



SUITE 17, 808 FOREST ROAD, PEAKHURST 2210 ABN 73 107 291 494
P. 02 9046 3800 ACOUSTICS@DAYDESIGN.COM.AU WWW.DAYDESIGN.COM.AU

Manildra Group
C/- Shoalhaven Starches Pty Ltd
PO Box 123
Nowra NSW 2541

5 May 2023

Refer: 7425-5.1L

Attention: Mr Dyllan Ware
Telephone: 02 4423 8212

Email: dyllan.ware@manildra.com.au

Dear Sir,

SHOALHAVEN STARCHES – MOD 9 & 21 – PACKING PLANT DESIGN NOISE VERIFICATION

Day Design Pty Ltd has been engaged to prepare a Design Noise Verification Report for modification approval MP 06_0228 issued by the Minister for Planning for the Packing Plant and container storage yard to be constructed at Lot DP 1121337 and Lot 2 DP 538289 Bolong Road, Bombaderry, NSW (Modification 9) and Packing Plant Alterations and Other Works (Modification 21).

Development Consent Condition 14F requires the Applicant to *'provide evidence ... to confirm that the design specifications detailed in the EA for MOD 9 have been implemented'*.

Development Consent Condition 14M requires the Applicant to provide *'a design noise verification report to demonstrate the additional plant and equipment will meet relevant design noise goals'*. The purpose of this requirement is to verify that the specifications have been sufficiently implemented and the design noise goals will be met for each future Modification (Mods 9 & 21).



• AIRCRAFT, ROAD TRAFFIC AND TRAIN NOISE CONTROL
• ARCHITECTURAL ACOUSTICS • INDUSTRIAL NOISE AND VIBRATION CONTROL
• ENVIRONMENTAL NOISE IMPACT INVESTIGATION AND CONTROL
• OCCUPATIONAL NOISE INVESTIGATION • QUIET PRODUCT DEVELOPMENT#



1.0 CONSENT CONDITIONS

The Consolidated Development Consent contains Conditions 12, 14F, 14H and 14M which are relevant to Modifications 9 and 21.

12. *The Applicant shall ensure that noise from the development does not exceed the noise limits in Table 2.*

Table 2: Development Noise Limits

Location	Day/Evening/Night <i>L_{Aeq}(15 minute) dB(A)</i>	Night <i>L_{A1}(1minute) dB(A)</i>
1 - Terara on the south side of the Shoalhaven River	38	48
2,3 & 4 - Nowra on the south side of the Shoalhaven River	38	48
5 - Meroo Street, Bomaderry	42	52
6 - Other residential locations in Bomaderry	40	50

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

In order to ensure compliance with the noise limits specified above, which will also ensure compliance with the noise limits specified in Section L5.1 of the Environmental Protection License 883, $L_{eq, 15 \text{ min}}$ design noise goals for this development are set to a minimum 15 dB below the noise limits specified in Condition 12. The project specific $L_{eq, 15 \text{ min}}$ noise criteria are calculated to be as shown in Table 1.

Table 1 Project Specific Noise Criteria

Location	Day/Evening/Night <i>L_{Aeq}(15 minute) dB(A)</i>
1 - Terara on the south side of the Shoalhaven River	23
2,3 & 4 - Nowra on the south side of the Shoalhaven River	23
5 - Meroo Street, Bomaderry	27
6 - Other residential locations in Bomaderry	25



