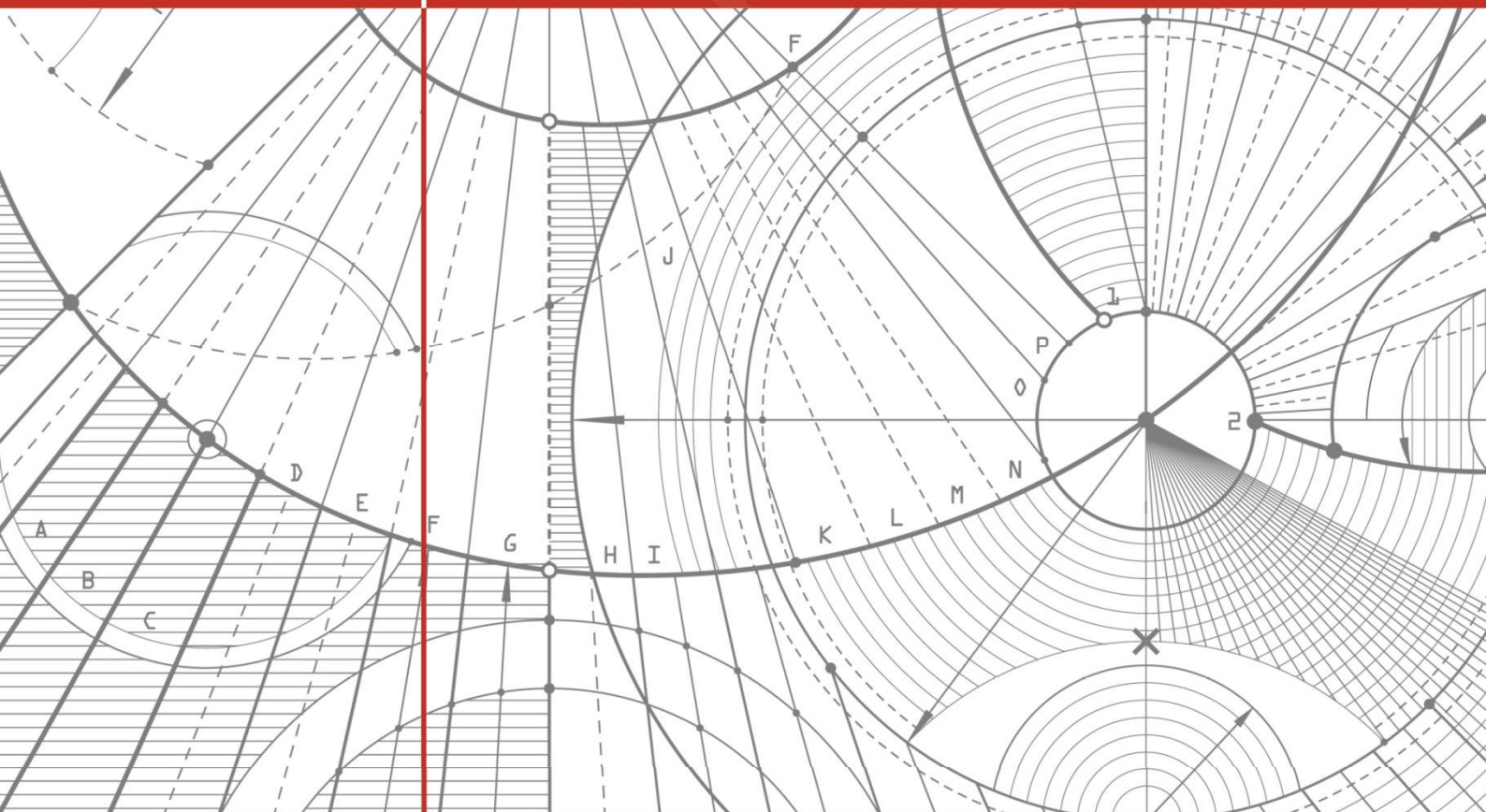


Orora Matraville noise validation Report

B9 Paper machine and associated operations

Draft

31 March 2014





Final v1

4 March 2014

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Contents

1.	Introduction and scope	4
1.1.	Background	4
1.2.	Objectives	4
2.	Operational noise limits	5
3.	Existing environment	7
3.1.	Existing noise sources	7
3.2.	Previous monitoring results	1
4.	Assessment Methodology	4
4.1.	Site measurements	4
4.2.	Modelling Parameters	4
4.3.	Validation measurements	5
5.	Modelling predictions	7
5.1.	Modelling scenarios	7
5.2.	Predicted noise levels	7
6.	Conclusions	9
	Appendix A	10

Document History and Status

Revision	Date issued	Reviewed by	Approved by	Date approved	Revision type
Draft A	11/03/2014			14/11/2013	Practice review

Distribution of Copies

Revision	Copy no	Quantity	Issued to
Draft	1	1	Jacob Chretien

Printed:	11 April 2014
Last saved:	10 April 2014 02:28 PM
File name:	G:\PROJECTS\EN04242 AMCOR Compliance\Amcor validation noise report.docx
Author:	
Project manager:	
Name of organisation:	Orora Limited
Name of project:	AMCOR B9 Paper machine
Name of document:	Validation modelling for noise compliance assessment
Document version:	Final v1
Project number:	EN04242

Glossary

Ambient noise	The all-encompassing noise associated within a given environment. It is the composite of sounds from many sources, both near and far.
Annoyance	Any sound that is perceived as irritating or a nuisance.
Rating Background Level (RBL)	The single-figure background level used in the EPA's <i>Industrial Noise Policy</i> . The ABL is the median of the daily 10 th percentile level of the background noise levels for each day, evening and night time period. That is, three assessment background levels are determined for each 24-h period. The procedure is defined in Appendix B of the EPA's <i>Industrial Noise Policy</i> .
Attenuation	In acoustics, the diluting or holding back of the energy of sound waves as they pass through a material. Materials are rated for their ability to prevent sounds from travelling through them.
