Macdonaldtown Gasworks

Noise & Vibration Report

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DOCUMENT CONTROL REGISTER

Project Number	2010459
Project Name	Macdonaldtown Gasworks
Document Title	Noise & Vibration Report
Document Reference	2010459/1309A/R6/GW
Issue Type	Email
Attention To	Incoll Management Pty Ltd Mr. Bryan Kidd

Revision	Date	Document Reference	Prepared By	Checked By	Approved By
0	13/09/2010	2010459/1309A/R0/GW	GW		
1	10/12/2010	2010459/1309A/R1/GW	GW		GW
2	20/2/2011	2010459/1309A/R2/GW	GW		GW
3	20/06/2011	2010459/1309A/R3/GW	GW		GW
4	12/07/2011	2010459/1309A/R4/GW	GW		BW
5	12/08/2011	2010459/1309A/R5/GW	GW		GW
6	18/01/2012	2010459/1309A/R6/GW	GW		GW

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EXECUTIVE SUMMARY

A noise and vibration assessment has been carried out for the proposed Macdonaldtown Gasworks Remediation Project (the Project) to assess whether the proposed activities would impact upon sensitive receivers close to the site.

The objective of the noise and vibration assessment is to ensure that all work is carried out in a manner that will minimise noise and vibration emissions to the sensitive receivers surrounding the site.

For at least part of the remediation work period, some processes are likely to generate noise levels that will require additional management. Whilst some of the remediation tasks will create high noise emissions when adjacent to the residential properties, the noise impact of the works will decrease as distance between the plant and the receiver increases. Many of the high level noise emitting works are short term, lasting approximately 7 to 14 days.

On the private access road adjacent to the rail corridor, the cumulative impact of truck and train noise on a noise receiver not shielded by a solid noise wall may result in an increase of 1.7 dB(A), though any impact will be of short duration and is expected to occur rarely.

Adoption of the following controls where feasible and reasonable will ensure that noise impacts on receivers will be minimised.

- All equipment shall be well maintained.
- A Polyvinyl enclosure with a minimum wall thickness of 7mm shall be installed, with all gaps being sealed. The opening of enclosure shall face away from western boundary.
- The ventilation system serving the enclosure shall be acoustically treated by silencers or similar to ensure that the noise emission to the western boundary is less than 50 dB(A).
- Static equipment shall be located as far as possible from residence (see Figures 2-5) and screened by enclosure.

To manage the effects of vibration, goals have been set to safeguard existing structures close to the project site and protect human comfort and amenity. The vibration generated by piling along the western boundary may result in exceedance of human comfort. If the works are performed in accordance with the recommendations in this report they should not exceed the building damage criteria.

1 PROJECT INTRODUCTION

The project site (the site) is located on Burren St in Erskineville (Lot 50 DP 1001467) within the City of Sydney Local Government Area. The site is indicated in Figure 1.

Figure 1 Site Map and Noise Receiver Location

The proposed works will involve the excavation, treatment and disposal of contaminated soils and impacted groundwater/ surface water from the Macdonaldtown site. The proposed works will involve remediation of approximately 23,000m^3 of various materials including soil, fill, clay, gravel, sand, tar sludge and demolition waste.

If required, an alternative site at Chullora (adjacent to the Chullora Railway Workshops) is proposed for the contaminated material treatment. A separate noise and vibration assessment has been prepared for the Chullora site (Acoustic Logic, 2011).

In order to minimise odour and noise emissions from selected areas, sections of the Macdonaldtown site (and the Chullora site if used) will be covered by a polyvinyl tent with an air supply fan and air extractor to keep the enclosure at negative pressure. Excavation of malodorous soils will occur under the enclosure to minimise noise and odour impacts.

The nearest noise receivers are the one to three storey residential buildings adjacent to the western boundary of the site. A site survey indicates that at the western boundary the residential side is approximately 2m below the level of the project site.

All of the above works will be performed as per the Remedial Strategy prepared for the project (JBS Environmental, 2011). The proposed activities are therein described in detail.

1.1 PROPOSED WORKS

The remediation work is planned to be completed in 4 stages as shown in Figures 2 to 5 (from JBS Remedial Strategy, 2011).

