

Mr Stuart Hodgson  
Principal Manager,  
Program Sustainability Environment & Planning  
Sydney Metro  
Transport for NSW  
PO Box 588  
NORTH RYDE BC NSW 1670

11 August 2017

Ref: CNVIS-Victoria Cross Rev H

Dear Stuart


**RE: Endorsement of Construction Noise and Vibration Impact Statement – Victoria Cross 2, Sydney Metro City & Southwest**

Thank you for providing the following documents for Environmental Representative (ER) review and endorsement as required by the Condition of Approval A24(d) of the Sydney Metro City & Southwest project (SSI – 15\_7400 January 9 2017).

- Construction Noise and Vibration Impact Statement (CNVIS) –Victoria Cross 2 Site, (Revision H dated 7 August 2017) required under Condition E33; and
- Acoustic Advisor (AA) Endorsement (of the above document) dated 11 August 2017

As an approved ER for the Sydney Metro City & Southwest project, I have reviewed the CNVIS for its suitability for implementation. The review did not comprise a technical review, as the ER has relied upon the AA's review of technical aspects of the document. On the basis of the endorsement of the document by the AA, I endorse the document.

Yours sincerely



Michael Woolley  
Environmental Representative – Sydney Metro – City and South West

**ENDORSEMENT  
CITY & SOUTHWEST ACOUSTIC ADVISOR**

<b>Review of</b>	<b>Construction Noise and Vibration Impact Statement for Delta demolition works at Victoria Cross</b>	<b>Document reference:</b>	Construction Noise & Vibration Impact Statement VICTORIA CROSS 2, prepared by Osterman Consulting for Delta Pty Ltd, report number 0116-041-04, Rev H
<b>Prepared by:</b>	Dave Anderson		
<b>Date of issue:</b>	11 August 2017		

As approved Acoustic Advisor for the Sydney Metro City & Southwest project, I have reviewed and provided comment on the Construction Noise and Vibration Impact Statement for the Delta demolition works at Victoria Cross, as required under A27 (d) of the project approval conditions.

I have spoken with Osterman Consulting to discuss drafts of the impact statement and to discuss my formal comments. The impact statement has been revised to address my comments. I note that it has also:

1. Adopted the Noise Management Level (NML) of  $65\text{dBL}_{\text{Aeq}(15\text{min})}$  the outdoor play area at the Child Care Centre (with all reasonable steps to manage demolition levels so that they do not exceed the NML by more than 10dBA at times when the outdoor play area is used), consistent with the conditional endorsement I provided previously for the Tower Square works.
2. Included noise monitoring data to verify that noise levels to date have been consistent with the assumptions in the CNVIS.

On this basis I endorse Rev H of this CNVIS.



Dave Anderson, City & Southwest Acoustic Advisor



# Construction Noise & Vibration Impact Statement

## VICTORIA CROSS 2

### Sydney Metro

Prepared for: Delta Group

7 August 2017

Report number: 0116-041-04

Prepared by: Mark Della Sabina & Rauf Osterman



1.	INTRODUCTION	4
1.1	CONTEXT	4
1.2	SITE OVERVIEW	4
1.3	SITE LAYOUT AND ACCESS	5
2.	APPLICABLE CRITERIA	6
2.1	AIRBORNE NOISE MANAGEMENT LEVELS	6
2.1.1	CHILDCARE CENTRE	6
2.2	GROUND-BORNE NOISE MANAGEMENT LEVELS	6
2.3	CONSTRUCTION VIBRATION	6
2.3.1	WARNING LEVELS	8
3.	NOISE AND VIBRATION ASSESSMENT	9
3.1	SENSITIVE RECEIVERS	9
3.2	CONSTRUCTION ACTIVITIES AND SOURCES OF NOISE	9
3.3	AIRBORNE NOISE PREDICTIONS	10
3.3.1	GENERAL SITE	11
3.3.2	HIGHLY SENSITIVE RECEIVERS	12
3.3.3	VERIFICATION OF NOISE PREDICTIONS	16
3.4	GROUND-BORNE NOISE	17
3.5	VIBRATION PREDICTIONS	18
4.	NOISE AND VIBRATION MANAGEMENT	21
4.1	ENVIRONMENTAL MONITORING	21
4.1.1	HERITAGE-LISTED STRUCTURES	21
4.2	MITIGATION MEASURES	22
4.2.1	STANDARD MITIGATION MEASURES	22
4.2.2	ADDITIONAL MITIGATION MEASURES	24
4.2.3	MITIGATION MEASURES FOR HIGHLY SENSITIVE RECEIVERS	25
5.	CONCLUSION	27
6.	REFERENCES	28
	APPENDICES	29
	APPENDIX A - LIST OF SENSITIVE RECEIVERS	29
	APPENDIX B - SENSITIVE RECEIVERS AND MONITORING POINTS	44
	APPENDIX C - CHILDCARE CENTRE FLOOR PLAN	45
	APPENDIX D - TOWER SQUARE EXCLUSION ZONES FOR NOISY ACTIVITIES	46
	APPENDIX E - 181 MILLER ST EXCLUSION ZONES FOR NOISY ACTIVITIES	47

Report revision History				
Rev no.	Date	Description	Prepared by	Reviewed by
A	05/02/2017	Initial Draft	Mark Della Sabina	Rauf Osterman
B	21/02/2017	General update and revision following review by Delta and Project AA	Mark Della Sabina	Rauf Osterman
C	02/05/2017	Updated to incorporate comments from ER dated 21/02/2017 and additional comments from Project AA dated 21/03/2017. Addition of detailed noise impact assessment on childcare centre	Mark Della Sabina	Rauf Osterman
D	11/05/2017	Updated to incorporate comments from Project AA dated 11/05/2017	Mark Della Sabina	Rauf Osterman
E	09/06/2017	Updated to address review comments from Project ER dated 11/05/2017	Mark Della Sabina	Rauf Osterman
F	29/06/2017	Incorporate revised limit for outdoor play area at CCC	Mark Della Sabina	Rauf Osterman
G	31/07/2017	Update to predicted impacts based on analysis of real noise data from Tower Square works	Mark Della Sabina	Rauf Osterman
H	07/08/2017	Addition of consultation information for OAC. Removal of reference to seals around windows.	Mark Della Sabina	Rauf Osterman

This document is and will remain the property of Osterman Consulting. No portion of this document, in part or whole, shall be duplicated, imitated or otherwise, in any form without prior written permission of Osterman Consulting. The document may only be used for the purposes for which it was commissioned and in accordance with the Terms of Engagement for the commission. This document is subject to copyright laws and is the intellectual property of Osterman Consulting.

---

# 1. Introduction

## 1.1 Context

This Construction Noise and Vibration Impact Statement (CNVIS) has been developed for Delta Pty Ltd (Delta) to assess the noise and vibration impacts associated with demolition and retention works at the Victoria Cross site (the site) on the Sydney Metro City & Southwest Project (the project). This CNVIS exists as a sub-plan to the Construction Noise and Vibration Management Plan 0116-041-01 (CNVMP) for the project.

The principal issues addressed within this CNVIS include:

- Identification of noise sensitive receivers near to the site;
- Prediction of the level of noise and vibration impact on these sensitive receivers from construction activities including assessment of predicted compliance with project-imposed Noise and Vibration Management Levels;
- Details of the plant and equipment to be used on site including details of sound mitigation measures to be employed to reduce noise impacts on adjacent noise sensitive receivers.

This impact statement provides an assessment of the site as a whole, as well as a more detailed assessment and mitigation plan for a number of Highly Sensitive Receivers that require a greater degree of management. The detailed assessment of Highly Sensitive Receivers in this version is based on analysis of real noise data captured from early demolition works on the Site. Therefore this document now applies to the entire VC2 site including 181 Miller St and 189 Miller St.

## 1.2 Site Overview

The Victoria Cross site is located beneath Miller Street (to the north of the Pacific Highway) between McLaren Street and south of Berry Street. Construction at the station is split across two sites - Victoria Cross 1 (VC1) to the North and Victoria Cross 2 (VC2) to the South - with temporary street-level working platforms over the excavations. Works on the site involve demolition of a number of low-rise commercial buildings and one high-rise commercial building. At the time of writing, the viability of VC1 was under review therefore this document considers **only the VC2 site**.





---

## 2. Applicable Criteria

### 2.1 Airborne Noise Management Levels

Conditions of Approval E37 and E38 for the project impose alternative requirements on Noise Management Levels for the Victoria Cross site. These alternative requirements override the CNVS and therefore ICNG NML's and refer to internal noise levels only. The objective of these conditions is to allow for longer working hours whilst mitigating impact to sensitive receivers, and are predicated on consultation with the affected sensitive receivers to determine appropriate respite hours. These requirements are outlined in Table 1.

Assessment Period	% of Assessment Period	Hours in Assessment period	Internal Noise Criteria <small>(which must not be exceeded)</small>
07:00 - 20:00	50	6.5	$L_{eq}(15 \text{ minute})$ 60dB(A)
	25	3.25	$L_{eq}(15 \text{ minute})$ 55dB(A)

In addition to the above, CoA A2 states that works "must be carried out in accordance with all procedures, commitments, preventative actions, performance criteria and mitigation measures set out in the EIS as amended by the PIR unless otherwise specified". Therefore, where specific criteria are not set in the approval conditions (i.e. remaining 6.5 hours of the Assessment Period, external noise levels affecting outdoor uses, etc.), the criteria in the EIS, PIR and CNVS should be used. Notwithstanding the above, at no time can noise generated by construction exceed the National Standard for exposure to noise in the occupational environment of an eight-hour equivalent continuous A-weighted sound pressure level of  $L_{Aeq,(8h)}$ , of 85dB(A) for any employee working at a location near the CSSI.

#### 2.1.1 Childcare Centre

The Childcare Centre at 65 Berry St is subject to additional Noise Criteria over and above that provided in Table 1. Specifically, a Noise Management Level (NML) of  $65dB L_{Aeq}(15min)$  applies to the outdoor play area at the Child Care Centre and all reasonable steps shall be taken to manage demolition noise levels so that they do not exceed the NML by more than 10dBA at times when the outdoor play area is used.

### 2.2 Ground-borne Noise Management Levels

The Noise Management Levels given in Section 2.1 apply also for ground-borne noise.

### 2.3 Construction Vibration

Condition E28 of the Conditions of Approval for the project stipulate that vibration from construction activities shall not exceed the vibration limits set out in the British Standard BS 7385-2:1993 Evaluation and measurement for vibration in buildings. Guide to damage levels from ground-borne vibration.



British Standard 7385: Part 2 1993 suggests levels of vibration at which ‘cosmetic’, ‘minor’ and ‘major’ damage may occur. This standard is based on data collated from a wide range of national and international sources which collectively saw relatively few cases of damage caused by vibration. BS7385 suggests that vibration levels up to the cosmetic damage level are considered ‘safe’ and have produced no observable damage for particular building types.

For the purposes of this standard, damage includes minor non-structural effects such as hairline cracks on drywall surfaces, hairline cracks in mortar joints and cement render, enlargement of existing cracks and separation of partitions or intermediate walls from load bearing walls.

BS7385 is based on peak particle velocity and specifies damage criteria for transient vibration within the range of frequencies usually encountered in buildings, being 4Hz to 250Hz. This criteria is reproduced in Table 2.

Table 2. BS7385: Part 2 Structural Damage Criteria					
Group	Type of Structure	Damage Level	Peak component particle velocity, mm/s		
			4 Hz - 15 Hz	15 Hz - 40 Hz	40 Hz and above
1	Reinforced or framed structures Industrial and heavy commercial buildings	Cosmetic	50 (all frequencies)		
		Minor	100 (all frequencies)		
		Major	200 (all frequencies)		
2	Unreinforced or light framed structures Residential or light commercial type buildings	Cosmetic	15 to 20	20 to 50	50
		Minor	30 to 40	40 to 100	100
		Major	60 to 80	80 to 200	200

Where dynamic loading caused by continuous vibration may result in magnification of vibration through a building structure the guideline values may need to be reduced by up to 50 per cent. Rock breaking, rock hammering and sheet piling activities are considered to have the potential to cause dynamic loading in some structures (eg residences).

For construction activities involving intermittent vibration sources such as rock breakers, piling rigs, vibratory rollers, excavators and the like, the predominant vibration energy occurs at frequencies greater than 4 Hz (and usually in the 10 Hz to 100 Hz range). On this basis, and consistent with the guidance from BS 7385, the following conservative vibration damage screening level per receiver type have been adopted for the project:

- Reinforced or framed structures: **25.0 mm/s**
- Unreinforced or light framed structures: **7.5 mm/s.**
- Heritage Structures: **7.5mm/s**

Where vibration levels are predicted to exceed the screening criteria, a more detailed assessment of the structure and attended vibration monitoring would be carried out to ensure vibration levels remain below appropriate limits for that structure.

---

With regards to heritage items, BS7385 states that “a building of historical value should not (unless it is structurally unsound) be assumed to be more sensitive”. Therefore any detailed assessment would specifically consider:

1. The structural condition of the building (in consultation with a structural engineer where required); and
2. The heritage values of the structure in consultation with a heritage specialist to ensure sensitive heritage fabric is adequately monitored and managed.

Derivation of suitable vibration limits for heritage structures shall consider the above and, where required, a suitable reduction factor applied based on industry best practice.

### **2.3.1 Warning Levels**

The INFRA Monitoring System used on this project features a number of real time alerts and alarms that enable instant notification where limits are approached or exceeded. Where vibration-intensive works are planned to occur in close proximity to sensitive receivers, and works are expected to approach the limits for cosmetic damage, monitoring equipment shall be equipped with visual and/or audible alarms that are triggered when the levels of vibration exceed the control criteria presented in Table 3.