A-weighting	An adjustment made to sound level measurement, by means of an electronic filter, to approximate the response of the human ear.
Background noise	The underlying level of noise present in the ambient noise, excluding the noise source under investigation, when extraneous noise is removed. This is de-scribed using the L _{A90} descriptor.
Barrier	Any natural or artificial physical barrier to the propagation of noise.
Buffer	An area of land between an assessment site and a noise-sensitive land use, used as open space or for some other noise-tolerant land use.
Compliance	The process of checking that source noise levels meet with the noise limits in a statutory context.
Construction activities	Activities that are related to the establishment phase of a development and that would occur on a site for only a limited period of time.
Day	The period from 0700 to 1800.
Evening	The period from 1800 to 2200.
Night	The period from 2200 to 0700.
dB(A)	(A weighted decibel) A single number measurement of the sound pressure based on the decibel but weighted to approximate the response of the human ear with respect to frequencies.
Intrusive noise	Refers to noise that intrudes above the background level by more than 5 dB (A)..The intrusiveness criterion is set out in Section 2.1 of the EPA's <i>Industrial Noise Policy</i> .
L _{A90}	The A-weighted sound pressure level that is exceeded for 90 % of the time over which a given sound is measured. This is considered to represent the background noise. During a 15 minute survey, it would represent the quietest 90 seconds.
L _{Aeq}	The equivalent continuous noise level—the level of noise equivalent to the energy-average of noise levels occurring over a measurement period
L _{A,Max}	Maximum noise level measured at a given location over a specified time interval.
L _{A1}	The sound pressure level that is exceeded for 1% of the time for which the given sound is measured.
L _{A10}	The sound pressure level that is exceeded for 10% of the time for which the given sound is measured. The L 10 level measured over a 1-hour period.

