ANNEXURE 6

ANNEXURE 6

Air Quality Impact Assessment

prepared by

Stephenson Environmental Management Australia

Stephenson

Environmental Management Australia

AIR QUALITY IMPACT ASSESSMENT

PROPOSED MODIFICATIONS TO BOILERS NO.2, 4 & 6

SHOALHAVEN STARCHES

BOLONG ROAD, BOMADERRY NSW

PROJECT NO.: 5766/S24556/17

DATE OF AQIA ISSUE: 1 JUNE 2017

PREPARED FOR COWMAN STODDART ON BEHALF OF THE MANILDRA GROUP

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TABLE OF CONTENTS

TABLE OF TABLES

TABLE OF FIGURES

1 INTRODUCTION

Stephenson Environmental Management Australia (SEMA) was engaged by Cowman Stoddart Pty Ltd on behalf of Shoalhaven Starches to undertake an Air Quality Impact Assessment (AQIA) for the proposed modifications of Boilers No. 2 and 4 and installation of an additional baghouse on Boiler 6 for the proposed optimisation of energy use and steam production at the Shoalhaven Starches manufacturing facility located on Bolong Road, Bomaderry, New South Wales (NSW).

The objective of this AQIA is to determine the impact on ground level concentration (GLC) of odour, particles (TSP and PM_{10}), oxides of nitrogen (NO_x) and sulphur dioxide (SO_2) from the proposed modifications to the boiler fuel types and additional emission control upgrades to determine that it is within Air Quality Standards. To achieve this objective, this AQIA will reference the approved ethanol expansion project development and the proposed boiler modifications.

The AERMOD computer based dispersion model was used to determine the maximum GLCs for this assessment in accordance with the *Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales (AMMAAP).* AERMOD dispersion model is now the model of choice recommended by EPA NSW/ OEH in AMMAAP because AUSPLUME is no longer supported. However, it is noted that AUSPLUME has been the regulatory dispersion model used in all previous air quality impact predictions for this Shoalhaven Starches site.

Odour, NO_x, SO_2 and TSP emission measurements have been conducted by SEMA on various occasions on each boiler and have been used to develop the emissions input files for the predictive dispersion modelling.

Shoalhaven Starches provided proposed operational data, discharge stack and equipment design information.

The NSW Department of Planning, MP 06_0228 has been referenced in this air quality impact assessment.

An air quality assessment prepared by GHD has also been referenced in this assessment; that is, Shoalhaven Starches – Ethanol Upgrade Air Quality Assessment 2008.

2 THE SITE

The Shoalhaven Starches site is approximately 13 hectares, located between Bolong Road and the Shoalhaven River, approximately 0.6 km south east of the Bomaderry Post Office and 80 kilometres (km) south of Wollongong.

Figure 2.1 displays an aerial view of the modelling domain.

Figure 2.2 shows an aerial view of the boilerhouse.

Figure 2.3 shows the overall site plan of Shoalhaven Starches with the location of the proposed modifications to the boilers.

Figure 2.4 shows the overall site elevations with the proposed modifications to the boilers.

Figure 2.5 shows the plan of the Boilerhouse proposed modifications.

Figure 2.6 displays the northern elevation of the proposed modifications Boilerhouse including stack heights.

Figure 2.7 displays the eastern elevation of the proposed modifications Boilerhouse including stack heights and associated works for Boilers No. 2 & 4.

Figure 2.8 displays the western elevation of the proposed modifications Boilerhouse including stack heights and additional baghouse on No. 6 Boiler.

