

**APPLICATION PURSUANT TO SECTION 75W
OF THE ENVIRONMENTAL PLANNING
AND ASSESSMENT ACT 1979**

**PROPOSED RELOCATION
OF STARCH DRYER No. 5**

**RELATING TO PROJECT APPROVAL MP 06_0228
SHOALHAVEN STARCHES EXPANSION PROJECT**

**LOT 201 DP 1062668
BOLONG ROAD
BOMADERRY**

Prepared for

Shoalhaven Starches Pty Ltd

November 2015



Prepared by:

COWMAN STODDART PTY LTD

ENVIRONMENTAL ASSESSMENT

APPLICATION PURSUANT TO SECTION 75W
OF THE ENVIRONMENTAL PLANNING
AND ASSESSMENT ACT 1979

PROPOSED RELOCATION
OF STARCH DRYER NO. 5

RELATING TO PROJECT APPROVAL MP 06_0228
SHOALHAVEN STARCHES EXPANSION PROJECT

LOT 201 DP 1062668
BOLONG ROAD, BOMADERRY

Ref. 14/35

Town Planning, Agricultural & Environmental Consultants

Stephen Richardson, M.App.Sc., BTP, Grad. Dip. Env. Mgt, CPP, MPIA

Stuart Dixon, B. Urb. & Reg. Plan., CPP, MPIA

Associates: Peter Cowman, B.Sc.Agr., MAIAST

Angela Jones, BA Hons, MSc

Toni Wearne, BA, Grad. Dip. Urb. & Reg. Plan.

The Holt Centre, 31 Kinghorne Street, Nowra

Telephone (02) 4423 6198 (02) 4423 6199

Fax (02) 4423 1569

PO Box 738, Nowra NSW 2541

www.cowmanstoddart.com.au

Email – info@cowmanstoddart.com.au



COWMAN STODDART PTY LTD

CERTIFICATION OF ENVIRONMENTAL ASSESSMENT
PREPARED PURSUANT TO PART 3A OF THE *ENVIRONMENTAL PLANNING*
AND ASSESSMENT ACT 1979

**ENVIRONMENTAL ASSESSMENT
PREPARED BY**

Name: S. D. Richardson

Qualifications: M. Appl. Sc., B.T.P., Grad. Dip. Env. Mgt,
CPP, MPIA

Address: Cowman Stoddart Pty Ltd
31 Kinghorne Street
NOWRA NSW 2541

in respect of

PROJECT TO WHICH PART 3A APPLIES

Proponent Name: Shoalhaven Starches Pty Ltd

Proponent Address: Bolong Road, Bomaderry

Land to be developed: Address Bolong Road, Bomaderry

Lot No., DP/MPS, Vol/Fol etc. Lot 201 DP 1062668

Project Development: Shoalhaven Starches Expansion Project (MP 06_0228)

Proposed Modification to Project: Proposed relocation of approved Starch Dryer No. 5.

Environmental Assessment

An Environmental Assessment is attached

Certification

I certify that I have prepared this environmental assessment and to the best of our knowledge

- It has been prepared in accordance with Section 75W of the *Environmental Planning and Assessment Act 1979*,
- The information contained in the Environmental Assessment is neither false nor misleading.



Signature:

Name: S. D. Richardson

Date: 5th November 2015

CONTENTS

EXECUTIVE SUMMARY	(i)
1.0 INTRODUCTION	1
2.0 THE SITE AND SURROUNDING LOCALITY	3
3.0 BACKGROUND.....	9
3.1 PRODUCTION PROCESSES.....	9
3.2 OPERATING WORKFORCE	10
3.2.1 Operations	10
3.2.2 Workforce.....	10
3.3 RAW MATERIALS.....	10
3.4 HISTORY OF DEVELOPMENT ON THE SITE	11
3.5 PROJECT APPROVAL MP 06_0228.....	14
3.6 APPROVAL HISTORY FOLLOWING MP 06_0228.....	15
3.7 LOCAL PLANNING PROVISIONS.....	17
3.8 PROTECTION OF THE ENVIRONMENT OPERATIONS ACT	33
4.0 THE MODIFICATION PROPOSAL	34
4.1 INTRODUCTION.....	34
4.2 PROJECT DESCRIPTION	34
4.3 SECTION 75W OF THE EP&A ACT	34
4.4 PROPOSED MODIFICATION.....	36
4.4.1 Relocation of Starch Dryer No. 5	36
5.0 CONSULTATION	41
6.0 RISK ASSESSMENT OF POTENTIAL ENVIRONMENTAL IMPACTS.....	42
7.0 KEY ISSUES	55
7.1 AIR QUALITY (AND ODOUR IMPACTS)	55
7.1.1 Impact Assessment Criteria	55
7.1.2 Dispersion Modelling Input Data	57
7.1.3 Cumulative Emissions.....	62
7.1.4 Impact Assessment Predictions	63
7.1.5 Conclusions	66
7.2 FLOODING.....	67
7.2.1 Approach to Flood Assessment	67
7.2.2 Flood Impact Assessment.....	70
7.2.3 Compliance with Chapter G9: Development on Flood Prone Land (Shoalhaven DCP 2014)	71
7.3 NOISE	74
7.3.1 Acoustic Criteria.....	75
7.3.2 Starch Dryer – Operational Noise Emission.....	78
7.3.3 Construction Noise Emission	80
7.3.4 Noise Control Recommendations	81
7.3.5 Conclusion	82

7.4	TRAFFIC	83
7.4.1	Existing Situation	83
7.4.2	Traffic and Access Associated with the Proposal.....	89
7.4.3	Impact Assessment.....	96
7.4.4	Conclusion	97
7.5	PRELIMINARY HAZARD ANALYSIS	97
7.5.1	Hazard Identification	98
7.5.2	Rick Analysis.....	100
7.5.3	PHA Conclusion and Recommendations	106
7.6	SITE CONTAMINATION	107
7.6.1	Site Conditions and Surrounding Environment	107
7.6.2	Site Interviews.....	110
7.6.3	Site Observations.....	110
7.6.4	Methodology	111
7.6.5	Assessment Criteria	112
7.6.6	Comparison of Results to Assessment Criteria.....	113
7.6.7	Conclusions and Recommendations.....	113
7.7	ACID SULFATE SOILS	114
7.7.1	Acid Sulphate Soil Risk	114
7.7.2	Laboratory Analysis.....	115
7.7.3	Acid Sulphate Soil Assessment Criteria	115
7.7.4	Conclusions and Recommendations.....	116
7.8	GEOTECHNICAL AND RIVER BANK STABILITY	116
7.9	VISUAL IMPACT	122
8.0	STATEMENT OF ADDITIONAL COMMITMENTS.....	134
8.1	PRELIMINARY HAZARD ANALYSIS	134
8.2	NOISE	135
8.3	VISUAL IMPACT	136
8.4	TRAFFIC	137
8.5	SITE CONTAMINATION	138
8.6	ACID SULPHATE SOILS	139
8.7	GEOTECHNICAL AND RIVERBANK STABILITY	139
9.0	CONCLUSION.....	140

FIGURES

Figure 1	Aerial Photograph of Site
Figure 2	Site Locality Plan
Figure 3	Zoning provisions applying under Shoalhaven LEP 2014
Figure 4	Process Flow Diagram
Figure 5	Wind Rose- January 1st –December 31st 2013
Figure 6	Building Input Data
Figure 7	Locations of Receptors of Interest
Figure 8	Predicted Odour Concentration – Relocated Starch Dryer
Figure 9	Predicted TSP Concentration – Relocated Starch Dryer

ANNEXURES

Annexure 1	Plans of Proposed Modification to Starch Dryer
Annexure 2	Requirements of the: <ul style="list-style-type: none">▪ Department of Planning & Environment; and▪ Department of Primary Industries – Water
Annexure 3	Submission under Clause 4.6 of Shoalhaven LEP 2014
Annexure 4	Flood Impact Assessment prepared by Webb McKeown & Associates
Annexure 5	Air Quality Impact Assessment prepared by Stevenson Environmental Management Australia
Annexure 6	Environmental Noise Impact Assessment prepared by Day Design Pty Ltd
Annexure 7	Traffic and Car Parking Assessment prepared by ARC Traffic & Transport
Annexure 8	Preliminary Hazard Analysis prepared by Pinnacle Risk Management Pty Ltd
Annexure 9	Environmental Investigation Report prepared by Coffey Geotechnics
Annexure 10	Geotechnical Assessment – Riverbank Stability prepared by Coffey Geotechnics

EXECUTIVE SUMMARY

Shoalhaven Starches is a member of the Manildra Group of companies. The Manildra Group is a wholly Australian owned business and the largest processor of wheat in Australia. It manufactures a wide range of wheat based products for both local and international food and industrial markets.

The Shoalhaven Starches factory located on Bolong Road, Bomaderry produces a range of products for the food, beverage, confectionary, paper and motor transport industries including: starch; gluten; glucose; and ethanol.

The use of ethanol as a fuel (or fuel additive) has many benefits including:

- it is a renewable fuel and lessens reliance on fossil fuels;
- it reduces greenhouse gas emissions and other air pollutants such as carbon monoxide and particulates;
- it reduces imports of oil and stimulates regional and local economies if produced locally.

Given the above benefits, the Federal and State Governments introduced a range of initiatives to encourage the increased use of ethanol as a fuel additive.

Since 2007 the NSW Government progressively increased the mandated ethanol content by volume in petrol in NSW from 2% to 6% from 1st October 2011.

In 2009 the Minister for Planning issued Project Approval pursuant to the then Part 3A of the Environmental Planning & Assessment Act for an application made by Shoalhaven Starches for the “Shoalhaven Starches Expansion Project” (SSEP) which sought to increase its ethanol production capacity to meet the expected increase in demand for ethanol arising from the abovementioned ethanol mandate by upgrading the existing ethanol plant located at the Shoalhaven Starches Plant at Bomaderry. This Project Approval enabled Shoalhaven Starches to increase its ethanol production in a staged manner from 126 million litres per year to 300 million litres per year subject to certain conditions.

Following the Minister’s determination Shoalhaven Starches have been implementing and commissioning works in accordance with this approval.

The Project Approval included the consolidation of all previous approvals (up to that time) into the one Project Approval. This included the consolidation of the Pollution Reduction Program (PRP) No. 7 Project (DA No. 223-7-2002), which included the installation of Starch Dryer No. 5 within the factory site. It is this Starch Dryer that is proposed to be relocated as part of this modification proposal.

Following further detailed engineering design it has become apparent that the area originally set aside for the approved but not yet constructed Starch Dryer No. 5 under the PRP No. 7 project provided insufficient area for the footprint of this proposed dryer. As a result an alternative location for the Starch Dryer is required to be identified.

Under this Modification Application it is proposed to relocate Starch Dryer No. 5 from its approved location within the existing Shoalhaven Starches factory site to a new location on land on the western side of Abernethy's Creek, otherwise known as the "Moorehouse" site (in recognition of the previous landowner). This land comprises Lot 201 DP 1062668, 24 Bolong Road.

The "Moorehouse" site provides sufficient area for the footprint of the proposal, and is situated within close proximity of the factory and the existing and proposed packing plants.

Two stages of construction works are proposed as part of this Modification proposal: Stage 1 external construction works and Stage 2 internal construction works.

At present the area situated between the buildings on the "Moorehouse" site and Bolong Road is used for staff parking. During the Stage 1 internal construction works, it will be necessary to use part of this staff parking area for the storage of construction materials and plant. During the Stage 1 construction phase it will therefore be necessary to relocate some of this staff parking on a temporary basis. It is proposed to temporarily relocate this staff parking onto the Company's land on the northern side of Bolong Road.

Following the completion of Stage 1 construction works, it will be possible to restore parking back onto the "Moorehouse" site.

The modified proposal will not result in any increase in production from the site over that which has been the subject of past approvals. The proposal will not involve any change in the amount of raw products that will be utilised; nor will it involve any changes in the amount of waste waters that will need to be treated and disposed.

The SSEP is a "Transitional Part 3A Project" pursuant to the provisions of the Environmental Planning & Assessment Act. This Modification Application is therefore made pursuant to Section 75W of the Environmental Planning & Assessment Act 1979.

The preparation of this Environmental Assessment has been undertaken following consultation with:

- The Department of Planning and Environment; and
- Department of Primary Industries - Water.

The EA is supported by expert assessments addressing:

- Noise Impacts – the EA is supported by a Noise Impact Assessment prepared by Day Design Pty Ltd which includes recommendations to ensure that this proposal will achieve the noise limits as outlined under the Environmental Protection Licence that applies to the site.
- Air Quality Impacts and including Odours – the EA is supported by an Air Quality Impact Assessment prepared by Stephenson Environmental Management Australia (SEMA).
- Flooding Impacts - the EA is also supported by a report prepared by WMA Water.
- Preliminary Hazard Analysis (PHA) prepared by Pinnacle Risk Pty Ltd that assesses and compares the risks associated with the proposal against the Department of Planning's risk criteria:
- Traffic and Car Parking Assessment prepared by ARC Traffic and Transport that identifies that there are no access, traffic or parking impacts associated with the proposal – either during operation or construction – that would significantly impact on the efficiency and/or safety of the local traffic environment or existing on-site operations.
- Environmental Investigation report prepared by Coffey Geotechnics ("Coffeys") that addresses acid sulphate soils and site contamination.
- A Geotechnical Assessment of the potential impacts of the proposal on riverbed stability (Abernethy's Creek and the Shoalhaven River) by Coffeys.

Following an assessment of the key issues associated with this proposal, this Environmental Assessment concludes that the proposal is suitable for the site and this locality.

The Minister's approval is therefore sought for the modification application.

1.0 INTRODUCTION

Shoalhaven Starches is a member of the Manildra Group of companies. The Manildra Group is a wholly Australian owned business and the largest processor of wheat in Australia. It manufactures a wide range of wheat based products for food and industrial markets both locally and internationally.

The Shoalhaven Starches factory located on Bolong Road, Bomaderry produces a range of products for the food, beverage, confectionary, paper and motor transport industries including: starch, gluten, glucose and ethanol.

The use of ethanol as a fuel (or fuel additive) has many benefits including:

- it is a renewable fuel and lessens reliance on fossil fuels;
- it reduces greenhouse gas emissions and other air pollutants such as carbon monoxide and particulates;
- it reduces imports of oil and stimulates regional and local economies if produced locally.

Given the above benefits, the Federal and State Governments have introduced a range of initiatives to encourage the increased use of ethanol as a fuel additive.

Since 2007 the NSW Government has progressively increased the mandated ethanol content by volume in petrol in NSW from 2% to 6% from 1st October 2011.

In 2009 the Minister for Planning issued Project Approval for an application made by Shoalhaven Starches to undertake works to enable an increase its ethanol production capacity to meet the expected increase in demand for ethanol arising from the abovementioned initiatives by upgrading the existing ethanol plant, located at the Shoalhaven Starches Plant at Bomaderry. Subject to certain conditions this Project Approval enabled Shoalhaven Starches to increase ethanol production in a staged manner at its Bomaderry Plant from the originally approved 126 million litres per year to 300 million litres per year.

The Project Approval included the consolidation of all previous approvals (up to that time) into the one Project Approval. This included the consolidation of the Pollution Reduction Program (PRP) No. 7 Project (DA No. 223-7-2002), which included the installation of Starch Dryer No. 5 within the factory site. It is this Starch Dryer that is proposed to be relocated as part of this modification proposal.

Following detailed engineering design it has become apparent that the area originally set aside for the approved but not yet constructed Starch Dryer No. 5 under the PRP No. 7 project provided insufficient area for the footprint of this proposed dryer. As a result an alternative location for the Starch Dryer was required to be identified.

It is proposed to relocate Starch Dryer No. 5 within the existing Shoalhaven Starches factory site from its approved location to a new location on the western side of Abernethy's Creek, otherwise known as the "Moorehouse" site (in recognition of the previous landowner). This land comprises Lot 201 DP 1062668, 24 Bolong Road.

The "Moorehouse" site provides sufficient area for the footprint of the proposal, and is situated within close proximity of the factory and the existing and proposed packing plants.

At present the area situated between the buildings on the "Moorehouse" site and Bolong Road is used for staff parking. During the construction phase for the relocation of the proposed Starch Dryer, it will be necessary to use part of this staff parking area for the storage of construction materials and plant. During the construction phase it will therefore be necessary to relocate part of this staff parking on a temporary basis. It is proposed to temporarily relocate this staff parking onto the Company's land on the northern side of Bolong Road.

Following the construction and commissioning of the Starch Dryer, it will be possible to restore parking back onto the "Moorehouse" site.

The modified proposal will not result in any increase in production from the site over that which has been the subject of past approvals. The proposal will not involve any change in the amount of raw products that will be utilised; nor will it involve any changes in the amount of waste waters that will need to be treated and disposed.

The application is made pursuant to Section 75W of the Environmental Planning & Assessment Act 1979.

2.0 THE SITE AND SURROUNDING LOCALITY

The Shoalhaven Starches factory site is situated on various allotments of land on Bolong Road, Bomaderry within the City of Shoalhaven. The factory site, which is located on the south side of Bolong Road on the northern bank of the Shoalhaven River, has an area of approximately 12.5 hectares (refer **Figure 1**).



Figure 1: Aerial photograph of Shoalhaven Starches factory site.

The Project Approval issued by the Minister related to the following parcels of land (**Table 1**):

Table 1
Shoalhaven Starches Property

Lot	Deposited Plan (DP) / FP.
Factory	
1	838753
A	334511
B	334511
B	376494
62	1078788
201	1062668
1	385145
241	1130535
Packing Plant	
16	1121337
2	538289

Table 1 (continued)

Lot	Deposited Plan (DP) / FP.
Wastewater Treatment Plant & Environmental Farm	
4	610696
	131008
1	842231
2	842231
3	235705
1	235705
2	235705
Part 2	854837
4	1109510
22	811233
164	4469
2	854764
210	6131
211	6131
PT 212	6131
213	6131
214	6131
248	6131
2	955009
42	751268
63	751268
PT 2	854837
3	1109510
2	1109510
1	1109510
2	833181
Overhead Bridge – Bolong Road Reserve	
2	538289
Fire Services	
241	1130535

The proposed Starch Dryer is to be sited on Lot 201 DP 1062668, within the western part of the factory site. The erection of the proposed Starch Dryer will require the demolition of an existing industrial building (refer **Plate 1**). The demolition of this existing industrial building is the subject of a separate modification application that has been submitted to the Department.

The proposed temporary car park will be located on the approved Shoalhaven Starches Packing Plant Site (PP Site) which lies on the northern side of Bolong Road (see **Figures 1 and 2** and **Plate 2**) and affects the following lots:

- Lot 16 DP 1121337; and
- Lot 2 DP 538289



Plate 1: View of building to be demolished.

The siting of this temporary car park has also been addressed as part of the same Modification Application that is dealing with the demolition of this building.

The town of Bomaderry is located 0.5 km (approx.) to the west of the factory site, and the Nowra urban area is situated 2.0 km to the south west of the site. The “Riverview Road” area of the Nowra Township is situated approximately 600 metres immediately opposite the factory site across the Shoalhaven River.

The village of Terara is situated approximately 1.5 kilometres to the south east of the site, across the Shoalhaven River. Pig Island is situated between the factory site and the village of Terara and is currently used for dairy cattle grazing.



Plate 2: View of site of proposed temporary car park.

There are a number of industrial land uses, which have developed on the strip of land between Bolong Road and the Shoalhaven River. Industrial activities include a metal fabrication factory; the Shoalhaven Starches site; Shoalhaven Dairy Co-op (formerly Australian Co-operative Foods Ltd – now owned by the Manildra Group); and the former Shoalhaven Paper Mill (Australian Papers). The industrial area is serviced by a privately owned railway spur line that runs from just north of the Nowra-Bomaderry station via the starch plant and the former Dairy Co-op site to the Paper Mill.

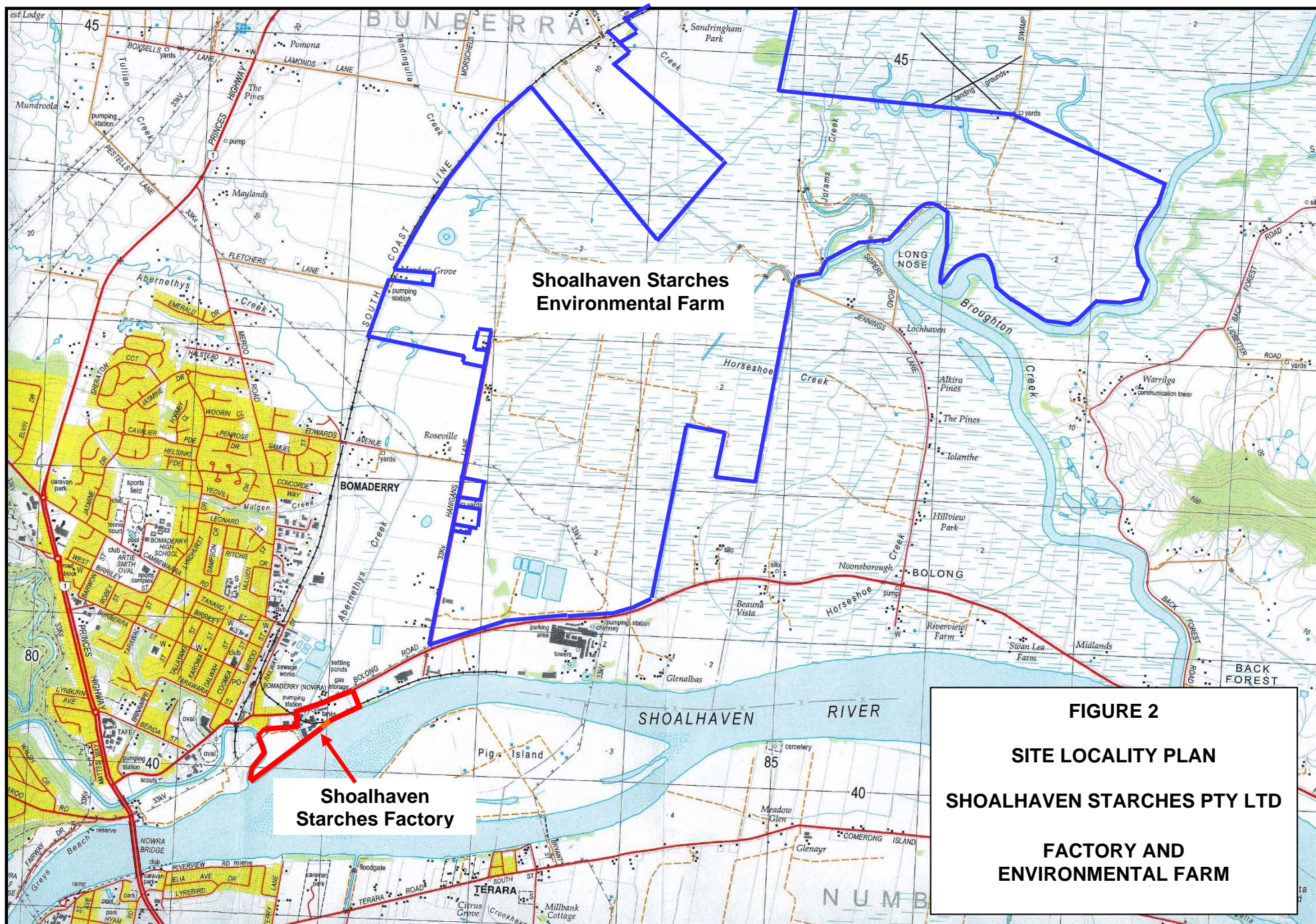
The state railway terminates at Bomaderry Railway Station with a separate, privately owned spur line to the factory site. Shoalhaven City Council sewerage treatment works is situated between the railway station and the factory.

The Company also has an Environmental Farm located over 1000 hectares on the northern side of Bolong Road. This area is cleared grazing land and contains spray irrigation lines and wet weather storage ponds (total capacity 925 megalitres). There are at present 6 wet weather storage ponds on the farm that form part of the waste water management system for the factory. A seventh pond approved in 2002 was converted into the biological section of the new wastewater treatment plant that has now been commissioned.

The Environmental Farm covers a broad area of the northern floodplain of the Shoalhaven River, stretching from Bolong Road in the south towards Jaspers Brush in the north. Apart

from its use as the Environmental Farm, this broad floodplain area is mainly used for grazing (cattle). The area comprises mainly large rural properties with isolated dwellings, although there is a clustering of rural residential development along Jennings Lane (approximately 1 kilometre away) and Back Forest Road (approximately between 500 metres to 1.2 kilometres away) to the west of the Environmental Farm; and Jaspers Brush Road, approximately 1.2 kilometres to the north of the Environmental Farm.

Figure 2 is a site locality plan depicting the location of the factory site and Environmental Farm as well as the surrounding locality.



3.0 BACKGROUND

3.1 PRODUCTION PROCESSES

The production process at the Shoalhaven Starches plant has developed over a number of decades. Originally the plant was primarily concerned with the production of starch and gluten from flour. However the Company has pursued a number of technological innovations particularly with respect to reducing the environmental impacts of the Company's operations. As a result Shoalhaven Starches has been moving towards a "closed" system of production. Essentially this entails the efficient use of end products to ensure wastage is reduced to a minimum.

The first step in the production process is the delivery of flour and grain, by rail, from the Company's flour mills at Manildra, Gunnedah, Narrandera as well as the flour mill located on the Shoalhaven Starches factory site. The trainloads are brought into the plant via the switching yard at Bomaderry.

Flour is transferred via storage to the "wet end" of the plant where fresh water is added. The subsequent mixing and separation process produces starch and gluten.

The gluten is dried to enable it to be packaged and distributed as a high protein food additive for human consumption. This product is then taken from the site after packaging for both local and export markets. The wastage from the starch process is used for fermentation and distillation to produce ethanol.

The starch that is separated from the flour is either dried or remains in liquid form. The dried and liquid starch is sold to the paper and food industries. The starch is used for food, cardboard, paper and other industrial purposes. The wastage from the liquid starch process is also used in the ethanol production process.

Starch is also used in the production of syrups on the site. The syrups plant products include glucose and brewer's syrup. These are used for foods, chocolates, confectionery, beer, soft drinks and fruit juice. The syrups plant also has some wastage that is also used in the ethanol process.

The wastage from the starch, gluten and syrup production processes are combined to feed the fermentation and distillation stage of ethanol production. The outputs are fuel and industrial and food grade ethanol. Industrial grade ethanol is used in producing pharmaceuticals, printer's ink and methylated spirits.

Ethanol production results in some waste solids and water, which are processed through the Stillage Recovery Process Plant (which was approved as part of PRP No. 7 in 2005).

The residue solids are recovered as DDGS (Dried Distillers Grains Syrup), dried and sold as a high protein cattle feed with the remaining water used for irrigation. The waste water resulting from the ethanol production is further treated before being re-circulated into the factory processes and/or irrigated onto Shoalhaven Starches Environmental Farm to the north of Bolong Road. This farm land is used for fodder crops, pasture and cattle grazing.

3.2 OPERATING WORKFORCE

3.2.1 Operations

The existing factory operates 24 hours per day, 7 days a week, 365 days of the year.

3.2.2 Workforce

The plant employs a total of 280 staff, covering all components of production - operators, administrative personnel and maintenance staff. Employee breakdown and hours of shifts are as follows:

A total of around 280 employees	Management, Technical & Administration	60
	Day Workers	75
	Shift Production (spread over 4 shifts)	145

Hours of Shifts

Plant:	6:00 am to 6:00 pm	- 36 employees	
	6:00 pm to 6:00 am	- 36 employees	
	Day – 7:00 am to 3:00 pm	but variable	75 employees, 60 Management, Technical & Administration
Farm:	5:00 am to 5:00 pm	- 2 employees	
	5:00 pm to 5:00 am	- 1 employee	
	7:00 am to 3:00 pm	- 3 employees	

Shift work at both the factory and farm is undertaken on a 2 day, 2 night and 4 day off basis.

3.3 RAW MATERIALS

There are six major raw material components used in the Shoalhaven Starches process. These are flour, grain; coal; natural gas; fresh water and salt water.

Flour is delivered to the site from the Company's mills at Manildra, Gunnedah and Narrandera each day of the week. The flour arrives into the plant by Company owned stainless steel rail wagons. The wagons have bottom dumping doors and are unloaded in a building. Flour is also produced by the Flour Mill located within the Bomaderry site.

From the silos, the flour is moved into the plant by air as required. The current approved flour consumption of the plant is 20,000 tonnes per week.

Grain is delivered to the site by rail. At present up to approximately 552 tonnes of grain is delivered to the site per day. The grain is milled to produce flour for further processing in the starch and gluten plants. The grain is “dumped” from the train into an underground hopper and conveyed by screw conveyors and bucket elevator into a silo.

Coal is delivered by road from Wallerawang near Lithgow. At present 10 trucks of 30 tonnes per truck are delivered daily. The coal storage area is located between the Shoalhaven River and the existing boilers. The transfer of coal from the storage bins to the boilers is undertaken by front-end loader pushing the coal through a grate and into a pneumatic conveying system up to the boilers.

Natural Gas - The Shoalhaven Starches plant operates partly on natural gas. The site is connected to a natural gas reticulation main.

Fresh water and recycled water is utilised in the starch production process. At present on average a total of 6900 kilolitres of water is used on a daily basis. This comprises 2600 KI from the town water supply, and 4300 KI from a raw water supply provided by Shoalhaven City Council via a pipeline from the former Shoalhaven Paper Mill.

Salt water from the Shoalhaven River is used to cool items of plant before the water is returned to the river.

In addition the factory operations utilise a range of enzymes, additives, fuels and other products in the overall operations. At present the plant utilises approximately 30 tonnes each of acid and caustic products per week.

3.4 HISTORY OF DEVELOPMENT ON THE SITE

The Shoalhaven Starches wheat starch and gluten plant at Nowra was originally constructed in 1970. The Manildra flour mills, at Manildra, Narrandera and Gunnedah, supply the Shoalhaven Starches factory, which currently produces wheat starch, gluten, syrups and ethanol (industrial and fuel grades). The Shoalhaven Starches operation provides direct on-site employment for 280 employees. Through the use of contractors it also indirectly creates employment for many more people in the local and regional economies.

In order to address the issue of waste water disposal, in 1984 Shoalhaven Starches installed a spray irrigation system, using farmland it owned on the northern side of Bolong Road at Bomaderry.

In June 1991, two storage ponds were built (Ponds No. 1 and 2) resulting in the cessation of waste water discharge to the Shoalhaven River.

To further reduce product wastage, Shoalhaven Starches sought to use excess starch for the production of ethanol. Ethanol production began at the Shoalhaven site in June 1992.

In 1994, the NSW Government approved the installation of a larger ethanol distillery within the existing site. The new distillery and its associated facilities enabled production of ethanol to increase from 20 million litres per annum to a production capacity of 100 million litres per year.

Subsequent to this approval Shoalhaven City Council issued development consent for:

- a protein isolate plant and DDGS Dryer; and
- a sorghum grinding plant.

Shoalhaven City Council issued development approval for the construction of a wet weather storage pond (Pond No. 6) on the 27th April 2001. At present, with the completion of Pond No. 6, Shoalhaven Starches has a combined waste water storage capacity within the existing ponds of 925 ML. A further wet weather storage pond (Pond No. 7) was approved by the Minister for Planning on the 23 December 2002 and construction of the Pond has been completed.

On the 1st June, 2001 the Minister for Urban Affairs & Planning, Dr Andrew Refshauge MP, declared both the Shoalhaven Starches factory and Environmental Farm as being State Significant Development for the purposes of the then Section 76A(7) of the Environmental Planning & Assessment Act.

In 2003 the Minister for Planning issued development consent (D223) for Shoalhaven Starches Pollution Reduction Program (PRP) No. 7. This approval enabled the implementation of the Company's Waste Water Management Strategy, and essentially sought to remove solids (suspended and soluble) from the Company's waste water, prior to its irrigation on the Environmental Farm.

This process, known as Stillage Recovery, essentially involved the introduction of additional decanters, the installation of an evaporation plant and additional dryers, to remove solids from the waste water. It was these "solids" in the waste water that when sprayed onto the Environmental Farm, or stored in the wet weather storage ponds, had the potential to result in the generation of odours.

The recovery of the suspended and soluble solids from the waste water could not be undertaken by the dryers in this process, without firstly providing additional coarse solids. Additional coarse solids (grain) were required to be imported to the site.

As a consequence of the additional grain, the starch contained in the grain resulted in a need to increase ethanol production to 126 million litres per year. This increase in ethanol production required the installation of additional fermenters, associated cooling towers and molecular sieves.

The increase in ethanol production also resulted in an increase in waste water, which was required to be disposed on the environmental farm. In this regard this previous proposal also included an increase in waste water disposal area on the Environmental Farm.

The plant associated with this previous approval has now been substantially installed and commissioned.

Shoalhaven Starches have subsequently received the following further development approvals:

- The establishment of a flour mill on the factory site. This proposal provides for the transportation of wheat grain directly to the site by train for processing into industrial grade flour for the use in the production of starch and gluten at the factory site.
- An application pursuant to Section 96 of the Environmental Planning & Assessment Act seeking to modify the development approval for the PRP No. 7 project to enable a DDGS Dryer to be installed in a slightly different location in the same building as previously approved; and the installation of an additional evaporator (a redundant piece of equipment located at the Company's Altona Plant in Victoria) to provide standby capacity for the existing evaporator plant when sections of the existing plant are out of service or cleaning.
- A Section 96 modification application for a standby fermenter tank to be installed on the site, to enable the existing fermenter tanks to be taken out of service for maintenance one at a time.