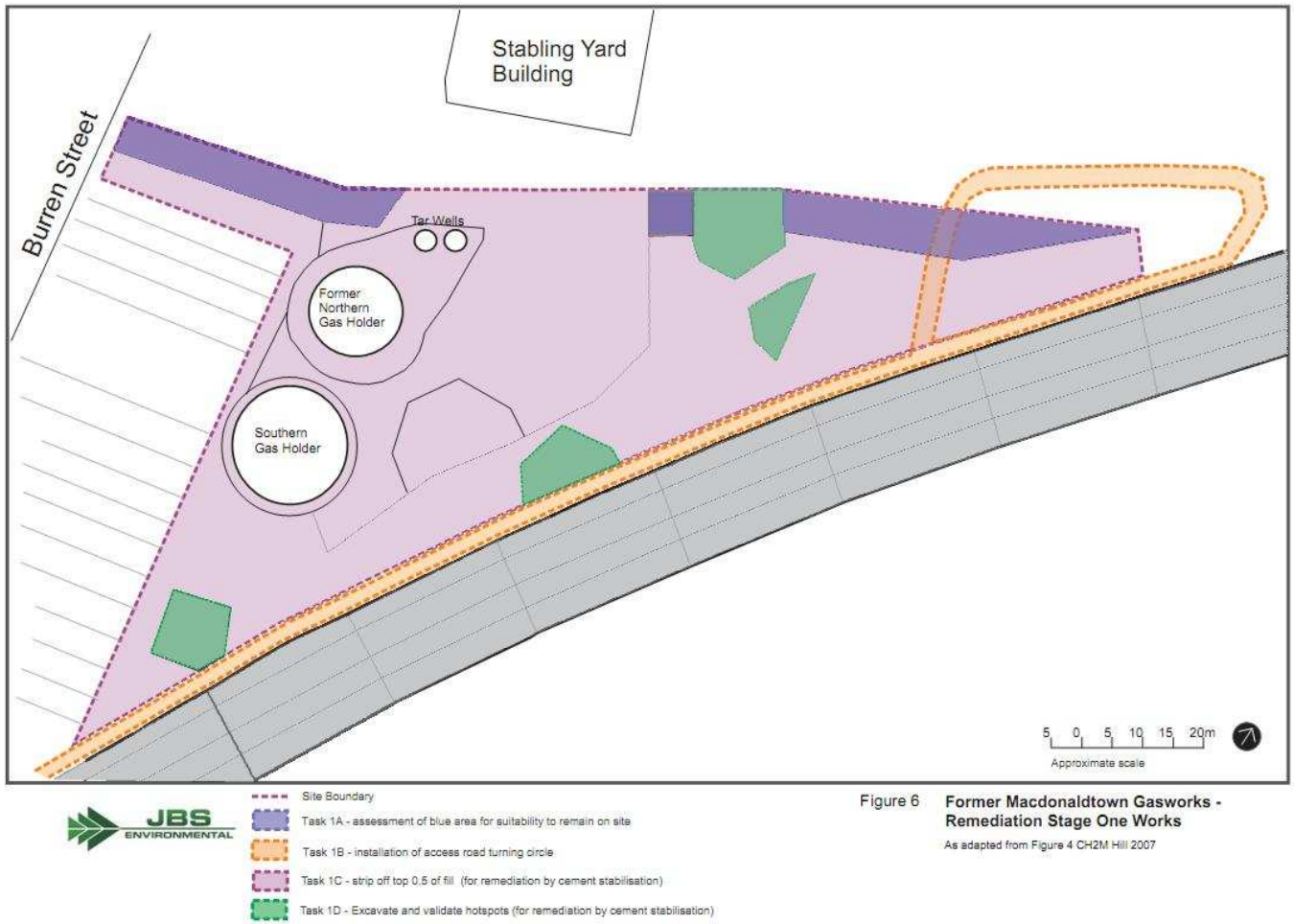


Figure 2 Stage 1 Works

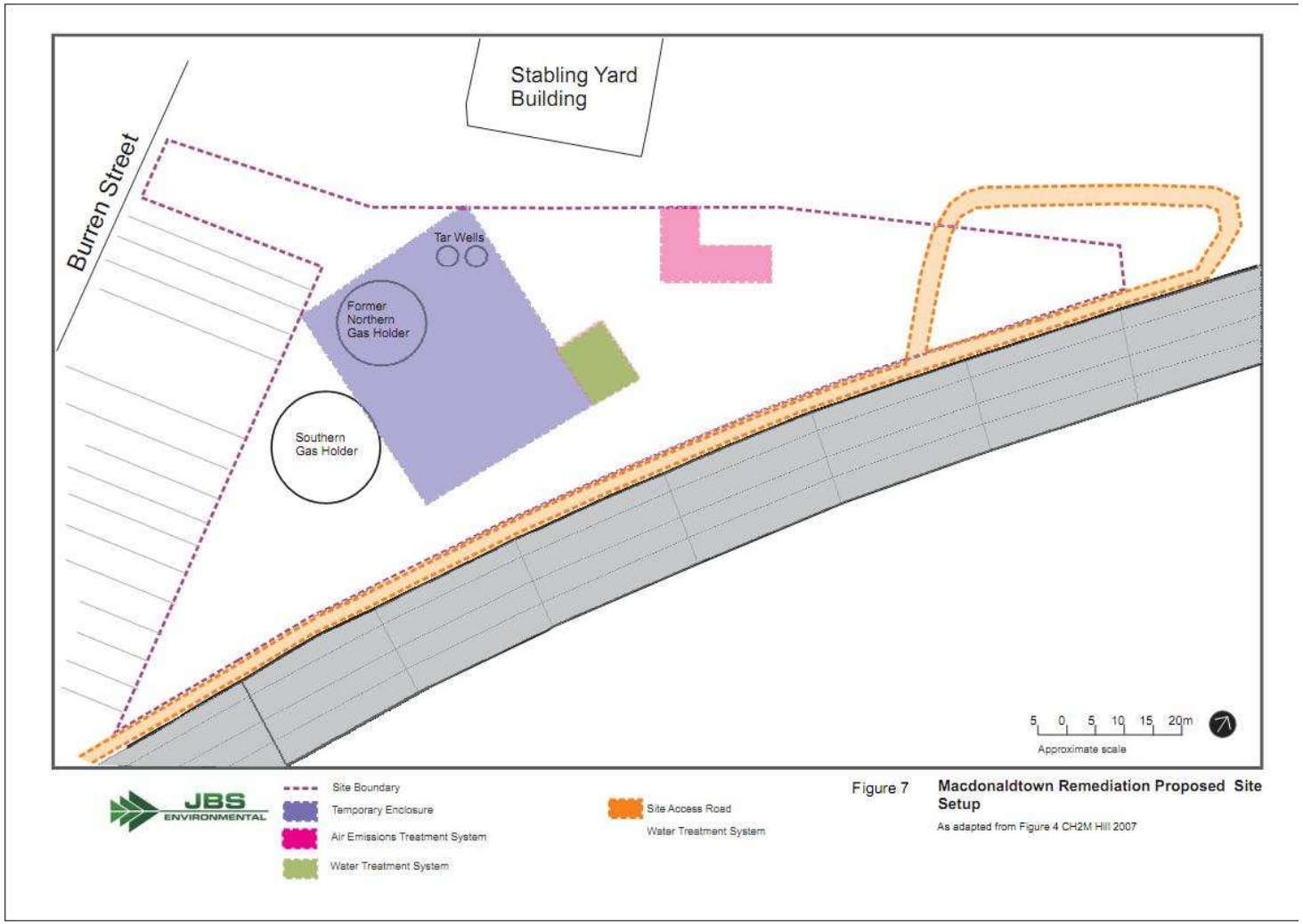


Figure 3 Site Setup

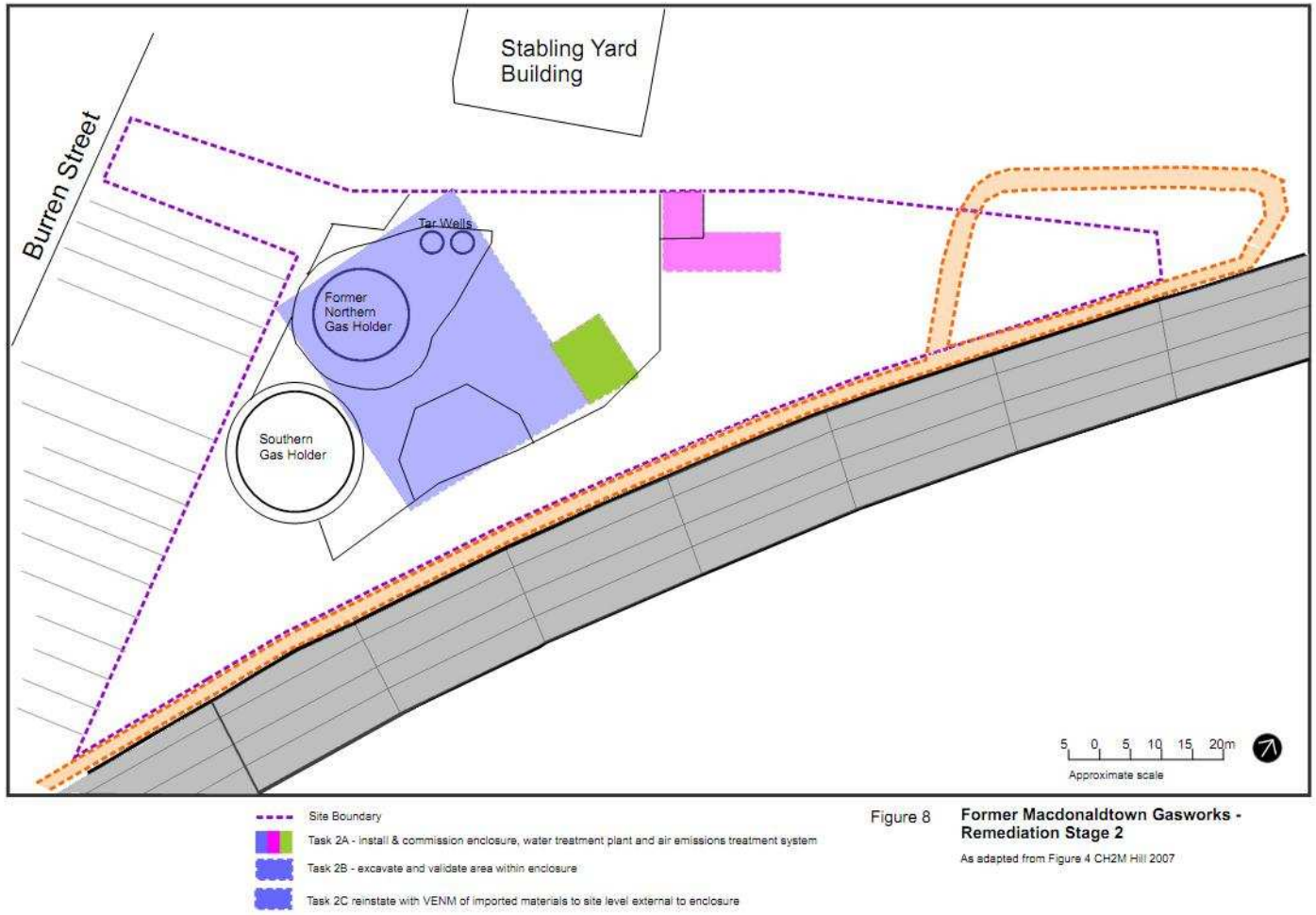


Figure 4 Stage 2 Works

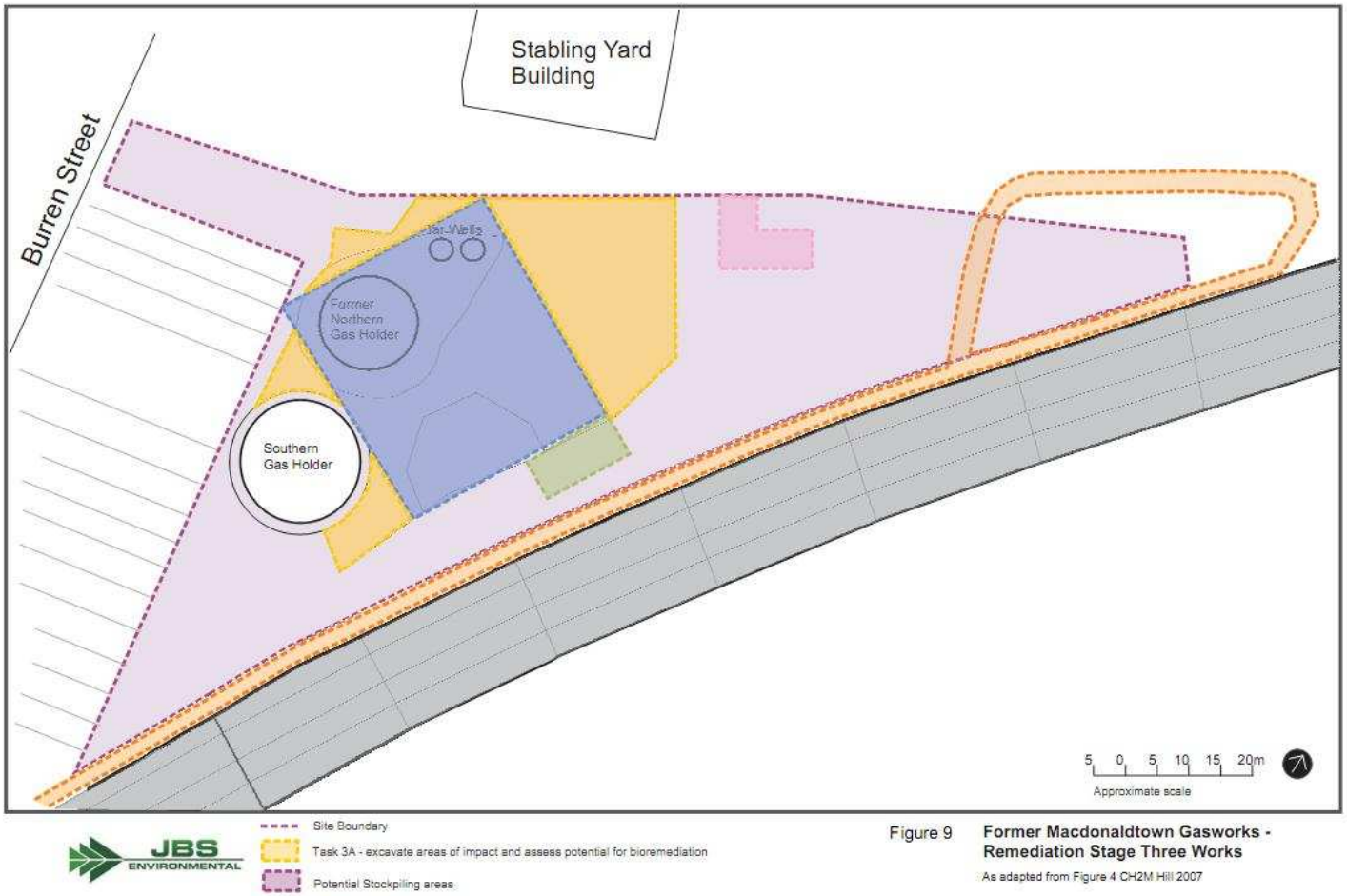


Figure 5 Stage 3 Works

1.2 PROPOSED EQUIPMENT

The major equipment proposed for use during each stage is detailed in Table 1.

Table 1 – Proposed Mobile Plant

Stage	Estimated Duration	Description of Works	Proposed Mobile Plant
1 *(Figure 2)*	30 Days	Task 1A Assessment of blue areas	• 20T excavator with bucket outside enclosure
		Task 1 B Installation of turning circle	• 20T excavator with bucket outside enclosure • Truck with dog trailer
		Task 1C Strip top 0.5m of fill	• Drilling rig for installation of piles for soil retention where required. • 20T excavator with bucket outside enclosure • Truck with dog trailer
		Task 1D Excavate and validate hotspots	• 20T excavator with bucket outside enclosure • Truck with dog trailer
		Site Setup (Enclosure, Water Treatment Systems (WTS), Air Emissions System, etc) *(Figure 3)*	• Float Trucks • Semi trailers
2 *(Figure 4)*	35 Days	Task 2A Commission air and water treatment systems	• Float Trucks • Semi trailers
		Task 2B Excavate and validate within enclosure	• 20T excavator with hydraulic hammer within enclosure for demolition purposes. • 20T excavators with bucket outside enclosure • Truck with dog trailer
		Task 2C Reinstate with VENM	• 20T excavator with bucket within enclosure • Truck with dog trailer
3 *(Figure 5)*	60 Days	Task 3A Excavate yellow areas external to enclosure	• 20T excavators with bucket outside enclosure • Truck with dog trailer
		Task 3B On site bioremediation within enclosure	• 20T excavators with bucket outside enclosure • 20T excavator with bucket within enclosure

4 (Entire site)	60 Days	Reinstatement and landscaping	• 20T excavators with bucket outside enclosure • Truck with dog trailer

1.3 HOURS OF OPERATION

The NSW Department of Planning have advised that the applicable operating hours are as per the DECCW Interim Construction Noise Guideline.

Construction activity will be limited to the hours stated detailed below:

- 7:00am-6:00pm Monday to Friday
- 8:00am-1:00pm Saturday
- No Work Sundays and public holidays

2 GUIDELINES AND STANDARDS

The following section identifies the noise and vibration guidelines applicable to the Project.

2.1 NOISE

The applicable general noise guidelines and standards are:

- Interim Construction Noise Guideline (DECCW, 2009).
- Australian Standard 2436-1981 "Guide to Noise Control on Construction Maintenance and Demolition Site" (In particular the requirements stipulated in Section 3 of the standard).
- NSW Industrial Noise Policy (EPA, 2000) for static plant

2.2 TRAFFIC

The applicable traffic noise guidelines and standards are:

- NSW Industrial Noise Policy (for traffic on private roads).
- Interim Construction Noise Guideline (DECCW, 2009).
- Environmental Criteria for Road Traffic Noise (EPA, 1999) guidelines for "land use developments with potential to create additional traffic on local roads".

2.3 VIBRATION

The applicable vibration guidelines and standards are:

- German Standard DIN 4150-3 (1999-02): "Structural Vibration – Effects of Vibration on Structures" (will be used to assess and limit building damage risk).
- DECC "Assessing Vibration: a technical guideline" DECC, 2006 (contains preferred and maximum vibration criteria for assessing human responses to vibration).

2.4 INTERIM CONSTRUCTION NOISE GUIDELINE (DECCW, 2009)

This guideline nominates acceptable levels of noise emissions above the background noise level. For major construction projects within the recommended standard hours (see Section 1.3) the guideline recommends an acceptable noise level of 10 dB(A) above the background level (RBL).

The noise affected level represents the point above which there may be some community reaction to noise.

- Where the predicted or measured LAeq (15min) is greater than the noise affected level, the proponent should apply all feasible and reasonable work practices to meet the noise affected level.
- 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.

The Interim Construction Noise Guideline also nominates a "highly noise affected" level (being over 75 dB(A) at the receiver). 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 relevant authority (consent, determining or regulatory) may require respite periods by restricting the hours that the activities can occur, taking into account the following:

- Times identified by the community when they are less sensitive to noise (such as before and after school for works near schools, or mid morning or mid afternoon for works near residences.
- If the community is prepared to accept a longer period of construction in exchange to restriction on construction times

2.5 AUSTRALIAN STANDARD 2436

Section 3 of AS 2436 states that care shall be taken in applying criteria that normally would be used to regulate noise emitted from industrial, commercial and residential premises to construction, particularly for those activities which are transitory and of short duration.

For the control and regulation of noise from construction sites AS2436 nominates the following:

- That a reasonable suitable noise criterion is established.
- That all practicable measures be taken on the building site to regulate noise emissions, including siting noisy static processes on parts of the site where they can be shielded, selecting less noisy processes, and if required regulating construction hours.
- The undertaking of noise monitoring where non-compliance occurs to assist in the management and control of noise emission from the building site.

2.6 NSW INDUSTRIAL NOISE POLICY (EPA, 2000)

The NSW Industrial Noise Policy provides guidelines for assessing noise impacts from industrial developments. The recommended assessment objectives vary depending on the potentially affected receivers, the time of day, and the type of noise source. The NSW Industrial Noise Policy has two requirements which both have to be complied with, namely an amenity criterion and an intrusiveness criterion. In addition, the EPA (in the Environmental Noise Control Manual) state that noise controls should be applied with the general intent to protect residences from sleep arousal.

2.7 PROTECTION OF THE ENVIRONMENT OPERATIONS ACT

The project shall adhere to the requirements for noise generated from mechanical plant concerning the transmission of "offensive noise" under the provisions of the Protection of the Environment Operations Act (POEO Act).

The Sound Pressure Level at the boundary of any receiver should not exceed the background (RBL) LA90 15minutes noise level by 5dB.

All **static** plant required to continually operate during working hours (supply fan, extractor fan, and generators etc) are to be managed to meet the background +5dB requirement.

3 IMPACT ASSESSMENT PROCESS

The process used in completing this noise and vibration assessment is presented below:

1) Measure Background Noise Level (see Section 4)

2) Identify applicable noise and vibration objectives (see Section 4).

3) Predict noise and vibration levels produced by proposed remediation plant at the source (see Section 5).

4) Predict noise and vibration impacts at the receiver. If predicted noise levels at receiver exceeds remediation noise objective, investigate and implement all practical and cost effective controls and techniques to limit noise emissions (see Section 6 and 7).

5) If the noise objective is still exceeded after applying all practical controls to limit noise emissions, investigate management and other techniques to mitigate noise impacts of receivers (see Section 9).

4 BACKGROUND NOISE LEVELS

The existing background noise was measured between 10th and 17th October 2010 by setting up an unattended background noise monitor along the western boundary with full microphone view of the nearby residences (refer to Figure 1).

4.1 MEASUREMENT EQUIPMENT USED

Unattended noise measurements were obtained using an Acoustic Research Laboratories Pty Ltd noise logger. The logger was programmed to store 15-minute statistical noise levels throughout the monitoring period. The noise monitors were calibrated at the beginning and the end of the measurement using a Rion NC-73 calibrator. No significant drift was detected.

4.2 RATED BACKGROUND NOISE LEVEL

The recorded background noise data was processed and is attached at Appendix 1 of this report. Weather affected noise data has been excluded during noise analysis. The day-time (7am-6pm) Rating Background Noise Level (RBL) is presented in Table 2.