FIGURE 2-1 MODELLING DOMAIN

FIGURE 2-2 AERIAL VIEW OF THE BOILERHOUSE

FIGURE 2-3 OVERALL SITE PLAN WITH LOCATION OF PROPOSED BOILER MODIFICATIONS

FIGURE 2-4 OVERALL SITE ELEVATION SHOWING PROPOSED MODIFICATIONS TO BOILERS

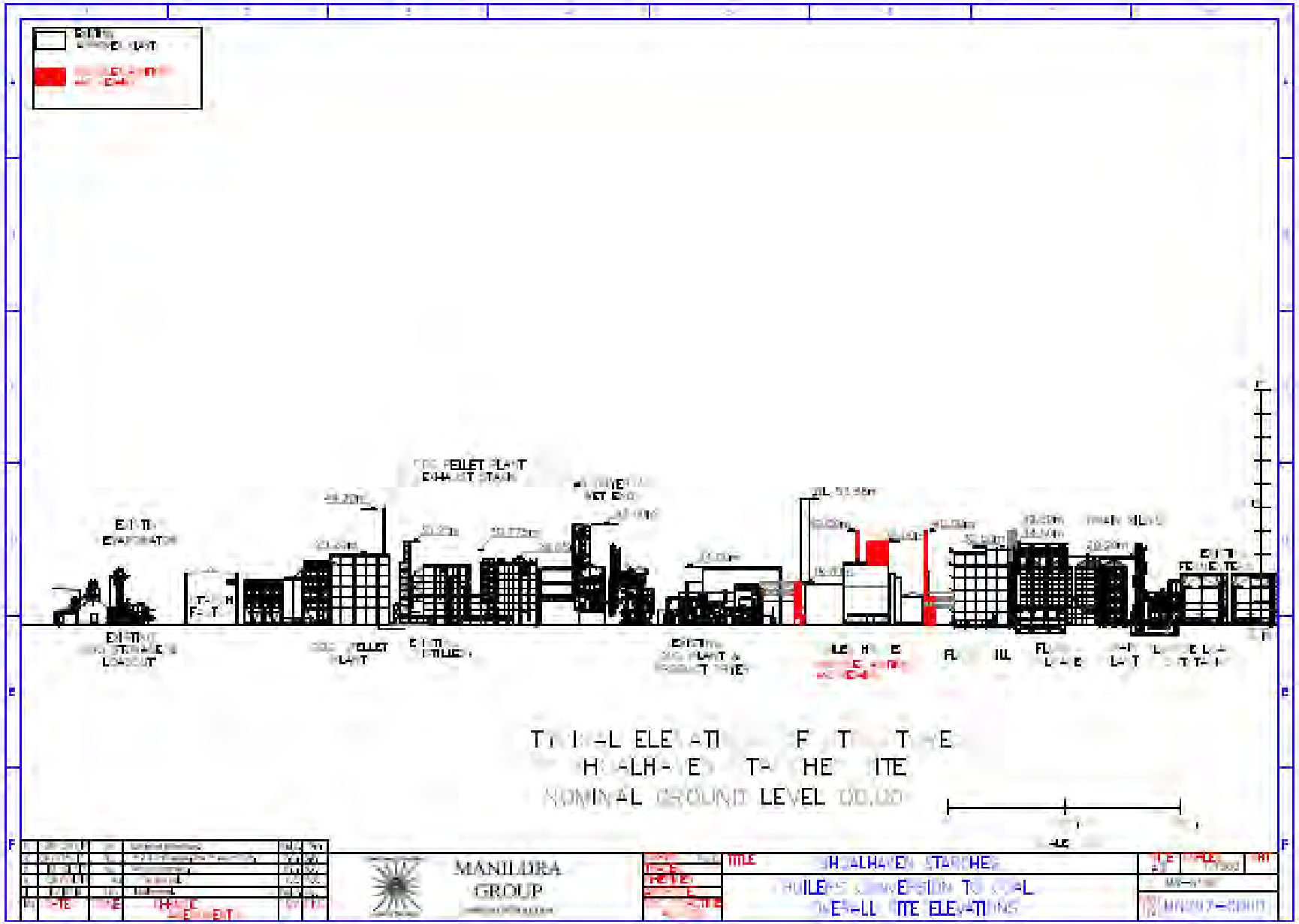


FIGURE 2-5 BOILERHOUSE PLAN - PROPOSED MODIFICATIONS

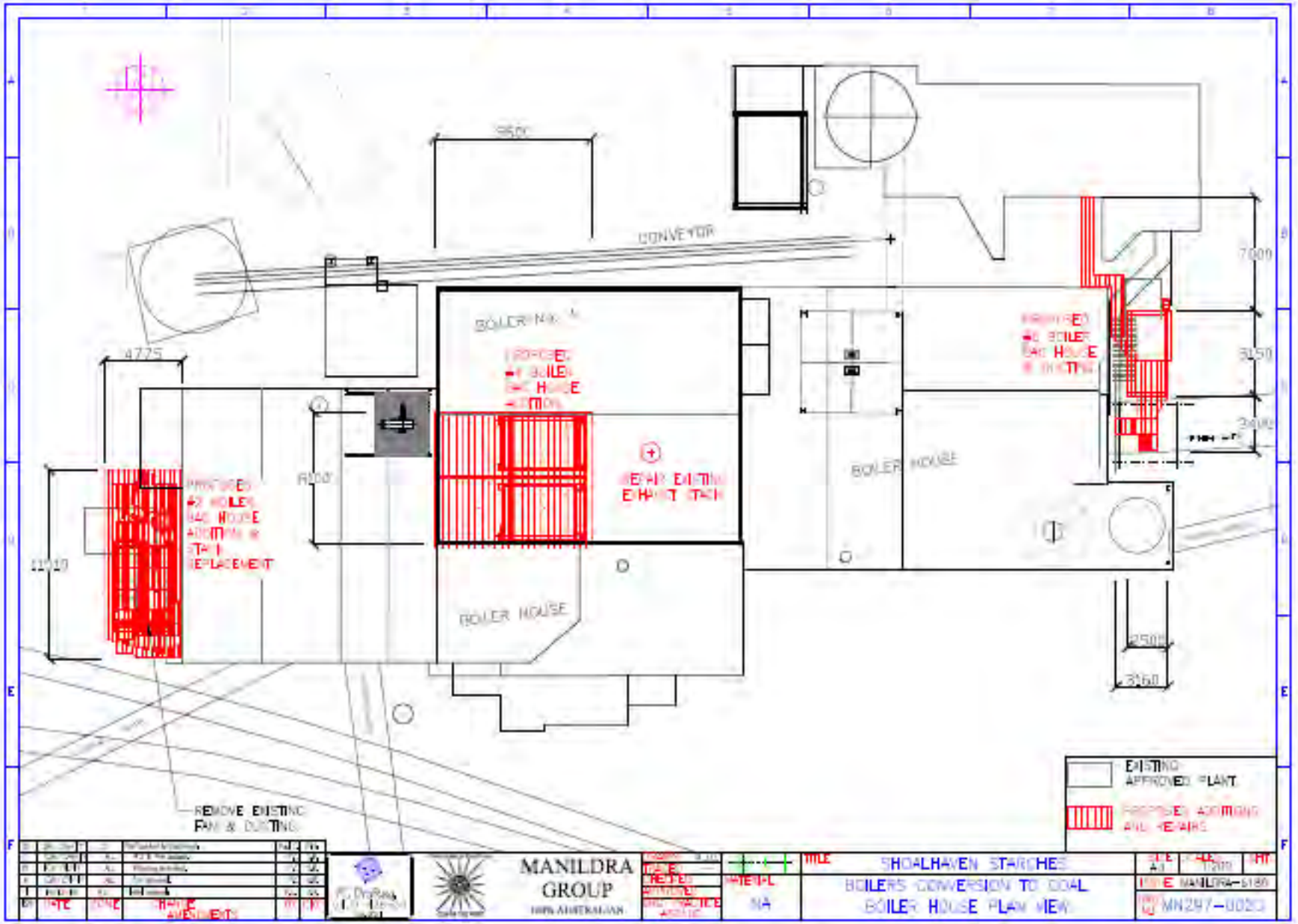


FIGURE 2-6 NORTHERN ELEVATION - BOILERHOUSE PROPOSED MODIFICATIONS

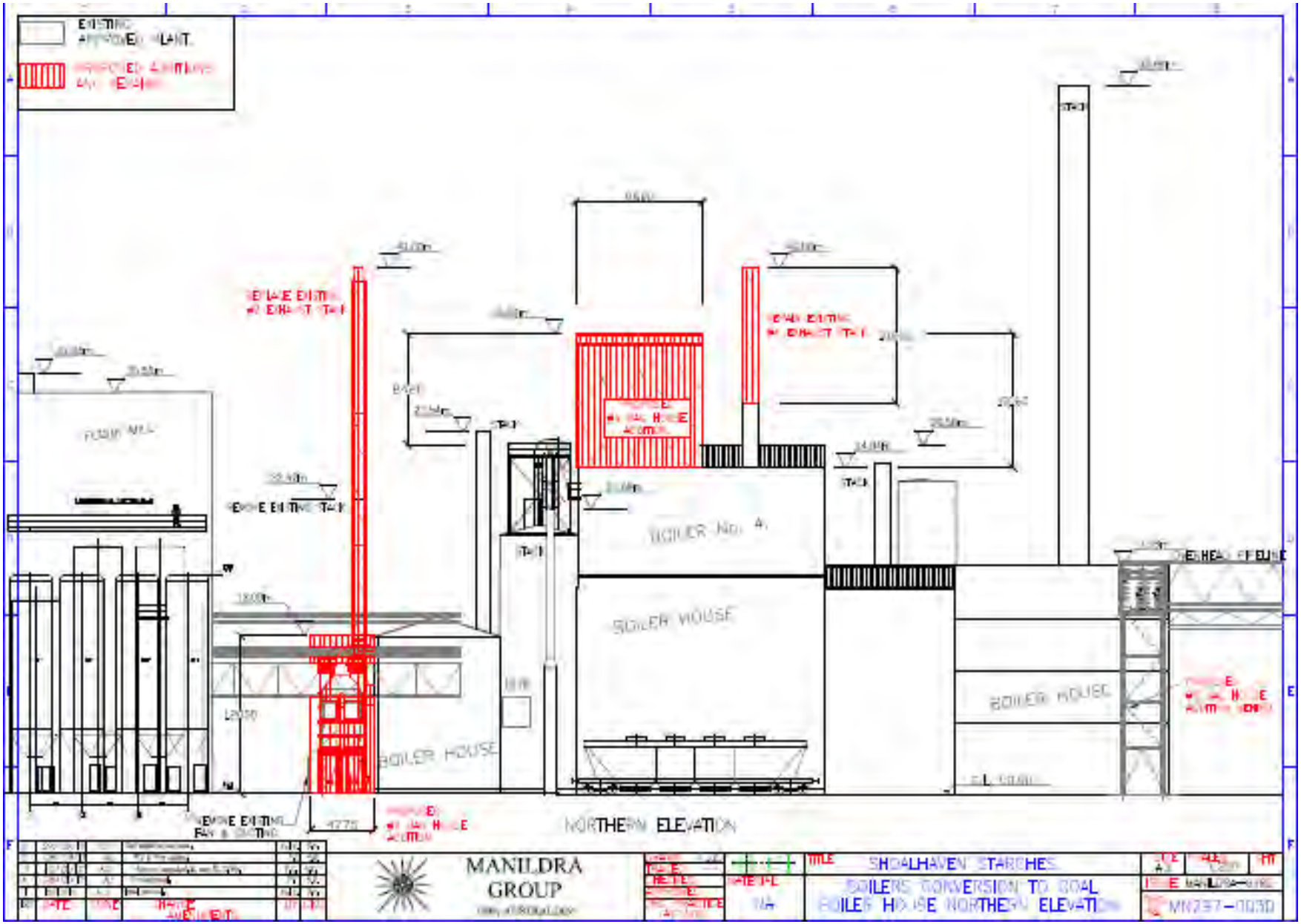


FIGURE 2-7 EASTERN ELEVATION - BOILERHOUSE PROPOSED MODIFICATIONS

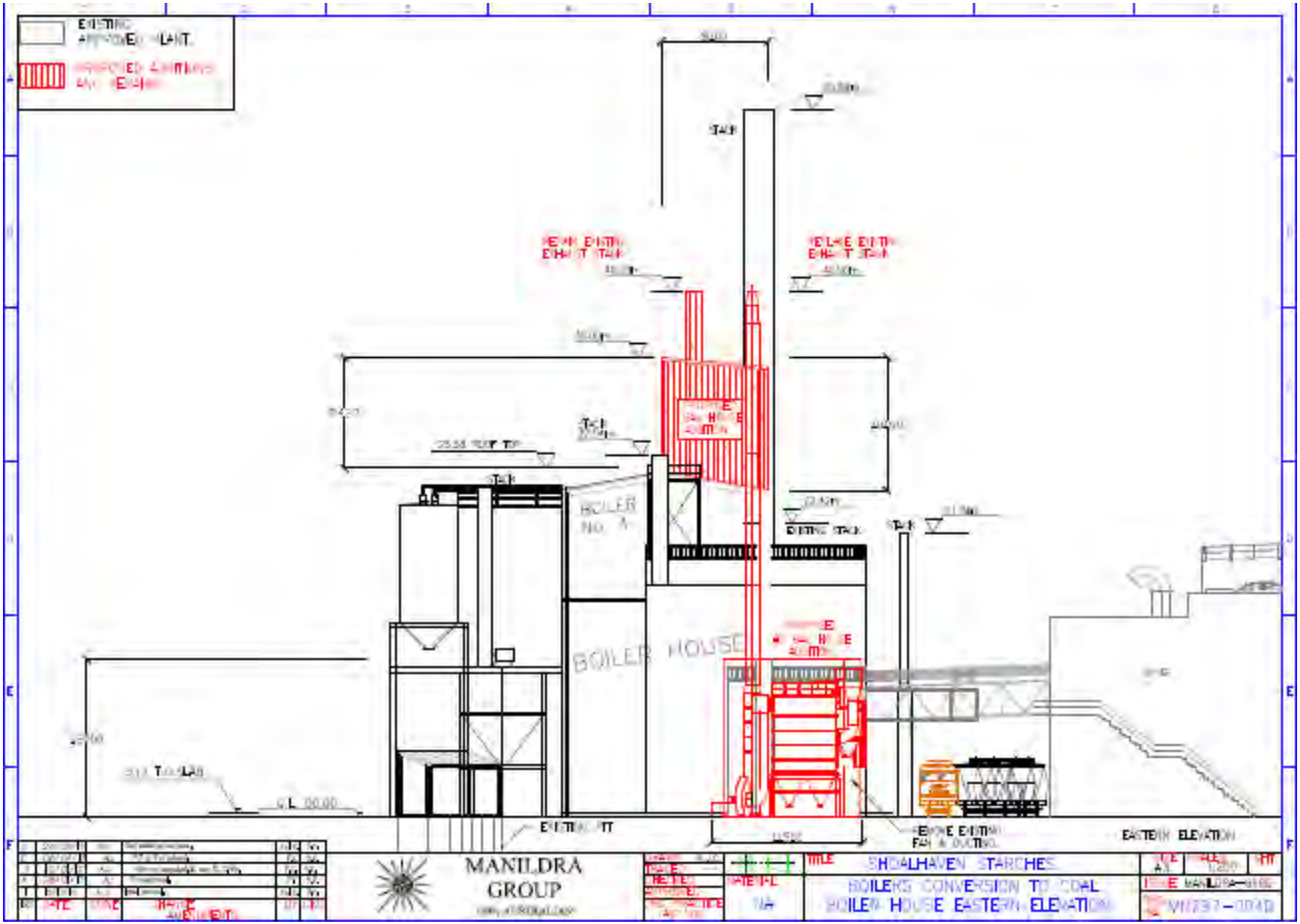
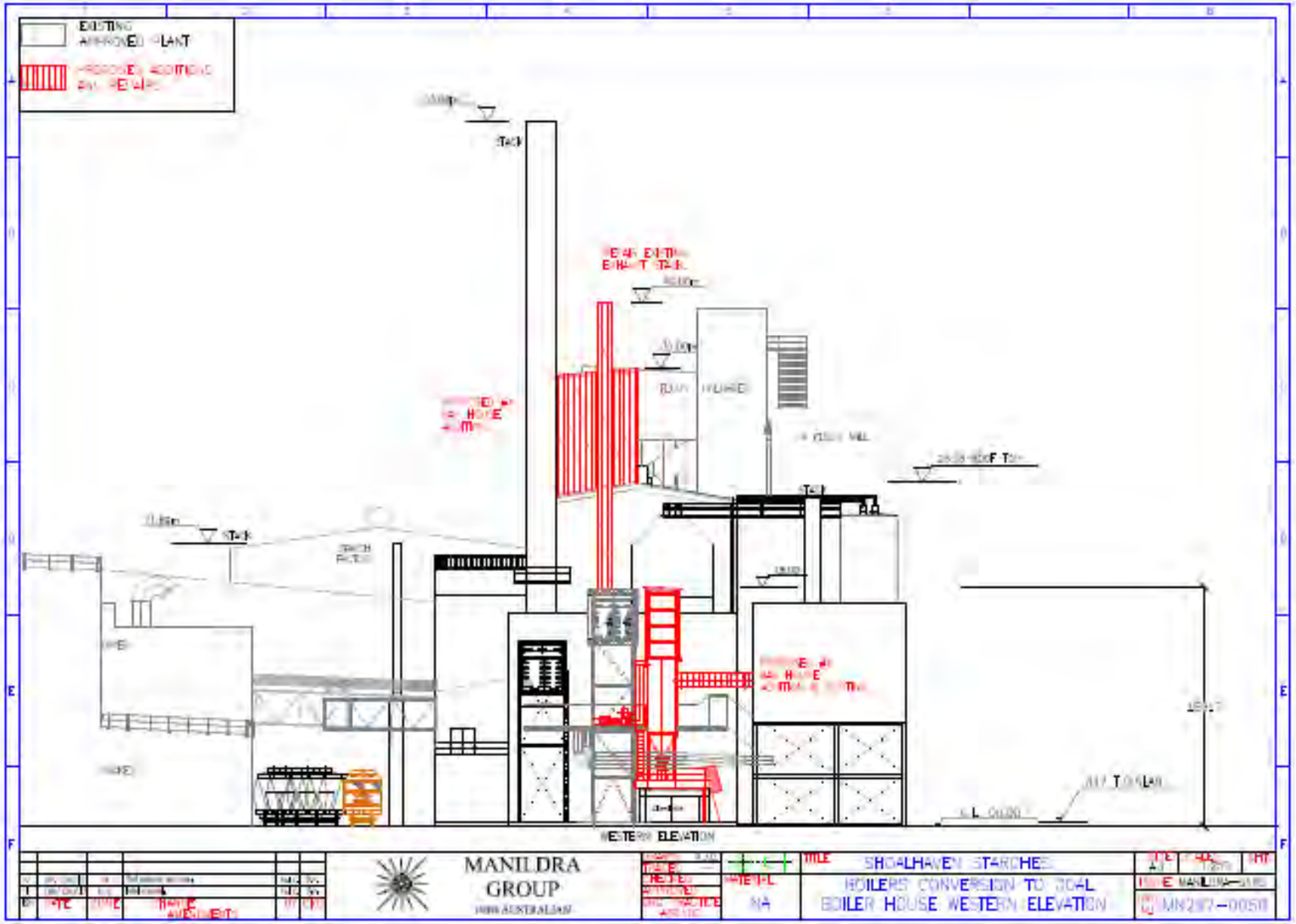


FIGURE 2-8 WESTERN ELEVATION - BOILERHOUSE PROPOSED MODIFICATIONS



3 THE MODIFICATION PROPOSAL

Appendix A contains copies of the letters dated 11 January 2017 and 13 April 2017 detailing the proposed modifications. Relevant extracts of these letters are presented below.

