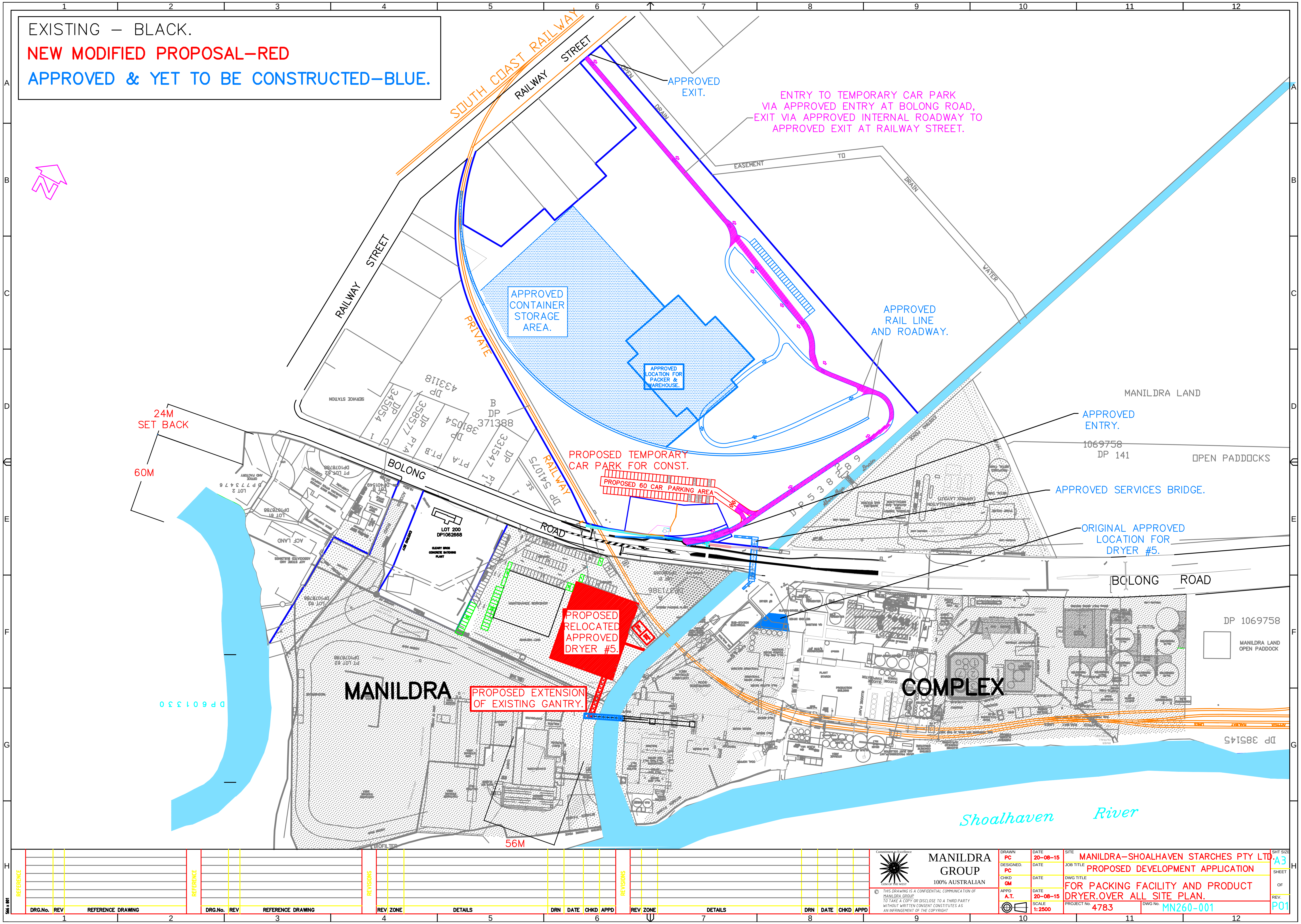
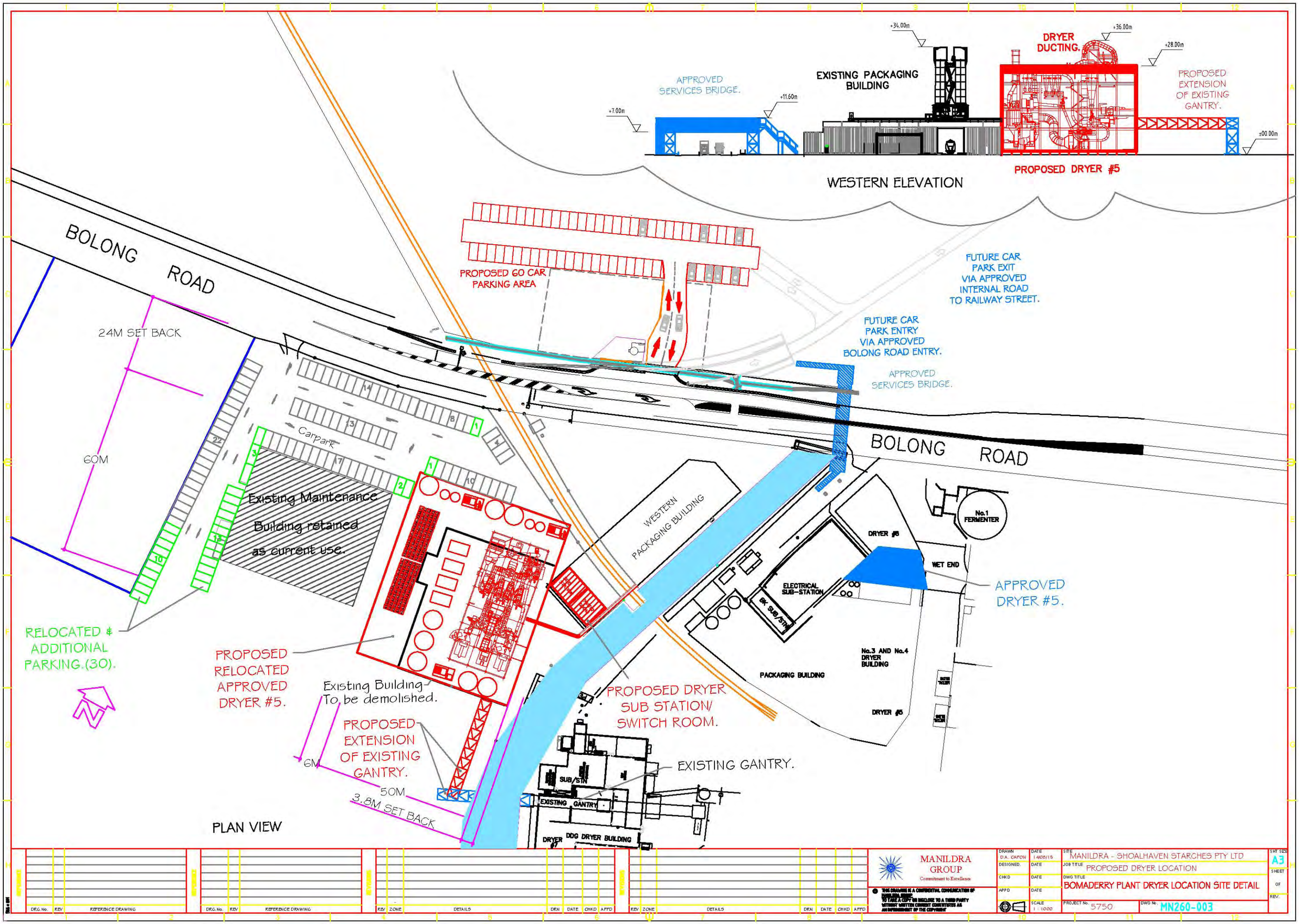
ANNEXURE 1

Plans of Proposed

Starch Dryer Modifications

ANNEXURE 1


EXISTING – BLACK.
NEW MODIFIED PROPOSAL–RED
APPROVED & YET TO BE CONSTRUCTED–BLUE.
SOUTH COAST RAILWAY
RAILWAY STREET
APPROVED EXIT.
ENTRY TO TEMPORARY CAR PARK VIA APPROVED ENTRY AT BOLONG ROAD, EXIT VIA APPROVED INTERNAL ROADWAY TO APPROVED EXIT AT RAILWAY STREET.
EASEMENT TO DRAIN
WATER
APPROVED CONTAINER STORAGE AREA.
APPROVED LOCATION FOR PACKER & WAREHOUSE
APPROVED RAIL LINE AND ROADWAY.
PRIVATE RAILWAY
MANILDRA LAND
APPROVED ENTRY.
1069758 DP 141
OPEN PADDOCKS
24M SET BACK
60M
BOLONG ROAD
PROPOSED TEMPORARY CAR PARK FOR CONST.
PROPOSED 60 CAR PARKING AREA
APPROVED SERVICES BRIDGE.
ORIGINAL APPROVED LOCATION FOR DRYER #5.
DP 433118
DP 345054
DP 358577
DP 381054
B DP 371388
DP 331547
DP 541075
LOT 200 DP1062688
DP 1069758
MANILDRA LAND OPEN PADDOCK
PROPOSED RELOCATED APPROVED DRYER #5.
MANILDRA
COMPLEX
PROPOSED EXTENSION OF EXISTING GANTRY.
DP 385145
56M
Shoalhaven River
MANILDRA GROUP
100% AUSTRALIAN
DRAWN PC DATE 20-08-15
DESIGNED PC
CHKD GM
APPD A.T. DATE 20-08-15
SCALE 1:2500
SITE MANILDRA–SHOALHAVEN STARCHES PTY LTD.
JOB TITLE PROPOSED DEVELOPMENT APPLICATION
DWG TITLE FOR PACKING FACILITY AND PRODUCT DRYER.OVER ALL SITE PLAN.
PROJECT No. 4783
DWG No. MN260-001
SHT SIZE A3
REV P01
DRG.No. REV REFERENCE DRAWING
REV ZONE DETAILS DRN DATE CHKD APPD

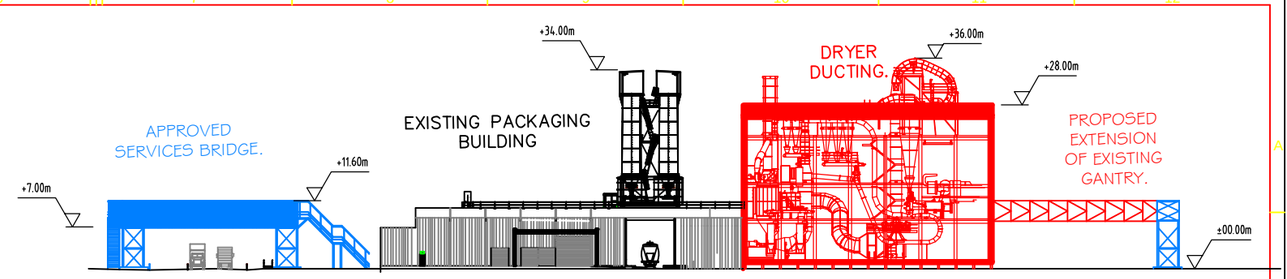


DRG. No.	REV	REFERENCE DRAWING	DRG. No.	REV	REFERENCE DRAWING	REV	ZONE	DETAILS	DRN	DATE	CHKD	APPD	REV	ZONE	DETAILS	DRN	DATE	CHKD	APPD

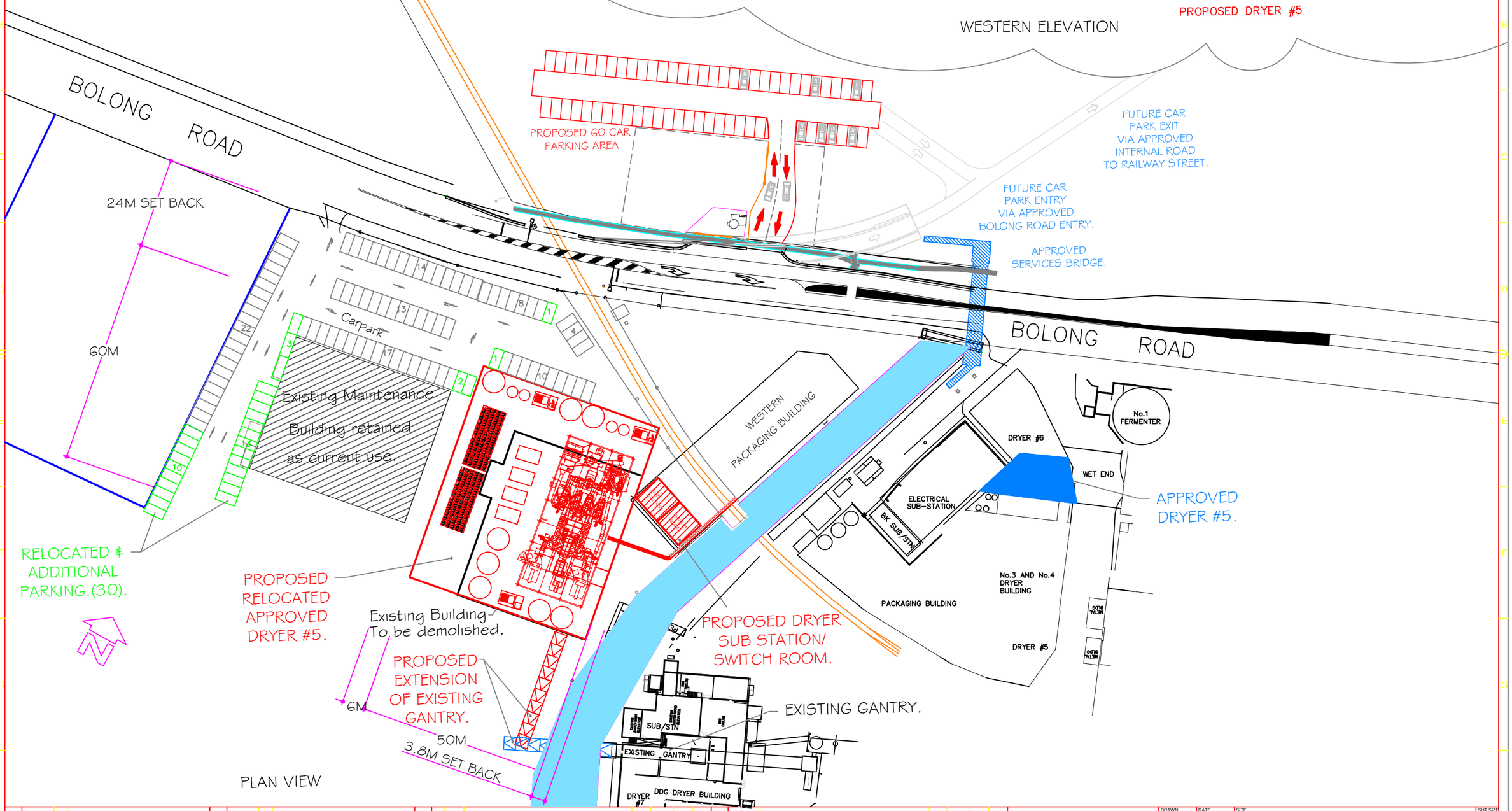
MANILDRA GROUP
Commitment to Excellence

DRAWN	D.A. CAPON	DATE	14/05/15
DESIGNED		DATE	
CHKD		DATE	
APP'D		DATE	
SCALE	1 : 1000		

SITE: MANILDRA - SHOALHAVEN STARCHES PTY LTD
JOB TITLE: PROPOSED DRYER LOCATION
DWG TITLE: BOMADERRY PLANT DRYER LOCATION SITE DETAIL
PROJECT No. 5750
DWG No. MN260-003
SHT SIZE: A3
SHEET
OF
REV.



WESTERN ELEVATION



PLAN VIEW

REFERENCE	DRG.No.	REV	REFERENCE DRAWING
REFERENCE	DRG.No.	REV	REFERENCE DRAWING

REVISIONS	REV	ZONE	DETAILS	DRN	DATE	CHKD	APPD
REVISIONS	REV	ZONE	DETAILS	DRN	DATE	CHKD	APPD

MANILDRA GROUP
Commitment to Excellence

DRAWN	D.A. CAPON	DATE	14/08/15
DESIGNED.		DATE	
CHKD		DATE	
APPD		DATE	
SCALE	1 : 1000		

SITE: MANILDRA - SHOALHAVEN STARCHES PTY LTD
JOB TITLE: PROPOSED DRYER LOCATION
DWG TITLE: BOMADERRY PLANT DRYER LOCATION SITE DETAIL
PROJECT No. 5750
DWG No. MN260-003
SHT SIZE A3
SHEET OF
REV.

566 x 801

To Nowra/
Sydney.

VEHICULAR SITE ENTRY/EXIT VIA GATE 13 ACCESS.

BOLONG ROAD

INDUCTION /TRAINING.

EXIT

ENTRY

ROAD ACCESS

EXISTING BRICK OFFICES MANILDRA OFFICE COMPLEX

BRICK OFFICE

CARPARK

CLEARY BRO'S CONCRETE

GATE 13.

ENTRY

EXIT

EXIT

EXIT

ENTRY

ENTRY

ENTRY

COAL STORAGE

Carpark

Existing Maintenance Building retained as current use.

Existing Building To be demolished

SITE FENCING.

EXISTING BARRIER WALKWAY

DDG CONTROL/ LUNCH.

DDG OUTLOAD

EVAPORATOR

SUB/STN

EVAPORATORS

COOLING TOWERS

WASTE SKIPS.

MACHINERY PARKING.

PROPOSED 60 CAR PARKING AREA

WESTERN ELEVATION

SOUTHERN ELEVATION

ELEVATIONS OF BUILDING TO BE DEMOLISHED.
Scale 1:500

BOLONG ROAD

To Shoalhaven Heads.

WESTERN PACKAGING BUILDING

No.1 FERMENTER

DRYER #6

WET END

ELECTRICAL SUB-STATION

6K SUB/STN

No.3 AND No.4 DRYER BUILDING

PACKAGING BUILDING

DRYER #5

TOILETS

PED BRIDGE

EXISTING GANTRY.

SUB/STN

EXISTING GANTRY

DDG DRYER BUILDING

DRYER #7

PLAN VIEW

REFERENCE	DRG.No.	REV	REFERENCE DRAWING
REFERENCE	DRG.No.	REV	REFERENCE DRAWING
REVISIONS	REV	ZONE	DETAILS	DRN	DATE	CHKD	APPD
REVISIONS	REV	ZONE	DETAILS	DRN	DATE	CHKD	APPD

MANILDRA GROUP
Commitment to Excellence

DRAWN	P.C.	DATE	14/08/15
DESIGNED.		DATE	
CHKD		DATE	
APPD		DATE	
SCALE	1 : 1250 (UNO)		

SITE: MANILDRA - SHOALHAVEN STARCHES PTY LTD
JOB TITLE: PROPOSED DRYER LOCATION
DWG TITLE: BOMADERRY PLANT DRYER DEMOLISHION SITE DETAIL
PROJECT No. 5750
DWG No. MN260-004
SHT SIZE A3
SHEET
OF
REV.

566 x 891

94M

88M.(2.75M x 32 SPACES).

18M

5.5M

7M

5.5M

PROPOSED 60 CAR PARKING AREA

FUTURE CAR PARK ENTRY VIA APPROVED BOLONG ROAD ENTRY.

PPOLE

14

13

8

1

4

17

2

1

10

PROPOSED RELOCATED APPROVED DRYER #5.