- 14F. *Prior to the commencement of operation of the packing plant, the Applicant shall provide evidence to the satisfaction of the Secretary to confirm that the design specifications detailed in the EA for MOD 9 have been implemented. The design specifications include:*
- a) the walls and ceiling of the packing plant building have a minimum weighted sound reduction index of R_w 33, unless otherwise agreed in writing by the Secretary,*
 - b) all external doors are a minimum 44 millimetres thick, solid core timber construction, or equivalent material, in well-sealed frames;*
 - c) building openings without acoustic treatments shall not exceed 36 square metres and shall be located in the south-eastern part of the packing plant building, as shown in Appendix 2I,*
 - d) external motors on the five storage silos shall have a maximum sound power level of 78 dB(A), unless otherwise agreed to by the Secretary in accordance with condition 14H,*
 - e) permanent sound barriers a minimum 11 m high relative to the finished ground level of the container storage yard. Barriers shall extend along the entire length of the north-western boundary of the container storage area, connecting to the packing plant along the north-eastern boundary (see the figure in Appendix 2I);*
 - f) permanent sound barriers a minimum 9 m high relative to the finished ground level of the container storage yard, along the south-western side of the rail spur lines, as shown in the figure in Appendix 2I, and*
 - g) sound barriers shall be constructed as solid masonry walls, or other equivalent material, without holes or gaps, other than a maximum of 50 mm at the base.*



14H. *Prior to the construction of any external mechanical plant exceeding a sound power level of 78dB(A), the Applicant shall prepare a noise validation report to demonstrate that operation of the mechanical plant meets the noise limits in condition 12. The noise validation report shall:*

- a) be prepared by an appropriately qualified and experienced noise expert;*
- b) be approved by the Secretary, prior to the installation of external mechanical plant;*
- c) demonstrate that the location, design and operation of external mechanical plant would achieve the noise limits in Condition 12;*
- d) describe any acoustic treatments required to ensure compliance with the noise limits in Condition 12; and*
- e) if necessary, recommend, prioritise and implement measures to improve noise controls on-site to ensure the Development meets relevant criteria and protects off-site receivers from excess noise.*

14M. *Prior to the construction of any modifications described in Schedule 2, Condition 2, the Applicant shall prepare a design noise verification report to demonstrate the additional plant and equipment will meet relevant design noise goals to ensure noise from the site does not exceed the noise limits in Condition 12. The noise verification report shall:*

- a) be prepared by an appropriately qualified and experienced noise expert;*
- b) be approved by the Secretary, prior to construction of the modification;*
- c) demonstrate that the location, design and operation of the modification would achieve the noise limits in Condition 12; and*
- d) if necessary, recommend, prioritise and implement measures to improve noise controls on-site to ensure the Development as modified meets the noise limits in Condition 12 and protects off-site receivers from excess noise.*



2.0 DOCUMENTS REVIEWED

The reports that form part of our review are listed below:

Modification 9

- *Environmental Noise Impact Assessment, Proposed Modification to Packing Plant and Container Storage Area* (ref: 5843-1.1R), prepared by Day Design dated 15 March 2016;
- *Design Noise Verification Report, Proposed Modification 9 to MP06_0228 – North Packing Plant* (ref: 2201012e-l), prepared by Harwood Acoustics dated 1 February 2022.

Modification 21

- *Environmental Noise Impact Assessment Packing Plant Alterations and Other Works Modification 21* (Ref: 2103003E-R) prepared by Harwood Acoustics dated 15 February 2022.

The construction drawings for Mods 9 and 21 that form part of our review are listed below:

Modification 9

- Building Design Plans, North Packing plant, prepared by Manildra Group, dated 20 May 2021.
- Approved and New Proposals Over All Site Plan, prepared by Manildra Group, dated 29 April 2019.
- Ventilation Fans - General Arrangement, prepared by Foxground Engineering dated 20 September 2021.
- Manildra North Packing Noise Wall, prepared by ROC Engineering, dated 12 July 2022.
- North Packing Plant_220225 – ‘Navisworks’ drawings supplied by Manildra Group, dated 30 May 2022.

Modification 21

- Warehouse Sheeting Arrangement, prepared by Foxground Engineering, dated 23 November 2021;
- Manildra North Packing Noise Wall, prepared by ROC Engineering, dated 12 July 2022;
- Packing Building – General Arrangement, prepared by Foxground Engineering, dated 17 November 2021;
- Truck Loadout & Silos – General Arrangement, prepared by Foxground Engineering, dated 4 March 2022;
- Ventilation Fans - General Arrangement, prepared by Foxground Engineering dated 20 September 2021;
- North Packing Plant_220225 – ‘Navisworks’ drawings supplied by Manildra Group, dated 30 May 2022.