Table 2 –Monitored Rating Background Noise Level (RBL) –Day (7am to 6pm)

Measurement Location	Rating Background Noise Level dB(A) L_{90} <15min>
Western Boundary (see Figure 1)	45

4.3 REMEDIATION NOISE OBJECTIVE

Based on the applicable guidelines in Section 2, the following objective has been set for remediation work noise emissions:

Table 3 –Remediation Noise Objective

Noise Receiver	Type of Plant	Applicable Guidelines	Objective
Nearest Residential Boundaries	Mobile	DECCW Interim Construction Noise Guideline(Section 2.4 of this report)	RBL +10 = 55 dB(A) L_{eq}
Nearest Residential Boundaries	Static	NSW Industrial Noise Policy (Section 2.6 of this report) POEO Act (Section 2.7 of this report)	RBL +5 = 50 dB(A) L_{eq}

5 NOISE IMPACT ASSESSMENT

5.1 PROPOSED PLANT NOISE

The proposed plant and equipment have been separated into the following classifications:

- **Static** Plant (required to operate the remediation polyvinyl enclosure, air treatment system, and the water treatments system) which does not change location on the site; and
- **Mobile** Plant (required to perform remediation tasks at various locations around the site).

5.1.1 Static Plant Noise Data

For static plant and equipment, test measurements were previously taken at a similar remediation project in Alexandria NSW. The remediation techniques used and plant required (negative pressure enclosure etc) are similar to those proposed for use in this project. The test site was also directly adjacent to sensitive noise receivers. These measured noise levels have been used to predict the noise impact from the similar static plant proposed for this project.

The remediation work noise was tested between 3pm and 5pm on 25th May 2010. No adverse weather conditions were present during the measurement period.

5.1.1.1 Equipment Used

Noise measurements were obtained using a Norsonic type SA140 Sound Analyser. The analyser was set to fast response and calibrated before and after the measurements using a Norsonics Sound Calibrator type 1251. No significant drift was noted.

5.1.1.2 Measured Noise Levels

The measured noise levels of the static plant (at the source and without any controls applied) have been converted into Sound Power Levels and are presented in Table 4.

Table 4 –Static Plant Noise Sound Power Level

EQUIPMENT	MEASURED SOUND POWER LEVEL dB(A)L_{eq}
Supply Air fan	109
Generator	98
Extractor	90

The sound power levels measured above are applicable to a specific type of equipment. Acoustic treatments such as silencers on the air intake and discharge sides, external cladding for the fan case, etc can be specified once the equipment is selected by the remediation contractor.

The correct specification of acoustic treatments (silencers etc) can result in reducing the noise emissions to below the Background +5dB(A) criteria.

5.1.2 Mobile Plant and Equipment Noise Data

For mobile plant and equipment, measured data held from previous studies of a similar nature, and data presented in Table D2 of Australian Standard 2436-1981 have been used to predict the noise levels for the mobile plant proposed for this project.

The A-weighted sound power levels for the proposed mobile plant and equipment (at the source and without any controls applied) are outlined in Table 5.

Table 5 - Mobile Plant Sound Power Level

EQUIPMENT / PROCESS	SOURCE SOUND POWER LEVEL dB(A) L_{eq}
Bored Piling	113
20 Ton Excavator with Hydraulic Hammer	120
20 Ton Excavator with bucket	107
Bulldozer	114
Bobcat	105
Truck with Dog trailer (max 19 metres long)	108
Angle grinders	114
Electric Saw	111
Drilling	94
Air compressor	86

5.2 PROPOSED TRAFFIC NOISE

For the purposes of this assessment, traffic generated by the project has been separated into the following categories:

- Private traffic (traffic on the site, and traffic along the site access road linking the site to Erskineville Road.); and
- Public traffic (traffic from Erskineville Road to the proposed material treatment facility at Chullora, or an appropriately licensed disposal facility).

The assessment of the traffic generated by the project has been prepared in "Traffic and Pedestrian Management Plan" (Transportation and Traffic Planning Associates, September 2010). An excerpt is presented below.

> *CONSTRUCTION VEHICLE ROUTES*
>
> *Truck movements associated with the construction processes have been determined through a review of appropriate roads in the area serving the site. All movements entering and exiting the site are restricted to LEFT/IN/LEFT OUT as a consequence of a median in Erskineville Rd adjacent to the access driveway to Macdonaldtown site. The site is well served by the arterial road network, therefore limiting the reliance on local roads.*
>
> *TRUCK MOVEMENTS*
>
> *The transfer of material between Macdonaldtown and Chullora will be carried out through the use of single unit of trucks with a 'dog trailer'. Articulated vehicles will not be utilised due to road geometry constraints when exiting the site at Macdonaldtown and at the intersection of Erskineville Rd and Wilson St.*
>
> *On the assumption that it takes up to 10 minutes to manoeuvre, load and release a truck and dog trailer, the theoretical maximum number of trucks which could be loaded in a 10 hour period would be in the order 65-70 vehicles. With the time taken to travel between Macdonaldtown and the potential treatment site at Chullora and return between Macdonaldtown and the potential treatment site at Chullora and return being approximately 2 hours, a fleet of 12 trucks would be required to remove up to 1,000m^3 in a single day. With the rate at which vehicles can be located on to trucks, dictating the amount of material which can be removed from the site, it is apparent that maximum number of truck daily movements generated by the proposed activity will be between 65-70. This level of activity will not have any measurable impact on the surrounding road network.*

5.2.1 Private Road Guideline

The traffic noise generated by traffic along the private road along the southern boundary of the site shall comply with the requirements of the NSW Industrial Noise Policy which has been detailed in Section 2. There are 2 criteria which apply; Intrusiveness and Amenity.

5.2.1.1 Intrusiveness Criterion

The NSW Industrial Noise Policy is intended to limit the audibility of noise emissions at residential receivers. It requires that noise emissions measured using the L_{eq} descriptor not exceed the background noise level by more than 5 dB(A).

Table 6 – DECCW INP Intrusiveness Acceptable Noise Levels

Rating Background Noise Level dB(A) L_{90}	Intrusiveness Criteria Acceptable Noise Level dB(A) L_{eq}
45	50

Where applicable, the intrusive noise level can be penalised (increased) to account for any annoying characteristics such as tonality.

5.2.1.2 Amenity Criterion

The NSW Industrial Noise Policy is intended to limit the absolute noise level from all noise sources to a level that is consistent with the general environment and sets out acceptable noise levels for various localities. Table 2.1 on page 16 of the policy indicates the appropriate categories for the receivers close to the site.

Table 7 provides the recommended ambient noise levels for the residential receiver near the site for the day period. For the purposes of this condition, Day is defined as the period from 7am to 6pm Monday to Saturday and 8am to 6pm Sundays and Public Holidays.

Table 7 – DECCW INP Recommended Acceptable Noise Levels

Type of Receiver	Time of day	Recommended Acceptable Noise Level dB(A) Leq
Residential	Day	60

If the existing amenity noise levels due to industrial noise are close to or above the recommended acceptable noise levels, the operation of the site shall be designed to a lower level than the acceptable noise level.

5.2.1.3 Private Road Objectives

Table 8 provides a summary of both of the NSW Industrial Noise Policy criteria (intrusiveness and amenity) and the private road traffic noise objective based on background noise monitoring conducted for the subject site (see Section 4).

Table 8 – Private Road Traffic Noise Objectives dB(A)

Time of day	Rating Background Noise Level dB(A) L90	Amenity Criteria dB(A) L_{eq}	Intrusiveness Criteria RBL + 5 dB(A) L_{eq}	Noise Objective dB(A) L_{eq}
Day	45	60	50	50

5.2.2 Public Road Guideline

The applicable guidelines are:

- "Interim Construction Noise Guideline" (DECCW, 2009). This guideline nominates Environmental Criteria for Road Traffic Noise.
- The ECRTN guidelines for "land use developments with potential to create additional traffic on local roads" are presented in Table 9.

5.2.3 Public Road Objective

The objective for public road noise impacts are presented in Table 9.

Table 9 - Public Road Traffic Noise Objectives

Type of Development	Day (7am to 10pm)	Night (10pm to 7am)	Where Criteria Are Already Exceeded
Land use developments with potential to create additional traffic on local road	55 dB(A)$L_{eq(1\ hour)}$*	50 dB(A)$L_{eq(1\ hour)}$*	Where feasible and reasonable, existing noise levels should be mitigated to meet noise criteria. Examples of applicable strategies include appropriate location of private access roads; regulating times of use; using clustering; using' quiet' vehicles; and use barriers and acoustic treatments. In all cases, traffic arising from the development should not lead to an increase in existing noise levels of more than 2 dB

*Measured outside residential façade containing a window

6 NOISE CONTROLS

This section describes general and specific noise control methods.

6.1 GENERAL NOISE CONTROLS

6.1.1 Silencing Devices

Where construction equipment generates unacceptable noise levels the use of silencing devices is to be employed. These may take the form of engine shrouding, or special industrial silencers fitted to exhausts.

In certain cases it may be possible to specifically treat a piece of equipment to dramatically reduce the sound levels emitted.

6.1.2 Reversing Alarms

All trucks are to be fitted with a reverse alarm that is automatically activated when reverse gear is selected. Alarms which vary the output in response to changes in the surrounding noise level, i.e. self-adjusting type alarms (e.g. “Smart Alarm”) are preferred.

If smart alarms are to be employed, they must be mounted with an unobstructed ‘vision’ to the rear of the truck. All alarms must be clearly audible above the noise level of the truck.

Fixed output reverse alarms originally fitted by the truck manufacturer are acceptable. Truck and trailer combinations must be fitted with a reverse alarm at the rear of the rear most trailer.

6.1.3 Restricted Operating hours

Operating hours can be restricted to limit the impact on amenity of nearby receivers. The operating hours applicable to this project are detailed in Section 1.3.

6.1.4 Location of Plant

The location of static plant can be sited as far as practical from surrounding noise sensitive receivers at all times. The proposed site plans have the truck loading/unloading zones located as far away as practical from residents (see Figures 2-5).

6.1.5 Noise Monitoring and Checks of Equipment

Noise monitoring of the site shall be undertaken to determine the effectiveness of controls which have been implemented. The monitoring results are to be used to devise further control measures

It is also recommended to undertake fortnightly noise checks of specific plant and equipment. If noise levels are found to be higher than nominated for that equipment type, items such as mufflers and engine shrouds will be examined to ensure they are in good working order.

A record of these measurements should be kept on a form similar to that shown below. This control is intended to maintain noise at constant levels, and prevent any increases throughout the life of the project.

MACDONALDTOWN GASWORK REMEDIATION SITE

Construction Appliance Compliance Certificate

Month _____

Year _____

Plant Item _____

Allowable Noise Level .....

Measured Noise Level .....

Complies Yes ☐ No ☐

Issuing Engineer .....

Sub-Contractor _____

Project Manager _____

6.2 STAGE SPECIFIC NOISE CONTROLS

In calculating the predicted noise levels in Section 7, the following feasible and reasonable noise controls have been applied for the applicable stages:

Table 10 – Stage Specific Noise Controls

Control	Control Description	Potential Noise Reduction
A	Equipment shall be well maintained	Variable
B	Selected plant to operate within the Polyvinyl enclosure.	3-8 dB(A)
C	Barrier effect (enclosure acts as a noise barrier between plant and receiver)	5 dB(A)
D	Distance attenuation	Variable

In some cases two or more control measures have been implemented in combination to achieve noise targets (see Table 11).

6.3 NOISE CONTROL DETAILS

6.3.1 A - Maintenance

All plant and equipment is to be maintained to a high standard with no worn or chipped gear teeth, dry bearings, loose or worn parts or drive belts, poor lubrication or damaged silencers etc.

6.3.2 B - Enclosure

A minimum wall thickness of 7mm (with all gaps sealed) has been specified in assessing the acoustic shielding properties of this control, with the opening of the enclosure facing away from the western boundary. This enclosure has been calculated to provide a 3-8dB reduction in noise emissions across a range of operating frequencies from plant inside the enclosure.

A 12mm wall thickness could also be used if additional shielding is required, pending cost and practicality considerations. A 12mm enclose has been estimated to provide a 3-13dB reduction across a range of frequencies.

6.3.3 C – Barrier Effect

Works which are being performed on the eastern side of the site may benefit from a noise barrier effect from the enclosure.

6.3.4 D – Distance Attenuation

Distance attenuation has been applied to the proposed plant and equipment. The mobile plant will vary in distance to the receiver, so a range of values have been calculated. In some cases, mobile plant will be operating in close proximity (approximately 5m) to the adjacent residents. These works are expected to be of a short duration with the majority of work being performed at a distance greater than 20m from the receivers.

7 PREDICTED NOISE LEVELS

7.1 PLANT NOISE PREDICTION

Tables 11 and 12 present predicted noise levels which may occur at the residences located on the western boundary.

7.1.1 Static Plant Noise Impact Prediction

The noise emissions from **static** plant required to operate the enclosure were measured at a similar remediation site (see Section 5). The ventilation system is separated into 3 noise emitting components; Supply air fan, generator and extractor fan. The effectiveness of the controls applied to each component is presented in Table 11.

7.1.2 Mobile Plant Noise Impact Prediction

The noise emissions from **mobile** plant (at the noise source, and at the receiver with controls applied) are presented in Table 12.

Table 11 – Static Plant Noise Impact Prediction

Plant	Noise Source Data (Sound Power Level) dB(A)	Source	Control	Control Reduction (dB)	Source Reduction (dB (A)L_{eq})	Plant Reduction (dB)	Predicted Plant noise level dB(A)	Noise goal at receiver dB(A)L_{eq}	Compliant with Guideline
Supply Air Fan	109	Air intake point	Distance attenuation (46m distant from receiver)	41	61	61	48	50	Y
			Barrier effect (enclosure between source and receiver)	5					
			Silencer (insertion loss)	15* (frequency dependant)					
		Fan motor	Distance attenuation (46m distant from receiver)	41* (frequency dependant)	66				
			Motor case / shroud	10					
			Enclosure (fan motor is within the enclosure)	5* (3-8, frequency dependant)					
			Case Lagging (foam)	10* 5-20(frequency dependant)					
		Air discharge point	Distance attenuation (8m distant from receiver)	26	61				
			Enclosure (supply discharge point is within the enclosure)	5* (3-8, frequency dependant)					
			Silencer (insertion loss)	30* (frequency dependant)					

*Where there is a range of control reductions, the remediation contractor should specify the silencer and frequency specification that achieves the required reduction in order to meet the noise goal at receiver.