WESTERN PACKAGING BUILDING

Drain

Abernethys

REFERENCE	DRG.No.	REV	REFERENCE DRAWING
REFERENCE	DRG.No.	REV	REFERENCE DRAWING

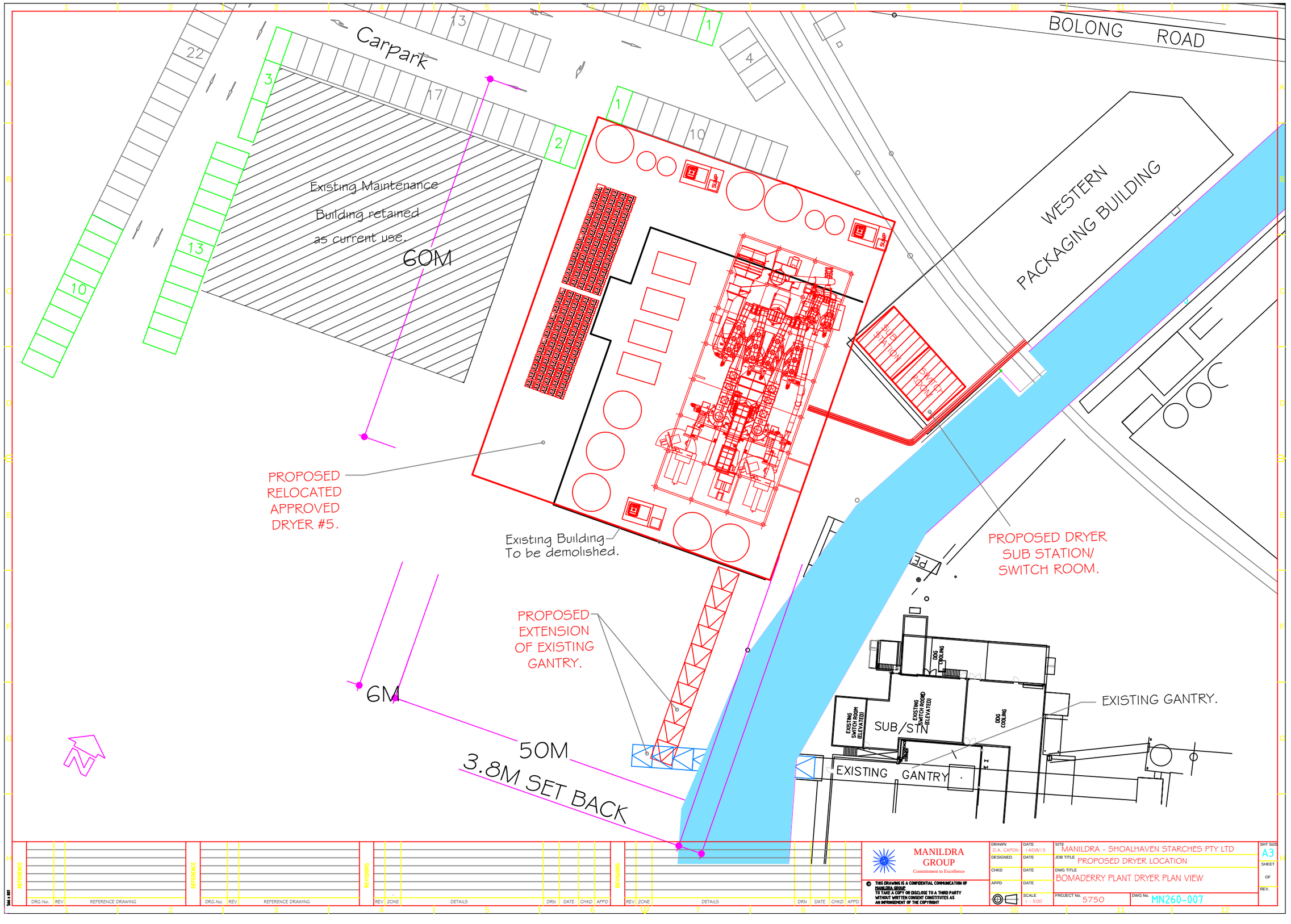
REVISIONS	REV	ZONE	DETAILS	DRN	DATE	CHKD	APPD
REVISIONS	REV	ZONE	DETAILS	DRN	DATE	CHKD	APPD

MANILDRA GROUP
Commitment to Excellence

DRAWN	D.A. CAPON	DATE	14/08/15
DESIGNED.		DATE	
CHKD		DATE	
APPD		DATE	
SCALE	1 : 500		

SITE: MANILDRA - SHOALHAVEN STARCHES PTY LTD
JOB TITLE: PROPOSED DRYER LOCATION
DWG TITLE: BOMADERRY PLANT DRYER CONSTRUCTION CARPARK
PROJECT No. 5750
DWG No. MN260-006
SHT SIZE A3
SHEET
OF
REV. P02

566 x 801



REFERENCE

DRG.No.	REV	REFERENCE DRAWING

REFERENCE

DRG.No.	REV	REFERENCE DRAWING

REVISIONS

REV	ZONE	DETAILS	DRN	DATE	CHKD	APPD

REVISIONS

REV	ZONE	DETAILS	DRN	DATE	CHKD	APPD

MANILDRA GROUP
Commitment to Excellence

DRAWN D.A. CAPON	DATE 14/08/15	SITE MANILDRA - SHOALHAVEN STARCHES PTY LTD
DESIGNED.	DATE	JOB TITLE PROPOSED DRYER LOCATION
CHKD	DATE	DWG TITLE BOMADERRY PLANT DRYER PLAN VIEW
APPD	DATE	
SCALE 1 : 500	PROJECT No. 5750	DWG No. MN260-007

SHT SIZE A3 | SHEET | OF | REV.

CLEARY BRO'S
CONCRETE

BOLONG ROAD

Carpark

14
13
22
3
17
10
13

Existing Maintenance
Building retained
as current use.

WASTE
SKIPS.

MACHINERY
PARKING.

WESTERN
PACKAGING BUILDING

Existing Building
To be demolished

SITE FENCING.

EXISTING BARRIER WALKWAY

PED BRIDGE

EXIT

ENTRY

APPROX
BUND

DOG
COOLING

EXISTING
SWITCH ROOM
(ELEVATED)

SUB/STN

EXISTING
SWITCH ROOM
(ELEVATED)

DOG
COOLING

N

REFERENCE	DRG.No.	REV	REFERENCE DRAWING
REFERENCE	DRG.No.	REV	REFERENCE DRAWING

REVISIONS	REV	ZONE	DETAILS	DRN	DATE	CHKD	APPD
REVISIONS	REV	ZONE	DETAILS	DRN	DATE	CHKD	APPD

MANILDRA GROUP
Commitment to Excellence

DRAWN	D.A. CAPON	DATE 14/08/15
DESIGNED.		DATE
CHKD		DATE
APPD		DATE
SCALE	1 : 500	

SITE: MANILDRA - SHOALHAVEN STARCHES PTY LTD
JOB TITLE: PROPOSED DRYER LOCATION
DWG TITLE: BOMADERRY PLANT DRYER PLAN VIEW
DEMOLITION OF EXISTING BUILDING
PROJECT No. 5750
DWG No. MN260-008
SHT SIZE A3
SHEET
OF
REV.

565 x 881

ANNEXURE 2

Requirements
of the
Department of Planning & Environment
and
Department of Primary Industries – Water

ANNEXURE 2

Stephen Richardson

From: Deana Burn <Deana.Burn@planning.nsw.gov.au>
Sent: Tuesday, 8 September 2015 3:01 PM
To: Stephen Richardson; Christopher Ritchie
Cc: Brian Hanley; John Studdert; Aaron Ticehurst
Subject: RE: Proposed Modification Application to MP06-0228, Shoalhaven Starches Expansion Project, Relocation of Product Dryer, Bolong Road, Bomaderry
Attachments: 141217 Assessment Requirements.pdf

Hi Stephen

I have reviewed the attached scoping submission outlining the proposed modification to the location of the starch dryer. I confirm that the Department has no further environmental assessment requirements beyond those included in your scoping submission and provided in my emails of 19 November 2014 and 17 December 2014 (attached).

Regards,
Deana.

From: Stephen Richardson [mailto:Steve@cowmanstoddart.com.au]
Sent: Thursday, 27 August 2015 8:49 AM
To: Christopher Ritchie; Deana Burn
Cc: Brian Hanley; John Studdert; Aaron Ticehurst
Subject: Proposed Modification Application to MP06-0228, Shoalhaven Starches Expansion Project, Relocation of Product Dryer, Bolong Road, Bomaderry

Dear Chris & Deana,

I understand that you have had in discussions with Brian Hanley in which the above modification proposal has been discussed.

I refer to our firm's letter to the Department dated 30th October 2014 which described a proposal that involved the relocation of a Product Dryer, Packing Plant and Container Storage area from the locations originally approved as part of the SSEP to the land adjacent to the former Dairy Farmers factory site to the east of the current Shoalhaven Starches factory site at Bolong Road Bomaderry. The Department subsequently issued its Environmental Assessment requirements in relation to this previous proposal.

Subsequent to the issue of the Department's Environmental Assessment requirements for this modification proposal, Shoalhaven Starches have reviewed this project, and are now proposing to amend this proposal by siting the proposed Product Dryer to land known as the "Moorehouse" site located within the western part of the factory site. This will essentially involve relocating the product dryer (No.5) from where it was originally approved just to the east of Abernethy's Creek, to the proposed site to the west of Abernethy's Creek.

Attached is a brief scoping submission that I have prepared on Shoalhaven Starches behalf, which outlines the proposed modification to the above approved project, and details issues that such a proposal will raise and which should be addressed in any Modification Application. It is envisaged that such will assist the Department in framing any requirements that it may have for this Modification Application submission.

The attached submission is therefore submitted seeking the Department's requirements for the Environmental Assessment for this modification project.

If you require any further clarification in connection with this matter please do not hesitate to contact me.

Regards

Stephen Richardson
Cowman Stoddart Pty Ltd
PO BOX 738 NOWRA NSW 2541
T 02 4423 6198
T 02 4423 6199
F 02 4423 1569
www.cowmanstoddart.com.au
steve@cowmanstoddart.com.au

From:	Deana Burn
To:	"steve@cowmanstoddart.com.au"; "john.studdert@manildra.com.au"
Cc:	Christopher Ritchie
Subject:	FW: Proposed Modification - Assessment Requirements
Date:	Wednesday, 17 December 2014 9:55:00 AM

Hi Steve, John

The Department received the request for Secretary's Environmental Assessment Requirements (SEARs) for the construction of an additional flour mill at the Shoalhaven Starches facility at Bomaderry.

As discussed, it is the Department's preference that the new flour mill be assessed via a modification to the project approval for the Ethanol Expansion Project (06_0228), as this approval consolidated all previous development consents into a single approval for the site; and Shoalhaven Starches are in the process of preparing a modification application for other aspects of the development (described in my email below). The Department recommends that Shoalhaven Starches lodge a single modification application that assesses all proposed plant relocations, layout amendments and new infrastructure. I note, following discussions with Chris earlier this week, Starches may seek to lodge a separate application for the new stack on the DDGS pellet plant in order to process this component urgently.

I have reviewed the Preliminary Environmental Assessment for the Proposed Additional Flour Mill, dated November 2014 and request that in addition to the requirements provided below, the Environmental Impact Statement includes:

- 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. For the new flour mill, the assessment needs to include cumulative impacts from the approved development + the new flour mill.
- 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).
- Flooding and riverbank stability – assessment of the impacts on riverbank stability, proposed mitigation measures and details of emergency bank stabilisation works in the vicinity of the modification.

As stated below, it is important that all proposed modifications are clearly described and shown on clear and legible site plans.

If you have any questions in relation to these requirements, feel free to call me on 9228 6453. Both Stefan Press at the EPA and David Zerafa at NOW are also available and happy to discuss the specific environmental assessment requirements directly.

Regards,
Deana.

From: Deana Burn
Sent: Wednesday, 19 November 2014 5:40 PM
To: Steve@cowmanstoddart.com.au; John.Studdert@manildra.com.au
Cc: Christopher Ritchie
Subject: Proposed Modification - Assessment Requirements

Hi Stephen, John

Thank you for your letters dated 30 October 2014 and 6 November 2014 describing proposed modifications to the Shoalhaven Starches factory at Bomaderry.

I understand from your letters that the proposed modifications include:

- relocation of the approved packing plant and container storage area;
- relocation of a product dryer (referred to as No. 5 Product Dryer);
- amended layout and design of the approved staff carpark; and
- construction of a stack (48m high) to disperse odours from the approved DDGS pellet plant.

As outlined in your letter, the environmental assessment for the modification should include detailed assessments of:

- air quality and odour;
- noise;
- flooding;
- traffic;
- hazards;
- acid sulphate soils
- contamination; and
- riverbank stability.

The Department also requests that the environmental assessment clearly describes and assesses the following:

- a clear description of the proposed modifications, approved works, constructed and yet to be constructed components of the development. For example the figures submitted with your letters show four large storage silos and tw o product dryers. Please confirm that these are approved components to be relocated and show copies of the approved plans with different colours for approved components, new components, modified/relocated components and approved but not constructed components;
- justification for the modification;
- describe any other related approvals, for example, did Council grant approval for a smaller packing plant on the southern side of Bolong Road? Was this constructed? How will this approval be affected by the proposed modification, will it be surrendered?
- 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.

Should you have any questions regarding the above, please contact me on 9228 6453.

Regards,
Deana.

Stephen Richardson

From: David Zerafa <david.zerafa@dpi.nsw.gov.au>
Sent: Wednesday, 9 September 2015 2:47 PM
To: Stephen Richardson
Subject: Re: Proposed Modification Application to MP 06-0228, Shoalhaven Starches Expansion Project, Modification to Approved Product Dryer Location,

Hello Stephen,

I was in Wollongong all day yesterday which is why you didn't get hold of me and I just listened to your message on my voicemail.

Stephen, I have had a quick look over your scoping submission and it would appear that there are not any substantial issues for DPI-Water for the modifications proposed given that the proposed dryer site is within the existing development footprint.

It would however be appropriate to provide some comment/consideration/impacts of the proposal on the adjoining Abernethys Creek channel.

From your drawing it would appear that the development footprint would maintain the status quo but you might confirm details of any works/extent of works required within the vicinity of the creek/on waterfront land.

Please call me if you need to discuss.

Regards David

David Zerafa
Senior Water Regulation Officer
Department of Primary Industries - Water

NSW Government Offices
5 O'Keefe Avenue, Nowra
PO Box 309 Nowra 2541
Phone (02) 4428 9142
Fax (02) 4421 2172
Mobile 0427 663187
Email:david.zerafa@dpi.nsw.gov.au

On 8 September 2015 at 16:41, Stephen Richardson <Steve@cowmanstoddart.com.au> wrote:

> Dear David,
>
> I tried to contact you by phone this afternoon without luck. The purpose of my call was to discuss with you a proposal by Shoalhaven Starches to relocate an approved Product Dryer from its approved location within the factory site to an alternative location known as the "Moorehouse" site located on the eastern side of Abernethy's Creek.
>
> Attached is a brief scoping submission that I prepared on Shoalhaven Starches behalf, which outlines the proposed modification (including plans of the proposal) and details the issues that such a proposal will

likely raise and which should be addressed in any modification application submission. This submission was submitted to the Department of Planning & Environment seeking their requirements for this application.

Given the proximity of the development site to the creek it was thought prudent to consult with your organisation before proceeding with the preparation of the modification application documentation.

I would appreciate it if you could supply me with any issues that you believe should be canvassed in the application so that we could take such into consideration as part of the application.

If you require any clarification in connection with this mater please do not hastate to contact me.

Regards

Stephen Richardson

Cowman Stoddart Pty Ltd

PO BOX 738 NOWRA NSW 2541

T 02 4423 6198

T 02 4423 6199

F 02 4423 1569

www.cowmanstoddart.com.au

steve@cowmanstoddart.com.au

ANNEXURE 3

Submission under Clause 4.6

of

Shoalhaven LEP 2014

ANNEXURE 3

SUBMISSION UNDER CLAUSE 4.6 OF SLEP 2014

SUBMISSION UNDER CLAUSE 4.6 OF SHOALHAVEN LEP 2014

PROPOSED MODIFICATION IN RELATION TO RELOCATION OF STARCH DRYER No. 5 STRUCTURES IN EXCESS OF ELEVEN METRE MAXIMUM BUILDING HEIGHT LIMIT (Clause 4.3(2A) Shoalhaven LEP 2014)

LOT 201 DP 1062668
24 BOLONG ROAD
BOMADERRY

Prepared for

Shoalhaven Starches Pty Ltd

November 2015

Prepared by:

COWMAN STODDART PTY LTD

Town Planning, Agricultural & Environmental Consultants

SUBMISSION UNDER
CLAUSE 4.6 OF SHOALHAVEN LEP 2014

PROPOSED MODIFICATION IN RELATION TO RELOCATION OF STARCH DRYER No. 5 STRUCTURES IN EXCESS OF ELEVEN METRE MAXIMUM BUILDING HEIGHT LIMIT (Clause 4.3(2A) Shoalhaven LEP 2014)

LOT 201 DP 1062668
NO. 24 BOLONG ROAD
BOMADERRY

Ref. 14/35

Town Planning, Agricultural & Environmental Consultants

Stephen Richardson, M.App.Sc., B.T.P., Grad. Dip. Env. Mgt, C.P.P., MPIA
Stuart Dixon, B.Urb & Reg Plan, C.P.P., MPIA

Associate: Peter Cowman, B.Sc.Agr., M.A.I.A.S.T.
Angela Jones, BA Hons, MSc.

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Fax (02) 4423 1569
Email – info@cowmanstoddart.com.au

COWMAN STODDART PTY LTD

CONTENTS

FIGURES

1.0 INTRODUCTION

This submission has been made in support of a modification application that seeks approval to relocate the approved but not yet constructed Starch Dryer No. 5 from within the existing Shoalhaven Starches factory site to the western side of Abernethy's Creek, otherwise known as the "Moorehouse" site. This land comprises Lot 201 DP 1062668, 24 Bolong Road.

The site is zoned IN1 General Industrial under the provisions of Shoalhaven LEP (SLEP) 2014. There are no specific maximum building height provisions specified for the subject site on mapping supporting the LEP. Clause 4.3(2A) of the Shoalhaven LEP stipulates that if no height limit is specified then a maximum height of any buildings is to be eleven (11) metres.

The proposal seeks approval to relocate Starch Dryer No. 5 and this will involve construction of a building that will have a height of 28 metres above ground level. 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 proposed structures will therefore exceed the 11 m building height limit set by Clause 4.3(2A) of SLEP 2014.

Clause 4.6 of Shoalhaven LEP 2014 deals with exceptions to development standards and provides that Council may consent to a development even though it contravenes a development standard. The provisions of Clause 4.6 require that a written request accompany a proposal that justifies the contravention of a development standard.

This submission has therefore been prepared pursuant to Clause 4.6 and provides justification that the proposal is appropriate and that strict compliance with the provisions of Clauses 4.3(2A) are unreasonable and unnecessary under the specific circumstances associated with the application.

2.0 DESCRIPTION OF SITE AND SURROUNDS

The Shoalhaven Starches Factory site is situated on various allotments of land on Bolong Road, Bomaderry within the City of Shoalhaven. The factory site is located on the south side of Bolong Road on the northern bank of the Shoalhaven River. The factory site (excluding the former Dairy Farmers site) has an area of approximately 12.5 hectares.

This development application concerns land located at 24 Bolong Road Bomaderry (Lot 201 DP 1062668).

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. Burraga (Pig) Island is situated between the factory site and the village of Terara and is currently used for dairy cattle grazing.

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 and the former Shoalhaven Paper Mill (Australian Papers). The industrial area is serviced by a privately owned spur railway line that runs from just north of the Nowra-Bomaderry station to the Starches plant.

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

The Company also carries out irrigation activities on the Company's Environmental Farm located over 1000 hectares on the northern side of Bolong Road. This area is cleared grazing land and also contains spray irrigation lines and wet weather storage ponds). These wet weather storage ponds on the farm form part of the irrigation management system for the factory.

The subject proposal is to be situated entirely within the factory site located on the southern side of Bolong Road and the west of Abernethy's Creek on Lot 201 DP 1062668, 24 Bolong Road, Bomaderry.

The land is zoned IN1 General Industrial pursuant to Shoalhaven Local Environmental Plan (SLEP) 2014. Mapping that supports the SLEP 2014 does not identify the subject site as having a specified building height limit. The provisions of Clause 4.3(2A) of the SLEP state

that if no height limit is specified for a parcel of land then a maximum building height of eleven (11) metres applies.

Figure 1 is a site locality plan, whilst **Figure 2** is an aerial photo of the locality.

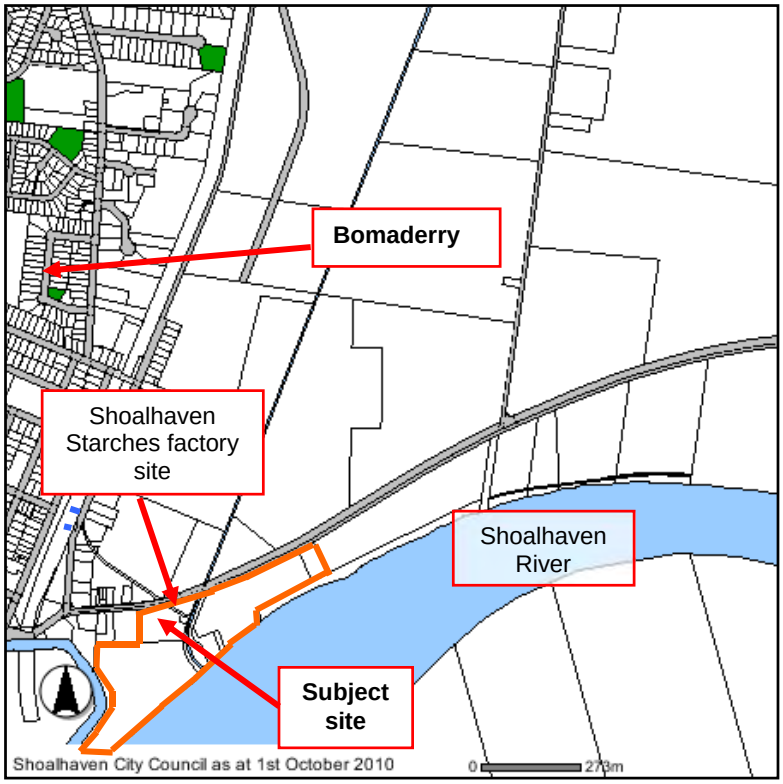


Figure 1: Site locality plan.

Figure 2: Aerial photograph of Shoalhaven Starches factory site.

3.0 THE PROPOSAL

This submission made pursuant to Clause 4.6 of the SLEP 2014 supports a modification application that seeks approval from the NSW Department of Planning & Environment to relocate Starch Dryer No. 5.

The proposal will relocate the approved but not yet constructed Starch Dryer No. 5 from within the existing Shoalhaven Starches factory site to the western side of Abernethy's Creek, on land otherwise known as the "Moorehouse" site. This land comprises Lot 201 DP 1062668, 24 Bolong Road.

The proposed Starch Dryer No. 5 building will have a height of 28 metres above ground level. 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.

3.1 JUSTIFICATION FOR PROPOSAL

The SSEP 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 the Starch Dryer is required to be identified.

Under the Modification Application it is proposed to relocate the approved but not yet constructed Starch Dryer No. 5 from within the existing Shoalhaven Starches factory site to the western side of Abernethy's Creek, otherwise known as the "Moorehouse" site.

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.

4.0 CLAUSE 4.3 OF SHOALHAVEN LEP 2014

Clause 4.3 of Shoalhaven LEP 2014 stipulates the following:

> ***4.3 Height of buildings***
>
> *(1) The objectives of this clause are as follows:*
>
> *(a) to ensure that buildings are compatible with the height, bulk and scale of the existing and desired future character of a locality,*
>
> *(b) to minimise visual impact, disruption of views, loss of privacy and loss of solar access to existing development,*
>
> *(c) 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.*
>
> *(2) 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.*
>
> *(2A) 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.*

Mapping supporting the SLEP 2014 does not identify a maximum building height that applies to this land. Under these circumstances, and having regard to Clause 4.3(2A) a maximum building height of 11 metres applies to the subject site.

The heights of the works associated with this modification application will be above the eleven metre maximum building height limit. The development therefore does not comply with the provisions of Clause 4.3(2A) of Shoalhaven LEP 2014.

5.0 CLAUSE 4.6 OF SHOALHAVEN LEP 2014

Clause 4.6 of Shoalhaven LEP 2014 stipulates:

4.6 Exceptions to development standards

(1) The objectives of this clause are as follows:

(a) to provide an appropriate degree of flexibility in applying certain development standards to particular development,

(b) to achieve better outcomes for and from development by allowing flexibility in particular circumstances.

