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Environmental Noise Assessment
Shoalhaven Starches

Proposed Modification to Shoalhaven Starches Expansion Project 06_0228 – Proposed Modification to Approved Cogeneration Plant – Modification 23.

At:-

160 Bolong Road,

Bomaderry, NSW 2541

Prepared for: -

Shoalhaven Starches Pty Ltd
C/- Cowman Stoddart Pty Ltd
29-31 Kinghorn Street
Nowra NSW 2541

Attention: Mr Stephen Richardson

Reference: 2103012E-R Rev B

Prepared by: -

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Shoalhaven Starches Pty. Ltd. commissioned Harwood Acoustics Pty. Ltd. to carry out an Environmental Noise Impact Assessment for a proposed modification to the Shoalhaven Starches Expansion Project (SSEP), approval reference 06_0228 at its facility at 160 Bolong Road, Bomaderry, NSW.

This modification (Mod 23) relates to the installation of a gas fired co-generation plant proposed to be constructed at the western end of the Shoalhaven Starches facility.

Accordingly, Harwood Acoustics Pty. Ltd. has prepared this report for the exclusive use of the Client identified on the title page. The report is prepared in accordance with the brief and scope of works agreed between the Client and Harwood Acoustics Pty Ltd and may not be suitable for use beyond that scope.

Harwood Acoustics Pty. Ltd. undertakes no duty nor accepts any responsibility to any third party who may rely upon this report.

Advice and recommendations provided in this report are in relation to acoustical issues only. No claims of expertise are made, and no liability is accepted, in relation to issues falling outside the field of acoustical consulting. These may include, but are not limited to, structural and waterproofing considerations, fire rating or thermal rating. Relevant authorities and / or experts should be consulted regarding areas other than acoustics.

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1. INTRODUCTION AND SUMMARY

Shoalhaven Starches Pty. Ltd. is part of the Manildra Group of companies and its 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 (the Department) for the Shoalhaven Starches Expansion Project (SSEP), reference 06_0228.

The approval made provision for a gas fired co-generation plant that would comprise two gas turbine generators that would deliver an anticipated net power output of 40 MW of power for the site.

Subsequently under Mod 16 the Independent Planning Commission approved an additional coal fired co-generation plant. This coal fired co-generation plant would generate a total of 15 MW of power for the site.

Neither the approved gas fired, nor coal fired co-generation plants have been constructed to date.

Following the original Project Approval, Shoalhaven Starches has obtained approval and / or are seeking approval for a range of modifications to the original SSEP comprising a range of additional developments that were not envisaged as part of the original application / Project Approval. It is forecasted that the electrical power load demand created by these and other additional works, subsequent to the original Project Approved development, will exceed the power supply capacity of the approved gas fired and coal fired co-generation plants.

Consequently, Shoalhaven Starches now propose to construct a new gas-fired co-generation plant which will consist of two natural gas turbines that will generate an anticipated power output of 30 MW each, providing a total power to the site of 60 MW and associated Heat Recovery Steam Generators (HRSG). The new gas fired co-generation plant will replace the previously approved gas fired and coal fired co-generators. In addition, Shoalhaven Starches also proposes to convert its existing coal fired boilers to gas.

This modification application also seeks approval for the relocation of the previously approved Dried Distillers Grain dryer # 6 (DDG # 6) and associated cooling towers of which there will be six.

The new gas fired co-generation plant (referred to henceforth as the co-gen plant) will be constructed at the western extent of the Site adjacent to Bomaderry Creek.

It is a requirement of the NSW Environment Protection Authority (EPA) and Department of Planning, Infrastructure and Environment, that an Environmental Noise Impact Assessment of the proposed modification is prepared, in accordance with the NSW *Noise Policy for Industry* (2017) and *Interim Construction Noise Guideline* (2008).

An initial Environmental Noise Assessment was prepared by Harwood Acoustics Pty. Ltd., reference 2103012E-R, dated 8 July 2021 (the July NIA) and was submitted with the initial application for the modification.

Subsequent to the submission of the application with the accompanying July NIA, in its letter reference DOC21/936070-6, dated 26/11/2021, the NSW EPA requested additional information and clarification in relation to the noise predictions therein.

A revised version of the assessment was then prepared (reference 2103012E-R Rev A) in 20 January 2022. Subsequent to the submission of the Rev A report the NSW EPA provided additional feedback in response to the Rev A report in its letter reference DOC22/57975-8, dated 14/02/2022 which in turn lead to a video conference between the key stake holders.

Shoalhaven Starches consequently commissioned Day Design Pty Ltd to prepare a 3D acoustical model of the cogeneration plant in order to satisfy the NSW EPA's request for such and to address the requests for further information in relation to noise modelling methodology.

This revised version of the Environmental Noise Assessment, 2103012E-R Rev B therefore includes the 3D modelling prepared by Day Design Pty Ltd.

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

Given the number of modifications and construction of new noise sources since the initial approval, the noise goals for any new plant are now set to a minimum 15 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 SSEP.

Noise goals were designed for the proposal to ensure existing overall noise levels from the operation of the facility are not increased by the introduction of the new plant and equipment. These noise level goals range from 23 dBA to 27 dBA depending upon the residential receptor location.

Receptor locations are derived from the EPL and are located in Nowra, Bomaderry and Terara as shown in Figure 1.

The co-gen plant will be supplied by GE Power (GE) and an itemised breakdown of the constituent components of the gas turbine plant were supplied by GE for the purpose of noise modelling. Noise data for the Heat Recovery Steam Generator (*HRSG*) component of the co-gen plant is based on a maximum noise level that was stipulated by GE to the HRSG supplier and that the supplier has confirmed will be met (i.e. not exceeded), as detailed in Section 4.1 of this Report. The co-gen plant will be located within a building of concrete construction.

Recommendations are made in Section 7 of this report to reduce the level of noise emission from the co-gen plant to within the design noise goals at all receptor locations, based on the noise data supplied by the manufacturer.

Recommendations include advice on the construction of building elements; providing target noise levels for the four discharge exhaust stacks that discharge externally from the building; restricting the total number of penetrations in the walls of the building for ventilation and installing acoustic louvres in those openings.

Recommendations are also made to ensure that the level of noise emission from the operation of DDG # 6 and the six cooling towers, in the proposed new locations, do not increase overall noise levels from the site.

Recommendations include the stipulation of maximum allowable noise levels for the cooling towers and advice on the construction of the building housing the DDG plant and equipment.

Consideration is also given in Section 7 of this Report to the cumulative noise impacts arising from the co-gen plant in conjunction with other approved modifications either currently under construction or soon to commence construction along with existing noise levels from the overall operation of the existing Shoalhaven Starches facility.

The construction works for the co-gen plant will consist of piling, pouring of concrete slabs for the buildings, the construction of the buildings and the installation of all plant and equipment.

Calculations show that there is potential for the construction noise management levels set by the NSW EPA's *Interim Construction Noise Guideline* to be exceeded at some receptors on occasions during construction works. Construction works will be carried out during the day time hours only, as recommended in the Project Approval. Construction noise mitigation measures are included in the Construction Noise Management Plan that will be prepared by Shoalhaven Starches.

Section 7.4 of this Report addresses and provides recommendations in relation to the potential for cumulative noise impacts from the construction of various projects simultaneously.

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, located to the north.

The nearest residential receptor locations to the proposal are at addresses and distances as follows:-

- Location 1 – Terara Road, Terara approximately 1000 metres to the south east,
- Location 2 – Riverview Road, Nowra approximately 845 metres to the south,
- Location 3 – Meroo Street / Tarawara Street, Bomaderry approximately 370 metres to the north west,
- Location 4 – Coomea Street, Bomaderry approximately 430 metres to the north west.

These locations are listed consistent with the order shown in Environment Protection Licence number 883, as detailed in Section 3.2 of this report.

Distances are based on the centre of the co-generation building to each receptor as a reference only. Various noise producing aspects of the proposal are at varying distances from each receptor, as is considered in all calculations. The Shoalhaven Starches site and receptor locations are shown in Figure 1.

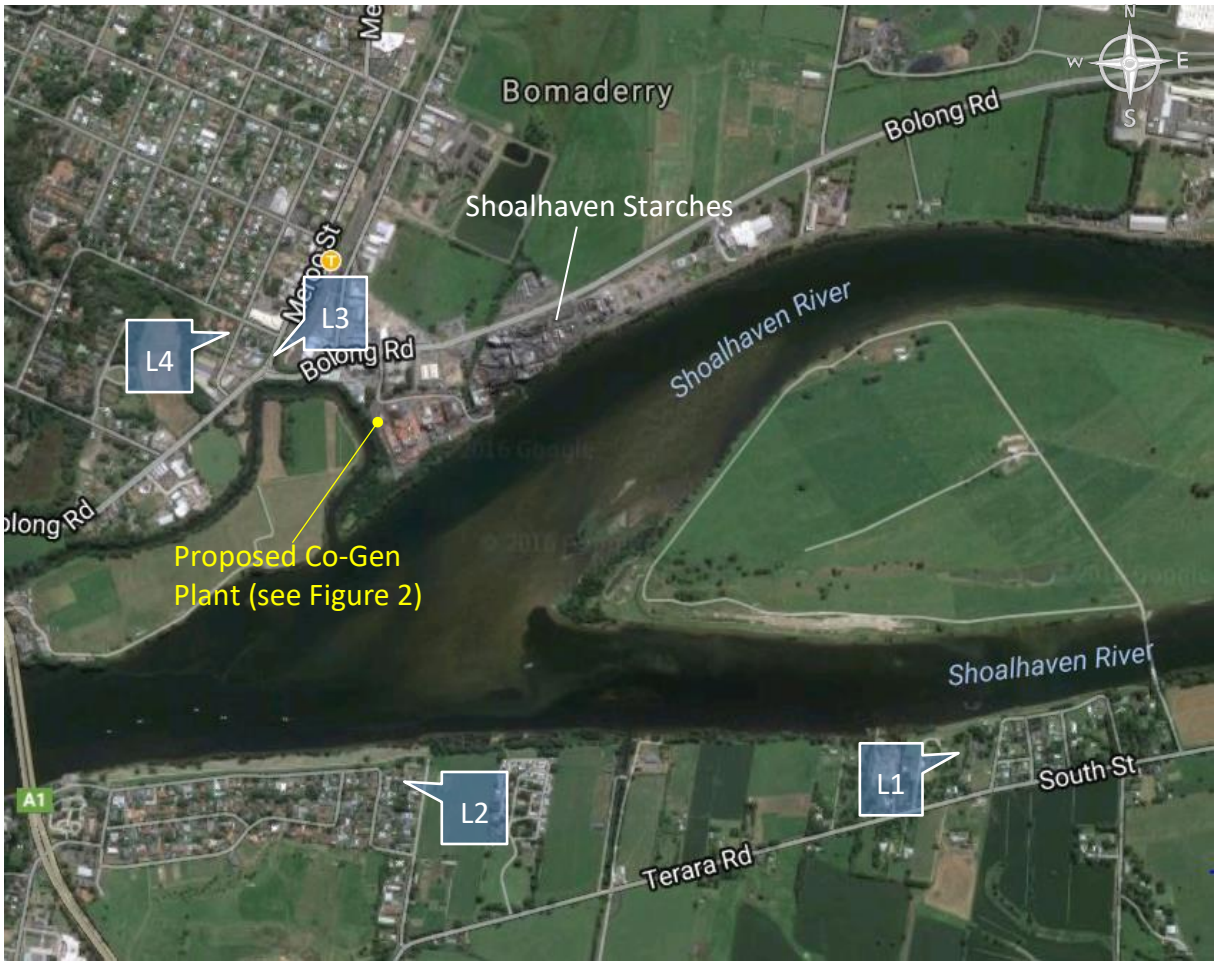

Figure 1. Location Plan – Shoalhaven Starches, Bomaderry, NSW *(source: Google Maps ©)*

Figure 2 below shows the location of the co-gen plant in the context of the overall Site in greater detail than Figure 1.

