

Moorebank Precinct West Intermodal Terminal Facility - Modification

Noise and Vibration Impact Assessment



SIMTA

SYDNEY INTERMODAL TERMINAL ALLIANCE

Part 4, Division 4.1, State Significant
Development

MPW CONCEPT PLAN MODIFICATION
NOISE AND VIBRATION IMPACT ASSESSMENT

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GLOSSARY OF ACOUSTIC TERMS

Most environments are affected by environmental noise which continuously varies, largely as a result of road traffic. To describe the overall noise environment, a number of noise descriptors have been developed and these involve statistical and other analysis of the varying noise over sampling periods, typically taken as 15 minutes. These descriptors, which are demonstrated in the graph below, are here defined.

Maximum Noise Level (L_{Amax}) – The maximum noise level over a sample period is the maximum level, measured on fast response, during the sample period.

L_{A1} – The L_{A1} level is the noise level which is exceeded for 1% of the sample period. During the sample period, the noise level is below the L_{A1} level for 99% of the time.

L_{A10} – The L_{A10} level is the noise level which is exceeded for 10% of the sample period. During the sample period, the noise level is below the L_{A10} level for 90% of the time. The L_{A10} is a common noise descriptor for environmental noise and road traffic noise.

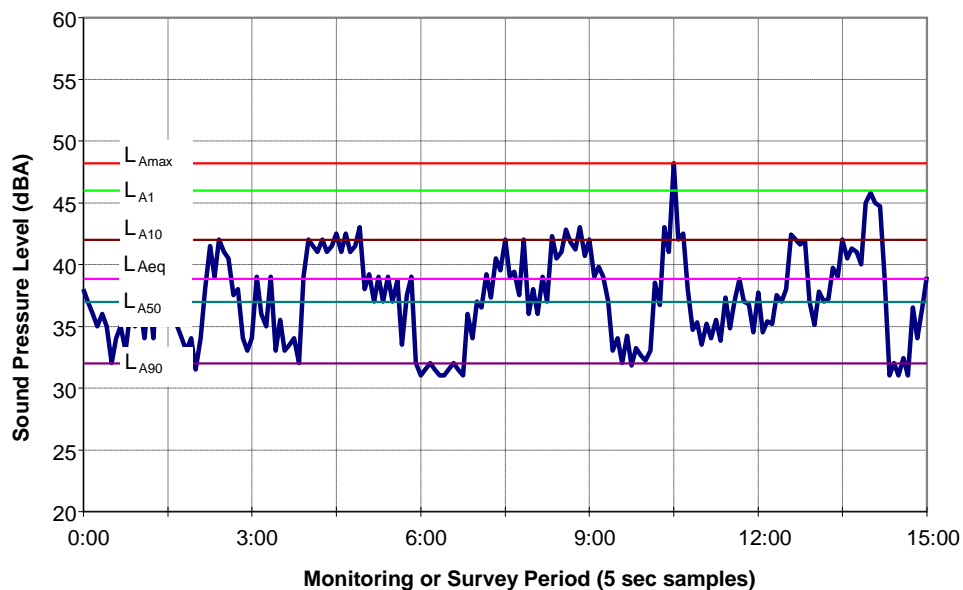
L_{A90} – The L_{A90} level is the noise level which is exceeded for 90% of the sample period. During the sample period, the noise level is below the L_{A90} level for 10% of the time. This measure is commonly referred to as the background noise level.

L_{Aeq} – The equivalent continuous sound level (L_{Aeq}) is the energy average of the varying noise over the sample period and is equivalent to the level of a constant noise which contains the same energy as the varying noise environment. This measure is also a common measure of environmental noise and road traffic noise.

ABL – The Assessment Background Level is the single figure background level representing each assessment period (daytime, evening and night time) for each day. It is determined by calculating the 10th percentile (lowest 10th percent) background level (L_{A90}) for each period.

RBL – The Rating Background Level for each period is the median value of the ABL values for the period over all of the days measured. There is therefore an RBL value for each period – daytime, evening and night time.

Typical Graph of Sound Pressure Level vs Time



1 INTRODUCTION

The Moorebank Intermodal Company (MIC) has received Concept Plan Approval, under Part 4, Division 4.1 of the *Environmental Planning and Assessment Act 1979* (EP&A Act), to develop the Moorebank Intermodal Terminal Project (MPW Project) on the western side of Moorebank Avenue, Moorebank, in south-western Sydney (the MPW site).

On 4 June 2015, the MIC, with the approval of the Commonwealth Government, entered an agreement with the Sydney Intermodal Terminal Alliance (SIMTA) under which SIMTA will obtain approvals, build and operate all stages of the MPW Project at Moorebank. SIMTA is seeking approval to modify the Moorebank Intermodal Company (MIC) Concept Proposal and Early Works (Stage 1) approval (SSD_5066) (MPW Concept Plan Approval).

The Environmental Impact Assessment (EIS) prepared for the Concept Plan Approval identified that fill material required for the development of the MPW site would be largely sourced from excavations within the MPW site and hence imported fill volumes for the project would be small. Subsequent civil design development for the MPW Project has identified that fill required to be imported to the MPW site is estimated at 1,600,000 cubic metres (m³). It is proposed to undertake additional site preparatory works, including the import, placement and stockpiling of clean fill, as a modification to the approved Stage 1 (Early Works) (Early Works).

This Noise and Vibration Impact Assessment (NVIA) has been prepared to support an application made under section (s) 96(2) of the EP&A Act to modify the MPW Concept Plan Approval (SSD_5066).

1.1 Proposed Works

It is proposed to undertake additional site preparatory works, including the import, placement and stockpiling of clean fill, as a modification to the approved Early Works. The proposed modification would result in an intensification of activity associated with the approved Early Works. The works, for which a modification is sought (the Modification Proposal), include the following:

- Minor vegetation removal (not Endangered Ecological Communities, slightly above that provided within Early Works)
- Import, by truck, of approximately 1,600,000m³ of fill (from offsite locations)
- Crushing and screening of oversized materials and demolition materials stockpiled during Early Works, for direct placement on site
- Stripping and stockpiling of topsoil within the area of impact, cut and fill (within the primary earthworks areas) and stockpiling of clean fill within the primary earthworks areas (see Figure 1-1)
- Temporary sediment and erosion control works, including onsite detention basins (greater than those envisaged within the Early Works)
- Establishment of temporary internal haulage routes, construction compounds (including, but not limited to, a materials crusher and other plant and equipment) (additional to those included within Early Works).