Letter dated 11 January 2017 from Cowman Stoddart to the Department of Planning & Environment, Ref: MP06_0228 stated:

"…..Shoalhaven Starches intend to convert Boiler No.4 situated within the existing factory site from gas to coal fired… The proposed conversion will require the construction of a baghouse on top of the boiler building. The baghouse will have a height of 8.3 metres, increasing the overall height of the boilerhouse to 35 metres above ground level…The proposal will also include repairs and extension to an existing stack, increasing the height of the stack by nine metres to an overall height above ground of 38.74 metres…"

Letter dated 13 April 2017 from Cowman Stoddart to the Department of Planning & Environment, Ref: MP06_0228 stated:

"…..Shoalhaven Starches have undertaken a further review of their energy supply requirements for their operations and have identified that in addition to the proposed modifications to convert Boiler No.4 from gas to coal fired that they will also need to seek to undertake the following modifications to two other boilers on the site including:

- *To undertake modifications to Boiler No.2. This boiler was originally a coal fired boiler but was converted to enable the use of woodchips instead of coal and presently generates approximately seven tonnes of steam per hour. It is now proposed to convert this boiler back to coal fired. This will require the construction of a new baghouse adjacent to the Boiler No.2 building and the construction of a new emission stack which will have a height above ground of 40 metres. These modifications will increase production of steam from this boiler back to 14 tonnes per hour (consistent with what it originally produced before it was converted to burn woodchips).*

- *To undertake modifications to Boiler No.6. This boiler is already a coal fired boiler. It is proposed to however to construct a new baghouse and associated ducting adjacent to this boiler. These works will have a maximum height above ground of 15 metres. "*

4 IMPACT ASSESSMENT CRITERIA

4.1 ODOUR IMPACT ASSESSMENT CRITERIA

The *Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales* (AMMAAP) provides a GLC impact assessment criterion for a number of potential air emissions, and states that dispersion modelling undertaken should assess the modelling predictions against the GLCs to determine if the predicted impact from the emissions exceeds the criteria.

The Impact Assessment Criteria (IAC) for complex mixtures of odours have been designed to take into account the range of sensitivity to odours within the community and to provide additional protection for individuals with a heightened response to odours. This is achieved by using a statistical approach dependent upon population size. As the population density increases, the proportion of sensitive individuals is also likely to increase, indicating that more stringent criteria are necessary in these situations.

The GLC assessment criteria for the complex odour compound emissions considered in the modelling are shown in Table 4.1. The predicted odour impact due to the pollutant source must be reported in units consistent with the IAC as peak concentrations (i.e. approximately one second average).

The odour criterion that has been selected for use in this assessment, to determine the maximum odour GLC concentration from the proposed boiler modifciation, is the 2.0 odour units (ou) criterion for the 100th percentile of predicted odour concentrations, which indicates that 100% of all odour predictions would fall below this concentration. This criterion has been chosen because there are residential areas in the vicinity of the Shoalhaven Starches facility, such that the population density of the area surrounding the facility as a whole is in excess of 2000 people.

TABLE 4-1 IMPACT ASSESSMENT CRITERIA FOR COMPLEX ODOROUS AIR POLLUTANTS

Population of affected community	Impact Assessment Criteria (ou)
Urban (>2000) and/or schools and hospitals	2.0
~ 500	3.0
~ 125	4.0
~ 30	5.0
~ 10	6.0
~ single rural residence (<= 2)	7.0

Key: ou = odour unit
> = greater than
< = less than

4.1.1 ADJUSTMENT FOR PEAK-TO-MEAN RATIOS

AMMAAP notes that the evaluation of odour impacts requires the estimation of short or peak concentrations on the time scale of less than one second. The dispersion modelling predictions are valid for one-hour ground level concentrations or longer. Therefore the dispersion model needs to supplemented to accurately simulate atmospheric dispersion of odours and the instantaneous perception of odours by the human nose.

AMMAAP Table 6.1, reproduced in Table 4.2 below, provides EPA recommended one-second to one-hour (P/M60) peak-to-mean ratios for estimating concentrations for different source types, stabilities and distances. It is important to note that these emission factors are for idealised situations for one source in flat terrain where the receptor is located along the centreline of the single plume and do not consider fluctuations away from the plume centre line, terrain influences or plume interactions from multiple sources.

AMMAAP further requires that the P/M60 ratio for wake-affected point sources be applied to the proposed boilerhouse modifications to determine the maximum permissible stack concentration. Therefore, maximum permissible stack source emission rate will need to be multiplied by 2.3 when checking for compliance with the ambient odour GLC criterion.

TABLE 4-2 PEAK-TO-MEAN FACTORS

Table 6.1: Factors for estimating peak concentrations in flat terrain (Katestone Scientific 1995 and 1998)

Source type	Pasquill–Gifford stability class	Near-field P/M60*	Far-field P/M60*
Area	A, B, C, D	2.5	2.3
	E, F	2.3	1.9
Line	A–F	6	6
Surface wake-free point	A, B, C	12	4
	D, E, F	25	7
Tall wake-free point	A, B, C	17	3
	D, E, F	35	6
Wake-affected point	A–F	2.3	2.3
Volume	A–F	2.3	2.3

* Ratio of peak 1-second average concentrations to mean 1-hour average concentrations

4.2 PARTICLE IMPACT ASSESSMENT CRITERIA

Table 7.1 of the AMMAAP presents impact assessment criteria (IAC) for ground level impact of particulate matter which is outlined in Table 4.3.

4.3 SULFUR DIOXIDE ASSESSMENT CRITERIA

Similarly, Table 7.1 of the AMMAAP presents impact assessment criteria for sulfur dioxide as outlined in Table 4.4.

4.4 NITROGEN OXIDES ASSESSMENT CRITERIA

The AMMAAP criterion for nitrogen oxide is outlined in Table 4.5.

TABLE 4-3 IMPACT ASSESSMENT CRITERIA FOR PARTICULATE MATTER

Pollutant	Averaging Period	Impact Assessment Criteria (µg/m³)	Source
TSP	Annual	90	NHMRC (1996)
PM_{10}	Annual	25	DoE (2016)
	24-hour	50	DoE (2016)

TABLE 4-4 IMPACT ASSESSMENT CRITERIA FOR SULFUR DIOXIDE

Pollutant	Averaging Period	Impact Assessment Criteria (µg/m³)	Source
Sulfur Dioxide	Annual	60	NEPC (1998)
	24-Hour	228	NEPC (1998)
	1-Hour	570	NEPC (1998)
	10-minutes	712	NHMRC (1996)

TABLE 4-5 IMPACT ASSESSMENT CRITERIA FOR NITROGEN OXIDES

Pollutant	Averaging Period	Impact Assessment Criteria (µg/m³)	Source
Nitrogen Dioxide (NO_2)	Annual	62	NEPC (1998)
	1-Hour	246	NEPC (1998)

Key to Tables 4.3 – 4.5.

TSP	=	Total suspended particulate matter
µg/m³	=	micrograms per cubic metre
NHMRC	=	National Health and Medical Research Council
NEPC	=	National Environment Protection Commission
DoE	=	Department of Environment

5 DISPERSION MODELING INPUT DATA

The NSW Environment Protection Authority approved regulatory dispersion model, AERMOD, developed by Lakes Environmental. This air pollution dispersion model has been designed to accurately predict Ground Level Concentrations (GLC's) of source emissions. AERMOD input data – meteorological, on-site buildings and structures, surrounding terrain, discrete receptors and emission and source information is detailed in this section.

5.1 METEOROLOGICAL DATA

The area considered in AQIA dispersion modelling experiences typical coastal weather in addition to locally influenced patterns. A mountain range to the north of the site means northerly winds are much less common than the east-west wind patterns occurring as a result of the coastal sea breeze cycle. MM5 (5th-generation Mesoscale Model) which is a prognostic meteorology model developed by Pennsylvania State University and the U.S. National Center for Atmospheric Research (NCAR) was used for modelling 2015 meteorological data for the dispersion modelling domain.

The AERMOD meteorological (AERMET) file was created using the MM5 output data provided by Lakes Environmental Met Data Services and included hourly data for temperatures, wind speed, wind direction, and mixing heights from January 1st to December 31st 2015.

The meteorological data was processed in two steps. MM5 (5th-generation Mesoscale Model) which is a prognostic meteorology model developed by Pennsylvania State University and the U.S. National Center for Atmospheric Research (NCAR) was used for modelling 2015 surface and upper air meteorological data for the dispersion modelling domain. Further processing of the MM5 data was then undertaken in AERMET to produce the wind field and weather data suitable for dispersion modelling with AERMOD.

5.2 BUILDINGS DATA

Buildings greater than 0.4 times the height of stack and within a distance of 5L must be incorporated into modelling, where L is the lesser of the height or width of the building. In addition to the proposed boiler modifications including baghouse additions, building modifications and stack heights, the flour mill buildings and silos, starch buildings, DDG building and existing boiler-house were incorporated into the modelling assessment.

5.3 TERRAIN DATA

The terrain surrounding the Shoalhaven Starches site ranges from flat terrain in the immediate area of the farm and plant to mountains between 100 and 200 metres above sea level in approximately 5km north-west of the plant.

The township of Bomaderry (to the west of the farm and plant) exists in moderately hilly terrain with slopes ranging from approximately 20 to 50 metres above sea level. The Shoalhaven River extends eastward from the south-east of the area under consideration, with a resultant river valley between Bomaderry and Nowra. The terrain is relatively flat around the river for the area east of Bomaderry thus terrain input data was not required.

5.4 DISCRETE RECEPTORS

The discrete receptors selected include 27 points along the Shoalhaven Starches boundary, in order to determine the odour impacts directly from the plant site. In total, six points were chosen on the western border of the plant, nine each on the northern and southern borders and three on the eastern border. Four residential properties closest were also chosen. Refer Figure 5.1 - discrete receptors are shown in red.

5.5 EMISSION INPUT DATA

Stack emission input data was derived from two information sources. The Manildra Group provided the building dimensions, the stack locations and dimensions and expected design exhaust flow rates. SEMA conducted emissions monitoring tests, including odour, NO_x, SO_2 PM_{10} and TSP on the existing boiler exhaust stacks, and used the resulting concentrations and exhaust temperatures as emission input data for the dispersion model.

5.5.1 EMISSION CONCENTRATION INPUT DATA

TSP, PM_{10}, NO_x, SO_2 and odour emission concentrations were derived from results from emission tests conducted at various times on the Boilers No. 2, 4 and 6 stack exhaust discharge points. Furthermore, the Manildra Group provided information on the proposed stacks including function, height, diameter and expected flow rates and discharge velocities. Table 5.1 shows the correlation between existing and proposed stacks.

5.5.2 STACK EXHAUST GAS INPUT DATA

Table 5.2 presents dimensions and exhaust gas flow rates for the stacks serving the proposed boiler modifications.

5.5.3 MASS EMISSION RATES

Mass emission rate calculations for emission parameters were based on the data presented in Tables 5.1 to 5.3 for each of the stacks and summarised in Table 5-3 for comparison of mass emission rates for both the existing and proposed modified boilers.

TABLE 5-1 EMISSION CONCENTRATIONS AND TEMPERATURES – BOILERS

Existing Boiler Stacks	Proposed Boiler Stacks	TSP Emission Conc. (mg/m^3)	Odour Emission Conc. (ou)	SO_2 Emission Conc. (mg/m^3)	NO_x (as NO_2) Emission Conc. (mg/m^3)	CO_2 Emission Conc. (%)	Exhaust Gas Emission Temp. (°C)
No.2	--	100	n/a	5	150	7.4	250
--	No.2	5	n/a	500	500	10	138
No.4	--	50	800	50	500	9.0	138
--	No.4	5	1350	1200	500	10	138
No.6	--	Note: No change from existing emission					

TABLE 5-2 PROPOSED BOILER EMISSIONS MODIFICATIONS TO PHYSICAL DATA

Proposed Boiler Stack No. & EPL ID	Stack Height (m)	Stack Exit Diameter (m)	Normal Flow Rate (Nm^3/s)	Exit Velocity (m/s)
No.2 - ID 45	39.00	0.63	6.0	19.9
No.4 - ID 42	39.00	1.16	6.1	5.76
No.6 - ID 35	53.88	No change	No change	No change

TABLE 5-3 MASS EMISSION RATE INPUT DATA

Existing Boiler Stacks	Proposed Boiler Stacks	TSP Emission MER (g/s)	Odour Emission MOER ($ou.m^3/s$)	SO_2 Emission MER (g/s)	NO_2 Emission MER (g/s)	CO_2 (g/s)	Exhaust Temp. (°C)
No.2	--	0.16	n/a	<1	0.54	872	250
--	No.2	0.03	n/a	3.00	3.00	1180	138
No.4	--	0.31	5400	0.31	3100	1080	138
--	No.4	0.03	8200	7.30	3.04	1200	138
No.6	--	Note: No change from existing emission					

Key to Tables 5.1 - 5.3

TSP	=	total suspended particulates (assume all TSP is PM_{10})
mg/m^3	=	milligrams per cubic metre @ 0 C and one atmosphere pressure
g/s	=	grams per second
ou	=	odour units
$ou/m^3/s$	=	odour units per cubic metre per second
°C	=	degrees Celsius
m	=	metres
Nm^3/s	=	cubic metres per second corrected to 1 atmospheric pressure and 273 Kelvin
m/s	=	metres per second

FIGURE 5-1 DISCRETE GROUND LEVEL RECEPTOR LOCATIONS

6 IMPACT ASSESSMENT PREDICTIONS

The impact assessment predictions of the AQIA for the proposed boiler modifications are presented in Table 6-1 and Figures 6-1 to 6-9 which indicate that:

- The worst case predicted odour GLC impact from proposed boiler modifications is 0.67 ou (cumulative total) on the boundary of the site. (Refer Figure 6-1);
- The 24-hour average and annual average worst case predicted PM_{10} GLCs are 0.72 and 0.11 $\mu g/m^3$ respectively. Refer Figures 6-3 and 6-4 respectively);
- The one-hour average and annual average worst case predicted NO_2 GLCs are 108 and 6.6 $\mu g/m^3$ respectively. Refer Figures 6-5 and 6-6 respectively);
- The one-hour, 24-hour average and annual average worst case predicted SO_2 GLCs are 306, 119 and 17.6 $\mu g/m^3$ respectively. Refer Figures 6-7 and 6-9 respectively);
- All of these predictions are for the total emission from the boilers, and not just the incremental increase in emission, and are thus conservative and cumulative;
- All predicted GLCs are compliant with the relevant IAC.