A full list of historic approvals that applied to the Shoalhaven Starches site were detailed within Section 2.4 of the EA prepared by our firm, in relation to the Shoalhaven Starches Expansion Project (MP 06_0228).

3.5 PROJECT APPROVAL MP 06_0228

On the 28th January 2009 the then Minister for Planning issued Project Approval MP 06_0228 for the “Shoalhaven Starches Expansion Project”.

The primary objective of the Shoalhaven Starches Expansion Project is to increase the Company’s ethanol production capacity to meet the expected increase in demand for ethanol arising from Federal and State Government initiatives by upgrading the existing ethanol plant.

The approval is subject to certain conditions enabling Shoalhaven Starches to increase ethanol production in a staged manner at its Bomaderry Plant from 126 million litres per year to 300 million litres per year.

To accomplish the increase in ethanol production, the Project Approval enables Shoalhaven Starches to upgrade plant and increase throughput of raw materials, principally flour and grain.

The following additions and alterations were approved as part of this Project Approval:

- the provision of an additional dryer for the starch/gluten plant;
- additional equipment and storage vessels for the ethanol plant including 3 additional fermenters, additional cooling towers and molecular sieves;
- upgrades to the Stillage Recovery Plant including 6 additional Dried Distillers Grains Syrup (DDGS) dryers; 10 decanters; chemical storage and two evaporators. This included the installation of a DDGS Pelletising Plant as part of these processes; and
- the establishment of a new packing plant, container loading area and a rail spur line. The establishment of this facility on the northern side of Bolong Road will require the provision of an overhead bridge structure to allow product and safe pedestrian movement across Bolong Road.

In addition, as part of the Project Approval Shoalhaven Starches are undertaking comprehensive odour reduction measures for both the existing factory site and the works associated with the Expansion Project. In 2006, the Land and Environment Court required Shoalhaven Starches to engage a suitably qualified person to conduct a comprehensive environmental audit of the factory and Environmental Farm. This Environmental Audit was undertaken GHD Pty Ltd (October 2007). The audit report included a number of recommendations for the implementation of works to the existing site, some of which require development approval. These works were included within this Project Approval.

The Project Approval enables a staged implementation of the expansion project. This staged implementation has now largely been implemented and the factory is now permitted to produce the maximum approved 300 million litres of ethanol per year.

The Project Approval also enables the biological treatment of waste waters from the factory site and the re-use of over half the treated waste water within the factory processes, with the remainder irrigated onto the Company's Environmental Farm.

3.6 APPROVAL HISTORY FOLLOWING MP 06_0228

DA 10/1843 – Upgrade Vehicle Entrance (Former Dairy Farmers Factory Site)

On the 30th September, 2010 Shoalhaven City Council approved Development Application DA 10/1843 permitting the upgrade of the existing vehicle entrance at 220 Bolong Road, otherwise known as the “former Dairy Farmers” factory site. The need for these upgrading works arose following the Project Approval requirements for the “SSEP”, and which included requirements to undertake upgrading works along Bolong Road along the frontage of the site. These upgrading works prevent vehicles travelling east along Bolong Road to turn right into the central vehicle access to the Shoalhaven Starches site; as well as vehicles turning right out from this access point and travelling east along Bolong Road. These approved works also prevent vehicles turning right out of the BOC Carbon Dioxide Plant.

The works associated with this approval will allow vehicles wishing to travel west from the BOC CO₂ plant to leave this site to travel first east; by allowing vehicles to travel to the former Dairy Farmers factory complex and using the upgraded access to turn around before travelling west along Bolong Road.

RA11/1002 Interim Packing Plant

Following the issue of Project Approval MP 06_0228 Shoalhaven Starches also obtained a separate development approval to use an existing factory building located at 22 Bolong Road (Lot 21 DP 100265) as an Interim Packing Plant from Shoalhaven City Council (RA11/1002 dated 26th October 2011). This Interim Packing Plant operates in conjunction with the Companies existing Packing Plant which is located within the existing factory site.

As outlined in Section 3.5 above, Project Approval MO 06_0228 made provision for a new Packing Plant to be located on land owned by the company on the northern side of Bolong Road.

Following the granting of MP 06_0228 however the Manildra Group of Companies have acquired the former Dairy Farmers factory site located at 220 Bolong Road. The Company has therefore been reconsidering the best location for the future Packing Plant.

During the interim period however the now existing Flour Mill and a new starch dryer were commissioned resulting in a subsequent increase in production of dried product from these new plants. Interim Packing Plant facilities were therefore required until the final location for the new packing plant was determined. It is intended that the Interim Packing Plant would operate on a temporary basis until a final location for the new Packing Plant is identified.

Shoalhaven Starches have held initial consultation with the Department of Planning & Environment with respect to submitting a separate modification application which will seek approval to relocate the approved Packing Plant (and dryer) to the former Dairy Farmers factory site at 220 Bolong Road. Once the modification application for the relocation of the Packing Plant has been approved, the new Packing Plant constructed and commissioned, the need for the Interim Packing Plant located at 22 Bolong Road will be reviewed.

DA 11/1855 – Widening of Driveway

A further development application (DA 11/1855) was submitted to Shoalhaven City Council on the 4th August 2011 seeking approval to widen the driveways serving 22 Bolong Road Bomaderry (ie. the site of the Interim Packing Plant) to accommodate semi-trailers. This development application was approved by Shoalhaven City Council on the 24th August 2011.

DA 13/1713 – Demolition of Dimethyl Ether Plant

On the 5th July 2013 Shoalhaven Starches submitted a development application to Shoalhaven City Council seeking the demolition of a Dimethyl Ether Plant on the site. This development application was approved by Shoalhaven City Council on the 15th July 2013.

DA 14/2161 – Additional Two (2) Grain Silos

On the 19th September 2014 Shoalhaven Starches submitted a development application to Shoalhaven City Council seeking development consent to erect two additional grain silos on the factory site within the vicinity of the existing Flour Mill.

The purpose of these two additional grain silos will be to provide security of raw material storage and supply when there are closures of the Illawarra rail line serving the

Shoalhaven Starches site enabling the factory operations to continue during rail line closures. Over recent years there have been occasions when there have been closures of the Illawarra rail line due to track construction work as well as a result of floods, storms and traffic accidents. During these closures the supply of grain and flour to the Shoalhaven Starches site has been interrupted. The additional grain silos associated with this application will provide a buffer for on-site storage and additional security of storage and supply should closures to the rail line occur in the future.

Other Approvals

There have been other approvals that have been issued by Shoalhaven City Council on lands associated with the Shoalhaven Starches operations, but which do not directly relate to the operations of Shoalhaven Starches including:

- DA 11/1936 - Algae Demonstration Plant for evaluation of algae production and processing for alternative fuel and CO2 sequestration. Proponent Algae Tec Pty Ltd at 220 Bolong Road (former Dairy Farmers factory site).
- DA 14/1327 - Alterations to existing building (former Dairy Farmers Factory Building) and re-use as a meat processing plant. Proponent – Candal Investments Pty Ltd at 220 Bolong Road (former Dairy Farmers factory site).

3.7 LOCAL PLANNING PROVISIONS

Shoalhaven Local Environmental Plan (SLEP) 2014

The site is zoned IN1 (General Industrial) zone under the provisions of SLEP 2014 (refer **Figure 2**). The objectives of the IN1 zone are:

- *To provide a wide range of industrial and warehouse land uses.*
- *To encourage employment opportunities.*
- *To minimise any adverse effect of industry on other land uses.*
- *To support and protect industrial land for industrial uses.*
- *To allow a diversity of activities that do not significantly conflict with the operation of existing or proposed development.*
- *To enable other land uses that provide facilities or services to meet the day to day needs of workers in the area.*

It is our view that the proposal is consistent with these objectives as the proposal involves alterations and additions to an existing industrial activity.

Industry is a permissible use within this zone. The proposal is permissible subject to Council's consent (see **Table 2** below).

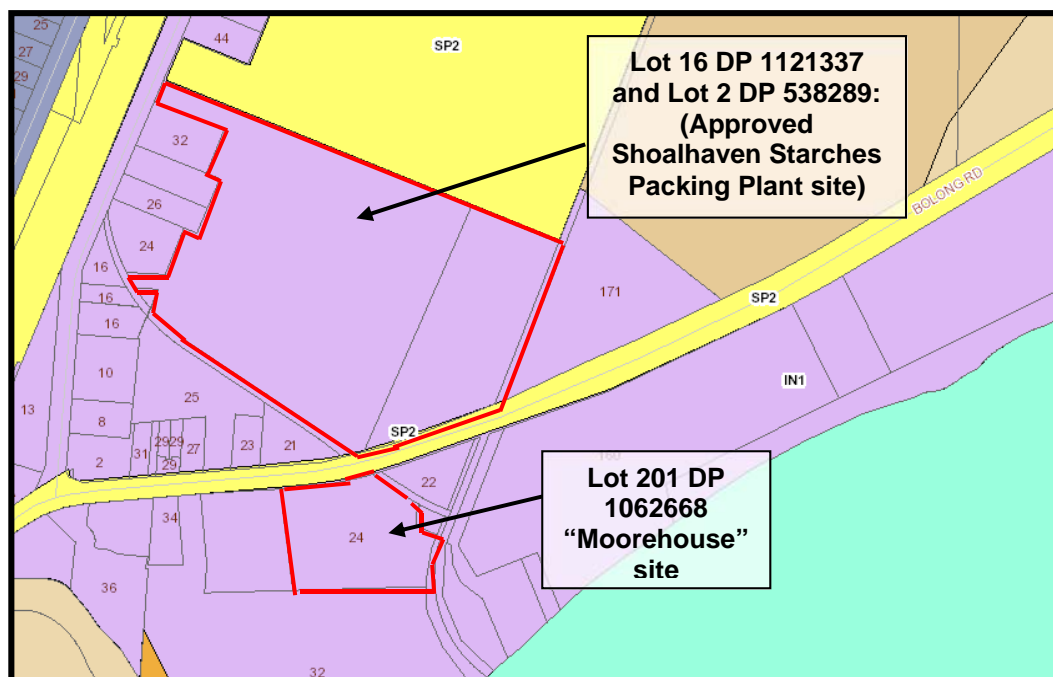


Figure 3: Zoning provisions applying under Shoalhaven LEP 2014.

Table 2

Land Use Permissibility – IN1 Zone (Shoalhaven LEP 2014)

Permitted without consent	Nil.
Permitted with consent	Bulky goods premises; Depots; Freight transport facilities; General industries ; Industrial training facilities; Kiosks; Light industries; Markets; Neighbourhood shops; Roads; Take away food and drink premises; Timber yards; Warehouse or distribution centres
Prohibited	Agriculture; Air transport facilities; Airstrips; Amusement centres; Animal boarding or training establishments; Camping grounds; Caravan parks; Cemeteries; Charter and tourism boating facilities; Child care centres; Correctional centres; Crematoria; Eco-tourist facilities; Educational establishments; Environmental facilities; Exhibition villages; Extractive industries; Farm buildings; Forestry; Function centres; Health services facilities; Highway service centres; Home-based childcare; Home businesses; Home occupations; Home occupations (sex services); Information and education facilities; Marinas; Mooring pens; Moorings; Office premises; Open cut mining; Places of public worship; Registered clubs; Residential accommodation; Respite day care centres; Restricted premises; Retail premises; Sex services premises; Tourist and visitor accommodation; Water recreation structures; Wharf or boating facilities.

The SLEP 2014 also has a number of specific provisions that apply to the land. The implications that these provisions have in relation to this proposal are discussed in **Table 3** below:

Table 3
Shoalhaven LEP 2014 Provisions

SLEP 2014 Clause	Provisions	Comments
4.3 Height of Buildings	<p>(1) <i>The objectives of this clause are as follows:</i></p> <ul style="list-style-type: none"> (a) <i>to ensure that buildings are compatible with the height, bulk and scale of the existing and desired future character of a locality,</i> (b) <i>to minimise visual impact, disruption of views, loss of privacy and loss of solar access to existing development,</i> (c) <i>to ensure that the height of buildings on or in the vicinity of a heritage item or within a heritage conservation area respect heritage significance.</i> <p>(2) <i>The height of a building on any land is not to exceed the maximum height shown for the land on the Height of Buildings Map.</i></p> <p>(2A) <i>If the Height of Buildings Map does not show a maximum height for any land, the height of a building on the land is not to exceed 11 metres.</i></p>	<p>The proposed Starch Dryer building will have a height above ground level of 28 metres. There will also be intrusions above the building, the highest of which will be the dryer ducting that will have a height of 36 m above ground level.</p> <p>Although there is no maximum height specified for the subject land part (2a) of Clause 4.3 of SLEP 2014 states no building is to be in excess of 11 metres.</p> <p>As such a submission for an exception to development standards under Clause 4.6 of the SLEP 2014 has been prepared and is attached under Annexure 3.</p>
4.6 Exceptions to development standards	<p>(1) <i>The objectives of this clause are as follows:</i></p> <ul style="list-style-type: none"> (a) <i>to provide an appropriate degree of flexibility in applying certain development standards to particular development,</i> (b) <i>to achieve better outcomes for and from development by allowing flexibility in particular circumstances.</i> <p>(2) <i>Development consent may, subject to this clause, be granted for development even though the development would contravene a development standard imposed by this or any other environmental planning instrument.</i></p> <p><i>However, this clause does not apply to a development standard that is expressly excluded from the operation of this clause.</i></p> <p>(3) <i>Development consent must not be granted for development that contravenes a development standard unless the consent authority has considered a written request from the applicant that seeks to justify the contravention of the development standard by demonstrating:</i></p> <ul style="list-style-type: none"> (a) <i>that compliance with the development standard is unreasonable or unnecessary in the circumstances of the case, and</i> 	<p>The height of the proposed building and intrusions above the building (including the dryer ducting) are in excess of the 11 metre maximum as specified in (2A) of Clause 4.3 Height of Buildings of the SLEP 2014.</p> <p>The proposed development will be erected within the surrounds of the Shoalhaven Starches factory site.</p> <p>As the proposed relocated starch dryer will be built within the existing industrial complex it is not expected that the new development will have an undue effect due to its height.</p> <p>A submission for an exception to development standards has been prepared and is attached to the SEE under Annexure 3.</p>

Table 3 (continued)

SLEP 2014 Clause	Provisions	Comments
4.6 continued	<p>(b) that there are sufficient environmental planning grounds to justify contravening the development standard.</p> <p>(4) Development consent must not be granted for development that contravenes a development standard unless:</p> <p>(a) the consent authority is satisfied that:</p> <p>(i) the applicant's written request has adequately addressed the matters required to be demonstrated by subclause (3), and</p> <p>(ii) the proposed development will be in the public interest because it is consistent with the objectives of the particular standard and the objectives for development within the zone in which the development is proposed to be carried out, and</p> <p>(b) the concurrence of the Director-General has been obtained.</p> <p>(5) In deciding whether to grant concurrence, the Director-General must consider:</p> <p>(a) whether contravention of the development standard raises any matter of significance for State or regional environmental planning, and</p> <p>(b) the public benefit of maintaining the development standard, and</p> <p>(c) any other matters required to be taken into consideration by the Director-General before granting concurrence.</p> <p>(6) Development consent must not be granted under this clause for a subdivision of land in Zone RU1 Primary Production, Zone RU2 Rural Landscape, Zone RU3 Forestry, Zone RU4 Primary Production Small Lots, Zone RU6 Transition, Zone R5 Large Lot Residential, Zone E2 Environmental Conservation, Zone E3 Environmental Management or Zone E4 Environmental Living if:</p> <p>(a) the subdivision will result in 2 or more lots of less than the minimum area specified for such lots by a development standard, or</p> <p>(b) the subdivision will result in at least one lot that is less than 90% of the minimum area specified for such a lot by a development standard.</p> <p>Note. When this Plan was made it did not include all of these zones.</p>	

Table 3 (continued)

SLEP 2014 Clause	Provisions	Comments
4.6 continued	<p>(7) After determining a development application made pursuant to this clause, the consent authority must keep a record of its assessment of the factors required to be addressed in the applicant's written request referred to in subclause (3).</p> <p>(8) This clause does not allow development consent to be granted for development that would contravene any of the following:</p> <p>(a) a development standard for complying development,</p> <p>(b) a development standard that arises, under the regulations under the Act, in connection with a commitment set out in a BASIX certificate for a building to which State Environmental Planning Policy (Building Sustainability Index: BASIX) 2004 applies or for the land on which such a building is situated,</p> <p>(c) clause 5.4,</p> <p>(ca) clause 6.1 or 6.2</p>	
5.5 Development within the coastal zone	<p>(1) The objectives of this clause are as follows:</p> <p>(a) to provide for the protection of the coastal environment of the State for the benefit of both present and future generations through promoting the principles of ecologically sustainable development,</p> <p>(b) to implement the principles in the NSW Coastal Policy, and in particular to:</p> <p>(i) protect, enhance, maintain and restore the coastal environment, its associated ecosystems, ecological processes and biological diversity and its water quality, and</p> <p>(ii) protect and preserve the natural, cultural, recreational and economic attributes of the NSW coast, and</p> <p>(iii) provide opportunities for pedestrian public access to and along the coastal foreshore, and</p> <p>(iv) recognise and accommodate coastal processes and climate change, and</p> <p>(v) protect amenity and scenic quality, and</p> <p>(vi) protect and preserve rock platforms, beach environments and beach amenity, and</p>	<p>The subject land is located within the coastal zone.</p> <p>The proposal is not considered to adversely affect the coastal zone based on the following:</p> <ul style="list-style-type: none"> • The proposal does not affect or impinge on public access to or along the coastal foreshore. • The proposed development is situated adjacent to existing industrial development and is considered to be suitable development given its type, location and design. The development is also consistent with the zoning objectives for the land. • The development will not lead to overshadowing of foreshore areas. The site is situated on the northern side of the Shoalhaven River.

Table 3 (continued)

SLEP 2014 Clause	Provisions	Comments
5.5 continued	<p>(vii) protect and preserve native coastal vegetation, and</p> <p>(viii) protect and preserve the marine environment, and</p> <p>(ix) ensure that the type, bulk, scale and size of development is appropriate for the location and protects and improves the natural scenic quality of the surrounding area, and</p> <p>(x) ensure that decisions in relation to new development consider the broader and cumulative impacts on the catchment, and</p> <p>(xi) protect Aboriginal cultural places, values and customs, and</p> <p>(xii) protect and preserve items of heritage, archaeological or historical significance</p> <p>(2) Development consent must not be granted to development on land that is wholly or partly within the coastal zone unless the consent authority has considered:</p> <p>(a) existing public access to and along the coastal foreshore for pedestrians (including persons with a disability) with a view to:</p> <p>(i) maintaining existing public access and, where possible, improving that access, and</p> <p>(ii) identifying opportunities for new public access, and</p> <p>(b) the suitability of the proposed development, its relationship with the surrounding area and its impact on the natural scenic quality, taking into account:</p> <p>(i) the type of the proposed development and any associated land uses or activities (including compatibility of any land-based and water-based coastal activities), and</p> <p>(ii) the location, and</p> <p>(iii) the bulk, scale, size and overall built form design of any building or work involved, and</p> <p>(c) the impact of the proposed development on the amenity of the coastal foreshore including:</p> <p>(i) any significant overshadowing of the coastal foreshore, and</p>	<ul style="list-style-type: none"> The scenic qualities of the area will not diminish. Visual impact is further addressed in Section 7.9 of this EA. The proposal will not lead to adverse impacts on threatened fauna and flora.

Table 3 (continued)

SLEP 2014 Clause	Provisions	Comments
5.5 continued	<p>(ii) any loss of views from a public place to the coastal foreshore, and</p> <p>(d) how the visual amenity and scenic qualities of the coast, including coastal headlands, can be protected, and</p> <p>(e) how biodiversity and ecosystems, including:</p> <p>(i) native coastal vegetation and existing wildlife corridors, and</p> <p>(ii) rock platforms, and</p> <p>(iii) water quality of coastal waterbodies, and</p> <p>(iv) native fauna and native flora, and their habitats, can be conserved, and</p> <p>(f) the cumulative impacts of the proposed development and other development on the coastal catchment.</p> <p>(3) Development consent must not be granted to development on land that is wholly or partly within the coastal zone unless the consent authority is satisfied that:</p> <p>(a) the proposed development will not impede or diminish, where practicable, the physical, land-based right of access of the public to or along the coastal foreshore, and</p> <p>(b) if effluent from the development is disposed of by a non-reticulated system, it will not have a negative effect on the water quality of the sea, or any beach, estuary, coastal lake, coastal creek or other similar body of water, or a rock platform, and</p> <p>(c) the proposed development will not discharge untreated stormwater into the sea, or any beach, estuary, coastal lake, coastal creek or other similar body of water, or a rock platform, and</p> <p>(d) the proposed development will not:</p> <p>(i) be significantly affected by coastal hazards, or</p> <p>(ii) have a significant impact on coastal hazards, or</p> <p>(iii) increase the risk of coastal hazards in relation to any other land.</p>	

Table 3 (continued)

SLEP 2014 Clause	Provisions	Comments
5.10 <i>Heritage Conservation</i>	<p>(1) <i>The objectives of this clause are:</i></p> <ul style="list-style-type: none"> (a) <i>to conserve the environmental heritage of Shoalhaven; and</i> (b) <i>to conserve the heritage significance of heritage items and heritage conservation areas including associated fabric, settings and views; and</i> (c) <i>to conserve archaeological sites; and</i> (d) <i>to conserve Aboriginal objects and Aboriginal places of heritage significance.</i> <p>(2) <i>Development consent is required for any of the following:</i></p> <ul style="list-style-type: none"> (a) <i>demolishing or moving any of the following or altering the exterior of any of the following (including, in the case of a building, making changes to its detail, fabric, finish or appearance):</i> <ul style="list-style-type: none"> (i) <i>a heritage item,</i> (ii) <i>an Aboriginal object</i> (iii) <i>a building, work, relic or tree within a heritage conservation area,</i> (b) <i>altering a heritage item that is a building by making structural changes to its interior or by making changes to anything inside the item that is specified in Schedule 5 in relation to the item,</i> (c) <i>disturbing or excavating an archaeological site while knowing, or having reasonable cause to suspect, that the disturbance or excavation will or is likely to result in a relic being discovered, exposed, moved, damaged or destroyed,</i> (d) <i>disturbing or excavating an Aboriginal place of heritage significance,</i> (e) <i>erecting a building on land:</i> <ul style="list-style-type: none"> (i) <i>on which a heritage item is located or that is within a heritage conservation area;</i> (ii) <i>on which an Aboriginal object is located or that is within an Aboriginal place of heritage significance,</i> (f) <i>subdividing land:</i> <ul style="list-style-type: none"> (i) <i>on which a heritage item is located or that is within a heritage conservation area, or</i> (ii) <i>on which an Aboriginal object is located or that is within an Aboriginal place of heritage significance.</i> 	<p>There are no heritage items within the subject land. And the subject site is not located within a heritage conservation area.</p> <p>An aboriginal archaeological assessment previously undertaken on this site indicated that:</p> <p style="padding-left: 40px;"><i>the potential for any Aboriginal heritage evidence to survive is virtually negligible.</i></p> <p>In view of the minimal extent of the proposed impacts, and the register searches, field survey and consultation with the Aboriginal community conducted to date, along with the extensive impacts from current infrastructure further heritage assessment is not considered to be warranted</p>

Table 3 (continued)

SLEP 2014 Clause	Provisions	Comments												
7.1 Acid sulphate soils	<p>(1) <i>The objective of this clause is to ensure that development does not disturb, expose or drain acid sulphate soils and cause environmental damage.</i></p> <p>(2) <i>Development consent is required for the carrying out of works described in the Table to this subclause on land shown on the Acid Sulphate Soils Map as being of the class specified for those works, except as provided by this clause.</i></p> <table><tr><th>Class of Land</th><th>Works</th></tr><tr><td>1</td><td><i>Any works.</i></td></tr><tr><td>2</td><td><i>Works below the natural ground surface. Works by which the watertable is likely to be lowered.</i></td></tr><tr><td>3</td><td><i>Works more than 1 metre below the natural ground surface. Works by which the watertable is likely to be lowered more than 1 metre below the natural ground surface.</i></td></tr><tr><td>4</td><td><i>Works more than 2 metres below the natural ground surface. Works by which the watertable is likely to be lowered more than 2 metres below the natural ground surface.</i></td></tr><tr><td>5</td><td><i>Works within 500 metres of adjacent Class 1, 2, 3 or 4 land that is below 5 metres Australian Height Datum by which the watertable is likely to be lowered below 1 metre Australian Height Datum on adjacent Class 1, 2, 3 or 4 land.</i></td></tr></table> <p>(3) <i>Development consent must not be granted under this clause for the carrying out of works unless an acid sulphate soils management plan has been prepared for the proposed works in accordance with the Acid Sulphate Soils Manual and has been provided to the consent authority.</i></p> <p>(4) <i>Despite subclause (2), development consent is not required under this clause for the carrying out of works if:</i></p> <p>(a) <i>a preliminary assessment of the proposed works prepared in accordance with the Acid Sulphate Soils Manual indicates that an acid sulphate soils management plan is not required for the works, and</i></p>	Class of Land	Works	1	<i>Any works.</i>	2	<i>Works below the natural ground surface. Works by which the watertable is likely to be lowered.</i>	3	<i>Works more than 1 metre below the natural ground surface. Works by which the watertable is likely to be lowered more than 1 metre below the natural ground surface.</i>	4	<i>Works more than 2 metres below the natural ground surface. Works by which the watertable is likely to be lowered more than 2 metres below the natural ground surface.</i>	5	<i>Works within 500 metres of adjacent Class 1, 2, 3 or 4 land that is below 5 metres Australian Height Datum by which the watertable is likely to be lowered below 1 metre Australian Height Datum on adjacent Class 1, 2, 3 or 4 land.</i>	<p>Mapping supporting the SLEP 2013 identifies the subject land as being affected by Class 3 and 4.</p> <p>This EA is supported by an Environmental Investigation Report carried out by Coffey Geotechnics (Annexure 9) which includes an assessment of the presence of acid sulphate soils and how such soils may be managed in context with this proposal.</p> <p>This issue is discussed in Section 7.7 of this EA.</p>
Class of Land	Works													
1	<i>Any works.</i>													
2	<i>Works below the natural ground surface. Works by which the watertable is likely to be lowered.</i>													
3	<i>Works more than 1 metre below the natural ground surface. Works by which the watertable is likely to be lowered more than 1 metre below the natural ground surface.</i>													
4	<i>Works more than 2 metres below the natural ground surface. Works by which the watertable is likely to be lowered more than 2 metres below the natural ground surface.</i>													
5	<i>Works within 500 metres of adjacent Class 1, 2, 3 or 4 land that is below 5 metres Australian Height Datum by which the watertable is likely to be lowered below 1 metre Australian Height Datum on adjacent Class 1, 2, 3 or 4 land.</i>													

Table 3 (continued)

SLEP 2014 Clause	Provisions	Comments
7.1 continued	<p>(b) the preliminary assessment has been provided to the consent authority and the consent authority has confirmed the assessment by notice in writing to the person proposing to carry out the works.</p> <p>(5) Despite subclause (2), development consent is not required under this clause for the carrying out of any of the following works by a public authority (including ancillary work such as excavation, construction of access ways or the supply of power):</p> <p>(a) emergency work, being the repair of the works of the public authority required to be carried out urgently because the works have been damaged, have ceased to function or pose a risk to the environment or to public health and safety,</p> <p>(b) routine management work, being the periodic inspection, cleaning, repair or replacement of the works of the public authority (other than work that involves the disturbance of more than 1 tonne of soil).</p> <p>(c) minor work, being work that costs less than \$20,000 (other than drainage work).</p> <p>(6) Despite subclause (2), development consent is not required under this clause to carry out any works if:</p> <p>(a) the works involve the disturbance of less than 1 tonne of soil, and</p> <p>(b) the works are not likely to lower the watertable.</p>	
7.3 Flood Planning	<p>(1) The objectives of this clause are as follows:</p> <p>(a) to minimise the flood risk to life and property associated with the use of land,</p> <p>(b) to allow development on land that is compatible with the land's flood hazard, taking into account projected changes as a result of climate change,</p> <p>(c) to avoid significant adverse impacts on flood behaviour and the environment.</p> <p>(2) This clause applies to:</p> <p>(a) land identified as "Flood Planning Area" on the Flood Planning Area Map, and</p>	<p>The Flood Planning Area Map that accompanies the SLEP 2014 identifies the subject land as being flood prone land.</p> <p>This EA is supported by a Flood Impact Assessment carried out by WMA Water (Annexure 4).</p> <p>Flooding is further discussed in Section 7.2 of this EA.</p>

Table 3 (continued)

SLEP 2014 Clause	Provisions	Comments
7.3 continued	<p>(b) other land at or below the flood planning level.</p> <p>(3) Development consent must not be granted to development on land to which this clause applies unless the consent authority is satisfied that the development:</p> <p>(a) is compatible with the flood hazard of the land, and</p> <p>(b) will not significantly adversely affect flood behaviour resulting in detrimental increases in the potential flood affectation of other development or properties, and</p> <p>(c) incorporates appropriate measures to manage risk to life from flood, and</p> <p>(d) will not significantly adversely affect the environment or cause avoidable erosion, siltation, destruction of riparian vegetation or a reduction in the stability of river banks or watercourses, and</p> <p>(e) is not likely to result in unsustainable social and economic costs to the community as a consequence of flooding, and</p> <p>(f) will not affect the safe occupation or evacuation of the land.</p> <p>(4) A word or expression used in this clause has the same meaning as it has in the Floodplain Development Manual (ISBN 0 7347 5476 0) published by the NSW Government in April 2005, unless it is otherwise defined in this clause.</p> <p>(5) In this clause:</p> <p>flood planning level means the level of a 1:100 ARI (average recurrent interval) flood event plus 0.5 metre freeboard.</p>	
7.4 Coastal Risk Planning	<p>(1) The objectives of this clause are as follows:</p> <p>(a) to avoid significant adverse impacts from coastal hazards,</p> <p>(b) to ensure uses of land identified as coastal risk are compatible with the risks presented by coastal hazards,</p> <p>(c) to enable the evacuation of land identified as coastal risk in an emergency,</p> <p>(d) to avoid development that increases the severity of coastal hazards.</p> <p>(2) This clause applies to the land identified as “Coastal Risk Planning Area” on the Coastal Risk Planning Map.</p>	<p>The Coastal Risk Planning Map that accompanies the SLEP 2014 does <u>not</u> identify the subject land as a “Coastal Risk Planning Area”.</p> <p>The provisions of this clause therefore do not apply to the subject site.</p>

Table 3 (continued)

SLEP 2014 Clause	Provisions	Comments
7.4 continued	<p>(3) <i>Development consent must not be granted to development on land to which this clause applies unless the consent authority is satisfied that the development:</i></p> <ul style="list-style-type: none"> (a) <i>will avoid, minimise or mitigate exposure to coastal processes, and</i> (b) <i>is not likely to cause detrimental increases in coastal risks to other development or properties, and</i> (c) <i>is not likely to alter coastal processes and the impacts of coastal hazards to the detriment of the environment, and</i> (d) <i>incorporates appropriate measures to manage risk to life from coastal risks, and</i> (e) <i>is likely to avoid or minimise adverse effects from the impact of coastal processes and the exposure to coastal hazards, and</i> (f) <i>provides for the relocation, modification or removal of the development to adapt to the impact of coastal processes and coastal hazards, and</i> (g) <i>has regard to the impacts of sea level rise.</i> <p>(4) <i>A word or expression used in this clause has the same meaning as it has in the NSW Coastal Planning Guideline: Adapting to Sea Level Rise (ISBN 978-1-74263-035-9) published by the NSW Government in August 2010, unless it is otherwise defined in this clause.</i></p> <p>(5) <i>In this clause:</i> coastal hazard <i>has the same meaning as in the Coastal Protection Act 1979.</i></p>	
7.5 Terrestrial Biodiversity	<p>(1) <i>The objective of this clause is to maintain terrestrial biodiversity, by:</i></p> <ul style="list-style-type: none"> (a) <i>protecting native flora and fauna,</i> (b) <i>protecting the ecological processes necessary for their continued existence, and</i> (c) <i>encouraging the recovery of native flora and fauna, and their habitats.</i> <p>(2) <i>This clause applies to land:</i></p> <ul style="list-style-type: none"> (a) <i>identified as “Biodiversity—habitat corridor” or “Biodiversity—significant vegetation” on the Terrestrial Biodiversity Map, and</i> 	<p>The <i>Terrestrial Biodiversity Map</i> that accompanies the SLEP 2014 does <u>not</u> identify the subject land as including areas of <i>Biodiversity - habitat corridor</i> and/or <i>Biodiversity - significant vegetation</i>.</p> <p>Given the industrialised nature of the site the proposal will not have any adverse impacts on the ecological value of the land.</p>

Table 3 (continued)

SLEP 2014 Clause	Provisions	Comments
7.5 continued	<p>(b) <i>situated within 40m of the bank (measured horizontally from the top of the bank) of a natural waterbody.</i></p> <p>(3) <i>Before determining a development application for development on land to which this clause applies, the consent authority must consider:</i></p> <p>(a) <i>whether the development is likely to have:</i></p> <p>(i) <i>any adverse impact on the condition, ecological value and significance of the fauna and flora on the land, and</i></p> <p>(ii) <i>any adverse impact on the importance of the vegetation on the land to the habitat and survival of native fauna, and</i></p> <p>(iii) <i>any potential to fragment, disturb or diminish the biodiversity structure, function and composition of the land, and</i></p> <p>(iv) <i>any adverse impact on the habitat elements providing connectivity on the land, and</i></p> <p>(b) <i>any appropriate measures proposed to avoid, minimise or mitigate the impacts of the development.</i></p> <p>(4) <i>Development consent must not be granted to development on land to which this clause applies unless the consent authority is satisfied that:</i></p> <p>(a) <i>the development is designed, sited and will be managed to avoid any significant adverse environmental impact, or</i></p> <p>(b) <i>if that impact cannot be reasonably avoided by adopting feasible alternatives—the development is designed, sited and will be managed to minimise that impact, or</i></p> <p>(c) <i>if that impact cannot be minimised—the development will be managed to mitigate that impact.</i></p> <p>(5) <i>For the purpose of this clause:</i> bank <i>means the limit of the bed of a natural waterbody.</i> bed, <i>of a natural waterbody, means the whole of the soil of the channel in which the waterbody flows, including the portion that is alternatively covered and left bare with an increase or diminution in the supply of water and that is adequate to contain the waterbody at its average or mean stage without reference to extraordinary freshets in the time of flood or to extreme droughts.</i></p>	There is no vegetation of importance located on the subject land.