The proposed works are planned to commence in the last quarter of 2016, with an approximate construction period of six to nine months.

Figure 1-1 shows the location and extent of the Modification Proposal, which would occur largely within the footprint of the approved Early Works.

It is anticipated that the Modification Proposal works would be undertaken during the hours identified in Table 1-1. These hours extend those identified in the MPW Concept Plan documentation to include the evening period between 6pm-10pm on weekdays and Saturday afternoons between 1pm and 6pm.

As presented in Table 1-1, direct placement is proposed to be carried out from 6:00pm to 10:00pm on weekdays. At certain stages of the proposed works, it may be desirable to conduct stockpiling between 6:00pm and 10:00pm on weekdays, however this would be conducted in lieu of direct placements, and not as an additional, concurrent activity.

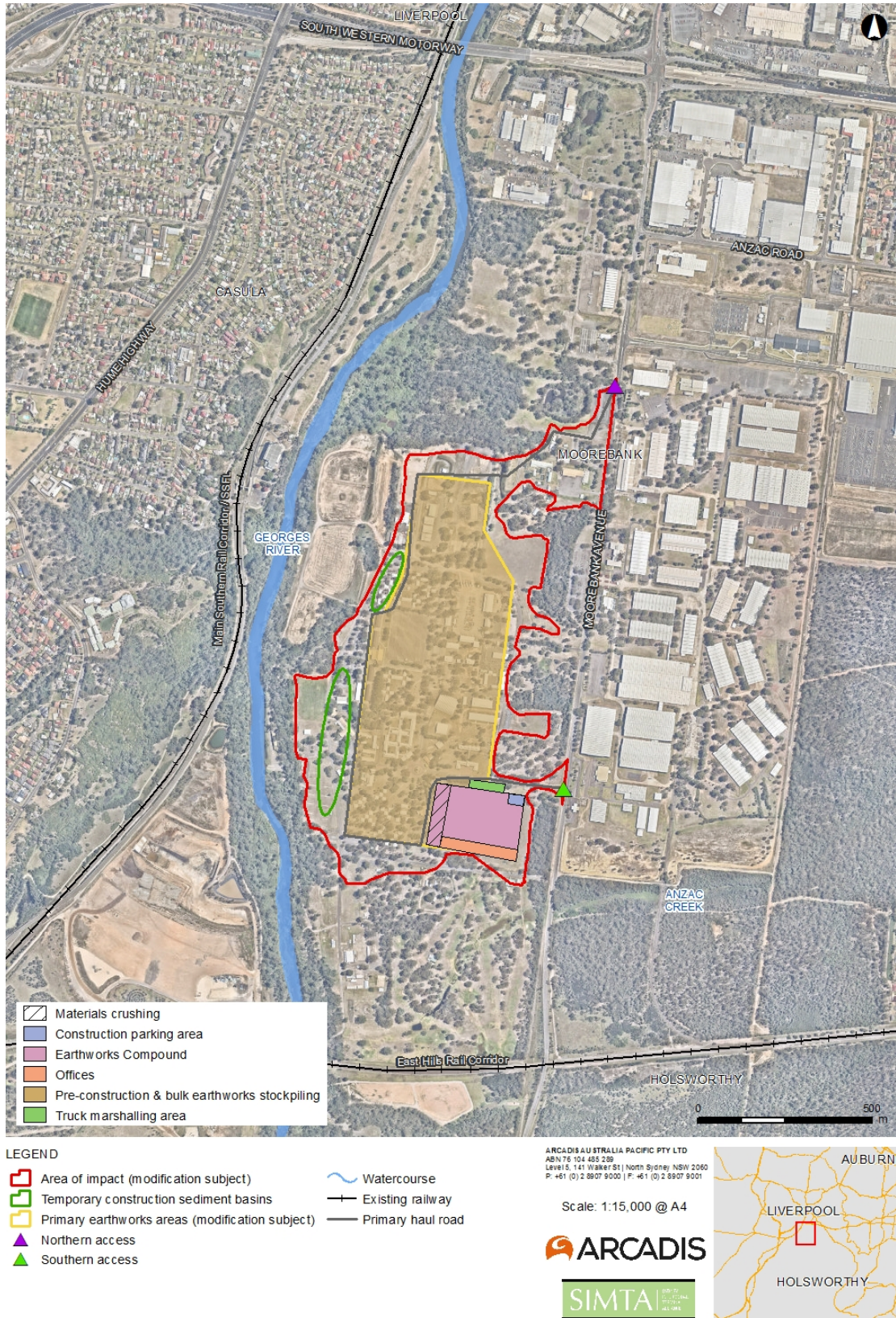
Table 1-1 Proposed Working Hours

| Day | Proposed Hours | Activities |
|-----------|------------------|---|
| Weekdays | 6:00am – 7:00am | <ul style="list-style-type: none"> • Material Delivery. |
| | 7:00am – 6:00pm | <ul style="list-style-type: none"> • Material Delivery • Direct Placement; and • Stockpiling; and • Crushing. |
| | 6:00pm – 10:00pm | <ul style="list-style-type: none"> • Material Delivery; and • Direct Placement; or • Stockpiling. |
| Saturdays | 7:00am – 8:00am | <ul style="list-style-type: none"> • Material Delivery; and • Direct Placement; or • Stockpiling. |
| | 8:00am – 1:00pm | <ul style="list-style-type: none"> • Material Delivery • Direct Placement; and • Stockpiling; and • Crushing. |
| | 1:00PM – 6:00PM | <ul style="list-style-type: none"> • Material Delivery; and • Direct Placement; or • Stockpiling. |
| | | |

1.2 Assessment Purpose

This noise and vibration assessment report has been prepared to provide further information on, and environmental assessment of, the Modification Proposal. The Modification Proposal has been reviewed against the documentation prepared for the MPW Concept Plan Approval, the Secretary's Environmental Assessment Requirements (SEARs) issued for the MPW Concept Plan (SSD_5066) and applicable legislation and guidelines to determine whether the works and associated impacts of the Modification Proposal are 'substantially the same development' as that proposed under the MPW Concept Plan Approval.

