Stephenson

Environmental Management Australia

AIR QUALITY IMPACT ASSESSMENT

PROPOSED FLOUR MILL B

SHOALHAVEN STARCHES

BOLONG ROAD,

BOMADERRY NSW

PROJECT NO.:	**5722/S24400/16**
DATE OF DRAFT AQIA ISSUE:	**10 OCTOBER 2016**
DATE OF FINAL AQIA ISSUE:	**17 OCTOBER 2016**

PREPARED FOR COWMAN STODDART ON BEHALF OF THE MANILDRA GROUP

Stephenson

Environmental Management Australia

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1 INTRODUCTION

Stephenson Environmental Management Australia (SEMA) was engaged by Cowman Stoddart Pty Ltd on behalf of the Manildra Group to undertake an Air Quality Impact Assessment (AQIA) for a proposed new flour mill, known as Flour Mill B, to be established adjacent to the existing Flour Mill A at the Shoalhaven Starches manufacturing facility located on Bolong Road, Bomaderry, New South Wales (NSW).

The objective of this AQIA is to determine the cumulative ground level concentration (GLC) of odour and total suspended particles (TSP) from the proposed Flour Mill B, and to determine that it is within Air Quality Standards. To achieve this objective, this AQIA will reference the cumulative impacts of the approved ethanol expansion project development and the proposed new Flour Mill B.

The AUSPLUME computer based dispersion model was used to determine the maximum odour and TSP GLCs for this assessment in accordance with the *Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales (AMMAAP)*. AUSPLUME has been used as the dispersion model of choice to enable predicted impacts to be compared with all previous air quality predictions.

Odour and TSP emission measurements conducted by SEMA at the existing flour mill on September 26th, 2011, have been used as emission input data for the predictive dispersion modelling.

The Manildra Group provided proposed operational data, discharge stack and equipment design information.

The NSW Department of Planning, PA 06_0228 Appendix 3 has been referenced in this air quality impact assessment.

Two air quality assessments by GHD were referenced in this assessment. These were Shoalhaven Starches - Air Quality Assessment for Short Flour Mill 2007 and Shoalhaven Starches – Ethanol Upgrade Air Quality Assessment 2008.

2 THE SITE

The Manildra Group 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. Figures 2.2 and 2.3 show the plan and elevation, respectively, of the proposed Flour Mill B in-situ on the Shoalhaven Starches site. Plans of proposed Flour Mill B are shown in Figures 2.4, 2.5 and 2.10. Elevations are presented in Figures 2.6, 2.7, 2.8, 2.9 and 2.11.