Table 3 (continued)

SLEP 2014 Clause	Provisions	Comments
7.6 <i>Riparian land and watercourses</i>	<p>(1) <i>The objective of this clause is to protect and maintain the following:</i></p> <ul style="list-style-type: none"> (a) <i>water quality within watercourses,</i> (b) <i>the stability of the bed and banks of watercourses,</i> (c) <i>aquatic and riparian habitats,</i> (d) <i>ecological processes within watercourses and riparian areas.</i> <p>(2) <i>This clause applies to all of the following:</i></p> <ul style="list-style-type: none"> (a) <i>land identified as “Riparian Land” on the Riparian Lands and Watercourses Map,</i> (b) <i>land identified as “Watercourse Category 1”, “Watercourse Category 2” or “Watercourse Category 3” on that map,</i> (c) <i>all land that is within 50 metres of the top of the bank of each watercourse on land identified as “Watercourse Category 1”, “Watercourse Category 2” or “Watercourse Category 3” on that map.</i> <p>(3) <i>Before determining a development application for development on land to which this clause applies, the consent authority must consider:</i></p> <ul style="list-style-type: none"> (a) <i>whether or not the development is likely to have any adverse impact on the following:</i> <ul style="list-style-type: none"> (i) <i>the water quality and flows within the watercourse,</i> (ii) <i>aquatic and riparian species, habitats and ecosystems of the watercourse,</i> (iii) <i>the stability of the bed and banks of the watercourse,</i> (iv) <i>the free passage of fish and other aquatic organisms within or along the watercourse,</i> (v) <i>any future rehabilitation of the watercourse and its riparian areas, and</i> (b) <i>whether or not the development is likely to increase water extraction from the watercourse, and</i> (c) <i>any appropriate measures proposed to avoid, minimise or mitigate the impacts of the development.</i> 	<p>The <i>Riparian Lands and Watercourses Map</i> that accompanies the SLEP 2014 identify a category 2 watercourse, (Abernethy's Creek) located within the eastern part of the site and a category 1 watercourse (Shoalhaven River) located to the south of the site.</p> <p>This EA is supported by a Geotechnical Assessment carried out by Coffey Geotechnics (Annexure 10), which includes an assessment of the potential impacts of the development on riverbank stability of the adjacent watercourses (Abernethy's Creek and the Shoalhaven River).</p> <p>The EA for the earlier demolition of the existing Moorehouse building included an Erosion and Control Sediment Control plan which detailed how water quality of the adjacent watercourses will be protected during the demolition and construction phase.</p>

Table 3 (continued)

SLEP 2014 Clause	Provisions	Comments
7.6 continued	<p>(4) Development consent must not be granted to development on land to which this clause applies unless the consent authority is satisfied that:</p> <p>(a) the development is designed, sited and will be managed to avoid any significant adverse environmental impact, or</p> <p>(b) if that impact cannot be reasonably avoided—the development is designed, sited and will be managed to minimise that impact, or</p> <p>(c) if that impact cannot be minimised—the development will be managed to mitigate that impact.</p> <p>(5) For the purpose of this clause:</p> <p>bank means the limit of the bed of a watercourse.</p> <p>bed, of a watercourse, means the whole of the soil of the channel in which the watercourse flows, including the portion that is alternatively covered and left bare with an increase or diminution in the supply of water and that is adequate to contain the watercourse at its average or mean stage without reference to extraordinary freshets in the time of flood or to extreme droughts.</p>	
7.7 Landslide risk and other land degradation	<p>(1) The objective of this clause is to maintain soil resources and the diversity and stability of landscapes, including protecting land:</p> <p>(a) comprising steep slopes, and</p> <p>(b) susceptible to other forms of land degradation.</p> <p>(2) This clause applies to the following land:</p> <p>(a) land with a slope in excess of 20% (1:5), as measured from the contours of a 1:25,000 topographical map, and</p> <p>(b) land identified as “Sensitive Area” on the Natural Resource Sensitivity—Land Map.</p> <p>(3) Before determining a development application for development on land to which this clause applies, the consent authority must consider any potential adverse impact, either from, or as a result of, the development in relation to:</p> <p>(a) the geotechnical stability of the site, and</p> <p>(b) the probability of increased erosion or other land degradation processes.</p>	<p><i>Natural Resource Sensitivity - Land Mapping</i> supporting the SLEP 2014 identifies the subject site as a Sensitive Area.</p> <p>This EA is supported by a Geotechnical Assessment carried out by Coffey Geotechnics (Annexure 10).</p> <p>Geotechnical matters are further discussed in Sections 7.6 to 7.8 of this EA.</p>

Table 3 (continued)

SLEP 2014 Clause	Provisions	Comments
7.7 continued	<p>(4) Before granting consent to development on land to which this clause applies, the consent authority must be satisfied that:</p> <p>(a) the development is designed, sited and will be managed to avoid any significant adverse environmental impact, or</p> <p>(b) if that impact cannot be reasonably avoided—the development is designed, sited and will be managed to minimise that impact, or</p> <p>(c) if that impact cannot be minimised – the development will be managed to mitigate that impact.</p> <p>(5) In this clause, topographical map means the most current edition of a topographical map, produced by Land and Property Information, a division of the Department of Finance and Services, that identifies the Council's local government area and boundary.</p>	
7.8 Scenic protection	<p>(1) The objective of this clause is to protect the natural environmental and scenic amenity of land that is of high scenic value.</p> <p>(2) This clause applies to land identified as "Scenic Protection" on the Scenic Protection Area Map.</p> <p>(3) In deciding whether to grant development consent for development on land to which this clause applies, the consent authority must:</p> <p>(a) consider the visual impact of the development when viewed from a public place and be satisfied that the development will involve the taking of measures that will minimise any detrimental visual impact, and</p> <p>(b) consider the number, type and location of existing trees and shrubs that are to be retained and the extent of landscaping to be carried out on the site, and</p> <p>(c) consider the siting of the proposed buildings.</p>	<p>The subject land is <u>not</u> identified as being within a "Scenic Protection" area by Scenic Protection Area Mapping that accompanies the SLEP 2014.</p> <p>The provisions of this clause therefore do not apply to the subject site.</p> <p>However, the development site is adjacent to the northern bank of the Shoalhaven River which is identified as being within a Scenic Protection area. The visual impact associated with this proposal is discussed in Section 7.9 of this EA.</p>
7.15 Development in the vicinity of extractive industries and sewerage treatment plants	<p>(1) The objective of this clause is to protect the operational environment of certain industries operating on the land to which this clause applies.</p> <p>(2) This clause applies to land identified as "Extractive Industry" and "Sewage Treatment Plant" on the Buffers Map.</p>	<p>The Buffers Map that accompanies the SLEP 2014 identifies that the subject land is located within the vicinity of a sewerage treatment plant.</p>

Table 3 (continued)

SLEP 2014 Clause	Provisions	Comments
7.15 continued	<p>(3) <i>Development consent must not be granted to the carrying out of development on land to which this clause applies unless the consent authority has:</i></p> <p>(a) <i>made an assessment of the impact of noise, odour and other emissions from any industry carried out on that land, and</i></p> <p>(b) <i>considered the potential impact of noise, odour and other emissions associated with that industry on any activities that will be associated with the development, and</i></p> <p>(c) <i>considered any opportunities to relocate the development outside that land, and</i></p> <p>(d) <i>has considered whether the development would adversely affect the operational environment of that industry.</i></p>	<p>The EA is supported by an Air Quality Assessment undertaken by Stephenson Environmental Management Australia (Annexure 5) and a Noise Assessment undertaken by Day Design Pty Ltd (Annexure 6).</p> <p>Air quality and noise issues are further discussed in Sections 7.1 and 7.3 of this EA respectively.</p>

3.8 PROTECTION OF THE ENVIRONMENT OPERATIONS ACT

The existing Shoalhaven Starches factory site and Environmental Farm has an Environmental Protection Licence (EPL) under the Protection of the Environment Operations Act 1997 (POEO Act) (EPL No. 883). The licence imposes requirements in terms of:

- discharges to air, water and land;
- irrigation controls;
- management of irrigation;
- maintenance of irrigation reticulation;
- odour control.

Following consultation with the Department of Planning and Environment in relation to this modification proposal, the Environmental Assessment is required to include detailed air quality, odour and noise assessments in accordance with relevant EPA guidelines. The assessments should provide a comparative analysis against the improved impacts of the Project Approval. Air quality and odour are discussed in Section 7.1 of this EA and noise is discussed in Section 7.3.

No additional environmental monitoring beyond that required for the Project Approval is understood to be required by the EPA in association with this modification proposal.

4.0 THE MODIFICATION PROPOSAL

4.1 INTRODUCTION

The modification proposal will seek approval for the relocation of approved but not yet constructed Starch Dryer No. 5 to an alternative location within the existing Shoalhaven Starches factory site within Lot 201 DP 1062668, 24 Bolong Road, Bomaderry.

4.2 PROJECT DESCRIPTION

The Starch Plant

Flour is pneumatically conveyed from storage bins to the starch plant, where the flour is mixed with water and separated into two components:

- (i) Gluten, which has a high protein content (about 75%) is sold to local and export markets.
- (ii) Starch, which is processed and then directed to:
 - (a) dry starch markets, both local and export;
 - (b) domestic liquid starch markets;
 - (c) the glucose plant which processes the starch further to produce glucose and other products;
 - (d) the ethanol plant, where the starch is converted to sugars, which are fermented and distilled to produce ethanol.

The SSEP Approval enabled an increase in the amount of flour transferred to the site for processing to 15,000 tonnes per week, in addition to the 5000 tonnes per week of flour to be produced on-site by the Company's previously approved flour mill.

As a result of the increased amount of flour arriving at the site an additional dryer and grinder have been approved (as part of the SSEP Approval) and installed. This dryer and grinder have similar throughput and operating parameters as the existing dryers. In addition, proposed Dryer No. 5 (approved under the previous PRP No. 7 approval) is also required to be constructed, and it is this dryer which is the subject of this modification proposal.

4.3 SECTION 75W OF THE EP&A ACT

Section 75W of the EP&A Act relates to modifications to Project Approvals issued by the Minister for Planning under the previous Part 3A of the EP&A Act ("Major Projects" provisions) and states:

75W Modification of Minister's approval

(1) *In this section:*

Minister's approval means an approval to carry out a project under this Part, and includes an approval of a concept plan.

modification of approval means changing the terms of a Minister's approval, including:

- (a) *revoking or varying a condition of the approval or imposing an additional condition of the approval, and*
 - (b) *changing the terms of any determination made by the Minister under Division 3 in connection with the approval.*
- (2) *The proponent may request the Minister to modify the Minister's approval for a project. The Minister's approval for a modification is not required if the project as modified will be consistent with the existing approval under this Part.*
- (3) *The request for the Minister's approval is to be lodged with the Director-General. The Director-General may notify the proponent of environmental assessment requirements with respect to the proposed modification that the proponent must comply with before the matter will be considered by the Minister.*
- (4) *The Minister may modify the approval (with or without conditions) or disapprove of the modification.*
- (5) *The proponent of a project to which section 75K applies who is dissatisfied with the determination of a request under this section with respect to the project (or with the failure of the Minister to determine the request within 40 days after it is made) may, within the time prescribed by the regulations, appeal to the Court. The Court may determine any such appeal.*
- (6) *Subsection (5) does not apply to a request to modify:*
- (a) *an approval granted by or as directed by the Court on appeal, or*
 - (b) *a determination made by the Minister under Division 3 in connection with the approval of a concept plan.*
- (7) *This section does not limit the circumstances in which the Minister may modify a determination made by the Minister under Division 3 in connection with the approval of a concept plan.*

This modification application is made pursuant to Section 75W of the EPA Act.

In this regard the Department of Planning & Environment issued formal requirements for the preparation of this Environmental Assessment for this Modification Application (**Annexure 2**). This Environmental Assessment has been prepared in accordance with those requirements.

4.4 PROPOSED MODIFICATION

4.4.1 Relocation of Starch Dryer No. 5

Following further detailed engineering design it has become apparent that the area originally set aside for Starch Dryer No. 5 under the PRP No. 7 Approval provided insufficient area for the footprint of this proposed dryer. Under the PRP 7 approval an area comprising of 255 m² was set aside for the Starch Dryer No. 5 building.

The revised Starch Dryer building however will require a footprint of 3000 m². Clearly the approved location for the Starch Dryer is insufficient to meet the needs for this building. Furthermore, given the somewhat congested nature of this part of the Shoalhaven Starches factory site there is now insufficient room to locate the Starch Dryer building within this part of the site.

As a result an alternative location for the Starch Dryer was required to be identified.

Under this Modification Application it is proposed to relocate the approved but not yet constructed Starch Dryer No. 5 from the existing Shoalhaven Starches factory site to land on the western side of Abernethy's Creek, otherwise known as the "Moorehouse" site. This land comprises Lot 201 DP 1062668, 24 Bolong Road.

The "Moorehouse" site provides sufficient area for the footprint of the proposal, and is situated within close proximity to the factory and the existing and proposed packing plants.

To enable the Starch Dryer building to be constructed in this part of this site, an existing industrial building will need to be demolished. A separate Modification Application has been submitted seeking approval for these demolition works to facilitate the streamlining of construction of the proposed Starches Dryer building.

At present the area situated between the buildings on the "Moorehouse" site and Bolong Road is used for staff parking. During the construction phase for the relocation of the proposed Starch Dryer, it will be necessary to use part of this staff parking area for the storage of construction materials and plant. During the construction phase it will therefore be necessary to relocate part of this staff parking on a temporary basis. It is proposed to temporarily relocate this staff parking onto the Company's land on the northern side of Bolong Road.

The proposed Starch Dryer will be located in an area that is currently occupied by a warehouse building. This building will be demolished and removed prior to construction.

The proposed Starch Dryer building will have dimensions of 50 metres by 60 metres, comprising a site area of 3,000 m² and a height above ground level of 28 metres. There will also be intrusions above the building, the highest of which will be a dryer stack with a height of 33.46 m and the dryer ducting that will have a height of 36 m above ground level. The proposed Starch Dryer building will be constructed of Colorbond metal cladding (colour “Jasper”).

The modified proposal will not result in any increase in production from the site over that which has been the subject of past approvals. The proposal will not involve any change in the amount of raw products that will be utilised; nor will it involve any changes in the amount of waste waters that will need to be treated and disposed.

Process Description

A water and starch mixture will be pumped from the existing Starch Plant to the new Starch Dryer. This is a low pressure transfer (as is the rest of the process) and the mixture is approximately 30 to 40°C.

The liquid starch can be stored in an atmospheric holding tank (approximately 50 m³) or pumped direct to the centrifuges feed tanks. If held in the holding tank, the liquid starch will be subsequently pumped to the centrifuges feed tanks in accordance with production demands.

From the centrifuges feed tanks, the liquid starch is pumped to the centrifuges. These are driven by approximately 200 kW motors. Centrate flows by gravity from the centrifuges to the effluent tank which is then recycled back to the existing plant. Any overflows or spills from the starch holding tank or the centrifuges feed tanks also flow into the effluent tank.

The wet starch from the centrifuges (approximately 40% solids) passes through an agitated feed vessel to ensure it is homogeneous. It is then combined with dry starch in a paddle mixer and conveyed to a disintegrator or hammer mill where the starch particle size is reduced. At this point, the stream is approximately 65% starch.

The starch is then fed into the dryer which is a vertical pipe with co-current hot air flow to provide the drying. The air is drawn through fabric filters to remove foreign objects, heated by steam and then a gas fired burner to approximately 185°C.

After passing through a hot air box, the air and starch combine and flow up through a pipe. The moisture in the starch is evaporated and this stream enters the primary cyclones where approximately 30% of the product starch is removed. This portion of the

product starch is conveyed via screw conveyors to the product cooler (atmospheric air is used for cooling) and then the cooler cyclones.

The air stream from the primary cyclones, still containing starch, flows to the secondary cyclones for further product starch collection. Again, the product starch from these cyclones is conveyed via screw conveyors to the product cooler and then the cooler cyclones.

The combined air stream from the secondary cyclones passes through the induced draught variable speed fan and is discharged via a tall stack. A silencer on the discharge of the air fan will limit the noise emitted from the stack. The product cooler air stream is also vented direct to atmosphere.

The starch from the cooler cyclones passes through a screw conveyor and a metal trap (to remove tramp metal and hence the risk of ignition) before entering the buffer hopper for the final sifting phase. There are three sifters in parallel which sift the final product to a size of 180 micron. The over-sized product is then conveyed to a small hopper prior to being processed through a grinder. This stream then returns to the buffer hopper to be re-sifted.

The final product will then be transferred to the proposed Packing Plant on the northern side of Bolong Road approved under the SEPP (and which the Department is aware will be subject of a separate modification application in the future).

Air emissions from the drying process will be ducted to and passed through fabric filters (located in a baghouse) to reduce particulate matter emissions before being discharged vertically to air via a stack approximately 36 m above ground level (approximately 8 m above the height of the proposed building).

Ductwork will be designed with consideration to the good practice ductwork design and maintenance outlined in the Audit Report; in particular, measures to minimise contamination in the ductwork in order to reduce the potential for the generation of malodorous emissions.

Figure 4 is a process flow diagram detailing the above processes.

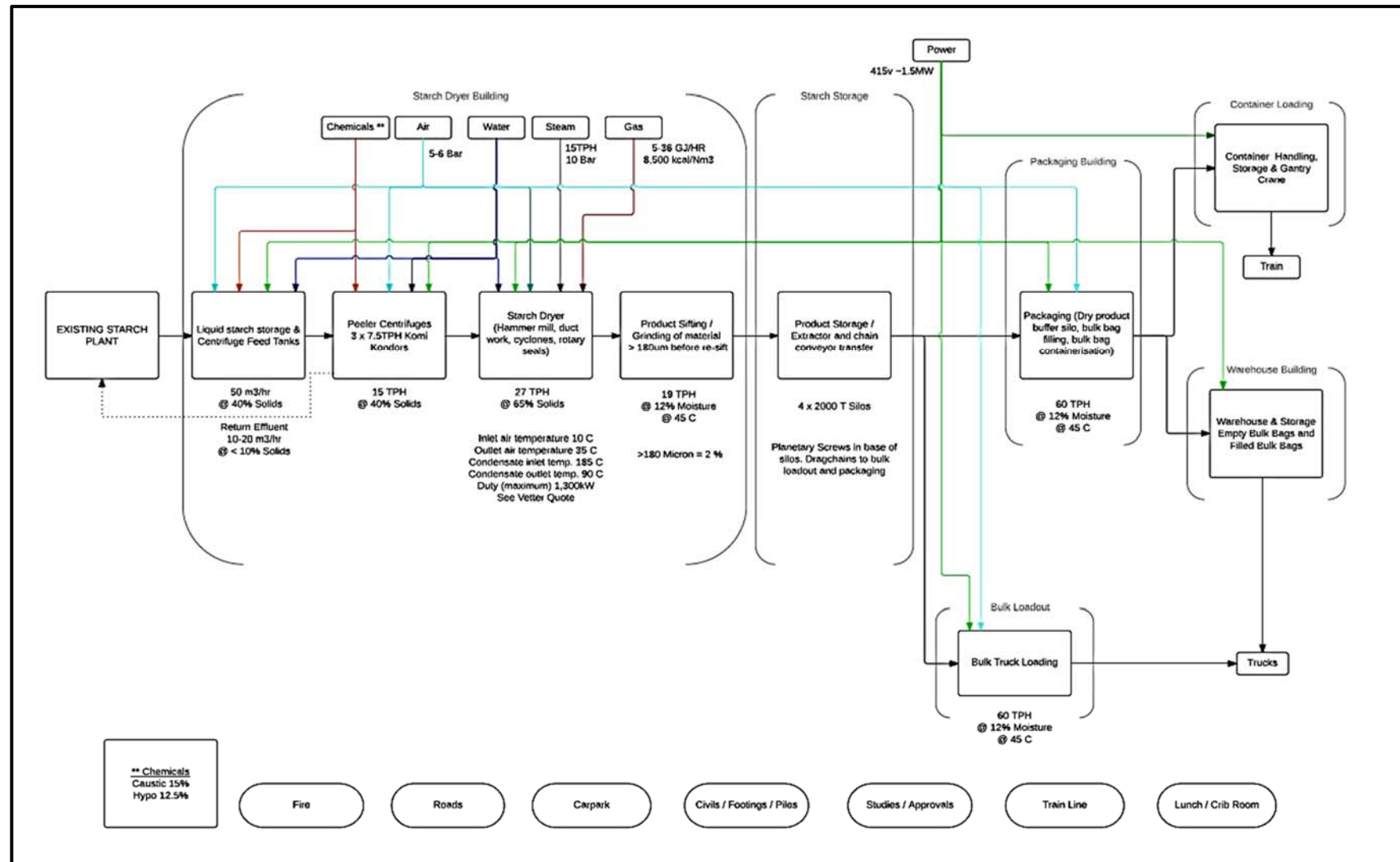


Figure 4: Process Flow Diagram

Construction Works

Two stages of construction works are proposed as part of this Modification proposal:

- Stage 1 external construction works (including pouring concrete slabs and erection of the building): and
- Stage 2 internal construction works (including fit-out of the building and installation of the Starch Dryer plant within the building).

During the Stage 1 external construction works, part of the area within the Moorehouse site that is currently used for staff parking will be required for construction activities. As a result, 30 of the 118 existing parking spaces will be required to be temporarily relocated to the Packing Plant Site on the northern side of Bolong Road. Following the completion of the Stage 1 construction works, Stage 2 (internal) construction works would allow for the reinstatement of these parking spaces at the Moorehouse Site.

5.0 CONSULTATION

During the preparation of this EA consultation has been undertaken with the following:

- Department of Planning and Environment;
- Department of Primary Industries – Water (DPI - Water); and
- Environment Protection Authority (EPA). (Meeting dated 6th November 2014.)

The Department of Planning & Environment have provided requirements for the preparation of this EA in emails dated 8th September 2015, 17th December 2014 and 19th November 2014. It is noted that the Department also consulted both the EPA and the DPI (Water) in framing these requirements. A copy of these requirements forms **Annexure 2** to this EA. This EA has been prepared in accordance with those requirements.

Following consultation with the DPI – Water, they have requested that the EA consider potential impacts of the modification proposal on Abernethy's Creek (also included in **Annexure 2**). This EA is supported by a Geotechnical Assessment carried out by Coffey Geotechnics (**Annexure 10**), which includes an assessment of potential impacts on Abernethy's Creek. Issues relating to Abernethy's Creek are discussed in Section 7.8 of this EA. Erosion and Sedimentation Control Measures were dealt with separately as part of the earlier modification application that related to the demolition of the existing building that was situated on this site.

6.0 RISK ASSESSMENT OF POTENTIAL ENVIRONMENTAL IMPACTS

The purpose of this section of the EA is to provide a risk assessment of the potential environmental impacts associated with this modification proposal compared to the proposal as originally approved. This section (**Table 4**) considers the potential impacts from the proposed modification and compares them against the approved project in order to determine if further assessment is required. The risk assessment uses the key environmental impacts assessed in the EA and summarises the potential issues associated with the proposed modification application and the relative change in environmental impacts associated with the proposed modification compared to the proposal as originally approved.

Table 4
Risk Assessment

<i>Issue</i>	<i>Relative Change in Environmental Impact</i>	<i>Additional Management or Mitigation Measures Required</i>	<i>Significance of Issue with this Modification Proposal</i>
Air Quality (including Odour) Assessment	<p>The Project Approval imposes a raft of measures that seek to prevent (or where this is not possible mitigate) the emission of offensive odours from the Company's activities. The Project Approval imposed requirements stipulating that the ethanol upgrade could not proceed without the recommendations of an air quality and odour audit being implemented. At this point in time the measures outlined to control odours have been implemented and approval has been issued to enable full ethanol production from the site.</p> <p>In addition to odour control management the existing plant has several other air emission sources. The existing operation has the following emission control equipment to minimise emissions to the atmosphere:</p> <ul style="list-style-type: none"> • Approximately 60 baghouses that capture particulate matter. • Wet scrubbers and condensers form part of the equipment to control the gas stream prior to the DDGS dryers bleed air passing through to the boiler for destruction. • In addition other DDG air streams are collected and treated in biofilters. • A carbon dioxide (CO₂) collection plant. This plant takes part of the CO₂ generated from fermenters and compresses the gas for sale, (eg. aerated "soft drinks"). This reduces the greenhouse gas emissions to the atmosphere. The plant is owned and operated by BOC Gases. <p>An assessment of the maximum ground level concentration (GLC) of odour and total suspended particles (TSP) from the proposed modified location of the starch plant is required to ensure it remains within Air Quality Standards. The assessments will provide a comparative analysis of the modification proposal against the Project Approval.</p>	<p>The EA is supported by an Air Quality Impact Assessment (AQIA) prepared by Stephenson Environmental Management (SEMA). A copy of this AQIA forms Annexure 5 to this EA. The AQIA predicts that emission of odours and particulate matter from the relocated Starch Dryer will not exceed regulatory assessment criteria in terms of both odours and particulate matter.</p>	<p>Key issue – addressed further in Section 7.1 of this EA.</p>

Table 4 (continued)

Issue	Relative Change in Environmental Impact	Additional Management or Mitigation Measures Required	Significance of Issue with this Modification Proposal
Greenhouse Gas Emissions	The proposed modification to the location of the starch dryer will have no impact in terms of greenhouse gas emissions emitted from the site. No change in environmental impacts from that originally identified in EA.	No additional management or mitigation measures proposed.	Not a key issue.
Wastewater Treatment	The proposed modification to the location of the starch dryer will not result in any change to the amount of wastewater generated from the site nor that will require treatment. No change in environmental impacts from that originally identified in EA.	No additional management or mitigation measures proposed.	Not a key issue.
Effluent Irrigation and Storage	The proposed modification to the location of the starch dryer will not result in any change to the amount of wastewater generated from the site and that will require to be irrigated onto the Company's Environmental Farm. No change in environmental impacts from that originally identified in EA.	No additional management or mitigation measures proposed.	Not a key issue.
Water & Soils	The proposed modification to the location of the starch dryer will require assessment of: <ul style="list-style-type: none"> • Acid sulphate soils; and • Site contamination. All of the subject site is identified as potentially containing acid sulphate soils. An investigation will need to be undertaken to determine the existence or otherwise of acid sulphate soils and the need for an Acid Sulphate Soils Management Plan for the construction stage of the project. Given the provisions of the <i>State Environmental Planning Policy No. 55 – Remediation of Land</i> it is proposed that a Phase 1 Site Contamination Assessment be undertaken for the development site. The proposed modification to the location of the Starch Dryer will have <u>no</u> additional environmental impact in terms of water supply and stormwater management.	The EA is supported by an Environmental Investigation Report carried out by Coffey Geosciences ("Coffey's") that examines the presence of acid sulphate soils and potential site contaminations within the subject site. A copy of this assessment forms Annexure 9 to this EA. In summary this assessment makes the following findings: <u>Site Contamination</u> "Based on the results of the site history and previous report, the main potential for site contamination was assessed to be associated with former workshop	Key issue – addressed further in Section 7.6 and 7.7 of this EA.

Table 4 (continued)

Issue	Relative Change in Environmental Impact	Additional Management or Mitigation Measures Required	Significance of Issue with this Modification Proposal
<i>Water & Soils (continued)</i>		<p><i>activities (mainly associated with mechanical maintenance and probable storage and use of oils, greases and degreasers).</i></p> <p><i>Intrusive assessment had difficulty penetrating into the subsurface with hand tools at most locations due to coarse/dense fill. However, due to the inferred top down mechanism of potential contamination, contamination (if present) would be expected to be found under the paved areas.</i></p> <p><i>Targeted sampling was carried out and no exceedances of the adopted criteria were recorded.</i></p> <p><i>Some petroleum hydrocarbons were detected by the laboratory, but not at concentrations that would be unsuitable for ongoing industrial land use.</i></p> <p><i>Previous testing in 2003 near a former underground storage tank which was decommissioned more than 20 years prior did not record evidence to suggest widespread contamination. Should earthworks require encroachment to the tank, then the tank should be removed and the area validated. As the</i></p>	

Table 4 (continued)

Issue	Relative Change in Environmental Impact	Additional Management or Mitigation Measures Required	Significance of Issue with this Modification Proposal
<i>Water & Soils (continued)</i>		<p><i>information on tank decommissioning was only anecdotal, appropriate care should be taken with any works near the tank and should follow relevant Australian Standards and codes of practice.</i></p> <p><i>Due to the history of workshop activities at the site and shallow investigations, an unexpected finds protocol should be adopted for civil works if significant soil disturbance is proposed. This will allow management of suspicious material if any is uncovered.</i></p> <p><i>We recommend that the pre-demolition hazardous materials survey be carried out of the building before demolition and that any subsequent demolition work is carried out appropriately and in accordance with relevant codes of practice to avoid the potential of cross contamination of hazardous materials (e.g. asbestos).</i></p> <p><i>Where cut to fill balances suggest a net soil excess or if there are geotechnically unsuitable soils, careful soil management is strongly recommended during civil work so that disposal costs</i></p>	

Table 4 (continued)

Issue	Relative Change in Environmental Impact	Additional Management or Mitigation Measures Required	Significance of Issue with this Modification Proposal
<i>Water & Soils (continued)</i>		<p><i>can be minimised. For example separation of like fill materials and segregation of fill from natural soils.”</i></p> <p><u><i>Acid Sulphate Soils</i></u></p> <p><i>“Acid sulphate soils could be encountered within alluvial soils underlying the fill materials. An acid sulphate soil management plan is recommended to manage these soils if construction activities require disturbance of these soils or any prolonged dewatering that could lower the groundwater table.”</i></p>	
Noise	<p>Shoalhaven Starches operates under Environment Protection Licence 883 issued by the NSW Environment Protection Authority (EPA).</p> <p>Section L5 ‘Noise Limits’ of the licence states:-</p> <p><i>“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:</i></p> <ul style="list-style-type: none"> <i>a) 38 dBA at locations in Terara on the south side of the Shoalhaven River;</i> <i>b) 38 dBA at locations in Nowra on the south side of the Shoalhaven River;</i> <i>c) 42 dBA at locations in Meroo Street, Bomaderry;</i> <i>d) 40 dBA at other locations in Bomaderry.”</i> <p>These noise limits apply to the overall operation of the Shoalhaven Starches complex.</p> 	<p>The EA is supported by a Noise Impact Assessment (NIA) prepared by Day Design Pty Ltd. A copy of this NIA forms Annexure 6 to this EA. This assessment finds that noise emission from the operation of the proposed Starch Dryer will meet noise design guidelines derived from the sites Environmental protection Licence, subject to the Dryer building being constructed in accordance with detailed recommendations outlined in this assessment.</p>	<p>Key issue – addressed further in Section 7.3 of this EA.</p>

Table 4 (continued)

Issue	Relative Change in Environmental Impact	Additional Management or Mitigation Measures Required	Significance of Issue with this Modification Proposal
<p>Noise (continued)</p>	<p>The Project Approval required the preparation of a Noise Management Plan for addressing and managing noise emission from the expansion project.</p> <p>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:-</p> <p><i>“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.”</i></p> <p>An Environmental Noise Impact Assessment for the proposed relocation of the Starch Dryer is required and will need to demonstrate how the proposed modified development will be able to satisfy the above noise goals.</p> <p>In addition it will be necessary to demonstrate that the level of noise emission from the construction phase will be within noise management levels set by the NSW EPA's Interim Construction Noise Guideline at all receptor locations for the majority of the construction phase.</p>		
<p>Transport & Traffic</p>	<p>Shoalhaven Starches have and are undertaking 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.</p>	<p>The EA is supported by a Traffic Impact Assessment (TIA) carried out by ARC Traffic and Transport (“ARC”). A copy of this TIA forms Annexure 7 to this EA. This assessment concludes that the proposal would not</p>	<p>Key issue – addressed further in Section 7.4 of this EA.</p>

Table 4 (continued)

Issue	Relative Change in Environmental Impact	Additional Management or Mitigation Measures Required	Significance of Issue with this Modification Proposal
<i>Traffic & Transport (continued)</i>	<p>A Traffic Impact Assessment is required to assess the likely traffic to be generated by the proposal, including heavy vehicle and construction traffic movements, and 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.</p> <p>Any additional staff demands may generate additional parking demands above that which occurs and which has been approved on the site. The Traffic Impact Assessment will therefore also need to address the adequacy of parking requirements for the overall factory complex to accommodate the overall need for the site.</p>	<p>have any significant impacts of local traffic. The assessment makes recommendations in terms of the relocation of the temporary construction car park; and the design and layout of this temporary construction car park.</p>	
Hazards	<p>The Shoalhaven Starches factory site and its operations comprise a “<i>potentially hazardous industry</i>” and “<i>potentially offensive industry</i>” under the provisions of <i>State Environmental Planning Policy No. 33. – Hazardous and Offensive Development</i>. Under the provisions of clause 12 of this SEPP any proposal involving a potential hazardous industry must be supported by Preliminary Hazard Analysis (PHA) prepared in accordance with relevant Circulars and</p>	<p>The EA is supported by a Preliminary Hazard Analysis (PHA) undertaken by Pinnacle Risk Pty Ltd. A copy of this PHA forms Annexure 8 to this EA. The PHA concludes and recommends:</p> <p><i>“The risks associated with the proposed new starch dryer at the Shoalhaven Starches Bomaderry site have been assessed and compared against the DoPE risk criteria.</i></p> <p><i>In summary:</i></p> <ul style="list-style-type: none"> ➤ <i>The potential hazardous events associated with the new equipment are primarily dust explosions. Given the location of the new equipment then no significant adverse off-site impacts to residential areas or similar are expected.</i> 	<p>Key issue – addressed further in Section 7.5 of this EA.</p>

Table 4 (continued)

<i>Issue</i>	<i>Relative Change in Environmental Impact</i>	<i>Additional Management or Mitigation Measures Required</i>	<i>Significance of Issue with this Modification Proposal</i>
<i>Hazards (continued)</i>	Guidelines published by the Department. A PHA for the proposed Modification Application has therefore been undertaken.	<ul style="list-style-type: none"> ➤ Correspondingly, all risk criteria in HIPAP 4 are expected to be satisfied for this proposal; ➤ The risk of propagation to neighbouring equipment is low given the proposed facility location; and ➤ Societal risk, environmental risk and transport risk are all considered to be broadly acceptable. <p>The following recommendations are made from this review:</p> <ol style="list-style-type: none"> 1. The existing safety management systems, e.g. maintenance procedures, operating procedures, training and emergency response plans, will need to be updated to reflect the proposed changes; and 2. All explosion vents should be positioned to avoid impact to personnel and sensitive equipment.” 	
River bank stability and riparian management	Abernethy’s Creek is located within the eastern part of the subject land. As such, the EA for the modification proposal should consider potential impacts upon this watercourse. Consultation with the DPI-Water (see Section 5.0 of this EA), confirmed that the above issue should be address in the EA.	The EA is supported by a geotechnical assessment of the impact of the proposed development will have on the banks of both the Shoalhaven River and Abernethy’s Creek. A copy of this assessment forms Annexure 10 to this EA. This assessment finds that the	Key issue - addressed further in Section 7.8 of this EA.

