# Botany Paper Mill

ORORA PTY LTD

## Noise Assessment B7 Demolition

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## Contents

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# 1. Introduction

Orora (formerly AMCOR Packaging) currently operates the B9 Paper Mill at its site in Matraville, Sydney. The Paper Mill commenced full production in early 2013 and was built to supersede two older paper machines, B7 and B8, located in separate buildings within the site.

In December 2013, a fire occurred in the B7 building causing significant structural damage to the building. As a consequence the B7 building has become structurally unsound and requires demolition to ensure the safety of the site.

Also as part of a previous modification, Orora obtained approval to subdivide the site to enable the sale of excess land. Subdivision boundaries were identified in the earlier modification application, however, Orora wishes to modify one of the boundaries of the McCauley Street precinct (Lot 1) slightly to better align with the final internal road alignments.

As a result of these changes, a modification to the existing Part 3A approval for the B9 paper machine is required. The noise impact assessment in this report provides information on the proposed works, identified noise levels at residential locations that may result from the proposal and mitigation measures to address these impacts.

## 1.1 Project description

### 1.1.1 Timing and duration of the works

It is envisaged that the complete demolition of the B7 building and associated infrastructure would take approximately 3 to 5 months. Currently these works would be completed in a single tranche of works with a commencement date to be confirmed.

### 1.1.2 Description of demolition

The areas and structures to be demolished are shown in Figure 4-1 of the main report.

The following activities would be undertaken to demolish the B7 building and associated infrastructure:

- Compound establishment – The demolition contractors would establish a compound adjacent to the B8 building which would include an equipment storage area, recycling and waste bins, a small office and worker amenities.
- Asbestos removal – This activity has already commenced and would continue throughout the demolition period. There is some asbestos lagging around pipes, some asbestos pipes, asbestos in some window eaves and infills and some asbestos sheeting in the internal roof structures. The removal and disposal of asbestos would be undertaken by an appropriately licensed contractor and would comply with the relevant guidelines.
- Removal of the paper machine and any associated services – the old B7 paper machine and associated services have yet to be removed and any salvable components that can be easily removed would be before the demolition of the building.
- Installation of any safety protection structures or measures – Safety protection measures such as scaffolding, supports, traffic diversions etc may be required to ensure that the demolition activities do not pose a risk to workers and site infrastructure. The incoming weighbridge, for example, would require specific protection due to its close proximity to the B7 building.
- Demolition of the building – The B7 building would be demolished progressively from one end to the other by mechanical means. This would be undertaken by specifically modified excavators ranging in size from

30 to 125 tonnes and equipped with shears, hammers, claws and other similar attachments. Generally three bays of the building would be demolished at once. After the further salvage and the loading of the demolition waste, the next three bays would be demolished.

- Further salvage of recyclable items – any recyclable items that are economically feasible to separate from the demolition rubble would be salvaged.
- Loading and disposal of demolition waste – The demolition waste would be load on to trucks and taken to appropriately licenced landfill.
- Demolition of associated infrastructure – Associated infrastructure includes a number of above ground tanks, sections of pipe bridges and other smaller items immediately adjacent to the B7 building.

Demolition of the building would be down to the slab (ie. the slab would be left in place). Any holes in the slab would be filled to provide a trafficable surface. There has been no decision on the future use of this land at this stage – and the areas would remain in Orora's management and ownership.

## 1.2 Scope of assessment

The modification report for the proposed demolition and boundary adjustments requires an operational and construction noise and vibration assessment to determine potential impacts on the nearby residential receiver locations.

The assessment has been undertaken in accordance with the relevant guidelines for the project (see **Section 2**) and has included the following details in identifying potential impacts associated with the proposed modification.

- Identification of residential locations that may be impacted by the proposal
- Details of the timing and proposed methodology for demolition/construction activities
- Assessment of noise and vibration impacts from demolition activities
- Assessment of changes in operational noise impacts due to the removal of B7 building
- Recommendations for noise monitoring and mitigation/management measures

# 2. Planning and approval requirements

A formal application for a modification to the existing Project Approval for the demolition of the B7 building and changes to the subdivision boundary of the McCauley Street precinct has been made to DP&E. The Secretary's environmental assessment requirements (SEARs) dated 27 June 2014 detail key assessment requirements including noise and vibration to be included in the modification report. The SEARs relating to the noise component of the works are presented in **Table 2-1**.

Table 2-1 Environmental assessment requirements for noise

| **Noise and Vibration** | |
|---|---|
| 1 | A quantitative assessment of all noise and vibration impacts on the sensitive receivers during demolition |
| 2 | Details of all management, mitigation and monitoring measures that will be implemented to manage these impacts |
| 3 | A quantitative assessment of the noise impacts on surrounding sensitive receivers once demolition has taken place including consideration of noise generated by activities within the Paper Mill site and existing development within the Port Botany precinct |

In addition to the specific requirements for assessment of noise impacts for the proposal, the SEARs require that consultation with other statutory bodies and authorities is undertaken to ensure consideration of broader impacts are included in the modification report.

Several issues were raised by various organisations however, only Randwick City Council identified noise impacts in their submission. The noise requirements from Council have been summarised as follows:

- Operational noise impacts on residential receivers from the removal of B7 building
- Requirement of detailed operational noise assessment
- Requirement for Demolition Noise & Vibration Management Plan
- Standard working hours for demolition activities.

These issues from Council are to be addressed and assessed in conjunction with the requirements from the SEARs.

## 2.1 Construction/demolition noise guidelines

For the purposes of this report the terms construction and demolition may be used interchangeably when referring to the proposal noise goals. These impacts are assessed against separate criteria for both noise and vibration. Noise transmitted through the atmosphere generally relate to audible noise while ground borne impacts generally relate to vibration.

Vibration impacts can be separated into two categories to where the effects are experienced by humans or building structures. The noise and vibration Standards and guidelines used in the assessment of construction activity for proposals are referenced below.

**Airborne noise guidance**

- Interim Construction Noise Guidelines (ICNG) (DECC, 2009)
- NSW Industrial Noise Policy (EPA 2000).

**Ground borne vibration guidance**

- Assessing Vibration: A Technical Guideline (DEC 2006)
- Australian Standard AS2187.2-2006 Explosives – Storage, Transport and Use
- German standard DIN 4150: Part 3 – 1999, Effects of Vibration on Structures

The methodologies and criteria in these documents provide the basis of the assessment of construction noise and vibration for the modification.