6.1 PROPOSED MODIFIED BOILER ODOUR IMPACTS

Based on available data and measurement results, SEMA estimates that, with the existing level of odour control, the proposed boiler modifications will emit 8,200 $ou.m^3/s$ of odour into the atmosphere. However, the majority of this odour emission has previously been counted and included in the total odour emissions from the Shoalhaven Starches factory site as input data to the GHD overall site odour assessment model.

The Boiler No. 4 odour emission includes the DDG odour destruction component of the existing Boiler No. 4 odour control duty.

The Boiler No. 2 (originally coal-fired) was not considered a principal odour emission source in the GHD 2008 air quality assessment. The change in fuel type from woodchip back to coal is not expected to increase odour emissions as boiler combustion temperature and residence times will remain unchanged. Therefore odour modelling on Boiler No.2 has not been included in this assessment.

6.2 GHD 2008 PREDICTED ODOUR IMPACTS

The GHD 2008 air quality assessment estimated the total odour emissions from the Shoalhaven Starches factory (not including the proposed boiler modifications) before the implementation of odour controls. Full details are presented in Appendix B.

The 2008 total factory predicted odour impacts at the Shoalhaven Starches boundary were 100 ou with existing controls, 25 ou with Stage 1 controls, 10 ou with Stage 2 controls and 5 ou with Stage 3 controls.

The 2008 total factory predicted odour impacts at Bomaderry were 40 ou with existing controls, 6 ou with Stage 1 controls, 3 ou with Stage 2 controls and 2 ou with Stage 3 controls.

TABLE 6-1 CUMULATIVE WORST CASE PREDICTED GLCS

Pollutant	Averaging Period	Maximum Predicted GLC		Impact Assessment Criteria
		Boiler No. 4 (Stack height - 38.74 m)	**Combined Boilers No. 2 and 4** (including Boiler No.4 total impacts at stack height - 38.74 m)	
PM_{10} * (ug/m^3)	**24 hours**	0.38	0.72	50
	Annual	0.065	0.11	25
Odour ** (ou)	**1 hour**	0.67	0.67	2.0
NO_x (as NO_2) * (ug/m^3)	**1 hour**	108	180	246
	Annual	6.6	11.4	62
SO_2 * (ug/m^3)	**1 hour**	260	306	570
	24 hours	93.4	119	228
	Annual	16	17.6	60

Key:

*	=	Maximum Predicted Incremental Impact for PM_{10}, NO_x and SO_2
**	=	99th Percentile Predicted Incremental Impact for Odour
GLC	=	Ground Level Concentrations
m	=	metres
PM_{10}	=	Particulate matter less than 10 microns
NO_x	-	oxides of nitrogen
NO_2	=	nitrogen dioxide
SO_2	=	sulfur dioxide
$\mu g/m^3$	=	micrograms per cubic metre
ou	=	odour units