3.0 SUMMARY OF ACOUSTIC RECOMMENDATIONS

The acoustic recommendations required by Day Design as specified in Section 7.1 of report 5843-1.1R dated 15 March 2016, as part of Modification 9 are:

- The external walls of the packing plant building should have a minimum weighted sound reduction index (R_w) 33;
- The roof and ceiling of the building should have a minimum weighted sound reduction index (R_w) 33;
- Acoustically untreated openings in the building should not exceed a total of 36 m² and be located in the south eastern façade, or south eastern end of the north western or south western facades only (see Appendix B);
- Roller door openings in the south western façade of the building should remain closed when containers are not being loaded in this location;
- All external doors should be of minimum 44 mm thick, solid core timber construction in well-sealed frames;
- Five (5) silo motors each with a maximum sound power level (L_w) of 78 dBA, which will be acceptable without additional noise controls;
- A final assessment should be carried out prior to the issue of a Construction Certificate once details of any external plant, if any, are known. Any items of externally located plant which exceed the allowable sound power level of 78 dBA may require additional acoustical treatment.

Sound barrier screens to be erected along the north western, north eastern and south western boundaries of the container area, as follows:

- Along the entire length of the north western boundary of the area and returning along the north eastern boundary to meet the packing plant building to a minimum height of 10 metres above the finished ground level of the container storage area; and
- Along the south western boundary of the site on the south western side of the site and to the south west of the rail spur line to a minimum height of 7.8 metres above the finished ground level of the container storage area;
- The south western barrier should overlap by a minimum 2 metres where it separates to accommodate the rail spur;
- Sound barriers may be constructed from, for example, masonry, shipping containers, 9 mm fibre cement sheet on both sides of 92 mm steel posts, a proprietary modular wall system with a minimum weighted sound reduction index of R_w20 ;
- Barriers should be constructed without holes or gaps other than a maximum 50 mm at the base;
- All sound barriers should remain in place at all times;



- The locomotive should not be used to shunt rail cars whilst being loaded or unloaded;
- All other recommendations forming the Project Approval, not superseded by the recommendations in Section 7.1 of the report should be implemented and maintained.

The acoustic recommendations required by Harwood Acoustics, as part of Modification 21 are:

- All external walls and the roofs of the packing plant extension and the penthouse above the external silos should achieve a minimum weighted sound reduction index of R_w33 , such as:
 - *Kingspan' Europanel S5 Extra series* 100 mm thick (minimum) or *Rockspan Extra* 100 mm thick (minimum);
 - Architectural Roof Panelling system '*K-Dek (KS 1000 KD)*' with an internal layer of 13 mm thick sound rated plasterboard, or 9 mm thick fibre cement sheet fixed directly to one side, or equivalent;
- Confirmation should be sought to ensure that the acoustical performance of the chosen construction satisfies the required sound reduction in each octave band centre frequency once the construction material for the walls and roof are finalised;
- There should be no acoustically untreated penetrations in the walls or roof of the packing plant extension or the penthouse;
- Any penetrations must not undermine the acoustical performance of the wall or roof system (R_w33 minimum);
- Ventilation fans where required must be acoustically treated to ensure that the noise design goals are not exceeded at any receptor location, this may be done, if required by the installation of acoustical silencers, lined ductwork, acoustic louvres or a combination;
- The selection of and requirement for ventilation fans in the proposed packing plant building extension and the penthouse, for silo motors, are not finalised at this stage. A detailed noise control design will be undertaken once these selections have been finalised during the noise design verification process prior to construction as required by Condition 14 M of the Project Approval.



4.0 VERIFICATIONS

The design specifications included in Condition 14F originate from the noise control recommendations made in the Day Design 2016 NIA and the Harwood 2022 NIA.

