ANNEXURE 6

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Noise Impact Assessment

prepared by

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Environmental Noise Impact Assessment Shoalhaven Starches - Proposed Modification to Ethanol Distillery

Bolong Road,

Bomaderry, NSW 2541

Prepared for:-

Shoalhaven Starches Pty Ltd
C/- Cowman Stoddart Pty Ltd
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Attention: Mr Stephen Richardson

Reference: 1608003E-R

Document Control Page

Revision	Author	Released By	Date
Draft	MH	MH	15/11/2016
Final	MH	MH	16/11/2016

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1. INTRODUCTION AND SUMMARY

Shoalhaven Starches Pty Ltd is part of the Manildra Group of companies and their existing facility is located on the southern side of Bolong Road, Bomaderry, NSW, on the northern side of the Shoalhaven River. The surrounding area is a mix of commercial, industrial and residential premises. The nearest residences are located in the township of Bomaderry to the north-west and across the Shoalhaven River in Nowra to the south and Terara to the south-east.

In 2009 Shoalhaven Starches received Project Approval from the Minister for Planning for the Shoalhaven Starches Expansion Project (SSEP), reference 06_0228. The SSEP included approval to increase ethanol production from 126 million litres per year to 300 million litres per year, which includes a small portion of beverage grade ethanol.

Shoalhaven Starches now proposes to modify the approval for this component of the SSEP by undertaking modifications to the existing distillation plant to enable an increase in the beverage grade ethanol proportion of total ethanol production.

This modification comprises the following components / amendments:-

- Beverage grade ethanol production plant (new columns, vessels, pumps, motors, etc);
- Relocation of previously approved evaporators;
- New ethanol storage tanks;
- New cooling towers;
- New sub-station;
- ISO container emergency storage yard;
- Replacement of pump station and water storage ;
- New car park areas; and
- Construction of additional rail sidings for scheduled maintenance of rolling stock.

The ethanol plant will be located adjacent to the existing ethanol distillery on the northern side of the site; the cooling towers, evaporators and substation will be located to the east of the existing fermentation tanks with the ISO container emergency storage yard further to the east; the ethanol storage tanks will be located on the southern side of the site; the rail sidings will be constructed adjacent to the existing sidings near to the former Diary Farmers Complex and two new car parking areas will be constructed on the northern side of Bolong Road, opposite the distillery.

A site plan showing the proposed location of all aspects of the modification is provided in the attached Appendix A and full details can be seen in the Manildra Group's building design plans, drawing number MN285-001H dated 31/10/16.

It is a requirement of the NSW Environment Protection Authority and Department of Planning and Environment, that an Environmental Noise Impact Assessment of the proposed modification is prepared, in accordance with the NSW Industrial Noise Policy 2000 and Interim Construction Noise Guideline 2008. The report is to provide a description of the proposed mitigation measures and a review of the modification against the existing Environment Protection Licence Conditions and any noise reduction programs.

The main sources of noise associated with this modification application will be the plant and equipment associated with the beverage grade ethanol plant, the cooling towers and evaporators.

Shoalhaven Starches operates under Environment Protection Licence Number 883 which sets noise limits for the overall operation of the complex.

The noise goals for any new plant are typically a minimum 10 dB below the EPL noise limits in accordance with Shoalhaven Starches Noise Management Plan originally prepared 31 October 2009 and revised 7 September 2010 under the Project Approval conditions for the Shoalhaven Starches Expansion Project.

Noise goals have been designed for the proposal so as to ensure existing noise levels are not increased by the introduction of the new plant and equipment. These range between 28 dBA and 32 dBA depending upon the residential receptor location.

Noise modelling has been undertaken using a combination of measured noise levels from existing indicative plant and equipment and similar processes at the existing complex, manufacturer's data and by providing maximum allowable noise levels for certain items of plant.

Recommendations are made in Section 6 of this report to reduce the level of noise emission from the overall operation of the modification to the Ethanol Distillery to within the design noise goals. These include advice on the maximum allowable noise levels of various noise producing plant and equipment, which will be achieved through the judicious selection of plant and / or acoustically treating external plant if required at the time of installation.

Providing the recommendations are satisfactorily implemented the level of noise emitted by the proposal will comply with the Shoalhaven Starches Environment Protection Licence noise limits.

