Sydney Metro City and Southwest - North Corridor Works

Summary Report – NCW Noise and Vibration Monitoring – May 2019 – October 2019

Project

Title	NCW Noise and Vibration Monitoring - Summary Report - May 2019 to October 2019
Client	Sydney Metro City and Southwest
Document Reference No.	LOR-NCW-Noise and Vibration Monitoring-May19-Oct19 Summary Report V0.3
Laing O'Rourke Project No.	K38

Document

Date	10 July 2020
Monitoring Period	May 2019 to October 2019
Prepared by:	Thomas Buchan
Reviewed by:	Steven De Luzuriaga

Revisions

Date	Version	Description
08/11/2019	V0.1	LOR-NCW-Noise and Vibration Monitoring-May19-Oct19 Summary Report
06/12/2019	V0.2	Address LOR comments
10/07/2020	V0.3	Revised draft report for client review





1. Overview

Main North and North Shore Corridor Works Project (MNNSCW): Portion 7 - Northern Corridor Works (NCW) are being carried out by Laing O'Rourke Australia Construction Pty Ltd (LOR) on behalf of Sydney Metro. LOR has engaged Environmental Resources Management Australia Pty Ltd (ERM) to undertake environmental noise and vibration monitoring during select works.

The monitoring is being undertaken with due regard to, and in accordance with, the NCW – Construction Noise and Vibration Management Plan (CNVMP), last updated November 2018 and other relevant policy, guidelines and standards as listed in the reference section of this report.

This technical report has been prepared to summarise the results and findings of operator attended noise and vibration monitoring as well as unattended noise and vibration monitoring completed from May 2019 to October 2019 inclusive.

The noise and vibration monitoring was conducted throughout various track possession works as described in the approved Out-of-Hours Work (OOHW) application forms (OOHWAF), application numbers 28 to 30 prepared by LOR (i.e. OOHWAF028-030). LOR identified the potential for these works to generate noise and vibration impacts, and as such the monitoring was conducted by qualified and/or suitably experienced specialists to measure levels, evaluated compliance and provide recommendations for any new or modified mitigation.

The aim of this summary report is to provide an overview of recent monitoring activities, information on the outcomes, and any further recommendations to reduce noise and vibration-related impacts. The structure of this report is as follows:

- Section 1 (this section): brief overview of the 2019 monitoring period and report objectives.
- Section 2: summary of the monitoring conducted and technical discussion.
- Section 3: summary of typical monitoring outcomes and recommendations.
- Section 4: conclusion.
- Appendix A: noise and vibration monitoring methodology.

This report is supported by the LOR-NCW-Noise and Vibration Monitoring (May19-Oct19) Addendum, which contains monitoring location maps, recorded data sets and supporting graphs of noise and vibration monitoring activities in chronological order.

2. Monitoring Summary (2019)

Table 2.1 presents a summary of the noise and vibration monitoring activities, both attended and unattended, for the period inclusive of May 2019 to October 2019.

As noted above, the full noise and vibration data sets are provided in the LOR-NCW-Noise and Vibration Monitoring (May19-Oct19) Addendum.



Table 2.1 – Noise and Vibration Monitoring Events Summary

Date (Report - Possession Ref.)	Approvals Documentation	Summary of Works	Complaints	Monitoring Type	Discussion
17.06.19 to 21.06.19 (RP32 – MW50, refer to Appendix A of the Addendum document)	OOHWAF-028	MW50 works included: Overhead wire (OHW) adjustments on the Up Shore Rail Relocation Drainage Pit Investigations	Two complaints were received relating to noise associated with NCW activities being undertaken near residential receptors on Drake Street. Specifically, a complaint (reference 190618TOM) was received in regards to "Vehicles and plant accessing the corridor at night". Investigation result was Laing O'Rourke are undertaking approved OOH work during Sydney Trains possession periods'. No further action was required as resident did not want to call helpline or offer any contact details.	Attended and Unattended Noise	During attended noise monitoring, the existing noise environment (in the absence of site noise) at the majority of community locations near to the MW50 works was generally dominated by non-project related noise emissions, including those generated by residences near the measurement position, animals (birds and insects and domestic animals), wind-blown vegetation and aircraft passing overhead. Measured site noise level contributions (Leq, 15 minutes) were between 32 - 77 dBA over the monitoring period, depending on the type (and proximity) of construction activity and the duration of noise events that occurred within the sample period. On average site, noise level contributions for the MW50 works were 25 dBA above the Noise Management Level (NML). Comparison of site noise levels to the predicted values presented in OOHWAF-028 indicate that on average, actual emissions associated with MW50 works were 13 dBA above the predicted values. This however includes data where predictions were not provided in OOHWAF-028 and a precautionary analysis was undertaken by adopting either the most appropriate or the lowest predicted values (depending on the activity) for MW50. Exceedances in predicted values noted when several vehicles arrived and were poorly managed at the Drake Street site entrance. LOR was informed of the exceedance and the site manager co-ordinated site vehicle movements to prevent further exceedances. All relevant AMMs were in place during this activity (notification, noise monitoring and respite/alternative accommodation, where required). The exceedances did not result in the application of additional AMMs. During unattended noise monitoring, the existing noise environment (in the absence of site noise) at the majority of community locations near to the MW50 works was generally dominated by non-project related road traffic on public roads and other non-project emissions including: • those generated by residences near the measurement position • non-project related rail traffic (outside of track the pos

Date (Report - Approvals Possession Ref.) Documentation	Summary of Works	Complaints	Monitoring Type	Discussion
22.06.19 OOHWAF-028 23.06.19 (RP33a – WE51, refer to Appendix B of the Addendum document)	 WE51 works included: Demolition 2 x Pits Remove GST post and spoil removal Ground investigations Ballast Works OHW Adjustment Works Signals Construction Works Demolition of Nelson St Pier 1 Demolition stockpile management and removal Pit 17 break down and lid placement OSD Spillway Construction Combined Services Routes works Drainage ULX Drainage Concrete Encasement 	Five complaints were received during WE51 relating to noise associated with NCW activities. Responses to compliants are provided below: One complaint (Reference 190622TUAN) necessitated noise monitoring to occur at their property. The monitoring was conducted and identified noise levels 35 dBA above the background noise of the area. As a result, alternate accommodation was provided, and works were staggered as per the original plan, with plant relocated as required. No complaints were received regarding vibration during the WE51 monitoring period.	Noise	During attended noise monitoring, the existing noise environment (in the absence of site noise) at the majority of community locations near to the WE51 works was generally dominated by non-project related noise emissions, including those generated by residences near the measurement position, animals (birds and insects and domestic animals), wind-blown vegetation and aircraft passing overhead. Measured site noise level contributions (Leq, 15 minutes) were between 55 and 80 dBA over the monitoring period, depending on the type (and proximity) of construction activity and the duration of noise events that occurred within the sample period. On average site, noise level contributions for the WE51 works were 26 dBA above the NML. Comparison of site noise levels to the predicted values presented in OOHWAF-028 indicated that on average, actual emissions associated with WE51 works were ~9 dBA above the predicted values. All works were predicted in OOHWAF-028, however, the situation that created the exceedance in predictd values was two machines working too close to one another (and adjacent a resident's property) - due to unplanned overlapping of planned activities. During unattended noise monitoring, the existing noise environment (in the absence of site noise) at the majority of community locations near to the WE51 works was generally dominated by non-project related road traffic on public roads and other non-project emissions including: • those generated by residences near the measurement position • non-project related rail traffic (outside of track possession hours) • animals (birds and insects, domestic animals) • wind-blown vegetation and aircraft passing overhead Noise at UNM01, UNM02 and UNM03 was dominated by project noise emissions during times of documented activity at the site. Estimated site noise level contributions were generally above the NML's at UNM01 and UNM02, which is expected for the type of activities being undertaken.

Date (Report - Possession Ref.)	Approvals Documentation	Summary of Works	Complaints	Monitoring Type	Discussion
22.06.19 to 23.06.19 (RP33b – WE51, refer to Appendix C of the Addendum document)	OOHWAF-028	 WE51 works included: Demolition 2 x Pits Remove GST post and spoil removal Ground investigations Ballast Works OHW Adjustment Works Signals Construction Works Demolition of Nelson St Pier 1 Demolition stockpile management and removal Pit 17 break down and lid placement OSD Spillway Construction Combined Services Routes works Drainage ULX Drainage Concrete Encasement 	No complaints were received regarding vibration during the WE51 monitoring period.	Unattended Vibration	Vibration generated by WE51 works was at times perceptible at both UVM01 and UVM03. Vibration was not perceptible at UVM02 due to the minor nature of activities occurring within the rail corridor. When vibration-generating activities occurred the vibration generated by the works dominated the emissions perceived and detected at the receptor. General construction activities were occurring throughout WE51 however, vibration generated by the majority of works was imperceptible. Ambient vibration associated with the existing acoustics environment also remained imperceptible. Despite certain events being perceptible throughout WE51, the highest measured vibration levels (8.2 mm/s) and associated characteristic frequencies (43Hz) are below and compliant with the applicable BS7385 vibration guideline values, as identified in the CNVMP.

Date (Report - Possession Ref.)	Approvals Documentation	Summary of Works	Complaints	Monitoring Type	Discussion
24.06.19 to 28.06.19 (RP34 – MW51, refer to Appendix	OOHWAF-028	 MW51 works included: OHW adjustments on the Up Shore Rail Relocation. Drainage Pit 	No complaints were received regarding noise and/or vibration during the MW51 monitoring period.	Attended and Unattended Noise	During attended noise monitoring , the existing noise environment (in the absence of site noise) at the majority of community locations near to the MW51 works was generally dominated by non-project related noise emissions, including those generated by residences near the measurement position, animals (birds and insects and domestic animals), wind-blown vegetation and aircraft passing overhead.
D of the Addendum document)		Investigations			Measured site noise level contributions (Leq, 15 minutes) were between 33 - 60 dBA over the monitoring period, depending on the type of construction activity and the duration of noise events that occurred within the sample period. On average site, noise level contributions for the MW51 works were 11 dBA above the NML .
					Comparison of site noise levels to the predicted values presented in OOHWAF-028 indicated that on average, actual emissions associated with MW51 works were 2 dBA above the predicted values in OOHWAF-028.
					During unattended noise monitoring , the existing noise environment (in the absence of site noise) at the majority of community locations near to the MW51 works was generally dominated by non-project related road traffic on public roads and other non-project emissions including:
					 those generated by residences near the measurement position non-project related rail traffic (outside of track the possession hours) animals (birds and insects, domestic animals) wind-blown vegetation and aircraft passing overhead
					Noise at UNM02 and UNM03 was dominated by project noise emissions during times of documented activity at the site. Estimated site noise level contributions were generally below the NML 's at UNM02 and UNM03, with the exception of a few isolated events, which is expected for the type of activities being undertaken.

Date (Report - Possession Ref.)	Approvals Documentation	Summary of Works	Complaints	Monitoring Type	Discussion
20.07.19 to 21.07.19 (RP35a – WE03,	OOHWAF-028	 WE03 works included: Free weld works Ballast prep and track tamping works OHW Adjustment 	No complaints regarding noise were received during the WE03 monitoring period.	Attended and Unattended Noise	During attended noise modelling , the existing noise environment (in the absence of site noise) at the majority of community locations near to the WE03 works was generally dominated by non-project related noise emissions, including those generated by residences near the measurement position, animals (birds and insects and domestic animals), wind-blown vegetation and aircraft passing overhead.
refer to Appendix E of the Addendum document)		 Works Locomotive tests Signalling Commissioning Works 			Measured site noise level contributions (Leq, 15 minutes) were between 53 - 71 dBA over the monitoring period, depending on the type (and proximity) of construction activity and the duration of noise events that occurred within the sample period. On average site, noise level contributions for the WE03 works were 15 dBA above the NML .
		Excavation and footing construction			Comparison of site noise levels to the predicted values presented in OOHWAF-028 indicated that on average, actual emissions associated with WE03 works were 2 dBA below the predicted values.
					During unattended noise monitoring , the existing noise environment (in the absence of site noise) at the majority of community locations near to the WE03 works was generally dominated by non-project related road traffic on public roads and other non-project emissions including:
					 those generated by residences near the measurement position non-project related rail traffic (outside of track possession hours) animals (birds and insects, domestic animals) wind-blown vegetation and aircraft passing overhead
					Noise at UNM01, UNM02 and UNM03 was dominated by project noise emissions during times of documented activity at the site. Estimated site noise level contributions were generally above the NML 's at UNM01, UNM02 and UNM03, which is expected for the type of activities being undertaken.

Date (Report - Possession Ref.)	Approvals Documentation	Summary of Works	Complaints	Monitoring Discussion Type
20.07.19 to 21.07.19 (RP35b – WE03, refer to Appendix F of the Addendum document)	OOHWAF-028	 WE03 works included: Free weld works Ballast prep and track tamping works OHW Adjustment Works Locomotive tests Signalling 	No complaints regarding vibration were received during the WE03 monitoring period.	Unattended Vibration generated by WE03 works was at times perceptible at both UVM01 and Vibration UVM03. Vibration was not perceptible at UVM02 due to the minor nature of activities occurring within the rail corridor. When vibration-generating activities occurred the vibration generated by the works dominated the emissions perceived and detected at the receptor. General construction activities were occurring throughout WE03 however, vibration generated by the majority of works was imperceptible. Ambient vibration associated with the existing acoustics environment also remained imperceptible.
,		Commissioning Works Excavation and footing construction		Despite certain events being perceptible throughout WE03, the highest measured vibration levels (3.70 mm/s) and associated characteristic frequencies (11Hz) are below and compliant with the applicable BS7385 vibration guideline values , as identified in the CNVMP.

Date (Report - Possession Ref.)	Approvals Documentation	Summary of Works	Complaints	Monitoring Type	Discussion
29.07.19 to 02.08.19 (RP36 – MW04,	OOHWAF-029	 MW04 works included: Track Adjustments Drainage preparation works and surveys 	No complaints were received regarding noise and/or vibration during the MW04 monitoring period.	and Unattended Noise	During attended noise monitoring , the existing noise environment (in the absence of site noise) at the majority of community locations near to the MW04 works was generally dominated by non-project related noise emissions, including those generated by residences near the measurement position, animals (birds and insects and domestic animals), wind-blown vegetation and aircraft passing overhead.
refer to Appendix G of the Addendum document)		Material delivery			Measured site noise level contributions (Leq, 15 minutes) were between 29 - 68 dBA over the monitoring period, depending on the type of construction activity and the duration of noise events that occurred within the sample period. On average site, noise level contributions for the MW04 works were 18 dBA above the NML .
					Comparison of site noise levels to the predicted values presented in OOHWAF-029 indicated that on average, actual emissions associated with MW04 works were 2 dBA above the predicted values.
					During unattended noise monitoring , the existing noise environment (in the absence of site noise) at the majority of community locations near to the MW04 works was generally dominated by non-project related road traffic on public roads and other non-project emissions including:
					 those generated by residences near the measurement position non-project related rail traffic (outside of track the possession hours) animals (birds and insects, domestic animals) wind-blown vegetation and aircraft passing overhead
					Noise at UNM02 and UNM03 was dominated by project noise emissions during times of documented activity at the site. Estimated site noise level contributions were above the NML's at UNM02 and below the NML's at UNM03 , which is expected for the type of activities being undertaken.

	Approvals Documentation	Summary of Works	Complaints	Monitoring Type	Discussion
03.08.19 to 04.08.19 (RP37a – WE05, refer to Appendix H of the Addendum document)	OOHWAF-029	WE05 works included: (OOHWAF-029) Signals Support & Construction Works Demolition of Nelson St Pier 1 footing Combined Services Routes works Deep drainage works HDPE Pipe Encasement works Drainage Concrete Encasement Vover-head wiring adjustments	Seven complaints were received during the WE05 monitoring period relating to noise associated with NCW activities. One complaint triggered attended noise monitoring as an additional mitigation measure, which was conducted to evaluate site related noise levels at their property. Additionally, a project-specific respite offer was provided to the complainant prior to works being conducted, as outlined throughout the OOHWAF-029. Respite periods were observed during NCW WE05 works during attended noise monitoring.		During attended noise monitoring, the existing noise environment (in the absence of site noise) at the majority of community locations near to the WE05 works was generally dominated by non-project related noise emissions, including those generated by residences near the measurement position, animals (birds and insects and domestic animals), wind-blown vegetation and aircraft passing overhead. Measured site noise level contributions (Leq, 15 minutes) were between 51 - 68 dBA over the monitoring period, depending on the type (and proximity) of construction activity and the duration of noise events that occurred within the sample period. On average site, noise level contributions for the WE05 works were 15 dBA above the NML. Comparison of site noise levels to the predicted values presented in OOHWAF-029 indicated that on average, actual emissions associated with WE05 works were 2 dBA above the predicted values. During unattended noise monitoring, the existing noise environment (in the absence of site noise) at the majority of community locations near to the WE05 works was generally dominated by non-project related road traffic on public roads and other non-project emissions including: • those generated by residences near the measurement position • non-project related rail traffic (outside of track possession hours) • animals (birds and insects, domestic animals) • wind-blown vegetation and aircraft passing overhead Noise at UNM01, UNM02 and UNM03 was dominated by project noise emissions during times of documented activity at the site. Estimated site noise level contributions were generally above the NML's at UNM01, UNM02 and UNM03, which is expected for the type of activities being undertaken.

Date (Report - Possession Ref.)	Approvals Documentation	Summary of Works	Complaints	Monitoring Type	Discussion
03.08.19 to 04.08.19	OOHWAF-029	WE05 works included: • Signals Support & Construction Works	No complaints were received regarding vibration during the WE05 monitoring	Unattended Vibration	Vibration generated by WE05 works was at times perceptible at UVM01, UVM02 and UVM03. When vibration-generating activities occurred the vibration generated by the works dominated the emissions perceived and detected at the receptor.
(RP37b – WE05, refer to Appendix I of the Addendum		 Demolition of Nelson St Pier 1 footing Combined Services 	period.		General construction activities were occurring throughout WE05 however, vibration generated by the majority of works was imperceptible . Ambient vibration associated with the existing acoustics environment also remained imperceptible.
document)		Routes works Deep drainage works HDPE Pipe Encasement works Drainage Concrete Encasement Over-head wiring adjustments			Despite certain events being perceptible throughout WE05, the highest measured vibration levels (1.99 mm/s) and associated characteristic frequencies (>100Hz) are below and compliant with the applicable BS7385 vibration guideline values, as identified in the CNVMP.

Date (Report - Approvals Possession Ref.) Documentar	Summary of Works ion	Complaints	Monitoring Type	Discussion
16.09.19 to OOHWAF-03 20.09.19 (RP38 – MW11, refer to Appendix J of the Addendum document)	MW11 works included: CSR/Drainage preparation and material movements for WE12 works Sig & Comms Construction works	received during the MW11		During attended noise monitoring, the existing noise environment (in the absence of site noise) at the majority of community locations near to the MW11 works was generally dominated by non-project related noise emissions, including those generated by residences near the measurement position, animals (birds and insects, and domestic animals), wind-blown vegetation and aircraft passing overhead. Measured site noise level contributions (Leq, 15 minutes) were between 36-68 dBA over the monitoring period, depending on the type of construction activity and the duration of noise events that occurred within the sample period. On average site, noise level contributions for the MW11 works were 14 dBA above the NML. Comparison of site noise levels to the predicted values presented in OOHWAF-030 indicated that on average, actual emissions associated with MW11 works were 4 dBA above the predicted values. The exceedance of the predicted values did trigger a requirement to consider additional mitigation measures - in this case, the activity was able to be curtailed to provide respite and remove / reduce the additional noise nuisance. During unattended noise monitoring, the existing noise environment (in the absence of site noise) at the majority of community locations near to the MW11 works was generally dominated by non-project related road traffic on public roads and other non-project emissions including: • those generated by residences near the measurement position • non-project related rail traffic (outside of track the possession hours) • animals (birds and insects, domestic animals) • wind-blown vegetation and aircraft passing overhead Noise at UNM01 and UNM02 was dominated by project noise emissions during times of documented activity at the site. Estimated site noise level contributions were above the NML's at UNM01 and UNM02, which is expected for the type of activities being undertaken.

Date (Report - Possession Ref.)	Approvals Documentation	Summary of Works	Complaints	Monitoring Type	Discussion
21.09.19 to 22.09.19 (RP39a – WE12,	OOHWAF-030	 WE12 works included: Signal Support & Construction Works Stockpile Management and 	No complaints regarding noise were received during the WE12 monitoring period.	Attended and Unattended Noise	During attended noise monitoring , the existing noise environment (in the absence of site noise) at the majority of community locations near to the WE12 works was generally dominated by non-project related noise emissions, including those generated by residences near the measurement position, animals (birds and insects and domestic animals), wind-blown vegetation and aircraft passing overhead.
refer to Appendix K of the Addendum document)		Removal Import of Material Tamping Guard Rail Installation			Measured site noise level contributions (Leq, 15 minutes) were between 55-75 dBA over the monitoring period, depending on the type (and proximity) of construction activity and the duration of noise events that occurred within the sample period. On average, site noise level contributions for the WE12 works were 21 dBA above the NML .
		 CSR ULX, Turning Unit routes, signal base install 			Comparison of site noise levels to the predicted values presented in OOHWAF-030 indicated that on average, actual emissions associated with WE12 works were 14 dBA above the predicted values.
		Pit and pipe install for 250 and 750 drainage route			The increase in noise did not trigger the requirement to consider additional mitigation measure beyond the AMMs already offered / implemented, but more consultations and improved management of traffic and flow of trucks/plant off site (at Drake Street) assisting in minimising disturbance as much as practicable.
					During unattended noise monitoring , the existing noise environment (in the absence of site noise) at the majority of community locations near to the WE12 works was generally dominated by non-project related road traffic on public roads and other non-project emissions including:
					 those generated by residences near the measurement position animals (birds and insects, domestic animals) wind-blown vegetation and aircraft passing overhead
					Noise at UNM01, UNM02, UNM03, UNM04, and UNM05 was dominated by project noise emissions during times of documented activity at the site. Estimated site noise level contributions were generally above the NML 's at all unattended devices, which is expected for the type of activities being undertaken.

Date (Report - Possession Ref.)	Approvals Documentation	Summary of Works	Complaints	Monitoring Type	Discussion
21.09.19 to 22.09.19 (RP39b – WE12, refer to Appendix L of the Addendum document)	OOHWAF-030	 WE12 works included: Signal Support & Construction Works Stockpile Management and Removal Import of Material Tamping Guard Rail Installation CSR ULX, Turning Unit routes, signal base install Pit and pipe install for 250 and 750 drainage route 	No complaints were received regarding vibration during the WE12 monitoring period.	Vibration	Vibration generated by WE12 works was at times perceptible at UVM02 and UVM03. When vibration-generating activities occurred the vibration generated by the works dominated the emissions perceived and detected at the receptor. General construction activities were occurring throughout WE12 however, vibration generated by the majority of works was imperceptible . Ambient vibration associated with the existing acoustics environment also remained imperceptible. Despite certain events being perceptible throughout WE12, the highest measured vibration levels (1.6 mm/s) and associated characteristic frequencies (32Hz) are below and compliant with the applicable BS7385 vibration guideline values , as identified in the CNVMP.

3. Outcomes and Recommendations

Technical reports were prepared for each monitoring period throughout May 2019 to October 2019 with specific recommendations provided throughout, based on the compliance evaluation and the magnitude and extent of impacts measured and/or observed. LOR (and their sub-contractors) were successful in implementing these recommendations where feasible, reasonable, practical and safe to do so.

Examples of the noise and vibration-reducing mitigation and management measures that have been implemented throughout May 2019 to October 2019 are provided below:

- Respite management measures i.e. providing one hour of respite between every three
 hours of noise-generating activities.
- Utilising the existing rail corridor noise barriers to reduce site emissions. Based on measurements conducted during 2018-2019, the current rail noise barrier is reducing site noise emissions by approximately 10 dBA or more.
 - This measure has been implemented for OOHW, particularly near the Hopetoun Avenue access/egress point (prior to its removal), and for any high noise-generating activities.
 - Additionally, temporary acoustic fencing was established along the fence line near the Drake Street site entrance, which was observed to reduce site noise emissions by approximately 5 dBA.
- Continued implementation of the CNVMP (established with due regard to the Construction Noise and Vibration Impact Statement (CNVIS)) during all NCW activities.
- Continued prediction of noise levels in support of the OOHWAF and ensuring that additional/all locations (e.g. where works could occur and monitoring may be required) are assessed. LOR currently assesses all receptors that may be impacted by a work activity to ensure additional mitigation measures are correctly applied, this information is then summarised in the OOHWAF.
- Implementation of the **Additional Mitigation Measures Matrix** (AMMM) as outlined in the CNVMP.
- Noise (and/or vibration) monitoring as per the requirements specified in the construction noise and vibration monitoring program established for NCW.
- Continued application the TfNSW safe working distances for vibration intensive activities
 to all works undertaken as part of the project, as far as practicable.
- Continued consideration of Peak Particle Velocity (PPV, mm/s) and Vibration Dose Values (VDV, m/s^{1.75}) to estimate potential for vibration generating activities to impact nearby sensitive receptors throughout future OOHWA, with reference to the Safe Working Distances of the CNVMP.
 - continuous vibration monitoring (attended or unattended) at the nearest sensitive receptors whenever vibration generating activities need to take place inside the TfNSW safe-working distances.
 - quantify the vibration levels associated with these construction activities and occur in the
 event of a complaint being received, as per the requirements specified in the construction
 noise and vibration monitoring program established for NCW.



Where measured noise levels were found to repeatedly exceed predicted noise levels for specific work activities, Additional Mitigation Measures were recommended as outlined in the CNVMP. Through consultation with ERM acoustics consultants, training was provided to LOR on how to predict more accurate noise levels for certain construction activities. Future OOHWAs contained more accurate predictions for work activities, which aligned more closely to measured values derived during attended noise monitoring. More accurate predictions in the OOHWA process allowed for a more appropriate level of mitigation to be applied during specific OOHW activities, to minimise impacts as much as practical during track possessions.

4. Conclusion

LOR continue to remain aware of the potential for nuisance, or an unacceptable level of amenity, to occur due to construction noise and vibration, and continue to plan for and then manage the construction works on the NCW project accordingly.

Construction noise and vibration levels have been reduced and impacts minimised with the successful implementation of the actions summarised in **Section 3** above.

Impacts may not always be reduced to negligible levels for all receptors during all construction activities; however, the summarised above have ensured that any residual impacts have been minimised as far as is practically achievable.

Technical Report

References

Laing O'Rourke - Sydney Metro City and Southwest - Northern Corridor Works - Construction Noise and Vibration Impact Statement (CNVIS), prepared by ERM and last updated February 2018

Laing O'Rourke - Sydney Metro City and Southwest - Northern Corridor Works - Construction Noise and Vibration Management Plan (CNVMP), prepared by ERM and dated October 2017

Laing O'Rourke - Sydney Metro City and Southwest - Northern Corridor Works - Construction Noise and Vibration Monitoring Program, prepared by ERM and dated October 2017

NSW Environment Protection Authority – NSW Environmental Noise Management – Industrial Noise Policy (INP), January 2000 and relevant application notes

NSW Department of Environment and Climate Change - NSW Interim Construction Noise Guideline (ICNG), July 2009

NSW Government – Sydney Metro Construction Noise and Vibration Strategy (CNVS), August 2017

Standards Australia AS1055–1997™ (AS1055) – Description and Measurement of Environmental Noise, Parts 1, 2 and 3

Standards Australia AS IEC 61672.1–2004™ (AS61672) – Electro Acoustics - Sound Level Meters Specifications Monitoring or Standards Australia AS1259.2-1990™ (AS1259) – Acoustics – Sound Level Meters - Integrating Averaging

Standards Australia AS/IEC 60942:2004/IEC 60942:2003 (IEC60942) - Australian Standard™ -**Electroacoustics – Sound Calibrators**



Summary Report – NCW Noise and Vibration Monitoring – May 2019 – October 2019

Appendix A - Noise and Vibration Monitoring Methodology

Noise Monitoring

A summary of the noise monitoring methodology is provided below. The monitoring was conducted with due regard to and by the CNVMP and other relevant policy, guidelines and standards as listed in the reference section of this report; and as per the construction noise and vibration monitoring program established for NCW.

1. Overview

1.1 Attended noise monitoring

For all monitoring events, a qualified and suitably experienced operator visited community areas surrounding the NCW works and completed operator attended noise measurements. In all cases, the closest receptors were targeted for monitoring, with actual measurement locations selected based on the position of site works and the potentially most affected receptors.

Overall noise levels (Lmax, Lmin, Leq, L1, L10 and L90 in dBA) were measured at all locations. Based on the measured overall values and observations made during each operator attended noise measurement a site Leq, 15minute noise level contribution in dBA was determined in the absence of any influential source not associated with the project.

1.2 Unattended noise monitoring

Details of the unattended noise monitoring are summarised below:

- Unattended noise monitoring was conducted continuously at the location. Overall noise levels (Lmax, Lmin, Leq, L1, L10 and L90 in dBA) were measured in 15 minutes samples;
- The unattended noise monitoring devices do not directly measure the site contribution. To estimate potential site noise contributions (in the absence of any influential source not associated with the project), it has been assumed that any measured Leq, 15-minute noise level above 35 dBA at the noise monitoring devices are associated with the site, while works are known to be in progress. These threshold values were determined based on recent monitoring and observations completed near the site;

1.3 Monitoring Locations

Each monitoring location is individually described in the corresponding OOHW technical monitoring report.



2. Technical Requirements

All construction noise monitoring was undertaken in accordance with the "construction noise and vibration monitoring guideline" that is included in Appendix A of the Construction Noise and Vibration Strategy (CNVS) and outlines the minimum requirements for contractors undertaking monitoring on the Sydney Metro Project.

In accordance with the CNVIS, both attended and unattended measurements were the focus of all noise monitoring based on the scope of works for P7. Attended noise monitoring results fed back directly to the project team and actions taken without delay during the works.

In accordance with Condition of Approval (CoA) – C11 monitoring data was made available to the construction team, and LOR and this report can be provided to the Environmental Representative and/or Acoustics Advisor, the Department of Planning and Environment (DP&E) and the NSW Environment Protection Authority (EPA) if needed.

2.1 Noise Monitoring Equipment

All noise measurements were conducted by suitably experienced and qualified personnel with due regard to, and by, the relevant local and international standards for environmental monitoring.

The noise measurement instrumentation used to conduct the monitoring complied with the requirements of AS 61672.1 and AS/IEC 60942. Each noise device had the current National Association of Testing Authorities, Australia (NATA) calibration certificates, with certification at intervals not exceeding two years at the time of use.

Noise instrument calibration was checked prior to monitoring and again at the conclusion with no difference noted between the two measurements. A suitably experienced person has completed all data handling and analysis and subsequently reviewed by a qualified and experienced acoustician.

The equipment utilized during attended noise monitoring is provided below. The quantities of noise logging equipment varied to suit the requirements of each possession.

- ARL Ngara (Type 1) Environmental Noise Loggers
 - Serial 8781B2, last calibration 18/01/2019
 - Serial 878184, last calibration 15/01/2019
 - Serial 87801C, last calibration 30/11/2017
- Brüel & Kjær 2250 Investigator (Type 1) Sound Analyser (Serial No. 3009001, last calibration 21/12/2017 – valid for two years).
- NTi Audio XL2 Sound Level Meter (Serial No. A2A-06272-E0, last calibration 15/02/2019);
 and
- Brüel & Kjær 4231 (Type 1) Sound Level Calibrator (Serial No. 2605910, last calibration 15/01/2019).

2.2 Other requirements

All attended measurements were conducted by appropriately trained personnel in the analysis and assessment of construction noise and vibration. They are familiar with the requirements of the relevant standards and procedures.



Sydney Metro City and Southwest – North Corridor Works

Summary Report - NCW Noise and Vibration Monitoring - May 2019 - October 2019

Technical Report

The noise measurement procedures employed throughout the monitoring were established by the requirements of the Australian Standard (AS) 1055:1997 Acoustics - Description and Measurement of Environmental Noise.

Attended noise measurements were conducted by an operator using a handheld Type 1 'integrating-averaging' sound level meter. All analyses were completed with the sound level meter mounted to a tripod and with a windscreen fitted, at the height of 1.2 to 1.5 metres above the ground.

Instantaneous noise levels for all noted noise emission sources (extraneous or otherwise), meteorological conditions (average and maximum wind speeds, temperature, precipitation and cloud cover etc.) were recorded during all measurements. Relevant measurement parameters, i.e. Leq, Lmin, Lmax, L1, L10 and L90 were recorded in dBA. All noise samples were recorded using the "fast" time response of the sound level meter.

Noise monitoring was not completed within 3.5 metres of any reflective structure or wall, unless behind a barrier. A reduction of up to 2.5 dB was not applied to the measured ambient or site noise contribution (Leq, 15 minute in dBA) as the barrier was reducing noise emissions from the site and in general, did not increase noise due to the reflective properties of the surface.

Noise monitoring was not completed during periods where wind speeds exceeded 5 m/s at the microphone. Noise monitoring was conducted during rain events however the rain was very light and had no effect on the measured data (if applicable).

The general setup of the sound level meter for attended noise measurements was as per Photo 4.1 of the Construction Noise and Vibration Monitoring Program established for NCW, as reproduced below as **Photo A2.1**.





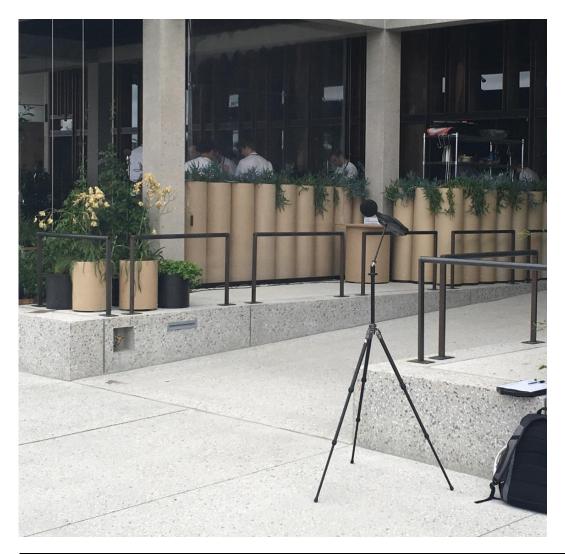


Photo A2.1: **Example Attended Noise Monitoring Setup**

Attended noise measurements were undertaken at the potentially most affected receptors identified in the LOR noise assessment (adapted for the phase of works) to confirm that the noise levels in the adjacent community were consistent with the predictions provided by LOR. Other potentially affected receptors were also considered as part of the monitoring regime. Monitoring occurred once works were underway but not at the commencement of activities. The duration of all community noise measurement samples was 15 minutes. The device's microphone was focused on the noise emission centre of the equipment being tested.

Vibration Monitoring Methodology

1. Monitoring Overview

1.1 Vibration Monitoring

Attended Vibration Monitoring

For all monitoring events, a qualified and suitably experienced operator visited the NCW P7 project site to conduct operator attended vibration measurements at the monitoring locations. The closest receptors were targeted for monitoring when outside of the rail corridor, with actual measurement locations selected based on the position of site works and the potentially most affected receptors. Vibration levels were measured to determine Peak Particle Velocity (PPV, mm/s and Frequency, Hz).

Unattended vibration monitoring

Unattended vibration monitoring was undertaken as requested by LOR during periods of extended, potentially vibration-generating works within the rail corridor.

1.2 Monitoring Locations

Each monitoring location is individually described in the corresponding OOHW technical monitoring report.

1.3 Vibration Monitoring Equipment

All vibration measurements were conducted by suitably experienced and qualified ERM personnel with due regard to, and in accordance with, the relevant local and international standards for environmental monitoring.

Vibration equipment was calibrated and checked to the manufacturer's specification, with certification at intervals not exceeding one year at the time of use.

A qualified and experienced acoustician has completed all data handling and analysis.

The equipment utilized during attended noise monitoring is provided below. The quantities of vibration logging equipment varied to suit the requirements of each possession.

- Saros Minimate Plus (Series III) Environmental Vibration Monitor.
 - Serial No. BE13734, last calibration 13/05/2019
 - Serial No. BE14130, last calibration 07/06/2019



END OF DOCUMENT

THIS PAGE IS INTENTIONALLY LEFT BLANK

Sydney Metro City and Southwest – North Corridor Works

Addendum – NCW Noise and Vibration Monitoring – May 2019 – October 2019

Project

Title	NCW Noise and Vibration Monitoring - Addendum - May 2019 to October 2019
Client	Sydney Metro City and Southwest
Document Reference No.	LOR-NCW-Noise and Vibration Monitoring-May19-Oct19 Addendum.V03
Laing O'Rourke Project No.	K38

Document

Date	6 July 2020							
Monitoring Period	May 2019 to October 2019							
Prepared by:	Thomas Buchan							
Reviewed by:	Steven De Luzuriaga							

Revisions

Date	Version	Description
08/11/2019	V0.1	LOR-NCW-Noise and Vibration Monitoring-May19-Oct19 Addendum
06/12/2019	V0.2	Address LOR comments
06/07/2020	V0.3	Revised draft report for client review

Addendum

1. Introduction

Main North and North Shore Corridor Works Project (MNNSCW): Portion 7 - Northern Corridor Works (NCW) are being carried out by Laing O'Rourke Australia Construction Pty Ltd (LOR) on behalf of Transport for New South Wales (TfNSW). LOR has engaged Environmental Resources Management Australia Pty Ltd (ERM) to undertake environmental noise and vibration monitoring during select works.