Figure 1-1 Extent of Proposed Works



Source: Arcadis

2 SENSITIVE RECEIVERS AND EXISTING AMBIENT NOISE LEVELS

2.1 Sensitive Receivers

Nearby receivers most sensitive to noise from construction activities are residents located in Casula, Glenfield, and Wattle Grove.

The location of these noise catchment areas in relation to the MPW site are shown in Figure 2-1.

In addition to residential receivers, a number of other sensitive land uses are identified in the vicinity of the MPW site. These include:

- All Saints Catholic College (S1); and,
- Casula Powerhouse (S2).

2.2 Existing Background Noise Levels

The existing background noise levels at sensitive residential receiver locations nearby the MPW site were established in the *Moorebank Intermodal Terminal EIS – Noise and Vibration Impact Assessment*, prepared by SLR Consulting, dated October 2014.

The Rating Background Noise Levels (RBL) for each residential receiver catchment are presented in Table 2-1.

Some activities associated with the Modification Proposal are proposed to occur between 6:00am and 7:00am on weekdays, which falls within the night time period, as defined in the INP. Due to the RBL calculation algorithm, the night time RBL is dominated by the background noise levels in the earliest hours of the morning, and may not be a good representation of typical background noise levels between 6:00am and 7:00am. Review of the monitoring data indicates that the daytime RBL, calculated in each receiver catchment, is a good representation of the existing background noise levels between 6:00am and 7:00am on weekdays, and has therefore been adopted as the RBL for the period 6:00am – 7:00am.

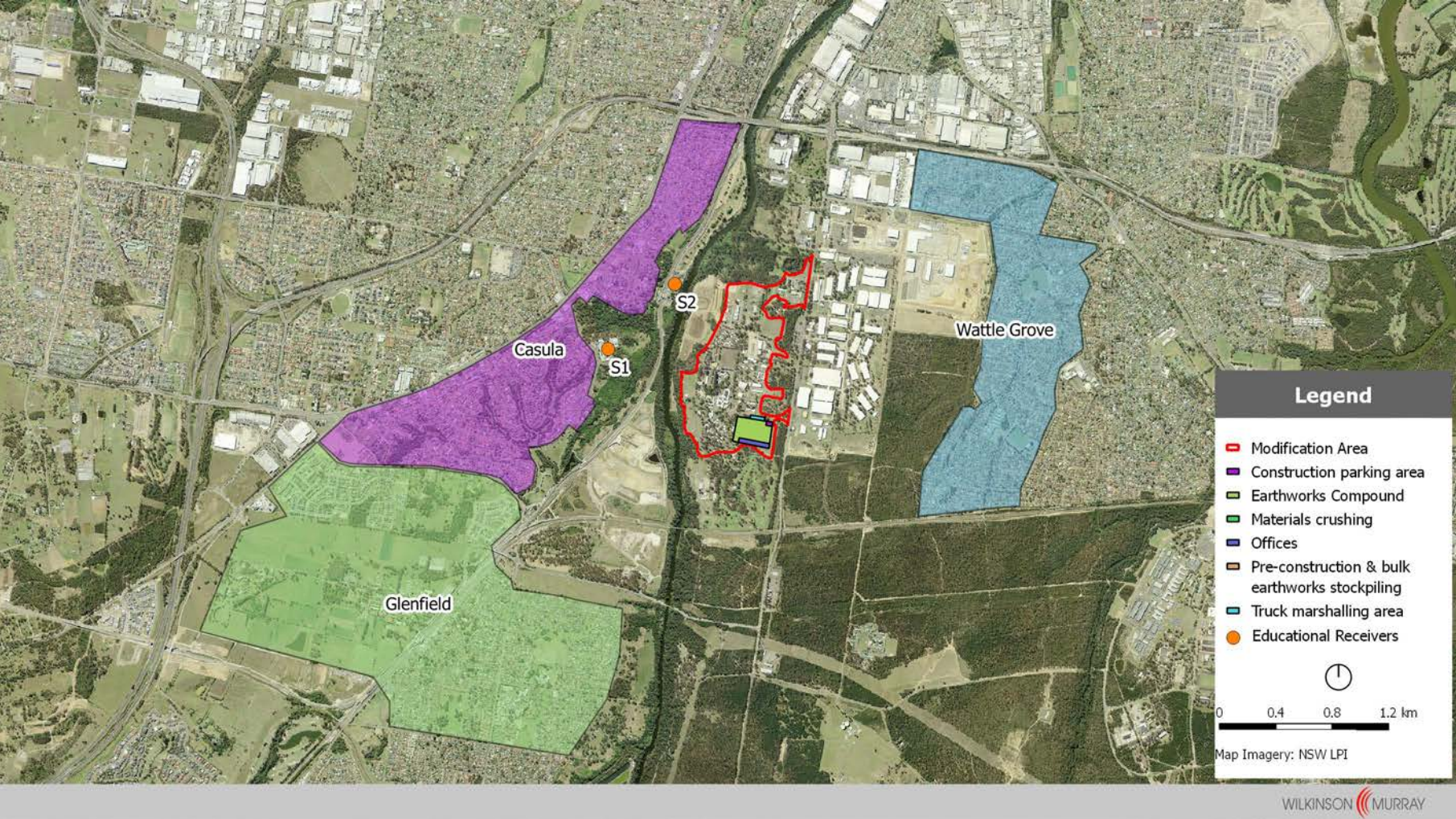
Table 2-1 Rating Background Noise Levels

| Receiver Catchment | RBL (dBA) | | |
|--------------------|------------------|-------------------------|--------------------|
| | Day ¹ | Evening ^{1, 2} | Night ¹ |
| Casula | 39 | 39 | 33 |
| Glenfield | 35 | 37 | 33 |
| Wattle Grove | 35 | 36 | 32 |

1. Day = 7:00am – 6:00pm, Evening = 6:00pm – 10:00pm, Night = 10:00pm – 6:00am

2. If the evening RBL is calculated to be greater than the daytime RBL, it is set equal to the daytime RBL.

Figure 2-1 Sensitive Receivers



3 CONSTRUCTION NOISE AND VIBRATION ASSESSMENT

3.1 Construction Noise and Vibration Criteria

3.1.1 Construction Noise Management Levels

The NSW EPA's *Interim Construction Noise Guideline* (DECC, 2009) (ICNG) recommends noise management levels (NML) to reduce the likelihood of noise impacts arising from construction activities. The ICNG NML for residential receivers are shown in Table 3-1.

