

ENDORSEMENT CITY & SOUTHWEST ACOUSTIC ADVISOR

Review of	Construction Noise and Vibration Impact Statement Addendum Update: Victoria Cross Evening Spoil Haulage	Document reference:	SYDNEY METRO CITY & SOUTHWEST-TSE WORKS Construction Noise and Vibration Impact Statement Addendum Update: Victoria Cross Evening Spoil Haulage <i>TH511-02 01.04.03 F04 VC South Evening Spoil Haulage (r6)</i> <i>Dated 24 June 2020</i>
Prepared by:	Larry Clark Alternate Acoustic Advisor		
Date of issue:	25 June 2020		

As approved Acoustic Advisor for the Sydney Metro City & Southwest project, I have reviewed revision 6 (update) of the Construction Noise and Vibration Impact Statement (CNVIS) Addendum for Victoria Cross evening spoil haulage, as required under A27 (d) of the project approval conditions.

The CNVIS addendum is to extend on-site spoil loading and haulage at Victoria Cross South (VXS) worksite to the evening period (i.e. 6:00pm to 10:00pm) from Monday to Friday until the end of the project (i.e. approximately September 2020), excluding public holidays.

The update is the addition of excavators to feed the stockpile with spoil whilst load out is occurring, to keep the stockpile volume up for the number of trucks. Because this results in predicted noise levels being closer to the criteria, there will be verification monitoring, and mitigation measures implemented if the criteria are exceeded.

I reviewed and commented on the CNVIS addendum. I am satisfied that the CNVIS is technically valid and that it includes appropriate noise and vibration mitigation and management. On this basis I endorse revision 6 of the CNVIS Addendum.



Larry Clark, City & Southwest Alternate Acoustic Advisor

24 June 2020

TH511-02 01.04.03 F04 VC South Evening spoil haulage (r6)

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Sydney Metro Chatswood to Sydenham – TSE Works - Victoria Cross Station - Evening Spoil haulage - CNVIS Addendum

1 Introduction

1.1 Overview of works

This technical memorandum is an addendum to the report Construction Noise and Vibration Impact Statement: Victoria Cross Constructions sites¹ (*Victoria Cross CNVIS*). It has been prepared on behalf of John Holland CPB Ghella Joint Venture (JHCPBG) in accordance with the Construction Noise and Vibration Management Plan (*CNVMP*)² for the Design and Construction of the Tunnel and Station Excavation (TSE) Works of the Sydney Metro City & Southwest Project (the Project).

JHCPBG is proposing to extend on-site spoil loading and haulage at Victoria Cross South (VXS) worksite to the evening period (i.e. 6:00pm to 10:00pm) from Monday to Friday until the end of the project (i.e. approximately September 2020) excluding public holidays (if any).

This memorandum has been prepared to address the potential construction noise and vibration impacts from the proposed construction activities during the evening period. The spoil operations have been assessed in isolation as no other regular site activities would occur at the same time. The construction works are detailed in Section 2.1 below.

¹ TH511-02 01.04.03 F01 VC CNVIS (r7), dated 21 September 2018

² Sydney Metro City & Southwest – TSE Works Construction Noise and Vibration Management Plan (SMCSTSE-JCG-TPW-EN-PLN-002012)

1.2 Justification for out of hours construction works

Under EPL20971 L4.2 works and activities may be carried out outside standard construction hours if *“the works and activities do not cause, when measured at the boundary of the most affected noise sensitive receiver:*

- a) *LAeq(15 minute) noise levels greater than 5dB above the day, evening and night rating background level (RBL) as applicable; and*
- b) *LA1(1 minute) or LAm_{ax} noise levels greater than 15dB above the night RBL for night works; and*
- c) *Continuous or impulsive vibration values greater than those for human exposure to vibration, set out for residences in Table 2.2 in “Environmental noise management – Assessing Vibration: a technical guideline” (Department of Environment and Conservation, February 2006); and*
- d) *Intermittent vibration value greater than those for human exposure to vibration, set out for residences in Table 2.4 in “Environmental noise management – Assessing Vibration: a technical guideline” (Department of Environment and Conservation, February 2006).”*

2 Construction noise assessment

2.1 Construction activities

The spoil truck loading operations would be undertaken using an excavator with clamshell bucket in the loading platform (the south-eastern section of the VXS worksite as shown in Figure 2.1 below). Spoil trucks would access via Spring Street and Denison Street and exit via Denison Street and Berry Street. Spoil trucks would be loaded on Denison Street close to the loading platform. On site, three excavators with bucket will transfer the spoil from the excavation area to the loading platform (shifting spoil from one stockpile to another) where the excavator with clamshell bucket will load the trucks (i.e. total of four excavators on site).

