REVERB ACOUSTICS

Noise and Vibration Consultants

Noise Impact Assessment
McWilliams Wines
Expansion to Hanwood Winery
Jack McWilliam Road
Hanwood NSW

June 2010

Prepared for McWilliams Wines Pty Ltd
Report No. 09-1341-R1

Building Acoustics – Council/OEH Submissions - Modelling - Compliance - Certification

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SECTION 1
Introduction

1.1 INTRODUCTION

Reverb Acoustics has been commissioned to conduct a noise impact assessment for expansion of the existing McWilliams Wines Winery at Hanwood. As part of the expansion a new Packaging Facility and Waste Water Treatment Works (WWTW) will be constructed at the site. This assessment considers loading and unloading activities, trucks entering and leaving and manoeuvring on the site, and mechanical plant.

Included within this report is a detailed noise audit for existing operations. The purpose of the audit is to identify the noise impact in the immediate residential area from existing winery operations, and to recommend noise control strategies to reduce impacts, where appropriate.

The assessment was requested by McWilliams Wines Pty Ltd in support of and to accompany an Environmental Assessment (EA) to the Department of Planning (DoP) and to ensure any noise control measures required for the development are incorporated during the design stages.

1.2 TECHNICAL REFERENCE / DOCUMENTS

Beranek, L.L and Istvan, L.V. (1992). *Noise and Vibration Control Engineering.* John Wiley and Sons, Inc.

Bies, D.A. and Hansen, C.H. (1996). *Engineering Noise Control: Theory and Practice*. London, E & F.N. Spon.

Harris, C.M. (ed) (1957). *Handbook of Noise Control.* New York, McGraw-Hill.
Gréhant B. (1996). *Acoustics in Buildings.* Thomas Telford Publishing.

AS 2107-2000 *"Acoustics-Recommended Design Sound Levels and Reverberation Times for Building Interiors"*.

AS 1276.1-1999 *"Acoustics – Rating of sound insulation in buildings and of building elements. Part 1: Airborne sound insulation"*.

Department of Environment and Climate Change NSW (2000). *Industrial Noise Policy*

Department of Environment and Climate Change NSW (1999). *Environmental Criteria for Road Traffic Noise*

NSW Roads and Traffic Authority (2001). *Environmental Noise Management Manual*

AS 2702-1984 *"Acoustics-Methods for the measurement of road traffic noise".*

AS 3671-1989 *"Acoustics-Road traffic noise intrusion-building siting and construction".*

Plans supplied by McWilliams Wines Pty Ltd. Note that variations from the design supplied to us, may affect the acoustic recommendations.

A Glossary of commonly used acoustical terms is presented in Appendix A to aid the reader in understanding the Report.

SECTION 2
Existing Acoustic Environment Assessment Criteria

2.1 EXISTING ACOUSTIC ENVIRONMENT

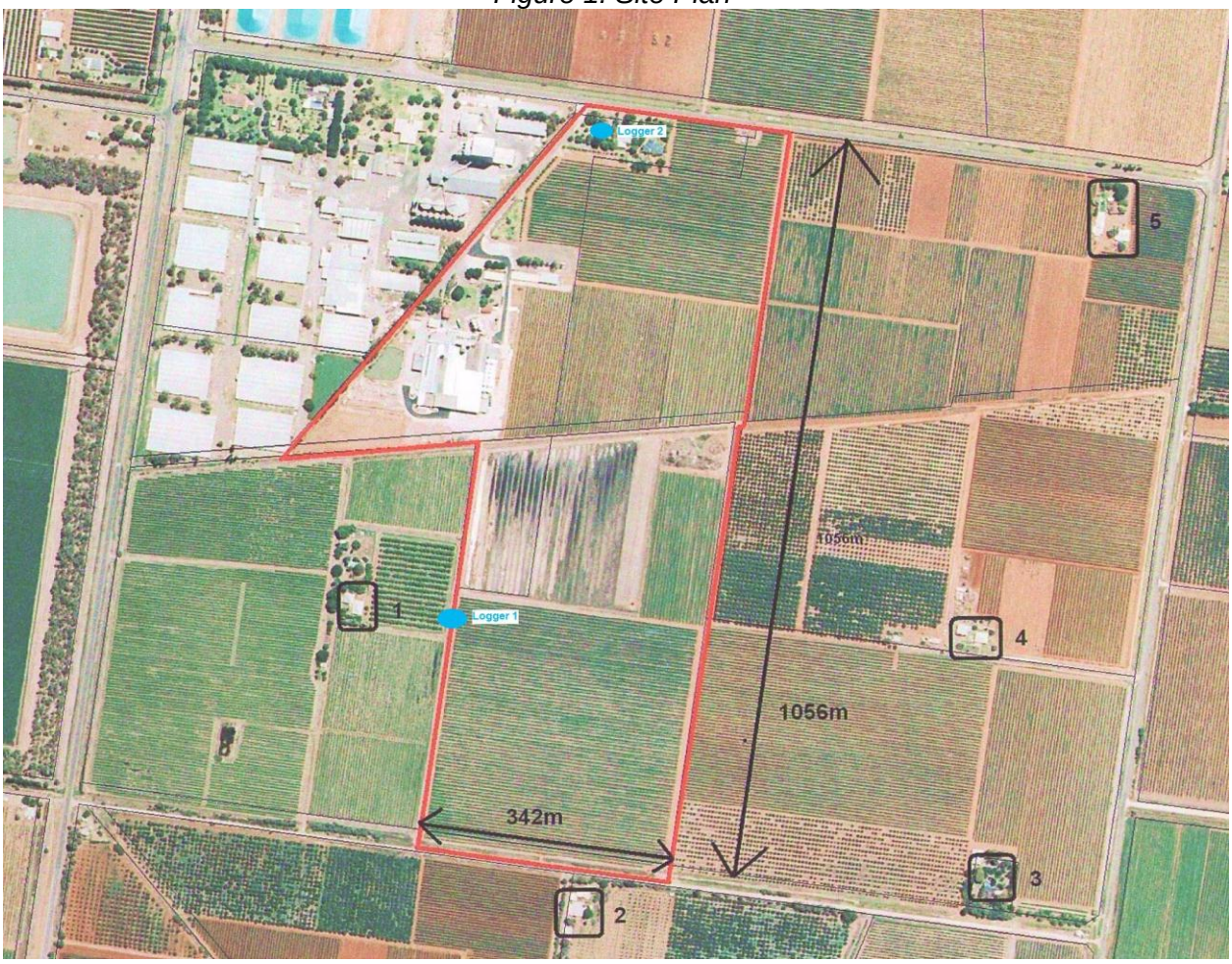
Background noise level surveys were conducted using a Type 1, 01dB, SIP-95S environmental noise logging monitors, installed at the following locations (also see Figure 1):

Logger 1: Approx 300m N of SW site boundary and 110m E of Farm 132.
Logger 2: Front facade McWilliams Wines owned residence and 30m from Jack McWilliams Rd.