Table 3-1 Construction Noise Management Levels at Residences

| Time of Day | Management Level $L_{Aeq,15min}$ (dBA) | How to Apply |
|--|--|--|
| Recommended Standard Hours: Monday to Friday 7am to 6pm Saturday 8am to 1pm No work on Sundays or Public Holidays | Noise affected RBL + 10dBA | The noise affected level represents the point above which there may be some community reaction to noise. Where the predicted or measured $L_{Aeq,(15min)}$ is greater than the noise affected level, the proponent should apply all feasible and reasonable work practices to minimise noise. The proponent should also inform all potentially impacted residents of the nature of works to be carried out, the expected noise levels and duration, as well as contact details. |
| | Highly noise affected 75dBA | The highly noise affected level represents the point above which there may be strong community reaction to noise. Where noise is above this level, the proponent should consider very carefully if there is any other feasible and reasonable way to reduce noise to below this level. If no quieter work method is feasible and reasonable, and the works proceed, the proponent should communicate with the impacted residents by clearly explaining the duration and noise level of the works, and by describing any respite periods that will be provided. |
| Outside recommended standard hours | Noise affected RBL + 5 dB | A strong justification would typically be required for works outside the recommended standard hours. The proponent should apply all feasible and reasonable work practices to meet the noise affected level. Where all feasible and reasonable practices have been applied and noise is more than 5dB(A) above the noise affected level, the proponent should negotiate with the community. For guidance on negotiating agreements see section 7.2.2. |

Based on the RBL presented in Table 2-1, the NML for residential receivers are presented in Table 3-2. Table 3-2 includes NML for the following out of hours (OOH) work periods:

- OOH Period 1: 6:00am – 7:00am weekdays;
- OOH Period 2: 6:00pm – 10:00pm weekdays;
- OOH Period 3: 7:00am – 8:00am Saturday; and,
- OOH Period 4 1:00pm – 6:00pm Saturday.

Table 3-2 Noise Management Levels for Residential Receivers

| Receiver | Noise Management Levels | | | | |
|--------------|-------------------------|--------------|--------------|--------------|--------------|
| | Standard Hours | OOH Period 1 | OOH Period 2 | OOH Period 3 | OOH Period 4 |
| Casula | 49 | 44 | 44 | 44 | 44 |
| Glenfield | 45 | 40 | 40 | 40 | 40 |
| Wattle Grove | 45 | 40 | 40 | 40 | 40 |

The ICNG also recommends NML for other sensitive land uses, such as schools, hospitals and places of worship. Pertinent to this assessment, the recommended NML for schools and other educational institutions is an internal $L_{Aeq, 15min}$ noise level of 45 dBA. It is conservative to assume that noise levels are attenuated by approximately 10 dBA through normally open windows. Therefore, an external $L_{Aeq, 15min}$ noise level of 55 dBA is an equivalent NML for receivers S1 and S2. The NML for S1 and S2 apply only when these facilities are in use.

3.1.2 Construction Vibration Criteria

Typically, vibration impacts are determined using the following documents:

- Building damage – German Standard DIN 4150: Part 3 – 1999 *Structural vibration in buildings: Effects on structures*. Since vibration in the frequency band below 10Hz is not expected, the limit at the residential foundation would be 5mm/s peak component particle velocity (pcpv); and
- Human comfort – *Environmental noise management assessing vibration: A technical guide* (DEC, 2006). Since vibration from the construction site below 8Hz is not expected, the comfort limit becomes 0.4mm/s rms vertical vibration.

Vibration intensive equipment is likely to be used during the proposed bulk earthworks. However, as the distance from vibration intensive plant to the nearest residential receiver is considered to be large (approximately 500 m), ground vibration at surrounding residential receivers would be low. On this basis, the recommended safe working distances for vibration intensive plant suggested in the Transport Construction Authority's *Construction Noise Strategy* (2012) have been adopted in this assessment to evaluate the vibration impacts. Table 3-3 sets out the recommended safe working distances for various vibration intensive plant.

Table 3-3 Recommended Safe Working Distances for Vibration Intensive Plant

| Item | Description | Safe Working Distance | |
|-------------------------|--------------------------------|-----------------------|------------------------------|
| | | Cosmetic Damage | Human Response |
| Small Hydraulic Hammer | (300 kg – 5 to 12t excavator) | 2m | 7m |
| Medium Hydraulic Hammer | (900 kg – 12 to 18t excavator) | 7m | 23m |
| Pile Boring | ≤ 800 mm | 2m (nominal) | N/A |
| Jackhammer | Hand held | 1m (nominal) | Avoid contact with structure |

- Construction Noise Strategy, 2012, Transportation Construction Authority

A review of the information in Table 3-3 indicates that the human comfort vibration impacts at surrounding residences would be negligible during construction activities. Furthermore, structural damage vibration criteria in residential buildings are much higher than human comfort criteria, and the nearest residential receiver is situated far enough for impacts to be minimal in all circumstances. Therefore, no further assessment of construction vibration is warranted.

3.2 Construction Methodology

3.2.1 Materials delivery

Imported material will be delivered by truck and dogs or semi-trailers from multiple locations within the Sydney Metropolitan area. Delivery routes will be established within a Traffic Management Plan (TMP) and truck drivers would only be permitted to use the nominated routes in the approved TMP.

Under the TMP no truck queuing will be allowed on Moorebank Avenue or feeder roads. A dedicated truck marshalling area will be providing within the site boundary and upon arrival at the entrance, the gate keeper will direct the trucks to one of the following locations:

- Truck holding/ marshalling area
- Direct placement of imported fill
- Stockpiling of imported fill.

During materials delivery activities a scraper and water carts would be operational to manage the materials and dust generation on site.

3.2.2 Direct Placement of Imported Fill and Earthworks

The area identified as the primary earthworks area will be progressively filled to the final site level required for subsequent stages of the MPW Project. Fill brought to the MPW site will be either placed directly at its final location and compacted, or temporarily stockpiled and then placed and compacted. The construction contractor would determine the locations for unloading and placement or stockpiling of fill material (unloading point) as the construction programme is progressively developed.

Trucks carrying fill material will be directed from the site entrance, via a haul road, to the unloading point for unloading. On exit of the truck, the imported fill would be spread out using a bulldozer, or similar equipment and compacted to achieve the required geotechnical compaction. This delivery, compaction and conditioning process will continue until the final surface level is reached for each individual area.