### 2.1.1 Construction/demolition noise goals

The ICNG is the primary noise guideline used for assessment and management of construction noise impact. This guideline takes into account the existing noise environments throughout the day and night and provides a method of calculating a noise goal based on the project specific parameters. The purpose of the ICNG is to enable proposals and projects to be completed in a timely manner, with minimal impact to the community.

The ICNG describes two methods of assessing noise impacts from construction activities:

- the quantitative method, which is suited to major and complex construction projects; and
- the qualitative method, suited to short-term (less than three weeks) works during standard construction hours.

For the quantitative method, the ICNG identifies a Noise Management Level (NML), which is the project specific noise criterion used to assess the level of impact at a receiver location. The NML is derived from the existing background noise levels at representative monitoring locations. The NML level applies at the property boundary or within 30 metres of the dwelling facade exposed to the construction noise, whichever is closer.

The qualitative method does not require assessment against criterion but rather determines if activities are likely to be noisy during sensitive times and/or under otherwise quiet conditions and focuses on work practices to minimise the risk of impact.

**Table 2-2** has been reproduced from the ICNG and outlines the NMLs for sensitive residential receivers for standard construction hours. The table identifies a category of 'highly noise affected' receivers that have been assessed for potential construction noise impacts and therefore restrictions of construction hours may apply to minimise these impacts on sensitive receivers. **Table 2-2** also identifies noise criteria for works undertaken outside standard construction hours. This definition refers to night time works that may be necessary due to accessibility or other reasons such as safety.

- Table 2-2 Construction noise management levels (NMLs)

| Time of day | Management level $L_{Aeq}$ (15 min)* | How to apply |
|---|---|---|
| Recommended standard hours<br><br>Monday to Friday<br>7 am to 6 pm<br><br>Saturday<br>8 am to 1 pm<br><br>No work on Sundays or public holidays | Noise affected<br>(RBL + 10 dB ) | The noise affected level represents the point above which there may be some community reaction to noise.<br>Where the predicted or measured LAeq (15 min) is greater than the noise affected level, the proponent should apply all feasible and reasonable work practices to meet the noise affected level.<br>The proponent should also inform all potentially impacted residents of the nature of works to be carried out, the expected noise levels and the duration, as well as contact details. |
| | Highly noise affected<br>(75 dB(A) ) | The highly noise affected level represents the point above which there may be strong community reaction to noise.<br>Where noise is above this level, the relevant authority (consent, determining or regulatory) may require respite periods by restricting the hours that the very noisy activities can occur, taking into account:<br>1. Times identified by the community when they are less sensitive to noise (such as before and after school for works near schools, or mid-morning or mid-afternoon for works near residences<br>2. If the community is prepared to accept a longer period of construction in exchange for restrictions on construction times. |
| Outside recommended standard hours | Noise affected<br>(RBL + 5 dB ) | A strong justification would typically be required for works outside the recommended standard hours.<br>The proponent should apply all feasible and reasonable work practices to meet the noise affected level.<br>Where all feasible and reasonable practices have been applied and noise is more than 5 dB(A) above the noise affected level, the proponent should negotiate with the community.<br>For guidance on negotiating agreements see Section 7.2.2 of the ICNG (DECC, 2009). |

Noise criteria are also provided within the ICNG for non-residential receivers:

- Industrial premises: external $L_{Aeq}$ (15min) 75 dB(A)
- Offices, retail outlets: external $L_{Aeq}$ (15min) 70 dB(A)
- Classrooms: internal $L_{Aeq}$ (15min) 45 dB(A)
- Places of worship: internal $L_{Aeq}$ (15min) 45 dB(A)
- Passive recreational areas: external $L_{Aeq}$ (15min) 60 dB(A).

The nearest affected sensitive receivers are located in Partanna Street adjacent to the B7 building and are residential dwellings only.

### 2.1.2 Construction vibration

**Human comfort**

Vibration from construction activities must comply with the EPA policy document *Assessing vibration: A technical Guideline* (DECC 2006), which may be classified as one of the following types:

- Continuous – where vibration occurs uninterrupted and can include sources such as machinery and constant road traffic.
- Impulsive – where vibration occurs over a short duration (typically less than 2 seconds) and occurs less than three times during the assessment period, which is not defined. This may include activities such as occasional dropping of heavy equipment or loading / unloading activities.
- Intermittent – occurs where continuous vibration activities are regularly interrupted, or where impulsive activities recur. This may include activities such as rock hammering, drilling, and some demolition activities.

Maximum and preferred values for continuous and impulsive vibration are defined in **Table 2-3**. Application of the human comfort criteria considers the magnitude of impact as well as the duration of exposure, and the time of day. There are also separate criteria for residential and non-residential receivers.

Table 2-3 Preferred and maximum weighted rms values for continuous and impulsive vibration acceleration ($m/s^2$) 1-80 Hz

| Location | Assessment period[1] | Preferred values | | Maximum values | |
|---|---|---|---|---|---|
| | | z-axis | x and y axis | z-axis | x and y axis |
| **Continuous vibration ($m/s^2$)** | | | | | |
| Critical areas[2] | Day or night time | 0.0050 | 0.0036 | 0.010 | 0.0072 |
| Residences | Daytime | 0.010 | 0.0071 | 0.020 | 0.014 |
| | Night-time | 0.007 | 0.005 | 0.014 | 0.010 |
| Offices, schools, educational institutions and places of worship | Day or night time | 0.020 | 0.014 | 0.040 | 0.028 |
| Workshops | Day or night time | 0.04 | 0.029 | 0.080 | 0.058 |
| **Impulsive vibration ($m/s^2$)** | | | | | |
| Critical areas[2] | Day or night time | 0.0050 | 0.0036 | 0.010 | 0.0072 |
| Residences | Daytime | 0.30 | 0.21 | 0.60 | 0.42 |
| | Night-time | 0.10 | 0.071 | 0.20 | 0.14 |
| Offices, schools, educational institutions and places of worship | Day or night time | 0.64 | 0.46 | 1.28 | 0.92 |
| Workshops | Day or night time | 0.64 | 0.46 | 1.28 | 0.92 |

Note
1. Daytime is 7.00am to 10.00pm and night-time is 10.00pm to 7.00am
2. Such as hospital operating theatres or precision laboratories.

Intermittent vibration impacts may be present when continuous vibration sources operate sporadically throughout the assessment period. This type of impact is assessed using vibration dose values (VDVs). The VDV method is more sensitive to peaks in the acceleration waveform and makes corrections to the criteria based on the duration of the source's operation. The VDV is calculated using the overall weighted rms acceleration of the vibrating source in each orthogonal axis and the duration which the vibration occurs. Preferred and maximum VDVs are in the guideline and are reproduced in **Table 2-4**.