(2) 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. However, this clause does not apply to a development standard that is expressly excluded from the operation of this clause.

(3) 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:

(a) that compliance with the development standard is unreasonable or unnecessary in the circumstances of the case, and

(b) that there are sufficient environmental planning grounds to justify contravening the development standard.

(4) Development consent must not be granted for development that contravenes a development standard unless:

(a) the consent authority is satisfied that:

(i) the applicant's written request has adequately addressed the matters required to be demonstrated by subclause (3), and

(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

(b) the concurrence of the Director-General has been obtained.

(5) In deciding whether to grant concurrence, the Director-General must consider:

(a) whether contravention of the development standard raises any matter of significance for State or regional environmental planning, and

(b) the public benefit of maintaining the development standard, and

(c) any other matters required to be taken into consideration by the Director-General before granting concurrence.

(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:

(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

(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.

Note. *When this Plan was made it did not include all of these zones.*

(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).

(8) This clause does not allow development consent to be granted for development that would contravene any of the following:

(a) a development standard for complying development,

(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,*

(c) clause 5.4,

(ca) clause 6.1 or 6.2

5.1 CLAUSE 4.6 AND ITS USE

Clause 4.6 of the SLEP 2014 sets out the general principle that a development standard may be varied where strict compliance can be shown to be unreasonable or unnecessary in the circumstances of the case; and that there are sufficient environmental planning grounds to justify contravening the development standard.

Before applying the discretionary power of Clause 4.6 the consent authority must be satisfied that the standard for which the departure is sought is a "development standard" and not a matter which would prohibit the proposal.

A development standard is defined within Section 4 of the EP&A Act.

"Development standard" means provisions of an environmental planning instrument in relation to the carrying out of development, being provisions by or under which requirements are specified or standards are fixed in respect of any aspect of that development, including, but without limiting the generality of the forgoing, requirements or standards in respect of -

(a) the area, shape or frontage of any land, the dimensions of any land, buildings or works, or the distance of any land, building or works, or the distance of any land, building or work from any specified point;

(b) the proportion or percentage of the area of a site which a building or work may occupy;

(c) the character, location, siting, bulk, scale, shape, size, height, density, design or external appearance of a building or work;

(d) the cubic content or floor space of a building;

(e) the intensity or density of the use of any land, building or work;

(f) the provision of public access, open space, landscaped space, tree planting or other treatment for the conservation, protection or enhancement of the environment;

(g) the provision of facilities for the standing, movement, parking, servicing manoeuvring, loading or unloading of vehicles;

(h) the volume, nature and type of traffic generated by the development;

(i) road patterns;

(j) drainage;

(k) the carrying out of earthworks;

(l) the effects of the development on patterns of wind, sunlight, daylight or shadows;

(m) the provision of services, facilities and amenities demanded by the development;

(n) the emission of pollution and means for its prevention or control or mitigation; and

(o) such other matters as may be prescribed.

Having regard to the definition of *"development standard"*, particularly paragraph (c), it is considered that Clause 4.3 contains a development standard limiting the height of a building. Furthermore, Clause 4.3 is contained in Part 4 of the Shoalhaven LEP, which contains the primary development standards outlined in the LEP. This reinforces the contention that the provisions of Clause 4.3 are a development standard. Such a development standard is therefore open to a written request made pursuant to Clause 4.6.

A consent authority must also be satisfied of three matters (pursuant to the provisions of Clause 4.6) before it may agree with the written request and grant development consent to a development application for development that could, but for a development standard, be carried out with development consent.

First, the request is to be in writing (Clause 4.6(3)), demonstrate that the compliance with that development standard is unreasonable or unnecessary in the circumstances of the case (Clause 4.6(3)(a)) and that there are sufficient environmental planning grounds to justify contravening the development standard (Clause 4.6(3)(b)).

Secondly, the consent authority must also be satisfied that 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 (Clause 4.6(4)(a)(ii)).

Finally, the consent authority can only grant development consent for a development that contravenes a development standard if the concurrence of the Secretary (formerly Director General) of Planning and Infrastructure has been obtained (Clause 4.6(4)(b)).

The Secretary in deciding whether to grant concurrence must consider pursuant to Clause 4.6(5):

(a) whether contravention of the development standard raises any matter of significance for State or regional environmental planning, and

(b) the public benefit of maintaining the development standard, and

(c) any other matters required to be taken into consideration by the Director-General before granting concurrence.

As this matter does not concern the subdivision of land zoned *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* the provisions of Clause 4.6(6) are also not applicable to this proposal and are not further addressed in this written request.

This submission has been prepared having regard to the above relevant matters.

5.2 DEPARTMENT OF PLANNING AND INFRASTRUCTURE GUIDELINES

The Department of Planning and Infrastructure has produced a document entitled "*Varying Development Standards – A Guide*" dated August 2011. This document updates the former Circular B1 which applied to *State Environmental Planning Policy No. 1 (SEPP No. 1) - Development Standards* to include the relevant matters applying under Clause 4.6 where the Standard Instrument LEP has been adopted.

The Guidelines build upon the matters outlined above and in Clause 4.6 itself, and also stipulates that the application should address the "five part test". In this regard, the Land and Environment Court (*Wehbe v Pittwater Council [2007] NSWLEC827 (21 December 2007)* has set out a "five part test" for consent authorities to consider when assessing a proposal that seeks to vary a development standard. The "five part test" is as follows:

1. the objectives of the standard are achieved notwithstanding non-compliance with the standard;

2. *the underlying objective or purpose of the standard is not relevant to the development and therefore compliance is unnecessary;*

3. *the underlying object of purpose would be defeated or thwarted if compliance was required and therefore compliance is unreasonable;*

4. *the development standard has been virtually abandoned or destroyed by the council's own actions in granting consents departing from the standard and hence compliance with the standard is unnecessary and unreasonable;*

5. *the compliance with development standard is unreasonable or inappropriate due to existing use of land and current environmental character of the particular parcel of land. That is, the particular parcel of land should not have been included in the zone.*

Relevant matters are addressed in Section 7.0 below.

6.0 ASSUMED CONCURRENCE

The Guidelines prepared by the Department deal with the concurrence requirements of proposals reliant upon an exception to development standards. Where a Standard Instrument LEP applies, as is the case with this proposal and the provisions of Shoalhaven LEP 2014, the Guidelines reference Planning Circular PS 08-003 issued in May 2008 and which advises that concurrence can be assumed with respect to all environmental planning instruments that adopt Clause 4.6, or a similarly worded clause, providing for exception to development standards.

The concurrence of the Secretary of the Department of Planning and Infrastructure can therefore be assumed with respect to this proposal.

7.0 THE REQUEST

7.1 WRITTEN REQUEST JUSTIFYING CONTRAVENTION OF CLAUSE 4.3 SLEP 2014

This written request seeks to justify the departure to the provisions of Clause 4.3(2A) of the SLEP 2011 which imposes a maximum building height of eleven (11) metres. The proposal seeks approval to relocate the approved but not yet constructed Starch Dryer No. 5 from within the existing Shoalhaven Starches factory site to the western side of Abernethy's Creek on land that comprises Lot 201 DP 1062668, 24 Bolong Road.

The proposed Starch Dryer No. 5 building will have a height of 28 metres above ground level. 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.

This written request demonstrates that compliance with Clause 4.3(2A) of SLEP 2014 is unreasonable and unnecessary given the specific circumstances of this case; and that there are sufficient environmental planning grounds to justify contravention of the maximum height limit.

7.1.1 Objectives Underpinning Clause 4.3 are Achieved

Preston CJ in *Wehbe v Pittwater Council [2007] NSWLEC827 (21 December 2007)* provides commentary with respect to establishing whether compliance with a development standard is unreasonable or unnecessary under the specific circumstances of a particular matter. Whilst this case related to the use of SEPP 1, given the similarities between the objects of SEPP No. 1 and Clause 4.6 the findings of Preston CJ does provide guidance with respect to the implementation of this clause.

According to Preston CJ one of the most commonly invoked ways to establish that compliance with the development standard is unreasonable or unnecessary is because the objectives of the development standard are achieved notwithstanding non-compliance with the standard.

The rationale is that development standards are not ends in themselves but means of achieving ends. The ends are environmental or planning objectives. Compliance with a development standard is fixed as the usual means by which the relevant environmental or planning objective is able to be achieved. However, if the proposed development proffers an alternative means of achieving the objective, strict compliance with the standard would be unnecessary (it is achieved anyway) and unreasonable (no purpose would be served).

As outlined in Section 6.2 above, the objectives underpinning the development standard – in this instance the maximum Building Height of eleven metres is a relevant consideration in determining whether strict compliance with that standard under the specific circumstances of the case would be unreasonable or unnecessary.

The objectives of the height of buildings standard are expressly stated in Clause 4.3 as follows:

> *(1) The objectives of this clause are as follows:*
>
> *(a) to ensure that buildings are compatible with the height, bulk and scale of the existing and desired future character of a locality,*
>
> *(b) to minimise visual impact, disruption of views, loss of privacy and loss of solar access to existing development,*
>
> *(c) 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.*

The above objectives in my view provide a clear understanding of the purposes underpinning the building height standard outlined in Clause 4.3(2A) and which applies to the subject site.

This written submission will demonstrate that this proposal will not prevent the above objectives from being achieved notwithstanding non-compliance with the eleven metre height restriction development standard in the specific circumstances of this case.

Having regard to the objectives of Clause 4.3, it is my view that the proposal is not inconsistent with these for the following reasons:

- the proposal seeks consent to relocate Starch Dryer No. 5 and this will involve construction of a building that will have a height of 28 metres above ground level. 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 proposed structures are not dissimilar to existing structures within the existing Shoalhaven Starches complex. The building forms, heights, shapes and characteristics as evident in **Figure 3** 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. **Figure 3** is the elevation plan for the proposed Starch Dryer. This plan illustrates how the proposed new development, illustrated in red, fits within the silhouette of the current factory site and is consistent in scale with existing development on the site. Detailed plans of the proposed development are attached as **Annexure 1** to the EA.

- The subject site is zoned IN1 general industrial and the proposed development meets the current and desired future character of the locality in which it is sited.
- The proposed development will have a limited visual impact. The bulk and scale of the structures associated with this modification application will not be dissimilar to that of other industrial type development associated with the existing factory site. The main vantage points from where the development could potentially be visible would be from along Bolong Road immediately in front of the site and possibly glimpses from the Bomaderry Township. Whilst the proposed structures will protrude above the canopy of the vegetation along the river, it should be noted however, that this is the case with the existing factory development. The proposed structures will be generally sited within the overall "silhouette" of the existing factory complex and individual structures will not be visually prominent. The works will be sited in the midst of the existing factory complex, and will be viewed within this context. As such this development will not diminish the views of existing development. The visual impact of the modification proposal is discussed in Section 7.9 of the EA.
- The development will not lead to excessive overshadowing of foreshore areas given the existing shadows cast by existing development and the nature of the foreshore in this locality.
- The proposed development site is not subject to a heritage listing under the provisions of SLEP 2014 nor is it sited within the in the vicinity of a heritage item or within a heritage conservation area.
- The proposed development has been designed to comply with all relevant statutory planning provisions applying to this form of development.

Given these circumstances, it is our view that the proposed relocation of Starch Dryer No. 5 will not be inconsistent with the prevailing character of this locality; or the envisaged character of the area given the planning provisions applying to the land, and will therefore not be inconsistent with the objectives outlined in Clause 4.3(1) of SLEP 2014.

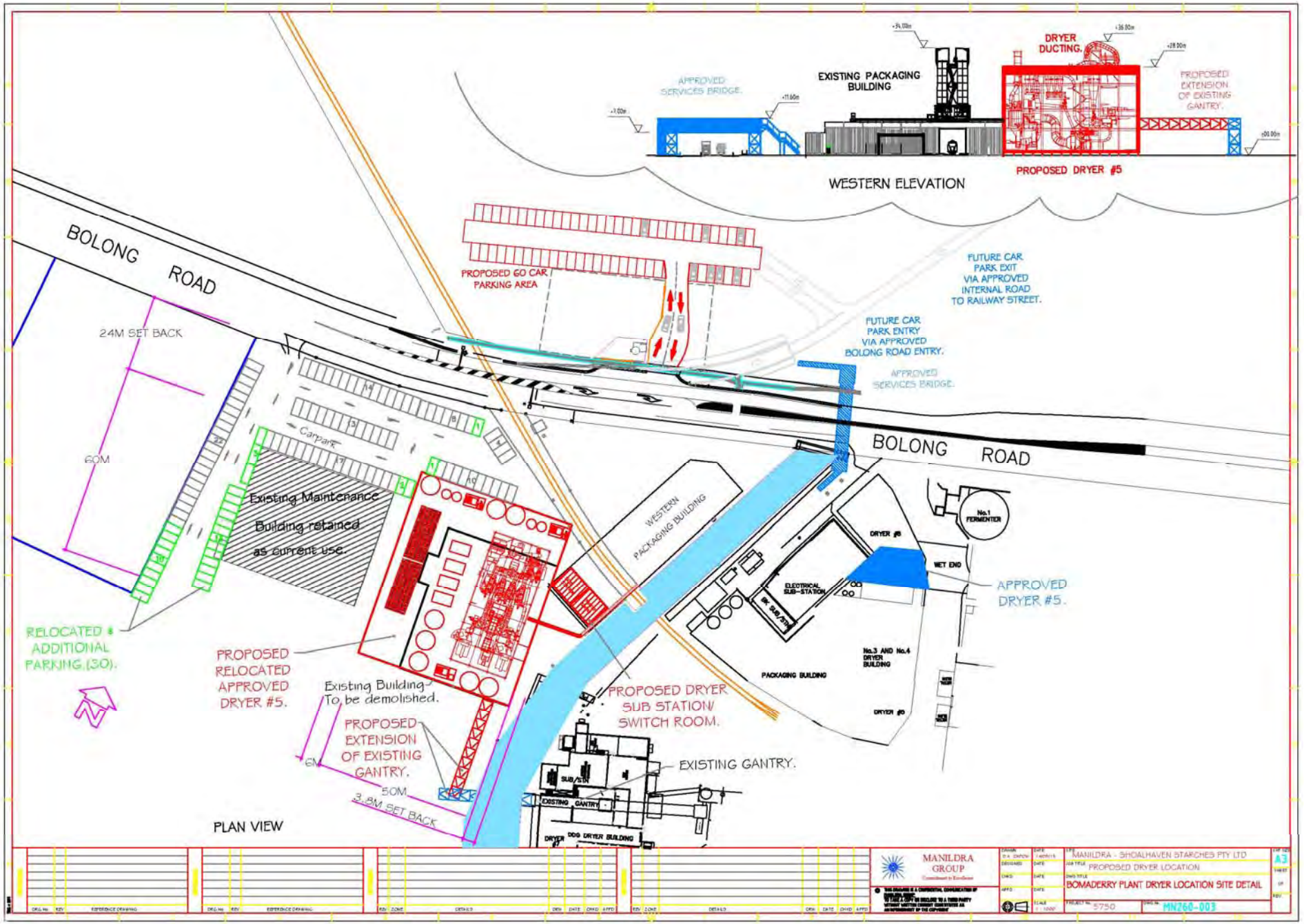


Figure 3: Elevation of proposed works.

7.1.2 Environmental Planning Grounds that Justify Contravening Development Standard

The written request is also required to demonstrate that there are sufficient environmental planning grounds to justify contravening the eleven metre height restriction.

- The proposal is not inconsistent with state and regional planning provisions applying to this land.
- The proposal is consistent with the objectives and is permissible within the IN1 zone that applies to the land.
- Despite non-compliance with eleven metre height restriction, the proposal is consistent with the stated objectives of Clause 4.3 as they relate to the building height requirements as outlined above in Section 7.1.1 of this written request.
- The proposed development is representative of the prevailing character of the locality, i.e. industrial development within an industrial zone and is of a height consistent with buildings already existent on the development.
- The subject site is eminently suitable for the proposal development.

7.1.3 Public Interest

The written request is also required to demonstrate that 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.

Section 7.1.1 of this submission demonstrates that the proposal will be able to satisfy the objectives of the development standard as enunciated within Clause 4.3 notwithstanding contravention of the eleven metre height restriction.

The subject site is zoned IN1 General Industrial under the provisions of the Shoalhaven Local Environmental Plan 2014.

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 not inconsistent with the above objectives:

- The site is an existing factory complex and the development will ensure that land that is zoned for industrial purposes is fully utilised for that purpose.
- The proposed Starch Dryer forms part of the former Pollution Reduction Program No. 7 Project, which was consolidated with all previous approvals (up to that time) as part of the as part of the Shoalhaven Starches Expansion Project Approval. As such the development will support and protect both the industrial use of the subject site and the employment opportunities provided by Shoalhaven Starches.
- Section 7.1 to 7.9 of the EA addresses the environmental impacts of the proposal, including visual impact, air quality and odour, noise, traffic, flooding and geotechnical issues. The assessment concludes that the proposal will not adversely impact the environment of this locality and that the proposal is suitable for the site.

Given the proposal is consistent with the objectives that underpin Clause 4.3 and is consistent with the objectives of IN1 zone that apply to the land. It is our view that the proposal will be in the public interest having regard to clause 4.6(4)(ii) of SLEP 2011.

7.1.4 Clause 4.6(5) Matters for Consideration by Director-General

As outlined the concurrence of the Director-General is to be assumed in this case.

- As identified in the original EA for the SSEP the overall proposal is consistent with state and regional planning provisions that apply to the site.
- As outlined in Section 7.1.3 of this submission it is our view that the proposal is in the public interest.

Under these circumstances it is my view that this objection made pursuant to Clause 4.6 is well founded and strict compliance with Clause 4.3(2A) of Shoalhaven LEP 2014 would be unreasonable under the specific circumstances of this case as:

- The objectives that underpin the development standard outlined in Clause 4.3 of Shoalhaven LEP are achieved notwithstanding non-compliance with the development standard.

- This proposal is consistent with state and regional planning provisions applying to this land.
- The proposal is consistent with the objectives of the IN1 zone that applies to the land.
- Despite non-compliance with the eleven metre height restriction, the proposal is consistent with the stated objectives of Clause 4.3 as they relate to the height of building requirements as outlined above in this written request.
- The proposed development is representative of the prevailing character of the locality, ie. industrial development within an industrial zone.
- The modified proposal is of a form, bulk and height consistent with buildings already existent on the development.
- The underlying purpose of the Starch Dryer No. 5 would be defeated if compliance was required as restricted height would limit the size and therefore function of the required Starch Dryer and therefore compliance is unreasonable. Such would have an adverse impact on the ongoing operations on the site.
- The subject site is eminently suitable for the proposal development.

Although well considered, the eleven metre height restriction for the broader Shoalhaven encapsulated within Clause 4.3 should not be rigidly enforced as a development standard in all cases.

This submission demonstrates that the variation to the development standard sought by this proposal is consistent with the objectives of the state, regional and local planning provisions for this site. It is my opinion that strict compliance with this development standard under the specific circumstances of this case would be unreasonable and unnecessary.

For these reasons, this submission pursuant to Clause 4.6 requests that the Department exercise the discretionary power and support this proposal and the development application.

Stephen Richardson.

