Transport Infrastructure
Development Corporation

# Construction Noise Strategy (Rail Projects)

November 2007

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# 1 INTRODUCTION

The construction noise and vibration emissions associated with rail projects can often cause disturbance to adjacent communities. For many rail projects, construction works are required outside normal construction hours because work during daytime periods would be highly disruptive to commuter rail services and road traffic on major roads. The potential noise and vibration impacts can often be minimised by informing the community of the potential impacts, the time periods over which these will occur and the proposed mitigation measures that will be employed to minimise the impacts.

This Construction Noise Strategy for Rail Projects (Strategy) provides practical guidance on how to minimise, to the fullest extent practicable, the impacts on the community from airborne noise, ground-borne noise and vibration generated during the construction of rail projects (and related infrastructure) through the application of all feasible and reasonable mitigation measures.

The key elements of the Strategy involve:

- evaluating the construction noise and vibration impacts during the environmental assessment stage of a project to identify, in consultation with the community and other stakeholders, project specific construction noise and vibration objectives and possible mitigation measures for them
- implementing a standard suite of noise and vibration mitigation measures on all projects
- implementing *additional* mitigation measures when construction noise or vibration is predicted to *exceed* the project's construction noise and vibration objectives
- verifying the validity of noise assessments undertaken during the environmental assessment stage *prior* to construction commencing to ensure that any changes to the project's design, scope, construction method or the mitigation measures proposed in the environmental assessment are re-evaluated and any additional (or changes to the) mitigation measures are identified
- monitoring the implementation and effectiveness of the project's noise and vibration mitigation measures via a three monthly audit cycle.

## 1.1 Distribution and Use

The Strategy may be used in the development of, or referred to in:

- environmental assessment documents
- design and construction environmental management documents
- contract documents
- approvals and licences (subject to the agreement of the relevant regulatory authority).

The Strategy does not take precedence over approval or licence conditions and will be reviewed as required in response to the release of relevant guidelines, standards and policies dealing with construction noise.

## 2 ASSESSING THE IMPACTS OF CONSTRUCTION NOISE AND VIBRATION

As part of the environmental assessment process, the impacts on nearby receivers of airborne noise, ground-borne noise and ground-borne vibration generated during the construction of the project are evaluated. This assessment shall be undertaken by an acoustic consultant and shall form part of the environmental assessment documentation (eg. Review of Environmental Factors) that is considered by the approval authorities. The noise and vibration construction assessment:

- is based on an initial design, scope and construction methodology for the project
- identifies sensitive receivers, the existing background noise levels and, in accordance with the Department of Environment & Climate Change's (DECC) guidelines (see Appendix A), the construction noise and vibration objectives
- identifies the feasible and reasonable noise and vibration mitigation measures (including any project specific measures[1]) that are needed to meet or mitigate any predicted exceedences of the construction noise and vibration objectives at the nearest receivers.

In most cases, a noise and vibration assessment is included in the documentation placed on public display. Comments received from the community and other stakeholders on the proposed mitigation measures for the project are considered and, if necessary, changes may be made to the measures proposed, or additional measures included, prior to the project being approved or licensed. Appendix A describes in detail the construction noise and vibration assessment process.

The construction noise and vibration objectives for the project and any accompanying mitigation measures in the environmental assessment documentation are based on an initial design and construction methodology. Typically, as the design of a project is further developed following its approval, the construction methodology and staging is also altered.

To ensure the adequacy of the noise and vibration mitigation measures for the actual design and construction method, a Construction Noise and Vibration Impact Statement (CNIS)must be prepared (for each major construction stage or key activity), prior to the preparation of the Construction Noise and Vibration Management Plan (CNVMP) for that stage/activity. This process is outlined in Figure 1. The CNIS must be prepared in accordance with the requirements of Appendix A. The CNIS should be used as the basis on which to develop the CNVMP[2] for the project. A separate CNIS must be prepared for each major stage of works or activity and the CNVMP revised as required.

[1] For example: physical structures such as construction noise barriers, acoustic sheds, dwelling treatment, acoustic barriers around noisy plant, operational noise barriers erected early etc or special construction methods such as penetrating cone fracture or controlled blasting in place of conventional rock breaking, etc.

[2] NB: Any changes to the project must be consistent with the environmental assessment documentation and project approval and cannot cause significant additional impacts on the environment or community.

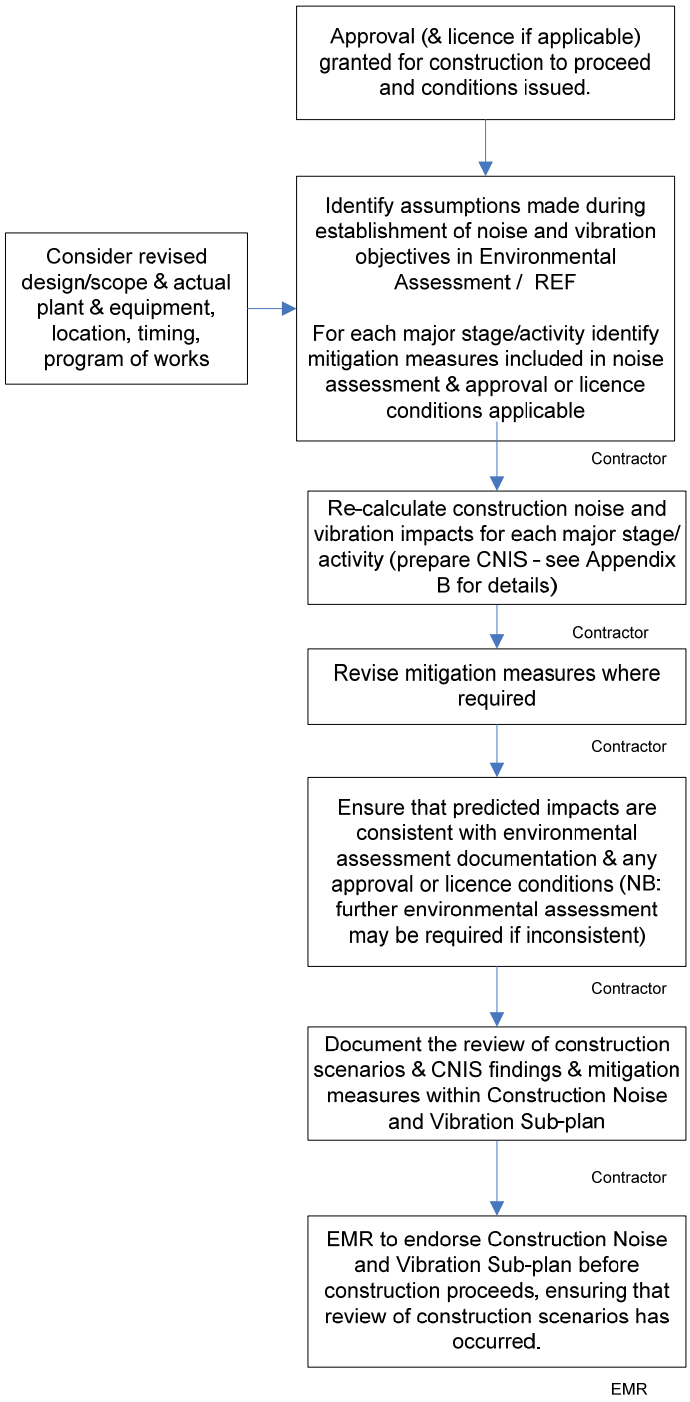



**Figure 1 – Construction noise and vibration assessment review procedure**

# 3 STANDARD MITIGATION MEASURES & MONITORING REQUIREMENTS

This section sets out the *standard* construction noise and vibration mitigation measures to be implemented on all rail-related projects and delivered via relevant procedures, systems, environmental assessment, construction environmental management and all relevant contract documentation.

For all rail-related construction projects, the standard mitigation measures in Table 1 shall be applied in order to minimise the potential noise and vibration impacts at the nearest receptors. Additional information in relation to specific mitigation measures, the assessment process and relevant objectives are provided in the Appendices.