This addendum provides supporting information to LOR-NCW-Noise and Vibration Monitoring-May 2019 to October 2019 - Summary Report, which was prepared by ERM in November 2019. The addendum includes monitoring location maps, data tables and supporting graphs of noise and vibration monitoring activities in chronological order.

The structure of this addendum is as follows:

- Appendix A Monitoring Report (RP32): Noise Monitoring OOHW P7: MW50 17 to 21 June 2019
- Appendix B Monitoring Report (RP33a): Noise Monitoring OOHW P7: WE51 22 to 23
 June 2019
- Appendix C Monitoring Report (RP33b): Vibration Monitoring OOHW P7: WE51 22 to 23 June 2019
- Appendix D Monitoring Report (RP34): Noise Monitoring OOHW P7: MW51 24 to 28
 June 2019
- Appendix E Monitoring Report (RP35a): Noise Monitoring OOHW P7: WE03 20 to 21 July 2019
- Appendix F Monitoring Report (RP35b): Vibration Monitoring OOHW P7: WE03 20 to 21 July 2019
- Appendix G Monitoring Report (RP36): Noise Monitoring OOHW P7: MW04 29 July to 2 August 2019
- Appendix H Monitoring Report (RP37a-): Noise Monitoring OOHW P7: WE05 3 to 4 August 2019
- Appendix I Monitoring Report (RP37b): Vibration Monitoring OOHW P7: WE05 3 to 4 August 2019
- Appendix J Monitoring Report (RP38): Noise Monitoring OOHW P7: MW11 16 to 20 September 2019
- Appendix K Monitoring Report (RP39a): Noise Monitoring OOHW P7: WE12 21 to 22 September 2019
- Appendix L Monitoring Report (RP39b): Vibration Monitoring OOHW P7: WE12 21 to 22 September 2019

Addendum

Appendix A – Monitoring Report (RP32)

Noise Monitoring - OOHW P7: MW50 - 17 to 21 June 2019

ERM: Level 15, 309 Kent Street Sydney, NSW 2000. T: (02) 8584 8888. F: (02) 8584 8800. www.erm.com



Figure A1.0 – OOHW MW50 – Attended and Unattended Noise Monitoring Locations

- NCW P7 (Monday, 17 June to Friday, 21 June 2019)

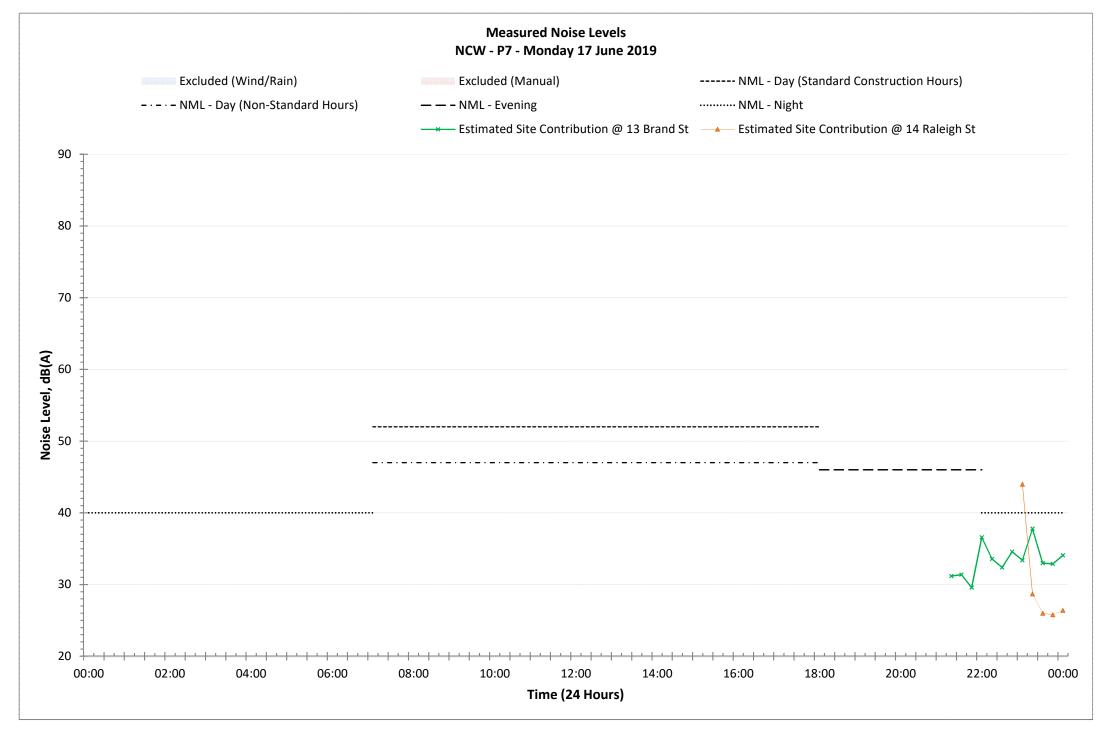


File Name	Date	Start Time	Elapsed Time	LAFmax	LAFmin	LAeq	LAF1.0	LAF10.0	LAF90.0	Percentage Sile Contribution (%)	Measured Site Noise Level - L.Aeq, 15minute	Impulsive Modifying Factor?	Tonal Modifying Factor? LF Modifying Factor?	Measured Site Noise Level - LAmax	NCA	Period	RBL - LA90, Period	NAML - L.Aeq, 15 minute	Predicted Site Noise Level - L.Aeq, 15min.ule	Sleep Disturbance Screening Level - LAmax	Comparison to RBL - LA90, Period	Comparison to NML - LAeq, 15 minute	Comparison to Predicted Site Noise Level - LAsq., 15minute	Guess and security of the control of
Project 001	17-Jun-19	23:46	00:14:03	73	37	43	50	44	38	100		4.5	0.0 0.0	50	NCA01	Night	35	40	52	50	12	7	-5	L01 - Project 001. Measurements undertaken at Drake Street. NCVI Involved a number of activities collined within DOWH4-028 slong with general construction activities, including use of a source were also observed to include distinct stuffic. Under how the control of the migraty of measurements with approximately 100% contribution. Estancous sources were also observed to include distinct stuffic, under how, rescess and board stuffic.
Project 002	18-Jun-19	00:00	00:15:00	73	36	50	61	52	39	100		2.0	5.0 5.0	65	NCA01	Night	35	40	52	50	27	22	10	LOT - Project 002. Measurements undertaken at Drake Street. NCV involved a number of activities cultinod within OOWH4-028 slong with general construction activities, including use of hard book and involvement of whickes and place within the ratio control. Size-related notes devinded the reportly of measurements with sportunitarily 20-100% contribution. Estimated Sources were also colorance for locked destar stells, excellenced, when't burn arrespines and text stells.
Project 003	18-Jun-19	00:15	00:15:00	72	37	54	67	58	39	100		3.1	0.0 5.0	65	NCA01	Night	35	40	52	50	27	22	10	L01 - Project 003. Measurements undertaken at Drake Street. NOV involved a number of activities collend within OOWH4-028 slong with general construction activities, including use of hand book and revenuent of wholes and place within the ratio control. Else-related moses dominated the importly of measurements with approximately 100% contribution. Estimated accounts were also document be located destart left, account out of activities.
Project 004	18-Jun-19	01:00	00:15:00	63	40	44	50	46	42	50		4.8	0.0 5.0	56	NCA01	Night	35	40	52	50	16	11	-1	L02 - Project D04. Measurements undertaken all Rollegh Street. NCW proched a number of activities cultimed within COV/914-Q28 along with general construction activities, including use of hard book and revolvement of wholes and place within the rad corroller. Site-related roles as dominated the respirity of measurements with approximately 15-100% contribution. Estatemosa concess were also colorented househall desirate first of herity, backers and that the first.
Project 005	18-Jun-19	01:15	00:15:00	85	42	66	79	66	46	100			0.0 0.0	85	NCA01	Night	35	40	52	50	31	26	14	102 - Project 005: Measurements undertaken all Rollegis Street NCW molecula number of activities cultimed within COWHA C28 along with general construction activities, including use of hand took and movement of whocks and plent within the rad contract. Site-related moses dominated the majority of measurements with approximately 100% contribution. Extranscus accuracy were also decrement in books described within or dominature.
Project 006	18-Jun-19	01:31	00:15:00	77	39	54	63	56	41	100			0.0 5.0	75	NCAD1	Night	35	40	52	50	24	19	7	L02 - Project 005. Measurements undertaken all Rallegh Street, NCW molecid a number of activities outlined within COWHA-028 along with general construction activities, including use of hard book and novement of whickes and place within the rail control. Citie-related moles download the mightly of measurements with approximately 100% contribution. Estrancous downloads were with all policines for books destructives or challen force.
Project 007	18-Jun-19	23:15	00:15:00	76	38	54	67	55	40	100		4.6	0.0 5.0	70	NCAD1	Night	35	40	52	50	29	24	12	LOT - Project 007. Measurements undertaken at Drake Street. NCV involved a number of activities cultinod within OCWH4-028 slong with general construction activities, including use of hard book and novement of whickes and place within the ratio contact. Other-leader mouse dominated the implicitly of measurements with approximately 5-107% contribution. Extraorous dominates were also colorented benefit and benefit and the colored destinate from the color with the father of the colored destinates from a white of the colored destinates for the colored with the father of the colored destinates for the colored with the father of the colored destinates for the colored with the father of the colored destinates for the colored with the colored destinates for the colored destination of the colored destinates for the colored destin
Project 008	18-Jun-19	23:30	00:15:00	55	38	42	49	43	39	50		3.2	0.0 5.0	48	NCAD1	Night	35	40	52	50	12	7	-5	LOT - Project 003. Measurements undertaken at Drake Street. NCV involved a number of activities cultinod within OCWH4-028 slong with general construction activities, including use of hard book and novement of whickes and place within the ratio confect. Size-related moises downloaded the majority of measurements with suppressionality 50-100% contribution. Estimated and some activities were also colored to place debate within Extensional Street, and activities are within the colored and street, and activities are street, and activ
Project 009	19-Jun-19	00:00	00:15:00	82	41	64	78	66	45	100			5.0 0.0	80	NCAD1	Night	35	40	52	50	34	29	17	L02 - Project 003. Measurements undertaken all Rollegh Street, NCW molecula number of activities outlined within COWHA-023 along with general construction activities, including use of hard book and novement of whickes and place within the rist control. Size-related molecular devices desirated the mightly of measurements with approximately 100% contribution. Estrancous forms were also colorance to holde desirate within and transition.
Project 010	19-Jun-19	00:15	00:15:00	84	43	59	70	58	45	100			0.0 5.0	85	NCA01	Night	35	40	52	50	29	24	12	L02 - Project 010. Measurements undertaken all Raliejh Street. NCW involved a number of activities cultimed within OCWHA-028 along with general construction activities, including use of hard tools and increment of whickes and plant within the rail contract. Site-related motes dominated the majority of measurements with approximately 100% contribution. Extrareous sources were also observed to include distant shall call resorts.
Project 011	19-Jun-19	00:30	00:15:00	75	42	51	60	53	44	100		3.8	0.0 5.0	65	NCAD1	Night	35	40	52	50	24	19	7	L02 - Project O11. Measurements undertaken all Rollegh Street, NCW molecid a number of activities outlined within COWHA-028 along with general construction activities, including use of hard book and novement of whickes and place within the risk confice. Size-released molecular discussions of the confice of the confidence of the con
Project 012	19-Jun-19	01:00	00:15:00	58	41	44	48	45	43	5		2.3	0.0 0.0	55	NCAD1	Night	35	40	69	50	-2	-7	-36	LG3 - Project 012: Measurements undertaken at Hopeton Avenue. NCW involved a number of activities outlined within COWHA-CB3 along with general construction activities, including use of hard close and convened of vehicles and place within fix nat control. She related include destinated the responsy of measurements with approximately 5-100% control.
Project 013	19-Jun-19	01:15	00:15:00	58	42	45	49	46	43	5		3.0	0.0 0.0	52	NCA01	Night	35	40	69	50	0	-5	-34	LS3 - Project 013. Measurements undertaken at Hispeton. Averue. NCW inviewd a number of activities outlined within COWHA-028 along with general construction activities, including use sources were also observed to include distant ranfle. Chatassould diseat ranfle. Chatassould diseat ranfle. Chatassould diseat ranfle. Chatassould diseat ranfle.
Project 014	19-Jun-19	01:30	00:15:00	63	42	46	52	49	43	50		5.2	0.0 0.0	60	NCA01	Night	35	40	69	50	14	9	-20	LIDI - Project 014. Measurements understalan at Hopeton Avenue, NCW involved a number of activities outlined within COWHA-C88 storp with general construction activities, including use of hand book and movement of whicks and pair within the real construct. She related notises dominated the majority of measurements with approximately 5-100% contribution. Extransous sources were also observed to include distant shall cand Chatassood dive site hum.
Project 015	19-Jun-19	02:01	00:15:00	74	39	49	63	45	41	30		4.1	0.0 0.0	65	NCA01	Night	35	40	52	50	12	7	-5	LOT + Project OTAL Measurements undertaken at Drake Steek I.NCV michod a number of activities cultined within OCNYHA-023 along with general construction schieldes, locksfing use of 15 sources were also observed to include distant ranks. Extraorous sources were also observed to include distant ranks, lock stellar construction. Extraorous sources were also observed to include distant ranks, lock stellar construction.
Project 016	19-Jun-19	23:00	00:15:00	77	39	60	73	61	41	100			0.0 0.0	75	NCAD1	Night	35	40	52	50	25	20	8	LO1 - Project 016, Measurements undertaken at Drale Street, NCW involved a number of activities collined within OOWH4A028 along with general construction activities, including use of hard tools and movement of vehicles and plant within the rail corridor. Site-related noises dominated the majority of measurements with approximately 50-100% contribution. Entaneous sources were also observed to include distant traffic, but staffic and wildfie.
Project 017	19-Jun-19	23:30	00:15:00	84	38	63	74	68	40	50			0.0 5.0	78	NCA01	Night	35	40	52	50	30	25	13	1.61 - Project OT Tribusparement undersides and that Speak 1907 modeds a number of activities called within ODWHA-023 along with general construction schalder, use of based one of movements of interesting and other schalders and other within the scholar orders. Schematic Research of the supply of resources were also observed to include distant smill, but can and wildle.
Project 018	20-Jun-19	00:00	00:15:00	64	42	52	58	55	44	100			0.0 5.0	80	NCA01	Night	35	40	52	50	22	17	5	1.01. Project Of It Massarement undersides and blading forces. IOV medicad nanotive of activities collected with OCWWIA-023 along with greated construction activities, including use of 300 handlook and informations and information and included. Silt-related received the importly of impactmental with approximating 6th 100%; contribution. Estimated sources were also observed to include distant shall be and others.
Project 019	20-Jun-19	00:15	00:15:00	59	42	48	53	51	44	100		4.7	0.0 5.0	85	NCAD1	Night	35	40	52	50	22	17	5	1.02 - Project 019, Measurements undertaken all Raleigh Street NCW molect a number of activities collined within COWHA 028 along with general construction activities, including use of hard tools and movement of whicks and plant within the rail contridur. Site-related noises dominated the majority of measurements with approximately 50-100%, contribution. Estameous sources were also observed to include distant staffs.
Project 020	20-Jun-19	01:00	00:15:00	59	47	49	53	50	48	5		4.7	0.0 5.0	55	NCAD1	Night	35	40	52	50	11	6	-6	LO4 - Project 2020. Measurements undertaken at Berkeley Court. NCW Involved a number of activities outlined within COWHA-022 along with general construction activities, including use of hand sooks and movement of sehricles and plant within the rail contrict. Site-related notices deministed the majority of measurements with approximately 5-100% contribution. Estraneous sources were also observed to include distant traffic, but staffic and Chatewood dive site.
Project 021	20-Jun-19	01:15	00:15:00	60	47	49	54	50	48	5	36		0.0 0.0	52	NCA01	Night	35	40	52	50	1	-4	-16	LO4 - Project 021. Measurements undertaken at Berkeley Court. NOW invoked a number of activities outlined within COWHA-028 along with general construction activities, including use of hard tools and incoverent of whicks and place within the rail contact. Site-related moses duminated the majority of measurements with approximately 55-100% contribution. Estimateous accurace were also observed to include detact hardle and Chateracous diverse as

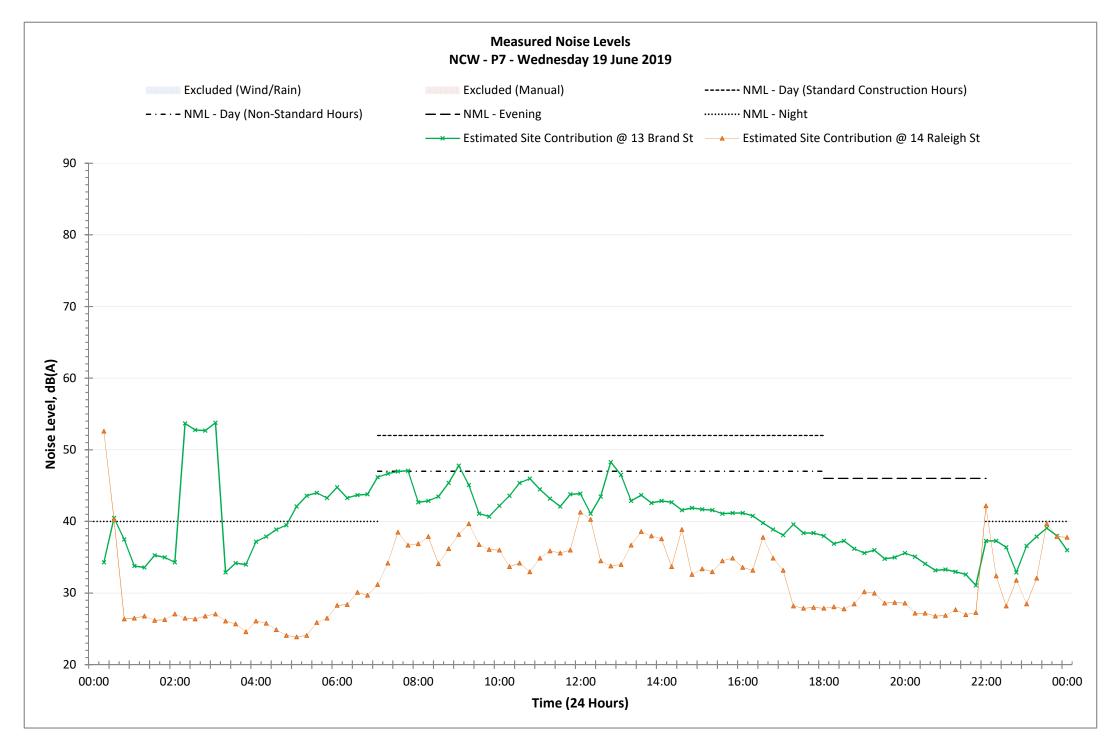
File Name	Date	Start Time	Elapsed Time	LAFmax	LAFmin	LAcq	LAF1.0	LAF10.0	LAF90.0	Percentage Site Contribution (%)	Messured Site Noise Level - L.Aeq, 15minute	Impulsive Modifying Factor?	Tonal Modifying Factor?	LF Modifying Factor? Measured Site Moles	Level - LAmax	NGA.	Period	RBL - LA90, Period	NMIL - L.Aeq, 15 minute	Predicted Site Noise Level - L.Aeq, 15minute	Sleep Disturbance Screening Level - LAmax	Comparison to RBL -LA90, Period	Comparison to NML - L/Aeq, 15 minute	Comparison to Predicted Site Noise Level - LAeq, 15min.ure	Comparison to Seep Disturbance & reening Level - LAmax	Description
Project 022	20-Jun-19	02:00	00:15:00	59	41	51	57	55	43	100		4.1	0.0	0.0	55	NCAD1	Night	35	40	52	50	20	15	3	5	L02 - Project 022. Measurements undertaken all Rakiegh Street. NCW proched a number of activities outlined within COWHA-028 storg with general construction activities, including use of hand looks and movement of whiches and glore within the risk cloridats. Clie-related moties during
Project 023	20-Jun-19	02:15	00:15:00	60	42	48	54	52	43	100		2.5	0.0	0.0	58	NCA01	Night	35	40	52	50	16	11	-1	8	LOT - Project 023. Measurements undertaken at Drake Street. NCW invoked a number of activities outlined within OOWH4-023 along with general construction activities, including use of hand loos and movement of whiches and place within the an all contribut. Site-related moses, dominated the majority of measurements with approximately 100% corribution. Extraerous downers were also demonstrate handles desired and the contribution of the contribution of the contribution.
Project 024	20-Jun-19	02:32	00:15:00	83	63	75	79	77	70	100		2.3	0.0	0.0	75	NCAD1	Night	35	40	52	50	42	37	25	25	U1 - Project 024. Measurements undertaken at Drake Street. NCW invoked a number of activities outlined within OOWH4-025 along with general construction activities, including use of hand tools and movement of vehicles and plant within the rall control. Site-related noises dominated the majority of measurements with approximately 50-100% contribution. Entraneous sources were inaucible.
Project 025	20-Jun-19	22:45	00:15:00	60	37	43	54	44	40	50		5.3	0.0	0.0	50	NCAD1	Night	35	40	52	50	11	6	-6	0	U1 - Project 025. Measurements undertaken at Drake Street. NCW involved a number of activities outlined within OOWHA-025 along with general construction activities, including use of hand tools and movement of vehicles and plant within the real control. Site-related noises dominated the majority of measurements with approximately 50-100% contribution. Entrancous sources were also observed to include distant traffic and reserve.
Project 026	20-Jun-19	23:00	00:15:00	86	37	64	76	68	40	100		2.3	0.0	5.0	84	NCA01	Night	35	40	52	50	37	32	20	34	LOT - Project 025. Measurements undertaken at Drake Street. NCW invoked a number of activities outlined within OOWH4-025 along with general construction activities, including use of hand looks and document of whiches and plant within the rat cloration. Site-related moses dominated the impurity of measurements with approximately 100% correlation. Extraerous accurace were also cloration for heads desiration and within a critical field.
Project 027	20-Jun-19	23:15	00:15:00	85	42	61	73	60	44	100		2.4	0.0	5.0	80	NCAD1	Night	35	40	52	50	33	28	16	30	LOT - Project 027. Measurements undertaken at Drake Street. NCVI involved a number of activities outlined within COWHA-028 along with general construction activities, including use of hand loos and movement of whiches and glore within the real comists. Ste-related moses dominated the migraty of reasurements with approximately 50-100% contribution. Entaneous accurace with approximately activities.
Project 028	20-Jun-19	23:45	00:15:00	61	42	49	56	53	44	100		2.0	0.0	5.0	55	NCA01	Night	35	40	52	50	21	16	4	5	L02 - Project 023. Measurements undertaken all Rallegis Street NCW Involved a number of activities outlined within OCWHA-023 along with general construction activities, including use of hand looks and novement of wholes and plant within it for all constant. Site-related roses dominated the reportly of measurements with approximately 50+100% contribution. Extransous courses were also decreated by Rude States under 100-8.
Project 029	21-Jun-19	00:00	00:15:00	63	40	49	57	52	43	100			0.0	5.0	55	NCA01	Night	35	40	52	50	19	14	2	5	L02 - Project 029. Measurements undertaken all Reliegh Street NCW invoked a number of activities outlined within COV/H4-C02 along with general construction activities, including use of hand look and movement of whiches and place within the rail cornists. Elementated uses deministed the majority of measurements with approximately 50+100%, contribution. Estimated according to the contribution of the contribution of the contribution of the contribution. Estimated uses the contribution of the contribution of the contribution of the contribution.
Project 030	21-Jun-19	00:15	00:15:00	67	40	47	54	50	42	100		5.3	0.0	5.0	55	NCA01	Night	35	40	52	50	22	17	5	5	L02 - Project G31. Measurements undertaken all Reliegh Street. NCW invoked a number of activities outlined within COV/H4-C22 along with general construction activities, including use of hand local and reviewent of whiches and place within the rat contribe. Site-entand roses dominated the reporty of measurements with approximately 50+100%, contribution. Entanteous courses were also decreated to hand the south of site fill.
Project 031	21-Jun-19	01:00	00:15:00	68	39	49	59	54	40	100		3.2	0.0	0.0	65	NCA01	Night	35	40	69	50	18	13	-16	15	L03 - Project 031. Measurements undertaken all Hopetoun Avenue. NCW involved a number of activities outlined within OOWHA-028 along with general construction activities, including use of hand tools and movement of varioties and plant within the rail comdor. Site-related notes deminated the majority of measurements with approximately 100% contribution. Extraneous sources were also observed to include Chattwood dive site, distant traffic and urban hum.
Project 032	21-Jun-19	01:15	00:15:00	55	38	42	47	43	40	5		3.9	0.0	0.0	45	NCAD1	Night	35	40	69	50	-3	-8	-37	-5	US - Project 032. Measurements undertaken att Hopetoun Avenue. NCW involved a number of activities codined within COWHA-028 along with general construction activities, including use of hard-looks and movement of vehicles and plate within the rail conduct. Site-related rouses downleaded the milpinty of measurements with approximately 100% contribution. Extranoous sources were also observed to include Chalaveood dive site, disaint faithrit, bod traffic and urban hum.

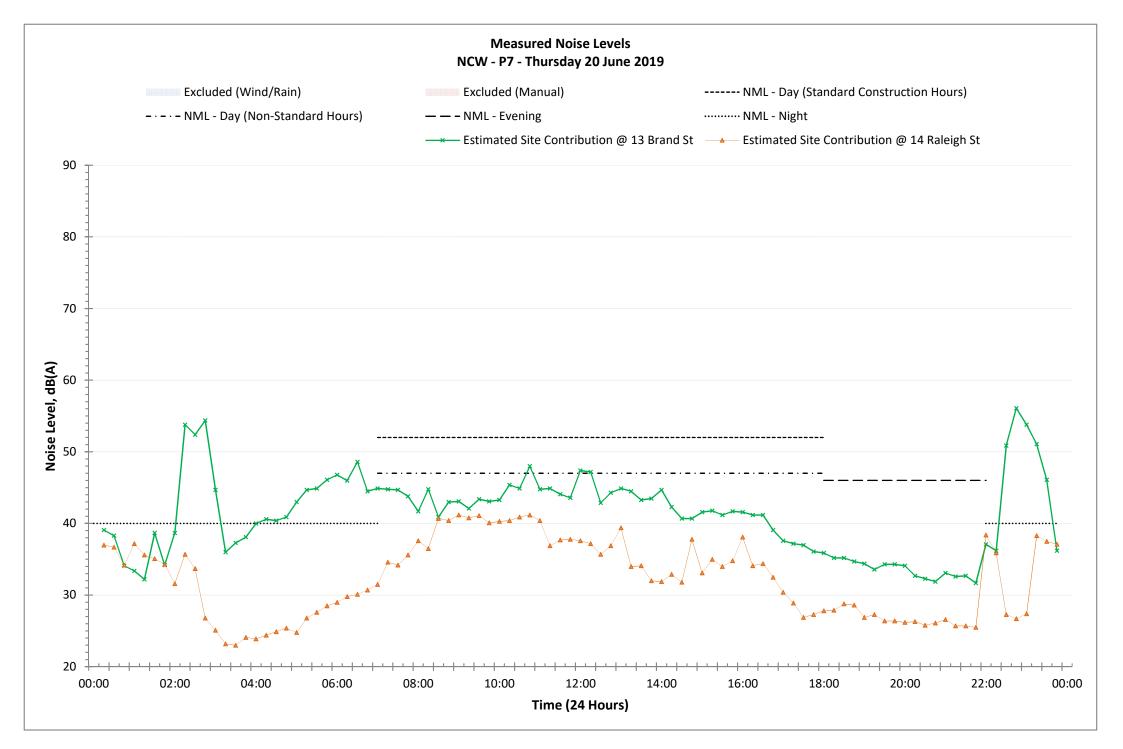
leather 21 - 25 June 2019: Acceptable for the noise monitoring and generally calm.

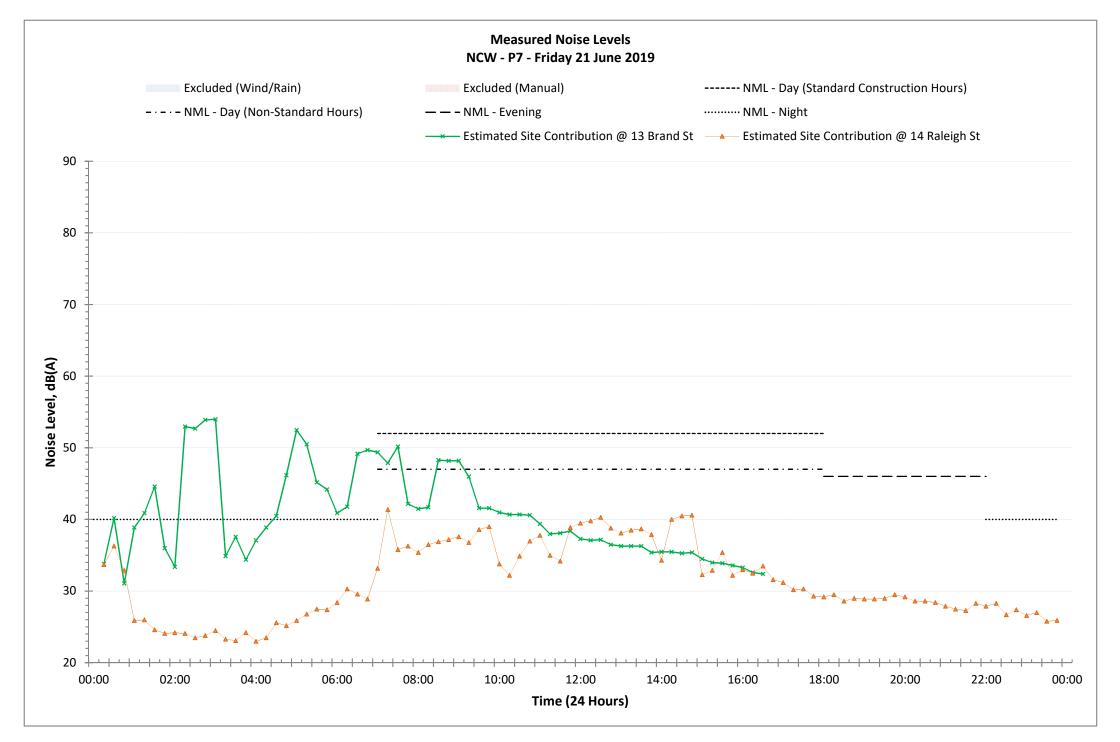
Note: all practical roles levels were reproduced from the LOR COM/MA Form for this trads possession. Note the production of the trade of the production of t











Addendum

Appendix B – Monitoring Report (RP33a)

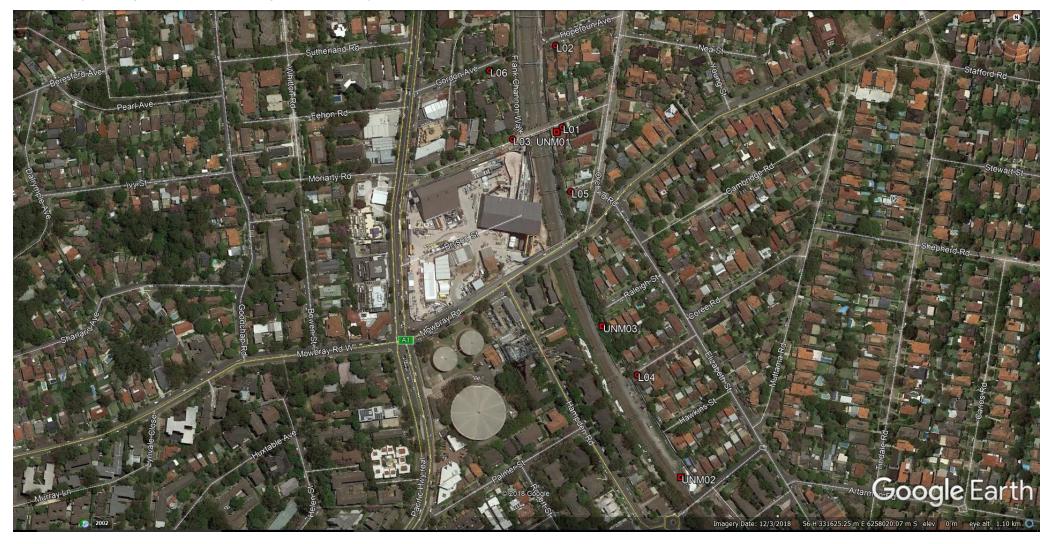
Noise Monitoring – OOHW P7: WE51 - 22 to 23 June 2019

ERM: Level 15, 309 Kent Street Sydney, NSW 2000. T: (02) 8584 8888. F: (02) 8584 8800. www.erm.com



Figure A1.0 – OOHW WE51 – Attended and Unattended Noise Monitoring Locations

- NCW P7 (Saturday, 22 June and Sunday, 23 June 2019)