Stephen Richardson
TOWN PLANNER CPP MPIA

ANNEXURE 4

ANNEXURE 4

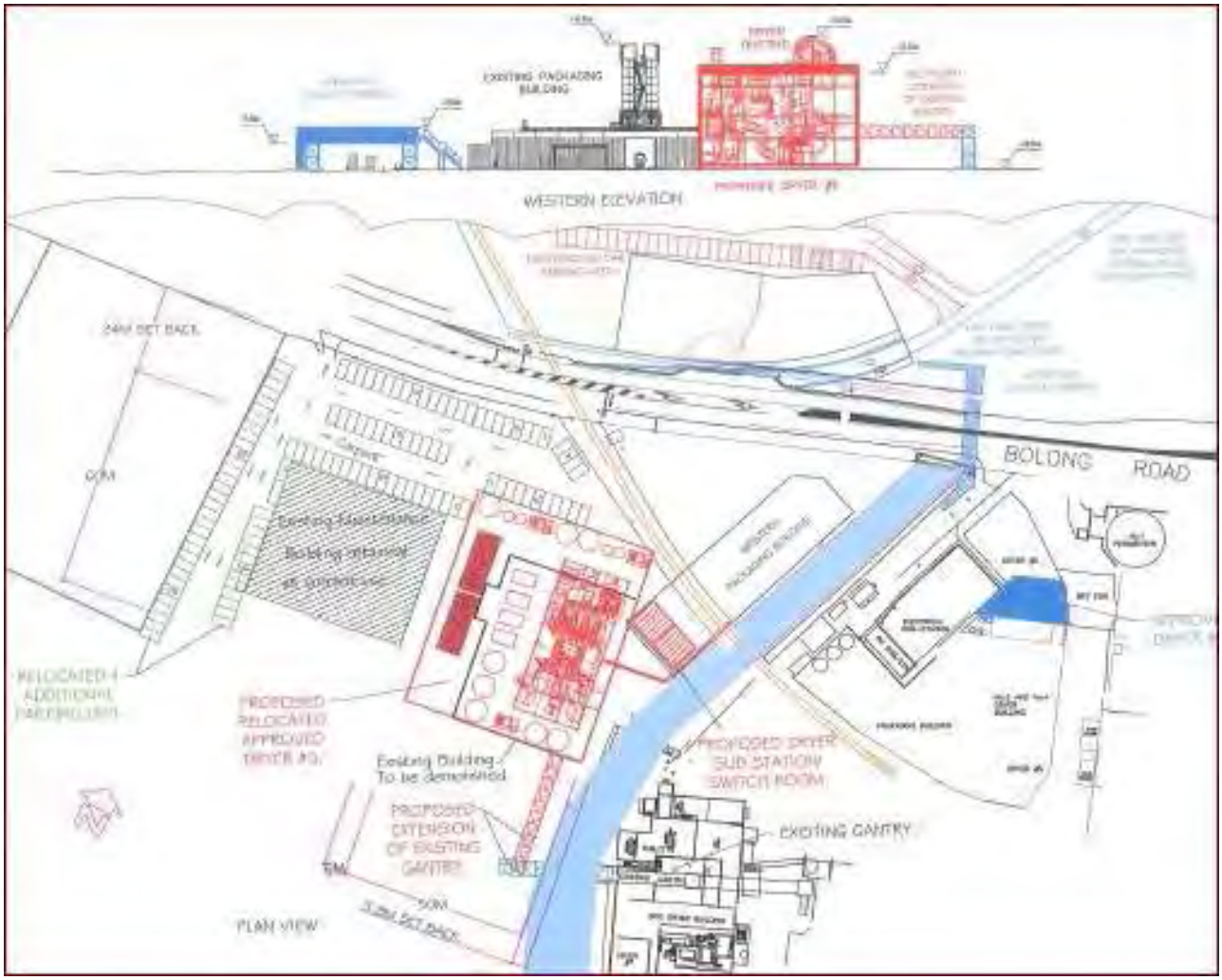
Flood Assessment

prepared by

Webb McKeown & Associates

SHOALHAVEN STARCHES

PROPOSED MODIFICATION APPLICATION TO MP06-0228, SHOALHAVEN STARCHES EXPANSION PROJECT, RELOCATION OF PRODUCT DRYER, FLOOD IMPACT ASSESSMENT



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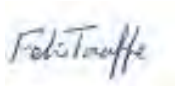
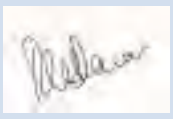
PROPOSED MODIFICATION APPLICATION TO MP06-0228, SHOALHAVEN STARCHES EXPANSION PROJECT, RELOCATION OF PRODUCT DRYER, FLOOD IMPACT ASSESSMENT

OCTOBER 2015

Project **Proposed Modification Application to MP06-0228, Shoalhaven Starches Expansion Project, Relocation of Product Dryer, Flood Impact Assessment**	**Project Number** **114044**
Client SHOALHAVEN STARCHES	**Client's Representative** Brian Hanley
Authors Felix Taaffe Richard Dewar	**Prepared by** 
Date 30 October 2015	**Verified by** 

Revision	Description	Distribution	Date
1	Flood Assessment Report	B Hanley S Richardson	30 October 2015

PROPOSED MODIFICATION APPLICATION TO MP06-0228, SHOALHAVEN STARCHES EXPANSION PROJECT, RELOCATION OF PRODUCT DRYER, FLOOD IMPACT ASSESSMENT

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EXECUTIVE SUMMARY

Background: Project Approval MP06_0228 was granted by the Minister of Planning on 28th January 2009 for the Shoalhaven Starches Expansion Project. The Project sought to increase ethanol production in a staged manner from 126 to 300 million litres per year. The Project Approval also consolidated all previous approvals into one Project Approval. This included the consolidation of the Pollution Reduction Program No. 7 which included the installation of the No. 5 Starch Dryer, the subject of this Modification Application.

Under this Modification Application it is proposed to relocate No. 5 Starch Dryer from within the existing Shoalhaven Starches factory site (Figure 1) to land on the western side of Abernethy's Creek. This land comprises Lot 201, DP 1062668, 24 Bolong Road. 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.

This report provides an assessment of the impact that the proposed relocation (Figure 2) has on surrounding flood levels.

Past Studies: Several previous studies have been undertaken by WMAwater for Shoalhaven Starches in regard to flooding. The key ones are listed below.

1. Lower Shoalhaven River Flood Study, April 1990 (Reference 1);
2. Shoalhaven River Flood Study, March 2013 (Reference 2);
3. Proposed Ethanol Production Upgrade Including Proposed Odour Reduction and Wastewater Treatment Measures for Existing and Proposed Shoalhaven Starches Operations - Bolong Road, Nowra. Hydraulic, Economic, Social and Environmental Impacts of Flooding, May 2008 (Reference 3).

Scope of Work: The scope of work was to use up to date hydraulic modelling from Reference 2 to assess the impacts of the proposed relocation of No. 5 Starch Dryer on flooding.

Assessment of Impacts of Proposed Development: Relocation of No. 5 Starch Dryer will increase flood levels as shown on Figure 3 and Figure 4. In summary the maximum increase in the 1% AEP flood level is between 0.025 and 0.05 m and mainly affects buildings and land owned by Shoalhaven Starches. The increase in flood level relative to building floor levels is provided on Chart 1 and Chart 2 with the building locations shown on Figure 3.

Climate Change: Possible changes to design flood levels (sea level rise and rainfall intensity increase) have been evaluated in Reference 1. The results indicated that sea level rise would have negligible impact on flood levels at the site due to the considerable distance upstream from the Pacific Ocean. Any increase in design rainfall intensities will increase design flood levels. Reference 1 indicates that a 10%, 20% and 30% increase in design rainfalls will increase 1% AEP flood levels by approximately 0.1m, 0.2m and 0.3m respectively.

1. INTRODUCTION

1.1. Background

Project Approval MP06_0228 was granted by the Minister of Planning on 28th January 2009 for the Shoalhaven Starches Expansion Project. The Project sought to increase ethanol production in a staged manner from 126 to 300 million litres per year. The proposed works included:

- Provision of an additional product dryer;
- Additional equipment and storage vessels;
- Upgrades to the Stillage Recovery Plant;
- Establishment of a new packing plant, container loading area and rail spur line on the northern side of Bolong Road.

The Project Approval also consolidated all previous approvals into one Project Approval. This included the consolidation of the Pollution Reduction Program No. 7 which included the installation of the 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. This land comprises Lot 201, DP 1062668, 24 Bolong Road. The proposed 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 (refer Image 1).

Image 1 - Proposed Development Footprint

WMAwater (formerly Webb McKeown & Associates) was commissioned by Shoalhaven

Starches to provide a flood impact assessment of the proposed relocation of No. 5 Starch Dryer.

A glossary of flood related terms is provided in Appendix A.

1.2. Scope of Work

The flood assessment undertaken included the following:

- assessment of existing flood conditions at the site;
- assessment of hydraulic impact (increase in 1% AEP flood level) if the No. 5 Starch Dryer is relocated to its proposed location. This was considered for two scenarios, firstly in comparison to "existing 2015" floodplain conditions and secondly as the cumulative impact on works by Shoalhaven Starches and others on the northern floodplain since 1990 (the cumulative impact);
- assessment of increases in depth of above building floor inundation of the proposed relocation.

This report does not include any water quality aspect, structural assessment in a flood, preparation of a stormwater management plan or erosion/sedimentation assessment. These other flood related issues are covered by others.

1.3. Study Area

The proposed development site is located within the Shoalhaven River catchment (Figure 1) which is part of the Shoalhaven City Local Government Area (LGA).

Shoalhaven Starches is located on the northern bank of the Shoalhaven River approximately 1.5 kilometres downstream of Nowra Bridge. The plant has been on this site since approximately 1970 and has expanded considerably since that time.

There is a well documented history of flooding on the Shoalhaven River since European settlement commenced around 1800. Most notable are the floods of 1860 and 1870 which devastated the then urban and commercial centre at Terara on the southern bank causing most of the population to move Nowra. Since that time Terara has declined to a small village.

Since the 1970's major flooding has occurred in 1974, 1975 and 1978 with smaller events in 1976 and 1988.

1.4. History of Floodplain Modelling

The Lower Shoalhaven River Flood Study (Reference 1) was commissioned by the NSW Government Public Works and determined design flood levels along the river and adjoining floodplain. From approximately the year 2000 to 2010 the hydraulic computer model, termed the CELLS model, established in that study was used by WMAwater, on behalf of Shoalhaven Starches, to evaluate the potential increases in flood level due to further works on the northern floodplain, including expansion of the plant itself and construction of the storage ponds.

In 2013 Shoalhaven Starches commissioned WMAwater to update the Shoalhaven River Flood Study to current best practice.

1.4.1. Brief description of Flood Modelling Undertaken in Reference 1

Flood modelling typically involves the setting up and calibration of two computer models. A hydrologic model that converts the rainfall to runoff and a hydraulic model that includes inflow from the hydrologic model, as well as ocean boundaries, which determines peak flood levels and velocities based on hydraulic formulae. Both models are calibrated to historical data, including historical flood levels and river flow gaugings, to ensure that they can replicate the historical events and are then used to determine design flood events. These are events that have a known probability of occurrence, such as the 1% Annual Exceedance Probability (AEP) event.

The CELLS model of the Shoalhaven River represented the channel and floodplain as a series of interconnected cells, termed either river or floodplain cells. The river cells were connected by cross sections and the floodplain cells connected by weirs. Approximately 100 cells were used in the Shoalhaven River model with some cells over 4km^2 in area. The CELLS model is termed a one dimensional (1D) branched model in that it cannot account for flow in other than the one direction but has “branches” which allow flow to extend across the floodplain. The model used both field survey for weirs as well as bathymetric survey for the river cross sections at approximately 1 to 2 kilometre spacing.

The CELLS model is an unsteady flow model in that it modelled the full flood event and not just the peak (rising and falling water levels) and included ocean tidal hydrographs at both entrances, namely the Shoalhaven Heads and Crookhaven River, and some six flow hydrographs from the WBNM model.

1.4.2. Advancements in Flood Modelling since 1990

Since 1990 there have been significant advancements in the field of hydraulic modelling, though in hydrologic modelling there has been significantly less advancements and the WBNM model used in Reference 1 is still used today.

The main advancements in hydraulic modelling are through the use of more complex computer software that allows the river and floodplain to be discretised into a grid. This is typically 15m by 15m on large rivers and up to 2m by 2m on small urban catchments. These models are termed 2 Dimensional (2D) in that they determine the flow direction between grid cells producing vector velocities. These models are thus able to more accurately define the topography and in turn can more accurately represent the hydraulic effects of even a small development on a large floodplain. With the CELLS model this was only possible using a conservative approach due to the large spacing between cross sections and weirs.

1.4.3. Availability of More Detailed Survey

2D hydraulic models also require much more detailed survey data than the CELLS model and this has only become possible with the advent of what is known as Airborne Laser Scanning survey or ALS or Light Detecting and Ranging or LIDAR. ALS uses laser technology that is emitted from a plane to define the ground levels (height in mAHD) and co-ordinates of points on the ground or on buildings. ALS cannot penetrate deep water in the Shoalhaven River and a detailed bathymetric survey of the river is therefore also required.

Ortho-rectified digital aerial photography is also required in combination with ALS to ensure that buildings and other features on the floodplain are accurately accounted for. ALS has been introduced since approximately the year 2000 over NSW and there is now coverage of the majority of the urban areas and coastal rural areas in NSW.

1.4.4. Summary

2D hydraulic models in conjunction with ALS, digital aerial photography and a detailed bathymetric survey provide the most accurate and up to date approach for determining flood levels that is currently available. This also allows an accurate representation of the effects of development on the floodplain that is far superior to that available with the CELLS model, by adjusting the characteristics of the grid cells. Thus for a new building several grid cells can be blocked out so no flow can occur across it.

1.5. Previous Reports

The key past reports relevant to this project are:

1. Shoalhaven River Flood Study, March 2013 (Reference 2);
2. Proposed Ethanol Production Upgrade Including Proposed Odour Reduction and Wastewater Treatment Measures for Existing and Proposed Shoalhaven Starches Operations - Bolong Road, Nowra. Hydraulic, Economic, Social and Environmental Impacts of Flooding, May 2008 (Reference 3).

1.5.1. Shoalhaven River Flood Study, March 2013 (Reference 2)

The main purpose of this report was to create a best practice hydraulic model (termed TUFLOW) that would supersede the CELLS model prepared as part of the Lower Shoalhaven River Flood Study (Reference 1) in 1990. The approach adopted in the study is summarised as follows:

- collect and digitally map available flood height data;
- as no floods have occurred since publication of the Lower Shoalhaven River Flood Study (Reference 1) in 1990 and the WBNM hydrologic model used in that study is still valid today, the same historical and design inflow hydrographs for the Shoalhaven River upstream of Nowra Bridge have been adopted in this study. Thus no recalibration of the 1990 WBNM hydrologic model was undertaken. Some minor changes to the inflow hydrographs downstream of Nowra Bridge were undertaken to ensure more accurate

representation in the hydraulic model;

- survey data was collated from a bathymetric survey of the Shoalhaven River and an ALS survey of the entire floodplain;
- a 2 Dimensional hydraulic computer model termed TUFLOW was established based on the survey data. Modifications were made to the topography to reflect changes to levees and increased development on the floodplain since 1974;
- historical and design ocean tidal hydrographs were obtained from Reference 1;
- the TUFLOW model was calibrated to match the historical flood level data for the 1974, 1975, 1978 and 1988 floods;
- design inflows were included in the TUFLOW model and peak flood depths, velocities and contours obtained for the 10%, 5%, 2%, 15, 0.5%, 0.2% AEP events and an Extreme event;
- sensitivity analysis into the possible impacts of both a possible climate change sea level rise and rainfall increase were undertaken for the 1% AEP event. The effect of a changed entrance condition, whether open or closed, at Shoalhaven Heads was also undertaken.

In summary the TUFLOW hydraulic model established in this reference provides a best practice tool that can be used to determine the hydraulic effects (increase in flood level, change in velocity of flow) of development within the Shoalhaven Starches plant.

1.5.2. Proposed Ethanol Production Upgrade Including Proposed Odour Reduction and Wastewater Treatment Measures for Existing and Proposed Shoalhaven Starches Operations - Bolong Road, Nowra. Hydraulic, Economic, Social and Environmental Impacts of Flooding, May 2008 (Reference 3)

Shoalhaven Starches proposed to undertake the following works (termed ethanol plant upgrade and odour reduction works in this report) on the floodplain in 2008:

- to construct additional plant facilities within the existing complex south of Bolong Road and including to the west of Abernethy's Drain,
- to establish a new packing plant and container loading area, including new railway spur line on vacant land north of Bolong Road and west of Abernethy's Drain (Creek),
- adaption of the approved Pond No. 7 as a wastewater treatment pond, (these proposed works do not increase the flood affectation above what was considered in previous reports as part of the approval for Pond No. 7.)

This report detailed the likely hydraulic, economic, social and environmental impacts of flooding as a result of the proposed works. The hydraulic assessment was undertaken using the CELLS model established for the Lower Shoalhaven River Flood Study (Reference 1) in 1990.

It also assessed possible mitigation measures to address the hydraulic impacts. In summary it stated: *Shoalhaven Starches cannot directly negate the hydraulic impacts of the works it has constructed or proposes to construct. For example it is not possible to construct a wet weather storage or wastewater treatment pond of the required dimensions with no increases in flood level or construct plant or associated works which does not in some way obstruct a flow path (e.g. railway spur line, container storage).*

In order to compensate for the adverse impacts of the existing and proposed works, a range of management measures have been considered which will at least partially offset the potential increases in damages caused by the cumulative impacts of the existing and proposed works on the northern floodplain since 1990.

2. APPROACH

2.1. 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 dryer) may be small the cumulative increases from several developments may be significant. Therefore, the proposed works 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 report the nominal starting date for the assessment of cumulative effects is 1990. This date was agreed previously (refer October 2000 report - Appendix C) 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 - Reference 1).

For the above reasons the impacts assessed in the May 2008 Proposed Ethanol Production Upgrade Report (Reference 3) 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 the proponent of the possible damages to the existing and proposed structures making up the plant, and also to advise Council 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 or 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).

2.2. Approach Adopted in this Study

The May 2008 Proposed Ethanol Production Upgrade Report (Reference 3) 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. This land comprises Lot 201 DP 1062668, 24 Bolong Road. The site is currently partially occupied by a large warehouse and partially by an open space area occupied by staff parking (refer Image 2, Figure 2 and plans provided in Appendix B). The proposed No. 5 Starch Dryer will replace the existing warehouse building with a slightly larger building footprint (refer Image 1).

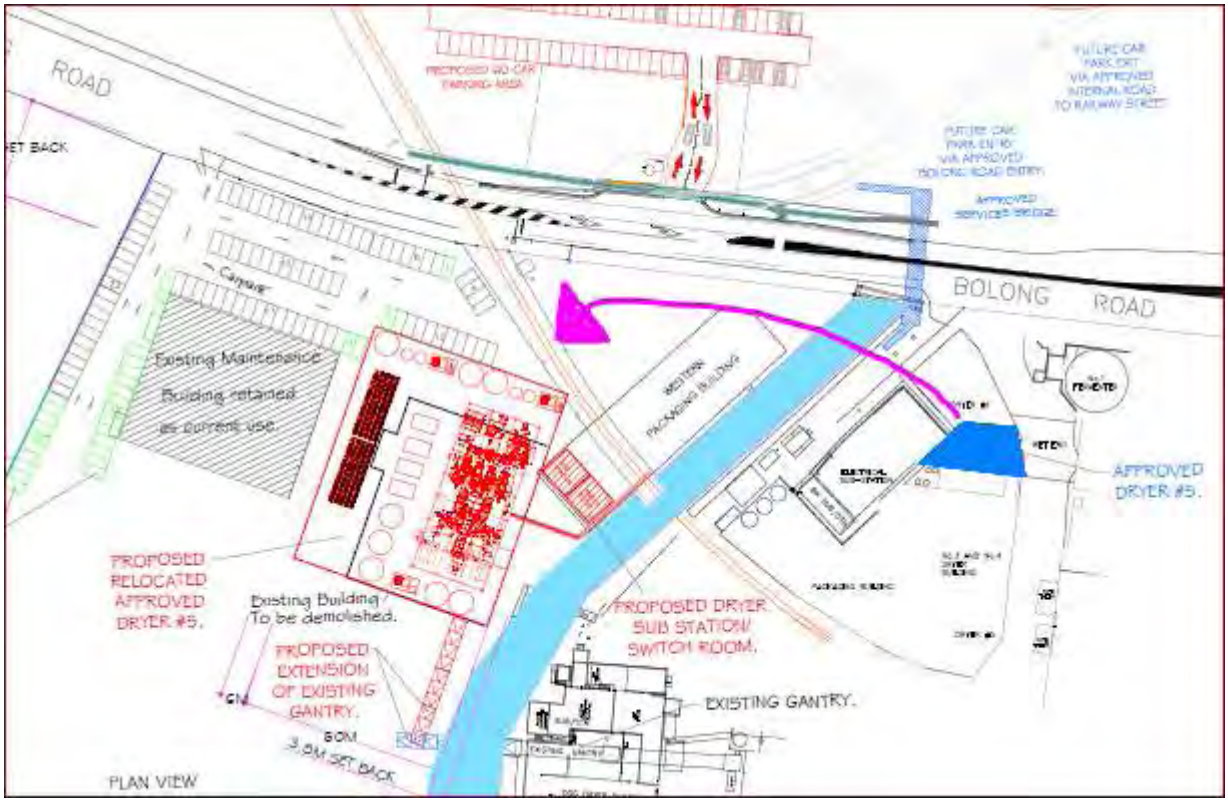

Image 2 - Proposed Relocation of No. 5 Starch Dryer

The loss of hydraulic conveyance depends on the extent of the restriction to a flowpath 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 in our October 2000 report titled "*Further Development within the Manildra starches Plant off Bolong Road, Bomaderry - Hydraulic Assessment*". The conclusions from that report are provided in Appendix C. In summary an agreement was reached that any future development within the intensively built-up area, as indicated on Image 3 below (taken from that report) would not require hydraulic modelling to quantify the hydraulic impacts and cumulative effects.

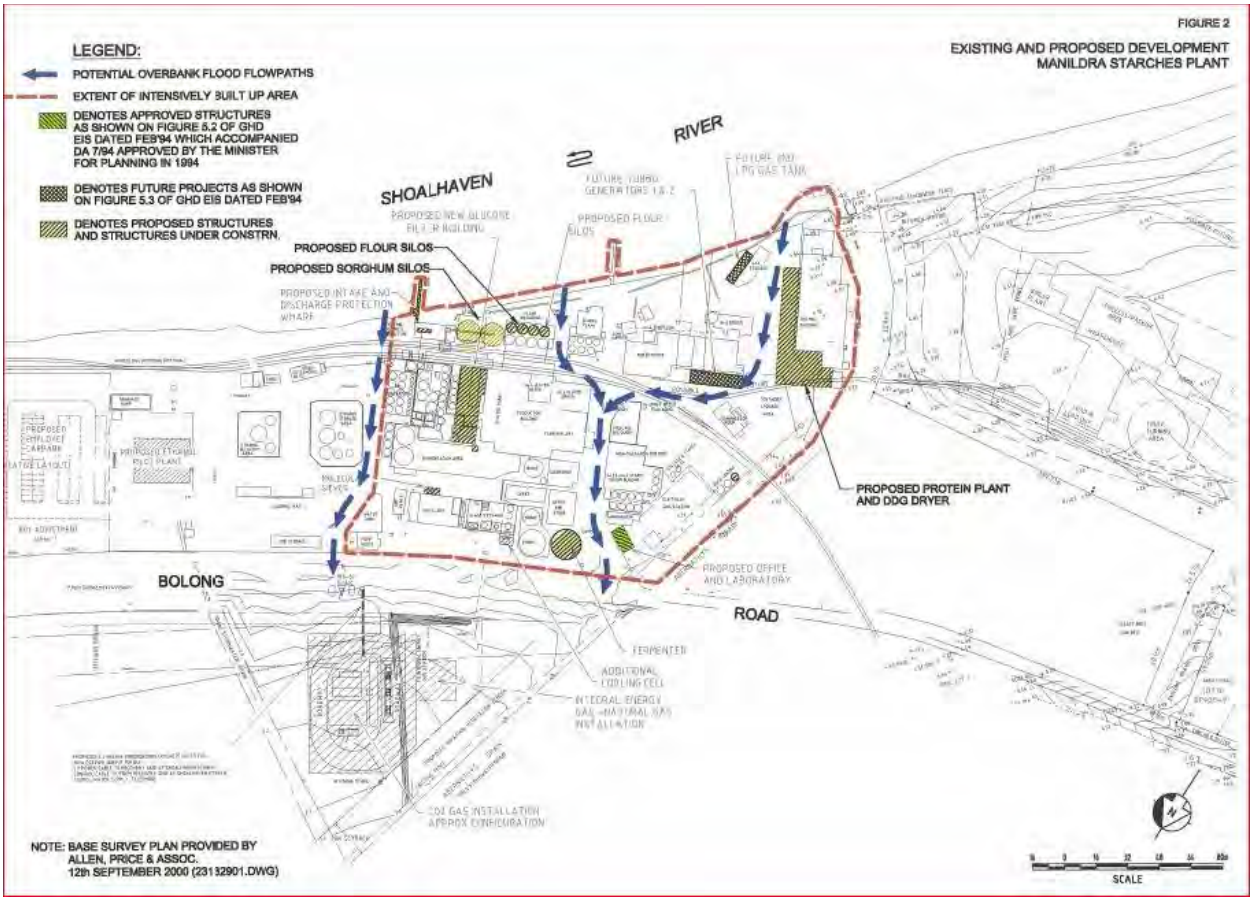

Image 3 - Agreed Extent of Intensively Built-up Area

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 study we 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 (i.e 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.