Where considered suitable, material excavated from the MPW site would be reused on-site for foundation preparation, levelling works or maintenance of access roads. Excavated material considered unsuitable for re-use on site would be temporarily stockpiled and then transferred off site. Material to be reused on site will be placed within the direct placement areas following the methods above.

At the end of each shift, or if rain is expected, the surface of the direct placement area will be sealed using a smooth drum roller and the surface trimmed using a grader to ensure rain would run off to the temporary sediment control basins.

3.2.3 Stockpiling of Imported Fill

Imported fills to be placed in stockpile for future use will be directed to the stockpile location by the gatekeeper. During stockpiling activities, trucks will be directed from the site entrance, via a haul road to a stockpile area. The trucks will unload onto a pre-prepared unloading area, comprising a firm, stable and level pad suitable to accommodate the intended size of the stockpile. Stockpile areas would be located within the primary earthworks area, the precise location of which will be determined by the construction contractor. Stockpiles will not exceed ten metres in height from the final site levels, with battered walls at gradients of 1:3.

Once unloaded the truck will exit the stockpile area and a D9 bulldozer, or similar, will move the materials over the leading edge of the stockpile. The surface of the stockpiles will be sealed using a smooth drum roller and graded to minimise the impact of rain events potentially saturating the materials.

3.2.4 Crushing and Screening of Oversized Materials

There is likely to be some oversized boulders contained within the imported fill that will require segregation and crushing to make the materials suitable as an engineered fill. The oversized materials may be identified at the entry gate by the gate keeper or at the fill tip location by the truck spotter.

Suitable demolition material, generated and stockpiled during the approved Early Works, will also be crushed on site as part of the Modification Proposal. Material that is deemed appropriate for the crushing facility and reuse for the MPW Project will be transported to the materials crushing area by trucks. Once material has been received into the materials crushing area it will be stockpiled until it is ready to be processed through the crushing system. These stockpiles will be located at one end of the crushing area and will be arranged by material type to a maximum height of 10 m above the final site levels.

Once identified, the oversized materials will be directed to a dedicated processing area containing a 75 mm Jaw Crusher and a soil screen. The materials will be loaded onto the screen and materials larger than 75mm size will be separated from the soil matrix. These screened materials will be loaded into the Jaw Crusher for processing to a nominal 75mm particle size. The product from the crushing and screening operation will be loaded using a Front End Loader into trucks and taken to direct placement of fill or placed in stockpile.

The crushing and screening will only operate during standard construction hours and will be placed in a location away from noise sensitive receivers.

3.3 Construction Equipment and Noise Source Levels

Sound Power Levels (SWLs) associated with typical construction plant to be used during the bulk earthworks phase are identified in Table 3-4. These SWLs have recently been measured at other similar construction sites. The table gives both Sound Power Level and Sound Pressure Levels (SPL) at 7m for the equipment. Sound Power Level is independent of measurement position.

Table 3-4 Typical Construction Plant Sound Levels – dBA

| Plant | Sound Power Level | Sound Pressure Level at 7m |
|------------------|-------------------|----------------------------|
| Bulldozer | 118 | 93 |
| Excavator | 110 | 85 |
| Front End Loader | 112 | 87 |
| Grader | 109 | 84 |
| Roller | 107 | 82 |
| Water Cart | 105 | 80 |
| Compactor | 112 | 87 |
| Truck & Dog | 103 | 78 |
| Lighting Tower | 98 | 73 |
| Mobile Crusher | 118 | 93 |

3.4 Assessment of Construction Noise Impacts

The following section presents predicted construction noise levels at sensitive receivers during the identified periods of the day.

3.4.1 Construction Noise Prediction Methodology

To predict the potential noise impacts of the proposed works, an acoustic model, implementing the CONCAWE algorithms, has been prepared using the CadnaA environmental noise modelling software. Factors addressed in the noise model are:

- Equipment noise emissions and locations;
- Shielding from structures;
- Noise attenuation due to geometric spreading;
- Ground absorption; and,
- Atmospheric absorption.

3.4.2 Predicted Construction Noise Levels During Standard Hours

During standard construction hours, 7:00am – 6:00pm weekdays and 8:00am – 1:00pm Saturdays, the following activities are proposed:

- Material Delivery;

- Direct Placement;
- Stockpiling; and,
- Crushing.

$L_{Aeq, 15min}$ noise levels at sensitive receivers have been predicted where all plant is operating simultaneously, with a modelled SWL of 128 dBA over the works area. The predicted levels are presented in Table 3-5.

Table 3-5 Predicted Construction Noise Levels During Standard Hours

| Receiver | Predicted $L_{Aeq, 15min}$ Noise Level | NML | Exceedance |
|--------------|--|-----|------------|
| Casula | 50 | 49 | 1 dB |
| Glenfield | 36 | 45 | - |
| Wattle Grove | 37 | 45 | - |
| S1 | 49 | 55 | - |
| S2 | 48 | 55 | - |

Review of Table 3-5 indicates that construction noise levels exceed applicable NML at sensitive receivers, in Casula, by up to 1 dB.

3.4.3 Predicted Construction Noise Levels During OOH Period 1

During OOH period 1, 6:00am – 7:00am weekdays, Material Delivery is the only proposed activity.

$L_{Aeq, 15min}$ noise levels at sensitive receivers have been predicted where all plant is operating simultaneously, with a modelled SWL of 117 dBA over the works area. The predicted levels are presented in Table 3-6.

Table 3-6 Predicted Construction Noise Levels During OOH Period 1

| Receiver | Predicted $L_{Aeq, 15min}$ Noise Level | NML | Exceedance |
|--------------|--|-----|------------|
| Casula | 39 | 44 | - |
| Glenfield | 26 | 40 | - |
| Wattle Grove | 26 | 40 | - |
| S1 | 38 | 55 | - |
| S2 | 47 | 55 | - |

Review of Table 3-6 indicates that construction noise levels are not predicted to exceed applicable NML at sensitive receivers during OOH Period 1

3.4.4 Predicted Construction Noise Levels During OOH Period 2, 3 and 4

During OOH period 2 (6:00pm – 10:00pm weekdays) OOH Period 3 (7:00am – 8:00am Saturday) and OOH Period 4 (1:00pm – 6:00pm Saturday), the following activities are proposed:

- Material Delivery; and,
- Direct Placement, or Stockpiling.