- Table 2-4 Acceptable vibration dose values for intermittent vibration ($ms^{-1.75}$)

| Location | Daytime (7.00 am – 10.00 pm) | | Night-time (10.00 pm – 7.00 am) | |
|---|---|---|---|---|
| | Preferred values | Maximum values | Preferred values | Maximum values |
| Critical areas[1] | 0.10 | 0.20 | 0.10 | 0.20 |
| Residences | 0.20 | 0.40 | 0.13 | 0.26 |
| Offices, schools, educational institutions and places of worship | 0.40 | 0.80 | 0.40 | 0.80 |
| Workshops | 0.80 | 1.60 | 0.80 | 1.60 |

Note Includes operating theatres, precision laboratories and other areas where vibration sensitive activities may occur.

### Structural damage

The *Australian Standard AS2187.2-2006 Explosives – Storage, Transport and Use* provides guidance for the assessment of structural damage to buildings caused by vibration. This section of the standard is based on the British Standard 7385: Part 2 *Evaluation and measurement of vibration in buildings* and is used as a guide to assess the likelihood of building damage from ground vibration from demolition equipment. The standard recommends levels at which 'cosmetic', 'minor' and 'major' categories of damage might occur based on the type of structure affected.

The standard uses the component Peak Particle Velocity (PPV) parameter to quantify vibration and specifies damage criteria for frequencies within the 4 Hz to 250 Hz range for buildings. The criteria levels identified in the standard are outlined in **Table 2-5**.

- Table 2-5 BS 7385 Structural damage criteria

| Group | Type of structure | Peak particle velocity (PPV), mm/s | | |
|---|---|---|---|---|
| | | 4Hz to 15Hz | 15Hz to 40Hz | 40Hz and above |
| 1 | Reinforced or framed structures Industrial and heavy commercial buildings | 50 | | |
| 2 | Un-reinforced or light framed structures Residential or light commercial type buildings | 15 to 20 | 20 to 50 | 50 |

The levels for structural damage outlined in the standard refer to non-continuous vibration sources and are considered 'safe limits' up to which no damage due to vibration effects are expected to occur for the various building types. Where vibration is continuous these levels may be reduced by up to 50 per cent and additional assessment against the standard would be necessary.

Where heritage structures are impacted, the German DIN Standard 4150-3 *Structural Vibration, Part 3*: *Effects of Vibration on Structures* can be used for guidance. This standard recommends guideline values for short term vibration impacts on heritage structures and have been summarised **Table 2-6**.

- Table 2-6 DIN 4150-3 Vibration guidelines for heritage buildings

| Type of structure | Guideline values for velocity V*i* (mm/s) | | | |
|---|---|---|---|---|
| | Vibration at the foundation at a frequency of | | | Vibration at the horizontal plane of the highest floor at all frequencies |
| | 1 Hz to 10 Hz | 10 Hz to 50 Hz | 50 Hz to 100 Hz | |
| Heritage buildings | 3 | 3 – 8 | 8 – 10 | 8 |

### 2.1.3 Summary of proposal specific vibration criteria

The guidelines outlined above detail a range of criteria used to determine vibration impacts on sensitive receivers. These vibration limits have been summarised for the proposal in **Table 2-7**, indicating the minimum values for human comfort and building damage criteria.

- Table 2-7 Vibration criteria summary

| Vibration impact type | Vibration limit | |
|---|---|---|
| | Daytime | Night-time |
| Human comfort 1-80 Hz (continuous) | 0.01 $m/s^2$ rms | 0.007 $m/s^2$ rms |
| Human comfort 1-80 Hz (impulsive) | 0.3 $m/s^2$ rms | 0.1 $m/s^2$ rms |
| Human comfort 1-80 Hz (intermittent – vibration does value) | 0.2 $m/s^{1.75}$ rms | 0.13 $m/s^{1.75}$ rms |
| Residential building damage – AS2187.2 (BS7385) | 15 mm/s peak | |
| Heritage building damage – DIN4150-3 | 3 mm/s max | |

## 2.2 Operational noise limits

As well as operational noise limits contained in the project approval, the B9 paper mill is also subject to the conditions of an Environmental Protection Licence (EPL) 1594, administered by the Environmental Protection Authority (EPA). This licence identifies operational noise limits for the site and is to be read in conjunction with item 3 of the SEARs. The following details for operational noise impacts are taken from Section L4 of the Orora EPL 1594:

***L4 Noise limits***

***L4.1*** *Noise emissions from the premises must not exceed the noise limits prescribed in the table below:*

| Location | Day $L_{Aeq(15\ min)}$ dB(A) | Evening $L_{Aeq(15\ min)}$ dB(A) | Night $L_{Aeq(15\ min)}$ dB(A) | Night $L_{Amax}$ dB(A) |
|---|---|---|---|---|
| Corner McCauley Street & Australia Avenue | 46 | 45 | 43 | 55 |
| Australia Avenue | 45 | 45 | 43 | 55 |
| Murrabin Avenue | 46 | 45 | 43 | 55 |
| Partanna Avenue | 42 | 41 | 41 | 55 |

| | | | | |
|---|---|---|---|---|
| Corner Partanna Avenue & Moorina Avenue | 42 | 42 | 39 | 55 |
| Moorina Avenue | 43 | 43 | 39 | 55 |

***L4.2*** *For the purposes of Condition L4.1:*

*a) 'Day' is defined as the period between 7:00 am and 6:00 pm Monday to Saturday and between 8:00 am and 6:00 pm Sundays and Public Holidays.*

*b) 'Evening' is defined as the period between 6:00 pm and 10:00 pm.*

*c) 'Night' is defined as the period between 10:00 pm Sunday to Friday and 7:00 am the following day, between 10:00 pm Saturdays and 8:00 am Sundays, and between 10:00 pm the day preceding a Public Holiday and 8:00 am on the Public Holiday.*

***L4.3*** *Noise from the premises must be measured at any point within 1 metre of any residential boundary to determine compliance with $L_{Aeq}$(15 min) licence noise limits.*

***L4.4*** *Noise from the premises must be measured at any point within 1 metre of any residential building facade to determine compliance with $L_{Amax}$ licence noise limits.*

***L4.5*** *The noise limits specified in Condition L4.1 apply under the following meteorological conditions:*

*a) Wind speeds up to 3 metres/ sec at 10 metres above ground level; and*

*b) Temperature inversion conditions of up to $3^0$C.*

# 3. Existing environment

The noise environment in the Port Botany area is characterised by a variety of noise sources but is dominated by emissions from road traffic, port operations and industrial premises. In addition to the constant background noise levels from these sources, ambient levels are also punctuated with infrequent noise events such as international and domestic aircraft movements at Sydney Airport. Other intermittent noise sources at residential locations around the B9 Paper Mill include local traffic, birds, and human activities in and around Purcell Park.