Table 4 (continued)

Issue	Relative Change in Environmental Impact	Additional Management or Mitigation Measures Required	Significance of Issue with this Modification Proposal
<i>River bank stability and riparian management (continued)</i>		<p>proposed building will not adversely affect the stability of the banks of either Abernethy's Creek or the Shoalhaven River. This report makes the following recommendations:</p> <ul style="list-style-type: none"> • <i>Provision of dedicated drainage paths (pipes and or open lined channels) with regularly spaced outlets to the western bank of the creek and suitable erosion protection at the discharge points;</i> • <i>Any excavations deeper than 600mm required for drainage or service installations between the dryer building and the western bank of Abernathy's Creek should be reviewed by Coffey, including shoring support and backfill requirements;</i> • <i>During and following the construction, regularly monitoring the creek banks should be carried out by observation following significant rainfall events. Should any signs of instability or obvious erosion become evident, geotechnical advice should be sought; and the area between the dryer building</i> 	

Table 4 (continued)

Issue	Relative Change in Environmental Impact	Additional Management or Mitigation Measures Required	Significance of Issue with this Modification Proposal
<i>Riparian (continued)</i>		<i>and the western creek bank should not be accessed by heavy vehicles or used for storage of heavy containers or equipment.</i>	
Flooding	The land associated with this Modification Proposal is identified by Shoalhaven City Council's Floodplain Management Study and Plan to be partly <i>High Hazard Floodway and Flood Storage</i> . The works associated with this Modification Proposal are to be sited largely within that area identified a <i>High Hazard Flood Storage</i> . A detailed Flood Assessment is required that addresses the potential impacts that the modification proposal will have on flood waters within the locality, and to examine measures that are proposed to mitigate such impacts.	The EA is supported by a Flood Impact Assessment carried out by WMA Water (refer Annexure 4).	Key issue – addressed further in Section 7.2 of this EA.
Waste Management	The proposed modification to the location of the Starch Dryer will not alter the level of waste that is required to be managed on site. The Waste Management Assessment carried out by Stephenson Environmental Management Australia (SEMA) did not identify the Starch Dryer as a significant contributor to the waste generation, nor did it specify any specific requirements for this component of the Expansion Project. The proposed modification to the location of the Starch Dryer will not alter the way waste is managed on the site. No change in environmental impacts from that originally identified in EA.	No additional management or mitigation measures proposed.	Not a key issue.
Visual Impact	The proposed Starch Dryer building will have a maximum height above ground level of 36 metres. There will also be intrusions above the building, the highest of which will be the dryer ducting that will have a height of 36 m above ground level. The proposal is therefore likely to be visible within the broader landscape. This must however be seen in context of the scale and size of other plant on the site, including the adjacent Interim Packing Plant which has a height of 34 m; the recently constructed Starch Dryer adjacent to the Bolong Road frontage of the site which has a height of m; and the boiler house stack which has a height above ground level of 53.7 metres.	No additional management or mitigation measures proposed	Key issue – addressed further in Section 7.9 of this EA.

Table 4 (continued)

<i>Issue</i>	<i>Relative Change in Environmental Impact</i>	<i>Additional Management or Mitigation Measures Required</i>	<i>Significance of Issue with this Modification Proposal</i>
Flora and Fauna	The proposed location of the Starch Dryer is devoid of vegetation. The original Flora and Fauna Assessment carried out by Kevin Mills & Associates for the SSEP did not identify any specific ecological constraints with this part of the site. The proposed modification to the location of the Starch Dryer will not require any additional vegetation to be disturbed. No change in environmental impacts from that originally identified in EA.	No additional management or mitigation measures proposed	Not a key issue.
Heritage and Archaeological Issues	The proposed Starch Dryer will be located within the factory site, which was not previously identified by the EA for the SSEP as an area subject to either Aboriginal or European cultural heritage significance. The original Aboriginal Archaeological Assessment that supported the EA prepared by South East Archaeology did not identify any constraints with respect to this part of the site or this project. The proposed modification to the location of the Starch Dryer will have no additional impact in terms of indigenous or non-indigenous heritage. No change in environmental impacts from that originally identified in EA.	No additional management or mitigation measures proposed	Not a key issue.

Following the above risk assessment of the potential environmental impacts of the proposed modification the key issues for assessment are:

- Preliminary hazard analysis;
- Noise impacts;
- Air quality (and including odour) impacts;
- Flooding;
- Visual impact;
- Traffic;
- Site contamination;
- Acid Sulphate Soils; and
- Riverbank stability.

7.0 KEY ISSUES

7.1 AIR QUALITY (AND ODOUR IMPACTS)

The Environmental Assessment Requirements as issued by the NSW Department of Planning & Environment (DoPE) for this project required:

“A detailed air quality, odour and noise assessments in accordance with relevant EPA guidelines. For the relocation of approved infrastructure, the assessments need to provide a comparative analysis against the approved impacts of the ethanol expansion project.”

This Modification Application is supported by an Air Quality Impact Assessment (AQIA) prepared by Stephenson Environmental Management Australia (SEMA). A copy of SEMA’s AQIA forms **Annexure 6** to this EA. This AQIA has been prepared in response to the DoPE’s requirements for this Environmental Assessment.

This section of the EA is based upon the findings of this assessment.

7.1.1 Impact Assessment Criteria

Odour Impact Assessment Criteria

The *Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales* (AMMAAP) provides a Ground Level Concentration (GLC) impact assessment criterion for a number of potential air emissions. This method 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 5**. The predicted odour impact due to the pollutant source according to SEMA must be reported in units consistent with the IAC as peak concentrations (ie. approximately 1 second average).

The odour criterion that has been selected for use in the AQIA by SEMA, to determine the maximum odour GLC concentration from the dryer, is the 2.0 odour units (ou) criterion for the 100th percentile of predicted odour concentrations, which indicates that

100 percent of all odour predictions would fall below this concentration. This criterion has been chosen by SEMA 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 expected to be in excess of 2000 people.

Table 5
Impact Assessment Criteria for Complex Odorous Air Pollutants

<i>Population of affected community</i>	<i>Impact Assessment Criteria (ou)</i>
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
 ~ = approximately
 <= = less than or equal to

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, according to SEMA, Gaussian dispersion models, need to be 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 6** 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. According to SEMA 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 dryer 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 6
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

Source: Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales

Particle Impact Assessment Criteria

The AMMAAP criterion for Total Suspended Particulate Matter is outlined in **Table 7**.

Table 7
Impact Assessment Criteria for Total Suspended Particulate Matter

Pollutant	Averaging Period	Impact Assessment Criteria ($\mu\text{g}/\text{m}^3$)	Source
TSP	Annual	90	NHMRC (1996)

Key: TSP = Total suspended particulate matter
 $\mu\text{g}/\text{m}^3$ = micrograms per cubic metre
 NHMRC = National Health and Medical Research Council

7.1.2 Dispersion Modelling Input Data

AERMOD is a recommended Gaussian dispersion modelling system as it accurately estimates Ground Level Concentrations (GLCs) of source emissions. AERMOD requires the following input data – meteorological, buildings and structures on site, surrounding terrain data, discrete receptors and emissions and source information. These are all detailed in this section.

Terrain Data

A domain of 10km by 10km surrounding the Shoalhaven Starches site was incorporated into the AQIA carried out by SEMA, which included terrain elevations. The terrain surrounding the Shoalhaven Starches site ranges from flat 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.

Meteorological Data

The area considered in AQIA dispersion modelling experiences typical coastal weather in addition to locally influenced patterns according to SEMA. 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. The meteorological (MET) file was 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. **Figure 5** presents the wind distribution for this 12 month period, used for this assessment. The arms in the figure represent the direction from which the wind is blowing. **Figure 5** shows westerlies and north-westerlies being most predominant for the 12 month period.

Building Data

According to SEMA 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. The buildings incorporated into the modelling assessment are presented in **Figure 6**. The buildings which will have an impact on plume dispersion include the proposed dryer building, the factory building directly east of Abernethy's Creek, including the silo on top of it, the maintenance building, the DDG building, the starch building, the boiler house and the packaging building directly west of Abernethy's Creek. For completeness, other buildings on the Shoalhaven Starches site which have been incorporated into the building profile include the flour mill, the flour unloader building, grain silos and the glucose plant.

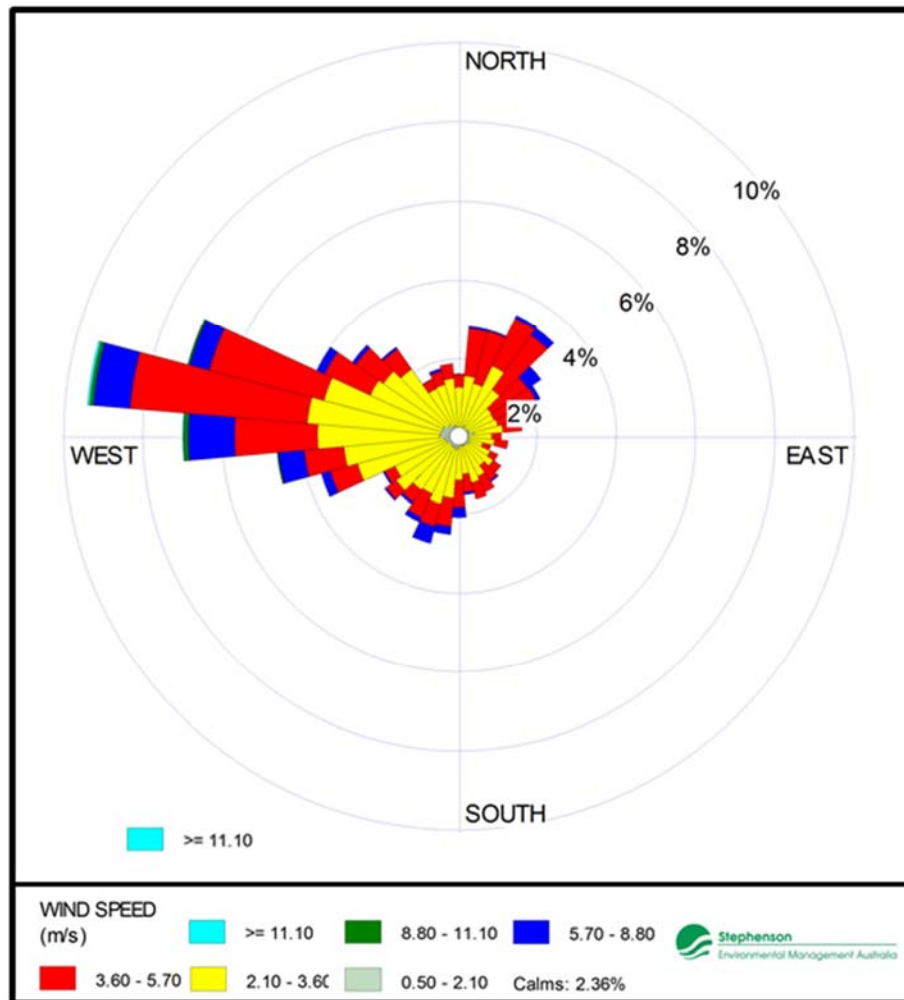


Figure 5: Wind Rose – January 1st – December 31st 2013.



Figure 6: Building Input Data

Receptors of Interest

The receptors of interest chosen for the AQIA by SEMA were reflective of those chosen in the 2008 GHD Air Quality Impact Assessment. The receptors selected included four (4) residential areas, which are Bomaderry, North Nowra, Nowra and Terara. These areas are highlighted in **Figure 7**. For this assessment, the highest odour and TSP GLCs in each of these residential areas was observed and included in this report, to compare with the GHD assessment.

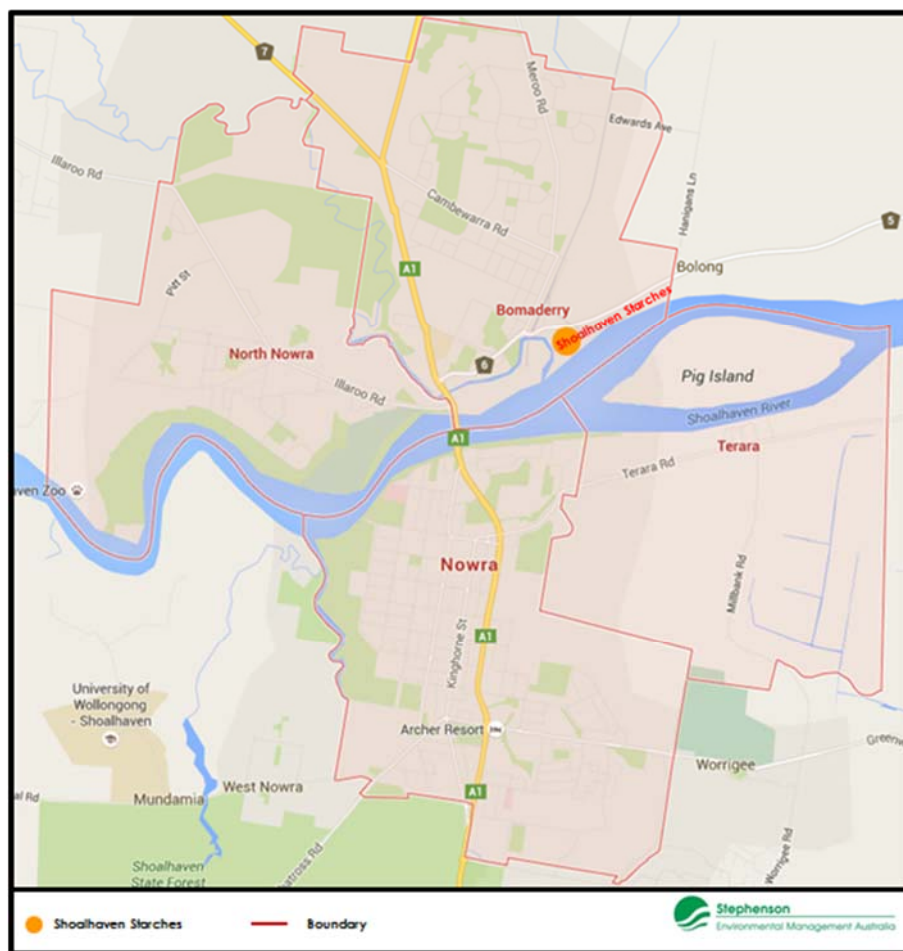


Figure 7: Locations of Receptors of Interest

Emission Input Data

Stack emission input data was derived from two sources. The Manildra Group provided building dimensions, the stack location and dimensions, expected flow rates and equipment design information. SEMA conducted odour emissions monitoring tests on the existing dryer stacks, and used the resulting concentrations and exhaust temperatures as input data. **Table 8** presents the starch dryer emission source physical characteristics used to develop the emissions input file.

Odour concentrations were derived by averaging emission rates from starch dryers measured by SEMA in May 2015 and August 2015. The average emission rate from all starch dryers tested during this period was used as the input rate in the modelling assessment. **Table 9** presents the odour emission concentrations and mass odour emission rates used as input data for this predictive modelling.

The design emission concentration from the stack is less than 50 mg/m³ however this is considered an unrealistically high concentration emission level to be emitted from a

source which includes a pollution control system such as a fabric filtration baghouse. Therefore, the emission concentration for this assessment was derived from the 2008 GHD assessment, and is presented in **Table 10**. This GHD assessment has used the emission concentration of 25 mg/m³. This is still considered high, but has been acknowledged as a conservative worst case particulate emission, compared with what would be expected which would be an emission concentration of the order of 5 mg/m³.

Table 8
Starch Dryer 5 – Characteristics

Stack Height	Stack Exit Diameter	Stack Temperature	Normal Flow Rate	Exit Velocity
33.5 m	2.35 m	56°C	65 Nm ³ /s	14.96 m/s

Table 9
Measured Starch Dryer Odour Emission Input Data

Starch Dryers Average Measured Odour Emission Rates (2015)			
Parameter	Total Odour Mass Emission Rate	Peak to Mean Ratio	Corrected Total Odour Mass Emission Rate
Odour	6,800 ou/m ³ /s	2.3	15,640 ou/m ³ /s

Table 10
TSP Emission Input Data

Parameter	Averaging Time	Concentration	Mass Emission rate
TSP	Annual	25 mg/m ³	1.62 g/s

Key to Tables 8 - 10: m = metres
°C = degrees Celsius
Nm³/s = dry cubic metre per second 0°C and 101.3 kilopascals (kPa)
m/s = metres per second
ou = odour units
ou/m³/s = odour units per cubic metre per second
TSP = Total Suspended Particulates
g/s = grams per second

7.1.3 Cumulative Emissions

Cumulative Odour Emissions

With the existing level of odour control, the relocated dryer according to SEMA is not considered to make a significant contribution to the factory's total cumulative odour impact.

The 2008 GHD assessment (Shoalhaven Starches – Report on Ethanol Upgrade Air Quality Assessment), estimated the total odour emissions from the Shoalhaven Starches factory before implementation of odour controls is 604,811 ou.m³/s. Based on available data and measurement results, GHD estimated the approved and relocated Starch Dryer 5 will emit 6,794 ou.m³/s of odour before controls and 5,095 ou.m³/s after implementation of the Additional Odour Controls (AOC). This is of the order of 1% of total odour emissions (GHD, 2008) from the Shoalhaven Starches factory complex at Bomaderry.

Now that the AOC, as per page 34 NSW DoPE Appendix 3 Odour Controls have been implemented, the relocated Starch Dryer 5 will appear to have an apparent increased contribution to the factory's total cumulative odour impact. According to SEMA this is an artefact caused by the significant decrease in total odour emissions from the factory complex after the implementation of these AOC.

The 2008 estimation of total odour emissions from the factory complex is a reduction to 148,807 ou.m³/s after the completion of these AOC.

Cumulative TSP Emissions

The 2008 assessment estimated that the total TSP emissions from the Shoalhaven Starches factory complex are 13.3 g/s. The conservative worst case TSP emission concentration of 25 mg/m³ from the relocated Starch Dryer 5 according to SEMA calculates through to a TSP mass emission rate of 1.62 g/s, which is 12% of the total TSP emissions from the Shoalhaven Starches factory complex. According to SEMA this is a worst case input and in reality would be expected to be of the order of one tenth of this predicted mass emission rate.

7.1.4 Impact Assessment Predictions

The air quality impact assessment worst case predictions from the dispersion modelling are presented in **Tables 11** and **12**. Each table presents the worst case result for Odour and TSP respectively. GHD predicted impact ground level concentrations have been drawn from Tables 8-2 (odour) and 8-3 (particulate (TSP)) from their Ethanol Upgrade Air Quality Assessment report (2008).

Figures 8 and **9** present the predicted ground level impacts of odour and TSP emissions respectively, from the relocated Starch Dryer 5.

According to SEMA the maximum predicted odour GLC from Starch Dryer 5 alone is 0.54 ou, which is within the plant boundary and below the regulatory impact assessment criteria (IAC) of 2 ou.

The 2008 assessment, predicted the total odour GLC from the whole Shoalhaven Starches factory to be 100 ou on the northwest boundary of the factory complex site, with mandatory odour controls in place. With the current AOC being implemented this prediction is expected to decrease to the order of 10 ou.

The highest odour impact of the relocated Dryer 5 at this northwest boundary according to SEMA would have a GLC of 0.4 ou.

TSP ground level impacts from the relocated dryer alone are not predicted to exceed regulatory impact assessment criterion of an annual average 90 µg/m³. The maximum TSP concentration at ground level is 4 µg/m³.

From the 2008 assessment, the reported TSP GLC at Bomaderry from the factory complex was predicted to be approximately 2 µg/m³ in Bomaderry. The highest TSP cumulative impact from the relocated Starch Dryer in the Bomaderry area is predicted to be 0.4 µg/m³.

Table11
Cumulative Worst Case Odour GLC

Location	Parameter	Averaging Time	Odour GLC Prediction		Impact Assessment Criteria (ou)
			Relocated Dryer 5* 2015 (ou)	Whole Factory ** 2008 (ou)	
Factory NW boundary	Odour	1 second (using peak-to-mean ratio)	0.4	100 (moc) ~25 (aoc) ~10 (aoc)	2.0
Bomaderry – Residential	Odour	1 second (using peak-to-mean ratio)	0.4	40 (moc) 6 (aoc) 3 (aoc)	2.0
North Nowra	Odour	1 second (using peak-to-mean ratio)	0.3	13 (moc) 3 (aoc) 2 (aoc)	2.0
Nowra	Odour	1 second (using peak-to-mean ratio)	0.3	20 (moc) 5 (aoc) 3 (aoc)	2.0
Terara	Odour	1 second (using peak-to-mean ratio)	0.2	18 (moc) 5 (aoc) 3 (aoc)	2.0

Key to Tables 11 and 12:

Ou = odour units

Moc = mandatory odour controls, equivalent to Stage 1 odour controls (2007 and 2008)

aoc = additional odour controls, equivalent to Stage 2 and 3 odour controls (2007 and 2008)

µg/m³ = micrograms per cubic metre

TSP = Total Suspended Particulates

GLC = Ground Level Concentration

** = SEMA prediction (2015)*

*** = GHD 2008 Ethanol Upgrade predictions (2008)*

Table 12
Cumulative Worst Case TSP GLC

<i>Location</i>	<i>Parameter</i>	<i>Averaging Time</i>	<i>Relocated Dryer 5 TSP GLC* ($\mu\text{g}/\text{m}^3$)</i>	<i>Whole Factory Predictions** ($\mu\text{g}/\text{m}^3$)</i>	<i>Impact Assessment Criteria ($\mu\text{g}/\text{m}^3$)</i>
Worst case	TSP	Annual	3.96	–	90
Bomaderry	TSP	Annual	0.4	2	90
N Nowra	TSP	Annual	0.1	1	90
Nowra	TSP	Annual	0.5	1	90
Terara	TSP	Annual	0.5	1.5	90

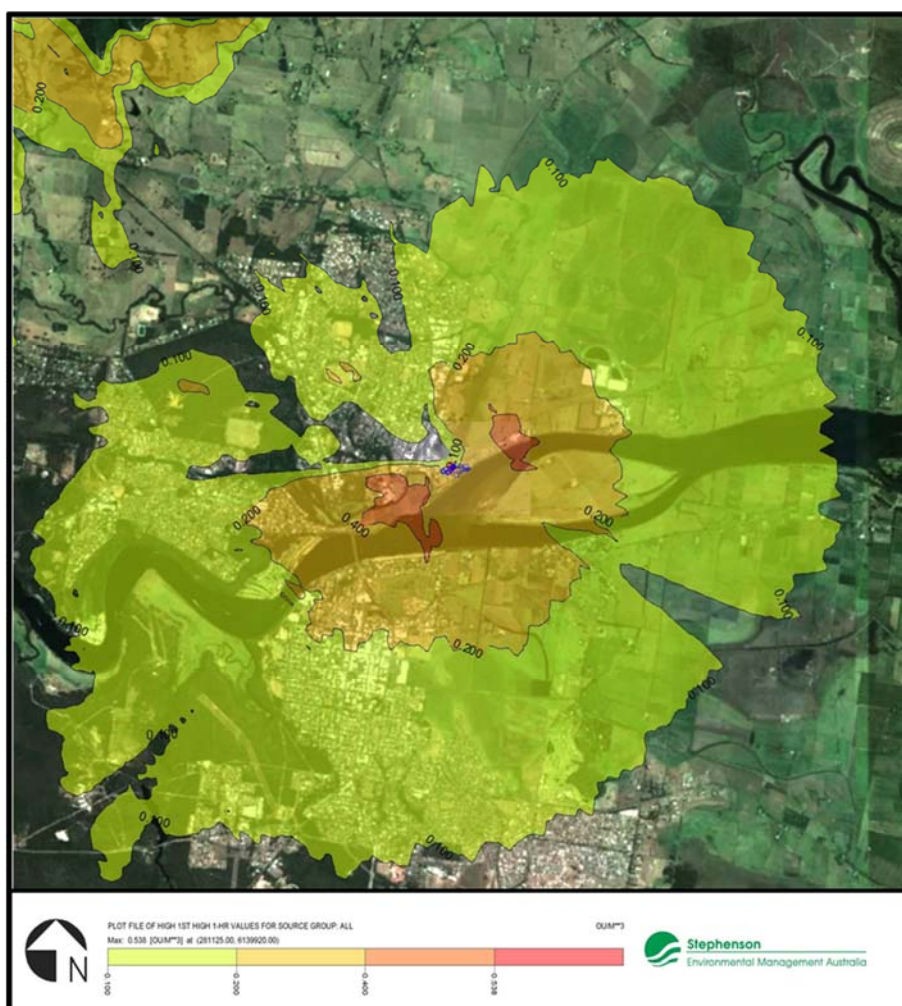


Figure 8: Predicted odour concentration – relocated Starch Dryer.

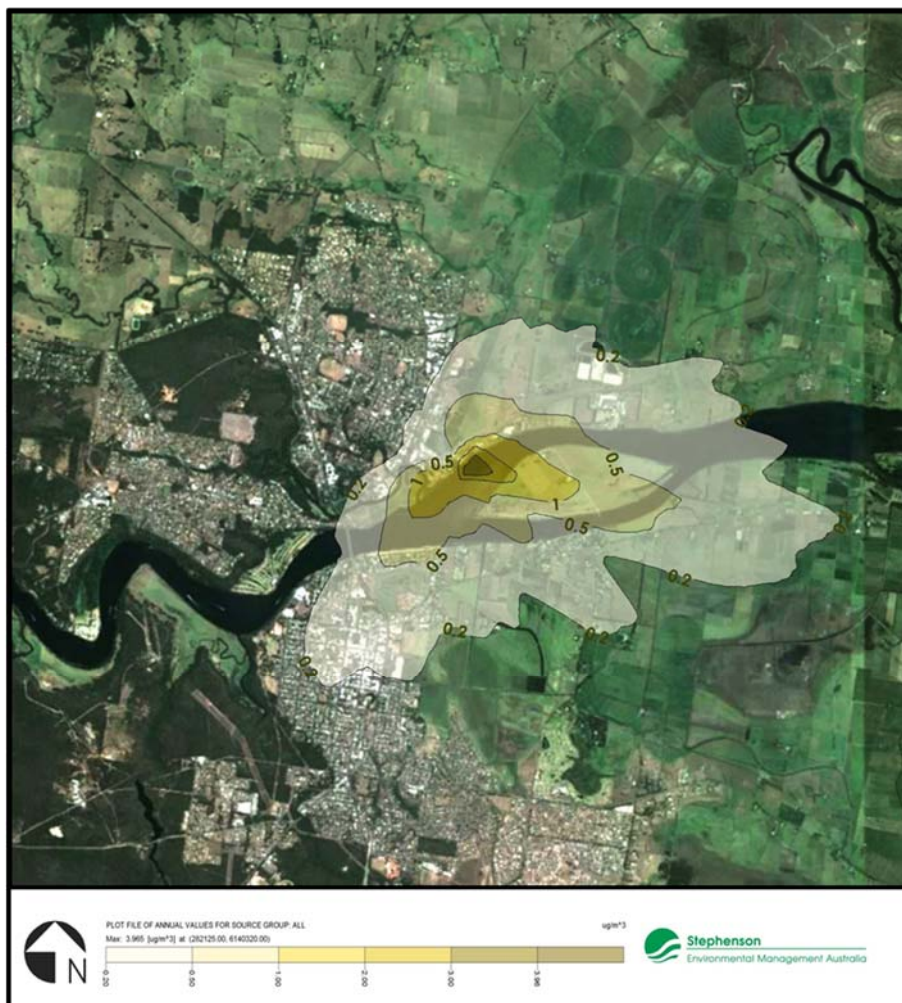


Figure 9: Predicted TSP concentration – relocated Starch Dryer.

7.1.5 Conclusions

The AQIA undertaken by SEMA makes the following conclusion with respect to this modification proposal:

This Air Quality Impact Assessment predicts that the emissions of odour and particulate matter from the relocated Starch Dryer 5 at the Shoalhaven Starches factory site at Bomaderry, New South Wales will have the following impacts:

- *Maximum worst case GLC **odour** impact from relocated Dryer 5 on the northwest boundary of the factory site is predicted to be 0.4 ou.*
- *Predicted **odour** GLCs from the relocated Dryer 5 will therefore be well below the IAC of 2 odour units.*
- *In the **Bomaderry residential area**:-*
 - *worst case GLC odour impact prediction from the relocated Starch Dryer No.5 stack is 0.4 ou; and,*

- *worst case predicted GLC TSP impact from the relocated Starch Dryer No. 5 stack is 0.4 $\mu\text{g}/\text{m}^3$.*
- ***In North Nowra, Nowra and Terara:-***
 - *worst case GLC **odour** impact prediction for the relocated Starch Dryer No. 5 stack ranged between 0.2 to 0.3 ou; and,*
 - *worst case predicted **TSP** impact prediction for the relocated Starch Dryer No. 5 ranged between 0.1 and 0.5 $\mu\text{g}/\text{m}^3$.*
- *GHD (2008) odour impact predictions for the cumulative sources are:*
 - *25 ou at the northwest site boundary and;*
 - *6 ou at **the Bomaderry residential area with MOC;***
 - *10 ou at the northwest site boundary and;*
 - *3 ou at the **Bomaderry residential area with AOC;***
- *GHD 2008 predicted a cumulative TSP impact of 2 $\mu\text{g}/\text{m}^3$. Current predicted worst case **TSP** GLC (annual average) within the site from the relocated Starch Dryer No. 5 will be 4 $\mu\text{g}/\text{m}^3$ at the site and 0.4 $\mu\text{g}/\text{m}^3$ at the Bomaderry residential area. This predicted impact in both locations is driven by the conservative assumption that the emission will be 10 times higher than actual best practice fabric filtration emission control. However, the predicted worst case GLC will still be well below the IAC of 90 $\mu\text{g}/\text{m}^3$.*

7.2 FLOODING

The Environmental Assessment Requirements as issued by the NSW DoPE for this project require flooding impacts associated with the proposal to be addressed.

This Modification Application is supported by a Flood Impact Assessment prepared by WMA Water (WMA). A copy of WMA's report forms **Annexure 4** to this EA. This section of the EA is based upon the findings of this assessment.