FIGURE 6-1 PREDICTED ODOUR CONCENTRATION, PROPOSED BOILERHOUSE MODIFICATIONS

FIGURE 6-2 PREDICTED TSP ANNUAL CONCENTRATION, PROPOSED BOILERHOUSE MODIFICATIONS

FIGURE 6-3 PREDICTED PM_{10} 24 HOUR CONCENTRATION, PROPOSED BOILERHOUSE MODIFICATIONS

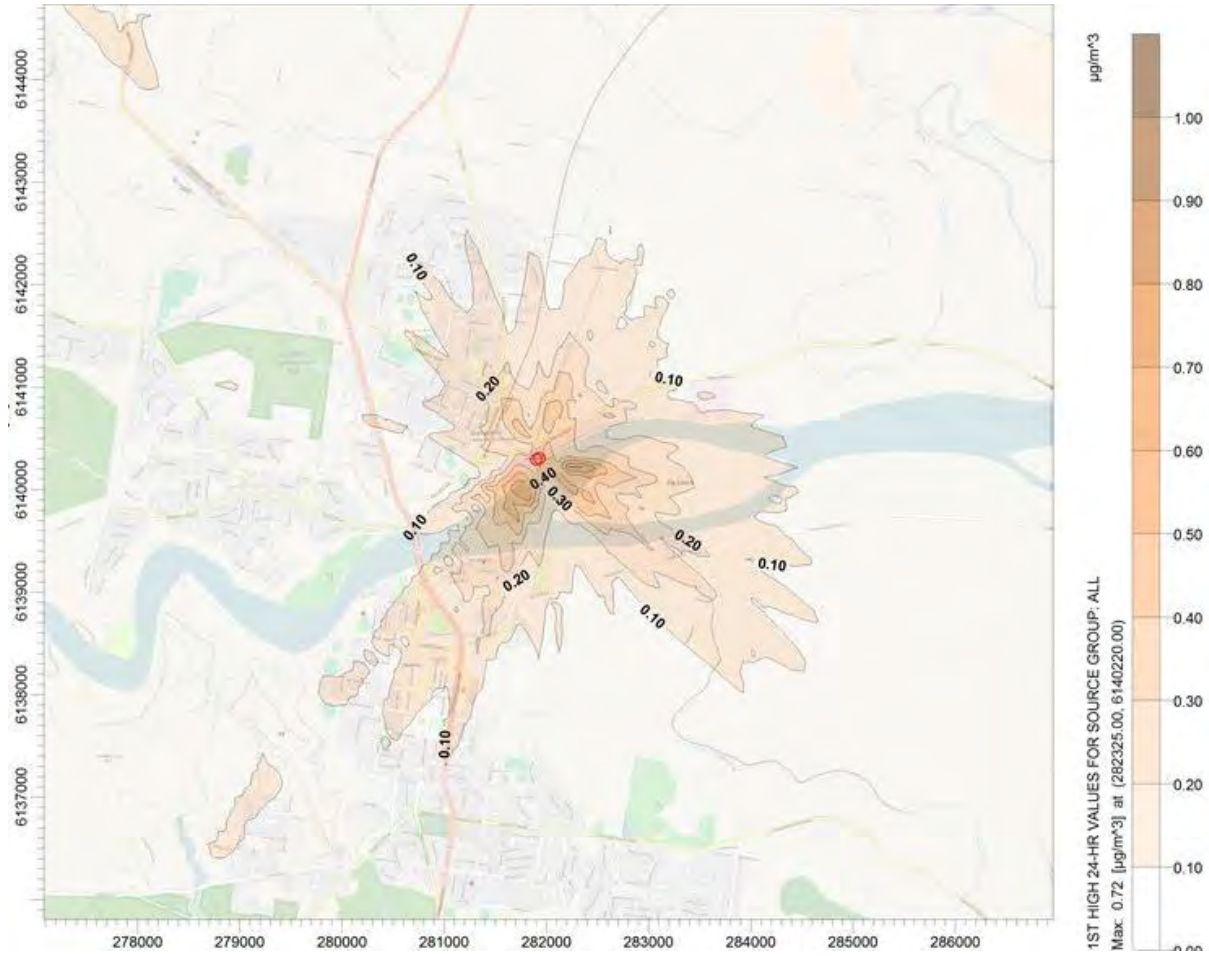


FIGURE 6-4 PREDICTED PM_{10} ANNUAL CONCENTRATION, PROPOSED BOILERHOUSE MODIFICATIONS

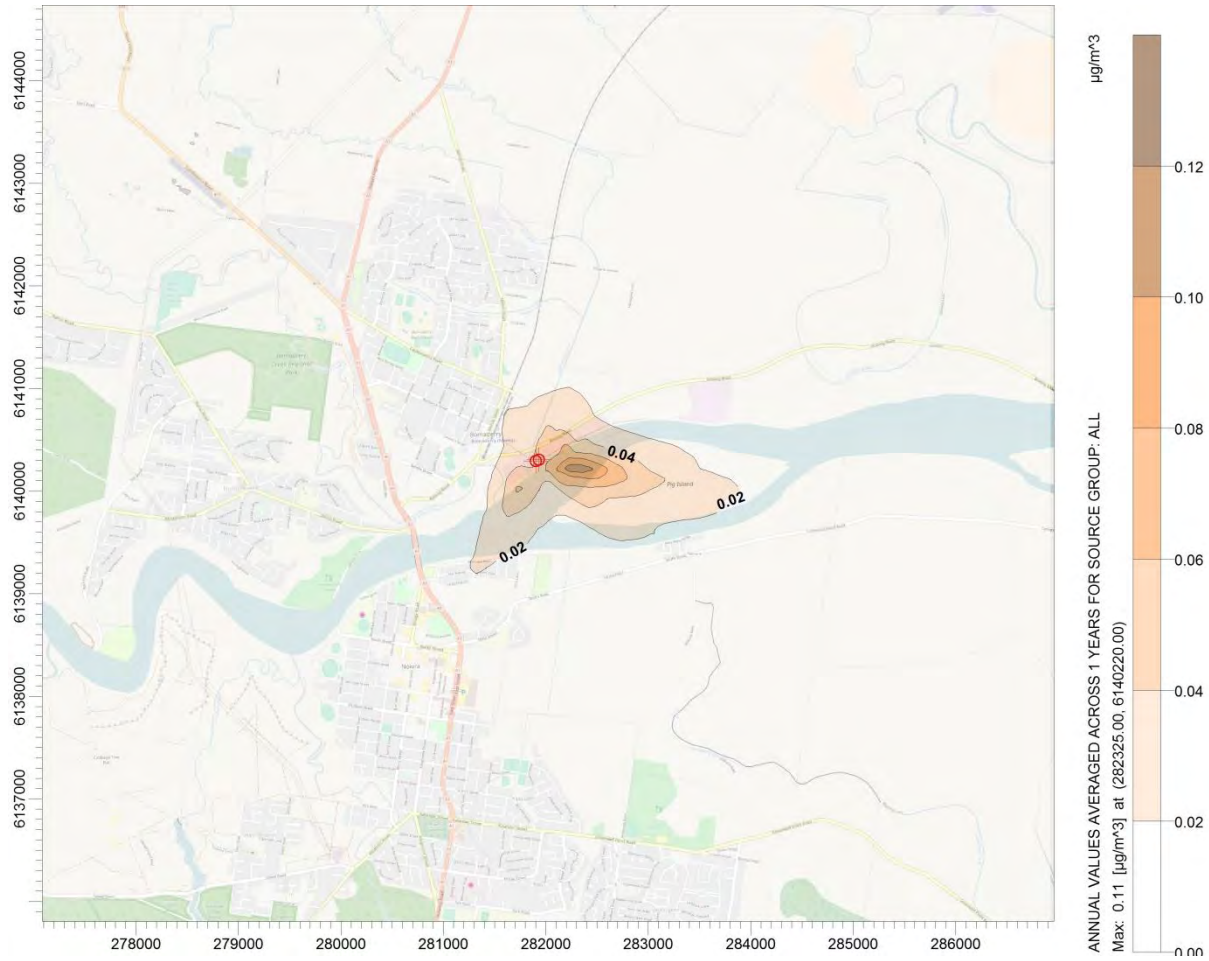


FIGURE 6-5 PREDICTED NO_2 1 HOUR CONCENTRATION, PROPOSED BOILERHOUSE MODIFICATIONS

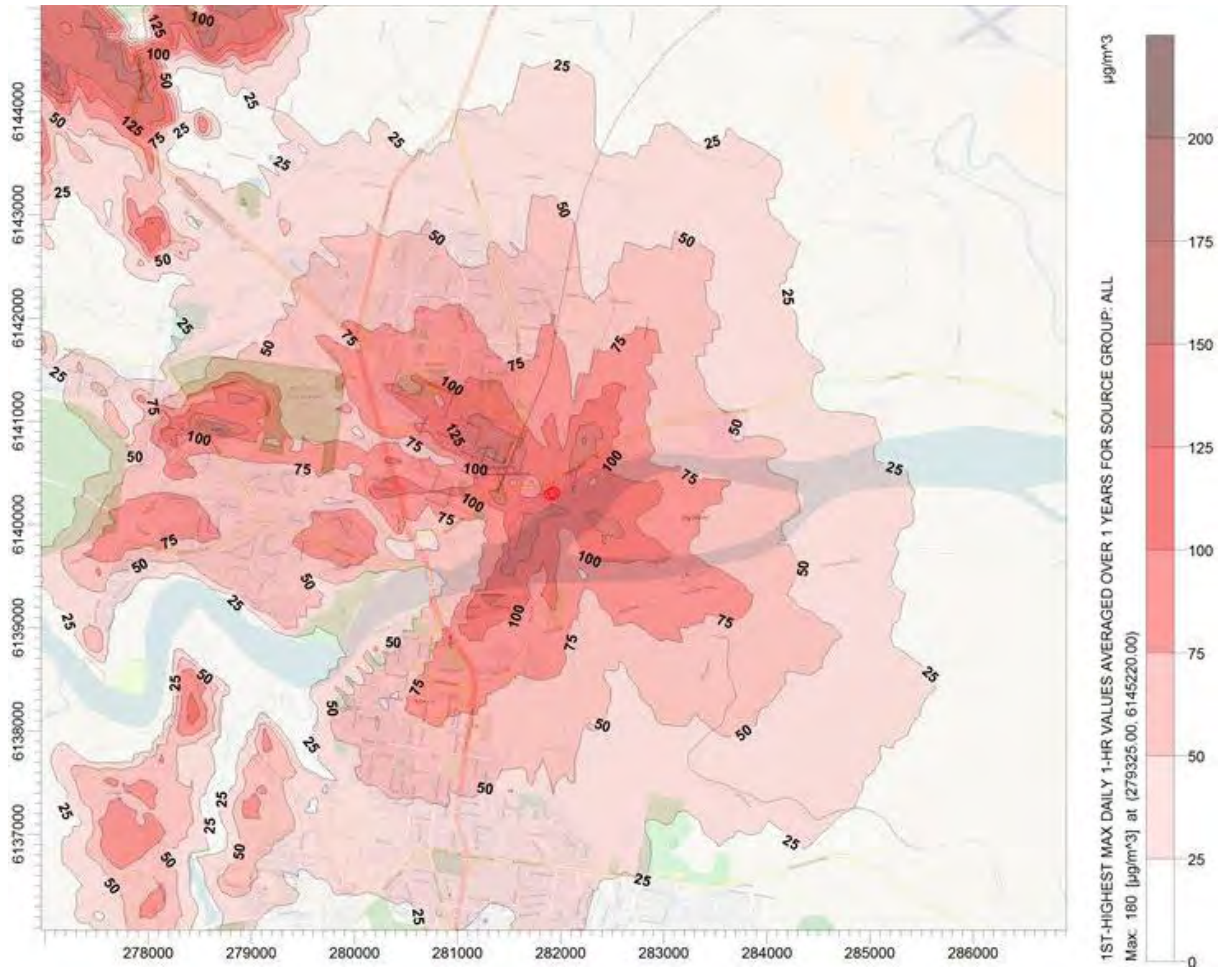


FIGURE 6-6 PREDICTED NO_2 ANNUAL CONCENTRATION, PROPOSED BOILERHOUSE MODIFICATIONS

FIGURE 6-7 PREDICTED SO_2 1 HOUR CONCENTRATION, PROPOSED BOILERHOUSE MODIFICATIONS

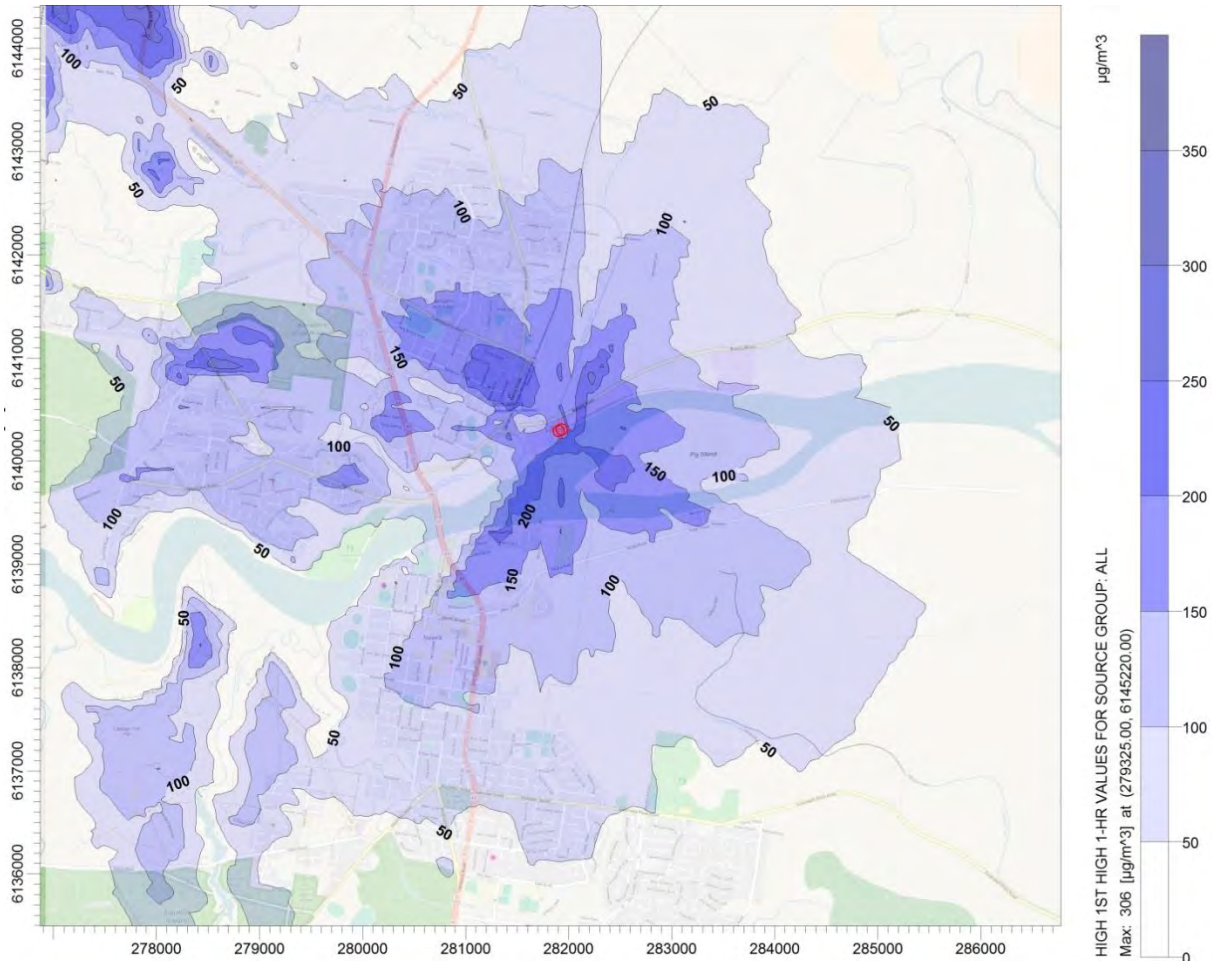


FIGURE 6-8 PREDICTED SO_2 24 HOUR CONCENTRATION, PROPOSED BOILERHOUSE MODIFICATIONS

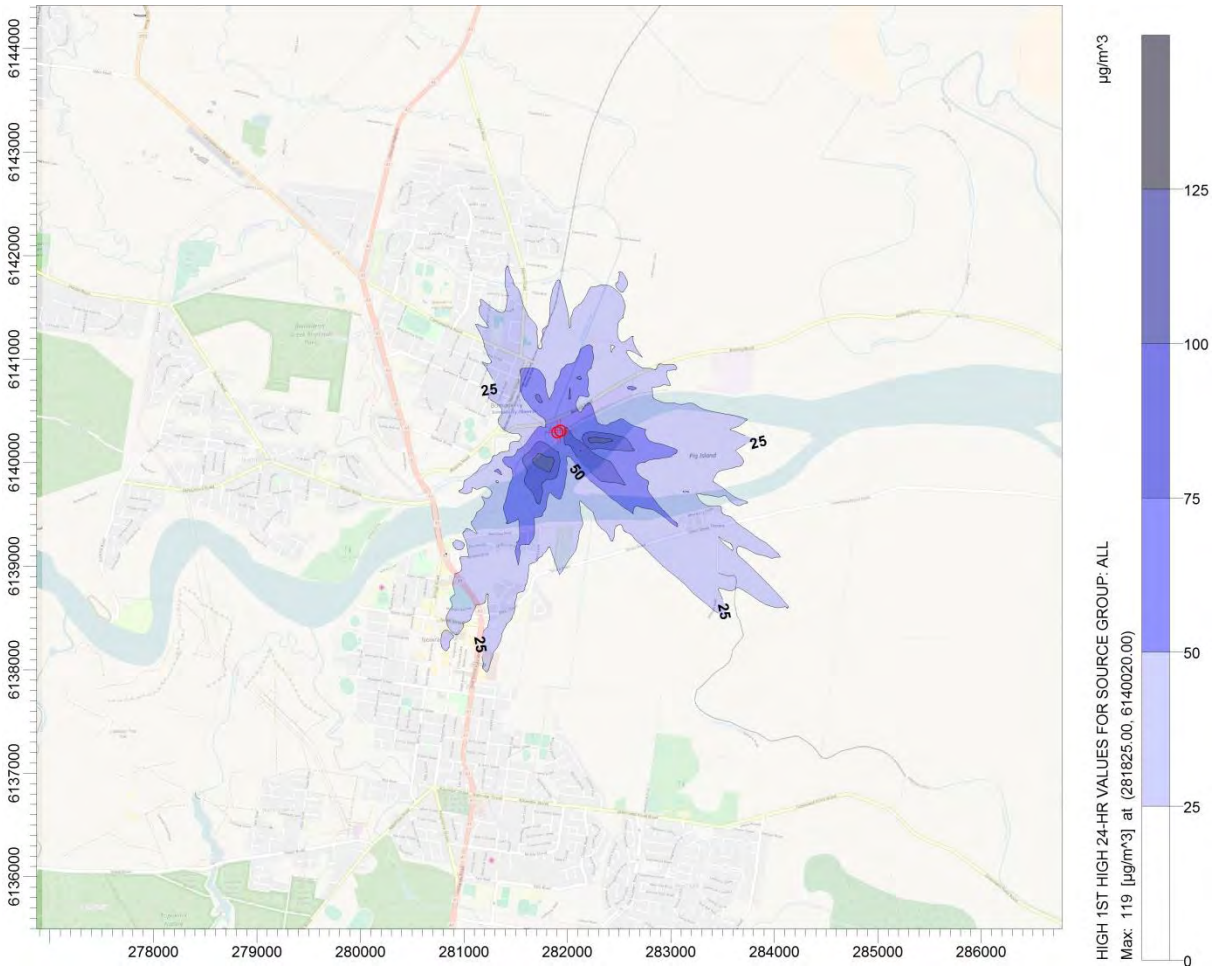
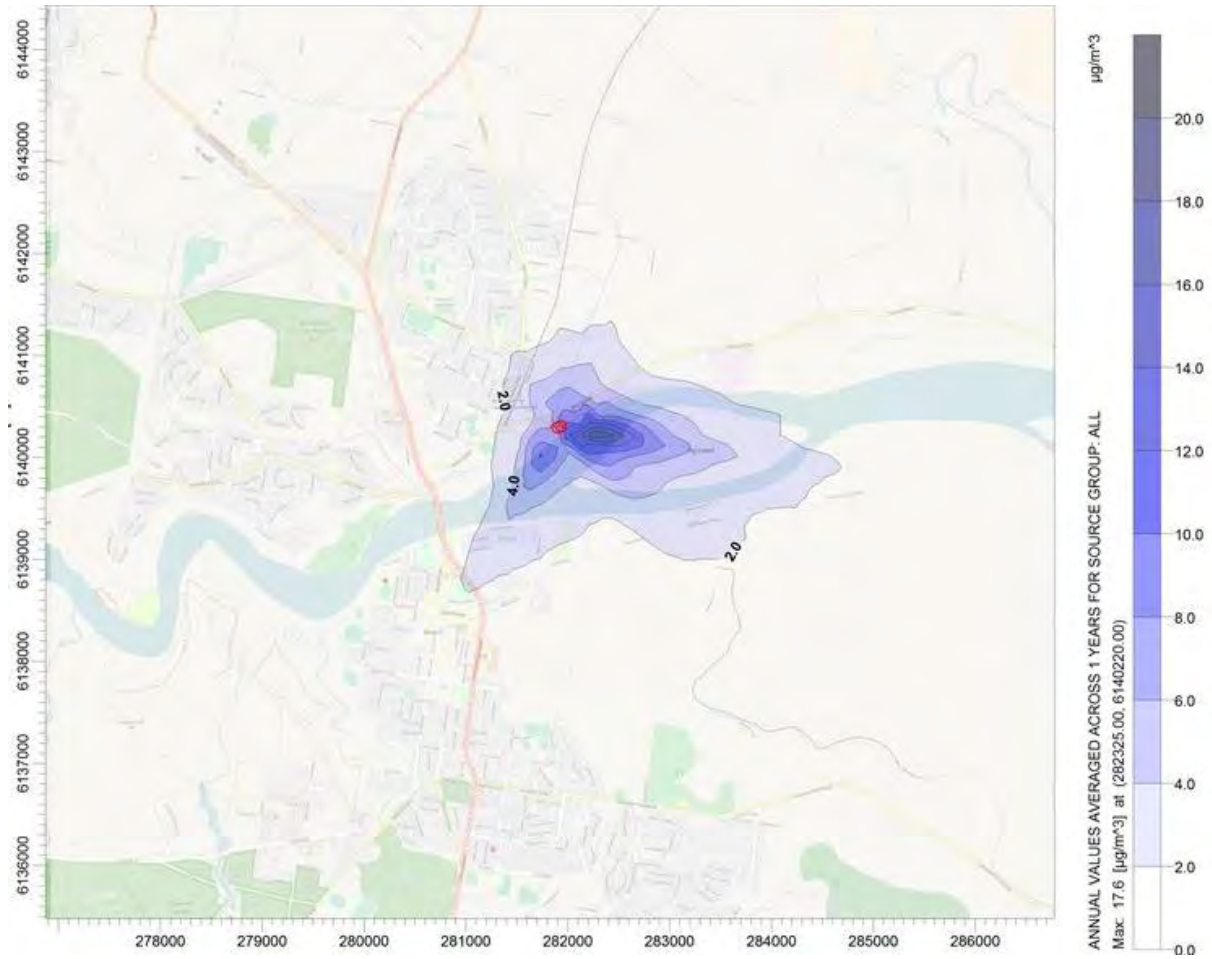