File Name	Date	Start Time	Elapsed Time	LAFmax	LAFmin	LAeq	LAF1.0	LAF10.0	LAF90.0	Percentage Site Contribution (%)	Measured Site Noise Level - LAeq, 15minute	Impulsive Modifying Factor? Tonal Modifying Factor?	LF Modifying Factor?	Measured Site Noise Level - LAmax	NCA	Period	RBL - LA90, Period	NML - LAeq, 15 minute	Predicted Site Noise Level - LAeq, 15minute	Sleep Disturbance Screening Level - LAmax	Comparison to RBL - LA90, Period	Comparison to NML - LAeq, 15 minute	Comparison to Predicted Site Noise Level - LAeq, 15minute	Comparison to Sleep Disturbance Screening Level - LAmax	Description
Project 001	22-Jun-19	12:58	00:15:00	83	48	71	80	77	50	70	70	- 0.	0.0	80	NCA01	Day	42	47	75	57	28	23	-5	23	A01 - Project 001. Measurements undertaken at Berkeley Court. NCW involved a number of activities outlined within OOWHA-028 along with general construction activities, including use of hand tools and movement of vehicles and plant within the rail corridor. Site-related noises dominated the majority of measurmeents with approximately 50-100% contribution. Extraneous sources were also observed to include distant traffic and leaking hydrant.
Project 002	22-Jun-19	13:15	00:15:00	73	50	56	64	58	52	90	58	2.6 0.	0.0	70	NCA01	Day	42	47	75	57	16	11	-17	13	A01 - Project 002. Measurements undertaken at Berkeley Court. NCW involved a number of activities outlined within OOWHA-028 along with general construction activities, including use of hand tools and movement of vehicles and plant within the rail corridor. Site-related noises dominated the majority of measurmeents with approximately 80-100% contribution. Extraneous sources were also observed to include distant traffic, plane, passing car and leaking hydrant.
Project 003	22-Jun-19	13:32	00:15:00	70	49	55	62	57	51	100	55	- 0.	0.0	70	NCA01	Day	42	47	75	57	13	8	-20	13	A01 - Project 003. Measurements undertaken at Berkeley Court. NCW involved a number of activities outlined within OOWHA-028 along with general construction activities, including use of hand tools and movement of vehicles and plant within the rail corridor. Site-related noises dominated the majority of measurmeents with approximately 80-100% contribution. Extraneous sources were also observed to include distant traffic, plane, passing car and leaking hydrant.
Project 004	22-Jun-19	13:57	00:15:00	98	59	76	79	78	67	100	79	3.4 0.	0.0	90	NCA01	Day	42	47	69	57	37	32	10	33	A02 - Project 004. Measurements undertaken at Hopetoun Avenue. NCW involved a number of activities outlined within OOWHA-028 along with general construction activities, including use of hand tools and movement of vehicles and plant within the rail corridor. Site-related noises dominated the majority of measurmeents with approximately 100% contribution. Extraneous sources were inaudible.
Project 005	22-Jun-19	14:14	00:15:00	90	64	76	82	80	69	100	80	3.5 0.	0.0	82	NCA01	Day	42	47	69	57	38	33	11	25	A02 - Project 005. Measurements undertaken at Hopetoun Avenue. NCW involved a number of activities outlined within OOWHA-028 along with general construction activities, including use of hand tools and movement of vehicles and plant within the rail corridor. Site-related noises dominated the majority of measurmeents with approximately 100% contribution. Extraneous sources were inaudible.
Project 006	22-Jun-19	14:30	00:15:00	93	68	74	76	75	73	100	78	3.1 0.	0.0	88	NCA01	Day	42	47	69	57	36	31	9	31	A02 - Project 006. Measurements undertaken at Hopetoun Avenue. NCW involved a number of activities outlined within OOWHA-028 along with general construction activities, including use of hand tools and movement of vehicles and plant within the rail corridor. Site-related noises dominated the majority of measurmeents with approximately 100% contribution. Extraneous sources were inaudible.
Project 007	22-Jun-19	15:31	00:15:00	74	55	67	72	70	56	90	66	- 0.	0.0	74	NCA01	Day	42	47	74	57	24	19	-8	17	A03 - Project 007. Measurements undertaken at Nelson St. NCW involved a number of activities outlined within OOWHA-028 along with general construction activities, including use of hand tools and movement of vehicles and plant within the rail corridor. Site-related noises dominated the majority of measurmeents with approximately 70-100% contribution. Extraneous sources were also observed to include wind blown vegetation, TSE works and birds.
Project 008	22-Jun-19	15:48	00:15:00	77	55	70	75	73	58	100	70	- 0.	0.0	76	NCA01	Day	42	47	74	57	28	23	-4	19	A03 - Project 008. Measurements undertaken at Nelson St. NCW involved a number of activities outlined within OOWHA-028 along with general construction activities, including use of hand tools and movement of vehicles and plant within the rail corridor. Site-related noises dominated the majority of measurmeents with approximately 60-100% contribution. Extraneous sources were also observed to include TSE works.
Project 009	22-Jun-19	16:15	00:15:00	76	55	69	74	73	57	100	69	- 0.	0.0	74	NCA01	Day	42	47	74	57	27	22	-5	17	A03 - Project 009. Measurements undertaken at Nelson St. NCW involved a number of activities outlined within OOWHA-028 along with general construction activities, including use of hand tools and movement of vehicles and plant within the rail corridor. Site-related noises dominated the majority of measurmeents with approximately 80-100% contribution. Extraneous sources were also observed to include TSE works.
Project 010	22-Jun-19	16:30	00:15:00	81	54	69	75	73	56	90	71	2.0 0.	0.0	76	NCA01	Day	42	47	74	57	29	24	-3	19	A03 - Project 010. Measurements undertaken at Nelson St. NCW involved a number of activities outlined within OOWHA-028 along with general construction activities, including use of hand tools and movement of vehicles and plant within the rail corridor. Site-related noises dominated the majority of measurmeents with approximately 80-100% contribution. Extraneous sources were also observed to include TSE works and nearby pedestrians.
Project 011	22-Jun-19	18:16	00:15:00	78	47	68	75	72	50	100	70	2.5 0.	0.0	78	NCA01	Evening	41	46	75	56	29	24	-5	22	A01 - Project 011. Measurements undertaken at Berkeley Court. NCW involved a number of activities outlined within OOWHA-028 along with general construction activities, including use of hand tools and movement of vehicles and plant within the rail corridor. Site-related noises dominated the majority of measurmeents with approximately 60-100% contribution. Extraneous sources were also observed to include distant traffic, car passing and leaking hydrant.
Project 012	22-Jun-19	18:32	00:15:00	78	49	68	76	73	53	100	72	4.3 0.	0.0	77	NCA01	Evening	41	46	75	56	31	26	-3	21	A01 - Project 012. Measurements undertaken at Berkeley Court. NCW involved a number of activities outlined within OOWHA-028 along with general construction activities, including use of hand tools and movement of vehicles and plant within the rail corridor. Site-related noises dominated the majority of measurmeents with approximately 80-100% contribution. Extraneous sources were also observed to include distant traffic, local traffic and leaking hydrant.
Project 013	22-Jun-19	18:47	00:15:00	80	50	71	77	75	54	100	74	2.8 0.	0.0	77	NCA01	Evening	41	46	75	56	33	28	-1	21	A01 - Project 013. Measurements undertaken at Berkeley Court. NCW involved a number of activities outlined within OOWHA-028 along with general construction activities, including use of hand tools and movement of vehicles and plant within the rail corridor. Site-related noises dominated the majority of measurmeents with approximately 80-100% contribution. Extraneous sources were also observed to include distant traffic, local traffic and leaking hydrant.
Project 014	22-Jun-19	19:04	00:15:00	82	48	69	79	74	49	60	69	2.3 0.	0.0	80	NCA01	Evening	41	46	75	56	28	23	-6	24	A01 - Project 014. Measurements undertaken at Berkeley Court. NCW involved a number of activities outlined within OOWHA-028 along with general construction activities, including use of hand tools and movement of vehicles and plant within the rail corridor. Site-related noises dominated the majority of measurmeents with approximately 60-100% contribution. Extraneous sources were also observed to include distant traffic, car passing and leaking hydrant.
Project 015	22-Jun-19	19:45	00:15:00	62	50	53	59	54	51	80	62	5.0 0.	5.0	60	NCA01	Evening	41	46	51	56	21	16	11	4	A04 - Project 015. Measurements undertaken at Drake St. NCW involved a number of activities outlined within OOWHA-028 along with general construction activities, including use of hand tools and movement of vehicles and plant within the rail corridor. Site-related noises dominated the majority of measurmeents with approximately 70-100% contribution. Extraneous sources were also observed to include distant traffic and plane.
Project 016	22-Jun-19	20:00	00:15:00	75	49	55	65	55	51	100	62	2.6 0.	5.0	74	NCA01	Evening	41	46	51	56	21	16	11	18	A04 - Project 016. Measurements undertaken at Drake St. NCW involved a number of activities outlined within OOWHA-028 along with general construction activities, including use of hand tools and movement of vehicles and plant within the rail corridor. Site-related noises dominated the majority of measurmeents with approximately 80-100% contribution. Extraneous sources were also observed to include staff entering site and a work ute entering and leaving site.
Project 017	22-Jun-19	20:44	00:15:00	71	53	63	68	66	56	100	65	2.6 0.	0.0	69	NCA01	Evening	41	46	51	56	24	19	14	13	A05 - Project 017. Measurements undertaken at Gillam St. NCW involved a number of activities outlined within OOWHA-028 along with general construction activities, including use of hand tools and movement of vehicles and plant within the rail corridor. Site-related noises dominated the majority of measurmeents with approximately 70-100% contribution. Extraneous sources were also observed to include distant traffic.
Project 018	22-Jun-19	21:00	00:15:00	72	53	62	67	65	56	64	64	3.2 0.	0.0	67	NCA01	Evening	41	46	51	56	23	18	13	11	A05 - Project 018. Measurements undertaken at Gillam St. NCW involved a number of activities outlined within OOWHA-028 along with general construction activities, including use of hand tools and movement of vehicles and plant within the rail corridor. Site-related noises dominated the majority of measurmeents with approximately 80-100% contribution. Extraneous sources were also observed to include distant traffic and a car passing by.
Project 019	22-Jun-19	21:15	00:06:53	69	52	62	68	65	55	100	64	2.2 0.	0.0	63	NCA01	Evening	41	46	51	56	23	18	13	7	A05 - Project 019. Measurements undertaken at Gillam St. NCW involved a number of activities outlined within OOWHA-028 along with general construction activities, including use of hand tools and movement of vehicles and plant within the rail corridor. Site-related noises dominated the majority of measurmeents with approximately 70-100% contribution. Extraneous sources were also observed to include distant traffic.
Project 020	22-Jun-19	22:11	00:15:00	84	55	71	77	74	58	100	74	3.8 0.	0.0	76	NCA01	Night	35	40	74	50	39	34	0	26	A03 - Project 020. Measurements undertaken at Nelson St. NCW involved a number of activities outlined within OOWHA-028 along with general construction activities, including use of hand tools and movement of vehicles and plant within the rail corridor. Site-related noises dominated the majority of measurmeents with approximately 50-100% contribution. Extraneous sources were inaudible.
Project 021	22-Jun-19	22:34	00:15:00	68	47	60	66	64	51	100	60	- 0.	0.0	66	NCA01	Night	35	40	51	50	25	20	9	16	A06 - Project 021. Measurements undertaken at Gordon Avenue. NCW involved a number of activities outlined within OOWHA-028 along with general construction activities, including use of hand tools and movement of vehicles and plant within the rail corridor. Site-related noises dominated the majority of measurmeents with approximately 100% contribution. Extraneous sources were inaudible.

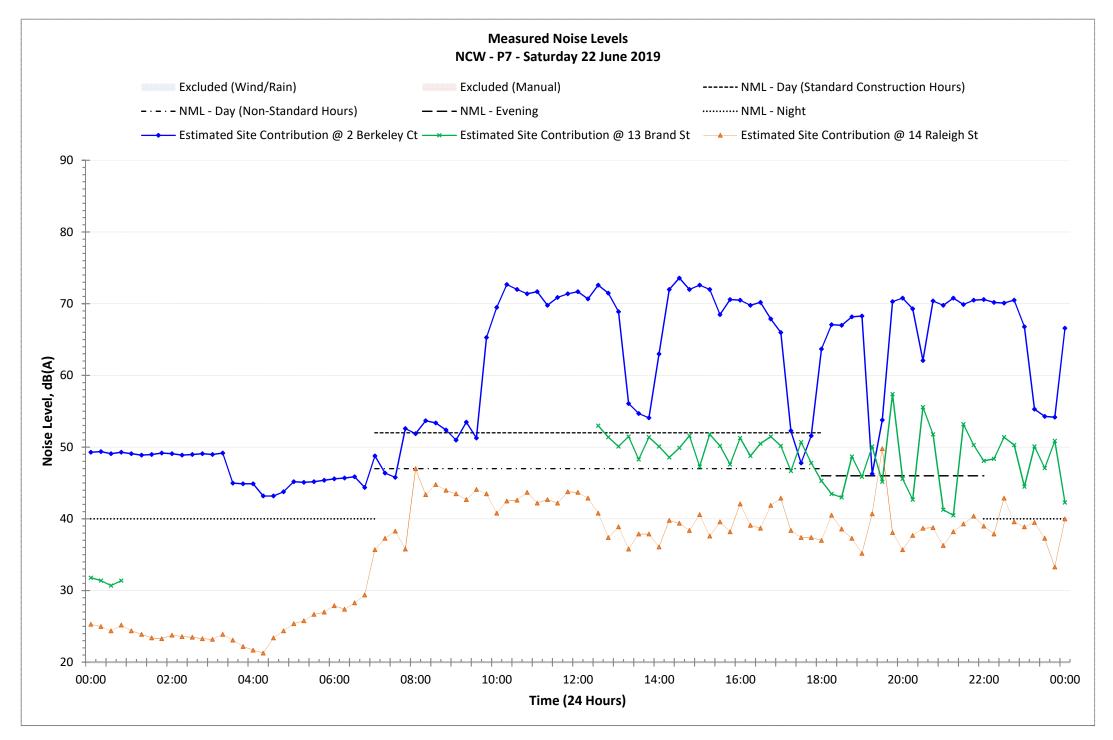
Environmental Resources Management Australia Pty Ltd

File Name	Date	Start Time	Elapsed Time	LAFmax	LAFmin	LAeq	LAF1.0	LAF10.0	LAF90.0	Percentage Site Contribution (%)	Measured Site Noise Level - LAeq, 15minute	Impulsive Modifying Factor?	Tonal Modifying Factor?	Measured Site Noise Level - LAmax	NCA	Period	RBL - LA90, Period	NML - LAeq, 15 minute	Predicted Site Noise Level - LAeq, 15minute	Sleep Disturbance Screening Level - LAmax	Comparison to RBL - LA90, Period	Comparison to NML - LAeq, 15 minute	Comparison to Predicted Site Noise Level - LAeq, 15minute	Comparison to Sleep Disturbance Screening Level - LAmax	Description
Project 022	22-Jun-19	22:49	00:15:00	69	45	60	67	64	51	100	60	-	0.0	.0 68	NCA01	Night	35	40	51	50	25	20	9	18	A06 - Project 022. Measurements undertaken at Gordon Avenue. NCW involved a number of activities outlined within OOWHA-028 along with general construction activities, including use of hand tools and movement of vehicles and plant within the rail corridor. Site-related noises dominated the majority of measurmeents with approximately 80-100% contribution. Extraneous sources were also observed to include a nearby motorbike.
Project 023	22-Jun-19	23:21	00:15:00	72	54	58	64	60	55	100	58		0.0	.0 65	NCA0 ²	Night	35	40	74	50	23	18	-16	15	A03 - Project 023. Measurements undertaken at Nelson St. NCW involved a number of activities outlined within OOWHA-028 along with general construction activities, including use of hand tools and movement of vehicles and plant within the rail corridor. Site-related noises dominated the majority of measurmeents with approximately 80-100% contribution. Extraneous sources were inaudible.
Project 024	23-Jun-19	12:44	00:15:00	80	54	72	77	75	62	100	75	3.0	0.0	.0 76	NCA0 ²	Day	42	47	75	57	33	28	0	19	A01 - Project 024. Measurements undertaken at Berkeley Court. NCW involved a number of activities outlined within OOWHA-028 along with general construction activities, including use of hand tools and movement of vehicles and plant within the rail corridor. Site-related noises dominated the majority of measurmeents with approximately 50-100% contribution. Extraneous sources were observed to include a nearby car.
Project 025	23-Jun-19	13:00	00:15:00	79	53	72	77	75	61	100	74	2.0	0.0	.0 78	NCA0 ²	Day	42	47	75	57	32	27	-1	21	A01 - Project 025. Measurements undertaken at Berkeley Court. NCW involved a number of activities outlined within OOWHA-028 along with general construction activities, including use of hand tools and movement of vehicles and plant within the rail corridor. Site-related noises dominated the majority of measurmeents with approximately 80-100% contribution. Extraneous sources were inaudible.
Project 026	23-Jun-19	13:15	00:15:00	79	48	67	76	73	51	70	68	2.2	0.0	.0 78	NCA0 ²	Day	42	47	75	57	26	21	-7	21	A01 - Project 026. Measurements undertaken at Berkeley Court. NCW involved a number of activities outlined within OOWHA-028 along with general construction activities, including use of hand tools and movement of vehicles and plant within the rail corridor. Site-related noises dominated the majority of measurmeents with approximately 40-100% contribution. Extraneous sources were observed to include distant traffic, a leaking hydrant, birds and a plane.
Project 027	23-Jun-19	14:29	00:15:00	77	47	59	65	62	52	100	62	3.6	0.0	.0 65	NCA0 ²	Day	42	47	51	57	20	15	11	8	A06 - Project 27. Measurements undertaken at Gordon Avenue. NCW involved a number of activities outlined within OOWHA-028 along with general construction activities, including use of hat tools and movement of vehicles and plant within the rail corridor. Site-related noises dominated the majority of measurmeents with approximately 60-100% contribution. Extraneous sources were observed to include loud distant traffic, local traffic, wind blown vegetation, birds and a plane.
Project 028	23-Jun-19	14:49	00:15:00	74	46	58	64	61	51	100	62	3.2	0.0	.0 63	NCA0 ²	Day	42	47	51	57	20	15	11	6	A06 - Project 28. Measurements undertaken at Gordon Avenue. NCW involved a number of activities outlined within OOWHA-028 along with general construction activities, including use of hat tools and movement of vehicles and plant within the rail corridor. Site-related noises dominated the majority of measurmeents with approximately 60-100% contribution. Extraneous sources were observed to include distant traffic, local traffic, wind blown vegetation, loud birds, a nearby dog barking and a plane.
Project 029	23-Jun-19	15:14	00:15:00	73	55	65	70	68	58	100	65	-	0.0	.0 70	NCA0 ²	Day	42	47	74	57	23	18	-9	13	A03 - Project 29. Measurements undertaken at Nelson Street. NCW involved a number of activities outlined within OOWHA-028 along with general construction activities, including use of hand tools and movement of vehicles and plant within the rail corridor. Site-related noises dominated the majority of measurmeents with approximately 80-100% contribution. Extraneous sources were inaudible.
Project 030	23-Jun-19	15:30	00:15:00	76	54	60	67	64	56	100	65	4.8	0.0	.0 66	NCA0 ²	Day	42	47	74	57	23	18	-9	9	A03 - Project 30. Measurements undertaken at Nelson Street. NCW involved a number of activities outlined within OOWHA-028 along with general construction activities, including use of handols and movement of vehicles and plant within the rail corridor. Site-related noises dominated the majority of measurmeents with approximately 100% contribution. Extraneous sources were observed to include a plan, birds and nearby residents.

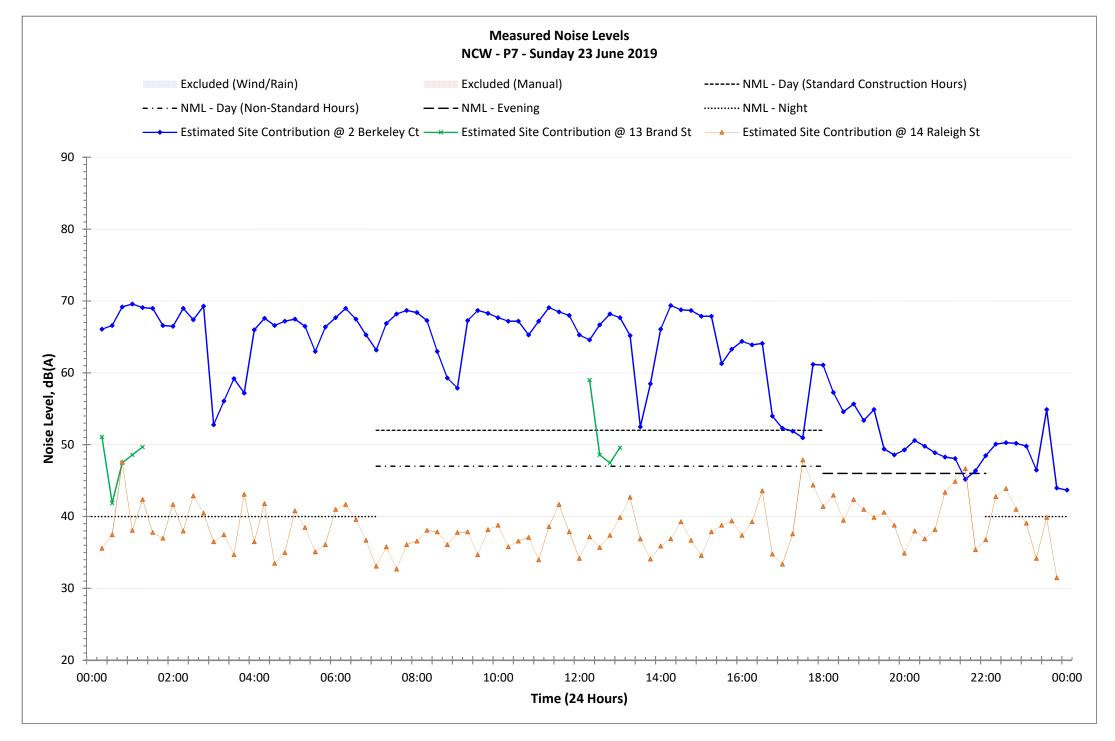
Weather 22-23 June 2019: Generally overcast weather, with calm winds. Temperature ranged between 8-14 degrees Celsius over the monitoring periods.

Note: all predicted noise levels were reproduced from the LOR OOHWA Form for this track possession.

Note: Low frequency, tonality and impulsive noise tests were conducted in accordance with the INP. The measured Leq data was applied in all cases. Modifying factor (penalty) values were applied as applicable to the low frequency, tonal or impulsive components detectable or attributable to the sites noise emission. The site noise contribution reported here is inclusive of all modifying factors (if applicable).



1 of 2



Appendix C – Monitoring Report (RP33b)

Vibration Monitoring – OOHW P7: WE51 - 22 to 23 June 2019

ENVIRONMENTAL RESOURCES MANAGEMENT AUSTRALIA PTY LTD

ERM: Level 15, 309 Kent Street Sydney, NSW 2000. T: (02) 8584 8888. F: (02) 8584 8800. www.erm.com



Figure A1.0 – OOHW WE51 – Unattended Vibration Monitoring Locations

- NCW P7 (Saturday, 22 June to Sunday, 23 June 2019)



saros

Start

End

Quick report NCW WE51

22/06/2019 24/06/2019 UVM01

Monitoring Results

 PPVmax
 8.21 mm/s

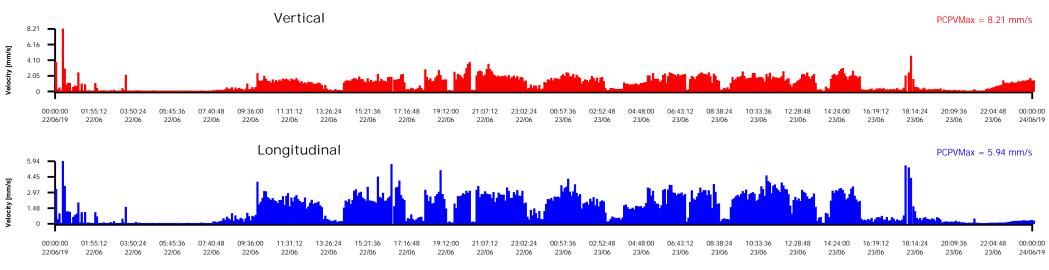
 PPVmax (99.9%)
 5.65 mm/s

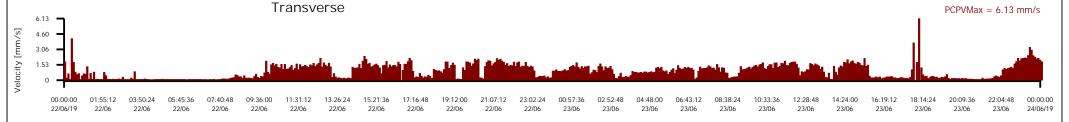
 PPVmax (99.8%)
 5.06 mm/s

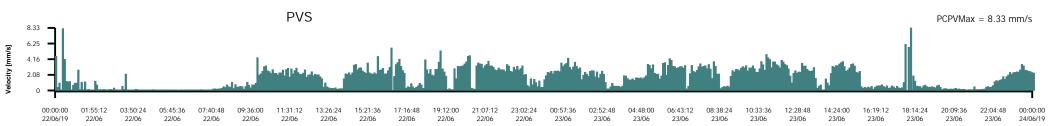
 PPVmax (99.5%)
 3.89 mm/s

 PPVmax (99.0%)
 3.57 mm/s











Copyright 2014 - Saros (International) Pty Ltd; ABN 76 160 599 244; P.O. Box 2079, Milton, QLD 4064 Telephone +61 7 3367 3400; Facsimile +61 7 3367 3844;

Printed: 04/07/2019 10:54:11

saros

00:00:00

22/06/19

01:55:12

22/06

03:50:24

22/06

05:45:36

22/06

07:40:48

22/06

09:36:00

22/06

11:31:12

22/06

13:26:24

22/06

15:21:36

22/06

17:16:48

22/06

19:12:00

22/06

21:07:12

22/06

Start

End

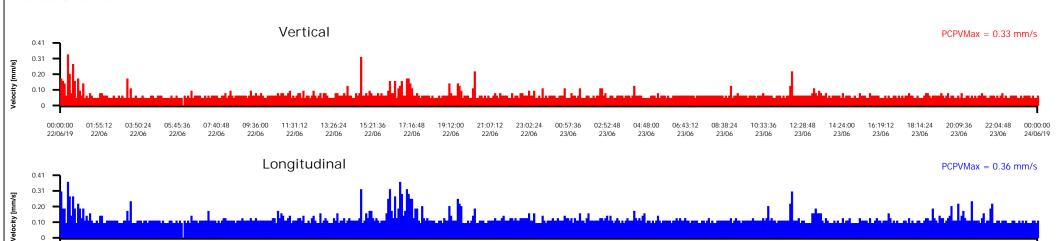
Monitoring Location

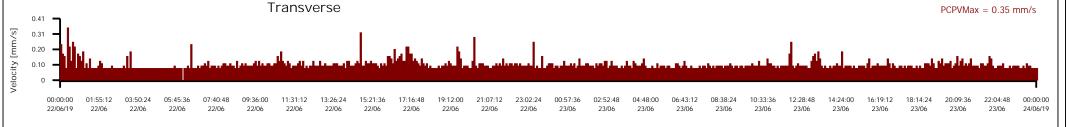
Quick report NCW WE51

22/06/2019 24/06/2019 UVM02

Monitoring Results

PPVmax (99.9%) 0.36 mm/s
PPVmax (99.9%) 0.32 mm/s
PPVmax (99.8%) 0.30 mm/s
PPVmax (99.5%) 0.27 mm/s
PPVmax (99.0%) 0.24 mm/s





23:02:24

22/06

00:57:36

23/06

02:52:48

23/06

04:48:00

23/06

06:43:12

23/06

08:38:24

23/06

10:33:36

23/06

12:28:48

23/06

14:24:00

23/06

16:19:12

23/06

18:14:24

23/06

20:09:36

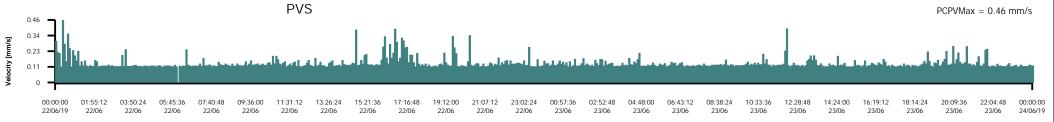
23/06

22:04:48

23/06

00:00:00

24/06/19





Copyright 2014 - Saros (International) Pty Ltd; ABN 76 160 599 244; P.O. Box 2079, Milton, QLD 4064 Telephone +61 7 3367 3400; Facsimile +61 7 3367 3844;

Printed: 04/07/2019 10:54:12



File Name

Histogram Start Time 00:00:07 June 22, 2019 Histogram Finish Time 05:59:59 June 22, 2019 **Number of Intervals** 1439.48 at 15 seconds Geo:254.0 mm/s Range

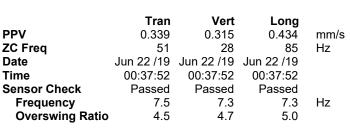
Sample Rate 1024sps

Operator/Setup: Operator/ERM.mmb Serial Number UM14423 V 10-89 Micromate ISEE

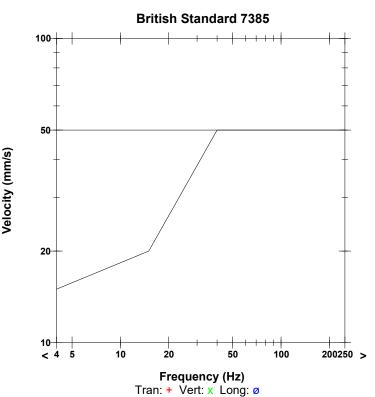
3.8 Volts **Battery Level**

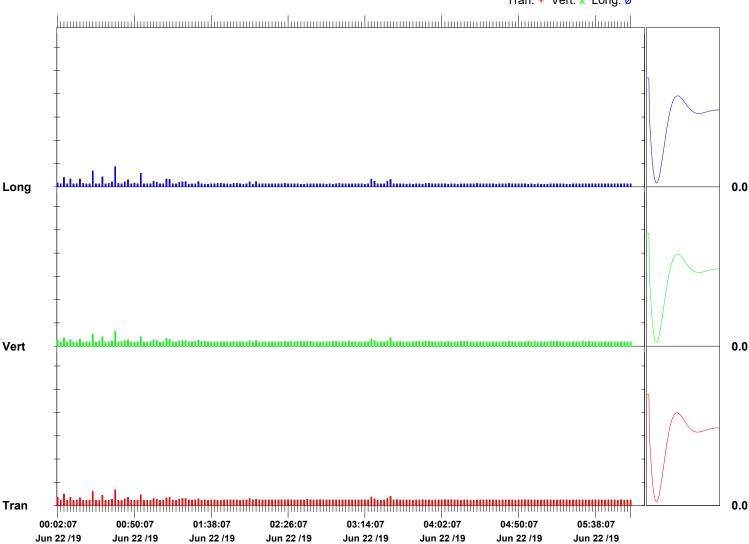
Unit Calibration December 7, 2018 by Instantel UM14423_20190622000007.IDFH

Notes



Peak Vector Sum 0.491 mm/s on June 22, 2019 at 00:37:52





Time Scale: 2 minutes /div Amplitude Scale: Geo: 0.500 mm/s/div



File Name

Histogram Start Time 06:03:39 June 22, 2019 Histogram Finish Time 17:59:59 June 22, 2019 **Number of Intervals** 2865.33 at 15 seconds Range Geo:254.0 mm/s

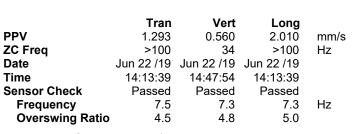
Sample Rate 1024sps

Operator/Setup: Operator/ERM.mmb Serial Number UM14423 V 10-89 Micromate ISEE

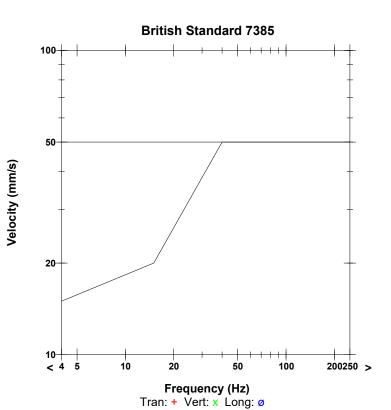
Battery Level 3.8 Volts

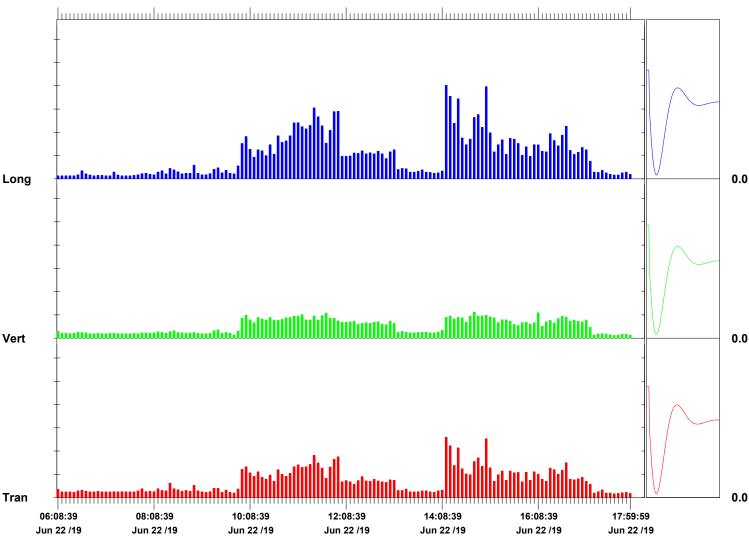
Unit Calibration December 7, 2018 by Instantel UM14423_20190622060339.IDFH

Notes



Peak Vector Sum 2.344 mm/s on June 22, 2019 at 14:13:39





Time Scale: 5 minutes /div Amplitude Scale: Geo: 0.500 mm/s/div



File Name

Histogram Start Time 18:03:39 June 22, 2019 Histogram Finish Time 23:59:59 June 22, 2019 **Number of Intervals** Range Sample Rate

1425.33 at 15 seconds Geo:254.0 mm/s 1024sps

Operator/ERM.mmb

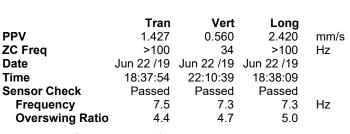
Serial Number UM14423 V 10-89 Micromate ISEE

Battery Level 3.8 Volts

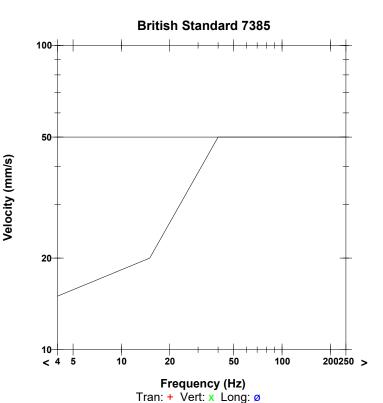
Unit Calibration December 7, 2018 by Instantel UM14423_20190622180339.IDFH

Notes

Operator/Setup:



Peak Vector Sum 2.789 mm/s on June 22, 2019 at 18:37:54



Long 0.0 Vert 0.0 0.0 Tran 19:41:39 23:41:39 18:05:39 18:53:39 20:29:39 21:17:39 22:05:39 22:53:39 Jun 22 /19 Jun 22 /19

Time Scale: 2 minutes /div Amplitude Scale: Geo: 0.500 mm/s/div



File Name

Histogram Start Time 00:00:07 June 23, 2019 Histogram Finish Time 05:59:59 June 23, 2019 **Number of Intervals** Geo:254.0 mm/s Range Sample Rate 1024sps

1439.48 at 15 seconds

Operator/ERM.mmb

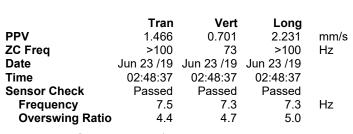
Serial Number UM14423 V 10-89 Micromate ISEE

Battery Level 3.8 Volts

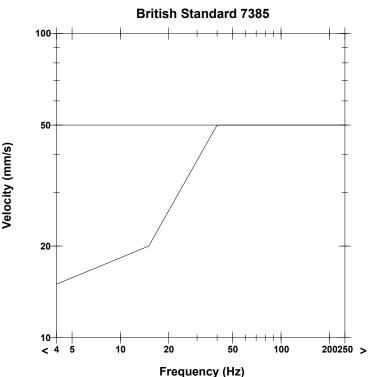
Unit Calibration December 7, 2018 by Instantel UM14423_20190623000007.IDFH

Notes

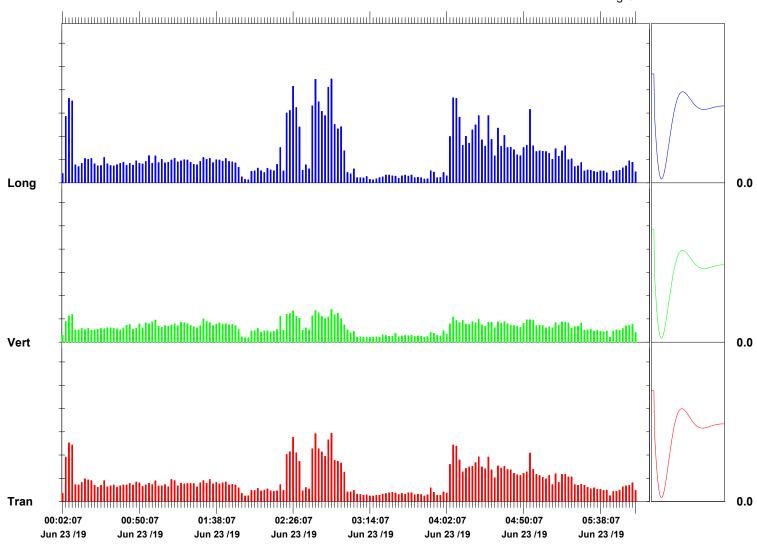
Operator/Setup:



Peak Vector Sum 2.654 mm/s on June 23, 2019 at 02:48:37



Tran: + Vert: x Long: Ø



Time Scale: 2 minutes /div Amplitude Scale: Geo: 0.500 mm/s/div



File Name

Histogram Start Time 06:03:39 June 23, 2019 Histogram Finish Time 17:59:59 June 23, 2019 **Number of Intervals** 2865.33 at 15 seconds Range Geo:254.0 mm/s Sample Rate 1024sps

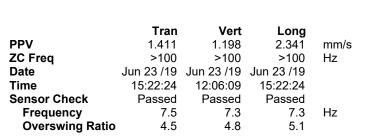
Operator/Setup: Operator/ERM.mmb

Serial Number UM14423 V 10-89 Micromate ISEE

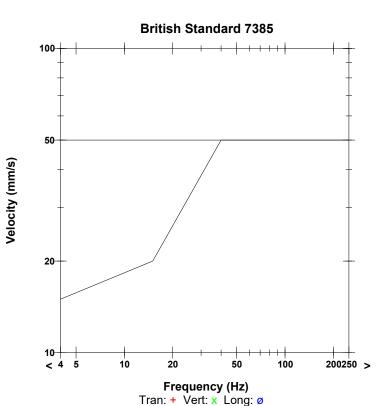
Battery Level 3.8 Volts

Unit Calibration December 7, 2018 by Instantel UM14423_20190623060339.IDFH

Notes



Peak Vector Sum 2.706 mm/s on June 23, 2019 at 15:22:24



0.0 Long Vert 0.0 0.0 Tran 06:08:39 08:08:39 12:08:39 14:08:39 16:08:39 17:59:59 10:08:39 Jun 23 /19 Jun 23 /19

Time Scale: 5 minutes /div Amplitude Scale: Geo: 0.500 mm/s/div



Overswing Ratio

UVM03 - Event Report

File Name

Histogram Start Time 18:03:39 June 23, 2019 Histogram Finish Time 23:59:59 June 23, 2019 **Number of Intervals** 1425.33 at 15 seconds Geo:254.0 mm/s Range