7.2.1 Approach to Flood Assessment

Background

Each development on the floodplain has the potential to cause an impact upon flood levels. The potential impacts of works within the floodplain on hydraulic characteristics are twofold – firstly a loss of temporary floodplain storage volume and secondly a loss of flow area. It is the loss of flow area which produces the greatest impact, as the area of floodplain storage lost due to all works since 1990, represents approximately less than 1% of the total available floodplain storage area for the northern floodplain (say 3000+ hectares).

Whilst the individual impacts (construction of a starch dryer) may be small the cumulative increases from several developments may be significant. Therefore, the works associated

with the SSEP in 2008 needed to be assessed in the context of total cumulative impacts of all development within the immediate area. It is not possible to itemise all of the developments on the floodplain and their effects since white settlement. For the purposes of this previous assessment the nominal starting date for the assessment of cumulative effects is 1990. This date was agreed previously and approximately corresponds to the floodplain development status at the time when the current design flood level information was established (Lower Shoalhaven River Flood Study).

For the above reasons the impacts assessed in the May 2008 Proposed Ethanol Production Upgrade Report for this SSEP by WMA represented the cumulative increases for all development by Shoalhaven Starches and others (Dairy Farmers pond) since 1990 and not just the incremental effects of the proposed ethanol upgrade and odour reduction works in 2008.

The impacts can be subdivided into hydraulic (changes in flood level, flow and velocity), social, economic and environmental.

An assessment of such impacts is required in order to advise of the possible damages to the existing and proposed structures making up the plant, and also to advise of the likelihood of any increase in risk to other occupiers or users of the floodplain. It should be noted that the three main floodplain users (Shoalhaven Starches, Dairy Farmers (now owned by Shoalhaven Starches) and the Paper Mill) work in conjunction and co-operation with each other. Each have swapped or sold land on the adjoining floodplain in recent times to suit their commercial needs.

Shoalhaven Starches and the Paper Mill “share” the railway line which passes through all three properties. Shoalhaven Starches also supplied product to the Paper Mill in the past. These two plants are located on the banks of the river in order to distance themselves from the urban environment and to be close to an unlimited supply of water. They also require a large amount of “flat” land for their operation with good road and rail access. Shoalhaven Starches makes excellent use of the floodplain by irrigating and farming the land using recycled water from the plant (initially stored in the seven effluent ponds).

Approach Adopted in this Study

The May 2008 Proposed Ethanol Production Upgrade assessment for the SSEP by WMA undertook a detailed hydraulic analysis using the CELLS model of all the works proposed as part of this program. The works included construction of No. 5 Starch Dryer. Under this Modification Application it is proposed to relocate No. 5 Starch Dryer from within the existing Shoalhaven Starches factory site to land on the western side of

Abernethy's Creek. The site is currently partially occupied by a large warehouse and partially by an open space area occupied by staff parking. The proposed No. 5 Starch Dryer will replace the existing warehouse building with a slightly larger building footprint.

The loss of hydraulic conveyance depends according to WMA on the extent of the restriction to a flow path caused by the works. Prior to construction of the Shoalhaven Starches plant at Bomaderry there would have been significant flow through the site during a flood, as there is across any river bank. However, since approximately 1960 the ongoing construction of the plant has effectively blocked the flow path through the site. This issue has been investigated by WMA in their report dated October 2000 titled "*Further Development within the Manildra starches Plant off Bolong Road, Bomaderry - Hydraulic Assessment*". The conclusions from that report in summary indicate that an agreement was reached that any future development within the intensively built-up area, as indicated on **Figure 10** below would not require hydraulic modelling to quantify the hydraulic impacts and cumulative effects.

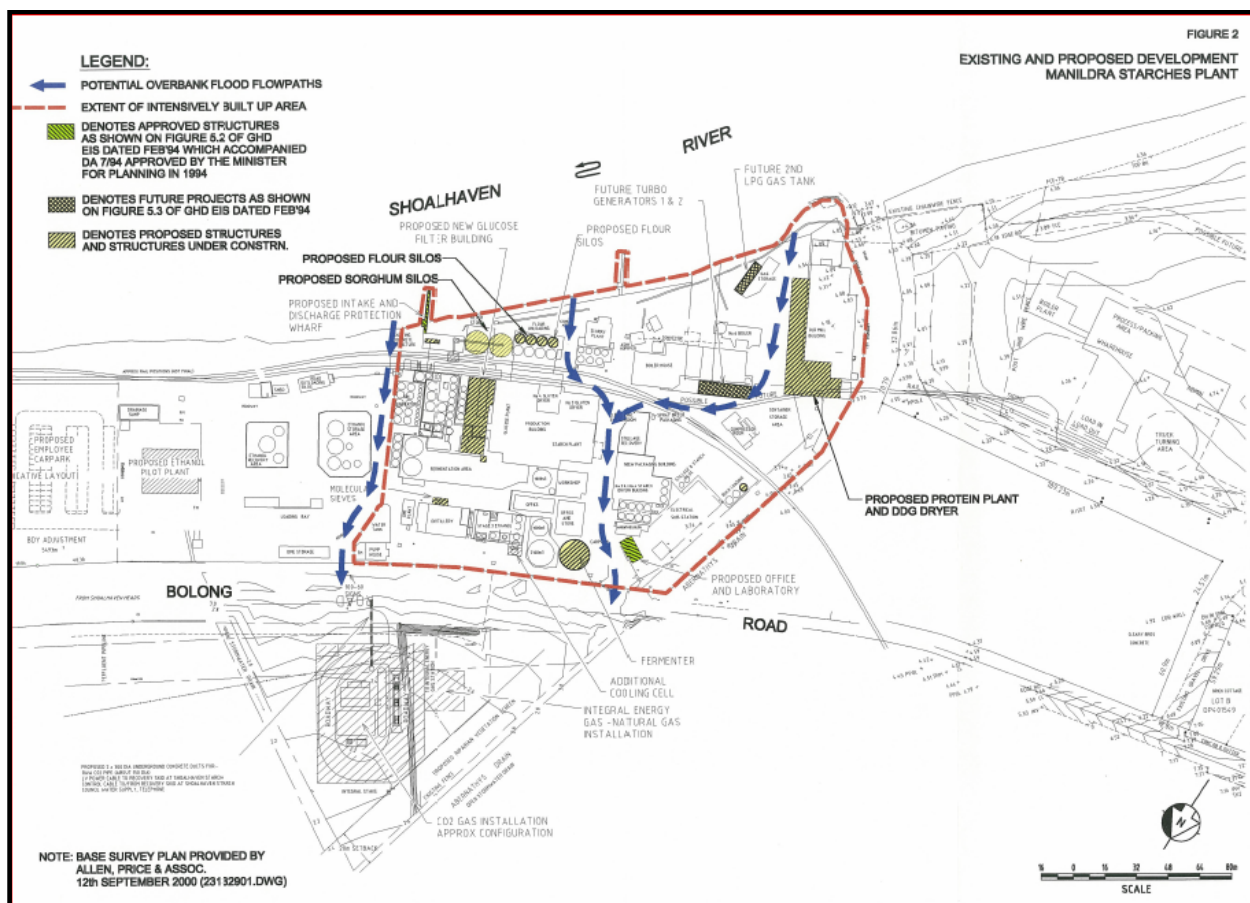


Figure 10: Agreed Extent of Intensively Built-up Area

Thus in simple terms location of No. 5 Starch Dryer would not require hydraulic modelling if located in its approved location but it does require hydraulic modelling if located outside the intensively built-up area (as is proposed).

As part of the current flood impact assessment, WMA have:

1. modified the TUFLOW model to represent the loss of conveyance and temporary floodplain storage due to the proposed relocation of No. 5 Starch Dryer. It should be noted that the modelling only considers the hydraulic effect of the increase in building footprint due to the No. 5 Starch Dryer, beyond the footprint of the existing warehouse building (ie. the footprint of the existing warehouse building already blocks flow under existing conditions);
2. compared the design flood levels for the design (with relocation of No. 5 Starch Dryer) to the present day approved extent of development flood levels. This indicates the incremental increase in flood level due to the proposed relocation of No. 5 Starch Dryer;
3. compared the design flood levels for the design (with relocation of No. 5 Starch Dryer) to the 1990 agreed approved extent of development. This indicates the cumulative increase in flood level due to all the proposed works on the northern floodplain since 1990;
4. indicated the increase in above floor building inundation as a result of the proposed relocation of No. 5 Starch Dryer for both the incremental and cumulative impacts.

7.2.2 Flood Impact Assessment

Increase in 1% AEP Flood Levels

WMA have undertaken an assessment of the increase in the 1% AEP flood level due to the proposed relocation of No. 5 Starch Dryer. It should be noted that the works will only increase flood levels in events that overtop the northern river bank (approximately a 5% AEP event) and floodwaters flow across the site and towards Bolong Road. Thus in smaller events (all historical floods since March 1978) the works would have no impact on flood levels.

Compared to Present Day 2015 Approved Works

According to WMA a comparison to present day 2015 approved works show that for the majority of the surrounding area there is no change to the 1% AEP flood level. The

increases that do occur are predominantly to land and buildings owned by Shoalhaven Starches.

Compared to 1990 Agreed Works

According to WMA the results from a comparison to 1990 approved works show more significant increases in flood level as they include the impact of all major works on the northern floodplain since 1990.

Increases in Above Floor Inundation

WMA have undertaken an assessment that shows the increase in above building floor depth of inundation relative to the 2015 and 1990 conditions respectively. WMA have identified that there are 29 buildings that would experience increased flood levels with relocation of the No. 5 Starch Dryer. However for 28 of the 29 buildings the increase in level is < 0.01m which is assumed to be the accuracy of the flood modelling approach. The greatest increases in level occur to the buildings closest (“building 2” for example which is on an industrial site on Figure 3 of the WMA report) to the proposed location of the No. 5 Starch Dryer. According to WMA the majority of building floors affected are already inundated by 0.5 m or more depth of floodwaters in the 1% AEP event, thus the small increase in flood level will have minimal impact on flood damages.

WMA have also undertaken an assessment of the cumulative impact of all approved works on the northern floodplain since 1990 for the 29 affected buildings.

7.2.3 Compliance with Chapter G9: Development on Flood Prone Land (Shoalhaven DCP 2014)

Council Flood Certificate

WMA’s assessment report includes Council’s flood certificate that advises the site is inundated in the 1% AEP event and is described as part High Hazard and part Floodway/Flood Storage. The remainder of the site is part Low Hazard and part Flood Storage/Flood Fringe. It should be noted that Council’s description of the hydraulic and hazard categorisation is based on CELLS model results from the 1990 Lower Shoalhaven River Flood Study. However according to WMA the CELLS model could not accurately define these categorisations due to its limited model structure.

The projected sea level rise estimates due to climate change according to WMA will not increase the 1% AEP flood level at this site as it is too far upstream from the ocean.

Compliance

Table 13 has been prepared by WMA and describes compliance with Chapter G9: Development on Flood Prone Land of Shoalhaven Council's DCP 2014. As the works will not involve subdivision of lands compliance with these performance criteria has not been addressed.

Table 13
Performance Criteria - General and Filling

<i>Performance criteria</i>	<i>Response</i>
P1 Development or work on flood prone land will meet the following:	
The development will not increase the risk to life or safety of persons during a flood event on the development site and adjoining land.	The works are such that their construction will not increase the number of workers on the site or additionally threaten their safety during a flood.
The development or work will not unduly restrict the flow behaviour of floodwaters.	Refer Flood Impact Assessment above.
The development or work will not unduly increase the level or flow of floodwaters or stormwater runoff on land in the vicinity. The development or work will not exacerbate the adverse consequences of floodwaters flowing on the land with regard to erosion, siltation and destruction of vegetation.	The works are within industrial land clear of vegetation and due to their relatively small footprint will have no significant impact on erosion or siltation.
The structural characteristics of any building or work that are the subject of the application are capable of withstanding flooding in accordance with the requirements of the Council.	A separate structural report will be provided.
The development will not become unsafe during floods or result in moving debris that potentially threatens the safety of people or the integrity of structures.	A separate structural report will be provided.
Potential damage due to inundation of proposed buildings and structures is minimised.	There will potentially be some damage to electrical and other components and these are considered in Shoalhaven Starches Flood Plan.
The development will not obstruct escape routes for both people and stock in the event of a flood.	The works will not occupy escape routes or cause workers to become trapped.
The development will not unduly increase dependency on emergency services.	The works are such that their construction will not increase the number of workers on the site, additionally threaten their safety during a flood or increase the need for emergency services.
Interaction of flooding from all possible sources has been taken into account in assessing the proposed development against risks to life and property resulting from any adverse hydraulic impacts.	Refer Flood Impact Assessment above.

Table 13 (continued)

Performance criteria	Response
The development will not adversely affect the integrity of floodplains and floodways, including riparian vegetation, fluvial geomorphologic environmental processes and water quality.	The works will be constructed on land designated as part high/low hazard and part floodway/flood storage in the 1% AEP event. The site is industrial land with nil existing vegetation and is beyond the influence of normal fluvial geomorphic processes. The works will have no impact on water quality.
P2 Filling or excavation on flood prone land will meet the following:	The works do not involve earthworks filling or excavation but the extension to the existing building footprint will act in a similar manner to filling by occupying temporary floodplain storage.
High hazard floodway areas are kept free of fill and/or obstructions.	The location is within both a high hazard and potentially floodway area, however the location of the works is determined by the nearby rail line and other related plant. There is no other location where the works could be situated. The hydraulic impact of the proposed No. 5 Starch Dryer is partially mitigated as it occupies an existing building footprint.
The proposed fill or excavation will not unduly restrict the flow behaviour of floodwaters.	Refer Flood Impact Assessment above.
The proposed fill or excavation will not unduly increase the level or flow of floodwaters or stormwater runoff on land in the vicinity, including adjoining land.	Refer Flood Impact Assessment above.
The proposed fill or excavation will not exacerbate erosion, siltation and destruction of vegetation caused by floodwaters flowing on the land.	The site is industrial land with nil existing vegetation and is beyond the influence of normal fluvial geomorphic processes.
The proposed fill or excavation will not be carried out on flood prone land if sufficient flood free area is available for development within the subject property.	The location is within a high hazard and potentially floodway area, however the location of the works is determined by the nearby rail line and other related plant. The hydraulic impact of the proposed No. 5 Starch Dryer is partially mitigated as it occupies an existing building footprint. Other sites have been evaluated and the outcome is that there is no other location where the works could be situated.
The proposed excavation does not create new habitable rooms, non-habitable storage areas or carparks with floor levels below the existing ground level.	The works do not involve habitable, non-habitable residential storage or car parking.

7.3 NOISE

The area surrounding Shoalhaven Starches is a mix of commercial, industrial and residential premises with vacant land, owned by the Manildra Group, to the north.

The nearest residential locations (refer **Figure 11**) to the complex are as follows:

- Location 1 – Nobblers Lane, Terara approximately 1400 metres to the south east;
- Location 2 – Riverview Road, Nowra approximately 975 metres to the south west;
- Location 3 – Meroo Street, Bomaderry approximately 620 metres to the north west;
- Location 4 – Coomea Street, Bomaderry approximately 750metres to the north west.

The above locations are listed in the order shown in the Environmental Protection Licence for the site.



Figure 11: Location of closest receptors under EPL.

The Environmental Assessment Requirements as issued by the NSW DoPE for this project require noise impacts associated with the proposal to be addressed.

This Modification Application is supported by a Noise Impact Assessment prepared by Day Design Pty Ltd. A copy of the Noise Impact Assessment prepared by Day Design forms **Annexure 6** to this EA. This section of the EA is based upon the findings of this assessment.

7.3.1 Acoustic Criteria

This section presents the noise guidelines applicable to this proposal and establishes the project specific noise criteria.

Environment Protection Licence 883

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

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.

Shoalhaven Starches Noise Management Plan

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

The Shoalhaven Starches Noise Management Plan 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 in Section 4.1 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.”

EPA Construction Noise Guideline

The NSW EPA published the *Interim Construction Noise Guideline* in July 2009. While some noise from construction sites is inevitable, the aim of the Guideline is to protect the majority of residences and other sensitive land uses from noise pollution most of the time.

The Guideline presents two ways of assessing construction noise impacts; the quantitative method and the qualitative method.

The quantitative method is generally suited to longer term construction projects and involves predicting noise levels from the construction phase and comparing them with noise management levels given in the guideline.

The qualitative method for assessing construction noise is a simplified way to identify the cause of potential noise impacts and may be used for short-term works, such as repair and maintenance projects of short duration.

In this instance the entire construction phase may take several months although significant noise producing aspects, such as piling, if required, will last a total of approximately two weeks. Consideration is given by Day Design to the potential for noise impact from construction activities on residential receptors.

Table 2 in Section 4 of the Guideline sets out noise management levels at affected residences and how they are to be applied during normal construction hours. The noise management level is derived from the rating background level (RBL) plus 10 dB in accordance with the Guideline. This level is considered to be the ‘noise affected level’ which represents the point above which there may be some community reaction to noise.

Day Design has carried out numerous noise surveys in Nowra, Bomaderry and Terara and has found daytime background noise levels range between 33 and 40 dBA depending on the location, as shown in **Table 14** below.

Table 14
Rating Background Levels

Noise Measurement Location	Time Period	Rating Background Level
135 Terara Road, Terara March 2012	Day (7:00 am to 6:00 pm)	33 dBA
250 Bolong Road, Bomaderry March 2014	Day (7:00 am to 6:00 pm)	38 dBA
Shoalhaven Village Caravan Park, Nowra - March 2012	Day (7:00 am to 6:00 pm)	40 dBA

For the purpose of determining the potential for community reaction to noise emission from construction activities, previously measured background noise levels in the vicinity of each receptor location have been used to determine the noise management levels as shown in **Table 15** below.

Table 15
L_{eq} Noise Management Levels from Construction Activities

Receptor Location	Noise Management Level	How to Apply
Location 1 (Terara)	43 dBA (33 + 10)	<p>The noise affected level represents the point above which there may be some community reaction to noise.</p> <ul style="list-style-type: none"> Where the predicted or measured LA_{eq} (15 min) noise level is greater than the noise affected level, the proponent should apply all feasible and reasonable* work practices to meet the noise affected level. The proponent should also inform all potentially impacted residents of the nature of works to be carried out, the expected noise levels and duration, as well as contact details.
Location 2 (Nowra)	50 dBA (40 + 10)	
Locations 3 & 4 (Bomaderry)	48 dBA (38 + 10)	
	Highly noise affected 75 dB(A)	<p>The highly noise affected level represents the point above which there may be strong community reaction to noise.</p> <ul style="list-style-type: none"> Where noise is above this level, the relevant authority (consent, determining or regulatory) may require respite periods by restricting the hours that the very noisy activities can occur, taking into account: <ol style="list-style-type: none"> times identified by the community when they are less sensitive to noise (such as before and after school for works near schools, or mid-morning or mid-afternoon for works near residences) if the community is prepared to accept a longer period of construction in exchange for restrictions on construction times.

* Section 6, “work practices” of The Interim Construction Noise Guideline, states:

“there are no prescribed noise controls for construction works. Instead, all feasible and reasonable work practices should be implemented to minimise

noise impacts. This approach gives construction site managers and construction workers the greatest flexibility to manage noise”.

Definitions of the terms feasible and reasonable are given in Section 1.4 of the Guideline.

The ‘highly noise affected’ level of 75 dBA represents the point above which there may be strong community reaction to noise. This level is provided in the Guideline and is not based on the RBL.

Project Specific Noise Criteria

Day Design indicate the most stringent noise criteria for the proposed modification are as follows:

Operational Phase (Environment Protection Licence noise limits less 10 dB):

- *28 dBA ($L_{10, 15 \text{ minute}}$) at locations in Terara on the south side of the Shoalhaven River;*
- *28 dBA ($L_{10, 15 \text{ minute}}$) at locations in Nowra on the south side of the Shoalhaven River;*
- *32 dBA ($L_{10, 15 \text{ minute}}$) at locations in Meroo Street, Bomaderry;*
- *30 dBA ($L_{10, 15 \text{ minute}}$) at other locations in Bomaderry.*

Construction Phase Noise Management Levels:

- *43 dBA ($L_{eq, 15 \text{ minute}}$) at locations in Terara;*
- *48 dBA ($L_{eq, 15 \text{ minute}}$) at locations in Bomaderry; and*
- *50 BA ($L_{eq, 15 \text{ minute}}$) at locations in Nowra.*

The residential criteria apply at the most-affected point on or within the residential property boundary or, if that is more than 30 metres from the residence, at the most-affected point within 30 metres of the residence. For upper floors, the noise is assessed outside the nearest window.

7.3.2 Starch Dryer – Operational Noise Emission

Starch Dryer Noise Levels

The main sources of noise associated with the operation of the starch dryer will be the plant and equipment located within the new building.

Day Design Pty Ltd has conducted several noise surveys at Shoalhaven Starches’ complex including noise measurements of similar plant and equipment to that proposed for the starch dryer. In addition, the manufacturers of some plant and equipment have supplied sound data for various items of plant to be installed at the site.

Table 16 below provides a schedule of the octave band and overall ‘A’ frequency weighted sound power levels, in decibels re: 1 pW, of noise sources associated with the starch dryer.

Table 16
L₁₀ Sound Power Levels – Grain Silos

<i>Mechanical Plant</i>	<i>dBA</i>	<i>Sound Power Levels (dB) at Octave Band Centre Frequencies (Hz)</i>							
		63	125	250	500	1k	2k	4k	8k
Sifters ¹	93	94	94	94	93	87	83	80	78
Gas and Steam Heaters ¹	99	93	91	91	93	91	91	95	87
Small motors / screw feeds ¹	87	85	91	91	82	81	77	75	69
Silo motors (roof top) ¹	82	89	77	78	81	78	74	68	57
Dryer ID Fan ²	83	71	75	81	79	79	74	73	59
Cooler ID Fan ²	83	71	75	81	79	79	74	73	59
Disintegrators ²	88	73	88	85	84	83	79	79	67
Centrifuges ²	88	86	83	85	87	83	80	75	71

1. Derived from Day Design’s noise measurements of similar existing plant and equipment;
2. Derived from Day Design’s noise measurements of similar existing plant and equipment adjusted to manufacturer’s specifications for new plant.

Predicted Noise Levels

Knowing the sound power level of a noise source (see **Table 16**), the sound pressure level (as measured with a sound level meter) can be calculated at a remote location using suitable formulae to account for building envelope transmission, distance losses, etc.

Table 17 below shows the predicted noise level at each of the receptor locations from the ongoing operation of the starch dryer.

Table 17
Predicted Noise Levels at Receptor Locations – Starch dryer

<i>Description</i>	<i>Predicted Noise Level L₁₀, 15 minute (dBA) at Receptor Location</i>			
	<i>Location 1</i>	<i>Location 2</i>	<i>Location 3</i>	<i>Location 4</i>
Starch Dryer Operating	21	27	32	30
Acceptable Noise Limit (L ₁₀ , 15 minute)	28	28	32	30
Complies	Yes	Yes	Yes	Yes

The above calculations and predictions consider distance loss to each receptor and depend on the following:

- Starch dryer building is constructed in accordance with the recommendations included in Section 7 of the Noise impact Statement (**Annexure 6**);
- Manufacturer's stated noise levels for all items of plant and equipment are achieved.

7.3.3 Construction Noise Emission

The construction process will involve demolition of the existing Moorehouse Building, preliminary earthworks, pouring of concrete slabs, erection and fit out of the buildings and installation of the starch dryer plant within the building.

It is likely also that piling will be required to establish the footing of the new structures.

As the Department of Planning and Environment is aware, a separate application is being submitted for the demolition of the Moorehouse Building site. Day Design Pty Ltd prepared a separate Construction Noise and Vibration Management Plan for the demolition of the Moorehouse Building to support this other modification application. This assessment therefore considers the construction processes following the demolition of the Moorehouse Building.

Table 18 below shows a schedule of sound power levels for typical construction equipment.

Table 19 below shows the predicted level of noise emission from construction activities at each of the receptor locations.

Table 18
Construction Equipment – L_{eq} Sound Power Levels

Description	L_{eq} Sound Power Level (dBA)
Piling Rig	118
Mobile Crane (Diesel)	110
Excavator – 30 T	110
Concrete Truck / Pump	105
Grinder	105
Power Saw	101

Table 19
Predicted Noise Levels at Receptor Locations – Construction Phase

Description	Predicted Noise Level $L_{eq, 15 \text{ minute}}$ (dBA) at Receptor Location			
	Location 1	Location 2	Location 3	Location 4
Construction Activity*	35 – 41	43 – 49	41 – 46	39 - 45
Acceptable Noise Limit ($L_{eq, 15 \text{ minute}}$)	43	50	48	48
Complies	✓	✓	✓	✓

* The range provided is with and without piling activity.

7.3.4 Noise Control Recommendations

The noise impact assessment prepared by Day Design makes the following recommendations in relation to this project:

Construction of the Starch Dryer Building

Walls

The external walls of the starch dryer building should have a minimum weighted sound reduction index (R_w) 23. In this instance calculations are based on 'Kingspan' architectural wall panelling system 'AWP/80'.

Alternative products may be suitable providing the minimum rating of R_w 23 is achieved or exceeded.

Roof / Ceiling

The roof and ceiling of the building should have a minimum weighted sound reduction index (R_w) 23. In this instance calculations are based on 'Kingspan' architectural roof panelling system 'K-Dek (KS 1000 KD)'.

Roller Doors

Roller doors should have a minimum weighted sound reduction index (R_w) 14, be located in the eastern and southern facades of the building only and not exceed a total area of 40 m² (ie. 2 doors 5 m x 4 m). Roller doors should remain closed at all times the starch dryer is in operation and opened only for maintenance and installation / removal of plant and equipment.

Ventilation Penetrations

There should be no acoustically untreated penetrations in the walls or roof other than the roller doors outlined above. Any doors to the starch dryer building must remain closed at all times the plant is in operation.

If natural ventilation is required, sections of the walls may be fitted with acoustic louvres.

The required insertion loss of acoustic louvres will depend on the maximum surface area of louvered sections required to facilitate adequate ventilation.

As an example, based on a maximum 20 m² of louvered sections in each of the four walls, acoustic louvres should have minimum insertion losses shown in **Table 20** below.

Table 20
Acoustic Louvre Insertion Loss

<i>Description</i>	<i>Minimum Insertion Loss (dB) at Octave Band Centre Frequencies (Hz)</i>							
	63	125	250	500	1k	2k	4k	8k
Acoustic Louvre *	3	7	9	13	15	16	15	14

**Based on the Sound Attenuators Australia Acoustic Louvre, type AL1H (300 mm depth).*

A larger area may result in a higher required insertion loss and consequently a deeper blade depth. A final assessment should be made prior to the issue of a Construction Certificate once the location and size of any openings for ventilation are finalised.

Additional Mechanical Plant and Equipment

At the time of preparation of the NIA it was not known what, if any significant noise producing mechanical plant or equipment may be located externally to the starch dryer building other than that considered in this assessment.

A final assessment should be carried out prior to the issue of a Construction Certificate once details of any external plant, if any, are known.

Day Design however are confident that the level of noise emission from the proposal will, or can easily be controlled to, meet the acceptable noise limits at all receptor locations.

Construction Noise

It can be seen from **Table 19** that the construction noise management levels are likely to be met at each receptor location.

7.3.5 Conclusion

The Noise Impact Assessment prepared by day Design makes the following conclusion in relation to this proposal:

“An assessment of the potential noise impact from the proposed construction and operation of a new starch dryer at Shoalhaven Starches on Bolong Road, Bomaderry, NSW has been undertaken.

Calculations show that the level of noise emission from the operation of the dryer will be within the noise design goals derived from Environment Protection Licence 883 noise limits at each receptor location. This is providing noise control recommendations made in Section 7 of this report are implemented and adhered to.”

7.4 TRAFFIC

The Environmental Assessment Requirements as issued by the NSW DoPE for this project require traffic impacts associated with the proposal to be addressed.

This Modification Application is supported by a traffic and car parking assessment prepared by ARC Traffic & Transport (ARC). In undertaking their assessment ARC has referenced their previous assessments that have been undertaken in relation to the Shoalhaven Starches site. This assessment has reviewed the potential construction and operational aspects of the proposal, and provides recommendations by which potential impacts can be minimised if not entirely ameliorated. A copy of ARC’s report forms **Annexure 7** to this EA. This section of the EA is based upon the findings of this assessment.

7.4.1 Existing Situation

Shoalhaven Starches Site

Manildra’s Shoalhaven Starches operations occupy a number of distinct ‘sites’ in Bomaderry. While operations are integrated across all sites, ARC has differentiated these sites in this assessment for ease of reference.

The primary Shoalhaven Starches (SS) Site and immediately adjacent Dairy Farmers Site (DF Site) to the east are located south of Bolong Road, Bomaderry, while the approved Packing Plant (PP) Site is located directly opposite the SS Site on the northern side of Bolong Road. Within the broader SS Site, the Moorehouse Site lies south of Bolong Road, immediately west of the railway line, while the Interim Packing Plant Site (IPP Site) lies south of Bolong Road immediately east of the railway line.

A final site warranting discussion is the small Shoalhaven Water Site (SW Site) which fronts Bolong Road directly opposite the IPP Site.

These sites are shown in their local context in **Figure 12**.

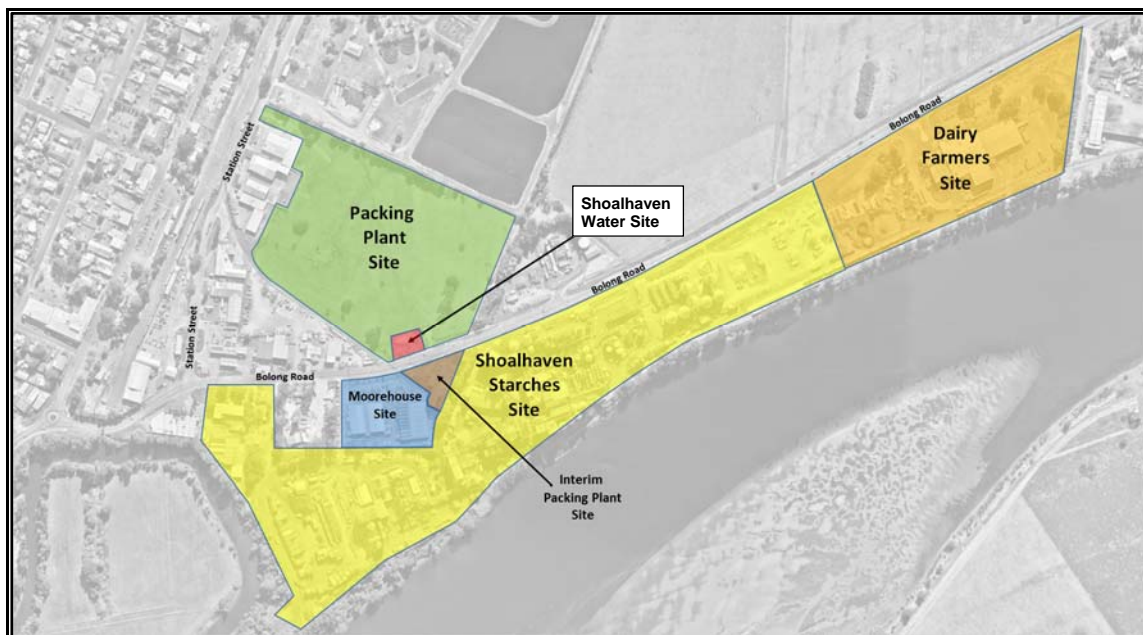


Figure 12: Location plan.
(ARC Traffic & Transport)

Access

Bolong Road and SS Site Western Access Point (AP 3)

The intersection of Bolong Road and AP 3 currently provides two-way access for light and heavy vehicle traffic generated in the western and southern parts of the SS Site. This intersection will provide access for all construction heavy vehicles, which would then use the internal SS Site access road network to enter and depart the Moorehouse Site from the south.

Bolong Road and Moorehouse Site Access Point (AP 4)

The intersection of Bolong Road & AP 4 currently provides two-way access to a designated staff car park for some 118 vehicles. Some 30 spaces would be relocated during the Stage 1 external construction works, but would then be fully reinstated during Stage 2 internal construction works.

Bolong Road and Interim Packing Plant Access Point (IPP 1)

The intersection of Bolong Road & IPP 1 provides separate entry and departure driveways (joined by a small internal access road). This intersection is located directly opposite the approved PP Site access point (PP 1), such that the use of PP 1 during the Stage 1 construction for access to the temporary car park, would effectively create an off-set four-way intersection.

PP Site Access Points

The SSEP provides for two access points to the PP Site.

At Bolong Road, an approval has been provided for a left in only access point (PP 1) accessed via a short deceleration lane. This deceleration lane and a driveway crossing for this intersection of Bolong Road & PP 1 have been constructed, but currently connect to a short access road running perpendicular to Bolong Road and providing two-way access, rather than angled access road from Bolong Road, providing left in arrival access only, as per the SSEP Approval.

The demolition of an existing industrial building at the Moorehouse site is required in order to enable construction of the No. 5 Starch Dryer and a modification proposal has been submitted separately for this proposal. The demolition modification provides for the retention of the above crossover and existing access road to provide access to a temporary car park that is to be constructed as part of the demolition modification to accommodate SS Site staff parking relocated from the Moorehouse Site during the demolition of the existing building, and for demolition staff.

This Modification requires almost identical SS Site staff parking relocation (for the Stage 1 external construction works) and construction staff parking provisions, and as such it is proposed that these same access arrangements and temporary car park would remain in place as part of this Modification.