1. Introduction and scope

1.1. Background

The Orora B9 Paper Mill at Matraville, formerly AMCOR Packaging was completed and commissioned in 2013.

The operation of the Paper Mill is subject to conditions set out in Ministers Conditions of Approval (MCoA) (including subsequent modifications) and the Environment Protection Licence (EPL) No. 1594. These requirements identify noise limits which the packaging plant must meet during its day to day operations.

As part of the EPL there is a requirement to undertake quarterly monitoring at receivers surrounding the site to show compliance with set noise limits. Also, as part of the MCoA, there is a requirement to undertake a 'noise validation study' to confirm that the noise emissions from the site match those predicted within the Environmental Impact Statement (EIS) and do not exceed the noise limits at each of the closest receivers set out in the MCoA and EPL.

Outcomes of the compliance reporting to date have shown that the noise contribution from the B9 facility cannot be directly measured at the identified receiver locations. This is due to the influence of the other significant noise sources such as traffic and other industry also contributing to the ambient noise level in the area. This has resulted in the need to develop a site wide noise model capturing all the significant noise sources including fixed and mobile plant and equipment.

1.2. Objectives

The objective of this report is to fully assess the noise contribution from the B9 Paper Mill and to quantify the impact on the nearby residential receiver locations. This report includes details of initial monitoring surveys undertaken in May and August 2013 and presents the outcome of site monitoring of noise levels and a modelling assessment that represents the current noise emissions from the Paper Mill.

Orora has taken a proactive approach to noise management for the B9 Paper Machine Project, by commissioning an assessment of noise emissions from the facility through measurement of individual noise sources, which can be used to identify the potential for noise minimisation as part of the overall environmental management for the site.

This model has been further developed as a tool to demonstrate the contribution of noise from within the site at the nearest receiver locations. As ongoing improvements and modifications are made to the Botany Plant, the noise model is being progressively updated to reflect any changes in noise contribution from operation of the new paper machine.

2. Operational noise limits

The noise limits for the B9 Paper machine and associated operations were determined as part of the project approval in July 2007. The site noise emission limits are detailed in Condition 10 of the MCoA and are reflected in Condition L4 of EPL 1594.

The site specific noise limits have been replicated in **Table 1**, with the location of key receivers, where these levels are applicable, presented in **Figure 1**. Condition L4.1 in the EPL, relating to noise emissions from the B9 Paper Mill, states that prescribed noise limits at representative receiver locations identified in **Table 1** must not be exceeded.

L4 Noise limits

■ Table 1 Noise Limits

ID	Location	Day $L_{Aeq,15min}$, dB(A)	Evening $L_{Aeq,15min}$, dB(A)	Night $L_{Aeq,15min}$, dB(A)	Night L_{Amax} , dB(A)
R1	Cnr. McCauley Street and Australia Avenue	46	45	43	55
R2	Australia Avenue	45	45	43	55
R3	Murrabin Avenue	46	45	43	55
R4	Partanna Avenue	42	41	41	55
R5	Cnr. Partanna and Moorina Avenues	42	42	39	55
R6	Moorina Avenue	43	43	39	55

The noise levels in **Table 1** reflect the predicted contribution from the B9 operations alone at nearby receiver locations and represent a noise level that is below the existing ambient L_{Aeq} at these locations and in most instances, below the measureable background noise levels. A discussion of the noise influences surrounding the Paper Mill and a review of previous noise monitoring data at the above listed monitoring locations has been presented in **Section 3**.