Nearest residential receivers (not owned by McWilliams Wines Pty Ltd), identified during our site visits are as follows:

R1. Residence Farm 132 approx 300m S of main facility.
R2. Residence No.73 Martins Rd approx 30m S of site bdry.
R3. Residence B235 14 N side Martins Rd approx 400m E of SE site bdry.
R4. Residence approx 200m W Old Willbriggie Rd & approx 300m E of site.
R5. Residence Farm 129 100m W of Jack McWilliams Rd and Willbriggie Rd int.

Figure 1: Site Plan



Noise level measurements were carried out at both logger locations from 5 April to 12 April 2009 during full day production, and from 12 April to 19 April 2009 when only minimal activity was occurring at the site. The instruments were programmed to accumulate environmental noise data continuously and store 1 second averages (Leq's) in internal memory. The data were then analysed to determine 15 minute Leq and statistical noise levels using dedicated software supplied with the instruments.

The instruments were calibrated with a Brüel and Kjaer 4230 sound level calibrator producing 94dB at 1kHz before and after the monitoring period, as part of the instrument's programming and downloading procedure, and showed an error less than 0.5dB.

The following Tables show summaries of our noise level surveys during full and minimal production, including the Assessment Background Levels (ABL's), for the day, evening and night periods. From these ABL's the Rating Background Level's (RBL's) have been calculated, according to the procedures described in the Office of Environment and Heritage's (OEH's) – Industrial Noise Policy (INP) and by following the procedures and guidelines detailed in Australian Standard AS1055-1997, "Acoustics - Description and Measurement of Environmental Noise, Part 1 General Procedures". Logger results are not shown, but available on request.

Table 1: Summary of Noise Logger Results Logger 1, dB(A)
4-12 April 2009 during Full Production

Time Period	Background L90			Ambient Leq		
	Day 7am-6pm	Evening 6pm-10pm	Night 10pm-7am	Day 7am-6pm	Evening 6pm-10pm	Night 10pm-7am
5-6 Apr	34.9	44.8	32.8	45.5	49.8	44.1
6-7 Apr	40.1	38.7	33.1	68.5	48.5	41.9
7-8 Apr	34.5	43.0	33.0	48.2	51.2	47.0
8-9 Apr	39.5	45.5	42.8	65.4	52.0	48.8
9-10 Apr	41.2	47.3	39.5	58.2	53.0	48.8
10-11 Apr	41.0	42.2	39.8	49.9	51.3	49.8
11-12 Apr	36.7	46.5	38.8	48.3	53.0	48.7
RBL*	**39.5**	**44.8**	**38.8**	**--**	**--**	**--**
LAeq	**--**	**--**	**--**	**62.1**	**51.5**	**47.7**

Table 2: Summary of Noise Logger Results Logger 2, dB(A)
4-12 April 2009 during Full Production

Time Period	Background L90			Ambient Leq		
	Day 7am-6pm	Evening 6pm-10pm	Night 10pm-7am	Day 7am-6pm	Evening 6pm-10pm	Night 10pm-7am
5-6 Apr	35.4	33.3	34.3	52.2	50.9	49.0
6-7 Apr	46.6	45.4	43.0	57.1	52.9	50.3
7-8 Apr	43.6	43.7	42.2	56.4	53.5	49.7
8-9 Apr	43.0	42.7	42.3	56.2	49.8	51.6
9-10 Apr	44.0	43.9	38.1	56.7	52.3	46.9
10-11 Apr	36.5	35.1	32.3	53.0	52.7	43.2
11-12 Apr	34.8	35.3	31.7	48.9	48.8	42.2
RBL*	**43.0**	**42.7**	**38.1**	**--**	**--**	**--**
LAeq	**--**	**--**	**--**	**55.1**	**51.8**	**48.6**
Leq, 1hr (day) = 56.7dB(A)			**Leq, 1hr (night) = 50.8dB(A)**			

Table 3: Summary of Noise Logger Results Logger 1, dB(A)
12-19 April 2009 during Minimal Production

Time Period	Background L90			Ambient Leq		
	Day 7am-6pm	Evening 6pm-10pm	Night 10pm-7am	Day 7am-6pm	Evening 6pm-10pm	Night 10pm-7am
12-13 Apr	34.4	44.1	37.2	54.3	51.4	45.5
13-14 Apr	35.3	44.3	35.2	44.9	51.8	48.6
14-15 Apr	37.2	44.3	41.5	50.3	53.2	49.6
15-16 Apr	45.2	34.3	33.2	52.3	45.7	45.3
16-17 Apr	40.3	34.2	30.3	49.0	46.8	44.1
17-18 Apr	33.9	36.8	27.4	47.5	52.2	42.6
18-19 Apr	32.4	36.4	26.6	51.5	45.2	36.8
RBL*	**35.3**	**36.8**	**33.2**	**--**	**--**	**--**
LAeq	**--**	**--**	**--**	**50.9**	**50.5**	**46.0**

Table 4: Summary of Noise Logger Results Logger 2, dB(A)
4-12 April 2009 during Minimal Production

Time Period	Background L90			Ambient Leq		
	Day 7am-6pm	Evening 6pm-10pm	Night 10pm-7am	Day 7am-6pm	Evening 6pm-10pm	Night 10pm-7am
12-13 Apr	32.3	31.7	30.8	53.0	49.1	41.6
13-14 Apr	31.5	34.9	32.5	49.0	47.3	45.7
14-15 Apr	42.9	45.1	44.2	54.8	50.2	49.7
15-16 Apr	47.7	45.4	32.4	57.4	50.0	48.7
16-17 Apr	44.0	44.3	43.3	55.5	49.4	51.1
17-18 Apr	42.6	32.6	32.1	54.5	49.2	46.7
18-19 Apr	33.9	31.8	27.9	52.2	46.1	41.0
RBL*	**42.6**	**34.9**	**32.3**	**--**	**--**	**--**
LAeq	**--**	**--**	**--**	**54.4**	**49.0**	**47.6**
Leq, 1hr (day) = 55.2dB(A)			**Leq, 1hr (night) = 50.6dB(A)**			

Site, weather and measuring conditions were all satisfactory during our surveys. We therefore see no serious reason to modify the results because of influencing factors related to the site, weather or our measuring techniques.

2.2 CRITERIA

2.2.1 Road Traffic Noise

The RTA describes criteria for the assessment of road traffic noise upon residential developments in their Environmental Noise Management Manual. Reference to Page 160 of the RTA's Manual, indicates that noise reduction measures for new developments should endeavour to meet the noise level targets set out in the OEH's Environmental Criteria for Road Traffic Noise (ECRTN). The ECRTN contains a number of criteria applied to a variety of road categories (freeway, collector and local roads) and situations (new, upgraded roads and new developments creating additional traffic on roads). Table 5 shows the relevant categories, taken from Table 1 of the ECRTN:

Table 5 - Extract from Table 2 of ECRTN Showing Relevant Criteria.