Figure 2.1 – Spoil loading location at VXS worksite

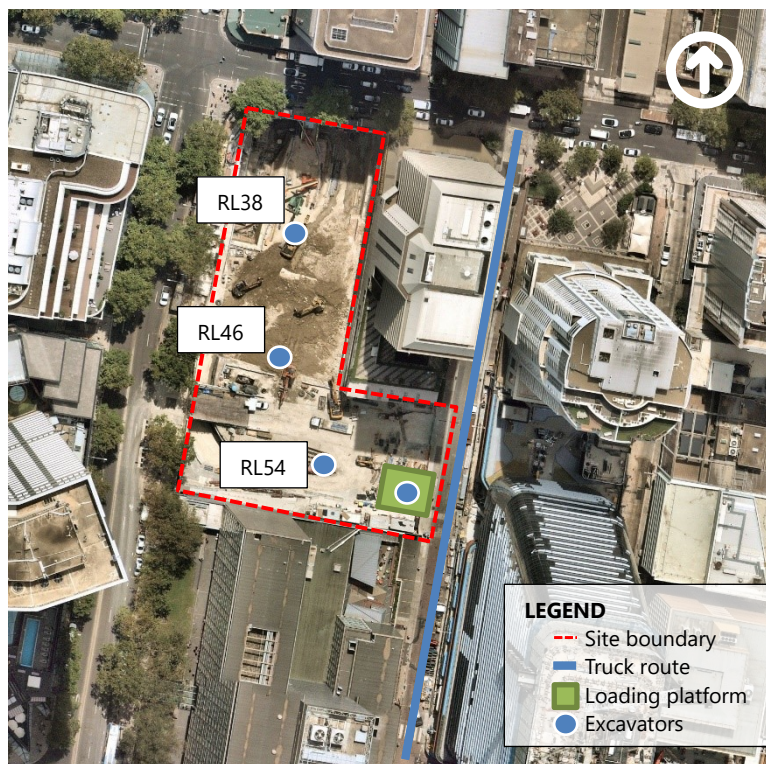


Table 2.1 presents the list of plant that are proposed to be used during these works and the associated sound power levels.

Table 2.1: Construction activities and associated sound power levels

Construction Work Area	Key plant and equipment	Evening 6:00pm – 10:00pm	Sound power level, dB(A)	
			L _{Aeq}	L _{A1}
See Figure 2.1	Spoil truck	7 p.h.	106	111
See Figure 2.1 – loading platform	Excavator with bucket ¹	1	103	112

Construction Work Area	Key plant and equipment	Evening 6:00pm – 10:00pm	Sound power level, dB(A)	
			L _{Aeq}	L _{A1}
See Figure 2.1 – transferring spoil onsite	Excavator with bucket ²	3	103	112

- Notes
- 1) A clamshell bucket will be used instead of a standard bucket. This will allow the operator to reduce the bucket height as much as possible when loading the truck tray and potentially reduce the noise levels compared to a standard excavator with bucket.
 - 2) These excavators will transfer the spoil from the shaft to the loading platform

Predicted noise levels associated with the spoil loading operations at the nearest residential receiver are presented in Table 2.2.

Table 2.2: Predicted noise levels at the closest noise sensitive receiver during evening period (6:00pm to 10:00pm)

NCA	Address	Type of receiver	Construction noise levels, L _{Aeq,15min} , dB(A)		
			Predicted level	ICNG NML	CoA E41 ¹
VC_07	79-81 BERRY STREET NORTH SYDNEY (residential level)	Residential apartment from level 5	65	68	65

- Notes: 1) External equivalent NML assuming a closed window and a conservative façade loss of 20dB(A).

As can be noted from Table 2.2, the predicted noise levels associated with spoil loading and haulage operations are not expected to be greater than the evening NML at the nearest residential receiver. Noise levels are predicted to be below the internal NML defined in PPA condition E41 at the nearest residential receiver.

Other noise sensitive receivers such as commercial and educational premises are not likely to be in use during the evening period.

2.2 Construction traffic noise

Potential construction traffic impacts on main access roads due to heavy vehicle movements was covered in Section 8.2 of the *Victoria Cross CNVIS*. A maximum of 14 heavy vehicle movements per hour during the day period (i.e. from 7:00am to 10:00pm) was assessed in the *Victoria Cross CNVIS* and predicted to have an increase less than 2dB(A) in the overall day L_{Aeq(15h)} noise at the nearest residential receiver.

As JHCPBG would only require 7 spoil trucks per hour during the evening period (i.e. 6:00pm to 10:00pm), the proposed spoil truck movements are expected to have negligible impact on noise generated by the main roads used to access the site.

2.3 Construction vibration

No vibration intensive plant and equipment are proposed for these works, therefore the vibration impact is considered to be negligible and in compliance with EPL conditions L4.2(c) and L4.2(d).