FIGURE 2-1 MODELLING DOMAIN

FIGURE 2-2 PLAN OF SHOALHAVEN STARCHES SITE WITH PROPOSED FLOUR MILL B

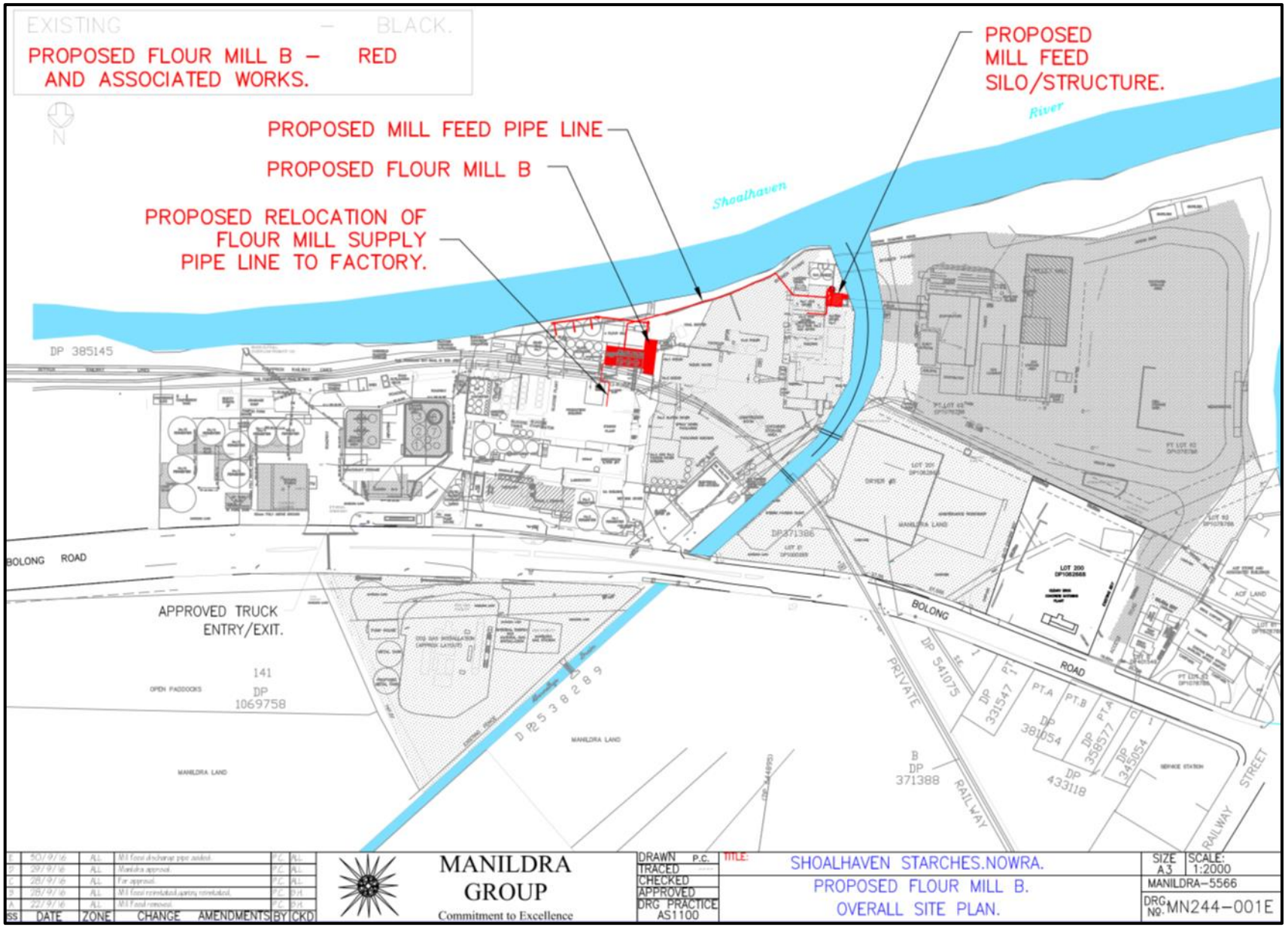


FIGURE 2-3 ELEVATION OF SHOALHAVEN STARCHES SITE WITH PROPOSED FLOUR MILL B

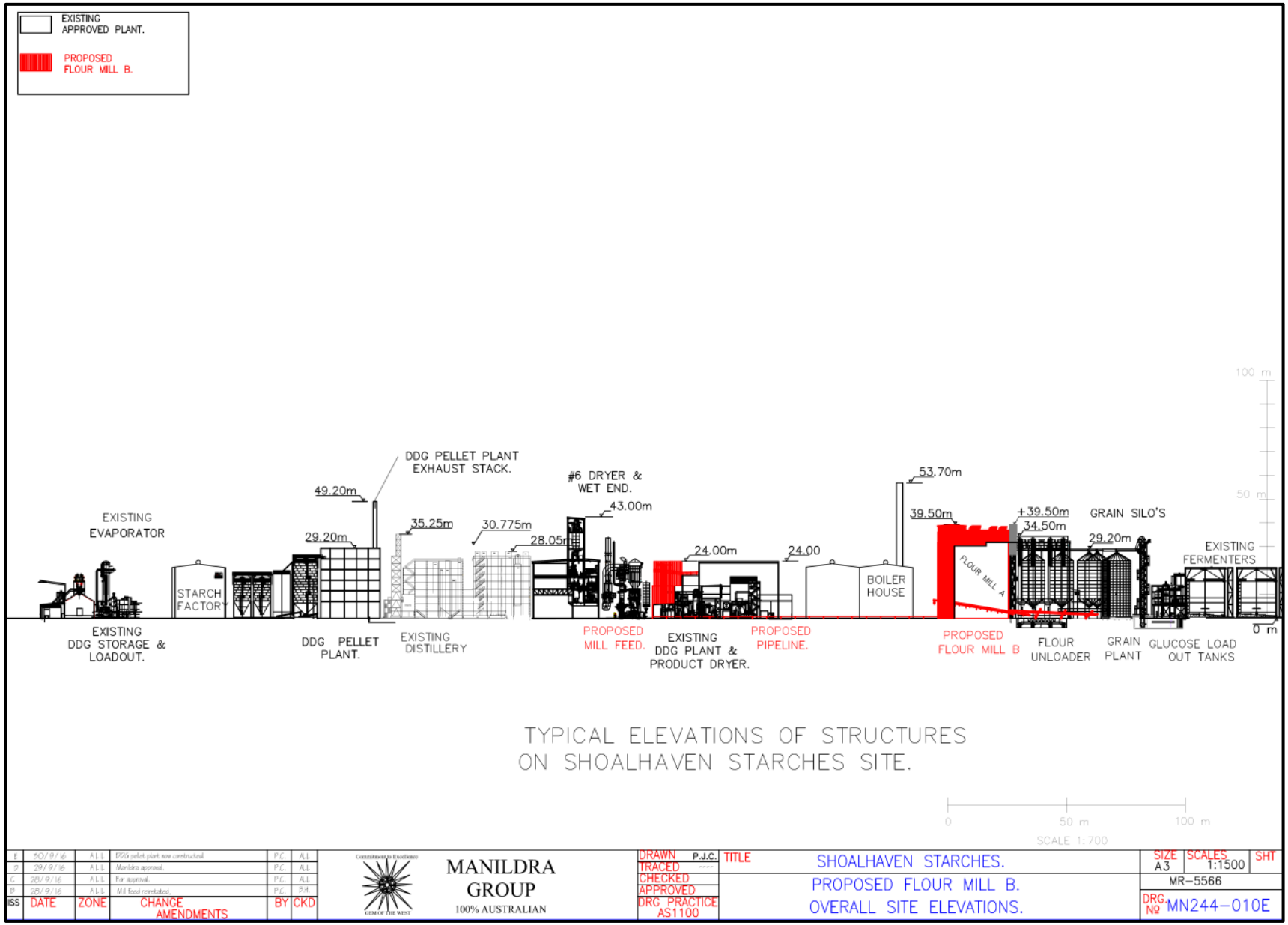


FIGURE 2-4 PROPOSED FLOUR MILL B PLAN

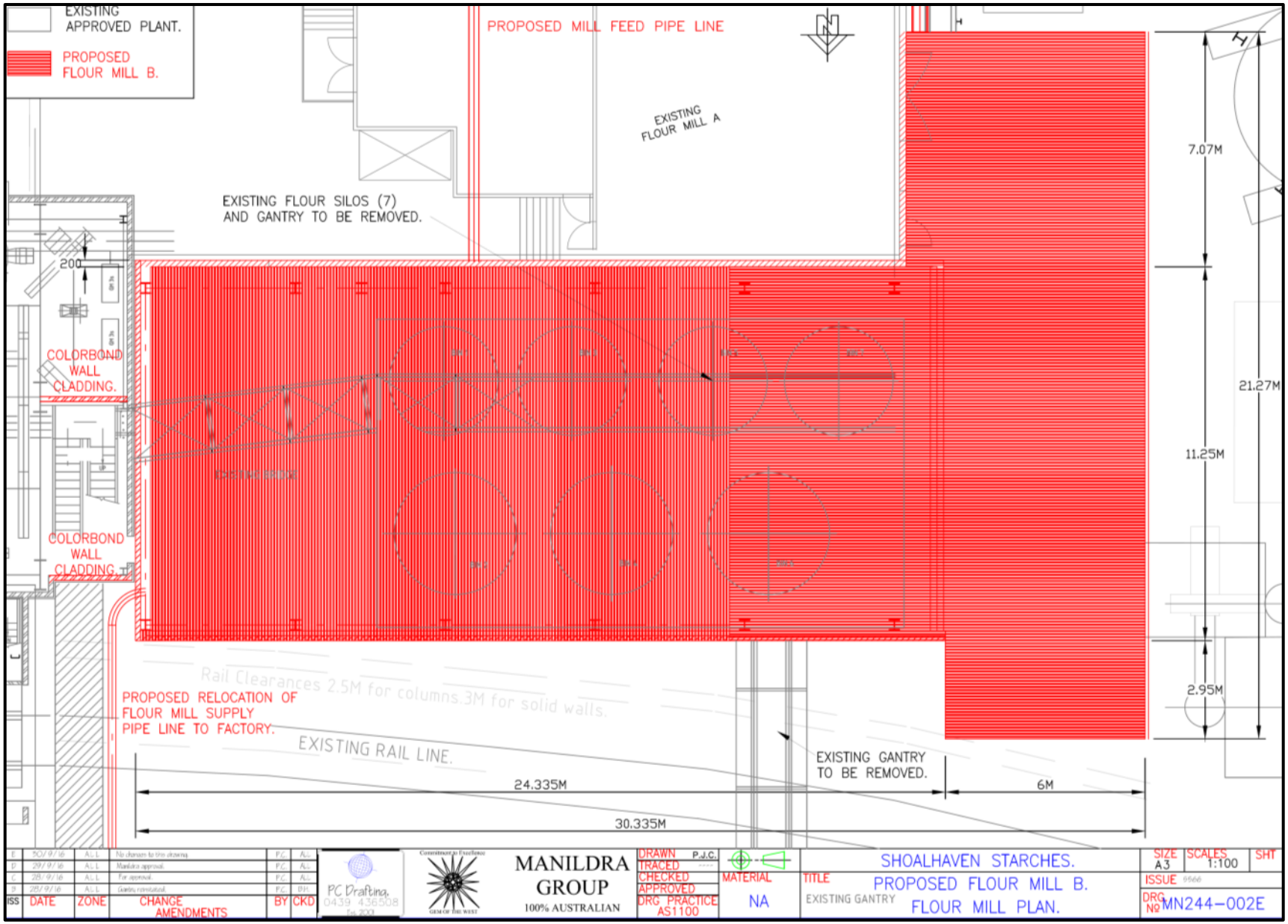


FIGURE 2-5 PROPOSED FLOUR MILL B PLAN AND ASSOCIATED WORKS

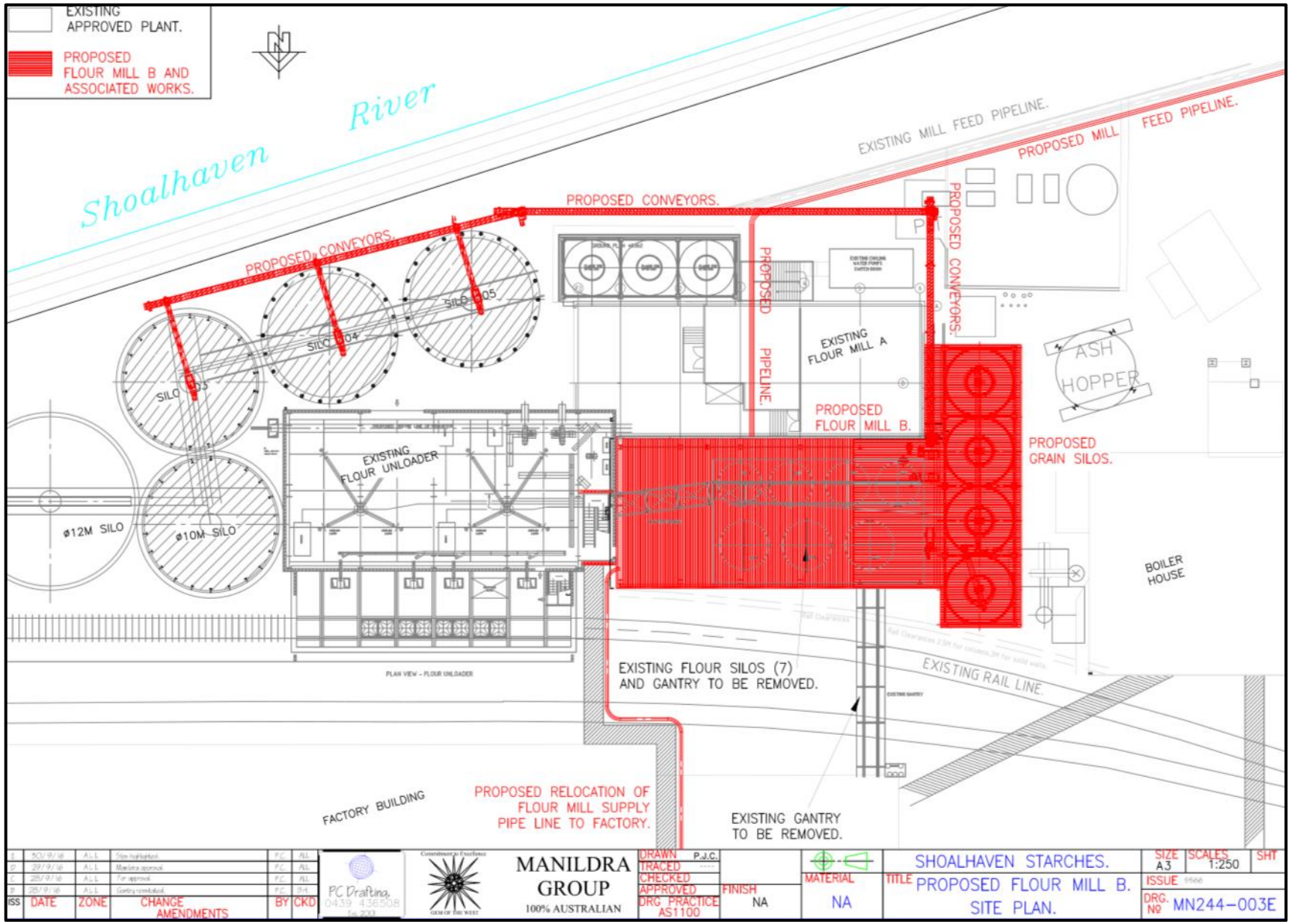


FIGURE 2-6 PROPOSED FLOUR MILL B NORTHERN ELEVATION