Figure 2. Co-Gen Plant Location – Shoalhaven Starches, Bomaderry, NSW

(source: Nearmap © and Shoalhaven Starches)

2.2 Description of Proposal

In 2009 Shoalhaven Starches received Project Approval from the Minister for Planning (the Department) for the Shoalhaven Starches Expansion Project (SSEP), reference 06_0228.

The approval made provision for a gas fired co-generation plant that would comprise two gas turbine generators that would deliver an anticipated net power output of 40 MW of power for the site.

Subsequently under Mod 16 the Independent Planning Commission approved an additional coal fired co-generation plant. This coal fired co-generation plant would generate a total of 15 MW of power for the site.

Neither the approved gas fired, nor coal fired co-generation plants have been constructed to date.

Following the original Project Approval, Shoalhaven Starches has obtained approval and / or are seeking approval for a range of modifications to the original SSEP comprising a range of additional developments that were not envisaged as part of the original Project Approval. It is forecasted that the electrical power load demand created by these and other additional works, subsequent to the original Project Approved development, will exceed the power supply capacity of the approved gas fired and coal fired co-generation plants.

Consequently, Shoalhaven Starches now propose to construct a new gas-fired co-generation plant (the co-gen plant) which will consist of two natural gas turbines that will generate an anticipated power output of 30 MW each, providing a total power to the site of 60 MW. The new gas fired co-generation plant will replace the previously approved gas fired and coal fired co-generators. In addition, Shoalhaven Starches also propose to convert its existing coal fired boilers to gas as well.

The co-gen plant will be constructed at the western extent of Shoalhaven Starches facility adjacent to Bomaderry Creek as shown in Figures 1 and 2 above and the proposed Site Plan provided in Figure 3 below.

The co-gen plant will be supplied by GE Power (GE) and an itemised breakdown of the constituent components of the gas turbine were supplied by GE for the purpose of noise modelling. Noise data for the Heat Recovery Steam Generator (*HRSG*) component of the co-gen plant is based on a maximum noise level that has been stipulated by GE to the HRSG supplier and that the supplier has confirmed will be met (i.e. not exceeded), as detailed in Section 4.1 of this Report.

The co-gen plant will be located within a concrete building structure, or acoustically equivalent construction. The building housing the cogeneration plant and HRSGs will be approximately 62 metres long (north / south) by 45 metres wide (east / west) and 20.5 metres high.

At the southern end of the co-gen building will be separate building containing an enclosed substation and process area.

Floor plans and elevations of the proposed buildings are shown in Figures 4, 5 and 6 and full details can be seen in Architects Edmiston Jones Pty Ltd architectural drawings for Job No. 21-0054, dated 10/11/21, rev P2.

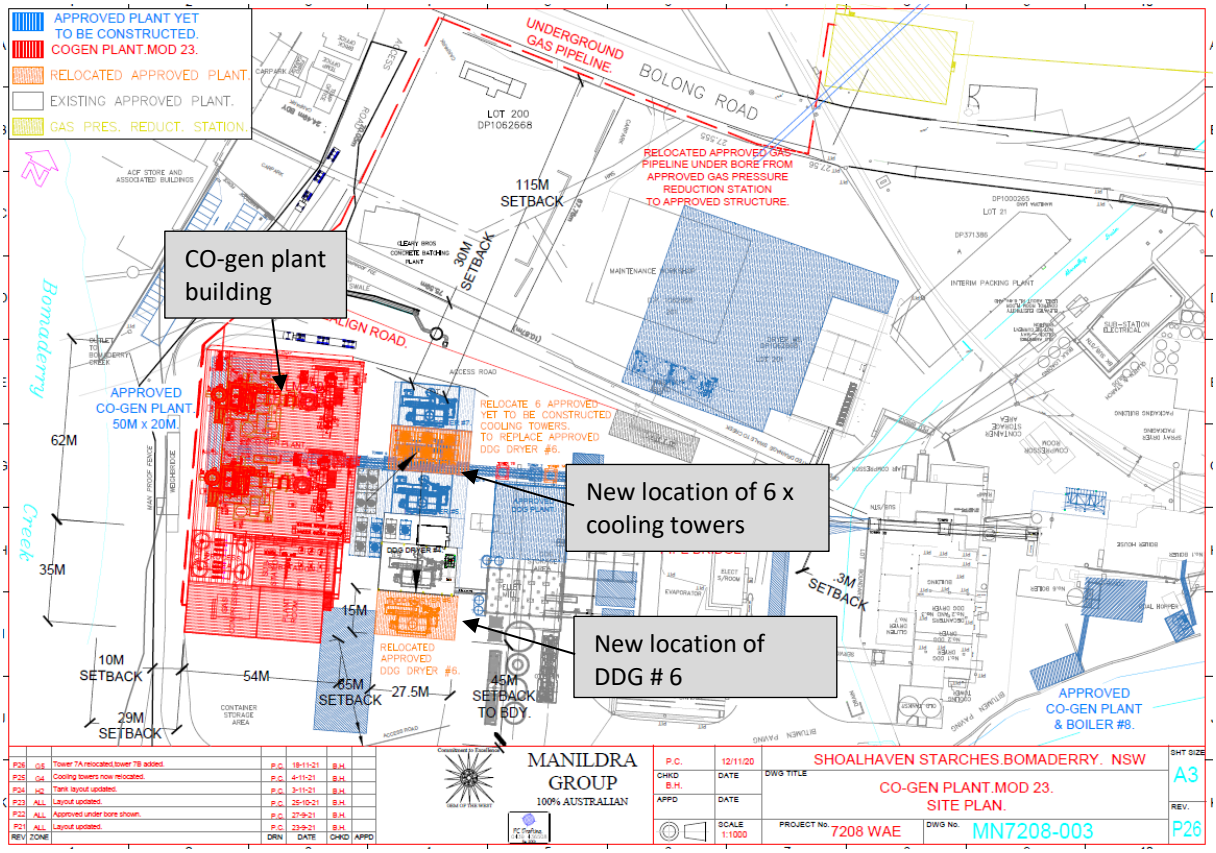

Figure 3. Proposed Co-Gen Site Plan

(source: Manildra Group's building design plans MN7208-003 for Project No. 7208, Rev P19 issued 12/07/2021)

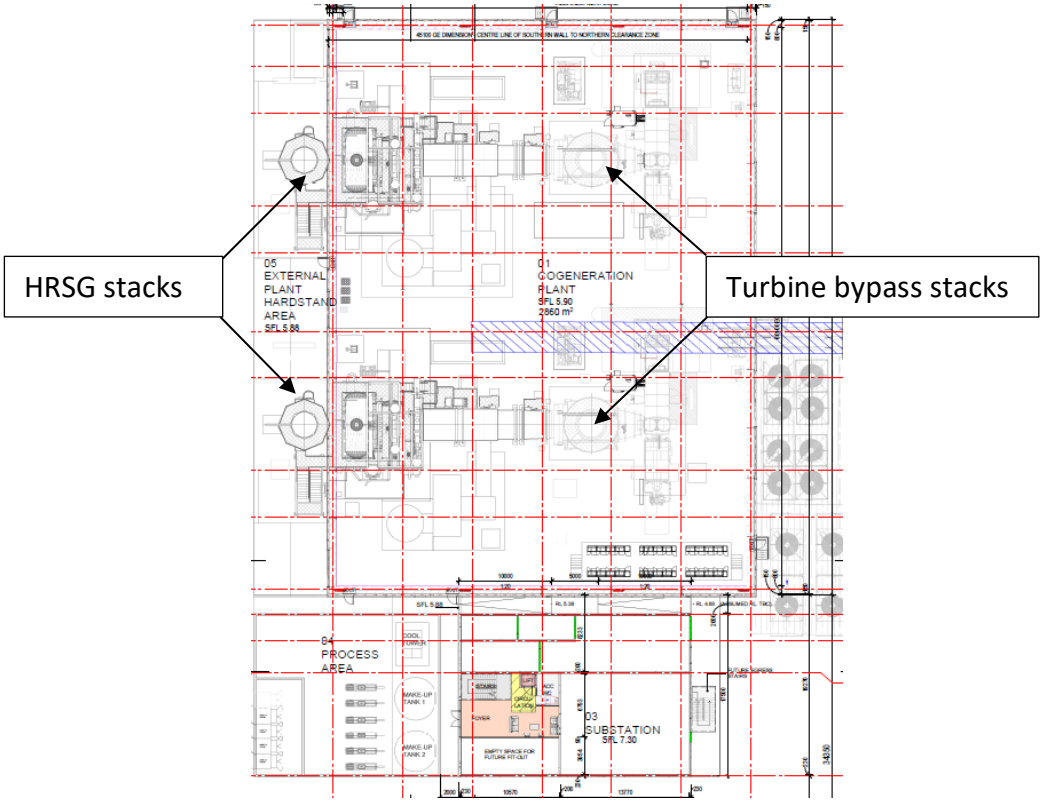

Figure 4. Proposed Ground Floor Plan Overall

(source: Architects Edmiston Jones' architectural drawing AR002, Rev P2 for Job No. 21-0054, dated 10/11/21)