Development Type		Day	Night	Where Criteria are Already Exceeded
2	New development affected by freeway / arterial road traffic noise	55 LAeq,15hr	50 LAeq,9hr	Where feasible measures should be implemented to reduce noise.
5	New development affected by collector road traffic noise	60 LAeq,1hr	55 LAeq,1hr	Where feasible measures should be implemented to reduce noise.
11	New development affected by local road traffic noise	55 LAeq,1hr	50 LAeq,1hr	Where feasible measures should be implemented to reduce noise.
13	Land use developments creating additional traffic on collector roads	60 LAeq,1hr	55 LAeq,1hr	Should not lead to an increase in noise of more than 2dB.

Road categories are defined in the ECRTN as follows:

Freeway/arterial includes sub-arterial roads and refers to roads handling through traffic, with characteristically heavy and continuous traffic flows during peak periods. Through traffic is traffic passing through a locality bound for another locality.

Collector road refers to a road situated in a built up area that collects local traffic leaving a locality and connects to a sub-arterial road.

Local road refers to a road handling local traffic with characteristically intermittent traffic flows.

Based on the above definitions Jack McWilliams Road is classified as a collector road.

2.2.2 Site Noise

Noise from industrial noise sources scheduled under the Protection of Environment Operations Act is assessed using the OEH's INP. However, local Councils and Government Departments may also apply the criteria for land use planning, compliance and complaints management. The INP specifies two separate criteria designed to ensure existing and future developments meet environmental noise objectives. The first limits intrusive noise to 5dB(A) above the background noise level and the other aims to protect against progressively increasing noise in developing areas, based on the existing (Leq) noise level from industrial noise sources. Project Specific Noise Levels are established for new developments by applying both criteria to the situation and adopting the more stringent of the two.

The existing L(A)eq for the receiver area is dominated by traffic on nearby roads and natural noise sources during the day, evening and night. Reference to Table 2.1 of the INP shows that the area is classified as urban, i.e. acoustic environment dominated by traffic generated urban hum, and industrial noise contributions are more than 6dB(A) below the recommended Leq, so the recommended Acceptable Noise Level (ANL) applies in this case, i.e. no ANL reduction required for industrial noise contributions.

Table 6 specifies the applicable base objectives for the proposal at nearest residences, based on results gathered at Logger 1 from 12-19 April 2009 to provide a measure of conservatism. In high traffic areas where the existing traffic noise levels are at least 10dB above the Acceptable Noise Level, the high traffic amenity criterion applies.

Table 6: - Base Noise Level Objectives

Period	Intrusiveness Criterion	Amenity Criterion
Day	40 (35+5)	60
Evening	40 (35+5)	50
Night	38 (33+5)	45
Receiver Type: Urban (See OEH's INP - Table 2.1)		

Page 5 of the OEH's *Application Notes-NSW Industrial Noise Policy* recommends that the intrusive noise level for evening be set no greater than the intrusive noise level for daytime and the intrusive noise level for night be set no greater than the intrusive noise level for evening.

Project specific noise levels, determined as the more stringent of the intrusiveness criterion and the amenity / high traffic criterion, are as follows:

Day **40dB LAeq,15 Minute** 7am to 6pm Mon to Sat or 8am to 6pm Sun and Pub Hol.
Evening **40dB LAeq,15 Minute** 6pm to 10pm
Night **38B LAeq,15 Minute** 10pm to 7am Mon to Sat or 10pm to 8am Sun and Pub Hol.

2.2.3 Short Duration Events – Sleep Arousal

Section 2.4.5 of the OEH's Noise Guide for Local Government and Chapter 19-3 of their Environmental Noise Control Manual (ENCM) state "the L1 level of any specific noise source should not exceed the background noise level (L90) by more than 15dB(A) when measured outside the bedroom window". This criterion is applied to residential situations between the hours of 10pm and 7am where a receptor's sleep may be interrupted by noise.

Based on an average minimum background noise level of 33dB(A),L90 for night (10pm-7am), the sleep arousal criterion is set at **48dB(A),L1(1min)** at the bedroom window of any affected residence.

SECTION 3
Noise Impact Assessment
New Packaging Facility and WWTW

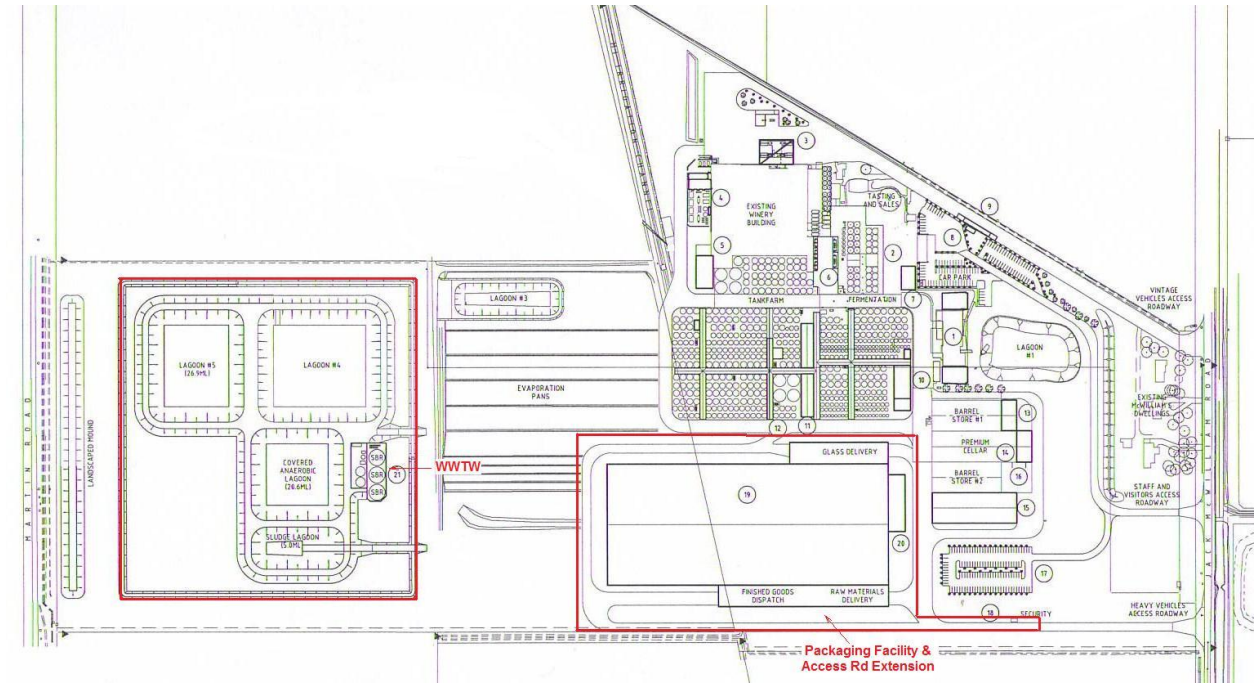
3.1 PROJECT DESCRIPTION

The proposal involves construction of a Packaging Facility and WWTW at the Hanwood Winery. Existing facilities at the site are inadequate for the expanded site, justifying construction of the new facilities. Trucks will access the Packaging Facility via the driveway extension adjacent to the east site boundary off Jack McWilliams Road. The trucks will then park on either the east or west side of the building to be unloaded or deliver goods beneath the covered loading/unloading areas. All product is transported on pallets and unloaded/loaded using gas driven fork lifts. Trucks visiting the site will be either semi-trailers or single-steer rigid single-steer trucks. During normal times deliveries will only occur between 7am and 6pm, except during vintage when 24 hour operation will occur.