Sample Rate 1024sps

Operator/Setup: Operator/ERM.mmb Serial Number UM14423 V 10-89 Micromate ISEE

3.8 Volts **Battery Level**

Unit Calibration December 7, 2018 by Instantel UM14423_20190623180339.IDFH

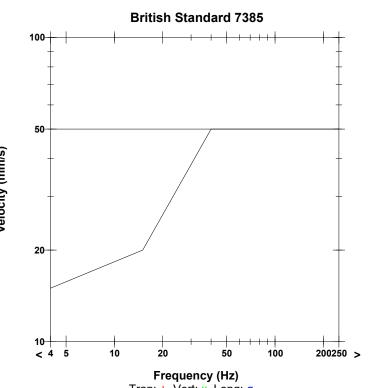
Notes

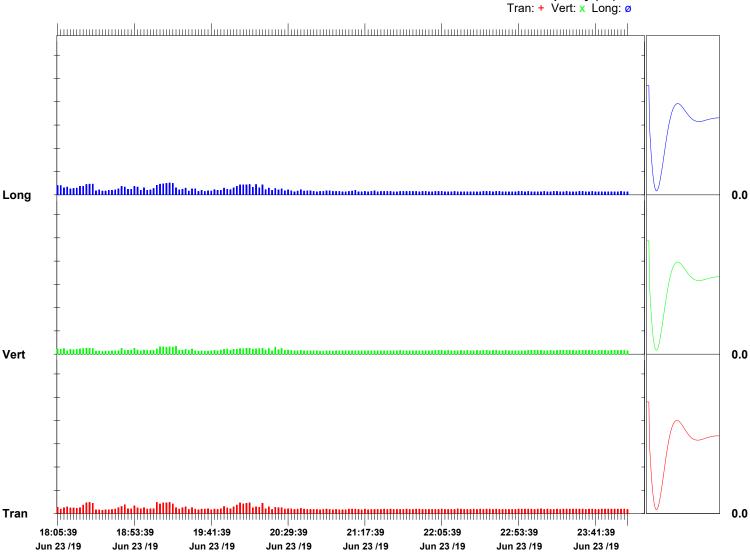
Tran Vert Long **PPV** $0.25\bar{2}$ 0.236 0.166 mm/s >100 **ZC Freq** 64 32 Hz Jun 23 /19 Jun 23 /19 Jun 23 /19 Date Time 18:25:24 19:18:39 19:13:54 **Sensor Check** Passed Passed Passed 7.3 7.3 Frequency 7.5 Hz

4.7

4.9

4.4 Peak Vector Sum 0.329 mm/s on June 23, 2019 at 19:11:39





Time Scale: 2 minutes /div Amplitude Scale: Geo: 0.500 mm/s/div

Appendix D – Monitoring Report (RP34)

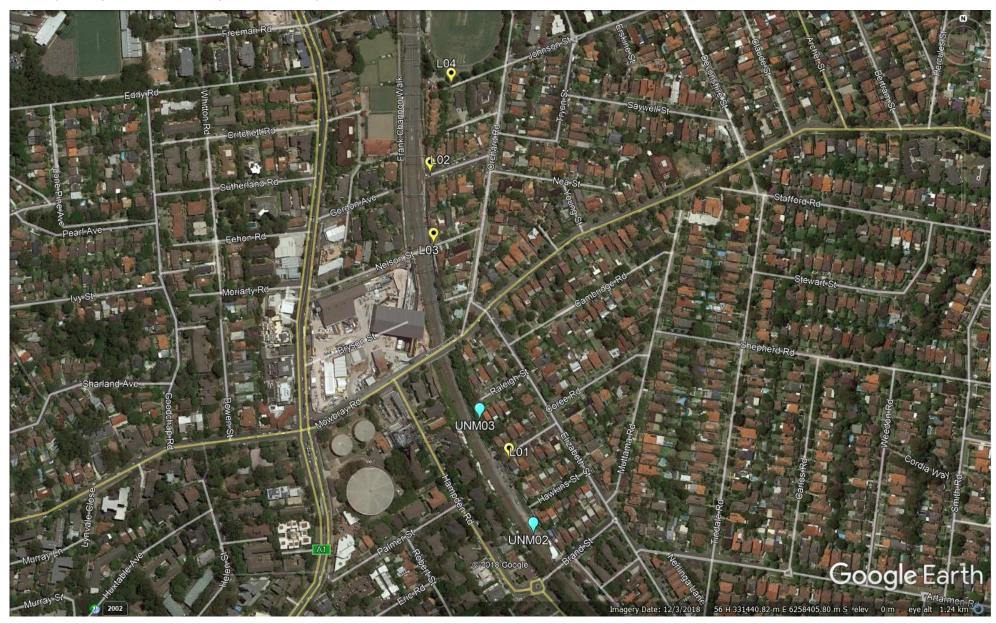
Noise Monitoring - OOHW P7: MW51 - 24 to 28 June 2019

ERM: Level 15, 309 Kent Street Sydney, NSW 2000. T: (02) 8584 8888. F: (02) 8584 8800. www.erm.com



Figure A1.0 – OOHW MW51 – Attended and Unattended Noise Monitoring Locations

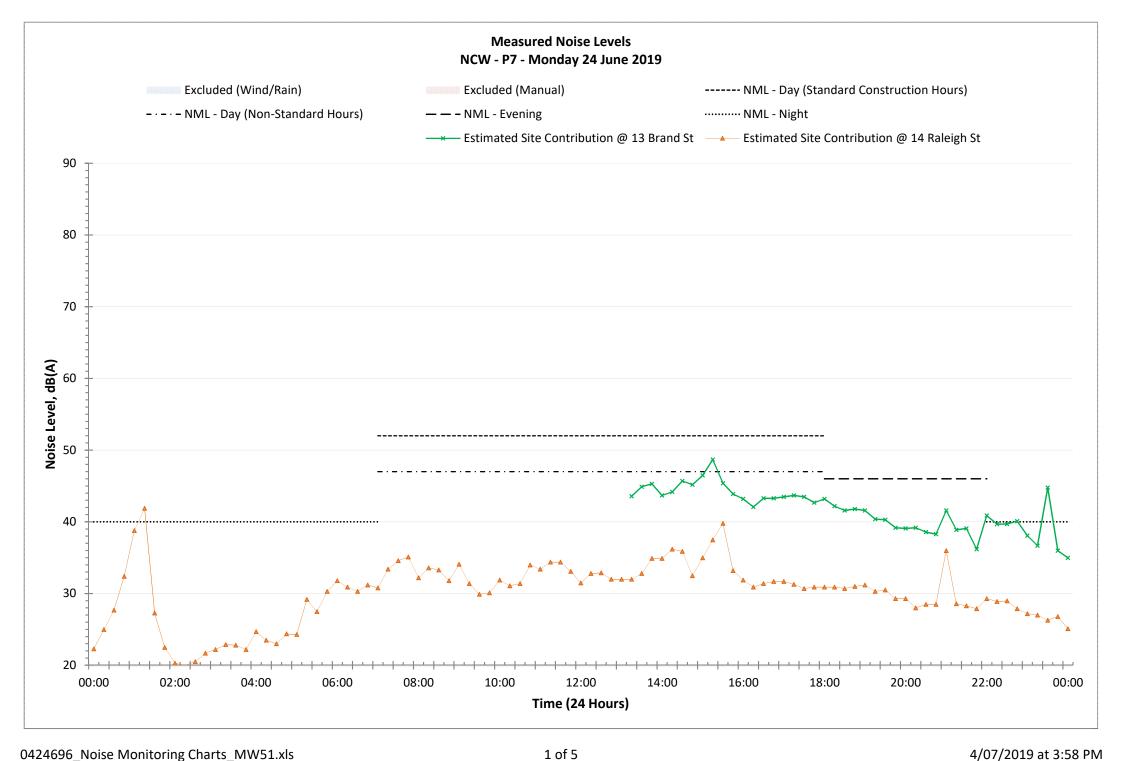
- NCW P7 (Monday, 24 June to Friday, 28 June 2019)

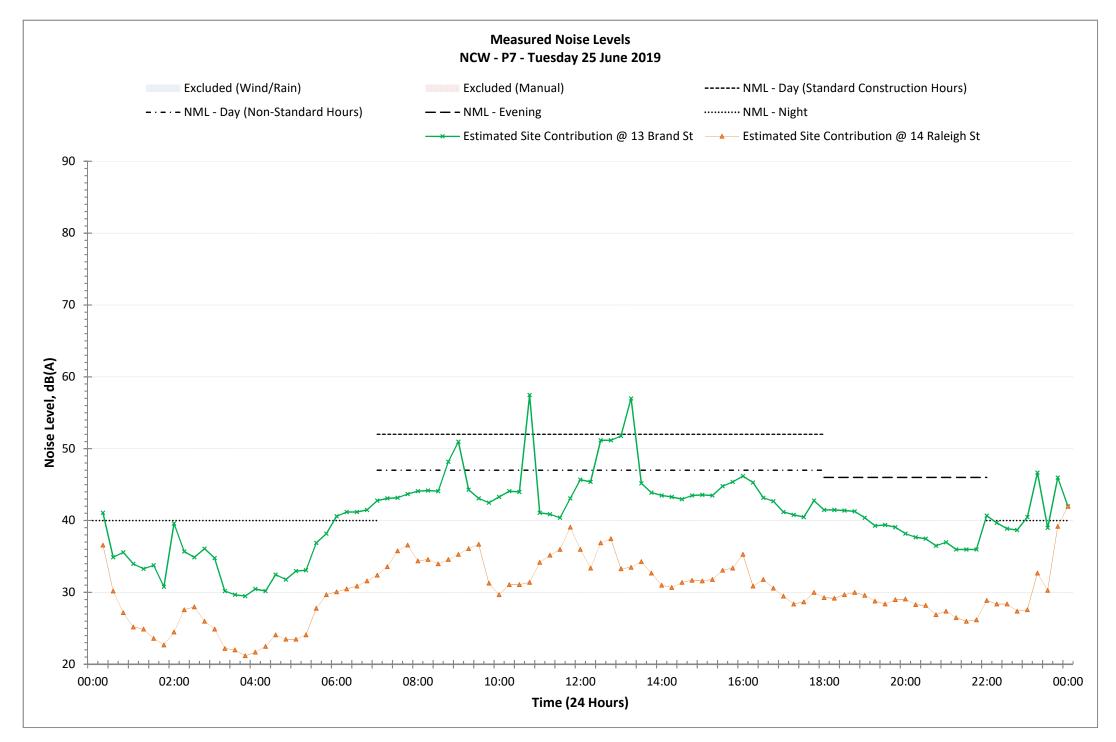


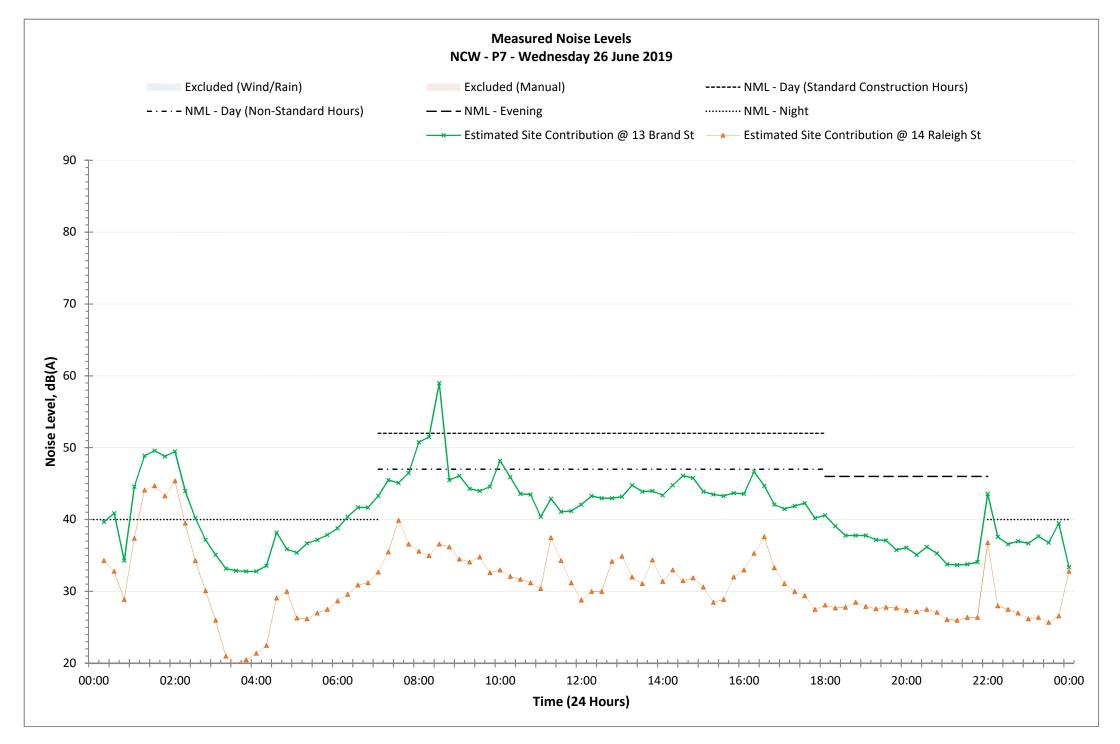
File Name	Date	Start Time	Elapsed Time	LAFma	ax LAFmin	LAeq	LAF1;	.0 LAF10.0	LAF90.0	Percentage Site Contribution (%)	Measured Site Noise Level - LAeq, 15min te	Impulsive Modifying Factor?	Tonal Modfying Factor?	LF Modifying Factor? Measured Site Noise	NCA	Period		RBL - LA90, Period	NANL - L.Aeq, 15 minute	Predicted Site Noise Level - L.Aeq, 1 Sminute	Skep Disturbance Screening Level - LAmax	Comparison to RBL - LA90, Period	Comparison to NML - LAeq, 15 minute	Comparison to Predicted Site Notice Level - LAeq, 15minute	Comparison to Se ep Disturbance Screening Level - LAmax	Description
Project 002 (no Project 001)	24-Jun-19	23:15	00:15:00	68	38	42	48	44	40	20		0.0	0.0	0.0 45	NGA01	Nigi	ht	47	52	48	62	-12	-17	-13	-17	1.01 - Project COS: Measurements understates of brain Serves MOVI revolved a native of activities collined within OOV/VHA-COS along with general construction activities, including use of bearings on the construction of the con
Project 003	25-Jun-19	00:15	00:04:19	81	42	52	62	50	43	20		0.0	0.0	0.0 45	NCA01	Nigl	ht	47	52	69	62	-2	-7	-24	-17	L02 - Project 003. Measurements undertaken at Hopeban Avenue. NCW involved a number of activities outlined within COWHA-001 along with general construction activities, including use of hard took and incomerced in which and place within the real contract. Service exploration in people of measurements with approximately 50% contribution. Estimated accounts were able obtained to holds of the high contribution. Estimated accounts were able obtained to high contribution. Estimated accounts were able obtained to high contribution. Estimated accounts were able obtained to high contribution.
Project 004	25-Jun-19	00:45	00:04:10	75	42	48	54	48	43	20		0.0	0.0	0.0 46	NCA01	Nigi	ht	47	52	69	62	-6	-11	-28	-16	LU2 - Project 004. Measurements undertaken at Hopeboun Avenue. NCW involved a number of activities outlined within OOWHA-028 along with general construction activities, including use of hand tools and movement of vehicles and plant within the nall constant. Site related noises dominated the majority of measurements with approximately 100% contribution. Extraneous sources were also observed to include Chatwood dive site, rain, heavy rain, and bout traffic.
Project 005	25-Jun-19	01:00	00:15:00	61	49	51	55	52	51	20		0.0	0.0	0.0 52	NCA01	Nigl	ht	47	52	75	62	-3	-8	-31	-10	103 - Project 005. Measurements undertaken at Berkeley Court (Nelson Street), NCW involved a number of activities outlined within COWHA-028 along with general construction activities, including use of hard both and movement of vehicles and plant within the rail comtox. Site-related rouses dominated the majority of measurements with approximately 33-40%, contribution. Entirescous sources were also observed to include Chalescood deve ate, light rain, and out fraitful.
Project 006	25-Jun-19	01:15	00:15:00	61	49	52	55	52	51	80		4.5	0.0	0.0 55	NCA01	Nigl	ht	47	52	75	62	8	3	-20	-7	LO3 - Project DISE. Measurements undertaken all Berkeley Court (Nelson Street), NCW invoked a number of activities outlined within COWHA-023 along with general construction activities, including use of head took and invovement of vehiclas and point with the articipation. Size-related document deep majority of reasurements with approximately 60-100% conflictions.
Project 007	25-Jun-19	01:45	00:11:10	68	41	45	50	47	43	50		2.6	0.0	5.0 50	NCA01	Nigl	ht	47	52	69	62	3	-2	-19	-12	L02 - Project 007. Measurements undertaken at Hopetoun Avenue. NCW involved a number of activities outlined within COWHA-001 along with general construction activities, including use of heart bods and incomment of whichis and place within the ratio critice. Size in effect occus dominated the inapply of measurements with approximately 60-100% corelibution. Extensions converse were able content to check Chemistro of the reside of the residence
Project 009 (no Project 008)	25-Jun-19	23:15	00:07:20	90	39	55	50	46	41	100		5.4	0.0	0.0 49	NCA01	Nigl	ht	35	40	48	50	11	6	-2	4	(CIT - Project 000. Measurements undertaken at Drake Street. NOV involved a number of activities outlined within OOV/HA-000 story with general construction activities, including use of heard look and movement of whiches and globar within the rail contrade. She retained notice deministed the required of measurements with approximately 50-100% contribution. Extransous accuracy and contract brackets may be form the contract in contract the contract of the contract in contract and contract brackets. See a contract the contract in contract the contract in contract the contract in contract the contract
Project 010	25-Jun-19	23:45	00:15:01	70	39	53	58	55	43	100		5.4	0.0	0.0 58	NCA01	Nigl	ht	35	40	48	50	23	18	10	8	(D1 - Project 010. Measurements undertaken at Drake Street. NOV involved a number of activities outlined within OOV/HA-028 along with general construction activities, including use of hear blood and movement of whiches and globar within the rail contract. She retained notice deministed the required of measurements with approximately 50-100% contribution. Extransous accesses within a contract to localize manufactor to involve manufactor
Project 011	26-Jun-19	00:00	00:15:00	89	39	54	58	56	41	100		5.3	0.0	0.0 60	NCA01	Nigi	ht	35	40	48	50	25	20	12	10	LD1 - Project 011. Measurements understates at Data Street. NCVI involved a number of activities outlined within ODVIHA-028 along with general construction activities, including use of fundamental properties of the construction activities. Including use of fundamental properties of the construction activities, including use of fundamental properties of the construction activities. Including use of fundamental properties of the construction activities of the con
Project 012	26-Jun-19	00:45	00:15:00	98	47	64	57	50	49	20		5.4	0.0	0.0 49	NCA01	Nigl	ht	35	40	75	50	12	7	-28	4	(23) - Project 012. Measurements undertaken at Benkely Court. NCW invoked a number of activities coldined within OCWHA-023 storg with general construction activities, including use of hard toos and movement of whichs and plant within the rat constant. Since retained notes dominated the mighty of measurements with approximately 204-07% combution. Entirecous accesses many ratios of constructive benchmark plant, but every law, Challand of the risk, a plant and cold staffs.
Project 014 (no Project 13)	27-Jun-19	00:00	00:15:00	69	36	43	51	44	38	100		3.8	0.0	0.0 53	NCA01	Nigi	ht	35	40	48	50	11	6	-2	3	(CI - Project OF4. Measurements undertaken at Drake Street. NCVI involved a number of activities outlined within OCVIVIA-028 along with general construction activities, including use of lead focal and movement of whicks and giver within the rat controls. Districtions demonstrated the imports of measurements with approximately TD-100% contribution. Extranous accesses with a soft-control to local feature first, Cost office, and extractorizements.
Project 015	27-Jun-19	00:30	00:15:00	65	38	47	55	51	40	100		3.7	0.0	0.0 58	NCA01	Nigi	ht	35	40	69	50	15	10	-19	8	LU2 - Project 015. Measurements undertaken at Hopeboun Avenue. NCW involved a number of activities outlined within OOWHA-028 along with general construction activities, including use of hand tools and movement of vehicles and plant within the rail constduct. Site-related noises dominated the majority of measurements with approximately 70-100% contribution. Exhancous sources were also observed to include loud trailsr, Chattascood dire site, Train (Chattascood station) and distant trailsc.
Project 016	27-Jun-19	00:45	00:15:00	53	38	41	47	42	39	5		4.7	0.0	0.0 39	NCA01	Nigi	ht	35	40	69	50	-2	-7	-36	-11	LU2 - Project 01ff. Measurements undertaken at Hopeboun Avenue. NCW involved a number of activities outlined within COWHA-028 along with general construction activities, including use of hand tools and movement of vehicles and plant within the rail consider. Site-related noises dominated the majority of measurements with approximately 10% contribution. Extraneous sources were also observed to include Chatwood dive site, distant traffic and bud traffic.
Project 017	27-Jun-19	01:45	00:15:00	63	41	47	53	49	43	100		5.2	0.0	0.0 53	NCA01	Nigi	ht	35	40	69	50	17	12	-17	3	LQ4 - Project 017. Measurements undertaken at Chapman Avenue. NCW involved a number of activities outlined within OOWHA-028 along with general construction activities, including use of hand tools and movement of vehicles and plant within the nall consider. Site-related noises dominated the majority of measurements with approximately 60-100% contribution. Exhapmous sources were also observed to include urban hum, Chattewood train station and loud staffic.
Project 018	27-Jun-19	02:00	00:15:00	69	42	45	48	45	43	70	48	5.3	0.0	0.0 49	NCA01	Nigi	ht	35	40	69	50	13	8	-21	4	LO4 - Project 018. Measurements undertaken at Chapman Avenue. NCW inched a number of activities outlined within COWHA-028 along with general construction activities, including use of hard tools and movement of vehicles and gloat within the rail construct. Site-related noises deminated the majority of measurements with approximately 30-100% contribution. Elemanous sources were also observed to include within him, leaves falling and dissert traffic.

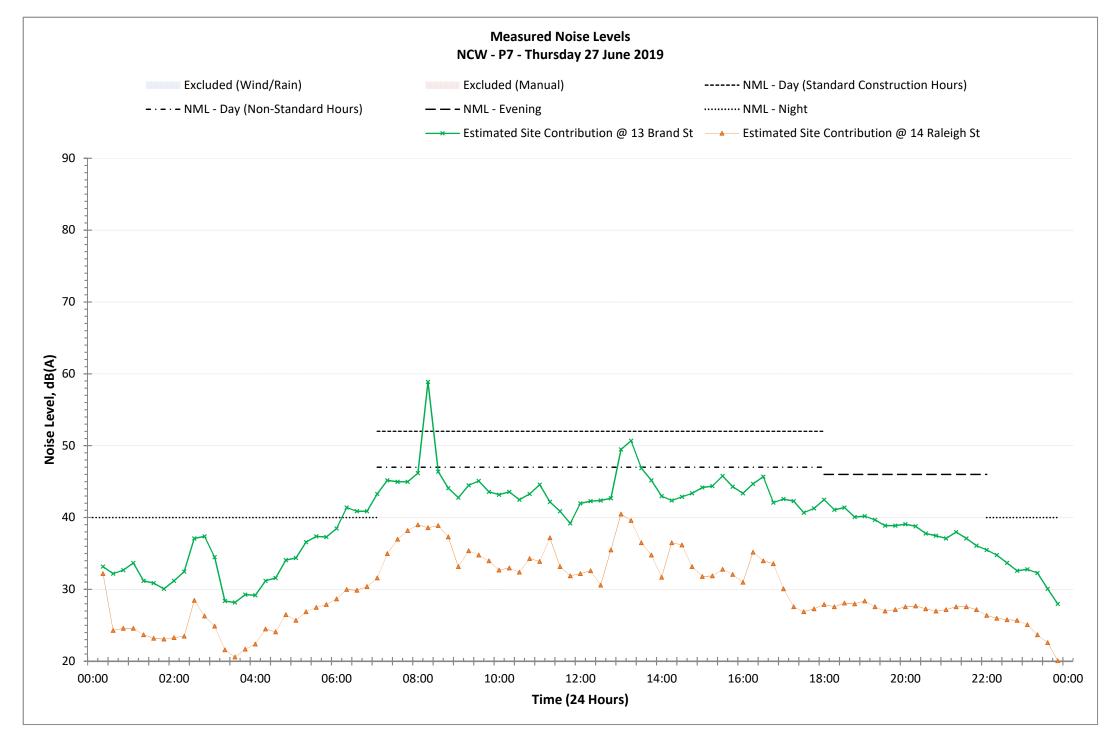
feather 24-28 June 2019: Generally overcast weather, some extended periods of rain, with calm winds.

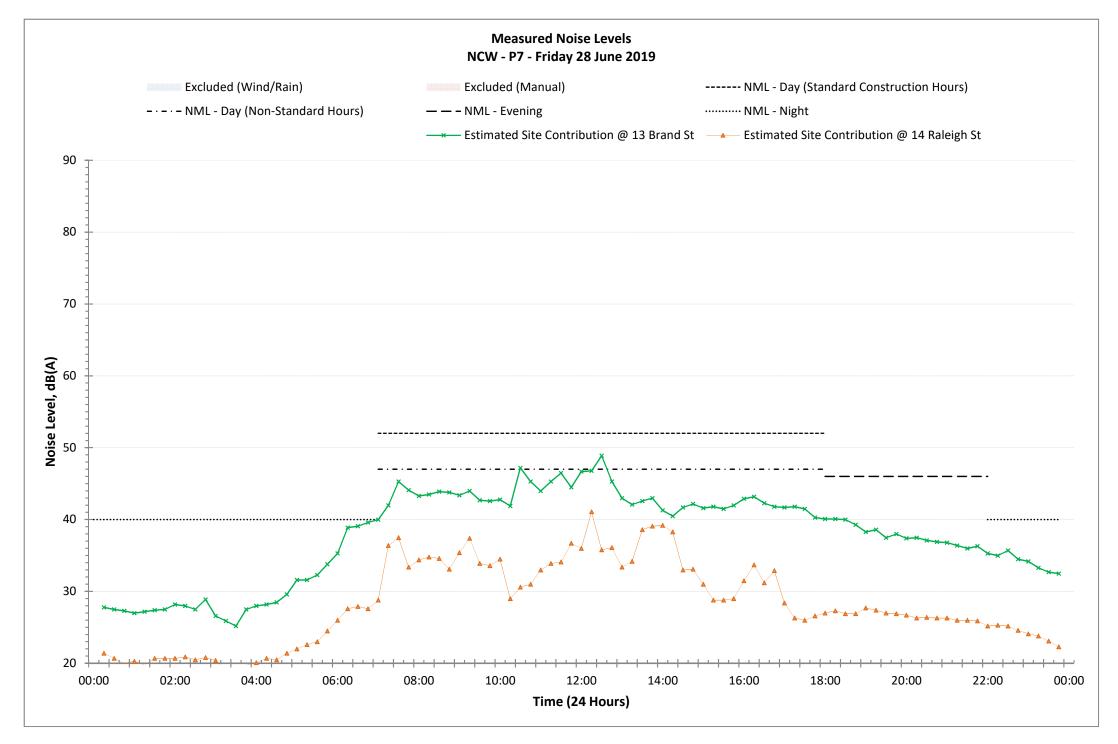
Note: Low frequency, tonally and impulsive noise tests were conducted in accordance with the INP. The measured Leng data was applied in all cases. Modifying factor (penalty) values were applied as applicable to the low frequency, tonally impulsive components detectable or attributable to the sites noise emission. The site noise contribution reported here is inclusive of all modifying factors (if applied as applicable to the low frequency, tonally and impulsive components detectable or attributable to the sites noise emission. The site noise contribution reported here is inclusive of all modifying factors (if applied as applicable to the sites noise emission. The site noise emission. The site noise contribution reported here is inclusive of all modifying factors (if applied as applicable to the low frequency, tonally and impulsive components detectable or attributable to the sites noise emission. The site noise contribution reported here is inclusive of all modifying factors (if applied as applicable to the low frequency, tonally and impulsive components detectable or attributable to the sites noise emission. The site noise contribution reported here is inclusive or all modifying factors (if applied as applicable to the sites noise emission. The site noise contribution reported here is inclusive or all modifying factors (if applied as applicable to the sites noise emission.)











Appendix E – Monitoring Report (RP35a)

Noise Monitoring – OOHW P7: WE03 - 20 to 21 July 2019

ERM: Level 15, 309 Kent Street Sydney, NSW 2000. T: (02) 8584 8888. F: (02) 8584 8800. www.erm.com



Figure A1.0 – OOHW WE03 – Attended and Unattended Noise Monitoring Locations

- NCW P7 (Saturday, 20 July and Sunday, 21 July 2019)

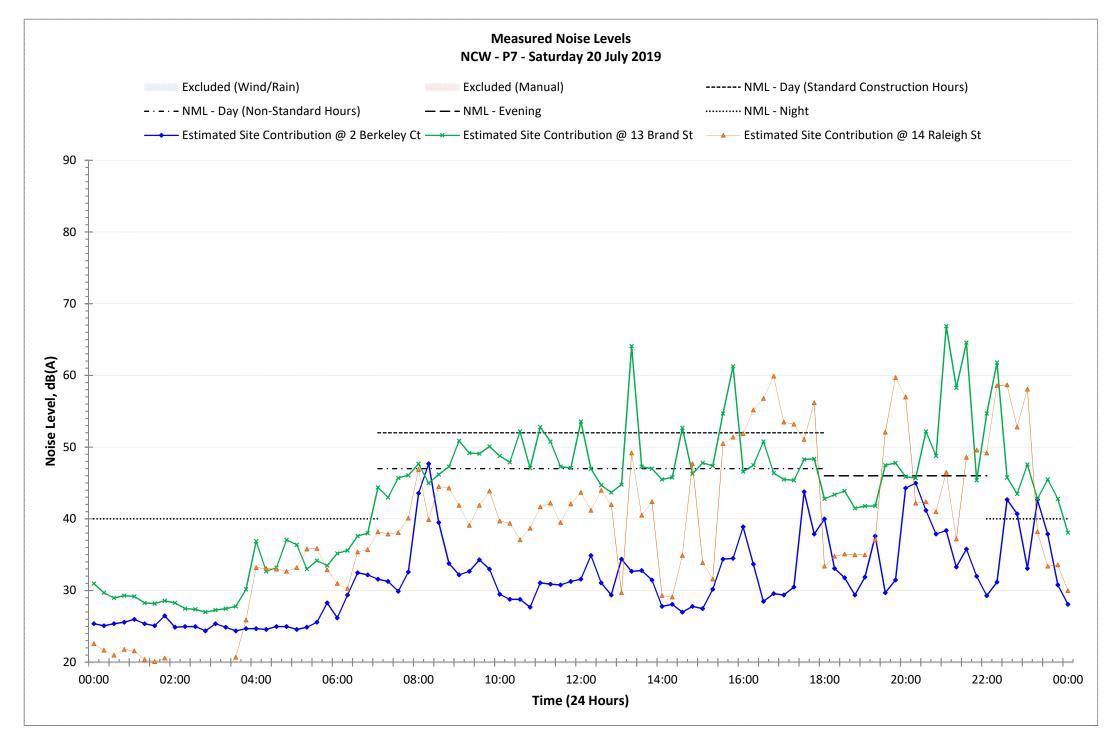


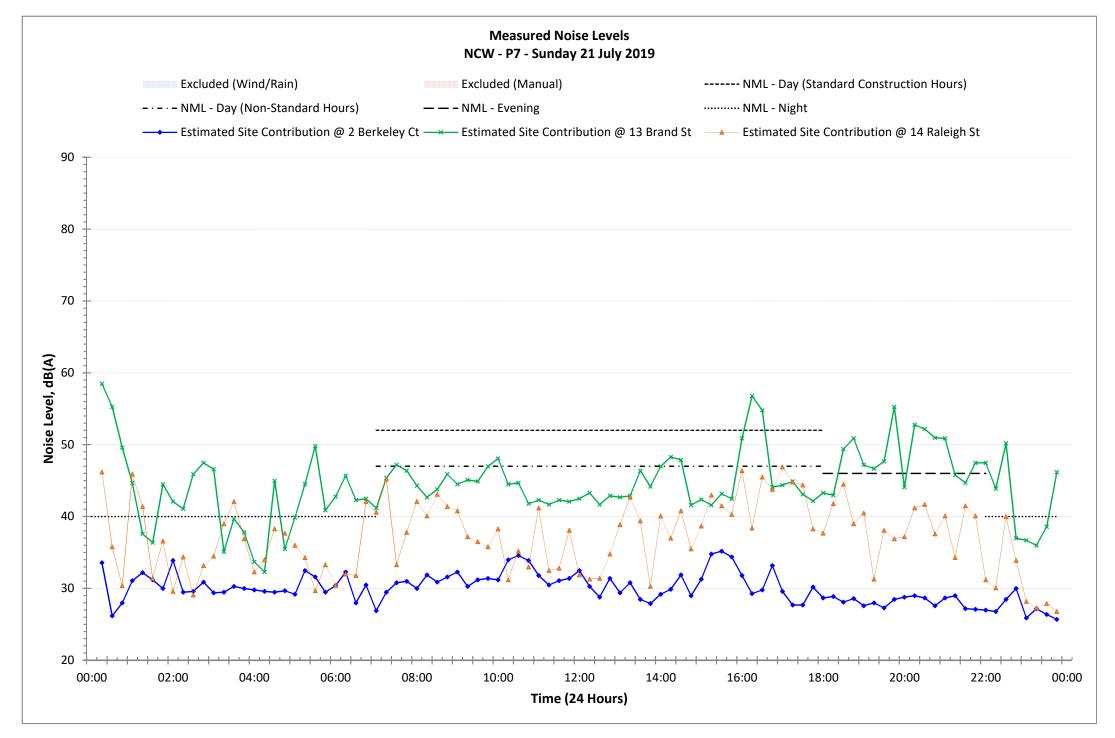
File Name	Date	Start Time	Bapsed Time	LAFmax	LAFmin	LAcq	LAP1.0	LAF10.0	LAF90.0	Percentage Site Contribution (%)	Measured Site Noise Level - L.Aeq, 15minute	Impulsive Modifying Factor?	Tonal Modifying Factor? LF Modifying Factor?	Measured Site Noise Level - L. Amax	NGA	Period	RBL - LAVo, Period	NML -LAeq. 15 minute	Predicted Ste Noise Level - LAcq. 15minute	Seep Disturbance Screening Level - LAmax	Comparison to RB L - LA90, Period	Comparison to NML - L.Aeq. 15 minute	Comparison to Predicted Site Noise Level - LAeq. 18minute	Comparison to Siesp Disturbance Screening Level - LAmax	On accription
Project 000	20-Jul-19	19:00	00:15:00	66	47	53	59	55	49	30				54	NCA01	Day	42	47	48	57	5	0	-1	-3	A01 - Project 000. Measurement undertaken all Serieley Court. NOW involved a number of activities cultimed within COVHA-023 along with general construction activities, including use of hand took and movement of vehicles and pairs within the rad control. Sits-related noises dominated the majority of measurement with approximately 30% contribution. Estimatous sources were also deserved to include detard traffic, non-site related construction activities and wind-followin vegetation.
Project 001	20-Jul-19	19:15	00:15:00	74	46	54	62	58	48	100		-		70	NCA01	Day	42	47	53	57	12	7	1	13	AU1 - Project IO1. Measurement undertaken all Serieley Court. NOV involved a number of activities colleted within COHH4-023 along with general construction activities, including use of hard took and movement of vehicles and plant within the rad corridor. Sits-related noises distributed the majority of measurement with approximately 100% contribution. Estimated sources were also observed to include distant traffic and nearby wisitfie.
Project 002	20-Jul-19	19:44	00:15:00	91	62	66	72	68	63	100		-	5.0 -	91	NCA01	Day	42	47	71	57	29	24	0	34	ACC - Poject 002. Measurement underhalen at Draile Street. NDW involved a nurber of activities cultined within COMMP-COS along with general construction activities, including use of hand tooks and involvement of whichis and joint within her all contricts. Six-related notices dominated the migrally of measurement with approximately 80-1107s contribution. Estimatous sources were also observed to include distant rail inc., plane, passing car and hailing hydrox.
Project 003	20-Jul-19	20:00	00:15:00	85	48	63	75	68	50	100		-	5.0 -	76	NCA01	Day	42	47	71	57	26	21	-3	19	AD: P Rigids DSI. Measurement underhalen at Danie Brees ADW involved a number of activities cultined within DOWHA-DSI along with general construction activities, including use of hand tooks and revenuent of vehicles and plant within the nat corridor. Sits-related noises dominated the mightly of measurement with approximately 100% contribution. Estimatous sources were also observed to handle nearly within and distinct trainfo.
Project 004	20-Jul-19	20:30	00:15:00	67	47	55	62	59	49	100		-		64	NCA01	Day	42	47	71	57	13	8	-16	7	AGI - Poject DGA. Measurement undertaken all Raliegh Street. MCM involved a number of activities cultimed within COMM4-XGB along with general construction activities, including use of hand took and movement of vehicles and plant within the rule construct. Size-related noises dominated the majority of measurement with approximately 100% contribution. Extraneous sources were also observed to include nearby witefile and wind-blean vegetation.
Project 005	20-Jul-19	20:45	00:15:00	70	47	55	64	59	49	100				69	NCA01	Day	42	47	71	57	13	8	-16	12	AG3 - Reject DIS. Measurement undertaken at Hopetoun Avenue. NON involved a number of activities outlined within COVM-AG3 along with general construction activities, including use of hand took and movement of vehicles and plant within the nal contrict. Size-related noises dominated the majority of measurement with approximately 100% contribution. Exhancous sources were also observed to include nearby witefile and wind-blevin vegetation.
Project 006	20-Jul-19	22:00	00:15:00	70	46	51	59	53	47	100		-	5.0 -	69	NCA01	Day	42	47	58	57	14	9	-3	12	AO4 - Paject D06. Measurement undertaken at Hapeton Avenue. NON involved a number of activities outlined within COVM-A COSI along with general construction activities, including use of hand tools and movement of virebics and plant within the nat constant. Site-related noises dominated the majority of measurement with approximately 100% contribution. Extransous sources were also observed to include distant traffic and nearby wildlife.
Project 007	20-Jul-19	22:15	00:15:00	69	45	53	64	55	47	100		-	-	69	NCA01	Day	42	47	58	57	11	6	-5	12	AG4 - Reject D07. Measurement undertaken at Hopetoun Avenue. NOW involved a number of activities outlined within COWRH-208 along with general construction activities, including use of hand took and movement of vehicles and plant within the rall contrict. Site-related noises dominated the majority of measurement with approximately 100% contribution. Extraneous sources were also observed to include distant traffic and nearby wildfile.
Project 008	20-Jul-19	22:45	00:15:00	80	50	67	75	72	51	100		-	5.0 -	80	NCA01	Day	42	47	71	57	30	25	1	23	AG2 - Reject DG8. Measurement undertaken at Dasle Street, NZW involved a number of activities outlined within DONNH-AG3 slong with general construction activities, including use of head tools and movement of vehicles and plant within the rail contrior. Site-related noises dominated the might yill measurement with approximately 100% contribution. Estranous sources were also observed to include distant staffic.
Project 009	20-Jul-19	23:00	00:15:00	82	54	68	76	74	58	90		-		78	NCA01	Day	42	47	71	57	25	20	-4	21	AGZ - Roject DGR. Measurement undertaken at Drake Street NDW involved a number of activities outlined within CONHA-CGB along with general construction activities, including use of hand tools and movement of vehicles and plant within the rail contrior. Site-related noises dominated the majority of measurement with approximately 100% contribution. Estameous sources were also observed to include distant staffic.
Project 010	20-Jul-19	23:45	00:15:00	74	47	63	73	69	49	100		-		73	NCA01	Evening	41	46	69	56	22	17	-6	17	AO4 - Reject 010. Measurement undertaken at Hispotoun Avenue. NOW involved a number of activities outlined within COWHA-028 along with general construction activities, including use of hand took and movement of vehicles and plant within the rall contrict. Site-related noises dominated the majority of measurement with approximately 100% contribution. Extraneous sources were also observed to include distant traffic and nearby wildfile.
Project 011	21-Jul-19	00:01	00:15:00	67	46	50	56	51	47	100		-	5.0 -	67	NCA01	Evening	41	46	69	56	14	9	-14	11	AO4 - Reject 011. Measurement undertaken at Hispetoun Avenue. NOW involved a number of activities outlined within COMPA-028 along with general construction activities, including use of hand took and movement of vehicles and plant within the rist control. Site-related noises dominated the majority of measurement with approximately 100% contribution. Extraneous sources were also observed to include distant traffic and nearby wildfile.
Project 012	21-Jul-19	00:30	00:15:00	59	43	46	52	47	45	5				47	NCA01	Evening	41	46	53	56	-8	-13	-20	-9	A01 - Roject 012. Measurement undertaken at Berkeley Court. NOW involved a number of activities cultimed within OOWH-003 along with general construction activities, including use of hand took and movement of vehicles and plant within the rist control. Sibe-related noises were minimal and contributed to approximately this of the measured LAop, Estransous noise sources dominated the measurement and included. Outsew ood dive site works, distant staffs and width.
Project 013	21-Jul-19	00:45	00:15:00	62	44	47	53	50	45	30		-		61	NCA01	Evening	41	46	53	56	1	-4	-11	5	A01 - Reject 013. Measurement undertaken at Berkeley Court. NON involved a number of activities outlined within COMH-0-03 along with general construction activities, including use of hand took and movement of vehicles and plant within the rist construct. Size-related noises were minimal and contributed to approximately 30% of the measured LAeq. Bit areason noise sources dominated the measurement and included. Outlow out dive size works and distart traffic.
Project 014	21-Jul-19	01:00	00:15:00	62	44	47	53	49	46	50		-		52	NCA01	Evening	41	46	53	56	3	-2	-9	-4	AD1 - Roged D14. Measurement undertaken at Berkeley Court. NOV involved a number of activities outled within COMHA-003 along with general construction activities, including use of hand tools and movement of vehicles and plant within the risk corrisk. Size-relation noises contributed to approximately 50% of the measured LAeq, Bithaneous noise sources were observed, and included Chabevood dive size works, nearby wittle and distant traffic.
Project 015	21-Jul-19	01:30	00:15:00	66	46	50	58	52	47	100				61	NCA01	Evening	41	46	58	56	9	4	-8	5	A04 - Reject 015. Measurement undertaken all Hipotous A venue. NOW involved a number of activities outlined within COWHA-028 along with general construction activities. Including use of hand took and movement of vehicles and plant within the rist constant. Site-related noises dominated the majority of measurement with approximately 100% contribution. Extransous sources were also observed to include distant traffic and wildfile.
Project 016	21-Jul-19	01:45	00:15:00	63	44	48	56	50	46	100		-		58	NCA01	Evening	41	46	58	56	7	2	-10	2	AD4 - Reject 016. Measurement undertaken all Hipotous A venue. NOW involved a number of activities outlined within COMPA-028 along with general construction activities. Including use of hand tools and movement of vehicles and plant within the rail corridor. Site-related noises dominated the majority of measurement with approximately 100% contribution. Extransous sources were also observed to include distant traffic.
Project 017	21-Jul-19	02:01	00:15:00	72	45	52	58	54	47	100				71	NCA01	Evening	41	46	58	56	11	6	-7	15	AD4 - Project 017. Measurement undertaken at Hepetoun A venue. NOW involved a number of activities outlined within COMPA-028 along with general construction activities, including use of hand tools and movement of vehicles and part within the rail constart. Sits-related noises dominated the majority of measurement with approximately 100% contribution. Extransous sources were also deserved to include distant traffic and widefit.
Project 018	21-Jul-19	03:00	00:06:53	63	44	48	56	49	46	70	46	-		49	NCA01	Evening	41	46	58	56	5	0	-12	-7	AD4 - Roject 018. Measurement undertaken all Repistions Avenue. NOW involved a number of activities outlined within COMP4-028 along with general construction activities, holiding use of hand tools and movement of vehicles and plant within the rial corridor. Site-related noises dominated the majority of measurement with approximately 100% contribution. Extransous sources were also dosewed to include nearby w lidfle.