The design of the packing plant building has been changed significantly since the preparation of the 2016 assessment, including the addition of the penthouse levels for which this report addresses. As such, some of the specific conditions from previous recommendations included in Condition 14F may not be applicable or appropriate for the penthouse levels.

However, this assessment addresses the requirements of Condition 14F, 14H and 14M based on the current proposed design of the north packing plant building to ensure that the current design meets the specific requirements, where appropriate, or at least satisfies the intent of those requirements with respect to minimising noise emission to meet the established design noise goals.

Each of the items in Condition 14F are responded to below.

- a) *“the walls and ceiling of the packing plant building have a minimum weighted sound reduction index of R_w33 , unless otherwise agreed in writing by the Secretary.”*

The external walls of the main packing plant building will be constructed from 200 mm thick concrete panels. Walls of this construction typically achieve a weighted sound reduction index of R_w50 .

The access panels for each of the container pods in the southern façade of the building will be fitted with TRU-THERM insulated sectional doors with a minimum weighted sound reduction index rating of R_w24 . The calculated composite acoustical performance of the southern façade (concrete and TRU-THERM) wall will achieve a minimum R_w33 as required.

The external walls of the north awning area will comprise one layer of external sheet metal cladding material, such as Colorbond or an equivalent product. Walls of this construction typically achieve a weighted sound reduction index of R_w21 .

The external walls and roof of the penthouse levels will be constructed from Kingspan proprietary panelling system, or an approved equivalent, which will be a minimum 100 mm thick. The weighted sound reduction index of 100 mm thick Kingspan panels is stated by the manufacturer to achieve R_w33 .

Noise modelling for the packing plant, north awning and penthouse building (Levels 2 – 4/4.5) has been undertaken based on the current design and use. Internal noise levels from processes, plant and equipment within the various areas of the packing plant, north awning and penthouse building have been modelled based on noise measurements of equivalent or similar processes, plant and equipment located within the existing Shoalhaven Starches complex.

External walls for the main packing plant building comprising 200 mm thick concrete panels are acceptable.



External roofs for the main packing plant building, north awning area and penthouse building comprising 100 mm thick Kingspan panels (min. R_w33) are acceptable.

The limited area of external walls for the north awning area comprising one layer of external sheet metal cladding (min. R_w21) are acceptable provided there are no holes or gaps.

External walls for Level 2, 3, and 4.5 of the penthouse comprising 100 mm thick Kingspan panels (min. R_w33) are acceptable.

- b) *'all external doors are a minimum 44 millimetres thick, solid core timber construction, or equivalent material, in well-sealed frames'.*

All external pedestrian access (PA) doors are of solid, fire rated steel construction (or equivalent) and will achieve the same, or greater, acoustical performance as 44 mm solid core timber doors.

- c) *'building openings without acoustic treatments shall not exceed 36 square metres and shall be located in the south-eastern part of the packing plant building, as shown in Appendix 2I'.*

All container pods opening in the southern façade of the building will be acoustically treated as detailed in item a).

There are two doors, emergency exit PA and a truck entry roller door on both the northeast and northwest corners of the north awning area. The truck entry doors will be interlocked with each other as well as being interlocked with the three fast-acting roller shutter doors to the main packing plant floor, which is acoustically acceptable.

There are three roller doors proposed in the northern façade of the packing plant building which will open to the internal north awning area. The design of the acoustically enclosed north awning area will be such that either of the three roller doors in the northern concrete façade of the building will only ever be open when the truck loadout area is closed. This design acoustically satisfies the intent of this condition with respect to acoustically treated openings whilst maintaining the acoustical integrity of the building façade.

The current design of the penthouse level specifies four wall openings on the northeast facades of Level 2 and Level 4.5 and are not acoustically treated. Each opening is approximately 2m² for a total untreated area of approximately 16 m². Noise modelling of the north packing plant facility indicates that these acoustically untreated openings do not compromise the overall integrity of the external walls and compliance with the design noise goals will be met. There are no other untreated openings within the packing plant building or penthouse level.