During the preparation of the environmental assessment documentation, a construction noise and vibration assessment is to be undertaken. This includes monitoring requirements in order to validate the modelling assumptions and confirm that noise levels from individual plant and equipment items are not excessive. This section provides guidance in relation to standard monitoring and survey requirements that are expected for rail-related construction projects.

Additional information is also provided in this section in relation to satisfactory operating distances to ensure that vibration levels are not excessive at nearby buildings in relation to cosmetic damage and human comfort.

## 3.1 Standard Mitigation Measures

The actions set out in the tables below must be implemented on all rail construction projects.

**Table 1: Standard mitigation measures to reduce construction noise and vibration**

| Action required | Applies to | Details |
|---|---|---|
| **Management Measures** | | |
| Implementation of any project specific mitigation measures required. | Airborne noise<br>Ground-borne noise & vibration | In addition to the measures set out in this table, any *project specific* mitigation measures identified in the environmental assessment documentation (eg REF, submissions or representations report) or approval or licence conditions must be implemented. |
| Implement community consultation measures (refer to Appendix C for further details of each measure). | Airborne noise.<br>Ground-borne noise & vibration. | • periodic notification (monthly letterbox drop)[3]<br>• website<br>• Project Infoline<br>• Construction Response Line<br>• email distribution list<br>• Community Liaison Group (if required by approval conditions). |

[3] Detailing all upcoming construction activities at least 14 days prior to commencement of relevant works

| Action required | Applies to | Details |
|---|---|---|
| Site inductions. | Airborne noise.<br>Ground-borne noise & vibration. | All employees, contractors and subcontractors are to receive an environmental induction. The induction must at least include:<br>• all relevant project specific and standard noise and vibration mitigation measures<br>• relevant licence and approval conditions<br>• permissible hours of work<br>• any limitations on high noise generating activities<br>• location of nearest sensitive receivers<br>• construction employee parking areas<br>• designated loading/unloading areas and procedures<br>• site opening/closing times (including deliveries)<br>• environmental incident procedures. |
| Behavioural practices. | Airborne noise. | No swearing or unnecessary shouting or loud stereos/radios on site.<br>No dropping of materials from height, throwing of metal items and slamming of doors. |
| Monitoring. | Airborne noise.<br>Ground-borne noise & vibration. | A noise monitoring program is to be carried out for the duration of the works in accordance with the Construction Noise and Vibration Management Plan and any approval and licence conditions. |
| Attended vibration measurements. | Ground-borne vibration. | Attended vibration measurements are required at the commencement of vibration generating activities to confirm that vibration levels are within the acceptable range to prevent cosmetic building damage. |
| **Source Controls** | | |
| Construction hours and scheduling. | Airborne noise.<br>Ground-borne noise & vibration. | Where feasible and reasonable, construction should be carried out during the standard daytime working hours. Work generating high noise and/or vibration levels should be scheduled during less sensitive time periods. |
| Construction respite period. | Ground-borne noise & vibration.<br>Airborne noise. | High noise and vibration generating activities[4] may only be carried out in continuous blocks, not exceeding 3 hours each, with a minimum respite period of one hour between each block[5].<br>No more than four consecutive nights of high noise and/or vibration generating work may be undertaken over any seven day period, unless otherwise approved by the relevant authority. |
| Equipment selection. | Airborne noise.<br>Ground-borne noise & vibration. | Use quieter and less vibration emitting construction methods where feasible and reasonable.<br>For example, when piling is required, bored piles rather than impact-driven piles will minimise noise and vibration impacts. Similarly, diaphragm wall construction techniques, in lieu of sheet piling, will have significant noise and vibration benefits. |
| Maximum noise levels. | Airborne-noise. | The noise levels of plant and equipment must have operating Sound Power or Sound Pressure Levels compliant with the criteria in Table 2. |

[4] Includes jack and rock hammering, sheet and pile driving, rock breaking and vibratory rolling.

[5] "Continuous" includes any period during which there is less than a 60 minutes respite between ceasing and recommencing any of the work.

| Action required | Applies to | Details |
|---|---|---|
| Rental plant and equipment. | Airborne-noise. | The noise levels of plant and equipment items are to be considered in rental decisions and in any case cannot be used on site unless compliant with the criteria in Table 2. |
| Use and siting of plant. | Airborne-noise. | Simultaneous operation of noisy plant within discernible range of a sensitive receiver is to be avoided.<br>The offset distance between noisy plant and adjacent sensitive receivers is to be maximised.<br>Plant used intermittently to be throttled down or shut down.<br>Noise-emitting plant to be directed away from sensitive receivers. |
| Plan worksites and activities to minimise noise and vibration. | Airborne noise.<br>Ground-borne vibration. | Plan traffic flow, parking and loading/unloading areas to minimise reversing movements within the site. |
| Non-tonal reversing alarms. | Airborne noise. | Non-tonal reversing beepers (or an equivalent mechanism) must be fitted and used on all construction vehicles and mobile plant regularly used on site and for any out of hours work. |
| Minimise disturbance arising from delivery of goods to construction sites. | Airborne noise. | Loading and unloading of materials/deliveries is to occur as far as possible from sensitive receivers.<br>Select site access points and roads as far as possible away from sensitive receivers.<br>Dedicated loading/unloading areas to be shielded if close to sensitive receivers.<br>Delivery vehicles to be fitted with straps rather than chains for unloading, wherever possible. |
| **Path Controls** | | |
| Shield stationary noise sources such as pumps, compressors, fans etc. | Airborne noise. | Stationary noise sources should be enclosed or shielded whilst ensuring that the occupational health and safety of workers is maintained. Appendix F of AS 2436: 1981 lists materials suitable for shielding. |
| Shield sensitive receivers from noisy activities. | Airborne noise. | Use structures to shield residential receivers from noise such as site shed placement; earth bunds; fencing; erection of operational stage noise barriers (where practicable) and consideration of site topography when situating plant. |

## 3.2 Noise & Vibration Auditing

The implementation of the noise and vibration mitigation measures, compliance with any applicable construction noise and vibration objectives, monitoring requirements and approval and licence conditions is to be audited at least every three months. This will involve the measurement of equipment noise levels (on site) and noise and vibration monitoring at the nearest sensitive receivers. A summary of the measurement requirements is provided below and in Appendix A.

The attended measurements will need to be carried out by an appropriately trained person in the measurement and assessment of construction noise and vibration, who is familiar with the requirements of the relevant standards and procedures.

### Maximum levels for plant and equipment

All plant and equipment used in the construction of rail projects must have operating Sound Power or Sound Pressure Levels less than or equal to those in Table 2.

The $L_{Amax}$ noise levels in Table 2 can also be used as a guide in the prediction of $L_{A10(15minute)}$ construction noise. In doing so, it is recognised that $L_{A10(15minute)}$ noise levels are typically 5 dBA to 10 dBA lower than the $L_{Amax}$ noise levels (depending on the duration of the construction activities, the number of plant items and their location on site in relation to the nearest receivers).

Attended measurements are to be undertaken within a period of 14 days of equipment arriving on site to confirm that the operating noise levels of all plant items comply with the maximum levels in Table 2. The attended measurements are to be repeated on a three-monthly basis to ensure that noise from individual plant items are still within the acceptable noise range.

### Noise and vibration monitoring in community

Attended measurements are to be undertaken within a period of 14 days from the commencement of construction activities to confirm that the noise and vibration levels in the adjacent community are consistent with the predictions in the CNIS[6], approval and/or licence conditions.

The attended measurements must be undertaken at the potentially most exposed receivers.

Noise measurements shall be undertaken in accordance with the procedure documented in AS1055.1-1997 *Acoustics - Description and Measurement of Environmental Noise - General Procedures*. Vibration measurements shall be undertaken in accordance with the procedures documented in the DECC's *Assessing Vibration - a technical guideline* and BS7385 Part 2-1993 *Evaluation and measurement for vibration in buildings*.