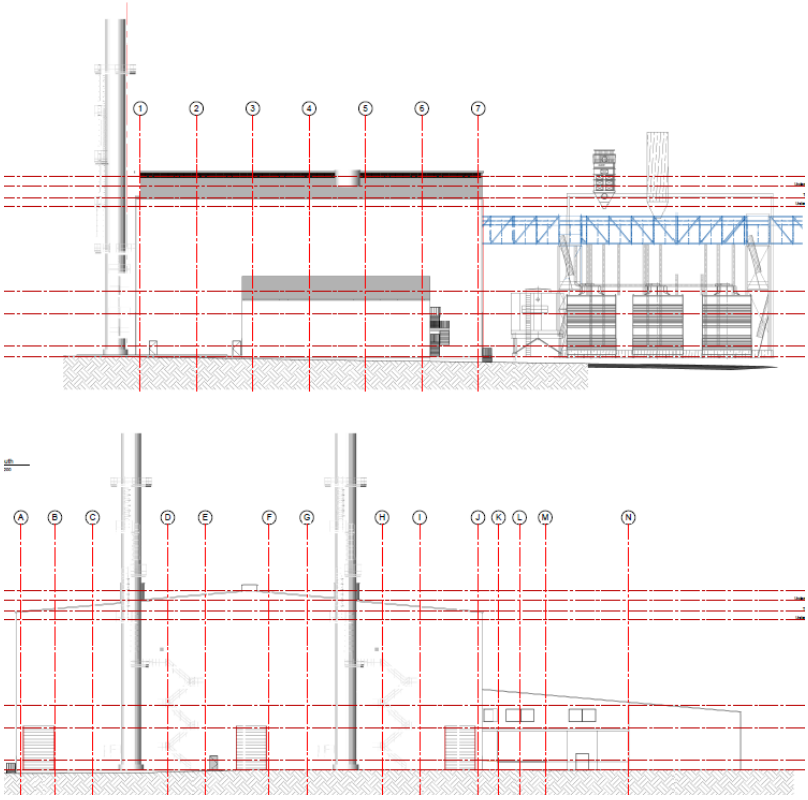

Figure 5. South and West Building Elevations

(source: Architects Edmiston Jones' architectural drawing AR201, Rev P2 for Job No. 21-0054, dated 10/11/21)

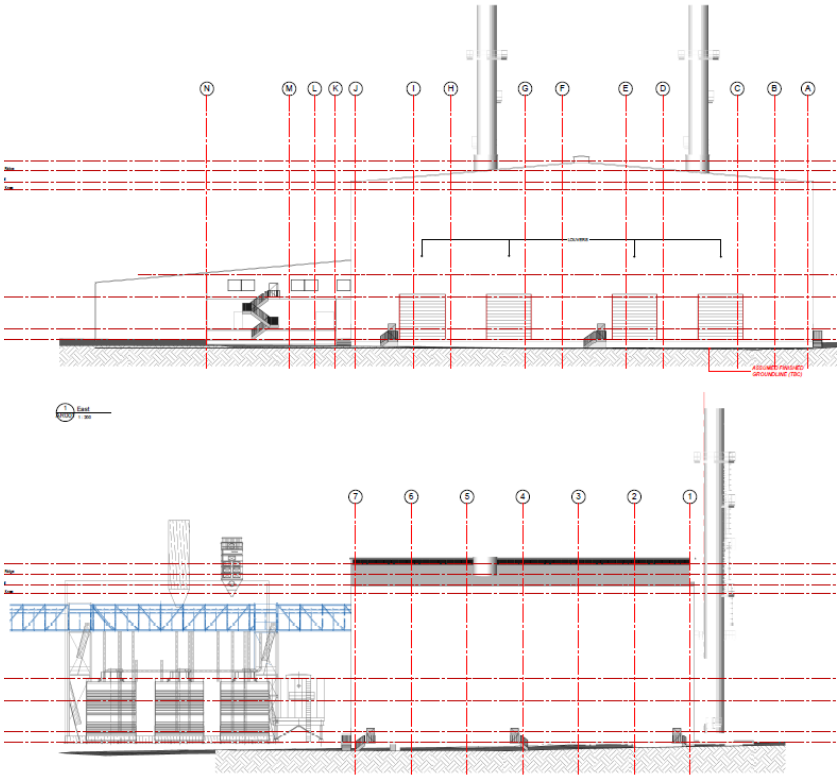

Figure 6. North and East Building Elevations

(source: Architects Edmiston Jones' architectural drawing AR202, Rev P2 for Job No. 21-0054, dated 10/11/21)

This modification also seeks approval for the relocation of approved Dried Distillers Grain (DDG) dryer # 6 (DDG # 6) and six previously approved cooling towers. It is proposed to relocate the six approved cooling towers to the location in which DDG # 6 was previously approved, as shown in Figure 3. DDG # 6 is then proposed to be relocated to the south on the southern side of the existing DDG # 4.

Harwood Acoustics Pty. Ltd. prepared an Environmental Noise Assessment for Modification 11 in October 2016, reference 1609010E-R, dated 27/10/2016 (the Mod 11 NIA). Modification 11 requested approval for a reduction in the number of approved DDG dryers from six (under Project Approval 06_0228) to four, as well as a slightly modified footprint to the dryers and the construction of two new bio filters. The Mod 11 NIA established noise levels for a DDG dryer and associated cooling towers. These noise levels are detailed in Section 4.1 of this Report and are used in this assessment to predict the level of noise emission from the proposed relocation of DDG # 6 and the six cooling towers.

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, 'Terms of Approval' states:-

"Condition 2

The applicant shall carry out the development generally in accordance with the:

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

Condition 2A

The applicant shall carry out the development in accordance with the:

a) Statement of commitments,

b) Conditions of this consent, and

c) Revised statement of commitments for Appendix 6."

The original Project Approval incorporated 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.

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 Modification Assessment Requirements

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

Following submission of the initial noise impact assessment, dated July 2021, the NSW Environment Protection Authority (EPA) requested additional information and clarification in relation to the predicted noise levels and assessment methodology. In response to that request a revised assessment (Rev A) was submitted was submitted in January 2022. Further information was again requested by the EPA in its letter dated 25 February 2022 in relation to 3D noise modelling and detail around construction noise mitigation. The revised noise assessment, Rev B, addresses the EPA's further request for additional information and clarification.

3.2 NSW Environment Protection Authority's (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 $L_{Aeq\ (15min)}$ 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 (dated 31 October 2009) and then revised (dated 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 Environment 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."

Given the number of modifications subsequent to the original approval and location of new noise sources, it is recommended that the noise design goals are set to a minimum 15 dB below the EPL noise limits henceforth.

3.4 Construction Noise Criteria

The NSW EPA published the *Interim Construction Noise Guideline* in July 2009. While some excess 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, will last a total of approximately two weeks. Consideration was given in Section 6 of this Report to the potential for noise impact on residential receptors emanating from construction activities associated with the co-gen plant.

Recommendations are also provided in Section 7.4 of this Report to minimise the potential for cumulative noise impacts from construction activities associated with this project in the event that this occurs simultaneously with the construction of other projects at the Shoalhaven Starches facility.

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 many noise surveys in Nowra, Bomaderry and Terara and has found day time background noise levels range from 33 to 40 dBA depending on the location, as shown in Table 1 below.

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

Location	Period / 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, Terara 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 were 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) **50 dBA** (40 + 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 **15 dB**) -

- *23 dBA ($L_{eq,\ 15\ minute}$) at locations in Terara on the south side of the Shoalhaven River,*
- *23 dBA ($L_{eq,\ 15\ minute}$) at locations in Nowra on the south side of the Shoalhaven River,*
- *27 dBA ($L_{eq,\ 15\ minute}$) at locations in Meroo Street, Bomaderry,*
- *25 dBA ($L_{eq,\ 15\ minute}$) 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. CO-GEN PLANT NOISE EMISSION

4.1 Co-Gen Plant and Equipment Source Noise Levels

The cog-gen plant will be supplied by GE Power (hereafter GE) and comprise two LM2500 model gas turbines and the associated Heat Recovery Steam Generators (HRSG).

The HRSG components will be supplied by John Cockerill, contracted by GE.

LM2500 Gas Turbines Noise Levels

An itemised breakdown of the constituent parts of the gas turbine components were supplied by GE along with an attendant schedule of overall 'A' frequency weighted and octave band centre frequency near field sound pressure levels which are shown in Table 3. A noise map prepared and provided by GE representing the near field sound pressure levels around the LM2500 is shown in Figure 7.

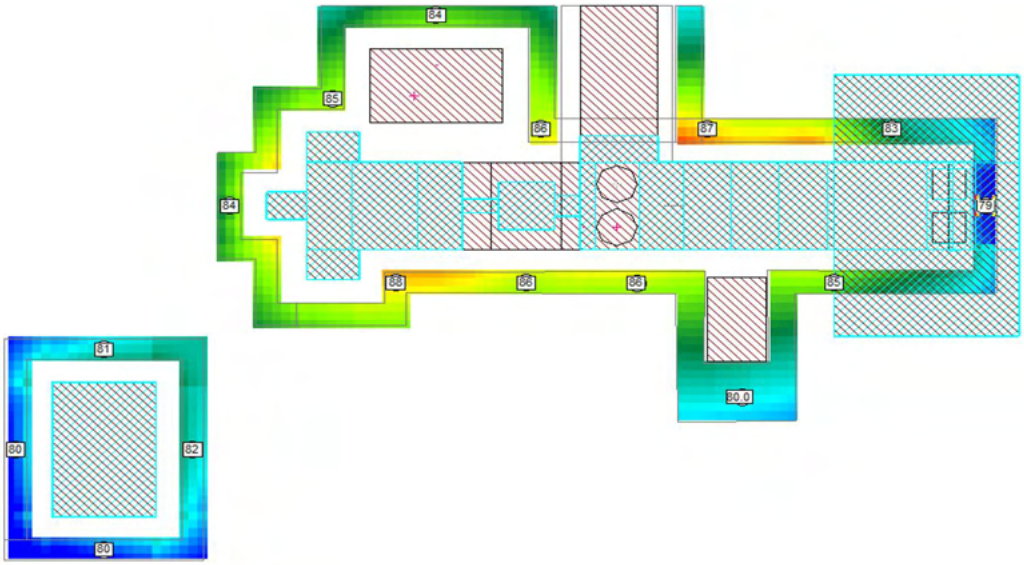

Figure 7. Near Field Noise Map of LM2500 Gas Turbine

(source: General Electric (GE Power), Houston, USA)

The noise map shown in Figure 7 above was produced by GE using *CadnaA* acoustical modelling software and a screen shot of that model is shown in Figure 8 below.