Table 11 – Static Plant Noise Impact Prediction (Cont.)

Plant	Noise Source Data (Sound Power Level) dB(A)	Source	Control	Control Reduction (dB)	Source Reduction (dB (A)L_{eq})	Plant Reduction (dB)	Predicted Plant noise level dB(A)	Noise goal at receiver dB(A)L_{eq}	Compliant with Guideline
Extractor	90	Air intake point	Distance attenuation (46m distant from receiver)	41	49	49	41	50	Y
			Enclosure (extractor intake point is within the enclosure)	*3 (3-8, frequency dependant)					
			Silencer (insertion loss)	*5 (5-20, frequency dependant)					
		Fan motor	Distance attenuation (46m distant from receiver)	41	54				
			Motor case / shroud	10					
			Enclosure (extractor fan motor is within the enclosure)	*3 (3-8,frequency dependant)					
		Air discharge point	Distance attenuation (46m distant from receiver)	41	55				
			Barrier effect (enclosure between source and receiver)	5					
			Silencer (insertion loss)	*9 (frequency dependant)					

Table 11 – Static Plant Noise Impact Prediction (Cont.)

Plant	Noise Source Data (Sound Power Level) dB(A)	Source	Control	Control Reduction (dB)	Source Reduction (dB (A)L_{eq})	Plant Reduction (dB)	Predicted Plant noise level dB(A)	Noise goal at receiver dB(A)L_{eq}	Compliant with Guideline
Generator	98	Generator	Distance attenuation (46m distant from receiver)	41	51	51	47	50	Y
			Barrier effect (enclosure between source and receiver)	5					
			Silencer (insertion loss)	5 (5-20, frequency dependant)					

Table 12 –Mobile Plant Noise Impact Prediction

					Controls (dB reduction) Refer Section 6.3							
Stage	**Task**	**Plant**	**Noise Source Data (Sound Power Level) dB(A)**	**Distance from receiver (metres)**	**A**	**B**	**C**	**D**	**Total reduction from controls (dB range)**	**Predicted noise level (at receiver) dB(A) L_{eq}**	**Noise goal at receiver dB(A)L_{eq}**	**Predicted Plant Exceedance dB(A) L_{eq}**
1	1A	20T Excavator with bucket (outside enclosure)	107	5.5 (at western boundary) – 160 (at eastern boundary)	☒	☐	☐	☒ (23 to 52)	23 to 52	55-84*	55	0 to 29*
	1B	20T Excavator with bucket (outside enclosure)	107	115 – 160	☒	☐	☐	☒ (49 to 52)	49 to 52	55-58	55	0 to 3
		Truck with dog trailer	108	115 – 160	☒	☐	☐	☒ (49 to 52)	49 to 52	56-59	55	1 to 4
	1C	Bored Piling	113	3.8	☒	☐	☐	☒ 20	20	93*	55	38*
		20T Excavator with bucket (outside enclosure)	107	5.5 – 160	☒	☐	☐	☒ (23 to 52)	23 to 52	55-84*	55	0 to 29*
		Truck with dog trailer	108	46 (at entrance to enclosure) - 160	☒	☐	☐	☒ (41-52)	41-52	55-67	55	1 to 12
	1D	20T Excavator with bucket (outside enclosure)	107	5.5 - 74	☒	☐	☐	☒ (23 to 45)	23 to 45	62 – 84*	55	7 to 29*
		Truck with dog trailer	108	115 – 160	☒	☐	☐	☒ (49 to 52)	49 to 52	55-59	55	0 to 4
	Site Setup	Trucks + Semitrailer	108	46 -160	☒	☐	☐	☒ (41-52)	41-52	55-67	55	0 to 12

Table 12 –Mobile Plant Noise Impact Prediction (Cont.)

					Controls (dB reduction) Refer Section 6.3							
Stage	**Task**	**Plant**	**Noise Source Data (Sound Power Level) dB(A)**	**Distance from receiver (metres)**	**A**	**B**	**C**	**D**	**Total reduction from controls (dB range)**	**Predicted noise level (at receiver) dB(A) L_{eq}**	**Noise goal at receiver dB(A)L_{eq}**	**Predicted Plant Exceedance dB(A) L_{eq}**
2	2A	Trucks + Semitrailer	108	46 -160	☒	☐	☒ (5)	☒ (41-52)	46-58	50 – 62	55	0 to 7
	2B	20T Excavator with Hydraulic Hammer (inside enclosure)	120	5.5 - 46 (at entrance to enclosure)	☒	☒ (3-8)	☐	☒ (23-41)	25-49	71-95*	55	16 to 30*
		20T Excavator with bucket (inside enclosure)	107	5.5 - 46	☒	☒ (3-8)	☐	☒ (23-41)	25-49	58-82*	55	3 to27*
		Truck with dog trailer	108	46 -160	☒	☐	☒ (5)	☒ (41-52)	46-58	50 – 62	55	0 to 7
	2C	20T Excavator with bucket (inside enclosure)	107	5.5 - 46	☒	☒ (3-8)	☐	☒ (23-41)	25-49	58-82*	55	3 to27*
		Truck with dog trailer	108	46 -160	☒	☐	☒ (5)	☒ (41-52)	46-58	50 – 62	55	0 to 7

Table 12 –Mobile Plant Noise Impact Prediction (Cont.)

					Controls (dB reduction) Refer Section 6.3							
Stage	**Task**	**Plant**	**Noise Source Data (Sound Power Level) dB(A)**	**Distance from receiver (metres)**	**A**	**B**	**C**	**D**	**Total reduction from controls (dB range)**	**Predicted noise level (at receiver) dB(A) L_{eq}**	**Noise goal at receiver dB(A)L_{eq}**	**Predicted Plant Exceedance dB(A) L_{eq}**
3	3A	20T Excavator with bucket (outside enclosure)	107	5.5 - 74	☒	☐	☐	☒ (22 to 45)	22 to 45	62 – 85*	55	7 to 30*
		Truck with dog trailer	108	46 -160	☒	☐	☒ (5)	☒ (41-52)	46-58	50 – 62	55	0 to 7
	3B	20T Excavator with bucket (inside enclosure)	107	5.5 - 46	☒	☒ (3-8)	☐	☒ (23-41)	25-49	58-82*	55	3 to27*
		20T Excavator with bucket (outside enclosure)	107	5.5 - 74	☒	☐	☐	☒ (22 to 45)	22 to 45	62 – 85*	55	7 to 30*
4	4	20T Excavator with bucket (outside enclosure)	107	5.5 – 160	☒	☐	☐	☒ (22 to 52)	22 to 52	55-85*	55	0 to 30*
		Truck with dog trailer	108	46 -160	☒	☐	☒ (5)	☒ (41-52)	46-58	50 – 62	55	0 to 7

* See Section 7 for discussion on additional measures which could be employed to further mitigate noise impacts on receivers.

7.2 MOBILE PLANT NOISE

During several works stages it is expected that the RBL + 10 criterion will be exceeded, as will the highly noise affected criteria (greater than 75 dB(A)).

There are 2 activities which generate particularly high noise impacts; the installation of the bored piles, and the demolition of the northern gasholder with excavators using hydraulic hammers, both of which occur in close proximity to adjacent residences, although both are expected to be of a short duration (approximately 7 to 14 days each).

Other remediation works may exceed the noise goals close to the receiver. As the works progress away from the receptor, the noise impact will reduce accordingly. It is noted that many of the noise sources are present over a small period of the day or may be present for a few days with a significant intervening period before the activity occurs again.

For works which continue to produce elevated levels of noise with all feasible and reasonable controls in place, respite periods and/or limited operating hours shall be used as detailed in the remediation contractors Noise and Vibration Management Plan (see Section 9).

7.3 TRAFFIC NOISE PREDICTION

7.3.1 Public Road Impact

The traffic report states:

"it is apparent that maximum number of truck daily movements generated by the proposed activity will be between 65-70 (or 6-7 vehicles movements per hour). This level of activity will not have any measurable impact on the surrounding road network."

And;

ERSKINEVILLE ROAD, ERSKINEVILLE
TRAFFIC VOLUMES

Time Period	Eastbound	Westbound	Total
7.00am – 8.00am	419	376	715
8.00am – 9.00am	508	484	**992**
9.00am – 10.00am	368	395	763
4.00pm – 5.00pm	329	608	937
5.00pm – 6.00pm	351	587	938
6.00pm – 7.00pm	321	644	965

The above table presents the existing traffic conditions on Erskineville Road, being a maximum number of **992** traffic movements in peak hour (between 8:00am and 9:00am). The addition of **7** truck movements per hour results in the below increase in traffic noise on public roads.

Table 12 –Predicted Public Road Noise Impact

ECTRN Criteria	Predicted Traffic Noise Increase on the surrounding road network	Compliance
traffic arising from the development should not lead to an increase in existing noise levels of more than 2 dB	0.03dB(A)	Yes

7.3.2 Private Road Impact

Although the majority of the residences adjacent to the private access road are shielded by an existing 4m high noise wall, the noise wall does not extend all the way to Erskineville Road. The receivers at the unshielded properties will experience a different level of traffic noise impacts than those shielded by the wall.

Closest to Erskineville Road the fence is chain wire, then becomes colour bond steel and then the 4m high noise wall starts (see Figures 2 and 3).