For projects with a duration of greater than three months, the attended measurements are to be repeated on a three-monthly basis as part of the audit cycle to ensure that noise and vibration levels in the adjacent community remain consistent with the predicted levels in the CNIS, approval and/or licence conditions. For projects with a duration of less than three months, or where out of hours works are required, the attended measurements must be undertaken at the time intervals described in the CNIS, out of hours assessment, approval and/or licence conditions.

[6] Or other relevant acoustic assessment

Table 2: Maximum allowable noise levels for construction equipment

| Equipment | Maximum Allowable Noise Level (dBA) – LAmax[1, 2, 3] | |
|---|---|---|
| | Sound Power Level | Sound Pressure Level at 7 m |
| Excavator Hammer | 122 | 97 |
| Excavator (approx. 3 tonne) | 90 | 65 |
| Excavator (approx. 6 tonne) | 95 | 70 |
| Excavator (approx. 10 tonne) | 100 | 75 |
| Excavator (approx. 20 tonne) | 105 | 80 |
| Excavator (approx. 30 tonne) | 110 | 85 |
| Excavator (approx. 40 tonne) | 115 | 90 |
| Skidsteer Loaders (approx. 1/2 tonne) | 107 | 82 |
| Skidsteer Loaders (approx. 1 tonne) | 110 | 85 |
| Dozer (equiv. CAT D8) | 118 | 93 |
| Dozer (equiv. CAT D9) | 120 | 95 |
| Dozer (equiv. CAT D10) | 121 | 96 |
| Backhoe/FE Loader | 111 | 86 |
| Dump Truck (approx. 15 tonne) | 108 | 83 |
| Concrete Truck | 112 | 87 |
| Concrete Pump | 109 | 84 |
| Concrete Vibrator | 105 | 80 |
| Bored Piling Rig | 110 | 85 |
| Scraper | 110 | 85 |
| Grader | 110 | 85 |
| Vibratory Roller (approx. 10 tonne) | 114 | 89 |
| Vibratory Pile Driver | 121 | 96 |
| Impact Piling Rig | 134 | 109 |
| Compressor (approx. 600 CFM) | 100 | 75 |
| Compressor (approx. 1500 CFM) | 105 | 80 |
| Concrete Saw | 118 | 93 |
| Jackhammer | 113 | 88 |
| Generator | 104 | 79 |
| Lighting Tower | 80 | 55 |
| Flood Lights | 90 | 65 |
| Cherry Picker | 102 | 77 |
| Mobile Crane | 110 | 85 |

Notes:

1. The Sound Power Level (SWL) represents the total noise output of the plant of equipment. The SWL is normally used in computer noise models to predict the Sound Pressure Levels (SPLs) at nearby receivers. When undertaking site compliance measurements, it is normally the SPL that is measured at a specified distance (typically 7m) from the plant or equipment.
2. The SWLs presented in the above table have been compiled from a selection of field measurements conducted by Heggies between 2004 and 2006 of plant and equipment operating on rail (and other similar) projects throughout NSW and are therefore considered to representative of plant and equipment SWLs which are readily achieved by current plant and equipment normally used in the construction industry.
3. Plant and equipment with SWLs higher than those presented in the table would be deemed to be emitting an excessive level of noise and should not be permitted to operate on rail construction sites.

## 3.3 Ground Vibration - Safe Working Distances for Intensive Activities

As a guide, safe working distances for typical items of vibration intensive plant are listed in Table 3. The safe working distances are quoted for both "cosmetic" damage (refer BS 7385) and human comfort (refer BS 6472). The safe working distances must be complied with at all times, unless otherwise approved by the relevant authority.

Table 3: Recommended safe working distances for vibration intensive plant

| Plant Item | Rating/Description | Safe Working Distance | |
|---|---|---|---|
| | | Cosmetic Damage (BS 7385) | Human Response (BS 6472) |
| Vibratory Roller | < 50 kN (Typically 1-2 tonnes) | 5 m | 15 m to 20 m |
| | < 100 kN (Typically 2-4 tonnes) | 6 m | 20 m |
| | < 200 kN (Typically 4-6 tonnes) | 12 m | 40 m |
| | < 300 kN (Typically 7-13 tonnes) | 15 m | 100 m |
| | > 300 kN (Typically 13-18 tonnes) | 20 m | 100 m |
| | > 300 kN (> 18 tonnes) | 25 m | 100 m |
| Small Hydraulic Hammer | (300 kg - 5 to 12t excavator) | 2m | 7m |
| Medium Hydraulic Hammer | (900 kg – 12 to 18t excavator) | 7m | 23m |
| Large Hydraulic Hammer | (1600 kg – 18 to 34t excavator) | 22m | 73m |
| Vibratory Pile Driver | Sheet piles | 2 m to 20 m | 20 m |
| Pile Boring | ≤ 800 mm | 2 m (nominal) | N/A |
| Jackhammer | Hand held | 1 m (nominal) | Avoid contact with structure |

Note: More stringent conditions may apply to heritage or other sensitive structures

The safe working distances presented in Table 3 are indicative and will vary depending on the particular item of plant and local geotechnical conditions. They apply to cosmetic damage of typical buildings under typical geotechnical conditions. Vibration monitoring is recommended to confirm the safe working distances at specific sites.

For highly sensitive receivers (eg, high technology facilities, recording studios and cinemas), specific assessment is required to ensure satisfactory operation of the facility and any mitigation or management measures are required to minimise the potential impacts.

In relation to human comfort (response), the safe working distances in Table 3 relate to continuous vibration. For most construction activities, vibration emissions are intermittent in nature and for this reason, higher vibration levels, occurring over shorter periods are allowed (see Appendix A). Where the predicted vibration levels exceed the human comfort objectives, the procedures in Section 5 are to be followed in order to mitigate the potential impacts at sensitive receivers.

# 4 CONSTRUCTION HOURS

The *standard* construction hours are set out in the approval and licence (if applicable) conditions for each project. The typical standard hours of construction in NSW are:

- 0700 to 1800 Monday to Friday; 0800 to 1300 Saturday (or 0700 to 1300 on Saturday if the noise is not audible at residential premises)
- No work on Sundays and Public Holidays

Other hours may be worked if approved by the relevant authority.

For rock hammering and breaking, sheet and driven piling and other impulsive/tonal noise generating activities, the typical standard hours of construction in NSW are:

- 0900 to 1200 Monday to Saturday; 1400 to 1700 Monday to Friday
- No work on Sundays and Public Holidays;

Other hours may be worked if approved by the relevant authority.

Confining construction activities (including the delivery of plant and equipment) to the hours above wherever feasible and reasonable helps reduce noise and vibration impacts by limiting potentially noisy construction activities to the day time, when background noise levels are higher, and by providing respite from construction noise during the evening, overnight and on weekends.

Where rail related construction work has to be carried out in close proximity to an operational rail network - while simultaneously maintaining a safe working environment and minimising disruption to commuters - the need for work to be undertaken outside the standard hours often arises. In many cases, work that needs to be carried out safely in close proximity to the live rail network or station platforms can only be undertaken during periods of scheduled trackwork (ie track possessions) which are typically scheduled during periods of lower commuter use (ie overnight, weekends and holiday periods).

Additionally, at the interfaces between rail and other transport (eg. road) and utility (eg. water, sewer, telecommunications) infrastructure, construction during the standard hours may not be possible due to the need to avoid unacceptable impacts on traffic or water, power or communications services.

For these reasons, it may be desirable (or unavoidable) for work to be scheduled outside the standard hours - subject to any approval or licence conditions. Box 1 below contains a sample approval condition that sets out the circumstances in which out of hours work is typically permitted.