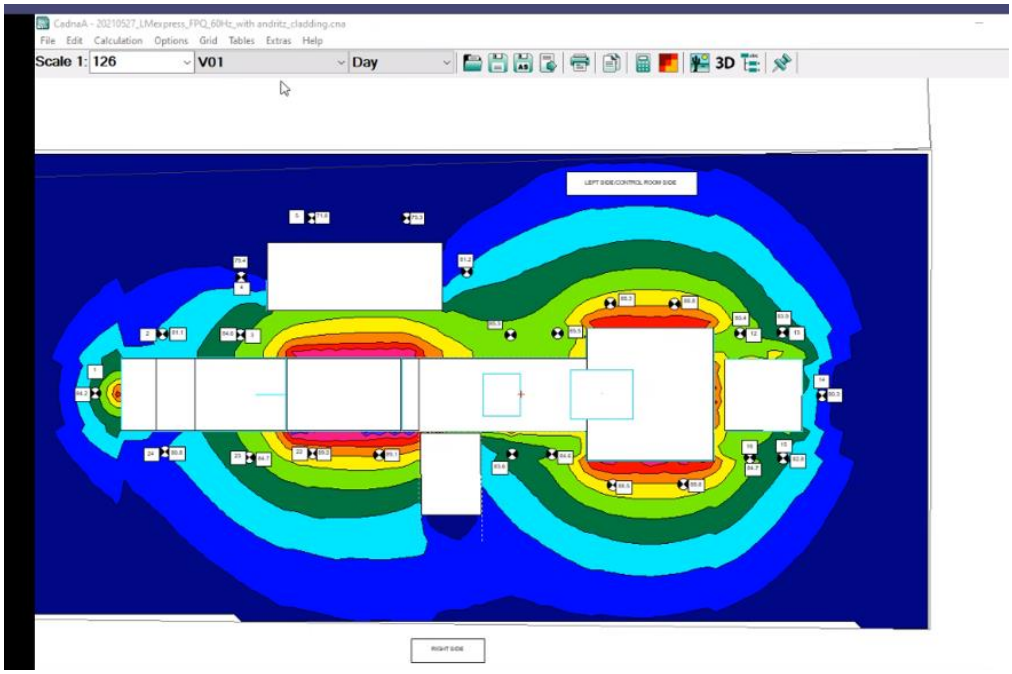

Figure 8. Screenshot of GE CadnaA LM2500 Noise Model

(source: General Electric (GE Power), Houston, USA)

The *CadnaA* software noise model prepared by GE is its intellectual property and consequently was not provided to Harwood Acoustics Pty. Ltd., however, the data from the model was provided in the form of the diagrammatical contour map / representation of the noise model shown in Figure 7 as well as the data provided in Table 3 below.

Table 3 L_{eq} Near Field Sound Pressure Levels – Plant and Equipment – Turbine Components LM2500 Classic (as supplied by GE)

Plant / Item of Equipment	Overall dBA	Sound Pressure Levels (dB) at Octave Band Centre Frequencies (Hz)							
		63	125	250	500	1k	2k	4k	8k
Air filter inlet faces	79	87	88	78	74	69	75	65	51
Air filter house casing	85	92	94	83	79	75	79	72	62
Air inlet plenum	86	92	95	86	82	78	77	76	66
Turbine enclosure	86	91	98	85	81	77	74	77	64
Turbine combustion inlet	88	93	101	86	81	77	74	75	62
Turbine exhaust inlet	84	91	97	84	77	76	72	69	62
Turbine vent outlet	85	92	98	84	79	76	73	74	63
Coupling guard to TE	84	89	96	82	80	77	73	73	61
Coupling guard to GE	86	90	97	85	81	78	74	78	68
Gear box	87	93	93	87	82	80	81	78	72
Gear box shaft	83	89	89	81	77	74	78	71	64
Generator enclosure	82	91	94	82	77	71	69	66	56
Generator cooling	82	91	94	82	78	71	70	67	56
Generator exciter	80	90	91	81	76	69	68	63	53
Generator lube oil	80	90	92	81	77	69	66	62	52

One third octave band data is discussed further in Section 4.2.3 where an assessment of modifying factors is undertaken.

HRSG

The HRSGs capture heat from the gas turbine exhaust and generate steam. Details of the HRSGs are not finalised at this stage. GE is outsourcing the design and supply of the HRSG components to John Cockerill. GE has confirmed that the supplier will meet (i.e not exceed) a near field noise target of **85 dBA at 1 metre** at any point around the unit.

The suppliers noise level design goal of 85 dBA at 1 metre distant from any point around the HRSG plant, is equal to the noise goal of the LM2500 gas turbine. Therefore, for the purpose of noise modelling, the same noise levels as those provided in Table 3 for the LM2500 are attributed to the HRSG components in this assessment. Consideration was also given to measurements of existing boiler equipment at the Shoalhaven Starches facility for the assessment of modifying factor corrections in the absence of noise data from the supplier on the HRSGs.

Exhaust Stacks

Each of the HRSGs will have a heat exhaust stack and there is also a turbine bypass stack between each of the turbines and the generators. During typical operation the turbine bypass stacks will be closed and the heat from the turbines will exhaust via the HRSG stacks on the western side of the building (refer Figure 4).

When the HRSGs are down for maintenance the heat created by the turbines will exhaust via the turbine bypass stacks which penetrate the roof in the centre of the building (refer Figure 4). We are therefore instructed that at no time can all four bypass stacks operate simultaneously and that there will be, and can only ever be, two stacks operating at once, being typically both HRSG stacks or on occasion, one HRSG stack and one gas turbine bypass stack. It is not envisaged that both turbine bypass stacks operate simultaneously, as this means both HRSGs are offline and therefore there would be insufficient steam to operate the facility.

In any event, all of the exhaust stacks are to be designed to achieve a **sound power level** (L_w) at the discharge outlet of no more than **88 dBA**. This is equivalent to approximately 66 dBA at 1 metre from the outlet of each duct and this is level is used in calculations in this assessment.

As such, any combination of two stacks operating simultaneously will result in the same noise level. The worst-case scenario acoustically is that both HRSG stacks operate simultaneously as these are the closest to the nearest receptors in Bomaderry. This is the scenario considered in the noise predictions in this assessment.

DDG # 6 & Cooling Towers

Table 4 below provides a schedule of overall 'A' frequency weighted sound power levels, in decibels re: 1 pW, of noise sources associated with the proposed modification. These sound power levels were provided by the client from the manufacturer's data for the Mod 11 NIA in 2016.

Table 4 $L_{eq,\ 15\ minute}$ Sound Power Levels – Plant and Equipment

Description	$L_{eq,\ 15\ minute}$ Sound Power Level (dBA)
DDG Dryer Components (Shoalhaven Starches' reference)	
Condenser Tank Pump (40A103)	**80**
High Speed Mixer Motor (40R191)	**81**
Leakage Air Fan (40V261)	**71**[1]
Manual Condenser Pump (40P183)	**70**
Dryer Drive Motor (40D200)	**89**
Wet Scrubber Pump (40F120)	**80**
Vapour Fan (40V260)	**83**[1]
DDG Dryer Components Combined	**91**
Cooling tower (1 only) – low noise 'Baltimore'	**87**

1. Housing / casing sound power level

It is advised that the DDG dryers are closed system and as such there are no external air intake or discharge outlets for the fans associated with each dryer. Consequently, the sound power levels used in calculations are based on the manufacturer's data for casing noise and not the sound power levels ascribed to the inlet or discharge side of either fan.

4.2 Noise Level Predictions

4.2.1 Noise Modelling Details and Parameters

A noise model has been developed by Day Design Pty Ltd using *iNoise noise prediction software* version 2022.

Table 5 below provides details on the specific parameters used to develop the noise model.

Table 5 Computer Noise Model Parameters

Parameter	Details
Buildings, structures and topography	Significant structures at the Shoalhaven Starches facility (including buildings, plant, and equipment) have been constructed in the model to determine the extent to which on-site structures may provide attenuation for new noise sources. Relevant intervening buildings and structures in Bomaderry, NSW including residential dwellings are also included in constructing the model. The topography of the site and surrounding area including Bomaderry, Nowra and Terara is imported into the model.
Noise Sources	*Cogeneration Plant* • Based on the near field sound pressure level data supplied by GE for the gas turbine components, and the GE guarantee that the sound pressure level will not exceed 85 dBA when measured at any point no greater than 1 metre from the gas turbine plant, • The guarantee from GE that the sub sub contractor for the HRSG equipment will achieve the same noise design goal of 85 dBA when measured at any point no greater than 1 metre from the HRSG component, • In the absence of any acoustical data provided for the HRSG plant, we have used the sound pressure level data supplied for the turbines to model the HRSG component, • One-third octave band spectra derived from noise surveys undertaken by Day Design Pty Ltd of the cogeneration plant located at Malabar, NSW • A target noise design goal of (sound power level) of **88 dBA** (L_W) for each of the four stacks.

Table 5 Computer Noise Model Parameters *Cont…*

Parameter	Details
Algorithm & Meteorological conditions	Noise sources are modelled in accordance with 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 attenuation. • The method allows for downwind propagation conditions namely:- • wind direction within an angle of ± 45° of the direction connecting the centre of the dominant sound source and the centre of the specified receiver region with the wind blowing from source to receiver, and • wind speed between approximately 1 m/s and 5 m/s measured at a height of 3 m to 11 m above the ground, The equations for calculating downwind sound pressure level, including the equations for attenuation… are the average for meteorological conditions within these limits. These equations also hold, equivalently, for average propagation under well-developed moderate ground-based temperature inversion, such as commonly occurs on clear, calm nights. <u>Noise enhancing weather conditions</u> Nothwistnading the above, we have modelled two additional scenarios with the inclusion of the following meteorological conditions:- 1. Standard conditions with stability category A and windspeeds of 0.5 m/s 2. Noise enhancing conditions with stability category G and windspeeds of 2 m/s

4.2.2 Predicted Noise Levels

Predicted noise levels at each receptor location are shown in Tables 6 and 7 below for the co-gen plant and DDG # 6 respectively.

The predicted noise levels assume recommendations made in Section 7 of this report will have been implemented.

Table 6 Predicted Noise Levels at Receptor Locations (Co-Gen Plant)

Noise Goal and Source / Description	Predicted Noise Level $L_{eq,\ 15\ minute}$ (dBA) as received at Receptor Location			
	Location 1	Location 2	Location 3	Location 4
Design Noise Goal ($L_{eq,\ 15\ minute}$)	**23**	**23**	**27**	**25**
Cogeneration plant	16	22	26	24
Complies	Yes	Yes	Yes	Yes

The calculations and predictions in Table 6 consider distance loss to each receptor as well as the following:-

- Construction of buildings as per recommendations made in Section 7.1 including the maximum allowable openings,
- Sound levels as detailed in Table 3 based on supplier's information,
- All noise predictions are produced by the *iNoise* computer model and contour maps are provided in Appendices B, C & D.

Table 7 Predicted Noise Levels at Receptor Locations (DDG # 6 & Cooling Towers)

Noise Goal and Source / Description	Predicted Noise Level $L_{eq,\ 15\ minute}$ (dBA) as received at Receptor Location			
	Location 1	Location 2	Location 3	Location 4
Design Noise Goal ($L_{eq,\ 15\ minute}$)	**23**	**23**	**27**	**25**
DDG # 6	15	19	19	13[1]
Cooling towers (6)	5	21	14	13
Combined	**15**	**23**	**20**	**16**
Complies	Yes	Yes	Yes	Yes

The calculations and predictions in Table 7 consider distance loss to each receptor as well as the following:-

- [1] the reduction at receptor R4 from the DDG # 6 building is greater than that at R3 due to the completed shielding from the 20.5 metre high co-gen building compared with partial shielding from a lower roof height of the section above the substation at R3,
- Construction of the DDG # 6 building as per recommendations made in Section 7.2,
- Sound levels as detailed in Table 4 based on client's and supplier's information.

4.2.3 Cumulative Noise Impacts

In order to determine the potential for overall noise impacts from Sholahaven Starches Projects, consideration was given to current noise levels from the operation of the facility along with proposed modifications and modifications currently under construction.