3. FLOOD IMPACT ASSESSMENT

3.1. Increase in 1% AEP Flood Levels

The increase in the 1% AEP flood level due to the proposed relocation of No. 5 Starch Dryer are provided in the Sections below. 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.

3.1.1. Compared to Present Day 2015 Approved Works

The results from a comparison to present day 2015 approved works are provided on Figure 3. These 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.

3.1.2. Compared to 1990 Agreed Works

The results from a comparison to 1990 approved works are provided on Figure 4. These show more significant increases in flood level than on Figure 3 as they include the impact of all major works on the northern floodplain since 1990 (including those by the previous Dairy Farmers).

3.1.3. Increases in Above Floor Inundation

Charts 1 and 2 show the increase in above building floor depth of inundation relative to the 2015 and 1990 conditions respectively. Thus on Chart 1 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 location of the buildings affected are shown on Figure 3.

The greatest increases in level occur to the buildings closest (building 2 for example which is on an industrial site) to the proposed location of the No. 5 Starch Dryer. As can be seen from the Charts the majority of building floors affected are already inundated by 0.5m or more depth of floodwaters in the 1% AEP event, thus the small increase in flood level will have minimal impact on flood damages.

Chart 2 shows the cumulative impact of all approved works on the northern floodplain since 1990 for the 29 affected buildings.

4. COMPLIANCE WITH CHAPTER G9: DEVELOPMENT ON FLOOD PRONE LAND (DCP2014)

4.1. Council Flood Certificate

Council's flood certificate (Appendix D) advises that 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 (Reference 1). However the CELLS model could not accurately define these categorisations due to its limited model structure (refer Section 1.4.1).

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

4.2. Compliance

The following sections describe compliance with Chapter G9: Development on Flood Prone Land (DCP2014). As the works will not involve subdivision of lands compliance with these performance criteria has not been addressed.

Performance Criteria - General and Filling

PERFORMANCE CRITERIA	RESPONSE
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 (Section 3).
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	**A separate structural report will be provided.**

PERFORMANCE CRITERIA	RESPONSE
with the requirements of the Council.	
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 (Section 3).
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

PERFORMANCE CRITERIA	RESPONSE
	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 (Section 3).
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 (Section 3).
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, nonhabitable 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.

5. REFERENCES

1. Public Works Department
Lower Shoalhaven River Flood Study
Report No. PWD 87049, ISBN 724028692, April 1990

2. Shoalhaven Starches
Shoalhaven River Flood Study
WMAwater, March 2013

3. Shoalhaven Starches
Proposed Ethanol Production Upgrade Including Proposed Odour Reduction and Wastewater Treatment Measures for Existing and Proposed Shoalhaven Starches Operations - Bolong Road, Nowra. Hydraulic, Economic, Social and Environmental Impacts of Flooding
Webb McKeown & Associates, May 2008

Figures

FIGURE 1
STUDY AREA

SYDNEY
WOLLONGONG
STUDY AREA
HUSKISSON

BERRY
BOMADERRY CREEK
BOMADERRY
ABERNATHY'S CREEK
BOLONG ROAD
SHOALHAVEN HEADS
SHOALHAVEN RIVER
SHOALHAVEN STARCHES PLANT
PIG ISLAND
TERARA ROAD
RIVERVIEW ROAD
TERARA
NOWRA
NUMBAA
COMERONG ISLAND
GREENWELL POINT ROAD
BERRYS CANAL
GREENWELL POINT
ORIENT POINT
PRINCES HIGHWAY
CROOKHAVEN RIVER
CULBURRA

N

Model Extent
Towns
Railways
Roads
Levee

0 0.5 1 2 3 4 km

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FIGURE 2
LAYOUT OF PROPOSED EXTENSION

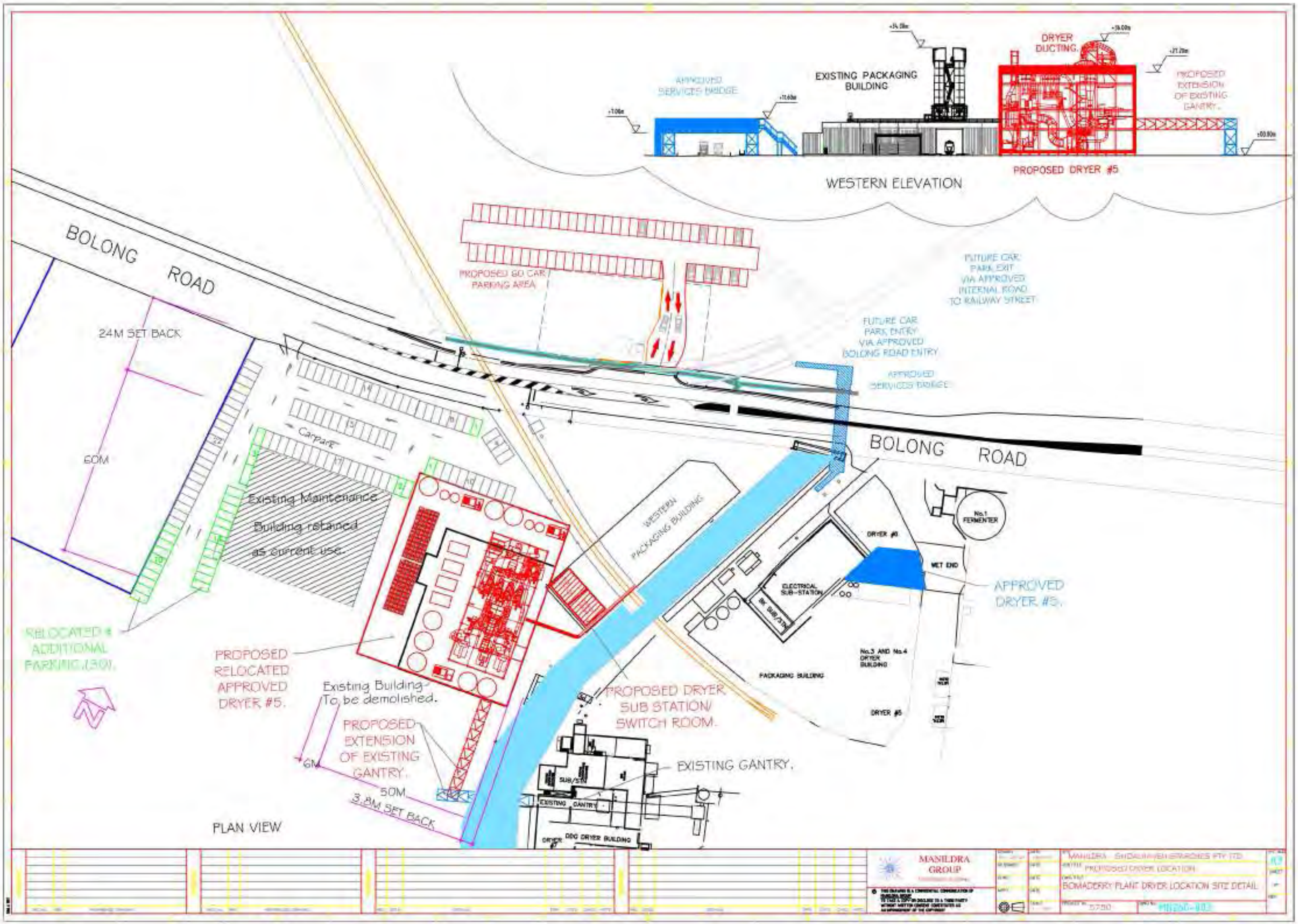

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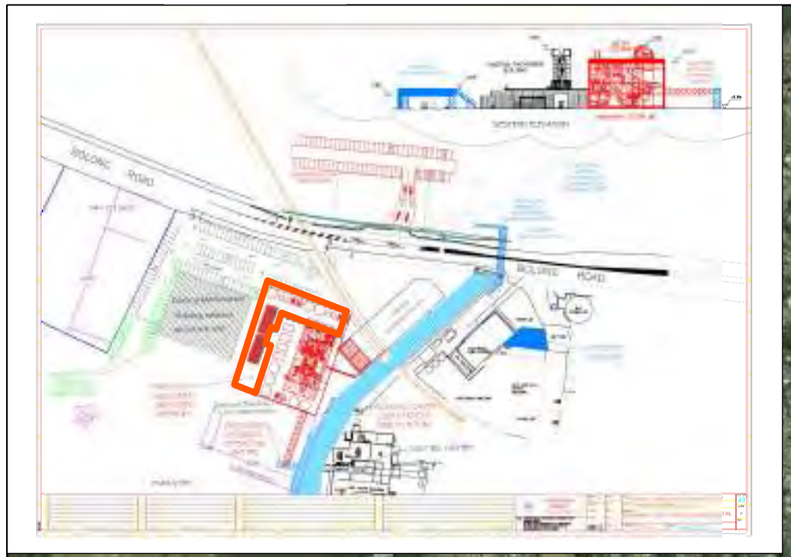
FIGURE 3
PEAK FLOOD LEVEL IMPACT
1% AEP EVENT
PROPOSAL AS PER PLAN



9 21 3 25 5 14 2 6 1 7 16 15 4 19 18 11 24 13 8 23 22 12 26

N

Impacted Properties (See Chart 1 and 2)

Proposed Dryer Extension

Impact (m)

- < -0.1
- -0.1 - -0.05
- -0.05 - -0.04
- -0.04 - -0.03
- -0.03 - -0.02
- -0.02 - -0.01
- -0.01 - 0.01
- 0.01 - 0.015
- 0.015 - 0.02
- 0.02 - 0.025
- 0.025 - 0.05
- 0.05 - 0.1
- > 0.1
- No Longer Flooded
- Newly Flooded

0 0.25 0.5 1 1.5 km

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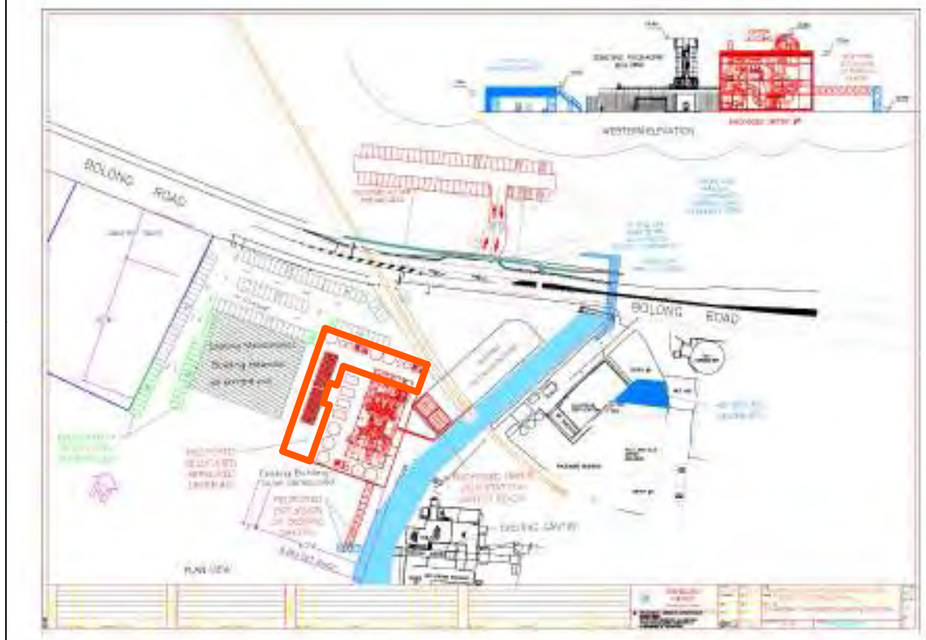
FIGURE 4
PEAK FLOOD LEVEL IMPACT
1% AEP EVENT
SHOALHAVEN STARCHES 1990 SCENARIO PROPOSAL AS PER PLAN



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Proposed Dryer Extension

Impact (m)

- < -0.1
- -0.1 - -0.05
- -0.05 - -0.04
- -0.04 - -0.03
- -0.03 - -0.02
- -0.02 - -0.01
- -0.01 - 0.01
- 0.01 - 0.015
- 0.015 - 0.02
- 0.02 - 0.025
- 0.025 - 0.05
- 0.05 - 0.1
- > 0.1
- No Longer Flooded
- Newly Flooded

0 0.25 0.5 1 1.5 km

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Chart 1 - Peak Flood Level Increases - 1% AEP event - Existing Situation and Proposals (As Per Plans)

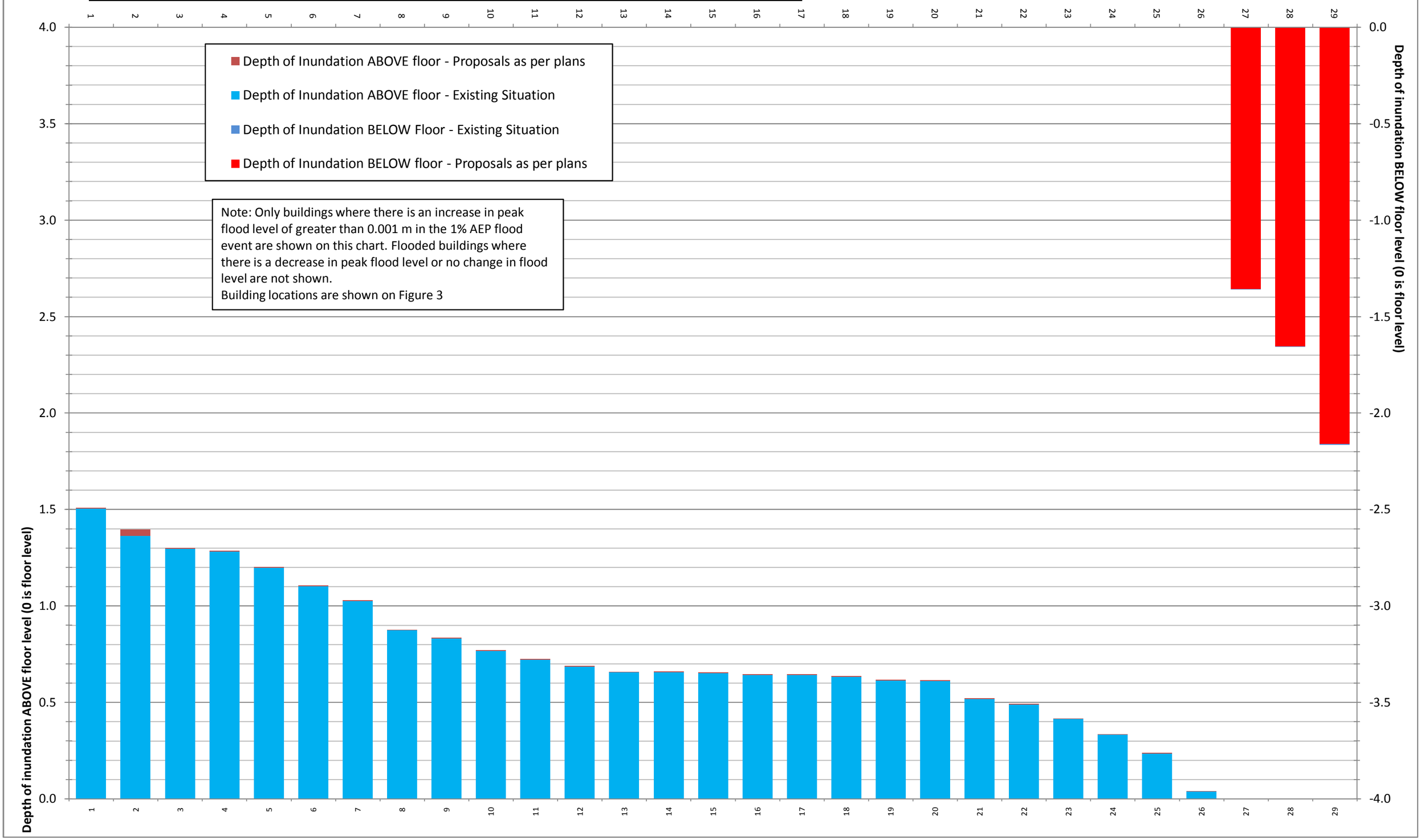
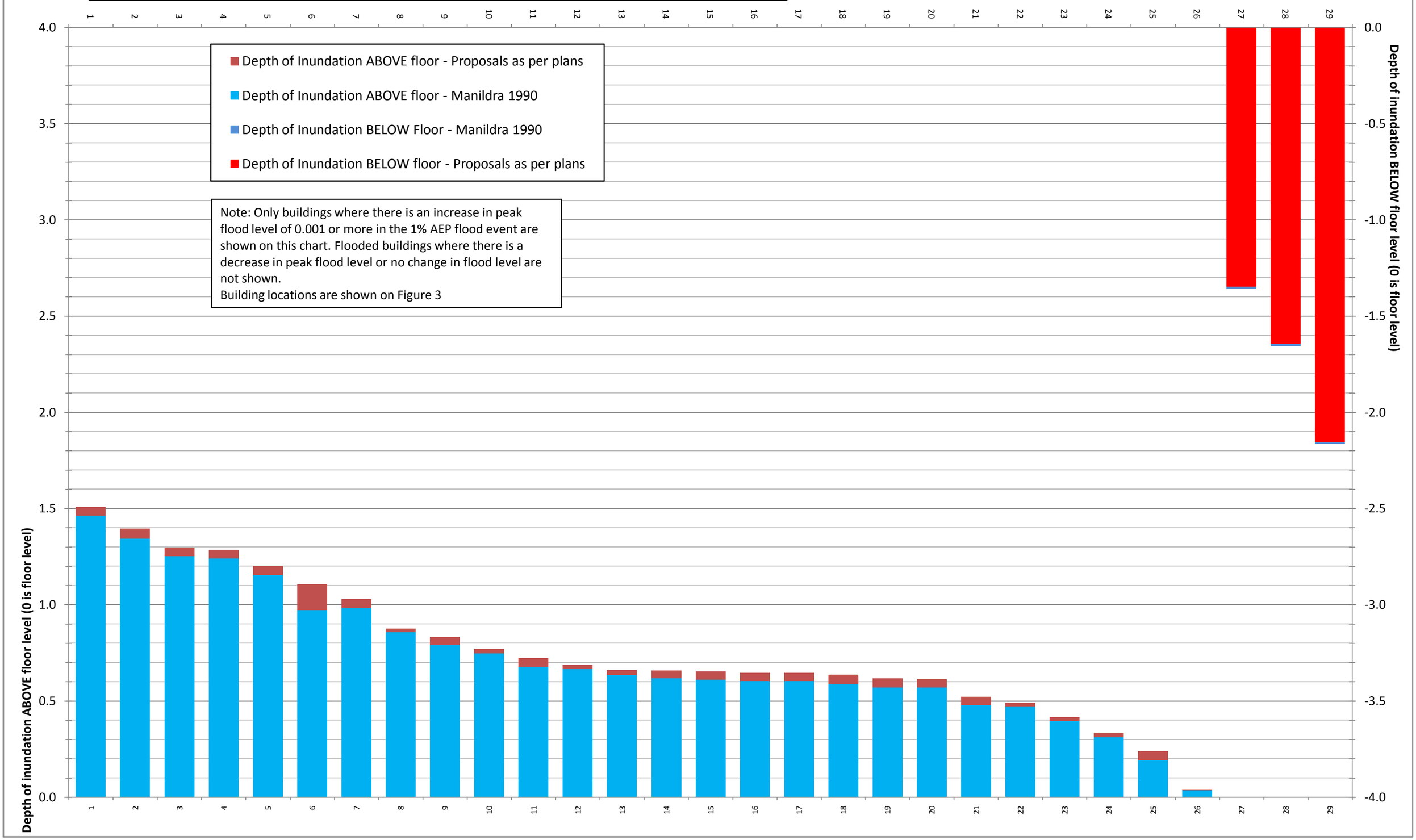


Chart 2 - Peak Flood Level Increases - 1% AEP event - 'Manildra 1990' and Proposals (As Per Plans)