It is acknowledged by ARC that the SSEP Approval provides for an angled access road from Bolong Road at PP 1 facilitating only heavy vehicle arrival trips; this design was proposed (and approved) to appropriately accommodate heavy vehicles entering PP 1 from Bolong Road. Following the construction and use of the existing access road and temporary car park for the construction works associated with the Modification, the construction of the PP 1 access road as per the SSEP Approval would be undertaken as part of the Packing Plant construction (a further separate modification application for which is currently being finalised).

In Railway Street, an approval has been provided for an all movement priority access point (PP 2). This access point would also be constructed as part of the future Packing Plant construction.

Other SS Site Access Points

Three other SS Site access points are provided to Bolong Road, including the Central Access Point (AP 2); Eastern Access Point (AP 1); and the Dairy Farmers Access Point

(DF 1). However, this Modification proposal would not generate any additional movements to these intersections.

Traffic Flows

Further to the commission of traffic surveys over many years, and in consultation with Council, ARC has over time developed base peak period traffic flows for the key intersections along Bolong Road that reflect 120th Highest Hour (or 'recreational peak') conditions. 2014 recreational peak flows were most recently reported in the Meat Plant TIA, and have been adapted for this assessment, and include:

- 2016 recreational peak through flows in Bolong Road;
- All approved/proposed access and intersection infrastructure to September 2015;
- All approved/proposed flows to the SS Site and DF Site to September 2015 (ie. including the DF Car Park and Meat Plan); and
- A minor trip assignment to reflect the occasional parking accessed via PP 1.

Base 2016 peak hour traffic flows for the assessment are provided in **Figures 13 and 14**. These flows take into account future flow estimates associated with the Princes Highway Upgrade.

Intersection Performance

SIDRA analysis undertaken by ARC identifies that all site access intersections (as described above) and the intersection of Bolong Road and Railway Street are currently operating at a good Level of Service (**LoS**), with minimal average delays and significant spare capacity.

ARC notes that further to the opening of upgraded sections of the Princes Highway, a large percentage of the arrival and departure trips from/to the east reported at the SS Site access points are expected to be redistributed to the Princes Highway (ie. to/from the west) in the same way as general sub-regional trips are redistributed. However, according to ARC, this would have little if any impact on the performance of the intersections

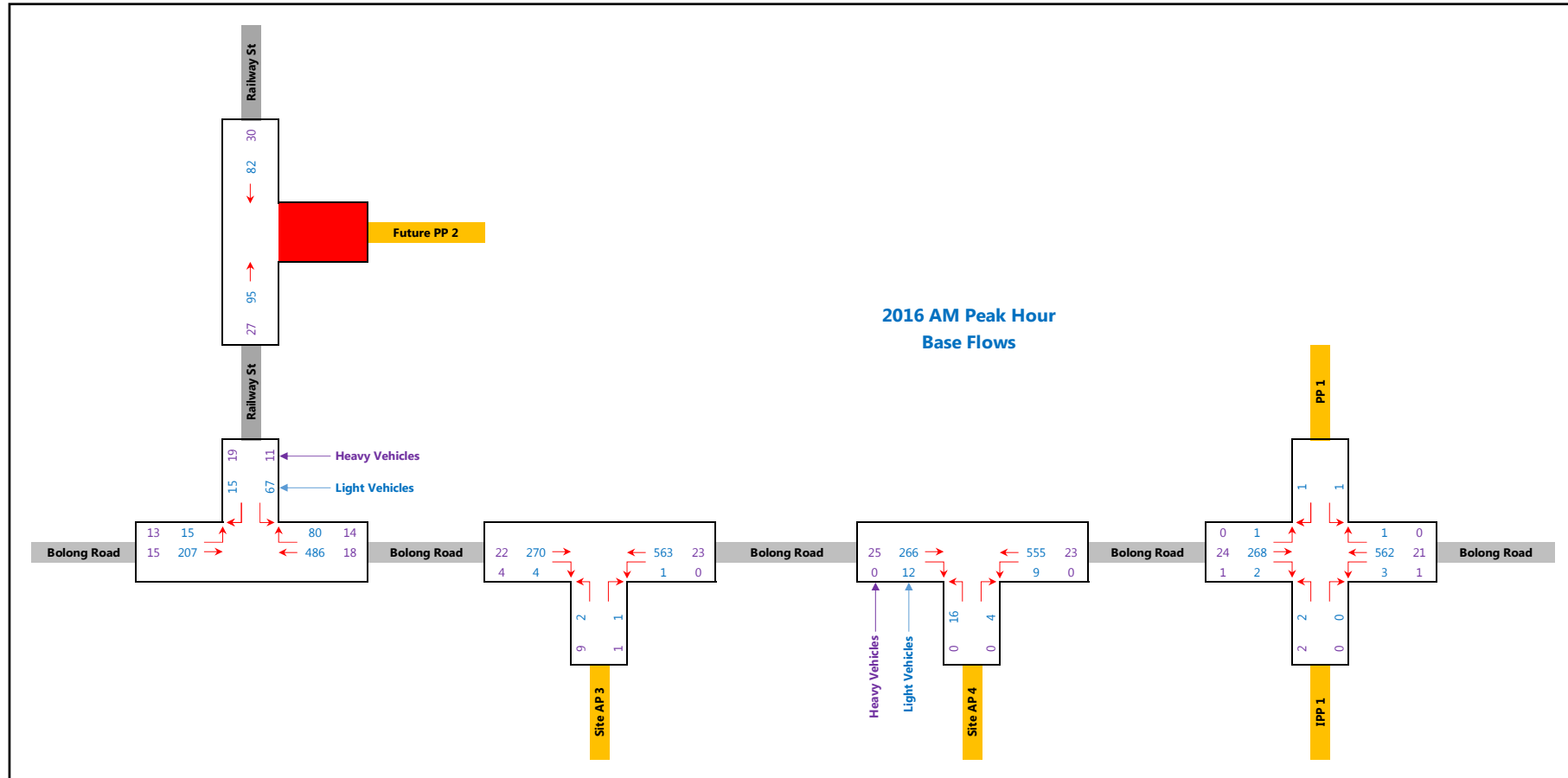


Figure 13: 2016 AM peak hour base traffic flows.
 (ARC Traffic and Transport)

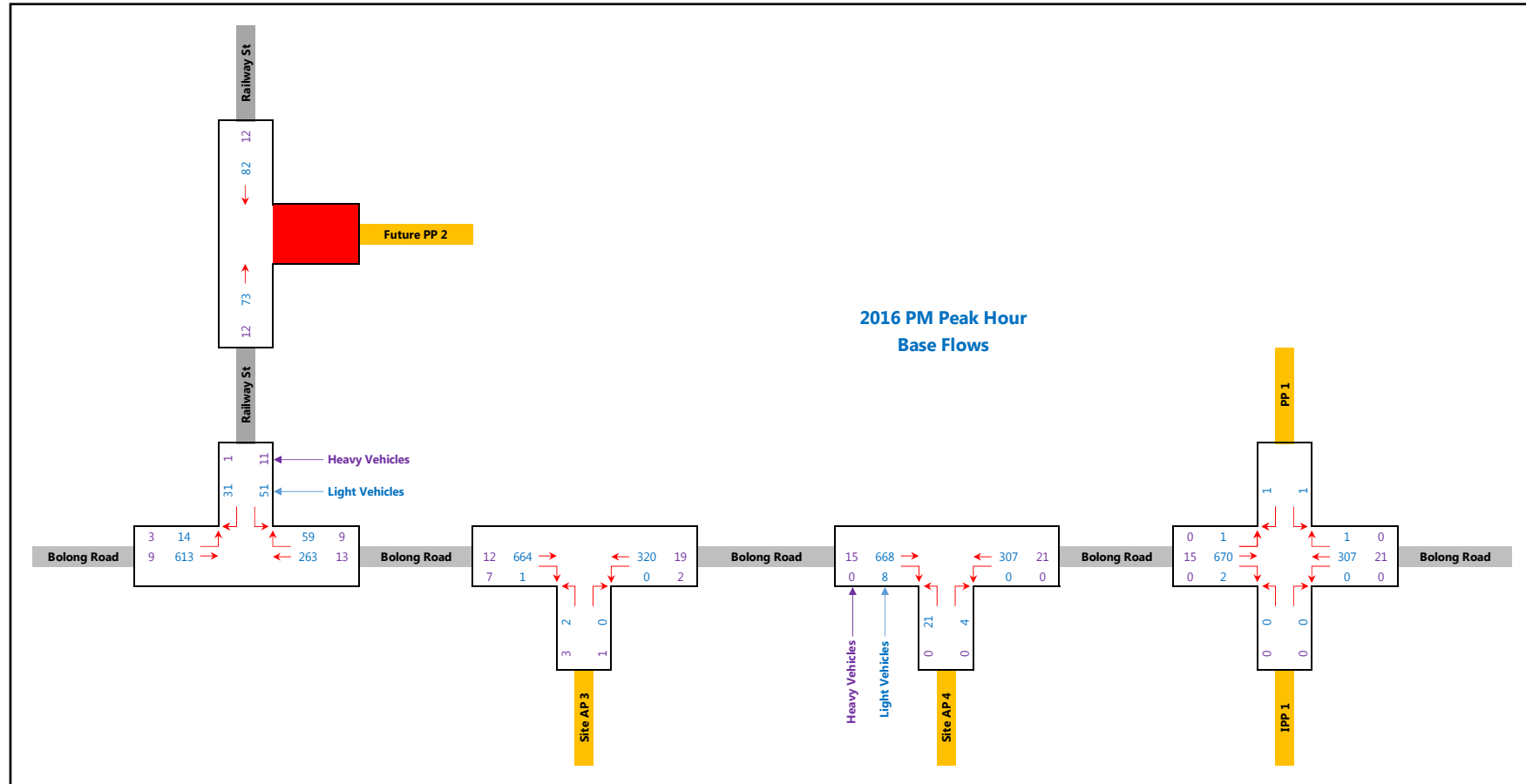


Figure 14: 2016 PM peak hour base traffic flows.
 (ARC Traffic and Transport)

7.4.2 Traffic and Access Associated with the Proposal

This Modification Application involves the relocation of Starch Dryer No. 5 from within the existing Shoalhaven Starches factory site to land on the western side of Abernethy's Creek, otherwise known as the "Moorehouse" site.

Two stages of construction works are proposed as part of this Modification proposal:

- Stage 1 external construction works: and
- Stage 2 internal construction works.

During the Stage 1 external construction works, part of the area within the Moorehouse site that is currently used for staff parking will be required for construction activities. As a result, 30 of the 118 existing parking spaces will be required to be temporarily relocated to the northern side of Bolong Road. Following the completion of the Stage 1 construction works, Stage 2 (internal) construction works would allow for the reinstatement of these parking spaces at the Moorehouse Site.

Once operational, the Starch Dryer would not result in any increase in production from over that which has been the subject of past approvals, nor any increase in either vehicle traffic or rail movements/duration of train crossings at the Bolong Road rail crossing over that which has been the subject of past approvals.

Under these circumstances, the Modification proposal has the potential to generate short term impacts associated with the construction stages only.

Construction Traffic and Access Characteristics

Access Paths

The Stage 1 and Stage 2 construction periods will result in a redistribution of staff trips, and the introduction of construction vehicle trips. In summary:

- AP 3 will generate minor additional construction heavy vehicle arrival and departure trips during both Stage 1 and Stage 2 construction works, which would be exclusively to/from the west.
- AP 4 will generate a reduced number of staff vehicle trips during Stage 1 construction commensurate with the relocation of 30 staff parking spaces to the northern site; during Stage 2 construction these spaces would be reinstated, and as such AP 4 would have a trip profile essentially identical to the existing trip profile.
- PP 1 will generate the staff arrival and departure vehicle trips relocated from the Moorehouse Site during the Stage 1 construction works, and construction staff vehicle trips during both Stage 1 and Stage 2 construction works.

Access Point Design

All access for the construction of the temporary car park on the PP Site will be via the intersection of Bolong Road and PP 1. To facilitate this access, the existing access road will be widened and extended between Bolong Road and the temporary car park with reference to AS 2890.2 as part of the Demolition Modification; further details of these works are provided in the Demolition Modification submission to the DP&E.

As discussed, as part of the future Packing Plant construction, PP 1 would be constructed in accordance with the SSEP Approval, as would PP 2 to Railway Street, and the temporary car park removed.

Heavy Vehicle Trips

According to ARC, it is estimated that both the Stage 1 and Stage 2 construction periods could generate up to 10 heavy vehicles (or 20 heavy vehicle trips) per day bringing construction materials and plant. As such, it is estimated that no more than 1 – 2 heavy vehicle trips would be generated during the (commuter) peak hours. It is noted by ARC that a crane and other plant required for the construction would remain on-site for the duration of their requirement rather than be transported daily.

Construction Staff - Vehicle Trips

Both Stage 1 and Stage 2 construction works are estimated to employ up to 30 construction staff per day, including an on-site supervisor and occasional specialists. As with previous projects, a core group of construction staff (11) are expected to arrive in group transport (ie. shuttle buses) from Wollongong, while other construction staff would generate a mix of shared and individual private vehicle trips. Given that construction work hours are expected to fall outside of (commuter) peak periods, and the expectation of only minor driver only trips, it is estimated that the no more than 1 – 2 construction staff vehicle trips would be generated during the commuter peak hours.

SS Site Staff Trip Redistribution

The relocation of 30 staff parking spaces from the Moorehouse Site during Stage 1 construction works is expected to result in a commensurate redistribution of staff vehicle trips. With reference to **Figure 13** and **Figure 14**, AP 4 currently generates the following peak period staff vehicle trips:

- In the AM peak hour, 21 arrival trips and 20 departure trips; and
- In the PM peak hour, 8 arrival trips and 25 departure trips.

As such, the relocation of 30 parking spaces from the Moorehouse Site to the northern site is expected to result in approximately 25% of staff trips being redistributed to PP 1, or the redistribution of the following trips:

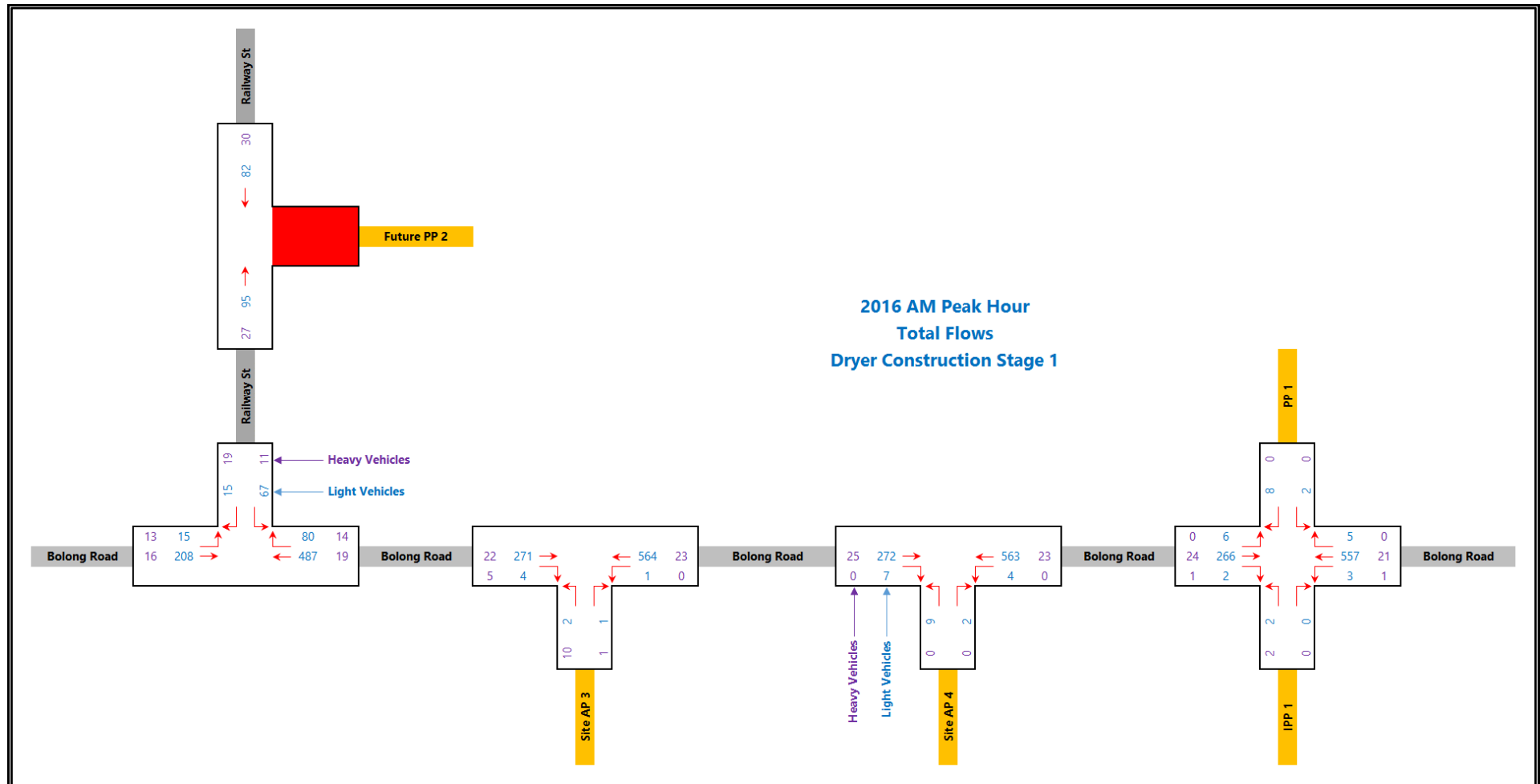
- In the AM peak hour, 6 arrival trips and 5 departure trips;
- In the PM peak hour, 2 arrival trips and 6 departure trips.

The trip generation associated with the remaining 88 spaces on the Moorehouse Site would continue to be generated at AP 4 during the Stage 1 construction works.

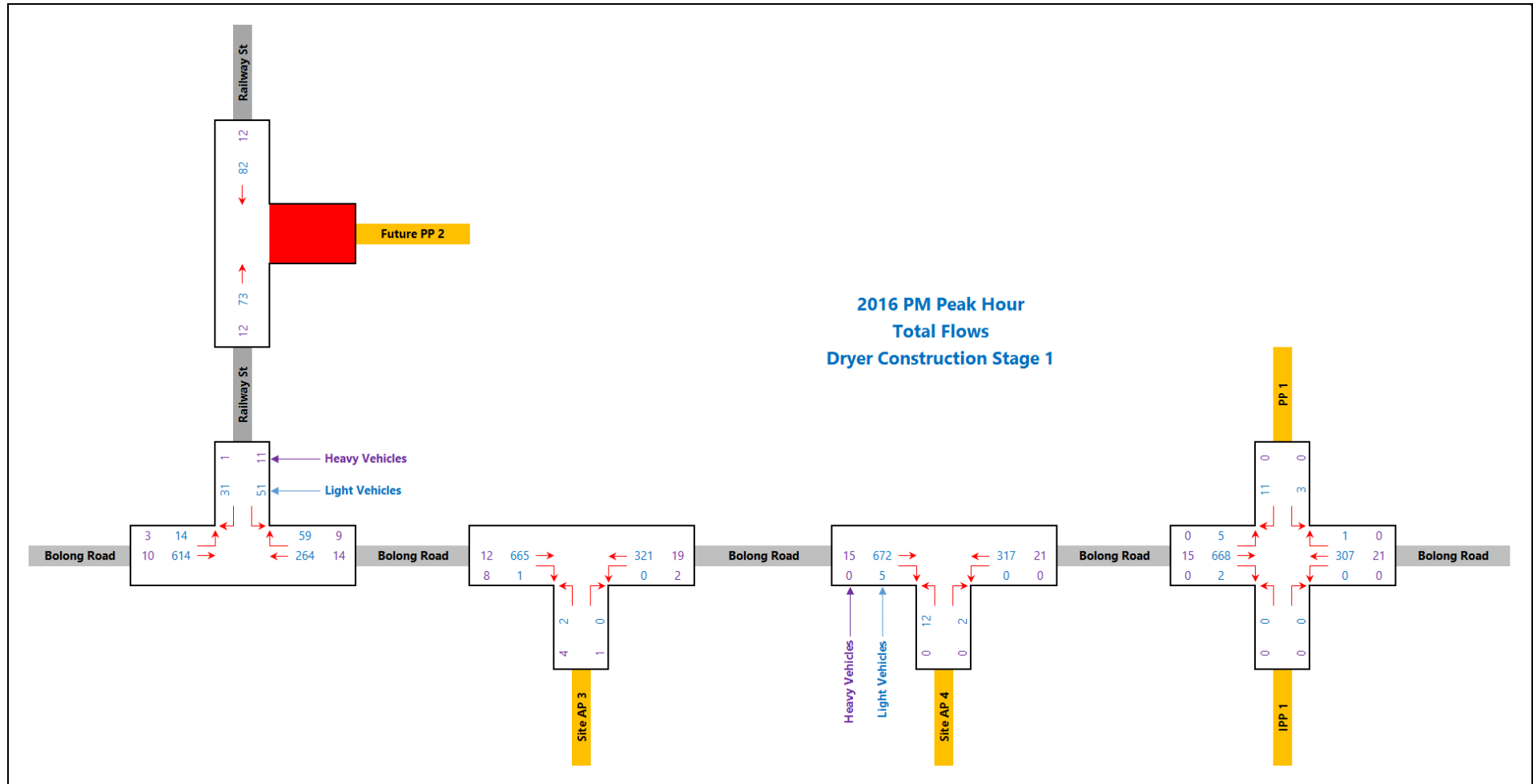
During the Stage 2 construction works, all staff parking spaces would be reinstated at the Moorehouse Site, ie. staff trips would return to their existing trip profile at AP 4.

Construction Stage – Traffic Flows

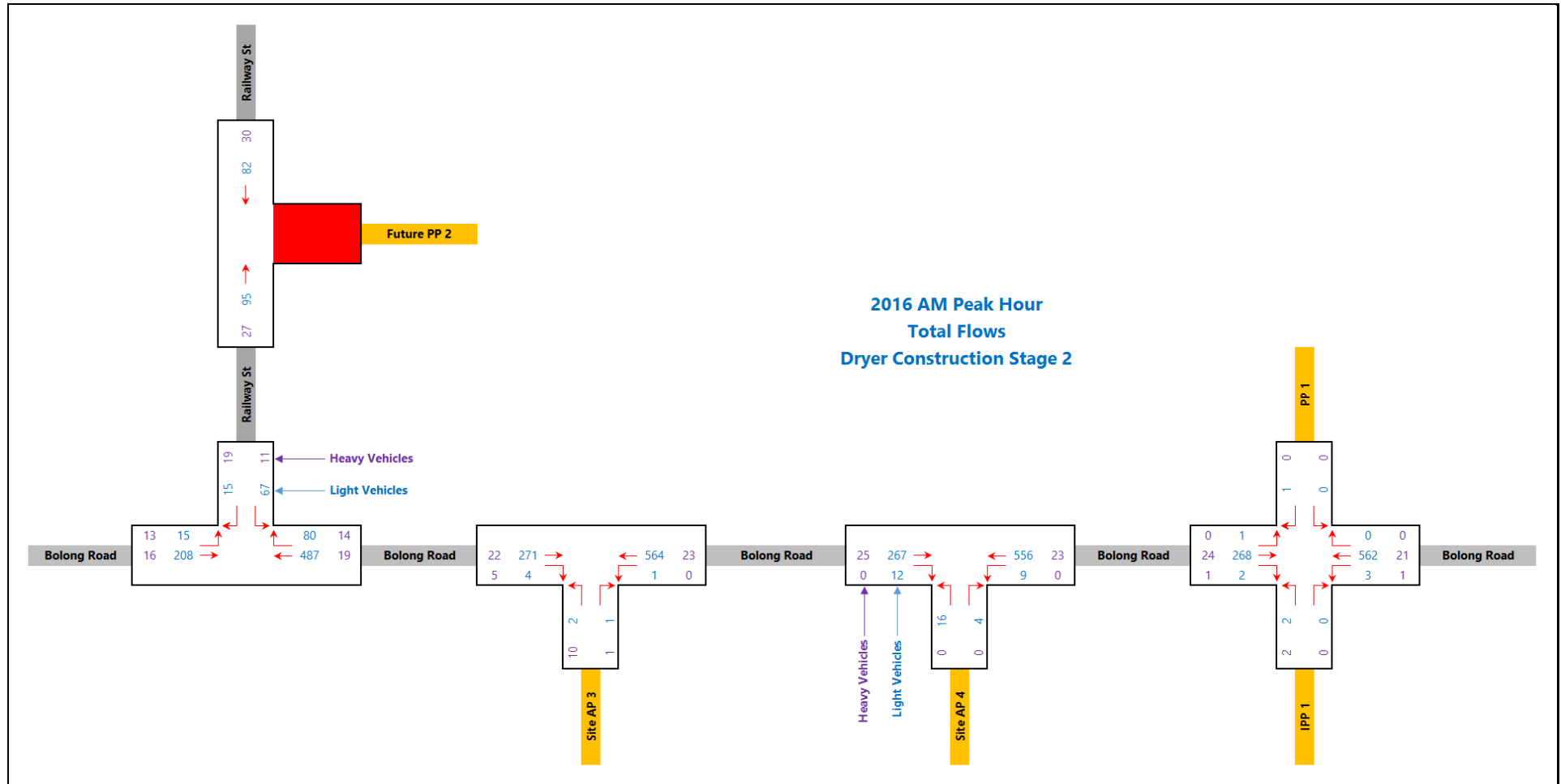
Total traffic flows during each of the construction stages are shown in **Figures 15 to 18**.



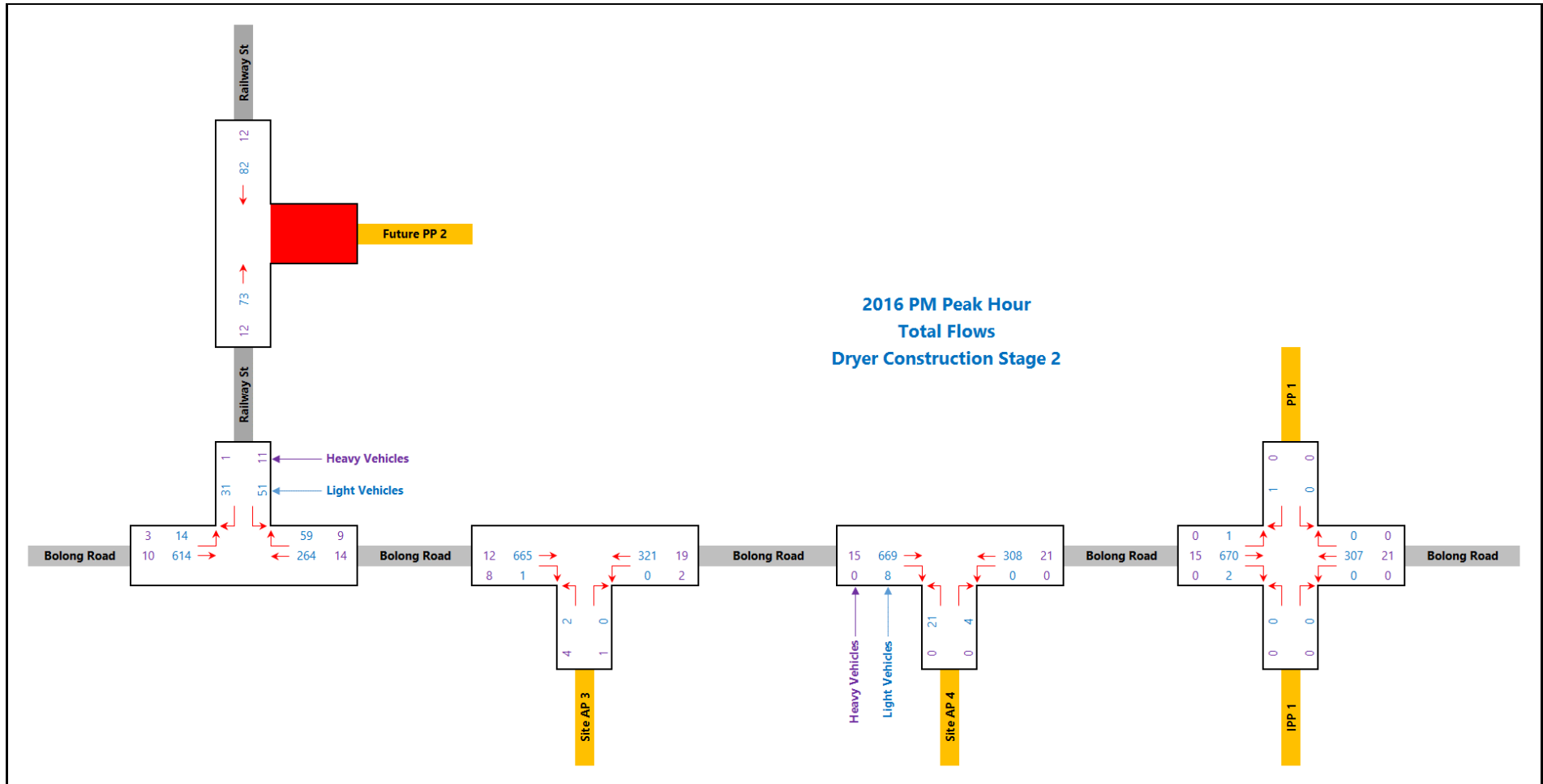
**Figure 15: Construction Stage 1 AM Peak Hour Total Flows
(ARC Traffic and Transport)**



**Figure 16: Construction Stage 1 PM Peak Hour Total Flows
(ARC Traffic and Transport)**



**Figure 17: Construction Stage 2 AM Peak Hour Total Flows
(ARC Traffic and Transport)**



**Figure 18: Construction Stage 2 PM Peak Hour Total Flows
(ARC Traffic and Transport)**

7.4.3 Impact Assessment

Intersection Performance

ARC have undertaken an assessment of intersection performance using SIDRA and based on the calculated total traffic flows during the construction stages. The results of ARC's analysis (see **Annexure 7**) clearly indicate that the new and redistributed traffic conditions during the construction stages would have no significant impact on the operation of the local traffic network, with no significant changes in average delay, reductions in capacity, or increases in queue lengths at any of the key intersections.

ARC note that, while the traffic generation to/from PP 1 will increase further to this modification, the turn paths to/from Bolong Road at PP 1 would be no different to those currently available, ie. all movements to and from PP 1. Moreover, the driveway would operate in an almost identical manner to other industrial and commercial driveways in this section of Bolong Road, and only for the Stage 1 construction works.

Parking

As described, during the Stage 1 construction works some 30 staff parking spaces will be relocated from the Moorehouse Site to the northern site. With reference to the demolition modification, it is proposed that 60 temporary spaces will be provided in the temporary car park, accommodating not only the relocated staff parking, but also all construction staff parking. The temporary car park would provide hardstand comprising steel mill slag with a bitumen surface, and be delineated with reference to Australian Standard 2890.1 so as to provide appropriate aisle width and parking space dimensions.

Again, once the Stage 1 construction works are completed, the full complement of staff parking would be reinstated at the Moorehouse Site, but the temporary car park would continue to be used by Stage 2 construction staff.

Pedestrian Access

During both stages of construction, staff and construction staff utilising the temporary car park would be able to cross Bolong Road via the existing pedestrian refuge immediately east of the PP1 access point. This links to the formal pedestrian path on the southern side of Bolong Road, and from there provides access to the broader internal pedestrian path network.

It is noted that the formal pedestrian footbridge crossing of Bolong Road per the Expansion Project Approval (between the PP Site and southern side of Bolong Road) is expected to be constructed as part of a future Packing Plant construction project.

7.4.4 Conclusion

The Traffic and Parking Assessment carried out by ARC makes the following conclusions:

During the Stage 1 construction works, 30 staff parking spaces will be relocated from the Moorehouse Site to the PP Site, with a resulting redistribution of existing trips. However, this redistribution of trips – and the minor additional generation of construction vehicle trips – would have no impact on the operation of the local road network during the Stage 1 construction.

During the Stage 2 construction, the 30 staff parking spaces relocated from the Moorehouse Site during the Stage 1 construction will be reinstated, but construction vehicle trips will continue to be generated at AP 3 and PP 1. However, these minor additional construction vehicle trips would have no impact on the operation of the local road network during the Stage 2 construction.

The temporary car park to be provided on the PP Site will be constructed as part of the Demolition Modification, and be designed with reference to AS 2890.1 in regard to aisle width and space dimensions. The temporary car park will be specifically constructed to accommodate the peak demand associated with the relocation of SS Site staff car parking and peak construction staff parking demand.

Pedestrian access between the PP Site and the broader SS Site south of Bolong Road would be via the existing pedestrian refuge crossing immediate adjacent to the intersection of Bolong Road & PP 1.

7.5 PRELIMINARY HAZARD ANALYSIS

In relation to hazards the Environmental Assessment Requirements issued by the NSW DoPE for this project require the following to be addressed.

In relation to hazards, as noted below, the assessment should include updated hazard studies that address all new/relocated/modified infrastructure. The purpose of requesting these studies as part of the environmental assessment is to minimise the post-approval requirements and enable construction to commence following approval (subject to satisfying any other pre-construction conditions).