$L_{Aeq, 15min}$ noise levels at sensitive receivers have been predicted where all plant is operating simultaneously, with a modelled SWL of 122 dBA over the works area. The predicted levels are presented in Table 3-7.

Table 3-7 Predicted Construction Noise Levels During OOH Period 2, 3 and 4

| Receiver | Predicted $L_{Aeq, 15min}$ Noise Level | NML | Exceedance |
|--------------|--|-----|------------|
| Casula | 44 | 44 | - |
| Glenfield | 31 | 40 | - |
| Wattle Grove | 35 | 40 | - |
| S1 | 44 | 55 | - |
| S2 | 43 | 55 | - |

Review of Table 3-7 indicates that construction noise levels are not predicted to exceed applicable NML at sensitive receivers during OOH Period 2, 3 or 4.

3.5 Sleep Disturbance Assessment

Some activities are proposed to occur between 6:00am and 7:00am on weekdays, which falls within the night time period, as defined in the majority of NSW Government noise guidelines and policies. Therefore, an assessment of potential sleep disturbance impacts is considered to be warranted.

3.5.1 Sleep Disturbance Screening Levels

The EPA's *Noise Guide for Local Government (NGLG)* notes that:

“Currently, there is no definitive guideline to indicate a noise level that causes sleep disturbance and more research is needed to better define this relationship. Where likely disturbance to sleep is being assessed, a screening test can be applied that indicated the potential for this to occur.

For example, this could be where the subject noise exceeds the background noise level by more than 15 dBA. The most appropriate descriptors for a source relating to sleep disturbance would be $L_{A1, 1\text{ minute}}$ (the level exceeded for 1% of the specified time period of 1 minute) or L_{Amax} (the maximum level during the specified time period) with measurement outside the bedroom window.”

Based on the above advice, sleep disturbance screening levels, for the period 6:00am – 7:00am, have been established for the receiver catchment areas, based on the daytime RBL, demonstrated to represent the background levels during this period, and are shown in Table 3-8.

Table 3-8 Sleep Disturbance Screening Levels

| Receiver Catchment | 6:00am – 7:00am RBL (dBA) | Sleep Disturbance Screening Level (dBA - $L_{A1, 1min}$ / L_{Amax}) |
|--------------------|---------------------------|---|
| Casula | 39 | 54 |
| Glenfield | 35 | 50 |
| Wattle Grove | 35 | 50 |

3.5.2 Sleep Disturbance Noise Sources

The most significant short duration, high intensity noise events, which have the potential to cause sleep disturbance, associated with the proposed works are truck tailgates slamming during unloading. Based on previous measurements conducted by Wilkinson Murray, the L_{Amax} sound power level of slamming tailgate is 118 dBA.

3.5.3 Predicted Maximum Noise Levels at Nearby Receivers

L_{Amax} noise levels at sensitive residential receivers, associated with truck tailgates, have been predicted and are presented in Table 3-9.

Table 3-9 Predicted L_{Amax} Noise Levels at Sensitive Receivers

| Receiver Catchment | Predicted L_{Amax} Noise Level (dBA) | Screening Level | Complies? |
|--------------------|--|-----------------|-----------|
| Casula | 50 | 54 | Yes |
| Glenfield | 40 | 50 | Yes |
| Wattle Grove | 42 | 50 | Yes |

Review of Table 3-9 indicates that the predicted L_{Amax} noise levels at sensitive residential receivers due to truck tailgates comply with the established screening levels. Accordingly, sleep disturbance impacts are unlikely.

3.6 Cumulative Construction Noise Assessment

In addition to the works proposed in the Modification Proposal, a number of other large-scale construction activities are expected to occur simultaneously in the vicinity of the MPW site. Specifically, the approved Early Works of the MPW Project, and the Site Preparation, Bulk Earthworks and Engineering Fill phases of the MPE Stage 1 Proposal.

The highest predicted $L_{Aeq, 15min}$ construction noise levels at sensitive receivers, during relevant phases, for each project have been added to provide an indication of potential cumulative construction noise impacts. Predicted $L_{Aeq, 15min}$ construction noise levels for the MIC Early Works have been taken from *Moorebank Intermodal Terminal EIS – Noise and Vibration Impact Assessment*, prepared by SLR Consulting, dated October 2014. Predicted $L_{Aeq, 15min}$ construction noise levels for the MPE Stage 1 Proposal have been taken from *SIMTA Intermodal Terminal Facility – Stage 1 – Noise and Vibration Impact Assessment*, prepared by Wilkinson Murray, dated May 2015.

Worst-case cumulative $L_{Aeq, 15min}$ construction noise levels at sensitive receivers, during standard construction hours, are presented in Table 3-10.

Review of Table 3-10 indicates that the predicted worst-case cumulative construction noise levels exceed the NML at the most affected residential receivers in Casula by up to 2 dB. This is considered a negligible exceedance.

Table 3-10 Worst-Case Cumulative Construction Noise Levels

| Receiver | Predicted $L_{Aeq, 15min}$ Noise Levels | | | Cumulative | NML | Exceedance |
|--------------|---|-----------------|---------------|------------|-----|------------|
| | Modification Proposal | MIC Early Works | SIMTA Stage 1 | | | |
| Casula | 50 | 44 | 40 | 51 | 49 | 2 dB |
| Glenfield | 36 | 40 | 32 | 42 | 45 | - |
| Wattle Grove | 37 | 38 | 40 | 43 | 45 | - |
| S1 | 49 | 49 | 39 | 52 | 55 | - |
| S2 | 48 | 49 | 37 | 52 | 55 | - |

3.7 Construction Noise Mitigation

The preceding sections have identified the potential for $L_{Aeq, 15min}$ construction noise levels to exceed the established management levels. Best practice mitigation and management measures will be used to minimise construction noise and vibration at noise sensitive receivers, and will be described in a Construction Noise and Vibration Management Plan (CNVMP), as required under Ministers Condition of Approval D20(b) (SSD_5066) and Revised Environmental Management Measures (REMMs) 5A and 5B.

In accordance with the MCoAs, the CNVMP will be developed in accordance with the ICNG, and will give consideration to the relevant REMMs, as outlined in Table 3-11.

