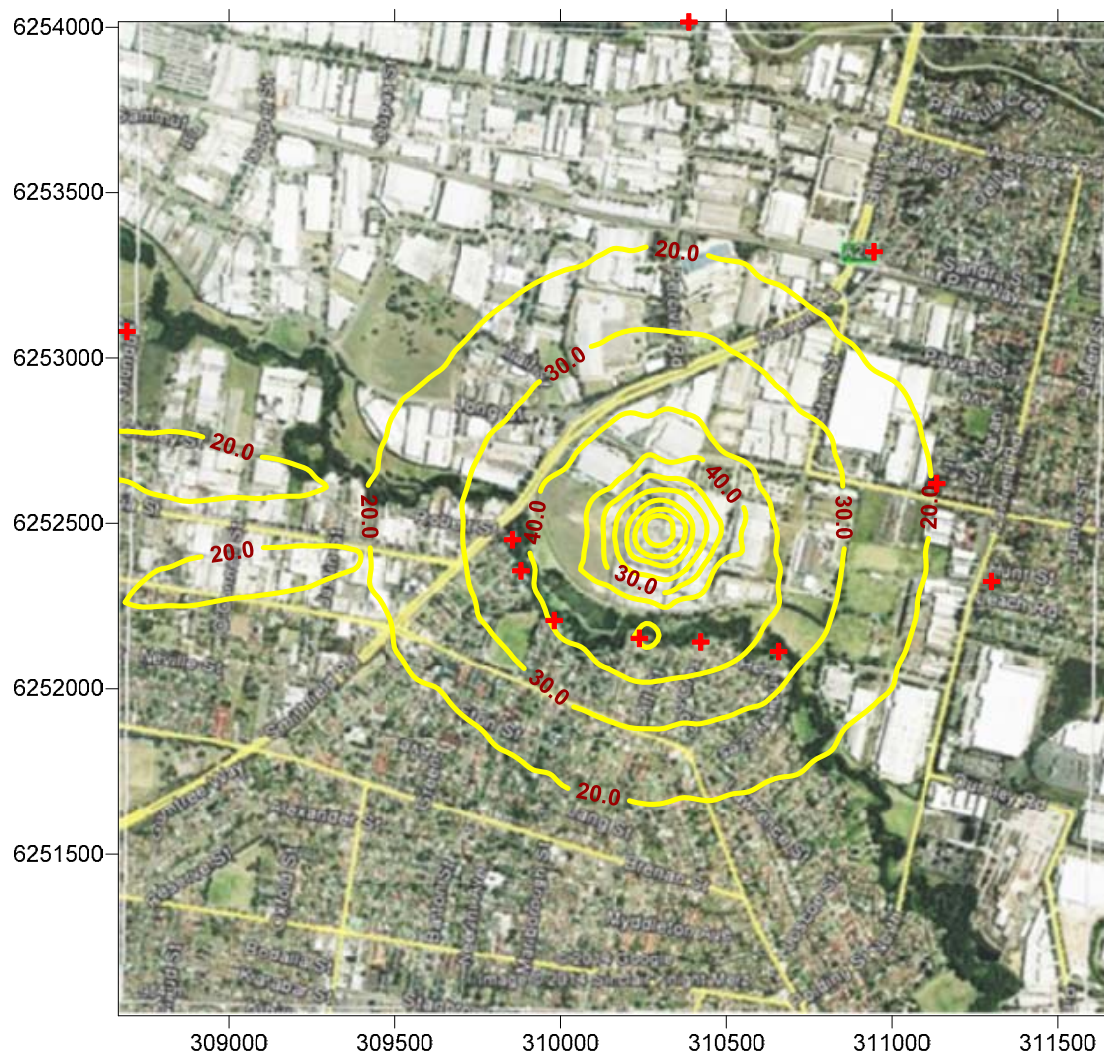


Table 7-4: Scenario 1 - Results for NO_x, 1 Year Averaging Period – Visy Only

Receptors	Incremental Impact (µg/m ³)	Background Air Quality (µg/m ³)	Cumulative Impact (µg/m ³)	Limit (µg/m ³)	Pass (Yes/No)
R1	1.56	18.8	20.4	62	Yes
R2	1.17		20.0		Yes
R3	0.71		19.5		Yes
R4	0.75		19.6		Yes
R5	1.02		19.8		Yes
R6	1.75		20.6		Yes
R7	1.40		20.2		Yes
R8	1.00		19.8		Yes
R9	0.51		19.3		Yes
R10	0.57		19.4		Yes
R11	0.69		19.5		Yes

Figure 7-4: Contour for NO_x, 1 Year Averaging Period – Visy Only

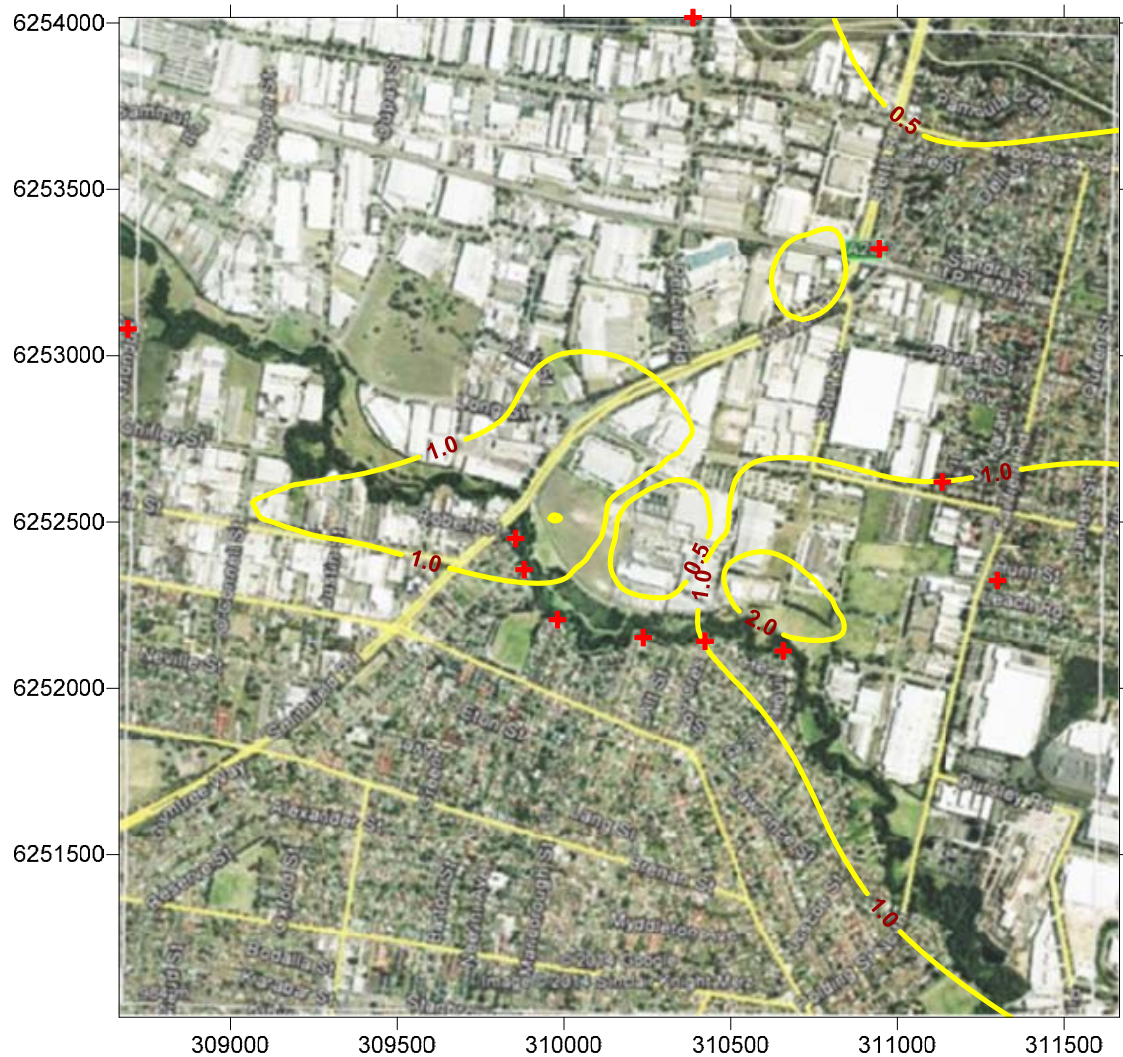


Table 7-5: Scenario 2 – Results for NO_x, 1 Year Averaging Period – Marubeni Only

Receptors	Incremental Impact (µg/m ³)	Background Air Quality (µg/m ³)	Cumulative Impact (µg/m ³)	Limit (µg/m ³)	Pass (Yes/No)
R1	0.22	18.8	19.0	62	Yes
R2	0.16		19.0		Yes
R3	0.13		18.9		Yes
R4	0.13		18.9		Yes
R5	0.16		19.0		Yes
R6	0.25		19.1		Yes
R7	0.26		19.1		Yes
R8	0.22		19.0		Yes
R9	0.10		18.9		Yes
R10	0.10		18.9		Yes
R11	0.15		19.0		Yes

Figure 7-5: Contour for NO_x, 1 Year Averaging Period – Marubeni Only

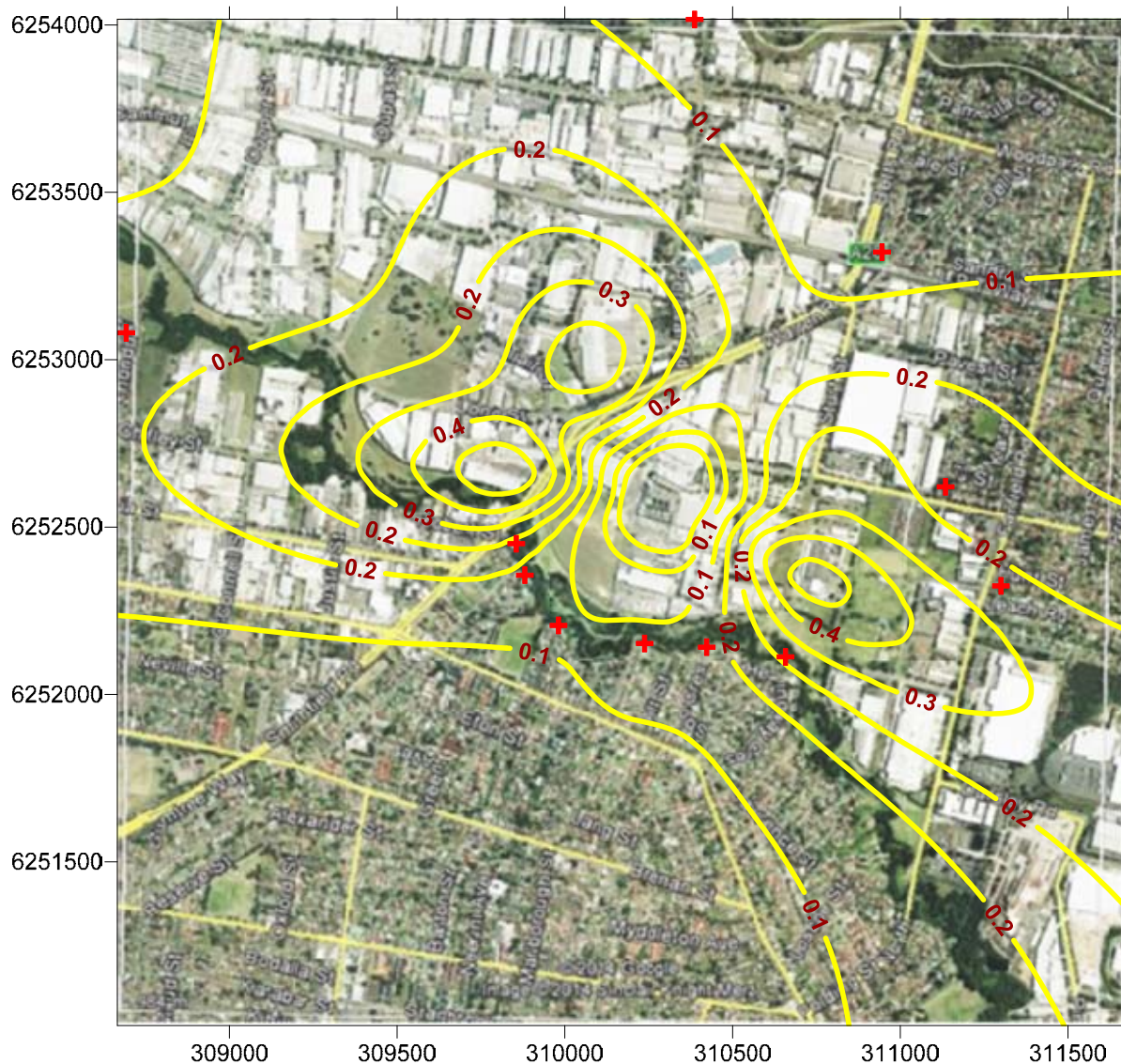
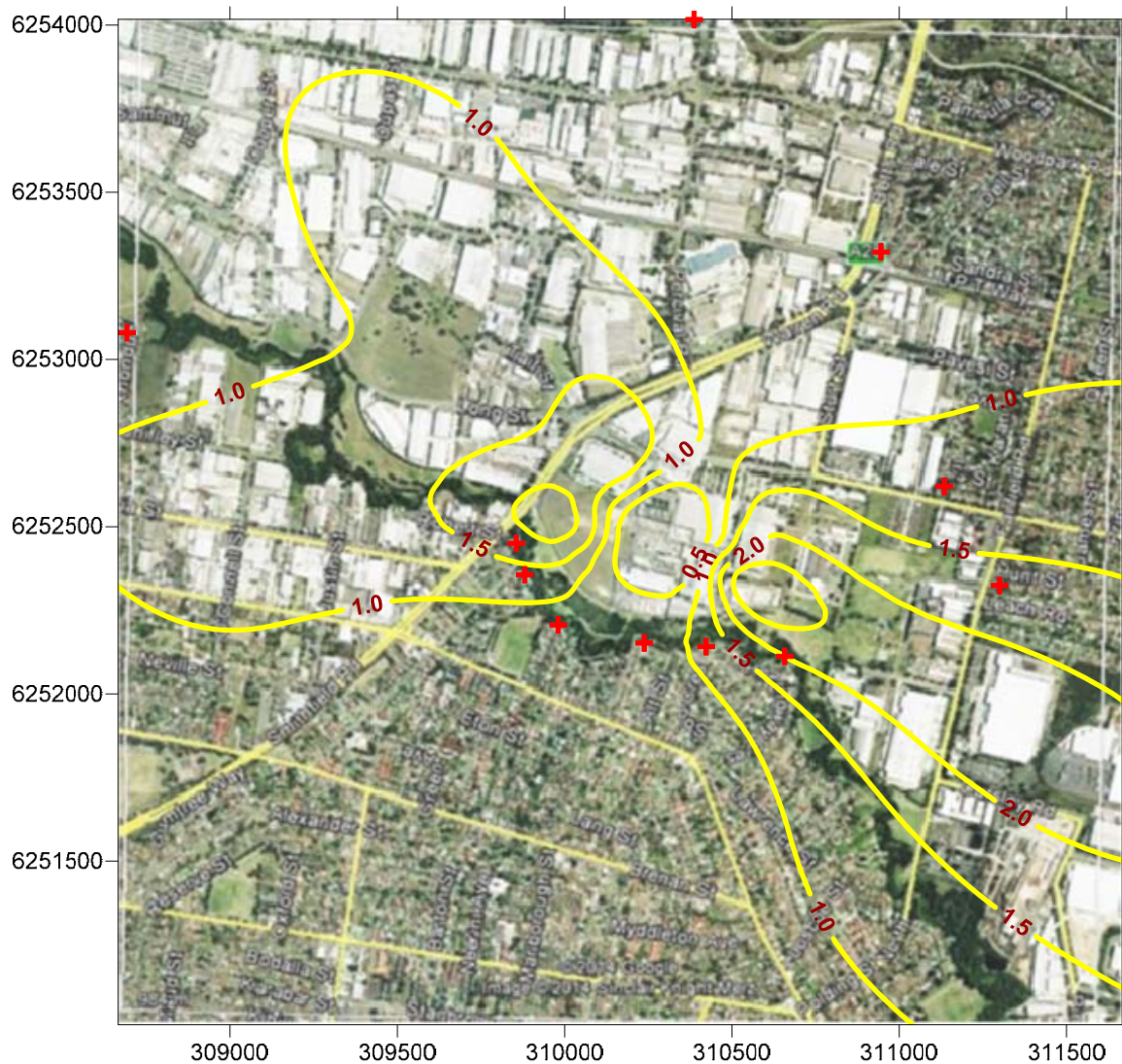


Table 7-6: Scenario 3 - Results for NO_x, 1 Year Averaging Period – Combined Visy and Marubeni

Receptors	Incremental Impact (µg/m ³)	Background Air Quality (µg/m ³)	Cumulative Impact (µg/m ³)	Limit (µg/m ³)	Pass (Yes/No)
R1	1.79	18.8	20.6	62	Yes
R2	1.33		20.1		Yes
R3	0.84		19.6		Yes
R4	0.88		19.7		Yes
R5	1.18		20.0		Yes
R6	2.00		20.8		Yes
R7	1.67		20.5		Yes
R8	1.22		20.0		Yes
R9	0.61		19.4		Yes
R10	0.67		19.5		Yes
R11	0.84		19.6		Yes

Figure 7-6: Contour for NO_x, 1 Year Averaging Period – Combined Visy and Marubeni





8. STATEMENT OF POTENTIAL AIR IMPACT

An air quality impact assessment was undertaken to assess the air emissions from the proposed boiler house. This has been initiated as part of the proposed modification under Section 75W of the Environment Planning and Assessment Act 1979. This air report will form part of the Environmental Assessment.

The assessment was undertaken in accordance with the NSW EPA guidelines “Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales”. Air emission impacts were quantified using AERMOD to determine whether or not exceedances to health-impact derived assessment criteria were apparent.

The dispersion modelling undertaken has shown that no exceedances to the referenced air quality limits were predicted. Given no application of further air emission reduction controls are required, it is to be expected that no air impact issues are associated with the proposal. The assessment concludes that the proposal meets the most relevant and applicable air assessment criteria in accordance with the NSW EPA guidelines and is expected to not cause any impact or harm to any of the nearest potentially affected residences.

This concludes the report.

R T Benbow
Principal Consultant

Linda Zanotto
Senior Environmental Engineer



9. LIMITATIONS

Our services for this project are carried out in accordance with our current professional standards for site assessment investigations. No guarantees are either expressed or implied.

This report has been prepared solely for the use of Build Run Repair Pty Ltd – Visy Paper, as per our agreement for providing environmental services. Only Build Run Repair Pty Ltd – Visy Paper is entitled to rely upon the findings in the report within the scope of work described in this report. Otherwise, no responsibility is accepted for the use of any part of the report by another in any other context or for any other purpose.

Although all due care has been taken in the preparation of this study, no warranty is given, nor liability accepted (except that otherwise required by law) in relation to any of the information contained within this document. We accept no responsibility for the accuracy of any data or information provided to us by Build Run Repair Pty Ltd – Visy Paper for the purposes of preparing this report.

Any opinions and judgements expressed herein, which are based on our understanding and interpretation of current regulatory standards, should not be construed as legal advice.

ATTACHMENTS

Attachment 1: Quotation No ABC-150418-1 Design, fabrication, supply and commissioning of 2
off 30 MW packaged water tube boilers and associated auxiliary equipment suitable for limited
attended operation



Quotation No ABC-150418-1



Design, fabrication, supply and commissioning of 2 off 30 MW packaged water tube boilers and associated auxiliary equipment suitable for Limited attended operation.

John Crosher
Build Run Repair Pte Ltd
8 Temasek Boulevard
#11-01 Suntec Tower 3
Singapore 038988

8th April 2015

Quotation No: ABC-150408-1

Advanced Boilers & Combustion have the pleasure in providing this Quotation to supply three new limited attended 30 MW gas fired Maxitherm Water tube Steam Boilers.

In accordance with your enquiry and specification, Advanced Maxitherm Boilers offer the well proven Maxitherm "D" type water tube boiler, a boiler that is widely used in a range of industries throughout Australia and South East Asia.

It is a compact steam generating system, which has been designed and approved for continuous operation and the minimum of supervision.

All of Maxitherm boiler construction is performed in accordance with a rigid Quality Management System, which provides the checks of material quality, construction methods, and workmanship to guarantee compliance with the approved design standard and the Inspection Authority's requirements.

If you require any further information, please do not hesitate to contact me

Kind Regards

A handwritten signature in grey ink, appearing to read 'Laurie Grigg', is shown within a light grey rectangular box.

Laurie Grigg

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1 Engineer, Design & Documentation

Advanced Boilers & Combustion will provide the following documentation as part of our proposal

1. Detailed execution plan.
2. Boilerhouse general arrangement
3. Boiler general arrangement
4. Deaerater general arrangement
5. Blowdown vessel general arrangement
6. Steam header general arrangement
7. Electrical schematics
8. Switchgear & control assembly drawings
9. Layout foundation drawing
10. Process & instrumentation diagram to instrument level
11. All other drawings listed in 5,6.3 of the tender document

2 Boilers

Supply of 2 x 30 MW Maxitherm unattended steam boilers

Maxitherm MDN Series Packaged Steam Boilers

The MAXITHERM “D” type watertube boiler is designed for Australian conditions, designed and developed by the Maxitherm Engineering Department with more than 50 years of experience and hundreds of installations of watertube boilers, providing a product to match the best in the world.

All of MAXITHERM'S boiler construction is performed in accordance with a rigid "QUALITY MANAGEMENT SYSTEM", which provides the checks of material quality, construction methods, and workmanship to guarantee compliance with the approved design standard and the Inspection Authority's requirements.

The MAXITHERM “D” Type boiler is a compact steam generating system, which has been designed and approved for continuous operation and the minimum of supervision.

The design, material and workmanship of all pressure parts will be in strict conformity with the rules and regulations in effect at the date of contract required by:-



- 1: AS1200-Pressure Equipment
- 2: AS1228-Pressure Equipment Boilers
- 3: AS2593 Boilers-Unattended & Limited Attendance
- 4: AS1853 for Automatic Oil & Gas Burners
- 5: The regulations and Laws of the State in which the equipment is to be installed
- 6: Requirements of the Inspecting Authority under whose supervision the pressure parts of each unit shall be constructed.

CERTIFICATION

Upon completion of the boiler, a Manufacturer's Data Report will be issued which confirms all material certification, construction data, testing and inspection results.

PRESSURE PARTS

The pressure vessel assembly will be of the natural circulation two drum water tube boiler type. The boiler drums are manufactured from carbon steel complying with AS1548 or an equivalent standard. All welding procedures and non-destructive examination will comply with requirements of AS1228.

Steam/water separation is effected by use of a steam drier from which dry steam is delivered to the steam connection and moisture separated from the steam, returned to the boiler water.

The lower drum is provided with at least one blowdown line connected for draining the discharge of precipitates or the connection of the automatic blowdown system.



TUBES

All tubes in the convection section are electric-resistance- welded carbon steel boiler or super heater tube, with material specification to BS3059.

All tubes are bent to a uniform radius using the minimum number of bends to facilitate internal cleaning.

WATER WALLS

The combustion chamber and each outer wall is constructed of fin tubes, seal welded to form a gas tight area.

UNHEATED DOWNCOMERS

A row of **unheated down comers** is fitted between the top drum and bottom drum to facilitate circulation, water line stability and fast response to steam load fluctuations.

INSULATION AND REFRACTORY

The steam drum and all outer walls are insulated with fiberglass with a thickness of 100mm. All surfaced will be maintained below 55 deg C. Refractory used for seals or jointing are of a top quality high alumina type.

Inspection Procedures

Inspection & test plans & quality control documents will be made readily available should Advanced Boilers & Combustion be the successful contractor.

The manufacture of all pressure parts is inspected by a third party (Sucofindo) and Advanced Boilers & Combustion welcome & recommends BRR view any stage of manufacture by attending our manufacturing premises in Jakarta.

Employment of an Australian agent to witness any particular manufacture stage would also be welcomed.

Warranty

Controls	1 year warranty
Pressure vessel	5 years conditional upon correct water treatment & boiler operation

3 Boiler Fittings

Safety Valves

Leser safety valves will be installed on each boiler steam drum, and comply with AS1271 Section 3 & AS 2593 Section 12.

Main Boiler stop valve

The boiler main stop valve will comply with AS1271 & AS2593,
The valve will be Armstrong brand

Intermittent Boiler Blowdown

A manual blowdown valve will be provided to permit on-line removal of sludge or sediment when the boiler is in normal operation in accordance with AS 3892.

Blowdown valves will comply with the requirements of AS2593 Section 12.3.

Automatic Boiler Blowdown

The automatic blowdown will be of TDS automated solenoid valve type

Pressure Gauges

Each boiler will be fitted with a minimum of one pressure indicator, being of the Bourdon type, marked to indicate normal & safety valve lift pressures, and be protected from high temperature by a siphon tube

Gauge Glasses

Two Klinger AB18 gauge glasses will be fitted to the boiler vessel with glasses to indicate water level. The gauge glasses conform to AS1271 and are installed so that the lowest visible reading will show the water level at 50mm above the point where overheating will occur.

Air vent

An air vent will be installed on the boiler to allow air to escape during start-up.

Access / Inspection Openings

The boiler vessel contains two access doors on both the top and bottom drums of the boiler.

An access doorway is fitted to the boiler furnace to allow access for inspection and cleaning.

All doorways conform to AS1210 section 3.20 and AS1228 section 3.9.

Data Sheet 1: Boiler Heat Balance & Thermal Performance

2x30 MW Steam boiler	Units (metric)	MCR
Maximum boiler rating (per boiler)	MW	30
Steam flow for process (per boiler)	kg/h	45,650
Maximum boiler rating (total for 2 boilers)	MW	60
Steam flow for process (total for 2 boilers)	kg/h	91,300
Steam pressure at stop valve	kPa(g)	1,750
Steam temperature at stop valve	°C	208.5
Steam quality	%	99.5
Make-up water temperature (assumed)	°C	20
Condensate return (advised by client)	%	70
Condensate temperature (advised by client)	°C	135
Steam for deaerator heating (per boiler)	kg/h	325
Steam for deaerator heating (total for 2 boilers)	kg/h	650
Feedwater temperature at deaerator outlet	°C	105
Feed water temperature at economizer outlet	°C	138
Feedwater TDS (assumed)	ppm	30
Rate of blowdown (based on above)	%	0.5
Blowdown flow (per boiler)	kg/h	230
Blowdown flow (total for 2 boilers)	kg/h	460
Ambient air temperature (advised by client)	°C	17
Ambient air humidity (assumed)	%	80
<i>Combustion data: Natural gas (per boiler)</i>		
Excess Air	%	15
Air required for combustion (@17°C)	kg/h (m³/h)	46,106 (38,060)
Gross calorific value of fuel	MJ/Sm³	37.5
Fuel firing rate (@15°C)	kg/h (Sm³/h)	2480 (3430)
Flue gas emissions:		
CO2	% dry basis	10.24
	g/s	1,811
O2	% dry basis	3.00
N2	% dry basis	86.76
SO2	% dry basis	0.00

2x30 MW Steam boiler	Units (metric)	MCR
NO _x at MCR (as NO ₂)	mg/m ³	<250
Flue gas rate (@140°C)	kg/h (m ³ /h)	48,470 (59,500)
Gross thermal efficiency (nett)	%	84.0 (93.6)
<u>Gas Temperatures</u>		
Leaving furnace	°C	1170
Leaving boiler bank	°C	260
Leaving economizer	°C	140
At top of chimney	°C	136
<u>Heat Balance</u>		
Heat to steam flow	MW	30.0
Heat loss due to sensible heat in dry flue gas	MW	1.47
Heat loss due to enthalpy of water vapour in dry flue gas	MW	4.04
Heat loss due to moisture in air	MW	0.03
Heat loss due to radiation	MW	0.15
Other unaccounted heat loss	MW	0.05
Total available heating capacity of fuel	MW	35.69

Data sheet 2: Boiler

30 MW Steam boiler	Units	
Technology Supplier	-	Maxitherm
Manufacturer	-	Maxitherm Boilers Indonesia
Place of manufacture	-	Jakarta, Indonesia
Type	-	Watertube
Shipping weight	kg	80,000
Flooded weight	kg	108,086
Base width	mm	4,665
Base length	mm	11,095
Bare height	mm	4,400
Circulation ratio	#	30
Design pressure	kPa	2,000
Design temperature	°C	250
<u>Furnace Dimensions</u>		
Width inside tubes	m	2.73
Depth inside tubes	m	10.33
Height, mean dimension	m	2.59
Volume	m ³	73.1
Furnace back pressure	Pa	1500
Tube OD	mm	50.8
Tube material specification		ASTM A192
Total radiant area	m ²	120
<u>Convective Bank</u>		
Total convective heating surface	m ²	732
Tube OD	mm	50.8
Tube material specification		BS3059 PT1 ER320 or ASTM A192
Total effective heating surface (radiant + convective)	m ²	852
Heat transfer area	m ² /MW	28.4
Heat transfer rate	kW/m ²	35.2
Furnace heat release	kW/m ³	315
Maximum gas velocity	m/s	12

30 MW Steam boiler	Units		
Tubes plain or finned?	-	Plain	
<u>Drum</u>		Steam Drum	Water Drum
Internal diameter	mm	1066	915
Length of shell	mm	10,478	
Drum Material		ASTM 515/516 GR70	
Description of steam separation intervals		Baffles	
Drum centre's	mm	3060	

Data Sheet 3: Combustion system/ Burners

Boiler 1	Units	
Technology supplier	-	Dunphy
Manufacturer	-	Dunphy
Model	-	BG 8.380 ME
Number of burners	#	1
Fuel		Natural gas
FD fan motor rating	kW	110
Features for low NO _x	-	Multi nozzle head
Turndown ratio		7:1
Oxygen control system		Siemens
Gas control methodology (e.g. independent modulating valve)		Servo motor fitted to Gas butterfly valve.
Air control methodology (e.g. independent modulating valve)		Servo motor fitted to burner air inlet dampers and burner mixing head.