■ Figure 1 Compliance monitoring locations



3. Existing environment

3.1. Existing noise sources

The noise environment at residential locations adjacent to the Paper Mill site is comprised of noise sources that generally fall into three main categories. These are:

- Road traffic
- Industrial/ commercial
- Environmental

The noise environment at the nearest residential receivers to the paper mill is a combination of all these noise influences and include identifiable noise sources such as:

- Major roads such as Botany Road/ Bunnerong Road and Perry Street
- Local road traffic and heavy vehicle access to businesses in McCauley Street
- Aircraft fly overs
- B9 Paper Mill noise
- General Port noise/
- Port botany substation
- Purcell Park birds/ domestic activities/domestic animals

Some of these major sources of noise are shown in **Figure 2** with major arterial roads in red, Sydney Ports in yellow and the Port Botany Substation in light blue. Traffic noise from the major transport routes of Botany Road, Beauchamp Road and Bunnerong Road provide a constant noise source for the area and add to the overall background noise levels as well as providing occasional loud noise events from heavy vehicles or loud cars.

Noise sources such as Sydney Ports, Port Botany substation, and the B9 Paper Mill also contribute to the background noise environment at residential locations. Sydney ports and the B9 paper Mill will, on occasion, have a loud noise event that is clearly audible above the general background noise.

Other noise sources such as aircraft movements during the day and evening, domestic and wild fauna, and human activities are characterised by noise events that affect the ambient environment and can mask other lower level noise sources.

The influence of the Paper Mill on the overall noise environment can be generally characterised by the constant nature of its operations, which result in a noise level from the site that does not fluctuate significantly. The Paper Mill noise influence on the overall environment is therefore closely related to the L_{A90} or background noise levels at nearby receiver locations.

The operations of the paper mill also include noise generating activities such as the delivery of raw products and the operation of the waste paper yard, as well as product collection and transport from the reel store adjacent to McCaully Street. These activities are often audible as distinct events within the site but are generally not frequent or loud enough so as to have an effect on the measureable L_{Aeq} noise level at an offsite location.

■ **Figure 2 Major influences of noise - Port Botany area**



3.2. Previous monitoring results

As the background noise level is the most accessible indicator of the steady state, continuous noise emission from the paper mill, a review of the L_{A90} data for the site and adjacent areas has been undertaken to provide additional commentary on the influence and contribution of the operations of the paper mill.

Historical data on the noise environment adjacent to the old AMCOR site has been taken from the original B9 Noise Impact Assessment completed in October 2005 (SKM). This data was measured during the AMCOR August shutdown in 2004. During the May-June period of 2012, the night-time noise levels were again measured during the shutdown of the B7 and B8 paper machines, prior to the commencement of operations of the B9 machine.

During these shutdown periods, without the influence of the paper mill, an estimate of the contribution of other noise sources in the area is possible. The night time L_{A90} background noise levels are more consistent with the main noise influences of the Orora Site, Sydney Port and Botany Road and therefore a better indicator of contribution. In practice the L_{Aeq} noise levels from the Orora site would be about 2 dB(A) above the measureable L_{A90} levels.

In **Table 2** the measured background noise levels during these two non-operational periods have been compared. These levels reflect the sum of existing noise sources at these locations without the contribution of the B7, B8 and B9 paper machines.

■ **Table 2 Background noise levels Orora site shutdown**

ID	Location	Assessment Period	Measured 2004 L_{A90} , 15 Min dB(A)	Measured 2012 L_{A90} , 8 hr dB(A)	Contributing noise sources
R1	Corner McCauley Street and Australia Avenue	Night	-	46	All noise sources other than Orora site: -Botany Road -Port noise -Local and distant traffic
R2	Australia Avenue	Night	43-45	46	
R3	Murrabin Avenue	Night	43-45	42	
R4	Partanna Avenue	Night	39-41	41	
R5	Cnr. Partanna and Moorina Avenues	Night	-	43	
R6	Moorina Avenue	Night	40-43	43	

The background noise levels measured in 2004 were short term averages taken on two separate days and when compared to the more recent 2012 long term monitoring data, indicate a similar noise environment, with common contributing noise sources.

Where the ambient noise environment at a receiver location is comprised of contributions from several different locations within a given geographical area, isolation of a single noise source is not possible. For receivers in adjacent to the Botany Paper Mill it is apparent that the direct measurement of the operations at the project limit levels will not be possible.