3 Noise mitigation and management

Based upon the assessment, as the predicted noise levels are expected to be below the PPA Condition E41 external equivalent NML, there are no additional noise mitigation or management measures applicable for the assessed works.

Nevertheless, toolbox talks will be used to advise all personnel of the need to follow quiet work practices during the evening period, including using the clamshell bucket, reducing the bucket height as much as possible when loading the truck tray, using the radio to communicate rather than horn "beeping", avoiding excessive acceleration from a stopped position and vigorous slamming of truck doors and warning personnel of the need to respect the residential receivers surrounding the works. It is noted that RT&A previous measurements have found that gentle placement of spoil into an empty truck may reduce instantaneous noise levels by up to 10 dB(A).

In addition, attended noise monitoring will be undertaken on a regular basis (i.e. at the beginning and half way through the period considered in this addendum- from now until the end of the project) at the location identified in Table 3.1 to verify that noise levels from construction works are not above the levels predicted in this memorandum or the evening NML.

Table 3.1: Nominated verification monitoring location

NCA	Nominated receiver address	Monitoring location at 1 m from	Predicted noise level, dB(A) L _{Aeq} 15 minute
VC_07	79-81 BERRY STREET NORTH SYDNEY	West facade	65 (68) ²

1. Monitoring on private property is subject to owner consent and where relevant, occupier consent. If property access is denied, monitoring will still be carried out outside property boundaries, where it is safe to do so.
2. The noise levels presented is at the nearest noise-sensitive receiver, which is the residential apartment located on level 5. The noise level in brackets (XX) is the noise level that is predicted at ground level adjacent to the building, to assist with verifying the predicted noise levels.

If verification monitoring shows that the external noise levels from the construction works are consistently above the predicted levels or the evening NML (i.e. for 2 or more consecutive monitoring events), investigation will be undertaken to understand the cause of the exceedance and relevant reasonable and feasible mitigation measures will be implemented.

4 Conclusion

This technical memorandum is an addendum to the report *Victoria Cross CNVIS* to review the potential noise and vibration impacts for the spoil loading and haulage operations at Victoria Cross South worksite during the evening period (i.e. 6:00pm to 10:00pm) from Monday to Friday until the end of the project (i.e. approximately September 2020) excluding public holidays (if any).

The proposed construction activities are expected to comply with the EPL20971 condition L4.2 and PPA Condition E41 at the nearest noise sensitive receivers, therefore in accordance with the EPL20971 they can be undertaken during the evening period.

As the predicted noise levels are expected to be below the PPA Condition E41 external equivalent NMLs, there are no additional noise mitigation or management measures applicable for the assessed works. Nevertheless, noise monitoring will be undertaken on a regular basis (i.e. at the beginning and half way through the period considered in this addendum- from now until the end of the project) to verify compliance with the predicted noise levels or the evening NML.

Document control

Date	Revision history	Non-issued revision	Issued revision	Prepared	Instructed	Authorised
03.06.2020	Initial issue	0	1	M. Tabacchi	-	T. Gowen
04.06.2020	Minor update	2	3	M. Tabacchi	-	T. Gowen
15.06.2020	Update following AA's comments	-	4	M. Tabacchi	-	T. Gowen
17.06.2020	Inclusion of 3 x excavators with bucket	-	5	M. Tabacchi	-	T. Gowen
24.06.2020	Update following AA's comments	-	6	M. Tabacchi	-	T. Gowen

Important Disclaimers:

The work presented in this document was carried out in accordance with the Renzo Tonin & Associates Quality Assurance System, which is based on Australian/New Zealand Standard AS/NZS ISO 9001.

This document is issued subject to review and authorisation by the suitably qualified and experienced person in the last column above. If no name appears, this document shall be considered as preliminary or draft only and no reliance shall be placed upon it other than for information to be verified later.

This document is prepared for the particular requirements of our Client referred to above in the 'Document details' which are based on a specific brief with limitations as agreed to with the Client. It is not intended for and should not be relied upon by a third party and no responsibility is undertaken to any third party without prior consent provided by Renzo Tonin & Associates. The information herein should not be reproduced, presented or reviewed except in full. Prior to passing on to a third party, the Client is to fully inform the third party of the specific brief and limitations associated with the commission.

In preparing this report, we have relied upon, and presumed accurate, any information (or confirmation of the absence thereof) provided by the Client and/or from other sources. Except as otherwise stated in the report, we have not attempted to verify the accuracy or completeness of any such information. If the information is subsequently determined to be false, inaccurate or incomplete then it is possible that our observations and conclusions as expressed in this report may change.

We have derived data in this report from information sourced from the Client (if any) and/or available in the public domain at the time or times outlined in this report. The passage of time, manifestation of latent conditions or impacts of future events may require further examination and re-evaluation of the data, findings, observations and conclusions expressed in this report.