File Nume	Date	Start Time	Bapsed Time	LAFmax	LAFmin	LAeq	LAP1.0	LAF10.0	LAP90.0	Percentage Site Contribution (%)	Measured Site Noise Level - L.Aeq, 15minute	Impuisive Modifying Factor?	Tonal Modifying Factor? LF Modifying Factor?	Measured Site Noise Level - L. Amax	NCA	Period	RBL - L A90, Period	NWAL. - L.Aeq. 15 minute	Predicted Ste Noise Lovel - LAsq. 15minute	Steep Disturban os Screening Level - L.Amax	Comparison to RB L - LA99, Period	Comparison to NML - L.Aeq, 15 minute	Comparison to Predicted Ste Noise Lovel - L.Aeq, 18minute	Comparison to Skep Disturbance Screening Level- LAmax	- Bescripton
Project 019	21-Jul-19	03:29	00:15:00	73	47	52	59	53	48	100		-	- -	72	NCA01	Night	35	40	53	50	17	12	-1	22	A01 - Reject 019. Measurement undertaken all Berkeley, NOV involved a number of activities outlined within COMHA-028 along with general construction activities, including use of hand tools and movement of vehicles and plant within the rail contrict. Ste-related noises dominated the majority of measurement with approximately 700% contribution. Estraneous sources were observed to include Chatter code diversities works, distant raftic and nearby widiffely institution, regulation.
Project 020	21-Jul-19	03:45	00:15:00	74	47	54	65	54	48	100		-		73	NCA01	Night	35	40	58	50	19	14	4	23	AG4 - Roject 000, Measurement undertaken at Expetion Avenue. NOW involved a number of activities collined within COWHA-028 along with general construction activities, including use of hand stock and movement of vehicles and joint within the rall contact. Ste-related noises dominated the majority of measurement with approximately 100% contribution. Extraneous sources were also observed to include nearby willfuller and distant traffic.
Project 021	21-Jul-19	16:00	00:15:00	79	45	51	58	52	47	30		-	- -	53	NCA01	Night	35	40	51	50	11	6	-5	3	Ad5 - Poject IZ1. Measurement undertaken at Chapman Avenue. NCM involved a number of activities cultified within COVAHA-028 along with general construction activities, including use of hand tools and movement of velocities and plant within the rail contrior. Site-related noises contributed to approximately 20% of the overall LAng. Extraoous sources were dominant and included nearby people in Challes and Old visible and distant surface.
Project 022	21-Jul-19	16:15	00:15:00	71	46	55	64	57	49	50		-	- -	63	NCA01	Night	35	40	51	50	16	11	0	13	Ad5 - Poject 122: Measurement undertaken at Chapman Avenue. NCM involved a number of activities cultified within COVAHA-028 along with general construction activities, including use of hand tools and movement of velocies and plant within the rail contrior. Site-related noises contributed to approximately 50% of the overall LAng. Estimatous sources were observed and included nearby people in Challes and CoVAHA-028.
Project 023	21-Jul-19	16:30	00:15:00	72	47	55	65	56	50	40		-	- -	59	NCA01	Day	42	47	51	57	9	4	0	2	A55 - Poject IZSI. Measurement undertaken at Chapmen Avenue MCM involved a number of activities cultified within COVAHA-USB along with general construction activities, including use of hand tools and movement of velocities and plant within the rail constore. Site-related noises contributed to approximately 45% of the overall Likey. Extraosus sources were dominant and included nearby people in Otalism and CoVAHA-USB along with people in Otalism and CoVAHA-USB along with great and covaHA-USB along with great people in Otalism and CoVAHA-USB a
Project 024	21-Jul-19	17:00	00:15:00	71	45	51	58	54	48	30		-	- -	57	NCA01	Day	42	47	53	57	4	-1	-7	0	Ad1 - Roger (204. Measurement undertaken all Berkeley Court NON1 involved a number of addrises unlined within COMH4-028 along with general construction advises, including use of hand took and movement of vehicles and joint within the rall contract. Size-existed noises contributed to approximately 20% of the overall measured LAeq. Extransous sources durinated the measurement and included Chatter code on the code of the code
Project 025	21-Jul-19	17:15	00:15:00	63	44	50	56	53	47	10		-		54	NCA01	Day	42	47	53	57	-2	-7	-13	-3	Add 1- Roject IZS. Measurement undertaken at Barkeley Court. NON involved a number of activities unifixed within CNMH-ACIS along with general construction achieties, including use of hand took and movement of vehicles and plant within the rail contract. Size-obtaind noises contributed to approximately 10% of the overall measured LiArq. Extransous sources dominated the measurement and included Chatter code of the size works, distant traffic and aemplane movement, readily will life and wind-blown vegetation.
Project 026	21-Jul-19	17:45	00:15:00	73	46	53	61	56	48	100		-		72	NCA01	Day	42	47	53	57	11	6	0	15	A65 - Poject D55. Measurement undertaken at Contron Aversum. MDV involved a number of activities outlined within 000H94-028 along with general construction activities, including use of hand tools and movement of vivinicies and plant within the nat control. Site-related noises dominated the majorly of measurement with approximately 60-100% contribution. Extraneous sources were observed to include board start furtific, local traffic, wind blown vegetation, belts and a plane.
Project 027	21-Jul-19	18:00	00:15:00	69	46	55	63	58	49	100		-		68	NCA01	Day	42	47	53	57	13	8	2	11	AID - Rogect 227: Measurement undertaken all Rollegh Street. MOW troubved a number of activities cultimed within COMHA-023 along with general construction activities, including use of hand tools and movement of vehicles and joint within the rail consider. Site-related noises dominated the majority of measurement with approximately 100% contribution. Enhanceus sources were observed to include distant traffic and nearby wildfile.
Project 028	21-Jul-19	18:15	00:15:00	74	46	54	62	57	49	100		-	5.0 -	73	NCA01	Day	42	47	53	57	17	12	6	16	AD3 - Roged D2B. Measurement undertaken all Religin) Street. MOVI involved a number of activities cultimed within COMHA-023 along with general construction activities, including use of hand tools and movement of viricinis and plant within the rial constor. Site-related noises dominated the majority of measurement with approximately 100% contribution. Enhanceus sources were observed to include distant traffic, wind-blave in vegetation and nearby widefic.
Project 029	21-Jul-19	18:45	00:15:00	82	48	56	62	58	51	100		-		82	NCA01	Day	42	47	61	57	14	9	-5	25	AD3 - Roged 1293. Measurement undertaken all Reliegh Street. MOW involved a number of activities cultimed within COMHA-023 along with general construction activities, including use of hand tools and movement of vehicles and joint within the rall contrict. Site-reliated noises dominated the majority of measurement with approximately 100% contribution. Enhanceus sources were observed to include distant traffic and aeropiane movements, wind-blow regulation and nearity wildle.
Project 030	21-Jul-19	19:00	00:15:00	85	49	58	68	60	51	100		-		84	NCA01	Day	42	47	61	57	16	11	-3	27	AGZ - Poject 109. Measurement undertaken at Drake Bross. MOV involved a number of activities cultivide of all one OOVMM-AGS along with general construction activities. Including use of band tacks and movement of vehicles and plant within the rail corridor. Sits-related noises dominated the majority of measurement with approximately 100% contribution. Extransous sources were also observed to include detaint sufficient or facility wilder.
Project 031	21-Jul-19	19:16	00:15:00	71	48	54	64	57	49	100			5.0 -	69	NCA01	Day	42	47	61	57	17	12	-2	12	ACC - Rogert DST. Measurement undertaken at Drake Street, MCW invoked a number of activities cuttled or silved and minor COMM-LOSI along with general construction activities, including use of hand took and movement of vehicles and plant within the rad corridor. Site-related noises dominated the majority of measurement with approximately 100% contribution. Extransous sources were also observed to include detart staffic and nearby widtle.
Project 032	21-Jul-19	19:32	00:15:00	81	49	58	69	59	50	100				80	NCA01	Day	42	47	61	57	16	11	-4	23	AGZ - Rogect 1932. Measurement undertaken at Drake Street, MCW invoked a number of activities cuttled or similar COMMH-028 along with general construction activities, including use of hand took and movement of vehicles and plant within the rat contrict. She related noises dominated the majority of measurement with approximately 100% contribution. Bit amount sources were also observed to include detart staff can disorption movements, and nearby wildfile.
Project 033	21-Jul-19	20:00	00:15:00	63	43	50	58	53	46	100				62	NCA01	Day	42	47	52	57	8	3	-2	5	A22 - Rogect 233. Measurement undertaken at Drake Street. NOW invoked a number of activities cuttined within CONMH-028 along with general construction activities. Psclading use of hand took and movement of vehicles and plant within the rat contrict. She related noises dominated the majority of measurement with approximately 100% contribution. Extransous sources were also observed to include detart staffs, nearby people and nearby widtle.
Project 034	21-Jul-19	20:15	00:15:00	65	44	52	58	54	48	100		-		65	NCA01	Day	42	47	52	57	10	5	0	8	ACI - Roget DIA Measurement undertaken at Religif) Street. MOW involved a number of activities cultimed within COMHA-023 along with general construction activities, including use of hand stocks and movement of vehicles and just or within the rial constant. Site reliabled noises downtailed the majority of measurement with approximately 100% contribution. Enhanceus sources were observed to include distant traffic and persplane movements, and nearby wildle.
Project 035	21-Jul-19	20:45	00:15:00	71	51	55	62	58	53	100	60	-	5.0 -	71	NCA01	Day	42	47	61	57	18	13	4	14	AG3 - Regist CISS. Measurement undestalen all Religish Street. NOV involved a number of activities cultimed within COVHH-QIS along with general construction activities, including use of hand tooks and movement of vehicles and joint within the risk control. Site-related noises dominated the majority of measurement with approximately 100% contribution. Ethalmeous sources were observed to include distant staffs and aeropiane movements, and nearby wildfis.

Neather 20-21 July 2019: Generally fine weather, low-cloud coverage with calm winds. Temperature ranged between 9-21 degrees Celsius over the monitoring periods

tote: Low frequency, treatly and impulsive noise basts were conducted in accordance with the PP. The measured Leg data was applied in all cases. Modifying factor (penalty) values were applied as applicable to the low frequency, broal or impulsive components detectable or attributable to the sites noise emission. The site noise contribution reported here is inclusive of all modifying factors (if applicable





Appendix F – Monitoring Report (RP35b)

Vibration Monitoring – OOHW P7: WE03 - 20 to 21 July 2019

ENVIRONMENTAL RESOURCES MANAGEMENT AUSTRALIA PTY LTD

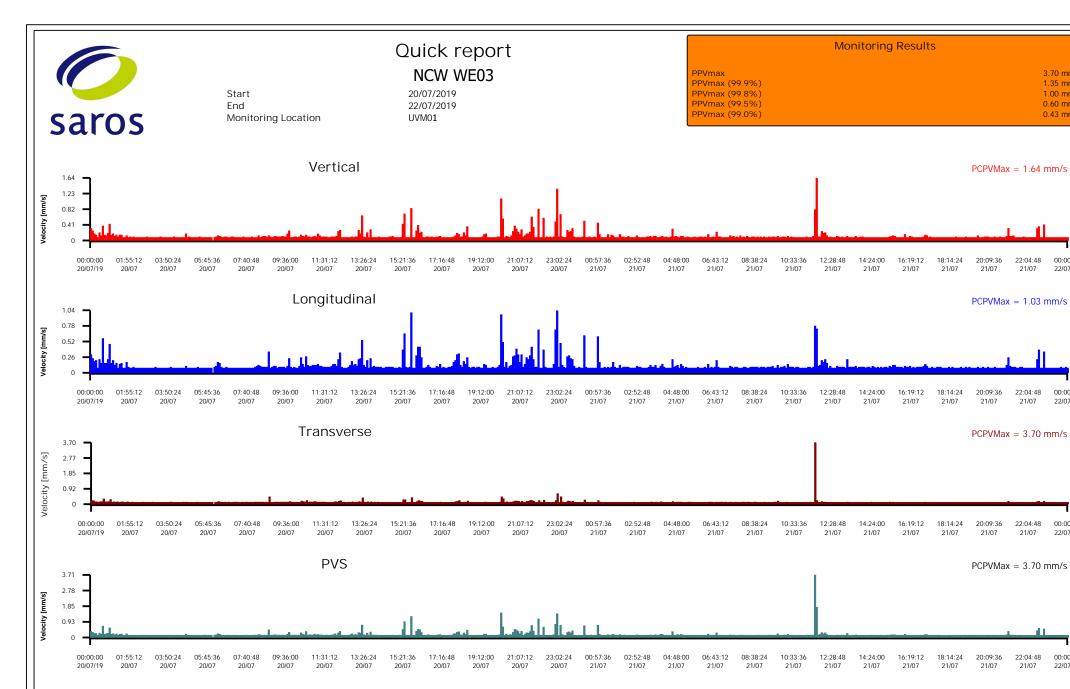
ERM: Level 15, 309 Kent Street Sydney, NSW 2000. T: (02) 8584 8888. F: (02) 8584 8800. www.erm.com



Figure A1.0 – OOHW WE03 – Unattended Vibration Monitoring Locations

- NCW P7 (Saturday, 20 July to Sunday, 21 July 2019)





saros

Copyright 2014 - Saros (International) Pty Ltd; ABN 76 160 599 244; P.O. Box 2079, Milton, QLD 4064 Telephone +61 7 3367 3400: Facsimile +61 7 3367 3844

Printed: 24/07/2019 13:01:32

3.70 mm/s

1.35 mm/s

1.00 mm/s

0.60 mm/s

0.43 mm/s

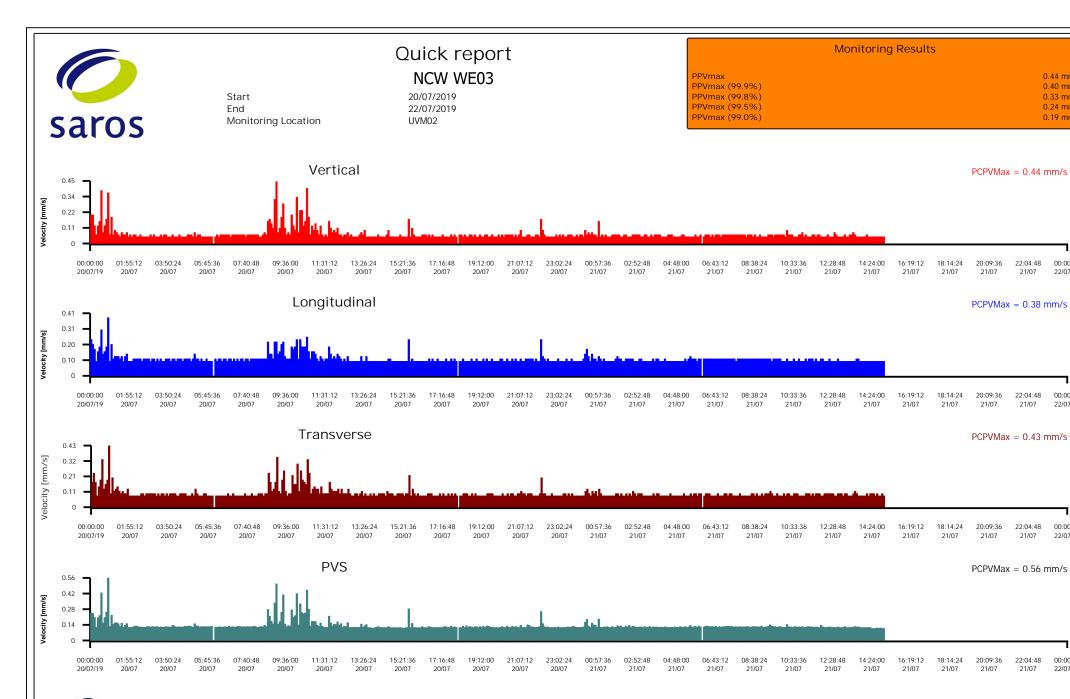
00:00:00

22/07/19

00:00:00

22/07/19

00:00:00



Copyright 2014 - Saros (International) Pty Ltd; ABN 76 160 599 244; P.O. Box 2079, Milton, QLD 4064 Telephone +61 7 3367 3400: Facsimile +61 7 3367 3844

saros

Printed: 24/07/2019 13:01:31

0.44 mm/s

0.40 mm/s

0.33 mm/s

0.24 mm/s

0.19 mm/s

00:00:00

00:00:00

00:00:00



Event Report

Histogram Start Time 14:23:58 July 18, 2019 Histogram Finish Time 12:47:39 July 23, 2019 Number of Intervals Range Geo:254.0 mm/s Sample Rate 1024sps

7103.68 at 1 minute

Operator/Setup: Operator/NCW.MMB Serial Number UM14423 V 10-89 Micromate ISEE

Battery Level 3.8 Volts

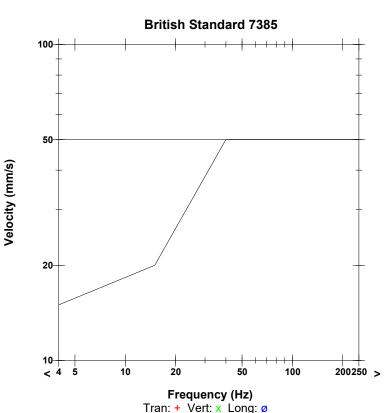
File Name

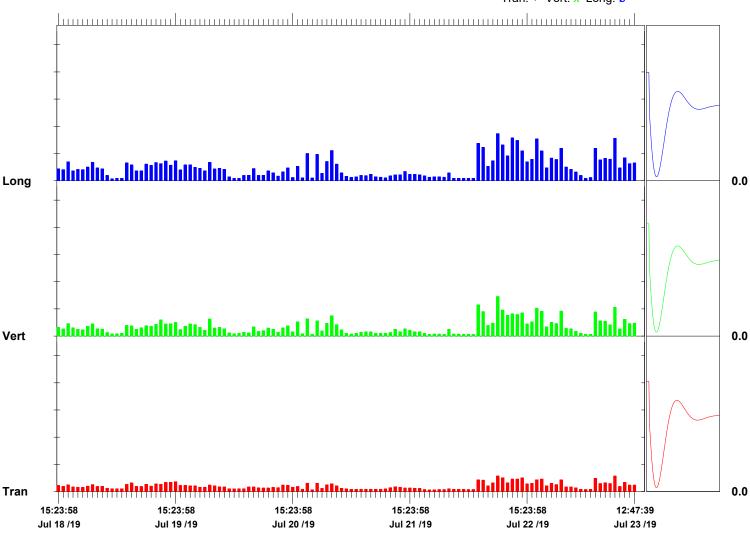
Unit Calibration December 7, 2018 by Instantel UM14423_20190718142358.IDFH

Notes

Tran Vert Long PPV 0.567 1.450 1.726 mm/s ZC Freq 47 51 47 Hz Date Jul 22 /19 Jul 22 /19 Jul 22 /19 Time 08:35:58 08:35:58 08:35:58 **Sensor Check** Passed Passed Passed Frequency 7.5 7.3 7.3 Hz 4.2 **Overswing Ratio** 4.5 4.8

Peak Vector Sum 2.194 mm/s on July 22, 2019 at 08:35:58





Time Scale: 1 hour /div Amplitude Scale: Geo: 1.000 mm/s/div

Appendix G – Monitoring Report (RP36)

Noise Monitoring – OOHW P7: MW04 - 29 July to 2 August 2019

ERM: Level 15, 309 Kent Street Sydney, NSW 2000. T: (02) 8584 8888. F: (02) 8584 8800. www.erm.com



Figure A1.0 – OOHW MW04 – Attended and Unattended Noise Monitoring Locations

- NCW P7 (Monday, 29 July to Friday, 2 August 2019)



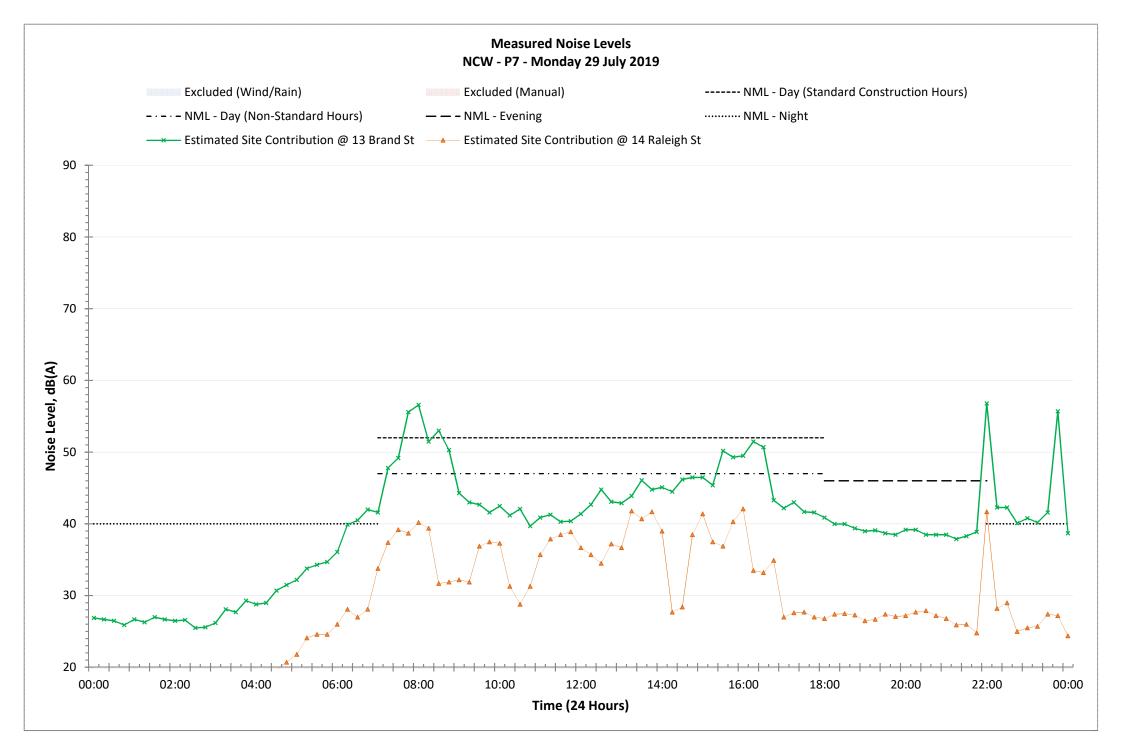
File Name	Date	Start Time	Elapsed Time	LAFmax	LAFmin	LAcq LAF1.	LAF10.0	LAF90.0	Percentage Sile Contribution (%)	Measured Site Noise Level - LAeq, 15minuse	Impulsive Modifying Factor? Tonal Modifying Factor?	LF Modifying Factor?	Measured Ste Noise Level - LAmax	NGA	Location	Period	RBL - LAS), Period	NAC. - LAeq, 15 minute	Predicted Site Noise Level - LAcq., 15m inute	Sleep Disturbance Screening Level - LAmax	Comparison to RBL - LASO, Period	Comparison to NML - LA eq. 15 minute	Compasison to Predicted Site Noise Level - LAcq., Heninute	Companison to Steep Disturbance Screening Level - LAmax	Description
Project 001	29-Jul-19	22:45	00:15:00	82	38	55 62	56	49	50		0.0 0.0	0.0	79	NCA01	L01	Night	47	52	57	62	5	0	-5	17	Lo1 - Project 00 1-002. Measurements undertaken outdisk 10 Banned Street agantements along Valetta Lane. ACVI innohed a number of activities outlined wilten OCHMA-029 along with general control of control of the cont
Project 002	29-Jul-19	23:00	00:15:00	71	38	51 60	55	41	50		0.0 0.0	0.0	70	NCAD1		Night	47	52	57	62	1	4	-9	8	-construction activities, including use of hard tooks and movement of whickes and plant within the nat corridor. Site-related noises contributed to approximately 50% of the overall Leq. Extraveous sources were observed to include distant and nearby fraffic, and light rain.
Project 003	29-Jul-19	23:30	00:15:00	79	36	59 70	64	39	50		0.0 0.0	0.0	70	NCAD1	L02	Night	47	52	52	62	9	4	4	8	LG2 - Project 003-004. Measurements undertaken at 12 Drake Street. NCW Involved a number of authorities cultimod within COHMA-029 along with general coorduction activities, including use— —of have tooks and movement of vehicles and plant within the rail control. Site-related noises combidated to approximately 50°W of the measured Leq over the measurements. Extraosco.
Project 004	29-Jul-19	23:45	00:15:00	62	35	44 54	48	37	50		0.0 0.0	0.0	55	NCAD1		Night	47	52	52	62	-6	-11	-11	-7	-or hado toos and movement of venous are part ween the fact control. Sub-related noises communate to approximately suff- or the measurest Leq over the measurement. Extradeous sources were observed to include light rain, and distant and focul traffic.
Project 005	30-Jul-19	00:15	00:15:00	76	44	54 70	49	45	12		0.0 0.0	0.0	57	NCAD1	L03	Night	47	52	48	62	-2	-7	-3	-5	LO3 - Project 055. Measurement undertaken at 14 Hawkins Sheet. NCW involved a number of adhities outlined within OCHM/ACD3 stop with general construction activities, including use of hand tools and movement of vehicles and plant within the not continue. Sin-related noises were burely auditie and contributed to approximately 17% of the overall Leq. Extransous source dominated the measurement and included delatat and local traffic, passing aeroplanes and nearby wildlife.
Project 006	30-Jul-19	00:45	00:15:00	68	37	42 48	44	39	30		0.0 0.0	0.0	45	NCAD1		Night	47	52	47	62	-10	-15	-10	-17	L04 - Project 005-007. Measurements undertaken at 14 Radegh Street. NCNV Involved a number of advitics outlined within ODHVIA-029 along with general construction advitics, including
Project 007	30-Jul-19	01:00	00:15:00	69	38	42 47	44	40	50		0.0 0.0	0.0	50	NCA01	L04	Night	35	40	47	50	-3	-8	-15	0	—use of hand tools and movement of vehicles and plant within the rail corotice. Site-related noises contributed approximately 30-50% of the overal Leq. Effortness sources generally deministed the measurements and included distant and local traffic.
Project 008	30-Jul-19	02:00	00:15:00	60	50	52 54	53	51	10		0.0 0.0	0.0	52	NCAD1	L05	Night	35	40	55	50	7	2	-13	2	LOS - Project UOE. Measurement undertaken at the western end of Bonkely Court. NCW involved a number of activities outlined within COHWA-202 along with general construction activities, including use of hand tooks and movement of vehicles and plant within the rail contion. Situ-related noises were burely auditive and contributed by approximately 10% of the overall Los, Extravectors sources dominated the measurement and included distant and local traffic and Chulsrecod Other Site works.
Project 009	30-Jul-19	02:30	00:15:00	75	36	58 71	61	38	100		0.0 0.0	0.0	72	NCAD1		Night	35	40	52	50	23	18	6	22	
Project 010	30-Jul-19	02:45	00:15:00	69	35	39 44	40	36	10		0.0 0.0	0.0	40	NCAD1	L02	Night	35	40	52	50	-6	-11	-23	-10	L02 - Project 009-012. Measurements undertaken at Disake Street. NCW involved a number of activities outlined within OCHWA-029 along with general construction activities, including use of
Project 011	30-Jul-19	22:30	00:15:00	73	39	51 62	55	41	50		0.0 0.0	0.0	68	NCAD1		Night	35	40	52	50	13	8	4	18	-mass soon and involvement of tender and paint water for the characteristic state of t
Project 012	30-Jul-19	22:45	00:15:00	73	37	60 68	65	40	30		0.0 0.0	0.0	65	NCAD1		Night	35	40	52	50	20	15	3	15	
Project 013	31-Jul-19	00:30	00:15:00	67	40	55 64	60	43	10		0.0 0.0	0.0	48	NCAD1		Night	35	40	47	50	10	5	-2	-2	
Project 014	31-Jul-19	00:45	00:15:00	69	42	51 59	54	44	20		0.0 0.0	0.0	50	NCA01	L04	Night	35	40	47	50	9	4	-3	0	LO4 - Project 013-016. Measurements undertaken at 14 Ratiojh Street. NOV involved a number of activities outlined within OCHMA-029 along with general construction activities, including law are reported to construction. The construction of the con
Project 015	31-Jul-19	01:45	00:15:00	64	38	43 50	45	40	50		0.0 0.0	0.0	50	NCA01	204	Night	35	40	47	50	5	0	-7	0	use of hard both and movement of vehicles and just within the rall control. Sib-related noises contributed approximately 10-50% of the overall Leg over the measurements. Extransous sources were generally dominant and included distant and local staffs, light rain and heavy rain.
Project 016	31-Jul-19	02:00	00:15:00	62	38	43 52	46	39	50		0.0 0.0	0.0	48	NCAD1		Night	35	40	47	50	5	0	-7	-2	
Project 017	31-Jul-19	02:30	00:15:00	68	35	46 61	42	36	50		0.0 0.0	0.0	60	NCA01	LO2	Night	35	40	52	50	8	3	.9	10	102 - Project 017-018. Measurements understaten all Dania Steet. NCVI involved a number of activities unlined within OCHMA-029 dong with general construction activities, including use of many to act or recommendative ONA of the rureal an exact the measurements. Entoneous our pre-
Project 018	31-Jul-19	02:45	00:14:47	78	34	53 64	56	36	50	49	0.0 0.0	0.0	65	NCAD1		Night	35	40	52	50	14	9	-3	15	hand took and movement of velocities and plant within the sal control. She reliade noises contributed approximately 20% of the overal Laq over the measurements. Extrareous sources were also observed to include light rain, distant and boal failtift, and nearby widtle.