The procedure for assessing and approving/rejecting proposals for out of hours works is set out in Figure 2 ***{NB: out of hours work covered by a licence is subject to a separate application to the DECC by the licence holder}***. The key features of the procedure include:

- All applications for out of hours work must be made on the approved form[7] and accompanied by the required information.
- Out of hours work with low or medium risk factors (see Figure 2) may be approved by the Environmental Management Representative (EMR) for the project.
- Applications for approval of out of hours work with medium or high risk factors ***(including those requiring the DECC's approval)*** must be supported by a CNIS or other acoustic assessment prepared in accordance with the guidance in Appendix B.
- Out of hours work with a high risk factor can only be approved by TIDC's Director Planning and Environment or the Director-General of the Department of Planning (whichever is applicable) following the endorsement of the EMR.

**Box 1: Works permitted outside of standard construction hours**

a) any works which do not cause noise emissions to be audible at any nearby residential property and other noise sensitive receivers

b) the delivery of plant, equipment and materials which is required outside these hours as requested by Police or other authorities for safety reasons and with suitable notification to the community as agreed by the Director Planning/Director-General (whichever is applicable)[8]

c) emergency work to avoid the loss of lives, property and/or to prevent environmental harm

d) any works requiring **track possessions** subject to the following:

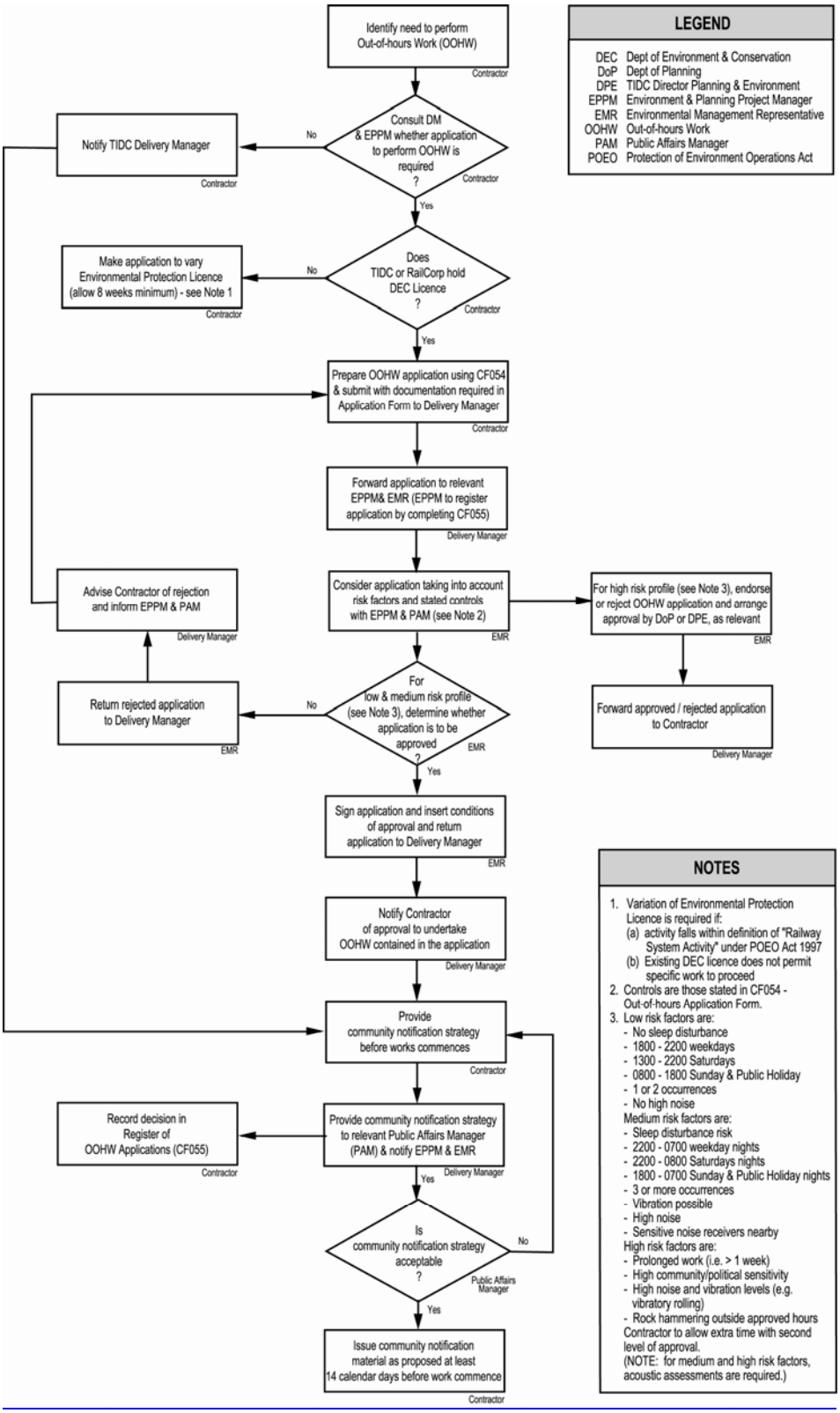
- the associated noise levels would be similar to noise levels associated with programmed maintenance works
- works which do not include high noise generating works including sheet piling, pile driving, rock hammering/breaking etc unless otherwise agreed by the Director Planning and Environment/Director-General (whichever is applicable) or as approved by DECC (where relevant to the issuing of a Licence)
- notification of the community at least 7 days in advance of such works or other period as agreed to by the EMR or Director Planning or as approved by DECC (where relevant to the issuing of an Licence) but with not less than 7 days notice to the community, including likely times and duration.

e) any other work as agreed by the Director Planning and Environment/Director-General (whichever is applicable) or DECC (where relevant to the issue of an Licence) and with suitable notification to the community and considered essential to the project.

[7] This form is not used for applications for out of hours work covered by a licence. The licence holder will have their own procedure covering such applications.

[8] Depending on whether the project is determined by TIDC or approved by the Minister for Planning.

Figure 2.: Out of hours work assessment and approval procedure



# 5 MITIGATING EXCEEDENCES OF CONSTRUCTION NOISE & VIBRATION OBJECTIVES

## 5.1 Approach

The implementation of the standard mitigation measures, compliance with maximum sound power levels for plant and equipment, construction hour management and standard community consultation measures in this Strategy should significantly reduce the noise and vibration impacts on nearby sensitive receivers.

Nevertheless, due to the highly variable nature of construction activities and the likelihood of work needing to be undertaken outside the standard construction hours on rail projects, exceedances of the project's construction noise and vibration objectives are likely to occur.

Where there is a potential for a project's construction noise and vibration objectives to be exceeded, a number of *additional* measures to mitigate such exceedances– primarily aimed at pro-active engagement with affected sensitive receivers – should be explored and have been included in this Strategy. The additional mitigation measures to be applied are outlined in Table 4 below. A full description of each measure is provided in Appendix C.

Table 4: Additional mitigation measures

| Measure | Abbreviation |
|---|---|
| Alternative accommodation | AA |
| Monitoring | M |
| Individual briefings | IB |
| Letter box drops[9] | LB |
| Project specific respite offer | RO |
| Phone calls | PC |
| Specific notifications | SN |

[9] In certain circumstances, on a case by case basis, media advertising may also be used to supplement letter box drops where considered effective.

## 5.2 Applying Additional Mitigation Measures

In circumstances where - after application of the standard mitigation measures - the $L_{A10(15minute)}$ construction noise and vibration levels are still predicted[10] to exceed the noise or vibration objectives, the relevant Additional Mitigation Measures Matrix (AMMM) (see Tables 5 – 7 below) is to be used to determine the additional measures to be implemented.

Using the relevant AMMM, the following steps need to be carried out to determine the additional mitigation measures to be implemented:

1. Determine the time period when the work is to be undertaken.
2. Determine the level of exceedance.
3. From the relevant AMMM table, identify the additional mitigation measures to be implemented (using the abbreviation codes - expanded in Table 4).