An important consideration for the Paper Mill is that the operational noise levels predicted during the project approval stage have been translated into the EPL compliance levels outlined in **Table 1**. It can be seen that when noise emissions from the Paper Mill with the L_{Aeq} values from **Table 1** are compared to the measured L_{A90} levels in **Table 2** the distinction of specific contributions cannot be simply calculated. Recent measurements of the L_{A90} night time noise levels undertaken for the operational compliance monitoring in August 2013 confirm this assertion. Background levels measured during the operation of the Paper Mill and the identified contributing sources are presented in **Table 3**. These measurements represent all observed noise sources and demonstrate that the currently measured levels are similar to the measured background levels during earlier shutdown periods When the Paper Mill was not operational.

■ **Table 3 Background noise monitoring results August 2013**

ID	Location	Assessment Period	Measured $L_{A90, 15 \text{ min}}$ dB(A)	Contributing noise sources
R1	Corner McCauley Street and Australia Avenue	Night	44	-Orora B9 operations -Botany Road traffic -Construction activities to NW -Pump operational McCauley St -Port Noise
R2	Australia Avenue	Night	46	-Orora B9 operations -Botany Road traffic -Port Noise
R3	Murrabin Avenue	Night	48	-Orora B9 operations -Botany Road Traffic -Port Noise
R4	Partanna Avenue	Night	42	-Orora B9 operations -Botany Road traffic -Port Noise -Local traffic
R5	Cnr. Partanna and Moorina Avenues	Night	42	-Botany Road traffic -Port Noise -Local traffic
R6	Moorina Avenue	Night	44	-Botany Road traffic -Port Noise -Local traffic

These measurements are again short term values as opposed to the shutdown monitoring, which collected data for the entire night time period. The short term data is therefore not as robust as the

long term monitoring results. This is apparent at R3 where background noise levels are higher than previously measured.

The result at R3 is expected to be an anomaly as the noise measurements for the receiver locations R2 and R4 either side of the receiver at R3, reflect levels consistent with earlier values for these locations.

Since ceasing operations of the B7 and B8 paper machines (in 2013), residents in Murrabin Avenue, Partanna Avenue and Moorina Avenue have been exposed to significantly lower noise levels from the B9 paper machine. This is due to the removal of the direct influence of B7 and B8 at these locations. In particular in Moorina Avenue and Partanna Avenue, emissions from the Orora site are inaudible and therefore the B9 operations do not contribute significantly to the current noise environment in these areas.

Monitoring to date indicates that the non-fluctuating operations of the B9 facility do not have a significant influence on the overall local noise environment. Where specific noise events such as reversing alarms or heavy vehicle noise or activities associated with the other operations from within the site are audible at residential locations, the perception of exceedances of the project noise limits may be possible.

4. Assessment Methodology

4.1. Site measurements

Measurements of noise sources within the Orora site were undertaken between 4 November 2013 and 5 November 2013. Measurements were generally carried out in a non-reflective, free-field environment. All measurements were undertaken using a calibrated Brüel & Kjær 2260 Type 1 Sound Level Meter (SLM). The SLM was set to measure third-octave band sound intensity levels with a 50 mm spacer designed to optimise noise measurement in the frequency region of interest (63 Hz to 1250 Hz) and was field calibrated prior to use.

Sound intensity levels were measured for a minimum of 20 seconds at a series of pre-determined positions around each piece of equipment and measurement positions were generally taken at a distance of 0.3 m from the principal radiating surface.

4.2. Modelling Parameters

The noise model was produced using SoundPLAN v7.2 modelling software and was developed with the latest available site data. Modelling was undertaken using the ISO9613 algorithm for calculation of outdoor noise propagation. This algorithm incorporates the effects of meteorological conditions favourable to the downwind propagation of noise or average propagation under a well-developed moderate ground-based temperature inversion, such as commonly occurs on clear, calm nights. The ISO9613 algorithm used for in the noise modelling has a published accuracy of ± 3 dB(A) for distances between 100 and 1000 metres, a range which encompasses the nearest residential receivers.