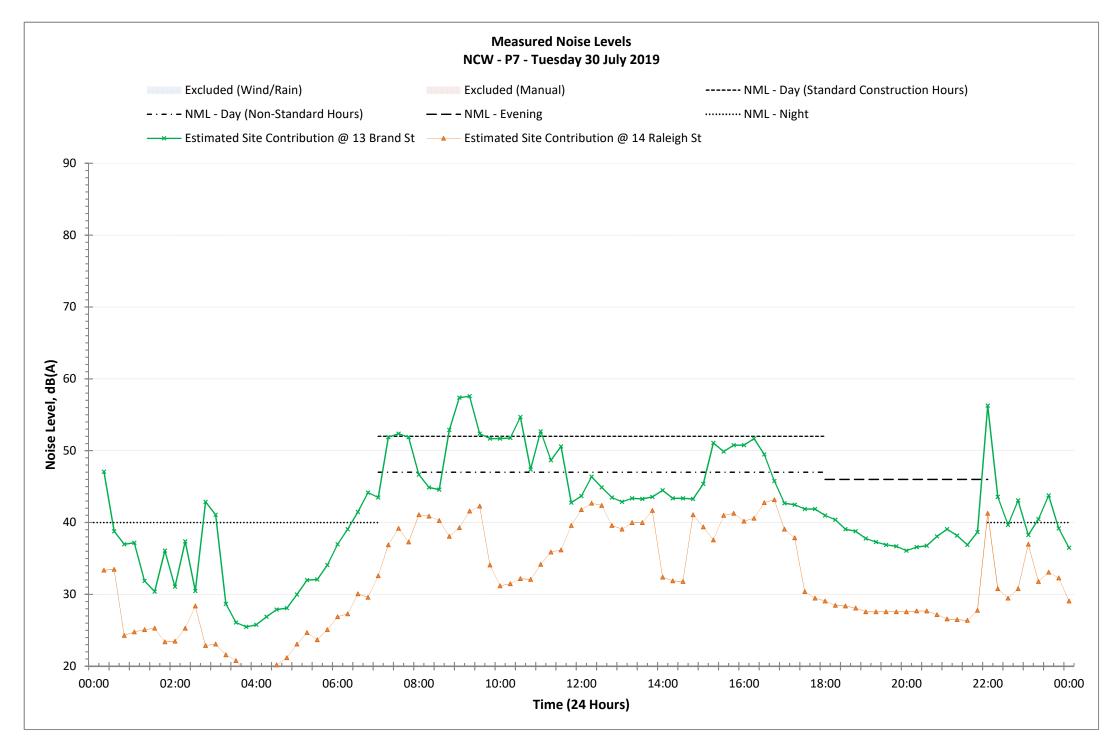
File Name	Date	Start Time	Elapsed Time	LAFmax	LAFmin	LAeq	LAF1.0	LAF10.0	0064by Percentage Site Contribution	Messured Ste Noise Level - LAeq. 15minute	Impulsive Modifying Factor?	Tonal Modifying Factor? LF Modifying Factor?	Measured Ste Noise Level - LAmax	NGA	Location	Period	RBL - LA9), Period	NM. - LAeq. 15minuse	Predicted Site Noise Level - LAeq., 15minute	Sleep Disturbance Screening Level - LAmax	Comparison to RBL - LA 90, Period	Comparison to NML - LAeq, 15 minute	Comparison to Predicted Site Noise Level - LAeq, Yenlinute	Comparison to Steep Disturbance Screening Level - LAmax	Description
Project 019	31-Jul-19	22:15	00:15:00	78	55	65	74	67	57 100	65	0.0	0.0 0.0	75	NCA01		Night	35	40	57	50	30	25	8	25	
Project 020	31-Jul-19	22:30	00:15:00	77	54	65	75	69	57 100	65	0.0	0.0 0.0	75	NCAD1	L01	Night	35	40	57	50	30	25	8	25	IC1 - Project 019-221. Measurements undertaken outside 10 Brand Street apartments along Varieta Lane. NCW involved a number of activities outlined within OCHWA-229 along with generic construction activities, including use of hand took and movement of vehicles and plant within the rail corridor. Site-related noises dominated the measurements at 100% contribution. Extracross sources were observed to include datest and nearby staffic.
Project 021	31-Jul-19	22:45	00:15:00	76	53	63	72	65	55 100	63	0.0	0.0 0.0	73	NCA01		Night	35	40	57	50	28	23	6	23	
Project 022	31-Jul-19	23:15	00:15:00	73	37	55	69	55	40 100	55	0.0	0.0 0.0	72	NCA01		Night	35	40	52	50	20	15	3	22	LG2 - Protect 2022/23, Measurements undertaken at Date Street, NOV Involved a number of activities outlined within OCHMA-029 alono with connect construction activities. Includes use to
Project 023	31-Jul-19	23:30	00:15:00	66	38	48	61	48	39 50	45	0.0	0.0 0.0	65	NCA01	L02	Night	35	40	52	50	10	5	.7	15	102 Project 022023. Measurements understann at Dasks Sheet KIVVI involved a number of absilities outless white OCHMA-029 along with general construction activities, including use of- mand tooks and more of vehicles and part with the neal control. Sheetilest noises contributed approximately 50-1076, of the overall Leg over the measurements. Extraorous sources were also observed to include distinct staffic and road works on Monderay Road.
Project 024	01-Aug-19	00:15	00:15:00	59	38	44	49	46	40 10	34	0.0	0.0 0.0	45	NCAD1	L04	Night	35	40	47	50	A	-6	-13	-5	L04 - Project 024-205. Measurements undertaken at 14 Raleigh Street. NCW involved a number of activities outlined within OCHWA-209 along with general construction activities, including
Project 025	01-Aug-19	00:30	00:15:00	67	40	45	49	47	42 10	35	0.0	0.0 0.0	45	NCAD1	- L04	Night	35	40	47	50	0	-5	-12	-5	—use of hard tools and movement of vehicles and plant within the rail confloir. Sibe-related noises were generally insudable and contributed to approximately 10% of the overall Leg over the measurements. Extraneous sources were generally dominant and included distant and loud traffic, and nearby road works on Movehray Road.
Project 026	01-Aug-19	01:00	00:15:00	65	45	51	54	53	47 50	48	0.0	0.0 0.0	52	NCAD1		Night	35	40	55	50	13	8	-7	2	
Project 027	01-Aug-19	01:15	00:15:00	69	45	49	57	50	46 50	46	0.0	0.0 0.0	59	NCAD1		Night	35	40	55	50	11	6	-9	9	L05 - Project 026-029. Measurements undertaken at the western end of Berkeley Court. NCVV involved a number of admittes outlined within OCHVIA-029 along with general construction
Project 028	01-Aug-19	01:45	00:15:00	70	50	53	57	54	52 80	62	0.0	0.0 0.0	55	NCAD1	L05	Night	35	40	55	50	17	12	-3	5	-activities, including use of hand tools and movement of vehicles and plant within the nall contdor. Site-related noises contributed to approximately 50% of the overall Leq. Estraneous source were observed to include distant and local traffic, and Chatterood Dive Site works.
Project 029	01-Aug-19	02:00	00:15:00	70	50	53	60	54	52 50	50	0.0	0.0 0.0	55	NCAD1		Night	35	40	55	50	15	10	-5	5	
Project 030	01-Aug-19	02:30	00:15:00	65	38	45	52	47	41 100	45	0.0	0.0 0.0	57	NCA01	L04	Night	35	40	47	50	10	5	-2	7	LO4 - Froject 030. Measurement undertaken at 14 Ratiogh Street. NCW involved a number of activities outlined within COHNVA-029 slong with general construction activities, including use of hard tools and involvement of vehicles and plant within the nall conflox. Site-related noises dominated the measurement at 100% contribution. Extraneous sources were observed to include dataset traffic, light rain and nearby widths.
Project 031	01-Aug-19	22:00	00:15:00	76	52	66	74	69	57 100	66	0.0	0.0 0.0	75	NCAD1		Night	35	40	57	50	31	26	9	25	L01 - Project 031-032. Measurements undertaken outside 10 Brand Sheet apartments along Valetta Lane. NCW Involved a number of activities outlined within OCHWA-229 along with general
Project 032	01-Aug-19	22:15	00:15:00	87	55	68	78	73	57 100	68	0.0	0.0 0.0	78	NCAD1	L01	Night	35	40	57	50	33	28	11	28	(cd) - Page (2013/22). Measurements understain outside 10 Brand Steet apartments story Valetta Lane. NCVI Involved a number of activities collected within COHWA-223 shory with greek construction activities. Underlying use of another and movement of valetta and plant within the rail contdor. Site-related noises dominated the measurements at 10%, contribution. Extracoous sources were observed to include distant staffic and passing trans.
Project 033	01-Aug-19	22:45	00:15:00	85	46	62	73	60	50 100	62	0.0	0.0 0.0	85	NCAD1		Night	35	40	55	50	27	22	7	35	
Project 034	01-Aug-19	23:00	00:15:00	81	47	64	77	68	50 100	64	0.0	0.0 0.0	80	NCAD1		Night	35	40	55	50	29	24	9	30	
Project 035	01-Aug-19	23:15	00:15:00	76	49	57	67	59	51 100	57	0.0	0.0 0.0	65	NCAD1	L02	Night	35	40	55	50	22	17	2	15	LC2 - Project 033-037. Measurements undertaken at Drake Street. NCW Involved a number of activities outlined within OCHWA-029 slong with general construction activities, including use of hand tools and movement of vehicles and plant within the rial contact. Sits-related noises dominated the measurements at 100% contribution. Estrateous sources were also observed to include distant, passing trains and nearby Sydney Trains works.
Project 036	01-Aug-19	23:30	00:15:00	66	39	53	62	58	42 100	53	0.0	0.0 0.0	60	NCAD1		Night	35	40	55	50	18	13	-2	10	
Project 037	01-Aug-19	23:45	00:15:00	78	42	60	72	63	44 100	60	0.0	0.0 0.0	75	NCA01		Night	35	40	55	50	25	20	5	25	

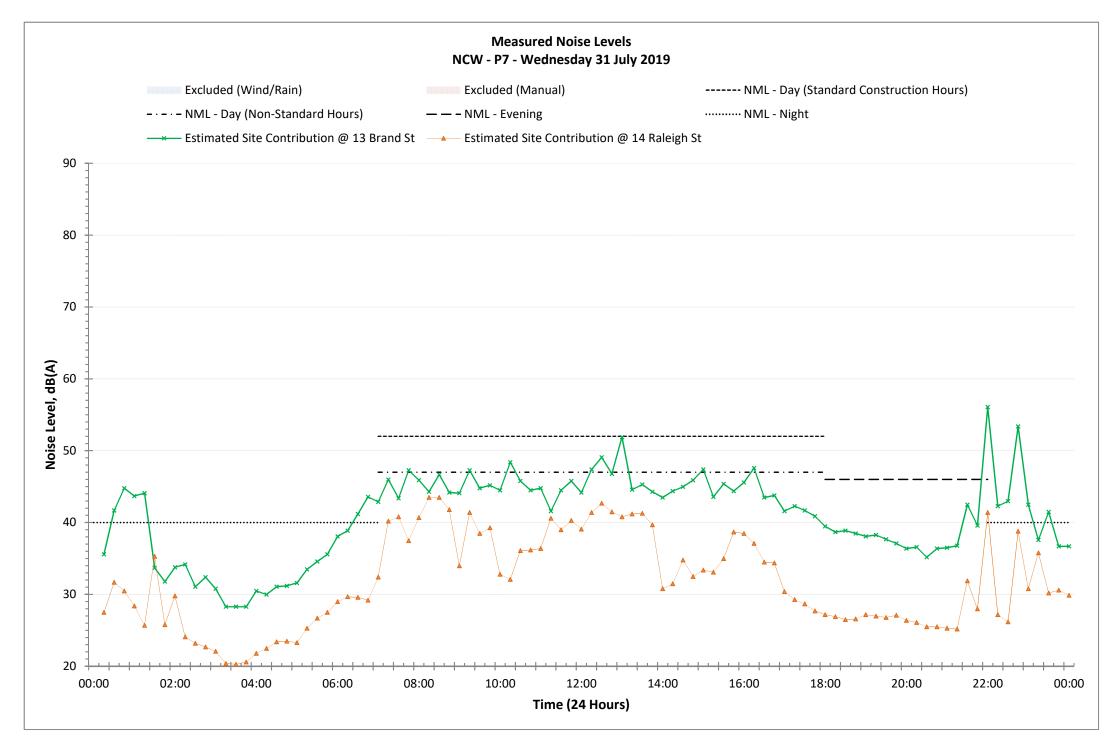
File Name	Date	Start Time	Elapsed Time	LAFmax	LAFmin	LAeq	LAF1.0	LAF10.0	LAF90.0	Percentage Site Contribution (%)	Messured Ste Noise Level - LAcq., 15minute	Impulsive Modifying Factor?	Tonal Modifying Factor? LF Modifying Factor?	Measured Ste Noise Level - LAmax	NGA	Location	Period	RBL - LAS), Period	NM. - LÅeq, 15minute	Predicted Site Noise Level - Libeq , 15minute	Sleep Disturbance Screening Level - LAmax	Companison to RBL	- LA 93, Period Comparison to NML L Aces, 15 minutes	Companison to Predicted	Site Noise Level - LAeq, Yaminute	Comparison to Steep Disturbance Screening Level - LAmax	Osscription
Project 038	02-Aug-19	00:30	00:15:00	61	44	49	53	51	45	1		0.0	0.0	0	NCAD1		Night	35	40	47	50	-6	6 -11	-	-18	-50	LG4 - Project 038-039. Measurements understann at 14 Ralegiji Street. HCVI involved a number of activities outlined within COHMA-039 along with general construction activities, including
Project 039	02-Aug-19	00:45	00:15:00	65	43	47	56	48	45	1		0.0	0.0 0.0	0	NCA01	L04	Night	35	40	47	50	-8	8 -13		-20	-50	use of hand tools and movement of vehicles and plant within the rall control. Site-related noises were inauditie throughout the measurements. Extraneous sources dominated the measurements and included distant, and meetly road works and weldfile.
Project 040	02-Aug-19	01:30	00:15:00	59	50	52	55	53	52	10		0.0	0.0 0.0	53	NCAD1		Night	35	40	55	50	7	7 2	-	-13	3	
Project 041	02-Aug-19	01:45	00:15:00	60	50	52	55	53	51	10		0.0	3.0 0.0	55	NCA01	L05	Night	35	40	55	50	7	7 2	-	-13	5	15. Project 040-042. Measurements understaken at the western end of Berkeley Court. NCW involved a number of activities outlined within COHWA-229 along with general construction activities, including use of hand tools and nonement of vehicles and plant within the all control. Site-related noises were generally insudible and contributed to approximately 15% of the overall tay. Estrancous sources were generally commant and included nearly road works and Chatterood Dive Site works.
Project 042	02-Aug-19	02:00	00:15:00	56	50	52	53	52	51	10		0.0	0.0 0.0	53	NCA01		Night	35	40	55	50	7	7 2	-	-13	3	
Project 043	02-Aug-19	02:30	00:15:00	67	41	44	51	45	42	50		0.0	0.0 0.0	58	NCA01	LO2	Night	35	40	52	50	6	5 1	-	-11	8	LG2 - Project 043-044. Measurements undertaken at Chaile Sheet. NCVI involved a number of activities outlined within OCHMA-029 along with general construction activities. Including use the hand looks and novel who in the construction activities. Producing use the hand looks and proportionally 50-100% of the overall lacy over the measurements. Extraorous
Project 044	02-Aug-19	02:45	00:15:00	82	36	58	71	55	38	100		0.0	0.0	75	NCA01	LUZ	Night	35	40	52	50	23	3 18		6	25	Inter took and involvent of verticals and part within the file control." Such easier noise commoned to approximately survivin, of the overall Leg over the measurement. Extranous control were also observed to include neutry flydlwy Trains works and wildful.

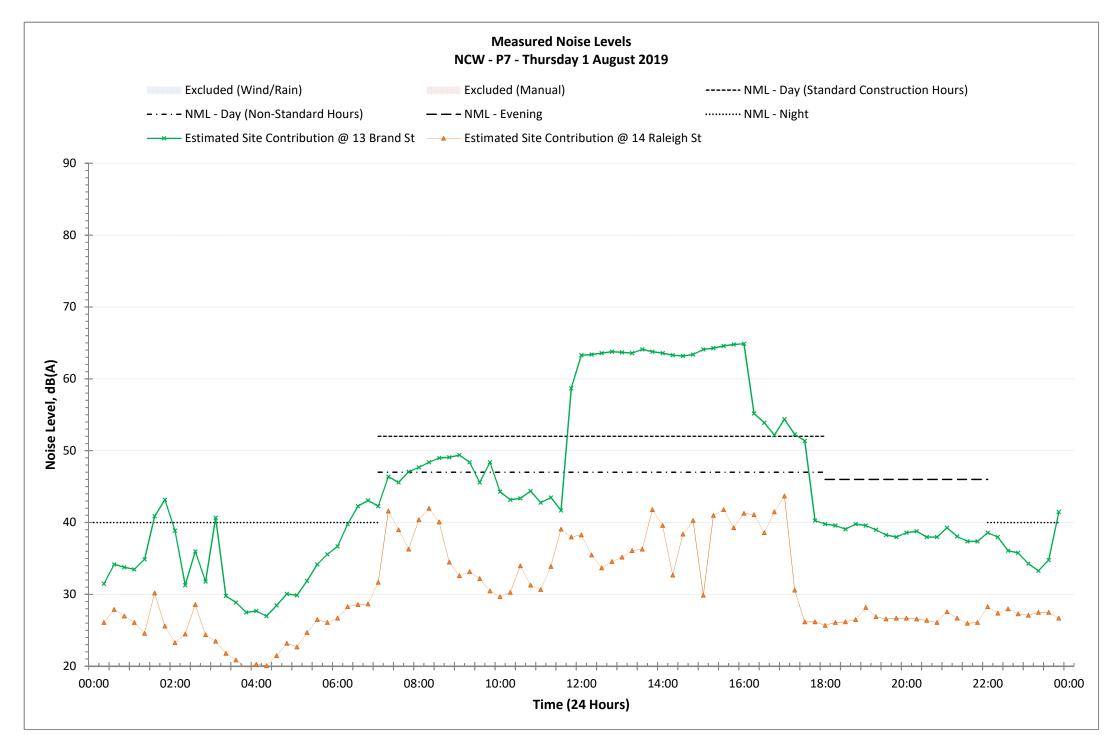
Weather 29 July - 02 August 2019: Generally overcast weather, some extended periods of rain, with calm winds. Temperatures ranged between 9 - 13 degrees Celsius over the monitoring period. Intake, oil president decision pricely users aproximately from the LOP CHEMNA From for this track propriets.

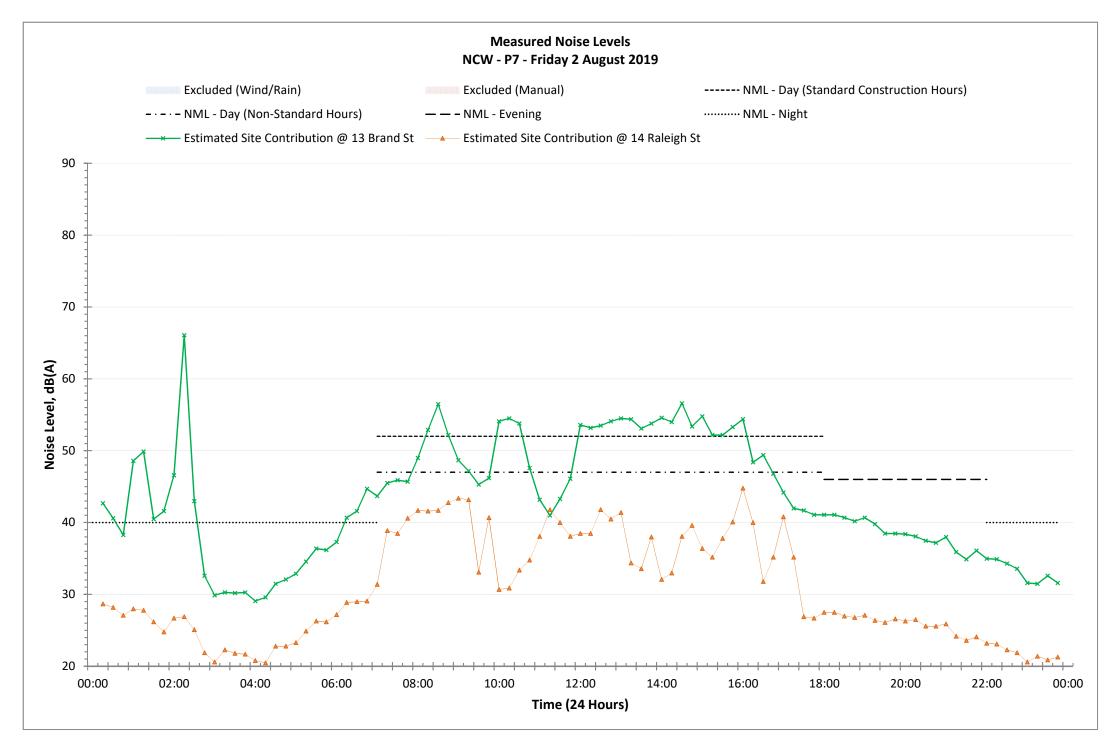
Note: Low frequency, tonality and impulsive noise tests were conducted in accordance with the INP. The measured Leq data was applied in all cases. Modifying factors (if applicable to the low frequency, tonal or impulsive roose tests were conducted in accordance with the INP. The measured Leq data was applied as applicable to the low frequency, tonal or impulsive roose tests were conducted in accordance with the INP. The measured Leq data was applied in all cases.











Appendix H – Monitoring Report (RP37a)

Noise Monitoring - OOHW P7: WE05 - 3 to 4 August 2019



Figure A1.0 – OOHW WE05 – Attended and Unattended Noise Monitoring Locations (Artarmon to Chatswood)

- NCW P7 (Saturday, 3 August and Sunday, 4 August 2019)

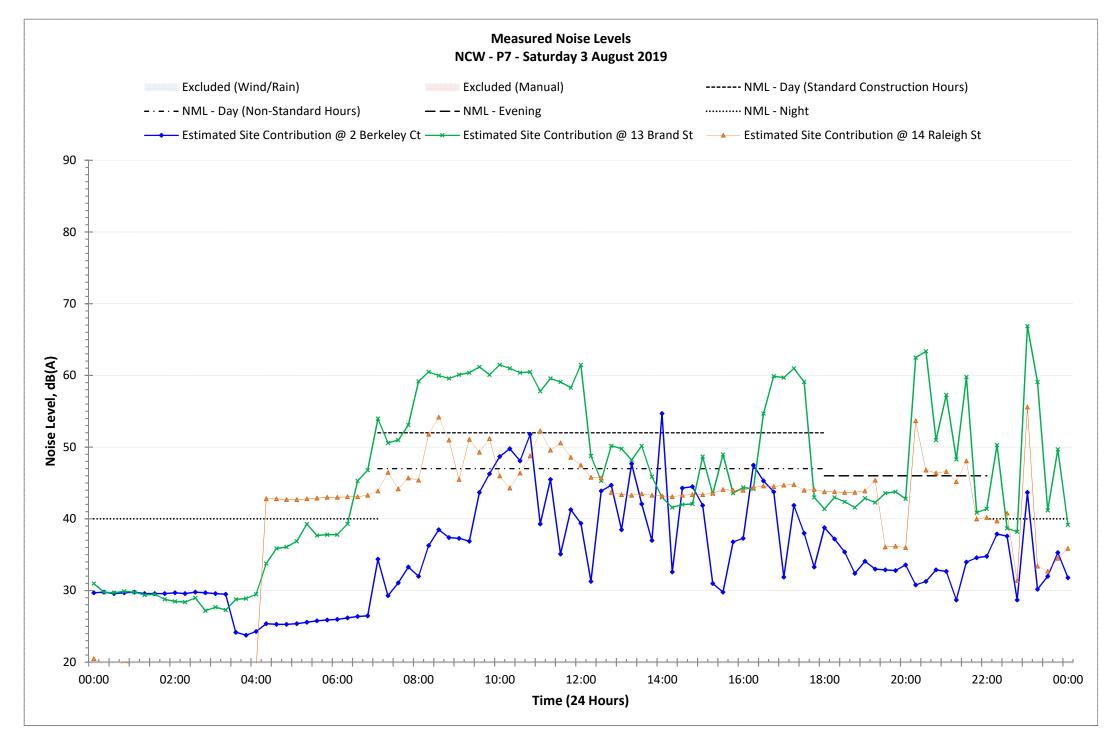


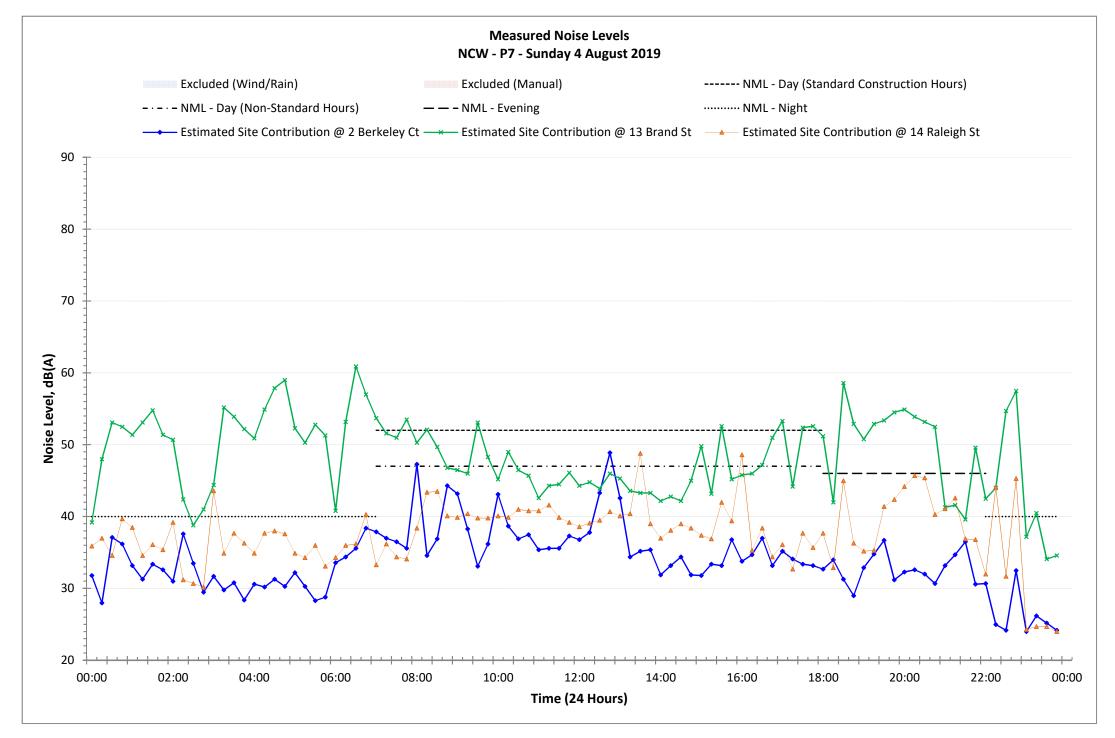
File Nam	e Date	Start Time	Elapsed Time	LAFmax	LAFmin	LAcq LAI	F1.0 LAF10.	0 LAF90.0	Percentage Site Contribution (%)	Measured Ste Noise Level - LAeq, 15minute	Impulsive Modifying Factor?	LF Modifying Factor?	Messured Ste Noise Level - LAmax	NGA	Location	Period	RBL • LASS, Period	N ME. - LA eq. 15 minute	Predicted Site Noise Leval - LAcq., Isminute	Sieep Disturbance Screening Level - LAmax	Companison to RBL - LASD, Period	Comparison to NML - LA 6q, 15 minute	Compasson to Predicted Site Noise Level - LAeq. 15minute	Comparison to Seep Disturbance Screening Level - LAmax	
Project 001	03-Aug-19	16:00	00:15:00	71	51	53 5	5 54	52	100		0.0 2	.0 0.0	55	NCA01	L01	Day	42	47	47	57	13	8	8	-2	L01 - Project 004-002. Measurements undertaken at 12 Date Street, NSW trevleted a number of activities outlined within OCHWA-429 along with general construction activities, including use— —If hard book and movement of whiteles and cards will be in all controls. Sh-reliated noises dominated the majorit of managements with accordinately 05% contribution. Extraneous
Project 002	03-Aug-19	16:15	00:15:00	79	51	56 6	5 57	53	100		0.0 0	.0 0.0	70	NCA01		Day	42	47	47	57	14	9	9	13	—If hard Lobs and movement of vehicles and plant with the rail contact. Site-related noises dominated the majority of measurements with approximately 100% contribution. Extraneous sources were also observed to include distant traffic and widdle.
Project 003	03-Aug-19	16:43	00:15:00	72	52	56 6	4 57	53	100		0.0 0	.0 0.0	64	NCA01		Day	42	47	65	57	14	9	-9	7	
Project 004	03-Aug-19	17:00	00:15:00	72	51	59 6	8 64	52	100		0.0 0	.0 0.0	70	NCA01	L02	Day	42	47	65	57	17	12	-6	13	102 - Project 013-015. Measurements undertaken at 12 Hepetous Avenue. NCM Involved a number of activities cultimed within COMMA-020 abony with general construction activities, including use of hand took and movement of vehicles and plant within the rad control. Size-related noises dominated the majority of measurements with approximately 100% contribution. Distrancess sources were also observed to include delated at and mad faultic, and w folie.
Project 005	03-Aug-19	17:35	00:15:00	66	52	54 5	9 55	53	100		0.0 7	.0 0.0	64	NCA01		Day	42	47	65	57	19	14	-4	7	
Project 006	03-Aug-19	18:55	00:15:00	69	49	53 5	9 54	51	100		0.0 5	.0 0.0	68	NCA01	L03	Evening	42	47	63	57	16	11	-5	11	LG3 - Project 004-007. Measurements undertaken outside 2 Behaley Court. NCW involved a number of activities outlined within OCHMA-029 along with general construction activities.
Project 007	03-Aug-19	19:15	00:15:00	75	49	53 5	i9 54	51	100		0.0 5	.0 0.0	71	NCA01	Lus	Evening	42	47	63	57	16	11	-5	14	
Project 008	03-Aug-19	19:51	00:15:00	67	51	56 6	12 58	53	100		0.0 5	.0 0.0	58	NCA01	L04	Evening	42	47	63	57	19	14	-2	1	LO4 - Project 058. Measurement understates at the eastern end of Gordon Avenue. NOH involved a number of activities outlined within COHMA-229 along with general construction activities, including use of hard took and invo
Project 009	03-Aug-19	20:30	00:15:00	66	55	58 6	11 59	57	100		0.0 0	.0 0.0	63	NCA01	L05	Evening	42	47	52	57	16	11	6	6	LOS - Project 009. Measurement understaten at 14 Releigh Street. NOW involved a number of activities outlined within COMMA-029 along with general construction activities, including use of heard looks and resonant of vehicles and plant within the real control. Site-related noises dominated the measurement with approximately 100% contribution. Estimatous sources were not observed throughout the measurement.
Project 010	03-Aug-19	21:00	00:15:00	78	44	61 7	2 64	46	70		0.0 0	.0 0.0	68	NCA01	L06	Evening	42	47	63	57	17	12	-4	11	LGS - Regisct 195-011. Measurement undertaken at 91 Hamptien Street, Artamon. NSW Involved a number of activities cultimat wittin COHMA-C99 along with general construction activities, —Robulling use of hind blook and movement of vivibiles and plant within the rist control. Sib-related noises dominated the registry of measurements with approximately 70% contribution.
Project 011	03-Aug-19	21:17	00:15:00	88	43	63 7	5 65	46	70		0.0 0	.0 0.0	64	NCA01		Evening	41	46	63	56	20	15	-2	8	-Robusty due to hade took all investment in resides all plant with interface controldecreases notes utilizated in major you introductions with important with a suppose to the second of the second sources were observed to include distant suffic, nearby pedestrians and impation.
Project 012	03-Aug-19	22:09	00:15:00	75	56	63 7	2 64	58	100		0.0 5	.0 0.0	74	NCA01	L05	Nght	41	46	63	56	27	22	5	18	Dis-Project 012. Measurement undertaken at 14 Rakelph Street. NOW involved a number of activities outlined within COHWA-029 along with general construction activities, including use of hard took and movement of vehicle and plant within the rad corridor. Sits-elated noises dominated the measurement with approximately 100% contribution. Estimatous sources were observed throughout the measurement to include passing anticidances.
Project 013	03-Aug-19	22:39	00:15:00	71	47	54 6	6 54	48	100		0.0 0	.0 0.0	70	NCA01	L03	Nght	41	46	63	56	13	8	-9	14	23. Project 013. Measurement undertaken outside 2 Berkeley Court. NCW involved a number of activities outlined within COHMA-023 along with general construction activities, including use of hand books and movement of vehicles and joint within the rail control. Sib-related noises domitated the mightly of measurement with approximately 100% contribution. Estimatous sources were not observed throughout the measurement.
Project 014	03-Aug-19	23:05	00:15:00	88	45	67 8	13 60	47	100		0.0 0	.0 0.0	86	NCA01	L02	Nght	41	46	63	56	26	21	4	30	LC2 - Project 014-015. Measurements undertaken at 12 Hepetoan Avenue. NOW involved a number of activities outlined within COHMM-429 along with general construction activities.
Project 015	03-Aug-19	23:24	00:15:00	73	45	52 6	11 53	48	100		0.0 5	.0 0.0	68	NCA01	502	Night	41	45	63	56	16	11	-6	12	
Project 016	03-Aug-19	23:54	00:15:00	71	44	49 5	7 50	46	100		0.0 5	.0 0.0	55	NCA01	L04	Night	41	45	55	56	13	8	-1	-1	LO4 - Project 01% bleaumement understaten at the eastern end of Gordon Avenue. NOW involved a number of activities outlined within COHWA-209 along with general construction activities, including use of hard table and involvement of vehicles and plant within the risk contribution. Six-related noises dominated the mightly of measurement with approximately 10% contribution. Data secures were also observed to include distant faultic.
Project 017	04-Aug-19	00:16	00:15:00	62	53	54 5	55	54	100		0.0 0	.0 0.0	55	NCA01	L07	Nght	41	45	55	56	13	8	-1	4	LDT - Project 017-018. Measurements undertaken at the eactern end of Nelson Street, cutaids of the TSE Site Cumpound. NCW involved a number of activities outlined within OCHWA-029
Project 018	04-Aug-19	00:35	00:15:00	70	54	59 6	12 61	55	100		0.0 0	.0 0.0	67	NCA01	L07	Nght	41	45	63	56	18	13	-4	11	— large with general construction achildres, including use of hand tools and movement of wholeles and glark within the real contrate. Site-related noises downward the majority of measurements with suppressimally 100% contribution. Estrateous sources were not observed throughout the measurements.
Project 019	04-Aug-19	01:03	00:15:00	65	42	53 6	12 58	44	100	53	0.0 0	.0 0.0	63	NCA01	L04	Nght	41	46	55	56	12	7	-2	7	LOA - Poject 019. Measurement undertaken at the earliers and Gordon Avienue. MOH invoked a number of activities outlined as the COMMA-030 along with general construction activities, including use of hard took and movement of vehicles and graft within the rail corridor. She-related notes dominated the majority of measurement with approximately 100% contribution. Extranscess sources were also observed to include delated self-rel.

File Name	Date	Start Time	Elapsed Time	LAFmax	LAFmin	LAcq	LAF1.0	LAF10.0	LAF90.0	Percentage Sile Contribution (%)	Measured Ste Noise Level - LAeq. 15minute	Impulsive Modifying Factor?	Tonal Modifying Factor? LF Modifying Factor?	Measured Ste Noise Level - LAmax	NCA	Location	Period	RBL - LASO, Period	NM. - LÁeq, 18 minute	Predicted Site Noise Level - LAeq, 15minute	Sleep Disturbance Screening Level - LAmax	Comparison to RBL - LA 90, Period	Comparison to NML - LA eq. 15 minute	Comparison to Predicted Site Noise Level - LAeq. 15minute	Comparison to Steep Disturbance Screening Level - LAmax	Description
Project 020	04-Aug-19	01:27	00:15:00	68	43	57	64	61	44	100		0.0	0.0 0.0	63	NCA01		Nght	35	40	55	50	22	17	2	13	Lt8 - Project 020-021. Measurements undertaken at 9 Hapatoun Avenue. NOW involved a number of activities outlined within COHMA-029 along with general construction activities, including
Project 021	04-Aug-19	01:45	00:15:00	63	42	55	61	60	44	100		0.0	0.0 0.0	62	NCA01	L08	Nght	35	40	55	50	20	15	0	12	—use of hand bols and movement of whiches and paint within the rail control. Site-related noises dominated the majority of measurements with approximately 100% contribution. Extransous sources were not observed throughout the measurements.
Project 022	04-Aug-19	02:15	00:15:00	76	48	63	73	70	49	100		0.0	0.0 0.0	73	NGA01	L02	Night	35	40	63	50	28	23	0	23	LIZ2 - Project (IZZ. Missourement understates at 12 Hapation Avenue NCW involved a number of activities cultimed within CCHMA-IZE2 along with general construction activities, including use of hard tools and movement of vehicles and plant within he rail contider. Site-related noises dominated the majority of measurement with approximately 100% contribution. Estimated associates we en not observed throughout the measurement.
Project 023	04-Aug-19	15:39	00:15:00	76	45	56	64	59	48	40		0.0	0.0 0.0	67	NGA01		Night	35	40	55	50	17	12	-3	17	L03 - Project 023-024. Measurements undertaken odal siz 2 Berkeley Court. NOW involved a number of activities outlined within OOHWA-029 along with general construction activities,
Project 024	04-Aug-19	15:56	00:15:00	67	47	52	58	54	49	50		0.0	2.0 0.0	54	NGA01	L03	Day	42	47	55	57	9	4	-4	-3	Including use of hand tooks and movement of whelea and plant within the rail comfor. Site-related roises contributed to approximately 40-50% of the overall Leq. Entaneous sources were also observed to include distant traffic and nearby widefe.
Project 025	04-Aug-19	16:19	00:15:00	75	50	59	68	61	55	100		0.0	0.0 0.0	65	NCA01		Day	42	47	65	57	17	12	-6	8	L02 - Project 075-005. Measurements undertaken at 12 Hopetous Avenue. NOW involved a number of activities outlined within COHMA-023 along with general construction activities.
Project 026	04-Aug-19	16:35	00:15:00	71	46	57	67	60	48	100		0.0	0.0 0.0	69	NCA01	L02	Day	42	47	65	57	15	10	-8	12	Including use of hand tooks and movement of vehicles and plant within the rall control. Site-related coloses dominated the majority of measurements with approximately 100% contribution. Extransous sources were also observed to include nearby pedestrians and widdle, and apssing aeroplanes.
Project 027	04-Aug-19	17:16	00:15:00	75	48	56	63	59	53	100		0.0	2.0 0.0	66	NGA01		Day	42	47	63	57	16	11	-5	9	LS4 - Project 027-029. Measurements undertaken at the eastern end of Cordon Avenue. NOW involved a number of activities outlined within OCHWA-529 along with general construction
Project 028	04-Aug-19	17:32	00:15:00	75	48	53	61	55	50	100		0.0	2.0 0.0	74	NGA01	L04	Day	42	47	63	57	13	8	-8	17	-activities, recluding use of hand tools and movement of vehicles and plant within the rail contrict. Sits-related noises dominated the majority of measurements with approximately 100% contribution. Extraveous sources were also observed to include nearly wildfle, passing aeroplanes and music.
Project 029	04-Aug-19	17:58	00:15:00	68	54	56	61	57	55	100		0.0	5.0 0.0	63	NCA01	L07	Day	42	47	63	57	19	14	-2	6	To 7- Project IO29. Measurement understaten at the eastern end of Nelson Street, outside of the TSE Sile Compound NOVI involved a number of activities codined within OOH/IA-009 along with general construction activities, recluding use of hand table and innovement of vehicles and just within the rail contrior. Sile-related motes dominated the importy of measurement with approximately 100% contribution. Extransous sources were observed to include passing sengtimes.
Project 030	04-Aug-19	18:26	00:15:00	79	56	62	72	54	57	100		0.0	5.0 0.0	76	NCA01	LO9	Evening	42	47	57	57	25	20	10	19	Lt0 - Project 000-031. Measurements undertaken all outside 10 Band Steed appartments on Validats Lane. NOW involved a number of activities outlined within OOHIVA-020 along with general
Project 031	04-Aug-19	18:43	00:15:00	80	56	64	73	67	59	100		0.0	0.0 0.0	80	NCA01	LOS	Evening	42	47	57	57	22	17	7	23	—construction activities, including use of hard tools and movement of vehicles and plant within the nat control. Sits-related noises dominated the majority of measurements with approximately 100% contribution. Bit amonus sources were observed to include distant traffic and aeroplane movements.

eather 3-4 August 2019: Generally fine weather, low cloud coverage with calm winds. Temperature ranged between 9-18 degrees Celsius over the monitoring periods.