Appendix A

APPENDIX A: GLOSSARY

Taken from the Floodplain Development Manual (April 2005 edition)

acid sulfate soils	Are sediments which contain sulfidic mineral pyrite which may become extremely acid following disturbance or drainage as sulfur compounds react when exposed to oxygen to form sulfuric acid. More detailed explanation and definition can be found in the NSW Government Acid Sulfate Soil Manual published by Acid Sulfate Soil Management Advisory Committee.
Annual Exceedance Probability (AEP)	The chance of a flood of a given or larger size occurring in any one year, usually expressed as a percentage. For example, if a peak flood discharge of 500 m^3/s has an AEP of 5%, it means that there is a 5% chance (that is one-in-20 chance) of a 500 m^3/s or larger event occurring in any one year (see ARI).
Australian Height Datum (AHD)	A common national surface level datum approximately corresponding to mean sea level.
Average Annual Damage (AAD)	Depending on its size (or severity), each flood will cause a different amount of flood damage to a flood prone area. AAD is the average damage per year that would occur in a nominated development situation from flooding over a very long period of time.
Average Recurrence Interval (ARI)	The long term average number of years between the occurrence of a flood as big as, or larger than, the selected event. For example, floods with a discharge as great as, or greater than, the 20 year ARI flood event will occur on average once every 20 years. ARI is another way of expressing the likelihood of occurrence of a flood event.
caravan and moveable home parks	Caravans and moveable dwellings are being increasingly used for long-term and permanent accommodation purposes. Standards relating to their siting, design, construction and management can be found in the Regulations under the LG Act.
catchment	The land area draining through the main stream, as well as tributary streams, to a particular site. It always relates to an area above a specific location.
consent authority	The Council, Government agency or person having the function to determine a development application for land use under the EP&A Act. The consent authority is most often the Council, however legislation or an EPI may specify a Minister or public authority (other than a Council), or the Director General of DIPNR, as having the function to determine an application.
development	Is defined in Part 4 of the Environmental Planning and Assessment Act (EP&A Act). **infill development:** refers to the development of vacant blocks of land that are generally surrounded by developed properties and is permissible under the current zoning of the land. Conditions such as minimum floor levels may be imposed on infill development. **new development:** refers to development of a completely different nature to that associated with the former land use. For example, the urban subdivision of an area previously used for rural purposes. New developments involve rezoning and typically require major extensions of existing urban services, such as roads, water supply, sewerage and electric power. **redevelopment:** refers to rebuilding in an area. For example, as urban areas age, it may become necessary to demolish and reconstruct buildings on a relatively large scale. Redevelopment generally does not require either rezoning or major extensions to urban services.
disaster plan (DISPLAN)	A step by step sequence of previously agreed roles, responsibilities, functions, actions and management arrangements for the conduct of a single or series of

	connected emergency operations, with the object of ensuring the coordinated response by all agencies having responsibilities and functions in emergencies.
discharge	The rate of flow of water measured in terms of volume per unit time, for example, cubic metres per second (m^3/s). Discharge is different from the speed or velocity of flow, which is a measure of how fast the water is moving for example, metres per second (m/s).
ecologically sustainable development (ESD)	Using, conserving and enhancing natural resources so that ecological processes, on which life depends, are maintained, and the total quality of life, now and in the future, can be maintained or increased. A more detailed definition is included in the Local Government Act 1993. The use of sustainability and sustainable in this manual relate to ESD.
effective warning time	The time available after receiving advice of an impending flood and before the floodwaters prevent appropriate flood response actions being undertaken. The effective warning time is typically used to move farm equipment, move stock, raise furniture, evacuate people and transport their possessions.
emergency management	A range of measures to manage risks to communities and the environment. In the flood context it may include measures to prevent, prepare for, respond to and recover from flooding.
flash flooding	Flooding which is sudden and unexpected. It is often caused by sudden local or nearby heavy rainfall. Often defined as flooding which peaks within six hours of the causative rain.
flood	Relatively high stream flow which overtops the natural or artificial banks in any part of a stream, river, estuary, lake or dam, and/or local overland flooding associated with major drainage before entering a watercourse, and/or coastal inundation resulting from super-elevated sea levels and/or waves overtopping coastline defences excluding tsunami.
flood awareness	Flood awareness is an appreciation of the likely effects of flooding and a knowledge of the relevant flood warning, response and evacuation procedures.
flood education	Flood education seeks to provide information to raise awareness of the flood problem so as to enable individuals to understand how to manage themselves an their property in response to flood warnings and in a flood event. It invokes a state of flood readiness.
flood fringe areas	The remaining area of flood prone land after floodway and flood storage areas have been defined.
flood liable land	Is synonymous with flood prone land (i.e. land susceptible to flooding by the probable maximum flood (PMF) event). Note that the term flood liable land covers the whole of the floodplain, not just that part below the flood planning level (see flood planning area).
flood mitigation standard	The average recurrence interval of the flood, selected as part of the floodplain risk management process that forms the basis for physical works to modify the impacts of flooding.
floodplain	Area of land which is subject to inundation by floods up to and including the probable maximum flood event, that is, flood prone land.
floodplain risk management options	The measures that might be feasible for the management of a particular area of the floodplain. Preparation of a floodplain risk management plan requires a detailed evaluation of floodplain risk management options.
floodplain risk management plan	A management plan developed in accordance with the principles and guidelines in this manual. Usually includes both written and diagrammatic information describing how particular areas of flood prone land are to be used and managed to achieve defined objectives.

flood plan (local)	A sub-plan of a disaster plan that deals specifically with flooding. They can exist at State, Division and local levels. Local flood plans are prepared under the leadership of the State Emergency Service.
flood planning area	The area of land below the flood planning level and thus subject to flood related development controls. The concept of flood planning area generally supersedes the Aflood liable land@ concept in the 1986 Manual.
Flood Planning Levels (FPLs)	FPL=s are the combinations of flood levels (derived from significant historical flood events or floods of specific AEPs) and freeboards selected for floodplain risk management purposes, as determined in management studies and incorporated in management plans. FPLs supersede the Astandard flood event@ in the 1986 manual.
flood proofing	A combination of measures incorporated in the design, construction and alteration of individual buildings or structures subject to flooding, to reduce or eliminate flood damages.
flood prone land	Is land susceptible to flooding by the Probable Maximum Flood (PMF) event. Flood prone land is synonymous with flood liable land.
flood readiness	Flood readiness is an ability to react within the effective warning time.
flood risk	Potential danger to personal safety and potential damage to property resulting from flooding. The degree of risk varies with circumstances across the full range of floods. Flood risk in this manual is divided into 3 types, existing, future and continuing risks. They are described below. **existing flood risk:** the risk a community is exposed to as a result of its location on the floodplain. **future flood risk:** the risk a community may be exposed to as a result of new development on the floodplain. **continuing flood risk:** the risk a community is exposed to after floodplain risk management measures have been implemented. For a town protected by levees, the continuing flood risk is the consequences of the levees being overtopped. For an area without any floodplain risk management measures, the continuing flood risk is simply the existence of its flood exposure.
flood storage areas	Those parts of the floodplain that are important for the temporary storage of floodwaters during the passage of a flood. The extent and behaviour of flood storage areas may change with flood severity, and loss of flood storage can increase the severity of flood impacts by reducing natural flood attenuation. Hence, it is necessary to investigate a range of flood sizes before defining flood storage areas.
floodway areas	Those areas of the floodplain where a significant discharge of water occurs during floods. They are often aligned with naturally defined channels. Floodways are areas that, even if only partially blocked, would cause a significant redistribution of flood flows, or a significant increase in flood levels.
freeboard	Freeboard provides reasonable certainty that the risk exposure selected in deciding on a particular flood chosen as the basis for the FPL is actually provided. It is a factor of safety typically used in relation to the setting of floor levels, levee crest levels, etc. Freeboard is included in the flood planning level.
habitable room	**in a residential situation:** a living or working area, such as a lounge room, dining room, rumpus room, kitchen, bedroom or workroom. **in an industrial or commercial situation:** an area used for offices or to store valuable possessions susceptible to flood damage in the event of a flood.
hazard	A source of potential harm or a situation with a potential to cause loss. In relation to this manual the hazard is flooding which has the potential to cause damage to

	the community. Definitions of high and low hazard categories are provided in the Manual.
hydraulics	Term given to the study of water flow in waterways; in particular, the evaluation of flow parameters such as water level and velocity.
hydrograph	A graph which shows how the discharge or stage/flood level at any particular location varies with time during a flood.
hydrology	Term given to the study of the rainfall and runoff process; in particular, the evaluation of peak flows, flow volumes and the derivation of hydrographs for a range of floods.
local overland flooding	Inundation by local runoff rather than overbank discharge from a stream, river, estuary, lake or dam.
local drainage	Are smaller scale problems in urban areas. They are outside the definition of major drainage in this glossary.
mainstream flooding	Inundation of normally dry land occurring when water overflows the natural or artificial banks of a stream, river, estuary, lake or dam.
major drainage	Councils have discretion in determining whether urban drainage problems are associated with major or local drainage. For the purpose of this manual major drainage involves: • the floodplains of original watercourses (which may now be piped, channelised or diverted), or sloping areas where overland flows develop along alternative paths once system capacity is exceeded; and/or • water depths generally in excess of 0.3 m (in the major system design storm as defined in the current version of Australian Rainfall and Runoff). These conditions may result in danger to personal safety and property damage to both premises and vehicles; and/or • major overland flow paths through developed areas outside of defined drainage reserves; and/or • the potential to affect a number of buildings along the major flow path.
mathematical/computer models	The mathematical representation of the physical processes involved in runoff generation and stream flow. These models are often run on computers due to the complexity of the mathematical relationships between runoff, stream flow and the distribution of flows across the floodplain.
merit approach	The merit approach weighs social, economic, ecological and cultural impacts of land use options for different flood prone areas together with flood damage, hazard and behaviour implications, and environmental protection and well being of the State=s rivers and floodplains. The merit approach operates at two levels. At the strategic level it allows for the consideration of social, economic, ecological, cultural and flooding issues to determine strategies for the management of future flood risk which are formulated into Council plans, policy and EPIs. At a site specific level, it involves consideration of the best way of conditioning development allowable under the floodplain risk management plan, local floodplain risk management policy and EPIs.
minor, moderate and major flooding	Both the State Emergency Service and the Bureau of Meteorology use the following definitions in flood warnings to give a general indication of the types of problems expected with a flood: **minor flooding:** causes inconvenience such as closing of minor roads and the submergence of low level bridges. The lower limit of this class of flooding on the reference gauge is the initial flood level at which landholders and townspeople

	begin to be flooded. **moderate flooding:** low-lying areas are inundated requiring removal of stock and/or evacuation of some houses. Main traffic routes may be covered. **major flooding:** appreciable urban areas are flooded and/or extensive rural areas are flooded. Properties, villages and towns can be isolated.
modification measures	Measures that modify either the flood, the property or the response to flooding. Examples are indicated in Table 2.1 with further discussion in the Manual.
peak discharge	The maximum discharge occurring during a flood event.
Probable Maximum Flood (PMF)	The PMF is the largest flood that could conceivably occur at a particular location, usually estimated from probable maximum precipitation, and where applicable, snow melt, coupled with the worst flood producing catchment conditions. Generally, it is not physically or economically possible to provide complete protection against this event. The PMF defines the extent of flood prone land, that is, the floodplain. The extent, nature and potential consequences of flooding associated with a range of events rarer than the flood used for designing mitigation works and controlling development, up to and including the PMF event should be addressed in a floodplain risk management study.
Probable Maximum Precipitation (PMP)	The PMP is the greatest depth of precipitation for a given duration meteorologically possible over a given size storm area at a particular location at a particular time of the year, with no allowance made for long-term climatic trends (World Meteorological Organisation, 1986). It is the primary input to PMF estimation.
probability	A statistical measure of the expected chance of flooding (see AEP).
risk	Chance of something happening that will have an impact. It is measured in terms of consequences and likelihood. In the context of the manual it is the likelihood of consequences arising from the interaction of floods, communities and the environment.
runoff	The amount of rainfall which actually ends up as streamflow, also known as rainfall excess.
stage	Equivalent to Awater level@. Both are measured with reference to a specified datum.
stage hydrograph	A graph that shows how the water level at a particular location changes with time during a flood. It must be referenced to a particular datum.
survey plan	A plan prepared by a registered surveyor.
water surface profile	A graph showing the flood stage at any given location along a watercourse at a particular time.
wind fetch	The horizontal distance in the direction of wind over which wind waves are generated.

Appendix B

EXISTING – BLACK.
NEW MODIFIED PROPOSAL–RED
APPROVED & YET TO BE CONSTRUCTED–BLUE.

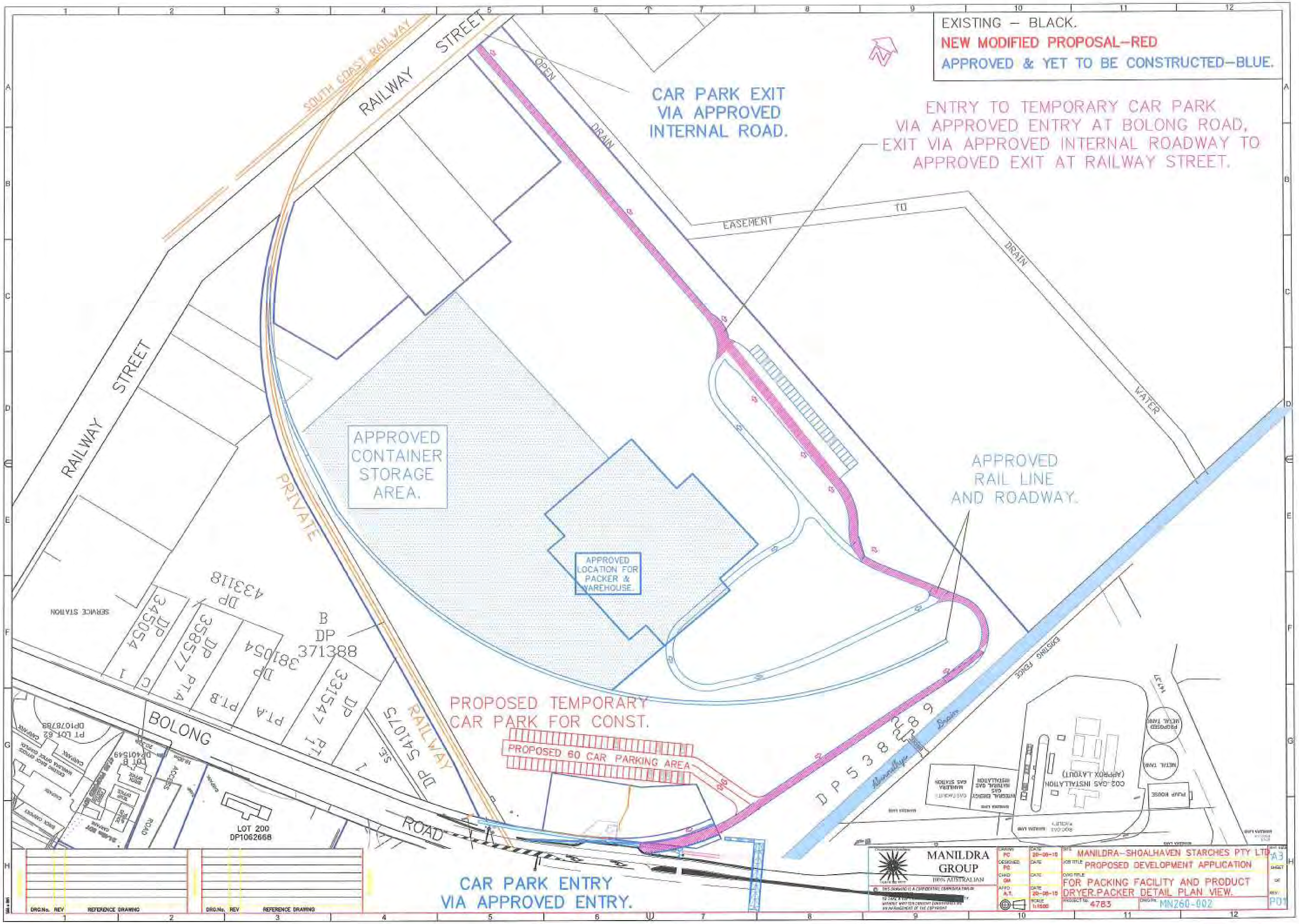
SOUTH COAST RAILWAY
RAILWAY STREET
RAILWAY STREET
APPROVED EXIT.
ENTRY TO TEMPORARY CAR PARK VIA APPROVED ENTRY AT BOLONG ROAD, EXIT VIA APPROVED INTERNAL ROADWAY TO APPROVED EXIT AT RAILWAY STREET.
APPROVED CONTAINER STORAGE AREA.
APPROVED LOCATION FOR PACKER & WAREHOUSE
APPROVED RAIL LINE AND ROADWAY.
PRIVATE
24M SET BACK
60M
BOLONG ROAD
PROPOSED TEMPORARY CAR PARK FOR CONST.
PROPOSED 50 CAR PARKING AREA
PROPOSED RELOCATED APPROVED DRYER #5.
PROPOSED EXTENSION OF EXISTING GANTRY.
MANILDRA
COMPLEX
MANILDRA LAND
APPROVED ENTRY
1069758
DP 141
OPEN PADDOCKS
APPROVED SERVICES BRIDGE.
ORIGINAL APPROVED LOCATION FOR DRYER #5.
BOLONG ROAD
DP 1069758
MANILDRA LAND OPEN PADDOCK
DP 385145
Shoalhaven River
56M

MANILDRA GROUP
100% AUSTRALIAN

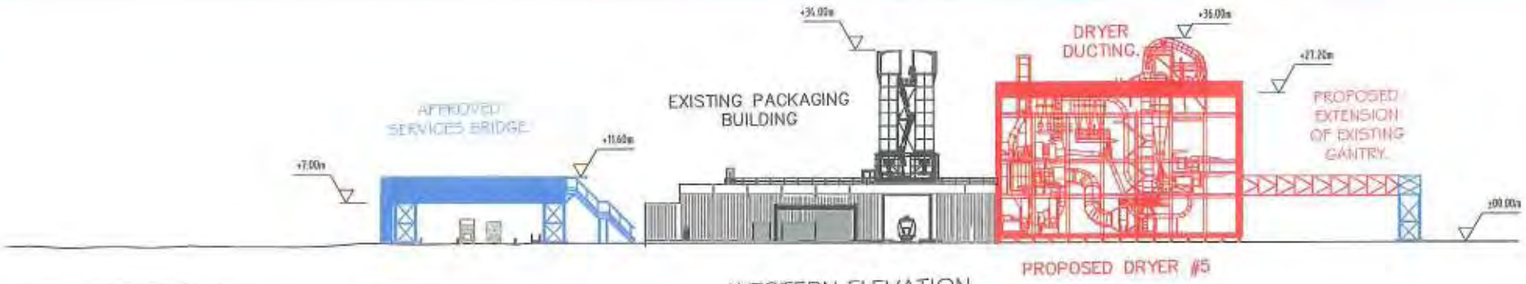
DRAWN PC DATE 20-08-15
DESIGNED RC DATE
CHKD GM DATE
APPD A.T. DATE 20-08-15
SCALE 1:2500

MANILDRA–SHOALHAVEN STARCHES PTY LTD
JOB TITLE PROPOSED DEVELOPMENT APPLICATION
DWG TITLE FOR PACKING FACILITY AND PRODUCT DRYER.OVER ALL SITE PLAN.
PROJECT No. 4783
DWG No. MN260-001
PRINT SIZE A3
SHEET
REV P01

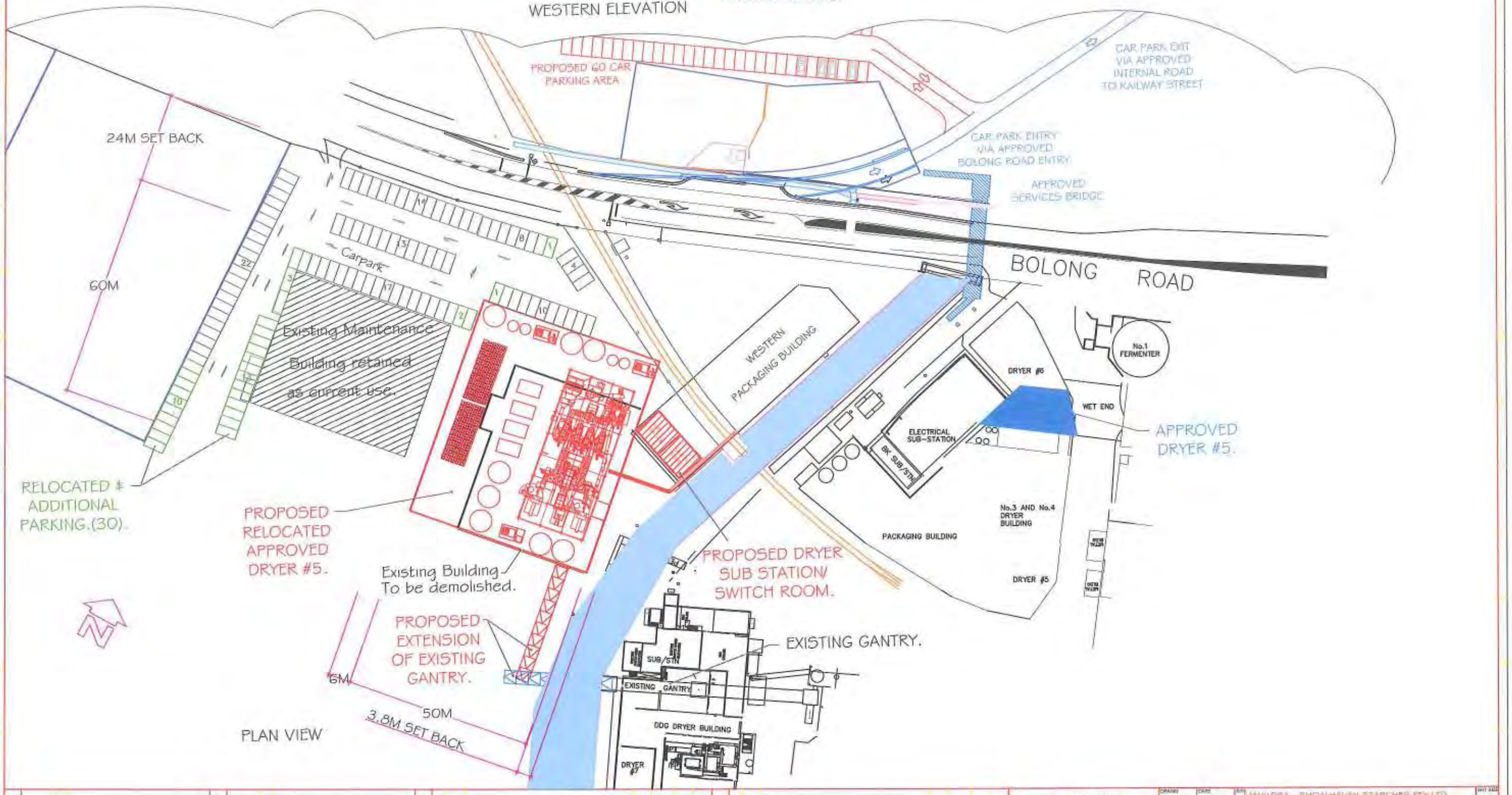
DRG.No.	REV	REFERENCE DRAWING	DRG.No.	REV	REFERENCE DRAWING	REV ZONE	DETAILS	DRN	DATE	CHKD	APPD	REV ZONE	DETAILS	DRN	DATE	CHKD	APPD



EXISTING – BLACK.
NEW MODIFIED PROPOSAL–RED
APPROVED & YET TO BE CONSTRUCTED–BLUE.
CAR PARK EXIT VIA APPROVED INTERNAL ROAD.
ENTRY TO TEMPORARY CAR PARK VIA APPROVED ENTRY AT BOLONG ROAD, EXIT VIA APPROVED INTERNAL ROADWAY TO APPROVED EXIT AT RAILWAY STREET.
SOUTH COAST RAILWAY
RAILWAY STREET
OPEN DRAIN
EASEMENT TO DRAIN
WATER
APPROVED CONTAINER STORAGE AREA.
APPROVED LOCATION FOR PACKER & WAREHOUSE.
APPROVED RAIL LINE AND ROADWAY.
PRIVATE RAILWAY
PROPOSED TEMPORARY CAR PARK FOR CONST.
PROPOSED 60 CAR PARKING AREA
BOLONG ROAD
LOT 200
DP1062668
DP 538889
DP 541075
DP 331547
DP 371388
DP 358577
DP 345054
DP 433118
EXISTING FENCE
CAR PARK ENTRY VIA APPROVED ENTRY.
MANILDRA GROUP
100% AUSTRALIAN
MANILDRA–SHOALHAVEN STARCHES PTY LTD
PROPOSED DEVELOPMENT APPLICATION
FOR PACKING FACILITY AND PRODUCT DRYER.PACKER DETAIL PLAN VIEW.
DRAWN PC
DATE 20-08-15
DESIGNED PC
CHKD GM
APP'D A.T.
DATE 20-08-15
SCALE 1:1500
PROJECT No. 4783
DWG No. MN260-002
A3
REV P01



WESTERN ELEVATION



PLAN VIEW

MANILDRA GROUP

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MANILDRA - SHOALHAVEN STARCHES PTY LTD

JOB TITLE: PROPOSED DRYER LOCATION

DWG TITLE: BOMADERRY PLANT DRYER LOCATION SITE DETAIL

PROJECT No: 5750

DWG No: MN260-003

SHEET SIZE: A3

3. CONCLUSIONS

3.1 Proposed Development

For the reasons detailed above, and as agreed in consultation with Council and DLWC, hydraulic modelling of the proposed development has not been undertaken. There is a need however, to consider (amongst other things) the flood hazard and structural assessment (with regard to velocity of floodwaters and impact by flood debris) of the proposed development. In quantifying the flood hazard, some important issues for consideration include:

- damage to the plant, including as a result of flood debris or structural failure,
- damage to the plant due to the possible buoyancy of equipment,
- malfunction of the plant (or any services on which the plant relies for operation) as a result of inundation and the associated risk of such malfunction to other users of the floodplain,
- access and evacuation.