The model included a ground absorption factor of 0% soft ground within the site boundary and a conservative ground absorption factor of 25% soft ground for external locations having a flow resistivity for hard ground.

The overall level of detail included in the model provides a very complete picture of the Paper Mill site, its noise emissions, and the surrounding area. All local buildings and noise barriers have been incorporated into the modelling, which includes LiDAR derived terrain data. Where appropriate existing major transport routes such as Botany Road and Bunnerong Road have been included for some of the modelling scenarios. Not all major sources of noise in the area been included in the modelling such as Sydney Ports, due to the operational complexity and variability in the location of noise sources.

Figure 3 shows a screen shot of the noise model with a view to the south showing the Paper Mill with respect to the nearby residential locations.

■ **Figure 3 SoundPLAN model of B9 Paper Mill and surrounds**



4.3. Validation measurements

Selected locations within the B9 facility were used to measure sound pressure levels for both near and far field to assist in validation of the acoustic model. The model validation locations within the site are shown in **Figure 4** and have been established for use in on going compliance monitoring. **Table 4** presents the results of modelling validation with the measured sound pressure level and the predicted noise level and the variation between the two.

■ **Table 4 Predicted noise levels at validation locations within B9 Paper Mill**

ID	Location description	Measured L _{A90, 15 min} dB(A)	Predicted L _{A90, 15 min} dB(A)	predicted v measured
O1	Fan Floor	83.8	81.8	-2.0
O2	Cooling tower	72.5	72.6	+0.1
O3	Water treatment plant	65.9	66.7	+0.8
O4	Opposite roller door	66.3	66.4	+0.1
O5	Tank farm	71.9	72.3	+0.4
O6	Corner of reel Store	61.0	60.0	-1.0

■ Figure 4 SoundPLAN model onsite validation points



In general the model shows a very good approximation of the onsite noise levels with most of the validation points being within about ± 2 dB(A) of the measured noise levels. The measured noise levels are a short term L_{Aeq} , which are locally influenced by the nearest items of plant and therefore should not be taken as an absolute indicator of the overall model performance. At these locations all L_{Aeq} noise sources are measured including any non-modelled extraneous sources, therefore some variation between the modelled and measured values is expected.

As compliance monitoring at these locations is progressed over time, a more accurate picture of the minor variations in site operational noise levels will be possible. Long term monitoring over several weeks at these locations within the site would be beneficial in establishing appropriate validation levels for future compliance measurements.

5. Modelling predictions

5.1. Modelling scenarios

Direct measurement of the noise from the B9 operations is not possible within the existing noise environment. Modelling scenarios that represent the operations of the Paper Mill alone have been developed to assist in determining what influence noise emissions from the plant have on the local noise environment.

The modelling scenarios include both day and night time operations to reflect the change in level of external activities such as recycled paper deliveries and waste paper yard operations. The modelling of noise emissions from the site can only provide information on the operations of the B9 Paper Mill and its influence on the overall noise environment, which has been demonstrated to be heavily influenced by other noise sources.

To provide a more complete picture of the noise environment, the two major traffic routes, Botany Road and Bunnerong Road, have been included in additional modelling scenarios for reference. These additional scenarios include the estimated influence from road traffic and are purely for comparison purposes to be considered in conjunction with the values obtained from the other background monitoring exercises.

Although the predicted noise levels are an $L_{Aeq, 15min}$ value, in order to give a level of confidence to the modelling, a comparison of the modelled results against to the most recent $L_{A90, 15min}$ monitoring data that includes the contribution from B9 paper machine operations is provided in the tables.

5.2. Predicted noise levels

Table 5 presents the results of daytime noise prediction scenarios both with and without the influence of traffic from Botany and Bunnerong Roads.