Boiler 2	Units	
Technology supplier	-	Dunphy
Manufacturer	-	Dunphy
Model	-	BDG 8.380 ME
Number of burners	#	1
Fuel		Natural gas / Biogas
FD fan motor rating	kW	132
Features for low NO _x	-	Multi nozzle head
Turndown ratio		7:1
Oxygen control system		Siemens
Gas control methodology (e.g. independent modulating valve)		Servo motor fitted to Gas butterfly valve.
Air control methodology (e.g. independent modulating valve)		Servo motor fitted to burner air inlet dampers and burner mixing head.

Data Sheet 4: Pumps

Boiler Feedwater Pumps	Units	
<u>Feed Pumps</u>		
Pump Application		Boiler Feedwater Pumps
Manufacturer		Pump Engineers
Type		Horizontal multistage
Model		DG85-45x5
Number required	#	2 per boiler
Design capacity	m ³ /h	63
Capacity at MCR	m ³ /h	53
Design discharge head	m	238
Efficiency at MCR	%	67
Material of pump head		Cast Iron
Material of shaft		Stainless Steel
Material of impeller and diffusers		Stainless Steel
Number of stages		5
Description of shaft seals		Single Mechanical
Motor size	kW	90
Motor speed	rpm	2900
NPSH _R	m	4.2

Data Sheet 4: Pumps

Deaerator Transfer pumps	Units	
<u>Feed Pumps</u>		
Pump Application		Deaerator Transfer Pumps
Manufacturer		Grundfos
Type		Horizontal single stage, end suction pump
Model		NBG 125-100-250/245
Number required	#	2
Design capacity	m ³ /h	110
Design discharge head	m	20
Efficiency at MCR	%	66.2
Material of casing		Cast Iron
Material of shaft		Stainless Steel
Material of impeller and diffusers		Bronze
Number of stages		1
Description of shaft seals		Mechanical
Motor size	kW	11
Motor speed	rpm	1450
NPSH _R	m	1.2

Data Sheet 5: Blowdown system

Blowdown tank	Units	
Technology Supplier		Maxitherm
Manufacturer		Advanced Boilers & Combustion
<u>Anticipated Design Performance:</u>		
Estimated flow rate (total from 2 boilers)	kg/h	460
Temperature on inlet	°C	160
Temperature on outlet	°C	60
<u>Blowdown vessel</u>		
Model		Maxitherm 24/06
Storage vessel size – shell length	m	3.0
Storage vessel size - diameter	m	1.22
Design pressure	kPag	700
Design temperature	°C	200
Shell thickness	mm	8
Shell corrosion allowance	mm	>0.75
Capacity of storage section - total	m ³	3.8
Capacity of storage section - within normal operating range;	m ³	1.9
Shell material		AS1548PT460
Shipping weight	kg	1450

Data Sheet 6: Feedwater system

Feedwater tank	Units	
Technology Supplier		Maxitherm
Manufacturer		Advanced Boilers & Combustion
Operating volume (30min operation @MCR)	Litres	32000
Design Temperature	°C	100
<u>Vessel Details</u>		
Tank size – inside diameter	m	3.2
Tank size - height	m	4.5
Shell thickness	mm	10
Shell material		AS 3678-250
Paint – internal		2 coats 'APEXIOR' No.1
Paint – external		1 coat 'GALMET' cold galvanizing
Insulation type		Rockwool
Insulation thickness		50
Cladding		0.8mm Colorbond

Data Sheet 7: Deaerator

D68 Deaerator	Units	
Technology Supplier		Maxitherm
Manufacturer		Advanced Boilers & Combustion
Type		Spray
<u>Anticipated Design Performance:</u>		
Feedwater flowrate	kg/h	108,800
Condensate return (% boiler steam flow)	%	70
Condensate temperature (advised by client)	°C	135
Operating pressure	kPag	20
Steam flowrate (normal operation)	kg/h	650
Steam supply pressure	kPag	1750
Steam temperature at inlet	°C	208
Guaranteed maximum oxygen content @MCR	ppb	7
Storage vessel size – shell length	m	6.25
Storage vessel size - diameter	m	2.76
Maximum allowable working pressure	kPag	350
Shell thickness	mm	12
Shell corrosion allowance	mm	>0.75
Capacity of storage section - total	m ³	43
Capacity of storage section - within normal operating range; i.e. normal to minimum operating level	m ³	22.2
Material of spray/baffle/trays		SS316
Shell material		AS1548PT460
Insulation type		Rockwool
Insulation thickness		50
Cladding		0.8mm Colorbond
Shipping weight	kg	9,000
Flooded weight	kg	52,000

Data Sheet 9: Economizer

Economizer	Units	
Technology supplier	-	AB&C
Manufacturer	-	AB&C
Counter or parallel flow	C or P	C
Coil face area	m ²	5.04
Tube OD and wall thickness	mm	33.4 x 3.38
Tube material		A192 Carbon steel
Finning length	mm	2285
No. tubes wide	-	29
No. tubes deep	-	12
Fin material	mm	15 x 1.5 carbon steel
Water inlet temperature	°C	105
Water outlet temperature	°C	138
Gas inlet temperature	°C	260
Gas outlet temperature	°C	140
Heat recovered	kW	1,838
Fuel saving	%	4.9

Data Sheet 10: Steam Header

Steam Header	Units	
Technology supplier	-	AB&C
Manufacturer	-	AB&C
Shell diameter	NB	500
Shell length	mm	6,000
Shell material		ASTM A106 GrB
Design pressure	kPa	1,920
Design temperature	°C	220
Flooded volume	L	1,176
Dry weight (without insulation & cladding)	kg	1,735
Insulation thickness	mm	50
Insulation type		Fibertex 350 Rockwool

Data Sheet 11: Stack and Ducting

Stack – 1 for 2 boilers	Units	
Type		Parallel
Diameter	mm	2,000
Height	m	30
Material		Carbon steel AS3678-250
Design temperature	°C	260
Emission velocity	m/s	15
Insulation thickness	mm	50
Insulation material	-	Rockwool
Insulation cladding type	-	0.8mm Colorbond
Type of support		Self Supported
Ducting	Units	
<u>Maximum Ducting Velocities at MCR</u>		
Air inlet duct	m/s	12
Economizer outlet	m/s	10
Material of ducting		AS 3678-250
<u>Expansion Joints</u>		
Manufacturer		Advanced Boilers & Combustion
Type of joint		Fabric sealed

5 Boiler Control & Supervisory System

Each boiler will be supplied with its own unattended control system, complying with all parts of AS2595

5.1 Panel

The control panel will comprise of Rital TS 8 baying system panels, mounted together on a 200mm plinth. Exhaust fans are fitted to the panel.

5.2 Level Checking System

Spirax Sarco High Integrity probes will be used as the level checking system. The probe system does not have any moving parts, eliminating faults to magnetic switches, dunk coil/solenoids & Level checking/watchdog timers. The probe system offers High reliability & low maintenance



5.3 Level control

The boiler water level measurement will be achieved by fitting a Yokagowa differential transmitter across the gauge glass measuring distance of the steam drum. The water level is scaled & displayed as 0 – 100% of visible gauge glass on the touch screen. High & low level alarms are adjustable. A second pump 'kick in' is also programmable, preventing low water levels when a pump is down in capacity or excessive load is drawn from the boiler. The feedwater control valve will be a Fischer control valve.

5.4 Motor control

The motor control cubicle will contain Allan Bradley motor circuit breakers mounted on a bus bar rail system, Allan Bradley contactors, main switch & control circuit breakers. The variable speed drive will be an AllenBradley Powerflex 752 VSD control will be installed on both feedwater pumps & the combustion air fan of each new boiler

5.5 PLC

Siemens S7300
Ethernet is available for plant BMS
15% spare I/O

5.7 Operator Interface

A Siemens touch screen will be installed into the front door of the control panel.

The touch screen is menu driven, giving easy operation with maximum visual display
Some displayed parameters are

- Burner Gas Flow
- Gas motor position
- Air motor position
- VSD Speed
- Flame Strength
- Boiler Water level
- Ignition Status
- Burner status
- Steam pressure
- Water control valve
- Feed pump operation
- Feed water pump sequencing
- Boiler pressure indication
- Boiler Steam Flow



Steam & water PID loops have full trending & adjustment, ensuring that plant pressure is controlled smoothly.

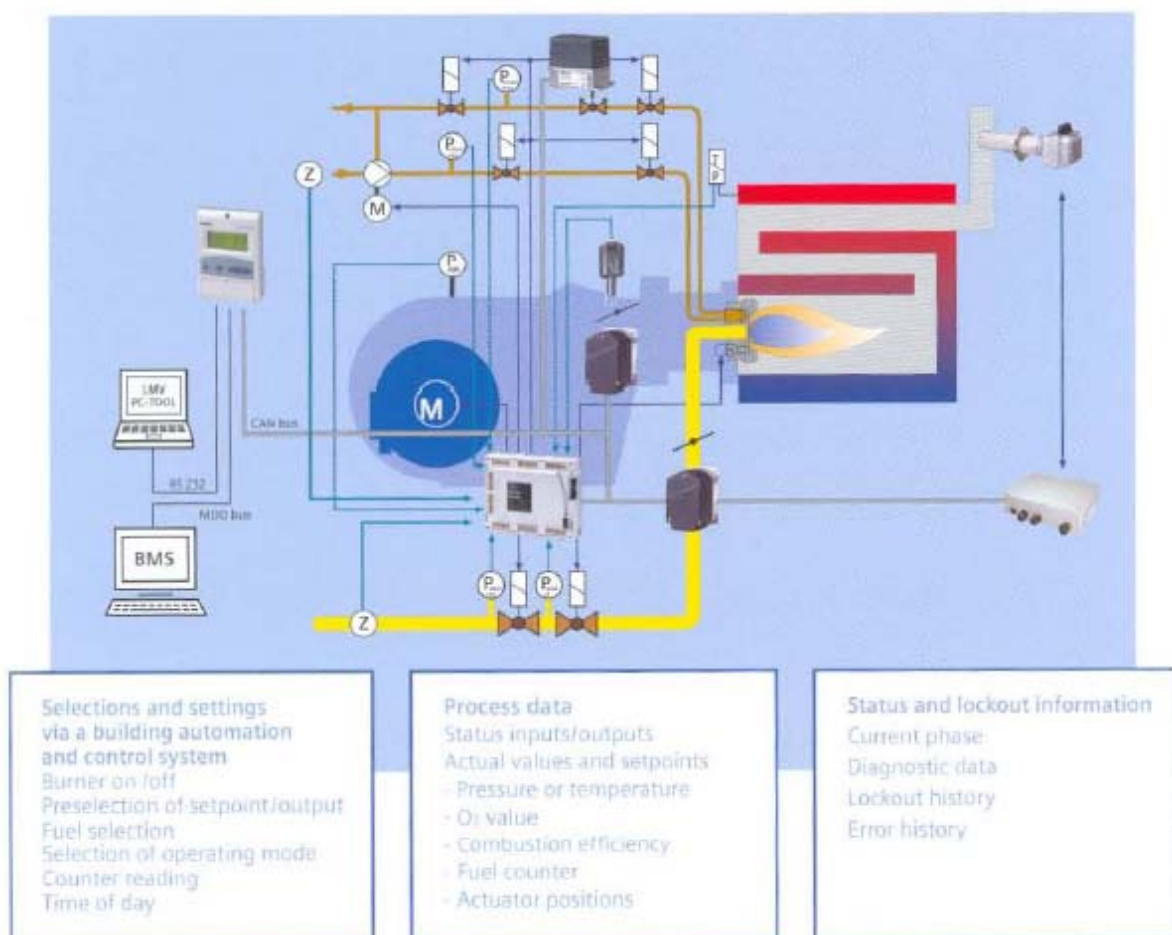
All alarms are monitored & logged in the alarm history

5.8 Combustion Control

The Siemens LMV 52 is an electronic burner management controller. There are no mechanical linkages between dampers & gas control motors.

Efficient combustion is achieved by electronic programming of up to 15 points of a ratio curve. The LMV52 monitors all alarms & controls the following

- Burner start/ stop sequence
- Valve pressure proving
- Air fuel ratio control
- Flame supervision
- Load control
- VFD control
- Oxygen control



6 Water Treatment

Water treatment plant will consist of

Water softeners, 100,000lt/hr. throughput, <2ppm CaCO₃

5 cooled water sampling pots

4 chemical pumps

7 Commissioning

Commissioning will be carried out by a qualified, licensed trained person

Commissioning will include the necessary checks to allow

- The gas to be admitted to the appliances.
- The burners to be fired
- The controls to be set up for unattended operation
- All pumps operable
- Safety valves to be tested
- The boilers to be set to work

After each boiler has operated satisfactorily in unattended mode for 24 hours the specified performance tests can be conducted.

All gas approvals will be obtained at this stage

8 Performance testing

Performance testing will be carried out as per the specification, to confirm the boiler performance to the figures supplied in the boiler specification..

It is assumed that a steam load equivalent to MCR of each boiler will be available; Provisions for test steam venting outlets have not been provided.

9 Operator Training

3 training sessions to train staff will be provided

10 Delivery

Boiler 1, 26 weeks manufacture, 6-8 weeks shipping

Boiler 2, 31 weeks Manufacture, 6-8 weeks shipping

Delivery from Australian port to site is not included

Schedule 1 - Prices/Rates

Item	Qty	Price each	Total price
30MW 20 bar Maxitherm D type boiler Nat gas	1	\$1,700,000	\$1,700,000
30MW 20 bar Maxitherm D type boiler Nat/Bio gas	1	\$1,750,000	\$1,750,000
Deaerater and Stand	1	\$255,000	\$255,000
Feedwater / condensate tank (if required)	1	\$50,000	\$50,000
Stack	1	\$180,000	\$180,000
Economizer	2	\$95,000	\$190,000
Blowdown Vessel	1	\$12800	\$12800
Feedwater treatment	1	\$105,000	\$105,000
Engineering & documentation	1	\$50,000	\$50,000
Commissioning and training	2	\$12,000	\$24,000
Steam Header with valves	1	\$85,000	\$85,000
Installation & insulation (budget)	2	\$170,000	\$340,000

Additional labour rates

Item	Price each	Qty	Unit
Normal hours	\$98	1	hr
Time & 1/2	\$120	1	hr
Double time	\$145	1	hr
Call out	Minimum 4 hours		
Mileage	\$0,7	1	km

Excluded

- GST
- Transport from port to site

Ph 1300 337 177

28 Treforest Drive
Clayton, Victoria 3168

1/13 Nello Place
Wetherill Park,
NSW, 2164

6/12 Aquarium Street
Hemmant, QLD 4174

ABN 96 119 141 007

John Crosher
Build Run Repair Pte Ltd
8 Temasek Boulevard
#11-01 Suntec Tower 3
Singapore 038988

22nd April 2015

Ref No: ABC-150422-1

Dear John

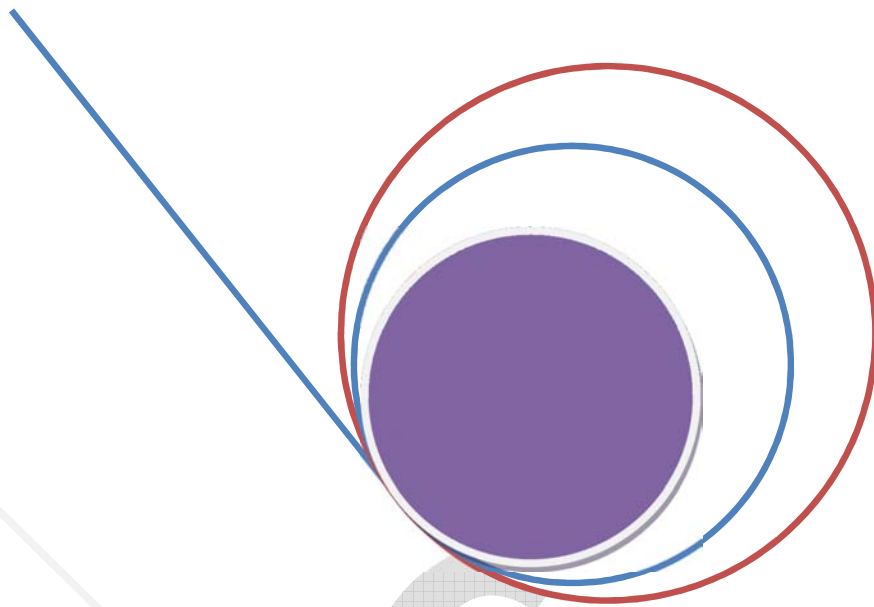
Advanced Boilers and Combustion can guarantee Nox levels of 250mg/m³ on the 30MW Maxitherm boiler using a Dunphy burner.

If you require any further information, please do not hesitate to contact me

Kind Regards



Laurie Grigg



Input Meteorological data files for AERMOD

Smithfield– NSW

This file was exclusively compiled
for **BENBO** By pDs Consultancy.

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INPUT METEOROLOGICAL DATA FILES FOR AERMOD

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pds



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INTRODUCTION

New generation regulatory model AERMOD requires hourly averaged meteorological data from a single site that is preferably within the model domain ('on-site' or site-specific data). However, data from the nearest 'off-site' meteorological station can be used when on-site data are not available, and the off-site data are representative of the area of concern (i.e. the meteorological parameters as well as surface characteristics characterise the transport and dispersion conditions of the location in question).

It is also preferable that:

- The compilation of the input meteorological data file is done in accordance with 'best practice', with procedures and algorithms recommended or set by environment regulators/US & VIC EPA.

pDs Consultancy has been engaged by **BENBO** to compile an 'AERMOD-type' meteorological files for an application site which is within about 20 KM radius of **Olympic Park** weather station in NSW.

This input meteorological data files have been compiled basically following the EPA, Victoria's draft guidelines: "Construction of input meteorological data files for EPA Victoria's regulatory air pollution model (AERMOD) (Publication No.1550)".

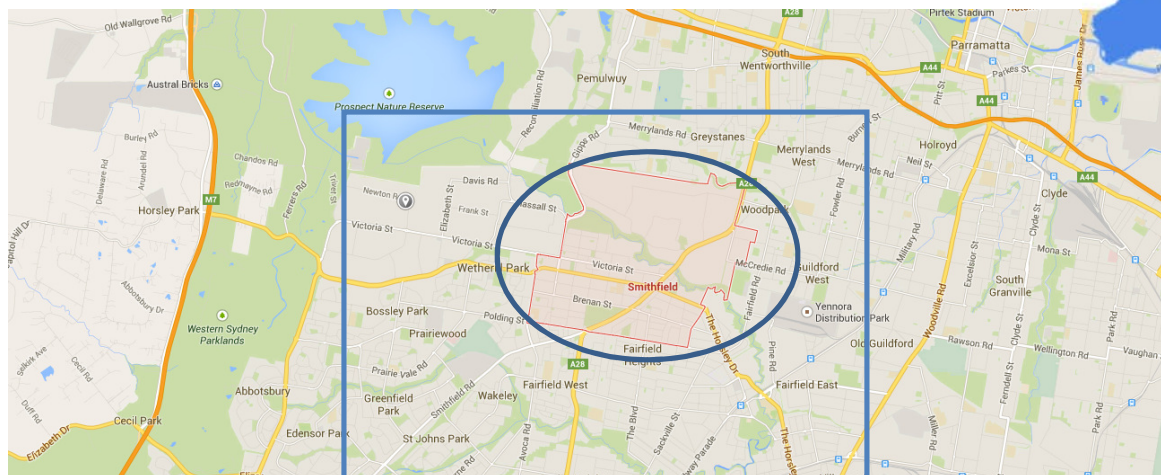


INPUT METEOROLOGICAL DATA FILES FOR AERMOD

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LOCATION OF THE MET DATA DATA SOURCE: SMITHFIELD, NSW



Application site and the met site are
just within 20 KM radius



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Page 4 of 17



Data Processing

Input Information

Data Used for the compilation

Meteorological Data

1. Mandatory Data

- i. 10m Wind Direction and Speed
- ii. Ambient Temperature (Screen Level)

2. Supplementary data (Olympic Park)

- I. Surface Pressure
- II. 3 Hourly Cloud observations
- III. Relative Humidity
- IV. Rainfall Rate

3. Upper air Data (Sydney Airport)

- I. Pressure Levels
- II. Geopotential Heights
- III. Temperature
- IV. Dew Point



DATA SOURCE

- National Climate Centre, Bureau of Meteorology, Melbourne for all 3 types of data
- Data Source :**Olympic Park/Sydney Airport**, NSW
- Period :1 Jan 2012 to 31 Dec 2012

QA/QC ON RAW DATA

- I. Hourly winds (last 10 minute average) both direction and speed and temperature examined for gaps and wind stalls
 - Suspected wind stalls (both wind direction and speed) removed and filled appropriately preserving the temporal consistency.
 - Note that BoM Syncrotec Anemometer's lowest detection limit of wind speed is 2 KM/Hour
 - Last 10 minute averaged winds were registered against the timestamp.
- II. Small gaps filled with pervious or following hour records
- III. Days with big gaps removed maintaining 90% data recovery
- IV. Parameters QA/QCed based on extreme values
- V. Wind directions were recorded with a resolution of 10 degree, randomisation technique was used to make their resolution to 1 degree.
- VI. Gaps in vertical temperature profiles were filled with previous or following day data for the completeness.

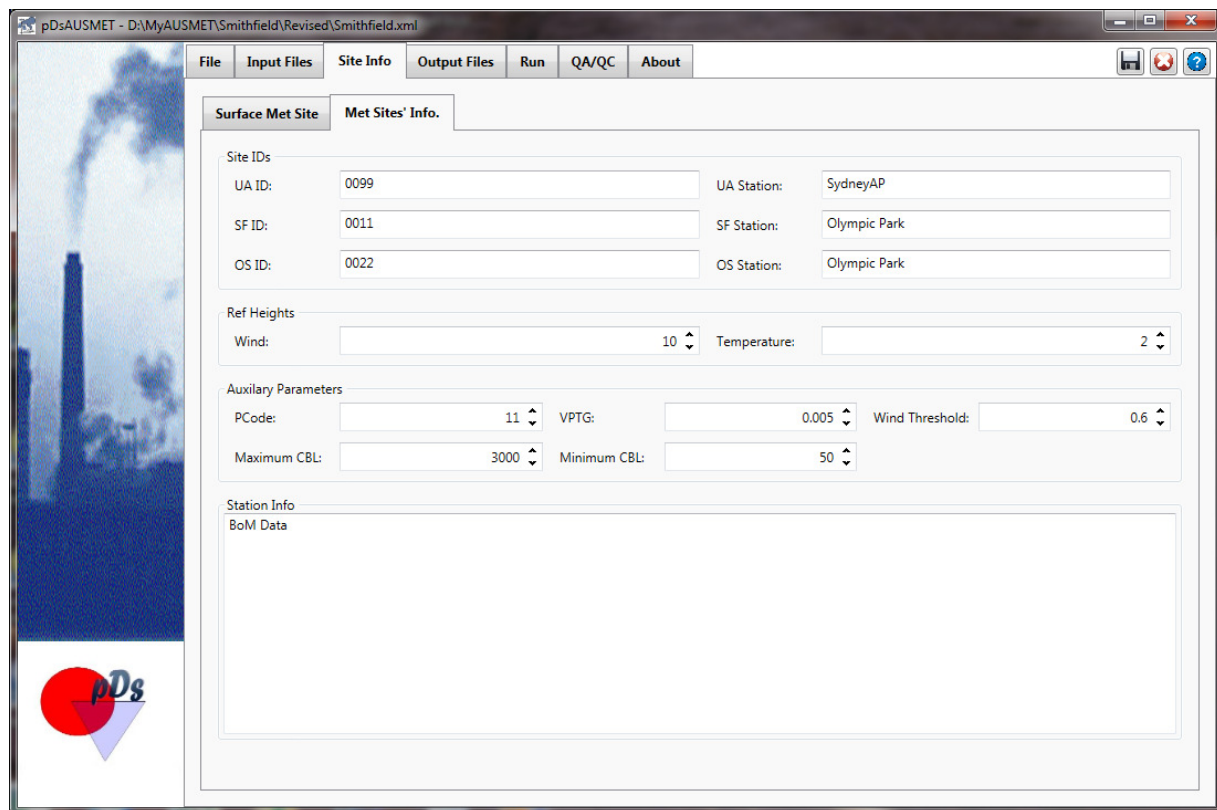


INPUT METEOROLOGICAL DATA FILES FOR AERMOD

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metfile@pdsconsultancy.com

METSITE INFORMATION



pDsAUSMET - D:\MyAUSMET\Smithfield\Revised\Smithfield.xml

File Input Files Site Info Output Files Run QA/QC About

Surface Met Site Met Sites' Info.

Site IDs

UA ID: 0099 UA Station: SydneyAP

SF ID: 0011 SF Station: Olympic Park

OS ID: 0022 OS Station: Olympic Park

Ref Heights

Wind: 10 Temperature: 2

Auxiliary Parameters

PCode: 11 VPTG: 0.005 Wind Threshold: 0.6

Maximum CBL: 3000 Minimum CBL: 50

Station Info

BoM Data

DATA COVERAGE:

Season	Coverage %
Summer	97
Autumn	100
Winter	100
Spring	98
Annual	99



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INPUT METEOROLOGICAL DATA FILES FOR AERMOD

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metfile@pdsconsultancy.com

Annual coverage is 99%. It is meeting regulatory requirement (90% or better).
Seasonal coverage is also meeting the requirement.

DETERMINATION OF SURFACE CHARACTERISTICS

All available surface maps including google maps examined to determine correct land use categories within 10 Km by 10 KM area centring the application site.

Albedo and **Bowen** ratio were determined using land use categories; Industrial High Intensity Residential, and Open Water.

Surface Met Site: **Met Sites' Info.**

Address: 6, Herbert Place, Smithfield, NSW

Latitude: -33.851 Longitude: 150.948 Time Zone: 10 Count Rainy Days 0 days

Northing: 6252512.953 Easting: 310362.842 UTM Zone: 56

Land Use Categories in a Sector

Land Use Category	Summer	Autumn	Winter	Spring
☒ Industrial/Commercial	0.1800	0.1800	0.1800	0.1800
☒ High intensity Residential	0.1800	0.1800	0.1800	0.1800
☒ Open Water	0.1000	0.1000	0.1000	0.1000
☐ Industrial/Commercial	0.1800	0.1800	0.1800	0.1800
☐ Industrial/Commercial	0.1800	0.1800	0.1800	0.1800
☐ Industrial/Commercial	0.1800	0.1800	0.1800	0.1800





INPUT METEOROLOGICAL DATA FILES FOR AERMOD

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Sector dependent surface roughness was determined considering 3 sectors.

Sector 1–Industrial, Sector 2–Professionally judged, Sector 3–Industrial

pDsAUSMET - D:\MyAUSMET\Smithfield\Revised\Smithfield.xml

File Input Files Site Info Output Files Run QA/QC About

Surface Met Site Met Sites' Info.

Address: 6, Herbert Place, Smithfield, NSW Locate

Latitude: -33.851 Longitude: 150.948 Time Zone: 10 Count Rainy Days 0 days

Northing: 6252512.953 Easting: 310362.842 UTM Zone: 56



1km x 1km Google Earth Hybrid

Roughness **Albedo** **Bowen**

Number of sectors: 3

	Summer	Autumn	Winter	Spring
Land Use	0.7000	0.7000	0.7000	0.7000
Land Use	0.9400	0.9400	0.9400	0.9400
Land Use	0.7000	0.7000	0.7000	0.7000

All sectors same All seasons same





The following parameters were determined/computed following EPA, VIC and US EPA guidelines.

Sensible Heat flux –Calculated based on cloud observations

- I. Friction Velocity (U^*)
- II. Monin–Obukhov Length (L)
- III. Height of the Stable Boundary Layer(SBL)
- IV. Vertical Velocity Scale (W^*)
- V. Height of the Convective Boundary Layer (CBL)

Mixing height (Convective)–CBL

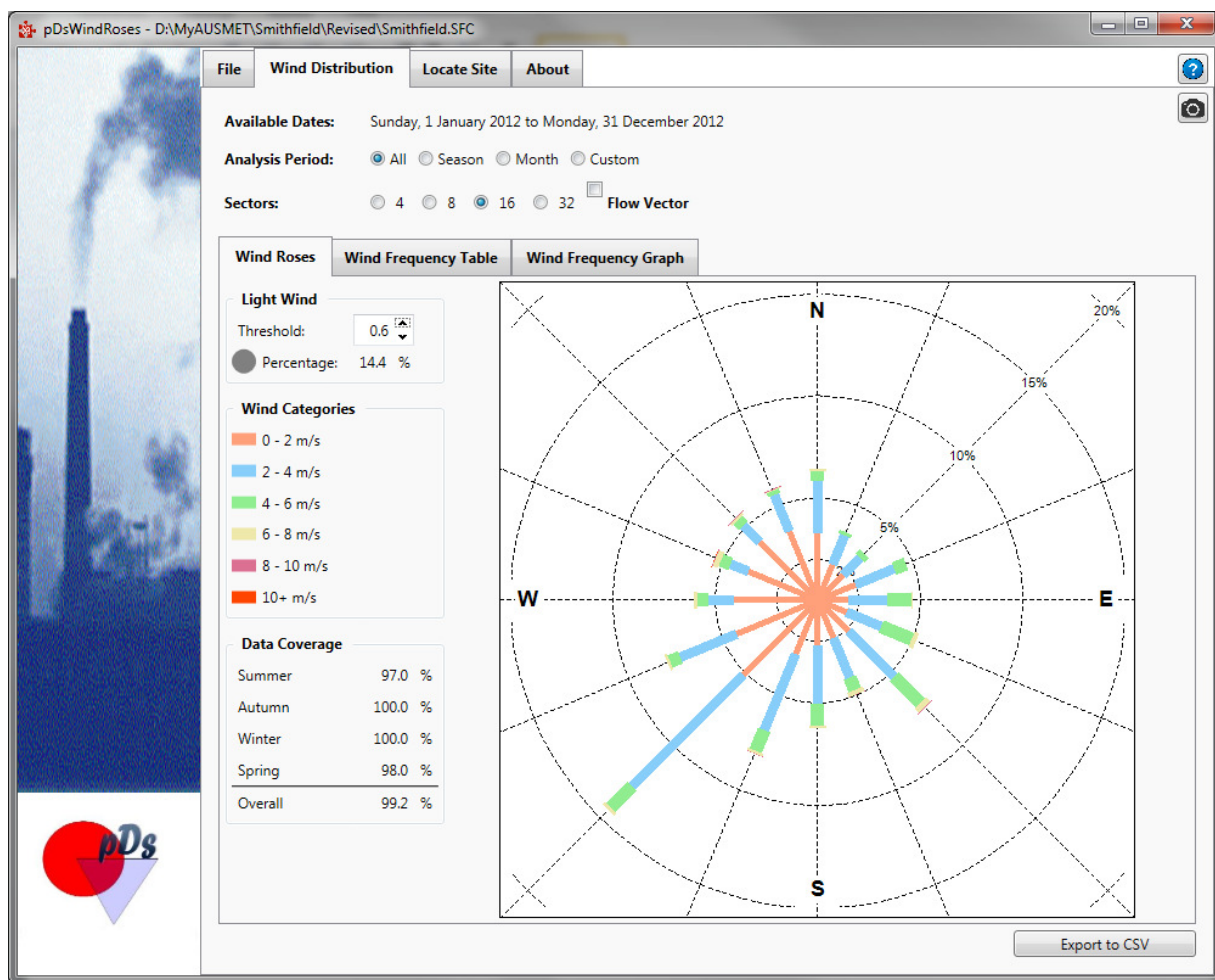
DEFINITION:

The convective mixing height, the depth of the surface mixed layer is the height of the atmosphere above the ground, which is well mixed due either to mechanical turbulence or convective turbulence. This height was determined by using the methodology of Benkley and Schulman (Journal of Applied Meteorology, Volume 18, 1979, pp 772–780). **Sydney Airport** upper air observation containing temperature and moisture profiles and surface temperature, pressure and relative humidity at **Olympic Park** were used to determine daytime mixing height.