The construction works will consist of piling, pouring of concrete slabs for the cooling towers, evaporators, substation and road base for the emergency ISO container yard, construction of the rail sidings and the erection and installation of the ethanol plant and equipment.

Calculations show that the level of noise emission from the construction phase will be within noise management levels set by the NSW EPA's Interim Construction Noise Guideline at all receptor locations for the majority of the construction phases. There is potential for the noise management levels to be exceeded during piling works by up to approximately 2 dB at the nearest receptors. This is not considered to be a significant impact, however it is recommended that piling works are carried out during day time hours only, as recommended in the Project Approval. A Construction Noise and Vibration Plan detailing best practices for the construction phase may be commissioned if required.

Construction noise mitigation measures are included in the Construction Safety & Environmental Management Plan prepared by Shoalhaven Starches.

2. SITE AND DEVELOPMENT DESCRIPTION

2.1 Site Description

The Shoalhaven Starches complex is located on the southern side of Bolong Road across the Shoalhaven River from Nowra.

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

The nearest residential receptor locations to the proposal are as follows:-

- Location 1 – Nobblers Lane, Terara approximately 1450 metres to the south east
- Location 2 – Riverview Road, Nowra approximately 1125 metres to the south west;
- Location 3 – Meroo Street, Bomaderry approximately 630 metres to the north west;
- Location 4 – Coomea Street, Bomaderry approximately 700 metres to the north west;

Locations are listed in keeping with the order shown in Environment Protection Licence number 883, as detailed in Section 3.1 of this report. Distances are based on the location of the proposed beverage grade ethanol columns and various noise producing aspects of the proposal are at varying distances from each receptor, as is considered in all calculations. The Shoalhaven Starches site, surrounding area and receptor locations are shown in Figure 1.