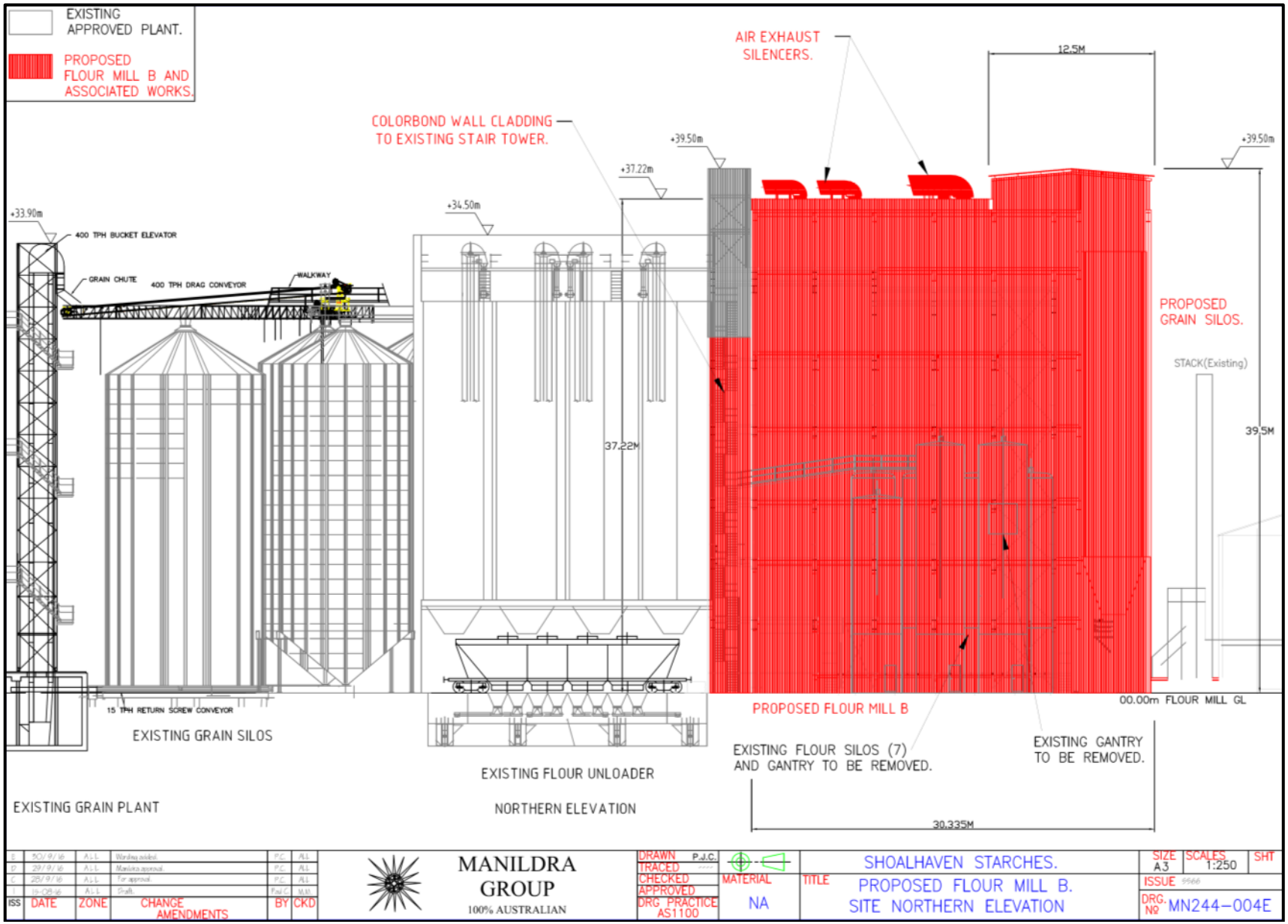


FIGURE 2-7 PROPOSED FLOUR MILL B NORTHERN ELEVATION DETAIL

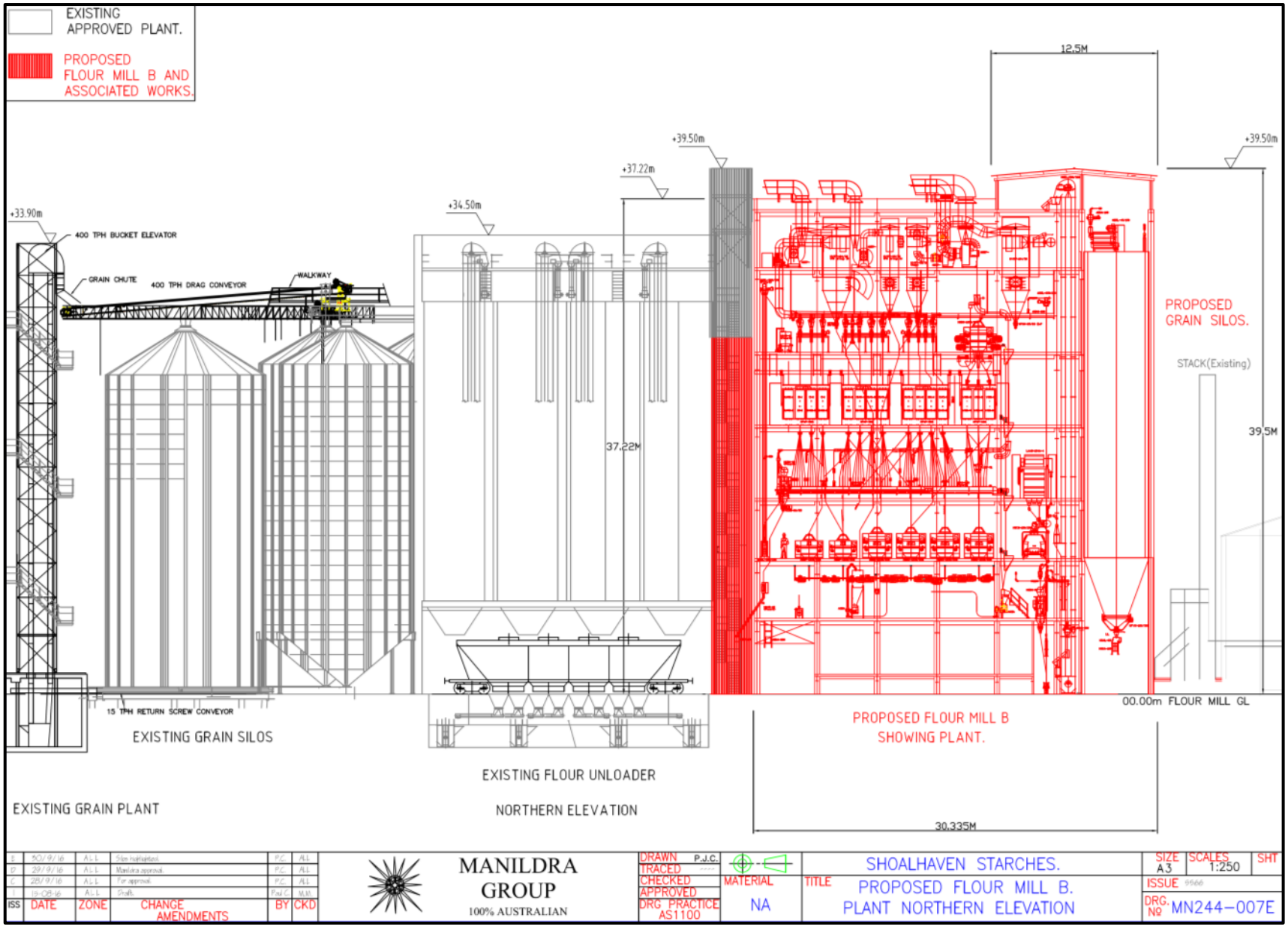


FIGURE 2-8 PROPOSED FLOUR MILL B WESTERN ELEVATION

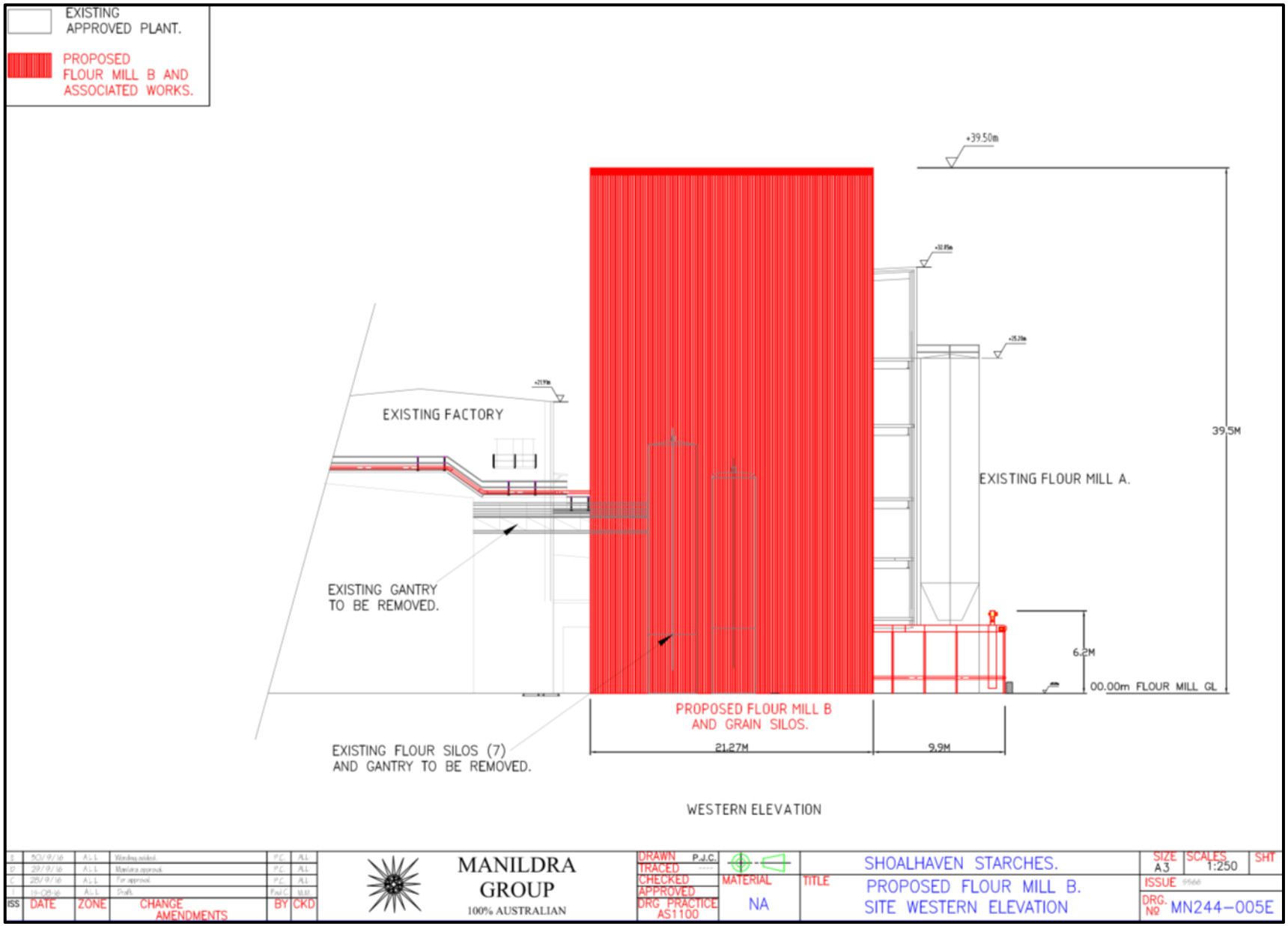


FIGURE 2-9 PROPOSED FLOUR MILL B SOUTHERN ELEVATION

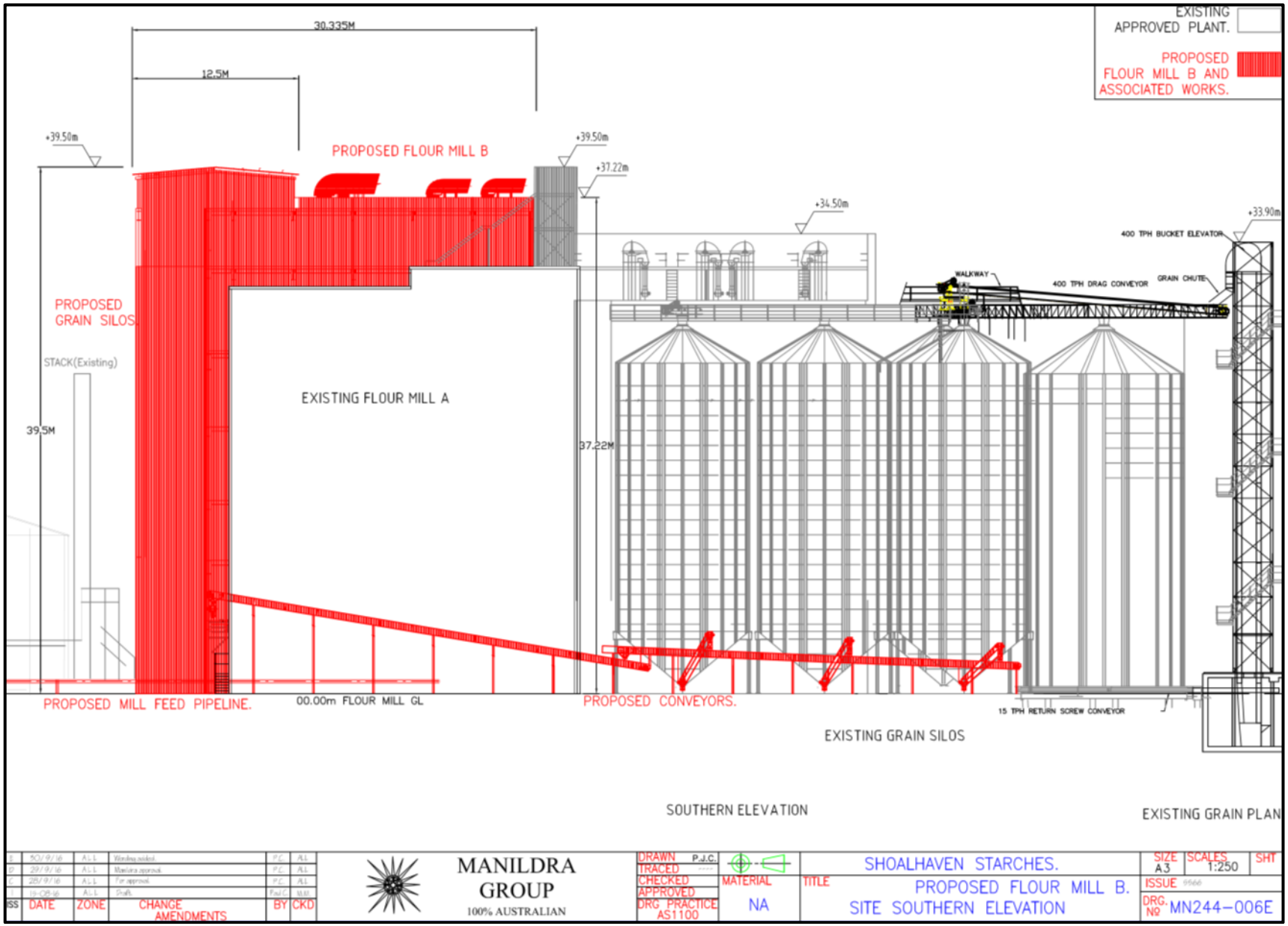


FIGURE 2-10 PROPOSED FLOUR MILL B, MILL FEED SILO PLAN

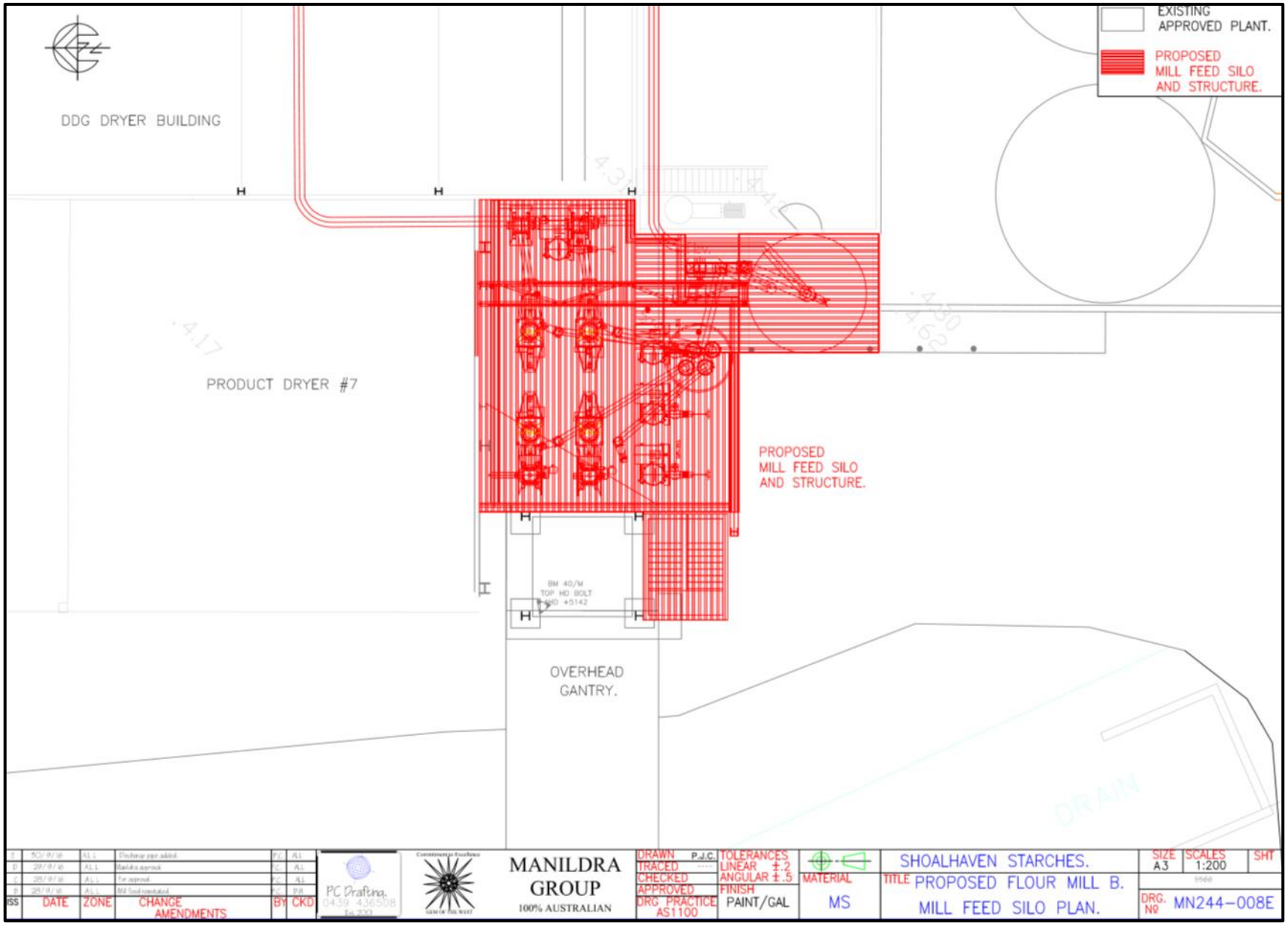
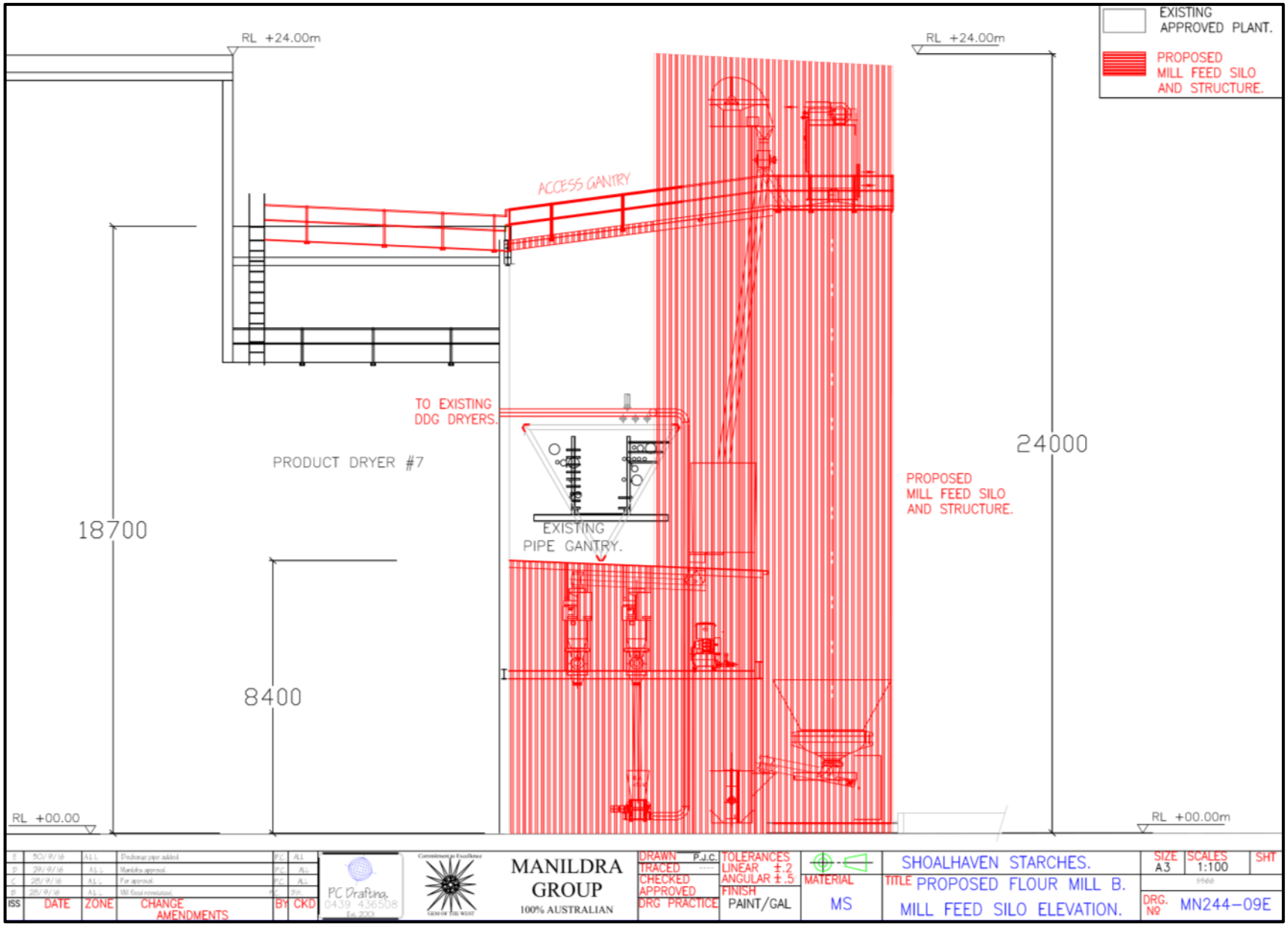