This design acoustically satisfies the intent of this condition with respect to acoustically treated openings whilst maintaining the acoustical integrity of the building façade.

- d) *external motors on the five storage silos shall have a maximum sound power level of 78 dB(A), unless otherwise agreed to by the Secretary in accordance with condition 14H.*



No external motors are included as part of Modification 9 or 21.

- e) *permanent sound barriers a minimum 11 m high relative to the finished ground level of the container storage yard. Barriers shall extend along the entire length of the north-western boundary of the container storage area, connecting to the packing plant along the north-eastern boundary (see the figure in Appendix 2I).*

We have reviewed the 'For Construction' drawings of the proposed noise wall, as prepared by ROC Engineering & Design dated 12 July 2022. The height of the noise wall sections along the northwest and northeast boundaries of the container storage area varies in height from 11.05 metres (Post № 37) to 13.78 metres (Post № 16) above ground level of the container storage yard. Therefore, the requirements specified in item e) are satisfied.

- f) *permanent sound barriers a minimum 9 m high relative to the finished ground level of the container storage yard, along the south-western side of the rail spur lines, as shown in the figure in Appendix 2I.*

We have reviewed the 'For Construction' drawings of the proposed noise wall, as prepared by ROC Engineering & Design dated 12 July 2022. The height of the noise wall sections along the southwest boundary of the container storage area varies in height from 10.43 metres (Post № 69) to 9.32 metres (Post № 42) above ground level of the container storage yard. Therefore, the requirements specified in item f) are satisfied.

- g) *sound barriers shall be constructed as solid masonry walls, or other equivalent material, without holes or gaps, other than a maximum of 50 mm at the base.*

We have reviewed the 'For Construction' drawings of the proposed noise wall, as prepared by ROC Engineering & Design dated 12 July 2022. The noise wall is found to be contiguous in construction with no gaps between sections. All gaps between the base of the wall and tops of footings are found to be in general accordance with the requirements of item g).

However, it can be seen from the drawings that a number of sections have gaps between the base of the wall panel and ground level which are larger than 50 mm. These gaps shall be filled with earth or construction aggregate to prevent noise leakage underneath the noise wall.

A response to Condition 14H and 14M is as follows:

'Prior to the construction of any external mechanical plant exceeding a sound power level of 78 dB(A), the Applicant shall prepare a noise validation report to demonstrate that operation of the mechanical plant meets the noise limits in condition 12.'

'Prior to the construction of any modifications described in Schedule 2, Condition 2, the Applicant shall prepare a design noise verification report to demonstrate the additional plant and equipment will meet relevant design noise goals to ensure noise from the site does not exceed the noise limits in Condition 12.'

We have reviewed preliminary mechanical drawings titled 'Revision B - Ventilation Fans General Arrangement', dated 20 September 2021, prepared by Foxground Engineering, which indicate the location and quantity of each ventilation fan to serve the plant.



We have also reviewed the fan specifications for each fan as supplied by Fanquip, received via email on 31 March 2023. A schedule of ventilation fans, as supplied by Fanquip, is shown in Table 2. It is noted that noise levels of some fans include inline silencers fitted. Sound power levels for these fans include attenuation provided by inline silencers, as supplied by Fanquip.