<b>Table 3. Operator Warning and Halt Levels</b>		
<b>Structure</b>	<b>Site Control Criteria (PPV in any Orthogonal Direction)</b>	
	<b>Operator Warning Level</b>	<b>Operator Halt Level</b>
Reinforced or framed structures	20 mm/s	25 mm/s
Unreinforced or light framed structures	5 mm/s	7.5 mm/s
Heritage structures	5 mm/s	7.5 mm/s

---

## 3. Noise and Vibration Assessment

### 3.1 Sensitive Receivers

A full list of sensitive receivers surrounding the site are listed in Appendix A. A subjective classification of the noise & vibration impact has been evaluated for each sensitive receiver and documented as:

- Low Impact
- Moderate Impact
- High Impact

The classifications were determined on a case-by-case basis using the metrics defined in the CNVS, including:

- The location of the works in relation to the NSR's with consideration of the noise attenuation features such as distance to NSR's, noise barriers, attenuation factor of NSR's windows and elements, Topographical features etc.
- The type and sensitivity of the NSR's:
  - Lower impact: e.g. commercial buildings/scattered residential (low density)
  - Moderate impact: eg standard residential (typical density)
  - High impact: e.g residential home for elderly/high density unit blocks/persistent complainers/residents deemed to have "construction noise fatigue", highly sensitive commercial (jewellers, etc.) or health applications e.g. operating theatres, MRI's, Psychotherapy units, Audio & video production studios etc. and schools/childcare centres.
- Predicted noise and vibration levels and extent of noise exceedance above Noise Management Level
- The type of and intensity of noise emitted from works (ie tonal or impulsive):
  - Lower Impact: No high noise and/or vibration intensive activities
  - Moderate Impact: Short/intermittent high noise and/or vibration intensive activities
  - High Impact: Prolonged high noise and/or vibration intensive activities.
- The duration of any OOHW required.

Site plans illustrating the location of, and degree of impact to, sensitive receivers can be found in Appendix B.

### 3.2 Construction Activities and Sources of Noise

The degree of noise impact on adjacent sensitive receivers from demolition activities is highly dependent on the type and size of machinery used. In consultation with Delta Group, a list of the activities to be undertaken and the associated machinery is provided in Table 4.

**Table 4. Construction Activities and Equipment Noise**

Equipment	Number	Construction Activity	Assumed Sound Power* Level dB(A)
2T Excavators	5	Strip Out	88
12T Excavators w/hammer	3	Structural Demolition	115
20T Excavators w/pulveriser	1	Structural Demolition	104
47T Excavators w/hammer <sup>+</sup>	1	Low Level Structural Demolition	119
Mustang Bobcats	2	Strip Out and Structural Demolition	110
Powered Hand Tools		Strip Out	100
Trucks	2	Haulage	105
Concrete Cutters		Concrete Cutting	119

\* Sound power levels provided in the table above should be verified against specifications of actual equipment used onsite.

+ Proposed for use on lower levels only. Hoarding may provide up to 10dB reduction in predicted noise levels

### 3.3 Airborne Noise Predictions

Using the sound power levels stated in Section 3.2, predicted noise levels have been calculated at representative locations around the site based on the distance between noise-emitting activities and the closest sensitive receivers for that location. These predictions assume that equipment is operating at the nearest point of works to the sensitive receiver and therefore represent worst-case scenarios. The predictions do not take into account any mitigation measures. Due to the staging of construction works and the expected spread of equipment across the full area of the site, cumulative noise impacts are expected to be minimal.

To convert the predicted noise level from external to internal, it is necessary to make an assessment of the degree of noise reduction between the outdoor and indoor environment. This assessment is made according to facade noise reduction values listed in Table 5.

**Table 5. Typical Facade Noise Reduction Values**

Building Environment	Noise Reduction
Most building types - with windows open	10dB
Most building types - with windows closed	20dB
Commercial buildings - non-opening double-glazed windows, etc.	30dB

Based on these reduction values, predicted internal noise levels are provided in Section 3.3.1 and are highlighted according to the following:

Exceeds 25% limit of 55dB(A)  
 Exceeds 50% limit of 60dB(A)

### 3.3.1 General Site

Due to the significant number of sensitive receivers across the project, and for the purposes of reducing the required number of monitors, sensitive receivers with like characteristics have been grouped into ‘noise catchment areas’ (NCAs) that can be represented by a single monitor. For the purpose of simplicity, NCA’s have been defined according to their general direction relative to the site. This is defined in the following table along with the applicable facade noise reduction values used for the purpose of converting external noise levels to internal noise levels.

Table 6. Noise Catchment Areas		
Location	Receiver Type	Assumed Facade Noise Reduction (dBA)
North - Opposite Berry Street	Commercial office building - non-opening windows	30
East - 65 Berry Street	Commercial office building - non-opening windows	30
South - 105-153 Miller Street	Commercial office building - non-opening windows	30
West - Opposite Miller Street	Commercial office building - non-opening windows	30

Table 7 provides a general assessment of worst-case noise impacts from the site as a whole on each of the NCA’s around the site.

**Table 7. Predicted Internal Noise Levels for NCAs**

Equipment	Noise Prediction $L_{eq(15\text{ minute})}$ (with 30dB Facade Noise Reduction)			
	North	East	South	West
2T Excavators	25	36	36	20
12T Excavators w/hammer	52	63	63	47
20T Excavators w/pulveriser	41	52	52	36
47T Excavators w/hammer	56	67	67	51
Mustang Bobcats	47	58	58	42
Powered Hand Tools	37	48	48	32
Trucks	42	53	53	37
Concrete Cutters	56	67	67	51

### 3.3.2 Highly Sensitive Receivers

Highly Sensitive Receivers generally include those that have raised concern over or objection to project works, or, due to the nature of activities conducted at the premises, require special consideration i.e. childcare centres, etc. This section provides a targeted assessment of noise impacts to each Highly Sensitive Receiver for the various stages of the works.

#### 3.3.2.1 65 Berry Street - Childcare Centre

A childcare centre (Only About Children) is located at Level 1, 65 Berry Street, on zero boundary with the Tower Square demolition site to the South, and 5m from the boundary of 181 and 189 Miller Street demolition sites to the West. Significant concern has been raised by the childcare centre over the impacts arising from long term exposure to construction activities. Consequently the childcare centre has become a high profile issue for the VC2 site. A detailed analysis of noise impacts to the childcare centre is therefore provided in this section. A floor plan of the childcare centre can be found in Appendix C.

A summary of key points raised during a consultation meeting onsite is provided below.

- The core sleep period is between 11:30am and 2:00pm.
- Children sleep in the activity/sleep rooms.
- Activity/sleep rooms are not against the external wall adjacent to the demolition site.
- The activity/sleep rooms have stairs or other rooms between them and the demolition site. It is reasonable to assume a 30 to 35 dBA noise reduction in the sleeping rooms without treatment.



- The playroom ('Playscape 1') features a large sliding door that is left open at all times to create an indoor/outdoor play area.
- Outdoor balcony café area (west facing) in use 7am to 5pm, Main outdoor balcony area in use 7am to 5.30pm

Due to the nature of activities conducted, childcare centres are subject to more stringent criteria for internal NML's than those specified under CoA E37/E38. Section 4.1.1 of the CNVMP stipulates the following limits for childcare centres:

- Internal Sleep Areas - 40dB(A) when in use
- Internal Play Areas - 55dB(A)

Monitoring of internal noise levels at the childcare centre shall occur in 'Activity 1' activity room, as it is the closest point to the works that is most representative of the indoor environment. Note that 'Playscape 1' play room, whilst closer to the works, is not truly representative of the indoor environment due to several large sliding doors that are always open to maintain an 'outdoor' feel.

Short term unattended monitoring was conducted at the childcare centre to determine the actual level of noise reduction between outdoor and indoor environments. Monitoring was simultaneously conducted internally ('Activity 1' room) and externally (Outdoor Play Area adjacent Tower Square) over a 1 week period. Data was analysed for periods where internal noise was at ambient levels (when childcare centre was closed - overnight, weekends). Instances of high external noise levels were time-correlated with internal noise levels to calculate the maximum noise reduction between external and internal environments. These 'unadjusted' values are presented in Table 8. Given that these values were obtained while the childcare centre was closed, the balcony sliding doors facing the VC site were also closed, providing a greater degree of noise reduction than would normally occur during opening hours where the balcony sliding doors are left open. To account for this, a 10dB reduction has been applied to the maximum noise reduction levels recorded, presented in Table 8 as 'adjusted' values.

<b>Table 8. Noise Reduction Values</b>		
<b>Period</b>	<b>Noise Reduction (Unadjusted)</b>	<b>Noise Reduction (Adjusted)</b>
5/5/17 - 6/5/17	36dB(A)	26dB(A)
6/5/17 - 7/5/17	48dB(A)	38dB(A)
7/5/17 - 8/5/17	45dB(A)	35dB(A)
8/5/17 - 9/5/17	41dB(A)	31dB(A)
9/5/17 - 10/5/17	48dB(A)	38dB(A)
10/5/17 - 11/5/17	47dB(A)	37dB(A)

Based on the data presented above, a maximum noise reduction of 38dBA between external and internal environments has been calculated for the childcare centre. Table 9 illustrates the minimum distances from the facade of the childcare centre that noisy works may occur to maintain compliance with applicable internal Noise Management Levels (NML).

In addition to the internal NML's, an external NML of 65dBL<sub>Aeq(15min)</sub> is to be adopted for the outdoor play area at the OAC Child Care Centre and all reasonable steps are to be taken to manage demolition noise levels so that they do not exceed the external NML by more than 10dBA at times when the outdoor play area is used. Table 9 illustrates the minimum distances from the facade of the childcare centre that noisy works may occur to maintain compliance with the outdoor play area NML.

Note that, due to the significant noise reduction factor between external and internal environments (38dBA), the outdoor play area NML becomes the overall limiting factor.

**Table 9. Minimum distances to comply with NML's**

Equipment	Sound Power Level	Distance from facade to achieve NML's (m)		
		Internal Sleep Areas <sup>1</sup> L <sub>eq</sub> (15 minute) 40dB(A) (78dB(A) @ facade)	Internal Play Areas <sup>2</sup> L <sub>eq</sub> (15 minute) 55dB(A) (93dB(A) @ facade)	External Play Area <sup>3</sup> L <sub>eq</sub> (15 minute) 75dB(A)
2T Excavators	88	<1	<1	<b>1</b>
12T Excavators w/ hammer	115	9	2	<b>13</b>
20T Excavators w/ pulveriser	104	3	<1	<b>4</b>
47T Excavators w/ hammer	119	14	3	<b>20</b>
Mustang Bobcats	110	5	1	<b>7</b>
Powered Hand Tools	100	2	<1	<b>2</b>
Trucks	105	3	1	<b>4</b>
Concrete Cutters	119	14	3	<b>20</b>

<sup>1</sup> Distances to comply with 40dB(A) for internal sleep areas when in use (equates to 78dB(A) NML at facade, which exceeds outdoor play area NML). Assumes a further 10dB(A) noise reduction due to shielding of works by existing structures.

<sup>2</sup> Distances to comply with 55dB(A) for internal play areas (equates to 93dB(A) NML at facade, which exceeds outdoor play area NML). Assumes a further 10dB(A) noise reduction due to shielding of works by existing structure.

<sup>3</sup> Distances to comply with 75dB(A) for external play area. Assumes a further 10dB(A) noise reduction due to shielding of works by existing structure.

Using the distance data in Table 9, a work regime for the site shall be adopted to ensure adequate respite is provided to the Childcare Centre during operating hours. The work regime is outlined in Section 4.2.3

### 3.3.2.2 65 Berry Street - Office Tower

An assessment of noise impacts to the office tower at 65 Berry St has been conducted with respect to demolition works as they progress down the towers at 181 and 189 Miller Street. Internal noise levels are predicted for the 65 Berry Street office tower based on an assumed facade noise reduction of 30dB. Table 10 illustrates the varying internal noise levels resulting from demolition works that occur on the same level as the measurement point, and as they move to subsequent levels below the measuring point. Naturally, the greatest level of noise impact will be recorded where works are occurring on the same level as the measuring point.

It can be seen that, for the noisiest equipment types (47T excavator with hammer, concrete cutter), predicted internal noise levels at 65 Berry St meet the 50% NML of 60dB(A) within 2 floor levels, and the 25% limit of 55dB(A) within 5 floor levels. Again, predicted values are for works that occur at the closest points of 181 and 189 Miller Street (i.e. demolition of eastern walls), and assume there are no additional noise barriers between the works and the measuring point other than the facade of 65 Berry St.

**Table 10. Predicted Internal Noise Levels - 65 Berry Street Office Tower**

Equipment	Noise Prediction $L_{eq(15\text{ minute})}$ (with 30dB Facade Noise Reduction)						
	Same Level	△1 Floor	△2 Floors	△3 Floors	△4 Floors	△5 Floors	△6 Floors
2T Excavators	33	32	29	27	26	24	23
12T Excavators w/hammer	60	59	56	54	53	51	50
20T Excavators w/pulveriser	49	48	45	43	42	40	39
47T Excavators w/hammer	64	63	60	58	57	55	54
Mustang Bobcats	55	54	51	49	48	46	45
Powered Hand Tools	45	44	41	39	38	36	35
Trucks	50	49	46	44	43	41	40
Concrete Cutters	64	63	60	58	57	55	54

N.B. Where the external walls of 181/189 Miller Street are still in place during works, it is reasonable to expect a further 10dB(A) reduction in predicted internal noise levels shown in Table 10 due to shielding. In this case, even for the noisiest equipment types, predicted internal NML's on the same and lower levels of 65 Berry St would comply with all internal limits. Similarly, where works occur away from the eastern edge of 181 and 189 Miller St, noise levels will again be lower than those predicted in Table 10.