3.2 Future Development

In consultation with Council and the DLWC, it is agreed that any future development of the Manildra Starches Plant within the intensively built-up area, as defined on Figures 2 and 4, will not require hydraulic modelling to quantify the hydraulic impacts and cumulative effects. The hydraulic impacts and cumulative effects of such developments are considered to be insignificant given the intensive development already present. As mentioned in previous sections, the only opportunity for floodwaters to pass through the intensively built-up area of the site is through the limited number of gaps or openings between the plant and associated buildings. Although these gaps or openings may be relocated to accommodate any future development, the movement of overland floodwaters will never be completely blocked, as gaps or openings similar to those which currently exist will always be maintained for trafficability requirements.

Any proposed future development is not exempt from flood hazard and structural assessment as outlined in Section 3.1

3.3 Future Development on the Northern Floodplain

This study has identified that there is no need for hydraulic modelling of the proposed, or any future proposed development within the existing intensively built-up area of the Manildra Starches Plant (shown on Figures 2 and 4). However during the course of this investigation, and in consultation with Council and the DLWC, it should be noted that any further development upon the northern floodplain (outside the built-up area shown on Figures 2 and 4), and in particular any development adjacent to the river bank, has the potential to increase the cumulative impact on flood levels and velocities.

The main areas of concern on the northern river bank are the unrestricted low lying areas between high ground and the existing developments, termed flowpaths or floodways. The bank is relatively

Appendix D

Shoalhaven City Council

Bridge Rd, Nowra NSW 2541 **02 4429 3111**
Deering St, Ulladulla NSW 2539 **02 4429 8999**
Address all correspondence to
The General Manager, PO Box 42, Nowra NSW 2541 Australia
DX5323 Nowra Fax 02 4422 1816

COUNCIL REFERENCE: 28112E (D15/274374)
CONTACT PERSON: Kate Britton
DATE: 23 September 2015

STEVEN RICHARDSON
PO Box 738
Nowra NSW 2541

Thank you for your recent inquiry in relation to flood data held by Shoalhaven City Council.

Please find below the original details of your inquiry, some general information on flooding as well as the requested property specific Flood Certificate.

Details of Inquiry:

Name of Inquirer	STEVEN RICHARDSON **Date Requested:** 14 Sep 2015
Reason for Enquiry	New Construction
Contact Details	Phone: 44236198 Email: steve@cowmanstoddart.com.au Postal: PO Box 738 Nowra
Preferred Response	Email
Notes	
Survey Detail	Not Provided
Flood Safety Tip	**Causeways can kill! Never drive through flood waters! Wait and be safe!**
General Flood Information	Shoalhaven City Council in conjunction with SES has produced site specific flood brochures for Shoalhaven Heads, Nowra / Bomaderry / Terara, Greenwell Point/Orient Point and Sussex Inlet. General Flood Information booklets, such as “What to do before, during & after a flood” prepared by Emergency Management Australia are also available. You can pick up free copies of all brochures at the City Administration Building in Nowra.

FLOOD CERTIFICATE

According to the ***Lower Shoalhaven River Floodplain Risk Management Plan*** – ***Climate Change Assessment (2011)*** this property, 24 Bolong Rd, BOMADERRY - Lot 201 DP 1062668, **is affected by the 1% AEP flood event.**

FLOOD INFORMATION

Year	Existing	Projected 2050	Projected 2100
Flood Planning Level	Not applicable	6.2m AHD	6.2m AHD
Hazard Category	High	High	High
Hydraulic Category	Floodway	Floodway	Floodway
Probable Maximum Flood Level	7.9m AHD	7.9m AHD	7.9m AHD
1% AEP Flood Level	5.7m AHD	5.7m AHD	5.7m AHD
2% AEP Flood Level	5.2m AHD	5.2m AHD	5.3m AHD
5% AEP Flood Level	4.7m AHD	4.8m AHD	4.8m AHD
10% AEP Flood Level	4.5m AHD	4.5m AHD	4.5m AHD
Velocity (1% AEP flood event)	1.0m/s	0.9m/s	0.9m/s

SITE SPECIFIC CONSIDERATIONS

1. Current NSW Government legislation requires climate change to be considered as part of this Floodplain Risk Management Study and Plan. Climate change related information evolves with time and it is expected that existing flood behaviour and levels may change in the future.
   All applications for buildings, and the like, must take into account the projected 2050 flood information. All subdivision and other long-term planning must take into account the projected 2100 flood information.
   On Tuesday 10th February 2015 Council's Policy & Resources Committee resolved to "Establish a sea level rise benchmarks for planning purposes based on a 2030 horizon 100 mm, a 2050 horizon of 230 mm and 360 mm horizon for 2100".
   These benchmarks vary from the benchmarks used in the flood information provided above (400mm and 900mm for the 2050 and 2100 horizon's respectively). The new benchmarks will be incorporated into the flood information in future. Until studies incorporating the new benchmarks are undertaken, however, Council will continue to use our best available information.

2. Not all of the property is categorised high hazard floodway. Part of the property is categorised high hazard storage and part of the property is categorised low hazard storage. For more specific information regarding the different hazard and hydraulic categorisations on this property please contact Council's Natural Resource and Floodplain Unit.

STANDARD CONSIDERATIONS

Properties below the Flood Planning Level:
Council considers the land in question to be below the flood planning level and therefore subject to flood related development controls. The conditions as set out below will reduce flood risk in flood events up to the Flood Planning Level, however the property may still be subject to flooding at higher levels during rare flood events.

Development controls apply to flood affected properties.

Development conditions will vary depending on flood hazard, hydraulic category as well as the type of development that is proposed. Please refer to the following documents for information on Council's flood related development controls and the NSW State Government's Floodprone Land Policy.

- Shoalhaven Development Control Plan – Chapter 9: Development on Flood Prone Land http://dcp2014.shoalhaven.nsw.gov.au/main-category/whole-document
- NSW Floodplain Development Manual 2005: http://www.environment.nsw.gov.au/floodplains/manual.htm

DISCLAIMER

Your enquiry relating to the likelihood of the land specified in the application being flooded has been referred to the Council's Floodplain Engineer.

In responding to your application the Council seeks to bring to your attention the fact that pursuant to s.733 of the Local Government Act a council does not incur liability in respect of the giving of any advice furnished in good faith by the Council relating to the likelihood of any land being flooded or the nature or extent of any such flooding.

The Council does not have a legal obligation to provide advice to you and to the extent that this reply is giving advice, the Council provides that advice in good faith with the intention of preserving, so far as is legally possible, the Council's immunity from liability pursuant to s.733 of the Local Government Act.

While all reasonable care has been taken to ensure the accuracy of the information given in this reply, its purpose is to provide a general indication of flood risk in the area. Flood lines shown on Council maps indicate the approximate extent of flooding only in relation to the abovementioned land.

The information provided may contain errors or omissions and the accuracy may not suit the purposes of all users. A site survey and further investigation are strongly recommended before commencement of any project based on this data.

The information given is the most current information at the time of the request. It is to be noted, however, that flood information is constantly reviewed and updated and as such, the information contained in this regard is current only on the day of issue.

Before acting upon the information provided in this reply, the Council urges you to obtain separate and independent advice as Council, in giving this information, does not intend it to be relied upon in such a fashion as to impose liability upon the Council.

Should you not be prepared to accept the information contained in this reply upon that basis then you should immediately notify Council.

GLOSSARY

AEP (Annual Exceedance Probability) means the chance of a flood of a given or larger size occurring in any one year, usually expressed as a percentage – for example a 1% AEP flood event has a 1% chance of occurring in any one calendar year.

AHD (Australian Height Datum) is a common national surface level datum corresponding approximately to mean sea level.

Flood fringe is the part of the floodplain remaining after the floodway and flood storage areas have be defined.

Flood planning area is any land identified as being flood affected in the 1% AEP flood event plus freeboard.

Flood planning level (FPL) is the 1% AEP flood level plus freeboard. The FPL is used for planning purposes, as determined in floodplain risk management studies and incorporated in floodplain risk management plans.

Flood prone land means any land susceptible to flooding up to the probable maximum flood event (that is, land within the floodplain) as identified in an adopted Council flood study or floodplain risk management study and plan.

Flood storage areas are those parts of the floodplain that are important for the temporary storage of floodwaters during the passage of a flood.

Flood study is a technical investigation of flood behaviour. It defines the nature of flood risk by establishing the extent, level and velocity of floodwaters. The study also provides information on the distribution of flood flows across various sections of the flood plain for the full range of flood events up to and including the PMF.

Floodplain risk management plan is a plan developed in accordance with the principles and guidelines contained in the NSW Government Floodplain Management Manual. Usually includes both written and diagrammatic information describing how particular areas of flood prone land are to be used and managed to achieve defined objectives.

Floodplain risk management study is a study that identifies and compares various risk management options. This includes an assessment of their social, economic, ecological and cultural impacts, together with opportunities to maintain and enhance river and floodplain environments.

Floodway means those parts of the floodplain where a significant discharge of water occurs during floods. They are often aligned with natural defined channels. Floodway's are areas that, even if only partially blocked, would cause a significant redistribution of flood flow, or a significant increase in flood levels.

Freeboard is currently 0.5m for all catchments in the Shoalhaven. Freeboard is a factor of safety used to set the FPL (i.e. FPL = 1% AEP flood level plus freeboard (0.5m)). Freeboard takes into account uncertainties in flood modelling and climate change predictions, local factors that cannot be included in the flood model or wave action caused by wind, boats or vehicles driving through flood waters.

Hazard category represents the risk or danger to personal safety, evacuation movements and buildings and structures within the Flood Planning Area during the 1% AEP flood. There are only two possible hazard categories – high or low.

Hydraulic category describes the function of a specific part of the Flood Planning Area in conveying flood waters during a 1% AEP flood. There are three possible hydraulic categories – floodway, flood storage or flood fringe.

Probable maximum flood (PMF) is the largest flood that could conceivably occur at a particular location, usually estimated from probable maximum precipitation. Generally, it is not physically or economically possible to provide complete protection against this event. The PMF defines the extent of flood prone land, that is, the floodplain.

Provisional is used for hazard categories that have been determined in a flood study. Hazard categories are provisional until the floodplain risk management study and plan has been completed and adopted by Council, as this document considers additions risks, not considered during the flood study.

ANNEXURE 5

Air Quality Impact Assessment

prepared by

Stevenson Environmental Management Australia

ANNEXURE 5

Stephenson

Environmental Management Australia

AIR QUALITY IMPACT ASSESSMENT (CUMULATIVE IMPACT)

STARCH DRYER 5 RELOCATION

SHOALHAVEN STARCHES

BOLONG ROAD, BOMADERRY

PROJECT NO.: 5564/S23934/15

DATE OF V3 ISSUE: 29 OCTOBER 2015

PREPARED FOR COWMAN STODDART ON BEHALF OF THE MANILDRA GROUP

Stephenson

Environmental Management Australia

Peter W Stephenson & Associates Pty Ltd
ACN 002 600 526 (Incorporated in NSW)
ABN 75 002 600 526

Newington Business Park
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E-Mail: info@stephensonenv.com.au

AIR QUALITY IMPACT ASSESSMENT (CUMULATIVE IMPACT)

STARCH DRYER 5 RELOCATION

SHOALHAVEN STARCHES

BOLONG ROAD, BOMADERRY

PROJECT NO.: **5564/S23934/15**

DATE OF V3 ISSUE: **29 OCTOBER 2015**

PREPARED FOR COWMAN STODDART ON BEHALF OF THE MANILDRA GROUP

P W STEPHENSON

A NAGHIZADEH

A PRADHAN

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1 INTRODUCTION

Stephenson Environmental Management Australia (SEMA) was engaged by Cowman Stoddart Pty Ltd on behalf of the Manildra Group to undertake an Air Quality Impact Assessment (AQIA) regarding the relocation of Starch Dryer 5 to be established between the existing maintenance building and Abernethy's Creek, at Bolong Road, Bomaderry, New South Wales (NSW).

The dryer was initially approved to be established directly east of the electrical substation, east of Abernethy's Creek.

This report has been prepared in response to requirements issued by the NSW Department of Planning and Environment which included:

> *"Detailed air quality, odour and noise assessment in accordance with relevant EPA guidelines. For the relocation of infrastructure, the assessments need to provide a comparative analysis against the approved impacts of the ethanol expansion project…"*

This AQIA references the cumulative impacts of odour and total suspended particulates (TSP) and presents a comparative analysis of the relocation of this infrastructure (Starch Dryer No. 5) against the approved ethanol expansion project (Air Quality Assessment conducted by GHD, 2008).

This modelling assessment has been undertaken in accordance with the *Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales (AMMAAP).* The AERMOD computer based dispersion model was used to determine the GLC impacts of odour and TSP.

Odour emission concentrations input data in this AQIA have been determined from the two most recent quarters of compliance odour monitoring conducted on 4th May and 5th August 2015 by SEMA on the existing starch dryers.

TSP emission concentrations input data in this AQIA are based on the 2008 GHD Air Quality Assessment.

The Manildra Group provided proposed operational data, building information, discharge stack and equipment design information for their Shoalhaven Starches site and this relocation of infrastructure.

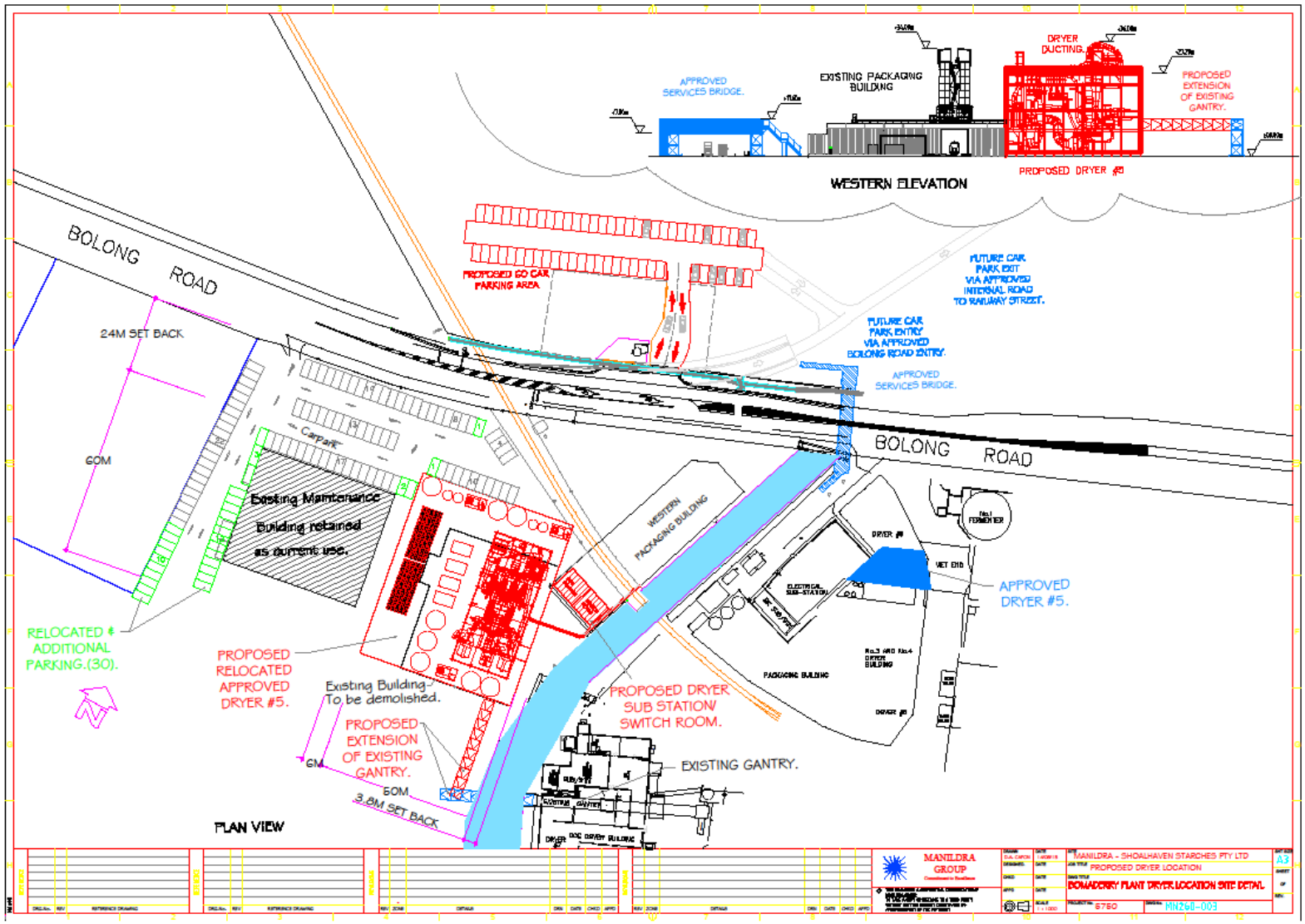
2 THE SITE

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

Figure 2-1 displays the location of the modelling domain and Figure 2-2 shows the plan and elevation of the relocated dryer on the Shoalhaven Starches site.

FIGURE 2-1 SHOALHAVEN STARCHES LOCATION

FIGURE 2-2 PROPOSED RELOCATION SITE AND ELEVATION OF STARCH DRYER 5



3 IMPACT ASSESSMENT CRITERIA

3.1 ODOUR IMPACT ASSESSMENT CRITERIA

The *Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales* (AMMAAP) provides a GLC impact assessment criterion for a number of potential air emissions. 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 3-1. The predicted odour impact due to the pollutant source must be reported in units consistent with the IAC as peak concentrations (i.e. approximately 1 second average).

The odour criterion that has been selected for use in this assessment, 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 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 3-1 IMPACT ASSESSMENT CRITERIA FOR COMPLEX ODOROUS AIR POLLUTANTS

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

Key:
ou = odour unit
> = greater than
~ = approximately
<= = less than or equal to

3.1.1 ADJUSTMENT FOR PEAK-TO-MEAN RATIOS

AMMAAP notes that the evaluation of odour impacts requires the estimation of short or peak concentrations on the time scale of less than one second. The dispersion modelling predictions are valid for one-hour ground level concentrations or longer. Therefore 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 3-2 below, provides EPA recommended one-second to one-hour (P/M60) peak-to-mean ratios for estimating concentrations for different source types, stabilities and distances. It is important to note that these emission factors are for idealised situations for one source in flat terrain where the receptor is located along the centreline of the single plume and do not consider fluctuations away from the plume centre line, terrain influences or plume interactions from multiple sources.

AMMAAP further requires that the P/M60 ratio for wake-affected point sources be applied to the proposed 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 3-2 PEAK-TO-MEAN FACTORS

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

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

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

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

3.2 PARTICLE IMPACT ASSESSMENT CRITERIA

The AMMAAP criterion for Total Suspended Particulate Matter is outlined in Table 3-3.