Potential noise sources which may impact nearby residents include loading and unloading activities (gas driven fork lift), trucks entering and leaving and manoeuvring on the site, and mechanical plant.

As part of the proposal a new WWTW will be constructed at the southern end of the site near Martins Road. The WWTW will be similar to an existing WWTW at Casella, which has been used as a model for this assessment. Additional storage tanks and some additional mechanical plant may also be required for the existing facility, although all new plant will be located within existing enclosures or structures and will not raise the noise level at any nearby residential receiver.

Figure 2: Proposed Packaging Facility & WWTW



3.2 METHODOLOGY

3.2.1 Road Traffic

Due to the non-continuous nature of traffic flow to and from the site, noise generated by traffic associated with the new Packaging Facility, on public roads, is assessed using the OEH approved US Environment Protection Agency's Intermittent Traffic Noise guidelines.

Equation 1 outlines the mathematical formula used in calculating the Leq,T noise level for intermittent traffic noise.

$$L_{eq},T = L_b + 10\log\left[1+\frac{ND}{T}\left(\frac{10^{(L\max - Lb)/10}-1}{2.3}-\frac{\left(L_{\max}-L_b\right)}{10}\right)\right] \quad \text{..... Equation 1}$$

Where L_b background noise level (dB(A))
T is the time for each group of vehicles (min)
D is duration of noise of each vehicle (min)
L_{MAX} is vehicle noise (dB(A))
N is number of vehicle trips

Typical vehicle noise levels were sourced from our library of technical data, while background noise levels are those described in Section 2.1. The Lmax vehicle noise levels used in Equation 1 are the maximum predicted noise levels produced at the facade of the residence by vehicles entering and departing the site.

3.2.2 Site Noise

Future noise sources on the site cannot be measured at this time, consequently typical noise levels from nearby similar facilities have been sourced from manufacturers' data and/or our library of technical data. This library has been accumulated from measurements taken in many similar situations on other sites, and allows theoretical predictions of future noise impacts at each receiver and recommendations concerning noise control measures to be incorporated in the design of the site. All noise level measurements were taken with a Svan 912AE Sound and Vibration Analyser. This instrument is Type 1 accuracy, in accordance with the requirements of AS1259, and has the capability to measure steady, fluctuating, intermittent and/or impulsive sound, and to compute and display percentile noise levels for the measuring period. A calibration signal was used to align the instrument train prior to measuring and checked at the conclusion. Difference in the two measurements was less than 0.5dB. Sound measurements were generally made around all sides of each machine, to enable the acoustic sound power (dB re 1pW) to be calculated. The sound power level of each item is then theoretically propagated to each receiver with allowances made for spherical spreading, directivity, molecular absorption, intervening topography or barriers and ground effects giving the received noise level at the receiver from that particular plant item.

The sound power level of each activity was determined according to the procedures described in AS2102 or AS1217 as appropriate, and theoretically propagated at to nearby receivers. Propagation calculations were carried out using the following equation. Where noise impacts above the criteria are identified, suitable noise control measures are implemented and reassessed to demonstrate satisfactory received noise levels in the residential area.

Addition of the received Sound Pressure Level (SPL) for each of the individual operating sources gives the total SPL at each receiver, which is then compared to the relevant criterion. Where noise impacts above the criterion are identified, suitable noise control measures are implemented and reassessed to demonstrate satisfactory received noise levels. Each activity/item of equipment was adjusted for duration using the following in-house mathematical formula:

Equation 2:

$$L_{eq},T = Lw - \left[10\ log\ (20\ log\ R + 8)\ + 10\ log\frac{(D\ x\ N)}{T}\right]$$

Where Lw is sound power level of source (dB(A))
R distance to receiver (m)
D is duration of noise for each event (sec)
N is number of events
T is total assessment period (sec)

Calculations were performed with RTA Technology Environmental Noise Model computer software, which accepts information on ground type and topography, source and receiver locations, weather details and source sound power spectra. Ground contours were obtained from topographical maps of the site and surrounds. Results from the noise model are presented for various scenarios in later Sections of this report.

3.2.3 ATMOSPHERIC CONDITIONS

In the Hanwood region atmospheric conditions can exacerbate received noise levels for a percentage of the time. Temperature inversions may be expected in the area during the night and early morning at a frequency of greater than 30% of the time during winter and to a lesser degree in the warmer months. Inversion effects are strongest in the early hours of the morning but tend to weaken rapidly and may be considered to have completely dissipated by 9am or earlier. The ENM model was prepared for the following operating scenarios, as shown below:

1. Neutral atmospheric conditions for day/evening/night, i.e. no wind.
2. 3m/sec wind source to receiver (day).
3. F-class temperature inversion of 3°C/100m and 2m/sec source to downhill receiver wind for night. (See Table C2, Appendix C-DEC's INP)

An F-class inversion, i.e. 3°C/100m, is typical in the Hunter Valley and slightly weaker inversions are generally expected for coastal areas. Therefore, we have modelled this default inversion strength.

Wind in a particular direction causes increased received noise levels at downwind receivers, therefore the effect of noise enhancement due to wind has been considered. Wind will occur more often in the colder months just before dawn, implying the cause is from inversion build-up at night. The INP suggests a 3° inversion with 2m/sec wind downhill for an area with rainfall greater than 500mm/year (See Table C2, Appendix C). Therefore, modelled conditions for night are 3° inversion with 2m/sec wind in each direction. Alternatively, a 3m/sec wind could have been modelled, however less noise enhancement is given for a wind of this strength in all directions, hence the preferred modelling scenario is the former.

3.3 ANALYSIS AND DISCUSSION

3.3.1 Received Noise Levels – Road Traffic

Traffic due to the proposal travelling on nearby public roads is assessed separate to site noise and is subject to the criteria described in Section 2.2.1 of this report. It is assumed that trucks will approach and depart the site from the both directions along Jack McWilliams Road and enter/leave via the dedicated entry/exit.