### Table 5: AMMM - Airborne construction noise

| **Time period** | | **Mitigation measures** | | | |
|---|---|---|---|---|---|
| | | **$L_{A10(15minute)}$ noise level above background (RBL)** | | | |
| | | **Qualitative assessment of noise levels[1]** | | | |
| | | **0 to 10 dBA** | **10 to 20 dBA** | **20 to 30 dBA** | **> 30 dBA** |
| | | **Noticeable** | **Clearly audible** | **Moderately intrusive** | **Highly intrusive** |
| Standard | Mon-Fri (7am - 6pm) | - | - | LB, M | LB, M |
| | Sat (8am - 1pm) | | | | |
| | Sun/Pub Hol (Nil) | | | | |
| OOHW | Mon-Fri (6pm - 10pm) | - | LB | M, LB, | M, IB, LB, RO, PC, SN, |
| | Sat (1pm - 10pm) | | | | |
| | Sun/Pub Hol (8am - 6pm) | | | | |
| OOHW | Mon-Fri (10pm - 7am) | LB | M, LB, | M, IB, LB, PC, SN, | AA, M, IB, LB, PC, SN, |
| | Sat (10pm - 8am) | | | | |
| | Sun/Pub Hol (6pm - 7am) | | | | |

Notes:

1. For some types of construction activities (refer Appendix B), a qualitative assessment of the potential noise impacts can be undertaken in lieu of detailed noise modelling. For these activities, noise mitigation measures should be evaluated on the basis of the noise levels being noticeable, clearly audible, moderately intrusive or highly intrusive. The qualitative assessment should consider the type of equipment being used, the character of the noise emissions, time of day, the location of the nearest receivers and the noise sensitivity of the nearest receivers. Where a qualitative assessment is being undertaken, this will need to be approved by the Environmental Management Representative.

[10] In the CNIS or other acoustic assessment

Table 6. AMMM - Ground-borne construction noise

| Time period | | Mitigation measures | | |
|---|---|---|---|---|
| | | Predicted $L_{Aeq(15minute)}$ noise level exceedance | | |
| | | Qualitative assessment of noise levels | | |
| | | 0 to 10 dBA | 10 to 20 dBA | > 20 dBA |
| | | Clearly audible | Moderately intrusive | Highly intrusive |
| Standard | Mon-Fri (7am - 6pm) | LB | LB | M, LB, SN, |
| | Sat (8am - 1pm) | | | |
| | Sun/Pub Hol (Nil) | | | |
| OOHW | Mon-Fri (6pm - 10pm) | LB | M, LB, RO, SN, | M, IB, LB, PC, SN, RO |
| | Sat (1pm - 10pm) | | | |
| | Sun/Pub Hol (8am - 6pm) | | | |
| OOHW | Mon-Fri (10pm - 7am) | M, LB, SN, | AA, M, IB, LB, PC, RP, SN, | AA, M, IB, LB, PC, RP, SN, |
| | Sat (10pm - 8am) | | | |
| | Sun/Pub Hol (6pm - 7am) | | | |

Table 7. AMMM - Ground-borne vibration

| Time period | | Mitigation measures |
|---|---|---|
| | | Predicted vibration levels exceed maximum levels |
| Standard | Mon-Fri (7am - 6pm) | M, LB, RP, |
| | Sat (8am - 1pm) | |
| | Sun/Pub Hol (Nil) | |
| OOHW | Mon-Fri (6pm - 10pm) | M, IB, LB, RO, PC, RP, SN, |
| | Sat (1pm - 10pm) | |
| | Sun/Pub Hol (8am - 6pm) | |
| OOHW | Mon-Fri (10pm - 7am) | AA, M, IB, LB, PC, RP, SN, |
| | Sat (10pm - 8am) | |
| | Sun/Pub Hol (6pm - 7am) | |

## 5.3 Ground-borne Vibration

If the predicted ground-borne vibration levels exceed the cosmetic damage objectives in Appendix A, a different construction method with lower source vibration levels must be used where reasonable and feasible otherwise construction works should not proceed unless attended vibration measurements are undertaken at the commencement of the works. If there is any risk of exceedance of the cosmetic damage objective, a permanent vibration monitoring system should be installed, to warn plant operators (via flashing light, audible alarm, SMS, etc) when vibration levels are approaching the cosmetic damage objective.

# 6 DOCUMENTATION

TIDC shall maintain a record of all complaints received and the subsequent action taken, in accordance with the approval and licence conditions.

Contractors are to retain records of the following:

- Complaints records
- Complaints responses and close out actions
- Correspondence
- Monitoring results
- Mitigation measures
- Construction Environmental Management Plans and associated sub-plans.

# 7 GLOSSARY

| | |
|---|---|
| DECC | New South Wales Department of Environment and Climate Change, including the Environment Protection Authority. |
| EMR | Environmental Management Representative. An independent environmental expert appointed by TIDC to review environmental management practices and authorise key management plans and out of hours work. |
| Licence | The relevant environment protection licence authorising scheduled development work on the project pursuant to the requirements of the *Protection of the Environment Operations Act 1997*. |
| TIDC | Transport Infrastructure Development Corporation, a State owned corporation constituted by *Transport Administration Act 1988* (NSW) of Level 7, Tower A, Zenith Centre, 821 Pacific Highway, Chatswood, NSW 2067. |

### Construction noise parameters

The three primary noise parameters that are used to describe airborne construction noise are:

| | |
|---|---|
| $L_{A1(60second)}$ | the "Typical Maximum Noise Level" for an event, used in the assessment of potential sleep disturbance during night-time periods; |
| $L_{A10(15\ minute)}$ | the "Average Maximum Noise Level" during construction activities. This is the main parameter used to assess the construction noise impacts; and |
| $L_{A90}$ | the "Background Noise Level" in the absence of construction activities. This parameter represents the average minimum noise level during the daytime, evening and night-time periods respectively. The $L_{A10(15\ minute)}$ construction noise objectives are based on an allowance margin above the $L_{A90}$ background noise levels. |

The subscript "A" indicates that the noise levels are filtered to match normal human hearing characteristics (ie A-weighted).

### Construction vibration parameters

The three primary parameters used to describe construction vibration are:

| | |
|---|---|
| PPV | "Peak Particle Velocity" evaluated at the building footings and used to assess the risk of damage to structures. |
| Arms | "Root mean squared weighted acceleration", a vibration parameter used to assess human response to continuous or intermittent vibration. |
| eVDV | "Estimated Vibration Dose Value", the overall vibration exposure assessed over the daytime or night-time period to assess human response to intermittent vibration. |

# APPENDIX A – OVERVIEW OF CONSTRUCTION NOISE & VIBRATION OBJECTIVES

This appendix provides a brief overview of construction noise and vibration and its potential effects on people, buildings and their contents. It also provides guidance on how to establish construction noise and vibration objectives during the environmental assessment phase.

## Construction airborne noise objectives

The construction airborne objectives are based on the EPA's *Environmental Noise Control Manual*.

- For a total construction period of up to four weeks duration, the $L_{A10}$ noise level when measured over a period of not less than 15 minutes should not exceed the $L_{A90}$ background noise level by more than 20 dBA.
- For a total construction period of between four and 26 weeks, the $L_{A10}$ noise level should not exceed the $L_{A90}$ background noise level by more than 10 dBA.
- For a total construction period of greater than 26 weeks, the $L_{A10}$ noise level should not exceed the $L_{A90}$ background noise level by more than 5 dBA.

The $L_{A90}$ Rating Background Levels (RBL's) should be determined using the "tenth percentile method" described in the DECC's *NSW Industrial Noise Policy* during the relevant assessment periods (daytime, evening or night-time).

As the duration of rail construction projects is typically greater than 26 weeks, the $L_{A90}$ background plus 5 dBA noise goal usually applies to residential and other noise sensitive receivers (eg schools, hospitals, and nursing homes).

For retail and commercial buildings, it is generally accepted that receivers are 5 dBA to 10 dBA less sensitive to noise emissions than residential receivers. For these receivers, an $L_{A10(15minute)}$ noise objective of $L_{A90}$ background plus 10 dBA is recommended. These objectives are only relevant in areas without nearby residential dwellings, otherwise the more stringent residential criterion should apply.