DATA ANALYSIS

ANNUAL WINDROSES FOR OLYMPIC PARK



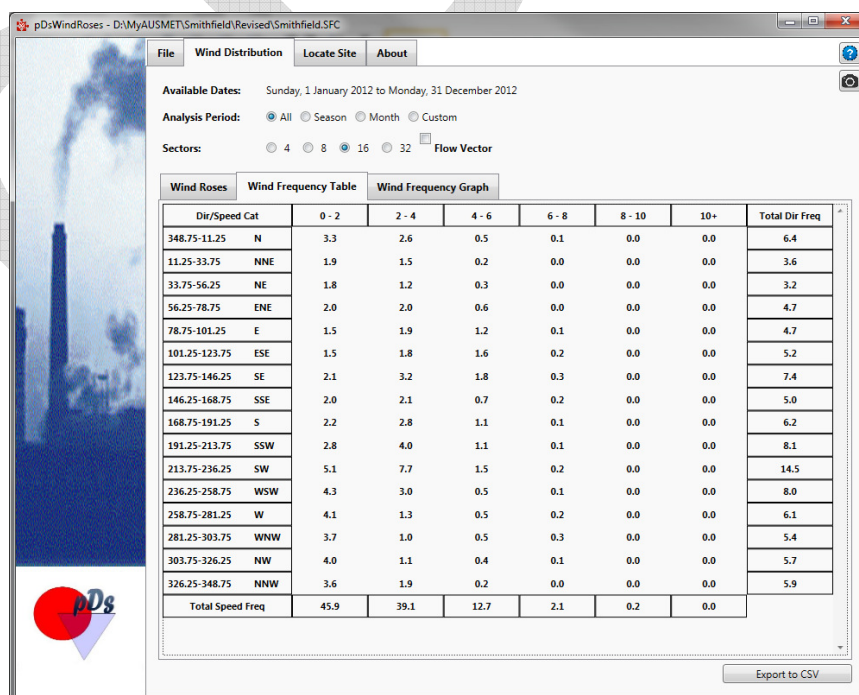
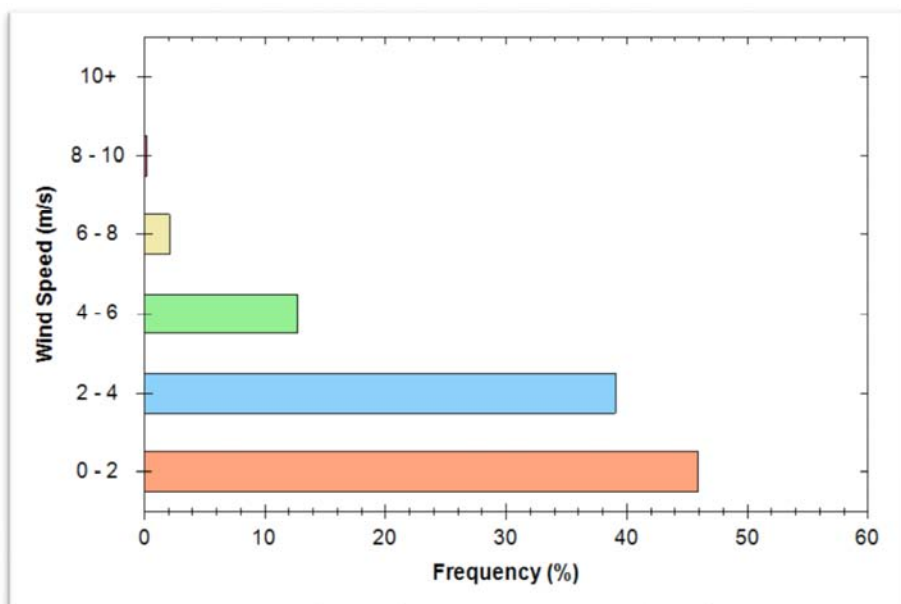


INPUT METEOROLOGICAL DATA FILES FOR AERMOD

www.pdsconsultancy.com.au

metfile@pdsconsultancy.com

FREQUENCY OF WIND SPEED





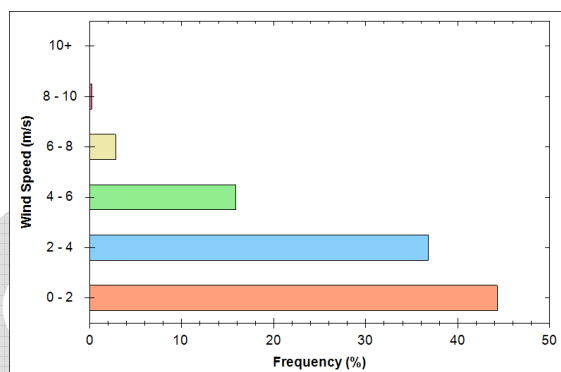
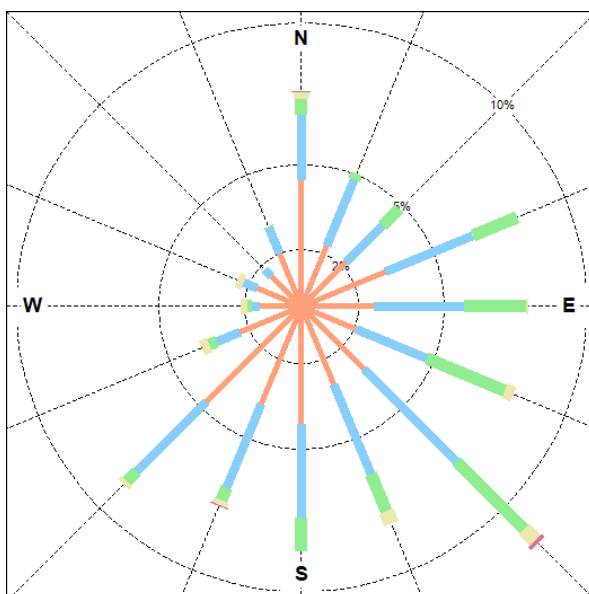
INPUT METEOROLOGICAL DATA FILES FOR AERMOD

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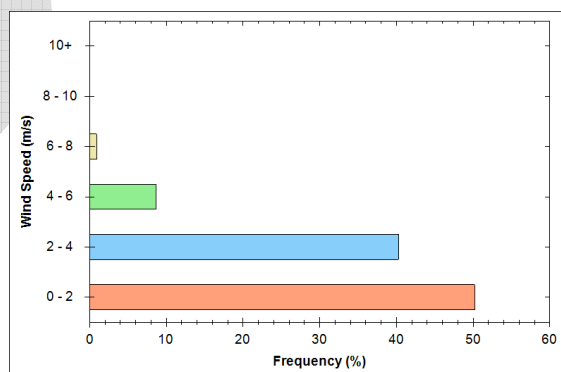
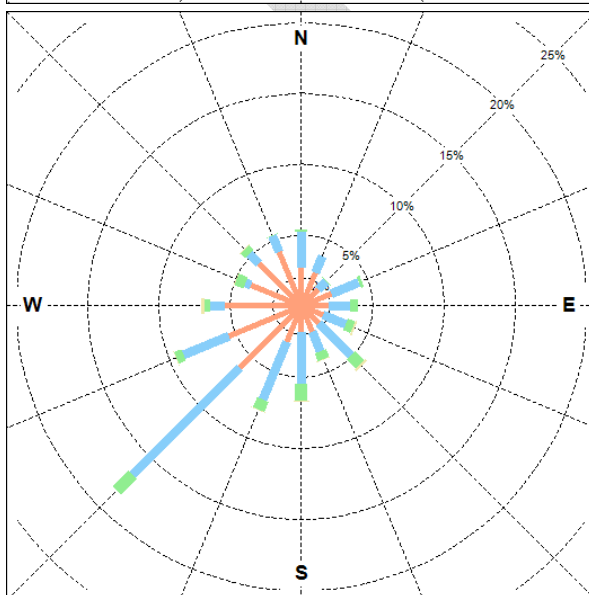
metfile@pdsconsultancy.com

SEASONAL WINDROSES

Summer



Autumn



Experts in Air Modelling and Meteorology

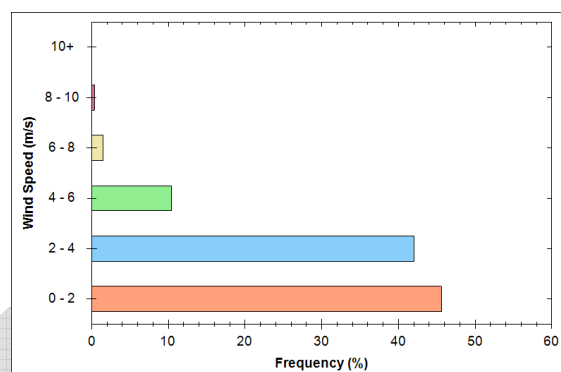
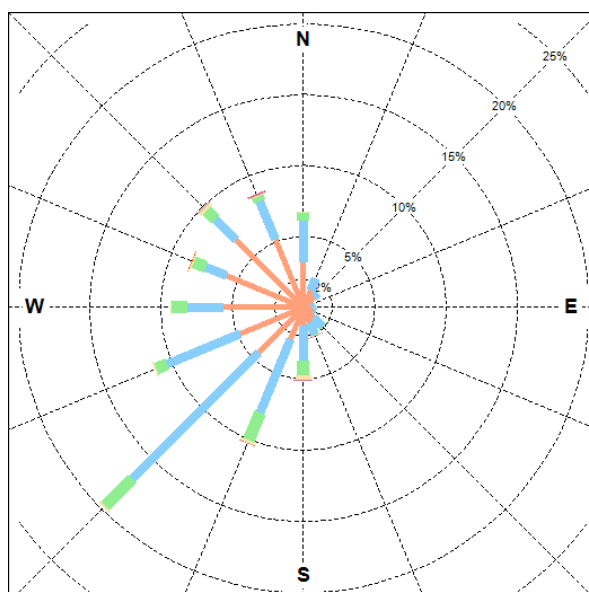


INPUT METEOROLOGICAL DATA FILES FOR AERMOD

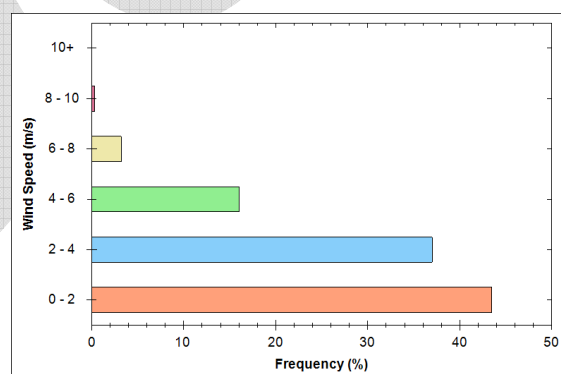
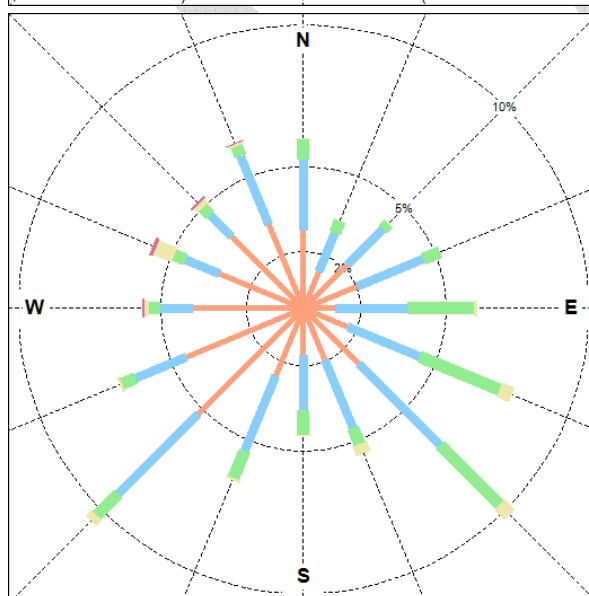
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Winter



Spring



Seasonal variations are clearly depicted.

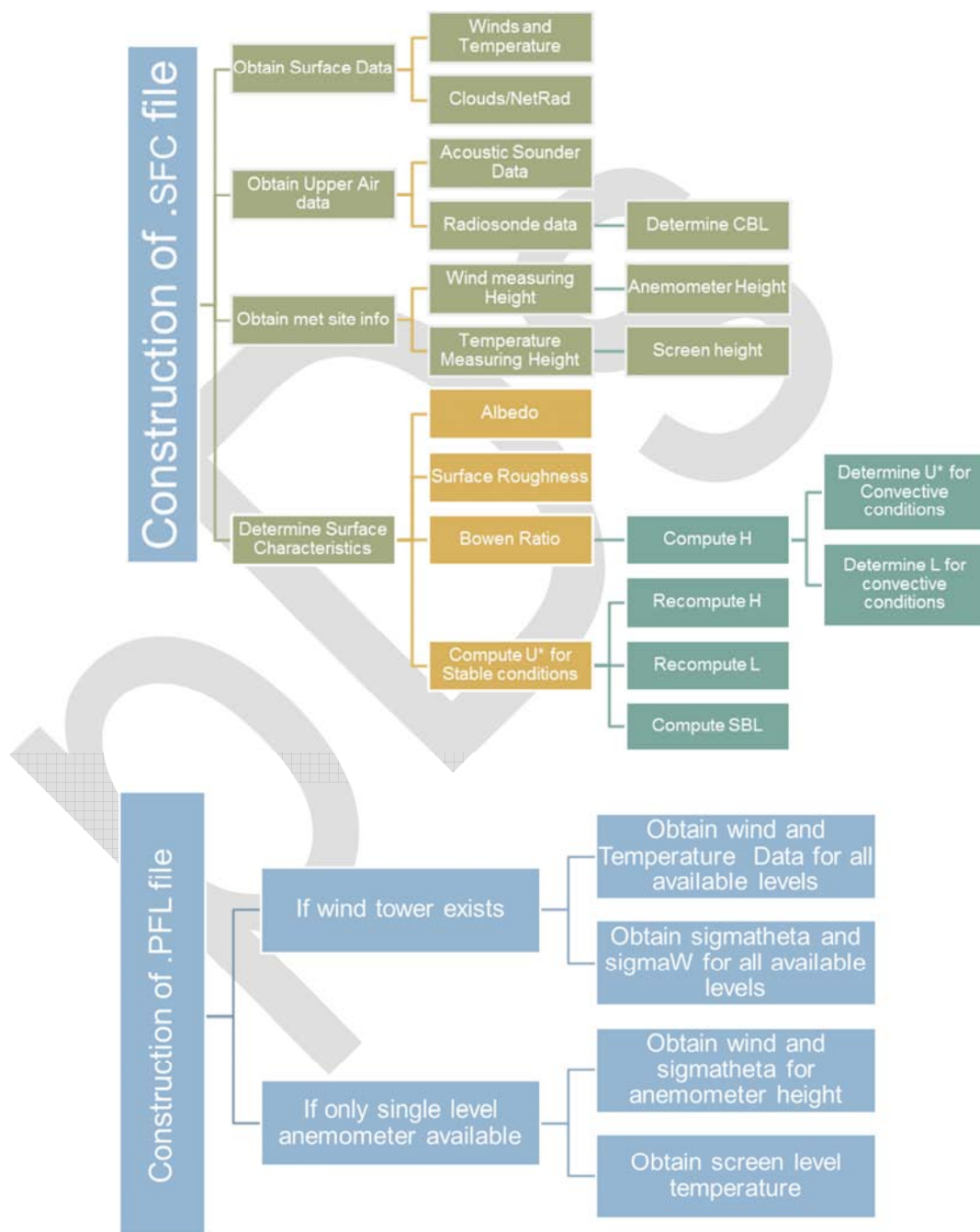


Experts in Air Modelling and Meteorology



Appendix

FLOW CHARTS - CONSTRUCTION PROCEDURE





Bibliography

Australian Standard 2923-1987: Standards Association of Australia

Benkley, C.W, & Schulman L.L 1979 :Estimating Hourly Mixing Depths from Historical Meteorological Data :Jl of Applied Meteorology Vol 1 page 772-780

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USEPA 2012, User Guide for the AERMOD Meteorological Processor-AERMET; Addendum, United States Environmental Protection Agency, Washington DC, USA.

USEPA, 2000, Meteorological Monitoring Guidance for Regulatory Modelling Applications, EPA-450/R-99-005. United States Environmental Protection Agency, Washington DC, USA.

USEPA, Office of Air Quality Planning and Standards, AERSURFACE User's Guide, Research Triangle Park, North Carolina, EPA 454/B-08-001

USEPA, Office of Air Quality Planning and Standards, User's Guide for the AERMOD Meteorological Processor (AERMET) and Addendum, Research Triangle Park, North Carolina, EPA 454/B-03-002.



INPUT METEOROLOGICAL DATA FILES FOR AERMOD

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A Comparison of AERMOD and AUSPLUME (6.0)

AERMOD was developed around the year 2000 to provide a more accurate steady state Gaussian plume model for near field modelling and where terrain and meteorology may be more influencing factors.

The information presented in this Attachment is compiled from a Tutorial Guide prepared as part of the pDs Consultancy AERMOD Technical Training Manual.

Similar comments are presented in the Good Practice Guide for Atmospheric Dispersion Modelling Ministry for the Environment, NZ.

AERMOD incorporates state of the art micro meteorology and dispersion. It uses more detailed input meteorology and is more representative of real life situations where corrective dispersion and complex terrain plume interactions may occur.

The overall model evaluation results for AERMOD conducted in the US (reference pDs Consultancy) are 0.97 overall predicted – to observed ratio for short-term averages using AERMOD. This would favour modelling of air quality criteria that have a health-based (hourly) limit.

The US EPA adopted AERMOD in 2006 and the Victorian EPA in January 2014.

The maximum concentration predicted by AERMOD is typically higher than the same source-modelling predicted by AUSPLUME (version 6.0).

The differences are likely to be even greater in terrain that is moderate to complex. AERMOD follows the terrain and uses algorithms that more accurately conform to the physics of plume buoyancy during unstable atmospheric conditions.

AERMOD, as used by pDs Consultancy, is able to handle the atmospheric reaction that converts NO to NO₂.

AERMOD for this project uses an accepted method of converting NO₂ based on in-stack ratio of 30% and an ambient ratio of 70%. 100% conversion of NO to NO₂ is assumed to occur.

AERMOD also has the ability to use the US EPA's Ozone Limiting Method (OLM).

Ozone Generation

A photochemical smog analysis has not been undertaken. Further advice will be sought from the NSW EPA's Air Technical Advisory Services Unit. This analysis is not a necessary part of the Air Quality Impact Assessment.

The closest monitoring station for Ozone is at Prospect. The results for 2012 are the latest results.

The results including the OLM method for the combined operation are shown in Table A below.

Daily maximum 1 hour average concentrations (2012) are:

Highest value 0.09 ppm

Second highest value 0.078 ppm

Daily maximum rolling 4 hour average concentrations (2012) Highest value 0.073 ppm and second highest value 0.070 ppm

The current ground level criteria are 0.100 ppm for 1 hour and 4 hour is 0.080 ppm.

The adoption of low NO_x burners for the boilers is therefore commendable to assist in the management, long term, of the prevention of photochemical smog exceeding the criteria.

Table A: Results for NO_x with OLM , 1 hour Averaging Period – Combined Visy and Marubeni

Receivers	Incremental Impact (µg/m ³)	Background Air Quality (µg/m ³)	Cumulative Impact (µg/m ³)	Limit (µm/m ³)	Pass (Yes/No)
R1	39.6	94	133.6	246	Yes
R2	40.6		134.6		Yes
R3	39.4		133.4		Yes
R4	49.1		143.1		Yes
R5	45.7		139.7		Yes
R6	32.5		126.5		Yes
R7	17.8		111.8		Yes
R8	18.4		112.4		Yes
R9	24.0		118.0		Yes
R10	18.9		112.9		Yes
R11	18.7		112.7		Yes

Results for NO_x with OLM , 1 Year Averaging Period – Combined Visy and Marubeni

Receptors	Incremental Impact (µg/m ³)	Background Air Quality (µg/m ³)	Cumulative Impact (µg/m ³)	Limit (µm/m ³)	Pass (Yes/No)
R1	1.3	18.8	20.1	62	Yes
R2	1.2		20.0		Yes
R3	1.1		19.9		Yes
R4	1.8		20.6		Yes
R5	1.8		20.6		Yes
R6	1.2		20.0		Yes
R7	1.1		19.9		Yes
R8	1.2		20.0		Yes
R9	2.2		21.0		Yes
R10	1.0		19.8		Yes
R11	0.8		19.6		Yes

Attachment 5: AERMOD Input/Output file

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**MODELOPTs: NonDEFAULT CONC FLAT NOCHKD

*** POINT SOURCE DATA ***

SOURCE ID	PART. CATS.	NUMBER	EMISSION	X	Y	BASE ELEV.	STACK HEIGHT	STACK TEMP.	STACK EXIT VEL.	STACK DIAMETER	BLDG EXISTS	URBAN SOURCE	CAP/	EMIS	RATE HOR	RATE SCALAR
		(USER	UNITS)										(METERS)	(METERS)		

VISY01R	0	0.24300E+03	310293.4	6252466.0	0.0	30.00	393.15	17.00	1.60	NO	NO	NO
VISY02R	0	0.24300E+03	310300.7	6252465.0	0.0	30.00	393.15	15.00	1.40	NO	NO	NO
MARU04	0	0.13000E+03	310287.1	6252598.2	0.0	35.00	371.90	23.00	3.05	NO	NO	NO
MARU05	0	0.15000E+03	310305.7	6252593.9	0.0	35.00	366.90	22.00	3.05	NO	NO	NO
MARU06	0	0.17000E+03	310324.3	6252589.5	0.0	35.00	368.90	23.00	3.05	NO	NO	NO

*** AERMOD - VERSION 14134 *** *** Impact of NO2 from NOx burners
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*** 04/14/15
*** 21:32:47
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**MODELOPTs: NonDEFAULT CONC    FLAT    NOCHKD
```

*** SOURCE IDs DEFINING SOURCE GROUPS ***

SRCGROUP ID	SOURCE IDs
-------------	------------

GP01 VISY01R , VISY02R ,

GP02 MARU04 , MARU05 , MARU06 ,

ALL VISY01R , VISY02R , MARU04 , MARU05 , MARU06 ,

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**MODELOPTs: NonDEFAULT CONC    FLAT    NOCHKD
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*** DISCRETE CARTESIAN RECEPTORS ***
(X-COORD, Y-COORD, ZELEV, ZHILL, ZFLAG)
(METERS)

(309855.2, 6252451.0,	0.0,	0.0,	0.0);	(309880.7, 6252357.0,	0.0,	0.0,	0.0);
(309981.0, 6252207.0,	0.0,	0.0,	0.0);	(310237.8, 6252153.0,	0.0,	0.0,	0.0);
(310422.8, 6252142.0,	0.0,	0.0,	0.0);	(310657.7, 6252113.0,	0.0,	0.0,	0.0);
(311300.0, 6252325.0,	0.0,	0.0,	0.0);	(311134.8, 6252621.0,	0.0,	0.0,	0.0);
(310945.5, 6253322.0,	0.0,	0.0,	0.0);	(310386.9, 6254017.0,	0.0,	0.0,	0.0);
(308692.3, 6253081.0,	0.0,	0.0,	0.0);				

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**MODELOPTs: NonDEFAULT CONC    FLAT    NOCHKD
```

*** METEOROLOGICAL DAYS SELECTED FOR PROCESSING ***
(1=YES; 0=NO)

[illegible]

NOTE: METEOROLOGICAL DATA ACTUALLY PROCESSED WILL ALSO DEPEND ON WHAT IS INCLUDED IN THE DATA FILE.

*** UPPER BOUND OF FIRST THROUGH FIFTH WIND SPEED CATEGORIES ***
(METERS/SEC)

1.54, 3.09, 5.14, 8.23, 10.80,

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**MODELOPTs: NonDEFAULT CONC FLAT NOCHKD

*** UP TO THE FIRST 24 HOURS OF METEOROLOGICAL DATA ***

Surface file: Smithfield2012R.SFC Met Version: 12345
Profile file: Smithfield2012R.PFL
Surface format: FREE
Profile format: FREE
Surface station no.: 11 Upper air station no.: 99
Name: UNKNOWN Name: UNKNOWN
Year: 2012 Year: 2012

First 24 hours of scalar data

YR	MO	DY	JDY	HR	H0	U*	W*	DT/DZ	ZICNV	ZIMCH	M-O	LEN	Z0	BOWEN	ALBEDO	REF	WS	WD	HT	REF	TA	HT
12	01	01	1	01	-25.7	0.297	-9.000	-9.000	-999.	373.	97.2	0.70	0.61	1.00	0.83	327.	10.0	290.7	2.0			
12	01	01	1	02	-25.9	0.297	-9.000	-9.000	-999.	373.	96.3	0.70	0.61	1.00	0.83	327.	10.0	290.0	2.0			
12	01	01	1	03	-26.1	0.298	-9.000	-9.000	-999.	373.	95.5	0.70	0.61	1.00	0.83	327.	10.0	289.4	2.0			
12	01	01	1	04	-26.3	0.298	-9.000	-9.000	-999.	374.	94.8	0.70	0.61	1.00	0.83	327.	10.0	288.8	2.0			
12	01	01	1	05	-26.4	0.298	-9.000	-9.000	-999.	374.	94.3	0.70	0.61	1.00	0.83	327.	10.0	288.4	2.0			
12	01	01	1	06	11.1	0.156	0.028	0.005	210.	141.	-32.1	0.70	0.61	0.44	0.83	327.	10.0	287.9	2.0			
12	01	01	1	07	77.1	0.174	0.197	0.005	210.	167.	-6.4	0.70	0.61	0.24	0.70	353.	10.0	287.4	2.0			
12	01	01	1	08	143.8	0.189	0.367	0.005	210.	188.	-4.4	0.70	0.61	0.15	0.70	353.	10.0	288.1	2.0			
12	01	01	1	09	191.3	0.196	0.488	0.005	302.	199.	-3.7	0.70	0.61	0.15	0.70	293.	10.0	290.6	2.0			
12	01	01	1	10	228.1	0.222	0.582	0.005	603.	240.	-4.6	0.70	0.61	0.15	0.83	322.	10.0	293.4	2.0			
12	01	01	1	11	251.5	0.423	0.641	0.005	918.	632.	-29.0	0.70	0.61	0.15	2.22	13.	10.0	295.8	2.0			
12	01	01	1	12	259.7	0.498	0.662	0.005	1118.	809.	-46.3	0.70	0.61	0.15	2.78	25.	10.0	297.3	2.0			
12	01	01	1	13	252.4	0.422	0.644	0.005	1243.	632.	-29.1	0.70	0.61	0.15	2.22	24.	10.0	298.6	2.0			
12	01	01	1	14	230.2	0.456	0.587	0.005	1356.	708.	-40.3	0.70	0.61	0.15	2.50	96.	10.0	299.7	2.0			
12	01	01	1	15	194.4	0.711	0.496	0.005	1465.	1380.	-181.5	0.70	0.61	0.15	4.44	98.	10.0	300.2	2.0			
12	01	01	1	16	147.6	0.742	0.376	0.005	1502.	1471.	-271.9	0.70	0.61	0.15	4.72	83.	10.0	300.3	2.0			
12	01	01	1	17	80.6	0.729	0.206	0.005	1443.	1433.	-472.3	0.70	0.61	0.24	4.72	86.	10.0	300.2	2.0			
12	01	01	1	18	14.3	0.672	0.037	0.005	1375.	1268.	-2079.6	0.70	0.61	0.45	4.44	86.	10.0	299.9	2.0			
12	01	01	1	19	-22.2	0.364	-9.000	-9.000	-999.	504.	211.8	0.70	0.61	1.00	3.89	83.	10.0	299.5	2.0			
12	01	01	1	20	-22.8	0.369	-9.000	-9.000	-999.	515.	214.6	0.70	0.61	1.00	4.17	85.	10.0	298.3	2.0			
12	01	01	1	21	-23.4	0.353	-9.000	-9.000	-999.	482.	181.8	0.70	0.61	1.00	3.33	69.	10.0	296.8	2.0			
12	01	01	1	22	-24.0	0.341	-9.000	-9.000	-999.	458.	159.4	0.70	0.61	1.00	2.78	57.	10.0	295.3	2.0			
12	01	01	1	23	-24.4	0.328	-9.000	-9.000	-999.	433.	139.7	0.70	0.61	1.00	2.22	58.	10.0	294.4	2.0			
12	01	01	1	24	-24.5	0.328	-9.000	-9.000	-999.	433.	138.7	0.70	0.61	1.00	2.22	81.	10.0	294.0	2.0			