### 3.3.2.3 199 Miller Street - Rag and Famish Hotel

The Rag and Famish Hotel will be mostly impacted by demolition of the northern portion of 189 Miller Street. It is reasonable to assume a facade noise reduction of 20dB(A) for the Rag and Famish Hotel given its openable (but otherwise closed) windows and doors. Maximum predicted internal noise levels (i.e. where demolition works occur at the closest point on 189 Miller St) fall between 35dB(A) (2T excavator w/hammer) and 66dB(A) (47T excavator w/hammer). In light of the type of premises (pub/restaurant) and therefore existing internal noise environment, these levels are considered to be low impact. Furthermore, where the external walls of 189 Miller St remain in place, it is reasonable to assume a further 10dB(A) reduction of these predicted values.

### 3.3.2.4 Monte Sant' Angelo Mercy College

Forming part of the Monte Sant' Angelo Mercy College, the McQuoin Centre is a multi-purpose hall, indoor pool and sports complex that is used to host school exams. This building is located approximately 53m from the closest point of works on 189 Miller St. For the noisiest of equipment types operating at the absolute closest point to this sensitive receiver, the maximum predicted internal noise level is 57dB(A).

### 3.3.3 Verification of Noise Predictions

Noise data recorded at the OAC childcare centre was analysed in light of the demolition activities occurring on Tower Square (155 Miller St) to assess the degree of impact to the childcare centre and determine accuracy of noise predictions.

Noise results from Friday 21st of July 2017 (Figure 3) were analysed to determine the likelihood of exceeding the external play area NML at the childcare centre.



Figure 3: Noise Monitoring Results - Friday 21st July 2017 - Childcare Centre Balcony

Between the hours of 9:30am and 4:30pm, the external play area NML of 65dB(A) was routinely exceeded. All transient recordings (short noise recordings when the trigger level is exceeded) identified children playing as

the source of the exceedance. No construction noise was discernible in any of the transient recordings. There were no exceedances of the 65dBA + 10dBA NML for the monitoring point.

Noise results from Saturday 22nd of July 2017 (Figure 4) were analysed to determine the level of noise contributed from the construction works (childcare centre closed on Saturdays).

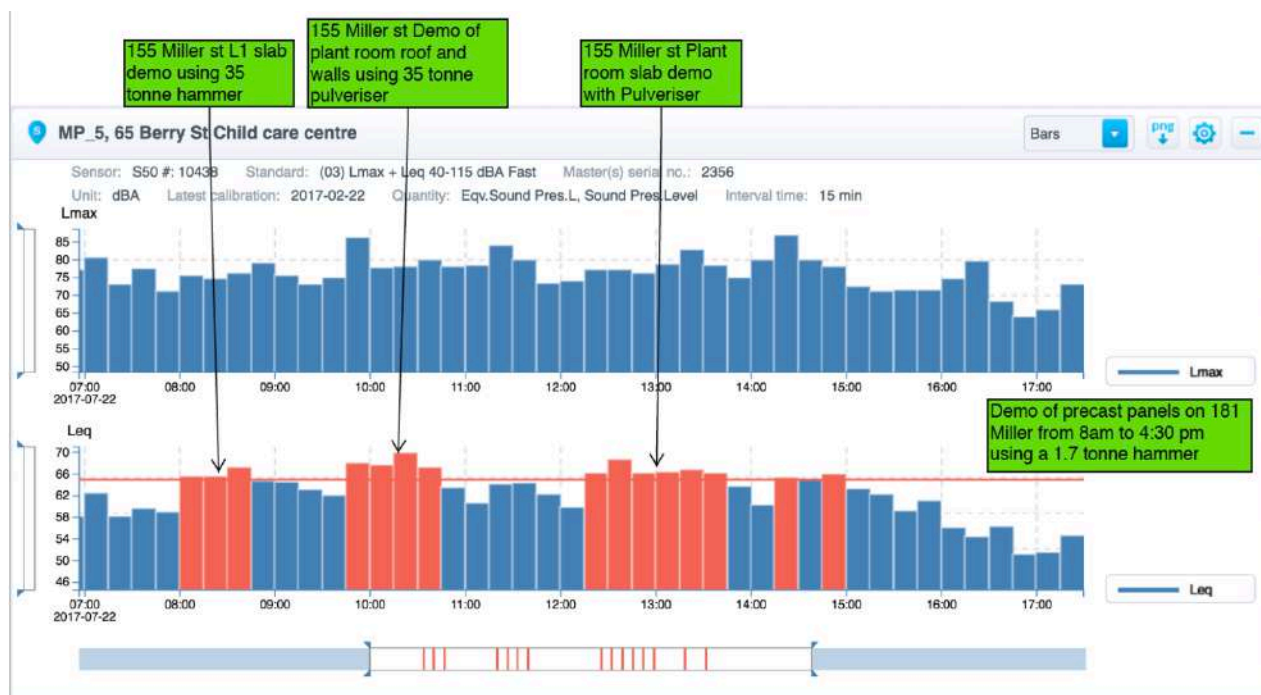


Figure 4: Noise Monitoring Results - Saturday 22nd July 2017 - Childcare Centre Balcony

The highest  $L_{eq}$  recordings for the day were attributable to demolition activities on 155 Miller St (Tower Square). Recorded noise levels were approximately 12dBA lower than predicted noise levels using a 35 tonne excavator with a hammer. This difference is in line with expectations considering that predicted values only take into account noise attenuation due to distance. Demolition works on this day were shielded from the monitor by the existing Tower Square structure. This type of shielding is commonly assumed to provide a minimum of 10dB(A) noise reduction.

Considering the above, predicted noise levels provided within this document are considered to be appropriate for the works.

### 3.4 Ground-borne Noise

As demolition and retention works generally do not involve ground excavation, ground-borne noise is expected to be an issue only where sensitive receivers are directly coupled to the works (structure-borne noise). On the Victoria Cross 2 site, this applies to 105-153 Miller Street.

105-153 Miller Street features a heritage-listed tiled facade that faces the site. The building also houses a cafe with outdoor seating that is located immediately adjacent to the site. To mitigate potential impacts to the facade and to the cafe, demolition of adjoining Tower Square structures shall be completed preferencing pulverisers. Ground-borne noise is therefore not anticipated to be a significant issue for 105-153 Miller Street.

### 3.5 Vibration Predictions

Vibration at the nearest sensitive receivers (adjacent to the building foundation) has been estimated using the formula from the FTA's Guideline "Transit Noise and Vibration Impact Assessment".

$$PPV_{Receiver} = PPV_{Ref} \times \left( \frac{d_{ref}}{d} \right)^{1.5}$$

Where:  $PPV_{Receiver}$  = peak particle velocity at the receiver in mm/s

$PPV_{Ref}$  = peak particle velocity of the source, measured at the reference distance (7.6 m)

$d_{ref}$  = reference distance for the vibration source (7.6 m)

$d$  = horizontal distance from the source to the receiver (m)

The values of  $PPV_{Ref}$  are based on a review of current literature and are provided in Table 11 for reference.

Table 11. Reference PPV's	
Equipment	PPV @ 7.6m (mm/s)
2T Excavators	2.5
12T Excavators w/hammer	3.8
20T Excavators w/pulveriser	2.5
47T Excavators w/hammer	7.6
Mustang Bobcats	0.3
Powered Hand Tools	0.2
Trucks	1.9
Concrete Cutters	0.2



The levels of predicted vibration at the nearest sensitive receivers are provided in Table 12. Note that:

- these predictions assume that equipment is operating at the nearest point of works to the sensitive receiver and therefore represent worst-case scenarios.
- these predictions represent maximum instantaneous levels for the purpose of assessing the likelihood of cosmetic damage and are not applicable for the assessment of human comfort which is measured as vibration dose values.

<b>Table 12. Predicted Ground Vibration</b>				
<b>Equipment</b>	<b>Predicted PPV (mm/s)</b>			
	<b>North (Berry St)</b>	<b>East (65 Berry St)</b>	<b>South (105-153 Miller St)</b>	<b>West (Miller St)</b>
2T Excavators	0.7	4.8	4.8	0.3
12T Excavators w/hammer	1.0	7.1	7.1	0.4
20T Excavators w/pulveriser	0.7	4.8	4.8	0.3
47T Excavators w/hammer	2.1	14.3 <sup>1</sup>	14.3 <sup>2</sup>	0.9
Mustang Bobcats	0.1	0.5	0.5	<0.1
Powered Hand Tools	<0.1	0.3	0.3	<0.1
Trucks	0.5	3.6	3.6	0.2
Concrete Cutters	<0.1	0.3	0.3	<0.1

<sup>1</sup>Maximum value predicted at the closest point of 65 Berry St on ground level only. Values will decrease rapidly when demolishing upper levels, or when operating away from the closest boundary at ground level.

<sup>2</sup>Maximum value predicted at the closest point of 105-153 Miller St on ground level only. Demolition of adjacent areas of Tower Square is expected to be completed with pulverisers.

The German Standard DIN 4150 Part 2 - 1975 presents information on the degree of human perception of various levels of motion. The threshold for 'noticeable' vibration is stated as 1mm/s, with 'easily noticeable' at 2.2mm/s. In light of this, and with reference to Table 12, it is evident that vibration from demolition works will at times be perceptible to persons occupying nearby sensitive receivers.

The highest levels of vibration are those associated with hard demolition works, namely hammering and pulverising. Unless otherwise coupled, vibration transmission from such works to adjacent sensitive receivers is via ground. Naturally then, vibration levels will only approach those limits in Table 12 where demolition works are occurring at or near ground level. Similarly, vibration impacts will diminish rapidly on upper levels of adjacent sensitive receivers.

---

Much of the impact to 105-153 Miller Street shall be mitigated by adoption of pulverising methods for demolition of adjacent Tower Square buildings. Still, occupants of those offices closest to the works will likely experience perceptible levels of vibration though only for a short period.

Similarly, lower floors along the Western side of 65 Berry Street are likely to experience perceptible levels of vibration where hard demolition works at 181 and 189 Miller Street approach ground level. Mitigation of vibration impacts will again rely on adoption of pulverising methods and/or smaller hammers in lieu of large hammers.

---

## 4. Noise and Vibration Management

### 4.1 Environmental Monitoring

Noise and vibration monitoring shall be undertaken using permanent installations supplemented with short term attended and unattended monitoring at the nearest representative sensitive receivers around the site. Results from these monitors shall be reviewed on a weekly basis to ensure ongoing compliance. Where complaints are received, additional monitoring may be conducted at the specific location of complaint. Monitor locations are detailed in Table 13 and illustrated in Appendix B.

**Table 13. Monitoring Locations**

Property	Monitor Category	Installation Type	Location	
65 Berry Street	Noise & Vibration	Permanent	External balcony, Only About Children childcare centre	Representative monitor for compliance
	Noise	Short term	'Activity 1' room, Only About Children childcare centre and upper floors of building	Validate noise reduction between external/internal environments
199 Miller Street	Noise & Vibration	Permanent	Beer garden	Representative monitor for compliance
105 - 153 Miller Street	Noise & Vibration	Permanent	Western facade - blue rendered wall on the terraced roof besides the L2 offices	Representative monitor for compliance
	Noise & Vibration	Short term	Internal, closest offices, multiple levels	Validate transfer relationships between permanent monitor and internal levels

The number and location of monitoring points shall be reviewed after an initial period of 2 - 3 months. Where noise and vibration levels are negligible and, in consideration of the works still to be completed, those levels are not expected to increase for the remainder of the project, consideration shall be given to the removal of redundant monitoring points.

For further detail on environmental monitoring, refer to Section 6.3 of the CNVMP.

#### 4.1.1 Heritage-listed Structures

Effective monitoring of heritage-listed structures can pose unique challenges where sensitive heritage fabrics are involved. CoA E31 stipulates that a heritage specialist shall provide advice regarding noise and vibration monitoring of heritage-listed structures. Such advice is provided in Appendix F.

## 4.2 Mitigation Measures

### 4.2.1 Standard Mitigation Measures

A range of standard noise and vibration mitigation measures shall be adopted on the site so as to minimise the impact of works on neighbouring sensitive receivers. These are outlined in Table 14. Where it is predicted that NML's will be exceeded even with the implementation of standard mitigation measures, additional mitigation measures shall be put in place (See Section 4.2.2).