## Ground-borne noise

There are no current guidelines for the assessment of ground-borne (sometimes referred to as regenerated) construction noise.

Ground-borne construction noise is usually present on tunnelling projects when equipment such as tunnel boring machines, roadheaders, rockhammers and drilling rigs are operated underground. The ground-borne noise inside buildings initially propagates as ground-borne vibration, before entering the building, which causes floors, walls and ceilings to gently vibrate and hence radiate noise. Sometimes the vibration may be perceptible within the building. For some critical spaces such as recording studios and cinemas, which are designed to reduce airborne noise intrusion, an assessment of ground-borne construction noise for surface construction may also be required.

Ground-borne noise is usually not a significant disturbance to building occupants during daytime periods due to higher ambient levels which mask the audibility of ground-borne noise emissions. During night-time periods however, when ambient noise levels are often much lower, ground-borne noise is more prominent and may result in adverse comment from building occupants.

Table A1 provides a summary of the ground-borne construction noise objectives that have been applied on recent construction projects in NSW.

Table A1 Review of ground-borne noise objectives on recent NSW tunnel projects

| Construction project | Ground-borne noise objectives (residential) | |
|---|---|---|
| (Tunnels) | Daytime | Night-time |
| Cross City Tunnel (Road) | Vibration objectives only (BS6472) | LAeq(15minute) 40 dBA (6pm to 10pm)<br>LAeq(15minute) 35 dBA (10pm to 7am) |
| 330kV Cable Tunnels in Sydney CBD | Vibration objectives only (BS6472) | LAeq(15minute) 40 dBA (6pm to 10pm)<br>LAeq(15minute) 35 dBA (10pm to 7am) |
| Lane Cove Tunnel (Road) | Vibration objectives only (BS6472) | LAeq(15minute) 40 dBA (6pm to 10pm)<br>LAeq(15minute) 35 dBA (10pm to 7am) |
| Epping to Chatswood Rail Line | LAeq(15minute) 45 dBA | LAeq(15minute) 40 dBA (6pm to 7am)<br>LAeq(15min) 35 dBA > 7 days (10pm to 7am) |

### Construction vibration objectives

The effects of vibration in buildings can be divided into three main categories; those in which the occupants or users of the building are inconvenienced or possibly disturbed, those where the building contents may be affected and those in which the integrity of the building or the structure itself may be prejudiced.

### Human perception of vibration

Guidance in relation to acceptable vibration levels for human comfort are provided in DECC's *Assessing Vibration: a technical guideline* (February 2006). This document is based on the guidelines contained in BS 6472-1992.

The DECC guideline provides thee assessment methods, depending on whether the vibration is continuous, impulsive or intermittent. The preferred and maximum values are provided in Table A2.

- Continuous vibration would normally be generated by fixed plant items such as generators, fans and the like where the vibration emissions continue uninterrupted (usually throughout the daytime or night-time period).

- Impulsive vibration would normally be generated by short duration (ie less than two second) events with no more than three occurrences in an assessment period. A typical example would be ground compaction by dropping a large mass. Higher levels are allowed for impulsive vibration, however if more than three impulsive vibration events occur during the assessment period, the more stringent intermittent objectives are applied.

- Intermittent vibration can be defined as interrupted periods of continuous vibration (eg vibratory rolling, heavy truck passbys or rockbreaking) or continuous periods of impulsive vibration (eg impact pile driving). Higher vibration levels are allowed for intermittent vibration compared with continuous vibration on the basis that the higher

levels occur over a shorter time period. Hence, for intermittent vibration, human comfort vibration levels are assessed on the basis of the Vibration Dose Value, based on the level and the duration of the vibration events.

Table A2 Preferred and maximum vibration levels for human comfort

| Location | Assessment period | Preferred values | | Maximum values | |
|---|---|---|---|---|---|
| **Continuous vibration** | | **z axis** | **x and y axes** | **z axis** | **x and y axes** |
| Critical areas | Day- or night-time | 0.005 m/s$^2$ | 0.0036 m/s$^2$ | 0.010 m/s$^2$ | 0.0072 m/s$^2$ |
| Residences | Daytime | 0.010 m/s$^2$ | 0.0071 m/s$^2$ | 0.020 m/s$^2$ | 0.014 m/s$^2$ |
| | Night-time | 0.007 m/s$^2$ | 0.005 m/s$^2$ | 0.014 m/s$^2$ | 0.010 m/s$^2$ |
| Offices, schools, educational institutions and places of worship | Day- or night-time | 0.020 m/s$^2$ | 0.014 m/s$^2$ | 0.040 m/s$^2$ | 0.028 m/s$^2$ |
| Workshops | Day- or night-time | 0.040 m/s$^2$ | 0.029 m/s$^2$ | 0.080 m/s$^2$ | 0.058 m/s$^2$ |
| **Impulsive vibration** | | **z axis** | **x and y axes** | **z axis** | **x and y axes** |
| Critical areas | Day- or night-time | 0.005 m/s$^2$ | 0.0036 m/s$^2$ | 0.010 m/s$^2$ | 0.0072 m/s$^2$ |
| Residences | Daytime | 0.30 m/s$^2$ | 0.21 m/s$^2$ | 0.60 m/s$^2$ | 0.42 m/s$^2$ |
| | Night-time | 0.10 m/s$^2$ | 0.071 m/s$^2$ | 0.20 m/s$^2$ | 0.14 m/s$^2$ |
| Offices, schools, educational institutions and places of worship | Day- or night-time | 0.64 m/s$^2$ | 0.46 m/s$^2$ | 1.28 m/s$^2$ | 0.92 m/s$^2$ |
| Workshops | Day- or night-time | 0.64 m/s$^2$ | 0.46 m/s$^2$ | 1.28 m/s$^2$ | 0.92 m/s$^2$ |
| **Intermittent vibration** | | **x, y and z axes** | | **x, y and z axes** | |
| Critical Areas | Day- or night-time | 0.10 m/s$^{1.75}$ | | 0.20 m/s$^{1.75}$ | |
| Residences | Daytime | 0.20 m/s$^{1.75}$ | | 0.40 m/s$^{1.75}$ | |
| | Night-time | 0.13 m/s$^{1.75}$ | | 0.26 m/s$^{1.75}$ | |
| Offices, schools, educational institutions and places of worship | Day- or night-time | 0.40 m/s$^{1.75}$ | | 0.80 m/s$^{1.75}$ | |
| Workshops | Day- or night-time | 0.80 m/s$^{1.75}$ | | 1.60 m/s$^{1.75}$ | |

Notes:

For continuous and intermittent vibration, the preferred and maximum values are weighted acceleration values (Wg for z axis and Wd for x and y axes).

For intermittent vibration, the preferred and maximum values are Vibration Dose Values (VDVs), based on the weighted acceleration values.

### Effects on building contents

People can perceive floor vibration at levels well below those likely to cause damage to building contents or affect their operation. For most receivers, the controlling vibration criterion is therefore the human comfort criterion and separate objectives are not normally required in relation to the effect of construction vibration on building contents.

Some scientific equipment (eg electron microscopes and microelectronics manufacturing equipment) can require more stringent objectives than those applicable to human comfort. Where appropriate, objectives for the satisfactory operation of critical instruments or manufacturing processes should be sourced from manufacturer's data and/or other published objectives.

### Effects of vibration on structures

The levels of vibration required to cause cosmetic damage to buildings tend to be at least an order of magnitude (10 times) higher than those at which people may consider the vibration to be intrusive.

In terms of the most recent relevant vibration damage objectives, Australian Standard AS 2187: Part 2-2006 "Explosives - Storage and Use - Part 2: Use of Explosives" recommends the frequency dependent guideline values and assessment methods given in BS 7385 Part 2-1993 "Evaluation and measurement for vibration in buildings Part 2" as they "are applicable to Australian conditions" BS7385.

The British Standard sets guide values for building vibration based on the lowest vibration levels above which damage has been credibly demonstrated. These levels are judged to give a minimum risk of vibration-induced damage, where minimal risk for a named effect is usually taken as a 95% probability of no effect.