First hour of profile data

YR	MO	DY	HR	HEIGHT	F	WDIR	WSPD	AMB	TMP	sigmaA	sigmaW	sigmaV
12	01	01	01	10.0	1	327.	0.83	290.7	99.0	-99.00	-99.00	

F indicates top of profile (=1) or below (=0)

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**MODELOPTs: NonDEFAULT CONC FLAT NOCHKD

*** THE PERIOD (8784 HRS) AVERAGE CONCENTRATION VALUES FOR SOURCE GROUP: GP01 ***
INCLUDING SOURCE(S): VISY01R , VISY02R ,

*** DISCRETE CARTESIAN RECEPTOR POINTS ***

** CONC OF NO2 IN MICROGRAMSPERCUBICMETRE **

X-COORD (M)	Y-COORD (M)	CONC	X-COORD (M)	Y-COORD (M)	CONC
309855.20	6252451.00	1.56296	309880.70	6252357.00	1.16551
309981.00	6252207.00	0.71180	310237.80	6252153.00	0.75139
310422.80	6252142.00	1.02030	310657.70	6252113.00	1.75317
311300.00	6252325.00	1.40497	311134.80	6252621.00	1.00121
310945.50	6253322.00	0.51047	310386.90	6254017.00	0.57105
308692.30	6253081.00	0.68688			

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**MODELOPTs: NonDEFAULT CONC FLAT NOCHKD

*** THE PERIOD (8784 HRS) AVERAGE CONCENTRATION VALUES FOR SOURCE GROUP: GP02 ***
 INCLUDING SOURCE(S): MARU04 , MARU05 , MARU06 ,

*** DISCRETE CARTESIAN RECEPTOR POINTS ***

** CONC OF NO2 IN MICROGRAMSPERCUBICMETRE **

X-COORD (M)	Y-COORD (M)	CONC	X-COORD (M)	Y-COORD (M)	CONC
309855.20	6252451.00	0.22337	309880.70	6252357.00	0.16206
309981.00	6252207.00	0.12602	310237.80	6252153.00	0.13124
310422.80	6252142.00	0.15531	310657.70	6252113.00	0.25135
311300.00	6252325.00	0.26162	311134.80	6252621.00	0.22166
310945.50	6253322.00	0.10171	310386.90	6254017.00	0.09871
308692.30	6253081.00	0.15221			

*** AERMOD - VERSION 14134 *** *** Impact of NO2 from NOx burners *** 04/14/15
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**MODELOPTs: NonDEFAULT CONC FLAT NOCHKD

*** THE PERIOD (8784 HRS) AVERAGE CONCENTRATION VALUES FOR SOURCE GROUP: ALL ***
 INCLUDING SOURCE(S): VISY01R , VISY02R , MARU04 , MARU05 , MARU06 ,

*** DISCRETE CARTESIAN RECEPTOR POINTS ***

** CONC OF NO2 IN MICROGRAMSPERCUBICMETRE **

X-COORD (M)	Y-COORD (M)	CONC	X-COORD (M)	Y-COORD (M)	CONC
309855.20	6252451.00	1.78633	309880.70	6252357.00	1.32757
309981.00	6252207.00	0.83782	310237.80	6252153.00	0.88264
310422.80	6252142.00	1.17562	310657.70	6252113.00	2.00452
311300.00	6252325.00	1.66659	311134.80	6252621.00	1.22286
310945.50	6253322.00	0.61218	310386.90	6254017.00	0.66976
308692.30	6253081.00	0.83909			

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**MODELOPTs: NonDEFAULT CONC FLAT NOCHKD

*** THE 1ST HIGHEST 1-HR AVERAGE CONCENTRATION VALUES FOR SOURCE GROUP: GP01 ***
 INCLUDING SOURCE(S): VISY01R , VISY02R ,

*** DISCRETE CARTESIAN RECEPTOR POINTS ***

** CONC OF NO2 IN MICROGRAMSPERCUBICMETRE **

X-COORD (M)	Y-COORD (M)	CONC	(YYMMDDHH)	X-COORD (M)	Y-COORD (M)	CONC	(YYMMDDHH)
309855.20	6252451.00	33.22471	(12112917)	309880.70	6252357.00	34.84556	(12121418)
309981.00	6252207.00	35.22441	(12040415)	310237.80	6252153.00	42.60223	(12021012)
310422.80	6252142.00	39.91047	(12042312)	310657.70	6252113.00	28.50979	(12061414)
311300.00	6252325.00	21.71211	(12060708)	311134.80	6252621.00	15.61277	(12040917)

310945.50 6253322.00 20.60480 (12022818) 310386.90 6254017.00 21.41946 (12041017)
308692.30 6253081.00 19.23180 (12021318)

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**MODELOPTs: NonDEFAULT CONC FLAT NOCHKD

*** THE 1ST HIGHEST 1-HR AVERAGE CONCENTRATION VALUES FOR SOURCE GROUP: GP02 ***
INCLUDING SOURCE(S): MARU04 , MARU05 , MARU06 ,

*** DISCRETE CARTESIAN RECEPTOR POINTS ***

** CONC OF NO2 IN MICROGRAMSPERCUBICMETRE **

X-COORD (M)	Y-COORD (M)	CONC (YYMMDDHH)	X-COORD (M)	Y-COORD (M)	CONC (YYMMDDHH)
309855.20	6252451.00	12.20672 (12010216)	309880.70	6252357.00	11.69546 (12021017)
309981.00	6252207.00	11.84153 (12121913)	310237.80	6252153.00	12.65512 (12030115)
310422.80	6252142.00	13.18364 (12013013)	310657.70	6252113.00	11.61708 (12092816)
311300.00	6252325.00	6.16783 (12042416)	311134.80	6252621.00	8.04671 (12042515)
310945.50	6253322.00	6.16386 (12080616)	310386.90	6254017.00	3.94024 (12032207)
308692.30	6253081.00	5.60043 (12012509)			

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**MODELOPTs: NonDEFAULT CONC FLAT NOCHKD

*** THE 1ST HIGHEST 1-HR AVERAGE CONCENTRATION VALUES FOR SOURCE GROUP: ALL ***
INCLUDING SOURCE(S): VISY01R , VISY02R , MARU04 , MARU05 , MARU06 ,

*** DISCRETE CARTESIAN RECEPTOR POINTS ***

** CONC OF NO2 IN MICROGRAMSPERCUBICMETRE **

X-COORD (M)	Y-COORD (M)	CONC (YYMMDDHH)	X-COORD (M)	Y-COORD (M)	CONC (YYMMDDHH)
309855.20	6252451.00	38.45671 (12121416)	309880.70	6252357.00	40.02067 (12122215)
309981.00	6252207.00	44.13888 (12121917)	310237.80	6252153.00	53.26028 (12030416)
310422.80	6252142.00	49.82504 (12071312)	310657.70	6252113.00	35.54794 (12022812)
311300.00	6252325.00	21.93293 (12060708)	311134.80	6252621.00	20.37089 (12071515)
310945.50	6253322.00	20.75542 (12022818)	310386.90	6254017.00	21.92949 (12041017)
308692.30	6253081.00	21.17566 (12021318)			

*** AERMOD - VERSION 14134 *** *** Impact of NO2 from NOx burners *** 04/14/15
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**MODELOPTs: NonDEFAULT CONC FLAT NOCHKD

*** THE 9TH HIGHEST 1-HR AVERAGE CONCENTRATION VALUES FOR SOURCE GROUP: GP01 ***
INCLUDING SOURCE(S): VISY01R , VISY02R ,

*** DISCRETE CARTESIAN RECEPTOR POINTS ***

** CONC OF NO2 IN MICROGRAMSPERCUBICMETRE **

X-COORD (M)	Y-COORD (M)	CONC (YYMMDDHH)	X-COORD (M)	Y-COORD (M)	CONC (YYMMDDHH)
309855.20	6252451.00	32.12606 (12020518)	309880.70	6252357.00	32.63485 (12101817)
309981.00	6252207.00	32.63993 (12121915)	310237.80	6252153.00	39.21652 (12102412)
310422.80	6252142.00	38.17692 (12031512)	310657.70	6252113.00	26.84199 (12071412)
311300.00	6252325.00	13.28825 (12071701)	311134.80	6252621.00	14.07737 (12080916)
310945.50	6253322.00	12.91296 (12020202)	310386.90	6254017.00	16.63140 (12031820)
308692.30	6253081.00	17.30969 (12011401)			

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**MODELOPTs: NonDEFAULT CONC FLAT NOCHKD

*** THE 9TH HIGHEST 1-HR AVERAGE CONCENTRATION VALUES FOR SOURCE GROUP: GP02 ***
INCLUDING SOURCE(S): MARU04 , MARU05 , MARU06 ,

*** DISCRETE CARTESIAN RECEPTOR POINTS ***

** CONC OF NO2 IN MICROGRAMSPERCUBICMETRE **

X-COORD (M)	Y-COORD (M)	CONC (YYMMDDHH)	X-COORD (M)	Y-COORD (M)	CONC (YYMMDDHH)
309855.20	6252451.00	10.79457 (12122218)	309880.70	6252357.00	10.09698 (12010318)
309981.00	6252207.00	10.57918 (12012913)	310237.80	6252153.00	11.18249 (12030113)
310422.80	6252142.00	11.82609 (12082314)	310657.70	6252113.00	10.85665 (12081714)
311300.00	6252325.00	5.78522 (12093013)	311134.80	6252621.00	7.80926 (12070212)
310945.50	6253322.00	5.80589 (12071912)	310386.90	6254017.00	3.53151 (12072215)
308692.30	6253081.00	3.19818 (12113016)			

*** AERMOD - VERSION 14134 *** *** Impact of NO2 from NOx burners *** 04/14/15
*** AERMET - VERSION 12345 *** *** Benbo-AERMOD Project April 2015 *** 21:32:47

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**MODELOPTs: NonDEFAULT CONC FLAT NOCHKD

*** THE 9TH HIGHEST 1-HR AVERAGE CONCENTRATION VALUES FOR SOURCE GROUP: ALL ***
INCLUDING SOURCE(S): VISY01R , VISY02R , MARU04 , MARU05 , MARU06 ,

*** DISCRETE CARTESIAN RECEPTOR POINTS ***

** CONC OF NO2 IN MICROGRAMSPERCUBICMETRE **

X-COORD (M)	Y-COORD (M)	CONC (YYMMDDHH)	X-COORD (M)	Y-COORD (M)	CONC (YYMMDDHH)
309855.20	6252451.00	37.34623 (12010118)	309880.70	6252357.00	37.83306 (12102417)
309981.00	6252207.00	41.25551 (12022513)	310237.80	6252153.00	50.75051 (12111212)
310422.80	6252142.00	48.06400 (12082314)	310657.70	6252113.00	34.58974 (12092817)
311300.00	6252325.00	15.07221 (12070211)	311134.80	6252621.00	19.55057 (12032315)
310945.50	6253322.00	14.39522 (12012006)	310386.90	6254017.00	17.08496 (12052716)
308692.30	6253081.00	17.64088 (12011401)			

*** AERMOD - VERSION 14134 *** *** Impact of NO2 from NOx burners *** 04/14/15
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**MODELOPTs: NonDEFAULT CONC FLAT NOCHKD

*** THE MAXIMUM 999 1-HR AVERAGE CONCENTRATION VALUES FOR SOURCE GROUP: GP01 ***
INCLUDING SOURCE(S): VISY01R , VISY02R ,

** CONC OF NO2 IN MICROGRAMSPERCUBICMETRE **

RANK TYPE	CONC (YYMMDDHH) AT	RECEPTOR (XR,YR) OF TYPE	RANK	CONC (YYMMDDHH) AT	RECEPTOR (XR,YR) OF
1.	42.60223 (12021012) AT (310237.80, 6252153.00)	DC	41.	36.41537 (12123113) AT (310237.80, 6252153.00)	DC
2.	41.25170 (12030416) AT (310237.80, 6252153.00)	DC	42.	36.30764 (12112111) AT (310422.80, 6252142.00)	DC
3.	41.02145 (12032112) AT (310237.80, 6252153.00)	DC	43.	36.27000 (12090514) AT (310422.80, 6252142.00)	DC
4.	40.69522 (12030113) AT (310237.80, 6252153.00)	DC	44.	36.26460 (12090511) AT (310422.80, 6252142.00)	DC
5.	40.30621 (12013010) AT (310237.80, 6252153.00)	DC	45.	36.24609 (12091611) AT (310422.80, 6252142.00)	DC
6.	40.05372 (12071015) AT (310237.80, 6252153.00)	DC	46.	36.23791 (12082314) AT (310422.80, 6252142.00)	DC
7.	39.91047 (12042312) AT (310422.80, 6252142.00)	DC	47.	36.23283 (12122412) AT (310237.80, 6252153.00)	DC
8.	39.88232 (12030115) AT (310237.80, 6252153.00)	DC	48.	36.18674 (12081710) AT (310237.80, 6252153.00)	DC
9.	39.86015 (12123110) AT (310237.80, 6252153.00)	DC	49.	36.12672 (12030112) AT (310237.80, 6252153.00)	DC
10.	39.21652 (12102412) AT (310237.80, 6252153.00)	DC	50.	36.01288 (12082309) AT (310422.80, 6252142.00)	DC
11.	39.13679 (12032111) AT (310422.80, 6252142.00)	DC	51.	35.95357 (12081713) AT (310422.80, 6252142.00)	DC
12.	39.08109 (12071314) AT (310422.80, 6252142.00)	DC	52.	35.92485 (12040612) AT (310237.80, 6252153.00)	DC
13.	39.03635 (12071312) AT (310422.80, 6252142.00)	DC	53.	35.87314 (12090510) AT (310422.80, 6252142.00)	DC
14.	38.85988 (12071114) AT (310422.80, 6252142.00)	DC	54.	35.59434 (12030414) AT (310237.80, 6252153.00)	DC
15.	38.82957 (12030415) AT (310237.80, 6252153.00)	DC	55.	35.57700 (12031513) AT (310422.80, 6252142.00)	DC
16.	38.77801 (12111212) AT (310237.80, 6252153.00)	DC	56.	35.48920 (12090509) AT (310422.80, 6252142.00)	DC
17.	38.62893 (12010310) AT (310237.80, 6252153.00)	DC	57.	35.39915 (12092611) AT (310237.80, 6252153.00)	DC
18.	38.58677 (12082215) AT (310422.80, 6252142.00)	DC	58.	35.27199 (12052512) AT (310422.80, 6252142.00)	DC
19.	38.46784 (12062114) AT (310422.80, 6252142.00)	DC	59.	35.22441 (12040415) AT (309981.00, 6252207.00)	DC

20.	38.42012 (12052513) AT (310422.80, 6252142.00) DC	60.	35.04079 (12040412) AT (309981.00, 6252207.00) DC
21.	38.20901 (12032114) AT (310237.80, 6252153.00) DC	61.	35.00554 (12071014) AT (310237.80, 6252153.00) DC
22.	38.20787 (12123111) AT (310237.80, 6252153.00) DC	62.	34.99009 (12090508) AT (310422.80, 6252142.00) DC
23.	38.17692 (12031512) AT (310422.80, 6252142.00) DC	63.	34.90645 (12040613) AT (310237.80, 6252153.00) DC
24.	38.17667 (12021612) AT (310237.80, 6252153.00) DC	64.	34.85421 (12082913) AT (310422.80, 6252142.00) DC
25.	38.00505 (12090516) AT (310422.80, 6252142.00) DC	65.	34.84556 (12121418) AT (309880.70, 6252357.00) DC
26.	37.90971 (12010212) AT (310237.80, 6252153.00) DC	66.	34.83921 (12021011) AT (310422.80, 6252142.00) DC
27.	37.73137 (12102413) AT (310237.80, 6252153.00) DC	67.	34.77039 (12040811) AT (310237.80, 6252153.00) DC
28.	37.62604 (12030411) AT (310422.80, 6252142.00) DC	68.	34.75789 (12082214) AT (310422.80, 6252142.00) DC
29.	37.39321 (12062210) AT (310422.80, 6252142.00) DC	69.	34.70913 (12021613) AT (310237.80, 6252153.00) DC
30.	37.27865 (12030116) AT (310237.80, 6252153.00) DC	70.	34.63343 (12100616) AT (309981.00, 6252207.00) DC
31.	37.26020 (12052211) AT (310422.80, 6252142.00) DC	71.	34.54081 (12013014) AT (310422.80, 6252142.00) DC
32.	37.20760 (12081711) AT (310237.80, 6252153.00) DC	72.	34.51144 (12121917) AT (309981.00, 6252207.00) DC
33.	37.13072 (12030111) AT (310422.80, 6252142.00) DC	73.	34.32561 (12012918) AT (309981.00, 6252207.00) DC
34.	37.09929 (12010111) AT (310237.80, 6252153.00) DC	74.	34.26011 (12092815) AT (310422.80, 6252142.00) DC
35.	37.02149 (12092811) AT (310422.80, 6252142.00) DC	75.	34.04114 (12092810) AT (310237.80, 6252153.00) DC
36.	36.79762 (12090709) AT (310422.80, 6252142.00) DC	76.	34.00957 (12110312) AT (310237.80, 6252153.00) DC
37.	36.72248 (12090513) AT (310422.80, 6252142.00) DC	77.	33.89058 (12021614) AT (310237.80, 6252153.00) DC
38.	36.72089 (12071112) AT (310422.80, 6252142.00) DC	78.	33.88920 (12011711) AT (310237.80, 6252153.00) DC
39.	36.71215 (12092713) AT (310237.80, 6252153.00) DC	79.	33.72875 (12081514) AT (310422.80, 6252142.00) DC
40.	36.55029 (12090512) AT (310422.80, 6252142.00) DC	80.	33.70217 (12111211) AT (310237.80, 6252153.00) DC

*** AERMOD - VERSION 14134 *** *** Impact of NO2 from NOx burners

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**MODELOPTs: NonDEFAULT CONC FLAT NOCHKD

*** THE MAXIMUM 999 1-HR AVERAGE CONCENTRATION VALUES FOR SOURCE GROUP: GP01 ***
INCLUDING SOURCE(S): VISY01R , VISY02R ,

** CONC OF NO2 IN MICROGRAMSPERCUBICMETRE **

RANK TYPE	CONC (YYMMDDHH) AT	RECEPTOR (XR,YR) OF TYPE	RANK	CONC (YYMMDDHH) AT	RECEPTOR (XR,YR) OF
81.	33.54705 (12010218) AT (309880.70, 6252357.00) DC		121.	32.12606 (12020518) AT (309855.20, 6252451.00) DC	
82.	33.46626 (12022511) AT (310237.80, 6252153.00) DC		122.	32.10259 (12122217) AT (309880.70, 6252357.00) DC	
83.	33.45907 (12071714) AT (310422.80, 6252142.00) DC		123.	32.09476 (12102416) AT (309880.70, 6252357.00) DC	
84.	33.40572 (12102417) AT (309880.70, 6252357.00) DC		124.	32.09356 (12011613) AT (310422.80, 6252142.00) DC	
85.	33.33045 (12013015) AT (310422.80, 6252142.00) DC		125.	32.08223 (12013018) AT (310422.80, 6252142.00) DC	
86.	33.27979 (12031317) AT (309880.70, 6252357.00) DC		126.	32.03663 (12031416) AT (309855.20, 6252451.00) DC	
87.	33.27978 (12032713) AT (310237.80, 6252153.00) DC		127.	32.03173 (12100615) AT (309981.00, 6252207.00) DC	
88.	33.27931 (12042414) AT (310422.80, 6252142.00) DC		128.	32.01018 (12021616) AT (309880.70, 6252357.00) DC	
89.	33.25147 (12092907) AT (310422.80, 6252142.00) DC		129.	31.99662 (12120111) AT (310237.80, 6252153.00) DC	
90.	33.24464 (12022513) AT (309981.00, 6252207.00) DC		130.	31.97393 (12111216) AT (309880.70, 6252357.00) DC	
91.	33.22471 (12112917) AT (309855.20, 6252451.00) DC		131.	31.96385 (12010314) AT (309880.70, 6252357.00) DC	
92.	33.18563 (12121916) AT (309981.00, 6252207.00) DC		132.	31.87847 (12010213) AT (309981.00, 6252207.00) DC	
93.	33.15027 (12121417) AT (309880.70, 6252357.00) DC		133.	31.84106 (12110517) AT (309880.70, 6252357.00) DC	
94.	33.11294 (12030114) AT (310237.80, 6252153.00) DC		134.	31.83057 (12011818) AT (309855.20, 6252451.00) DC	
95.	33.10662 (12010118) AT (309855.20, 6252451.00) DC		135.	31.72323 (12112414) AT (309981.00, 6252207.00) DC	
96.	33.10049 (12040812) AT (310237.80, 6252153.00) DC		136.	31.65866 (12032616) AT (309880.70, 6252357.00) DC	
97.	33.05829 (12031417) AT (309855.20, 6252451.00) DC		137.	31.58518 (12121318) AT (309880.70, 6252357.00) DC	
98.	32.99419 (12092814) AT (310422.80, 6252142.00) DC		138.	31.57574 (12021415) AT (309880.70, 6252357.00) DC	
99.	32.98370 (12011618) AT (309880.70, 6252357.00) DC		139.	31.56239 (12122218) AT (309880.70, 6252357.00) DC	
100.	32.95901 (12100314) AT (310422.80, 6252142.00) DC		140.	31.51065 (12121218) AT (309855.20, 6252451.00) DC	
101.	32.83804 (12010217) AT (309880.70, 6252357.00) DC		141.	31.49642 (12121217) AT (309855.20, 6252451.00) DC	
102.	32.83703 (12092312) AT (310422.80, 6252142.00) DC		142.	31.45156 (12121316) AT (309880.70, 6252357.00) DC	
103.	32.76274 (12112415) AT (309981.00, 6252207.00) DC		143.	31.42110 (12092812) AT (310422.80, 6252142.00) DC	
104.	32.72031 (12010717) AT (309880.70, 6252357.00) DC		144.	31.40981 (12092908) AT (310422.80, 6252142.00) DC	
105.	32.67254 (12022510) AT (310237.80, 6252153.00) DC		145.	31.40612 (12042415) AT (310422.80, 6252142.00) DC	
106.	32.63993 (12121915) AT (309981.00, 6252207.00) DC		146.	31.35615 (12012015) AT (309855.20, 6252451.00) DC	
107.	32.63485 (12101817) AT (309880.70, 6252357.00) DC		147.	31.34586 (12122718) AT (309855.20, 6252451.00) DC	
108.	32.58352 (12010317) AT (309855.20, 6252451.00) DC		148.	31.30292 (12021717) AT (309855.20, 6252451.00) DC	
109.	32.58238 (12022516) AT (309880.70, 6252357.00) DC		149.	31.25685 (12120315) AT (309855.20, 6252451.00) DC	
110.	32.47731 (12122215) AT (309880.70, 6252357.00) DC		150.	31.25405 (12071113) AT (310422.80, 6252142.00) DC	
111.	32.45827 (12032717) AT (309880.70, 6252357.00) DC		151.	31.23547 (12092717) AT (309855.20, 6252451.00) DC	
112.	32.39807 (12112417) AT (309855.20, 6252451.00) DC		152.	31.23207 (12121416) AT (309855.20, 6252451.00) DC	
113.	32.34678 (12031316) AT (309880.70, 6252357.00) DC		153.	31.23130 (12120316) AT (309855.20, 6252451.00) DC	
114.	32.26190 (12022417) AT (309855.20, 6252451.00) DC		154.	31.22548 (12012412) AT (310422.80, 6252142.00) DC	
115.	32.24382 (12091013) AT (310422.80, 6252142.00) DC		155.	31.21720 (12040416) AT (309880.70, 6252357.00) DC	

116.	32.23807 (12103015) AT (309880.70, 6252357.00) DC	156.	31.21351 (12010315) AT (309855.20, 6252451.00) DC
117.	32.21349 (12121918) AT (309981.00, 6252207.00) DC	157.	31.21263 (12120812) AT (309981.00, 6252207.00) DC
118.	32.19894 (12111817) AT (309880.70, 6252357.00) DC	158.	31.19434 (12102915) AT (309855.20, 6252451.00) DC
119.	32.14370 (12010117) AT (309855.20, 6252451.00) DC	159.	31.13253 (12011317) AT (309855.20, 6252451.00) DC
120.	32.12851 (12103016) AT (309855.20, 6252451.00) DC	160.	31.12984 (12112616) AT (309855.20, 6252451.00) DC

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**MODELOPTs: NonDEFAULT CONC FLAT NOCHKD

*** THE MAXIMUM 999 1-HR AVERAGE CONCENTRATION VALUES FOR SOURCE GROUP: GP01 ***
 INCLUDING SOURCE(S): VISY01R , VISY02R ,

** CONC OF NO2 IN MICROGRAMSPERCUBICMETRE **

RANK TYPE	CONC (YYMMDDHH) AT	RECEPTOR (XR,YR) OF TYPE	RANK	CONC (YYMMDDHH) AT	RECEPTOR (XR,YR) OF
--------------	--------------------	--------------------------	------	--------------------	---------------------

161.	31.09296 (12110516) AT (309855.20, 6252451.00) DC	201.	30.43392 (12052314) AT (310422.80, 6252142.00) DC
162.	31.08436 (12092809) AT (310237.80, 6252153.00) DC	202.	30.42024 (12110616) AT (309855.20, 6252451.00) DC
163.	31.06611 (12011318) AT (309855.20, 6252451.00) DC	203.	30.41286 (12111815) AT (309981.00, 6252207.00) DC
164.	31.04200 (12042313) AT (310422.80, 6252142.00) DC	204.	30.41031 (12121515) AT (309855.20, 6252451.00) DC
165.	31.03254 (12011617) AT (309855.20, 6252451.00) DC	205.	30.39306 (12013013) AT (310422.80, 6252142.00) DC
166.	31.03154 (12121914) AT (309981.00, 6252207.00) DC	206.	30.38321 (12110814) AT (309855.20, 6252451.00) DC
167.	31.01898 (12021016) AT (309880.70, 6252357.00) DC	207.	30.36464 (12011313) AT (310237.80, 6252153.00) DC
168.	30.97713 (12012914) AT (309981.00, 6252207.00) DC	208.	30.34577 (12041516) AT (309855.20, 6252451.00) DC
169.	30.95867 (12102816) AT (309855.20, 6252451.00) DC	209.	30.31901 (12112916) AT (309880.70, 6252357.00) DC
170.	30.95410 (12092714) AT (310237.80, 6252153.00) DC	210.	30.27539 (12123116) AT (309855.20, 6252451.00) DC
171.	30.94347 (12092615) AT (309855.20, 6252451.00) DC	211.	30.27502 (12110917) AT (309855.20, 6252451.00) DC
172.	30.94117 (12011718) AT (309880.70, 6252357.00) DC	212.	30.26774 (12010312) AT (309981.00, 6252207.00) DC
173.	30.93799 (12110815) AT (309855.20, 6252451.00) DC	213.	30.26675 (12012116) AT (309855.20, 6252451.00) DC
174.	30.92564 (12102817) AT (309855.20, 6252451.00) DC	214.	30.26369 (12091212) AT (309981.00, 6252207.00) DC
175.	30.82917 (12103114) AT (309880.70, 6252357.00) DC	215.	30.22963 (12012515) AT (309981.00, 6252207.00) DC
176.	30.82204 (12110715) AT (309855.20, 6252451.00) DC	216.	30.21792 (12101916) AT (309855.20, 6252451.00) DC
177.	30.76070 (12021414) AT (309855.20, 6252451.00) DC	217.	30.15785 (12112114) AT (310237.80, 6252153.00) DC
178.	30.75978 (12030110) AT (310422.80, 6252142.00) DC	218.	30.13058 (12122214) AT (309880.70, 6252357.00) DC
179.	30.75547 (12031415) AT (309855.20, 6252451.00) DC	219.	30.12796 (12120817) AT (309855.20, 6252451.00) DC
180.	30.75000 (12032716) AT (309880.70, 6252357.00) DC	220.	30.12164 (12120113) AT (310422.80, 6252142.00) DC
181.	30.74923 (12031414) AT (309855.20, 6252451.00) DC	221.	30.10339 (12120716) AT (309981.00, 6252207.00) DC
182.	30.74836 (12031517) AT (309880.70, 6252357.00) DC	222.	30.06856 (12101813) AT (309981.00, 6252207.00) DC
183.	30.73030 (12111413) AT (309855.20, 6252451.00) DC	223.	30.06780 (12110417) AT (309855.20, 6252451.00) DC
184.	30.72769 (12021714) AT (309880.70, 6252357.00) DC	224.	30.03559 (12012016) AT (309855.20, 6252451.00) DC
185.	30.68935 (12113017) AT (309855.20, 6252451.00) DC	225.	30.01713 (12121615) AT (309855.20, 6252451.00) DC
186.	30.65852 (12012014) AT (309855.20, 6252451.00) DC	226.	29.98795 (12030117) AT (310237.80, 6252153.00) DC
187.	30.64876 (12101810) AT (309981.00, 6252207.00) DC	227.	29.98189 (12022617) AT (309880.70, 6252357.00) DC
188.	30.64625 (12110414) AT (309880.70, 6252357.00) DC	228.	29.97608 (12040614) AT (310237.80, 6252153.00) DC
189.	30.63346 (12121315) AT (309880.70, 6252357.00) DC	229.	29.95028 (12101814) AT (309981.00, 6252207.00) DC
190.	30.62621 (12112612) AT (309880.70, 6252357.00) DC	230.	29.91218 (12112416) AT (309880.70, 6252357.00) DC
191.	30.59570 (12110115) AT (310422.80, 6252142.00) DC	231.	29.90898 (12123112) AT (310237.80, 6252153.00) DC
192.	30.58798 (12021416) AT (309855.20, 6252451.00) DC	232.	29.90107 (12092610) AT (310237.80, 6252153.00) DC
193.	30.58695 (12100614) AT (309855.20, 6252451.00) DC	233.	29.88689 (12101417) AT (309855.20, 6252451.00) DC
194.	30.57238 (12111217) AT (309981.00, 6252207.00) DC	234.	29.88004 (12011717) AT (309855.20, 6252451.00) DC
195.	30.55752 (12101807) AT (309855.20, 6252451.00) DC	235.	29.85411 (12032809) AT (309855.20, 6252451.00) DC
196.	30.52482 (12110617) AT (309855.20, 6252451.00) DC	236.	29.82829 (12011616) AT (309880.70, 6252357.00) DC
197.	30.52080 (12122716) AT (309855.20, 6252451.00) DC	237.	29.81407 (12032115) AT (310237.80, 6252153.00) DC
198.	30.50703 (12111814) AT (309981.00, 6252207.00) DC	238.	29.80453 (12110909) AT (310237.80, 6252153.00) DC
199.	30.45464 (12122417) AT (309855.20, 6252451.00) DC	239.	29.79549 (12091616) AT (309855.20, 6252451.00) DC
200.	30.45176 (12081513) AT (310422.80, 6252142.00) DC	240.	29.75670 (12092512) AT (309880.70, 6252357.00) DC