FIGURE 2-11 PROPOSED FLOUR MILL B, MILL FEED SILO ELEVATION



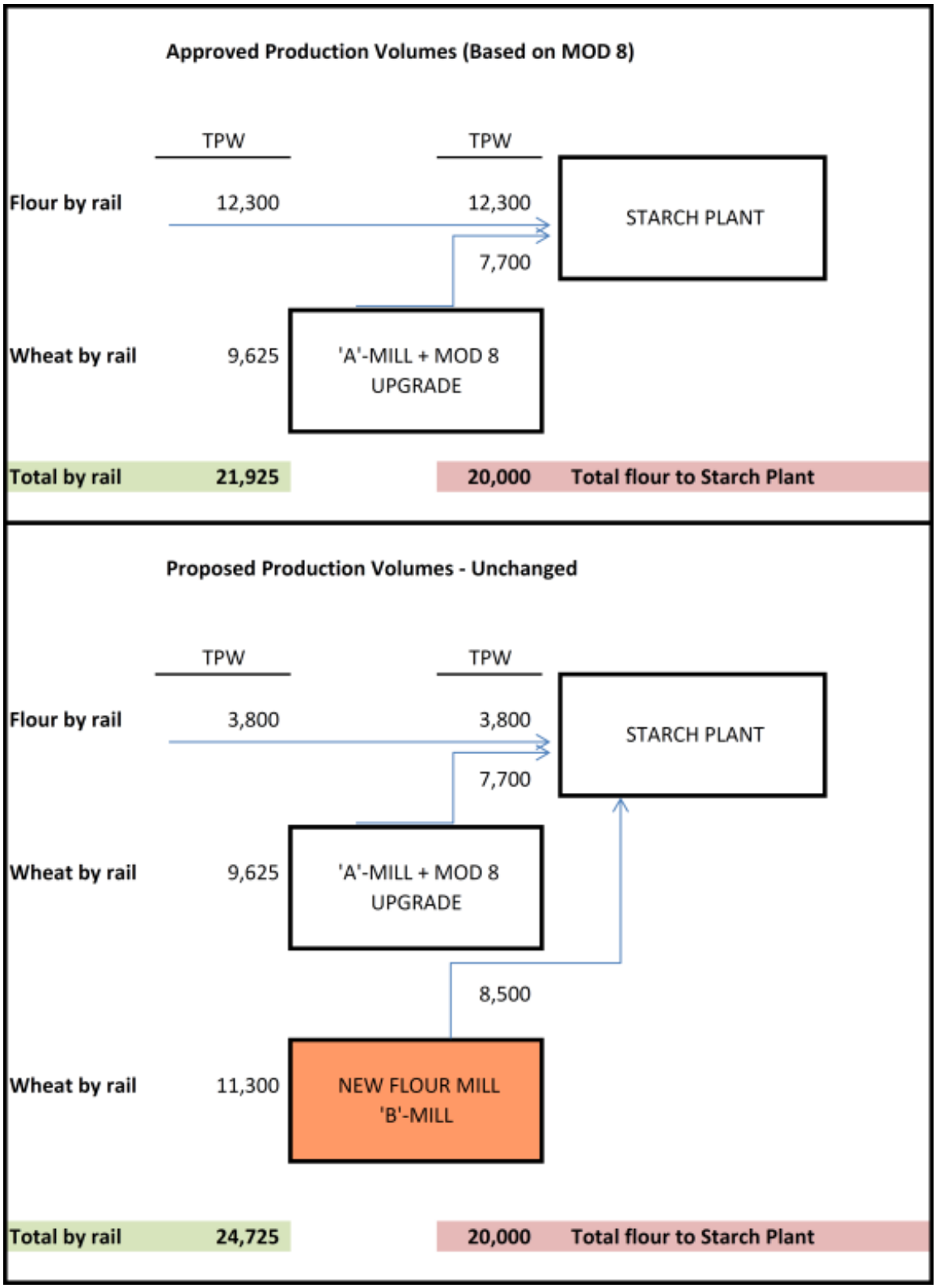
3 PROPOSED FLOUR MILL OPERATIONS

At present, industrial grade flour is supplied to the Starch Plants at Shoalhaven Starches, Bomaderry by rail from the flour mills at the company's various flour milling operations (owned by the Manildra Group of Companies) including the mill at Manildra, NSW. Further flour is milled on the Bomaderry site from wheat grain delivered by rail in the existing Shoalhaven flour mill. Currently, 12,300 tonnes per week of industrial grade flour is delivered to the site by rail and an additional 7,700 tonnes of industrial grade flour is produced on-site in the existing Shoalhaven flour mill.

The company's flour mills also have the capacity to produce premium grade flour, in addition to the industrial grade flour used by the Shoalhaven Starches site. The Manildra Group propose to optimise the production capacity of the mills for the production of the premium grade flour. The construction of an additional industrial grade flour mill on the Bomaderry site will achieve this. This proposed Flour Mill B would produce the flour that was no longer being milled at the Manildra mill. However, Shoalhaven Starches would continue to receive 3,800 tonnes per week of flour from the Manildra mill by rail. The remaining 16,200 tonnes per week of industrial grade flour would be produced by the existing and proposed flour mills at Bomaderry.

Refer Figure 3-1 for production flow diagram.

FIGURE 3-1 PROPOSED FLOUR MILL PRODUCTION FLOW DIAGRAM



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 flour mill, 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, such as AUSPLUME, 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 flour mill stack 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

The AMMAAP criterion for Total Suspended Particulate Matter is outlined in Table 4.3.

TABLE 4-3 IMPACT ASSESSMENT CRITERIA FOR TOTAL SUSPENDED PARTICULATES

Pollutant	Averaging Period	Impact Assessment Criteria (µg/m³)	Source
TSP	Annual	90	NHMRC (1996)

Key:

TSP	=	Total suspended particulate matter
µg/m³	=	micrograms per cubic metre
NHMRC	=	National Health and Medical Research Council

5 DISPERSION MODELING INPUT DATA

The Victorian Environment Protection Authority developed AUSPLUME, a pollution dispersion model that accurately estimates Ground Level Concentrations (GLC's) of source emissions. AUSPLUME 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 2013 meteorological data for the dispersion modelling domain.

The AUSPLUME meteorological (MET) 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 2013.

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 Flour Mill B and Mill Feed Silo, the existing flour mill buildings and silos, proposed silos to the south of the unloader, the flour unloader, starch buildings, DDG building and boiler-house were incorporated into the modelling assessment.

Refer Figure 5.1 showing stack emission points for the proposed Flour Mill B and the mill feed silo.

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 5.2 - discrete receptors are shown in red.

FIGURE 5-1 MODELLING ASSESSMENT BUILDING PROFILE SHOWING STACK EMISSION POINTS

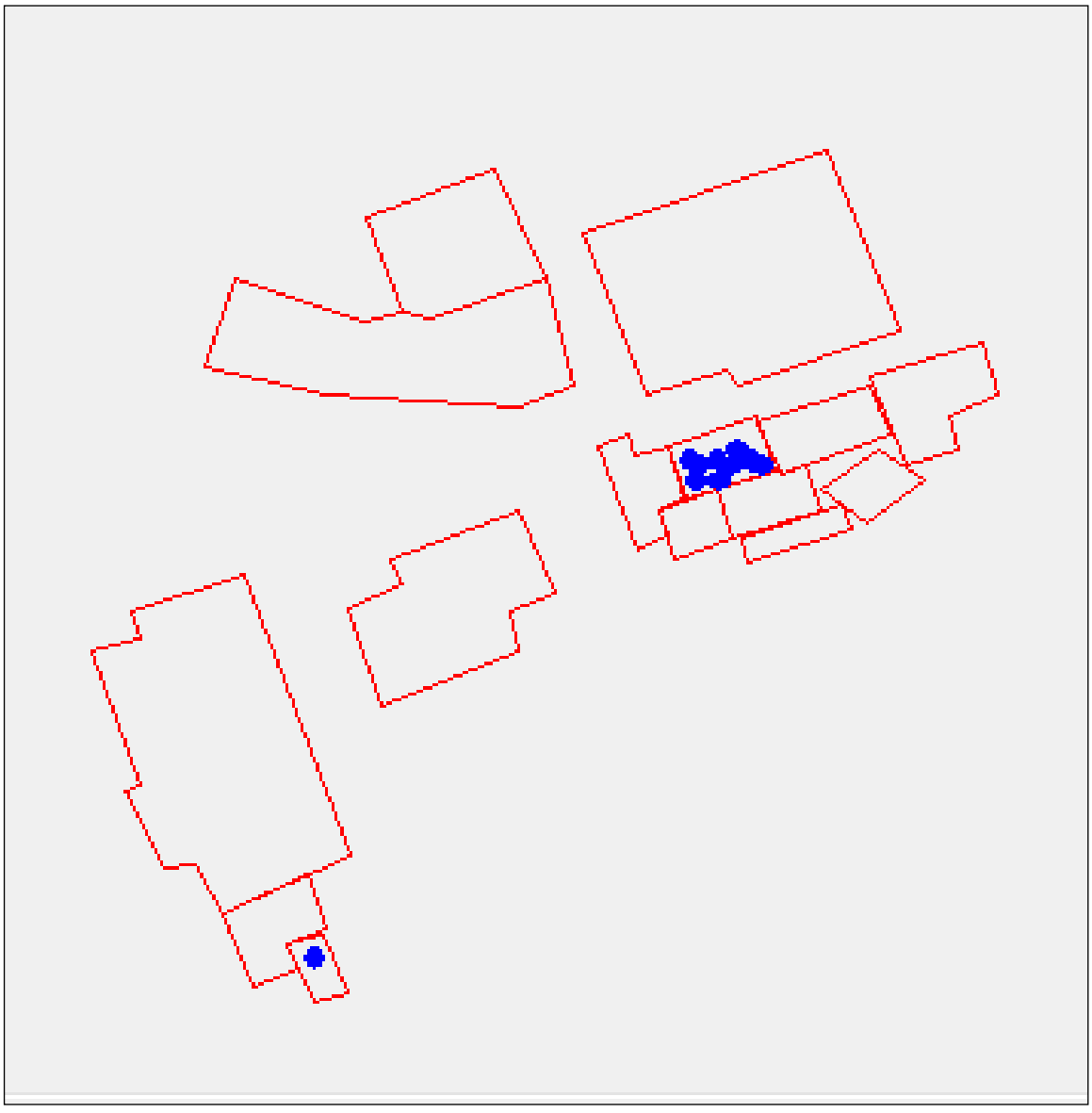


FIGURE 5-2 DISCRETE GROUND LEVEL RECEPTOR LOCATIONS

5.5 EMISSION INPUT DATA

Stack emission input data was derived from two information sources. The Manildra Group provided the building dimensions, stack locations and dimensions and expected flow rate. SEMA conducted emissions monitoring tests, including odour and TSP on the existing flour mill 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 and odour concentrations were derived from results from emission tests conducted in September 2011 on four stack exhaust points, servicing the existing flour mill. The Manildra Group provided information on the proposed stacks including function, diameter and expected flow rates. 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 Flour Mill B and the mill feed silo.

5.5.3 MASS EMISSION RATES

Mass emission rate calculations for TSP and odour were based on the data presented in Tables 5.3 and 5.4 respectively for each of the stacks serving proposed Flour Mill B.