Table 3-11 Revised Environmental Management Measures (REMMs)

| No. | Mitigation Measure | Mandatory (M) / Subject to Review (SR) | Implementation Phase |
|-----|--|--|-------------------------|
| 5A | A construction noise and vibration management plan (CNVMP) (or equivalent) would be developed for construction activities. | M | Construction |
| 5D | <p>Construction works outside of the standard construction hours identified in condition 5C may be undertaken in the following circumstances:</p> <ul style="list-style-type: none"> • construction works that generate noise that is: <ul style="list-style-type: none"> • no more than 5 dB(A) above rating background level at any residence in accordance with the Interim Construction Noise Guideline (Department of Environment and Climate Change, 2009); and • no more than the noise management levels specified in Table 3 of the Interim Construction Noise Guideline (Department of Environment and Climate Change, 2009) at other sensitive receivers; or • for the delivery of materials required outside these hours by the NSW Police Force or other authorities for safety reasons; or <ul style="list-style-type: none"> • where it is required in an emergency to avoid the loss of lives, property and/or to prevent environmental harm; • works approved through an EPL, or works as approved through the out-of-hours work protocol outlined in the CEMP. | SR | Construction |
| 5E | During site inductions and toolbox talks, all site workers (including subcontractors and temporary workforce) are to be made aware of the hours of construction and how to apply practical, feasible and reasonable measures to minimise noise and vibration when undertaking construction activities. | SR | Construction |
| 5F | Quieter and less vibration-emitting construction methods would be applied where feasible and reasonable. For example, when piling is required, bored piles rather than impact-driven piles would minimise noise and vibration impacts. | SR | Construction |
| 5G | The construction site would be arranged to minimise noise impacts by locating potentially noisy activities away from the nearest receivers wherever possible. | SR | Construction |
| 5H | Where possible, equipment that emit directional noise would be oriented away from sensitive receptors. | SR | Construction |

| No. | Mitigation Measure | Mandatory (M) / Subject to Review (SR) | Implementation Phase |
|-----|--|--|-------------------------|
| 5J | Reversing of vehicles and mobile equipment would be minimised so as to prevent nuisance caused by reversing alarms. This could be achieved through one-way traffic systems and the use of traffic lights which could also limit the use of vehicle horns. | SR | Construction |
| 5J | Where work is proposed in the vicinity of residences, potentially affected residents would be advised, at least two weeks prior to the commencement of works, of the potential noise and vibration levels and the proposed management measures to control environmental impacts. | SR | Construction |
| 5K | Whenever possible, loading and unloading areas would be located away from the nearest residences. | SR | Construction |
| 5L | Broadband reversing alarms would be considered instead of tonal reversing alarms, in particular outside standard working hours (such as during night-time rail possession works). | SR | Construction |
| 5M | Equipment that is used intermittently would be shut down when not in use for extended periods of time. | SR | Construction |
| 5N | Where possible, all engine covers would be kept closed while equipment is operating. | SR | Construction |
| 5O | Where possible, trucks associated with the work would not be left standing with their engines operating in streets adjacent to or within residential areas. | SR | Construction |
| 5P | Traffic speeds would be signposted. All drivers would be expected to comply with speed limits and to implement responsible driving practices to minimise noise associated with unnecessary acceleration and braking. Traffic movements should be scheduled to minimise continuous traffic flows (convoys). | SR | Construction |
| 5Q | The site manager (as appropriate) should provide a community liaison phone number and permanent site contact so that any noise and/or vibration related complaints can be received and addressed in a timely manner. Consultation and cooperation between the site and its neighbours would assist in limiting uncertainty, misconceptions and adverse reactions to noise and vibration. | SR | Construction |

| No. | Mitigation Measure | Madatory (M) / Subject to Review (SR) | Implementation Phase |
|-----|---|---|-------------------------|
| 5R | <p>Attended noise and ground vibration measurements would be undertaken at monthly intervals, In areas within close proximity to sensitive receivers and upon receipt of adverse comment/complaints during the construction program, to confirm that noise and vibration levels at adjacent communities and receptors are consistent with the predictions in this assessment and any approval and/or licence conditions.</p> | SR | Construction |
| 5S | <p>If noise generating construction works are undertaken outside the standard daytime construction hours and/or measured construction noise levels at nearest residences are greater than 75 dB(A) LAeq, the following additional noise mitigation measures would be considered:</p> <ul style="list-style-type: none"> • Localised acoustic screens, comprising a solid structure such as plywood fencing to surround noise generating construction plant or work locations. To be effective for ground level noise, the screens would be lined with acoustic absorptive material, at least 2 m in height and installed within 5 m of the noise source. • Dominant noise-generating mechanical plant would be fitted with feasible noise mitigation controls such as exhaust mufflers and engine shrouds. • Respite periods of one hour are recommended for every continuous three-hour period of work; alternatively, daytime works would be scheduled between 9.00 am and 12.00 pm, and between 2.00 pm and 5.00 pm <p>Where practical, and when night works are being undertaken, noisy construction work would be undertaken during the less sensitive 6.00 pm to 10.00 pm evening period</p> | SR | Construction |

No further mitigation measures, additional to those identified in the MCoAs and REMMs, are considered warranted for the Modification Proposal.

4 CONSTRUCTION TRAFFIC NOISE ASSESSMENT

4.1 Road Traffic Noise Criteria

Applicable noise criteria for proposals which have the potential to indefinitely increase traffic on roads are presented in the *NSW Road Noise Policy* (RNP) (DECCW, 2011).

The Proposal will generate additional traffic along the M5 Motorway and Moorebank Avenue. According to the *RNP*, the M5 Motorway is classified as a Freeway, while Moorebank Avenue is classified as a sub-arterial road.

The *RNP* assessment criteria for residential land uses are shown in Table 4-1.

With regard to the permissible increase in road traffic noise from a land use development the *RNP* states:

"For existing residences and other sensitive land uses affected by additional traffic on existing roads generated by land use developments, any increase in the total traffic noise level should be limited to 2 dB above that of the corresponding 'no build option'."

Table 4-1 Road Noise Criteria

| Road | Category | Assessment Criteria - dBA | |
|------------------|-------------------|---|--|
| | | Day (7am – 10pm) | Night (10pm – 7am) |
| M5 Motorway | Freeway | L _{Aeq} , 15 hour 60 (external) | L _{Aeq} , 9 hour 55 (external) |
| Moorebank Avenue | Sub-arterial Road | L _{Aeq} , 15 hour 60 (external) | L _{Aeq} , 9 hour 55 (external) |

4.2 Traffic Generated by the Proposal

Traffic generated by the proposal on public roads will include trucks importing fill, workers travelling to site, and miscellaneous deliveries. Table 4-2 summarises the total daily traffic generated by the proposal.