FIGURE 6-9 PREDICTED SO_2 ANNUAL CONCENTRATION, PROPOSED BOILERHOUSE MODIFICATIONS



7 CONCLUSIONS

This Air Quality Impact Assessment (AQIA) concludes that the cumulative impacts of the approved ethanol expansion project development and the proposed boiler modifications at the Shoalhaven Starches factory site at Bomaderry, New South Wales will be as follows:

- All emission parameters modelled and their impacts at ground level as presented in Section 6 of this report were compliant with the relevant Impact Assessment Criteria.

- Particulate emissions from Boilers No. 2 and 4 will now be controlled by fabric filtration air pollution control devices (baghouses) and hence will be less than the current configuration of boilers.

- An additional baghouse is proposed to be installed on Boiler No.6 to further reduce the particulate emissions from the EPL ID No.35, which is the combined stack serving Boilers 5 and 6.

- The existing odour control efficiencies for Boiler No. 4 will be maintained with the fuel change from gas to coal because the combustion temperatures and residence time in the boiler remain unchanged.

- There will be no changes to existing odour emissions from Boiler No.6 under the proposed modifications.

- Boiler No. 2 was a coal fired boiler in 2008, when the GHD odour emissions inventory was conducted and was not considered to be a source of odour, thus was not included in the inventory. Therefore odour emissions from Boiler No.2 have not been included in this AQIA.

APPENDIX A – DETAILS OF PROPOSED MODIFICATION MP06_228

Town Planning, Agricultural & Environmental Consultants

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11 January, 2017

Our ref: 16/45

Your ref: MP 06_0228

The Secretary
Department of Planning & Environment
GPO BOX 39
SYDNEY NSW 2001

Attention: Chris Ritchie / Deana Burn

Dear Sir

RE: PROPOSED MODIFICATION APPLICATION TO MP06_0228
SHOALHAVEN STARCHES EXPANSION PROJECT
PROPOSED CONVERSION OF BOILER NO. 4 FROM GAS TO COAL FIRED
SHOALHAVEN STARCHES, BOLONG ROAD, BOMADERRY

1.0 Introduction

Shoalhaven Starches Pty Ltd. intend to convert Boiler No. 4 situated within the existing factory site from gas to coal fired.

The purpose of this submission is to provide a brief scoping submission that will outline the proposed modification to the above approved project, and outline issues that such a modified proposal will raise and which should be addressed in any Modification Application. Such will assist the Department in framing any requirements that it may have for this Modification Application submission.

2.0 MP06_0228 – The Approved Development

Project Approval MP06_0228 was granted by the Minister for Planning on the 28th January 2009 for the Shoalhaven Starches Expansion Project. This approval also encapsulated previous approvals for the site into one overall approval for the site (at that time).

The Shoalhaven Starches Expansion Project is a 'transitional Part 3A Project' for the purposes of Schedule 6A of the Environmental Planning & Assessment Act.

The Shoalhaven Starches Expansion Project sought to increase ethanol production at the Bomaderry plant in a staged manner from 126 million litres per year to 300 million litres per year. To accomplish the increase in ethanol production, this project required a series of plant upgrades and increase in throughput of raw materials, principally flour and grain. The Project included the following alterations and additions:

- The provision of an additional product dryer;
- Additional equipment and storage vessels for the ethanol plant including additional fermenters, additional cooling towers and molecular sieves.
- Upgrades to the Stillage Recovery Plant, including additional DDGS Dryers, Decanters, chemical storage and evaporators. This proposal also included the installation of a DDGS Pellet Plant.
- The establishment of a new packing plant, container loading area and rail spur line on the northern side of Bolong road.

As outlined above, the Project Approval also consolidated all previous approvals (up to that time) into the one Project Approval.

3.0 The Modification Proposal

Shoalhaven Starches intend to convert Boiler No. 4 situated within the existing factory site from gas to coal fired.

The reason for the conversion is due to the costs associated with natural gas compared to coal Shoalhaven Starches anticipate that converting from natural gas to coal will result in a saving of $ 4 million per annum in energy costs.

The proposed conversion will require the construction of a bag house on top of the boiler building. The bag house will have a height of 8.3 metres, increasing the overall height of the boiler house to 35.0 m above ground level.

The proposal will also include repairs and extension to an existing stack, increasing the height of the stack by 9 metres to an overall height above ground level of 38.74 m.

Plan details of the proposal are attached to this submission for the Department's consideration.

4.0 Key Issues arising from the Modification Proposal

The following is a brief summary of the main issues arising in relation to this specific proposal.

- **Air Quality (and Odours)**

  Air quality, and in particular odours, have long been an issue of contention with respect to the Shoalhaven Starches operation.

  The Land and Environment Court judgement of 2 November 2006 required Shoalhaven Starches to engage a suitably qualified person to conduct a comprehensive environmental audit of the factory and environmental farm in order to identify and quantify all odours generated by the operations, and to provide recommendations for the improved management of odours. Shoalhaven Starches engaged GHD to conduct the environmental audit.

  The environmental audit of odour sources at Shoalhaven Starches was conducted between December 2006 and June 2007. The audit considered the management of

processes, activities and substances stored or used at the premises that generate or have the potential to generate odours.

The findings of the "Shoalhaven Starches Environmental Audit – Odour Sources" (GHD, 2007), formed the basis of the data for the Air Quality Impact Assessment that was subsequently prepared by GHD and which supported the Environmental Assessment, Shoalhaven Starches Expansion Project subsequently approved by the Minister for Planning (MP 06_0228) Shoalhaven Starches, and which have been implemented by the Company at the site.

The use of coal instead of gas as a fuel for boiler 4 is not expected to generate a significant odours. The boilers have not previously been considered an odour source on the site. Indeed odorous air emissions from the DDG process are currently directed to Boilers 4, 5 and 6 as an odour treatment (combustion in the boilers destroys odour compounds).The boiler stacks are tested quarterly for odours in conjunction with the site's EPA license requirements.

It is proposed that the Modification Application would be supported by an Air Quality Impact Assessment the objective of which would be to address Sulphur dioxides, Nitrogen Oxides, total suspended particles (TSP) and greenhouse gas emissions from the proposed boiler conversion to ensure compliance with Air Quality Standards. This assessment will need to provide a comparative analysis against the approved impacts of the overall ethanol expansion project and including the cumulative impacts from the approved development in addition to the proposed modification.

It is anticipated that the Air Quality Assessment modelling would be undertaken in accordance with the *Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales (AMMAAP)*.

- **Noise**

Shoalhaven Starches operates under Environment Protection Licence 883 issued by the NSW Environment Protection Authority (EPA).

Section L5 'Noise Limits' of the licence states:-

> *"L5.1 the LA10 (15min) sound pressure level contribution generated from the premises must not exceed the following levels when measured at or near the boundary of any residential premises:*
>
> *a) 38 dBA at locations in Terara on the south side of the Shoalhaven River;*
>
> *b) 38 dBA at locations in Nowra on the south side of the Shoalhaven River;*
>
> *c) 42 dBA at locations in Meroo Street, Bomaderry;*
>
> *d) 40 dBA at other locations in Bomaderry."*

These noise limits apply to the overall operation of the Shoalhaven Starches complex.

The Project Approval required the preparation of a Noise Management Plan for addressing and managing noise emission from the expansion project.

The Shoalhaven Starches Noise Management originally prepared 31 October 2009 and revised 7 September 2010 addresses, among other things, acoustic criteria relating to the

Shoalhaven Starches complex and any new developments. Section 3 of the plan lists noise limits from the Environmental Protection Licence as shown above and states:-

> *"Compliance testing conducted on a regular basis on behalf of the Mill* [Shoalhaven Starches complex] *has found noise emission from the premises satisfies the EPA criteria as a result of works on the Shoalhaven Starches site. In order to ensure that there is no increase in noise emission from the subject premises, with respect to the noise criteria nominated by the EPA in License Condition 6.3* [now 5.1]*, the design goal for such additional plant should be at least 10 dB below the criteria nominated by the EPA."*

It is therefore proposed that the Modification Application be supported by an Environmental Noise Impact Assessment which will need to demonstrate how the proposed modified development will be able to satisfy relevant noise goals.

- **Traffic & Transportation**

Shoalhaven Starches have undertaken a comprehensive upgrade to existing vehicle entrances to the Shoalhaven Starches factory site as well as the recently acquired former Dairy Farmers site to Bolong Road in accordance with the Project Approval as well as other approvals granted by Shoalhaven City Council.

Converting the boiler from gas to coal fired will require approximately 2.6 trucks per day (Monday to Friday) to deliver coal to the site. These vehicles will likely comprise semi-trailers or truck and dog, and will enter the site via the western driveway to the site. In addition 1 truck will be required every second day to remove ash.