TABLE 5-1 EMISSION CONCENTRATIONS AND TEMPERATURES - PROPOSED FLOUR MILL B

Existing Stacks	Proposed Stacks	TSP Emission Concentration (mg/m^3)	Odour Emission Concentration (ou)	Exhaust Temperature (°C)
1	D, E, F	0.113	77	27.1
2	No equivalent	-	-	-
3	B	0.106*	168*	49.0
4	G, H, I, M	0.118	100	20.0
5	A, C	0.106	168	49.0

TABLE 5-2 PROPOSED FLOUR MILL B EMISSIONS PHYSICAL DATA

Proposed Stack ID	Stack Height (m)	Stack Exit Diameter (m)	Normal Flow Rate (Nm^3/s)	Exit Velocity (m/s)
A	39.5	0.65	3.3	10.1
B	39.5	1.00	7.5	9.55
C	39.5	1.00	7.5	9.55
D	39.5	0.65	3.3	10.1
E	39.5	1.10	8.3	8.77
F	39.5	1.10	8.3	8.77
G	39.5	0.50	2.0	10.2
H	39.5	0.65	3.0	9.04
I	39.5	0.65	3.0	9.04
M	24.0	0.65	2.2	6.53

Key to Tables 5.1 and 5.2

mg/m^3	=	milligrams per cubic metre @ 0 C and one atmosphere pressure
ou	=	odour units
°C	=	degrees Celsius
*	=	Not tested 09/2011. Manildra expect emissions to be same as existing stack 5.
M	=	metres
Nm^3/s	=	cubic metres per second corrected to 1 atmospheric pressure and 273 Kelvin
m/s	=	metres per second

TABLE 5-3 TSP EMISSION RATE INPUT DATA

Proposed Stack ID	Parameter	Averaging Time	Concentration (mg/m^3)	TSP Mass Emission Rate (g/s)
A	TSP	Annual	0.106	0.0004
B	TSP	Annual	0.106	0.0008
C	TSP	Annual	0.106	0.0008
D	TSP	Annual	0.113	0.0004
E	TSP	Annual	0.113	0.0009
F	TSP	Annual	0.113	0.0009
G	TSP	Annual	0.118	0.0002
H	TSP	Annual	0.118	0.0004
I	TSP	Annual	0.118	0.0004
M	TSP	Annual	0.118	0.0003
TOTAL	TSP	--	--	0.0054

TABLE 5-4 ODOUR EMISSION RATE INPUT DATA

Proposed Stack ID	Parameter	Concentration (ou)	Total Odour Mass Emission Rate ($ou.m^3/s$)	Peak to Mean Ratio	Corrected Total Odour Mass Emission Rate ($ou.m^3/s$)
A	Odour	168	560	2.3	1288
B	Odour	168	1260	2.3	2898
C	Odour	168	1260	2.3	2898
D	Odour	77	257	2.3	590
E	Odour	77	642	2.3	1476
F	Odour	77	642	2.3	1476
G	Odour	100	200	2.3	460
H	Odour	100	300	2.3	690
I	Odour	100	300	2.3	690
M	Odour	100	217	2.3	498
TOTAL	Odour	--	--	--	12964

Key to Tables 5.3 and 5.4

TSP	=	total suspended particulates
mg/m^3	=	milligrams per cubic meter
g/s	=	grams per second
ou	=	odour units
$ou/m^3/s$	=	odour units per cubic metre per second

6 IMPACT ASSESSMENT PREDICTIONS

The impact assessment predictions of the AQIA indicate that:

- The worst case predicted odour GLC impact from proposed Flour Mill B is 1.8 ou at the southern boundary of the site. Refer Tables 6.l and 6.2 and Figure 6.2.

- The annual average worst case predicted TSP GLC for proposed Flour Mill B is 0.01 $\mu g/m^3$. Refer Table 6.3 and Figure 6.1.

6.1 PROPOSED FLOUR MILL B AND MILL FEED SILO ODOUR IMPACTS

Based on available data and measurement results, SEMA estimates that, with the existing level of odour control, the proposed Flour Mill B will emit 5,637 $ou.m^3/s$ of odour into the atmosphere, which is 0.9% of total odour emissions from the Shoalhaven Starches factory site at Bomaderry.

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 Flour Mill B and mill feed silo) before the implementation of odour controls to be 604,811 odour units per cubic metre per second ($ou.m^3/s$). Full details are presented in Appendix B and summarised in Tables 6.1 and 6.2.

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
- 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
- 2 ou with Stage 3 controls.

6.3 PREDICTED CUMULATIVE ODOUR IMPACTS

Predicted cumulative odour impacts from the entire Shoalhaven Starches factory complex, including the proposed Flour Mill B, was estimated by adding the predicted worst case odour GLCs for the existing factory plus the predicted worst case odour GLCs for the proposed Flour Mill B and Mill Feed Silo.

This approach assumes that:

- Both the SEMA and GHD models worst case odour GLC were predicted for identical coordinates and time; and
- Ground level odour concentrations are additive.

Furthermore, the output of the Ethanol Upgrade odour impact model prepared by GHD did not report in two significant numbers. Therefore rather than a specific GLC, only a statistical range can be predicted for the worst case cumulative GLC. More accurate prediction of the cumulative odour impact to more than one significant number is not possible.

Worst case predictions indicate there may be an increase in odour concentrations from the Shoalhaven Starches factory complex due to the cumulative impact of the proposed Flour Mill B and other factory emissions. These cumulative worst case odour impacts could be in range of 2.2 to 3.2 ou, which may exceed the IAC of 2 ou but is less than the GHD 2008 predictions for Bomaderry of 6 ou with Stage 1 controls in place and 3 ou with Stage 2 controls.

Following implementation of Stage 2 odour controls, the proposed Flour Mill B appears to have an apparent relatively larger contribution to the factory's cumulative odour impact. However, this is an artefact caused by the significant decrease in overall odour emissions from the factory site after the implementation of all three stages of odour control nominated in 2008 (GHD).

GHD, 2008, estimated total factory odour emissions would be reduced to 155,393 ou.m^3/s after Stage 2 odour control completion. Odour emissions from the proposed Flour Mill B are predicted to be 5,637 ou.m^3/s; (that is, 3.5% of total odour emissions from the factory site after implementation of Stage 2 odour control).

TABLE 6-1 CUMULATIVE WORST CASE ODOUR GLC

Parameter	Averaging Time	SEMA 2016	GHD 2008				Impact Assessment Criteria
		Proposed Flour Mill B and Mill Feed Silo	Total Factory excluding Proposed Flour Mill				
Odour *southern boundary*	1 second: *using peak-to-mean ratio*	1.8 ou	5 ou *Stage 3*	10 ou *Stage 2*	25 ou *Stage 1*	100 ou *Existing*	2.0 ou
Odour *Bomaderry*		0.7 ou	2 ou *Stage 3*	3 ou *Stage 2*	6 ou *Stage 1*	40 ou *Existing*	

Key:
GLC = Ground Level Concentration
ou = odour units

TABLE 6-2 WORST CASE ODOUR GLC AT DISCRETE RECEPTOR LOCATIONS

Location	Averaging Time	Number of Receptors	Worst Case GLC	Impact Assessment
Northern Boundary	1 second: *using peak-to-mean ratio*	9	0.8 ou	2.0 ou
Southern Boundary		9	1.8 ou	
50 Coomea St, Bomaderry		6	0.7 ou	
Western Boundary		1	0.6 ou	
29 Meroo St, Bomaderry		3	0.6 ou	
Eastern Boundary		1	0.6 ou	
59 Meroo St, Bomaderry		1	0.6 ou	
Cr Tarawara & Meroo Sts, Bomaderry		1	0.5 ou	

Key:
GLC = Ground Level Concentration
ou = odour units

6.4 HEDONIC TONE

The odour analysis by ORLA of existing flour mill emissions indicated a neutral hedonic tone of zero. Hedonic tone is measured on a scale of plus ten through zero to minus ten. Therefore an odour with an hedonic tone of zero would be considered neither pleasant nor unpleasant. Odour emissions from the proposed Flour Mill B, processing similar grain and operating equipment and processes as the existing mill, can also be expected to have a similar, neutral hedonic tone.

6.5 CUMULATIVE TSP IMPACTS

The proposed Flour Mill B is not considered to make a significant contribution to the factory's total cumulative impact for TSP.

GHD estimated the total TSP emissions from the Shoalhaven Starches factory site would be 13.3 g/s. (Refer to Appendix C). Based on available data and measurement results, SEMA estimates the proposed Flour Mill Bwill emit 0.0054 g/s of TSP into the atmosphere, which is 0.03% of total TSP emissions from the Shoalhaven Starches factory complex.

TABLE 6-3 CUMULATIVE WORST CASE PARTICULATE GLC

Parameter	Averaging Time	SEMA 2016	GHD 2008	Impact Assessment Criteria
		Proposed Flour Mill B and Mill Feed Silo	Total Factory excluding Proposed Flour Mill and Mill Feed Silo	
TSP	Annual	0.01 µg/m^3	2 µg/m^3 **	90 µg/m^3
PM_{10}		0.01 µg/m^3*	1 µg/m^3 **	30 µg/m^3

Key:

TSP	=	Total Suspended Particles
PM_{10}	=	Particulate matter less than 10 microns
µg/m^3	=	micrograms per cubic metre
*	=	assume all TSP <10 µm Bomaderry

FIGURE 6-1 PREDICTED TSP CONCENTRATION, PROPOSED FLOUR MILL, SHOALHAVEN STARCHES

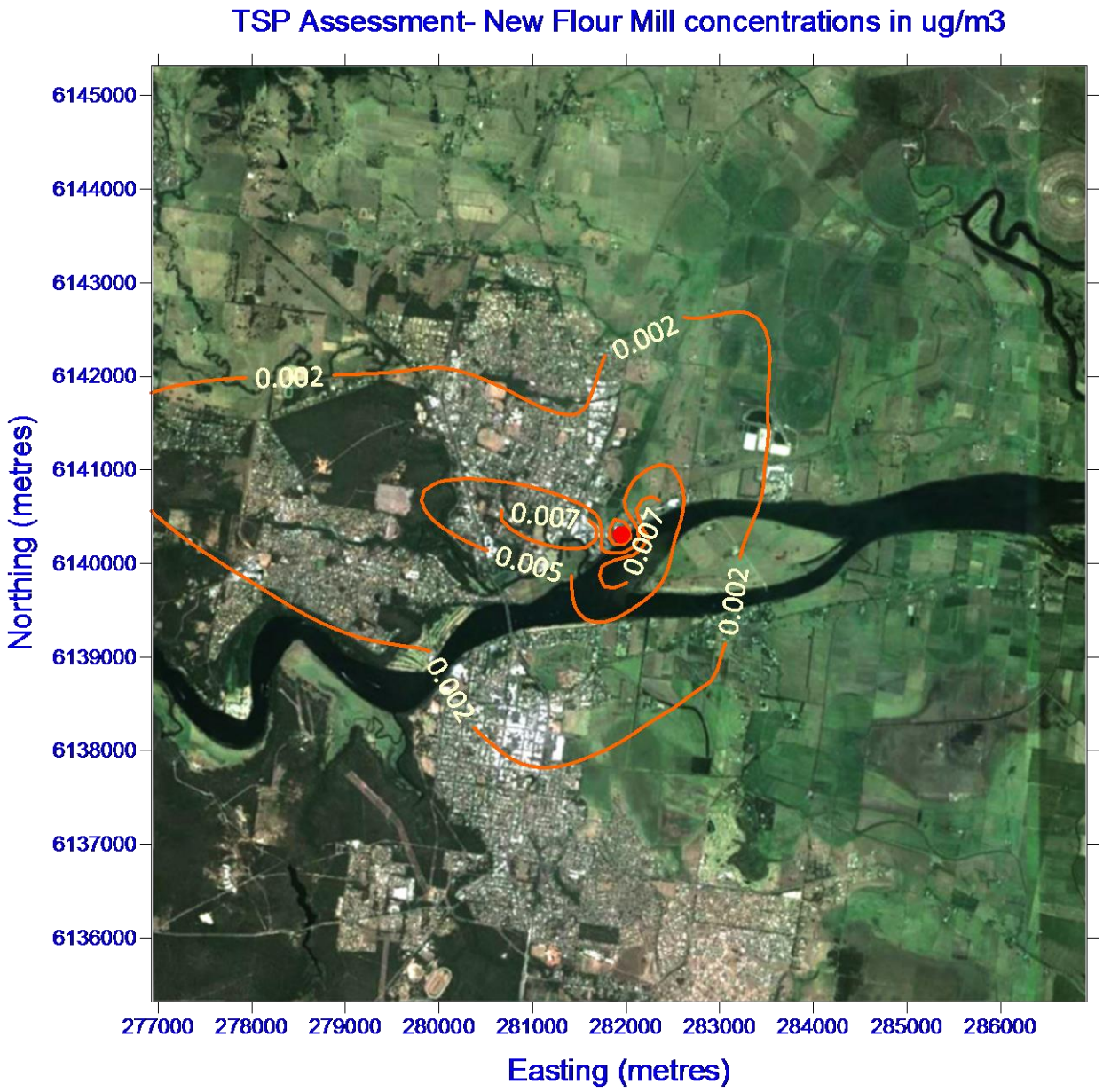
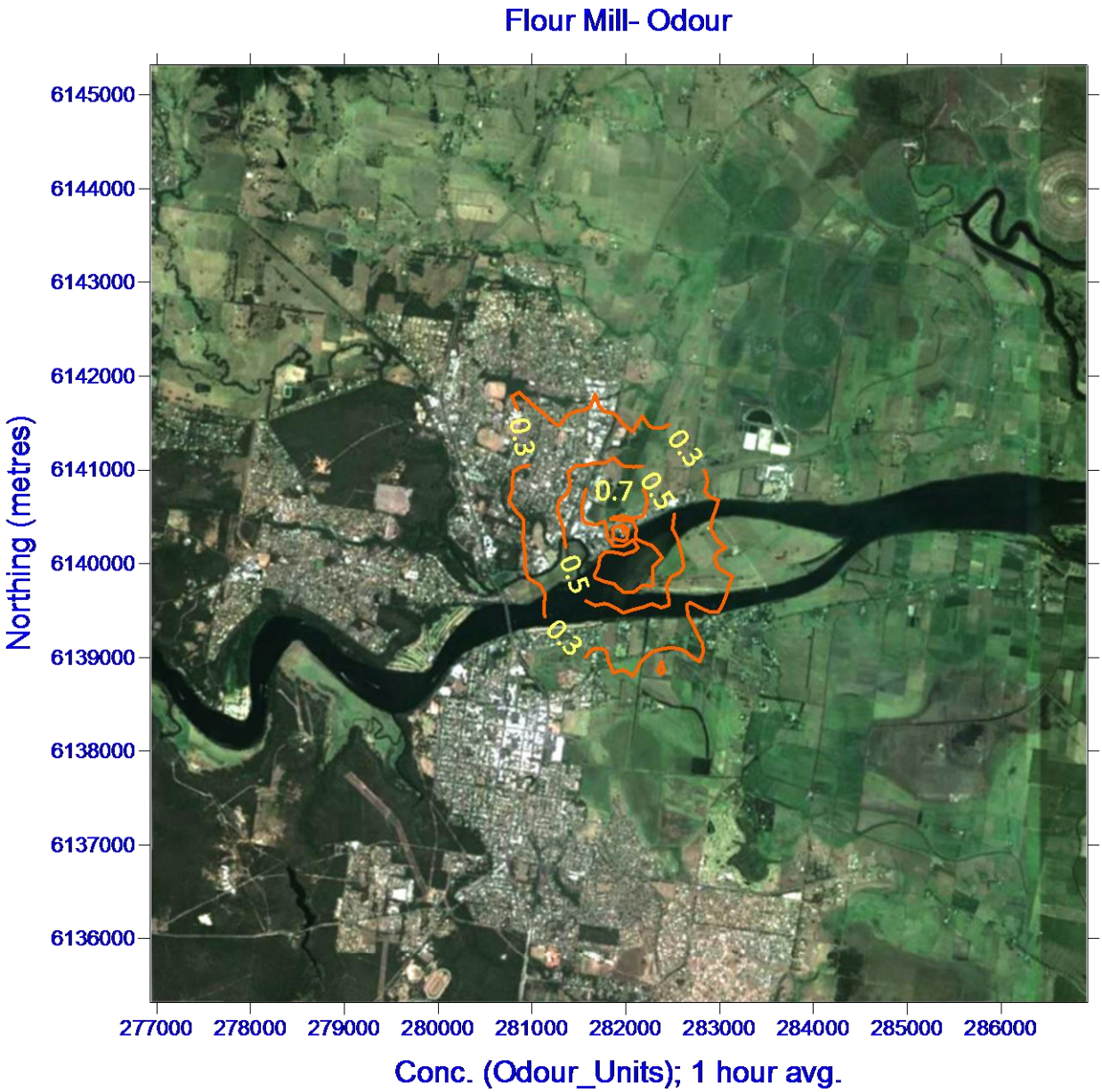