There have been numerous noise studies undertaken for the Paper Mill during the operations of the B7 and B8 paper machines prior to the commissioning of the B9 paper machine. These studies do not reflect the current noise environment, which has changed as the result of the revised layout and operations due to:

- The new B9 Paper machine located along the South Eastern boundary;
- Demolition of redundant buildings with the site prior to and after commencement of B9 operations;
- Altered traffic access arrangements for waste paper deliveries;

In addition to the onsite changes, operations at Port Botany container terminal have also seen a gradual expansion in activity over the last few years. Port operations for container storage and loading for transport are now located immediately adjacent to Botany Road. These operations are located about 300-400 metres from the nearest residential receivers in Partanna and Moorina Avenues. These and other factors such as increasing traffic on major arterial routes around the Orora site have transformed the noise environment at nearby receiver locations.

## 3.1 Background noise levels

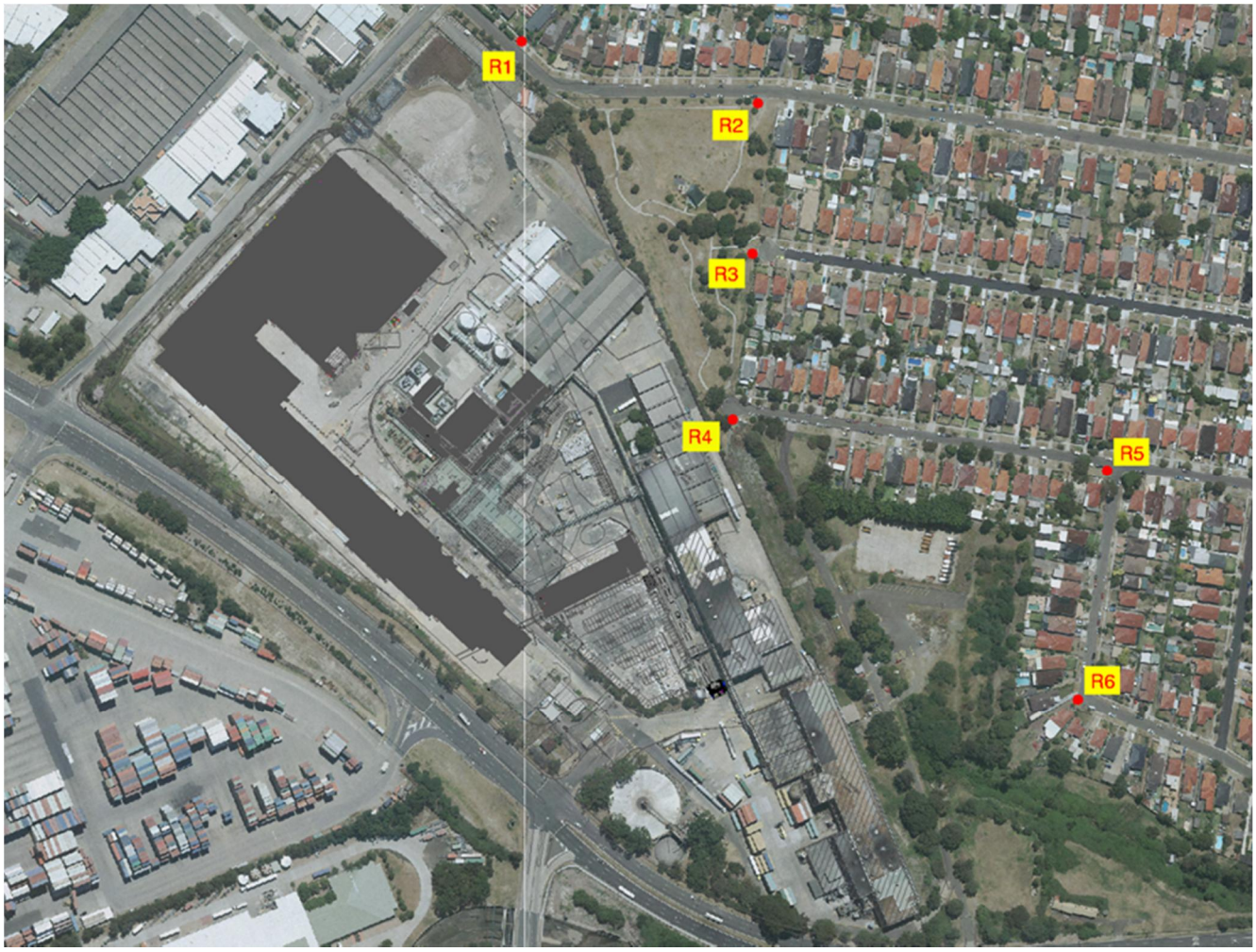
Background noise levels adjacent to the mill have are regularly monitored and measured as part of the operational compliance requirements of the Orora site. **Table 3-1** presents the latest background noise monitoring survey undertaken in July 2014. The daytime noise levels have been adopted for the modification assessment and compared to the predicted construction noise impacts from the demolition works.

Table 3-1 Operational noise monitoring results (15 minute samples)

| ID | Location | Time period | | Noise level dB(A) | | |
|---|---|---|---|---|---|---|
| | | | | $L_{Aeq}$ | $L_{A90}$ | $L_{Amax}$ |
| R1 | 92 Australia Avenue | Day | 12:23 | 54.1 | 45.0 | 75.1 |
| | | Night | 22.05 | 52.4 | 47.4 | 70.0 |
| R2 | Australia Avenue and Purcell Park | Day | 12:42 | 49.1 | 43.4 | 68.9 |
| | | Night | 23:46 | 53.6 | 50.0 | 60.4 |
| R3 | Murrabin Avenue | Day | 13:05 | 48.8 | 44.3 | 66.2 |
| | | Night | 22.28 | 54.8 | 52.3 | 63.3 |
| R4 | Partanna Avenue | Day | 13:28 | 49.2 | 43.8 | 69.2 |
| | | Night | 22:45 | 47.7 | 46.8 | 62.9 |
| R5 | Cnr. Partanna and Moorina Avenues | Day | 14:05 | 50.3 | 40.8 | 78.0 |
| | | Night | 23:27 | 48.7 | 45.7 | 72.2 |
| R6 | Moorina Avenue | Day | 13:46 | 47.9 | 40.6 | 66.8 |
| | | Night | 23:08 | 45.4 | 44.3 | 63.1 |

**Figure 3-1** presents the EPL monitoring locations corresponding to the ID in **Table 3-1**.

Figure 3-1 Compliance monitoring locations




Since commissioning of the B9 paper machine, noise monitoring has been undertaken to assist in establishing an understanding of the noise environment both with and without the B9 mill operating.