Note: Low frequency, tonally and impulsive notice losts were conducted in accordance with the NPT. The measured Leq data was applied in all cases. Modifying factors (if applicable to the low frequency, tonal or impulsive components detectable or attributable to the sites noise emission. The site noise emission. The site noise emission. The site noise contribution reported here is inclusive of all modifying factors (if applicable





Appendix I – Monitoring Report (RP37b)

Vibration Monitoring – OOHW P7: WE05 - 3 to 4 August 2019



Figure A1.0 – OOHW WE05 – Unattended Vibration Monitoring Locations

- NCW P7 (Saturday, 3 August to Sunday, 4 July 2019)



saros

Start

End

Monitoring Location

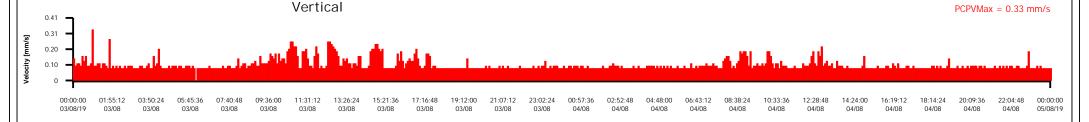
Vibration Report (UVM01)

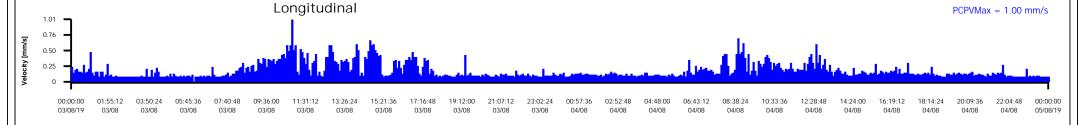
Rail Corridor - Nelson Street

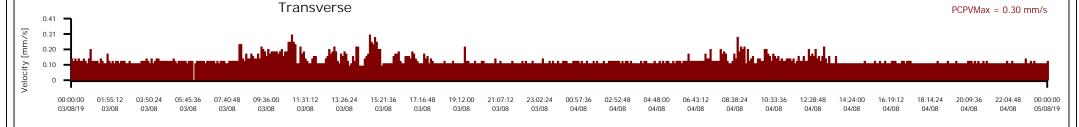
3/08/2019 5/08/2019 UVM01

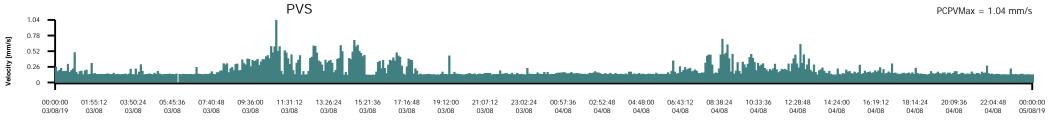
Monitoring Results

PPVmax | 1.00 mm/s
PPVmax (99.9%) | 0.67 mm/s
PPVmax (99.8%) | 0.62 mm/s
PPVmax (99.5%) | 0.59 mm/s
PPVmax (99.0%) | 0.51 mm/s











Copyright 2014 - Saros (International) Pty Ltd; ABN 76 160 599 244; P.O. Box 2079, Milton, QLD 4064 Telephone +61 7 3367 3400; Facsimile +61 7 3367 3844;

Printed: 05/08/2019 13:29:58

Monitoring Results Vibration Report (UVM02) Rail Corridor - Hawkins Street 0.82 mm/s PPVmax (99.9%) 0.54 mm/s 3/08/2019 PPVmax (99.8%) Start 0.46 mm/s 5/08/2019 PPVmax (99.5%) 0.36 mm/s End saros PPVmax (99.0%) 0.25 mm/s Monitoring Location UVM02 Vertical PCPVMax = 0.67 mm/s0.50 Velocity [mm/s] 12:28:48 16:19:12 00:00:00 01:55:12 03:50:24 05:45:36 07:40:48 09:36:00 11:31:12 13:26:24 15:21:36 17:16:48 19:12:00 21:07:12 23:02:24 00:57:36 02:52:48 04:48:00 06:43:12 08:38:24 10:33:36 14:24:00 18:14:24 20:09:36 22:04:48 00:00:00 03/08/19 03/08 03/08 03/08 03/08 03/08 03/08 03/08 03/08 03/08 03/08 03/08 03/08 04/08 04/08 04/08 04/08 04/08 04/08 04/08 04/08 04/08 04/08 04/08 04/08 Longitudinal PCPVMax = 0.82 mm/s00:00:00 01:55:12 03:50:24 05:45:36 07:40:48 09:36:00 11:31:12 13:26:24 15:21:36 17:16:48 19:12:00 21:07:12 23:02:24 00:57:36 02:52:48 04:48:00 06:43:12 08:38:24 10:33:36 12:28:48 14:24:00 16:19:12 18:14:24 20:09:36 22:04:48 00:00:00 04/08 03/08/19 03/08 03/08 03/08 03/08 03/08 03/08 03/08 03/08 03/08 03/08 03/08 03/08 04/08 04/08 04/08 04/08 04/08 04/08 04/08 04/08 04/08 04/08 04/08 Transverse PCPVMax = 0.54 mm/s0.55 Velocity [mm/s] 00:00:00 01:55:12 03:50:24 05:45:36 07:40:48 09:36:00 11:31:12 13:26:24 15:21:36 17:16:48 19:12:00 21:07:12 23:02:24 12:28:48 14:24:00 16:19:12 20:09:36 03/08/19 03/08 03/08 03/08 03/08 03/08 03/08 03/08 04/08 04/08 04/08 04/08 04/08 PVS PCPVMax = 0.98 mm/sVelocity [mm/s] 0.49 00:00:00 01:55:12 03:50:24 05:45:36 07:40:48 09:36:00 17:16:48 21:07:12 00:57:36 16:19:12 11:31:12 13:26:24 15:21:36 19:12:00 23:02:24 02:52:48 04:48:00 06:43:12 08:38:24 10:33:36 12:28:48 14:24:00 18:14:24 20:09:36 22:04:48 00:00:00 03/08/19 03/08 03/08 03/08 03/08 03/08 03/08 03/08 03/08 03/08 03/08 03/08 03/08 04/08 04/08 04/08 04/08 04/08 04/08 04/08 04/08 04/08 04/08 04/08 04/08 05/08/19

Printed: 05/08/2019 13:29:57

Copyright 2014 - Saros (International) Pty Ltd; ABN 76 160 599 244; P.O. Box 2079, Milton, QLD 4064

Telephone +61 7 3367 3400: Facsimile +61 7 3367 3844

saros



Event Report - NCW WE05

Histogram Start Time 13:44:37 August 1, 2019 Histogram Finish Time 09:40:23 August 7, 2019 **Number of Intervals** 8395.78 at 1 minute Geo:254.0 mm/s Range Sample Rate 1024sps

Operator/Setup: Operator/NCW.MMB Serial Number UM14423 V 10-89 Micromate ISEE

Battery Level 3.8 Volts

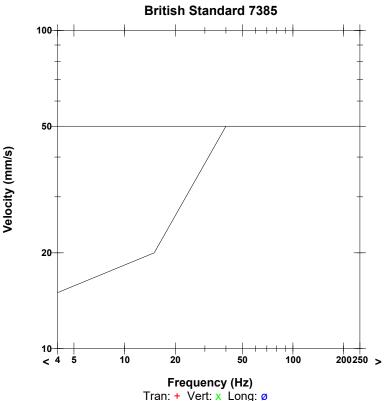
File Name

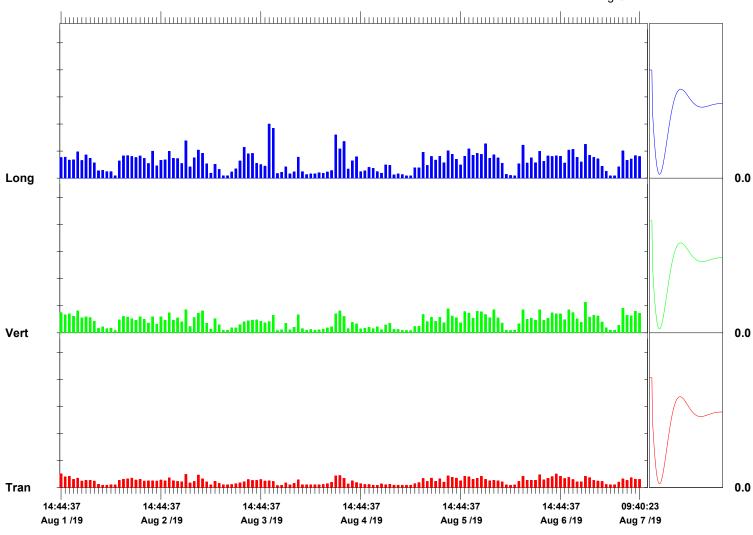
Unit Calibration December 7, 2018 by Instantel UM14423_20190801134437.IDFH

Notes

Long Tran Vert **PPV** 0.504 1.127 1.994 mm/s **ZC Freq** 51 51 >100 Hz Aug 1 /19 Date Aug 6 / 19 Aug 3 / 19 Time 14:05:37 19:48:37 16:43:37 **Sensor Check** Passed Passed Passed Frequency 7.5 7.3 7.3 Hz **Overswing Ratio** 4.2 4.5 4.8

Peak Vector Sum 2.001 mm/s on August 3, 2019 at 16:43:37





Time Scale: 1 hour /div Amplitude Scale: Geo: 1.000 mm/s/div

Sensor Check

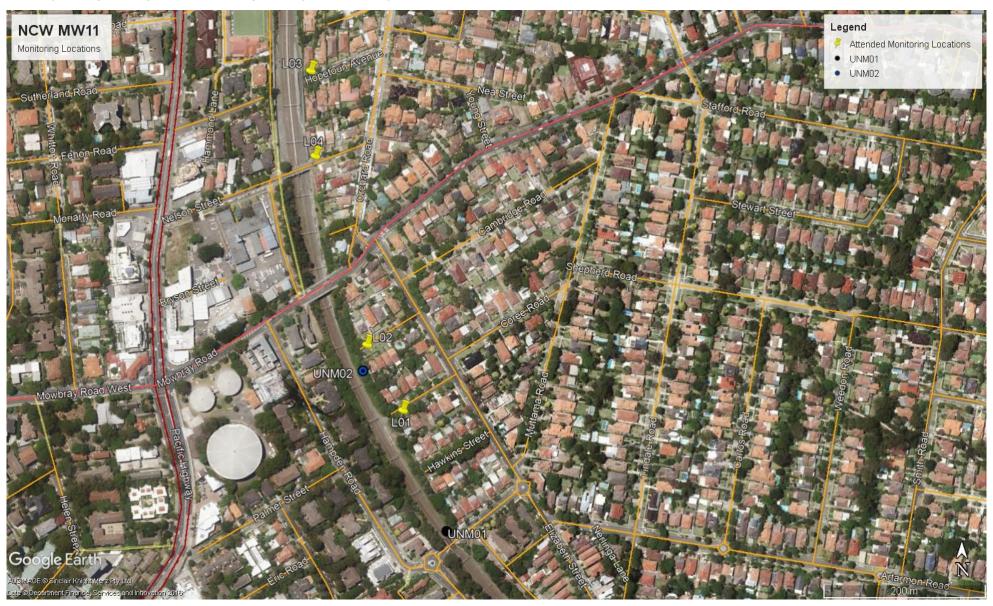
Appendix J – Monitoring Report (RP38)

Noise Monitoring – OOHW P7: MW11 - 16 to 20 September 2019



Figure A1.0 – OOHW MW11 – Attended and Unattended Noise Monitoring Locations

- NCW P7 (Monday, 16 September to Friday, 20 September 2019)

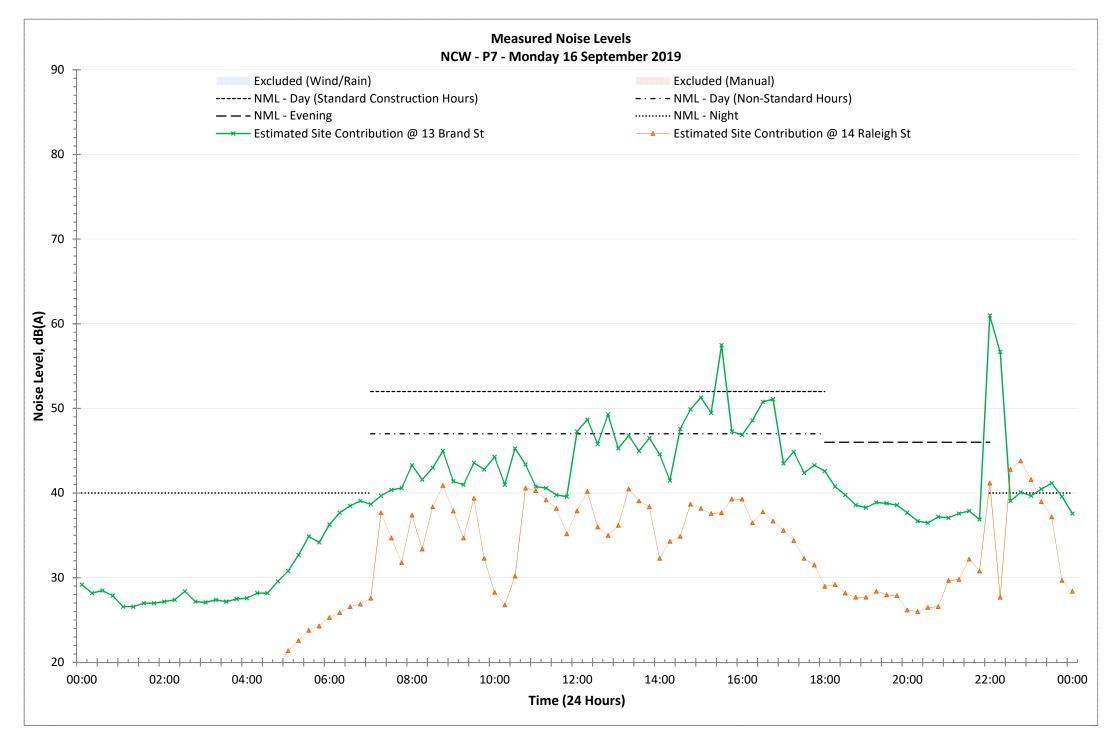


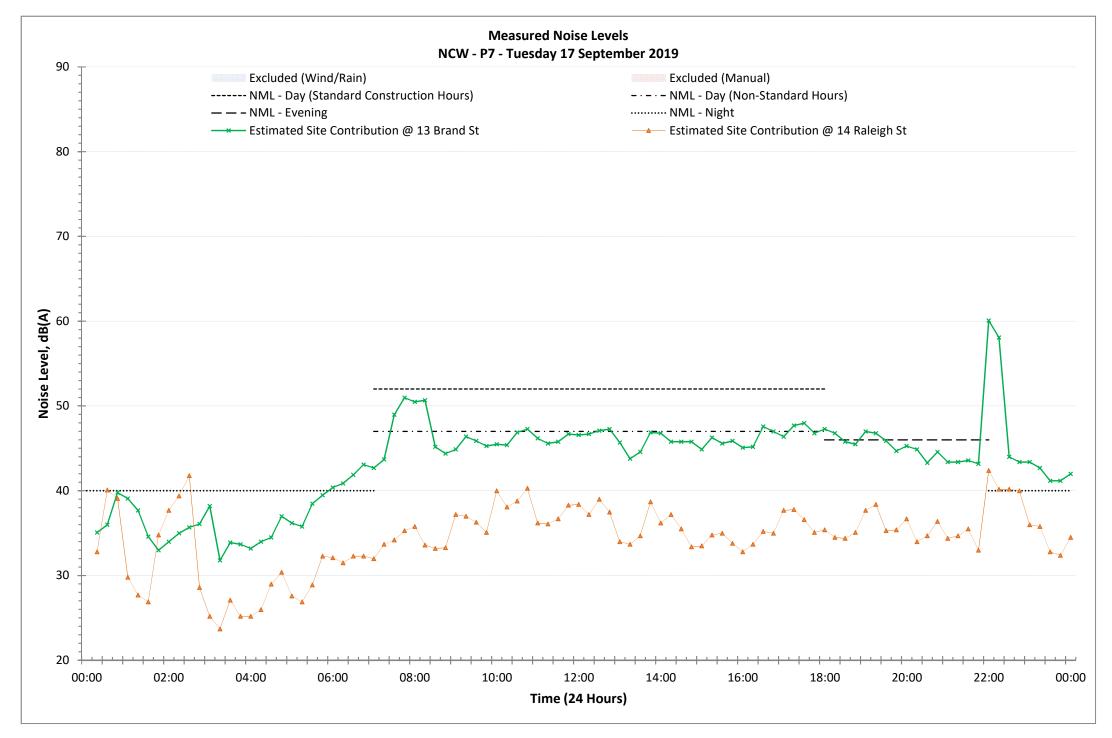
Fie Name	Date	Start Time	Elaosed Time	LAFmax	LAFmin	LAca	LAF1.0	LAF10.0	LAF90.0	(S)	Measured Ste No iso Level - LAeq, 15minus	Impulsive Modifying Factor? Tonal Modifying Factor?	LF Modifying Factor?	Vessured Site Noise Level - LAmax	NGA	Period	Location	R BL - LA90, Period	N.M. - LAeq, 15 minuso	Predicted Site Noise Level - LAeq. 15minute	Sleep Disturbance Screening Level - LAmax	Comparison to RB L - LA90, Period	Comparison to NML - LAcq. 15 minus	Comparison to Predicted Site Noise Level - LAeq, fâminate	Comparison to Sleep Disturbance Screening Level - L.Amax	- Rescribition
Project 001	16-Sep-19	23:48	00:15:00	63.3	44.3	47.4	52.3	48.6	45.8	50		0.0 5.	0.0	61	NCA01	Night	LO1	35	40	52	50	14	9	-3	11	L01 - Project 001-000. Measurement taken at Otale Street. Six noise contribution republic from plate aggress, vicios on six, and dange and lange. Six related roless contributed to approximately 50% of the overall. Enterenous sources were observed to include distant and nearby traffic, light rain, and windbown regulation.
Project 002 Project 003	17-Sep-19	01:02	00:15:00	63.3	44.5	46.5	53.9	46.8		50 60		0.0 0.		62	NCA01	Night Night	L01	35	40	52	50	12	7	-9	12	
Project 004	17-Sep-19	01:18	00:15:00	64	43.9	46.4	50.9	47.5	45	70		0.0 5.	0.0	49	NCA01	Night	L02	35	40	52	50	15	10	-2	-1	LIZ - Project 033-004. Measurements balen at Raligh Street. Sha-related noise included part engines, durgs and bargs, and reverse alarm. She noise contributed to approximately 50% of the measured Leq (nor the measurements. Extremol ecuries were obscioned to include fight rail, obtain and local traffic, and and beam regardator.
Project 005	17-Sep-19	01:47	00:15:00	54.6	48.4	51.4	53.5	52.4	50.3	5		0.0 0.	0.0	54	NCA01	Night	L03	35	40	54	50	3	-2	-16	4	LO3 - Project OSS. Measurement undertaken all Hippetora. Avenue. Ste-related noises consisted of clargs and bangs, contributing to 5% of the overall Leq. Estimatous sources dominated the measurement and included distant and boal traffic, windown vegetation, and noise generated at the Chateseoof Diveste.
Project 006	17-Sep-19	23:30	00:04:00	58.6	45	48	53.3	50.1	45.9	0		0.0 0.	0.0	36	NCA01	Night	L03	35	40	54	50	1	-4	-18	-14	LCO - Perject OSE. Measurement undertaken at Hepotous Avenue. Measurement was ceased at 4-mins duration due to Indement wealther. In the 4-min measured, no site-valend contributions were road. Eleteropus noise sources included distant staffic, rain, and windolous vegetation.
Project 007	18-Sep-19	00:46	00:15:00	64.8	43.5	48.7	56	50.5	45.3	30		0.0 0.	0.0	58	NCA01	Night	L03	35	40	54	50	14	9	-5	8	LG3 - Project 007. Measurement taken at Hopebun Avenus, Site-related noise originated from movement of high-relatedehandlers, liding plant engines, clarge, and bargs, and alter stations. Site noise contributed to 30% of the total measurement. Estawous noise dominated the measurement, consisting of passing selffic, weer flowing into stommation dates and wind.
Project 008	18-Sep-19	01:01	00:15:00	75.8	45.2	52.7	62.9	52.8		100		0.0 5.		75	NCA01	Night	L03	35	40	55	50	23	18	3	25	1.03 - Poject OR. Measurement undertaken at Hopotous Avenue. She activities generated approximately 100% of the overall combusion. She related note was generated by plant engines, movement of plant and machinery, change and bangs, plant home and tablery. Entereous noise contributions were minimal, consisting of largely of wind and rais.
Project 009 Project 010	18-Sep-19	01:17	00:15:00	99 61.9	44.5	64.8	61.8 57.4	51.7		30		0.0 5.		68	NCA01	Night Night	L03	35	40	52	50	7	28	-10	18	LO3 - Project CO3 and CV10. Measurement undersiation all Hopedourn Avenue. Site related noise originated from reverse buzzers, plant engines, charge and barge, and voices from site. These site— noise contributions accounted for approximately 60% of the overall measured noise. Strong wints and can contribute to extravour noise and reculted in the measurement ending early at 8 minutes.
Project 011	18-Sep-19	2231	00:15:00	74.3	43.7	65.3	70.2	68.9	45.5	100		0.0 0.	0.0	74	NCA01	Night	L01	36	40	52	50	30	25	13	24	
Project 012	18-Sep-19	22.46	00:15:00	66.1	41.6	49.8	57.2	54	43	100		0.0 0.	0.0	66	NCA01	Night	L01	35	40	52	50	15	10	-2	16	L01 - Poject 011 and Project 012. Measurements understain at Disals Steet Size robs resulting from plant regions, cast convenations, clarge and bargs and movement of alle vehicles and plant. Size robs contributed to approximately 100% of the overall measurement.
Project 013	18-Sep-19	23:30	00:15:00	64	46	48.6	54	49.1	47.4	30		0.0 0.	0.0	63	NCA01	Night	L04	35	40	59	50	8	3	-16	13	
Project 014	18-Sep-19	23.45	00:15:00	60.3	46.3	48.7	54.5	49.1	47.4	50		0.0 0.	0.0	54	NCA01	Night	L04	35	40	59	50	11	6	-13	4	LO4 - Projects 013, 014 and 015. Measurements undertaken at Berkeley Street. Site noise contributed to approximately 30-50% of the overal noise measured, resulting from reverse buzzen, movement of plant and muletiels, and change and barge. Distant traffic, works at the Chalaewood dive site, basking dogs and emergency vehicle strens were the sources of estimatous noise observed.
Project 015	19-Sep-19	00:01	00:15:00	58.2	46.5	49.2	53	50.7	47.9	50		0.0 0.	0.0	58	NCA01	Night	L04	35	40	59	50	11	6	-13	8	
Project 016	19-Sep-19	01:00	00:15:00	56.9	38.9	41.9	47.3	43.6	40	100		0.0 0.	0.0	55	NCA01	Night	L03	35	40	54	50	7	2	-12	5	Los - Project 016. Measurement undertaken at Hopetoun Avenue. Site-related noise was generated by clargs and bangs, movement of plant and vehicles, and sting machinary. Site noise was responsible for approximately
Project 017	19-Sep-19	01:15	00:15:00	54	37.6	40.9	45.4	42		80		0.0 0.		48	NCA01	Night	L03	35	40	54	50	5	0	-14	-2	LtD - Projects 017 and 018. Measurement undertaken at Hopation Avenue. Site-related noise was generated by clarge and barge, movement of plant and vehicles, and siding machinery. Size-noise was responsible for approximately 89-100% of the measurement. Emisreous noise sources sever noted, including distant traffic, insects, a metro train, and work at the Chatewood Diversity.
Project 018	19-Sep-19	01:31	00:14:47	54.2	37.9	41.1	45.7	42.5	39.2	100	41	0.0 0.	0.0	52	NCA01	Night	L03	35	40	54	50	6	1	-13	2	

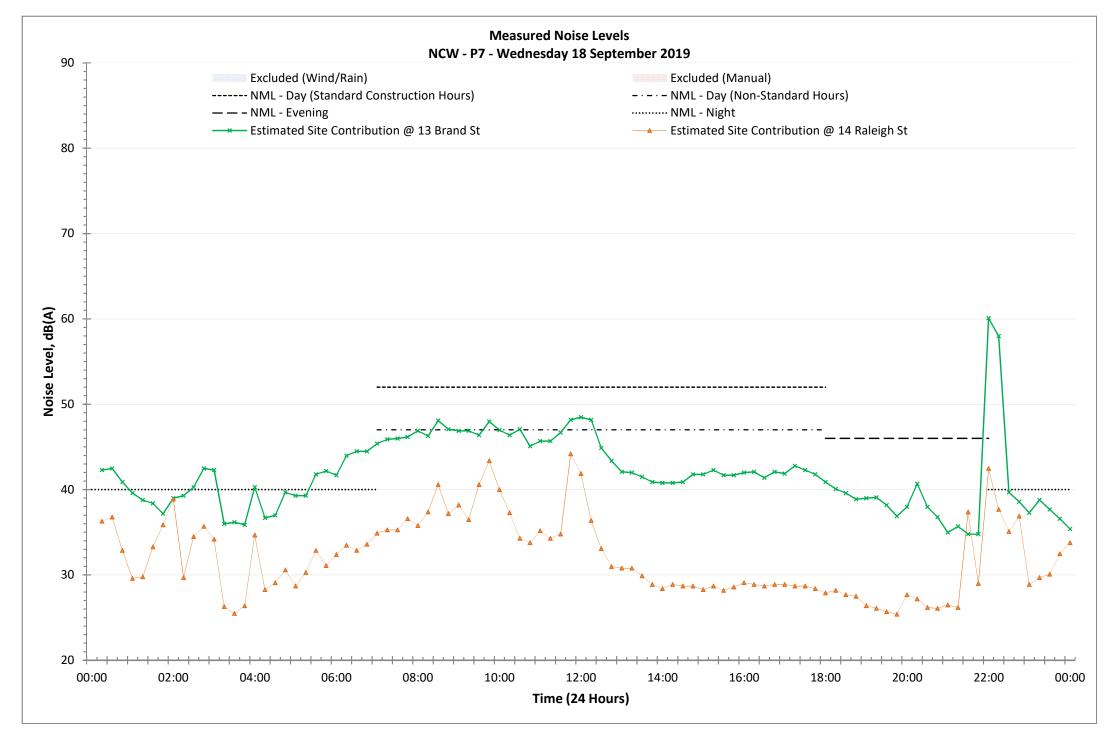
File Nam	Date	Start Time	Elapsed Time	LAFmax	c LAFmin	LAco	LAF1.0	LAF10.0	LAF90.0	Percentage Site Contribution (%)	Measured Ste Noise Level - LAkep, 15minuse	in pulsive Modifying Factor?	LF Modifying Factor?	Measured Ste Noise Level - LAmax	NGA	Period	Location	R BL. - LA90, Period	N.M. - LAeq. 15 minue	Predicted Site Noise Level - LAsq., 15minute	Sleep Disturbance Screening Level - LAmax	Comparison to RB.L.	· LA90, Period	Comparison to NWL - LAeq, 15 minuse Comparison to Predicted Rue Avines 1 most	- LAeq. 15minute	Comparison to Sleep Disturbance Screening Level - LAmax	Describión
Project 019	19-Sep-19	01:47	00:15:00	55.2	37.4	40.5	47	41.3	38.7	50		0.0	0.0	52	NCA01	Night	L03	35	40	54	50	:	2	-3 -1	17	2	LG3 - Project 019. Measurement understates at Hepotous Avenue. Site related noise accounted for approximately 50% of the overall contribution. Site noise was generated by clarge, and barga, movement of plant and materials, everate buzzers and screeding. Editaneous noise was observed from passing traffic, moto trains, and rain/viet.d.
Project 020	19-Sep-19	22:30	00:15:00	64.9	40.1	44.8	55.5	44.3	41.6	30		0.0	0.0	64	NCA01	Night	LO1	35	40	52	50		5	0 -	12	14	Lot - Projects (CO) and COT. Measurement taken at Drafe Street. Site rose contributions resulting from generatoringine iding, vioces from site, use of hand sock, and clarge and banys. Site
Project 021	19-Sep-19	22:45	00:15:00	60	41.1	45.2	49.2	45.9	42.9	50		0.0	0.0	60	NCA01	Night	L01	35	40	52	50	:	7	2 4	10	10	rose contributed to approximately 30-50% of the overall measurement. Extraveour noise resulted from winddown vegetation, dogs bashing, passing traffic and acrost, and insects.
Project 022	19-Sep-19	23:30	00:15:00	57.8	40.7	44.4	48.4	46.1	42.3	30		0.0	5.0 0.0	57	NCAD1	Night	L02	35	40	52	50	1	9	4 .	8	7	LU2 - Projects CU2 and CU3. Measurements tables at Rakelph Street. Site roise contributions resulting from dangs and bangs, revenent of plant and melatisks, revenes buzzers, from bleats and
Project 023	19-Sep-19	23:45	00:15:00	66.5	40.2	48.5	60.7	48.9	42.1	60		0.0	0.0	66	NCAD1	Night	L02	35	40	52	50	1	1	6 .	6	16	Utiling plantigorerations. Site noise was responsible for approximately 30-60% of overall recorded measurements. Estamosus noise sources included distant straffs, emergency vehicle stimes, animals, passing aircraft and insects.
Project 024	20-Sep-19	00:01	00:15:00	60.8	42.5	48.1	56.5	50.3	43.7	100		0.0	5.0 0.0	58	NCA01	Night	L02	35	40	52	50	1	18	13	1	8	LG2 - Project CG4. Measurement taken at Riskigh, Street. Size notice expensing from alleg plant, movement of plant and missionis, oits said taking, born blasts, and novem buzzers resulted in approximately 100% of the measured notice. Extraneous notes from distant traffic and windown vegetation sea considered to have minimal contribution to observed levels.
Project 025	20-Sep-19	00:30	00:15:00	57.5	44.5	47.9	53.2	50.3	45.7	70		0.0	0.0	54	NCAD1	Night	L04	35	40	59	50	1	1	6 4	13	4	Lot - Project QCS and QCS, Measurements undertaken at Berkely Court. Site related noise originated from movement of plant, revenes buzzers, dangs and barge, and site staff balling.
Project 026	20-Sep-19	00:45	00:15:00	63.6	43.6	47.1	53.3	48.1	45.1	80		0.0	0.0	63	NCA01	Night	L04	35	40	59	50	1	1	6 4	13	13	Overall bits noise contributed to 70 80% of observed levels. Extransous noise sources included resect noises, passing staffic, and metro staffic.
Project 027	20-Sep-19	01:15	00:15:00	67.2	37.7	42.7	50.8	44.4	38.9	80		0.0	i.0 0.0	47	NCAD1	Night	L03	35	40	54	50	1	2	7	7	-3	LG3 - Projects GG7 and GG8. Measurement taken at Hopetous Averus. Site related noise accounted for approximately 80-100% of observed levels, resulting from reverse buzzers, site staff
Project 028	20-Sep-19	01:30	00:15:00	60.8	36.2	45.4	56.2	48.1	37.6	100		0.0	5.0 0.0	60	NCA01	Night	L03	35	40	54	50	1	5	10 -	4	10	taking, dding engines, movement of plant, from blaste, and dangs and bangs. Extraneous noise sources included insects, distant traffic, and matro trans.
Project 029	20-Sep-19	02:15	00:15:00	65.8	43	46.5	51.1	47.2	44.2	60	44	0.0	0.0	65	NCA01	Night	L04	35	40	59	50		9	4	15	15	LG4 - Project 079. Measurements undertaken all Berkeley Court. Site related noise sources included reverse buzzers, clarge and burgs, use of hard tools, bud clarge and burgs, and movement of plant. Site related noise was responsible for approximately 60% of the recorded measurements. Extravour noise sources included need and melto train.

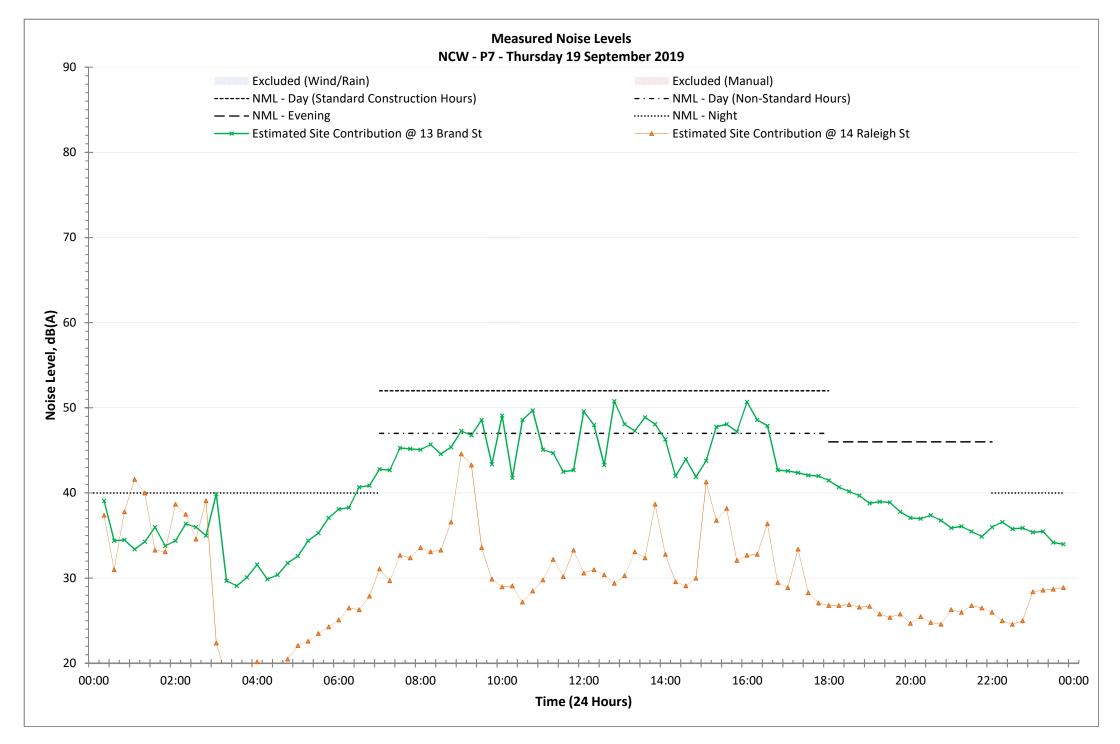
Weather 16:20 September: Generally overcast weather, some extended periods of rain, with heavy winds. Temperatures ranged between 9 - 17 degrees Celsius over the monitoring period.