Current overall noise levels from the operation of the facility have not been measured or assessed by Harwood Acoustics Pty. Ltd. However, Shoalhaven Starches is required to undertake annual noise compliance monitoring.

Noise compliance testing was carried out by the Acoustic Group Pty Ltd (TAG) in February 2021 and the results of the noise compliance testing have been supplied in report reference 51.3849.R89:MCC, dated 24 June 2021.

Therefore, for the purpose of considering cumulative noise impacts, the measured noise levels from the TAG February 2021 report were used as representing the existing level of noise emission from the overall facility at each of the respective receptor Locations. These are shown in Table 8 below along with the predicted noise levels for current, approved modifications. Existing noise levels and predicted noise levels are then combined (logarithmically summed) to predict future cumulative noise levels from the Shoalhaven Starches facility. The future combined noise levels are then compared with the Environment Protection Licence Noise Limits to determine the potential for compliance.

Table 8 Predicted Cumulative Noise Levels at Receptor Locations

Noise Foal and Source / Description	**Predicted Noise Level $L_{eq,\ 15\ minute}$ (dBA) as received at Receptor Locations**			
	Location 1	**Location 2**	**Location 3**	**Location 4**
EPL Noise Limit ($L_{eq,\ 15\ minute}$)	**38**	**38**	**42**	**40**
Existing Facility Noise Levels as at Feb 2021 (per TAG Report)[1]	34	36	<41[2]	<37[2]
Predicted Noise from New and Future Modifications				
Mod 23 – Cogeneration plant	16	22	26	24
DDG # 6 & associated cooling towers	15	23	20	16
DDG # 5 (no associated cooling towers)	15	15	14	<10
Mod 21 & Mod 9 – Packing plant	28	28	32	30
Mod 16/17 – GD 8	23	23	27	25
Mod 16/17 – SPB	23	23	27	25
Mod 19 – Beverage grade ethanol	17	20	22	23
New Mods combined	31	32	35	34
Plus existing noise (row 2 in this table)	**36**	**37**	**42**	**39**
EPL Noise Limit ($L_{eq,\ 15\ minute}$) repeated	**38**	**38**	**42**	**40**
Complies	**Yes**	**Yes**	**Yes**	**Yes**

Notes:-

1. As quoted from Acoustic Group Pty Ltd (TAG) report reference 51.3849.R89:MCC, dated 24 June 2021,
2. 41 and 37 respectively used as a worst-case scenario (rather than 'less than').

NB – Shoalhaven Starches Pty Ltd has commissioned Day Design Pty Ltd to prepare a 3D acoustical model of the overall site which will provide cumulative noise levels at all receptors. The model will be available in 2022.

4.2.4 Meteorological Conditions and Noise Enhancement

The predicted noise levels from the Cogen plant, as shown in Table 6, are derived from computer noise modelling using the International Standard ISO 9613-2 (1996(E)) *'Acoustic – Attenuation of sound during propagation outdoors Part 2 General method of calculation'*.

As detailed in Table 5 of this Report, the method allows for downwind propagation conditions namely:-

- wind direction within an angle of ± 45° of the direction connecting the centre of the dominant sound source and the centre of the specified receiver region with the wind blowing from source to receiver, and
- wind speed between approximately 1 m/s and 5 m/s measured at a height of 3 m to 11 m above the ground level (AGL),

These equations also hold, equivalently, for average propagation under well-developed moderate ground-based temperature inversion, such as commonly occurs on clear, calm nights.

At the request of the NSW EPA, computer noise modelling has also been undertaken with specific meteorological inputs from Fact Sheet D of the *Noise Policy for Industry* 2017, including:-

- Standard met conditions with stability category A and windspeeds of 0.5 m/s at 10 m AGL, and
- Noise-enhancing met conditions with stability category G and windspeeds of 2 m/s at 10 m AGL.

Table 9 below shows the predicted noise levels for each of the various scenarios.

Table 9 Predicted Noise Levels at Receptor Locations (Co-Gen Plant) – Various Meteorological Scenarios

Noise Goal and Source / Description	Predicted Noise Level $L_{eq,\ 15\ minute}$ (dBA) as received at Receptor Location			
	Location 1	Location 2	Location 3	Location 4
Design Noise Goal ($L_{eq,\ 15\ minute}$)	**23**	**23**	**27**	**25**
Cogeneration plant – No specific met conditions	16	22	26	24
Complies	Yes	Yes	Yes	Yes
Cogeneration plant – Standard met conditions	12	18	23	20
Complies	Yes	Yes	Yes	Yes
Cogeneration plant – Noise-enhancing met conditions	15	22	28	26
Complies	Yes	Yes	No + 1 dB	No + 1 dB

It can be seen from Table 9 that:-

- The predicted noise levels using the EPA's standard meteorological conditions are considerably lower than the predicted noise levels in this assessment (refer row 4 compared with row 2),
- The predicted noise levels with enhanced meteorological conditions (being category G stability) with winds up to 2 m/s at 10 m AGL are similar to the predicted noise levels in this assessment with a potential increase of 2 dB at receptors 3 and 4 only (refer row 6 compared with row 2),
- The potential exceedence of the noise design goal at receptors R3 and R4 of 1 dB during worst-case noise-enhancing meteorological conditions will not result in the overall cumulative noise level from the site exceeding the EPL noise limits (refer Table 8) and is therefore acceptable,
- The predicted noise levels in Table 5 of this Report are therefore considered representative of a typical worst-case scenario at all receptors.

5. MODIFYING FACTOR ADJUSTMENT ANALYSIS

In order to consider the potential for modifying factor corrections that may be applicable to the co-gen plant, the computer noise model (*iNoise*) predicts one-third octave band noise levels at each receptor location.

Tonality Assessment

GE has not been able to supply one-third octave band noise data for the turbine or HRSG plant, however as detailed in Table 5 of this Report, input data is based on noise measurements of the cogeneration plant at Malabar, NSW, undertaken by Day Design Pty Ltd.

Figure 9 below shows the L_{eq}, short-term one-third octave band spectra of the cogeneration plant predicted at the closest receptor to the Site in Bomaderry, NSW.

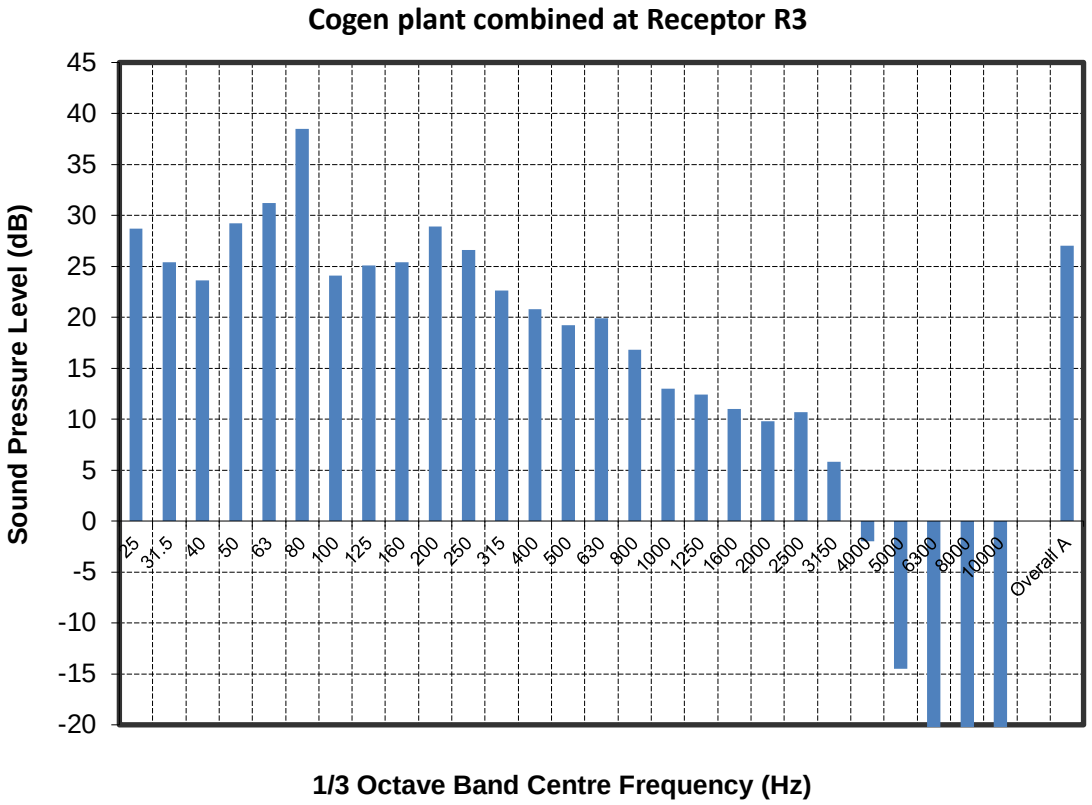

Figure 9. One-Third Octave Band Spectrum LM2500 Inside Reverberant Field

(source: iNoise model prediction at Receptor R3)

The predicted noise levels from the cogeneration plant do not display tonal characteristics at any of the receptor locations.

Low frequency noise assessment

Table 10 below shows the difference between the C and A frequency weighted predicted sound pressure levels at the closest receptor for assessment of the potential for low frequency noise.

Table 10 Low Frequency Noise Assessment

Description	**Predicted Sound Pressure Level from Cogeneration Plant at Receptor R3 $L_{eq,\ 15\ minute}$ (dBA)**
Predicted Sound Pressure Level – dBA	27
Predicted Sound Pressure Level - dBC	40
Difference	13
Allowable Difference	15
Low Frequency Factor	No

The difference between the A frequency weighted and C frequency weighted predicted noise levels at the nearest receptor to the Site is not greater than 15 dB and consequently no adjustment for low frequency noise is required to be considered in accordance with the NSW EPA's *Noise Policy for Industry* 2017 *Fact Sheet C* (refer Appendix A).

There is however low frequency content in the spectrum as can be seen in Figure 9 above and so an assessment of the predicted one-third octave band noise levels of the cogen plant against the base noise levels in Table C2 of the NPfI is provided in Table 11 below.

Table 11 L_{10} Design Noise Goals at nearest residences – applicable to patron noise

Description	Sound Pressure Levels (dB) at Octave Band Centre Frequencies (Hz)												
	10	12.5	16	20	25	31.5	40	50	53	80	100	125	160
Table C2 (NPfI)	92	89	86	77	69	61	54	50	50	48	48	46	44
Predicted Noise Level (cogen plant)	-	-	-	-	29	25	24	29	31	39	24	25	25
Is the predicted level below the base level	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Whilst the *iNoise* model does not predict one-third octave band noise levels below 25 Hz, all other one-third octave band centre frequency noise levels are well below the NPfI base noise levels up to 160 Hz.

A review of the measured data from the Day Design Pty Ltd noise assessment of the cogeneration plant at Malabar, NSW shows no significant difference between the noise levels below 25 Hz when compared to those between 25 Hz and 160 Hz.