FIGURE 6-2 PREDICTED ODOUR CONCENTRATION, PROPOSED FLOUR MILL, SHOALHAVEN STARCHES



7 CONCLUSIONS

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

The maximum TSP ground level concentration (GLC) is predicted to be 0.01 $\mu g/m^3$, which is significantly below the impact assessment criteria of 90 $\mu g/m^3$.

The worst case predictions from this assessment indicate, with the additional operation of the proposed Flour Mill B, there may be an increase in odour concentrations emitted from the Shoalhaven Starches factory site.

Following implementation of the approved odour controls, the maximum worst case odour GLC is predicted to be between 2.2 ou and 3.2 ou, which potentially exceeds the regulatory impact assessment criteria of 2 ou.

However, the following will ameliorate this worst case predicted odour impact:

- The output of the Ethanol Upgrade odour impact model prepared by GHD did not report in two significant numbers. Therefore rather than a specific GLC, only a statistical range can be predicted for the worst case cumulative GLC. More accurate prediction of the cumulative odour impact to more than one significant number is not possible.

- Worst case cumulative odour predictions assume that both the SEMA and GHD models used identical coordinates and time, and that ground level odour concentrations are additive.

- Odour emissions from the proposed Flour Mill B can also be expected to have a similar, neutral hedonic tone to the existing mill because the proposed mill will be processing the same type of grain using equipment and processes similar to the existing mill. That is to say the predicted odour emissions from the proposed Flour Mill B will not have a significant adverse incremental or additional cumulative odour impact at the Shoalhaven Starches factory complex.

APPENDIX A – SAMPLE AUSPLUME OUTPUT FILE

1 _____

Flour Mill- Odour

_____

Concentration or deposition Concentration
Emission rate units OUV/second
Concentration units Odour_Units
Units conversion factor 1.00E+00
Constant background concentration 0.00E+00
Terrain effects None
Smooth stability class changes? No
Other stability class adjustments ("urban modes") None
Ignore building wake effects? No
Decay coefficient (unless overridden by met. file) 0.000
Anemometer height 10 m
Roughness height at the wind vane site 0.300 m
Use the convective PDF algorithm? No

DISPERSION CURVES

Horizontal dispersion curves for sources <100m high Pasquill-Gifford
Vertical dispersion curves for sources <100m high Pasquill-Gifford
Horizontal dispersion curves for sources >100m high Briggs Rural
Vertical dispersion curves for sources >100m high Briggs Rural
Enhance horizontal plume spreads for buoyancy? Yes
Enhance vertical plume spreads for buoyancy? Yes
Adjust horizontal P-G formulae for roughness height? Yes
Adjust vertical P-G formulae for roughness height? Yes
Roughness height 0.200m
Adjustment for wind directional shear None

PLUME RISE OPTIONS

Gradual plume rise? Yes
Stack-tip downwash included? Yes
Building downwash algorithm: PRIME method.
Entrainment coeff. for neutral & stable lapse rates 0.60,0.60
Partial penetration of elevated inversions? No
Disregard temp. gradients in the hourly met. file? No

and in the absence of boundary-layer potential temperature gradients
given by the hourly met. file, a value from the following table
(in K/m) is used:

Wind Speed	Stability Class					
Category	A	B	C	D	E	F

_____

1	0.000	0.000	0.000	0.000	0.020	0.035
2	0.000	0.000	0.000	0.000	0.020	0.035
3	0.000	0.000	0.000	0.000	0.020	0.035
4	0.000	0.000	0.000	0.000	0.020	0.035
5	0.000	0.000	0.000	0.000	0.020	0.035
6	0.000	0.000	0.000	0.000	0.020	0.035

WIND SPEED CATEGORIES

Boundaries between categories (in m/s) are: 1.54, 3.09, 5.14, 8.23, 10.80

WIND PROFILE EXPONENTS: "Irwin Rural" values (unless overridden by met. file)

AVERAGING TIMES

1 hour

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1 _____

Flour Mill- Odour

SOURCE CHARACTERISTICS

_____

STACK SOURCE: A

X(m)	Y(m)	Ground Elev.	Stack Height	Diameter	Temperature	Speed
281962	6140308	0m	40m	0.65m	49C	10.1m/s

_____ Effective building dimensions (in metres) _____

Flow direction	10°	20°	30°	40°	50°	60°	70°	80°	90°	100°	110°	120°
Effective building width	36	35	33	44	36	39	33	31	33	41	34	36
Effective building height	37	37	37	35	35	32	32	32	35	35	37	37
Along-flow building length	-21	-25	-27	-29	-30	-30	-30	-32	-33	-33	-32	-30
Along-flow distance from stack	15	14	14	6	6	0	-2	-3	0	-1	-8	-10
Across-flow distance from stack	31	34	36	56	57	58	56	58	59	58	35	33

Flow direction	130°	140°	150°	160°	170°	180°	190°	200°	210°	220°	230°	240°
Effective building width	36	36	34	56	35	36	36	35	33	44	36	39
Effective building height	37	37	37	35	37	37	37	37	37	35	35	32
Along-flow building length	-27	-24	-20	-15	-10	-10	-10	-9	-8	-26	-27	-27
Along-flow distance from stack	-11	-12	-13	-2	-14	-15	-15	-14	-14	-6	-6	0
Across-flow distance from stack	30	26	22	22	23	27	31	34	36	56	57	58

Flow direction	250°	260°	270°	280°	290°	300°	310°	320°	330°	340°	350°	360°

Effective building width 33 31 33 41 34 36 36 36 34 56 35 36
Effective building height 32 32 35 35 37 37 37 37 37 35 37 37
Along-flow building length -27 -27 -26 -25 -3 -3 -3 -2 -3 -7 -12 -17
Along-flow distance from stack 2 3 0 1 8 10 11 12 13 2 14 15
Across-flow distance from stack 56 58 59 58 35 33 30 26 22 22 23 27

(Constant) emission rate = 1.29E+03 OUV/second
No gravitational settling or scavenging.

STACK SOURCE: B

X(m)	Y(m)	Ground Elev.	Stack Height	Diameter	Temperature	Speed
281960	6140309	0m	40m	1.00m	49C	9.6m/s

_____ Effective building dimensions (in metres) _____

Flow direction 10° 20° 30° 40° 50° 60° 70° 80° 90° 100° 110° 120°
Effective building width 36 35 33 44 36 39 33 31 33 41 34 36
Effective building height 37 37 37 35 35 32 32 32 35 35 37 37
Along-flow building length -22 -25 -27 -29 -29 -29 -28 -30 -30 -30 -29 -28
Along-flow distance from stack 12 12 11 3 3 -3 -4 -5 -2 -2 -8 -10
Across-flow distance from stack 31 34 36 56 57 58 56 58 59 58 35 33

Flow direction 130° 140° 150° 160° 170° 180° 190° 200° 210° 220° 230° 240°
Effective building width 36 36 34 56 35 36 36 35 33 44 36 39
Effective building height 37 37 37 35 37 37 37 37 37 35 35 32
Along-flow building length -25 -21 -17 -13 -9 -9 -9 -9 -8 -27 -28 -28
Along-flow distance from stack -11 -12 -12 0 -12 -13 -12 -12 -11 -3 -3 3
Across-flow distance from stack 30 26 22 22 23 27 31 34 36 56 57 58

Flow direction 250° 260° 270° 280° 290° 300° 310° 320° 330° 340° 350° 360°
Effective building width 33 31 33 41 34 36 36 36 34 56 35 36
Effective building height 32 32 35 35 37 37 37 37 37 35 37 37
Along-flow building length -28 -29 -28 -27 -6 -6 -5 -5 -5 -9 -14 -18
Along-flow distance from stack 4 5 2 2 8 10 11 12 12 0 12 13
Across-flow distance from stack 56 58 59 58 35 33 30 26 22 22 23 27

(Constant) emission rate = 2.90E+03 OUV/second
No gravitational settling or scavenging.

STACK SOURCE: C

X(m)	Y(m)	Ground Elev.	Stack Height	Diameter	Temperature	Speed
281956	6140308	0m	40m	1.00m	49C	9.6m/s

_____ Effective building dimensions (in metres) _____

Flow direction 10° 20° 30° 40° 50° 60° 70° 80° 90° 100° 110° 120°
Effective building width 36 35 33 44 36 39 33 31 33 41 34 36
Effective building height 37 37 37 35 35 32 32 32 35 35 37 37
Along-flow building length 31 34 36 56 57 58 56 58 59 58 35 33
Along-flow distance from stack -20 -22 -24 -25 -26 -25 -24 -26 -27 -27 -26 -25
Across-flow distance from stack 9 9 8 1 2 -3 -4 -5 0 0 -6 -7

Flow direction 130° 140° 150° 160° 170° 180° 190° 200° 210° 220° 230° 240°
Effective building width 36 36 34 56 35 36 36 35 33 44 36 39
Effective building height 37 37 37 35 37 37 37 37 37 35 35 32
Along-flow building length 30 26 22 22 23 27 31 34 36 56 57 58
Along-flow distance from stack -23 -20 -16 -13 -9 -10 -11 -11 -11 -30 -32 -32
Across-flow distance from stack -7 -8 -8 4 -8 -9 -9 -9 -8 -1 -2 3

Flow direction 250° 260° 270° 280° 290° 300° 310° 320° 330° 340° 350° 360°
Effective building width 33 31 33 41 34 36 36 36 34 56 35 36
Effective building height 32 32 35 35 37 37 37 37 37 35 37 37
Along-flow building length 56 58 59 58 35 33 30 26 22 22 23 27
Along-flow distance from stack -32 -33 -32 -31 -9 -8 -7 -6 -6 -9 -13 -17
Across-flow distance from stack 4 5 0 0 6 7 7 8 8 -4 8 9

(Constant) emission rate = 2.90E+03 OUV/second
No gravitational settling or scavenging.