We have prepared this report in accordance with the usual care and thoroughness of the consulting profession, for the sole purpose described above and by reference to applicable standards, guidelines, procedures and practices at the date of issue of this report. For the reasons outlined above, however, no other warranty or guarantee, whether expressed or implied, is made as to the data, observations and findings expressed in this report, to the extent permitted by law.

The information contained herein is for the purpose of acoustics only. No claims are made and no liability is accepted in respect of design and construction issues falling outside of the specialist field of acoustics engineering including and not limited to structural integrity, fire rating, architectural buildability and fit-for-purpose, waterproofing and the like. Supplementary professional advice should be sought in respect of these issues.

APPENDIX A Glossary of terminology

The following is a brief description of the technical terms used to describe noise to assist in understanding the technical issues presented.

Adverse weather	Weather effects that enhance noise (that is, wind and temperature inversions) that occur at a site for a significant period of time (that is, wind occurring more than 30% of the time in any assessment period in any season and/or temperature inversions occurring more than 30% of the nights in winter).
Ambient noise	The all-encompassing noise associated within a given environment at a given time, usually composed of sound from all sources near and far.
Assessment period	The period in a day over which assessments are made.
Assessment point	A point at which noise measurements are taken or estimated. A point at which noise measurements are taken or estimated.
Background noise	Background noise is the term used to describe the underlying level of noise present in the ambient noise, measured in the absence of the noise under investigation, when extraneous noise is removed. It is described as the average of the minimum noise levels measured on a sound level meter and is measured statistically as the A-weighted noise level exceeded for ninety percent of a sample period. This is represented as the L90 noise level (see below).
Decibel [dB]	The units that sound is measured in. The following are examples of the decibel readings of every day sounds: 0dB The faintest sound we can hear 30dB A quiet library or in a quiet location in the country 45dB Typical office space. Ambience in the city at night 60dB CBD mall at lunch time 70dB The sound of a car passing on the street 80dB Loud music played at home 90dB The sound of a truck passing on the street 100dB The sound of a rock band 115dB Limit of sound permitted in industry 120dB Deafening
dB(A)	A-weighted decibels. The A-weighting noise filter simulates the response of the human ear at relatively low levels, where the ear is not as effective in hearing low frequency sounds as it is in hearing high frequency sounds. That is, low frequency sounds of the same dB level are not heard as loud as high frequency sounds. The sound level meter replicates the human response of the ear by using an electronic filter which is called the "A" filter. A sound level measured with this filter switched on is denoted as dB(A). Practically all noise is measured using the A filter.
dB(C)	C-weighted decibels. The C-weighting noise filter simulates the response of the human ear at relatively high levels, where the human ear is nearly equally effective at hearing from mid-low frequency (63Hz) to mid-high frequency (4kHz), but is less effective outside these frequencies.
Frequency	Frequency is synonymous to pitch. Sounds have a pitch which is peculiar to the nature of the sound generator. For example, the sound of a tiny bell has a high pitch and the sound of a bass drum has a low pitch. Frequency or pitch can be measured on a scale in units of Hertz or Hz.
Impulsive noise	Having a high peak of short duration or a sequence of such peaks. A sequence of impulses in rapid succession is termed repetitive impulsive noise.
Intermittent noise	The level suddenly drops to that of the background noise several times during the period of observation. The time during which the noise remains at levels different from that of the ambient is one second or more.
L _{Max}	The maximum sound pressure level measured over a given period.
L _{Min}	The minimum sound pressure level measured over a given period.

L ₁	The sound pressure level that is exceeded for 1% of the time for which the given sound is measured.
L ₁₀	The sound pressure level that is exceeded for 10% of the time for which the given sound is measured.
L ₉₀	The level of noise exceeded for 90% of the time. The bottom 10% of the sample is the L90 noise level expressed in units of dB(A).
L _{eq}	The "equivalent noise level" is the summation of noise events and integrated over a selected period of time.
Reflection	Sound wave changed in direction of propagation due to a solid object obscuring its path.
SEL	Sound Exposure Level (SEL) is the constant sound level which, if maintained for a period of 1 second would have the same acoustic energy as the measured noise event. SEL noise measurements are useful as they can be converted to obtain L _{eq} sound levels over any period of time and can be used for predicting noise at various locations.
Sound	A fluctuation of air pressure which is propagated as a wave through air.
Sound absorption	The ability of a material to absorb sound energy through its conversion into thermal energy.
Sound level meter	An instrument consisting of a microphone, amplifier and indicating device, having a declared performance and designed to measure sound pressure levels.
Sound pressure level	The level of noise, usually expressed in decibels, as measured by a standard sound level meter with a microphone.
Sound power level	Ten times the logarithm to the base 10 of the ratio of the sound power of the source to the reference sound power.
Tonal noise	Containing a prominent frequency and characterised by a definite pitch.