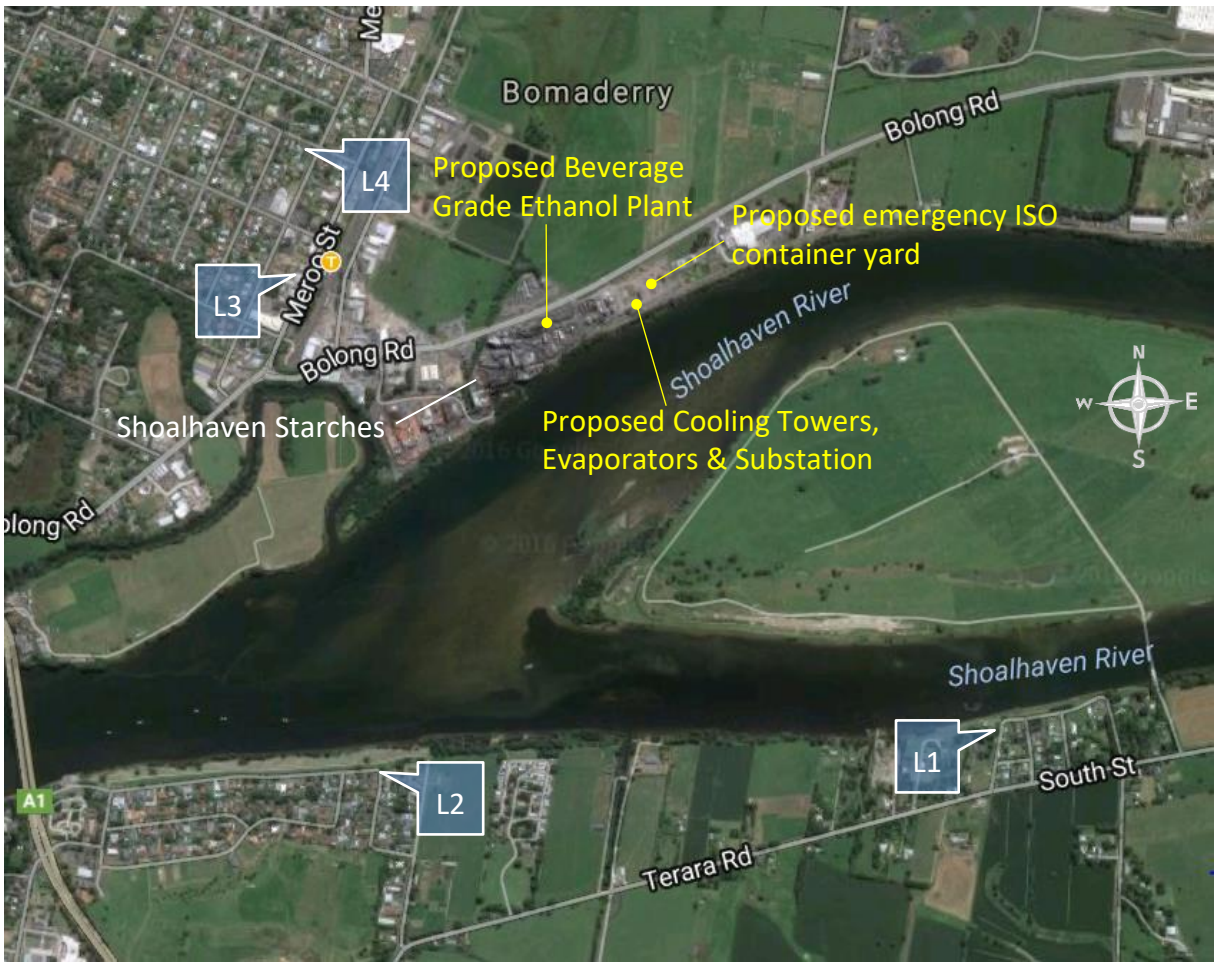

Figure 1. Location Plan – Shoalhaven Starches, Bomaderry, NSW *(source: Google Maps © 2016)*

2.2 Description of Proposal

In 2009 Shoalhaven Starches received Project Approval from the Minister for Planning for the Shoalhaven Starches Expansion Project (SSEP), reference 06_0228. The SSEP included approval to increase ethanol production from 126 million litres per year to 300 million litres per year, which includes a small portion of beverage grade ethanol.

Shoalhaven Starches now proposes to modify the approval for this component of the SSEP by undertaking modifications to the existing distillation plant to enable an increase in the beverage grade ethanol proportion of total ethanol production.

This modification comprises the following components / amendments:-

- Beverage grade ethanol production plant (new columns, vessels, pumps, motors, etc);
- Relocation of previously approved evaporators;
- New ethanol storage tanks;
- New cooling towers;
- New sub-station;
- ISO container emergency storage yard;
- Replacement of pump station and water storage ;
- New car park areas; and
- Construction of additional rail sidings for scheduled maintenance of rolling stock.

The ethanol plant will be located adjacent to the existing ethanol distillery on the northern side of the site; the cooling towers, evaporators and substation will be located to the east of the existing fermentation tanks with the ISO container emergency storage yard to be located further to the east; the ethanol storage tanks will be located on the southern side of the site; the rail sidings will be constructed adjacent to the existing sidings near to the former Diary Farmers Complex and two new car parking areas will be constructed on the northern side of Bolong Road, opposite the distillery.

A site plan showing the proposed location of all aspects of the modification is provided in the attached Appendix A and full details can be seen in the Manildra Group's building design plans, drawing number MN285-001H dated 31/10/16.

The beverage grade ethanol plant will comprise a hydro selection column, rectification columns, refining column and evaporators. Noise producing plant and equipment associated with the beverage grade ethanol plant and evaporators will comprise a variety of pumps, motors, steam ejectors, compressors, valves, etc.

An equipment list has been supplied, however at the time of writing this report noise levels of individual components is not yet known. Noise design goals for the overall level of noise emission from each of the noise producing aspects of the modification proposal are provided in Section 6 of this report. These are based on previously measured noise levels of similar plant and equipment and are considered to be achievable through localised acoustical treatment.

Additional noise sources include the cooling towers, substation, forklift operating in the ISO container yard and the syrup tank.

3. NOISE CRITERIA

This section outlines the noise guidelines applicable to this proposal and establishes the project specific noise goals.

3.1 NSW Department of Planning and Environment

3.1.1 Existing Project Approval

Project Approval for Application No. 06_0228, provided by the Minister for Planning, dated January 2009, Schedule 2, Condition 2, 'Terms of Approval' states:-

"The proponent shall carry out the project generally in accordance with the:

a) EA and associated site plans (see Appendix 2);

b) Statement of commitments; and

c) Conditions of this approval."