It is proposed that the Modification Application would be supported by a Traffic Impact Assessment that would assess the likely traffic impacts associated with this proposal; in particular heavy vehicle movements; the impacts that such traffic movements would have on the existing access points; and whether such access points to the site will be sufficient to accommodate traffic generated by the modified proposal.

- **Preliminary Hazard Analysis**

In general, risk assessment of industrial developments follows 5 basic steps:

- identification of potential hazards;
- an evaluation of safeguards to minimise the chance of occurrence of the identified hazards and their impact;
- an assessment of the magnitude of the consequences of the identified hazards;
- an assessment of the likelihood of occurrence; and
- an assessment of the risk by a combination of the consequences and likelihoods and comparison with tolerability criteria.

The Department of Planning has prepared a set of guidelines to help determine the level required according to the nature of the development:

- Multi-level Risk Assessment (MRA) describes the level and extent of the analysis reflecting the nature, scale, location of the proposed development;

- Hazardous Industry Planning Advisory Paper (HIPAP) No. 6 provides guidelines on requirements of the analysis;
- Hazardous Industry Planning Advisory Paper (HIPAP) No. 4 provides the adopted risk criteria for land use planning decisions;
- SEPP No. 33 provides a screening tool to determine whether a proposed development is hazardous and offensive, whether it requires a PHA, whether the PHA needs to be qualitative or quantitative and whether a detailed transportation study is required.

As the proposal involves modifications to the existing boiler, and given the nature of the existing processes on the existing factory site, the proposal is subject to the provisions of SEPP No. 33 - Offensive & Hazardous Industry. A Preliminary Hazard Analysis will therefore need to accompany the EIS.

- **Visual Impact**

The Shoalhaven Starches factory site is situated on Bolong Road, the gateway to Bomaderry, within an area currently containing predominantly industrial land uses, although lands to the north have a rural character. These different land uses contrast with each other and result in a mixed visual character.

The rural areas, much of which comprises the Shoalhaven Starches Environmental Farm, are generally flat to gently undulating and planted with pasture grasses. These areas have a typical rural/agricultural character, common throughout the region. To the north and forming a background to the rural landscape are the timbered slopes of the Cambewarra escarpment.

The Shoalhaven Starches factory complex is characterised by typical industrial structures with an overall bulk and scale that dominates the surrounding locality. The factory complex, despite being partially screened by vegetation along Bolong Road, the Shoalhaven River and Abernathy's Creek visually dominates the locality. The overall complex is particularly exposed to view along Bolong Road. This view reveals some of the internal structures within the site including recovery and storage tanks, car park, fermentation tanks and the Ethanol Plant. Overall the appearance of the site is typical of an industrial facility of this nature.

The proposal will involve the construction of a bag house on the roof of the exiting boiler house, and extension to an existing stack.

The visual impact of the proposed works will need to be taken into consideration in context of existing development on this site, and the setting of the site within the broader landscape both to the north across rural lands; as well as to the south across the Shoalhaven River.

The above are the main issues that we consider should be addressed as part of any Modification Application.

Given the proposed works involve only extensions to the roof of the existing boiler house, the proposal does not involve any works at ground level. Under these circumstances it is our view that the following issues will <u>not</u> be required to be addressed as part of this modification application:

- Flooding
- Acid Sulphate Soils
- Site Contamination

Shoalhaven Starches propose to modify the approved Shoalhaven Starches Expansion Project to convert the existing Boiler No. 4 from gas fired to coal fired. It is anticipated that the conversion will result in saving in energy costs of $ 4 million per annum.

The proposed modification does not seek to increase production at the site over that which has been approved.

The purpose of this submission is to seek any requirements or issues that the Department consider will need to be addressed as part of any Modification Application submission.

I trust that the above and attached documents will be sufficient to enable the Department to supply any requirements it may have in relation to this matter. If you require any clarification in connection with this matter please do not hesitate to contact me.

Yours faithfully

Stephen Richardson

Stephen Richardson
COWMAN STODDART PTY LTD

Enc.

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13 April, 2017

Our ref: 16/45

Your ref: MP 06_0228

The Secretary
Department of Planning & Environment
GPO BOX 39
SYDNEY NSW 2001

Attention: Deana Burn

Dear Sir

RE: PROPOSED MODIFICATION APPLICATION MP06_0228
SHOALHAVEN STARCHES EXPANSION PROJECT
PROPOSED CONVERSION OF BOILER NO. 4 FROM GAS TO COAL FIRED
SHOALHAVEN STARCHES, BOLONG ROAD, BOMADERRY

I refer to our submission dated 11th January 2017 in which we sought the Department's requirements for the preparation of the Environmental Assessment (EA) in relation to the above Modification Application. The Department subsequently issued their requirements in an email dated 14th February 2017.

The purpose of this submission is to advise the Department that Shoalhaven Starches have undertaken a further review of their energy supply requirements for their operations and have identified that in addition to the proposed modifications to convert Boiler No. 4 from gas to coal fired that they will also need to seek to undertake the following modifications to two other boilers on the site including:

- To undertake modifications to Boiler No.2. This boiler was originally a coal fired boiler but was converted to enable the use of woodchips instead of coal and presently generates approximately 7 tonnes of steam per hour. It is now proposed to convert this boiler back to coal fired. This will require the construction of a new baghouse adjacent to the Boiler No. 2 building and the construction of a new emissions stack which will have a height above ground level of 40 metres. These modifications will increase production of steam from this boiler back to 14 tonnes per hour (consistent with what it originally produced before it was converted to burn woodchips).

- To undertake modifications to Boiler No. 6. This boiler is already a coal fired boiler. It is proposed however to construct a new baghouse and associated ducting adjacent to this boiler. These works will have a maximum height above ground level of 15 metres. The

purpose of this work will be to increase steam production from this boiler by 7 tonnes per hour.

Any increase in production of steam as a result of these modifications will be balanced by a corresponding reduction in steam generated by boilers on the site that use natural gas.

These modifications are being implemented due to substantial increases in natural gas prices that are currently being experienced nationwide. Shoalhaven Starches are therefore seeking to reduce their reliance on natural gas for their energy generation. It is anticipated that the modifications to all these boilers (Nos. 2, 4 and 6) will result in a saving of energy costs of $ 9 million per annum for the company.

Drawings detailing the above amendments including the original modifications to Boiler No. 4 are attached to this submission for the Departments consideration.

It is understood that staff from Shoalhaven Starches have discussed these further modifications with staff from both the Department on the 13th April 2017 as well as the EPA on the 28th March 2017.

In our view the proposed modifications will not alter the key issues that will need to be addressed in the preparation of the EA as detailed in our submission dated 11th January 2017 except for the following:

- The proposed modifications to Boiler No. 2 will require external additions to the Boiler No. 2 building. These extensions will in part replace existing structures on this site, however the footprint of these works will be slightly larger compared to the existing development. Given the subject land is flood prone land the flooding impacts associated with this slight increase in building footprint will need to be taken into consideration as part of any assessment.

- The proposed modifications to Boiler No. 2 will also require excavation works to enable construction of foundations for the proposed additions. Given the Shoalhaven Starches factory site is identified as containing potential acid sulphate soils and has a history of industrial use it would be prudent that the EA be supported by assessments that would address:

    - the potential for acid sulphate soils to be present in the area of the proposed works within the anticipated depth of disturbance with recommendations on the need for management (if required); and

    - assess the likelihood for contamination to exist on the site from past or present activities in context of the continuing site use as an industrial facility, and provide guidance on additional assessment / management (if required).

As outlined in our original submission dated 11th January 2017 this amended modification does not seek to increase production at the site over that which has been previously approved at the site.

The purpose of this submission is to seek any additional requirements or issues that the Department consider will need to be addressed as part of this Modification Application.

Proposed Modifications to Boilers 2, 4 and 6
Shoalhaven Starches Pty Ltd
Orient Road, Bomaderry Page 3

I trust that the above and attached documents will be sufficient to enable the Department to supply any additional requirements it may have in relation to this matter. If you require any clarification in connection with this matter please do not hesitate to contact me.

Yours faithfully

Stephen Richardson

Stephen Richardson
COWMAN STODDART PTY LTD

APPENDIX B – ODOUR EMISSION INVENTORY (GHD REPORT)

The OER inventory presented in the following sub-sections is limited to the principal factory and environmental farm odour sources identified in the Audit Report plus the potential odour sources associated with the ethanol upgrade. The odour reduction at each stage of odour control implementation is also included for each source or source group.

NB: The existing scenario includes emission sources that have been granted Development Approval (flour mill, starch dryer No. 5 and fermentation tanks No. 10 – 13). These odour sources have been included in the group of principal (existing) factory odour sources. The OERs for these sources have been derived from the OERs for similar equipment examined in the Audit Report.

In all cases, the adopted and projected odour emission rates for each odour source should be verified by odour emission testing following installation and commission of odour control measures to confirm performance against projected odour emission rates.

5.1.1 Factory

A breakdown of the principal odour sources from the existing factory OER and proposed ethanol upgrade at the different stages of odour control implementation is given in Table 5-1.

OERs in the following tables are expressed in odour units (OU) volumes per second (OU m^3/s). OERs are taken directly from Table 23 in the Audit Report except where footnoted. Definitions of the abbreviations used to denote odour control actions are also given in the footnotes (refer to previous sections for detail on the odour control actions and their anticipated odour reduction efficiencies).

Table 5-1 Odour Emission Inventory – Existing Factory and Ethanol Upgrade

Plant	Odour Source	ID	OER Before Control OU m^3/s	Stage 1 Odour Control [1] OU m^3/s		Stage 2 Odour Control [1] OU m^3/s		Stage 3 Odour Control [1] OU m^3/s	
				Control	OER	Control	OER	Control	OER
Existing Factory									
DDG (liquids)	Feed dump tank	DDG 20	8,900	BIO	1,338	BIO	1,338	BIO	1,338
DDG (liquids)	Condensate tank [14]	DDG 23	25,711	BIO	3,857	BIO	3,857	BIO	3,857
DDG (liquids)	Vent condensor	DDG 24	3,500	BIO	525	BIO	525	BIO	525
DDG (liquids)	Condensor drain	DDG 25	3,167	Nil	3,167	BIO	475	BIO	475
DDG (liquids)	Finish Feed tank	DDG 26	18,333	BIO	2,750	BIO	2,750	BIO	2,750
DDG (liquids)	Finisher pump tank	DDG 28	1,433	BIO	215	BIO	215	BIO	215

Plant	Odour Source	ID	OER Before Control OU m^3/s	Stage 1 Odour Control [1] OU m^3/s		Stage 2 Odour Control [1] OU m^3/s		Stage 3 Odour Control [1] OU m^3/s	
				Control	OER	Control	OER	Control	OER
DDG (liquids)	Dryer feed tank	DDG 30	1,433	BIO	215	BIO	215	BIO	215
DDG (liquids)	Feed holding tank	DDG 31	1,317	BIO	198	BIO	198	BIO	198
DDG (liquids)	CIP tank	DDG 32	417	BIO	63	BIO	63	BIO	63
DDG (solids)	DDG tent storage area	DDG 36	12,862	PP	1,929	PP	1,929	PP	1,929
DDG (solids)	DDG product storage sheds	DDG 34	6,820	PP	1,023	PP	1,023	PP	1,023
DDG (solids)	Grounds	DDG 37	203	HK	0	HK	0	HK	0
DDG (solids)	DDG - palmer cooler [7]	DDG 16	17,666	BIO	2,650	BIO	2,650	BIO	2,650
DDG (solids)	DDG heat exchanger [6]	DDG 45	2,333	Repair	0	-	0	-	0
DDG (solids)	Decanter 3&4	DDG 5	1,700	Nil	1,700	BIO	255	BIO	255
DDG (solids)	Decanter 1&2	DDG 2	260	Nil	260	BIO	39	BIO	39
DDG (solids)	Decanter feed tank	DDG 1	217	WL	108	BIO	33	BIO	33
DDG (solids)	Feed dryer baghouses	DDG 18	867	BIO	130	BIO	130	BIO	130
DDG (liquid)	Light phase tank	DDG 19	450	Nil	450	Nil	450	BIO	68
DDG (solids)	DDG Dryer building	DDG 39	70,504	IV	7,050	IV / BIO[16]	7,050	IV / BIO[16]	7,050
DDG	Cooling towers	DDG 46	68,333	HK	6,833	HK	6,833	HK	6,833
Distillery	Incondensible gases vent	D6	400	Nil	400	Nil	400	Nil	400
Distillery	Molecular Sieve - Vacuum drum	D2	1,350	Nil	1,350	Nil	1,350	BIO	203
Distillery	DME vent	D12	107	Nil	107	Nil	107	Nil	107