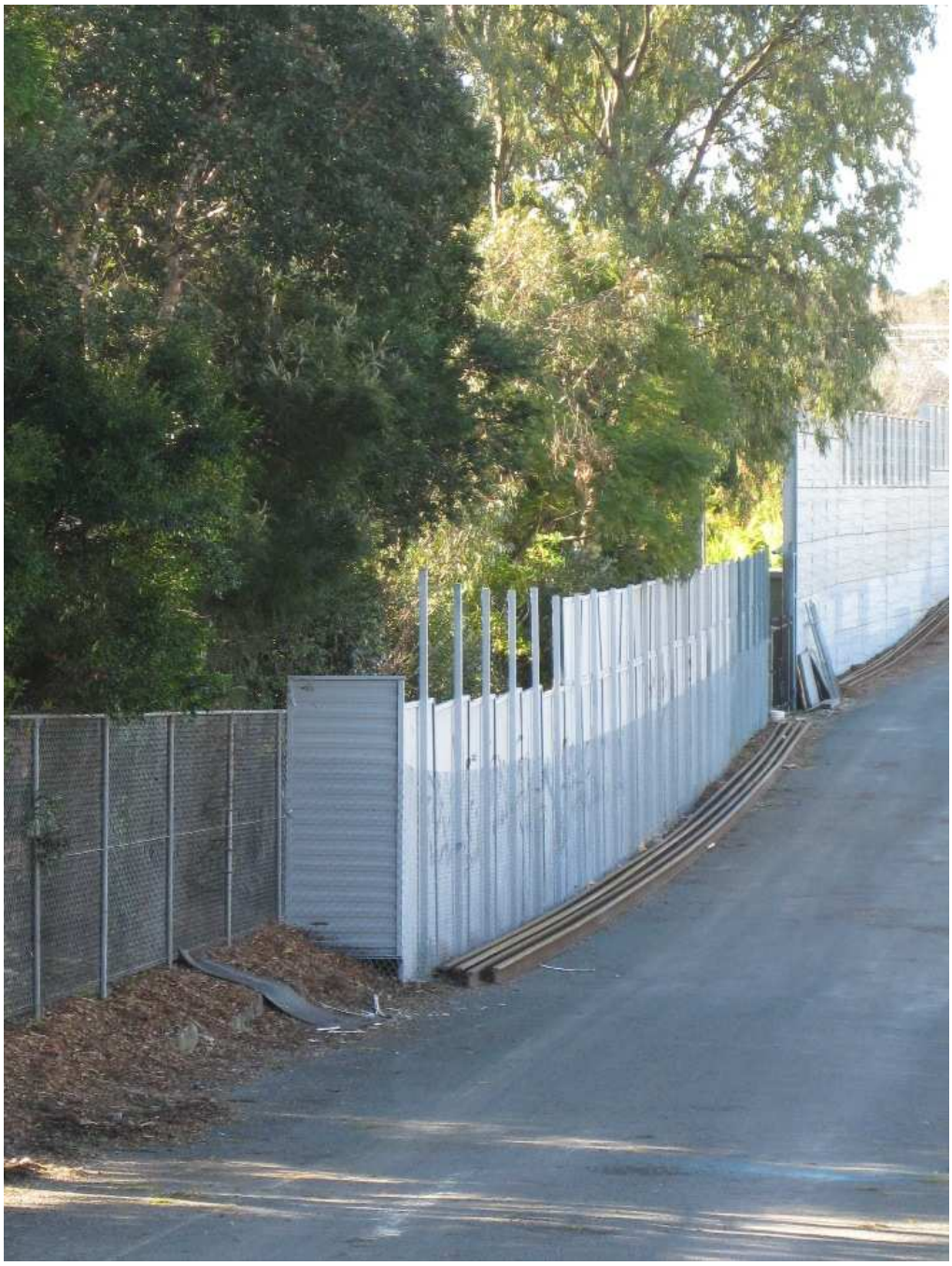


Figure 2 Access Road Colour Bond Noise wall

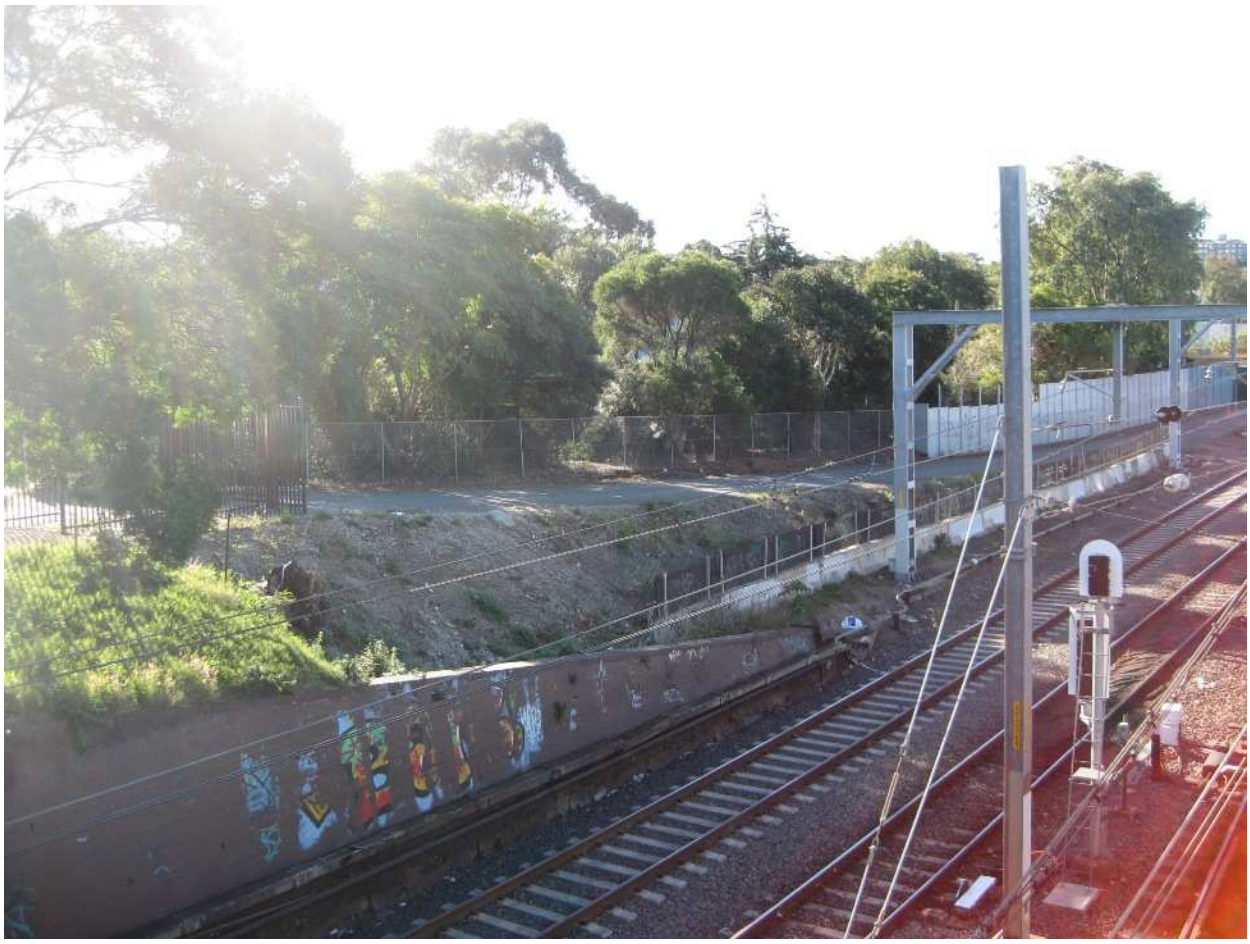


Figure 3 Access Road Chain Wire Fence

The following items have been considered for the prediction of traffic noise generated by the private road:

- 8km/h speed limit.
- Typical Sound Power Level of truck with a 'dog trailer' movements measured by this office 108 dB(A).

The following controls have been applied to the truck sound power level to determine the predicted noise level at the receivers:

- Distance attenuation.
- Barrier effect created by noise wall (where applicable).

With the application of the above considerations and controls, FHWA software has predicted the traffic noise impact on the noise receivers in Table 13.

Table 13 – Predicted Private Road Noise Impact

		Controls					
Noise Receiver	**Source Sound Power Level dB(A)**	**Barrier Effect dB(A) Leq**	**Distance Attenuation dB(A) Leq**	**Reduction due to Controls dB(A) Leq**	**Predicted Traffic Noise Level dB(A) Leq**	**INP Criteria dB(A) Leq**	**Compliance**
Residents with perforated boundary fence facing the private drive way	108	0*	44 (at 8m distance)	44	64	50	No*
The residents adjacent to the site, behind the existing noise wall.	108	5	54 (at 12m distance)	59	49	50	Yes

*See Section 7.3.2.

7.3.1 Existing Train noise on Private Road

As shown in Table 13 above, the predicted private traffic noise may exceed the applicable noise criteria at residences not shielded by the existing noise wall. Additional calculations were performed to ascertain the current noise impacts from existing train activity.

The effectiveness of the existing 4m high noise wall was calculated using the background measurements taken on-site (see Section 4) were used, and a train source sound level was extrapolated. This sound power level was then used to establish the existing noise level at the noise receivers which are not shielded by the existing noise wall.

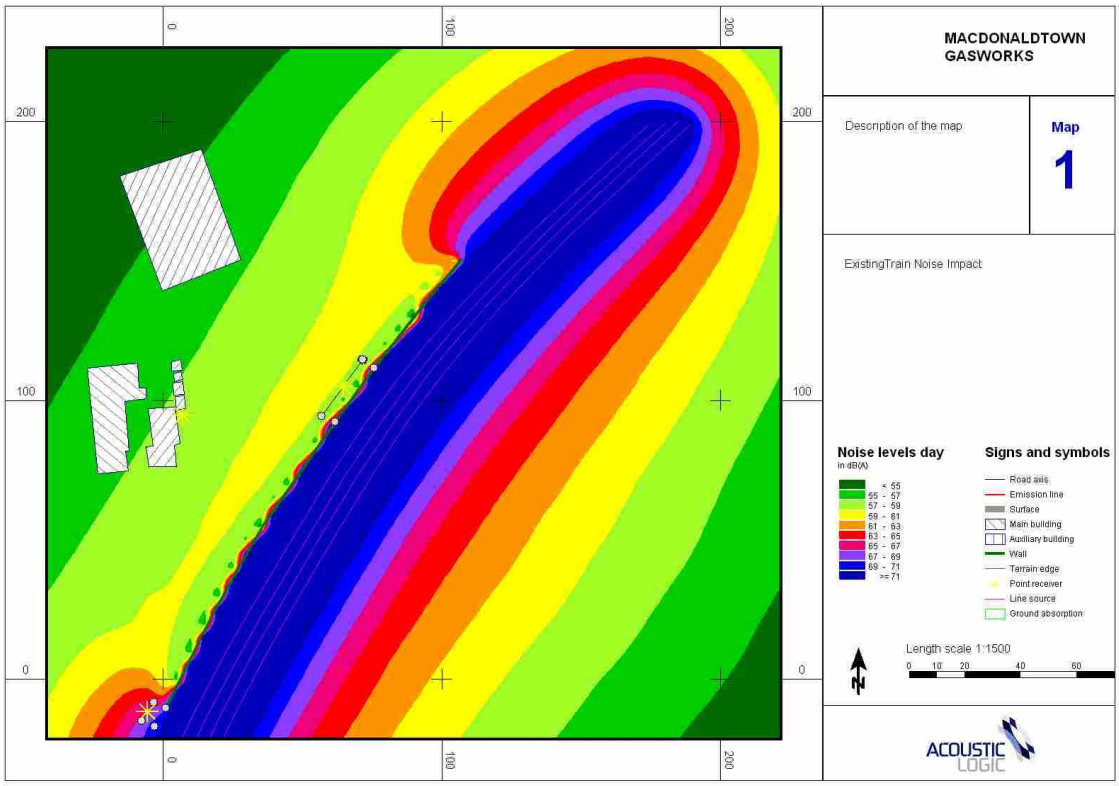


Figure 4 – Train Noise Emissions

Existing train noise levels to the noise receivers with perforated fence facing the rail corridor have been predicted at the receiver using SoundPlan™ modelling software implementing the ISO 9613-2:1996 "Acoustics – Attenuation of Sound During Propagation Outdoors – Part 2: General Method of Calculation" noise propagation Standard (see Figure 4).

The existing noise levels created by train activity were modelled from the data collected by the unattended noise logger on the site (see Figure 1 and Section 4). The measured typical peak hour train noise level at the receivers was 57 dB(A)Leq (1hour).

The determined result at the noise receiver location 8m distance from rail corridor (without barrier) was calculated to be 68 dB(A) L_{eq} (1hour).

7.3.2 Existing Train Noise Discussion

The potential worst case noise scenario is one in which relative to a residence, the passing of a truck coincides with the passing of a train. Due to the relatively low number of truck movements on the private access road (6 - 7 per hour – see Section 7.3.1) this is expected to occur rarely.

The cumulative impact of these two noise sources has been calculated and is shown in Table 14.

Table 14 – Comparison of Predicted Access Road Noise Impacts

Predicted traffic noise level dB(A) Leq.(1hour)	Calculated peak hour train noise level dB(A) Leq.(1hour)	Cumulative impact of train and truck noise dB(A) Leq	INP Criteria dB(A) Leq
64	68	69.7	50

As shown in Table 14 the predicted truck only noise level exceeds the INP criteria, though it is lower than the calculated noise level caused by the existing train activity. The cumulative impact of truck and train noise would result in a predicted noise level of 69.7 dB(A) with the train only noise component being 68 dB(A). As such, the presence of truck traffic over and above the existing train noise may result in an increase of 1.7 dB(A) at an affected receiver, though any impact will be of short duration and is expected to occur rarely.

8 VIBRATION

Vibration limits have been established for both human amenity, and damage to buildings.

The criteria and the application of the German Standard DIN 4150-3 standard is discussed below.

8.1 DAMAGE LIMITS

DIN 4150-3 provides vibration velocity guideline levels for use in evaluating the effects of vibration on structures. The criteria presented in DIN 4150-3 are presented in Table 15.

It is noted that the peak velocity is the absolute value of the maximum of any of the three orthogonal component particle velocities as measured at the foundation, and the maximum levels measured in the x- and y-horizontal directions in the plane of the floor of the uppermost storey.

Table 15 – DIN 4150-3 (1999-02) Safe Limits for Building Vibration

TYPE OF STRUCTURE		PEAK PARTICLE VELOCITY (mms^{-1})			
		At Foundation at a Frequency of			Plane of Floor of Uppermost Storey
		< 10Hz	10Hz to 50Hz	50Hz to 100Hz	All Frequencies
1	Buildings used in commercial purposes, industrial buildings and buildings of similar design	20	20 to 40	40 to 50	40
2	Dwellings and buildings of similar design and/or use	5	5 to 15	15 to 20	15
3	Structures that because of their particular sensitivity to vibration, do not correspond to those listed in Lines 1 or 2 and have intrinsic value (e.g. buildings that are under a preservation order)	3	3 to 8	8 to 10	8

Project specific vibration limits have been developed based on:

- The recommendations shown in Table 14.
- The vibration sources producing the highest vibration levels would not generate significant vibration at frequencies of less than 10Hz.

8.2 DAMAGE VIBRATION OBJECTIVE

The appropriate damage vibration limit for the building is **5mm/s PPV for residential building and 3mm/s PPV for heritage structure**.

8.3 HUMAN COMFORT LIMITS

Table 2.2 of DECCW "Assessing Vibration: A technical guideline" specified the following vibration goal for human comfort:

Table 16 –Preferred and Maximum Weighted rms values Vibration Acceleration (m/s2) 1-80 Hz

Location	Assessment Period	Preferred Values Z-axis	Preferred Values X & Y-axis	Maximum Values Z-axis	Maximum Values X & Y-axis
Continuous Vibration					
Residences	Day time	0.010	0.0071	0.020	0.014
Impulsive Vibration					
Residence	Day Time	0.3	0.21	0.6	0.42

Acceptable values for intermittent vibration shall comply with the requirements in Table 2.4 of DECCW "Assessing Vibration: A technical guideline" detailed as below.

Table 17 – Acceptable Vibration Dose Values for Intermittent Vibration (m/s1.75)

Location	Day time preferred value	Day time maximum value
Residences	0.20	0.40

Vibration is assessed in terms of "continuous" or "intermittent/ impulsive" vibration criteria. Continuous vibration is vibration that is present at a reasonable steady level for long periods of time. Intermittent or impulsive vibration results from sources such as piling. Continuous vibration limits are generally more stringent than the intermittent/ impulsive vibration limits.

Section 2.5 of DECCW "Assessing Vibration: A technical guideline" also states:

"When short term works such as piling, demolition and construction give rise to impulsive vibrations, undue restriction on vibration values may significantly prolong these operations and results in greater annoyance. Short term works are works that occur for duration of approximately one week."

"In circumstance where work is short term, feasible and reasonable mitigation measures have been applied, and the project has a demonstrated high level of social worth and broad community benefits, then higher vibration values (above the maximum) may apply."

In these cases, best management practices in Section 8.5 should be used to reduce values as far as practicable.