Project criteria and a selection of historical data for the night time period are tabulated in **Table 3-2** and compared to the latest monitoring survey in July 2014. The most recent noise data for the night time period is strongly influenced by a temperature inversion. In contrast, the daytime data exhibited a reduction in noise levels compared to the previous monitoring survey at the key receiver locations.

Table 3-2 Comparison of night time background noise (dB(A) rounded)

| ID | Location | Criteria | Background Noise May 2012 | Operational noise Aug 2013 | Operational noise July 2014 | Difference (Aug 2013 vs. Jul 2014) |
|---|---|---|---|---|---|---|
| | | $L_{Aeq}$,15min | $L_{A90}$,period | $L_{A90}$,15min | $L_{A90}$,15min | |
| R1 | Cnr. McCauley Street and Australia Avenue | 43 | 46 | 44 | 47 | +3 |
| R2 | Australia Avenue | 43 | 46 | 46 | 50 | +4 |
| R3 | Murrabin Avenue | 43 | 42 | 48 | 52 | +4 |

| ID | Location | Criteria | Background Noise May 2012 | Operational noise Aug 2013 | Operational noise July 2014 | Difference (Aug 2013 vs. Jul 2014) |
|---|---|---|---|---|---|---|
| | | $L_{Aeq}$,15min | $L_{A90}$,period | $L_{A90}$,15min | $L_{A90}$,15min | |
| R4 | Partanna Avenue | 41 | 41 | 42 | 47 | +5 |
| R5 | Cnr. Partanna and Moorina Avenues | 39 | 43 | 42 | 46 | +4 |
| R6 | Moorina Avenue | 39 | 43 | 44 | 44 | 0 |

Typical noise levels during the day and night (in no particular order) at the monitoring locations included:

- Orora site noise (boiler relief)
- Aircraft movements
- Reverse quacker (Weighbridge/Landscape supplies)
- Orora paper yard reversing beeper
- Heavy vehicle movements (McCauly St)
- General traffic on Botany Road
- Regular aircraft movements
- Bird song
- Distant Port noise
- General traffic (Beauchamp Rd/ Perry St)
- Heavy vehicle movements within the Orora site

The monitoring results indicate that there is a degree of seasonal variation which may also be more or less impacted by meteorology and the relative combination of local noise influences.

# 4. Impact assessment

The impact assessment has been completed for both the construction and operational scenarios through noise modelling of the site and surrounding area. The noise model has been calibrated using measured noise levels from both within the Orora site and externally. As additional monitoring surveys are undertaken, the noise model is being refined to provide increased accuracy for prediction of noise impacts.

For the assessment of this modification request , the noise model is assumed to provide the most accurate estimate of impacts from the Orora site at the current time.

## 4.1 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.

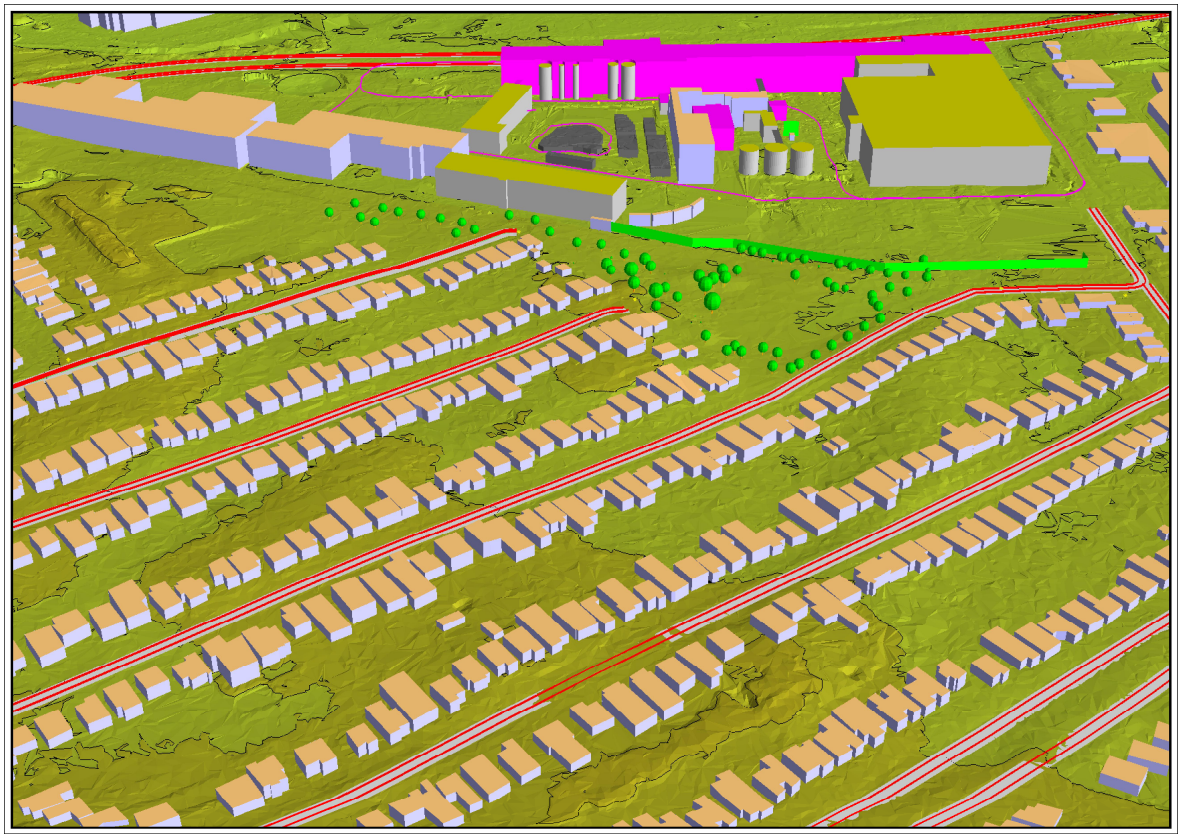
The model included a ground absorption factor of 0% soft ground within the site boundary and a conservative ground absorption factor of 25% soft ground for external locations having a flow resistivity for hard ground.