Table 14. Noise and Vibration Mitigation Measures			
No.	Control	Anticipated Noise Reduction	Timing
<b>Administration</b>			
NVM1	Conduct a site induction addressing the requirements of this CNVMP for all new personnel undertaking site activities	N/A	Prior to starting works
NVM2	Educate staff on noise and the impacts of workers activities on the noise environment	N/A	Prior to starting works / following noise complaints
NVM3	Develop a complaints handling procedure and respond to complaints	N/A	Prior to starting works / as required
NVM4	Conduct regular toolbox talks to reiterate the appropriate noise and vibration management methodologies	N/A	Periodically
<b>Procedural</b>			
NVM5	Turn off machinery when not in use	Up to 10 dB	Daily
NVM6	Conduct regular noise measurements in the vicinity of the site to assess compliance with noise criteria	N/A	As needed / following changes in activities
NVM7	The coincidence of noisy plant working simultaneously close together would be avoided	Up to 10 dB	Daily
NVM8	Operate and maintain equipment according to manufacturers' specifications.	Up to 3 dB	Daily
NVM9	Do not use crane whistles, amplified external telephone ringers/ horns or alarms (excluding emergencies)	N/A	Daily
NVM10	Preference the use of the following in lieu of hydraulic hammers: <ul style="list-style-type: none"> <li>• hydraulic concrete shears</li> <li>• hydraulic concrete pulverisers</li> <li>• saw cutting and lifting</li> </ul>	Up to 15 dB	At all times so far as is practicable
NVM11	Maximise offset of noisy plant to sensitive receivers as much as possible.	N/A	Where practicable
NVM12	Sequencing of demolition works to retain noise shields (walls, etc.) as long as possible ie floor by floor leaving the perimeter wall	5 to 15 dB	Where practicable
NVM13	Positioning of load out areas and dump chutes away from neighbouring walls and enclosing dump chutes	N/A	Where practicable

**Table 14. Noise and Vibration Mitigation Measures**

No.	Control	Anticipated Noise Reduction	Timing
NVM14	<p>Unless compliance with the relevant traffic noise criteria can be achieved, night time heavy vehicle movements at the Chatswood dive site, Crows Nest Station, and Victoria Cross Station and Waterloo Station sites would be restricted to:</p> <ul style="list-style-type: none"> <li>• The Pacific Highway and Mowbray Road at the Chatswood dive site</li> <li>• The Pacific Highway, Hume Street and Oxley Street at the Crows Nest Station construction site</li> <li>• McLaren Street, Miller Street and Berry Street at the Victoria Cross Station construction site</li> <li>• Botany Road and Raglan Street at the Waterloo Station construction site.</li> </ul>	N/A	Night time works only
NVM15	<p>Where vibration levels are predicted to exceed the screening criteria, a more detailed assessment of the structure and attended vibration monitoring would be carried out to ensure vibration levels remain below appropriate limits for that structure.</p> <p>For heritage items, the more detailed assessment would specifically consider the heritage values of the structure in consultation with a heritage specialist to ensure sensitive heritage fabric is adequately monitored and managed.</p>		Ongoing
<b>Engineering</b>			
NVM16	Use site offices, sheds as noise barriers during demolition works	5 to 15 dB	Prior to starting works
NVM17	Use equipment appropriately sized for each task.	Up to 2 dB	Daily
NVM18	Use a noise reduction kit on the jack hammer to limit its sound power level to 115 dBA.	6 dB per source	When selecting equipment
NVM19	Use smart broadband reversing alarm on mobile equipment where possible.	2 to 5 dB	When selecting equipment
NVM20	Removal of any points of contact between the buildings	Up to 15 dB	Where practicable
NVM21	Installation of carpet/ply on scaffold at level of demolition.	Up to 10 dB	Where practicable
<b>Hours of Work</b>			
NVM22	Operate during standard work hours wherever possible	N/A	Daily
NVM23	Introduce respite periods and/or take smoke and lunch breaks when noisy equipment is operating close to the site boundaries.	N/A	Daily
NVM24	Consultation shall be undertaken with affected sensitive receivers to determine sensitive periods	N/A	Daily
NVM25	Noise-intrusive works shall not be timetabled within sensitive periods	N/A	Daily
<b>Site-Specific</b>			
NVM/C1	Acoustic barriers on scaffolding	10dB	Prior to starting works

---

**Table 14. Noise and Vibration Mitigation Measures**

No.	Control	Anticipated Noise Reduction	Timing
NVMVC2	Scheduling of works so as to achieve internal NML of 40dB(A) at internal sleep areas of childcare centre between 11:30am and 2pm	N/A	Monday to Friday
NVMVC3	Scheduling of works so as to achieve internal NML of 55dB(A) at internal play areas of childcare centre between 7:00am and 5:00pm	N/A	Monday to Friday
NVMVC4	Adoption of pulverising methods for demolition of Tower Square buildings immediately adjacent to 105-153 Miller Street.	15dB	As required
NVMVC5	Vibration monitor installed on facade of 105-153 Miller Street to assess vibration impacts to heritage listed tiles	N/A	Prior to starting works
NVMVC6	No hammering/concrete sawing during Childcare Centre operating hours	15dB	Tower Square demo only
NVMVC7	Adoption of specific measures identified in the Health Risk Assessment	N/A	Ongoing

#### **4.2.2 Additional Mitigation Measures**

The Sydney Metro Construction Noise and Vibration Strategy outlines additional mitigation measures that shall be adopted where exceedance of imposed limits is expected, with the level of measure commensurate with the degree of exceedance.

The latest version of the strategy, as referenced in Section 6, outlines the following additional measures for works within standard construction hours:

##### Noise

- Letterbox Drops - Information to neighbours on expected duration of noise-intrusive activities
- Monitoring - Monitoring at the nearest affected sensitive receiver (may include attended monitoring where permanent monitors do not reflect the nearest affected sensitive receiver)

It is anticipated that these measures will be required where hammering activity approaches the boundaries of the site and where demolition works approach adjoining properties outlined in Section 3.4.

##### Vibration

- Letterbox Drops - Information to neighbours on expected duration of vibration-intrusive activities
- Monitoring - Monitoring at the nearest affected sensitive receiver (may include attended monitoring where permanent monitors do not reflect the nearest affected sensitive receiver)
- Project-specific respite offer - Consultation with affected receivers to determine appropriate means of respite



---

## **4.2.3 Mitigation Measures for Highly Sensitive Receivers**

### **4.2.3.1 65 Berry Street - Childcare Centre**

#### Demolition of Tower Square

The Childcare Centre at 65 Berry St has an outdoor area immediately adjacent to, and facing towards, Tower Square. As such, there is significant potential for major noise and vibration impacts to the Childcare Centre from demolition works on this site. To comply with the NML's for the Childcare Centre, and using the distance data presented in Table 9, the following work regime shall be adopted for Tower Square (illustrated graphically in Appendix D):

Within Childcare Centre operating hours:

- Hammers and concrete saws shall not be used at all for demolition of Tower Square structures
- Mustang bobcats shall not be used within Exclusion Zones 1 and 2 unless compliance with internal NMLs can be verified through attended monitoring.
- Trucks, pulverisers and powered hand tools shall not be used within Exclusion Zone 2 unless compliance with internal NMLs can be verified through attended monitoring.

Demolition of Tower Square structures within 4m of the facade of the childcare centre shall be completed outside of normal childcare centre opening hours on Saturdays. As this area represents only a small portion of the works, Sunday works will not be required.

#### Demolition of 181 and 189 Miller Street

Analysis of real noise data (Section 3.3.3) has shown that predicted noise levels are in line with actual noise levels when a further 10dB(A) reduction due to shielding is applied. While works are generally compliant with internal NML's for the 65 Berry Street tower, the external NML at OAC childcare centre will affect demolition works on 181 Miller Street. Using the distance data presented in Table 9, the following work regime shall be adopted for 181 Miller Street (illustrated graphically in Appendix E):

Within Childcare Centre operating hours:

- Hammers of any type shall not be used within Exclusion 2 unless compliance with internal NMLs can be verified through attended monitoring (restriction does not apply above Level 6 due to vertical distance from CCC).
- 47T hammers shall not be used within Exclusion Zones 1 and 2 unless compliance with internal NMLs can be verified through attended monitoring (restriction does not apply above Level 10 due to vertical distance to CCC).
- Pulverising methods may be used in all areas.

---

Consultation with the 'Only About Children' (OAC) childcare in the form of a meeting was undertaken on Thursday 3rd August 2017 to discuss the following:

- Work schedule and indicative timing at the Victoria Cross 2 worksite
- Work methodology (including equipment use), indicative program milestones, predicted impacts and mitigation to be implemented
- Scheduling of works based on noise goals, modelled impacts and agreed respite periods
- Communication around upcoming works, changes to the program and general activities to enable OAC to accurately inform parents and address any issues parents may raise
- OAC representatives confirmed the agreed respite period (11.30am to 2.00pm) and that the current mitigation measures were working satisfactorily.

It is noted that the childcare will receive weekly construction updates, targeted communications around specific works i.e. crane use, program changes etc and weekly reports detailing monitoring results.

#### **4.2.3.2 65 Berry Street - Office Tower**

Following consultation with all tenants of 65 Berry St, no additional requirements for specific mitigation measures have been identified. It is further noted that an outdoor terrace is located above the childcare centre and is tenanted by Blackbaud. Consultation with this sensitive receiver has identified that the terrace is used mainly by staff during lunch and subsequently no requirements for specific noise or vibration mitigation measures were raised.

#### **4.2.3.3 199 Miller Street - Rag and Famish Hotel**

Noise predictions presented in Section 3.3.2.3 suggest demolition works will be of low impact to the Rag and Famish Hotel. No requirement for specific mitigation measures has been identified for this sensitive receiver. Note however that a permanent noise and vibration monitor is located at this premises and data shall be reviewed on a weekly basis as part of reporting requirements.

#### **4.2.3.4 Monte Sant' Angelo Mercy College**

While works on the VC2 site are expected to comply with internal NML's for this receiver, the Monte College has requested that noise be minimised during key exam periods. These periods are noted in Appendix F. This request shall be managed on an ongoing basis through regular consultation with the college via the Place Manager.

---

## 5. Conclusion

Victoria Cross 2 is a particularly sensitive site given the type and proximity of neighbouring sensitive receivers. Airborne noise is predicted to be the key environmental impact arising from demolition works, particularly to the childcare centre at 65 Berry Street and, to a lesser extent, nearby street level businesses with openable doors and windows.

Structure-borne noise and ground vibration may pose a moderate yet short-term impact during demolition of Tower Square buildings immediately adjacent to 105-153 Miller Street, and to lower levels of 65 Berry Street where demolition works on 181 and 189 Miller Streets occur at or very close to ground level. The use of hydraulic shears/pulverisers will be necessary to mitigate both noise and vibration related impacts to the greatest extents possible.

Works within 4m of the facade of the childcare centre shall be scheduled for Saturdays.

---

## 6. References

Additional guidelines and standards relating to the management of construction noise and vibration from this project include:

- NSW Interim Construction Noise Guideline (ICNG), Department of Environment and Climate Change 2009
- NSW Road Noise Policy, Dept. of Environment, Climate Change and Water 2011
- NSW Industrial Noise Policy, Environment Protection Authority 2000
- NSW Assessing Vibration – a technical guideline (AVTG), Department of Environment and Conservation 2006
- Australian Standard AS/NZS 2107:2000 Acoustics - Recommended design sound levels and reverberation times for building interiors
- Australian Standard 2834-1995 Computer Accommodation, Chapter 2.9 Vibration
- Australian Standard AS 2187.2 Explosives - Storage and use - Part 2 Use of explosives
- Australian Standard AS2436-1981 Guide to Noise Control on Construction, Maintenance and Demolition Sites
- British Standard BS 6472-2008, 'Evaluation of human exposure to vibration in buildings (1- 80Hz)
- British Standard 7385: Part 2-1993 'Evaluation and measurement of vibration in buildings'
- German Standard DIN4150-1999 Structural vibration Part 3: Effects of vibration on Structures
- Sydney Metro Construction Noise and Vibration Strategy, Report No. 610.14213-R3, Transport for NSW 2016
- Sydney Metro City and Southwest Environmental Impact Statement, Transport for NSW 2016
- Sydney Metro City and Southwest Submissions and Preferred Infrastructure Report, Transport for NSW 2016
- Sydney Metro City and Southwest Conditions of Approval, Department of Planning and Environment 2017
- Transit Noise and Vibration Impact Assessment, Federal Transit Administration 2006
- Environmental Noise Management Manual (ENMM), Roads and Traffic Authority 2001

## Appendices

### Appendix A - List of Sensitive Receivers

Property Number	Address	Business	Business Category	Distance	Impact		Notes
					Noise	Vibration	
1	200 Miller Street	North Sydney Council	Public Buildings	46m	Low Impact	Low Impact	
2	196 Miller Street	Cala Luna	Restaurant	0m	High Impact	High Impact	
3	31 McLaren st	Residential	Residential Buildings	15m	High Impact	Moderate Impact	
4	29 McLaren st	Residential	Residential Buildings	28m	Moderate Impact	Low Impact	
5	128 - 192 Miller	Monte Sant Angelo College	Educational Buildings	40m	Moderate Impact	Low Impact	
5	128 - 192 Miller	Monte Sant Angelo College	Church	40m	Moderate Impact	Moderate Impact	
6	237 Miller Street	Vima Café	Residential Buildings	32m	Low Impact	Negligible	
6	237 Miller Street	Residential	Residential Buildings	32m	Low Impact	Negligible	
7	225 Miller Street	Sakura Japanese	Public Buildings	35m	Moderate Impact	Negligible	
7	225 Miller Street	Enta Australia	Shop Buildings	35m	Low Impact	Negligible	
7	225 Miller Street	Azzopardi & Partners	Office Buildings	35m	Low Impact	Negligible	
7	225 Miller Street	Nelson 7 Robertson Exports	Office Buildings	35m	Low Impact	Negligible	
8	199 Miller Street	Rag and Famish Hotel	Public Buildings	21m	Moderate Impact	Low Impact	
9	105 - 153 Miller Street	Aesop's	Shop Buildings	0m	Moderate Impact	Moderate Impact	
9	105 - 153 Miller Street	Bittersweet	Public Buildings	0m	Moderate Impact	Moderate Impact	
9	105 - 153 Miller Street	Boost Juice Bar	Public Buildings	0m	Moderate Impact	Moderate Impact	
9	105 - 153 Miller Street	Bourke Street Bakery	Public Buildings	0m	Moderate Impact	Moderate Impact	
9	105 - 153 Miller Street	Bupa Australia	Shop Buildings	0m	Moderate Impact	Moderate Impact	
9	105 - 153 Miller Street	City Convenience	Shop Buildings	0m	Moderate Impact	Moderate Impact	