As well as the following in a separate email dated 19th November 2014;

In relation to hazards, the Department requests that your application is supported by the following studies. The studies should also incorporate/respond to comments provided on these studies by the Department in October 2014:

- *a construction safety study for the modification;*
- *an updated site-wide fire safety study;*
- *a hazard and operability study for the modification;*
- *an updated preliminary hazard analysis for the modification.*

The need to provide the Construction Safety Study, Site-wide Fire Safety Study and HAZOP as part of this EA was revised by the DoPE in an email dated 27th October 2015 (**Annexure 2**). As a result the EA is only required to be supported by a Preliminary Hazard Analysis.

This Modification Application is supported by a PHA prepared by Pinnacle Risk Management Pty Ltd (“Pinnacle”). A copy of the PHA forms **Annexure 8** to this EA. This section of the EA is based upon the findings of this assessment.

The PHA prepared by Pinnacle assesses the credible and potential hazardous events and corresponding risks associated with the relocating of Starch Dryer No. 5 with the potential for off-site impacts only. Transport of the starch is not included as, according to Pinnacle, it is not a Dangerous Good.

In accordance with the approach recommended by the DoPE in *Hazardous Industry Planning Advisory Paper (HIPAP) 6 – Hazard Analysis* the underlying methodology of the PHA is risk-based, that is, the risk of a particular potentially hazardous event is assessed as the outcome of its consequences and likelihood.

The PHA prepared by Pinnacle was conducted as follows:

- Initially, the new starch dryer and its location were reviewed to identify credible, potential hazardous events, their causes and consequences. Proposed safeguards were also included in this review;
- As the potential hazardous events are located at a significant distance from other sensitive land users, the consequences of each potential hazardous event were estimated to determine if there is any possible unacceptable off-site impacts;
- Included in the analysis is the risk of propagation between the proposed equipment and the adjacent processes; and
- If adverse off-site impacts could occur, assess the risk levels to check if they are within the criteria as outlined in the DoPE’s *HIPAP 4 – Risk Criteria for Land Use Safety Planning*.

7.5.1 Hazard Identification

Process Materials

Starch

Starch or “*amylum*” is a carbohydrate consisting of a large number of glucose units joined together. According to Pinnacle it is not defined as a hazardous material or a Dangerous Good.

Starch is produced by most green plants as an energy store. It is the most common carbohydrate in human diets and is contained in large amounts in such staple foods as potatoes, wheat, corn, rice, and cassava.

Papermaking is the largest non-food application for starches globally. In a typical sheet of copy paper, the starch content may be as high as 8%.

Starch is a fine, white, odourless powder. The respiratory TWA according to Pinnacle is 5 mg/m³. It is insoluble in water. Starch is not defined as a combustible solid (it will not support combustion) but may form explosive mixtures with air. According to Pinnacle it is a potentially explosive dust when critical parameters exist, eg. particle size less than 500 micron and moisture content less than 30%.

According to Pinnacle potential ignition sources include:

- Smouldering, self-heating or burning dust;
- Open flames, eg. welding, hot work, cutting and matches;
- Hot surfaces, eg. hot bearings, dryers, incandescent materials and heaters;
- Lightning;
- Heat from mechanical impact or friction; and
- Electrical discharges and arcs.

K_{st} is a measure of a dust's explosibility classification and is a measure of the maximum rate of pressure rise, ie. the higher the K_{st} value, the greater the explosive energy. According to Pinnacle starch, has a K_{st} value of 199 bar.m/s and deemed to comprise potentially weak explosions although Pinnacle notes previous incidents involving starch dust explosions have led to fatalities

Starch is non-toxic to people and has a low environmental impact potential. It is mildly irritating to eyes and lungs.

CIP Chemicals

Typical chemicals used are low strength caustic soda, sodium hypochlorite, hydrochloric acid and sulphuric acid. These materials are all Class 8 corrosive liquids, ie. there is the potential for burn injuries to personnel on contact.

According to Pinnacle there is the potential for adverse reactions if mixed, eg. caustic with sulphuric acid or hydrochloric acid which create give heat whilst sodium hypochlorite with sulphuric acid or hydrochloric acid will yield chlorine gas. These are existing known hazards at the site given these materials are routinely used for equipment cleaning.

From the above review, according to Pinnacle the quantities of Dangerous Goods associated with the new starch dryer, ie. the CIP chemicals, is limited. From the

State Environmental Planning Policy (SEPP) No.33 (Ref), a PHA would not be required for them. However, as dust explosions are possible with the product starch then a PHA is required.

Potential Hazardous Incidents Review

In accordance with the requirements of HIPAP 6 it is necessary to identify hazardous events associated with the facility's operations. As recommended in HIPAP 6, the PHA prepared by Pinnacle focuses on "*atypical and abnormal events and conditions. It is not intended to apply to continuous or normal operating emissions to air or water*".

In keeping with the principles of risk assessments, credible, hazardous events with the potential for off-site effects have been identified by Pinnacle. That is, "*slips, trips and falls*" type events are not included nor are non-credible situations such as an aircraft crash occurring at the same time as an earthquake.

The identified credible, significant incidents with the potential for off-site impacts for the proposed facility are summarised in the PHA prepared by Pinnacle. These potential events are based on known incidents and dust process safety and were derived by Pinnacle via a Hazardous Event Identification workshop conducted at the site. Only the potential hazardous events that could cause significant consequences are addressed in the PHA.

7.5.2 Risk Analysis

The assessment of risks to both the public as well as to operating personnel around the new starch dryer requires an analysis technique commensurate with the nature of the risks involved. Risk analysis could be qualitative, semi-quantitative or quantitative.

The typical risk analysis methodology attempts to take account of all credible hazardous situations that may arise from the operation of processing plants etc.

Having identified all credible, significant incidents, risk analysis requires the following general approach for individual incidents:

$$\text{Risk} = \text{Likelihood} \times \text{Consequence}$$

The risks from all individual potential events are then summated to get cumulative risk.

For QRA and hazard analysis, the consequences of an incident are calculated using standard correlations and probit-type methods which assess the effect of fire radiation, explosion overpressure and toxicity to an individual, depending on the type of hazard.

In this PHA, however, the approach adopted by Pinnacle to assess the risk of the identified hazardous events is scenario based risk assessment. The reasons for this approach are according to Pinnacle:

1. *The distance from the new equipment to residential and other sensitive land users is large and hence it is unlikely that any significant consequential impacts, e.g. due to radiant heat from fires, from the facility will have any significant contribution to off-site risk;*
2. *The new equipment is to be protected from explosions using explosion vents and hence these will limit the impact distance; and*
3. *There are a limited number of process safety events and therefore cumulative and societal risk is not required. The main events of interest are dust explosions and fire events. Therefore, these are analysed in the remaining sections of this report.*

Dust Explosions

The PHA prepared by Pinnacle includes a summary of historical dust explosions. Pinnacle note that analysts suggest that not all dust explosions are reported. One analyst reports that only 15% of the actual dust explosions that occur are reported, ie. many more may have occurred.

Based upon the above Pinnacle identify that dust explosions are credible events and can cause significant impacts.

According to Pinnacle the damage radius of a dust explosion is usually limited to the building (or equipment item) in which it occurs and to a very short range outside. This is supported by the historical incidents involving dust explosions where the majority of fatalities involve on-site personnel.

The majority of dust explosion incidents according to Pinnacle resulted in no fatalities. For the incidents where fatalities occurred, these were to on-site personnel. Historically, about one in six fatalities occur in the food and grain industry. Again, the greater risk for fatality or injury for dust explosions is to on-site personnel.

Given the estimated impact distances and the distances to off-site areas from the vents (at least 50 m) Pinnacle indicate that there would be no significant off-site impacts, ie. fatalities, or injuries in residential areas are expected from explosion overpressures associated with this modification proposal.

With respect to possible maximum horizontal flame length from a vented dust explosion Pinnacle indicate that no flame length has ever been measured greater than 30 m (even for large volumes). Pinnacle indicate that this should be taken as the upper limit. Pinnacle also indicate that the effects of thermal radiation from the fireball is limited to

close to the fireball's surface given the short duration. For the new starch dryer, the estimated flame length according to Pinnacle is approximated as 30 m (ie. the worst case flame length).

Typically, the flames from a ruptured or vented vessel travel horizontally and vertically. For the new explosion vents, the flame will travel horizontally given the proposed orientation. For a 30 m flame length, the flames are therefore unlikely to impact people off-site as the new explosion vents are elevated (approximately 25 m high) and point to the east, ie. across the creek that runs through the site.

Hence, given the above consequence assessment, according to Pinnacle adverse impacts from the vented dust explosions is unlikely for off-site personnel and therefore the risk of fatality, injury or property damage is expected to comply with risk criteria.

Building Explosions

According to Pinnacle it is possible that dust explosions could occur in the new starch dryer building, eg. deposited dust is not removed due to failure of the housekeeping program.

This hazard exists at the site now for the existing dryer buildings.

The primary means to prevent this event is to design for containment, ie. do not release combustible dust into the building. This is the basis for the design of the existing dryer buildings and will be similar for the new starch dryer.

Should losses of containment of combustible dust occur then controls such as housekeeping, hazardous zoning and permits to work are required. These are important measures to lower the risk of dust explosions within the existing building. As this hazard exists now on-site and the new equipment is being designed to the same standard as the existing equipment then no further safeguarding is recommended for this scenario.

As supported by historical evidence. Pinnacle indicates that as the damage radius of dust explosions is usually limited to the building (or equipment item) in which it occurs and to a very short range outside, significant adverse impact to people off-site is not expected, in particular, given the large distances to residential areas.

Natural Gas Pipeline Failures

Failures associated with the natural gas feed line to the air heater will release the natural gas to atmosphere and, if ignited, it can form a jet fire, a flash fire and/or an explosion.

The natural gas line will be installed aboveground in a pipe rack from the existing on-site natural gas main. The supply pressure is 2 barg. The gas pipe will be approximately

80 mm nominal diameter (maximum heating is approximately 36 GJ/hr) and it will be approximately 100 m long. The pipe will have welded joints where possible. All flanged joints will have a hazardous atmosphere zone around them.

Based upon Pinnacles analysis no adverse radiant heat levels will be imposed off-site as the natural gas pipe will be at least 59 m from Bolong Road.

Potential vapour cloud explosions and flash fires can occur from the natural gas line failures, ie. delayed ignition.

For flash fires, any person inside the flash fire cloud is assumed to be fatally injured. As flash fires are of limited duration (typically burning velocity is 1 m/s) then those outside the flash fire cloud have a high probability of survival without serious injury.

For these releases of natural gas, choked flow exists and rapid jet mixing with air occurs. The result is a relatively small vapour cloud size with limited consequential impacts if ignited. The 30 minute release duration also has no significant impact on the release. Steady state conditions are reached soon after the release occurs (ie. after approximately 4 minutes, the distance to the LEL does not change at steady state dispersion conditions).

Given these results for the natural gas vapour cloud explosions and flash fires, it is Pinnacle's view that no adverse consequential impacts will be imposed off-site.

As an estimate of a natural gas release with subsequent ignition, take the following:

1. 80 mm pipe, catastrophic failure frequency is 3×10^{-7} per metre per year.
2. For 100 m of pipe, the total catastrophic release frequency is 3×10^{-5} per year.
3. For an ignition probability of approximately 0.1 then the release and ignition frequency is 3×10^{-6} per year.

According to Pinnacle this is a low level of risk and not considered intolerable. Given the significant consequential effects are contained on-site then the relevant criteria are expected to be satisfied.

Dust Explosion Safeguarding

For equipment processing a potentially explosive dust, it is generally not possible to always ensure the concentration of the dust is below the lower explosive limit. Rather, safeguarding is required to prevent and/or control the potential explosions as discussed below.

There are no mandatory standards or regulations that dictate the design criteria and features for equipment where dust explosions can occur. However, the main means for safeguarding against dust explosions according to Pinnacle include:

- Dust Free Process;
- Dust Control;
- Control of Ignition Sources;
- Inerting;
- Explosion Containment;
- Explosion Isolation;
- Explosion Suppression;
- Explosion Venting;
- Equipment Separation.

With respect to this modification proposal Pinnacle indicate in practice the assessment of dust explosion hazards is bound to be subjective because the problem is too complex for quantitative analytical methods to yield an indisputable answer. Therefore, the acceptable safeguards for any given design will vary from company to company. Based upon references reviewed by Pinnacle most of the dust explosion hazards in the grain, feed and flour industry can be eliminated by soft means such as training, motivation, improving the organisation, good housekeeping and proper maintenance. All of these safeguards are in-place at Shoalhaven Starches.

When these are combined with the additional measures proposed for the new equipment then further risk reduction is achieved. According to Pinnacle these additional measures include all equipment handling potentially explosive dust is to be designed to ATEX standards including rotary valves, explosion vents, spark arrestors, interlocks to prevent only dry feed to the paddle mixers, metal trap to minimise the risk of ignitions in the pin mill, equipment bonding and earthing, minimisation of horizontal surfaces in the buildings where dust can collect, screw feeders to contain plugs to prevent flame propagation, steam quenching and hazardous area zoning with the electrics and instruments to suit the requirements.

Aircraft Impact and Other External Events

According to Pinnacle previous risk assessments have shown that the likelihood of an aircraft crash is acceptably low within Australia. Typical frequencies associated with aircraft crashes are:

- Scheduled aircraft 1×10^{-8} /year; and
- Unscheduled aircraft 4×10^{-7} /year.

The likelihood of this type of event according to Pinnacle is acceptably low for a site of this size and location.

Other external events that may lead to propagation of incidents on any site include:

Subsidence	Landslide
Burst Dam	Vermin/insect infestation
Storm and high winds	Forest fire
Storm surge	Rising water courses
Earthquake	Storm water runoff
Breach of security	Lightning
Tidal waves	

These events were reviewed by Pinnacle and none of them were found to pose any significant risk to the new facility given the proposed safeguards. Flooding can occur at this site, however according to Pinnacle, any potential propagation events are unlikely to be significant given that the new equipment is being designed for the expected flood conditions.

Cumulative Risk

The PHA demonstrates that the proposed modification will have negligible impact on the cumulative risk results for the local area as the significant consequential effects such as explosion overpressures are local to the equipment.

Pinnacle concludes that the development does not make a significant contribution to the existing cumulative risk in the area.

A review of the potential propagation risks both from and to the new equipment was conducted by Pinnacle. The main potential for propagation is dust explosions including flames being emitted from the new explosion vents. From the information available to date, either the vented explosions discharge vertically up from the top of the building (ie. to a safe location) or are pointed to the east of the building across the creek that flows through the site. Propagation from the latter is not expected given the low overpressures beyond 10 m from the vents (ie. less than 9 kPa) and the short duration of the event.

Societal Risk

According to Pinnacle the risk of fatality does not extend significantly from the equipment and is therefore well away from the residential areas. The concept of societal risk applying to residential population is therefore, according to Pinnacle, not applicable for the new equipment.

Risk to the Biophysical Environment

The main concern for risk to the biophysical environment generally concerns effects on whole systems or populations.

As there are no hazardous materials of significant quantities associated with the new equipment, significant environmental impact is not expected. Importantly, any spilt material will be contained in the area or via the environmental farm.

Whereas any adverse effect on the environment is obviously undesirable, according to Pinnacle the risk of losses of containment impacting the environment is broadly acceptable.

The PHA identified no incident scenarios where the risk of whole systems or populations being affected by a release to the atmosphere, waterways or soil is intolerable.

Transport Risk

As starch is not deemed to be a Dangerous Good or hazardous material then the transport risk via road and rail is low. The CIP chemicals (Class 8 Dangerous Goods) are currently transported to site in limited quantities. The CIP operations for the new equipment will not result in a significant increase in these chemicals. The expected usage of these chemicals is only approximately 200 L per week. Therefore, according to Pinnacle the new facility is not deemed to be potentially hazardous due to materials transport by SEPP 33 and hence the transport risk is broadly acceptable.

7.5.3 PHA Conclusion and Recommendations

The PHA prepared by Pinnacle in relation to the proposed relocation of No. 5 Starches Dryer concludes:

The risks associated with the proposed new starch dryer at the Shoalhaven Starches Bomaderry site have been assessed and compared against the DoPE risk criteria.

In summary:

- *The potential hazardous events associated with the new equipment are primarily dust explosions. Given the location of the new equipment then no significant adverse off-site impacts to residential areas or similar are*

expected. Correspondingly, all risk criteria in HIPAP 4 are expected to be satisfied for this proposal;

- *The risk of propagation to neighbouring equipment is low given the proposed facility location; and*
- *Societal risk, environmental risk and transport risk are all considered to be broadly acceptable.*

The PHA prepared by Pinnacle makes the following recommendations in relation to this modification proposal:

1. *The existing safety management systems, e.g. maintenance procedures, operating procedures, training and emergency response plans, will need to be updated to reflect the proposed changes; and*
2. *All explosion vents should be positioned to avoid impact to personnel and sensitive equipment.*

7.6 SITE CONTAMINATION

The Environmental Assessment Requirements issued by the NSW DoPE for this project in part required the potential of site contamination to be addressed.

This Modification Application is supported by an Environmental Investigation Report prepared by Coffey Geotechnics (“Coffeys”) prepared in response to this issue. This assessment has reviewed issues pertaining to site contamination and acid sulphate soils. A copy of Coffeys report forms **Annexure 9** to this EA. This section of the EA is based upon the findings of this assessment.

7.6.1 Site Conditions and Surrounding Environment

Summary of Geo-environmental Site Setting

Coffey’s summarise the geo-environmental setting of the site as follows:

- *The investigation area is set within Manildra starches plant and is one of two light industrial warehouses within Lot 201 of DP 106268.*
- *Bolong Road is located to the north, workshops to the west and the Shoalhaven starches plant to the east and south;*
- *The site is located within the local government area of Shoalhaven, Parish of Bunberra and County of Camden;*
- *The site lies within a mainly commercial/industrial area and is zoned IN1 – general industrial viewed under the Shoalhaven City Council’s Local Environmental Plan webmaps;*
- *Geological information obtained from 1:250,000 Wollongong Geological Series Sheet (S1 56-9, First Edition) prepared by the NSW Department of Mines (1952) indicates the site is likely to be underlain by Quaternary Alluvium, gravel, swamp deposit and sand dunes;*

- *The Kiama 1:100,000 soil landscape series sheet 90928, published by the Department of Conservation and Land Management in 1984 indicates that the site is located on a landscape of flat to gently undulating terrace surfaces of the Shoalhaven River. From site observations during a previous environmental investigation by Coffey in 2003 the site was noted to have a gentle slope of <1% to the south. The Berry 1:25,000 Topographic Map indicates that the site lies at an elevation less than 10m above Australian Height Datum (AHD);*
- *During a recent Geotechnical investigation for the proposed starch dryer, groundwater was encountered between 2.8mbgs to 3.5mbgs (Coffey, 2015); and*
- *The nearest potential receiving surface water body in relation to the site is the Abernethy's Creek to the east approximately 10m. It was noted that the Abernethy's Creek flows in a southerly direction into the Shoalhaven River, approximately 200m south of the investigation area (Coffey, 2003).*

Previous reports

Two previous reports by Coffey's are associated with this site:

- *Coffey Geosciences Pty Ltd, Preliminary Environmental Site Assessment, Part Lot 22 DP 1000265 (No. 24) Bolong, Road, Bomaderry (Ref: SC1537/7-AD, dated 10 June 2003)*
- *Coffey Geotechnics Pty Ltd, Geotechnical investigation, proposed dryer plant, Manildra, Bomaderry (Ref: GEOTWOLL03658AE-AA, dated 26 August 2015)*

The Coffey (2003) report was a due diligence assessment prior to Manildra's purchase of a larger parcel of land which included the site of this investigation. The scope included a site history review and targeted sampling and analysis of site soils. The relevant site history indicated the following:

- Prior to 1948 the site was owned by private individuals and may have been vacant and used for farming or grazing purposes although this cannot be confirmed. In 1948 the site was purchased by a company named British Chemicals and Biologicals (formerly Bengel-Genatosan). Aerial photographs indicate that a warehouse was constructed in the eastern portion of the site and was apparent by 1949. Anecdotal evidence suggests that this company constructed the warehouse but never actually ended up using it or the site. This warehouse was subsequently used by the local technical college and later by the army reserve for only a short period.
- The site was purchased in 1964 by Moorehouse Industries (the registered proprietor back in 2003). A second warehouse was built nearby but to the west of the

investigation area at around this time and the site was used to build farm machinery up until about 1978. After 1978 the two light industrial warehouses were subdivided into smaller sections and leased to various companies which have used the warehouses and the site for things such as mechanical repairs and manufacturing of tractors and front end loaders. .

- The warehouse was occupied by “R.M.S Fabrication” and a mechanical repairs workshop and was used for the manufacture of tractors and front end loaders. The workshops appeared to contain metal manufacturing equipment and operations such as welding and spray painting were observed in this warehouse. Observations made inside the warehouse indicated that it had a concrete floor which appeared to be in fair to good condition with only minor cracking observed at the time.
- An underground storage tank was installed at a location adjacent to the central western boundary of the current site in the 1960s and used to store petrol for refuelling of vehicles. The tank apparently had a capacity of about 300 gallons. This tank was apparently abandoned in-situ about 30 years ago by filling with concrete. The site owner was not aware of the tank ever leaking.
- Based on the site history, the report identified relevant areas of environmental concern (AECs) and associated contaminants of concern. The AECs identified that are relevant to the current site are summarised below:
 - The whole site which may contain imported fill materials of unknown origin;
 - Exposed surfaces near the warehouses from potential weathering of lead based paint and fibro (potentially containing asbestos) roofing materials;
 - The light industrial warehouses from historical use for industrial activities comprising metal manufacturing and mechanical repairs.

Intrusive investigations were carried out to target some of the AECs, but excluded the workshop forming the majority of the current site due access constraints.

The results of this assessment identified some petroleum hydrocarbons in soil in areas where equipment was previously stored, but away from the current site. Coffeys note that guidelines used in 2003 are superseded. No evidence of petroleum hydrocarbon impact was noted at three borehole locations positioned near the UST which suggested, according to Coffeys that the likelihood of widespread contamination from the UST is low.

7.6.2 Site Interviews

Two interviews were carried out by Coffeys as part of the current environmental investigation to assess change in site activities since 2003 and whether the site conditions have materially changed the likelihood of contamination to exist in areas within and immediately surrounding the warehouse.

One interview identified that forklifts were given oil changes in the forklift maintenance area and that waste oil and transmission oil was kept in two intermediate bulk containers (IBCs) within this area. No oil was kept in the motor store and that this area was formerly a steel warehouse (Shoalhaven Steel) and that no chemicals were stored in the electricians' workshop. Underground storage tanks or sumps were not known of and that the former mechanics' workshop and belt store contained asbestos roofing. Degreasers, grease oil, engine fluids, coolant and possible fuels were once used in this area. Several 44 gallon drums outside contained food hydraulic oil.

The second interview indicated that within the former workshop there was a mechanics' pit (approximately 8 – 9 years ago) that was 0.65 m deep. The pit was used for mechanics to work under cars for performing oil changes. There were no hoists, as the roof was too low. The waste oil (no other chemicals mentioned during interview) was kept outside in the north-west corner of the building and a former aboveground storage tank was located on the concrete platform in this location. Other areas of the shed were rented out to others. Welding fabrication was carried out in the south-west and north-east corners of the shed and that a sheet metal workshop was carried out in the south-east part of the shed.

7.6.3 Site Observations

Site observations were made by Coffey's at the time of the fieldwork (21 and 23 September 2015). The observations are summarised below:

- The site was mainly occupied by a single storey workshop building made of a mixture of brick and corrugated iron walls with corrugated asbestos cement roof.
- The areas adjacent to the workshop were predominantly asphalt paved.
- The workshop was partitioned into sections and currently used for:
 - Forklift maintenance;
 - Cardboard processing;
 - Centrifuge maintenance; and
 - Electrical workshop.

- The workshop had a concrete floor which appeared old, but generally in good condition. Typical patchy darker oil stains were noted in various parts of the workshop with an area of darker staining was in the central area.
- Waste oil IBCs were present in the forklift maintenance area and 44 gallon drums.
- Cardboard and empty IBC were stored in the cardboard processing area.
- General equipment and shelving was located in the centrifuge maintenance area.
- Other parts of the workshop had isolated shelving, general equipment storage or was partially vacant.
- An equipment bath/wash area was located on the south-western side of the workshop. This area was on concrete and asphalt paving.
- Evidence of a former mechanics pit was observed in the central western part of the workshop.
- This pit had a metal cover.
- Several 44 gallon drums were stored outside the workshop building near the north-western corner.
- The majority of the site was paved and there were no visible indicators of acid sulphate soils.

7.6.4 Methodology

Based on the results of the site history and previous report, the main potential for site contamination was assessed by Coffeys to be associated with former workshop activities (mainly associated with mechanical maintenance and probable storage and use of oils, greases and degreasers). The associated contaminants of concern for this activity are considered to be:

- Total recoverable hydrocarbons (TRH);
- Benzene, toluene, ethylbenzene, xylene (BTEX);
- Polycyclic aromatic hydrocarbons (PAH);
- Volatile halogenated compounds (VHC); and
- Heavy metals (arsenic, cadmium, chromium, copper, lead, mercury, nickel and zinc).

Previous testing of fill materials of this general area did not suggest the fill was impacted other than from probable site activities. The target depth for the assessment was set at 1 m. If contamination was to be present it would be expected below the concrete from top down sources.

The site has an area of approximately 2,800 m². Reference to the NSW EPA (1995) Sampling Design. Guidelines recommends a minimum of about 8 sample locations, subject to the results of the site history. For this assessment Coffeys targeted the site with 9 sample locations (6 hand auger boreholes and 3 surface samples).

7.6.5 Assessment Criteria

The soil analytical results have been screened by Coffey's against the criteria sourced from:

- NEPC (1999) National Environment Protection (Assessment of Site Contamination) Amendment Measure (No. 1) 2013 (NEPM); and
- CRC CARE (2011) Cooperative Research Centre for Contamination Assessment and Remediation of the Environment, Technical Report Series, no. 10.

The NEPC (1999) National Environment Protection (Assessment of Site Contamination) Amendment Measure (No. 1) (NEPM, 2013) presents assessment guidelines for different land uses (e.g. industrial / commercial, residential, recreational, etc.) as well as ecological considerations (EILs). Based on information provided by Manildra, the assessment criteria adopted to assess the soils for the existing and proposed land use is industrial.

To assess the soil for potential risks associated with dermal contact with petroleum hydrocarbons, the CRC CARE (2011) direct contact HSLs was adopted by Coffeys.

Therefore, the following assessment criteria was adopted by Coffeys for soil assessment purposes:

- NEPM (2013) Health investigation level (HIL) D for commercial/industrial land use;
- NEPM (2013) Health screening level (HSL) D commercial/industrial land use based on sand lithology;
- NEPM (2013) Health screening level (HSL) D commercial/industrial land use based on clay lithology;
- CRC CARE (2011) Soil Direct Contact, HSL-D Commercial/Industrial;
- CRC CARE (2011) Soil Intrusive Maintenance Worker, HSL-D Commercial/Industrial; and
- NEPM (2013) Management limits (coarse soil, residential, parkland and open space).

HSLs are for application against potential vapour intrusion issues with petroleum hydrocarbons. For asbestos Coffeys adopted a conservative screening criteria of no asbestos detected. The site is heavily industrialised and intended to be used for a commercial industrial food dryer plant, therefore the environmental investigation and/or screening levels were not considered by Coffeys as relevant for the current investigation.

7.6.6 Comparison of Results to Assessment Criteria

According to Coffeys the results of the investigation reported all requested analytes below the adopted criteria.

7.6.7 Conclusions and Recommendations

The Environment Assessment undertaken by Coffeys made the following conclusions and recommendations in relation to site contamination:

“Based on the results of the site history and previous report, the main potential for site contamination was assessed to be associated with former workshop activities (mainly associated with mechanical maintenance and probable storage and use of oils, greases and degreasers).

Intrusive assessment had difficulty penetrating into the subsurface with hand tools at most locations due to coarse/dense fill. However, due to the inferred top down mechanism of potential contamination, contamination (if present) would be expected to be found under the paved areas.

Targeted sampling was carried out and no exceedances of the adopted criteria were recorded.

Some petroleum hydrocarbons were detected by the laboratory, but not at concentrations that would be unsuitable for ongoing industrial land use.

Previous testing in 2003 near a former underground storage tank which was decommissioned more than 20 years prior did not record evidence to suggest widespread contamination. Should earthworks require encroachment to the tank, then the tank should be removed and the area validated. As the information on tank decommissioning was only anecdotal, appropriate care should be taken with any works near the tank and should follow relevant Australian Standards and codes of practice.

Due to the history of workshop activities at the site and shallow investigations, an unexpected finds protocol should be adopted for civil works if significant soil disturbance is proposed. This will allow management of suspicious material if any is uncovered.

We recommend that the pre-demolition hazardous materials survey be carried out of the building before demolition and that any subsequent demolition work is carried out appropriately and in accordance with relevant codes of practice to avoid the potential of cross contamination of hazardous materials (e.g. asbestos).

Where cut to fill balances suggest a net soil excess or if there are geotechnically unsuitable soils, careful soil management is strongly

recommended during civil work so that disposal costs can be minimised. For example separation of like fill materials and segregation of fill from natural soils.”

7.7 ACID SULFATE SOILS

The Environmental Assessment Requirements issued by the NSW DoPE for this project in part required the potential for acid sulphate soils to be impacted by the proposal to be addressed.

As referred to in Section 7.6 above the Environmental Investigation Report prepared by Coffey Geotechnics (“Coffeys”) and which forms **Annexure 9** to this EA also included an assessment acid sulphate soils (ASS). This section of the EA is based upon the findings of this assessment.

Coastal acid sulphate soils are commonly found in low lying coastal floodplains, estuaries, rivers and creeks. They are naturally occurring sediments rich in iron sulphides that form sulfuric acid where exposed to oxygen. Acid sulphate soils include potential acid sulphate soils (PASS) and actual acid sulphate soils (AASS).

Potential acid sulphate (PASS) soils are soils which contain iron sulphides or sulfidic material. In the undisturbed state, PASS may exhibit a pH of 4 or greater, and may be slightly alkaline. Where exposed to air, the sulphides in PASS oxidise and can release significant quantities of acid. Following oxidation, the pH of these soils may fall considerably below pH 3.5.

Actual acid sulphate soils (AASS) are highly acidic soils resulting from the oxidation of iron sulphides or sulfidic material present in the soil profile. AASS are formed through the disturbance of PASS, which may be a result of either natural disturbances (eg. regional fall in groundwater levels that exposes PASS to oxygen) or human disturbances (eg. excavating PASS). AASS are typically characterised by pale yellow mottles, coating of soils with jarosite and pH of 4 or less.

7.7.1 Acid Sulphate Soil Risk

According to Coffeys reference to the Burrier / Berry 1:25,000 Acid Sulphate Soil Risk Map (1997) edition 2, prepared by the DLWC, indicates that the site is located on an area described as an alluvial plain which is between 2 m – 4 m above AHD. According to the map, the site is located in an area of “low probability” of occurrence of acid sulphate soil material within the soil profile. If present, acid sulphate soil materials would be expected to occur at depths between 1 m and 3 m below the ground surface. Acid

sulphate soil materials (if present) are said to be widespread or sporadic within the soil profile and may be buried by alluvium or wind-blown sediment.

The borehole undertaken by Coffeys closest to Abernathy's drain (CBH501) (refer **Annexure 9**) encountered soils logged as alluvial soil from about 2.8 m (clayey SAND, grey). Soils of similar description have been found to be acid sulphate soil in other parts of the Shoalhaven Starches plant.

Other soils (upper fill layers) and deeper residual soil and rock and not likely to be acid sulphate soil based on their appearance and geological origin.

7.7.2 Laboratory Analysis

One soil sample (CBH503/0.85-0.95) was selected by Coffey's for laboratory analysis using the chromium reducible sulphur method. This sample was selected as it was from the borehole where the deepest penetration was achieved and it was also closest to Abernathy's Drain. The sample comprised natural alluvial material described as Silty CLAY: low plasticity, brown to dark brown, stiff.

7.7.3 Acid Sulphate Soil Assessment Criteria

In order to assess the significance of the ASS potential, the laboratory results were compared to action criteria in the *Acid Sulphate Soil Management Advisory Committee 1998 (ASSMAC) Acid Sulphate Soil Manual 1*. The ASSMAC action criteria trigger the need to prepare a management plan and obtain development consent. The action criteria are based on oxidisable sulphur concentrations for three differing soil textures. The ASS Manual provides different action levels depending on the amount of ASS that is to be disturbed (ie. < 1000 tonnes and >1000 tonnes). The volume of ASS to be disturbed is unknown, therefore criteria applying to disturbance of >1000 tonnes has been conservatively adopted. The action criteria provided in the ASS manual are summarised in **Table 21** below.

Table 21
ASSMAC (1998) Acid Sulphate Soil Action Criteria*

Soil Texture Category	Approximate Clay Content (%)	Action Criteria*			
		Sulphur Trail Percent Oxidisable Sulphur (SCR) (%)		Acid Trail TAA (mol H ⁺ /tonne)	
Coarse	< 5%	0.03	0.03	18	18
Medium	5% to 40%	0.06	0.03	36	18
Fine	> 40%	0.1	0.03	62	18

A field pH below 4 can indicate that actual acid sulphate soils are present (ie. soils in which oxidation of iron sulphides has already occurred and have produced acid). Generally a pH drop below 3.5 following oxidation with hydrogen peroxide indicates the probable presence of unoxidised sulphides in the samples, and for the purposes of the screening test, is taken as an indication of the probable presence of potential acid sulphate soils.