■ Table 5 Predicted noise levels at EPL compliance locations – day

ID	Location	Day time noise Limit	Measured Day $L_{A90, 15min}$ dB(A)	Predicted Day $L_{Aeq, 15min}$ dB(A)		Predicted without traffic v Limit dB(A)
			May - Aug 2013	With traffic	Without traffic	
R1	Australia Ave	46	45-44	48.6	48.3	+2.3
R2	Australia Ave	45	48-45	44.4	44.1	-0.9
R3	Murabbin Ave	46	45-47	45.3	45.0	-1.0
R4	Partanna Ave	42	46-47	43.5	41.9	-0.1
R5	Cnr Partanna and Moorina Ave	42	39	46.2	37.3	-4.7
R6	Moorina Ave	43	39	46.5	33.8	-9.2

Table 6 presents the results of the night time noise predictions with the same scenario options as the day time.

■ **Table 6 Predicted noise levels at EPL compliance locations - night**

ID	Location	Night time noise Limit	Measured Night L _{A90 15 min} dB(A)	Predicted Night L _{Aeq 15 min} dB(A)		Predicted without traffic v Limit dB(A)
			May - Aug 2013	With traffic	Without traffic	
R1	Australia Ave	43	46-44	45.5	45.2	+2.2
R2	Australia Ave	43	51-46	40.1	39.8	-3.2
R3	Murabbin Ave	43	51-48	41.4	41.0	-2.0
R4	Partanna Ave	41	43-42	39.9	39.0	-2.0
R5	CNR Partanna and Moorina Ave	39	44-42	41.6	35.2	-3.8
R6	Moorina Ave	39	43-44	42.0	32.7	-6.3

The predicted noise levels from the modelling exercise indicate that the Paper Mill operations is currently within its license conditions at the majority of receiver locations. At the location R1 in Australia Avenue, noise levels are predicted to be above the noise criterion at this location by about 2 dB(A) for the daytime and the night time operational scenarios. The predicted exceedance in this location is primarily due to truck movements through the McCauley Street exit, a scenario which has not yet been the subject of a noise monitoring survey.

Contour plots for the above night time scenarios with and without road traffic are presented in **Appendix A** and provide a more complete picture of the influence of the Paper Mill at all receiver locations.

Modelling has incorporated the effects of meteorology favourable to downwind propagation of noise for each receiver. When these conditions are in effect, the influence of Botany Road and the Sydney Ports site are also expected to enhance the noise environment at the compliance locations.

Ongoing monitoring for external locations is expected to provide greater detail of the existing background noise levels and its composition, while internal monitoring of noise levels will enable continued refinement of the B9 Paper Mill noise model.

6. Conclusions

Jacobs SKM has undertaken a noise compliance assessment for the recently commissioned Orora B9 Paper Mill in Matraville. The operations of the B9 Paper Mill have been the subject of a detailed modelling assessment to assist in determining the noise contribution at receiver locations identified in EPL1594. This assessment has presented historical and current data for offsite measurements both with and without the influence of the B9 or B8 and B7 operations to assist in quantifying the contribution of the B9 Paper Mill to the ambient noise environment.

At receiver locations the noise influence from the B9 Paper Mill is best represented by background noise levels due to the constant nature of the source emissions from the site. The historical data at the key receiver locations indicate that the B9 Paper Machine operations do not have a significant influence on the existing background noise environment when considered in conjunction with other noise sources in the area.

With the exception of a receiver in Australia Avenue, the modelled noise levels from the Paper Mill site are within the required licence conditions for the operation of the plant. Some exceedances are predicted for Australia Avenue due to the movement of product and delivery trucks within the Orora site.

Additional noise monitoring is currently being undertaken in accordance with operational reporting requirements to establish a better indication of noise levels at nearby receiver locations, across a range of seasonal and environment conditions. Additional onsite monitoring is also underway to develop an internal site noise profile, which will be used in refining the noise model and providing a series of reference points for site condition monitoring.



Appendix A Night time noise contours



Appendix B