This assessment assumes up to 3 trucks may visit the Packaging Facility each hour during normal periods, which may occur at any time from 7am to 6pm. Peak periods are also assessed where up to 6 trucks may visit the facility during the busiest 1 hour period. This equates to 3 trucks (6 movements) each hour during normal day periods and 6 trucks (12 movements) during busy periods during day and night.

Truck noise varies from one machine to another, with more modern larger trucks consistently producing a sound power in the range 104 to 108 dB(A) at full power. This assessment assumes a typical truck sound power of 104dB(A), as full engine power is not typically required to approach and depart the site at low speed.

Other vehicle movements during operation of the Packaging Facility include employee vehicles, and private vehicles for occasional deliveries or maintenance, replacement equipment, etc. The number of employee/visitor vehicles visiting the site each day is difficult to quantify as some employees may car pool. However, we have assumed approximately 20 vehicle movements are estimated during a typical hour, with perhaps a further 4-5 vehicles estimated during maintenance periods or other unusual circumstances.

Cars typically produce an average sound power of 92dB(A), however wide variations are noted particularly with smaller modern cars and larger V8 or diesel powered vehicles. Our calculations present the worst case for the situation, as the noise produced by a typical car accelerating at full power is used to determine the received noise level. In reality, many people will not leave the site at full acceleration but will depart more sedately.

Worst case traffic noise generated is therefore estimated to be 12 truck movements and approximately 15 smaller vehicle movements during the busiest 1 hour period. During normal periods perhaps 6 truck movements and 10 smaller vehicle movements may occur each hour.

Traffic Noise Calculations

Tables 7 shows calculations to determine received traffic noise levels at worst affected receivers along Jack McWilliams Road, for typical and peak periods.

Table 7: Traffic Noise Calculations Busiest 1 Hr Period, - dB(A)Leq,1hr
Residences along Jack McWilliams Rd

Traffic and Receiver	Typical Day		Peak Day		Night	
Vehicle Type	Cars	Trucks	Cars	Trucks	Cars	Trucks
Movements per hour	10	6	15	12	15	12
Vehicle Sound Power	92	104	92	104	92	104
Received Noise Level, Lmax	55	67	55	67	55	67
Average Distance to Rec, m	30					
Received Noise Level	35.6	45.8	37.4	48.8	37.4	48.8
Total Received	**46.2**		**49.1**		**49.1**	
Criterion	**60dB(A),Leq 1hr**				**55dB(A),Leq 1hr**	
Impact	**-**		**-**		**-**	
Existing Noise level	**55dB(A),Leq 1hr**				**51dB(A),Leq 1hr**	
Sum current & future	**55.7**		**56.2**		**52.9**	
Criteria (existing Leq +2dB)	**57dB(A),Leq 1hr**				**53dB(A),Leq 1hr**	
Increase	**0.7**		**1.2**		**1.9**	
Acceptable	**Yes**		**Yes**		**Yes**	

The above Table shows the noise impact from traffic movements associated with the new Packaging Facility compliant with the ECRTN criteria during the day and night for typical residences along Jack McWilliams Road. Note that where the criteria are already exceeded, i.e. prior to occupation of the facility, the ECRTN requires that the combined impact from existing and future traffic must not raise the noise level by more than 2dB(A). As can be seen by the above results, vehicle movements will only raise noise levels by 0.7-1.9dB(A), which are considered acceptable. Reference to our logger results reveals that existing average Lmax noise levels are above those predicted from trucks accessing the facility are typical at the facades of residences. Therefore, it is unlikely that there will be any noticeable change in received noise levels due to trucks entering and leaving the facility.

3.3.2 Received Noise Levels – Site Noise

The Acoustic Power Levels of plant and machinery proposed for the Packaging Facility and WWTW, which were input into our computer model, are shown in the following Table. The Table gives the A-weighted sound power levels for each listed plant item, principally based on measurements by us at the site and/or sourced from our library of technical data. Also shown is the number of plant operating at each location on the site.

Table 8: Operation Plant and Equipment – Day/Evening/Night

Machine/Process	Lw dB(A)	Facility Blg W	Facility Blg E	Facility Blg Int	Access Rd/Cpk	WWTW	WWTW Lagoon
Truck	**102**	1	1			2	
Forklift (gas driven)	**82**	1	1				
Packaging line (x4)	**86**			1			
Alarm	**96**			1			
Refrigeration plant	**92**			1			
Wine transf pump	**84**			1			
WWTW plant	**98**					1	
Irrigation pumps	**86**						1
Employee vehicle	**82**				5		
Centrifuge	**84**			1			

Additional plant and noise sources encountered on the site include split system air conditioners, small pumps, small evaporate condensers, etc, all of which produce a sound power less than 80dB. Collectively, with up to 3 or 4 sources operating simultaneously on occasions, the sum could be as high as 95dB. This overall sum is at least 10dB below significant sources shown in Table 8, therefore they will not contribute or raise the sound level at nearby receivers.

Tables 9 shows predicted received noise levels at all nearby residential receivers under neutral and noise enhancing atmospheric conditions, for operation of the Packaging Facility and WWTW. Allowances have been made for intervening structures, topographical features in the calculations.

Table 9: Received Noise Levels for Site Operation – No Noise Control

	Received Noise Levels, dB(A),Leq		
Residential Receiver	**Neutral Conditions # (Day)**	**3m/sec Wind Source to Rec (Day)**	**3°C/100m Inversion (Night)**
R1 – Farm 132 SW	40	42	41
R2 – Martins Rd S	41	44	43
R3 – Martins rd SW	37	40	39
R4 – Old Wil Rd E	39	40	39
R5 – Jack Mc Rd E	37	38	38

Reference to results in Table 9 show that site operations are predicted to exceed the criteria during all time periods at most residential receivers, under neutral and adverse weather conditions. To achieve compliance, noise control must be incorporated into the design of the Packaging Facility and WWTW, consisting of the following:

- Acoustically treat any roof ventilation of the facility.
- Enclose refrigeration plant in an acoustically rated enclosure.
- Install acoustic ventilation louvres to plant room walls.
- Provide absorption to underside of dock roof.
- Erect free-standing acoustic barriers adjacent to all WWTW plant and irrigation pumps.

Tables 10 shows recalculation of received noise levels at all nearby residential receivers under neutral and noise enhancing atmospheric conditions, for site operations, with the above noise control in place.

Table 10: Received Noise Levels for Site Operation – Noise Control in Place

	Received Noise Levels, dB(A),Leq		
Residential Receiver	**Neutral Conditions # (Day)**	**3m/sec Wind Source to Rec (Day)**	**3°C/100m Inversion (Night)**
R1 – Farm 132 SW	36	38	37
R2 – Martins Rd S	35	38	37
R3 – Martins rd SW	34	37	36
R4 – Old Wil Rd E	37	38	37
R5 – Jack Mc Rd E	36	37	37

Theoretical results in Table 10 show that site operations will be compliant with the criteria at all residential receivers, subject to incorporating the specified noise control into the design of the site. Included in Section 6 are noise management strategies and modifications that can be implemented to ensure ongoing compliance.