Property Number	Address	Business	Business Category	Distance	Impact		Notes
					Noise	Vibration	
9	105 - 153 Miller Street	Dr Jalal Khan & Associates/Wisdom Dental Care	Health Buildings	0m	Moderate Impact	Moderate Impact	
9	105 - 153 Miller Street	Drew's Pharmacy	Health Buildings	0m	Moderate Impact	Moderate Impact	
9	105 - 153 Miller Street	Investa (Managing Agent)	Office Buildings	0m	Moderate Impact	Moderate Impact	Investa have queried vibration management with respect to heritage tiled façade of 105-153 Miler Street.
9	105 - 153 Miller Street	Meet @ 105	Public Buildings	0m	High Impact	Moderate Impact	Immediately adjacent to Tower Square. Outdoor eating area. Busiest times 8-11am and 12-1.30pm.
9	105 - 153 Miller Street	Mlc Group	Office Buildings	0m	Moderate Impact	Moderate Impact	
9	105 - 153 Miller Street	Mount Espresso & Fresh Food	Public Buildings	0m	Moderate Impact	Moderate Impact	
9	105 - 153 Miller Street	National Australia Bank	Office Buildings	0m	Moderate Impact	Moderate Impact	Operates a number of call centres
9	105 - 153 Miller Street	Pita Pit	Public Buildings	0m	Moderate Impact	Moderate Impact	
9	105 - 153 Miller Street	Pizza Hut	Public Buildings	0m	Moderate Impact	Moderate Impact	
9	105 - 153 Miller Street	Rolls Vietnam	Public Buildings	0m	Moderate Impact	Moderate Impact	
9	105 - 153 Miller Street	Rolls Vietnam	Public Buildings	0m	Moderate Impact	Moderate Impact	
9	105 - 153 Miller Street	Subway	Public Buildings	0m	Moderate Impact	Moderate Impact	
9	105 - 153 Miller Street	Sushi Ever	Public Buildings	0m	Moderate Impact	Moderate Impact	
9	105 - 153 Miller Street	Tecnoprint	Office Buildings	0m	Moderate Impact	Moderate Impact	
9	105 - 153 Miller Street	Telstra Shop	Shop Buildings	0m	Moderate Impact	Moderate Impact	
10	100 Miller Street	Asg - Callon Systems Group	Office Buildings	35m	Low Impact	Negligible	



Property Number	Address	Business	Business Category	Distance	Impact		Notes
					Noise	Vibration	
10	100 Miller Street	Astrum Recruitment	Office Buildings	35m	Low Impact	Negligible	
10	100 Miller Street	Atom Aged Care Services Australia	Office Buildings	35m	Low Impact	Negligible	
10	100 Miller Street	Blue Coat Systems Australia	Office Buildings	35m	Low Impact	Negligible	
10	100 Miller Street	Bluestone Lobby Cafe	Public Buildings	35m	Low Impact	Negligible	
10	100 Miller Street	Bqe Software Australia	Office Buildings	35m	Low Impact	Negligible	
10	100 Miller Street	Broadcast Map (Aust) Pty Limited	Office Buildings	35m	Low Impact	Negligible	
10	100 Miller Street	Brandscreen	Office Buildings	35m	Low Impact	Negligible	
10	100 Miller Street	Callcentres Net Pty Ltd	Office Buildings	35m	Low Impact	Negligible	
10	100 Miller Street	Carbon Reduction Institute Pty Ltd	Office Buildings	35m	Low Impact	Negligible	
10	100 Miller Street	Centuria Capital Ltd	Office Buildings	35m	Low Impact	Negligible	
10	100 Miller Street	Colliers International (Nsw) Pty Ltd	Office Buildings	35m	Low Impact	Negligible	
10	100 Miller Street	Corporate Traveller	Office Buildings	35m	Low Impact	Negligible	
10	100 Miller Street	Cromwell Property Services	Office Buildings	35m	Low Impact	Negligible	
10	100 Miller Street	Cromwell Property Services Pty Ltd	Office Buildings	35m	Low Impact	Negligible	
10	100 Miller Street	Eight Dragons Digital Pty Ltd	Office Buildings	35m	Low Impact	Negligible	
10	100 Miller Street	Engine Room Productions	Studio Buildings	35m	Moderate Impact	Negligible	
10	100 Miller Street	Equitech Finance Pty Ltd	Office Buildings	35m	Low Impact	Negligible	
10	100 Miller Street	Eutility Pty Ltd	Office Buildings	35m	Low Impact	Negligible	
10	100 Miller Street	Experian Asia Pacific	Office Buildings	35m	Low Impact	Negligible	

Property Number	Address	Business	Business Category	Distance	Impact		Notes
					Noise	Vibration	
10	100 Miller Street	Fifth Quadrant	Office Buildings	35m	Low Impact	Negligible	
10	100 Miller Street	Griffith Hack Lawyers	Office Buildings	35m	Low Impact	Negligible	
10	100 Miller Street	Gs Global Australia Pty Ltd	Office Buildings	35m	Low Impact	Negligible	
10	100 Miller Street	Hays Recruiting	Office Buildings	35m	Low Impact	Negligible	
10	100 Miller Street	Htc Australia	Office Buildings	35m	Low Impact	Negligible	
10	100 Miller Street	I Buy New	Office Buildings	35m	Low Impact	Negligible	
10	100 Miller Street	Insurance Advisernet Australia	Office Buildings	35m	Low Impact	Negligible	
10	100 Miller Street	Ibuy New	Office Buildings	35m	Low Impact	Negligible	
10	100 Miller Street	Jll	Office Buildings	35m	Low Impact	Negligible	
10	100 Miller Street	Ls Cable	Office Buildings	35m	Low Impact	Negligible	
10	100 Miller Street	Moneymen Financial Group	Office Buildings	35m	Low Impact	Negligible	
10	100 Miller Street	Mortgage Choice	Office Buildings	35m	Low Impact	Negligible	
10	100 Miller Street	Ms Australia	Office Buildings	35m	Low Impact	Negligible	
10	100 Miller Street	Multiple Sclerosis Research Australia	Office Buildings	35m	Low Impact	Negligible	
10	100 Miller Street	National Australia Bank Ltd	Office Buildings	35m	Low Impact	Negligible	
10	100 Miller Street	Netiq	Office Buildings	35m	Low Impact	Negligible	
10	100 Miller Street	Next Telecom Pty Ltd	Office Buildings	35m	Low Impact	Negligible	
10	100 Miller Street	Micro Focus	Office Buildings	35m	Low Impact	Negligible	
10	100 Miller Street	Object Consulting Pty Ltd	Office Buildings	35m	Low Impact	Negligible	

Property Number	Address	Business	Business Category	Distance	Impact		Notes
					Noise	Vibration	
10	100 Miller Street	Objective Corporation Ltd	Office Buildings	35m	Low Impact	Negligible	
10	100 Miller Street	Orbis Asiapac Pty Ltd	Office Buildings	35m	Low Impact	Negligible	
10	100 Miller Street	Pharmout	Office Buildings	35m	Low Impact	Negligible	
10	100 Miller Street	Phoenix Executive Search	Office Buildings	35m	Low Impact	Negligible	
10	100 Miller Street	Primary Health Care	Office Buildings	35m	Low Impact	Negligible	
10	100 Miller Street	Progress Software Pty Ltd	Office Buildings	35m	Low Impact	Negligible	
10	100 Miller Street	Proscan Australia	Office Buildings	35m	Low Impact	Negligible	
10	100 Miller Street	Platform	Office Buildings	35m	Low Impact	Negligible	
10	100 Miller Street	Red Engine	Office Buildings	35m	Low Impact	Negligible	
10	100 Miller Street	Red-Hat	Office Buildings	35m	Low Impact	Negligible	
10	100 Miller Street	Red Note	Studio Buildings	35m	Moderate Impact	Negligible	
10	100 Miller Street	Rewards Media	Office Buildings	35m	Low Impact	Negligible	
10	100 Miller Street	Rhipe	Office Buildings	35m	Low Impact	Negligible	
10	100 Miller Street	Rivera Capital	Office Buildings	35m	Low Impact	Negligible	
10	100 Miller Street	Secure Parking	Shop Buildings	35m	Low Impact	Negligible	
10	100 Miller Street	Secure Parking Group	Office Buildings	35m	Low Impact	Negligible	
10	100 Miller Street	Semantic Software Asia Pacific Ltd	Office Buildings	35m	Low Impact	Negligible	
10	100 Miller Street	Simon + Kucher & Partners	Office Buildings	35m	Low Impact	Negligible	
10	100 Miller Street	Suse	Office Buildings	35m	Low Impact	Negligible	

Property Number	Address	Business	Business Category	Distance	Impact		Notes
					Noise	Vibration	
10	100 Miller Street	Tancraft	Office Buildings	35m	Low Impact	Negligible	
10	100 Miller Street	The Australia Traffic Network Pty Ltd	Office Buildings	35m	Low Impact	Negligible	
10	100 Miller Street	The Executive Centre (Sydney) Pty Ltd	Office Buildings	35m	Low Impact	Negligible	
10	100 Miller Street	Third Horizon Consulting Partners Pty Ltd	Office Buildings	35m	Low Impact	Negligible	
10	100 Miller Street	Transacta Pty Ltd	Office Buildings	35m	Low Impact	Negligible	
10	100 Miller Street	Verint Systems Pty Ltd	Office Buildings	35m	Low Impact	Negligible	
10	100 Miller Street	Visionary Capital	Office Buildings	35m	Low Impact	Negligible	
10	100 Miller Street	Walliss Financial Services	Office Buildings	35m	Low Impact	Negligible	
10	100 Miller Street	Wrays Intellectual Property	Office Buildings	35m	Low Impact	Negligible	
10	100 Miller Street	Wt Partnership	Office Buildings	35m	Low Impact	Negligible	
10	100 Miller Street	Wyza	Office Buildings	35m	Low Impact	Negligible	
11	116 Miller Street	Rokujuni	Restaurant	30m	Low Impact	Low Impact	
11	116 Miller Street	Salmat	Office Buildings	30m	Low Impact	Low Impact	
11	116 Miller Street	Ubank	Office Buildings	30m	Low Impact	Low Impact	
11	116 Miller Street	APP	Office Buildings	30m	Low Impact	Low Impact	
11	116 Miller Street	Aquas	Office Buildings	30m	Low Impact	Low Impact	
11	116 Miller Street	Commonwealth Bank	Office Buildings	30m	Low Impact	Low Impact	
11	116 Miller Street	ANZ Bank	Office Buildings	30m	Low Impact	Low Impact	
11	116 Miller Street	Rukujun Restaurant	Public Buildings	30m	Moderate Impact	Low Impact	

Property Number	Address	Business	Business Category	Distance	Impact		Notes
					Noise	Vibration	
12	53 Berry Street	Cubane Consulting	Office Buildings	30m	Low Impact	Low Impact	
12	53 Berry Street	Dashing Print	Office Buildings	30m	Low Impact	Low Impact	
12	53 Berry Street	East Coast Power	Office Buildings	30m	Low Impact	Low Impact	
12	53 Berry Street	Evans Rossouw + Young	Office Buildings	30m	Low Impact	Low Impact	
12	53 Berry Street	Fenwicke Financial	Office Buildings	30m	Low Impact	Low Impact	
12	53 Berry Street	Georgiou Group Pty Ltd	Office Buildings	30m	Low Impact	Low Impact	
12	53 Berry Street	Lumix Wealth	Office Buildings	30m	Low Impact	Low Impact	
12	53 Berry Street	Murchisons	Office Buildings	30m	Low Impact	Low Impact	
12	53 Berry Street	National Credit Insurance (Brokers) Pty Ltd	Office Buildings	30m	Low Impact	Low Impact	
12	53 Berry Street	Patterson Houen & Commins	Office Buildings	30m	Low Impact	Low Impact	
12	53 Berry Street	Rbhm Commercial Lawyers	Office Buildings	30m	Low Impact	Low Impact	
12	53 Berry Street	Upm - Kymmene Pty Ltd	Office Buildings	30m	Low Impact	Low Impact	
13	50 Berry Street	Lot 50 Café	Public Buildings	22m	Moderate Impact	Low Impact	Ground floor café with outdoor eating area. Busy periods 8-10am and 12-2pm.
13	50 Berry Street	Arkadin Global Collaboration Services	Office Buildings	22m	Low Impact	Low Impact	
13	50 Berry Street	Besmaw/All Sands Pty Ltd	Office Buildings	22m	Low Impact	Low Impact	
13	50 Berry Street	Candor Family Office	Office Buildings	22m	Low Impact	Low Impact	
13	50 Berry Street	Cis International	Office Buildings	22m	Low Impact	Low Impact	