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 accutare to within 0.2 of a metre.

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 4-1** 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 4-1 SoundPLAN model of Orora site and surrounds



The prediction of noise impacts is undertaken against the details provided for the demolition and operational scenarios outlined below.

## 4.2 Construction/demolition scenario

The demolition of the B7 Paper Machine Building would be completed by experienced contractors specialising in the dismantling and removal of industrial buildings. For a full description of the proposed activities see **Section 1.1.2**.

The operator is expected to have about 20 staff on site at any time comprising:

- 4 x plant operators;
- 4 x demolition technicians;
- 10 x asbestos removal technicians; and
- Crane crew

Prior to works commencing temporary site accommodation would be established to cater for the project staff and would consist of lunch rooms, toilets, site office & first aid room. The buildings would be established near the B7 & B8 buildings.

The work would be completed with purpose built demolition and scrap processing machines including 30t, 45t, 80t and 125t excavators with attachments such as:

- demolition shears

- concrete pulverizes
- scrap shears
- scrap grapples
- hydraulic impact breakers
- demolition breakers

The B7 building and redundant machinery and equipment would be demolished using mechanical means wherever possible. Cold cutting techniques will be adopted using scrap & demolition shears, which will minimise the use of hot works and thereby reduce fire hazards, but would have higher noise contribution.

The demolition would be completed progressively demolishing, processing and removing the existing structure in 3-bay increments. This progressive demolition would be undertaken moving from east to west through the building using mechanical means to remove the material in a controlled manner. Higher noise levels would be expected during the demolition process with significant periods of reduced noise emissions during the scrap sorting and removal.

The work undertaken in each section would start with the removal of the roof structure followed by the systematic scraping of debris from the first floor using a long reach excavator. Dust would be supressed by means of a water mist suppression system. The debris would be transferred to the ground floor then to lined bins for disposal as contaminated waste. The whole process is expected to require the removal of about 12,750 tonnes of masonry and concrete, and about 1,700 tonnes of scrap steel.

The modelling scenario has considered 7 stages (7x3bays) for the building demolition. These works would be undertaken over about 3-5 months from establishment to site handover. Three items of equipment having a combined Sound Power Level of 120 dB(A) has been used in the prediction of demolition noise impacts.

The demolition is expected to take place starting from the eastern end of the building and progressing towards the west. Truck movements removing spoil would be from via the main front gate on to Botany Road. All operations during the demolition phase would be undertaken during standard construction hours outlined in **Table 2-2**.

## 4.3 Operational scenarios

Vehicles unloading paper to the waste paper yard would use the existing route through the site during the demolition process. The operational scenario of the mill would not change after the demolition has been completed.

Once the B7 building is removed, some residences in Partanna Avenue may have a clear view of Botany Road and the Port Botany container terminals. The waste paper yard operations and the B9 building would be visible by some residents in Partanna and Moorina, which would become more identifiable within the noise environment as a source of noise emissions.

## 4.4 Construction noise and vibration

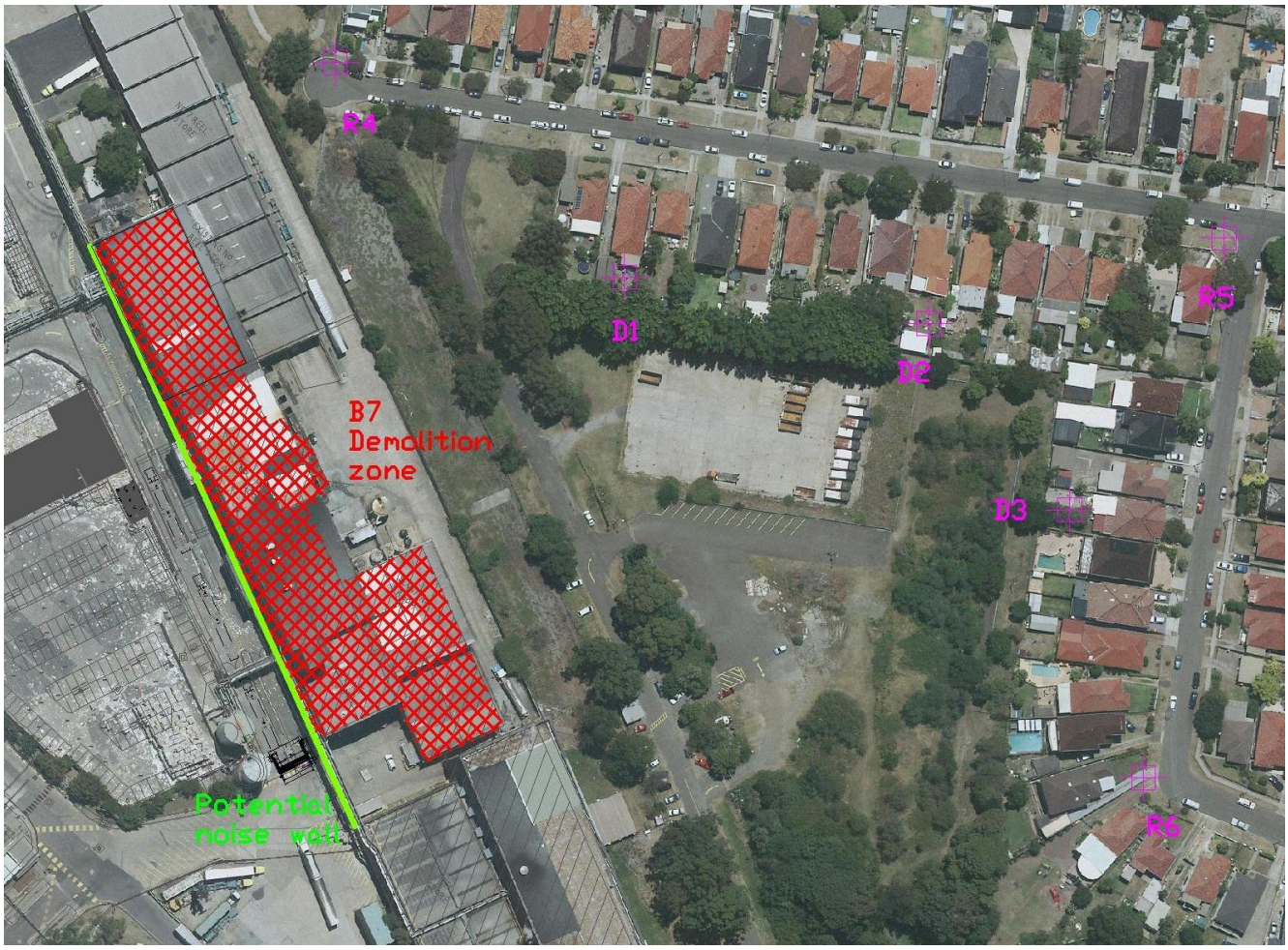
Vibration criteria for the proposal have been outlined in **Section 2.1.2**. The closest residential dwellings are situated about 100 metres from the nearest point on the B7 building. The activities to be undertaken for the demolition of B7 do not require extensive subsurface earthworks and therefore would have minimal opportunity to generate vibration impacts at these residential locations.