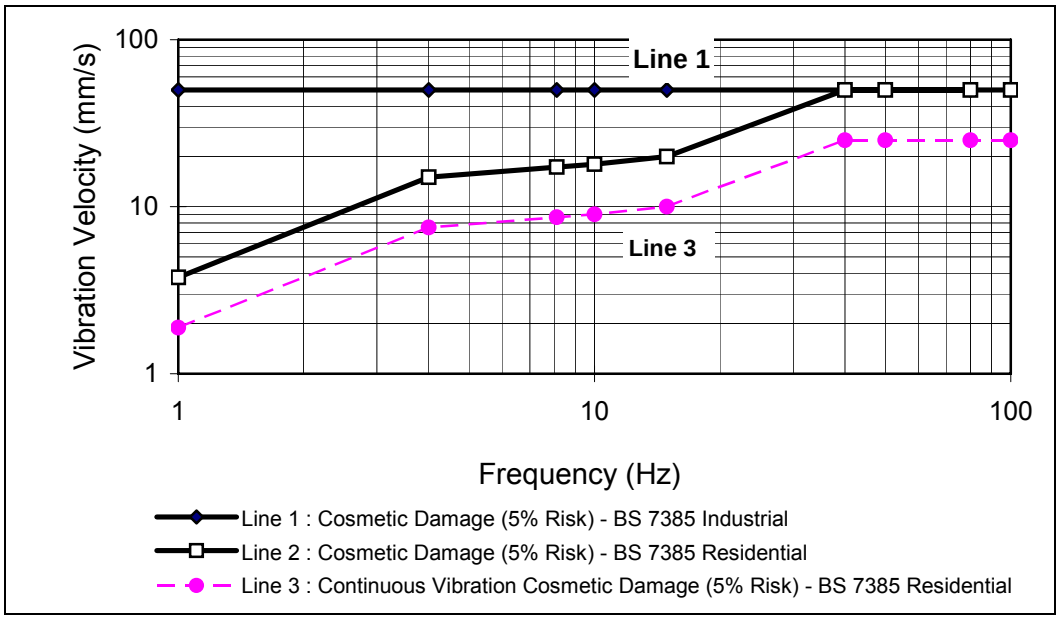
The recommended limits (guide values) from BS7385 for transient vibration to ensure minimal risk of cosmetic damage to residential and industrial buildings are presented numerically in Table A3 and graphically in Figure A1.

Table A3 Transient vibration guide values - minimal risk of cosmetic damage

| Line | Type of building | Peak component particle velocity in frequency range of predominant pulse | |
|---|---|---|---|
| | | 4 Hz to 15 Hz | 15 Hz and above |
| 1 | Reinforced or framed structures<br>Industrial and heavy commercial buildings | 50 mm/s at 4 Hz and above | |
| 2 | Unreinforced or light framed structures<br>Residential or light commercial type buildings | 15 mm/s at 4 Hz increasing to 20 mm/s at 15 Hz | 20 mm/s at 15 Hz increasing to 50 mm/s at 40 Hz and above |

The standard states that the guide values in Table A3 relate predominantly to transient vibration which does not give rise to resonant responses in structures, and to low-rise buildings. Where the dynamic loading caused by continuous vibration is such as to give rise to dynamic magnification due to resonance, especially at the lower frequencies where lower guide values apply, then the guide values in Table A3 may need to be reduced by up to 50% (as shown by Line 3 of Figure A1 for Residential Buildings).

Figure A1 Graph of Transient Vibration Guide Values for Cosmetic Damage




In the lower frequency region where strains associated with a given vibration velocity magnitude are higher, the guide values for building types corresponding to Line 2 are reduced. Below a frequency of 4 Hz where a high displacement is associated with the relatively low peak component particle velocity value, a maximum displacement of 0.6 mm (zero to peak) is recommended. This displacement is equivalent to a vibration velocity of 3.7 mm/s at 1 Hz.

The standard goes on to state that minor damage is possible at vibration magnitudes which are greater than twice those given in Table A3 and major damage to a building structure may occur at values greater than four (4) times the tabulated values.

Fatigue considerations are also addressed in the standard and it is concluded that unless calculation indicates that the magnitude and number of load reversals is significant (in respect of the fatigue life of building materials) then the guide values in Table A3 should not be reduced for fatigue considerations.

It is noteworthy that, extra to the guide values nominated in Table A3, the standard states that:

> *"Some data suggests that the probability of damage tends towards zero at 12.5 mm/s peak component particle velocity. This is not inconsistent with an extensive review of the case history information available in the UK."*

Also that:

> *"A building of historical value should not (unless it is structurally unsound) be assumed to be more sensitive."*

# APPENDIX B – GUIDELINES FOR ASSESSING NOISE & VIBRATION IMPACTS (INCLUDING CNIS)

Whenever construction works are proposed as part of a rail project, a prediction and assessment of the airborne noise, ground-borne noise and ground-borne vibration levels is required to determine the potential impacts on nearby receivers. The determination of the mitigation measures required will depend on the level of impact, the duration of the works and the time at which the noise or vibration activity occurs.

The intention is to minimise the level of site noise and vibration and inconvenience to affected receivers while having regard to the reasonableness and feasibleness of any proposed control or mitigation measures.

## Type of assessment

The level of detail for a construction assessment will vary depending on the scale of the works and the likely noise and vibration impacts.

For some small projects, involving low-powered plant where sensitive receivers are not located in close proximity to the works, it may be sufficient to undertake a qualitative assessment of the potential noise and vibration impacts.

For larger projects, involving many plant items and extended periods of construction adjacent to sensitive receivers, a quantitative assessment of the potential noise and vibration impacts would normally be required (although some activities or work stages may still require only a qualitative assessment).

The construction of a chain wire safety fence as part of preparatory works during the daytime or evening period, for example, may require only a qualitative assessment of the potential noise impacts. However, the construction of a new rail bridge out of hours over a period of 4-weeks would require a quantitative assessment of the potential noise and vibration impacts.

Where a qualitative assessment is being undertaken, this will need to be approved by the Environmental Management Representative.

## Qualitative assessment procedure

For qualitative construction assessments, the following minimum requirements would need to be included as part of the assessment report:

- Justification for undertaking a qualitative assessment including endorsement by Environmental Management Representative.
- Duration of the construction works and time periods over which works will be undertaken.
- Equipment expected to be used (during noisiest operations).
- Identification and description of nearest sensitive receivers potentially impacted by the proposed construction works.
- List of standard mitigation measures that will be employed to minimise the potential noise impacts (including management measures, source controls and path controls).

- Discussion of the Qualitative Assessment with reference to the relevant Additional Mitigation Measures Matrix (AMMM) in Tables 5-7.
- List of additional mitigation measures that will be employed to minimise the potential impacts (including monitoring and management measures).

### Quantitative assessment procedure

Quantitative construction assessments are performed by comparing the predicted noise and vibration levels with the appropriate assessment criteria for the receiver types and time of day.

Quantitative assessment reports will need to address the same minimum requirements as per the qualitative assessment procedure above, plus detailed information in relation to the source noise levels, the determination of appropriate assessment criteria, relevant construction scenarios and predicted noise and vibration levels.

The quantitative assessment procedure steps are as follows:

### Step 1: Determine noise and vibration objectives

The relevant noise and vibration objectives for the nearest sensitive receivers that may be potentially impacted by the construction works should be determined with reference to Appendix A.

### Step 2: Assess construction scenarios

Identify a representative range of construction scenarios.

If the assessment is being carried out for the environmental assessment documentation (eg REF) it will be based on a concept design and construction scenarios for the project (usually prepared by a technical advisor and/or planning consultant).

If the assessment is being undertaken prior to construction (eg CNIS) it will be based on a more detailed design and actual construction scenario (usually prepared by the design and/or construction contractors).