Based on the input data for the noise model and the one-third octave band centre frequency spectrum derived from the Malabar Cogeneration plant, there is no requirement to include a low frequency content modifying factor adjustment for this assessment.

6. CONSTRUCTION NOISE EMISSION

The construction works will consist of piling, pouring of concrete slabs for the buildings, construction of the building and the installation of all plant and equipment.

Table 12 below shows a schedule of sound power levels for typical construction equipment.

Table 12 Typical Construction Equipment – L_{eq} Sound Power Levels

Equipment / Description	L_{eq} Sound Power Level (dBA)
Auger Piling (CFA Rig)	113
Hammer or Driven Piling	118
Mobile Crane (Diesel)	110
30 Tonne Excavator	110
Concrete Truck / Pump	105
Dump Truck	110
Grinder	105
Power Saw	101

Table 13 below shows the predicted level of potential noise emission from construction activities at each of the receptor locations.

Table 13 Predicted Noise Levels at Receptor Locations – Construction Phase

Noise Goal / Activity / Description	Predicted Noise Level $L_{eq,\ 15\ minute}$ (dBA) as received at Receptor Locations			
	Location 1	Location 2	Location 3	Location 4
Noise Design Goal ($L_{eq,\ 15\ minute}$)	**43**	**50**	**48**	**48**
With hammer piling	41	51	58	57
With auger piling	38	48	55	53
Construction activity (no piling)	35	45	52	51
Complies	Yes	No exceeds by 1 dB (if hammer piling)	No exceeds by 4 to 10 dB	No exceeds by 3 to 9 dB

There is potential for construction noise design goals to be exceeded at receptors R2, R3 and R4 on occasion.

The exceedence of 1 dB predicted at receptor R2 may only occur if hammer piling is undertaken.

Recommendations relating to reducing construction noise as received at receptors R3 and R4 are provided in Section 7 below.

7. RECOMMENDED NOISE CONTROLS

The predicted noise levels detailed in Section 4.2.2 of this Report are based on the proviso that the following noise control measures have been implemented and continue to be adhered to.

7.1 Buildings Construction

Walls

- All external walls of the co-gen plant building will be constructed using 170 mm (minimum) thick tilt up concrete panels or in situ concrete which will be acceptable,

Roof / Ceiling

- The roof of the building should achieve a minimum R_w rating of 42, with minimum R ratings of:-
  - 31 dB at 63 Hz, and
  - 35 dB at 125 Hz.
- For example, 75 mm (minimum) thick concrete,
- Or approved equivalent.

The construction details of the roof system will be finalised prior to commencement of construction.

Fresh Air Penetrations

It is proposed to install a roof ridge line air intake for passive ventilation. The opening along the roof ridge must face to the east only and not exceed a total of 31 m^2 (i.e. 62 metres x 500 mm high) and be fitted with acoustic louvres the minimum transmission losses shown in Table 14 below:-

Table 14 Example Acoustic Louvre Sound Transmission Loss

Description	Minimum Insertion Loss (dB) at Octave Band Centre Frequencies (Hz)							
	63	125	250	500	1k	2k	4k	8k
Acoustic Louvre*	3	8	16	21	27	27	24	21

* Based on NAP Silentflo 600 H Line

Any proposed or required additional penetrations will require greater noise attenuation such that the acoustical performance of the wall or roof is not compromised. If required, this will be addressed, so far as is reasonably practicable, at the preconstruction noise design report stage, in accordance with Condition 14M.

7.2 Exhaust Duct Roof Penetrations

The supplier has stipulated that each of the four (4) exhaust stacks that will penetrate the building roof will not exceed a sound power level at the stack outlet of **88 dBA**, which equates to an energy average sound pressure level (L_{eq}) of **70 dBA** when measured at 3 metres from the outlet.

The construction of the stack or duct must also be such that it does not undermine the acoustical integrity and performance of the roof at the penetration. For example, the breakout noise from the exhaust stack walls must be a minimum 10 dB less than that at the outlet.

A final assessment will be undertaken at the Noise Design Verification stage, once the details of all proposed exhaust stacks are finalised.

7.3 Access Doors

Large access doors (other than pedestrian doors) in the eastern façade will not exceed a total of 144 m^2 (i.e. 6 m x 6 m x 4 doors).

- The doors should achieve a minimum R_w rating of 34, with minimum R ratings of:-
    - 11 dB at 31.5 Hz,
    - 18 dB at 63 Hz, and
    - 19 dB at 125 Hz.

The construction details of the access panel / doors will be finalised prior to commencement of construction.

All pedestrian doors are to be of 40 mm (minimum) thick solid core timber construction or approved equivalent material with similar minimum acoustical rating.

If maintenance access doors are required to be located in the western, southern or northern facades of the building, these doors will need to be constructed to ensure that the acoustical integrity of the overall wall is not compromised or undermined.

Any proposed or required additional penetrations will require greater noise attenuation such that the acoustical performance of the wall or roof is not compromised. If required, this will be addressed, so far as is reasonably practicable, at the preconstruction noise design report stage in accordance with Condition 14M.

7.4 Construction Noise

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

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

Given the proximity of the co-gen plant to the township of Bomaderry, there is potential for noise goals to be exceeded at receptors R3 and R4 during a variety of works, most notably during piling activity.

Augur (CFA), or bored or rotary piling should be adopted over driven piling where practicable.

Additional construction noise mitigation measures and management practises will be detailed in the Construction Noise Management Plan (CNVMP) that will be prepared by Shoalhaven Starches in accordance with NSW EPA's *Interim Construction Noise Guideline* and to satisfy Condition 13 of the Project Approval if required.

It is worth noting that the potential predicted exceedances of the construction noise objectives during the Mod 23 construction works will occur (potentially) only during the impact piling phase which will last approximately 4 weeks.

Shoalhaven Starches standard CNVMP includes processes for notifying affected residences of the timing and duration of piling works and includes provision for periods of respite.

Cumulative construction noise impacts from multiple projects

A number of current modifications are underway at the Shoalhaven Starches facility with other works due to commence in 2022.

A time line of construction activities is as follows:-

- MOD 16/17 Specialty Products Building, incl. Product Dryer 9 – due for completion by end of **April 2022** (piling activities completed),
- MOD 16/17 Gluten Dryer 8 – due for completion by end of **October 2022** (piling activities completed),
- MOD 19 Beverage Grade Ethanol Plant – due for completion by end of **May 2022** (piling activities completed),
- MOD 21 Packing Plant – due for completion by end of **December 2022** (stage 1 piling activities completed), Stage 2 piling works are anticipated to commence in June 2022 which will occur for 2 to 3 days,
- MOD 23 Co-Gen Plant – **March 2022 to December 2022** (piling activities due April 2022)

As can be seen from the predicted noise levels in Table 8, the greatest noise impacts will occur during the piling works. There is no potential for piling works to occur simultaneously with other projects as these are all complete.

Shoalhaven Starches construction noise and management plan will be updated following approval to ensure that all construction works across the facility are appropriately staged, where necessary, to avoid cumulative impacts.

This will be necessary once Mod 21 and Mod 23 are approved as both locations are close to the receptors in Bomaderry. Once the approvals are received and the schedule for construction activities are finalised the management plan will be updated to address cumulative noise impacts.

The construction noise management plan will include procedures for community liaison and complaint management and handling, as detailed below.

Community Liaison, Complaint Handling and Hours of Construction

Consultation and Notification

- Use of site information board at the front of the site with the name of the organisation responsible for the site and their contact details, hours of operation including after-hours emergency contact details.
- Notification to nearby residences of the project details, construction dates and construction duration
- 24 hour Environmental Complaints Line 1300 300 104 published on the Manildra Group web site.
- According to the NSW EPA's Construction Noise Guideline (Table 2 & Table 12) the highly noise affected level of 75 dB(A) will not be triggered during construction hence no respite periods are required. Notwithstanding this, the Company will consult with the community on the option of piling activity with no respite but a shorter

construction timeframe, or respite periods during the piling activity and a longer construction timeframe.

Complaints Handling

- All noise complaints will be handled according to Shoalhaven Starches Environmental Complaints Handling procedure EN-P-0010
- An investigation of the noise complaint will be conducted by the Environmental Coordinator immediately, including noise checks at residential receiver locations to verify the complaint details where applicable.
- Follow-up noise measurements to be conducted on and off-site as required.
- All corrective and preventive actions implemented will be documented as per Shoalhaven starches Corrective and Preventative Action procedure QMS-P-0130.

Approved Construction Hours

The construction hours of the project will be strictly adhered to as prescribed in Condition 11 of the consent, which specify allowable operation hours for construction activities, as shown in Table 15 below.

Table 15 Approved Hours of Construction for the Project

Activity	Day	Time
Construction	Monday to Friday	7 am to 6 pm
	Saturday	8 am to 1 pm
	Sundays and public Holidays	Nil
Piling activities	Monday to Friday	9 am to 5 pm

8. CONCLUSION

An assessment of the potential noise impact from the proposed construction and operation of a 60 MW gas fired co-generation plant to be installed at Shoalhaven Starches facility on Bolong Road, Bomaderry, NSW was undertaken. This assessment includes noise impacts from the proposed relocation of approved DDG # 6 and associated cooling towers.

Noise control recommendations are made in Section 6 of this Report to reduce the level of noise emission from the co-gen plant to within site specific noise design goals at all receptor locations.

The noise design goals are established to ensure that the noise limits for the overall operation of the facility, as prescribed in Environment Protection Licence 883, continue to be complied with at all receptors.

The level of noise emission from the construction phase of the may exceed the noise management levels set by the NSW EPA's *Interim Construction Noise Guideline* at receptors in Bomaderry on some occasions.

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

This Revision B report, dated 15 March, 2022, supersedes any / all previous versions.

Matthew Harwood, MAAS

Principal Acoustical Consultant

Attachments:-

Important Note and Disclaimer
Appendix A – Modifying Factor Adjustments – EPA Fact Sheet C
Appendix B – *iNoise* 3D contours no additional meteorological conditions
Appendix C – *iNoise Google Earth* noise model no additional meteorological conditions
Appendix D – *iNoise* 3D contours standard meteorological conditions
Appendix E – *iNoise Google Earth* noise model standard meteorological conditions
Appendix F – *iNoise* 3D contours noise-enhancing meteorological conditions
Appendix G – *iNoise Google Earth* noise model noise-enhancing meteorological conditions

Important Note

All products and materials suggested by Harwood Acoustics Pty Ltd are selected for its acoustical properties only. Recommendations made in this report are intended to resolve acoustical problems only, therefore all other properties such as aesthetics, air flows, chemical, corrosion, combustion, construction details, decomposition, expansion, fire rating, fumes, grout or tile cracking, loading, shrinkage, smoke, exhaust etc. are outside Harwood Acoustic's field of expertise and ***must*** *be checked with the supplier or suitably qualified specialist before purchase.*

Disclaimer

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All noise predictions in this assessment are based on the noise level data supplied by either Shoalhaven Starches or the various manufacturers of plant or equipment, or from direct noise measurements of existing plant and equipment that is stipulated to be similar to, and equivalent to, that which is to be installed in this project, as advised by the client.