During demolition it is possible that falling debris could generate infrequent impulsive vibrations into the existing building slab, which may then be transferred to the nearby receivers. These impacts are not expected to exceed

the guideline levels however, potential impacts would be managed throughout the demolition process with measures outlined in **Section 5**.

Construction noise impacts have been estimated at each of the key receiver locations as well as 3 additional demolition locations. The additional demolition locations indicated by the prefix ‘D’ in Figure 4-2 represent the most affected receivers in Partanna and Moorina Avenues.

- Figure 4-2 Demolition zone and receiver locations




The daytime NMLs for the proposal have been adopted from the requirements in **Table 2-2** and the most recent noise monitoring outlined in **Table 3-1**.

Construction/demolition NML are presented in **Table 4-1** against the predicted noise levels at each location. The various stages assessed account for the gradual removal of the building and the increase influence of traffic noise and the Orora site.

Table 4-1 Predicted demolition noise levels at key locations (daytime)

| ID | Location | Day NML criteria $L_{Aeq,15min}$ | Demolition stages (Per 3 bays) | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| R1 | Cnr. McCauley Street and Australia Avenue | 55 | 46 | 46 | 46 | 46 | 46 | 46 | 46 |
| R2 | Australia Avenue | 53 | 45 | 42 | 42 | 42 | 43 | 43 | 43 |
| R3 | Murrabin Avenue | 54 | 47 | 44 | 46 | 46 | 48 | 46 | 44 |
| R4 | Partanna Avenue | 54 | 55 | 59 | 59 | 60 | 59 | 60 | 57 |
| R5 | Cnr. Partanna and Moorina Avenues | 51 | 55 | 51 | 49 | 50 | 51 | 53 | 49 |
| R6 | Moorina Avenue | 51 | 49 | 53 | 53 | 53 | 53 | 54 | 48 |
| D1 | Partanna Avenue | 54 | 63 | 59 | 66 | 67 | 66 | 68 | 62 |
| D2 | Partanna Avenue | 51 | 61 | 61 | 62 | 62 | 61 | 63 | 58 |
| D3 | Moorina Avenue | 51 | 57 | 57 | 57 | 58 | 57 | 56 | 52 |

The predicted noise levels indicate that the NMLs for receivers in Partanna and Moorina avenues are likely to be exceeded during most stages of the demolition works. Residential receivers directly opposite the B7 building would be the most affected due to the absence of any direct shielding between the dwellings and the building.

While exceedances are predicted, the estimated levels are expected to be worst case and are not expected to reach the highly impacted noise levels criteria from **Table 2-2**. In practice, levels will vary depending on the activity and the quantity of plant operating at the time, and would be audible within about a 7 dB(A) range, with the higher levels near the upper end of these values.

Noise monitoring surveys should be used to confirm these predictions during demolition and provide recommendations for reducing noise levels where impacts cannot be managed using standard mitigation measures. Details of management and mitigation options are presented in **Section 5**.

## 4.5 Operational noise

**Table 4-2** presents the results of daytime noise prediction scenarios without the B7 building or the influence of traffic from Botany and Bunnerong Roads. These results provide information on the true predicted influence of the B9 operations on the nearby residential receivers after the removal of the B7 building. The predicted noise levels do not include any benefit from noise walls or other mitigation to replace the loss of shielding offered by the building.

Table 4-2 Predicted noise levels at EPL compliance locations – No B7, No External Roads

| ID | Location | Project noise Limit $L_{Aeq(15\ min)}$ dB(A) | | Predicted $L_{Aeq(15\ min)}$ dB(A) | |
|---|---|---|---|---|---|
| | | Day time | Night time | Day time | Night time |
| R1 | Australia Ave | 46 | 43 | 45.6 | 44.2 |
| R2 | Australia Ave | 45 | 43 | 41.5 | 39.5 |
| R3 | Murabbin Ave | 46 | 43 | 42.4 | 40.6 |
| R4 | Partanna Ave | 42 | 41 | 42.8 | 42.1 |
| R5 | Cnr Partanna and Moorina Ave | 42 | 39 | 39.8 | 39.1 |
| R6 | Moorina Ave | 43 | 39 | 38.9 | 38.4 |

The predicted levels indicate general compliance with project noise limits. Marginal exceedances or compliance in Partanna Avenue and Moorina Avenues are indicated by the modelling. The increase in noise levels at these locations is a direct result of the removal of the B7 building resulting in greater exposure to the operations from within the site.

At Partanna Avenue, a greater exposure to the waste paper yard operational activities is the major contributor to the increase in noise levels.

The predicted increase in noise levels impacts would be mitigated by means of additional shielding adjacent to the waste paper yard from a local noise barrier. **Table 4-3** presents the outcomes of modelling with an 8 metre noise wall in place at the boundary of the B7 building adjacent to the paper yard.

Table 4-3 Predicted noise levels at EPL compliance locations – No B7, No External Roads

| ID | Location | Project noise Limit $L_{Aeq(15\ min)}$ dB(A) | | Predicted $L_{Aeq(15\ min)}$ dB(A) | |
|---|---|---|---|---|---|
| | | Day time | Night time | Day time | Night time |
| R1 | Australia Ave | 46 | 43 | 45.6 | 44.2 |
| R2 | Australia Ave | 45 | 43 | 41.4 | 39.5 |
| R3 | Murabbin Ave | 46 | 43 | 42.3 | 40.6 |
| R4 | Partanna Ave | 42 | 41 | 40.5 | 39.3 |
| R5 | Cnr Partanna and Moorina Ave | 42 | 39 | 39.3 | 38.9 |
| R6 | Moorina Ave | 43 | 39 | 38.0 | 37.7 |

The predicted noise levels indicate that a noise barrier located adjacent the waste paper yard would provide sufficient attenuation to reduce noise levels to within the project noise limits (see Figure 4-2). The location and finished height of the modelled noise wall is indicative only and would be subject to survey and feasibility constraints for the site once the B7 building has been removed.