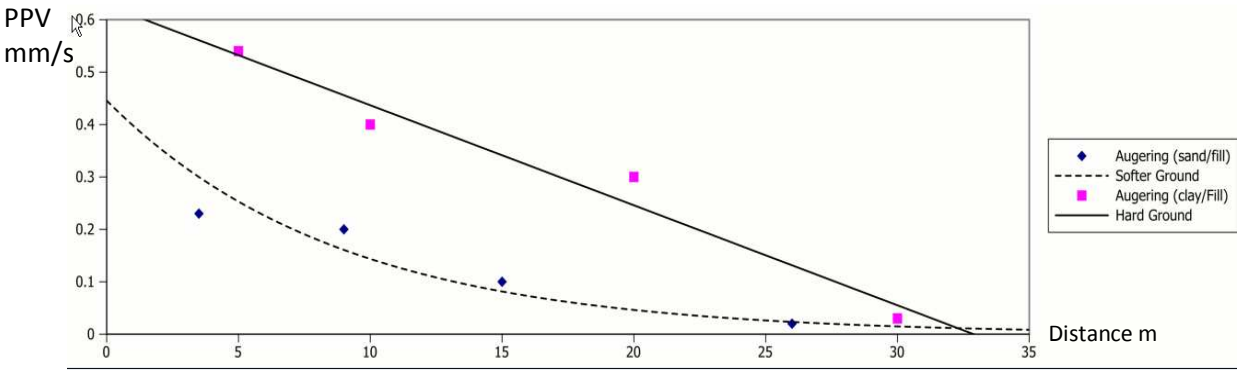
8.4 PROPOSED VIBRATION INDUCING WORKS

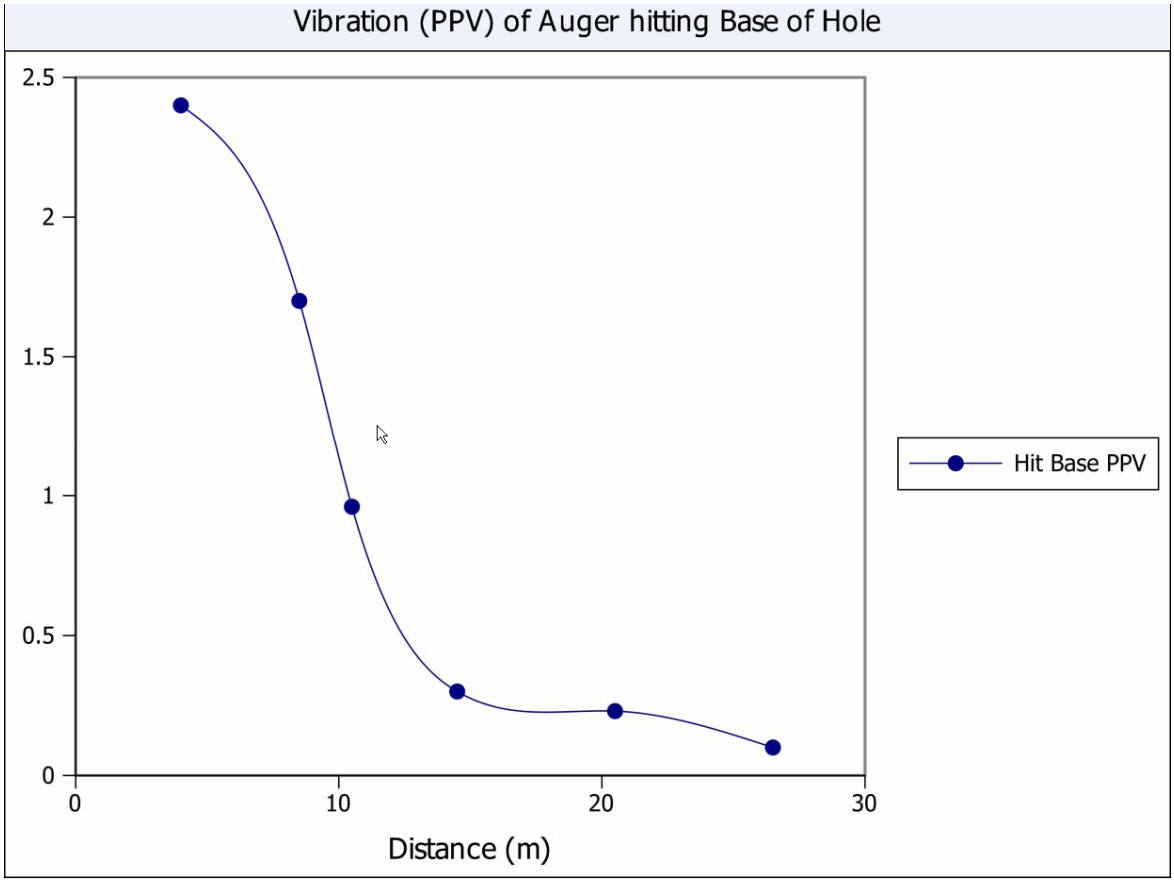
The following proposed works have the potential to produce excessive vibrations:

- Piling along western boundary to retain soil prior to excavation.
- Hydraulic hammers to demolish northern gasholder.

Due to the short term nature of the above, both the piling and the demolition of the northern gasholder shall be regarded as short term “intermittent / impulsive“ works.

The following vibration study has been previously conducted based on the vibration measurement results PPV mm/s of a similar project site:





8.5 VIBRATION CONTROLS

In order to lessen the vibration impacts on the sensitive receivers the following vibration controls are recommended:

- The Excavator with Hydraulic Hammer should keep a minimum of 8m distance from the nearest residential property*.
- CFA/Bored piling should be undertaken in lieu of impact piles to significantly reduce any vibration impacts upon the adjoining residents.
- Practical management methods such as restrict the operation hours of piling, and changing the speed of CFA piling.
- Vibration monitors should be installed on the heritage structure or residential properties close to the project site. SMS messages shall be sent to the site manager if the vibration to the heritage structure exceeds 2mm/s PPV.

*The rear of the nearest residential boundary is approximately 5m, and the nearest residential building is approximately 12m away from the northern gasholder.

8.6 PREDICTED VIBRATION IMPACTS

The vibration generated by CFA/Bored piling along the western boundary may result in the exceedance of the human comfort criteria. This is due to the proximity of the works to the nearest residential receivers, although the impacts can be reduced by varying the speed of the piling.

In the event that with these controls in place, the human comfort criteria are still exceeded, then respite periods and / or additional management techniques can be employed (see Section 9).

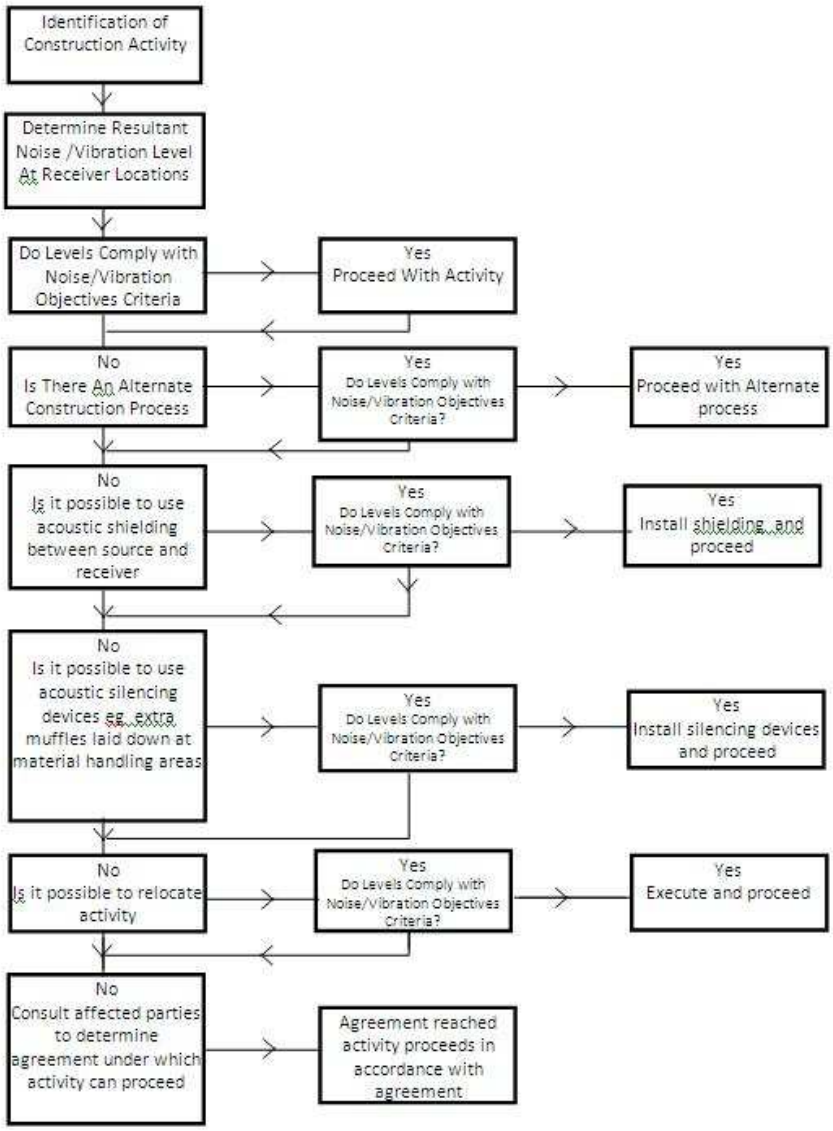
If the controls recommended in Section 8.5 are used by the remediation contractor, the building damage criteria should not be exceeded by the proposed activities.

9 MANAGEMENT OF REMEDIATION IMPACTS

9.1 NOISE AND VIBRATION MANAGEMENT PLAN

Further to the controls listed in Sections 6 and 8.5, it is recommended that a noise and vibration management plan be implemented by the remediation contractor. The purpose of the plan is to review the predicted noise levels from the works taking into account any changes to plant and equipment, provide greater detail on expected noise and vibration levels from the works where relevant, document all feasible and reasonable work practices which will be applied to manage noise (including vibration where relevant) from the works and provide a methodology for evaluating performance and compliance with the plan.

A flow chart which illustrates the process to be followed in assessing construction activities is presented below.



Further, hazard identification for noisy equipment/work practices should be undertaken by the remediation contractor to ensure best practice is followed resulting in lower noise levels at the western boundary.

At times, direct negotiation with affected residents should be undertaken in order to establish additional noise controls. More restrictive operating hours can be applied to plant which exceed the relevant noise criteria by scheduling works at times which receivers are less sensitive to noise, e.g. mid morning or mid afternoon for works near residences.

The remediation contractor should incorporate this requirement into the Noise and Vibration Management Plan and submit the plan to the Director General for approval and comment prior to the commencement of any works on-site.

9.2 ESTABLISHMENT OF DIRECT COMMUNICATION WITH AFFECTED PARTIES

In order for any construction noise management programme to work effectively, continual communication is required between all parties which may be potentially impacted upon, the builder and the regulatory authority. This establishes a dynamic response process which allows for the adjustment of control methods and criteria for the benefit of all parties.

The objective in undertaking a consultation processes is to:

- Inform and educate the groups about the project and the noise controls being implemented.
- Increase understanding of all acoustic issues related to the project and options available.
- Identify group concerns generated by the project, so that they can be addressed.
- Ensure that concerned individuals or groups are aware of and have access to the remediation contractor's complaints register/Site Manager's number which will be used to address any construction noise related problems should they arise.

A sign is to be erected on the boundary fence at the Macdonaldtown site (and the Chullora site if utilised) throughout the remediation works which should advise the following:

- Contractor details; and
- 24 hour emergency contact details.

To ensure that the communication with residents is effective, regular scheduled meetings between the remediation contractor and local residents may be required until all noise and vibration issues have been addressed and the evidence of successful implementation of mitigation processes has been acknowledged by all parties.

RailCorp are committed to producing newsletters to keep the community abreast of the progress of the project. Future meetings with residents will be held as necessary to communicate the progress of the project and measure the success of noise control measures.

Additional newsletters informing residents of the progress of the works and the upcoming construction activities may be issued as required.

10 CONCLUSION

This noise and vibration assessment has been undertaken for the proposed remediation works at Macdonaldtown to identify whether these activities would impact sensitive receivers around the site. The assessment of noise and vibration indicates that:

- For part of the remediation works period, some processes are likely to generate noise levels that will require additional management. Adoption of the elements of these controls will ensure that any noise impacts will be minimised.
- Traffic noise levels on public roads will not impact on sensitive receivers.
- Traffic noise levels on the private access road will not affect receivers which are already benefiting from the permanent 4m high noise wall. Traffic noise to residents not benefiting from the existing noise wall may be above the relevant noise criteria, but will be below existing noise levels from the adjacent rail corridor.
- The suggested noise controls for the static plant will meet the noise objectives if appropriately specified and installed by the remediation contractor.
- Ground vibration goals have been set to safeguard existing structures close to the project site and protect human comfort and amenity. The vibration generated by piling along western boundary may result in exceedance of human comfort but would not exceed the building damage criteria.
- The remediation contractor should prepare a Noise and Vibration Management Plan and submit the plan to the Director General for approval and comment prior to the commencement of any works on-site.

We trust this information is satisfactory. Please contact us should you have any further queries.