In this assessment all noise predictions for the entire cogeneration plant are based on the sound pressure levels supplied by GE for the LM2500 gas turbine unit and GE's confirmation that the same levels will be met for the HRSG units. Specifically, an energy average sound pressure level that does not exceed 85 dBA at 1 metre from any location around the plant. All noise control recommendations are predicated on those source noise levels. Any increase in actual source noise levels because of, for example, but not necessarily limited to, alternative or additional equipment to that stated, alternative operating conditions or operational scenarios, may result in higher than predicted noise levels at any receptor locations. Harwood Acoustics Pty Ltd therefore accepts no responsibility or liability for any noncompliance with regulatory noise limits as a result of changes to GE's stated sound pressure levels.

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Modifying Factor Corrections (EPA 2017) — Appendix A

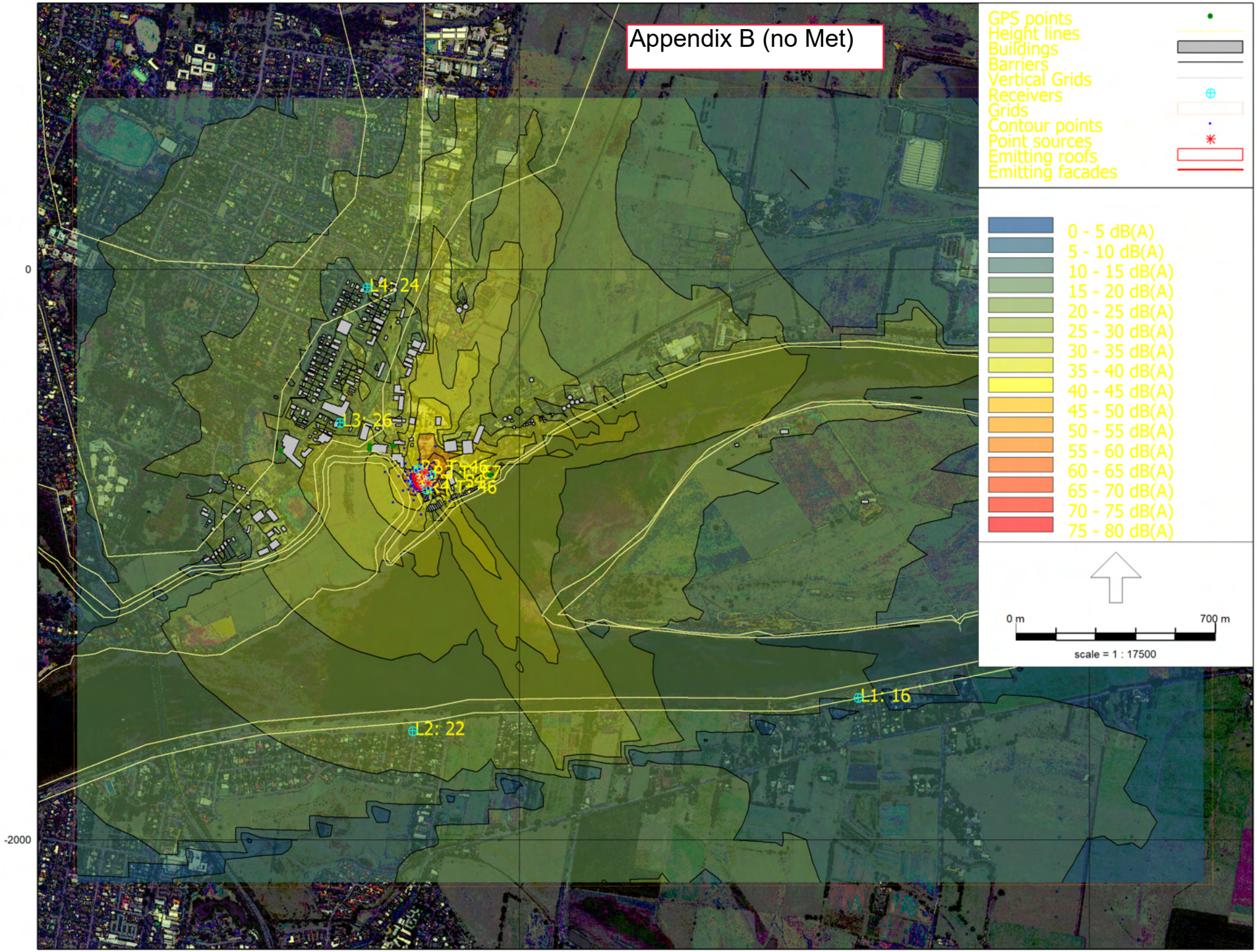
Table C1 Modifying Factor Corrections (from Table C.1 of the NSW Noise Policy for Industry 2017)

Factor	Assessment/ Measurement	When to Apply	Correction	Comments
Tonal Noise	One-third octave band analysis using the objective method for assessing the audibility of tones in noise – simplified method (*ISO1996.2-2007 – Annex D*).	Level of one-third octave band exceeds the level of the adjacent bands on both sides by: • 5 dB or more if the centre frequency of the band containing the tone is in the range 500–10,000 Hz • 8 dB or more if the centre frequency of the band containing the tone is in the range 160–400 Hz • 15 dB or more if the centre frequency of the band containing the tone is in the range 25–125 Hz.	5 dB	Third octave measurements should be undertaken using unweighted or Z-weighted measurements. **Note:** Narrow-band analysis using the reference method in *ISO1996-2:2007, Annex C* may be required by the consent/regulatory authority where it appears that a tone is not being adequately identified, e.g. where it appears that the tonal energy is at or close to the third octave band limits of contiguous bands.
Low Frequency Noise	Measurement of source contribution C-weighted and A-weighted level and one-third octave measurements in the range 10–160 Hz	Measure/assess source contribution C- and A-weighted Leq,T levels over same time period. Correction to be applied where the C minus A level is 15 dB or more and: • where any of the one-third octave noise levels in Table C2 are exceeded by up to and including 5 dB and cannot be mitigated, a 2 dB(A) positive adjustment to measured/predicted A-weighted levels applies for the evening/night period • where any of the one-third octave noise levels in Table C2 are exceeded by more than 5 dB and cannot be mitigated, a 5-dB(A) positive adjustment to measured/predicted A-weighted levels applies for the evening/night period and a 2-dB(A) positive adjustment applies for the daytime period.	2 or 5 dB	A difference of 15 dB or more between C- and A-weighted measurements identifies the potential for an unbalance spectrum and potential increased annoyance. The values in Table C2 are derived from Moorhouse (2011) for DEFRA fluctuating low-frequency noise criteria with corrections to reflect external assessment locations.

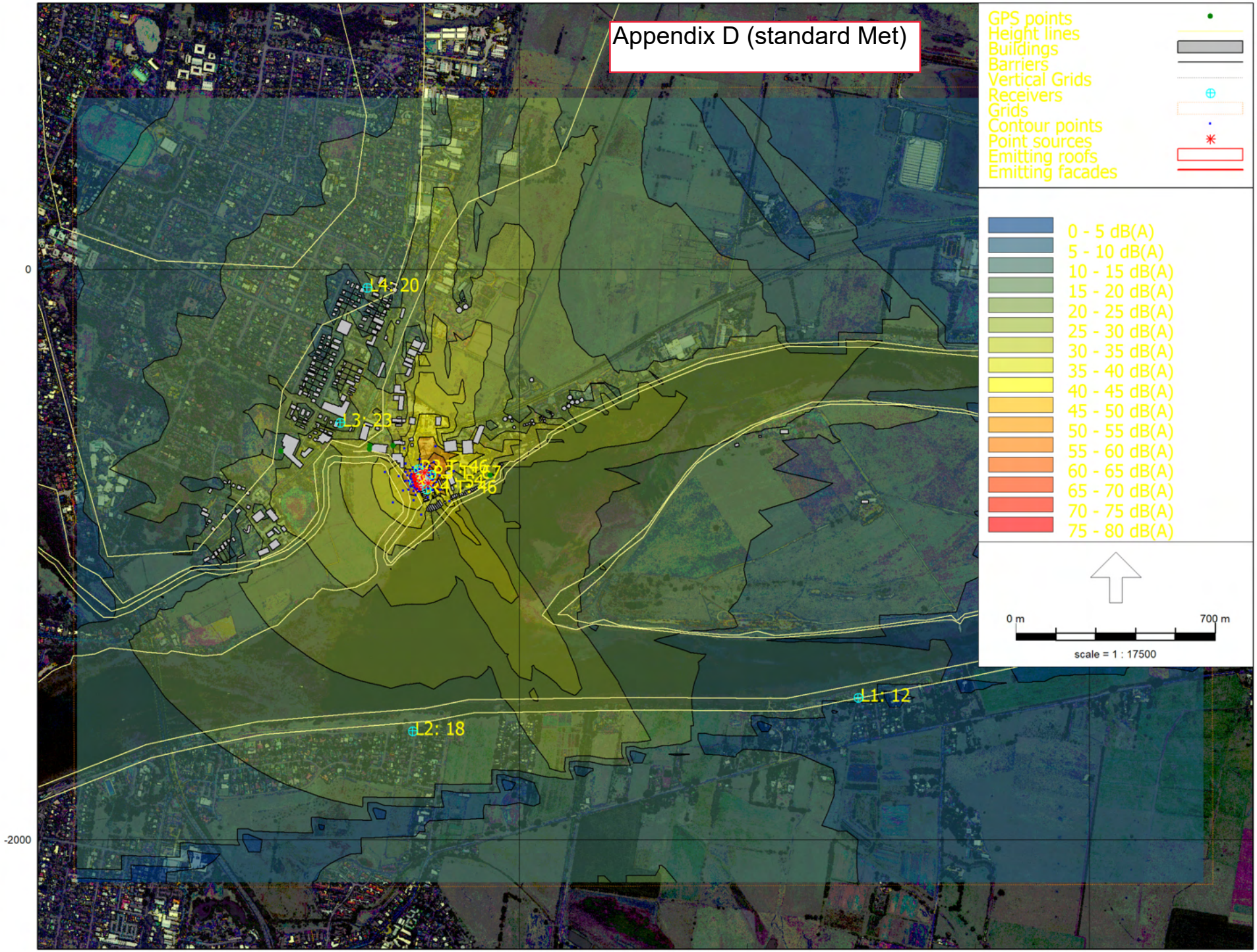
Table C1 Modifying Factor Corrections (from Table C.1 of the NSW Noise Policy for Industry 2017) *Cont…*

Factor	Assessment/ Measurement	When to Apply	Correction	Comments
Intermittent Noise	Subjectively Assessed but should be assisted with measurement to gauge the extent of change in noise level.	The source noise heard at the receiver varies by more than 5 dB(A) and the intermittent nature of the noise is clearly audible.	5 dB	Adjustment to be applied for **night-time only**.
Duration	Single-event noise duration may range from 1.5 m to 2.5 h	One event in any 24-hour period	0 to -20dBA	The acceptable noise trigger level may be increased by an adjustment depending on duration of noise (see Table C.3)
Maximum adjustment	Refer to individual modifying factors	Where two or more modifying factors are indicated	Maximum correction of 10 dBA[2] (excluding duration correction)	

Notes:
1. Corrections to be added to the measured or predicted levels, except in the case of duration where the adjustment is to be made to the criterion.
2. Where a source emits tonal and low-frequency noise, only one 5-dB correction should be applied if the tone is in the low-frequency range, that is, at or below 160 Hz.
3. Where narrow-band analysis using the reference method is required, as outlined in column 5, the correction will be determined by the ISO1996-2:2007 standard.