According to Coffeys the results indicated the following:

- The pH of the soil was measured at 5.4 – not suggestive of actual acid sulphate soil conditions;
- Titratable actual acidity – 17mol H+/t (below the adopted criteria of 18 mol H+/t)
- Chromium reducible sulphur – 0.006% (below the adopted criteria of 0.03%)
- The net acidity – 0.03% (equal to the criteria of 0.03%).

The results according to Coffeys are marginal. It generally suggests, according to Coffeys, that there could be some acid sulphate potential based on the net acidity, but is not severe. Based on other assessments carried out by Coffeys for Manildra along the flanks of the river, acid sulphate soils are likely to be present in estuarine material and intermittent in alluvial soils.

7.7.4 Conclusions and Recommendations

The Environment Investigation Report undertaken by Coffeys made the following conclusions and recommendations in relation to Acid Sulphate Soils:

“Acid sulphate soils could be encountered within alluvial soils underlying the fill materials. An acid sulphate soil management plan is recommended to manage these soils if construction activities require disturbance of these soils or any prolonged dewatering that could lower the groundwater table.”

7.8 GEOTECHNICAL AND RIVER BANK STABILITY

The Geotechnical Assessment Requirements as issued by the NSW DoPE for this project require an assessment be undertaken of riverbank stability and with specific reference to:

“...assessment of the impacts on riverbank stability, proposed mitigation measures and details of emergency bank stabilisation works in the vicinity of the modification.”

Coffeys have also prepared a specific geotechnical report which addresses the potential impacts arising from this proposal on riverbank stability for both Abernethy's Creek

(which the proposed building adjoins) as well as the Shoalhaven Rover (which is somewhat more distant from the development site – about 100 m). This geotechnical assessment forms **Annexure 10** to this EA. This section of the EA is based upon the findings of this assessment.

Coffeys make the following observations as to the existing condition of the banks of Abernathy's Creek and the ground surface adjacent to the banks where it passes the proposed site for the new starch dryer plant.

- The southern and eastern extent of the proposed starch dryer building will be positioned approximately on the current alignment of the southern and eastern walls of the existing warehouse/workshop which is to be demolished (see **Plate 3** below).



Plate 3: Existing warehouse/workshop and pedestrian bridge over Abernathy's Creek at the proposed location for dryer plant; view looking north.
Note mounded surface along top of creek bank.

- The footprint of the proposed dryer will be positioned approximately 8 m from the top of the western bank of Abernathy's Creek at the southern end of the building and 16 m from the top of the creek bank at the northern end.
- The approximate height of the creek banks is 3.5 m.
- The creek banks (specifically western bank nearest the Starch Dryer Plant) are relatively steep with slopes ranging from approximately 35° to 45° adjacent to the proposed location for the new Starch Dryer, with flatter slope to the south.

- The depth of the water in the creek at the time of observation was approximately between 0.5 m to 1 m with a steady flow.
- The water level had increased to about 1 m below the crest of the bank during the recent flooding event and then returned to the level as observed above a few days after the flooding event.
- No sign of any slumping or failure of the banks due to the recent flooding was observed.
- Parts of the creek banks were covered with thick vegetation at the time of our site observations, comprising mainly grass, creepers and weeds, with trees ranging from small to mature towards the southern and northern sections of the creek near the proposed Starch Dryer.
- There is a pedestrian bridge (see **Plates 3 to 5**) over Abernathy's Creek (approximately 10 m from the south-east corner of the proposed dryer site) which will remain following construction of the new dryer. The creek banks exhibited no signs of instability or erosion at or adjacent to the bridge abutments where the banks were clear of vegetation.
- The ground surface adjacent to top of the western bank of Abernathy's Creek is near level and is mainly a gravel surfaced hard stand area. The ground surface adjacent to the eastern bank was mainly concrete paved (footpath) to the south of the existing pedestrian bridge. No cracking of the concrete paving , or signs of instability were observed on the ground surface adjacent to the banks (see **Plate 6** below);
- There is a raised earth mound (see **Plates 3 and 4**) approximately 0.5 m high running along the western bank crest to the south of the existing building. It appears that the mound prevents surface water from flowing directly overflow over the bank.
- Surface water on the western side of the creek generally appears to be directed to the surface drains to the south and north of the existing building (at the proposed location for Starch Dryer) and then is piped to the creek at each location. We are advised by Manildra that the outlet of the northern pipe is near the creek bed (below water) and was not visible. The southern surface water drains to the creek through a pipe (approximately 150 mm in diameter) located to the south east of the site (see **Plate 7** below) and positioned at a higher elevation on the bank. No obvious signs of local/general instability or recent erosion were observed at this drainage outlet.



Plate 4: Existing pedestrian bridge and thick vegetation over western banks of creek – view looking north-east.



Plate 5: Pedestrian bridge abutments and eastern creek bank – view looking east.



Plate 6: View of creek banks showing paved areas either side of creek and thick vegetation over the banks to the south of the site – photo looking south.



Plate 7: Surface water drain to the south-east of the site – view looking north.

- The creek banks (specifically to the south of the pedestrian bridge) were covered with relatively thick vegetation at the time of our site visit. However, no obvious signs of any recent local/general instability or erosion of the banks were observed at the time of our site visit.

- There are a number of trees on both creek banks to the north of the pedestrian bridge (see **Plate 8** below).
- The lower part of the western creek bank to the north of the pedestrian bridge was covered by an old rock revetment (see **Plate 8**) which appeared to have minimal interlock between the rocks, but has been effective in protecting this part of the bank for some years. The eastern bank and southern part of the western bank were not protected by any rock revetment or similar.



Plate 8: Trees on the western creek bank to the north of the pedestrian bridge, and old rock revetment on the western bank – view looking south-west.

Conclusion and Recommendations

Coffey's make the following conclusions:

"We understand that a deep foundation system (piles) will be used to transfer loads from the new dryer plant structure to the bedrock. We also understand that there will be no significant excavations or filling and the current ground surface will remain at or very close to current levels. Therefore, taking into account the position of the new dryer relative to the nearest creek bank (a minimum of 8m from top of western bank) and the existing condition of the creek banks, it is assessed that the development of the new dryer building will not adversely affects the stability of the Abernathy's creek banks.

In relation to potential effects of the dryer building on the stability of the northern bank of the Shoalhaven River, it is assessed that as the river bank is approximately 100m from the dryer site, the development of the dryer building will not adversely affect the stability of the river bank.

In order to manage surface water flows from the new building (roof and paved surrounds), we recommend the following:

- *Provision of dedicated drainage paths (pipes and or open lined channels) with regularly spaced outlets to the western bank of the creek and suitable erosion protection at the discharge points.*
- *Any excavations deeper than 600mm required for drainage or service installations between the dryer building and the western bank of Abernathy's Creek should be reviewed by Coffey, including shoring support and backfill requirements.*
- *During and following the construction, regularly monitoring the creek banks should be carried out by observation following significant rainfall events. Should any signs of instability or obvious erosion become evident, geotechnical advice should be sought.*
- *The area between the dryer building and the western creek bank should not be accessed by heavy vehicles or used for storage of heavy containers or equipment.*

7.9 VISUAL IMPACT

The Shoalhaven Starches Factory Site is located on Bolong Road, one of the main gateway entrances to the Nowra/Bomaderry urban areas, and a significant tourist route along this section of the South Coast.

The Scenic Character and Environment

The Shoalhaven Starches factory site is situated on Bolong Road, the gateway to Bomaderry, within an area currently containing a mixture of rural and industrial land uses. 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 City Council Heritage Study 1995 – 1998 prepared by Peter Freeman Pty Ltd in association with JRC Planning Services identified the rural landscapes north of the Shoalhaven River as the Berry-Bolong Pastoral Landscape. This Study described this area as:

“North of the Shoalhaven River the area is dominated by the close relationship between the Princes Highway (formalised by Berry in 1857/1858) and the railway (1893) which were instrumental in determining the location of new homesteads on Berry estate lands which resulted from drainage schemes implemented by Sir John Hay. In the foothills to the north-west, and towards Cambewarra, settlement patterns were in the main determined by the impact of Free Selection after 1861. Sub-zones include the Cambewarra-Tapitallee area, Bellawongarah and the catchment areas of Broughton Creek north of Berry. The latter are focused around communities which developed outside the Berry Estate: Cambewarra, Tapitallee, Bundewallah, Woodhill and Broughton Vale. The scale and character are dependent on the distribution of small dairy farms, with internal and external boundaries created by modified and natural vegetation (River Oaks), roads, creeks and property boundaries.

Continuing dairy farms has contributed to the survival of the underlying late nineteenth and early twentieth century landscape patterns.”

The Shoalhaven Starches factory complex is characterised by typical industrial structures with an overall bulk and scale that dominates the surrounding locality. The site, despite being partially screened by vegetation along Bolong Road, the Shoalhaven River and Abernethy's Creek visually dominates the locality. The development 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 most relevant vantage points from where the overall factory site is visible would include:

The Princes Highway – views of the existing factory site are possible from selected locations along the Princes Highway north of Bomaderry, travelling in both a northerly and southerly direction. Whilst the factory site is visible in the landscape, its overall visual impact is reduced by virtue of the distance between the plant; the intermittent nature of the views; a rise in topography which screens the site from view; and vegetation.

Burruga (Pig) Island – Burruga Island is situated in the middle of the Shoalhaven River and provides the closest vantage point to the southern boundary of the site. The island however is privately owned and not accessible to the public. Vegetation screening along the riverbank adjacent to the site also reduces the visibility of the existing buildings and structures.

Bolong Road – Bolong Road runs along the frontage of the site. Views of the factory are possible when travelling in both an easterly or westerly direction. Some attempts have been made to provide some tree planting along the boundaries to “soften” the appearance of the development. The existing building forms and structures, including the existing Moorehouse building, are clearly visible to motorists travelling along this stretch of Bolong Road.

Nowra Bridge – The Nowra Bridge crosses the Shoalhaven River and provides limited opportunities for views of the factory site. The dominant visual elements from the bridge are the river, vegetation along the riverbanks and the escarpment. The visual impact of the factory site is reduced by distance as well as the bridge structure which permits only glimpses of the site. The existing Moorehouse building is not visible from this vantage points.

Bomaderry urban area – The existing plant is visible from a number of locations within the eastern outskirts of Bomaderry. Bomaderry is slightly elevated and some locations within the urban area do have extensive views of the site.

Terara – Distant views of the Plant are possible from a number of vantage points in and around the village of Terara on the southern bank of the River. The visual impact of the site however is reduced by distance, the intervening landform of Burraga (Pig) Island and the vegetated riverbanks.

Riverview Road – Views of the site are available from residential development on the southern bank of the Shoalhaven River. Vegetation along both the northern and southern banks of the river partially screen the site from view.

Cambewarra Lookout – Cambewarra lookout is a popular tourist lookout providing panoramic views over the Shoalhaven floodplain and estuary. Shoalhaven Starches, like the other significant industrial sites, is visible from the lookout.

Visual Impact of Proposal

The proposed relocation of Starch Dryer No. 5 will involve a change in location and an increase in height of the Starch Dryer from that which was approved. The proposed modification will relocate Starch Dryer No. 5 from within the existing Shoalhaven Starches factory site to land on the western side of Abernethy's Creek, otherwise known as the “Moorehouse” site. The “Moorehouse” site is situated within close proximity of the factory and the existing and proposed packing plants.

The proposed Starch Dryer building will have a height above ground level of 28 metres. There will also be intrusions above the building, the highest of which will be the dryer ducting that will have a height of 36 metres above ground level.

It is acknowledged that the proposal will have a height that is higher than many structures within the existing factory site however there are a range of structures which have or will have a height similar and even higher than the structures associated with this modification proposal. For instance:

- The adjacent Interim Packing Plant – 34 metres
- The existing boiler house stack has a height of 53.7 metres;
- The No. 5 Starches Dryer stack was approved at 33 metres;
- The existing Flour Mill has a height above ground level of 34.78 metres.
- The constructed No. 6 Dryer (Wet End) has a height of 43.0 metres.

The proposal will therefore comprise a height that is generally consistent with the prevailing height of existing development within the site.

The building forms, shapes and characteristics are also similar to those that presently exist on the site, and will conform to the visual character of the site, i.e. it is industrial development within an industrial setting.

The external cladding of the proposed Starch Dryer building will also be coloured “Jasper” (of the Colourbond range) consistent with the prevailing external colours of the adjacent Interim Packing Plant building.

The visual impact of these works from the identified vantage points (refer **Figure 19**) is described as follows:

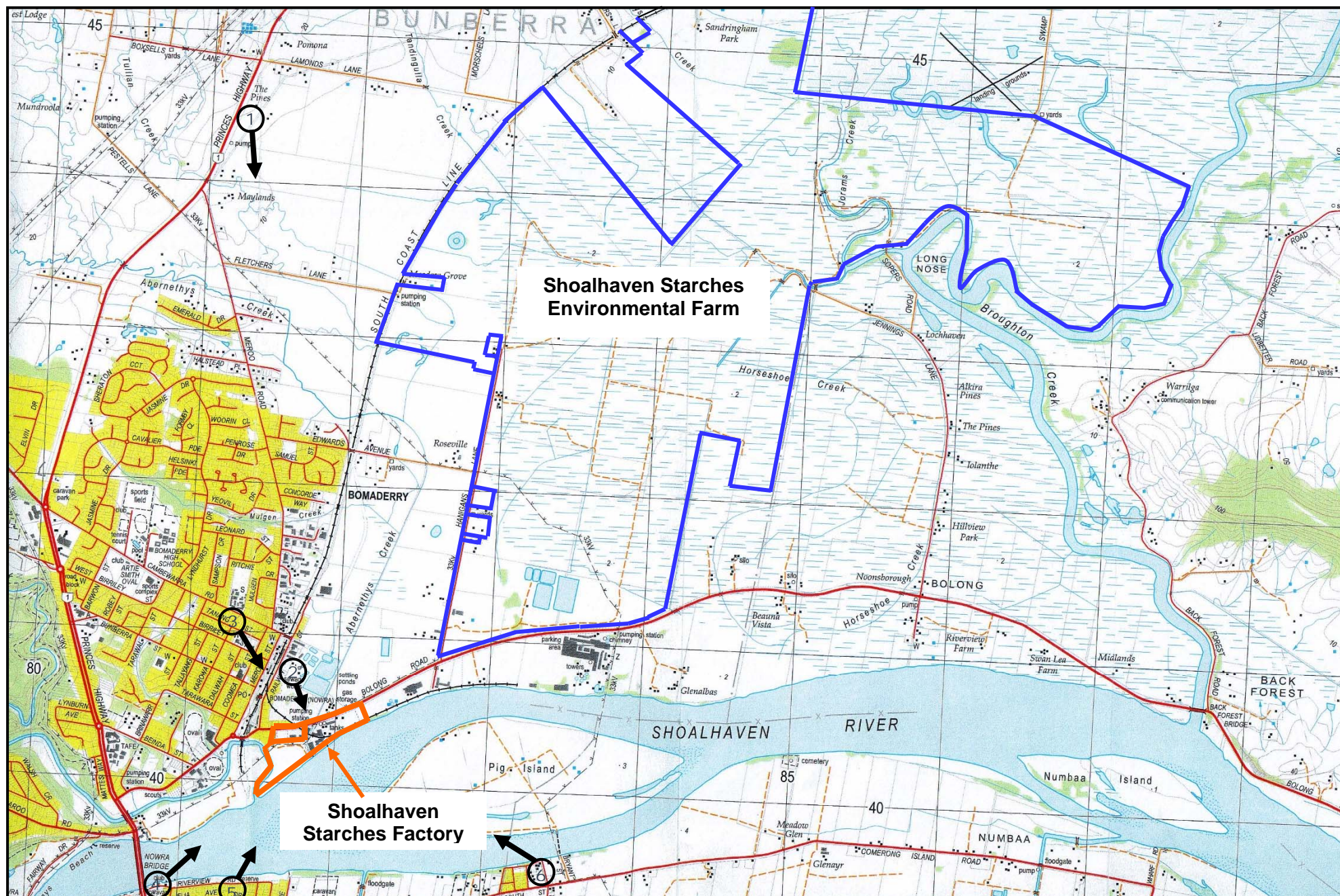


Figure 19: Vantage Points for Plates.

The Princes Highway

The Shoalhaven Starches factory is mainly visible from a section of the Princes Highway between Boxsells Lane and Devitts Lane, Jaspers Brush (refer **Plate 9**). Due to the configuration of the highway and the siting of the factory, only southbound vehicles view the site. Vantage points along this section of the highway are 4.5 to 5.0 km from the site. The site becomes less exposed and is eventually obscured by a rise in topography further south of Boxsells Lane.

Given the distance from these vantage points the factory site is only barely visible. The rising topography upon which Bomaderry is sited screens the western portion of the site, as does intervening vegetation.

Given the distance of these views, and the screening of the site attributed to terrain and vegetation it is considered the developments associated with this project will not adversely impact on views from this vantage point.



Plate 9: View of Shoalhaven Starches Factory from Princes Highway
(within vicinity of Boxsells Lane).
Factory stack barely visible from this vantage point.

Bolong Road

The existing factory site is clearly visible from Bolong Road by vehicles approaching from the east, and along the frontage of the site refer (**Plate 10**).

Works associated with the proposed relocation of the Starch Dryer to the west of Abernethy's Creek will mainly involve structures of a similar bulk and scale as existing structures within this part of the site. In these circumstances the proposed structures create forms similar to existing industrial structures within the vicinity.



Plate 10: View of Shoalhaven Starches factory site from Bolong Road.

Bomaderry Urban Area

The township of Bomaderry is slightly elevated and some locations within this urban area have extensive views of the site (refer **Plate 11**).



Plate 11: View of Shoalhaven Starches factory site from corner of Meroo Road and Cambewarra Road, Bomaderry.

The relocated Starch Dryer No. 5 will be visible from this vantage point as are other similar scale size and structures, although the proposed Starch Dryer No. 5 building will be shielded somewhat by intervening vegetation. In this way the vista from this vantage point will not be significantly altered.

Nowra Bridge

The view from Nowra Bridge to the east is mainly dominated by the river, riparian vegetation and the floodplain (refer **Plate 12**).



Plate 12: View of Shoalhaven Starches factory site from Nowra Bridge over the Shoalhaven River.

The site is largely obscured by riverside vegetation. The top of the proposed Starch Dryer No. 5 building will protrude above the canopy of the vegetation along the river, as does the existing flour mill, boiler house and starch plant. The proposed Starch Dryer No. 5 will be sited generally within the overall “silhouette” of the existing factory complex. Although it is likely to intrude into the existing skyline created by the existing factory, it will not be out of context in terms of the existing factory development when viewed from this vantage point.

Riverview Road

The main vantage point from where the relocated Starch Dryer No. 5 will be visible will be from residences along Riverview Road directly south of the site (refer **Plate 13**). This view is from a distance of about 750 metres. Riverside vegetation along both the northern and southern banks of the river softens much of the site from view.



Plate 13: View of Shoalhaven Starches factory site from Riverview Road area.

The relocated Starch Dryer No. 5 will be visible from this vantage point and will intrude above the tree canopy, although will be shielded by the existing DDG Pellet Plant that is under construction in this view. From this vantage point however, the proposal will be sited within close proximity of the existing factory complex, and will be viewed within this context.

It is noted there are 'gaps' in the vegetation along the riverbank to the south of the site, and the proposed development may be visible through these 'gaps'. There is, therefore, scope for supplementary landscaping and revegetation to take place along the riverbank adjoining the factory site to help soften or obscure views of the site, particularly from this vantage point. This was addressed as part of the Project Approval for the SSEP.

Terara

The village of Terara is approximately 1.5 kilometres from the factory. The view of the Shoalhaven Starches factory site as seen from the banks of the Shoalhaven River adjacent to the village of Terara is shown in **Plate 14**.



Plate 14: View of Shoalhaven Starches factory site from village of Terara.

The relocated Starch Dryer No. 5 will unlikely be visible from this vantage point. Such should also be seen in context however as other parts of the factory site such as the Flour Mill, associated grain silos, ethanol plant and boiler house stack are already visible from this vantage point. The proposal will not be out of character with the prevailing structures which are already visible from this vantage point.

Cambewarra Lookout

Cambewarra Lookout is situated about 7 km to the northwest of the site. Views from the lookout are from an elevation over 620 m ASL, and encompass the Shoalhaven River floodplain and the coast including Jervis Bay. Whilst the factory site is visible from this vantage point, due to scale of the view, it would be extremely difficult to make out the works associated with the project from this vantage point.

Overall it is considered that the proposed works will not create a significant adverse visual impact due, principally, to the existing industrial development. There are however measures which Shoalhaven Starches could undertake to minimise the visual impact of

the proposed stack. Where appropriate and possible, the relocated Starch Dryer No. 5 building should be constructed of similar materials as those previously used on the site and be of a non-reflective nature. Colours should blend with existing structures on the site to ensure visual harmony. Consideration should be given to incorporating a cladding colour if possible which will match existing development on the site.

8.0 STATEMENT OF ADDITIONAL COMMITMENTS

Section 8.0 of the EA for the Shoalhaven Starches Expansion Project prepared by our firm provides a Statement of Commitments agreed to by Shoalhaven Starches Pty Ltd outlining environmental management, mitigation and monitoring measures to be implemented to minimise potential impacts associated with the proposed modification and having regard to the findings of the EA.

The only additional commitments arising from this modification proposal include the following:

8.1 PRELIMINARY HAZARD ANALYSIS

Table 22 outlines recommended additional management procedures and design considerations that Shoalhaven Starches commits to implementing and incorporating into practices that would prevent and / or minimise risk scenarios from occurring.

Table 22
Preliminary Hazard Analysis

<i>Preliminary Hazard Analysis</i>
<p>Shoalhaven Starches commits to implementing the recommendations made by Pinnacle Risk as detailed in their PHA in relation to this Modification Application, and as follows:</p> <ol style="list-style-type: none"><i>1. The existing safety management systems, e.g. maintenance procedures, operating procedures, training and emergency response plans, will need to be updated to reflect the proposed changes; and</i><i>2. All explosion vents should be positioned to avoid impact to personnel and sensitive equipment.</i>

8.2 NOISE

Table 23 outlines the recommended additional noise mitigation measures and design considerations that Shoalhaven Starches commits to implementing and incorporating into the design, construction and operation of the proposed relocation of Starch Dryer No. 5.

Table 23
Noise Mitigation Measures

<i>Measures and Design Considerations</i>
<p>Shoalhaven Starches commits to implementing the following recommendations of the Noise Impact Assessment prepared by day Design Pty Ltd in relation to this project:</p> <p><i>Construction of the Starch Dryer Building</i></p> <p><u>Walls</u></p> <p>The external walls of the starch dryer building should have a minimum weighted sound reduction index (Rw) 23. In this instance calculations are based on 'Kingspan' architectural wall panelling system 'AWP/80'.</p> <p>Alternative products may be suitable providing the minimum rating of Rw 23 is achieved or exceeded.</p> <p><u>Roof / Ceiling</u></p> <p>The roof and ceiling of the building should have a minimum weighted sound reduction index (Rw) 23. In this instance calculations are based on 'Kingspan' architectural roof panelling system 'K-Dek (KS 1000 KD)'.</p> <p><u>Roller Doors</u></p> <p>Roller doors should have a minimum weighted sound reduction index (Rw) 14, be located in the eastern and southern facades of the building only and not exceed a total area of 40 m² (ie. 2 doors 5 m x 4 m). Roller doors should remain closed at all times the starch dryer is in operation and opened only for maintenance and installation / removal of plant and equipment.</p> <p><u>Ventilation Penetrations</u></p> <p>There should be no acoustically untreated penetrations in the walls or roof other than the roller doors outlined above. Any doors to the starch dryer building must remain closed at all times the plant is in operation.</p> <p>If natural ventilation is required, sections of the walls may be fitted with acoustic louvres.</p> <p>The required insertion loss of acoustic louvres will depend on the maximum surface area of louvered sections required to facilitate adequate ventilation.</p> <p>As an example, based on a maximum 20 m² of louvered sections in each of the four walls, acoustic louvres should have minimum insertion losses shown in Table 20 below.</p> <p>A larger area may result in a higher required insertion loss and consequently a deeper blade depth. A final assessment should be made prior to the issue of a Construction Certificate once the location and size of any openings for ventilation are finalised.</p>

Table 23 (continued)

Measures and Design Considerations								
Table 20 Acoustic Louvre Insertion Loss								
<i>Description</i>	<i>Minimum Insertion Loss (dB) at Octave Band Centre Frequencies (Hz)</i>							
	63	125	250	500	1k	2k	4k	8k
<i>Acoustic Louvre*</i>	3	7	9	13	15	16	15	14

**Based on the Sound Attenuators Australia Acoustic Louvre, type AL1H (300 mm depth)*

Additional Mechanical Plant and Equipment

At the time of writing their report it was unknown whether any significant noise producing mechanical plant or equipment may be located externally to the starch dryer building other than that considered in their assessment.

A final assessment should be carried out prior to the issue of a Construction Certificate once details of any external plant, if any, are known.

Day Design are confident that the level of noise emission from the proposal will, or can easily be controlled to, meet the acceptable noise limits at all receptor locations.

Construction Noise

According to Day Design construction noise management levels are likely to be met at each receptor location.

8.3 VISUAL IMPACT

As outlined in Section 8.5 of this EA it is our view that the relocation of Starch Dryer No. 5 will not create a significant adverse visual impact due principally to the location of the proposed works within the vicinity of existing structures of a similar height, bulk and scale as those works which are proposed. Shoalhaven Starches however commit to the following additional measures as outlined in **Table 24** to assist in screening and further minimising visual impacts arising from the proposed works.

Table 24
Visual Impact

Measures
Shoalhaven Starches commits to where appropriate and possible, the proposed Starch Dryer No. 5 building should be constructed of similar materials as those previously used on the site and be of a non-reflective nature. Colours should blend with existing structures on the site to ensure visual harmony. Consideration should be given to incorporating a cladding colour if possible which will match existing development on the site.

8.4 TRAFFIC

As outlined in Section 8.6 of this EA it is the view of ARC that there are no access, traffic or parking impacts associated with the proposal – either during operation or construction – that would significantly impact on the efficiency and/or safety of the local traffic environment or existing on-site operations.

Shoalhaven Starches however commit to the following additional measures as outlined in **Table 25** to assist in screening and further minimising visual impacts arising from the proposed works.

Table 25
Traffic Impacts

<i>Measures</i>
<p>Shoalhaven Starches commits to:</p> <ul style="list-style-type: none">• During the Stage 1 construction works, 30 staff parking spaces will be relocated from the Moorehouse Site to the PP Site, with a resulting redistribution of existing trips. However, this redistribution of trips – and the minor additional generation of construction vehicle trips – would have no impact on the operation of the local road network during the Stage 1 construction.• During the Stage 2 construction, the 30 staff parking spaces relocated from the Moorehouse Site during the Stage 1 construction will be reinstated, but construction vehicle trips will continue to be generated at AP 3 and PP 1. However, these minor additional construction vehicle trips would have no impact on the operation of the local road network during the Stage 2 construction.• The temporary car park to be provided on the PP Site will be constructed as part of the Demolition Modification, and be designed with reference to AS 2890.1 in regard to aisle width and space dimensions. The temporary car park will be specifically constructed to accommodate the peak demand associated with the relocation of SS Site staff car parking and peak construction staff parking demand.• Pedestrian access between the PP Site and the broader SS Site south of Bolong Road would be via the existing pedestrian refuge crossing immediate adjacent to the intersection of Bolong Road & PP 1.

8.5 SITE CONTAMINATION

Table 26 outlines recommended additional management procedures that Shoalhaven Starches commits to implementing and incorporating into practices to address potential site contamination.

Table 26
Potential Site Contaminations

<i>Management Procedures</i>
<p>Based on the results of the site history and previous report, the main potential for site contamination was assessed by Coffeys to be associated with former workshop activities (mainly associated with mechanical maintenance and probable storage and use of oils, greases and degreasers).</p> <p>Intrusive assessment had difficulty penetrating into the subsurface with hand tools at most locations due to coarse/dense fill. However, due to the inferred top down mechanism of potential contamination, contamination (if present) would be expected to be found under the paved areas.</p> <p>Targeted sampling was carried out and no exceedances of the adopted criteria were recorded.</p> <p>Some petroleum hydrocarbons were detected by the laboratory, but not at concentrations that would be unsuitable for ongoing industrial land use.</p> <p>Previous testing in 2003 near a former underground storage tank which was decommissioned more than 20 years prior did not record evidence to suggest widespread contamination. Should earthworks require encroachment to the tank, then Shoalhaven Starches commit to removing the tank and ensuring that the area validated. As the information on tank decommissioning was only anecdotal, appropriate care should be taken with any works near the tank and should follow relevant Australian Standards and codes of practice.</p> <p>Due to the history of workshop activities at the site and shallow investigations, Shoalhaven Starches commit to adopting an unexpected finds protocol for civil works if significant soil disturbance is proposed. This will allow management of suspicious material if any is uncovered.</p> <p>Shoalhaven Starches commit to a pre-demolition hazardous materials survey be carried out of the building before demolition and that any subsequent demolition work is carried out appropriately and in accordance with relevant codes of practice to avoid the potential of cross contamination of hazardous materials (eg. asbestos).</p> <p>Where cut to fill balances suggest a net soil excess or if there are geotechnically unsuitable soils, Shoalhaven Starches commit to careful soil management during civil work so that disposal costs can be minimised. For example separation of like fill materials and segregation of fill from natural soils.</p>

8.6 ACID SULPHATE SOILS

Table 27 outlines recommended additional management procedures that Shoalhaven Starches commits to implementing and incorporating into practices to address potential acid sulphate soils.

Table 27
Potential Acid Sulphate Soils

<i>Management Procedures</i>
Shoalhaven Starches commits to implementing an Acid Sulphate Soils Management Plan to manage these soils if construction activities require disturbance of these soils or any prolonged dewatering that could lower the groundwater table.

8.7 GEOTECHNICAL AND RIVERBANK STABILITY

Table 28 outlines recommended additional management procedures that Shoalhaven Starches commits to implementing and incorporating into practices to address geotechnical and riverbank stability issues.

Table 28
Geotechnical and Riverbank Stability

<i>Management Procedures</i>
<p>In order to manage surface water flows from the new building (roof and paved surrounds), Shoalhaven Starches commit to the following:</p> <ul style="list-style-type: none">• Provision of dedicated drainage paths (pipes and or open lined channels) with regularly spaced outlets to the western bank of the creek and suitable erosion protection at the discharge points;• Any excavations deeper than 600 mm required for drainage or service installations between the dryer building and the western bank of Abernathy's Creek should be reviewed by Coffey, including shoring support and backfill requirements;• During and following the construction, regularly monitoring the creek banks should be carried out by observation following significant rainfall events. Should any signs of instability or obvious erosion become evident, geotechnical advice should be sought; and• The area between the dryer building and the western creek bank should not be accessed by heavy vehicles or used for storage of heavy containers or equipment.

9.0 CONCLUSION

The SSEP was approved in January 2009 by the then Minister for Planning under Part 3A of the Environmental Planning & Assessment Act.

The Project Approval included the consolidation of all previous approvals (up to that time) into the one Project Approval. This included the consolidation of the Pollution Reduction Program (PRP) No. 7 Project (DA No. 223-7-2002), which included the installation of Starch Dryer No. 5 within the factory site. It is this Starch Dryer that is proposed to be relocated as part of this modification proposal.

Following detailed engineering design it has become apparent that the area originally set aside for Starch Dryer No. 5 under the PRP No. 7 project provided insufficient area for the footprint of this proposed dryer. As a result an alternative location for Starch Dryer No. 5 is required to be identified.

Under this Modification Application it is proposed to relocate the approved but not yet constructed Starch Dryer No. 5 within the existing Shoalhaven Starches factory site from its approved location to a new location on the western side of Abernethy's Creek, otherwise known as the "Moorehouse" site (in recognition of the previous landowner).

The "Moorehouse" site provides sufficient area for the footprint of the proposal, and is situated within the factory site and within close proximity to existing and proposed packing plants.

Two stages of construction works are proposed as part of this Modification proposal: Stage 1 external construction works and Stage 2 internal construction works.

At present the area situated between the buildings on the "Moorehouse" site and Bolong Road is used for staff parking. During the Stage 1 internal construction works, it will be necessary to use this staff parking area for the storage of construction materials and plant. During the Stage 1 construction phase it will therefore be necessary to relocate this staff parking on a temporary basis. It is proposed to temporarily relocate this staff parking onto the Company's land on the northern side of Bolong Road.

Following the completion of Stage 1 construction works, it will be possible to restore parking back onto the "Moorehouse" site.

The modified proposal will not result in any increase in production from the site over that which has been the subject of past approvals. The proposal will not involve any change in the amount of raw products that will be utilised; nor will it involve any changes in the amount of waste waters that will need to be treated and disposed.

This application is made pursuant to Section 75W of the Environmental Planning & Assessment Act 1979 and seeks to modify the location of the approved Starch Dryer.

The preparation of this Environmental Assessment has been undertaken following consultation with staff from:

- The Department of Planning and Infrastructure;
- Department of Primary Industries - Water.

Following a comparison of the modified proposal to that originally approved having regard to the key issues originally identified associated with this Project, this Environmental Assessment concludes that the proposal is suitable for the site and this locality and consistent with the objects of the Environmental Planning & Assessment Act.

The Minister's approval of this proposed modification to Project Approval MP 06_0228 is sought.