TABLE 3-3 IMPACT ASSESSMENT CRITERIA FOR TOTAL SUSPENDED PARTICULATE MATTER

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

Key:

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

4 DISPERSION MODELLING INPUT DATA

AERMOD is a recommended Gaussian dispersion modelling system as it accurately estimates Ground Level Concentrations (GLC's) 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.

4.1 TERRAIN DATA

A domain of 10km by 10km surrounding the Shoalhaven Starches site was incorporated into this assessment, 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.

4.2 METEOROLOGICAL DATA

The area considered in AQIA dispersion modelling experiences typical coastal weather in addition to locally influenced patterns. A mountain range to the north of the site means northerly winds are much less common than the east-west wind patterns occurring as a result of the coastal sea breeze cycle. 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 4-1 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 4-1 shows westerlies and norwesterlies being most predominant for the 12 month period.

4.3 BUILDING DATA

Buildings greater than 0.4 times the height of stack and within a distance of 5L must be incorporated into modelling, where L is the lesser of the height or width of the building. The buildings incorporated into the modelling assessment are presented in Figure 4-2. 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.

4.4 RECEPTORS OF INTEREST

The receptors of interest chosen for this assessment 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 4-3. 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.

4.5 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 4-1 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 4-2 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/m^3 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 4-3. This GHD assessment has used the emission concentration of 25 mg/m^3. 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/m^3.

TABLE 4-1 STARCH DRYER 5 – CHARACTERISTICS

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

TABLE 4-2 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 4-3 TSP EMISSION INPUT DATA

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

Key to Tables 4-1 to 4-3:

m	=	metres
^{o}C	=	degrees Celsius
Nm^3/s	=	dry cubic metre per second 0°C and 101.3 kilopascals (kPa)
m/s	=	metres per second
ou	=	odour units
ou/m^3/s	=	odour units per cubic metre per second
TSP	=	Total Suspended Particulates
g/s	=	grams per second

FIGURE 4-1 WIND ROSE- JANUARY 1ST –DECEMBER 31ST 2013

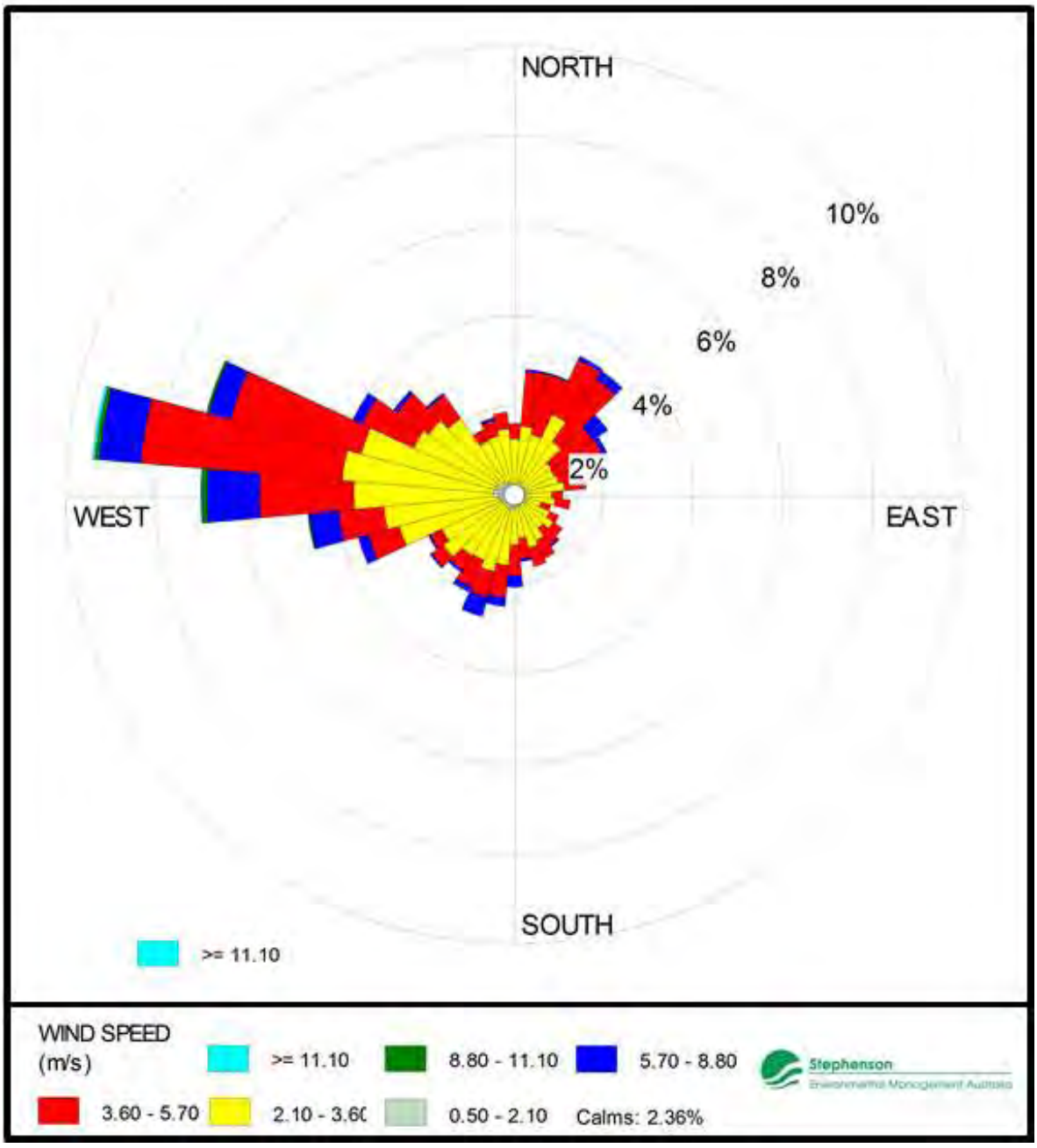


FIGURE 4-2 BUILDING INPUT DATA

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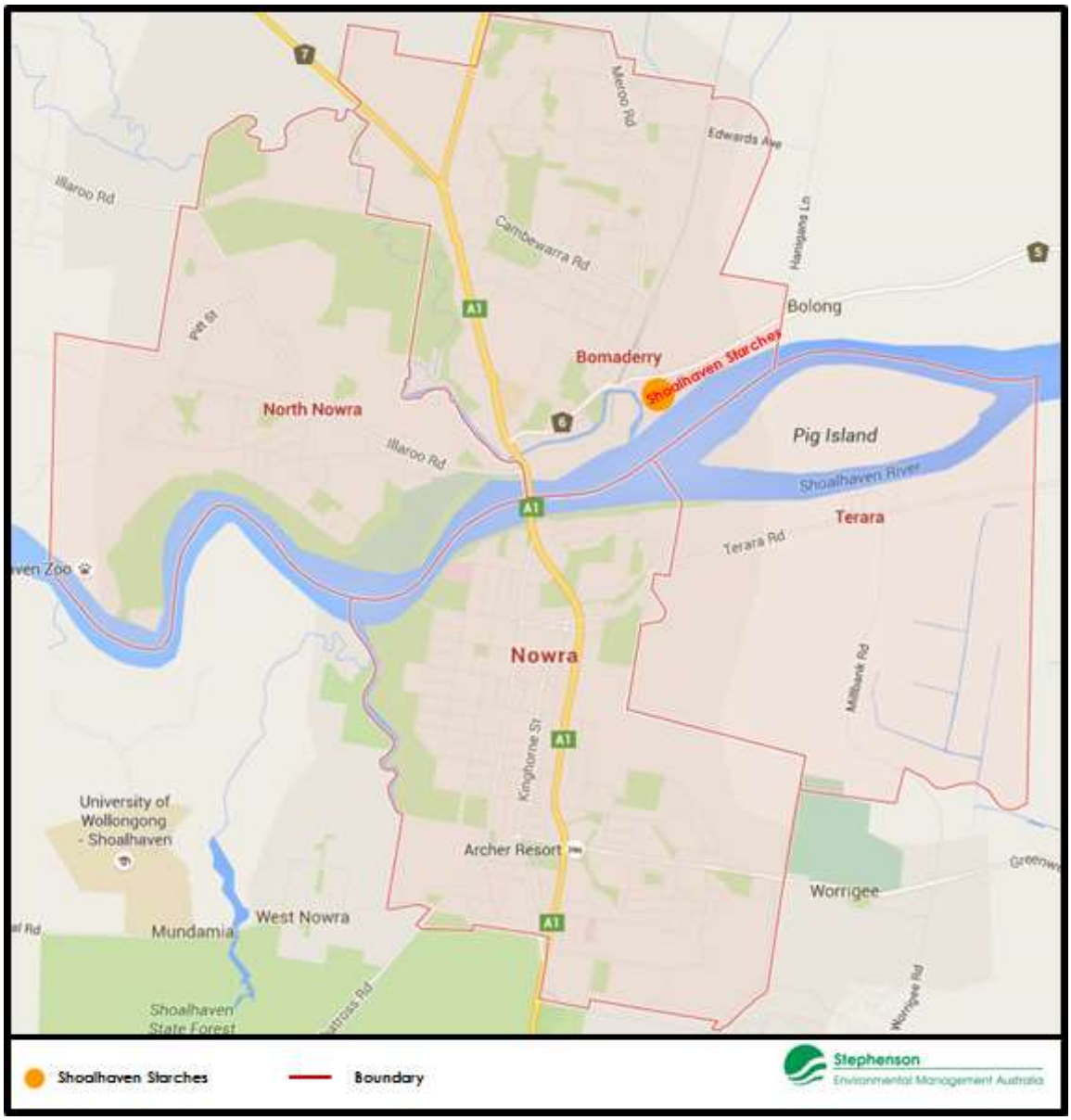
FIGURE 4-3 LOCATIONS OF RECEPTORS OF INTEREST



5 CUMULATIVE EMISSIONS

5.1 CUMULATIVE ODOUR EMISSIONS

With the existing level of odour control, the relocated dryer 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.m^3/s. Based on available data and measurement results, GHD estimated the approved and relocated Dryer 5 will emit 6,794 ou.m^3/s of odour before controls and 5,095 ou.m^3/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. 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 148,807ou.m^3/s after the completion of these AOC.

Refer Appendix A for details of odour sources and odour emissions reported by GHD.

5.2 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/m^3 from the relocated Starch Dryer 5 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. As stated in Section 4.5, 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.

Refer Appendix B for details of 2008 particulate matter sources and emissions assessment.

6 IMPACT ASSESSMENT PREDICTIONS

The air quality impact assessment worst case predictions from the dispersion modelling are presented in Tables 6-1 and 6-2. 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 6-1 and 6-2 present the predicted ground level impacts of odour and TSP emissions respectively, from the relocated Dryer 5.

The maximum predicted odour GLC from 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 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 $\mu g/m^3$. The maximum TSP concentration at ground level is 4 $\mu g/m^3$.

From the 2008 assessment, the reported TSP GLC at Bomaderry from the factory complex was predicted to be approximately 2 $\mu g/m^3$ in Bomaderry. The highest TSP cumulative impact from the relocated dryer in the Bomaderry area is predicted to be 0.4 $\mu g/m^3$.

TABLE 6-1 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 6.1 and 6.2

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 6-2 CUMULATIVE WORST CASE TSP GLC

Location	Parameter	Averaging Time	Relocated Dryer 5 TSP GLC* (µg/m³)	Whole Factory Predictions** (µg/m³)	Impact Assessment Criteria (µg/m³)
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 6-1 PREDICTED ODOUR CONCENTRATION, RELOCATED DRYER, SHOALHAVEN STARCHES

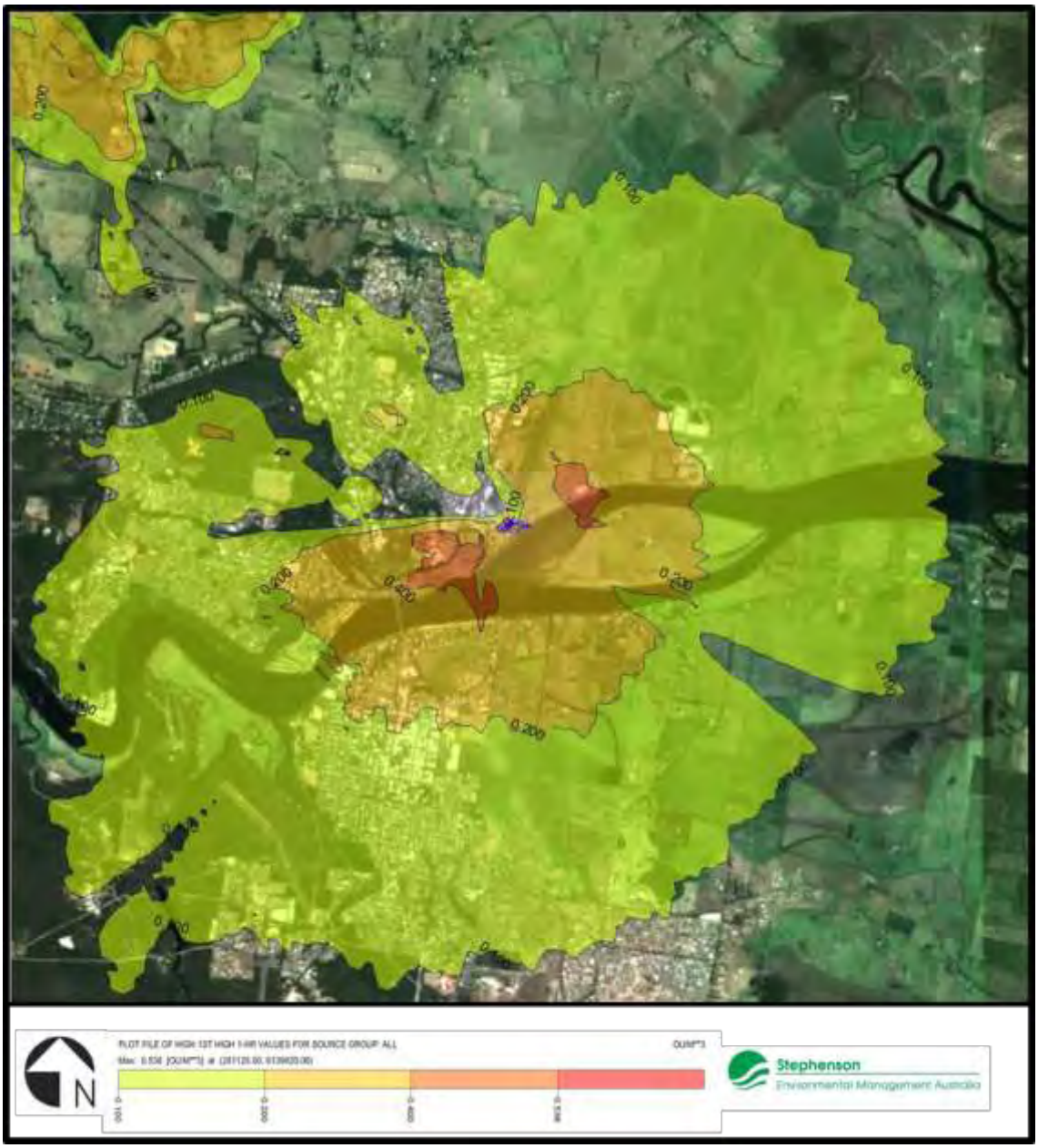


FIGURE 6-2 PREDICTED TSP CONCENTRATION RELOCATED DRYER, SHOALHAVEN STARCHES

7 CONCLUSIONS

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 $\mu g/m^3$.

- 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 $\mu g/m^3$.

- 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 $\mu g/m^3$. Current predicted worst case **TSP** GLC (annual average) within the site from the relocated Starch Dryer No. 5 will be 4 $\mu g/m^3$ at the site and 0.4 $\mu g/m^3$ 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 $\mu g/m^3$.

APPENDIX A – ODOUR EMISSION INVENTORY (GHD REPORT 2008)

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

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

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

5.1.1 Factory

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

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

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

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

Plant	Odour Source	ID	OER Before Control OU m^3/s	Stage 1 Odour Control [1] OU m^3/s		Stage 2 Odour Control [1] OU m^3/s		Stage 3 Odour Control [1] OU m^3/s	
				Control	OER	Control	OER	Control	OER
DDG (liquids)	Dryer feed tank	DDG 30	1,433	BIO	215	BIO	215	BIO	215
DDG (liquids)	Feed holding tank	DDG 31	1,317	BIO	198	BIO	198	BIO	198
DDG (liquids)	CIP tank	DDG 32	417	BIO	63	BIO	63	BIO	63
DDG (solids)	DDG tent storage area	DDG 36	12,862	PP	1,929	PP	1,929	PP	1,929
DDG (solids)	DDG product storage sheds	DDG 34	6,820	PP	1,023	PP	1,023	PP	1,023
DDG (solids)	Grounds	DDG 37	203	HK	0	HK	0	HK	0
DDG (solids)	DDG - palmer cooler [7]	DDG 16	17,666	BIO	2,650	BIO	2,650	BIO	2,650
DDG (solids)	DDG heat exchanger [6]	DDG 45	2,333	Repair	0	-	0	-	0
DDG (solids)	Decanter 3&4	DDG 5	1,700	Nil	1,700	BIO	255	BIO	255
DDG (solids)	Decanter 1&2	DDG 2	260	Nil	260	BIO	39	BIO	39
DDG (solids)	Decanter feed tank	DDG 1	217	WL	108	BIO	33	BIO	33
DDG (solids)	Feed dryer baghouses	DDG 18	867	BIO	130	BIO	130	BIO	130
DDG (liquid)	Light phase tank	DDG 19	450	Nil	450	Nil	450	BIO	68
DDG (solids)	DDG Dryer building	DDG 39	70,504	IV	7,050	IV / BIO [15]	7,050	IV / BIO [15]	7,050
DDG	Cooling towers	DDG 46	68,333	HK	6,833	HK	6,833	HK	6,833
Distillery	Incondensible gases vent	D5	400	Nil	400	Nil	400	Nil	400
Distillery	Molecular Sieve - Vacuum drum	D2	1,350	Nil	1,350	Nil	1,350	BIO	203
Distillery	DME vent	D12	107	Nil	107	Nil	107	Nil	107

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

Plant	Odour Source	ID	OER Before Control OU m^3/s	Stage 1 Odour Control [1] OU m^3/s		Stage 2 Odour Control [1] OU m^3/s		Stage 3 Odour Control [1] OU m^3/s	
				Control	OER	Control	OER	Control	OER
Starch	High protein dust collector	S8	600	Nil	600	Nil	600	Nil	600
Starch	Flour bin	S6	283	Nil	283	Nil	283	Nil	283
Starch	Flour bin aspirator	S13	1,000	Nil	1,000	Nil	1,000	Nil	1,000
Starch	Pellet silo	S12	350	Nil	350	Nil	350	Nil	350
Starch	No.4 Gluten Dryer [4]	S5	13,331	HK	9,998	HK	9,998	CTS	9,998
Starch	No.3 Gluten Dryer [4]	S3	19,501	HK	14,625	HK	14,825	CTS	14,625
Starch	No.1 Gluten Dryer [4]	S2	13,182	HK	9,886	HK	9,886	CTS	9,886
Starch	No.2 Gluten Dryer [4]	S4	5,511	HK	4,133	HK	4,133	CTS	4,133
Starch	No. 4 Starch Dryer [4]	S19	7,151	HK	5,363	HK	5,363	CTS	5,363
Starch	No. 3 Starch Dryer [4]	S18	6,436	HK	4,827	HK	4,827	CTS	4,827
Starch	No. 1 Starch Dryer [4]	S1	6,315	HK	4,736	HK	4,736	CTS	4,736
Starch	No. 5 Starch Dryer [5]	5	6,794	HK	5,095	HK	5,095	HK	5,095
Starch	Spray dryer	S20	983	HK	738	HK	738	HK	738
Starch	Kestner dryer	DDG 40	3,000	D	0	D	0	D	0
Factory	**TOTAL**		**468,105**		**158,290**		**110,659**		**111,266**
ETHANOL UPGRADE									
DDG	DDG tank vents	-	36,000	BIO	5,400	IV	5,400	IV	5,400
DDG	DDG transfer cyclones (6 units) [9]	-	9,083	BIO	1,362	BIO	1,362	BIO	1,362
DDG	DDG dryers (6 units) [9]	-	6,321	BIO	948	BIO	948	BIO	948
DDG	Decanters (10 units) [9]	-	8,417	BIO	1,263	BIO	1,263	BIO	1,263
DDG	Pelletiser baghouses (2 units) [10]	-	34,378	BIO	5,157	BIO	5,157	BIO	5,157

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

Footnotes to table above:

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

APPENDIX B – TSP EMISSION INVENTORY (GHD REPORT 2008)

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

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

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

Table 5-3 Emission Inventory – Particulate Matter

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

Discharge Point	Emission Control	In-stack TSP (mg/m^3) at Stack Gas Condition	In-stack TSP (mg/m^3) at Reference Condition	In-stack TSP Concentration Standard (mg/m^3)	TSP g/s	PM10 g/s
Spray dryer [5]	Fabric filter	60	60	250 [9]	0.48	0.14
Flour Mill (approved)	Fabric filter	<10	<10	20 [6]	0.03	0.009
Other (aggregate) [11]	Fabric filter	<10	<10	250 [6]	0.1	0.1
Total existing					**13**	**3.6**
Gluten dryer No. 5 (proposed) [8]	Fabric filter	<10	<10	20 [6]	0.02	0.02
Gluten grinder (proposed) [8]	Fabric filter	<10	<10	20 [6]	0.02	0.02
Boiler No. 7 (proposed) [12]	Gas-fired	ND	ND	-	0.07	0.07
Co-generator turbine No. 1 (proposed) [13]	Gas-fired	ND	ND	-	0.1	0.1
Co-generator turbine No. 2 (proposed) [13]	Gas-fired	ND	ND	-	0.1	0.1
Total – increment for proposed upgrade					**0.31**	**0.31**
Total – existing + upgrade					**13.3**	**3.9**

Footnotes to table above:

ND: No data

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