It should be noted that a number of traffic movements generated by the proposal are expected to occur between 6:00am and 7:00am, which falls into the RNP night time period.

Table 4-2 Traffic Generated by Works

| Activity | Additional Traffic (vehicles/day) | | | |
|---|-----------------------------------|------------|--------------------------|------------|
| | Day (7:00am – 10:00pm) | | Night (10:00pm – 7:00am) | |
| | Light | Heavy | Light | Heavy |
| Trucks importing fill materials | - | 633 | - | 100 |
| Light Vehicles (Travel to work) | 50 | - | 10 | - |
| Light Vehicles (Deliveries and visitors) | 20 | - | 5 | - |
| Heavy Vehicles | - | 12 | - | - |
| Total | 70 | 645 | 15 | 100 |

4.3 Assessment of Traffic Noise Impacts

Since the contractor for this proposed works is not confirmed, there is some uncertainty regarding the distribution of the generated traffic on the road network. However, the following is known:

- Up to 8 trucks per day will travel from the site to the Glenfield Waste facility, along Moorebank Avenue and Cambridge Avenue; and,
- All other heavy vehicles travelling to and from the site will travel north along Moorebank Avenue to the M5 Motorway, but will not continue along Moorebank Avenue north of the M5.

The most affected residential receivers to potential increases in road noise resulting from the proposed works are those residents located immediately adjacent to the M5 Motorway and also on Moorebank Avenue, north of the M5 Interchange. No sensitive receivers are identified along Moorebank Avenue between the Proposal site and the M5 Interchange.

Due to the very small number of truck movements generated along Moorebank Avenue south of the MPW site, and along Cambridge Avenue, quantitative traffic noise assessments are not considered warranted for these sections of road.

It was confirmed through attended traffic noise measurements, conducted by Wilkinson Murray on 16 May 2013, that the existing levels of traffic noise along Moorebank Avenue, north of Anzac Road, are above the RNP assessment levels. Therefore, the RNP recommends that any increase in traffic noise levels, at residential receivers, due to the Stage 1 Proposal should not exceed 2 dBA.

To assess potential traffic noise impacts at sensitive receivers along the relevant sections of roads, it is assumed that all traffic travels along that section of road, subject to the restrictions stated above. Specifically, when assessing noise levels along the M5 Motorway, it is assumed that all traffic is travelling on that section of the Motorway; however, when assessing noise levels along Moorebank Avenue, north of Anzac Road, it is assumed that all light vehicles are travelling on that section of road.

The existing traffic volumes along the roads of interest have been provided by Arcadis.

Table 4-3 provides a summary of the traffic volume and percentage heavy vehicles along the relevant roads.

Table 4-3 Existing and Future Traffic Volumes

| Location | Time ² | Current (no Development) | | Future (with Development) | |
|----------------------------|-------------------|-----------------------------|-----|------------------------------|-----|
| | | Volume | Mix | Volume | Mix |
| M5 Motorway | Day | 103,000 | 10% | 104,430 | 11% |
| – East of Moorebank Avenue | Night | 20,200 | 11% | 20,430 | 12% |
| M5 Motorway | Day | 120,300 | 10% | 121,730 | 11% |
| – West of Moorebank Avenue | Night | 23,600 | 11% | 23,830 | 12% |
| Moorebank Avenue | Day | 28,300 | 10% | 28,440 | 10% |
| – North of M5 Motorway | Night | 6,600 | 10% | 6,630 | 10% |

Using the data in Table 4-3, the increase in traffic noise levels along the M5 Motorway and Moorebank Avenue has been calculated. The calculations have been conducted using the *Calculation of Road Traffic Noise (CORTN)* algorithm, and are based upon the following assumptions:

- Vehicle speeds are 100 km/h and 60 km/h along the M5 Motorway and Moorebank Avenue respectively.
- Typical receiver setbacks are approximately 25 metres along the M5 Motorway and approximately 12 metres along Moorebank Avenue. It is important to highlight that receiver setbacks are important when calculating absolute traffic noise levels, however setbacks are not important when calculating increases in traffic noise levels due to changes in traffic volume and mix.

The predicted increases in traffic noise levels are shown in Table 4-4.

Table 4-4 Increases in Traffic Noise Levels

| Location | Predicted Increase (dBA) | |
|---|--------------------------|--------|
| | Day* | Night* |
| M5 Motorway – East of Moorebank Avenue | 0.2 | 0.2 |
| M5 Motorway – West of Moorebank Avenue | 0.2 | 0.3 |
| Moorebank Avenue – North of M5 Motorway | 0.0 | 0.1 |

* Day = 7.00am – 10.00pm, Night = 10.00pm – 7.00am

Review of Table 4-4 shows that increases in road traffic noise levels along the M5 Motorway and along Moorebank Avenue north of the M5 interchange are considerably less than 2 dBA. In accordance with the RNP, no mitigation of traffic noise levels is warranted.

5 CONCLUSION

A Noise and Vibration Impact Assessment (NVIA) has been conducted for the Modification Proposal for the MPW Project. The NVIA investigates the potential for construction noise and vibration, and road traffic noise impacts associated with the Modification Proposal.

Construction noise impacts associated with the Modification Proposal would result in a 4 dB increase $L_{Aeq, 15min}$ noise levels during standard working hours, compared with the Early Works under the MPW Concept Plan EIS, RtS and SRtS. The 4 dB increase results in the predicted noise levels exceeding the NML by 1dB, which is considered a negligible exceedance. Construction noise levels during all identified out of hours works periods are predicted to comply with the established NML at all receivers

Through the implementation of the mitigation measures approved for the MPW Concept Plan, identified above, noise impacts associated with the Modification Proposal are expected to be consistent with the impacts predicted within the MPW Concept Plan EIS.

Maximum noise levels at sensitive residential receivers from 6:00am to 7:00am on weekdays are predicted to comply with sleep disturbance screening levels, and no sleep disturbance impacts are considered likely.

Predicted increases in road traffic noise levels along Moorebank Avenue and the M5 Motorway due to traffic temporarily generated by the proposal are well below 2 dB, and in accordance with the RNP, no mitigation is warranted.