Prepared by

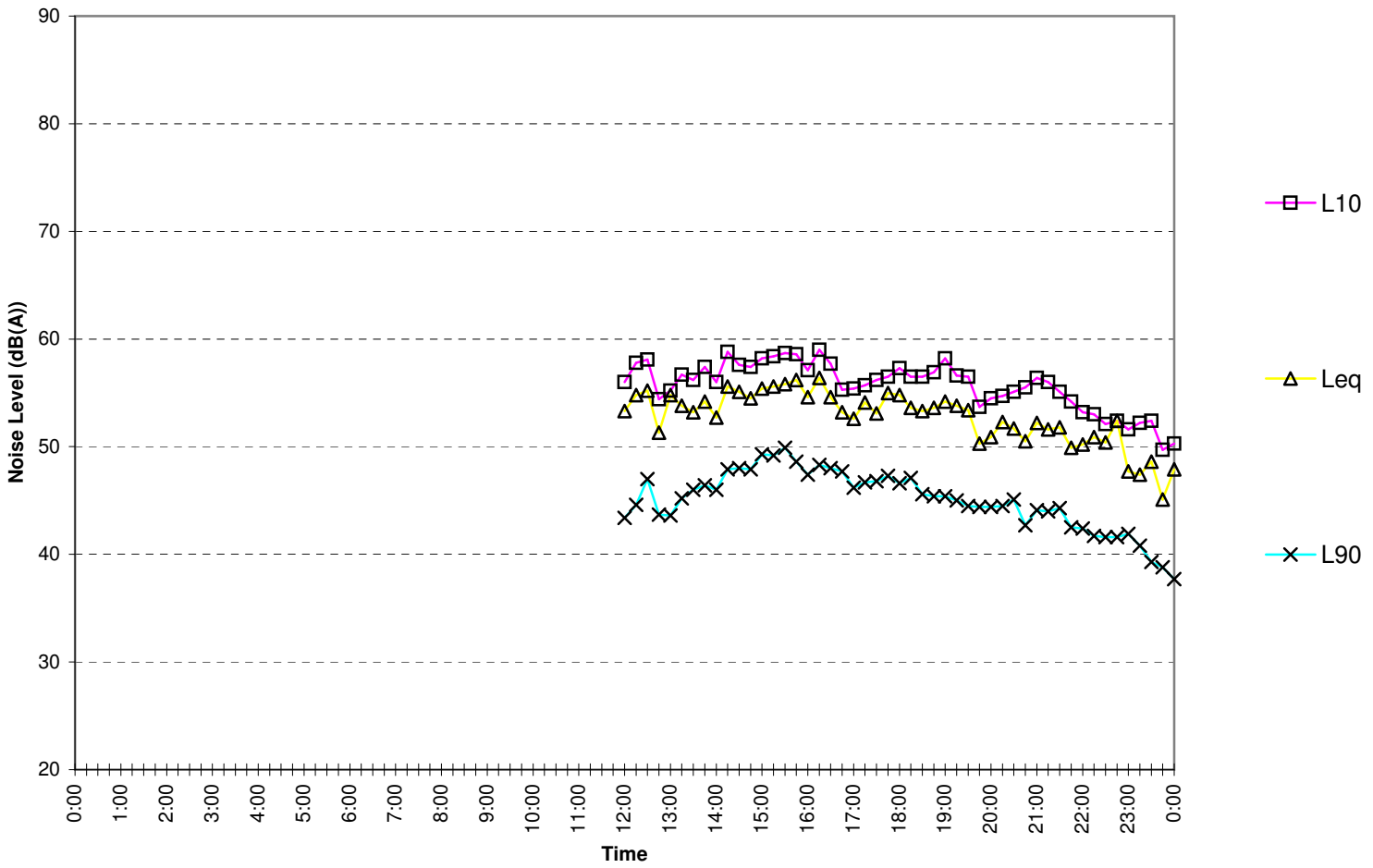
Acoustic Logic Consultancy Pty Ltd
George Wei