Appendix B (no Met)
GPS points
Height lines
Buildings
Barriers
Vertical Grids
Receivers
Grids
Contour points
Point sources
Emitting roofs
Emitting facades
0 - 5 dB(A)
5 - 10 dB(A)
10 - 15 dB(A)
15 - 20 dB(A)
20 - 25 dB(A)
25 - 30 dB(A)
30 - 35 dB(A)
35 - 40 dB(A)
40 - 45 dB(A)
45 - 50 dB(A)
50 - 55 dB(A)
55 - 60 dB(A)
60 - 65 dB(A)
65 - 70 dB(A)
70 - 75 dB(A)
75 - 80 dB(A)
0 m
700 m
scale = 1 : 17500
L4: 24
L3: 26
L1: 16
L2: 22
0
-2000
2000
4000


Nowra Anglican College
Mamma's Italian Kitchen
Bomaderry
Bomaderry Hotel
Manildra Group
The Lions Park
My Car Wash Bomaderry
Belong Rd
Bomaderry Creek
Shoalhaven River
Belinda St
AFE NSW - Nowra



7425 Cogen Plant - Total Emissions
14 Mar 2022, 10:00

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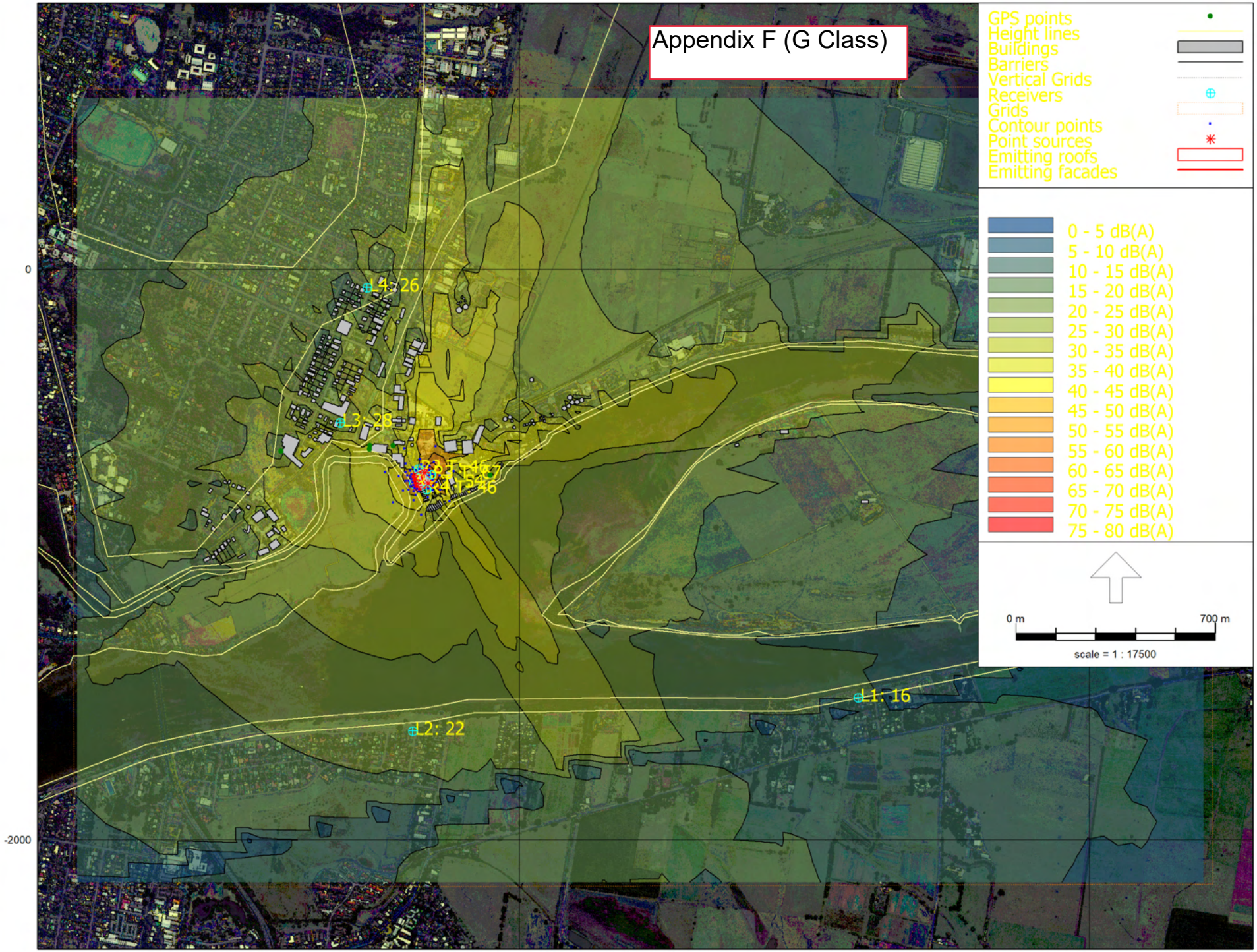
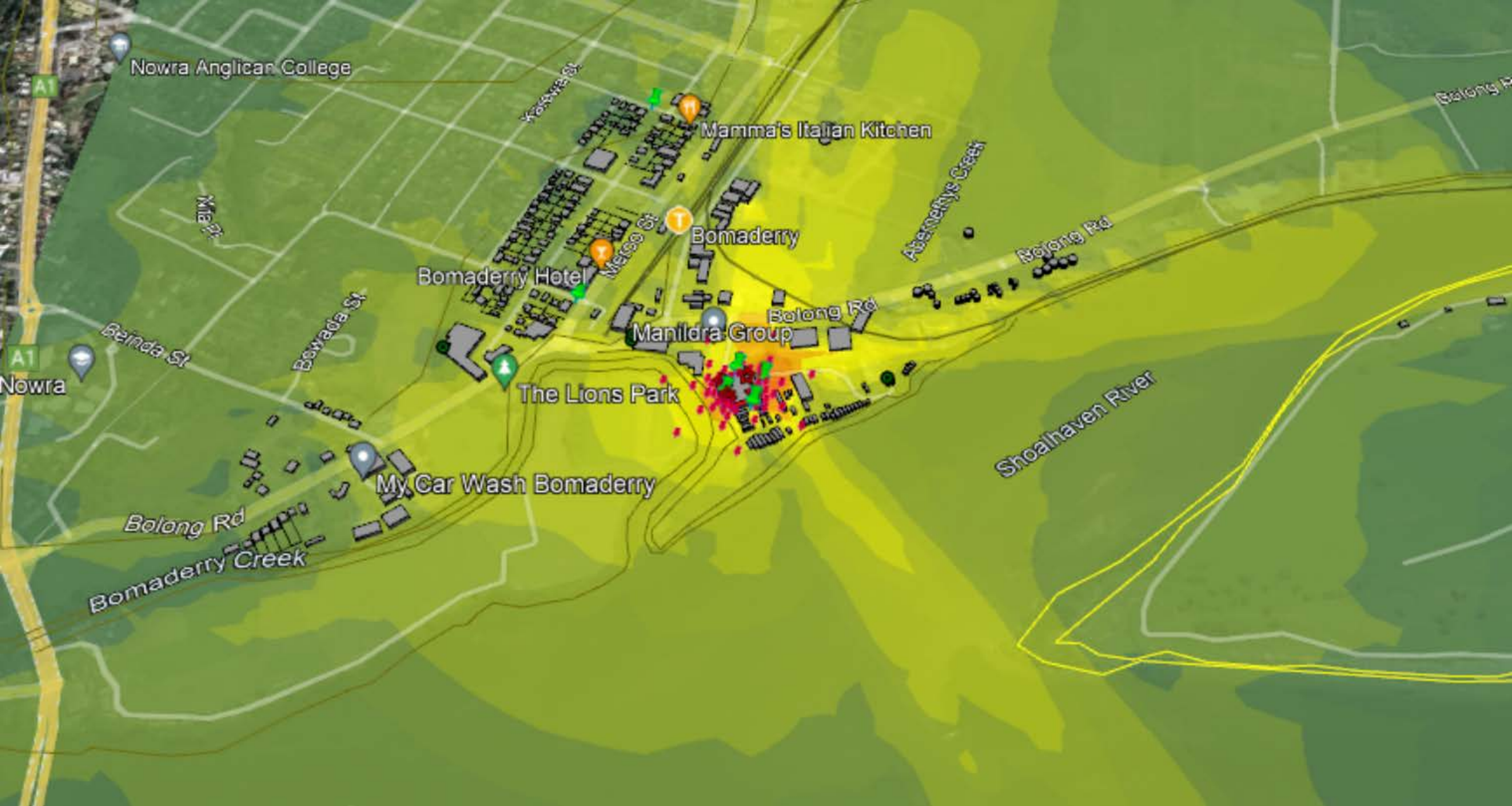
Nowra Anglican College
Mamma's Italian Kitchen
Bomaderry
Bomaderry Hotel
Manildra Group
The Lions Park
TAFE NSW - Nowra
My Car Wash Bomaderry
Bolong Rd
Bomaderry Creek
Shoalhaven River
Abernethys Creek
Meroo St
Bowada St
Belinda St


Appendix F (G Class)
GPS points
Height lines
Buildings
Barriers
Vertical Grids
Receivers
Grids
Contour points
Point sources
Emitting roofs
Emitting facades
0 - 5 dB(A)
5 - 10 dB(A)
10 - 15 dB(A)
15 - 20 dB(A)
20 - 25 dB(A)
25 - 30 dB(A)
30 - 35 dB(A)
35 - 40 dB(A)
40 - 45 dB(A)
45 - 50 dB(A)
50 - 55 dB(A)
55 - 60 dB(A)
60 - 65 dB(A)
65 - 70 dB(A)
70 - 75 dB(A)
75 - 80 dB(A)
0 m
700 m
scale = 1 : 17500
L4: 26
L3: 28
L1: 16
L2: 22
0
-2000
2000
4000


Nowra Anglican College
A1
Mamma's Italian Kitchen
Bomaderry
Bomaderry Hotel
Manildra Group
The Lions Park
My Car Wash Bomaderry
Nowra
Bolong Rd
Bomaderry Creek
Shoalhaven River
Abernethys Creek
Beinda St
Bowada St
Meroo St
Mia Pl
Bolong Rd
Bolong Rd