Due to the expected marginal compliance of the site noise limits, it is recommended that a detailed noise monitoring survey is undertaken after the removal of the B7 building to confirm the noise levels predicted in this assessment.

To provide additional information on the expected noise levels at these receiver locations, a cumulative noise impact assessment has been undertaken for the site. The cumulative impacts include the influence of road traffic noise from some of the nearby arterial roads which provide a significant noise source in in the area. In modelling these impacts an estimate of actual noise levels at the key receiver locations is possible.

## 4.6 Cumulative Impacts

The cumulative impacts resulting from the demolition of B7 have been assessed based on the available information of traffic data for Botany Road. Estimated total vehicle movements for the modelling are expected to be around 30,000 vpd for Botany Road and about 22,000 vpd for Bunnerong Road.

The modelling for the cumulative case with and without the B7 building providing shielding to the residents in Partanna and Moorina is presented in **Table 4-4**.

Table 4-4 Predicted noise levels at EPL compliance locations – Including external roads

| ID | Location | Predicted With B7 $L_{Aeq(15\ min)}$ dB(A) | | Predicted No B7 $L_{Aeq(15\ min)}$ dB(A) | | Difference B7 and no B7 dB(A) | |
|---|---|---|---|---|---|---|---|
| | | Day | Night | Night | Day | Night | Day |
| R1 | Australia Ave | 48.3 | 46.6 | 48.4 | 46.6 | 0.1 | 0 |
| R2 | Australia Ave | 45.7 | 43.6 | 46.2 | 44.2 | 0.5 | 0.6 |
| R3 | Murabbin Ave | 45.9 | 43.9 | 46.4 | 44.2 | 0.5 | 0.3 |
| R4 | Partanna Ave | 47.1 | 44.2 | 48.7 | 46.3 | 1.6 | 2.1 |
| R5 | Cnr Partanna and Moorina Ave | 47.9 | 45.1 | 49 | 46.5 | 1.1 | 1.4 |
| R6 | Moorina Ave | 51.9 | 48.6 | 52 | 48.9 | 0.1 | 0.3 |

The predicted noise levels from the modelling indicate that the noise levels at the nearest receivers without the B7 building in place would be about 2 dB(A) above the predicted noise levels with the building in situ.

While the increase in the $L_{Aeq}$ noise level is predicted to be small, the audibility of specific site noise emissions such as the operations of the waste paper yard is expected to be an identifiable source of the overall noise levels.

The resulting noise levels outlined in table **Table 4-4** would exceed the project noise goals however, as per the predictions in **Table 4-2**, the contribution from the Orora site is expected to be with the EPL noise limits. Overall noise levels are expected to be comparable to the existing $L_{Aeq}$ levels measured during the compliance noise surveys undertaken for the Paper Mill. This assumption will be detailed further using information from upcoming monitoring surveys undertaken during both normal and shutdown conditions.

# 5. Mitigation

Potential mitigation measures are presented for the construction and operational scenarios for the proposal. These measures would be further advanced in accordance with the proposal requirements outlined is Section 2, with a specific Demolition Noise and Vibration Management Plan (DNVMP) to be incorporated into the overall site Environmental Management Plan for the demolition works.

The operational noise levels are to be further assessed in the Orora noise barrier management plan that forms a wider strategy for the whole site. This management plan is to be updated once the B7 site has been cleared and a post demolition noise survey is completed.

## 5.1 Demolition mitigation

Exceedances of the Proposal NMLs are predicted at a number of the closer receiver locations during the demolition works. Where these exceedances expected to occur, noise would be mitigated through management and mitigation measures to minimise and eliminate some impacts.

Prior to commencing the demolition activities, the existing staged CNVMP would be updated to include demolition activities. This would detail how work is to be carried out to minimise the impacts of noise and vibration on adjacent properties.

Measures to reduce potential noise impacts should include general controls such as:

- Compliance with standard construction hours: 7am – 6pm (Monday-Friday), 8am-1pm (Saturday) and at no time Sundays and public holidays, unless otherwise approved through a DNVMP approved by the Department of Planning.
- Notifying the nearest noise receptors of the works plan and expected levels of noise well in advance of the works occurring, and responding to residents comments when planning noisy activities.
- Timetabling to minimise noise impacts - this may include time and duration restrictions and respite periods, and should be considered after consultation with affected receivers.
- Where reasonable and feasible, locating static equipment such as generators and air compressors as far as possible from residential receivers, or within acoustic enclosures or behind noise barriers..
- Where possible, avoiding using noisy plant simultaneously and/or close together. This should include equipment operating at separate early work sites to avoid cumulative noise impacts.
- Orienting equipment and demolition work sites where possible to reduce noise emissions to sensitive receivers. This may include using the existing façade of the structure as a noise barrier until the final stage of demolition phase during the bay removal.
- Maintaining equipment in efficient working order.
- Using quieter construction methods where possible.
- Where acceptable from an Occupational Health and Safety perspective, using quieter alternatives to reversing alarms (such as spotters, closed circuit television monitors and ‘smart’ reversing alarms), particularly during night time activities.
- Dealing promptly with all noise complaints received.
- Machinery would not be turned on prior to the work hours outlined above. This would include the daily maintenance activities and/or ‘warming up’ of engines.

- Where it has been identified as necessary (eg in response to community complaints), noise monitoring would be undertaken to check that the noise mitigation measures are effective.

Further construction noise mitigation methods are contained in Tables 4 to10 of the *Interim Construction Noise Guideline* (DECC, 2009). The final DNVMP would be completed in conjunction with the selected contractor and submitted for approval to Planning and Council prior to commencement of the works.

## 5.2 Operational mitigation

The proposed demolition of the B7 building would remove a significant source of shielding that cannot be directly replaced. The expected increase in noise levels resulting from the demolition of the B7 building is likely to be marginal in meeting the EPL compliance levels. It has been demonstrated that additional mitigation such as a local noise wall would reduce noise levels to below the EPL noise limits at the nearest receiver locations, and therefore becomes an effective mitigation option.

To provide a full assessment of the required barrier height and location, a noise monitoring survey and detailed assessment for the noise barrier management plan would be completed for the site once the B7 building is demolished.

An updated Noise Barrier Design Plan would be submitted to DP&E once the location and height of the new noise wall had been determined.