Property Number	Address	Business	Business Category	Distance	Impact		Notes
					Noise	Vibration	
13	50 Berry Street	Cmc Markets Asia Pacific	Office Buildings	22m	Low Impact	Low Impact	
13	50 Berry Street	Comptel	Office Buildings	22m	Low Impact	Low Impact	
13	50 Berry Street	Crofts Chartered Accountants	Office Buildings	22m	Low Impact	Low Impact	
13	50 Berry Street	Direct Health Solutions	Office Buildings	22m	Low Impact	Low Impact	
13	50 Berry Street	Fire Safe Australia	Office Buildings	22m	Low Impact	Low Impact	
13	50 Berry Street	Fronde Australia	Office Buildings	22m	Low Impact	Low Impact	
13	50 Berry Street	Golf Link Partners & <a href="http://iseekgolf.com">iseekgolf.com</a>	Office Buildings	22m	Low Impact	Low Impact	
13	50 Berry Street	Id Planning	Office Buildings	22m	Low Impact	Low Impact	
13	50 Berry Street	Impress Design	Office Buildings	22m	Low Impact	Low Impact	
13	50 Berry Street	Independant Data Solutions	Office Buildings	22m	Low Impact	Low Impact	
13	50 Berry Street	Kores Australia	Office Buildings	22m	Low Impact	Low Impact	
13	50 Berry Street	Kwik Copy Australia	Office Buildings	22m	Low Impact	Low Impact	
13	50 Berry Street	Nm Insurance	Office Buildings	22m	Low Impact	Low Impact	
13	50 Berry Street	Oncosil Medical	Office Buildings	22m	Low Impact	Low Impact	
13	50 Berry Street	Organo Gold Australia	Office Buildings	22m	Low Impact	Low Impact	
13	50 Berry Street	Oztam	Office Buildings	22m	Low Impact	Low Impact	
13	50 Berry Street	Pigdon Norgate Family Lawyers	Office Buildings	22m	Low Impact	Low Impact	
13	50 Berry Street	Portcullis Capital	Office Buildings	22m	Low Impact	Low Impact	
13	50 Berry Street	Selector Group	Office Buildings	22m	Low Impact	Low Impact	

Property Number	Address	Business	Business Category	Distance	Impact		Notes
					Noise	Vibration	
13	50 Berry Street	Semf	Office Buildings	22m	Low Impact	Low Impact	
13	50 Berry Street	Stephen Financial Solutions	Office Buildings	22m	Low Impact	Low Impact	
13	50 Berry Street	Wealth Foundation	Office Buildings	22m	Low Impact	Low Impact	
13	50 Berry Street	Ws Atkins International	Office Buildings	22m	Low Impact	Low Impact	
13	50 Berry Street	YMI/MI-BIKE	Office Buildings	22m	Low Impact	Low Impact	
14	26 - 62 Berry Street	Afea	Office Buildings	31m	Low Impact	Negligible	
14	26 - 62 Berry Street	Alexandra Roberts	Health Buildings	31m	Low Impact	Negligible	
14	26 - 62 Berry Street	Arch Woolprotection	Office Buildings	31m	Low Impact	Negligible	
14	26 - 62 Berry Street	Asc Employment	Office Buildings	31m	Low Impact	Negligible	
14	26 - 62 Berry Street	Aussie Paws	Office Buildings	31m	Low Impact	Negligible	
14	26 - 62 Berry Street	Aust. Convenience & Petroleum Marketers	Office Buildings	31m	Low Impact	Negligible	
14	26 - 62 Berry Street	Bk It Consulting	Office Buildings	31m	Low Impact	Negligible	
14	26 - 62 Berry Street	Black Label Solutions	Office Buildings	31m	Low Impact	Negligible	
14	26 - 62 Berry Street	Blue Cats	Office Buildings	31m	Low Impact	Negligible	
14	26 - 62 Berry Street	Bridge Legal	Office Buildings	31m	Low Impact	Negligible	
14	26 - 62 Berry Street	Clear Day Consulting, Dr Yuliya Richard	Health Buildings	31m	Low Impact	Negligible	
14	26 - 62 Berry Street	Compass Project Management	Office Buildings	31m	Low Impact	Negligible	
14	26 - 62 Berry Street	Dako Aust.	Health Buildings	31m	Low Impact	Negligible	
14	26 - 62 Berry Street	Dashing Print	Office Buildings	31m	Low Impact	Negligible	



Property Number	Address	Business	Business Category	Distance	Impact		Notes
					Noise	Vibration	
14	26 - 62 Berry Street	Dillstone Systems	Office Buildings	31m	Low Impact	Negligible	
14	26 - 62 Berry Street	Dr Peter Richard Herbert	Health Buildings	31m	Low Impact	Negligible	
14	26 - 62 Berry Street	Dr Robert Gordon	Health Buildings	31m	Low Impact	Negligible	
14	26 - 62 Berry Street	Enosys Solutions	Office Buildings	31m	Low Impact	Negligible	
14	26 - 62 Berry Street	Fonality	Office Buildings	31m	Low Impact	Negligible	
14	26 - 62 Berry Street	Godfrey Renumeration Group	Office Buildings	31m	Low Impact	Negligible	
14	26 - 62 Berry Street	Ignite Energy Resources	Office Buildings	31m	Low Impact	Negligible	
14	26 - 62 Berry Street	Intouch Home Loans	Office Buildings	31m	Low Impact	Negligible	
14	26 - 62 Berry Street	Jet Financial	Office Buildings	31m	Low Impact	Negligible	
14	26 - 62 Berry Street	Knowledgeone Corporation	Office Buildings	31m	Low Impact	Negligible	
14	26 - 62 Berry Street	Konnectus	Office Buildings	31m	Low Impact	Negligible	
14	26 - 62 Berry Street	Leach Chicks	Office Buildings	31m	Low Impact	Negligible	
14	26 - 62 Berry Street	Licella	Office Buildings	31m	Low Impact	Negligible	
14	26 - 62 Berry Street	Lowe Wines	Office Buildings	31m	Low Impact	Negligible	
14	26 - 62 Berry Street	Mm Consultancy	Office Buildings	31m	Low Impact	Negligible	
14	26 - 62 Berry Street	Mulesoft Aust.	Office Buildings	31m	Low Impact	Negligible	
14	26 - 62 Berry Street	Perforce Software	Office Buildings	31m	Low Impact	Negligible	
14	26 - 62 Berry Street	Plus Locations Systems	Office Buildings	31m	Low Impact	Negligible	
14	26 - 62 Berry Street	Premier Wealth Management	Office Buildings	31m	Low Impact	Negligible	

Property Number	Address	Business	Business Category	Distance	Impact		Notes
					Noise	Vibration	
14	26 - 62 Berry Street	Proscience	Office Buildings	31m	Low Impact	Negligible	
14	26 - 62 Berry Street	Primary Health Care	Office Buildings	31m	Low Impact	Negligible	
14	26 - 62 Berry Street	Royal Haskoning Dhv	Office Buildings	31m	Low Impact	Negligible	
14	26 - 62 Berry Street	Scalable Data Systems	Office Buildings	31m	Low Impact	Negligible	
14	26 - 62 Berry Street	Searle & Assoc. Lawyers	Office Buildings	31m	Low Impact	Negligible	
14	26 - 62 Berry Street	Strata Community Insurance	Office Buildings	31m	Low Impact	Negligible	
14	26 - 62 Berry Street	Voyager Software	Office Buildings	31m	Low Impact	Negligible	
15	77 Berry Street	Five Point Café	Public Buildings	14m	Low Impact	Low Impact	
15	77 Berry Street	Pea Berry Espresso Café	Public Buildings	14m	Low Impact	Low Impact	
15	77 Berry Street	Pekish Café	Public Buildings	14m	Low Impact	Low Impact	
15	77 Berry Street	Custom Luggage	Shop Buildings	14m	Low Impact	Low Impact	
15	77 Berry Street	Flight Centre	Shop Buildings	14m	Low Impact	Low Impact	
15	77 Berry Street	Grana Bar	Public Buildings	14m	Low Impact	Low Impact	
15	77 Berry Street	Junior Thair	Public Buildings	14m	Low Impact	Low Impact	
15	77 Berry Street	Michael Berton Jewellery	Shop Buildings	14m	Low Impact	Low Impact	
15	77 Berry Street	Opsm	Health Buildings	14m	Low Impact	Low Impact	
15	77 Berry Street	Oz10 Hair Design	Shop Buildings	14m	Low Impact	Low Impact	
15	77 Berry Street	Shoe Shop	Shop Buildings	14m	Low Impact	Low Impact	
15	77 Berry Street	Tokyo Roll	Public Buildings	14m	Low Impact	Low Impact	
15	77 Berry Street	Wangs Massage & Medical	Health Buildings	14m	Low Impact	Low Impact	

Property Number	Address	Business	Business Category	Distance	Impact		Notes
					Noise	Vibration	
15	77 Berry Street	Mays Laksa House	Public Buildings	14m	Low Impact	Low Impact	
15	77 Berry Street	Alteration Studio	Shop Buildings	14m	Low Impact	Low Impact	
15	77 Berry Street	Bibaps Korean	Public Buildings	14m	Low Impact	Low Impact	
15	77 Berry Street	Cignall Tobacco	Shop Buildings	14m	Low Impact	Low Impact	
15	77 Berry Street	Cuts Dino Barber	Shop Buildings	14m	Low Impact	Low Impact	
15	77 Berry Street	The Flower Factory	Shop Buildings	14m	Low Impact	Low Impact	
15	77 Berry Street	Grab A Kabab	Public Buildings	14m	Low Impact	Low Impact	
15	77 Berry Street	Office Works	Shop Buildings	14m	Low Impact	Low Impact	
15	77 Berry Street	Perfects Italian Cuisine	Public Buildings	14m	Low Impact	Low Impact	
15	77 Berry Street	Newsagency	Shop Buildings	14m	Low Impact	Low Impact	
15	77 Berry Street	Shopping World Shoe Repair	Shop Buildings	14m	Low Impact	Low Impact	
15	77 Berry Street	Speedy Oriental	Public Buildings	14m	Low Impact	Low Impact	
15	77 Berry Street	Sweet Tart	Shop Buildings	14m	Low Impact	Low Impact	
15	77 Berry Street	Taste Buddies	Public Buildings	14m	Low Impact	Low Impact	
15	77 Berry Street	Indilite	Public Buildings	14m	Low Impact	Low Impact	
15	77 Berry Street	Xquisito	Public Buildings	14m	Low Impact	Low Impact	
15	77 Berry Street	Oracle Books	Shop Buildings	14m	Low Impact	Low Impact	
15	77 Berry Street	Coffee Origins	Public Buildings	14m	Low Impact	Low Impact	
15	77 Berry Street	Pjs Dry Cleaning	Shop Buildings	14m	Low Impact	Low Impact	
15	77 Berry Street	Mini Mart	Shop Buildings	14m	Low Impact	Low Impact	

Property Number	Address	Business	Business Category	Distance	Impact		Notes
					Noise	Vibration	
15	77 Berry Street	Elle Bache	Shop Buildings	14m	Low Impact	Low Impact	
15	77 Berry Street	Objective Corporation Ltd	Office Buildings	14m	Low Impact	Low Impact	
15	77 Berry Street	Text 100	Office Buildings	14m	Low Impact	Low Impact	
15	77 Berry Street	Global Public Relations	Office Buildings	14m	Low Impact	Low Impact	
15	77 Berry Street	Capital Insight	Office Buildings	14m	Low Impact	Low Impact	
15	77 Berry Street	Atkinson Capital Insight	Office Buildings	14m	Low Impact	Low Impact	
15	77 Berry Street	Jba	Office Buildings	14m	Low Impact	Low Impact	
15	77 Berry Street	Residential	Residential Buildings	14m	Moderate Impact	Low Impact	
16	65 Berry street	MediaCom	Office Buildings	5m	Moderate Impact	Moderate Impact	
16	65 Berry street	Reckon	Office Buildings	5m	Moderate Impact	Moderate Impact	
16	65 Berry Street	Only About Children (Lvl 1)	Child care	5m	High Impact	Low Impact	Core sleep period 11.30am-2pm Outdoor balcony café area (west facing) in use 7am to 5pm Main outdoor balcony area in use 7am to 5.30pm
16	65 Berry Street	Blackbaud	Office Buildings	5m	Moderate Impact	Low Impact	Blackbaud office also has a functional outdoor balcony area with furniture. Blackbaud are concerned about dust/ air quality.
16	65 Berry Street	Think Tank Group	Office Buildings	5m	Moderate Impact	Low Impact	
16	65 Berry Street	Ferrovial	Office Buildings	5m	Moderate Impact	Low Impact	

Property Number	Address	Business	Business Category	Distance	Impact		Notes
					Noise	Vibration	
16	65 Berry Street	IPCA	Office Buildings	5m	Moderate Impact	Low Impact	
16	65 Berry Street	Spark44	Office Buildings	5m	Moderate Impact	Low Impact	
16	65 Berry Street	Westpac	Office Buildings	5m	Moderate Impact	Low Impact	
16	65 Berry Street	Group M	Office Buildings	5m	Moderate Impact	Low Impact	
16	65 Berry Street	Arrowstone Wealth Planning	Office Buildings	5m	Moderate Impact	Low Impact	
16	65 Berry Street	Blackie McDonald Communications Group	Office Buildings	5m	Moderate Impact	Low Impact	
16	65 Berry Street	Cadigal Office Leasing	Office Buildings	5m	Moderate Impact	Low Impact	
16	65 Berry Street	Cintra	Office Buildings	5m	Moderate Impact	Low Impact	
16	65 Berry Street	Edward Family Lawyers	Office Buildings	5m	Moderate Impact	Low Impact	
16	65 Berry Street	Essence	Office Buildings	5m	Moderate Impact	Low Impact	
16	65 Berry Street	Iceberg Communications	Office Buildings	5m	Moderate Impact	Low Impact	
16	65 Berry Street	Inco Ships	Office Buildings	5m	Moderate Impact	Low Impact	
16	65 Berry Street	Maxus	Office Buildings	5m	Moderate Impact	Low Impact	
16	65 Berry Street	Media Lab	Shop Buildings	5m	Low Impact	Low Impact	*****
16	65 Berry Street	Mindshare	Office Buildings	5m	Moderate Impact	Low Impact	
16	65 Berry Street	Plista	Office Buildings	5m	Moderate Impact	Low Impact	
16	65 Berry Street	Sudler	Office Buildings	5m	Moderate Impact	Low Impact	
16	65 Berry Street	Trimble	Office Buildings	5m	Moderate Impact	Low Impact	
16	65 Berry Street	WPP Aunz	Office Buildings	5m	Moderate Impact	Low Impact	