SECTION 4
Noise Impact Assessment
Existing Winery Operations during Vintage

4.1 DESCRIPTION OF EXISTING OPERATIONS

During non-vintage periods activities at the winery are scaled down, although the majority of fixed mechanical plant remains in operation. However, during vintage activities may occur at full capacity over the full 24 period. Product is transported to the site by highway trucks that enter the site off Jack McWilliams Road. The trucks stop at the weighbridge and then tip the load into the crushers before leaving the site. The presses are empied by conveyor and stockpiled marc at the base of the presses is removed with a front end loader. The product is then processed.

Transport of product to and from the site is provided by sub-contractors using semi-trailers, tippers, twin-steer trucks, or single steer trucks with dog trailers. Peak traffic is estimated at 8 trucks (16 movements) per hour. Employee and contractor vehicles are estimated at 20 vehicles movements each hour during peak periods.

Noise generated by passing vehicles has been assessed at a typical offset distance from Jack McWilliams Road, while noise levels from processing activities were measured during our site visits and with the aid of our unattended noise loggers. Note that during our site visit activities only occurred during the day after 7.00am.

The assessment includes measurement of the existing acoustic environment in the immediate residential area, as detailed in Section 2, to provide baseline data and enable establishment of noise assessment criteria. Nearest residential receivers are described in Section 2.1.

4.2 METHODOLOGY

4.2.1 Road Traffic

As previously stated in Section 2.1, noise loggers were placed at selected locations for the period 5-12 April 2009 when peak activities were occurring at the site, and from 12-19 April 2009 when activities had scaled down. Logger 2 therefore gives a good indication of the traffic noise increase due to truck and car movements associated with the site.

Results have been compared to the criteria to confirm compliance or otherwise.

4.2.2 Site Noise

Noise levels produced by plant and equipment at the winery were measured at nearest residences during our site visits. Measurements were taken with a Svan 912AE Sound and Vibration Analyser, and supplemented by our logger results. The instruments are Type 1 accuracy, in accordance with the requirements of AS1259, and have the capability to measure steady, fluctuating, intermittent and/or impulsive sound, and to compute and display percentile noise levels for the measuring period.

A calibration signal was used to align the instrument train prior to measuring and checked at the conclusion. Difference in the two measurements was less than 0.5dB.

To ensure extraneous noise was eliminated from our attended measurements at residential receivers, i.e. passing neighbourhood traffic, etc, we conducted measurements over a 30 minute period and stored 0.25 second averages (Leq's) in the instrument' internal memory. The duration of each extraneous noise source, such as a birds, barking dog, etc, was time stamped and eliminated from the time trace during analysis.

The desired noise level descriptor was then recalculated to determine the noise level contribution from the winery operations. Where noise impacts above the criteria are identified, suitable noise control measures are offered for consideration to reduce noise impacts at nearest residences.

Site, weather and measuring conditions were all satisfactory during our noise surveys. We therefore see no serious reason to modify the results because of influencing factors related to the site, weather or our measuring techniques.

4.3 ANALYSIS AND RESULTS

4.3.1 Received Noise – Road Traffic

Logger 2 (see Figure 1) was installed at the front facade of the company owned residence 30m from McWilliams Road to measure road traffic noise levels. Table 2 shows results during peak periods, while Table 4 shows results during scaled down production. A summary of the traffic noise metrics are as follows:

Period	***Noise Level Day (7am-10pm) dB(A),Leq 1hr***	***Noise Level Night (10pm-7am) dB(A),Leq 1hr***
5-12 April (Full Prod)	56.7	50.8
12-19 April (Scaled Down Prod)	55.2	50.6

As can be seen by the above results noise from passing traffic at the typical facade of residences along Jack McWilliams Road is 56.7dB(A),Leq 1hr during the day. Jack McWilliams Road is a collector Road and traffic due to the development should not exceed 60dB(A),Leq 1hr. Site traffic noise is below this limit confirming compliance. The RTA also requires noise level increases due to the proposal to be less than 2dB(A). The above results confirm that an acceptable increase of only 1.5dB(A) occurs during full production, confirming compliance.

4.3.2 Received Noise – Winery Site Noise during Vintage

Mechanical Plant:

Logger 1 (see Figure 1) was installed to the south of the winery along the west site boundary and opposite Residence R1, which is the closest residence and most potentially affected by noise from winery operations. The advantage with unattended noise loggers is that they can operate over several days to record noise for an extended period. The disadvantage with using unattended loggers is identifying the origin of exceedances, particularly during the day and evening when extraneous noise from passing cars, birds, etc, will dominate the acoustic environment. For this reason both methods of noise monitoring have been carried out.

Unattended noise loggers are reliable when measuring quasi-steady state noise sources such as chillers, fans pumps, etc, which all run continuously. As stated above, however, the Leq descriptor is significantly influenced by short, loud noise sources and is extremely unreliable in determining the contribution from plant noise when extraneous noise is high. Given the intermittent nature of ambient noise in the area, in comparison to the steady state nature of noise generated by mechanical plant, the L90 logger value is more reliable in describing plant noise emissions.

Note that short-term noise events such as passing cars would need to constitute at least 13.5 minutes of each 15 minute monitoring period to influence the L90 result. Section 2.3 of the OEH's INP supports this methodology and states *"…where the noise emissions from the source are constant and the ambient noise level has a degree of variability, the L90 descriptor may adequately describe the noise source and be much easier to measure/assess. In these cases, it may be preferable to replace the L(A)eq descriptor".*

Reference to Table 1 reveals that plant noise contributions during the day are in the order of 40dB(A) at Residence R1. Since plant will run continuously, this implies a 2dB(A) exceedances of the night criterion of 38dB(A),Leq (15 minute).

Site Activities

Results for our attended noise level survey along the west site boundary adjacent to Logger 1 (see Figure 1) are presented below in the following Table, showing audible noise sources during measurement ranked in approximate order of loudness as read from left to right.

Table 11: Measured Noise Levels – Residence R1

Time	Date	Overall L(A)eq	Winery Activities	Criterion (day)	Impact	Audible Noise
07:00	6/04/09	46	44	40dB(A),Leq	4	4,1,7,12,5,3,2,10
Noise Source Contributions:		Trucks = 45-52			Ind plant to west = 42	
McWilliams Wines = 44 (est)						
L1: 56dB(A) trucks		L10: 51dB(A) plant, natural sources			L90: 39dB(A) plant	

Legend of Noise sources:

1. Trucks
2. Fork lift
3. Winery press
4. Winery press alarm
5. Reverse alarm
6. FEL
7. Birds
8. Fork lift
9. Truck airbrake
10. Winery refrig plant
12. Industrial activity west of site

The above results show that existing winery operations are 4-6dB(A) above the criteria at nearest residences during busy periods. Noise control strategies are therefore offered for consideration in Section 6.