Table 2 L_{eq} Sound Power Levels – Ventilation Fans

Description	Sound Power Levels (dB) at Octave Band Centre Frequencies (Hz)								
	dBA	63	125	250	500	1k	2k	4k	8k
Main building - Exhaust ¹	68	68	72	69	60	60	63	58	56
Main building – Supply ¹	78	71	72	79	70	70	74	67	65
Penthouse Level 2 West Side – Exhaust ¹	69	62	71	63	62	62	66	59	57
Penthouse Level 2 West Side - Supply	89	74	76	88	85	84	83	75	72
Penthouse Level 2 East Side - Exhaust ¹	59	59	64	65	56	57	59	54	49
Penthouse Level 2 East Side - Supply	85	70	73	87	82	81	80	72	69
Penthouse Level 3 West Side - Exhaust ¹	59	59	64	65	56	57	59	54	49
Penthouse Level 3 West Side - Supply	85	70	73	87	82	81	80	72	69
Penthouse Level 3 East Side - Exhaust ¹	61	57	62	64	54	53	55	50	46
Penthouse Level 3 East Side – Supply	82	70	82	82	79	78	75	66	63
Penthouse Level 4 Exhaust ¹	71	73	77	74	64	63	66	61	59
Penthouse Level 4 Supply	89	74	76	88	85	84	83	75	72

¹ Inclusive of inline silencer installed.



We are advised by Fanquip that acoustic louvres will be fitted to the external façade to attenuate noise from supply and exhaust fans which do not have inline silencers fitted. Attenuation values for Fanquip louvres are shown in Table 3.

Table 3 Fanquip Acoustic Louvre – Insertion Loss

Louvre Model	Insertion Loss (dB) at Octave Band Centre Frequencies (Hz)							
	63	125	250	500	1k	2k	4k	8k
100	4	2	4	6	11	10	7	7
150	6	3	1	7	11	10	8	8
200	8	5	6	10	15	15	13	12
300	12	7	10	15	22	22	19	18
450	16	11	11	21	33	32	26	24
600	24	14	19	30	42	42	37	33

The current design of the north awning area will include 7 exhaust fans which will be enclosed below the awning roof, fully enclosed within the north awning area. These exhaust fans will operate 24 hours a day.

The current design of the main packing plant building will include 10 supply fans installed within the southwest facade. These supply fans will operate 24 hours a day.

The current design of the packing plant penthouse includes four ventilation fans serving each level of the penthouse installed within the northeast and southwest walls for a total of 12 fans. These exhaust fans will operate 24 hours a day.

In order to meet the design noise goals specified in Condition 12, the following recommendations should be adopted into the design of the ventilation system:

- Supply/exhaust fans without inline silencers should have Fanquip Model 300 acoustic louvres installed on the intake or discharge of each fan, or an equivalent louvre that achieves or exceeds the insertion loss values specified for this model of acoustic louvre.



5.0 CONCLUSION

A review of previous Environmental Noise Impact Assessment reports and Design Verification reports has been conducted in conjunction with various construction drawings relating to the Packing Plant building to demonstrate that the noise emission from the general operation of the development will meet the established design noise goals.

The construction drawings indicate that the design of the noise wall, main packing plant building and north awning area have generally implemented the various noise control recommendations into the construction of the buildings provided in previous Environmental Noise Impact Assessment reports specified by Day Design and Harwood Acoustics, and satisfies Consent Condition 14F.

Additional noise controls are required for mechanical plant design and various components of the penthouse building, such as ensuring the external walls of the penthouse levels achieve a minimum R_w33 in order to ensure design noise goals are met. Recommendations are made in Section 4 of this report, in accordance with the requirements of Consent Conditions 14H and 14M, to reduce the level of noise emission from items of plant and equipment associated with Modifications 9 and 21 to within the design noise goals in order to comply with Environment Protection License 883 noise limits at each receptor location.



Alexander Mendoza, MDesSc(Audio & Acoustics), MAAS

Acoustical Consultant

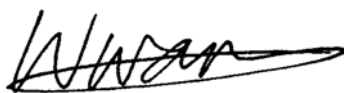
for and on behalf of Day Design Pty Ltd

AAAC MEMBERSHIP

Day Design Pty Ltd is a member company of the Association of Australasian Acoustical Consultants, and the work herein reported has been performed in accordance with the terms of membership.



The undersigned hereby certifies that this Report has been checked and approved in accordance with our Quality Management System.



Date: 5/5/23