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**MODELOPTs: NonDEFAULT CONC FLAT NOCHKD

*** THE MAXIMUM 999 1-HR AVERAGE CONCENTRATION VALUES FOR SOURCE GROUP: GP01 ***
 INCLUDING SOURCE(S): VISY01R , VISY02R ,

** CONC OF NO2 IN MICROGRAMSPERCUBICMETRE **

RANK TYPE	CONC (YYMMDDHH) AT	RECEPTOR (XR,YR) OF TYPE	RANK	CONC (YYMMDDHH) AT	RECEPTOR (XR,YR) OF
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241.	29.74653 (12111412) AT (309855.20, 6252451.00) DC	281.	29.18332 (12040515) AT (309855.20, 6252451.00) DC
242.	29.73392 (12042314) AT (310237.80, 6252153.00) DC	282.	29.17748 (12022717) AT (309855.20, 6252451.00) DC
243.	29.71676 (12022509) AT (310237.80, 6252153.00) DC	283.	29.15659 (12092813) AT (310422.80, 6252142.00) DC
244.	29.70988 (12101812) AT (309981.00, 6252207.00) DC	284.	29.14688 (12022313) AT (310422.80, 6252142.00) DC
245.	29.68482 (12122317) AT (309880.70, 6252357.00) DC	285.	29.13865 (12122316) AT (309855.20, 6252451.00) DC
246.	29.68398 (12121317) AT (309880.70, 6252357.00) DC	286.	29.13811 (12010714) AT (309880.70, 6252357.00) DC
247.	29.66771 (12032617) AT (309880.70, 6252357.00) DC	287.	29.11939 (12092612) AT (309981.00, 6252207.00) DC
248.	29.66195 (12010518) AT (309855.20, 6252451.00) DC	288.	29.11377 (12122715) AT (309855.20, 6252451.00) DC
249.	29.61926 (12052510) AT (310422.80, 6252142.00) DC	289.	29.06832 (12011715) AT (309880.70, 6252357.00) DC
250.	29.56949 (12021014) AT (309855.20, 6252451.00) DC	290.	29.06147 (12092614) AT (309880.70, 6252357.00) DC
251.	29.56461 (12010818) AT (309981.00, 6252207.00) DC	291.	29.04846 (12031116) AT (309855.20, 6252451.00) DC
252.	29.56418 (12010715) AT (309855.20, 6252451.00) DC	292.	29.00988 (12101915) AT (309855.20, 6252451.00) DC
253.	29.54605 (12100608) AT (309855.20, 6252451.00) DC	293.	28.97585 (12040411) AT (309880.70, 6252357.00) DC
254.	29.53721 (12071313) AT (310422.80, 6252142.00) DC	294.	28.95572 (12052514) AT (310422.80, 6252142.00) DC
255.	29.52603 (12122812) AT (310237.80, 6252153.00) DC	295.	28.95543 (12032714) AT (309981.00, 6252207.00) DC
256.	29.52048 (12102617) AT (309855.20, 6252451.00) DC	296.	28.94143 (12010215) AT (309880.70, 6252357.00) DC
257.	29.49189 (12010316) AT (309855.20, 6252451.00) DC	297.	28.93762 (12022517) AT (309855.20, 6252451.00) DC
258.	29.49141 (12010116) AT (309855.20, 6252451.00) DC	298.	28.93322 (12110817) AT (309855.20, 6252451.00) DC
259.	29.47498 (12010214) AT (309880.70, 6252357.00) DC	299.	28.93232 (12102411) AT (310237.80, 6252153.00) DC
260.	29.44424 (12020917) AT (309855.20, 6252451.00) DC	300.	28.92772 (12010911) AT (309880.70, 6252357.00) DC
261.	29.43826 (12091216) AT (309855.20, 6252451.00) DC	301.	28.87166 (12110608) AT (309855.20, 6252451.00) DC
262.	29.43720 (12111415) AT (309855.20, 6252451.00) DC	302.	28.85865 (12011314) AT (310237.80, 6252153.00) DC
263.	29.43578 (12121815) AT (309855.20, 6252451.00) DC	303.	28.82107 (12011716) AT (309855.20, 6252451.00) DC
264.	29.43056 (12011315) AT (309855.20, 6252451.00) DC	304.	28.81747 (12112915) AT (309855.20, 6252451.00) DC
265.	29.38723 (12103113) AT (309880.70, 6252357.00) DC	305.	28.79722 (12022316) AT (309855.20, 6252451.00) DC
266.	29.38643 (12111215) AT (309855.20, 6252451.00) DC	306.	28.74705 (12020517) AT (309855.20, 6252451.00) DC
267.	29.37578 (12122113) AT (309855.20, 6252451.00) DC	307.	28.73454 (12120813) AT (309855.20, 6252451.00) DC
268.	29.37293 (12092616) AT (309855.20, 6252451.00) DC	308.	28.73277 (12021513) AT (309855.20, 6252451.00) DC
269.	29.37084 (12112814) AT (309880.70, 6252357.00) DC	309.	28.73004 (12102514) AT (309855.20, 6252451.00) DC
270.	29.36506 (12021715) AT (309855.20, 6252451.00) DC	310.	28.68052 (12110413) AT (309855.20, 6252451.00) DC
271.	29.35118 (12032017) AT (309855.20, 6252451.00) DC	311.	28.67423 (12092014) AT (309855.20, 6252451.00) DC
272.	29.32556 (12030412) AT (310237.80, 6252153.00) DC	312.	28.66276 (12021017) AT (309981.00, 6252207.00) DC
273.	29.31613 (12122416) AT (309855.20, 6252451.00) DC	313.	28.63290 (12042814) AT (310422.80, 6252142.00) DC
274.	29.28263 (12071716) AT (310422.80, 6252142.00) DC	314.	28.61358 (12091215) AT (309981.00, 6252207.00) DC
275.	29.23663 (12020916) AT (309855.20, 6252451.00) DC	315.	28.60617 (12040416) AT (309855.20, 6252451.00) DC
276.	29.23084 (12020813) AT (309855.20, 6252451.00) DC	316.	28.57254 (12102916) AT (309880.70, 6252357.00) DC
277.	29.22738 (12012913) AT (309981.00, 6252207.00) DC	317.	28.54986 (12010215) AT (309855.20, 6252451.00) DC
278.	29.19236 (12033015) AT (309855.20, 6252451.00) DC	318.	28.52730 (12120117) AT (309855.20, 6252451.00) DC
279.	29.18869 (12010216) AT (309880.70, 6252357.00) DC	319.	28.50979 (12061414) AT (310657.70, 6252113.00) DC
280.	29.18750 (12022517) AT (309880.70, 6252357.00) DC	320.	28.50958 (12012317) AT (309855.20, 6252451.00) DC

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**MODELOPTS: NonDEFAULT CONC FLAT NOCHKD

*** THE MAXIMUM 999 1-HR AVERAGE CONCENTRATION VALUES FOR SOURCE GROUP: GP01 ***
INCLUDING SOURCE(S): VISY01R , VISY02R ,

** CONC OF NO2 IN MICROGRAMSPERCUBICMETRE **

RANK TYPE	CONC (YYMMDDHH) AT	RECEPTOR (XR,YR) OF TYPE	RANK	CONC (YYMMDDHH) AT	RECEPTOR (XR,YR) OF
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321.	28.50502 (12010718) AT (309880.70, 6252357.00) DC	361.	27.93545 (12020415) AT (309855.20, 6252451.00) DC
322.	28.47381 (12122417) AT (309880.70, 6252357.00) DC	362.	27.92593 (12040513) AT (309981.00, 6252207.00) DC
323.	28.46547 (12121814) AT (309855.20, 6252451.00) DC	363.	27.91274 (12121311) AT (310237.80, 6252153.00) DC
324.	28.46457 (12121812) AT (309855.20, 6252451.00) DC	364.	27.90557 (12012617) AT (309855.20, 6252451.00) DC
325.	28.45685 (12012114) AT (309855.20, 6252451.00) DC	365.	27.88228 (12120110) AT (310237.80, 6252153.00) DC
326.	28.45530 (12101917) AT (309855.20, 6252451.00) DC	366.	27.87636 (12021512) AT (309855.20, 6252451.00) DC
327.	28.43662 (12011713) AT (309981.00, 6252207.00) DC	367.	27.87596 (12013012) AT (310422.80, 6252142.00) DC
328.	28.42986 (12122318) AT (309981.00, 6252207.00) DC	368.	27.86957 (12122410) AT (309981.00, 6252207.00) DC
329.	28.42284 (12082313) AT (310422.80, 6252142.00) DC	369.	27.85819 (12011815) AT (309880.70, 6252357.00) DC
330.	28.41014 (12012318) AT (309855.20, 6252451.00) DC	370.	27.85621 (12101313) AT (309880.70, 6252357.00) DC
331.	28.36799 (12031217) AT (309855.20, 6252451.00) DC	371.	27.85312 (12040514) AT (309855.20, 6252451.00) DC
332.	28.32187 (12010817) AT (309981.00, 6252207.00) DC	372.	27.85188 (12032812) AT (309880.70, 6252357.00) DC
333.	28.31635 (12013011) AT (310237.80, 6252153.00) DC	373.	27.80676 (12030317) AT (309981.00, 6252207.00) DC

334.	28.30180 (12100215) AT (309880.70, 6252357.00) DC	374.	27.80322 (12110615) AT (309855.20, 6252451.00) DC
335.	28.30082 (12010313) AT (309880.70, 6252357.00) DC	375.	27.79566 (12012911) AT (309981.00, 6252207.00) DC
336.	28.28238 (12102916) AT (309855.20, 6252451.00) DC	376.	27.79242 (12010116) AT (309880.70, 6252357.00) DC
337.	28.26837 (12112815) AT (309855.20, 6252451.00) DC	377.	27.74283 (12052312) AT (310657.70, 6252113.00) DC
338.	28.26370 (12010718) AT (309855.20, 6252451.00) DC	378.	27.73880 (12022612) AT (310422.80, 6252142.00) DC
339.	28.26348 (12122409) AT (309981.00, 6252207.00) DC	379.	27.73402 (12122312) AT (309855.20, 6252451.00) DC
340.	28.26060 (12103013) AT (309855.20, 6252451.00) DC	380.	27.70773 (12041613) AT (309855.20, 6252451.00) DC
341.	28.24538 (12112412) AT (309981.00, 6252207.00) DC	381.	27.67256 (12101808) AT (309880.70, 6252357.00) DC
342.	28.23617 (12031516) AT (309855.20, 6252451.00) DC	382.	27.65096 (12100609) AT (309855.20, 6252451.00) DC
343.	28.21682 (12112517) AT (309855.20, 6252451.00) DC	383.	27.64111 (12121909) AT (309880.70, 6252357.00) DC
344.	28.18008 (12103115) AT (309855.20, 6252451.00) DC	384.	27.63671 (12011816) AT (309855.20, 6252451.00) DC
345.	28.14096 (12082716) AT (309855.20, 6252451.00) DC	385.	27.61426 (12092314) AT (310422.80, 6252142.00) DC
346.	28.13429 (12032712) AT (309981.00, 6252207.00) DC	386.	27.61072 (12100212) AT (309855.20, 6252451.00) DC
347.	28.09918 (12010311) AT (309981.00, 6252207.00) DC	387.	27.60512 (12021617) AT (309981.00, 6252207.00) DC
348.	28.05269 (12100215) AT (309855.20, 6252451.00) DC	388.	27.57400 (12021015) AT (309880.70, 6252357.00) DC
349.	28.04707 (12121910) AT (309981.00, 6252207.00) DC	389.	27.55680 (12011616) AT (309855.20, 6252451.00) DC
350.	28.02946 (12012817) AT (309855.20, 6252451.00) DC	390.	27.55458 (12112416) AT (309855.20, 6252451.00) DC
351.	28.02776 (12061413) AT (310422.80, 6252142.00) DC	391.	27.53980 (12103116) AT (309855.20, 6252451.00) DC
352.	28.02190 (12012818) AT (309855.20, 6252451.00) DC	392.	27.52329 (12031117) AT (309855.20, 6252451.00) DC
353.	28.02113 (12102314) AT (309855.20, 6252451.00) DC	393.	27.51297 (12121416) AT (309880.70, 6252357.00) DC
354.	27.99762 (12042311) AT (310422.80, 6252142.00) DC	394.	27.49985 (12040813) AT (309981.00, 6252207.00) DC
355.	27.99453 (12091615) AT (309855.20, 6252451.00) DC	395.	27.48588 (12060415) AT (310657.70, 6252113.00) DC
356.	27.95068 (12111214) AT (309981.00, 6252207.00) DC	396.	27.48512 (12122316) AT (309880.70, 6252357.00) DC
357.	27.94454 (12111213) AT (310237.80, 6252153.00) DC	397.	27.48412 (12101617) AT (310657.70, 6252113.00) DC
358.	27.94438 (12052515) AT (310422.80, 6252142.00) DC	398.	27.47905 (12020416) AT (309880.70, 6252357.00) DC
359.	27.94168 (12052511) AT (310422.80, 6252142.00) DC	399.	27.45700 (12103113) AT (309855.20, 6252451.00) DC
360.	27.93969 (12081712) AT (310237.80, 6252153.00) DC	400.	27.44649 (12012917) AT (309880.70, 6252357.00) DC

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**MODELOPTS: NonDEFAULT CONC FLAT NOCHKD

*** THE MAXIMUM 999 1-HR AVERAGE CONCENTRATION VALUES FOR SOURCE GROUP: GP01 ***
INCLUDING SOURCE(S): VISY01R , VISY02R ,

** CONC OF NO2 IN MICROGRAMSPERCUBICMETRE **

RANK TYPE	CONC (YYMMDDHH) AT	RECEPTOR (XR,YR) OF TYPE	RANK	CONC (YYMMDDHH) AT	RECEPTOR (XR,YR) OF
401.	27.44195 (12012117) AT (309855.20, 6252451.00) DC		441.	26.84642 (12020912) AT (309855.20, 6252451.00) DC	
402.	27.41554 (12122212) AT (309981.00, 6252207.00) DC		442.	26.84199 (12071412) AT (310657.70, 6252113.00) DC	
403.	27.40691 (12092616) AT (309880.70, 6252357.00) DC		443.	26.82837 (12032110) AT (310422.80, 6252142.00) DC	
404.	27.37756 (12021914) AT (309855.20, 6252451.00) DC		444.	26.79819 (12101513) AT (310422.80, 6252142.00) DC	
405.	27.37233 (12103013) AT (309880.70, 6252357.00) DC		445.	26.79322 (12040414) AT (309981.00, 6252207.00) DC	
406.	27.36621 (12120114) AT (310422.80, 6252142.00) DC		446.	26.79210 (12110114) AT (310422.80, 6252142.00) DC	
407.	27.33317 (12101815) AT (309981.00, 6252207.00) DC		447.	26.79157 (12031413) AT (309855.20, 6252451.00) DC	
408.	27.28524 (12012315) AT (309855.20, 6252451.00) DC		448.	26.78218 (12010412) AT (310237.80, 6252153.00) DC	
409.	27.28330 (12092609) AT (310237.80, 6252153.00) DC		449.	26.78035 (12031215) AT (309855.20, 6252451.00) DC	
410.	27.27895 (12020416) AT (309855.20, 6252451.00) DC		450.	26.77286 (12092817) AT (310657.70, 6252113.00) DC	
411.	27.23808 (12012316) AT (309855.20, 6252451.00) DC		451.	26.76071 (12121913) AT (309981.00, 6252207.00) DC	
412.	27.23231 (12121814) AT (309880.70, 6252357.00) DC		452.	26.72859 (12092115) AT (309880.70, 6252357.00) DC	
413.	27.22171 (12110512) AT (309855.20, 6252451.00) DC		453.	26.72089 (12031115) AT (309855.20, 6252451.00) DC	
414.	27.21965 (12030109) AT (310657.70, 6252113.00) DC		454.	26.71793 (12031515) AT (309855.20, 6252451.00) DC	
415.	27.21492 (12122317) AT (309855.20, 6252451.00) DC		455.	26.70966 (12021611) AT (310422.80, 6252142.00) DC	
416.	27.20282 (12052212) AT (310657.70, 6252113.00) DC		456.	26.67154 (12110414) AT (309855.20, 6252451.00) DC	
417.	27.17017 (12071111) AT (310422.80, 6252142.00) DC		457.	26.66486 (12102115) AT (310657.70, 6252113.00) DC	
418.	27.16358 (12092613) AT (309981.00, 6252207.00) DC		458.	26.65708 (12060510) AT (310657.70, 6252113.00) DC	
419.	27.14651 (12011716) AT (309880.70, 6252357.00) DC		459.	26.64890 (12030413) AT (310237.80, 6252153.00) DC	
420.	27.14512 (12013017) AT (310422.80, 6252142.00) DC		460.	26.59542 (12091214) AT (309981.00, 6252207.00) DC	
421.	27.08319 (12031614) AT (310422.80, 6252142.00) DC		461.	26.56838 (12021713) AT (309981.00, 6252207.00) DC	
422.	27.07421 (12090914) AT (309880.70, 6252357.00) DC		462.	26.56715 (12082213) AT (310657.70, 6252113.00) DC	
423.	27.06841 (12021716) AT (309855.20, 6252451.00) DC		463.	26.56605 (12010716) AT (309880.70, 6252357.00) DC	
424.	27.06535 (12103017) AT (309880.70, 6252357.00) DC		464.	26.56104 (12121413) AT (309855.20, 6252451.00) DC	
425.	27.05432 (12022514) AT (310237.80, 6252153.00) DC		465.	26.55181 (12122914) AT (309855.20, 6252451.00) DC	
426.	27.04741 (12101415) AT (309855.20, 6252451.00) DC		466.	26.54147 (12033113) AT (310657.70, 6252113.00) DC	
427.	27.04614 (12092808) AT (310237.80, 6252153.00) DC		467.	26.54070 (12111715) AT (309855.20, 6252451.00) DC	
428.	27.01525 (12122115) AT (309855.20, 6252451.00) DC		468.	26.52786 (12011108) AT (310657.70, 6252113.00) DC	
429.	26.99699 (12122918) AT (309855.20, 6252451.00) DC		469.	26.51757 (12092115) AT (309855.20, 6252451.00) DC	

430.	26.96429 (12040516) AT (309855.20, 6252451.00) DC	470.	26.51717 (12011817) AT (309855.20, 6252451.00) DC
431.	26.96068 (12032117) AT (310237.80, 6252153.00) DC	471.	26.50529 (12040615) AT (310237.80, 6252153.00) DC
432.	26.95819 (12010318) AT (309981.00, 6252207.00) DC	472.	26.50514 (12110112) AT (310657.70, 6252113.00) DC
433.	26.92594 (12112516) AT (309855.20, 6252451.00) DC	473.	26.48555 (12103014) AT (309880.70, 6252357.00) DC
434.	26.91744 (12040116) AT (309855.20, 6252451.00) DC	474.	26.46758 (12092110) AT (310657.70, 6252113.00) DC
435.	26.87345 (12052608) AT (310657.70, 6252113.00) DC	475.	26.44481 (12100507) AT (310657.70, 6252113.00) DC
436.	26.87301 (12102114) AT (310237.80, 6252153.00) DC	476.	26.43820 (12031213) AT (309855.20, 6252451.00) DC
437.	26.87102 (12060413) AT (310657.70, 6252113.00) DC	477.	26.43796 (12010112) AT (310237.80, 6252153.00) DC
438.	26.86740 (12012616) AT (309855.20, 6252451.00) DC	478.	26.41944 (12062215) AT (310657.70, 6252113.00) DC
439.	26.85468 (12110517) AT (309855.20, 6252451.00) DC	479.	26.41869 (12122714) AT (309880.70, 6252357.00) DC
440.	26.85104 (12122913) AT (309855.20, 6252451.00) DC	480.	26.41199 (12121817) AT (309855.20, 6252451.00) DC

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 *** AERMET - VERSION 12345 *** *** Benbo-AERMOD Project April 2015

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**MODELOPTs: NonDEFAULT CONC FLAT NOCHKD

*** THE MAXIMUM 999 1-HR AVERAGE CONCENTRATION VALUES FOR SOURCE GROUP: GP01 ***
 INCLUDING SOURCE(S): VISY01R , VISY02R ,

** CONC OF NO2 IN MICROGRAMSPERCUBICMETRE **

RANK	CONC (YYMMDDHH) AT	RECEPTOR (XR,YR) OF TYPE	RANK	CONC (YYMMDDHH) AT	RECEPTOR (XR,YR) OF
TYPE					

481.	26.39849 (12121811) AT (309855.20, 6252451.00) DC	521.	25.88069 (12122116) AT (309855.20, 6252451.00) DC
482.	26.39425 (12022614) AT (309855.20, 6252451.00) DC	522.	25.85372 (12070915) AT (309981.00, 6252207.00) DC
483.	26.38084 (12110116) AT (310657.70, 6252113.00) DC	523.	25.84737 (12010113) AT (310237.80, 6252153.00) DC
484.	26.36022 (12012513) AT (309855.20, 6252451.00) DC	524.	25.82364 (12011814) AT (309855.20, 6252451.00) DC
485.	26.35663 (12011414) AT (309855.20, 6252451.00) DC	525.	25.81228 (12062211) AT (310657.70, 6252113.00) DC
486.	26.34930 (12092715) AT (310237.80, 6252153.00) DC	526.	25.80762 (12072515) AT (310237.80, 6252153.00) DC
487.	26.34757 (12072616) AT (310422.80, 6252142.00) DC	527.	25.80393 (12100315) AT (310657.70, 6252113.00) DC
488.	26.34358 (12040511) AT (310237.80, 6252153.00) DC	528.	25.79960 (12041313) AT (310657.70, 6252113.00) DC
489.	26.33765 (12101416) AT (309855.20, 6252451.00) DC	529.	25.77679 (12121811) AT (309880.70, 6252357.00) DC
490.	26.32450 (12091016) AT (309880.70, 6252357.00) DC	530.	25.75256 (12012414) AT (309855.20, 6252451.00) DC
491.	26.28697 (12030315) AT (309981.00, 6252207.00) DC	531.	25.74920 (12091613) AT (310422.80, 6252142.00) DC
492.	26.25669 (12103012) AT (309855.20, 6252451.00) DC	532.	25.74366 (12021315) AT (309855.20, 6252451.00) DC
493.	26.24957 (12031615) AT (310422.80, 6252142.00) DC	533.	25.74299 (12031315) AT (309880.70, 6252357.00) DC
494.	26.24132 (12101613) AT (310657.70, 6252113.00) DC	534.	25.68978 (12012111) AT (310237.80, 6252153.00) DC
495.	26.23764 (12010715) AT (309880.70, 6252357.00) DC	535.	25.68818 (12102913) AT (309981.00, 6252207.00) DC
496.	26.23757 (12012311) AT (309855.20, 6252451.00) DC	536.	25.67789 (12031214) AT (309855.20, 6252451.00) DC
497.	26.22375 (12093008) AT (310657.70, 6252113.00) DC	537.	25.67186 (12061415) AT (310657.70, 6252113.00) DC
498.	26.18037 (12032716) AT (309855.20, 6252451.00) DC	538.	25.62523 (12090310) AT (310657.70, 6252113.00) DC
499.	26.16115 (12091610) AT (310657.70, 6252113.00) DC	539.	25.62237 (12040216) AT (309855.20, 6252451.00) DC
500.	26.15957 (12022317) AT (309855.20, 6252451.00) DC	540.	25.50881 (12082312) AT (310422.80, 6252142.00) DC
501.	26.14729 (12100411) AT (310657.70, 6252113.00) DC	541.	25.50208 (12122914) AT (309880.70, 6252357.00) DC
502.	26.14541 (12100413) AT (310657.70, 6252113.00) DC	542.	25.47469 (12032817) AT (309855.20, 6252451.00) DC
503.	26.14422 (12122117) AT (309855.20, 6252451.00) DC	543.	25.46004 (12112413) AT (309981.00, 6252207.00) DC
504.	26.14358 (12012415) AT (309855.20, 6252451.00) DC	544.	25.45793 (12032811) AT (309855.20, 6252451.00) DC
505.	26.13439 (12032409) AT (310657.70, 6252113.00) DC	545.	25.41234 (12031515) AT (309880.70, 6252357.00) DC
506.	26.12910 (12050913) AT (310657.70, 6252113.00) DC	546.	25.36453 (12110910) AT (310657.70, 6252113.00) DC
507.	26.12847 (12080813) AT (310657.70, 6252113.00) DC	547.	25.34104 (12022713) AT (309981.00, 6252207.00) DC
508.	26.12510 (12022715) AT (309855.20, 6252451.00) DC	548.	25.29925 (12100311) AT (310657.70, 6252113.00) DC
509.	26.08896 (12101816) AT (309880.70, 6252357.00) DC	549.	25.29118 (12031415) AT (309880.70, 6252357.00) DC
510.	26.03317 (12121417) AT (309855.20, 6252451.00) DC	550.	25.29036 (12013016) AT (310422.80, 6252142.00) DC
511.	26.01759 (12111816) AT (309880.70, 6252357.00) DC	551.	25.28549 (12012017) AT (309855.20, 6252451.00) DC
512.	26.01651 (12112814) AT (309855.20, 6252451.00) DC	552.	25.28118 (12111113) AT (309855.20, 6252451.00) DC
513.	26.00252 (12091813) AT (309855.20, 6252451.00) DC	553.	25.26562 (12112315) AT (309855.20, 6252451.00) DC
514.	26.00027 (12111112) AT (309855.20, 6252451.00) DC	554.	25.25748 (12081511) AT (310657.70, 6252113.00) DC
515.	25.94303 (12080815) AT (310657.70, 6252113.00) DC	555.	25.23471 (12092712) AT (310657.70, 6252113.00) DC
516.	25.92775 (12081810) AT (310657.70, 6252113.00) DC	556.	25.21686 (12122917) AT (309855.20, 6252451.00) DC
517.	25.92635 (12011413) AT (309855.20, 6252451.00) DC	557.	25.20057 (12050315) AT (310422.80, 6252142.00) DC
518.	25.90114 (12021417) AT (309855.20, 6252451.00) DC	558.	25.19196 (12123115) AT (309855.20, 6252451.00) DC
519.	25.88620 (12032408) AT (310657.70, 6252113.00) DC	559.	25.18488 (12021615) AT (310237.80, 6252153.00) DC
520.	25.88584 (12111215) AT (309880.70, 6252357.00) DC	560.	25.17335 (12122114) AT (309855.20, 6252451.00) DC

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 *** AERMET - VERSION 12345 *** *** Benbo-AERMOD Project April 2015

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 *** 21:32:47

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**MODELOPTs: NonDEFAULT CONC FLAT NOCHKD

*** THE MAXIMUM 999 1-HR AVERAGE CONCENTRATION VALUES FOR SOURCE GROUP: GP01 ***
 INCLUDING SOURCE(S): VISY01R , VISY02R ,