STACK SOURCE: D

X(m)	Y(m)	Ground Elev.	Stack Height	Diameter	Temperature	Speed
281953	6140305	0m	40m	0.65m	27C	10.1m/s

_____ Effective building dimensions (in metres) _____

Flow direction 10° 20° 30° 40° 50° 60° 70° 80° 90° 100° 110° 120°
Effective building width 36 35 33 44 36 39 33 31 33 41 34 36
Effective building height 37 37 37 35 35 32 32 32 35 35 37 37
Along-flow building length 31 34 36 56 57 58 56 58 59 58 35 33
Along-flow distance from stack -17 -19 -20 -21 -22 -21 -20 -23 -24 -25 -25 -24
Across-flow distance from stack 7 7 8 1 3 -2 -2 -2 3 4 -2 -3

Flow direction 130° 140° 150° 160° 170° 180° 190° 200° 210° 220° 230° 240°
Effective building width 36 36 34 56 35 36 36 35 33 44 36 39
Effective building height 37 37 37 35 37 37 37 37 37 35 35 32
Along-flow building length 30 26 22 22 23 27 31 34 36 56 57 58
Along-flow distance from stack -23 -21 -18 -14 -12 -13 -14 -15 -15 -34 -36 -36
Across-flow distance from stack -3 -4 -4 8 -5 -6 -7 -7 -8 -1 -3 2

Flow direction 250° 260° 270° 280° 290° 300° 310° 320° 330° 340° 350° 360°
Effective building width 33 31 33 41 34 36 36 36 34 56 35 36

Effective building height 32 32 35 35 37 37 37 37 37 35 37 37
Along-flow building length 56 58 59 58 35 33 30 26 22 22 23 27
Along-flow distance from stack -36 -36 -35 -33 -10 -9 -8 -6 -5 -7 -11 -14
Across-flow distance from stack 2 2 -3 -4 2 3 3 4 4 -8 5 6

(Constant) emission rate = 5.90E+02 OUV/second
No gravitational settling or scavenging.

STACK SOURCE: E

X(m)	Y(m)	Ground Elev.	Stack Height	Diameter	Temperature	Speed
281949	6140305	0m	40m	1.10m	27C	8.8m/s

_____ Effective building dimensions (in metres) _____

Flow direction 10° 20° 30° 40° 50° 60° 70° 80° 90° 100° 110° 120°
Effective building width 36 35 33 44 36 39 33 31 33 41 34 36
Effective building height 37 37 37 35 35 32 32 32 35 35 37 37
Along-flow building length 31 34 36 56 57 58 56 58 59 58 35 33
Along-flow distance from stack -15 -17 -17 -18 -18 -17 -16 -18 -19 -20 -21 -20
Across-flow distance from stack 2 3 4 -2 0 -4 -3 -2 3 5 0 0

Flow direction 130° 140° 150° 160° 170° 180° 190° 200° 210° 220° 230° 240°
Effective building width 36 36 34 56 35 36 36 35 33 44 36 39
Effective building height 37 37 37 35 37 37 37 37 37 35 35 32
Along-flow building length 30 26 22 22 23 27 31 34 36 56 57 58
Along-flow distance from stack -20 -18 -16 -14 -12 -14 -16 -17 -18 -38 -40 -41
Across-flow distance from stack 0 0 0 12 -1 -1 -2 -3 -4 2 0 4

Flow direction 250° 260° 270° 280° 290° 300° 310° 320° 330° 340° 350° 360°
Effective building width 33 31 33 41 34 36 36 36 34 56 35 36
Effective building height 32 32 35 35 37 37 37 37 37 35 37 37
Along-flow building length 56 58 59 58 35 33 30 26 22 22 23 27
Along-flow distance from stack -40 -41 -39 -37 -14 -13 -11 -8 -6 -8 -11 -13
Across-flow distance from stack 3 2 -3 -5 0 0 0 0 0 -12 1 1

(Constant) emission rate = 1.48E+03 OUV/second
No gravitational settling or scavenging.

STACK SOURCE: F

X(m)	Y(m)	Ground Elev.	Stack Height	Diameter	Temperature	Speed
281947	6140309	0m	37m	1.10m	27C	8.8m/s

_____ Effective building dimensions (in metres) _____

Flow direction 10° 20° 30° 40° 50° 60° 70° 80° 90° 100° 110° 120°

Effective building width 36 35 33 44 36 39 33 31 33 41 34 36
Effective building height 37 37 37 35 35 32 32 32 35 35 37 37
Along-flow building length 31 34 36 56 57 58 56 58 59 58 35 33
Along-flow distance from stack -20 -21 -21 -21 -20 -18 -16 -17 -18 -18 -18 -17
Across-flow distance from stack 0 0 0 -6 -5 -9 -8 -7 -2 1 -4 -3

Flow direction 130° 140° 150° 160° 170° 180° 190° 200° 210° 220° 230° 240°
Effective building width 36 36 34 56 35 36 36 35 33 44 36 39
Effective building height 37 37 37 35 37 37 37 37 37 35 35 32
Along-flow building length 30 26 22 22 23 27 31 34 36 56 57 58
Along-flow distance from stack -15 -13 -11 -8 -7 -9 -11 -13 -15 -35 -38 -39
Across-flow distance from stack -3 -2 -1 12 0 0 0 0 0 6 5 9

Flow direction 250° 260° 270° 280° 290° 300° 310° 320° 330° 340° 350° 360°
Effective building width 33 31 33 41 34 36 36 36 34 56 35 36
Effective building height 32 32 35 35 37 37 37 37 37 35 37 37
Along-flow building length 56 58 59 58 35 33 30 26 22 22 23 27
Along-flow distance from stack -40 -41 -41 -39 -17 -16 -15 -13 -11 -13 -16 -18
Across-flow distance from stack 8 7 2 -1 4 3 3 2 1 -12 0 0

(Constant) emission rate = 1.48E+03 OUV/second
No gravitational settling or scavenging.

STACK SOURCE: G

X(m)	Y(m)	Ground Elev.	Stack Height	Diameter	Temperature	Speed
281957	6140311	0m	40m	0.50m	20C	10.2m/s

_____ Effective building dimensions (in metres) _____

Flow direction 10° 20° 30° 40° 50° 60° 70° 80° 90° 100° 110° 120°
Effective building width 36 35 33 44 36 39 33 31 33 41 34 36
Effective building height 37 37 37 35 35 32 32 32 35 35 37 37
Along-flow building length 31 34 36 56 57 58 56 58 59 58 35 33
Along-flow distance from stack -23 -25 -27 -28 -28 -27 -26 -27 -28 -27 -26 -24
Across-flow distance from stack 9 9 8 0 1 -5 -6 -7 -3 -2 -8 -9

Flow direction 130° 140° 150° 160° 170° 180° 190° 200° 210° 220° 230° 240°
Effective building width 36 36 34 56 35 36 36 35 33 44 36 39
Effective building height 37 37 37 35 37 37 37 37 37 35 35 32
Along-flow building length 30 26 22 22 23 27 31 34 36 56 57 58
Along-flow distance from stack -22 -19 -15 -10 -7 -8 -8 -9 -9 -28 -29 -30
Across-flow distance from stack -10 -10 -10 2 -10 -10 -9 -9 -8 0 -1 5

Flow direction 250° 260° 270° 280° 290° 300° 310° 320° 330° 340° 350° 360°
Effective building width 33 31 33 41 34 36 36 36 34 56 35 36
Effective building height 32 32 35 35 37 37 37 37 37 35 37 37

Along-flow building length 56 58 59 58 35 33 30 26 22 22 23 27
Along-flow distance from stack -30 -31 -31 -30 -9 -9 -8 -8 -8 -11 -16 -19
Across-flow distance from stack 6 7 3 2 8 9 10 10 10 -2 10 10

(Constant) emission rate = 4.60E+02 OUV/second
No gravitational settling or scavenging.

STACK SOURCE: H

X(m)	Y(m)	Ground Elev.	Stack Height	Diameter	Temperature	Speed
281953	6140309	0m	40m	0.65m	20C	9.0m/s

_____ Effective building dimensions (in metres) _____

Flow direction	10°	20°	30°	40°	50°	60°	70°	80°	90°	100°	110°	120°
Effective building width	36	35	33	44	36	39	33	31	33	41	34	36
Effective building height	37	37	37	35	35	32	32	32	35	35	37	37
Along-flow building length	31	34	36	56	57	58	56	58	59	58	35	33
Along-flow distance from stack	-20	-22	-24	-24	-24	-23	-22	-23	-24	-24	-23	-22
Across-flow distance from stack	6	6	5	-2	0	-5	-6	-6	-1	0	-5	-6

Flow direction	130°	140°	150°	160°	170°	180°	190°	200°	210°	220°	230°	240°
Effective building width	36	36	34	56	35	36	36	35	33	44	36	39
Effective building height	37	37	37	35	37	37	37	37	37	35	35	32
Along-flow building length	30	26	22	22	23	27	31	34	36	56	57	58
Along-flow distance from stack	-20	-18	-14	-11	-8	-9	-11	-11	-12	-32	-33	-34
Across-flow distance from stack	-6	-6	-6	7	-6	-6	-6	-6	-5	2	0	5

Flow direction	250°	260°	270°	280°	290°	300°	310°	320°	330°	340°	350°	360°
Effective building width	33	31	33	41	34	36	36	36	34	56	35	36
Effective building height	32	32	35	35	37	37	37	37	37	35	37	37
Along-flow building length	56	58	59	58	35	33	30	26	22	22	23	27
Along-flow distance from stack	-35	-35	-35	-34	-12	-11	-10	-9	-8	-11	-15	-18
Across-flow distance from stack	6	6	1	0	5	6	6	6	6	-7	6	6

(Constant) emission rate = 6.90E+02 OUV/second
No gravitational settling or scavenging.

STACK SOURCE: I

X(m)	Y(m)	Ground Elev.	Stack Height	Diameter	Temperature	Speed
281949	6140308	0m	40m	0.65m	20C	9.0m/s

_____ Effective building dimensions (in metres) _____

Flow direction	10°	20°	30°	40°	50°	60°	70°	80°	90°	100°	110°	120°
Effective building width	36	35	33	44	36	39	33	31	33	41	34	36

Effective building height 37 37 37 35 35 32 32 32 35 35 37 37
Along-flow building length 31 34 36 56 57 58 56 58 59 58 35 33
Along-flow distance from stack -18 -20 -21 -21 -20 -19 -18 -19 -20 -20 -20 -19
Across-flow distance from stack 2 3 3 -4 -2 -6 -6 -5 0 2 -3 -3

Flow direction 130° 140° 150° 160° 170° 180° 190° 200° 210° 220° 230° 240°
Effective building width 36 36 34 56 35 36 36 35 33 44 36 39
Effective building height 37 37 37 35 37 37 37 37 37 35 35 32
Along-flow building length 30 26 22 22 23 27 31 34 36 56 57 58
Along-flow distance from stack -18 -16 -14 -11 -9 -11 -13 -14 -15 -35 -37 -38
Across-flow distance from stack -3 -2 -2 11 -2 -2 -2 -3 -3 4 2 6

Flow direction 250° 260° 270° 280° 290° 300° 310° 320° 330° 340° 350° 360°
Effective building width 33 31 33 41 34 36 36 36 34 56 35 36
Effective building height 32 32 35 35 37 37 37 37 37 35 37 37
Along-flow building length 56 58 59 58 35 33 30 26 22 22 23 27
Along-flow distance from stack -39 -39 -39 -37 -15 -14 -12 -10 -9 -11 -14 -16
Across-flow distance from stack 6 5 0 -2 3 3 3 2 2 -11 2 2

(Constant) emission rate = 6.90E+02 OUV/second
No gravitational settling or scavenging.

STACK SOURCE: M

X(m)	Y(m)	Ground Elev.	Stack Height	Diameter	Temperature	Speed
281871	6140208	0m	24m	0.65m	21C	6.5m/s

_____ Effective building dimensions (in metres) _____

Flow direction 10° 20° 30° 40° 50° 60° 70° 80° 90° 100° 110° 120°
Effective building width 59 64 66 67 66 65 87 67 69 68 66 62
Effective building height 30 30 30 30 30 30 24 30 30 30 30 30
Along-flow building length 68 66 62 56 51 44 39 45 53 59 64 66
Along-flow distance from stack 6 3 -1 -5 -11 -17 -24 -33 -45 -55 -64 -70
Across-flow distance from stack 26 32 37 41 45 47 35 46 44 41 36 30

Flow direction 130° 140° 150° 160° 170° 180° 190° 200° 210° 220° 230° 240°
Effective building width 56 51 44 39 45 53 59 64 33 44 36 65
Effective building height 30 30 30 30 30 30 30 30 37 35 35 30
Along-flow building length 67 66 65 63 67 69 68 66 36 56 57 44
Along-flow distance from stack -75 -78 -80 -79 -80 -79 -75 -69 -141 -162 -161 -27
Across-flow distance from stack 23 14 5 -5 -11 -18 -26 -32 15 -1 -25 -47

Flow direction 250° 260° 270° 280° 290° 300° 310° 320° 330° 340° 350° 360°
Effective building width 87 67 69 68 66 62 56 51 44 39 45 53
Effective building height 24 30 30 30 30 30 30 30 30 30 30 30
Along-flow building length 39 45 53 59 64 66 67 66 65 63 67 69

Along-flow distance from stack -15 -12 -8 -4 0 4 8 12 15 16 13 10
Across-flow distance from stack -35 -46 -44 -41 -36 -30 -23 -14 -5 5 11 18

(Constant) emission rate = 4.98E+02 OUV/second
No gravitational settling or scavenging.