Plant	Odour Source	ID	OER Before Control OU m^3/s	Stage 1 Odour Control [1] OU m^3/s		Stage 2 Odour Control [1] OU m^3/s		Stage 3 Odour Control [1] OU m^3/s	
				Control	OER	Control	OER	Control	OER
Ethanol	Grain silo - baghouse	E1	183	Nil	183	Nil	183	Nil	183
Ethanol	Cooling towers	E23	65,833	D	0	D	0	D	0
Ethanol	Propagator tanks 4 & 5	E15	28,333	Nil	28,333	BIO	4,250	BIO	4,250
Ethanol	Grain retention - tank 2	E8	6,500	WL	3,250	BIO	975	BIO	975
Ethanol	Propagator-tanks 1,2&3	E14	5,500	Nil	5,500	BIO	825	BIO	825
Ethanol	Jet cooker2&4	E7	1,133	Nil	1,133	Nil	1,133	BIO	170
Ethanol	Jet cooker 1 - retention tank	E13	1,067	Nil	1,067	Nil	1,067	BIO	160
Ethanol	Rejects tank	E10	183	Nil	183	Nil	183	Nil	183
Ethanol	Feed to distillery	E22	167	WL	83	WL	25	WL	25
Ethanol	Fermentation vent [2]	FER M10	518	Nil	518	Nil	518	Nil	518
Ethanol	Fermentation vent [2]	FER M11	719	Nil	719	Nil	719	Nil	719
Ethanol	Farm tank	F18	7,667	WL	3,834	BIO	1,150	BIO	1,150
Flour	Cyclone and fabric filter [3]	4	1,654	ID	1,654	ID	1,654	ID	1,654
Flour	Cyclone and fabric filter [3]	5	617	ID	617	ID	617	ID	617
Flour	Cyclone and fabric filter [3]	6	1,477	ID	1,477	ID	1,477	ID	1,477
Flour	Cyclone and fabric filter [3]	7	551	ID	551	ID	551	ID	551
Glucose	Drum vacuum receiver	C4	3,500	Nil	3,500	Nil	3,500	BIO	525
Glucose	Ion exchange effluent tank	C18	250	Nil	250	Nil	250	BIO	38
Glucose	Enzyme Tanks (7 of)	B7	4,083	WL	2,042	BIO	613	BIO	613
Glucose	Cooker A & B Flash Tanks	B3	950	Nil	950	Nil	950	BIO	143
Starch	Dry gluten bin	S7	4,500	Nil	4,500	Nil	4,500	CTS	4,500

Plant	Odour Source	ID	OER Before Control OU m^3/s	Stage 1 Odour Control [1] OU m^3/s		Stage 2 Odour Control [1] OU m^3/s		Stage 3 Odour Control [1] OU m^3/s	
				Control	OER	Control	OER	Control	OER
Starch	High protein dust collector	S8	600	Nil	600	Nil	600	Nil	600
Starch	Flour bin	S6	283	Nil	283	Nil	283	Nil	283
Starch	Flour bin aspirator	S13	1,000	Nil	1,000	Nil	1,000	Nil	1,000
Starch	Pellet silo	S12	350	Nil	350	Nil	350	Nil	350
Starch	No.4 Gluten Dryer [4]	S5	13,331	HK	9,998	HK	9,998	CTS	9,998
Starch	No.3 Gluten Dryer [4]	S3	19,501	HK	14,625	HK	14,625	CTS	14,625
Starch	No.1 Gluten Dryer [4]	S2	13,182	HK	9,886	HK	9,886	CTS	9,886
Starch	No.2 Gluten Dryer [4]	S4	5,511	HK	4,133	HK	4,133	CTS	4,133
Starch	No. 4 Starch Dryer [4]	S19	7,151	HK	5,363	HK	5,363	CTS	5,363
Starch	No. 3 Starch Dryer [4]	S18	6,436	HK	4,827	HK	4,827	CTS	4,827
Starch	No. 1 Starch Dryer [4]	S1	6,315	HK	4,736	HK	4,736	CTS	4,736
Starch	No. 5 Starch Dryer [5]	8	6,794	HK	5,095	HK	5,095	HK	5,095
Starch	Spray dryer	S20	983	HK	738	HK	738	HK	738
Starch	Kestner dryer	DDG 40	3,000	D	0	D	0	D	0
Factory	**TOTAL**		**468,105**		**158,296**		**118,659**		**111,266**
ETHANOL UPGRADE									
DDG	DDG tank vents	-	36,000	BIO	5,400	IV	5,400	IV	5,400
DDG	DDG transfer cyclones (6 units) [8]	-	9,083	BIO	1,362	BIO	1,362	BIO	1,362
DDG	DDG dryers (6 units) [8]	-	6,321	BIO	948	BIO	948	BIO	948
DDG	Decanters (10 units) [9]	-	8,417	BIO	1,263	BIO	1,263	BIO	1,263
DDG	Pelletiser baghouses (2 units) [10]	-	34,378	BIO	5,157	BIO	5,157	BIO	5,157

30 Ethanol Upgrade
Air Quality Assessment 22/13594/81099 R0

Plant	Odour Source	ID	OER Before Control OU m^3/s	Stage 1 Odour Control [1] OU m^3/s		Stage 2 Odour Control [1] OU m^3/s		Stage 3 Odour Control [1] OU m^3/s	
				Control	OER	Control	OER	Control	OER
DDG	General ventilation [15]	-	722	BIO	108	BIO	108	BIO	108
Ethanol	Propagation tank [11]	2	14,167	Nil	14,167	BIO	2,125	BIO	2,125
Ethanol	Fermenters (3 tanks) [12]	3	1,856	ID	1,856	ID	1,856	ID	1,856
Starch	No. 5 Gluten dryer [13]	9	12,881	HK	9,661	HK	9,661	HK	9,661
Starch	Gluten grinder [13]	10	12,881	HK	9,661	HK	9,661	HK	9,661
SUB-TOTAL	**Upgrade**		**136,706**		**49,583**		**37,541**		**37,541**
SUB-TOTAL	**Factory**		**468,105**		**158,296**		**117,852**		**111,266**
TOTAL	**Factory + upgrade**		**604,811**		**207,879**		**155,393**		**148,807**

Footnotes to table above:

1. Odour control abbreviations used are as follows: BIO – bioscrubber; WL - wet-leg installed on tanks to condense vapour emissions; D – decommissioned plant item; HK - housekeeping actions such as ductwork cleaning and maintenance, IV: industrial ventilation improvements; ID – improve dispersion from discharge points; PP – DDG pelletiser plant installation; CTS – common tall stack; Nil – no odour control at this stage.
2. Plant item was not commissioned at the time of the odour audit. OER taken from SEMA odour testing report (March 2008).
3. The flourmill was not commissioned at the time of this assessment. OER adopted from the Short Mill Flour Environmental Assessment report (GHD, March 2007).
4. A limited quantity of OER data for the gluten and starch dryers was available from the Audit Report (singleton samples were collected using pre-dilution). Extensive emission testing has been conducted by SEMA on these sources as a result of routine emission testing, as set out in Shoalhaven Starch's licence conditions (samples were collected without pre-dilution) and data was also available also from tests conducted by SEMA to determine the potential for odour emission reduction from ductwork cleaning in March 2008 (samples here were collected with and without static pre-dilution). Consideration was given to all available data with respect to data quality and quantity. Odour concentrations reported in the Audit Report were an order of magnitude higher than the odour emissions that were reported on a consistent basis during routine testing. The Audit report the gluten and starch dryers were treated as outliers by GHD. For the purpose of this assessment, OER data was adopted from the SEMA emission survey report (March 2008), which was conducted as part of the ductwork cleaning trials.

APPENDIX C – TSP EMISSION INVENTORY (GHD REPORT)

The emission rate data used for TSP and PM10 in this air quality assessment were primarily based on emission testing conducted by SEMA, which was either reported in the SEMA emission survey report (March, 2008) or in the quarterly discharge license monitoring reports (in the case of Boiler No. 5/6).

Fugitive emissions of TSP and PM10 have not been included in this assessment. It is assumed that the application of standard dust mitigation measures around the site (e.g. housekeeping) would provide adequate control to minimise air quality impacts.

Table 5-3 shows the factory emission inventory for particulate matter as TSP and PM10.

Table 5-3 Emission Inventory – Particulate Matter

Discharge Point	Emission Control	In-stack TSP (mg/m^3) at Stack Gas Condition	In-stack TSP (mg/m^3) at Reference Condition	In-stack TSP Concentration Standard (mg/m^3)	TSP g/s	PM10 g/s
Boiler No. 1 [12]	Gas-fired	ND	ND	-	0.07	0.07
Boiler No. 2 [1]	Cyclone	543	881 [7]	250 [8]	3.2	0.62
Boiler No. 3 [12]	Gas-fired	ND	ND	-	0.04	0.04
Boiler No. 4 [1]	Cyclone	741	723 [7]	250 [8]	6.1	1.2
Boiler No. 5/6 [2]	Cyclone & Fabric filter	32	32	50 [9]	1.0	0.75
Gluten dryer No. 1 [1]	Fabric filter	0.83	0.83	250 [8]	0.015	0.0003
Gluten dryer No. 2 [1]	Fabric filter	1.3	1.3	250 [8]	0.015	0.001
Gluten dryer No. 3 [1]	Fabric filter	0.56	0.56	250 [8]	0.02	0.02
Gluten dryer No. 4 [1,3]	Fabric filter	0.56	0.56	250 [8]	0.02	0.02
Starch dryer No. 1 [1,4]	Wet-scrubber	60	60	250 [8]	0.59	0.18
Starch dryer No. 3 [1]	Wet-scrubber	2	2	250 [8]	0.04	0.013
Starch dryer No. 4 [1]	Wet-scrubber	63	63	250 [8]	1.2	0.31
Starch dryer No. 5 (approved) [10]	Wet-scrubber	25	25	100 [8]	0.39	0.12

Discharge Point	Emission Control	In-stack TSP (mg/m^3) at Stack Gas Condition	In-stack TSP (mg/m^3) at Reference Condition	In-stack TSP Concentration Standard (mg/m^3)	TSP g/s	PM10 g/s
Spray dryer [5]	Fabric filter	60	60	250 [8]	0.48	0.14
Flour Mill (approved)	Fabric filter	<10	<10	20 [8]	0.03	0.009
Other (aggregate) [11]	Fabric filter	<10	<10	250 [8]	0.1	0.1
Total existing					**13**	**3.6**
Gluten dryer No. 5 (proposed) [6]	Fabric filter	<10	<10	20 [8]	0.02	0.02
Gluten grinder (proposed) [6]	Fabric filter	<10	<10	20 [8]	0.02	0.02
Boiler No. 7 (proposed) [12]	Gas-fired	ND	ND	-	0.07	0.07
Co-generator turbine No. 1 (proposed) [13]	Gas-fired	ND	ND	-	0.1	0.1
Co-generator turbine No. 2 (proposed) [13]	Gas-fired	ND	ND	-	0.1	0.1
Total – increment for proposed upgrade					**0.31**	**0.31**
Total – existing + upgrade					**13.3**	**3.9**

Footnotes to table above:

ND: No data

1. TSP and PM10 mass emission rate adopted from SEMA report "Stack Emission Survey – Particles, Odour, Metals & Gases" (April 2008).
2. Highest PM10 emission rate selected from recent discharge licence test results reported by SEMA "Emission survey – Boilers No. 5 and 6" (April 2007).
3. TSP concentration reported was 35 mg/m^3. GHD was advised by Shoalhaven Starches that this test result indicated a failure in the fabric filter control system, which would be fixed. Therefore, the emission rate measured for gluten dryer No. 3 was adopted.