All activities that occur during the day are expected to also occur at night during vintage, when 24 hour operation will occur. Short term noise events such as alarms, truck movements, front end loaders, etc, have the potential to produce louder noise for short periods of time. Our attended monitoring has confirmed that short term events currently produce noise as high as 56dB(A),L1, which is up to 8dB(A) above the Sleep Arousal Criterion of 48dB(A),L1 (1 min). Strategies to reduce the occurrence and level of short term events are discussed further in Section 6.

SECTION 5

Cumulative Noise impact
McWilliams Wines Existing Operations and Proposed Warehouse

5.1 RESULTS AND DISCUSSION

The cumulative noise impact, at the nearest residential receiver to the south (R1), from all activities associated with existing winery activities and the proposal (i.e. Packaging Facility and WWTW), is shown in the following Table.

Table 12: Combined Noise Impact – Peak Activities
Propagated Nearest Residence South of the Site (R1)

Location / Activity	Packaging Facility & WWTW	Existing Winery
Received	38	44
Combined	**45**	
Crit. (day/evening/night)	**40/40/38dB(A),Leq (15 minute)**	
Impact	**5/5/7**	

As can be seen by the results in the above Table, the cumulative noise impact from activities associated with existing operations and the proposal are expected to exceed the criteria by up to 7dB(A) at Residence R1. It should be acknowledged however, that proposed operations will only increase noise at this receiver by 1dB(A) above the existing winery impact.

SECTION 6
Summary of Recommended Noise Control

6.1 NOISE CONTROL RECOMMENDATIONS PROPOSED PACKAGING FACILITY & WWTW

1. We understand Packaging Facility building construction will consist of metal wall and roof sheeting with thermal insulation faced to the inside of all walls and the roof. We further recommend that all walls are faced with 10mm plywood, 9mm FC sheeting or similar material, to a height of 2100mm above FFL.

2. Gaps at wall ceiling junctions are to be sealed with materials of equivalent mass to roof construction, while smaller penetrations are to be sealed with a non-setting sealant, bituminous compound, eaves filler strips, or similar.

3. All doors may remain open during operating hours. However, in the event that complaints do arise (particularly at night or in the late evening), we recommend closing doors closest to the noise source of concern.

4. Any lightweight clear roof sheeting, i.e. alsanite, makralon, laserlight, or similar, proposed to provide natural lighting will reduce the overall noise transmission loss of the building. Therefore, sheets must only be used sparingly at regular intervals along the roof or wall length, i.e. no more than 4m² for each 40m² roof/wall area.

5. Any mechanically driven roof mounted exhaust outlet that produces an SPL above 65dB(A) at a distance of 1 metre must be acoustically treated. An available option is to erect an acoustic barrier around the fan discharge. The barrier must fully enclose at least three sides towards any residence. In our experience, a more efficient and structurally secure barrier is one that encloses all four sides. The barrier must extend at least 500mm above and below the fan centre and/or the highest point of the discharge outlet. The barrier must be no further than 1200mm from the edges of the exhaust. Barrier construction should consist of an outer layer of one sheet of 9mm fibre cement sheeting (Villaboard, Hardiflex), or 15mm marine plywood.

6. Care should be taken when positioning any ventilation openings in the building, as these have the potential to substantially reduce the acoustic performance. Any vents that are located high on the walls or on the roof must be designed to minimise noise leakage and should be positioned where possible so other parts of the structure interrupt the line of sight between the source and the receiver. A total vent area up to 0.5m² is permitted in the east wall and 2m² in other walls. Roof and/or wall vents/louvres above the maximum permitted vent area must be acoustic type louvres in preference to standard louvres. Acoustic louvres will require insertion loss values as detailed below (typically Fantech SBL1, Nap Silentflo 300S Line or Robertson Type 7010):

Required Insertion Loss Values for Louvres – dB

	Octave Band Centre Frequency, Hz							
	63	**125**	**250**	**500**	**1k**	**2k**	**4k**	**8k**
NR	10	12	15	19	20	18	18	14
STL	4	6	9	13	14	12	12	8

7. Any plant outside the main facility building is to be placed in a partial enclosure, i.e. roof structure and solid walls towards residences, or a plant room.

8. Any supply/exhaust fans in plant room roof must not produce an SLP of 65dB(A) at 1 metre. Acoustically rated ducts/louvres must be installed at plant room side of fan for any opening.

9. In-duct silencers are to be fitted to plant room exhaust/intake fan openings. Required insertion loss values are as follows:

Required Insertion Loss Values for Intake/Outlet Fans – dB

	Octave Band Centre Frequency, Hz							
	63	**125**	**250**	**500**	**1k**	**2k**	**4k**	**8k**
dB	3	4	7	13	14	18	18	14

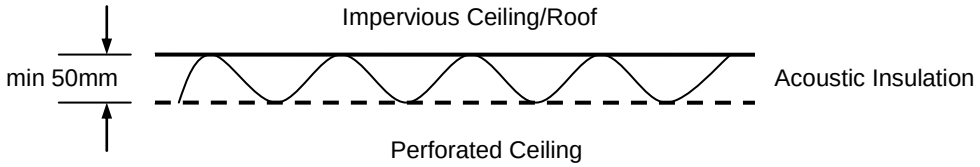
10. Standard ventilation openings are not permitted in the plant room walls. We recommend installing acoustic louvres. The louvres must have the following insertion loss values (typically Fantech SBL1, Nap Silentflo 300S Line or Robertson Type 7010):

Required Insertion Loss Values for Acoustic Barriers – dB

	Octave Band Centre Frequency, Hz							
	63	**125**	**250**	**500**	**1k**	**2k**	**4k**	**8k**
NR	10	12	15	19	20	18	18	14
STL	4	6	9	13	14	12	12	8

11. The underside of awnings over delivery/dispatch loading areas should be treated to absorb reflected noise. See Figure 3 for detail. We recommend a perforated metal ceiling to the underside, i.e. Luxalon, Renhurst, or similar, minimum 10-15% open area, backed with R2 fibreglass or S2 polyester insulation. Alternatively, a perforated plasterboard or perforated FC sheet ceiling may be installed with cavity insulation. If the insulation is exposed to the weather, hosing, washing, etc, we recommend using a water resistant acrylic blanket (available through the supplier of the perforated metal ceiling).

Figure 3: Absorbent Ceiling Detail to Underside of Loading Dock



12. The contractor responsible for supplying and installing mechanical plant must provide evidence that installed plant meets this noise emission limit, or that noise control included with the plant is effective in reducing the sound level to the specified limit. Once the plant layout has been finalised, details should be forwarded to the acoustic consultant for approval.