The original Project Approval incorporates noise mitigation measures recommended in the 'Acoustical Assessment, Proposed Ethanol Upgrade, Shoalhaven Starches' – prepared by The Acoustic Group Pty Ltd, ref 38.3849.R52:ZJM, dated 26 June 2008. This document forms part of the EA and statement of commitments and it is implicit that the noise control recommendations within this document are required to be implemented as part of the Project Approval. These are addressed in Section 7 of this report.

Schedule 3, Conditions 11 to 14 inclusive of the Project Approval, also refer to noise emission and are summarised as follows:-

Condition 11 relates to restricted hours of construction activities. Condition 12 reiterates the noise limits contained with Environment Protection Licence 883. Condition 13 requires that all feasible and reasonable noise mitigation measures must be implemented during the construction phase of the project. Condition 14 required the preparation of a noise management plan (see Section 3.3 below).

3.1.2 Existing Project Approval

In response to a request for information relating to noise emission from the proposed modification, the NSW Department of Planning and Environment requires an assessment of the potential for noise impact.

3.2 NSW EPA's Environment Protection Licence

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

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

"L5.1 the $L_{A10\ (15min)}$ sound pressure level contribution generated from the premises must not exceed the following levels when measured at or near the boundary of any residential premises:

a) 38 dBA at locations in Terara on the south side of the Shoalhaven River;
b) 38 dBA at locations in Nowra on the south side of the Shoalhaven River;
c) 42 dBA at locations in Meroo Street, Bomaderry;
d) 40 dBA at other locations in Bomaderry."

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

3.3 Shoalhaven Starches Noise Management Plan

Previous approval for the Shoalhaven Starches Expansion Project, required the preparation of a Noise Management Plan for addressing and managing noise emission from the expansion project.

The Shoalhaven Starches Noise Management Plan originally prepared 31 October 2009 and revised 7 September 2010 addresses, among other things, acoustic criteria relating to the Shoalhaven Starches complex and any new developments. Section 3 of the plan lists noise limits from the Environmental Protection Licence as shown in Section 4.1 above and states:-

"Compliance testing conducted on a regular basis on behalf of the Mill

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

3.4 Construction Noise Criteria

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

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

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

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

In this instance the entire construction phase may take several months although significant noise producing aspects, such as piling, if required, will last a total of approximately two weeks. Consideration is given to the potential for noise impact from construction activities on residential receptors in Section 6 of this report.

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

The author has carried out numerous noise surveys in Nowra, Bomaderry and Terara and has found daytime background noise levels range between 33 and 40 dBA depending on the location, as shown in Table 1 below.

Table 1 Rating Background Levels – Nowra, Terara and Bomaderry, NSW

Location	Time of Day	Rating Background Level (L_{90})
135 Terara Road, Terara March 2012	Day (7 am to 6 pm)	**33 dBA**
55 Terara Road, Nowra February 2015	Day (7 am to 6 pm)	**36 dBA**
Cambewarra Rd, Bomaderry July 2010	Day (7 am to 6 pm)	**40 dBA**
Shoalhaven Village Caravan Park, Nowra March 2012	Day (7 am to 6 pm)	**40 dBA**

For the purpose of determining the potential for community reaction to noise emission from construction activities, previously measured background noise levels in the vicinity of each receptor location have been used to determine the noise management levels as shown in Table 2 below.

Table 2 L_{eq} Noise Management Levels from Construction Activities

Receptor Location	Noise Management Level	How to Apply
Location 1 (Terara) Location 2 (Nowra) Locations 3 & 4 (Bomaderry)	**43 dBA** (33 + 10) **50 dBA** (40 + 10) **48 dBA** (38 + 10)	The noise affected level represents the point above which there may be some community reaction to noise. ▪ Where the predicted or measured $L_{Aeq\ (15\ min)}$ noise level is greater than the noise affected level, the proponent should apply all feasible and reasonable* work practices to meet the noise affected level. ▪ The proponent should also inform all potentially impacted residents of the nature of works to be carried out, the expected noise levels and duration, as well as contact details.
	Highly noise affected 75 dB(A)	The highly noise affected level represents the point above which there may be strong community reaction to noise. ▪ Where noise is above this level, the relevant authority (consent, determining or regulatory) may require respite periods by restricting the hours that the very noisy activities can occur, taking into account: 1. times identified by the community when they are less sensitive to noise (such as before and after school for works near schools, or mid-morning or mid-afternoon for works near residences) 2. if the community is prepared to accept a longer period of construction in exchange for restrictions on construction times.