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1 _____

Flour Mill- Odour

RECEPTOR LOCATIONS

_____

The Cartesian receptor grid has the following x-values (or eastings):
276925.m 277025.m 277125.m 277225.m 277325.m 277425.m 277525.m
277625.m 277725.m 277825.m 277925.m 278025.m 278125.m 278225.m
278325.m 278425.m 278525.m 278625.m 278725.m 278825.m 278925.m
279025.m 279125.m 279225.m 279325.m 279425.m 279525.m 279625.m
279725.m 279825.m 279925.m 280025.m 280125.m 280225.m 280325.m
280425.m 280525.m 280625.m 280725.m 280825.m 280925.m 281025.m
281125.m 281225.m 281325.m 281425.m 281525.m 281625.m 281725.m
281825.m 281925.m 282025.m 282125.m 282225.m 282325.m 282425.m
282525.m 282625.m 282725.m 282825.m 282925.m 283025.m 283125.m
283225.m 283325.m 283425.m 283525.m 283625.m 283725.m 283825.m
283925.m 284025.m 284125.m 284225.m 284325.m 284425.m 284525.m
284625.m 284725.m 284825.m 284925.m 285025.m 285125.m 285225.m
285325.m 285425.m 285525.m 285625.m 285725.m 285825.m 285925.m
286025.m 286125.m 286225.m 286325.m 286425.m 286525.m 286625.m
286725.m 286825.m 286925.m

and these y-values (or northings):
6135320.m 6135420.m 6135520.m 6135620.m 6135720.m 6135820.m 6135920.m
6136020.m 6136120.m 6136220.m 6136320.m 6136420.m 6136520.m 6136620.m
6136720.m 6136820.m 6136920.m 6137020.m 6137120.m 6137220.m 6137320.m
6137420.m 6137520.m 6137620.m 6137720.m 6137820.m 6137920.m 6138020.m
6138120.m 6138220.m 6138320.m 6138420.m 6138520.m 6138620.m 6138720.m
6138820.m 6138920.m 6139020.m 6139120.m 6139220.m 6139320.m 6139420.m
6139520.m 6139620.m 6139720.m 6139820.m 6139920.m 6140020.m 6140120.m
6140220.m 6140320.m 6140420.m 6140520.m 6140620.m 6140720.m 6140820.m
6140920.m 6141020.m 6141120.m 6141220.m 6141320.m 6141420.m 6141520.m
6141620.m 6141720.m 6141820.m 6141920.m 6142020.m 6142120.m 6142220.m
6142320.m 6142420.m 6142520.m 6142620.m 6142720.m 6142820.m 6142920.m
6143020.m 6143120.m 6143220.m 6143320.m 6143420.m 6143520.m 6143620.m
6143720.m 6143820.m 6143920.m 6144020.m 6144120.m 6144220.m 6144320.m

6144420.m 6144520.m 6144620.m 6144720.m 6144820.m 6144920.m 6145020.m
6145120.m 6145220.m 6145320.m

DISCRETE RECEPTOR LOCATIONS (in metres)

No.	X	Y	ELEVN	HEIGHT	No.	X	Y	ELEVN	HEIGHT
1	281639	6140079	0.0	0.0	17	282419	6140641	0.0	0.0
2	281617	6140134	0.0	0.0	18	282456	6140583	0.0	0.0
3	281599	6140172	0.0	0.0	19	282375	6140523	0.0	0.0
4	281523	6140259	0.0	0.0	20	282290	6140482	0.0	0.0
5	281472	6140275	0.0	0.0	21	282224	6140446	0.0	0.0
6	281443	6140288	0.0	0.0	22	282107	6140382	0.0	0.0
7	281468	6140311	0.0	0.0	23	282015	6140309	0.0	0.0
8	281566	6140338	0.0	0.0	24	281973	6140276	0.0	0.0
9	281629	6140347	0.0	0.0	25	281918	6140226	0.0	0.0
10	281708	6140353	0.0	0.0	26	281857	6140176	0.0	0.0
11	281818	6140384	0.0	0.0	27	281715	6140110	0.0	0.0
12	281905	6140417	0.0	0.0	28	281339	6140371	0.0	0.0
13	282012	6140459	0.0	0.0	29	281479	6140701	0.0	0.0
14	282077	6140491	0.0	0.0	30	281374	6140546	0.0	0.0
15	282197	6140560	0.0	0.0	31	281552	6140875	0.0	0.0
16	282326	6140639	0.0	0.0					

METEOROLOGICAL DATA : Shoalhaven meteorological data from 01/01/2013 to 31
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1 Peak values for the 100 worst cases (in Odour_Units)
Averaging time = 1 hour

Rank	Value	Time Recorded hour,date	Coordinates (* denotes polar)
1	2.33E+00	12,21/10/13	(281925, 6140320, 0.0)
2	2.16E+00	08,18/01/13	(281925, 6140320, 0.0)
3	1.98E+00	12,13/05/13	(281925, 6140320, 0.0)
4	1.94E+00	11,21/10/13	(281925, 6140320, 0.0)
5	1.93E+00	17,16/10/13	(281925, 6140320, 0.0)
6	1.93E+00	07,10/03/13	(281925, 6140320, 0.0)
7	1.92E+00	24,17/02/13	(281925, 6140320, 0.0)
8	1.92E+00	14,08/11/13	(281925, 6140320, 0.0)
9	1.91E+00	11,04/12/13	(281925, 6140320, 0.0)

10	1.88E+00	07,06/03/13	(281925, 6140320,	0.0)
11	1.87E+00	07,19/02/13	(281925, 6140320,	0.0)
12	1.86E+00	02,30/07/13	(281925, 6140320,	0.0)
13	1.85E+00	19,21/09/13	(281925, 6140320,	0.0)
14	1.84E+00	23,15/09/13	(281925, 6140320,	0.0)
15	1.84E+00	22,08/10/13	(281925, 6140320,	0.0)
16	1.84E+00	22,14/10/13	(281925, 6140320,	0.0)
17	1.84E+00	18,30/04/13	(281973, 6140276,	0.0)
18	1.83E+00	21,08/04/13	(281925, 6140320,	0.0)
19	1.83E+00	09,31/05/13	(281925, 6140320,	0.0)
20	1.82E+00	07,10/02/13	(281925, 6140320,	0.0)
21	1.80E+00	09,24/09/13	(281925, 6140320,	0.0)
22	1.78E+00	21,13/07/13	(281925, 6140320,	0.0)
23	1.78E+00	09,16/10/13	(281925, 6140320,	0.0)
24	1.78E+00	13,31/08/13	(281973, 6140276,	0.0)
25	1.78E+00	18,28/11/13	(281925, 6140320,	0.0)
26	1.77E+00	17,05/09/13	(281925, 6140320,	0.0)
27	1.77E+00	14,10/05/13	(281973, 6140276,	0.0)
28	1.77E+00	09,20/07/13	(281925, 6140320,	0.0)
29	1.76E+00	09,14/08/13	(281925, 6140320,	0.0)
30	1.75E+00	23,13/07/13	(281925, 6140320,	0.0)
31	1.74E+00	11,01/10/13	(281925, 6140320,	0.0)
32	1.73E+00	09,02/10/13	(281925, 6140320,	0.0)
33	1.73E+00	23,17/08/13	(281925, 6140320,	0.0)
34	1.73E+00	01,31/01/13	(281925, 6140320,	0.0)
35	1.73E+00	07,05/03/13	(281925, 6140320,	0.0)
36	1.72E+00	06,02/12/13	(281925, 6140320,	0.0)
37	1.72E+00	24,25/03/13	(281925, 6140320,	0.0)
38	1.72E+00	22,13/07/13	(281925, 6140320,	0.0)
39	1.72E+00	12,09/04/13	(281973, 6140276,	0.0)
40	1.71E+00	17,12/01/13	(281973, 6140276,	0.0)
41	1.71E+00	14,22/12/13	(281925, 6140320,	0.0)
42	1.70E+00	06,06/02/13	(281925, 6140320,	0.0)
43	1.70E+00	23,07/08/13	(281925, 6140320,	0.0)
44	1.70E+00	08,14/04/13	(281925, 6140320,	0.0)
45	1.70E+00	06,10/10/13	(281925, 6140320,	0.0)
46	1.69E+00	22,08/09/13	(281925, 6140320,	0.0)
47	1.69E+00	08,02/09/13	(281925, 6140320,	0.0)
48	1.69E+00	12,01/06/13	(281925, 6140320,	0.0)
49	1.69E+00	10,02/10/13	(281925, 6140320,	0.0)
50	1.69E+00	10,01/10/13	(281925, 6140320,	0.0)
51	1.68E+00	20,21/09/13	(281925, 6140320,	0.0)
52	1.68E+00	12,15/07/13	(281925, 6140320,	0.0)
53	1.68E+00	03,12/06/13	(281925, 6140320,	0.0)
54	1.68E+00	04,12/06/13	(281925, 6140320,	0.0)
55	1.68E+00	06,06/03/13	(281925, 6140320,	0.0)
56	1.67E+00	01,04/09/13	(281925, 6140320,	0.0)

57	1.67E+00	16,15/08/13	(281973, 6140276,	0.0)
58	1.66E+00	02,12/06/13	(281925, 6140320,	0.0)
59	1.66E+00	08,17/08/13	(281925, 6140320,	0.0)
60	1.66E+00	13,13/01/13	(281973, 6140276,	0.0)
61	1.66E+00	13,21/10/13	(281925, 6140320,	0.0)
62	1.66E+00	06,15/05/13	(281925, 6140320,	0.0)
63	1.65E+00	18,02/10/13	(281925, 6140320,	0.0)
64	1.64E+00	12,04/12/13	(281925, 6140320,	0.0)
65	1.64E+00	23,08/10/13	(281925, 6140320,	0.0)
66	1.64E+00	20,13/07/13	(281925, 6140320,	0.0)
67	1.64E+00	07,02/10/13	(281925, 6140320,	0.0)
68	1.63E+00	06,08/12/13	(281925, 6140320,	0.0)
69	1.63E+00	03,30/07/13	(281925, 6140320,	0.0)
70	1.63E+00	08,30/09/13	(281925, 6140320,	0.0)
71	1.63E+00	08,01/09/13	(281925, 6140320,	0.0)
72	1.63E+00	16,24/06/13	(281973, 6140276,	0.0)
73	1.63E+00	13,04/12/13	(281925, 6140320,	0.0)
74	1.62E+00	13,28/11/13	(281925, 6140320,	0.0)
75	1.62E+00	07,25/09/13	(281925, 6140320,	0.0)
76	1.62E+00	12,02/10/13	(281925, 6140320,	0.0)
77	1.62E+00	02,30/05/13	(281925, 6140320,	0.0)
78	1.62E+00	15,30/04/13	(281973, 6140276,	0.0)
79	1.62E+00	15,10/05/13	(281973, 6140276,	0.0)
80	1.62E+00	14,30/07/13	(281973, 6140276,	0.0)
81	1.62E+00	08,13/06/13	(281925, 6140320,	0.0)
82	1.62E+00	05,12/06/13	(281925, 6140320,	0.0)
83	1.62E+00	15,29/01/13	(281973, 6140276,	0.0)
84	1.61E+00	23,02/09/13	(281925, 6140320,	0.0)
85	1.61E+00	07,12/10/13	(281925, 6140320,	0.0)
86	1.61E+00	09,30/09/13	(281925, 6140320,	0.0)
87	1.61E+00	07,15/05/13	(281925, 6140320,	0.0)
88	1.61E+00	13,07/04/13	(281973, 6140276,	0.0)
89	1.61E+00	10,19/11/13	(281973, 6140276,	0.0)
90	1.60E+00	06,06/11/13	(281925, 6140320,	0.0)
91	1.60E+00	24,13/07/13	(281925, 6140320,	0.0)
92	1.60E+00	04,22/08/13	(281925, 6140320,	0.0)
93	1.60E+00	13,01/06/13	(281925, 6140320,	0.0)
94	1.59E+00	09,04/07/13	(281925, 6140320,	0.0)
95	1.59E+00	18,06/06/13	(281925, 6140320,	0.0)
96	1.59E+00	13,30/11/13	(281973, 6140276,	0.0)
97	1.59E+00	08,02/10/13	(281925, 6140320,	0.0)
98	1.59E+00	18,09/04/13	(281973, 6140276,	0.0)
99	1.59E+00	11,19/11/13	(281973, 6140276,	0.0)
100	1.58E+00	23,05/08/13	(281925, 6140320,	0.0)

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

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.