** CONC OF NO2 IN MICROGRAMSPERCUBICMETRE **

RANK TYPE	CONC (YYMMDDHH) AT	RECEPTOR (XR,YR) OF TYPE	RANK	CONC (YYMMDDHH) AT	RECEPTOR (XR,YR) OF
561.	25.16012 (12072615) AT (310422.80, 6252142.00)	DC	601.	24.51653 (12052509) AT (310237.80, 6252153.00)	DC
562.	25.15707 (12042016) AT (309855.20, 6252451.00)	DC	602.	24.51318 (12091612) AT (310422.80, 6252142.00)	DC
563.	25.14754 (12100217) AT (309855.20, 6252451.00)	DC	603.	24.50978 (12121318) AT (309855.20, 6252451.00)	DC
564.	25.14343 (12032615) AT (309855.20, 6252451.00)	DC	604.	24.50908 (12122712) AT (309855.20, 6252451.00)	DC
565.	25.12301 (12122915) AT (309855.20, 6252451.00)	DC	605.	24.48766 (12052610) AT (310657.70, 6252113.00)	DC
566.	25.12093 (12082715) AT (309855.20, 6252451.00)	DC	606.	24.48736 (12100613) AT (309855.20, 6252451.00)	DC
567.	25.09916 (12042009) AT (310422.80, 6252142.00)	DC	607.	24.43337 (12082109) AT (310657.70, 6252113.00)	DC
568.	25.08127 (12072513) AT (310657.70, 6252113.00)	DC	608.	24.41129 (12122713) AT (309880.70, 6252357.00)	DC
569.	25.06965 (12041515) AT (309855.20, 6252451.00)	DC	609.	24.41069 (12121218) AT (309880.70, 6252357.00)	DC
570.	25.04748 (12032116) AT (310237.80, 6252153.00)	DC	610.	24.40926 (12060509) AT (310657.70, 6252113.00)	DC
571.	25.02490 (12040710) AT (310657.70, 6252113.00)	DC	611.	24.39811 (12030316) AT (309880.70, 6252357.00)	DC
572.	25.02106 (12082212) AT (310422.80, 6252142.00)	DC	612.	24.39795 (12092313) AT (310657.70, 6252113.00)	DC
573.	25.01510 (12092909) AT (310657.70, 6252113.00)	DC	613.	24.38125 (12092315) AT (310422.80, 6252142.00)	DC
574.	24.97423 (12072514) AT (310237.80, 6252153.00)	DC	614.	24.37647 (12111114) AT (309855.20, 6252451.00)	DC
575.	24.96440 (12091311) AT (310657.70, 6252113.00)	DC	615.	24.36640 (12122415) AT (309855.20, 6252451.00)	DC
576.	24.96030 (12112112) AT (310237.80, 6252153.00)	DC	616.	24.34272 (12010415) AT (310657.70, 6252113.00)	DC
577.	24.93155 (12021913) AT (309855.20, 6252451.00)	DC	617.	24.33521 (12011318) AT (309880.70, 6252357.00)	DC
578.	24.92916 (12022812) AT (310657.70, 6252113.00)	DC	618.	24.32827 (12011111) AT (310657.70, 6252113.00)	DC
579.	24.92130 (12082712) AT (310657.70, 6252113.00)	DC	619.	24.29628 (12112611) AT (309880.70, 6252357.00)	DC
580.	24.92103 (12010114) AT (309855.20, 6252451.00)	DC	620.	24.29620 (12051308) AT (310657.70, 6252113.00)	DC
581.	24.91951 (12020516) AT (309855.20, 6252451.00)	DC	621.	24.28003 (12031114) AT (309880.70, 6252357.00)	DC
582.	24.88088 (12080512) AT (310657.70, 6252113.00)	DC	622.	24.24648 (12120817) AT (309880.70, 6252357.00)	DC
583.	24.87288 (12121911) AT (309981.00, 6252207.00)	DC	623.	24.23729 (12022311) AT (310657.70, 6252113.00)	DC
584.	24.86424 (12031613) AT (310657.70, 6252113.00)	DC	624.	24.21835 (12110511) AT (309880.70, 6252357.00)	DC
585.	24.85823 (12011617) AT (309880.70, 6252357.00)	DC	625.	24.21740 (12010115) AT (309855.20, 6252451.00)	DC
586.	24.82366 (12032014) AT (309981.00, 6252207.00)	DC	626.	24.21027 (12021014) AT (309880.70, 6252357.00)	DC
587.	24.81450 (12122414) AT (309981.00, 6252207.00)	DC	627.	24.20534 (12101911) AT (310657.70, 6252113.00)	DC
588.	24.78544 (12101114) AT (310422.80, 6252142.00)	DC	628.	24.20077 (12111813) AT (309981.00, 6252207.00)	DC
589.	24.69841 (12040311) AT (310657.70, 6252113.00)	DC	629.	24.19009 (12012113) AT (309880.70, 6252357.00)	DC
590.	24.64190 (12031113) AT (309855.20, 6252451.00)	DC	630.	24.18121 (12031314) AT (309981.00, 6252207.00)	DC
591.	24.64063 (12101611) AT (310657.70, 6252113.00)	DC	631.	24.16743 (12063012) AT (310657.70, 6252113.00)	DC
592.	24.61145 (12022815) AT (310657.70, 6252113.00)	DC	632.	24.14935 (12103015) AT (309855.20, 6252451.00)	DC
593.	24.61127 (12021511) AT (309880.70, 6252357.00)	DC	633.	24.14845 (12011312) AT (310422.80, 6252142.00)	DC
594.	24.60338 (12110113) AT (310657.70, 6252113.00)	DC	634.	24.13957 (12072508) AT (310657.70, 6252113.00)	DC
595.	24.59460 (12100814) AT (309855.20, 6252451.00)	DC	635.	24.13905 (12083011) AT (310657.70, 6252113.00)	DC
596.	24.58539 (12011316) AT (309855.20, 6252451.00)	DC	636.	24.13538 (12092012) AT (309855.20, 6252451.00)	DC
597.	24.58416 (12031214) AT (309880.70, 6252357.00)	DC	637.	24.11649 (12091014) AT (310422.80, 6252142.00)	DC
598.	24.55769 (12121614) AT (310422.80, 6252142.00)	DC	638.	24.09576 (12011717) AT (309880.70, 6252357.00)	DC
599.	24.54139 (12082016) AT (309880.70, 6252357.00)	DC	639.	24.08877 (12082310) AT (310657.70, 6252113.00)	DC
600.	24.52734 (12102613) AT (309981.00, 6252207.00)	DC	640.	24.08033 (12100312) AT (310657.70, 6252113.00)	DC

SMITHFIELD PACKAGE BOILER REINSTATEMENT

ATTACHMENT S-2

Noise Impact Assessment Report (April 2015)

**NOISE IMPACT ASSESSMENT
REPORT
BUILD RUN REPAIR PTY LTD
Visy Paper, Herbert St, Smithfield NSW**

Prepared for: John Crosher, Build Run Repair Pty Ltd
Julia Beck, Project Consultant, Visy Paper

Prepared by: Daniele Albanese, Senior Acoustical Engineer
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Report No: 141108_NIA_Rev5A
April 2015
(Released: 27 April 2015)



Benbow
ENVIRONMENTAL

Engineering a Sustainable Future for Our Environment

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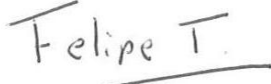
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Felipe Torres	Senior Acoustical Engineer		27 April 2015
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Attachments

- Attachment 1: Glossary of Noise Terminology
- Attachment 2: Fan, Silencer and Lagging/Sound Enclosure Acoustic Data





1. INTRODUCTION

Benbow Environmental has been engaged by Build Run Repair Pty Ltd on behalf of Visy Paper Smithfield to prepare a noise impact assessment for the proposed Boiler House at the site located at 6 Herbert Place, Smithfield as part of the proposed modification under Section 75W of the Environment Planning and Assessment Act 1979. This noise report will form part of the Environmental Assessment.

This version of the Noise Impact Assessment (NIA) applies to the planned installation and operation of two 30 MW natural gas fired water tube boilers. The previous version of the NIA applied to three 20 MW boilers.

The site is located within the industrial area of Smithfield. The nearest sensitive residential receptors were noted as being approximately 400 metres south of the site boundary. Noise predictions were undertaken utilising the noise modelling software, SoundPLAN (v7.3).

This assessment has been carried out in accordance with the following relevant guidelines and documents:

- *NSW Environment Protection Authority Industrial Noise Policy (EPA 2000)* ;
- *Holroyd Development Control Plan 2013 Part D: Industrial Controls*; and
- *Protection of the Environment Operations Act, 1997.*

Reference to other guidelines and Australian Standards has been made throughout the report.

NSW EPA has requested that adverse weather data be assessed based on use of Sydney Olympic Park weather data. This has led to the need to assess enhanced noise levels due to the presence of temperature inversions.

1.1 SCOPE OF WORKS

This noise impact assessment has been limited to the following scope of works:

- a) Site inspection and review of proposed site operations;
- b) Review of the existing Environment Protection Licence (ref. 4100) and establishment of project specific noise levels;
- c) Determine all potential noise sources associated with the proposed boiler house operations;
- d) Collection of required noise source data;
- e) Predict potential noise impacts at the nearest potentially affected receptors to the site;
- f) Assess potential noise impacts against relevant legislation and guidelines;
- g) Investigate ameliorative measures/control solutions (where required); and
- h) The compilation of this report containing concise statements of potential noise impact.

To aid in the review of this report, supporting documentation has been included within the Attachments.

2. SITE IDENTIFICATION

2.1 SITE LOCATION

The subject site is located on the following parcels of land:

- Lot 2 in DP 849480 – 2 Herbert Place, Smithfield;
- Lot 34 in DP 850596 – 6 Herbert Place, Smithfield;
- Lot 12 in DP 808195 – 158-160 McCredie Road, Smithfield.

The proposed development will be located on Lot 34 DP 850596 – 6 Herbert Place, Smithfield.

The site location is shown in Figure 2-1 and the location of the proposed boiler house is displayed in Figure 2-2.

Figure 2-1: Site Location



Figure 2-2: Proposed Boiler House Location



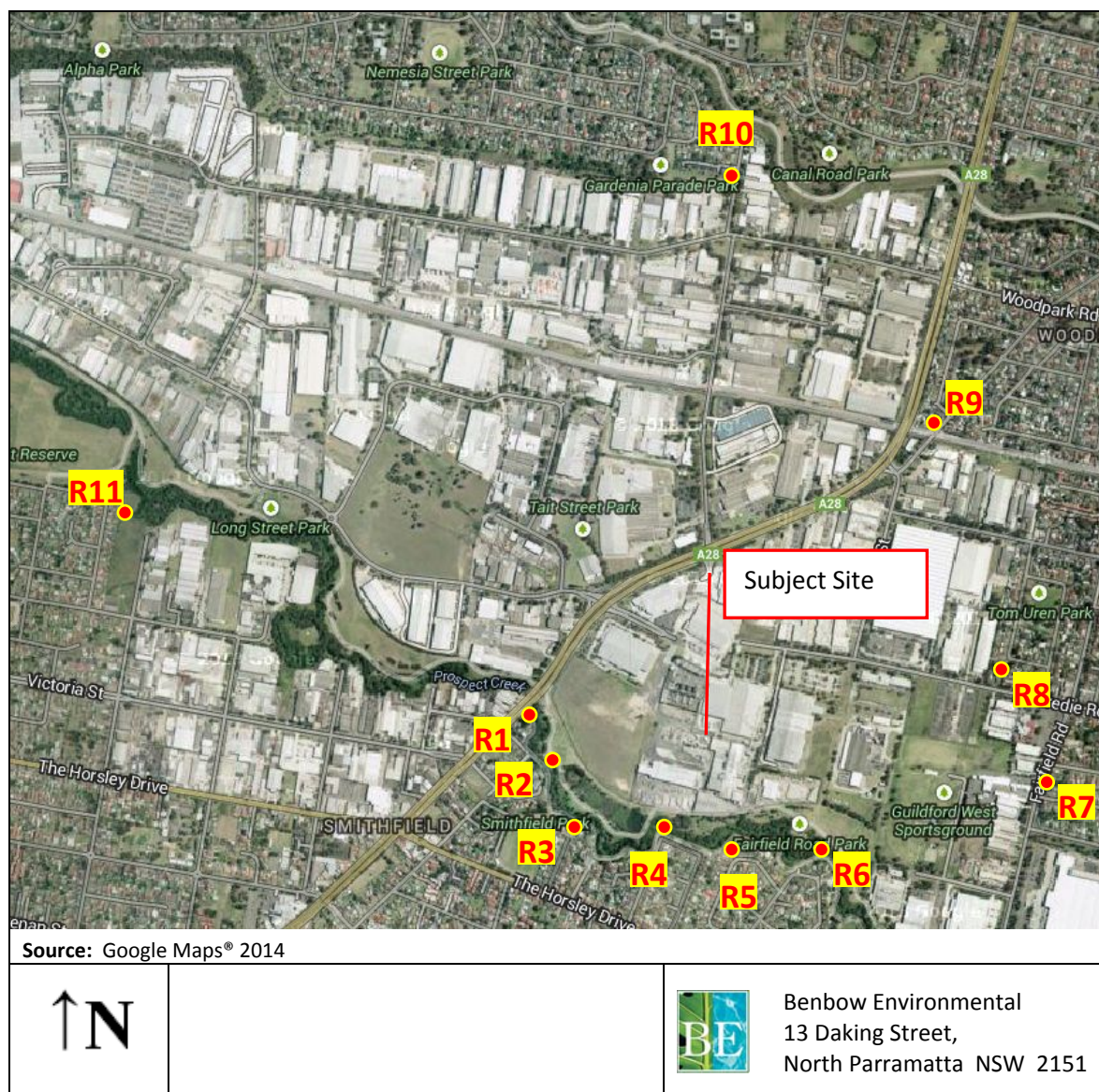
3. NEAREST SENSITIVE RECEPTORS

The nearest sensitive receptors are listed in Table 3-1 and their location is shown in Figure 3-1. These receptors are considered to represent the primary receptors likely to be affected by noise emissions associated with the proposed development.

Table 3-1: Nearest Sensitive Receptors

Receptors	Address	Approximate Distance to Proposed Development (m)	Direction	Description
R1	6 Low Street, Smithfield	447	W	Residential
R2	12 Kiola Street, Smithfield	425	WSW	Residential
R3	20 Vineyard Avenue, Smithfield	407	SW	Residential
R4	31 Chisholm Street, Smithfield	310	S	Residential
R5	44 Solo Crescent, Smithfield	336	SSE	Residential
R6	124 Granville Street, Fairfield	494	SE	Residential
R7	126 Fairfield Road, Guilford West	1006	ESE	Residential
R8	127 McCredie Road, Guilford West	848	ENE	Residential
R9	79 Warren Road, Woodpark	1079	NE	Residential
R10	9 Magnolia Street, Greystanes	1564	N	Residential
R11	17 Rhondda Street, Smithfield	1727	NW	Residential

Figure 3-1: Nearest Sensitive Residential Receptors



4. NOISE ASSESSMENT CRITERIA

4.1 NSW EPA ENVIRONMENT PROTECTION LICENCE

The noise emissions from the existing on-site operations are required to satisfy specific NSW EPA requirements, as outlined in the site's Environment Protection Licence (Licence n.4100, Anniversary Date: 18 September). The following conditions apply:

"L4 Noise limits

L4.1 Noise from the premises must not exceed:

- a) an LA10 (15 minute) noise emission criteria of 53 dB(A) 7.00am to 10pm seven days a week;
- and
- b) at all other times an LA10 (15 minute) noise emission criteria of 43 dB(A);

when measured or computed at any point within one metre of any residential boundary at Cooper Crescent, Solo Crescent, Granville Street and Alt Street, Fairfield.

L4.2 Noise from the premises must not exceed:

- a) an LA10 (15 minute) noise emission criteria of 51 dB(A) 7.00am to 10pm seven days a week; and
- b) at all other times an LA10 (15 minute) noise emission criteria of 41 dB(A);

when measured or computed at any point within one metre of any residential boundary at Kiola Street, Fairfield.

L4.3 Noise from the premises must not exceed:

- a) an LA10 (15 minute) noise emission criteria of 70 dB(A) 7.00am to 10pm seven days a week; and
- b) at all other times an LA10 (15 minute) noise emission criteria of 65 dB(A);

when measured or computed at any point within one metre of the western plant boundary.

L4.4 5dB(A) must be added to the measured noise levels if the noise is substantially tonal or impulsive in character."

4.2 APPLICABLE NOISE CRITERIA

The proposed development is intended to be designed so that the noise emissions associated with the development would not increase the current overall noise emissions from the site.

In order to achieve this requirement the noise criteria is set at 10 dB lower than the criteria specified in the NSW EPA Environment Protection Licence n. 4100 applicable for the site.

The applicable noise criteria are presented in the following Table 4-1.

Table 4-1: Applicable Noise Criteria

Receptors	Noise Criteria as per EPL n.4100		Applicable Noise Criteria	
	L _{A10} (15 minute)		L _{A10} (15 minute)	
	Day and Evening	Night	Day and Evening	Night
R1, R2 and R3	51	41	41	31
R4, R5, R6, R6, R7, R8, R9, R10, R11	53	43	43	33
Western Boundary	70	65	60	55

Note: Day is defined as 7:00am to 6:00pm, Monday to Saturday and 8:00am to 6:00pm Sundays and Public Holidays.
Evening is defined as 6:00pm to 10:00pm, Monday to Saturday, Sundays and Public Holidays.
Night is defined as 10:00pm to 7:00am Monday to Saturday and 10:00pm to 8:00am Sundays and Public Holidays.

5. NOISE IMPACT ASSESSMENT

An outline of the predictive noise modelling methodology and operating scenarios is provided below.

5.1 NOISE MODELLING

Predictive Noise Modelling was implemented by using the Concawe algorithm within SoundPLAN v7.3. This model has been extensively utilised by Benbow Environmental for assessing noise emissions for existing and proposed developments, and it is recognised by regulatory authorities throughout Australia. The model allows for the prediction of noise from a site, at the specified receptor, by calculating the individual contribution of each noise source.

The noise sources as well as the topographical features of the subject area and receptor locations, were all input into the noise model to determine the noise emissions of the proposed development at the nearest potentially affected residences. Based on inspection, the local topography for the area appears to be consistent with levels as printed on the topographic map. On-site structures were included in the model to account for shielding provided by the walls of the existing buildings.

The modelling scenario has been carried out using the L_{Aeq} descriptor. Given that the noise emissions associated with the proposed development would be constant in nature, the L_{Aeq} noise descriptor has been considered equivalent to the L_{A10} noise descriptor. Using this descriptor, noise emission levels were predicted at the nearest potentially affected sensitive receptors to determine the noise impact against the project specific noise levels and other relevant noise criteria in accordance with the NSW EPA Industrial Noise Policy.

It has to be noted that the $L_{10(15 \text{ minute})}$ noise descriptor is no longer utilised to assess the noise emission from an industrial site. With the introduction of the NSW EPA Industrial Noise Policy, the $L_{10(15 \text{ minute})}$ noise descriptor was replaced with the $L_{eq(15 \text{ minute})}$.

5.1.1 Noise Sources

The sound power levels for the identified noise sources associated with the operational activities have been calculated from measurements of sound pressure levels undertaken by the principal consultant from Benbow Environmental during operations at similar facilities.

Additional acoustic data were provided by the manufacturer of the proposed boiler.

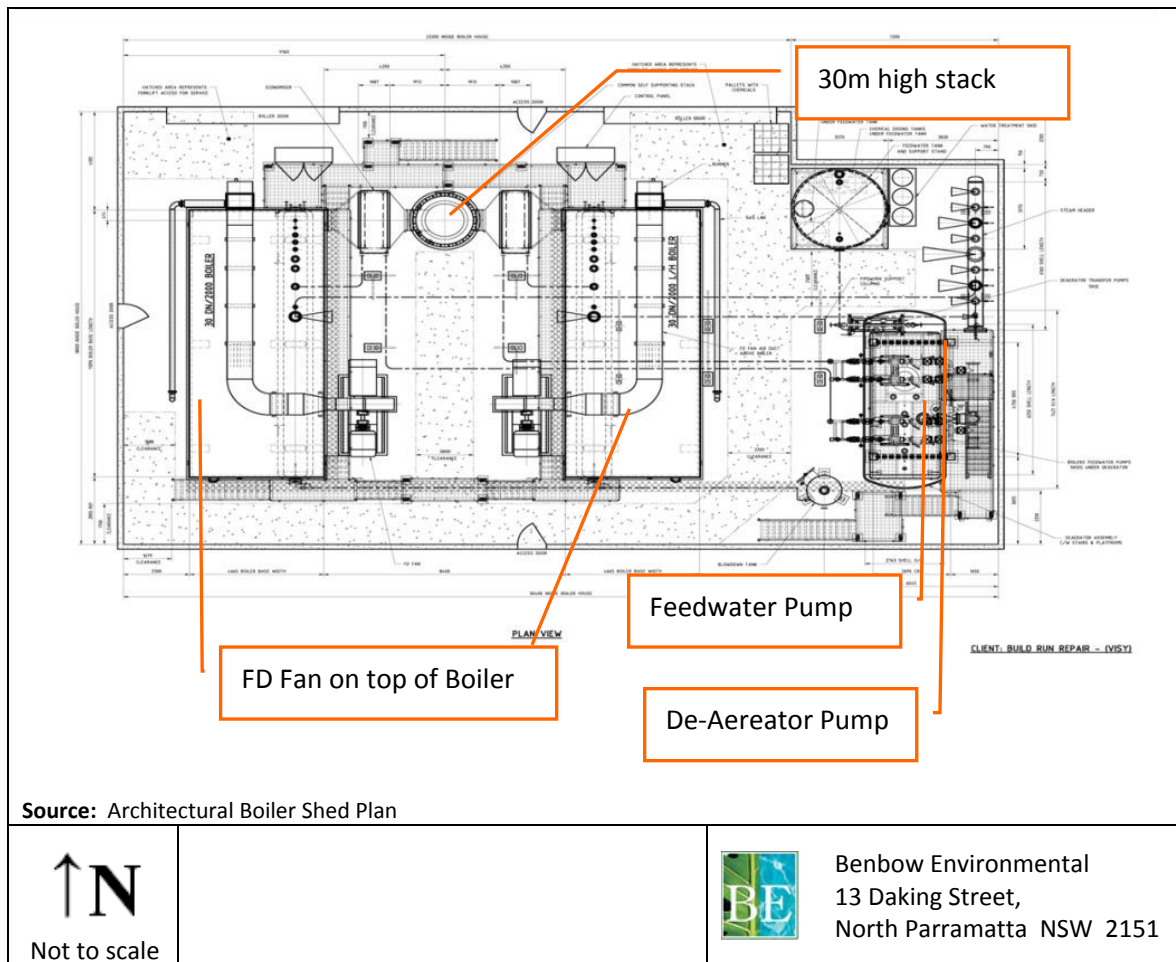
A-weighted third octave band centre frequency sound power levels have been used and are presented in Table 5-1 below. The noise sources utilised as part of this assessment comprise the primary noise generating activities associated with the effective operation of the proposed development.

The table also presents information on the assumed height of the acoustical centre of the noise source and sound power level, expressed in dB(A), for the noise sources associated with the proposed development.

Table 5-1: Sound Power Levels Associated with the Primary Noise Sources, dB(A)

Noise Source	Height [m]	Lmax	Overall	63Hz	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz	8kHz
Stack Outlet and in-duct	30	118	118	77	92	101	113	112	112	110	105
Fan-Casing	4	105	105	73	85	91	100	98	99	97	91
Feedwater Pump	1	88.5	88.5	76	73	73	80	85	81	79	75
De-aerator Transfer Pump	1	88.5	88.5	76	73	73	80	85	81	79	75
Duct Breakout	8 to 30	102	102	70	82	88	97	95	96	94	88

Figure 5-1: Operational Noise Source Locations



5.1.2 Meteorological Factors

Wind and temperature inversions may affect the noise emission from the site and these need to be assessed when they are considered to be a feature of the area.

This section of the report presents the analysis undertaken on the 2013 weather data in order to establish whether wind and temperature inversions are features of the area.

5.1.2.1 Wind Effects

Wind is considered to be a feature where source-to-receptor wind speeds (at 10 m above ground) of 3 m/s or below occur for 30% or more of the time in any assessment period in any season.

The meteorological data was obtained from the weather station operated by the Bureau of Meteorology (BoM) located at Sydney Olympic Park (Station No. 066212).

Seasonal wind rose plots for the site-representative meteorological file have been included in the following, based on the BoM data received.

Based on the wind rose analysis source-to receptor wind speeds of 3 m/s or below are present for less than 30% of the time, wind effects have not been considered in the assessment.

Figure 5-2, Figure 5-3 and Figure 5-4 show the wind roses plot for the year 2013 at the abovementioned weather station for daytime, evening time and night time respectively.

Figure 5-2: Wind Rose Plots for the Referenced Meteorological Station – Bureau of Meteorology Sydney Olympic Park (2013) – Day time

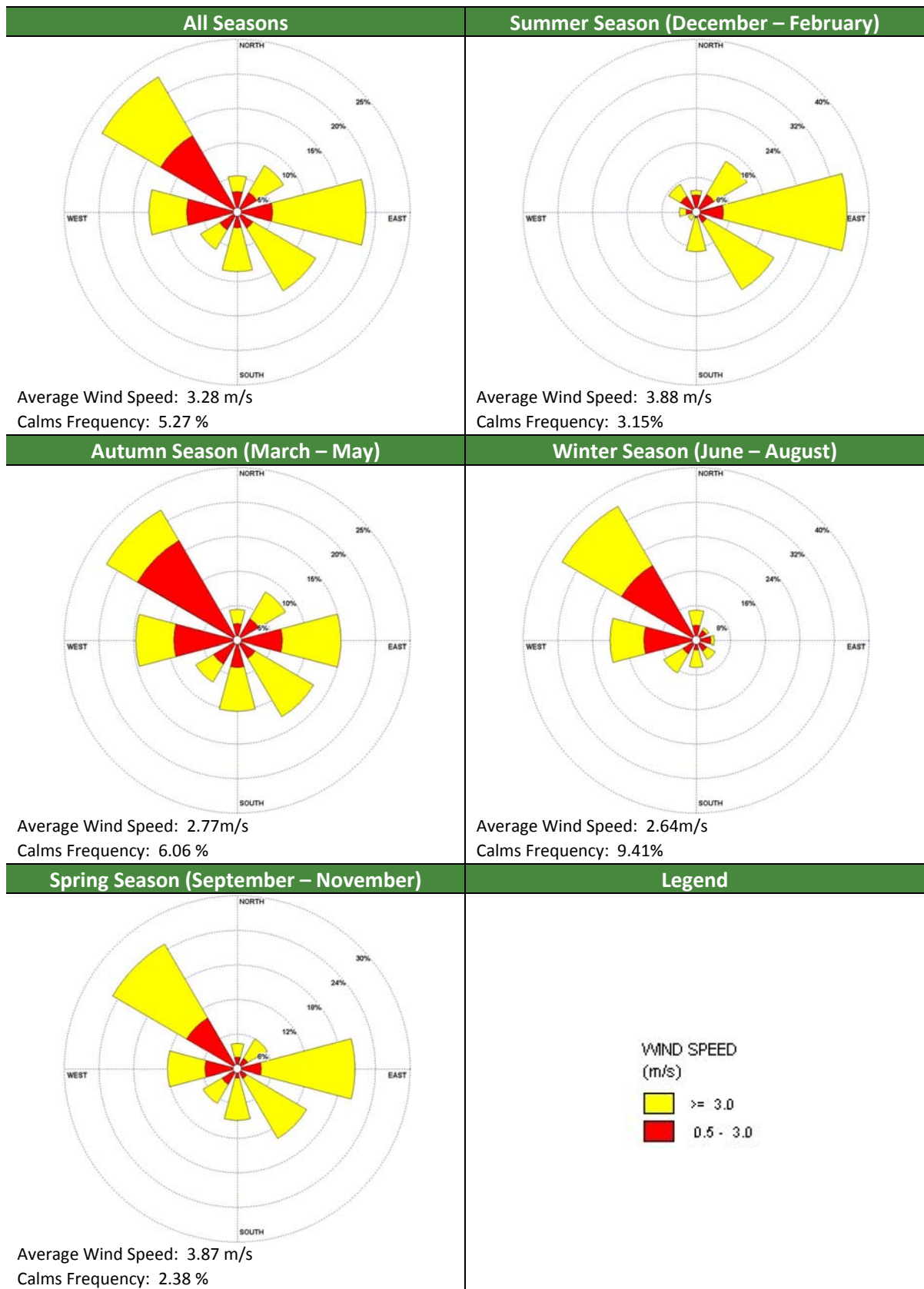


Figure 5-3: Wind Rose Plots for the Referenced Meteorological Station – Bureau of Meteorology Sydney Olympic Park (2013) – Evening Time

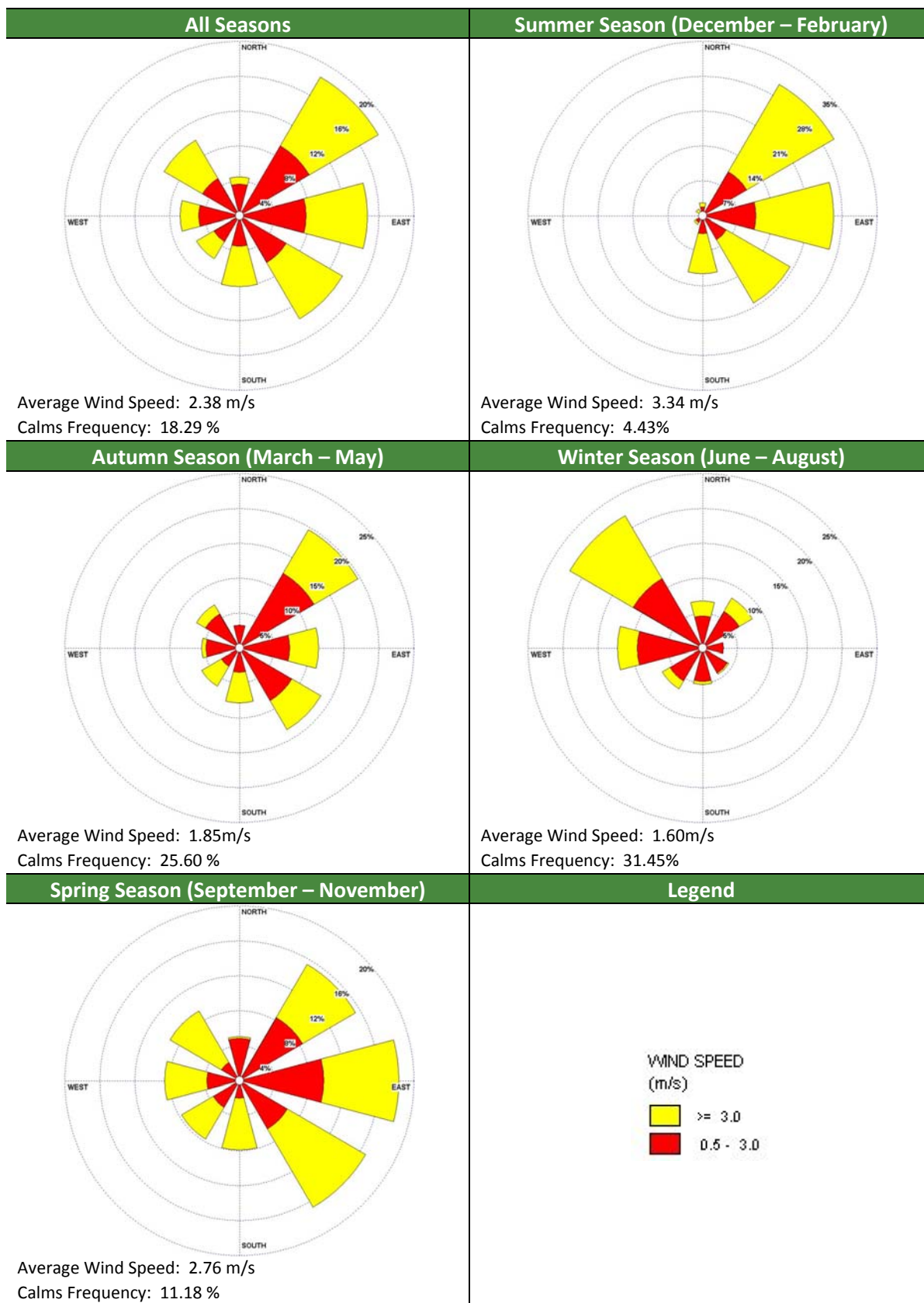
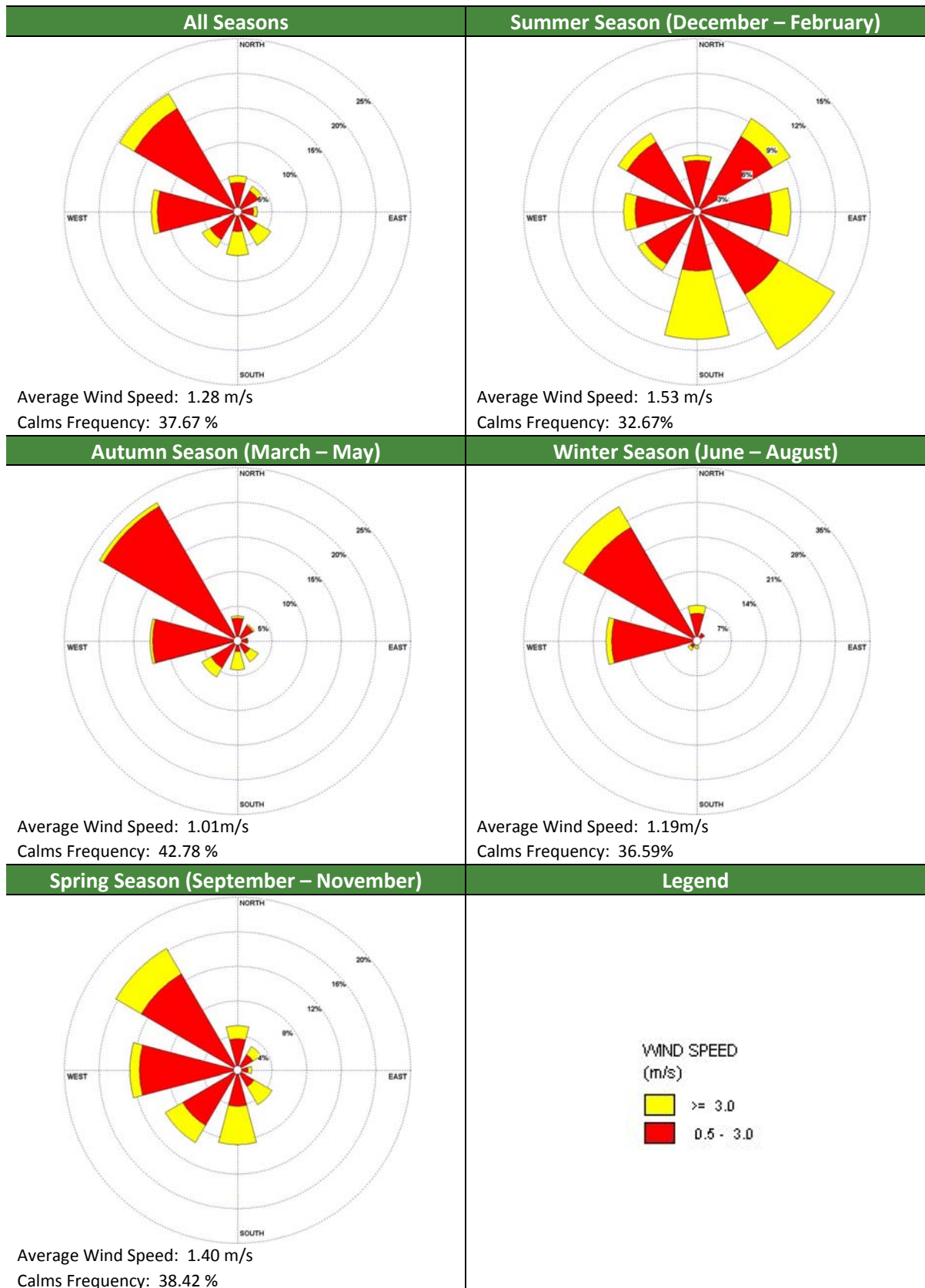


Figure 5-4: Wind Rose Plots for the Referenced Meteorological Station – Bureau of Meteorology Sydney Olympic Park (2013) – Night Time



5.1.2.2 Temperature Inversion

Temperature inversion is considered a feature where this occurs more than 30% of the nights in winter.