Property Number	Address	Business	Business Category	Distance	Impact		Notes
					Noise	Vibration	
16	65 Berry Street	Xaxis	Office Buildings	5m	Moderate Impact	Low Impact	
16	65 Berry Street	Mooneys Insurance Advisors	Office Buildings	5m	Moderate Impact	Low Impact	
16	65 Berry Street	Halcyon Wealth Advisers	Office Buildings	5m	Moderate Impact	Low Impact	
16	65 Berry Street	MEC	Office Buildings	5m	Moderate Impact	Low Impact	
17	243 Miller st	Life Connect	Psychology/ Health	72m	Low Impact	Low Impact	
18	77 Berry st	Residential	Residential Buildings	17m	Moderate Impact	Low Impact	

---

*Appendix B - Sensitive Receivers and Monitoring Points*

This page intentionally left blank





Impact Category

- Low Impact
- Moderate Impact
- High Impact
- Demolition Zone

Monitoring Category

- Noise
- Regenerated Noise
- Vibration
- Noise & Vibration

Sensitive Receiver Category

- Commercial
- Residential
- Educat/Childcare
- Industrial
- Heritage
- Place of worship
- 5 Property no.
- Monitored RBL



www.ostermanconsult.com

Sydney Metro Demolition - Victoria Cross St  
Noise and Vibration Receivers & Land Uses

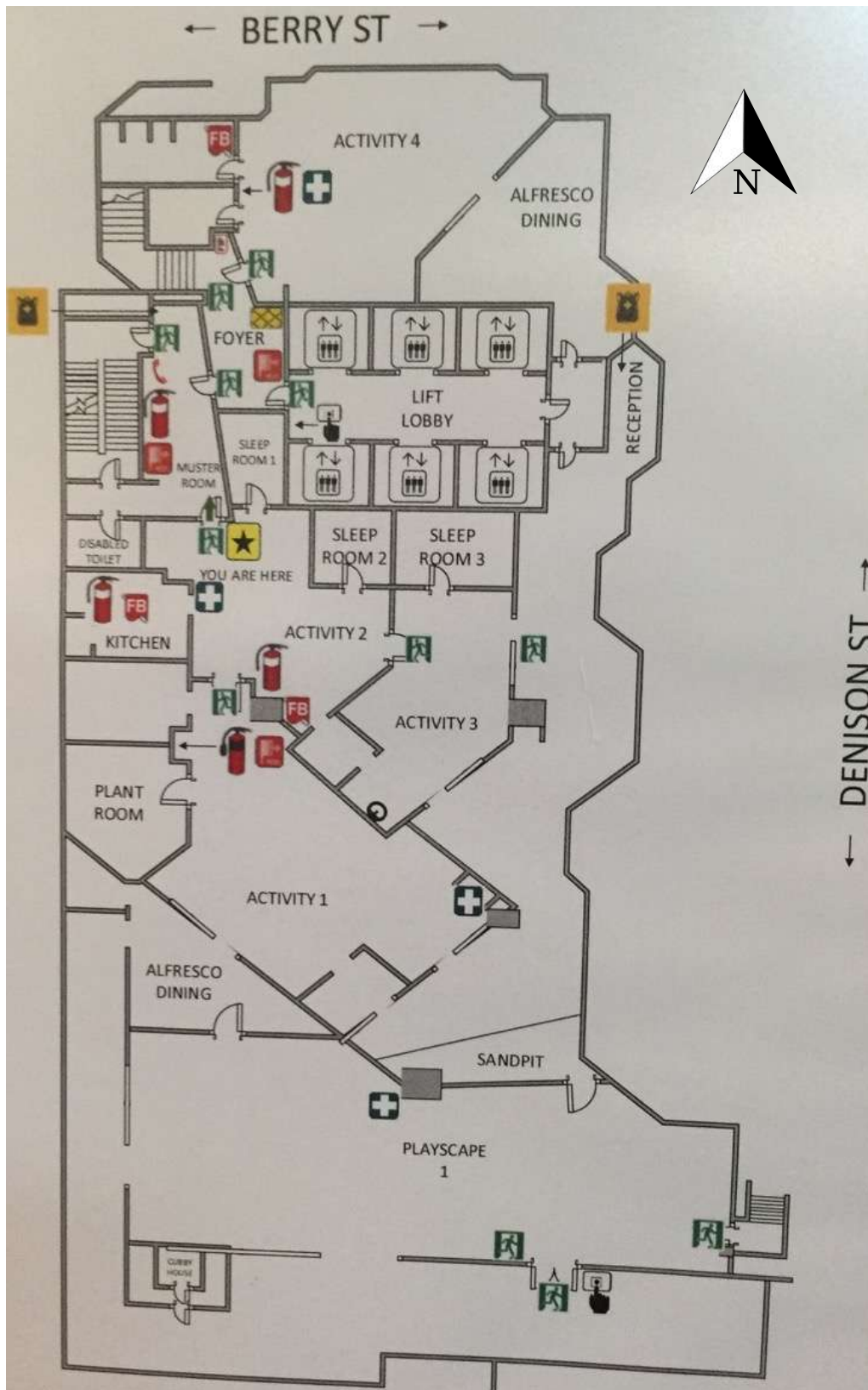
Date: 27/05/2017  
Created by: RO  
Report No: 0116 041 04



The contents within this document are based on third party data. The accuracy of the information can not be guaranteed



Appendix C - Childcare Centre Floor Plan



---

*Appendix D - Tower Square Exclusion Zones for Noisy Activities*

This page intentionally left blank





Zone	Excluded Equipment	Distance from Facade <sup>1</sup>
1	Mustang Bobcats	7m
2	Trucks, Pulverisers, Powered Hand Tools	4m

<sup>1</sup>Assumes 10dB(A) noise reduction due to solid hoarding around CCC



www.ostermanconsult.com

## Sydney Metro Demolition - VC2 Tower Square Exclusion Zones

Childcare Centre, Lvl 1, 65 Berry Street  
Compliance with 75dB(A) for External Play Area

Date: 29/06/2017  
Created by: MDS  
Report No: 0116 041 04

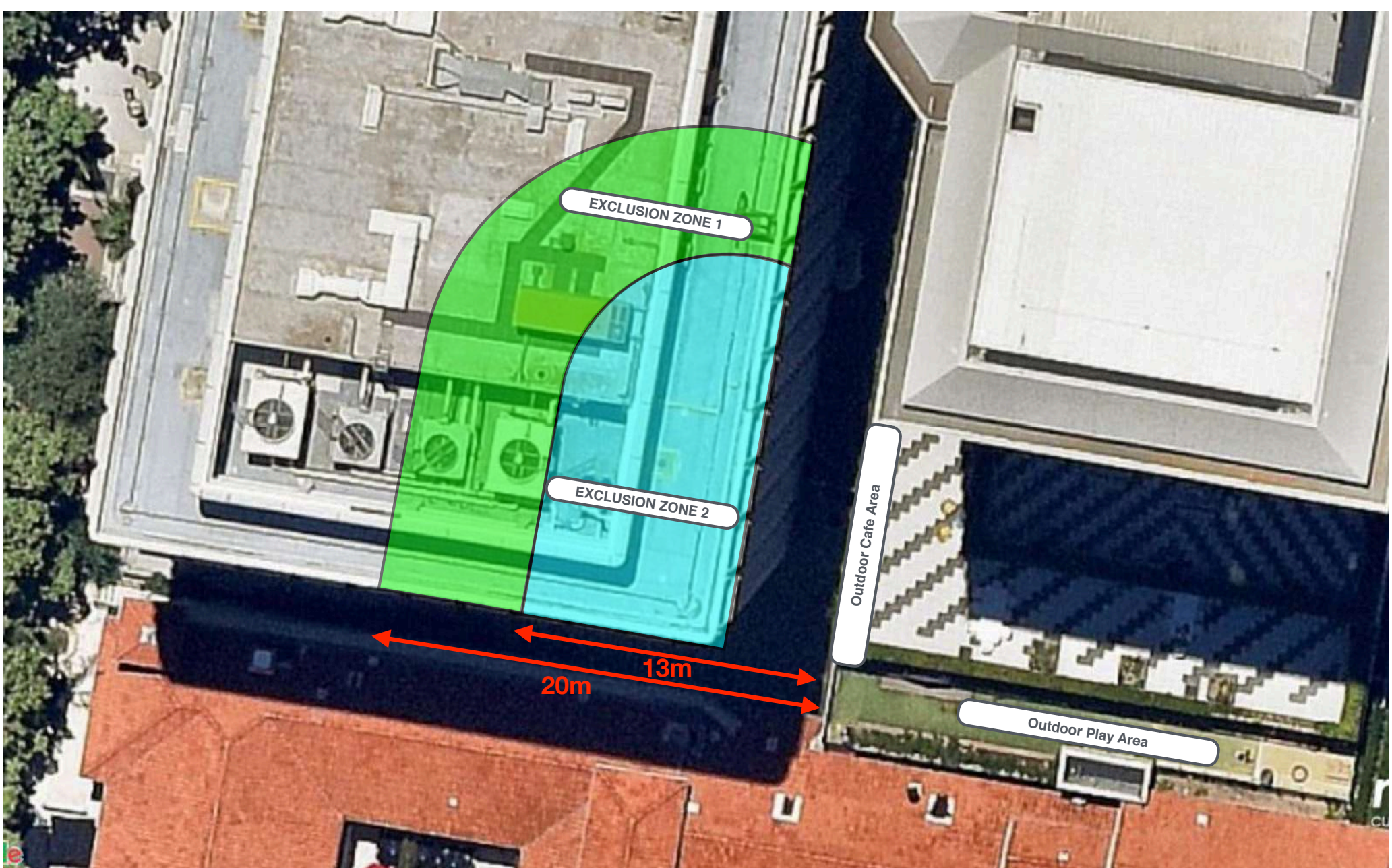
The contents within this document are based on third party data. The accuracy of the information can not be guaranteed





---

*Appendix E - 181 Miller St Exclusion Zones for Noisy Activities*

This page intentionally left blank



Zone	Excluded Equipment	Distance from Facade <sup>1</sup>
 1	47T Hammer	20m
 2	12T Hammer	13m

<sup>1</sup>Assumes 10dB(A) noise reduction due to shielding by existing structures



www.ostermanconsult.com

## Sydney Metro Demolition - VC2 181 Miller St Exclusion Zones

Childcare Centre, Lvl 1, 65 Berry Street  
Compliance with 75dB(A) for External Play Area

Date: 31/07/2017  
Created by: MDS  
Report No: 0116 041 04

The contents within this document are based on third party data. The accuracy of the information can not be guaranteed

---

*Appendix F - Heritage Specialist Advice on Monitoring Methods and Locations*

This page intentionally left blank

# MEMO



**DATE:** 5 May 2017

**AMBS Ref:** 16278 VM

---

**TO:** Rauf Osterman, Director Osterman Consulting

---

**FROM:** Jennie Lindbergh, Director Historic Heritage, AMBS Ecology & Heritage

---

**SUBJECT:** Sydney Metro Demolitions – Vibration Monitoring, MLC Building North Sydney

---

## ***Background***

The Sydney Metro City & Southwest Chatswood to Sydenham Metro was approved as a State Significant Development (SSD) on 7 January 2017. The Minister's Conditions of Approval (CoA) that are relevant to vibration monitoring on heritage structures are:

*E30 The Proponent must conduct vibration testing before and during vibration generating activities that have the potential to impact on heritage items to identify minimum working distances to prevent cosmetic damage. In the event that the vibration testing and monitoring shows that the preferred values for vibration are likely to be exceeded, the Proponent must review the construction methodology and, if necessary, implement additional mitigation measures.*

*E31 The Proponent must seek the advice of a heritage specialist on methods and locations for installing equipment used for vibration, movement and noise monitoring of heritage-listed structures.*

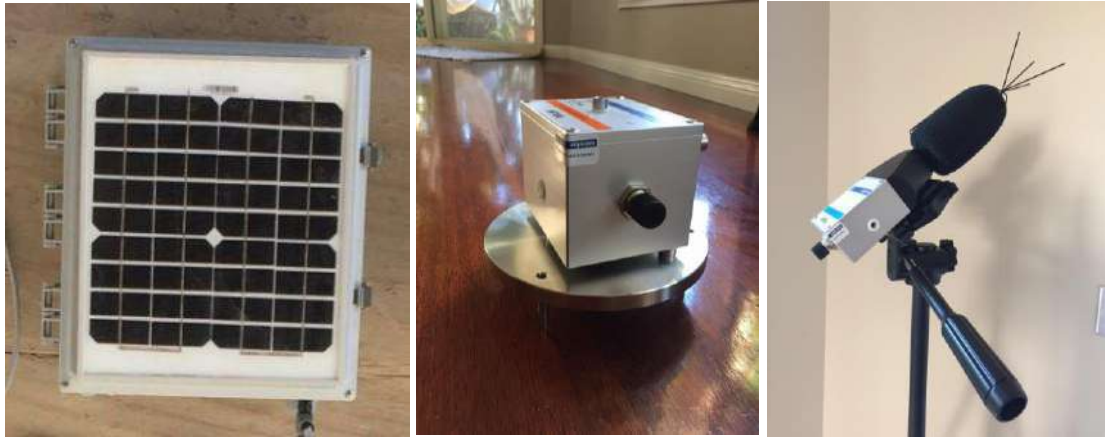
The standard equipment and methodology to be used for monitoring heritage structures adjacent to buildings to be demolished is described below.