The assessment should be conservative and sufficiently detailed to identify any project specific noise or vibration mitigation measures (including, but not limited to: physical structures such as construction noise barriers, acoustic sheds, dwelling treatment, acoustic barriers around noisy plant, operational noise barriers erected early or special construction methods such as penetrating cone fracture or controlled blasting in place of conventional rock breaking) that are both necessary to meet the construction noise or vibration objectives and reasonable and feasible to implement.

In predicting the level of noise or vibration at nearby sensitive receivers, the assessment (whether based on concept or detailed design) must include the implementation of all relevant mitigation measures in Table 1.

### Step 3: Predicting noise and/or vibration impacts

#### For airborne construction noise

1. Determine the source noise levels (SWLs) of each plant item proposed as part of the construction scenario. Note that the noise levels (SWLs) of each plant or equipment item should be less than the maximum allowable levels in Table 2. If the noise from a particular plant item is tonal or impulsive in nature, a 5 dBA penalty should be added to the noise source level.
2. Determine the location of each plant or equipment item in relation to each receiver.
3. Include the effects of all *project specific* (see above) mitigation measures.
4. Include the effects of all relevant *standard* mitigation measures.
5. Include the effects of noise shielding provided by site offices, noise barriers or natural topographic features.
6. Include the effects of noise reflections and ground attenuation.
7. On the basis of the duration of each activity (over a typical "worst-case" 15-minute period), determine whether any correction between the $L_{Amax}$ and $L_{A10(15minute)}$ is required.
8. Calculate the $L_{A10(15minute)}$ noise levels from the proposed construction activities at each receiver and compare these with the airborne construction noise objectives.
9. For night-time activities, calculate the $L_{A1(60second)}$ noise levels and compare with the DECC's RBL plus 15 dBA sleep disturbance screening criterion. On the basis of the ambient noise environment during the night-time period, the predicted $L_{A1}$ noise levels and number of expected $L_{A1}$ noise events should be predicted in order to determine the likelihood of potential sleep disturbance.

#### Notes

The number of receivers would be dependent on the size of the construction site, the time at which the construction noise occurs and the level of potential noise impact. Calculations would normally be undertaken at locations considered to be representative of a group of receivers with a similar level of exposure to the construction works.

For night-time construction works or large construction sites with many nearby receivers, it may be more appropriate to provide noise contour plots in order to illustrate the degree to which each receiver or group of receivers are impacted by the construction works.

For ground-borne construction noise

1. Determine the location of each plant or equipment item in relation to each receiver.
2. On the basis of ground-borne noise levels versus distance prediction curves for each plant item, determine the level of ground-borne noise at each building location. For highly sensitive building occupancies, the assessment may need to incorporate the acoustic properties of the building space and the structural response of the building.
3. Include the effect of all relevant *standard* mitigation measures as part of the construction scenario.
4. Calculate the $L_{Aeq(15minute)}$ noise levels from the proposed construction activities at each receiver and compare these with the ground-borne construction noise objectives.

For ground-borne construction vibration

1. Determine the location of each plant or equipment item in relation to each receiver.
2. On the basis of ground-borne vibration levels versus distance prediction curves for each plant item, determine the level of ground-borne vibration at each building location. For highly sensitive equipment, the assessment may need to incorporate the structural response of the building and particular sensitivities of the equipment.
3. Incorporate all relevant *standard* mitigation measures as part of the construction scenario.
4. Calculate the continuous, intermittent and impulsive vibration levels from the proposed construction activities at each receiver and compare these with the ground-borne construction vibration objectives.

Step 4: Determining *additional* mitigation measures required

1. Consult the relevant Additional Mitigation Measures Matrix (AMMM) in Tables 5-7 to determine, based on the level of exceedance of the background noise or groundborne noise or vibration level, the *additional* mitigation measures to be implemented.

# APPENDIX C - STANDARD AND ADDITIONAL MITIGATION MEASURES

## Periodic notification (monthly letterbox drop)

For each TIDC project, a newsletter entitled 'Project Update' or 'Construction Update' is produced and distributed to the local community via letterbox drop and the project mailing list. These newsletters provide an overview of current and upcoming works across the project and other topics of interest. The objective is to engage and inform and provide project-specific messages. Advanced warning of potential disruptions (eg traffic changes or noisy works) can assist in reducing the impact on the community. The approval conditions for projects specify requirements for notification to the community about works that may impact on them.

Content and newsletter length is determined on a project-by-project basis. Most projects distribute notifications on a monthly basis. Each newsletter is graphically designed within a branded template.

## Website

The TIDC website (www.tidc.nsw.gov.au) is a key resource for members of the community to seek further information on projects, noise and vibration management plans, current and upcoming construction activities. It serves to inform on a 24-hour basis and provides a constant and additional layer of information over-and-above the periodic notifications.

The website is reviewed and updated on a monthly basis or in line with construction works.

As the website is a public forum, all information to be uploaded is approved by TIDC's Senior Manager Public Affairs or Director Corporate Communications. The aim is to provide a visually appealing, easy-to-navigate tool for members of the public. Information is provided in plain English with use of illustrative graphics and photos and a minimum of jargon.

## Project Infoline and Construction Response Line

The Construction Response Line and Project Infoline are mandatory on all TIDC projects to provide a contact point for interested stakeholders. TIDC has established two 24 hour free-call telephone numbers:

- Construction Response Line, 1800 775 465 – providing a dedicated 24 hour contact point for any complaints regarding construction works.
- Project Infoline, 1800 684 490 – providing a dedicated contact point for any project enquiries.

These lines are managed via a professional answering service and are the key mechanism for the receipt of enquiries/complaints to TIDC for all projects. These numbers are listed with Telstra and are advertised in all project-related communications materials.

All enquiries require a verbal response within 24 hours during standard construction hours, or on the next working day during out of hours work (unless the enquirer agrees otherwise).

The answering service immediately directs any complaints to an on-duty TIDC representative via a pager system. Communications team members are scheduled on the pager roster and

are on-call 24-hours per day during this period. This ensures that complaints are managed by experienced personnel to facilitate swift resolution.

### Email distribution list

Email distribution lists are used on all TIDC projects to disseminate project information to interested stakeholders. Advanced warning of audible activities can assist to reduce the impact of projects experienced by the community.

TIDC and its contractors maintain mailing lists of stakeholders interested in receiving project information via email.

### Signage

Signage is used on all TIDC projects to disseminate project information. Signage is provided at each TIDC project to notify stakeholders of project details and project emergency and enquiry contact information. Where available, the full community notification, detailing likely audible construction noise is on display at the station.

### Specific notifications (SN)

Specific notifications are letterbox dropped or hand distributed to identified stakeholders no later than seven days ahead of construction activities that are likely to exceed the noise objectives. The exact conditions under which specific notifications would proceed are defined in the relevant Additional Mitigation Measures Matrix (Tables 5-7). This form of communication is used to support periodic notifications, or to advertise unscheduled works.

### Phone calls (PC)

Phone calls detailing relevant information would be made to identified/affected stakeholders within seven days of proposed work. Phone calls provide affected stakeholders with personalised contact and tailored advice, with the opportunity to provide comments on the proposed work and specific needs etc.

### Individual briefings (IB)

Individual briefings are used to inform stakeholders about the impacts of high noise activities and mitigation measures that will be implemented. Communications representatives from the contractor would visit identified stakeholders at least 48 hours ahead of potentially disturbing construction activities. Individual briefings provide affected stakeholders with personalised contact and tailored advice, with the opportunity to comment on the project.

### Project specific respite offer (RO)

Residents subjected to lengthy periods of noise or vibration may be eligible for a project specific respite offer. The purpose of such an offer is to provide residents with respite from an ongoing impact. The offer could comprise pre-purchased movie tickets or similar offer. This measure is determined on a project-by-project basis, and may not be applicable to all TIDC projects.

### Alternative accommodation (AA)

Alternative accommodation options should be provided for residents living in close proximity to construction works that are likely to incur noise levels significantly above the applicable level (Tables 5-7).