Temperature inversion conditions would be best associated with F-class stability conditions – generally associated with still/light winds and clear skies during the night time or early morning period (these are referred to as stable atmospheric conditions).

The analysis conducted on the 2013 weather data highlighted that during winter **34.7%** of the nights presented temperature inversion conditions, therefore more than 30% of the nights in winter. Temperature inversion effects are to be considered in the noise impact assessment as per NSW EPA INP.

5.1.2.3 Weather Conditions Considered in the Assessment

The following condition was considered:

- Condition A: Neutral weather conditions.
- Condition B: Adverse weather conditions – Temperature inversion.

The meteorological condition considered in the noise model has been displayed in detail in Table 5-2 below.

Table 5-2: Meteorological Conditions Assessed in Noise Propagation Modelling

Condition	Classification	Ambient Temp.	Ambient Humidity	Wind Speed	Wind Direction (blowing from)	Temperature Inversion	Affected Receptors	Applicability
A	Neutral	10 °C	70%	–	–	–	All	All periods
B	Temperature Inversion	10 °C	70%	2 m/s	Source to receiver	Yes 3°C/100m	All	Night time

5.2 MODELLING SCENARIOS

Operational scenarios were configured to provide an assessment of maximum operations for the proposed facility. The scenario was established for the model to provide an accurate estimate of potential noise impacts at the aforementioned residential, industrial and other noise sensitive receptors under the proposed maximum operating conditions.

The following scenarios were implemented:

Scenario 1 – Boiler house operating at full capacity – No noise controls applied.

Scenario 2 – Boiler house operating at full capacity – Silencers mounted at stack inlet.

Scenario 3 – Boiler house operating at full capacity – Silencer mounted at stack inlet and lagging/sound enclosure built on fan casing.

All scenarios were implemented based on the assumption listed as follows.

5.2.1 Modelling Assumptions

The assumptions used for the predictive noise model are based on maximum operational procedures typical for this type of facility.

The following assumptions were applied to the model:

- The boiler house is operational 24/7;
- Noise generating activities were assessed over a 15 minute assessment period;
- Boiler shed is constructed of the following materials:
 - ▶ Ground: concrete
 - ▶ Walls: 0.42 mm BMT Colorbond Monoclad
 - ▶ Roof: 0.42 mm BMT Colorbond Monoclad
- Three roller shutter doors located on the southern facade of the boiler shed – 7.4 m x 6 m motorised industrial roller shutters with powder coat finish;
- Two public access doors made of 920 mm solid core, located on the northern and eastern facades of the boiler shed;
- The boiler shed is free of gaps or imperfections that would reduce the insulation properties of the shed;
- Fan type: S-RNN8B/630/200/1 (data provided in Attachment 2); Data has been adjusted considering an increase in the air flow supplied by the fan necessary for combustion.
- Silencer: Rectangular attenuator 454 L=1200 W=325 (data provided in Attachment 2);
- Lagging/sound enclosures SL2 (100mm, 1.5mm steel) (data provided in Attachment 2);
- Stack outlet was modelled as point sources at a height of 30 metres, stack outlet directivity was applied to the point source;
- One stack duct was modelled as industrial buildings at a height from 8 to 30 metres;
- All the noise sources located within the proposed boiler shed were modelled as a point source;
- The SoundPLAN function “Hallout (In>Out)” was utilised to calculate the noise breakout through the proposed boiler shed;
- A ground factor equal to zero (0) was utilised for the ground surfaces on site. This represents a totally reflecting surface (e.g. concrete).
- A ground factor equal to 0.5 was utilised for the modelling of the grassed areas on site and off site (Ground factor = 1 indicates “Grass”, ground factor =0 indicates hard surfaces (e.g. concrete)).
- All other areas were modelled by using a ground factor of zero (0).

5.3 MODELLING RESULTS

Noise emissions from the proposed facility have been predicted utilising a conservative approach, assuming all equipment and machinery operate simultaneously over the 15 minute assessment period.

The predicted noise levels at the considered residential locations for the above operational scenarios are displayed in Table 5-3, Table 5-4 and Table 5-5.

Table 5-3: Noise Modelling Results – Scenario 1 – No Noise Controls – $L_{Aeq}(15 \text{ minute})$

Receptors	Applicable Noise Criteria		Predicted Noise Levels		Compliance ( yes -  no)	
	$L_{Aeq} (15 \text{ minute})$		Condition A	Condition B	Day and Evening	Night
	Day and Evening	Night	Day, Evening and Night	Day, Evening and Night		
R1	41	31	51	54		
R2	41	31	52	55		
R3	41	31	53	56		
R4	43	33	55	59		
R5	43	33	54	58		
R6	43	33	51	56		
R7	43	33	43	49		
R8	43	33	46	52		
R9	43	33	43	49		
R10	43	33	39	46		
R11	43	33	38	44		
Western Boundary	60	55	52	57		

Table 5-4: Noise Modelling Results – Scenario 2 – Silencer at stack inlet - $L_{Aeq}(15 \text{ minute})$

Receptors	Applicable Noise Criteria		Predicted Noise Levels		Compliance ( yes -  no)	
	$L_{Aeq} (15 \text{ minute})$		Condition A	Condition B	Day and Evening	Night
	Day and Evening	Night	Day, Evening and Night	Day, Evening and Night		
R1	41	31	36	40		
R2	41	31	37	41		
R3	41	31	38	41		
R4	43	33	37	41		
R5	43	33	35	39		
R6	43	33	34	39		
R7	43	33	27	34		
R8	43	33	30	35		
R9	43	33	26	32		
R10	43	33	23	30		
R11	43	33	23	30		
Western Boundary	60	55	35	40		

Table 5-5: Noise Modelling Results – Scenario 3 – Silencer at stack inlet and Lagging/ Noise enclosure at fan casing

Receptors	Applicable Noise Criteria		Predicted Noise Levels		Compliance ( yes -  no)	
	L _{Aeq} (15 minute)		Condition A	Condition B		
	Day and Evening	Night	Day, Evening and Night	Day, Evening and Night	Day and Evening	Night
R1	41	31	27	30		
R2	41	31	27	31		
R3	41	31	28	31		
R4	43	33	30	33		
R5	43	33	27	31		
R6	43	33	27	31		
R7	43	33	20	25		
R8	43	33	22	27		
R9	43	33	19	24		
R10	43	33	16	21		
R11	43	33	15	20		
Western Boundary	60	55	28	32		

Comments:

Noise levels associated with the proposed boiler house were predicted to exceed the project specific noise levels at all the considered receptors during day, evening and night-time when no noise control measures are implemented. This scenario was modelled as Scenario 1.

The installation of a silencer at the duct's inlet would significantly reduce the noise emissions. However, based on the modelling results (Scenario 2), the noise reduction would not be sufficient to achieve compliance with the PSNL at all the considered receptors.

Compliance with the PSNL was predicted at all the receptor after implementing a lagging/noise enclosure of the fan casings (Scenario 3).



6. RECOMMENDATIONS AND CONCLUSION

Benbow Environmental has been engaged by Build Run Repair Pty Ltd on behalf of Visy Paper Smithfield to prepare a noise impact assessment for the proposed Boiler House at the site located at 6 Herbert Place, Smithfield as part of the proposed modification under Section 75W of the Environment Planning and Assessment Act 1979. This noise report will form part of the Environmental Assessment.

The project specific noise levels were derived from the existing applicable NSW EPA Environment Protection Licence n. 4100.

The proposed development is intended to be designed so that the noise emissions associated with the development would not increase the current overall noise emissions from the Visy Industries site and also the Marubeni site. The basis of the noise controls summarised below is to meet the EPL limits for both Visy Industries and the separate noise limits in the EPL of Marubeni. Therefore both the proposed Visy Boiler House and the Marubeni cogeneration plants are assumed to be operating simultaneously.

In order to achieve this, the project specific noise levels were set at 10 dB lower than the criteria specified in the above mentioned EPL.

Compliance with the project specific noise levels was achieved at all the considered residential receptors only after the implementation of noise control measures.

The recommended noise control measures consist of the following:

- Installation of silencers at the duct inlets; and
- Construction of lagging/sound enclosure of the fan casing.

Details of these noise controls are included in Attachment 2.

In addition, there are several safeguards that are recommended, aimed at reducing potential noise emission issues. These are detailed below.

Maintenance of Equipment:

Mechanical equipment in poor condition will create more noise than well maintained equipment. It is important to ensure that all machinery and ancillary equipment meet the appropriate environmental noise requirements.

Avoid Gaps in Building Structures:

Openings/gaps within the proposed boiler shed walls and roof shall be avoided.
All the openings utilised for ducts or other purposes must be sealed.

Details of sealing materials and techniques will be provided at a later stage of the development prior to the issue of a construction certificate.



This concludes the report.

Prepared by:

A handwritten signature in black ink that reads 'Daniele Albanese'.

Daniele Albanese
Senior Acoustical Engineer

A handwritten signature in black ink that reads 'R T Benbow'.

R T Benbow
Principal Consultant



7. LIMITATIONS

Our services for this project are carried out in accordance with our current professional standards for site assessment investigations. No guarantees are either expressed or implied.

This report has been prepared solely for the use of Build Run Repair Pty Ltd , as per our agreement for providing environmental services. Only Build Run Repair Pty Ltd is entitled to rely upon the findings in the report within the scope of work described in this report. Otherwise, no responsibility is accepted for the use of any part of the report by another in any other context or for any other purpose.

Although all due care has been taken in the preparation of this study, no warranty is given, nor liability accepted (except that otherwise required by law) in relation to any of the information contained within this document. We accept no responsibility for the accuracy of any data or information provided to us by Build Run Repair Pty Ltd for the purposes of preparing this report.

Any opinions and judgements expressed herein, which are based on our understanding and interpretation of current regulatory standards, should not be construed as legal advice.

ATTACHMENTS

Attachment 1: Glossary of Noise Terminology

'A' FREQUENCY WEIGHTING

The 'A' frequency weighting roughly approximates to the Fletcher-Munson 40 phon equal loudness contour. The human loudness perception at various frequencies and sound pressure levels is equated to the level of 40 dB at 1 kHz. The human ear is less sensitive to low frequency sound and very high frequency sound than midrange frequency sound (i.e. 500 Hz to 6 kHz). Humans are most sensitive to midrange frequency sounds, such as a child's scream. Sound level meters have inbuilt frequency weighting networks that very roughly approximates the human loudness response at low sound levels. It should be noted that the human loudness response is not the same as the human annoyance response to sound. Here low frequency sounds can be more annoying than midrange frequency sounds even at very low loudness levels. The 'A' weighting is the most commonly used frequency weighting for occupational and environmental noise assessments. However, for environmental noise assessments, adjustments for the character of the sound will often be required.

AMBIENT NOISE

The ambient noise level at a particular location is the overall environmental noise level caused by all noise sources in the area, both near and far, including all forms of traffic, industry, lawnmowers, wind in foliage, insects, animals, etc. usually assessed as an energy average over a set time period 'T' ($L_{Aeq,T}$).

AUDIBLE

Audible refers to a sound that can be heard. There are a range of audibility grades, varying from "barely audible", "just audible" to "clearly audible" and "prominent".

BACKGROUND NOISE LEVEL

Total silence does not exist in the natural or built-environments, only varying degrees of noise. The Background Noise Level is the minimum repeatable level of noise measured in the absence of the noise under investigation and any other short-term noises such as those caused by all forms of traffic, industry, lawnmowers, wind in foliage, insects, animals, etc.. It is quantified by the noise level that is exceeded for 90 % of the measurement period 'T' ($L_{A90,T}$). Background Noise Levels are often determined for the day, evening and night time periods where relevant. This is done by statistically analysing the range of time period (typically 15 minute) measurements over multiple days (often 7 days). For a 15 minute measurement period the Background Noise Level is set at the quietest level that occurs at 1.5 minutes.

'C' FREQUENCY WEIGHTING

The 'C' frequency weighting approximates the 100 phon equal loudness contour. The human ear frequency response is more linear at high sound levels and the 100 phon equal loudness contour attempts to represent this at various frequencies at sound levels of approximately 100 dB.

DECIBEL

The decibel (dB) is a logarithmic scale that allows a wide range of values to be compressed into a more comprehensible range, typically 0 dB to 120 dB. The decibel is ten times the logarithm of the ratio of any two quantities that relate to the flow of energy (i.e. power). When used in acoustics it is the ratio of square of the sound pressure level to a reference sound pressure level, the ratio of the sound power level to a reference sound power level, or the ratio of the sound intensity level to a reference sound intensity level. See also Sound Pressure Level and Sound Power Level. Noise levels in decibels cannot be added arithmetically since they are logarithmic numbers. If one machine is generating a noise level of 50 dB, and another similar machine is placed beside it, the level will increase to 53 dB (from $10 \log_{10} (10^{(50/10)} + 10^{(50/10)})$) and not 100 dB. In theory, ten similar machines placed side by side will increase the sound level by 10 dB, and one hundred machines increase the sound level by 20 dB. The human ear has a vast sound-sensitivity range of over a thousand billion to one so the logarithmic decibel scale is useful for acoustical assessments.

dBA – See ‘A’ frequency weighting

dBC – See ‘C’ frequency weighting

EQUIVALENT CONTINUOUS SOUND LEVEL, LAeq

Many sounds, such as road traffic noise or construction noise, vary repeatedly in level over a period of time. More sophisticated sound level meters have an integrating/averaging electronic device inbuilt, which will display the energy time-average (equivalent continuous sound level - L_{Aeq}) of the ‘A’ frequency weighted sound pressure level. Because the decibel scale is a logarithmic ratio, the higher noise levels have far more sound energy, and therefore the L_{Aeq} level tends to indicate an average which is strongly influenced by short term, high level noise events. Many studies show that human reaction to level-varying sounds tends to relate closer to the L_{Aeq} noise level than any other descriptor.

‘F’(FAST) TIME WEIGHTING

Sound level meter design-goal time constant which is 0.125 seconds.

FLETCHER–MUNSON EQUAL LOUDNESS CONTOUR CURVES

The Fletcher–Munson curves are one of many sets of equal loudness contours for the human ear, determined experimentally by Harvey Fletcher and Wilden A. Munson, and reported in a 1933 paper entitled "Loudness, its definition, measurement and calculation" in the Journal of the Acoustic Society of America.

FREE FIELD

In acoustics a free field is a measurement area not subject to significant reflection of acoustical energy. A free field measurement is typically not closer than 3.5 metres to any large flat object (other than the ground) such as a fence or wall or inside an anechoic chamber.

FREQUENCY

The number of oscillations or cycles of a wave motion per unit time, the SI unit is the hertz (Hz). 1 Hz is equivalent to one cycle per second. 1000 Hz is 1 kHz.

IMPACT ISOLATION CLASS (IIC)

The American Society for Testing and Materials (ASTM) has specified that the IIC of a floor/ceiling system shall be determined by operating an ISO 140 Standard Tapping Machine on the floor and measuring the noise generated in the room below. The IIC is a number found by fitting a reference curve to the measured octave band levels and then deducting the sound pressure level at 500 Hz from 110 decibels. Thus the higher the IIC, the better the impact sound isolation. Not commonly used in Australia.

'I' (IMPULSE) TIME WEIGHTING

Sound level meter time constant now not in general use. The 'I' (impulse) time weighting is not suitable for rating impulsive sounds with respect to their loudness. It is also not suitable for assessing the risk of hearing impairment or for determining the 'impulsiveness' of a sound.

IMPACT SOUND INSULATION ($L_{nT,w}$)

Australian Standard AS ISO 717.2 – 2004 has specified that the Impact Sound Insulation of a floor/ceiling system be quantified by operating an ISO 140 Standard Tapping Machine on the floor and measuring the noise generated in the room below. The Weighted Standardised Impact Sound Pressure Level ($L_{nT,w}$) is the sound pressure level at 500 Hz for a reference curve fitted to the measured 1/3 octave band levels. Thus the lower $L_{nT,w}$ the better the impact sound insulation.

IMPULSE NOISE

An impulse noise is typified by a sudden rise time and a rapid sound decay, such as a hammer blow, rifle shot or balloon burst.

LOUDNESS

The volume to which a sound is audible to a listener is a subjective term referred to as loudness. Humans generally perceive an approximate doubling of loudness when the sound level increases by about 10 dB and an approximate halving of loudness when the sound level decreases by about 10 dB.

MAXIMUM NOISE LEVEL, LAF_{max}

The root-mean-square (rms) maximum sound pressure level measured with sound level meter using the 'A' frequency weighting and the 'F' (Fast) time weighting. Often used for noise assessments other than aircraft.

MAXIMUM NOISE LEVEL, LAS_{max}

The root-mean-square (rms) maximum sound pressure level measured with sound level meter using the 'A' frequency weighting and the 'S' (Slow) time weighting. Often used for aircraft noise assessments.

NOISE RATING NUMBERS

A set of empirically developed equal loudness curves has been adopted as Australian Standard AS1469-1983. These curves allow the loudness of a noise to be described with a single NR number. The Noise Rating number is that curve which touches the highest level on the measured spectrum of the subject noise. For broadband noise such as fans and engines, the NR number often equals the 'A' frequency weighted dB level minus five.

NOISE

Noise is unwanted, harmful or inharmonious (discordant) sound. Sound is wave motion within matter, be it gaseous, liquid or solid. Noise usually includes vibration as well as sound.

NOISE REDUCTION COEFFICIENT – See: "Sound Absorption Coefficient"

OFFENSIVE NOISE

Reference: Dictionary of the NSW Protection of the Environment Operations Act 1997).
"Offensive Noise means noise:

(a) that, by reason of its level, nature, character or quality, or the time at which it is made, or any other circumstances:

(i) is harmful to (or likely to be harmful to) a person who is outside the premise from which it is emitted, or

(ii) interferes unreasonably with (or is likely to interfere unreasonably with) the comfort or repose of a person who is outside the premises from which it is emitted, or

(b) that is of a level, nature, character or quality prescribed by the regulations or that is made at a time, or in other circumstances prescribed by the regulations."

PINK NOISE

Pink noise is a broadband noise with an equal amount of energy in each octave or third octave band width. Because of this, Pink Noise has more energy at the lower frequencies than White Noise and is used widely for Sound Transmission Loss testing.

REVERBERATION TIME, T₆₀

The time in seconds, after a sound signal has ceased, for the sound level inside a room to decay by 60 dB. The first 5 dB decay is often ignored, because of fluctuations that occur while reverberant sound conditions are being established in the room. The decay time for the next 30 dB is measured and the result doubled to determine the T₆₀. The Early Decay Time (EDT) is the slope of the decay curve in the first 10 dB normalised to 60 dB.

SOUND ABSORPTION COEFFICIENT, α

Sound is absorbed in porous materials by the viscous conversion of sound energy to a small amount of heat energy as the sound waves pass through it. Sound is similarly absorbed by the flexural bending of internally damped panels. The fraction of incident energy that is absorbed is termed the Sound Absorption Coefficient, α . An absorption coefficient of 0.9 indicates that 90 % of the incident sound energy is absorbed. The average α from 250 to 2 kHz is termed the Noise Reduction Coefficient (NRC).

'S' (SLOW) TIME WEIGHTING

Sound level meter design-goal time constant which is 1 second.

SOUND ATTENUATION

A reduction of sound due to distance, enclosure or some other device. If an enclosure is placed around a machine, or an attenuator (muffler or silencer) is fitted to a duct, the noise emission is reduced or attenuated. An enclosure that attenuates the noise level by 20 dB reduces the sound energy by one hundred times.

SOUND EXPOSURE LEVEL (LAE)

Integration (summation) rather than an average of the sound energy over a set time period. Use to assess single noise events such as truck or train pass by or aircraft flyovers. The sound exposure level is related to the energy average ($L_{Aeq, T}$) by the formula $L_{Aeq, T} = L_{AE} - 10 \log_{10} T$. The abbreviation (SEL) is sometimes inconsistently used in place of the symbol (L_{AE}).

SOUND PRESSURE

The rms sound pressure measured in pascals (Pa). A pascal is a unit equivalent to a newton per square metre (N/m^2).

SOUND PRESSURE LEVEL, L_p

The level of sound measured on a sound level meter and expressed in decibels (dB). Where $L_p = 10 \log_{10} (P_a/P_o)^2$ dB (or $20 \log_{10} (P_a/P_o)$ dB) where P_a is the rms sound pressure in Pascal and P_o is a reference sound pressure conventionally chosen is $20 \mu Pa$ (20×10^{-6} Pa) for airborne sound. L_p varies with distance from a noise source.

SOUND POWER

The rms sound power measured in watts (W). The watt is a unit defined as one joule per second. A measures the rate of energy flow, conversion or transfer.

SOUND POWER LEVEL, L_w

The sound power level of a noise source is the inherent noise of the device. Therefore sound power level does not vary with distance from the noise source or with a different acoustic environment. $L_w = L_p + 10 \log_{10} 'a'$ dB, re: 1pW, (10^{-12} watts) where 'a' is the measurement noise-emission area (m^2) in a free field.

SOUND TRANSMISSION CLASS (STC)

An internationally standardised method of rating the sound transmission loss of partition walls to indicate the sound reduction from one side of a partition to the other in the frequency range of 125 Hz to 4000 kHz. (Refer: Australian Standard AS 1276–1979). Now not in general use in Australia see: weighted sound reduction index.

SOUND TRANSMISSION LOSS

The amount in decibels by which a random sound is reduced as it passes through a sound barrier. A method for the measurement of airborne Sound Transmission Loss of a building partition is given in Australian Standard AS1191 - 2002.

STATISTICAL NOISE LEVELS, L_n .

Noise which varies in level over a specific period of time 'T' (standard measurement times are 15 minute periods) may be quantified in terms of various statistical descriptors for example:-

- The noise level, in decibels, exceeded for 1 % of the measurement time period, when 'A' frequency weighted and 'F' time weighted is reference to as L_{AF1} , T. This may be used for describing short-term noise levels such as could cause sleep arousal during the night.
- The noise level, in decibels, exceeded for 10 % of the measurement time period, when 'A' frequency weighted and 'F' time weighted is reference to as L_{AF10} , T. In most countries the L_{AF10} , T is measured over periods of 15 minutes, and is used to describe the average maximum noise level.
- The noise level, in decibels, exceeded for 90 % of the measurement time period, when 'A' frequency weighted and 'F' time weighted is reference to as L_{AF90} , T. In most countries the L_{AF90} , T is measured over periods of 15 minutes, and is used to describe the average minimum or background noise level.

STEADY NOISE

Noise, which varies in level by 6 dB or less, over the period of interest with the time-weighting set to "Fast", is considered to be "steady". (Refer AS 1055.1 1997.)

WEIGHTED SOUND REDUCTION INDEX, R_w

This is a single number rating of the airborne sound insulation of a wall, partition or ceiling. The sound reduction is normally measured over a frequency range of 100 Hz to 3.150 kHz and averaged in accordance with ISO standard weighting curves (Refer AS/NZS 1276.1:1999). Internal partition wall $R_w + C$ ratings are frequency weighted to simulate insulation from human voice noise. The $R_w + C$ is similar in value to the STC rating value. External walls, doors and windows may be $R_w + C_{tr}$ rated to simulate insulation from road traffic noise. The spectrum adaptation term C_{tr} adjustment factor takes account of low frequency noise. The weighted sound reduction index is normally similar or slightly lower number than the STC rating value.

WHITE NOISE

White noise is broadband random noise whose spectral density is constant across its entire frequency range. The sound power is the same for equal bandwidths from low to high frequencies. Because the higher frequency octave bands cover a wider spectrum, white noise has more energy at the higher frequencies and sounds like a hiss.

'Z' FREQUENCY WEIGHTING

The 'Z' (Zero) frequency weighting is 0 dB within the nominal 1/3 octave band frequency range centred on 10 Hz to 20 kHz. This is within the tolerance limits given in AS IEC 61672.1-2004:

'Electroacoustics - Sound level meters – Specifications'.

Attachment 2: Fan, Silencer and Lagging/Sound Enclosure Acoustic Data

Fan speed	2,894 1/min	Flow rate	32,000 m ³ /h
Inlet density	1.200 kg/m ³	Rel.flow rate V/V _{opt}	0.79 -
Inlet pressure	101.360 kPa	Blade frequency	386 Hz
Inlet temperature	20 °C	Fan curve no.:	1

Basic sound	dB	115							
Correction V/V _{opt}	dB	1							
Octave-band	Hz	63	125	250	500	1K	2K	4K	8K
Blade freq.corr.	dB	0	0	0	3	0	0	0	0
Strouhal-number	dB	0.4	0.8	1.6	3.3	6.6	13	26	53
Rel. spectrum	dB	-16	-11	-9	-6	-7	-8	-10	-13
Octave-power-lev.	dB	100	105	107	113	109	108	106	103
A-weighting corr.	dB	-26	-16	-9	-3	0	1	1	-1
Octave-power-level in duct	dB(A)	74	89	98	110	109	109	107	102

with reference to the definitions in DIN 45 635 Part 38 :

Sound power level radiated into duct **115 dB(A) re 10⁻¹² W**
Motor sound power level **88 dB(A) re 10⁻¹² W**

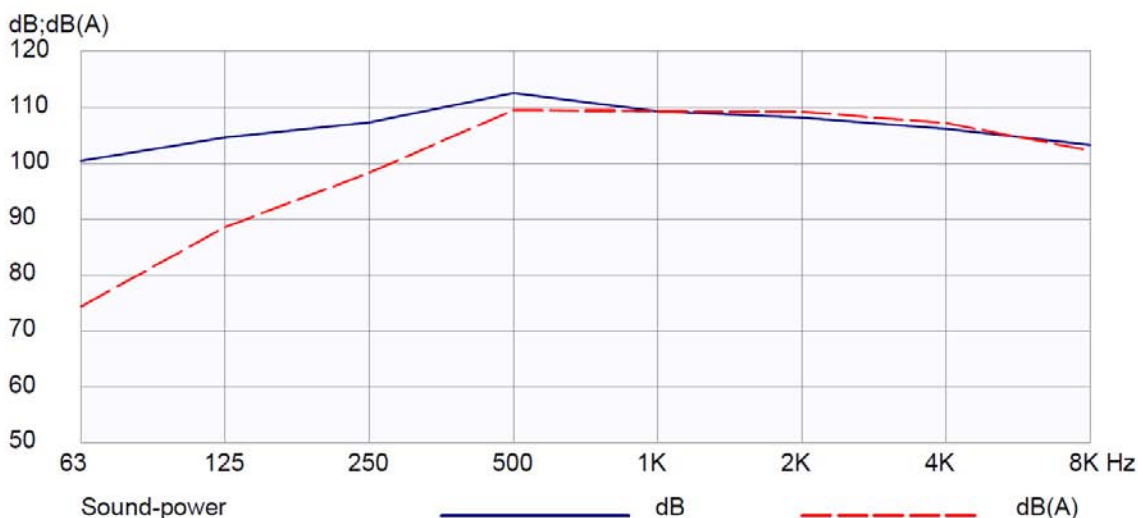
Free inlet/outlet sound power level **115 dB(A) re 10⁻¹² W**
Free inlet/outlet sound pressure level, free field 1m/45° **107 dB(A) re 20 µPa**
Free inlet/outlet sound pressure level, free field 3m/45° **98 dB(A) re 20 µPa**

Casing break-out noise, sound power level ¹⁾ **102(107) dB(A) re 10⁻¹² W**
Casing break-out noise, average sound pres. level, free field 1m **89(94) dB(A) re 20 µPa**
Casing break-out noise, average sound pres. level, free field 3m **82(87) dB(A) re 20 µPa**

△LP to casing breakout noise, free field, 1m owing to el. motor: **0 dB(A) re 20 µPa**

Uncertainty of total levels at undisturbed inlet flow: Standard deviation 4 dB

1) Without noise contribution from motor, ducts, flexible connections, shaft gap etc. which the customer must take responsibility for. Values in brackets for aluminium casing.