* Section 6, “work practices” of The *Interim Construction Noise Guideline*, states:- *“there are no prescribed noise controls for construction works. Instead, all feasible and reasonable work practices should be implemented to minimise noise impacts.*

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

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

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

3.5 Project Specific Noise Goals

The most relevant criteria are as follows:-

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

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

Construction Phase Noise Management Levels

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

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

4. BEVERAGE GRADE ETHANOL PLANT NOISE EMISSION

4.1 Plant and Equipment Source Noise Levels

The main sources of noise associated with the modification proposal will be the cooling towers, evaporators, pumps, motors and valves associated with the beverage grade ethanol plant and the intermittent forklift truck operating in the new emergency ISO container yard.

Table 3 below provides a schedule of overall 'A' frequency weighted sound power levels, in decibels re: 1 pW, of noise sources associated with proposed modification. These are derived from manufacturer's data, previously measured noise levels of indicative plant and equipment and the author's data base of similar items of plant and equipment.

Table 3 L_{10} Sound Power Levels – Plant and Equipment

Description	$L_{10,\ 15\ minute}$ Sound Power Level (dBA)
Cooling Towers x 1 (Low Noise – Baltimore)	**87**
32 tonne forklift movement	**104**
Evaporators (combined)	**90**
Beverage Grade Ethanol Plant (combined)	**90**
Syrup Tank	**80**
Substation	**64**

4.2 Noise Level Predictions

4.2.1 Modelling Equations

For all outdoor noise sources, the external noise level at each receptor has been calculated from the formula:-

$$L_{eq} = L_w + Dc - A$$

Where:

- L_w is the sound power level of the noise source;
- Dc is directivity correction; and
- A is the attenuation that occurs during the propagation from source to receiver.

The term A in the equation includes attenuation from geometric divergence (distance loss), atmospheric absorption, ground absorption, barrier effects and miscellaneous other effects.

This model derives from the International Standard ISO 9613-2 (1996(E)) *'Acoustic – Attenuation of sound during propagation outdoors Part 2 General method of calculation'*.

The method described in the Standard is general in the sense that it may be applied to a wide variety of noise sources, and covers the major mechanism of sound attenuation. The method allows for propagation conditions with the wind blowing from the source to the receiver.

The modification also includes the construction of two new rail sidings adjacent to the existing rail sidings near to the former dairy farmers site as well as the construction of two new car parking areas on the northern side of Bolong Road, the decommissioning of an existing pump house and the replacement of these with a previously approved pump house.

The rail sidings will be used for scheduled maintenance of the locomotives and stock (carriages / wagons) and will allow for a greater capacity of stationary wagons to be stored in this area. There will be no new noise producing aspects associated with the rail sidings.

Similarly, with the car parking areas and replacement of pump motors, there will be no noise producing aspects associated with these components of the proposal that are not currently part of existing operations at Shoalhaven Starches facility.

4.2.2 Predicted Noise Levels

Predicted noise levels at each receptor location are shown in Table 4 below.

Table 4 Predicted Noise Levels at Receptor Locations

Description	Predicted Noise Level $L_{10,\ 15\ minute}$ (dBA) at Receptor Location			
	Location 1	Location 2	Location 3	Location 4
Cooling towers	21	24	24	22
Forklift	22	24	23	26
Evaporators	16	19	20	22
Beverage Grade Ethanol Plant	<15	<5	16	20
Syrup Tank	<10	15	<10	<10
Substation	<10	<10	<10	<10
Combined	26	27	28	29
Design Noise Goal ($L_{10,\ 15\ minute}$)	28	28	32	30
Complies	✓	✓	✓	✓

The calculations and predictions in Table 4 consider distance loss to each receptor as well as the following:-

- Recommendations with regard to maximum allowable sound levels detailed in Section 6.1 of this report are achieved and adhered to;
- Barrier attenuation from existing site structures for various items of plant and equipment;
- Manufacturer's sound power levels are achieved as detailed in Section 6; and
- Ground absorption to receptor R1 only.

It can be seen from the predicted noise levels in Table 4 that the design noise goals for this proposal can be met without the need for additional noise controls, this is providing that the assumed power levels for individual plant and equipment are achieved as detailed in Section 6.1.