Senior Acoustic Engineer

Appendix 1: Unattended Ambient Noise Monitoring

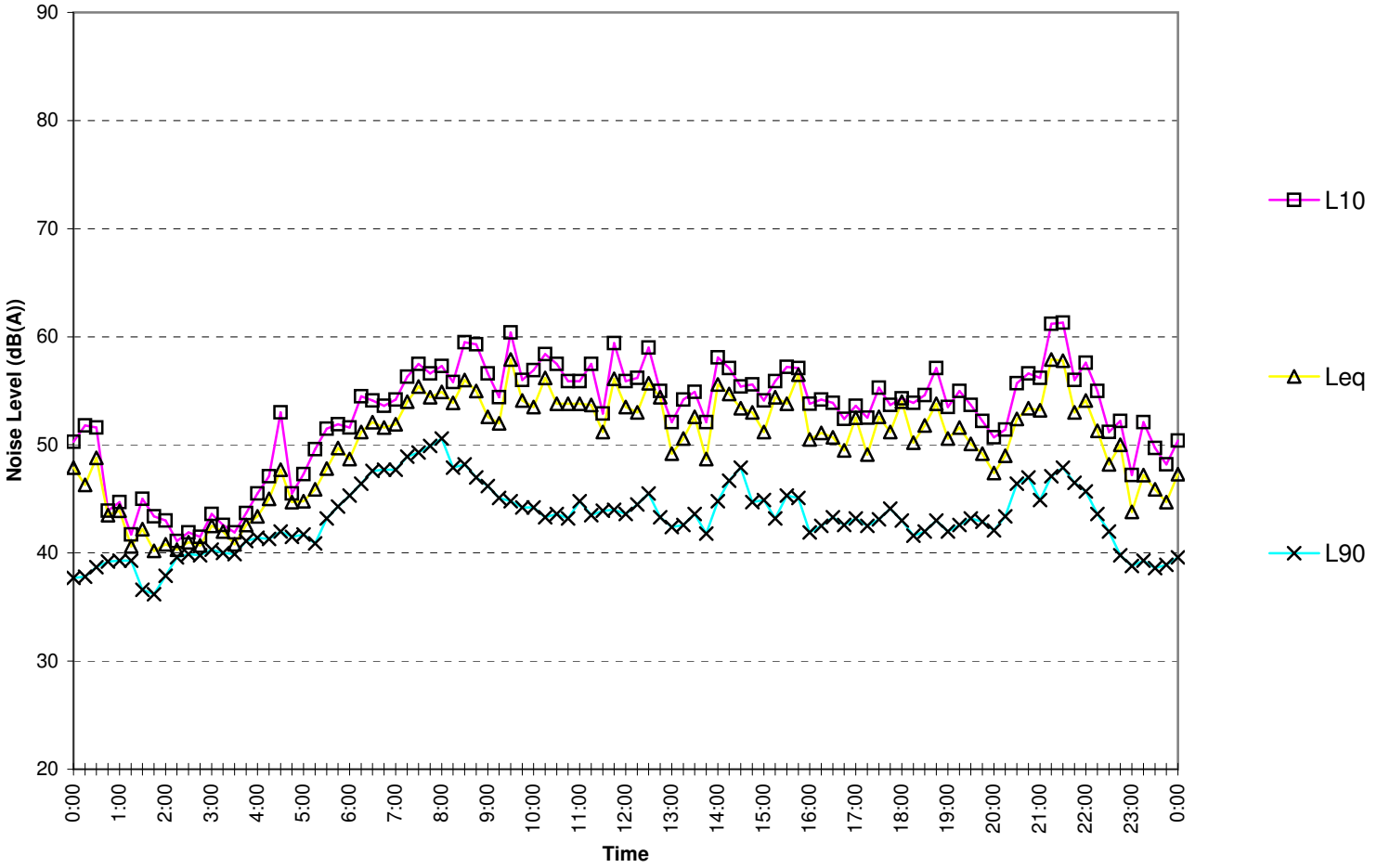
Lot 50 DP 1001467 Macdonaldtown

Monday May 10,2010



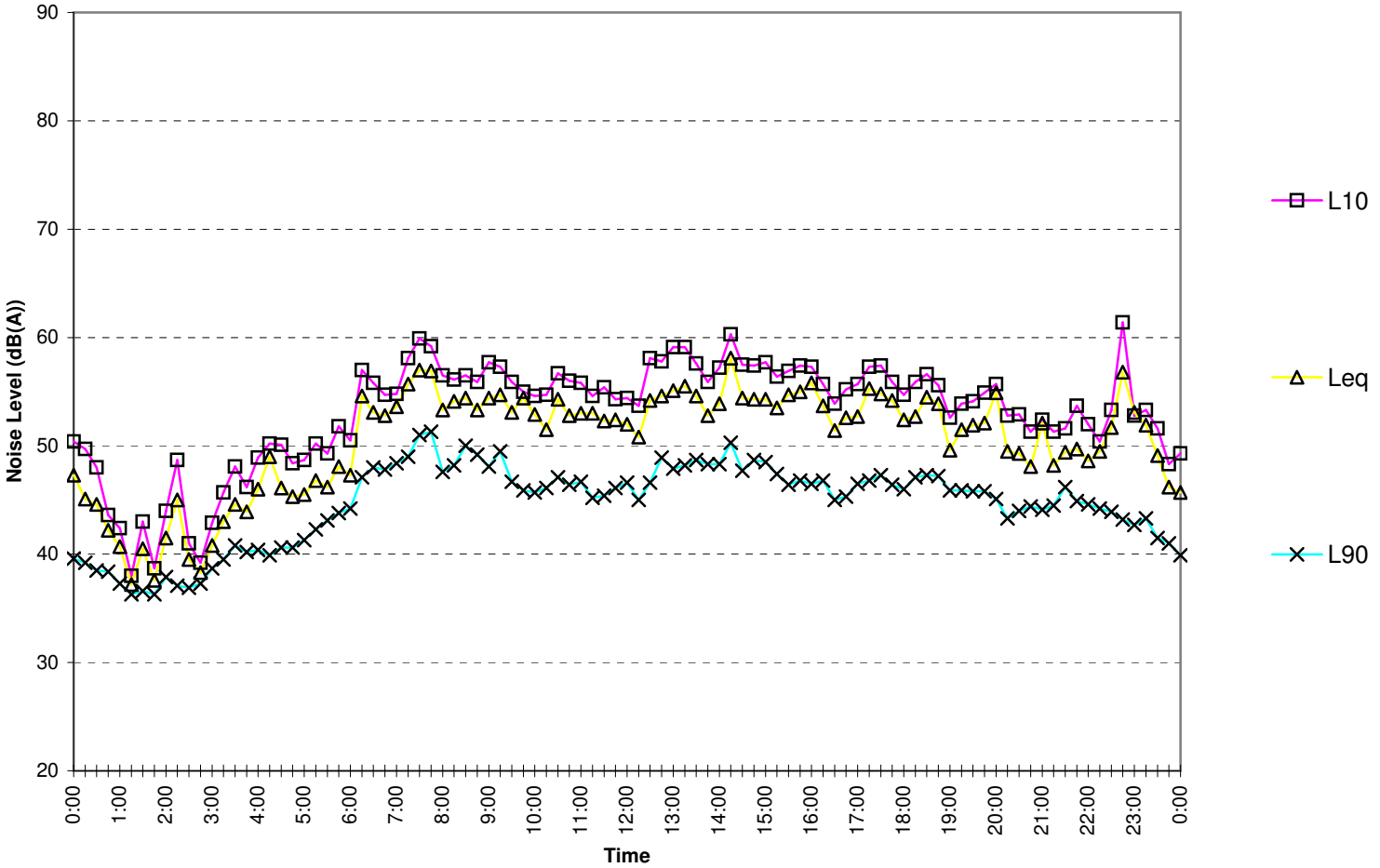
Lot 50 DP 1001467 Macdonaldtown

Tuesday May 11,2010



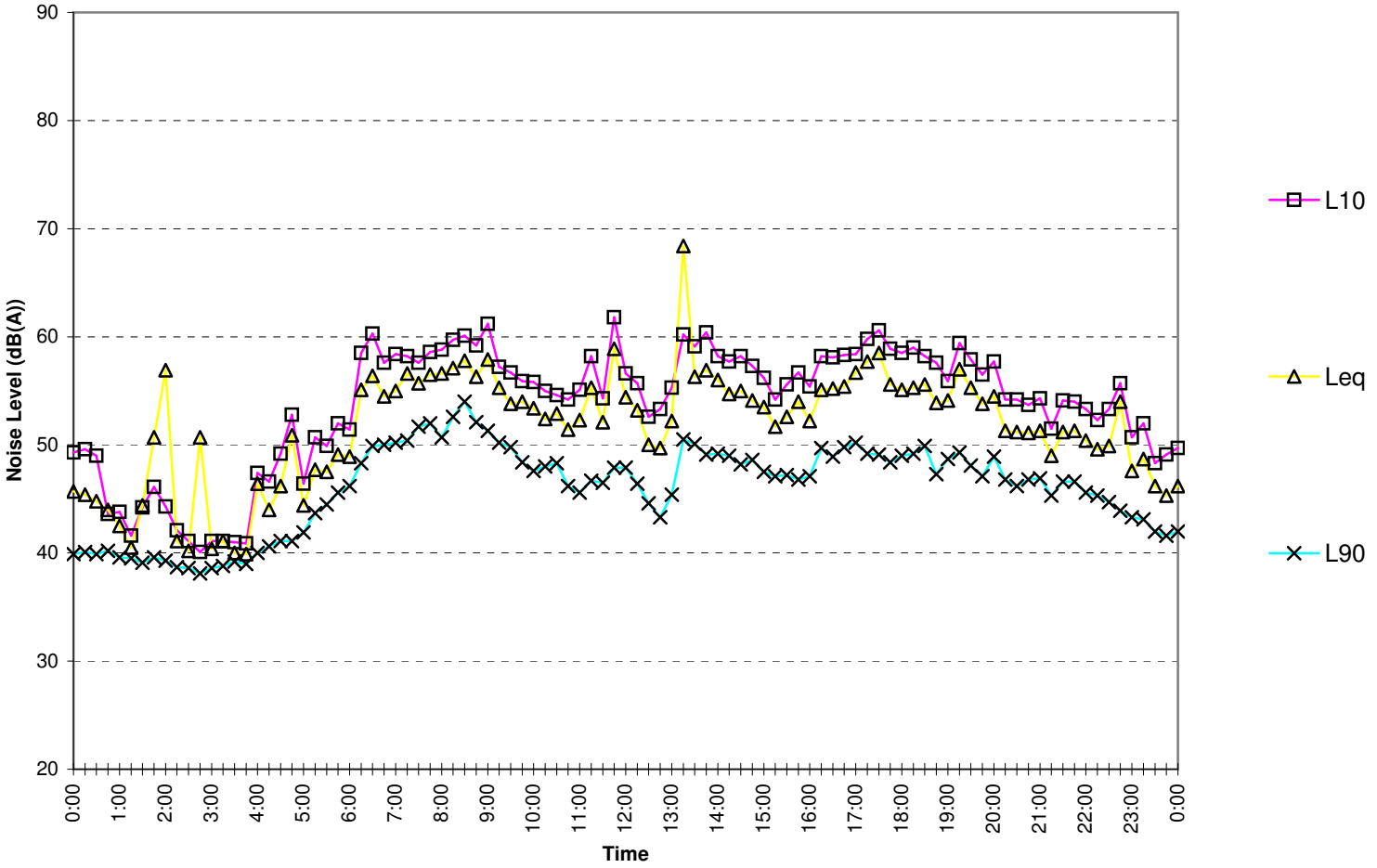
Lot 50 DP 1001467 Macdonaldtown

Wednesday May 12,2010



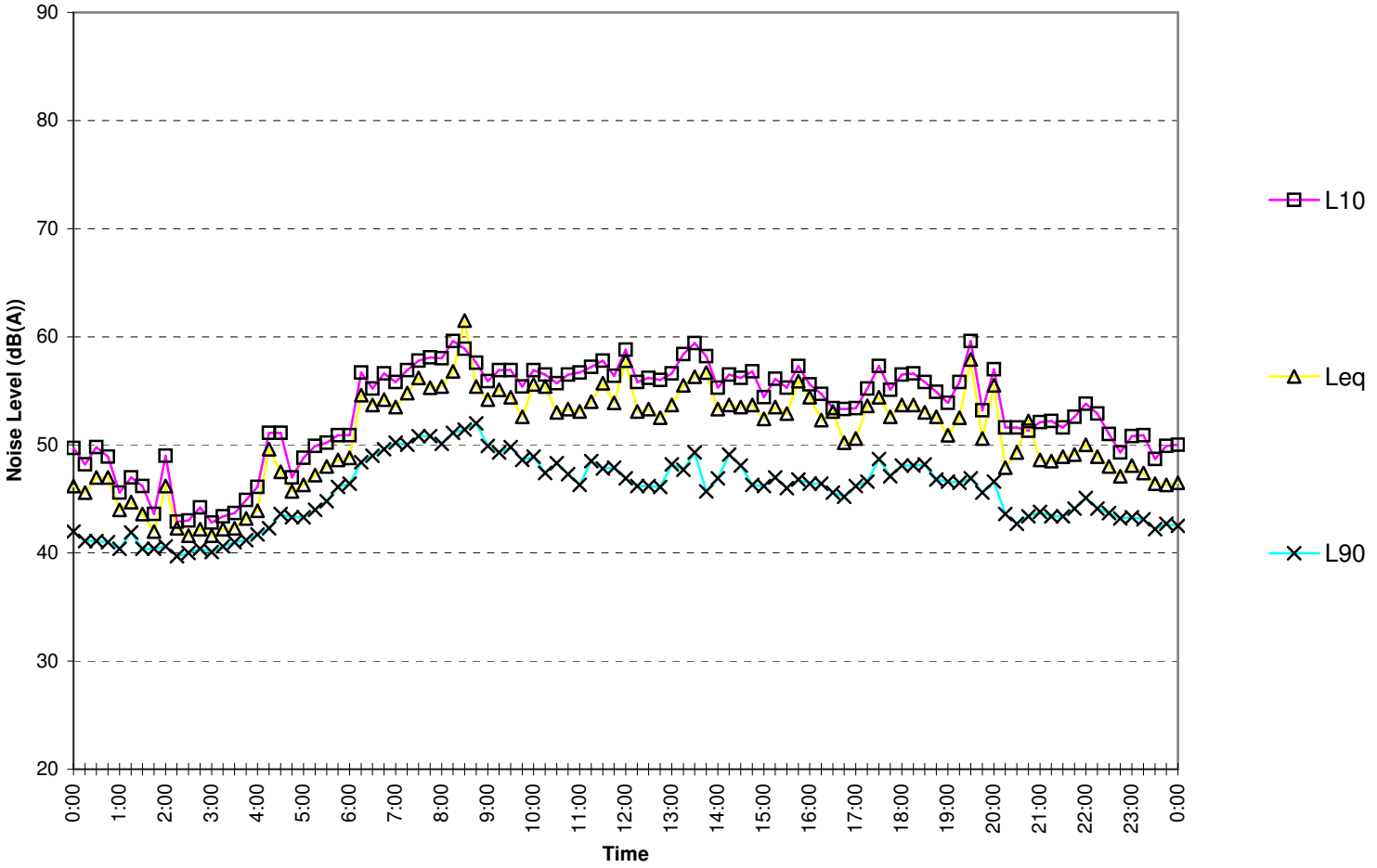
Lot 50 DP 1001467 Macdonaldtown

Thursday May 13,2010



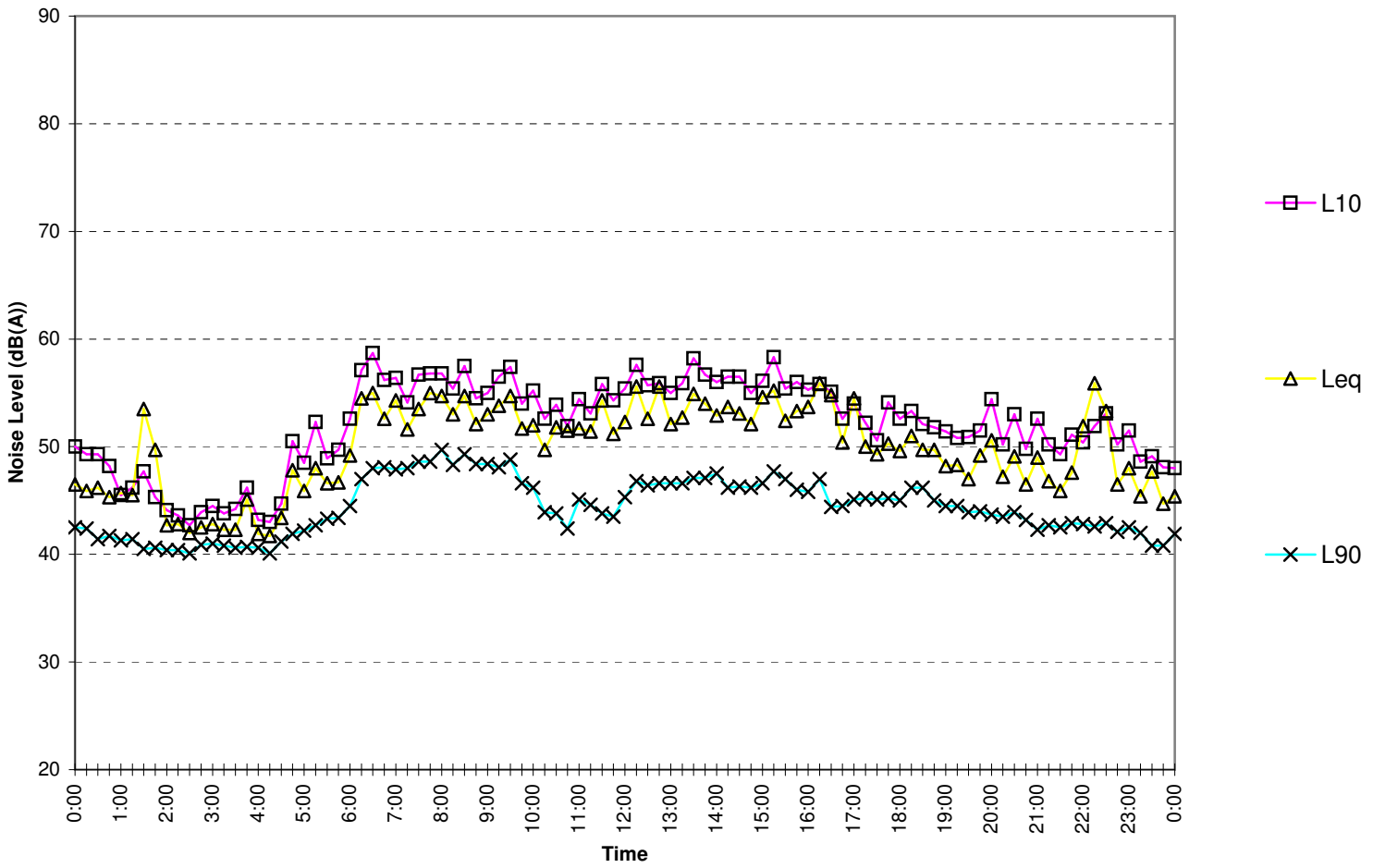
Lot 50 DP 1001467 Macdonaldtown

Friday May 14,2010



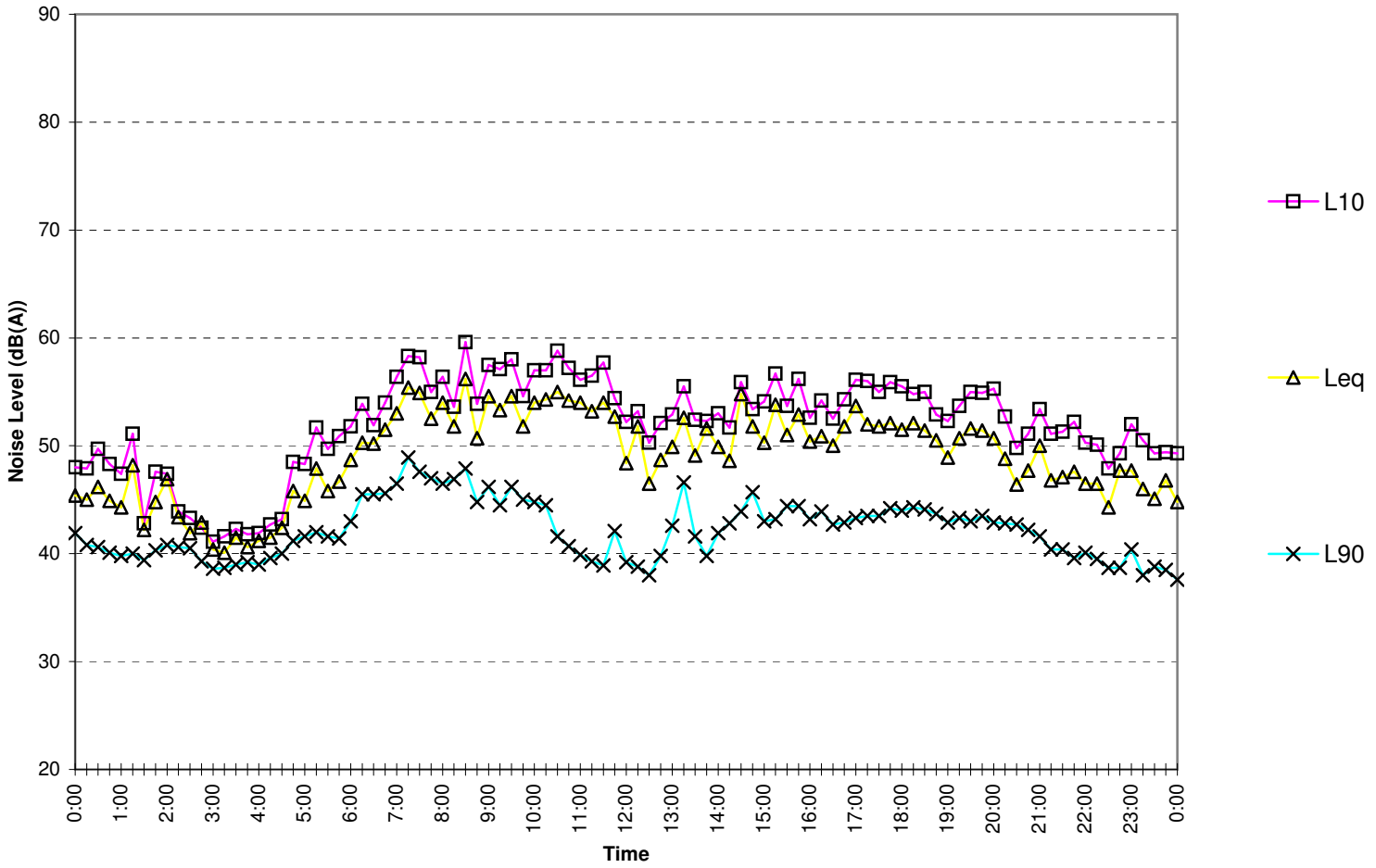
Lot 50 DP 1001467 Macdonaldtown

Saturday May 15,2010



Lot 50 DP 1001467 Macdonaldtown

Sunday May 16,2010



Lot 50 DP 1001467 Macdonaldtown

Monday May 17,2010