Fan type : S-RNN8B/630/800/1

Fan speed	2894 1/min	Flow rate	32000 m3/h
Inlet density	1.200342 kg/m3	Rel.flow rate V/Vopt	.79 -
Inlet pressure	101.36 kPa	Blade frequency	386 Hz
Inlet temperature	20 °C		

Fan	Octavband	Hz	63	125	250	500	1K	2K	4K	8K	Total
Fan-Sound power level radiated into duct			74	89	98	110	109	109	107	102	115 dB(A) re 10 ⁻¹² W
Fan-casing sound power level			70	82	88	97	95	96	94	88	102 dB(A) re 10 ⁻¹² W
Motor sound power level											88 dB(A) re 10 ⁻¹² W

Silencer (inlet) - Rectangular Attenuator 454 L=1200 W=325

Insertion losses silencer	-7	-11	-22	-35	-42	-38	-26	-21			dB(A)
Total Fan-Sound power level in duct	67	78	76	75	67	71	81	81			86 dB(A) re 10 ⁻¹² W
Free inlet sound power level											86 dB(A) re 10 ⁻¹² W
Free inlet sound pressure level, free field 1m/45°											78 dB(A) re 20 µPa
Free inlet sound pressure level, free field 3m/45°											69 dB(A) re 20 µPa
potential nozzle reflection										at diameter 630 mm	0 dB

Lagging/sound enclosures - Sound lagging/insulation SL2 - (100mm, 1.5 mm Steel)

Insertion losses lagging/sound enclosures	-3	-6	-10	-15	-15	-10	-10	-9			dB(A)
Casing break-out noise, sound power level	67	76	78	82	80	86	84	79			91 dB(A) re 10 ⁻¹² W
Casing break-out noise, average sound pressure level, free field 1m ¹⁾											77 dB(A) re 20 µPa
Casing break-out noise, average sound pressure level, free field 3m ¹⁾											70 dB(A) re 20 µPa
Increase of sound level, owing to electric motor											2 dB(A)

1) Without noise contribution from motor, ducts, flexible connections, shaft gap etc. which the customer must take responsibility for.

SMITHFIELD PACKAGE BOILER REINSTATEMENT

ATTACHMENT S-3

Greenhouse Gas Assessment Report (May 2015)

**GREENHOUSE GAS ASSESSMENT
FOR SMITHFIELD BOILERS REINSTATEMENT PROJECT
HERBERT PLACE, SMITHFIELD**

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1. INTRODUCTION

Benbow Environmental were engaged by Build Run Repair Pty Ltd on behalf of Visy Paper Smithfield to undertake a Greenhouse Gas Assessment for the Smithfield Boilers Reinstatement Project at 6 Herbert Place, Smithfield.

The proposal involves the installation and operation of two (2) x 30 MW boilers. The operation of the boilers would be assessed for emissions of greenhouse gases from the boilers operating independent of the Marubeni Energy Plant. This will be compared to the previously proposed installation of three (3) x 20 MW boilers.

The selection of the boiler types has been heavily dependent on the need to use low NO_x emitting burners.

The facility would be required to report GHG emissions under the *National Greenhouse and Energy Reporting Act 2007*, since it exceeds one or more of the facility thresholds noted below under the Act for mandatory reporting. Facility thresholds include:

- 25 kilotonnes (kt) or more of greenhouse gases—carbon dioxide equivalence (CO₂-e)
- production of 100 terajoules (TJ) or more of energy, or
- consumption of 100 TJ or more of energy

The calculations used throughout this report are based on the *GHG Protocol Corporate Standard* and the *National Greenhouse Accounts (NGA) Factors*. The NGA factors are default emission factors provided by the Department of Climate Change and Energy Efficiency for use in calculating an organisation's greenhouse gas emissions, and are used here.

1.1 SCOPE OF WORKS

The scope of this assessment is limited to the following:

- Identification of all Scope 1 and 2 GHG emissions and the Scope 3 emissions that would be associated with the operation of the 2 x 30 MW boilers (Scenario 1) and 3 x 20 MW boilers (Scenario 2);
- Estimation of annual GHG emissions for operation of the boilers using relevant National Greenhouse Accounts (NGA) Factors and equations for both scenarios; and
- Preparation of a summary report which outlines the methodology and the results of the assessment, including, if necessary, any recommendations to reduce GHG emissions from use of the boilers.

1.2 PROPOSAL DETAILS

1.2.1 Site Location

The site is located at 6 Herbert Place, Smithfield in NSW, approximately 25 km west of the Sydney CBD. Figure 1-1 shows the site in a regional context.

Figure 1-1: Site Location in a Regional Context



1.2.2 The Proposal

The proposal involves the installation and operation of 2 x 30 MW boilers and related auxiliary equipment at the Visy Site. Figure 1-2 and Figure 1-3 show the Boiler Arrangement and Boiler House Layout respectively.

The following information relevant to the 2 x 30 MW boilers for calculation of greenhouse gas emissions was provided by the client:

- Annual natural gas consumption for two 30 MW boilers over 8400 hours is 1.642284 PJ (10^{15} Joules);
- Electricity consumption for the boilers is 2.723 GWh;
- Each Boiler has a FD Fan 110 kW, two (2) Feed pumps 90 kW (one operating, one standby) operating on average of 76% maximum capacity rating;
- Two (2) Deaerator Lift Pumps 11 kW (one operating, one standby provide for both boilers) operating on average of 76% maximum capacity rating;
- Four (4) Chemical dosing pumps 0.117 kW operating at 100% capacity;
- Boiler room lighting 2500 Watts operating at 100% capacity; and
- Two (2) Control panels 500 Watts operating at 100% capacity.



Information related to the 3 x 20 MW boilers for comparison of GHG emissions is:

- Annual natural gas consumption for three x 20 MW boilers over 8400 hours is 1.632468 PJ (10^{15} Joules);
- Electricity consumption for the boilers is 2.416 GWh;
- Each Boiler has a FD Fan:75 kW, Feed Pumps: 2 x 45 kW (one operating, one standby) operating on average of 76%maximum capacity rating;
- Two (2) Deaerator Lift Pumps 11 kW (one operating, one standby provide for all boilers) operating on average of 76% maximum capacity rating;
- Four (4) Chemical dosing pumps 0.117 kW operating at 100% capacity;
- Boiler room lighting 2500 Watts operating at 100% capacity; and
- Two (2) Control panels 500 Watts operating at 100% capacity.



Figure 1-2: Boiler Arrangement

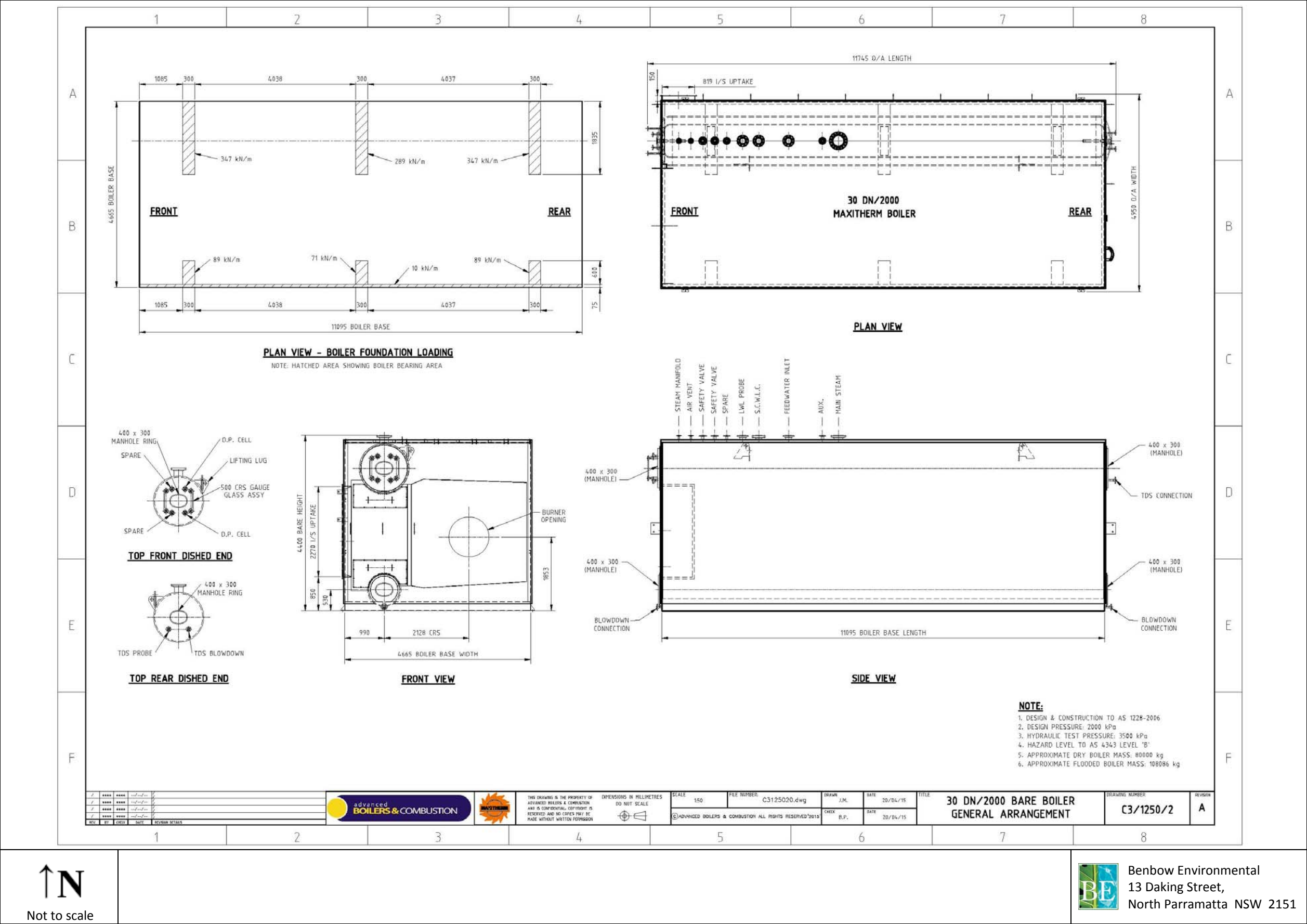
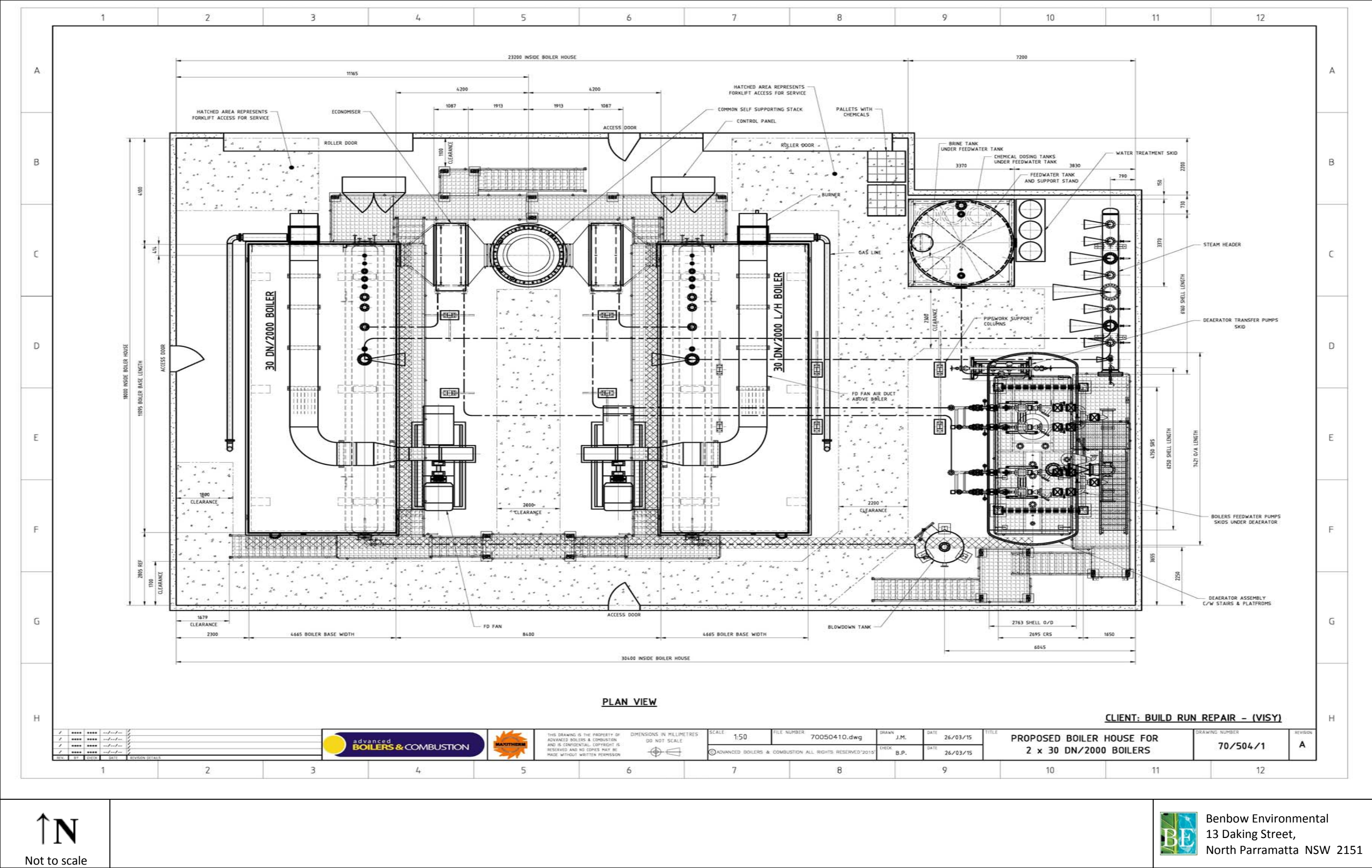




Figure 1-3: Boiler House Layout





2. STANDARDS AND GUIDELINES

The following standards, sources and guidelines have been used as part of this greenhouse gas (GHG) assessment:

- Australian Standard AS ISO 14064.1: 2006 – “Greenhouse gases” – “Part 1: Specification with guidance at the organization level for quantification and reporting of greenhouse gas emissions and removals”;
- Department of Climate Change and Energy Efficiency, July 2014. *Australian National Greenhouse Accounts – National Greenhouse Accounts Factors*;
- Department of Climate Change and Energy Efficiency, July 2014. *National Greenhouse and Energy Reporting System Measurement – Technical Guidelines*;
- Department of Climate Change and Energy Efficiency, 2015. *Australian National Greenhouse Accounts, Quarterly Update of Australia’s National Greenhouse Gas Inventory, September Quarter 2014*; and
- Greenhouse Gas Protocol, revised edition March 2004. *Corporate Accounting and Reporting Standard*.



3. DIRECT AND INDIRECT EMISSIONS

Emissions are commonly classified as direct or indirect emissions, which are defined by the GHG Protocol as:

- Direct GHG emissions are emissions from sources that are owned or controlled by the reporting entity;
- Indirect GHG emissions are emissions that are a consequence of the activities of the reporting entity, but occur at sources owned or controlled by another entity.

Direct and indirect emissions are further categorized into three broad scopes:

- Scope 1: All direct GHG emissions;
- Scope 2: Indirect emissions from consumption of purchased electricity, heat or steam;
- Scope 3: Other indirect emissions, such as the extraction and production of purchased materials and fuels, transport-related activities in vehicles not owned or controlled by the reporting entity, electricity-related activities (e.g. T&D losses) not covered in Scope 2, outsourced activities, waste disposal, etc.

The operation of the boilers would generate direct and indirect emissions as described in the following sub-sections.

3.1 DIRECT EMISSIONS

Direct greenhouse gas emissions from the proposed development would be generated from the consumption of natural gas in the two boilers. This would contribute to Scope 1 emissions.

3.2 INDIRECT EMISSIONS

Indirect emissions can be Scope 2 or Scope 3 emissions generated by the proposed development. These include:

- Consumption of purchased electricity by the auxiliary equipment (Scope 2); and
- Other indirect emissions calculated for the purposes of this assessment, limited to upstream extraction and processing of raw materials required for producing the natural gas and electricity only (Scope 3).



4. ESTIMATION OF GREENHOUSE GAS EMISSIONS

Operation of the boilers involves activities that require energy and fuel consumption; hence there would be greenhouse gas emissions. This assessment estimates all Scope 1 and 2 GHG emissions, and also some Scope 3 emissions with the given information.

Two Scenarios were assessed:

- Scenario 1 – GHG emissions for 2 x 30 MW boilers; and
- Scenario 2 – GHG emissions for 3 x 20 MW boilers.

Methodology used and results are provided in the following sub-sections.

4.1 SCOPE 1 GHG EMISSIONS

Scope 1 greenhouse gas emissions are produced as a result of gas consumption within the boilers.

The National Greenhouse Accounts (NGA) Factors, July 2014 was used to estimate the Scope 1 GHG emissions. The following formula for fuel combustion emissions of gaseous fuels was adopted:

$$E = \frac{Q \times EC \times EF}{1,000}$$

Where:

E is the amount of estimated greenhouse gas emissions in tonnes CO_{2-e} (carbon dioxide equivalent)

Q is the volume of fuel combusted in m³

EC is the energy content of specific fuel type in GJ/m³

EF is the greenhouse gas emission factor specific to fuel type in kg CO_{2-e}/GJ

4.1.1 Scenario 1 (2 x 30 MW Boilers) Scope 1 GHG Emissions

Calculation of these emissions is estimated based on the following assumptions:

- The energy content (EC) for Natural Gas is 39.3 x 10⁻³ GJ/m³ (NGA, 2014); and
- Assumed Natural Gas consumption of 1.642284 PJ per annum (1642284 GJ per annum);

Applying the formula above, the annual GHG emissions from natural gas consumption is 84,084.9 tCO_{2-e}.

Table 4-1 summarises the annual Scope 1 GHG emissions for Scenario 1.



Table 4-1: Estimated Scope 1 (Direct) Greenhouse Gas Emissions – Scenario 1 (2x30 MW Boilers)

Activity	Annual Consumption (GJ)	Emission Factor (kg CO _{2-e} /GJ)			Annual GHG Emissions (tonnes CO _{2-e})
		CO ₂	CH ₄	N ₂ O	
Consumption of Natural Gas by Boilers	1642284	51.2	0.1	0.03	84,084.9
Total Annual Scope 1 GHG Emissions for Scenario 1					84,084.9

4.1.2 Scenario 2 (3 x 20 MW Boilers) Scope 1 GHG Emissions

Calculation of these emissions is estimated based on the following assumptions:

- The energy content (EC) for Natural Gas is 39.3×10^{-3} GJ/m³ (NGA, 2014); and
- Assumed Natural Gas consumption of 1.632468 PJ per annum (1632468 GJ per annum);

Applying the formula above, the annual GHG emissions from natural gas consumption is 83,794.6 tCO_{2-e}.

Table 4-1 summarises the annual Scope 1 GHG emissions for Scenario 2.

Table 4-2: Estimated Scope 1 (Direct) Greenhouse Gas Emissions – Scenario 2 (3x20 MW Boilers)

Activity	Annual Consumption (GJ)	Emission Factor (kg CO _{2-e} /GJ)			Annual GHG Emissions (tonnes CO _{2-e})
		CO ₂	CH ₄	N ₂ O	
Consumption of Natural Gas by Boilers	1632468	51.2	0.1	0.03	83,794.6
Total Annual Scope 1 GHG Emissions for Scenario 2					83,794.6



4.2 SCOPE 2 GHG EMISSIONS

Scope 2 GHG emissions are associated with the consumption of purchased electricity due to the use of fuels (e.g. coal) upstream at power generation plants. Electricity is used on site for the operation of several equipment on site such as fans, blower and office and related amenities.

The 2014 NGA Factors were used to estimate the greenhouse gas emissions. The following formula was adopted:

$$E = \frac{Q \times EF}{1,000}$$

Where:

E is the amount of estimated greenhouse gas in tonnes CO₂-e

Q is the quantity of purchased electricity in kWh

EF is the greenhouse gas emission factor specific to fuel type in kg CO₂-e/kWh

GHG calculations are based on the assumption that equipment will operate for 8,400 hours of the year (with the exception of standby equipment). Standby equipment has been excluded from the assessment.

4.2.1 Scenario 1 (2 x 30 MW Boilers) Scope 2 GHG Emissions

The assumptions for Scenario 1 are based on information in the following table:

Table 4-3: Assumptions for Scope 2 Calculations – Scenario 1

Equipment Name	No. operating	Power Rating	Operating Capacity	Annual Consumption (kWh)
Fans	2	110 kW	76%	1,404,480
Feed pumps	2	90 kW	76%	1,149,120
Deaerator Lift Pumps	1	11kW	76%	70,224
Chemical dosing pumps	4	0.117 kW	100%	3,931
Boiler room lighting	All	2,500 W	100%	21,000
Control panels	2	500 W	100%	8,400
Total Electricity Consumption (kWh)				2,657,155

Annual electricity consumption (Q) will be approximately 2,657,155 kWh.

The estimated annual Scope 2 greenhouse gas emissions is summarised in the following table.



Table 4-4: Estimated Scope 2 (Indirect) Greenhouse Gas Emissions – Scenario 1

Activity	Annual Consumption (kWh)	Emission Factor (kg CO ₂ -e/kWh)	Annual GHG Emissions (tonne CO ₂ -e)
Electricity consumption	2,657,155	0.86	2,285.2
Total Annual Scope 2 GHG Emissions for Scenario 1			2,285.2

4.2.2 Scenario 2 (3 x 20 MW Boilers) Scope 2 GHG Emissions

The assumptions for Scenario 2 are based on information in the following table:

Table 4-5: Assumptions for Scope 2 Calculations – Scenario 2

Equipment Name	No. operating	Power Rating	Operating Capacity	Annual Consumption (kWh)
Fans	3	75 kW	76%	1,436,400
Feed pumps	3	45 kW	76%	861,840
Deaerator Lift Pumps	1	11kW	76%	70,224
Chemical dosing pumps	4	0.117 kW	100%	3,931
Boiler room lighting	All	2,500 W	100%	21,000
Control panels	2	500 W	100%	8,400
Total Electricity Consumption (kWh)				2,401,795

Annual electricity consumption (Q) will be approximately 2,401,795 kWh.

The estimated annual Scope 2 greenhouse gas emissions is summarised in the following table.

Table 4-6: Estimated Scope 2 (Indirect) Greenhouse Gas Emissions – Scenario 2

Activity	Annual Consumption (kWh)	Emission Factor (kg CO ₂ -e/kWh)	Annual GHG Emissions (tonne CO ₂ -e)
Electricity consumption	2,401,795	0.86	2,065.5
Total Annual Scope 2 GHG Emissions for Scenario 2			2,065.5



4.3 SCOPE 3 GHG EMISSIONS

Scope 3 emissions encompass a wide range of potential sources. For this facility, only a few sources have been studied in this report due to availability of information. These are emissions from the a large number of processes and a range of often diffuse sources and production, distribution and consumption processes of natural gas, and the extraction/processing of fuels burned at electricity generation plants as well as indirect emissions due to transmission and distribution (T&D) losses.

Natural Gas Scope 3 emissions

The exploration, production, transmission and distribution of natural gas to site also have associated GHG emissions. A scope 3 emissions factor of 12.8 kg CO₂-e/GJ is provided in the NGA Factors (2014). Using the same methodology as used for Scope 1, we find that natural gas scope 3 emissions total 21,021.2 tCO₂-e for Scenario 1 and 20,895.6 tCO₂-e for Scenario 2. Refer to Table 4-7 Table 4-8 below.

Electricity Scope 3 emissions

Further GHG emissions are produced upstream of the site, due to the extraction, processing and transport of fuels to electricity power plants, as well as indirect emissions associated with compensating for transmission and distribution losses in the electricity network. A scope 3 emissions factor of 0.13 kg CO₂-e/kWh, for NSW electricity, is provided in the NGA Factors (2014). Using the same methodology as used for Scope 2, we find that electricity Scope 3 emissions total 345.4 tonnes CO₂-e for Scenario 1 and 339.1 tonnes CO₂-e for Scenario 2. Refer to Table 4-7 and Table 4-8 below.

Table 4-7: Total Estimated Scope 3 (Other Indirect) Greenhouse Gas Emissions – Scenario 1

Energy Source	Annual Consumption	Emission Factor (kg CO ₂ -e/GJ)	Annual GHG Emissions (Tonne CO ₂ -e)
Natural Gas	1642284 GJ	12.8 CO ₂ -e/GJ	21,021.2
Electricity	2,657,155kWh	0.13 CO ₂ -e/kWh	345.4
Total Annual Scope 3 GHG Emissions			21,366.6

Table 4-8: Total Estimated Scope 3 (Other Indirect) Greenhouse Gas Emissions – Scenario 2

Energy Source	Annual Consumption	Emission Factor (kg CO ₂ -e/GJ)	Annual GHG Emissions (Tonne CO ₂ -e)
Natural Gas	1632468 GJ	12.8 CO ₂ -e/GJ	20,895.6
Electricity	2,401,795 kWh	0.13 CO ₂ -e/kWh	312.2
Total Annual Scope 3 GHG Emissions			21,207.8



4.4 SUMMARY OF GHG EMISSIONS

A summary of the above-calculated GHG emissions is shown in Table 4-9.

Table 4-9: Estimated Total Annual GHG Emissions – Scenarios 1 and 2

Emission Type	Annual GHG Emissions (Tonne CO ₂ -e)	
	SCENARIO 1	SCENARIO 2
Scope 1 – Natural gas consumption of boilers	84,084.9	83,794.6
Scope 2 – Electricity consumption	2,285.2	2,065.5
Scope 3 – Natural gas and electricity scope 3 emissions	21,366.6	21,207.8
Total (Scope 1 + 2 + 3)	107,736.7	107,067.9

The total amount of greenhouse gas emissions from the proposed development is approximately 107,736.7 tonnes CO₂-e per annum (Scenario 1 – 2 x 30 MW boilers). Scenario 2 shows slightly lower GHG emissions of 107,067.9 tonnes CO₂-e per annum. GHG emissions would be 0.6% or 668.8 tonnes CO₂-e per annum higher by implementing 2 x 30 MW boilers.

The estimation of scope 1 and 2 emissions has been conducted based on primary activities only which include the use of natural gas and purchased electricity. The calculations have been made based on the 2014 NGA factors, stated assumptions and also figures provided by the proponent.

For Scenario 1, the largest source of GHG emissions is Scope 1 at 78.05%. Indirect emissions from the use of electricity (Scope 2) account for only 2.12% of the total emissions. Scope 3 emissions are much less than Scope 1, however, not all potential Scope 3 sources have been included due to lack of information. Wider Scope 3 emissions are considered to be accounted for in the Scope 1 and 2 emissions of other organisations related to the project.

Australia's total emissions in 2013–14 were estimated to be 548 Mt CO₂-e (DCCEE, 2015). In comparison, the estimated annual greenhouse emission for the Project is 0.1077 Mt CO₂-e. Therefore, the annual contribution of greenhouse emissions from the project in comparison to the Australian greenhouse emissions in 2014-5 is approximately 0.02%.



5. MEASURES TO REDUCE GREENHOUSE EMISSIONS

Opportunities to reduce greenhouse gas emissions need to be considered as an ongoing objective within the site's Environmental Management Plan. Understanding where the greenhouse gas emissions are generated is the first step in determining ways to reduce emission per unit of material processed.

The site, because of its recycling activities, makes a considerable contribution to reducing greenhouse gas emissions.

This concludes the report.

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Daniele Albanese
Senior Environmental Engineer

R T Benbow
Principal Consultant



6. LIMITATIONS

Our services for this project are carried out in accordance with our current professional standards for site assessment investigations. No guarantees are either expressed or implied.

This report has been prepared solely for the use of Build Run Repair Pty Ltd – Visy Paper, as per our agreement for providing environmental services. Only Build Run Repair Pty Ltd – Visy Paper is entitled to rely upon the findings in the report within the scope of work described in this report. Otherwise, no responsibility is accepted for the use of any part of the report by another in any other context or for any other purpose.

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Any opinions and judgements expressed herein, which are based on our understanding and interpretation of current regulatory standards, should not be construed as legal advice.



7. REFERENCES

Australian Standard AS ISO 14064.1: 2006 – “Greenhouse gases” – “Part 1: Specification with guidance at the organization level for quantification and reporting of greenhouse gas emissions and removals”

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