5. CONSTRUCTION NOISE EMISSION

The construction works will consist of piling, pouring of concrete slabs for the cooling towers, evaporators, substation and road base for the emergency ISO container yard, construction of the rail sidings and the erection and installation of the ethanol plant and equipment.

Table 5 below shows a schedule of sound power levels for typical construction equipment.

Table 5 Construction Equipment – L_{eq} Sound Power Levels

Description	L_{eq} Sound Power Level (dBA)
Piling Rig	118
Mobile Crane (Diesel)	110
30 Tonne Excavator (with rail attachments)	110
Concrete Truck / Pump	105
Traxcavator	100
Dump Truck	110
Grinder	105
Power Saw	101

Table 6 below shows the predicted level of potential noise emission from construction activities at each of the receptor locations.

Table 6 Predicted Noise Levels at Receptor Locations – Construction Phase

Description	Predicted Noise Level $L_{eq,\ 15\ minute}$ (dBA) at Receptor Locations			
	Location 1	Location 2	Location 3	Location 4
Construction Activity*	40 – 46	41 – 47	45 – 51	44 – 50
Acceptable Noise Limit ($L_{eq,\ 15\ minute}$)	43	50	48	48
Complies	No + 6 dB (during piling)	Yes	No + 3 dB (during piling)	No + 2 dB (during piling)

* Range provided with and without piling activity.

6. RECOMMENDED NOISE CONTROLS

It can be seen from the noise modelling and predictions in Section 4.2 that the noise design goals can be met without the need for additional noise controls. This is providing that maximum allowable sound levels for individual items of plant are achieved.

6.1 Sound Level Design Goals

Cooling Towers

The cooling towers should have an individual sound power level of (L_w) **87 dBA** each (assumes six (6) will be installed).

Evaporators

The plant and equipment associated with the evaporators should not exceed a combined sound power level (L_w) of **90 dBA**.

This equates to a sound pressure level of 73 dBA when measured at a distance of 3 metres from the evaporators for all noise producing components of the evaporators combined.

Beverage Grade Ethanol Plant

The plant and equipment associated with the beverage grade ethanol plant should not exceed a combined sound power level (L_w) of **90 dBA**.

This equates to a sound pressure level of 73 dBA when measured at a distance of 3 metres from the plant for all noise producing components combined.

Once the noise level of the individual components of the evaporators and beverage grade ethanol plant are known, localised acoustical treatment can be designed to ensure the above design noise goals are met, if required.

This may include silencers, specially selected flow valves or localised acoustical screening or enclosures.

6.2 Construction Noise

The Project Approval prescribes allowable operation hours for construction activities in Clause 11 and Clause 13, which states:-

> *"During construction, the Proponent shall prepare and implement all reasonable and feasible measures to minimise the construction noise impacts of the project."*

It can be seen from Table 6 that the construction noise management levels are likely to be met at each receptor location during general construction activity, with the exception of piling. During piling (if required) there is potential for the noise management levels to be exceeded on some occasions. This is not considered a significant exceedance during day time hours for short and sporadic duration.

However, a Construction Noise Management Plan may be provided in accordance with NSW EPA's Interim Construction Noise Guideline and to satisfy Condition 13 of the Project Approval.

Construction noise mitigation measures are included in the Construction Safety & Environmental Management Plan prepared by Shoalhaven Starches.

7. CONCLUSION

An assessment of the potential noise impact from the proposed construction and operation of modifications to the ethanol distillery plant, associated cooling towers, emergency container yard and rail sidings at Shoalhaven Starches on Bolong Road, Bomaderry, NSW has been undertaken.

Calculations show that the level of noise emission from the modification to this approved proposal will be within the noise design goals derived from Environment Protection Licence 883 noise limits at each receptor location providing noise control recommendations made in Section 6 of this report are implemented and adhered to.

The level of noise emission from the construction phase of the project will be within the noise management levels set by the NSW EPA's *Interim Construction Noise Guideline*

Matthew Harwood, MAAS

Principal Acoustic Consultant

Attachments:-

Appendix A – Site plan showing proposed components of the approval

Site Layout (source: Manildra Group Drawing No. MN285-001H dated 31/10/16)	**Appendix A**