## ***Equipment***

The noise and vibration monitoring equipment consists of:

- a logger for data storage, communication and power supply;
- a vibration sensor – Geophone;
- a Noise sensor – Microphone; and,
- associated data cables





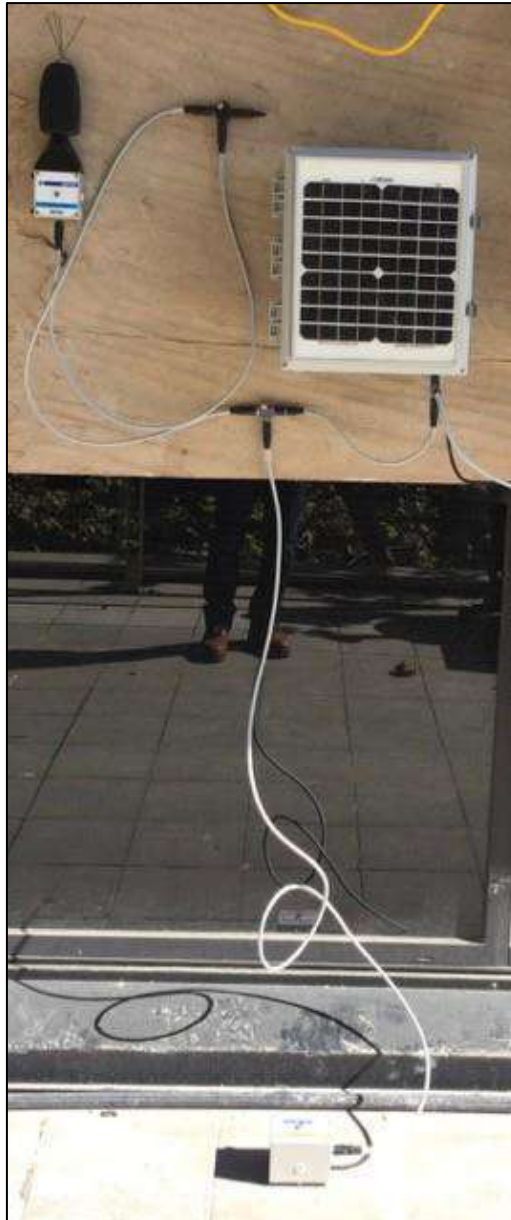
**Figure 1** The components of the vibration monitoring; the logger (left), geophone set on comfort plate (centre) and microphone (left).

The *logger* can be installed on a wall or a pole or at ground level.

The preferred installation of the *geophone* is on the foundation of the structure being monitored. The best level of coupling is achieved when the geophone is coupled using a bolt positioned through the centre of the geophone. The process requires an 8mm masonry brass expander to be inserted into an 8mm drill hole and the geophone fastened using a 6mm stainless bolt through the centre of the geophone. In rare cases when drilling into the foundation is not permitted, the geophone may be installed on nearby structures. There is also the option of fastening a plate to the foundation using a two part epoxy putty. The geophone is then screwed onto the plate. The least preferred option is the use of a comfort plate. A comfort plate is generally for internal use when measuring for human comfort and is not ideal for vibration monitoring for cosmetic/structural damage.

The *microphone* can be installed on a pole or wall using the bolt hole in the centre of the sensor or it can be zip tied to an object. There is also the possibility to install the microphone on a tripod when in a secure environment. The preferred height of installation is 1.5 metres but for practical reasons (to prevent theft or damage) the monitor can be positioned at a height of 2.5 to 3 metres.





**Figure 2 Typical layout of the vibration monitoring equipment.**

### ***MLC Building***

The following describes the methodology to be used at the MLC Building, 105-153 Miller Street, North Sydney. The MLC Building is a fourteen storey cubiform office block built c.1957 in the Post-War International style. The MLC Building is Item 0893 on the heritage schedule of the North Sydney Local Environmental Plan 2013, having historical, associative, aesthetic and rarity significance with good integrity. The Statement of Significance is:

*The first high rise office block in North Sydney and the largest for a number of years after its construction. Seminal building on subsequent high-rise design in Sydney and utilised construction and structural techniques not previously used in Australia. First use of curtain wall design; first use of modular units in Australia. Major landmark in North Sydney. The interior, exterior and landscape setting are of significance.*



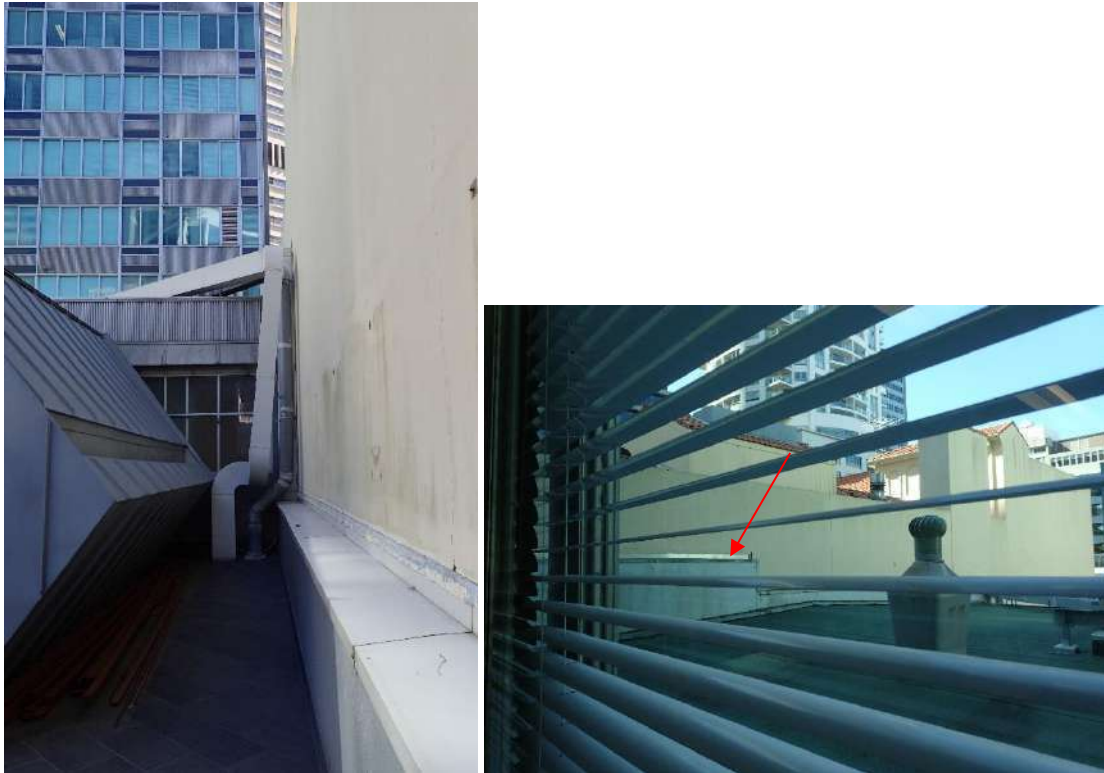
**Figure 3 View of the western façade of the MLC Building (Source: North Sydney Council).**

Following on-going issues with the glazed terracotta tiled façades, conservation works were undertaken and completed in 2006. It is understood that an assessment of the tiled façades has been, or is nearing completion, review of which will be important in understanding any issues that may affect the demolition of the adjacent building.

### ***Vibration Monitoring***

The preferred location for the monitoring equipment is the northern upstand rendered and painted parapet wall of the Level 2 terrace. An alternative location is the northern upstand rendered and painted parapet wall of the Level 1 terrace. In addition:

- Fixings are not to be made through any flashings, waterproof membranes or roof sheeting.
- Engineering advice is to be sought regarding the risk to the façade tiles from vibration and their recommendations to mitigate this risk should be followed.
- Following removal of the monitoring equipment, any damage to the fabric of the MLC Building is to be made good based on the principle of like-for-like.



**Figure 4** View of the Level 1 upstand parapet wall (left) and the Level 2 upstand parapet wall (arrowed, right).

### ***Conclusion***

Installation of the vibration monitoring would have a negligible effect on the fabric of MLC Building that is mitigated by monitoring the building, in its entirety, against damage from vibration. Neither of the two options proposed is preferred as each would have the same effect. There would not be an adverse effect on the local heritage significance of the building and as such, the work complies with the requirements of Conditions E30 and E31.

---

*Appendix G - High Impact Receivers Consultation Register*

This page intentionally left blank

Address	Description	Stakeholders	Consultation
65 Berry St	Commercial office building	Charter Hall	Meetings conducted early to mid-2017. Majority of tenants are commercial offices, childcare on level 1.
1/ 65 Berry St	Childcare	Only About Children childcare (Level 1)	Meetings conducted throughout 2017. Core sleep period 11.30am-2pm. Outdoor balcony café area (west facing) in use 7am to 5pm. Main outdoor balcony area in use 7am to 5.30pm. Further details provided in attached activity schedule.
2/ 65 Berry St	Tenant	Blackbaud (Level 2)	Drop-in session early 2017. Blackbaud office has a functional outdoor balcony area with furniture. Blackbaud are concerned about dust/ air quality.
128 Miller St	Education	Monte de Sant Angelo - McQuoin Centre	Meetings conducted mid-2017. McQuoin Centre school hall in southeast corner of property is used for exams, performances and assemblies. HSC and IB exam period in October/ November. The building utilises cross ventilation with high windows and large fans, so currently has little in the way of noise mitigation. Specific exam dates and times provided to Delta Group in separate email: Provided following upcoming schedule of exams for McQuoin Centre: Trials: (8am to 12pm) 31/7 2 hour exam 1/8 2 hour exam 3/8 3 hour exam 7/8 3 hour exam HSC exams: 16/10 9am to 12pm 17/10 9am to 12pm 27/10 9am to 12pm Annual charity and fundraising event between 11am to 5pm on 11/8 (Very important event).
105-153 Miller St	Commercial office building	Investa (Managing Agent)	Several meetings early to mid-2017 with Property Managers Investa. Auditorium in adjacent building which is used for events/ functions. NAB Call centre on Level 5 of northern building including dealing floor servicing international time zones). Investa noted heritage tiled façade of 105-153 Miller Street.
105-153 Miller St	Hospitality	Phoenix Café	Immediately adjacent to Tower Square. Outdoor eating area. Busiest times 8-11am and 12-1.30pm.
105-153 Miller St	Tenant	NAB	NAB Call centre on Level 5 of northern building including dealing floor servicing international time zones).
105-153 Miller St	Education	KU Tree Tops Child Care Centre	Located in southeast corner of MLC building furthest away from Victoria Cross station site.
199 Miller St	Hospitality	Rag & Famish Hotel	Meeting mid-2017. Busy periods 12-2pm and 4pm-7pm.
50 Berry St	Hospitality	Lot 50 Café	Ground floor café with outdoor eating area. Busy periods 8-10am and 12-2pm.

**ENDORSEMENT  
CITY & SOUTHWEST ACOUSTIC ADVISOR**

<b>Review of</b>	<b>Construction Noise and Vibration Impact Statement for Delta demolition works at Victoria Cross</b>	<b>Document reference:</b>	Construction Noise & Vibration Impact Statement VICTORIA CROSS 2, prepared by Osterman Consulting for Delta Pty Ltd, report number 0116-041-04, Rev H
<b>Prepared by:</b>	Dave Anderson		
<b>Date of issue:</b>	11 August 2017		

As approved Acoustic Advisor for the Sydney Metro City & Southwest project, I have reviewed and provided comment on the Construction Noise and Vibration Impact Statement for the Delta demolition works at Victoria Cross, as required under A27 (d) of the project approval conditions.

I have spoken with Osterman Consulting to discuss drafts of the impact statement and to discuss my formal comments. The impact statement has been revised to address my comments. I note that it has also:

1. Adopted the Noise Management Level (NML) of  $65\text{dBL}_{\text{Aeq}(15\text{min})}$  the outdoor play area at the Child Care Centre (with all reasonable steps to manage demolition levels so that they do not exceed the NML by more than 10dBA at times when the outdoor play area is used), consistent with the conditional endorsement I provided previously for the Tower Square works.
2. Included noise monitoring data to verify that noise levels to date have been consistent with the assumptions in the CNVIS.

On this basis I endorse Rev H of this CNVIS.



Dave Anderson, City & Southwest Acoustic Advisor

Mr Stuart Hodgson  
Principal Manager,  
Program Sustainability Environment & Planning  
Sydney Metro  
Transport for NSW  
PO Box 588  
NORTH RYDE BC NSW 1670

11 August 2017

Ref: CNVIS-Victoria Cross Rev H

Dear Stuart

**RE: Endorsement of Construction Noise and Vibration Impact Statement – Victoria Cross 2, Sydney Metro City & Southwest**

Thank you for providing the following documents for Environmental Representative (ER) review and endorsement as required by the Condition of Approval A24(d) of the Sydney Metro City & Southwest project (SSI – 15\_7400 January 9 2017).

- Construction Noise and Vibration Impact Statement (CNVIS) –Victoria Cross 2 Site, (Revision H dated 7 August 2017) required under Condition E33; and
- Acoustic Advisor (AA) Endorsement (of the above document) dated 11 August 2017

As an approved ER for the Sydney Metro City & Southwest project, I have reviewed the CNVIS for its suitability for implementation. The review did not comprise a technical review, as the ER has relied upon the AA's review of technical aspects of the document. On the basis of the endorsement of the document by the AA, I endorse the document.

Yours sincerely



Michael Woolley  
Environmental Representative – Sydney Metro – City and South West