13. All noise generating plant at the WWTW must be enclosed on all sides with acoustic barriers at least 500mm above the top of the highest plant item. An acoustic barrier is one which is impervious from the ground to the recommended height, and is typically constructed from lapped and capped timber, Hebel Powerpanel, earthen mound, mound/fence combination, etc. No significant gaps should remain in the barrier to allow the passage of sound below the recommended height. Other construction options are available if desired, providing the barrier is impervious and of equivalent or greater surface mass than the above construction options.

14. Acoustic barriers equivalent in height to the top of the plant must be erected on the east, west and south sides of any irrigation pump on bund walls of the WWTW lagoons. Construction should be similar to Item 13 above.

6.2 NOISE CONTROL STRATEGIES – EXISTING OPERATIONS

Theoretical results Section 4 show that existing winery operations during vintage exceed the OEH's criteria at residential receivers by 4-6dB(A) for all time periods, particularly at night.

Many strategies to reduce noise impacts involve simple changes in operational practices which will result in immediate noise reductions. However, other noise reduction strategies involve construction of enclosures, partial barriers, replacement of plant, etc, which can be progressively implemented in various stages over an agreed period and/or as equipment requires replacement.

The following strategies are offered for consideration:

15) Compression braking should be discouraged as trucks approach the site.

16) The front end loader is the dominant noise source on site. We noted that it regularly operates for extended periods of time. Noise sources include the motor, reverse alarm, bucket scraping on concrete to clean up around press area, and bucket bangs caused by hydraulic ram extension.

- The duration of loading activities should be reduced and only necessary tasks carried out at night.
- A flashing light could be installed on the machine and used at night in place of the reverse alarm, subject to occupational health and safety regulations.
- In the long term the loader could be replaced with a quieter machine or a gas driven/silenced bobcat could be used at night.

17) The press alarms should be governed to emit sound no more than 10dB(A) above the ambient background noise level.

18) Trucks and other machines should not be left idling unnecessarily. Machines found to produce excessive noise compared to industry best practice should be removed from the site or stood down until repairs or modifications can be made.

19) The site manager and construction contractor should take responsibility and be available to consult with residents and community representatives. Response to complaints or comments should be made in a timely manner and action reported to the concerned party. Encouraging resident understanding and "participation" gives the local community a sense of ownership in the development and promotes a good working relationship with staff.

20) For both staff and customers, some form of education campaign is suggested to ensure satisfactory noise levels at nearby residences. For staff, the education can be part of in-service training, which can be flowed down contractually to all sub contractors. For visitors reminders may be included in promotional material and reinforced with erection of appropriate signage.

21) All general maintenence activities/equipment, i.e. leaf blowers, edge trimmers and the like must not start prior to 8.00am each morning. We recommend conducting quieter activities such as routine equipment servicing, gardening, etc, before this time. However, some flexibility is available providing compliance with the OEH's INP is upheld.

22) Doors to the Barrel Store Plantroom, main plant room should be kept closed at all times. Ventilation openings in walls should be replaced with acoustic louvres. The louvres must have the following insertion loss values (typically Fantech SBL1, Nap Silentflo 300S Line or Robertson Type 7010):

Required Insertion Loss Values for Acoustic Barriers – dB

	Octave Band Centre Frequency, Hz							
	63	**125**	**250**	**500**	**1k**	**2k**	**4k**	**8k**
NR	10	12	15	19	20	18	18	14
STL	4	6	9	13	14	12	12	8

23) Acoustic barriers should be constructed at the perimeter of the chillers. Barriers should be equivalent in height to the top of the plant and can be constructed from 9mm FC sheeting, 20mm construction plywood, or materials of equivalent surface mass.

24) Speed restriction signs should be erected at regular intervals along all access roads. A speed limit of 20km/hr or lower should be imposed.

25) All access roads should be kept in good condition, i.e. no potholes, etc. Bitumen or other surface coverings should also be considered.

26) All compressors, electric motors, etc, should either be located in acoustic enclosures, within buildings, or in a shielded location behind other structures.

27) Waste disposal bins are to be located in shielded areas, ideally behind walls or buildings, to reduce impacts during collection. It is recommended that waste collection be restricted to weekdays 7.00am to 6.00pm.

28) A regular maintenance schedule should be adopted for all mobile and fixed plant items. Items found producing high noise should be stood down until repairs are completed.

SECTION 7
Conclusion

7.1 CONCLUSION

A noise impact assessment for expansion of the existing McWilliams Wines Winery at Hanwood, has been completed. The report has shown that the site is suitable for operation of the new Packaging Facility and WWTW, providing our recommendations are implemented. With these or equivalent measures in place, noise from activities associated with the proposal will be either within the criterion or generally below the existing background noise level in the area for the majority of the time.

The OEH recognises the difficulty in achieving Project Specific Noise levels for existing developments and generally allows the progressive reduction of noise levels to a predetermined and agreed noise goal (See Section 10.1 – INP). In saying this, the long term goal should be to obtain compliance with the OEH's specified limits, through a continued and diligent noise reduction program. The OEH suggests that the Project Specific Noise Levels should not be applied as mandatory noise limits, but rather provide the initial target levels and drive the process of assessing all feasible and reasonable noise control measures.

Attended noise monitoring surveys confirm that noise emissions from existing winery operations during vintage are currently between 4-6dB(A) above the criteria at nearest residences. However, practical and effective noise control strategies have been offered to reduce noise emissions to acceptable levels. Our suggested strategies are not necessarily the only options available, but are expected to be the most cost-effective and practical with the information currently to hand. Alternative options can be considered providing they result in the same or lower received noise levels at any nearby residence.

We recommend further noise monitoring programs be conducted in the future. The programs will verify the effectiveness of noise control measures incorporated into operation of the site. In the event that complaints may arise, the program will enable noise generating activities to be identified and subsequent measures to be implemented, where required.

REVERB ACOUSTICS

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Principal Consultant

APPENDIX A
Definition of Acoustic Terms

Definition of Acoustic Terms

Term	Definition
dB(A)	A unit of measurement in decibels (A), of sound pressure level which has its frequency characteristics modified by a filter ("A-weighted") so as to more closely approximate the frequency response of the human ear.
ABL	*Assessment Background Level* – A single figure representing each individual assessment period (day, evening, night). Determined as the L90 of the L90's for each separate period.
RBL	*Rating Background Level* – The overall single figure background level for each assessment period (day, evening, night) over the entire monitoring period.
Leq	Equivalent Continuous Noise Level - which, lasting for as long as a given noise event has the same amount of acoustic energy as the given event.
L90	The noise level which is equalled or exceeded for 90% of the measurement period. An indicator of the mean minimum noise level, and is used in Australia as the descriptor for background or ambient noise (usually in dBA).
L10	The noise level which is equalled or exceeded for 10% of the measurement period. L_{10} is an indicator of the mean maximum noise level, and was previously used in Australia as the descriptor for intrusive noise (usually in dBA).