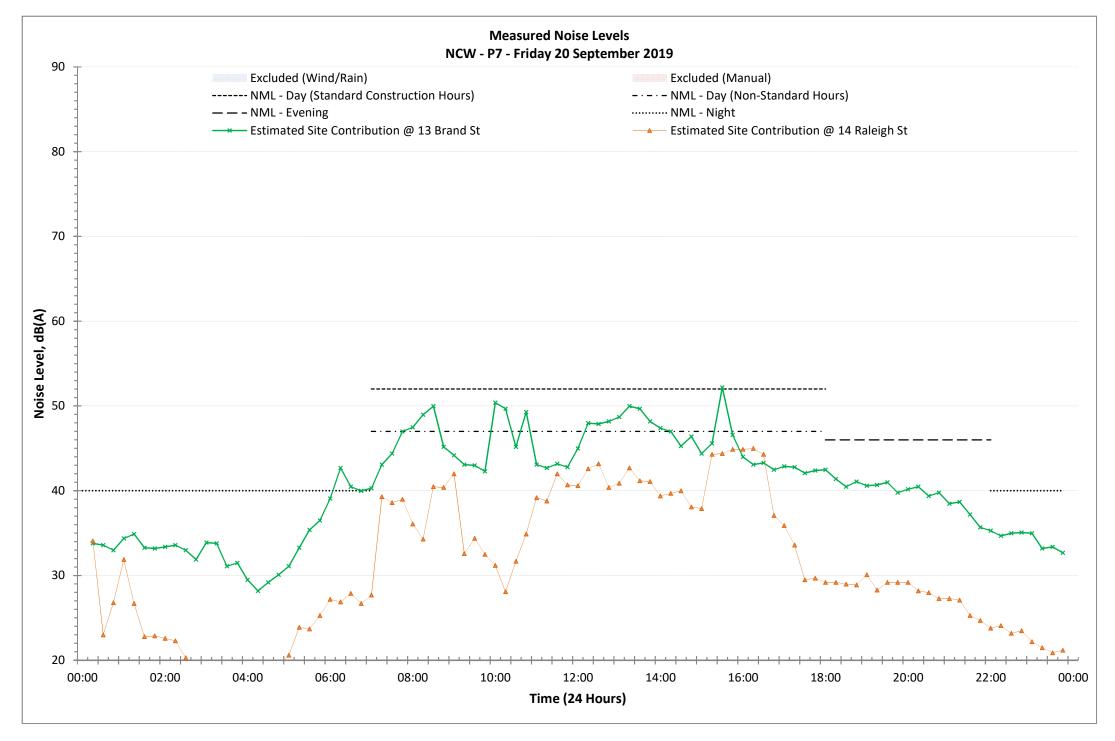
Note: Low frequency, torsally and impublive roise tests were conducted in accordance with the INP. The measured Leq data was applied in all cases. Modifying factors (if applicable to the low frequency, torsall or impublive components detectable or attributable to the stee roise emission. The stee noise contribution reported here is inclusive of all modifying factors (if applicable to the low frequency, torsall or impublive components detectable or attributable to the stee roise emission. The stee noise contribution reported here is inclusive of all modifying factors (if applicable to the low frequency, torsall or impublive components detectable or attributable to the stee roise emission. The stee noise contribution reported here is inclusive of all modifying factors (if applicable to the low frequency, torsall or impublive components detectable or attributable to the stee roise emission. The stee noise contribution reported here is inclusive of all modifying factors (if applicable to the low frequency) and impulsive components detectable or attributable to the stee roise emission. The stee noise contribution reported here is inclusive or all modifying factors (if applicable to the low frequency) and impulsive components detectable or attributable to the stee roise emission. The stee noise contribution reported here is not all the stee noise and the stee noise emission.











Appendix K – Monitoring Report (RP39a)

Noise Monitoring – OOHW P7: WE12 - 21 to 22 September 2019

ENVIRONMENTAL RESOURCES MANAGEMENT AUSTRALIA PTY LTD

ERM: Level 15, 309 Kent Street Sydney, NSW 2000. T: (02) 8584 8888. F: (02) 8584 8800. www.erm.com



Figure A1.0 – OOHW WE12 – Unattended Noise Monitoring Location – St Leonards

- NCW P7 (Saturday, 21 September and Sunday, 22 September 2019)

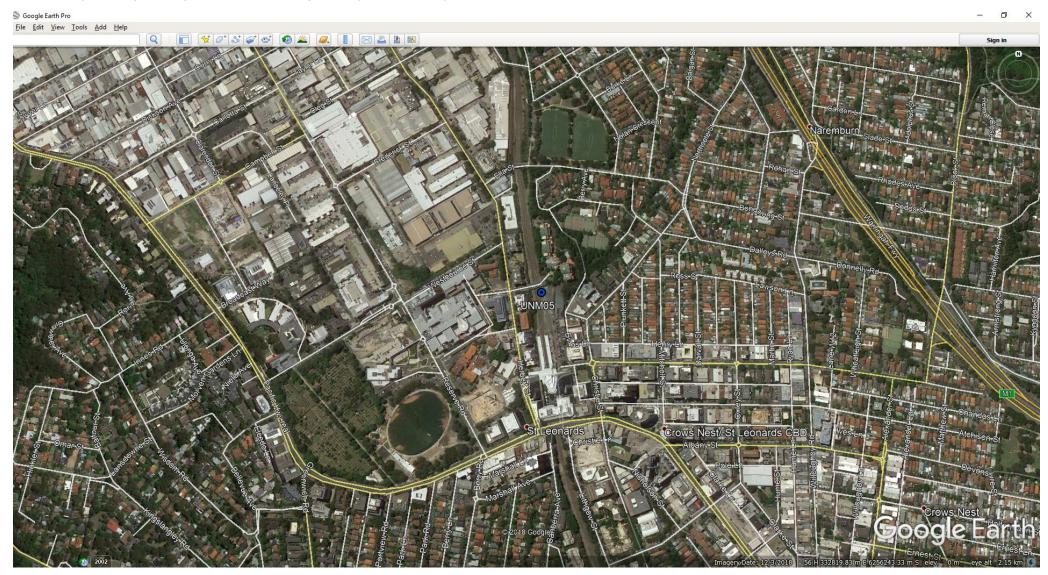
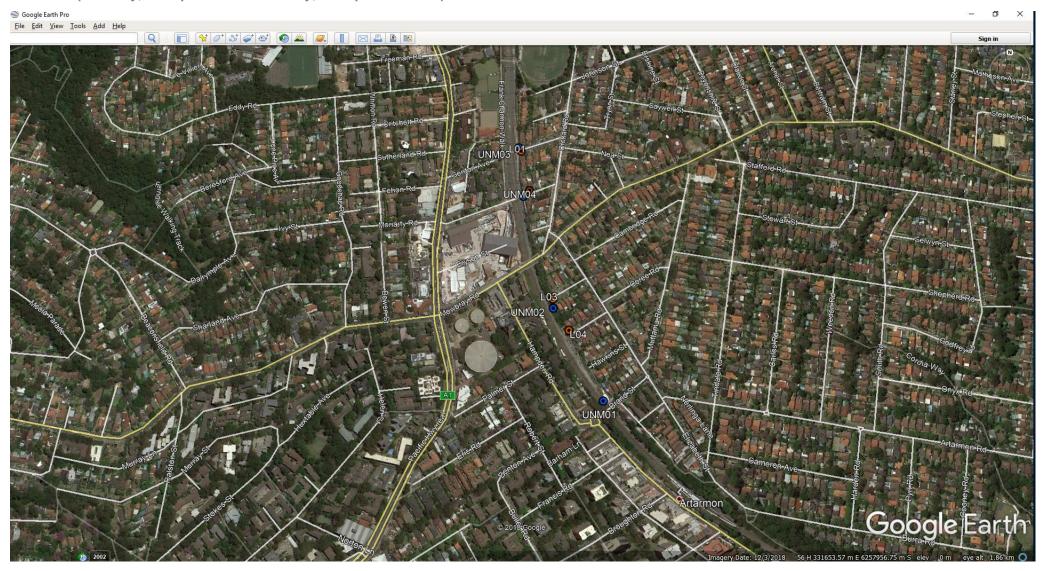




Figure A1.1 – OOHW WE12 – Attended and Unattended Noise Monitoring Locations - Artarmon

- NCW P7 (Saturday, 21 September and Sunday, 22 September 2019)

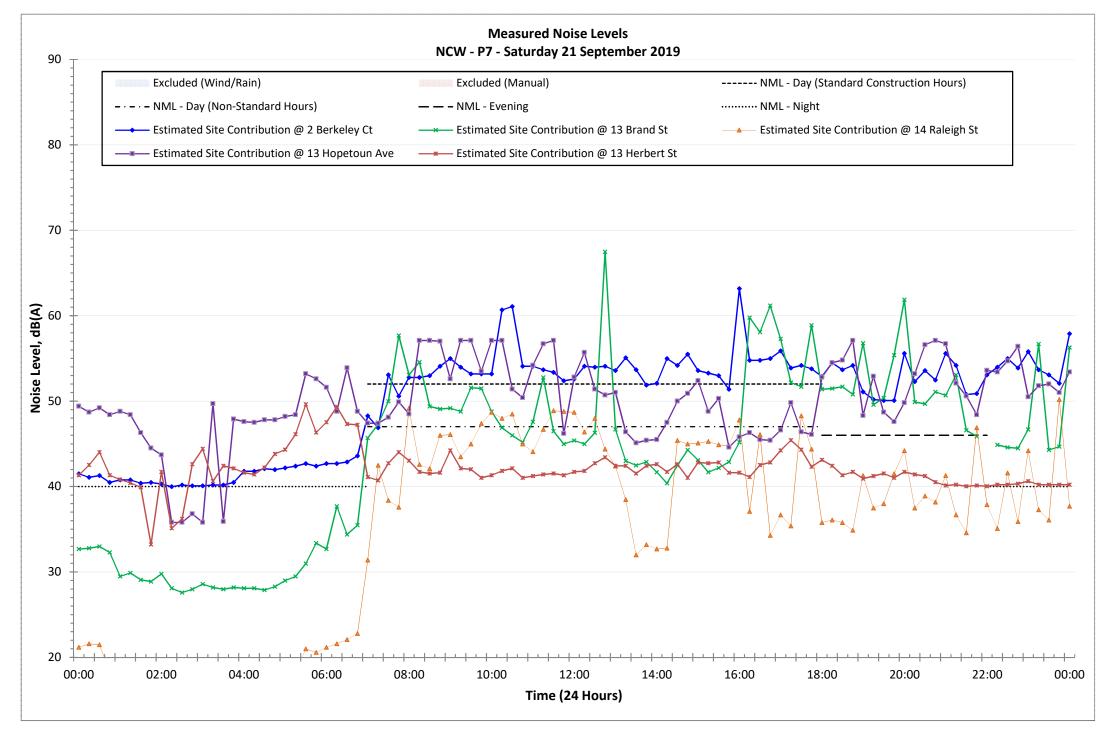


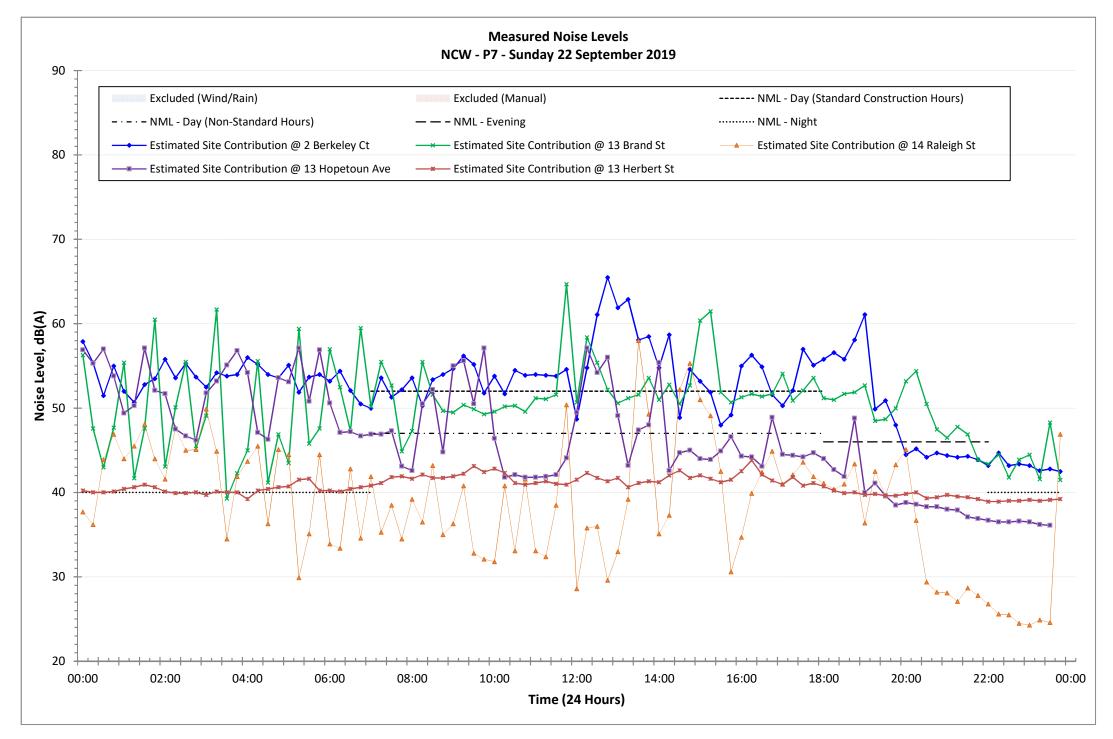
File Name	Date	Start Time	Elaosed Time	LAFmax	LAFmin	LAsq	LAF1.0	LAF10.0	0.0064PT	Measured Ste No iso Level - LAcq. 1 Smirute	im pulsive Modifying Factor?	Forsi Modifying Factor?	L F Modifying Factor?	Measured Ste Noise Lerel - LAmax	NGA		Period	R BL · LA90, Period	N.M. L.Aeq, 15 minue	Predicted Site Noise Level - LAeq, 15minute	Sieep Disturbance Screening Level - LAmax	Comparison to RBL - LA90, Period	Comparison to NML	Comparison to Predicted Site Notice Level - LAeq, 15minute	Comparison to Sleep Disturbance Screening Level - L Amax	Cescration
Project 001	21/09/2019	17:30	0:15:00	85	46.8	58.2	65.2	56.7	49.1 90	58	0.0	0.0	0.0	55	NCA01	L01	Day	42	47	71	57	16	11	-13	-2	LO1 - Project CO1-CO2. Measurements taken at the end of Hopebus Avenus. Site-related roles resided from movement of plant and trains, train home, and urboading of ballest. Site-related noises derivated for majoring of measurements with approximately 80-100% contributes. Estimanous sources were also observed to include distinct trailing and wildlife.
Project 002	21/09/2019	18:00	0:15:00	81.4	53.3	61.1	67	62.6	56.4 100	61	0.0	0.0	0.0	70	NCA01	L01	Evening	41	46	71	56	20	15	-10	14	
Project 003	21/09/2019	18:30	0:15:00	81.3	49.9	54.9	61.1	54.7	51.6 90	59	0.0	5.0	0.0	64	NCA01	L02	Evening	41	46	68	56	18	13	-9	8	L02 - Project 003. Measurement taken outside 5 Berkeley Court. Site noise contributions included dange and bargs, generatoriplent idling and train horne. Site related noises dominated the majority of measurements with approximately 80% contribution. Estimations sources were also observed to include observ
Project 004	21/09/2019	20:00	0:15:00	84.3	53.4	61.2	69.1	62.2	55.3 80	60	0.0	0.0	0.0	70	NCA01	L01	Evening	41	46	71	56	19	14	-11	14	
Project 005	21/09/2019	20:30	0:15:00	83.5	55.5	62	68.6	62.9	59 95	62	0.0	0.0	0.0	64	NCA01	L01	Night	35	40	62	50	27	22	0	14	LO1 - Projects CO4. CO5 and CO5 Measurements taken at the end of Hopston Avenue. Site-related roise resided from movement of plant and trains, train horse, and unknown of the related rolline dominated the respiritly of measurements with approximately 69-107% contribution. Estimateus sources were also observed in include local traffic and emergency vehicles.
Project 006	21/09/2019	21:15	0:15:00	67.3	49.7	55.4	59	57.3	52.5 100	55	0.0	0.0	0.0	68	NCA01	L01	Night	35	40	71	50	20	15	-16	18	
Project 007	21/09/2019	21:45	0:15:00	73	47.9	53.4	58.9	54.8	50.4 95	58	0.0	5.0	0.0	71	NCA01	L02	Night	35	40	68	50	23	18	-10	21	Ltz - Project 07f. Measurement statem outside 5 Benkeley Courf. Site noise contributions included plant engines siting, plant movement, unloading of ballest and train horse. Site-related noises dominated the majority of measurements with approximately 95% contribution. Extensions sources were also observed to include passing air traffic.
Project 008	21/09/2019	22:45	0:15:00	82.5	52.9	59	64.4	61.1	54.8 95	64	0.0	5.0	0.0	58	NCA01	L01	Night	35	40	71	50	29	24	-7	8	
Project 009	21/09/2019	23:15	0:15:00	74.2	52.5	60.8	66.8	63.7	55.8 90	60	0.0	0.0	0.0	63	NCA01	L01	Night	35	40	71	50	25	20	-11	13	LOT - Projects COS
Project 010	22/09/2019	00:00	0:15:00	78.3	55.7	62.4	68.7	64.5	59.3 95	62	0.0	0.0	0.0	68	NCA01	L01	Night	35	40	71	50	27	22	-9	18	urbading of balast and materials, and operation of machinery. Sile-related noises dominated the napphy of massurament with approximately 10-100% contribution. Entrances sources were also observed to include distant staffic, and operator generated sources.
Project 011	22/09/2019	00:30	0:15:00	79.6	52.1	63.5	68.3	66	59.4 100	64	0.0	0.0	0.0	64	NCA01	L01	Night	35	40	71	50	29	24	-8	14	
Project 012	22/09/2019	01:00	0:15:00	69.9	51.9	55.5	59.6	56.5	53.9 100	56	0.0	0.0	0.0	59	NCA01	L02	Night	35	40	68	50	21	16	-13	9	L02 - Project 012. Measurement taken outside 5 Benkeley Courf. Site rollse contributions included plant operation, reverse buzzers, and sting plant. Site-related noises dominated the majority of measurements with approximately 100% contribution. No entereous source observed.
Project 013	22/09/2019	15:45	0:15:00	71.2	50.9	58.1	64.4	61	54.3 80	57	0.0	0.0	0.0	70	NCA01	L01	Day	42	47	71	57	15	10	-14	13	LO1 - Project 013. Measurement talen at the vesteem ent of Hopetous Avenue. Site noise contributions included felling plant, revenue buzzers, movement of plant and machinery and clarge, and burgs. Site noise resulted in approximately 60% of the overall measurement. Entereous noise sources included distant traffic.
Project 014	22/09/2019	16:15	0:15:00	75	51.2	57.1	64.5	58.2	53.7 75	61	0.0	5.0	0.0	86	NCA01	L02	Day	42	47	68	57	19	14	-7	29	Ltz: Project 014. Measurement talann udalels 6 Besteley Courf. Sile noise contributions included plant operation, reverse buzzen, ballest bading and siling plant. Sile related noises dominated the majority of measurement with approximately 70% contribution. Extensions noise included distant suffic, a passing motifisha, and a memby resident playing baseletful.
Project 015	22/09/2019	16:45	0:15:00	70.8	51.6	58.3	66.1	61	54.5 75	57	0.0	0.0	0.0	68	NCA01	L03	Day	42	47	61	57	15	10	4	11	LO3 - Projects 015 and 016. Measurement undertailern outside 14 Raisign Street. NCW alle noise resulting from plant movement and operation, along with hom blasts and general clangs and bargs. Site noise contributed to approximately 75-100% of the overall measurement. Estimations sources included brind and children playing
Project 016	22/09/2019	17:15	0:15:00	76.1	49.7	62	71.6	66.4	54 100	62	0.0	0.0	0.0	73	NCA01	L03	Day	42	47	61	57	20	15	1	16	beings. Dile noise contributed to approximately 75-100% of the overall measurement. Extremous sources included birds and children playing
Project 017	22/09/2019	17:45	0:15:00	99.9	51.7	75.3	82.9	76.9	64.8 100	75	0.0	0.0	0.0	80	NCAD1	L04	Day	42	47	51	57	33	28	24	23	LOJ. Project 017. Measurement talatin valide 13 Deale Street. Site noise occurring as a result of took movement and bading and use of hard took. Site noise contributed to 100% of the overall misseurement, with no editorious sources noted.
Project 018	22/09/2019	18:30	0:15:00	68.8	49.5	54.7	59.3	56.6	52 50	57	0.0	5.0	0.0	67	NCAD1	L01	Evening	41	46	71	56	16	11	-14	11	LS1. People 018. Measurement at Hopetous Avenue. Site noise relating to plant movement was noted, contributing to 50% of the overall measurement. Local staffic and passing around were noted as estimated as estimated as estimated as estimated as estimated.
Project 019	22/09/2019	19:00	0:15:00	64.3	52.4	56.4	61.7	58.2	54.3 90	56	0.0	0.0	0.0	63	NCA01	L02	Evening	41	46	68	56	15	10	-12	7	Ltz - Project 019. Measurement undertaken all Berkeley Court. Site noise resulting from plant movement and engine liding, clargs and bange, and plant operation. Distant halfs also noted. Site-nested rises accounted for approximately 90% of the overall contribution.

Fis Nams	Date	Start Time	Elaosed Time	LAFmax	LAFmin	LAca	LAF1.0	LAF10.0 L	O S S S S S S S S S S S S S S S S S S S	ę	Measured Ste Noise Level - LAsq, 15minuse	Impulsive Modifying Factor?	Tonal Modifying Factor? LF Modifying Factor?	Weasured Ste Noise Level - LAmax	NGA		Period	RBL LA90, Period	NM. - LAeq. 15 minuse	Predicted Site Noise Level - LAeq, 15minute	Sleep Disturbance Screening Level - LAmax	Comparison to RBL LA90, Period	Comparison to NML - LAeq, 15 minute	Comparison to Predicted Site Noise Level - LAeq. 15m inute	Comparison to Sleep Disturbance Screening Level - LAmax	Description.
Project 020	22/09/2019	19:30	0:15:00	80.2	50.3	57.9	66.1	60.5	52.4 10	0		0.0	5.0 0.0	63	NCA01	L04	Evening	41	46	52	56	22	17	11	7	
Project 021	22/08/2019	19.45	0:15:00	87.4	52	70.5	81.1	74.6	54.3 10	0		0.0	0.0 0.0	83	NCA01	L04	Evening	41	46	52	56	30	25	19	27	1.04 - Projects 020, 021 and 022. Measurements undertaken at 13 Drake Street. Site related noise contributed to 100% of all measurements, created by voices on site, loading of plant onto trucks, generators running, and movement of plant and vehicles. No extransous sources noted.
Project 022	22/09/2019	20:10	0:15:00	98.9	50.5	74.9	82.6	77.3	70.9 10	0	75	0.0	0.0 0.0	93	NCA01	L04	Evening	41	46	52	56	34	29	23	37	

Weather 21-22 September 2019: Generally line weather, tow cloud coverage with calm winds. Some patchy rain in the evenings. Temporature ranged between 18-21 degrees Celsius over the moritoring periods.

Now. as procused process were reproduced in a control of the same of the same





Sydney Metro City and Southwest – North Corridor Works Addendum – NCW Noise and Vibration Monitoring – May 2019 – October 2019

Technical Report

Appendix L – Monitoring Report (RP39b)

Vibration Monitoring – OOHW P7: WE12 - 21 to 22 September 2019

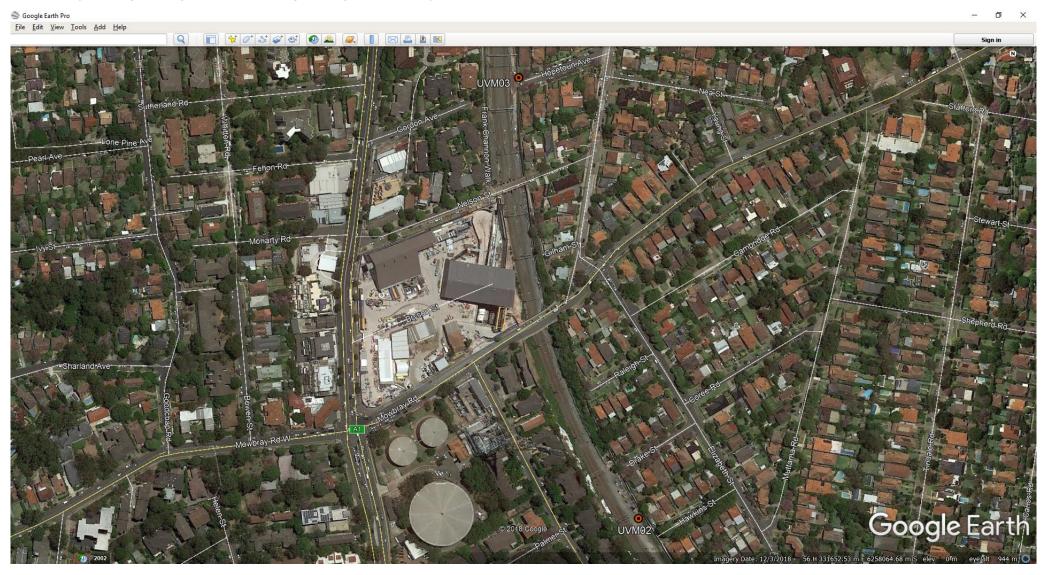
ENVIRONMENTAL RESOURCES MANAGEMENT AUSTRALIA PTY LTD

ERM: Level 15, 309 Kent Street Sydney, NSW 2000. T: (02) 8584 8888. F: (02) 8584 8800. www.erm.com



Figure A1.0 – OOHW WE12 – Unattended Vibration Monitoring Locations

- NCW P7 (Saturday, 21 September to Sunday, 22 September 2019)





Histogram Start Time 18:06:48 September 20, 2019 Histogram Finish Time 06:00:01 September 21, 2019

Number of Intervals 714.00 at 1 minute Geo:31.75 mm/s Range

Sample Rate 1024sps Serial Number BE13734 V 10.72-8.17 MiniMate Plus

Battery Level 6.8 Volts

Unit Calibration May 13, 2019 by Saros Int. **File Name**

O734I4AV.NC0

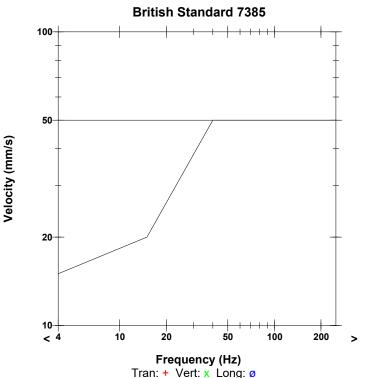


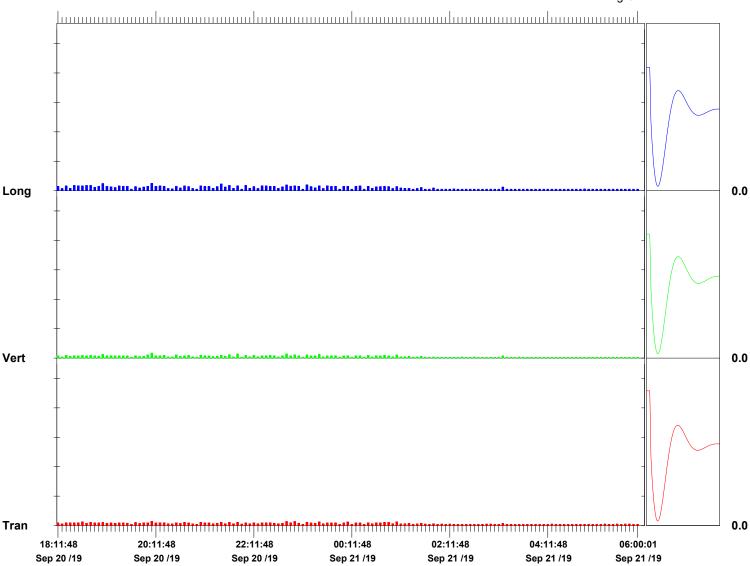
Location: Client: User Name: General:

Extended Notes

	Tran	Vert	Long	
PPV	0.286	0.333	0.492	mm/s
ZC Freq	28	51	43	Hz
Date	Sep 20 /19	Sep 20 /19	Sep 20 /19	
Time	20:04:48	20:04:48	20:04:48	
Sensor Check	Passed	Passed	Passed	
Frequency	7.5	7.5	7.4	Hz
Overswing Ratio	3.9	3.7	3.9	

Peak Vector Sum 0.502 mm/s on September 20, 2019 at 20:04:48





Time Scale: 5 minutes /div Amplitude Scale: Geo: 2.000 mm/s/div



Histogram Start Time 06:06:49 September 21, 2019 Histogram Finish Time 16:45:31 September 21, 2019

Number of Intervals 638.00 at 1 minute Range Geo:31.75 mm/s Sample Rate

1024sps

Serial Number BE13734 V 10.72-8.17 MiniMate Plus

6.7 Volts **Battery Level**

Velocity (mm/s)

Unit Calibration May 13, 2019 by Saros Int. File Name

O734I4BS.ZD0

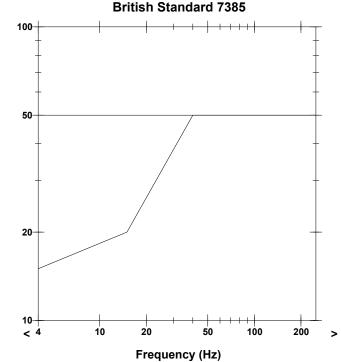


Location: Client: User Name: General:

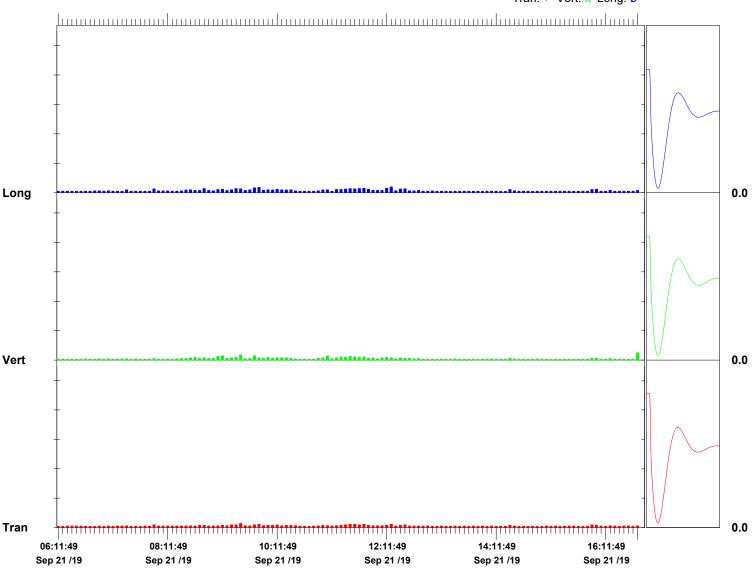
Extended Notes

	Tran	Vert	Long	
PPV	0.270	0.492	0.381	mm/s
ZC Freq	20	5.1	20	Hz
Date	Sep 21 /19	Sep 21 /19	Sep 21 /19	
Time	09:27:49	16:43:49	12:12:49	
Sensor Check	Passed	Passed	Passed	
Frequency	7.5	7.5	7.4	Hz
Overswing Ratio	3.9	3.7	4.0	

Peak Vector Sum 0.496 mm/s on September 21, 2019 at 16:43:49



Tran: + Vert: x Long: Ø



Time Scale: 5 minutes /div Amplitude Scale: Geo: 2.000 mm/s/div



Histogram Start Time 16:50:59 September 21, 2019 Histogram Finish Time 18:00:00 September 21, 2019

Number of Intervals 70.00 at 1 minute Range Geo:31.75 mm/s Sample Rate 1024sps

Serial Number **Battery Level**

File Name

BE13734 V 10.72-8.17 MiniMate Plus 6.8 Volts

Unit Calibration May 13, 2019 by Saros Int.

O734I4CM.SZ0

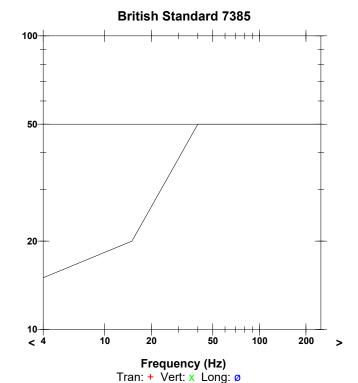


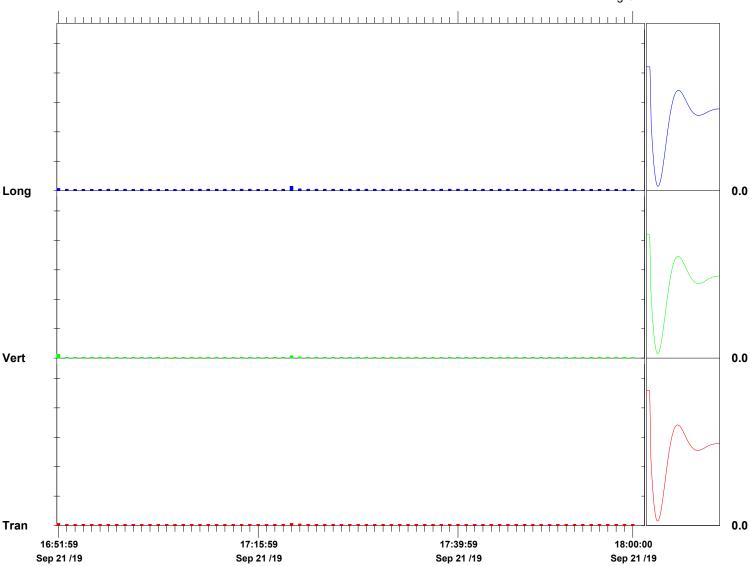
User Name: General:

Extended Notes

	Tran	Vert	Long	
PPV	0.143	0.254	0.286	mm/s
ZC Freq	21	30	30	Hz
Date	Sep 21 /19	Sep 21 /19	Sep 21 /19	
Time	16:51:59	16:51:59	17:19:59	
Sensor Check	Passed	Passed	Passed	
Frequency	7.6	7.5	7.4	Hz
Overswing Ratio	3.8	3.6	3.9	

Peak Vector Sum 0.290 mm/s on September 21, 2019 at 17:19:59





Time Scale: 1 minute /div Amplitude Scale: Geo: 2.000 mm/s/div



Histogram Start Time 18:06:48 September 21, 2019 Histogram Finish Time 06:00:01 September 22, 2019

Number of Intervals 714.00 at 1 minute Geo:31.75 mm/s Range

Sample Rate 1024sps Serial Number BE13734 V 10.72-8.17 MiniMate Plus

Battery Level 6.3 Volts

Unit Calibration May 13, 2019 by Saros Int. File Name

O734I4CQ.BC0

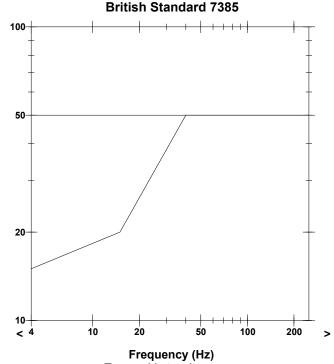


Location: Client: User Name: General:

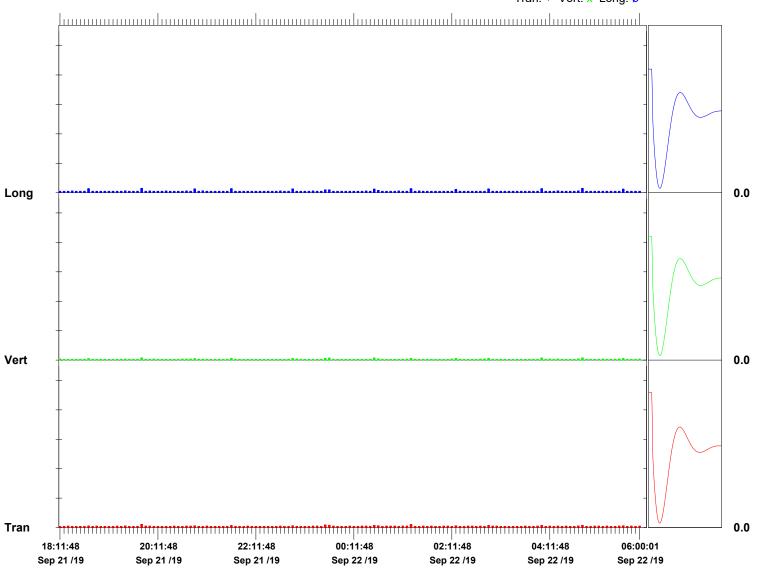
Extended Notes

	Tran	Vert	Long	
PPV	0.222	0.159	0.302	mm/s
ZC Freq	34	57	16	Hz
Date	Sep 21 /19	Sep 21 /19	Sep 21 /19	
Time	19:48:48	19:48:48	19:48:48	
Sensor Check	Passed	Passed	Passed	
Frequency	7.5	7.5	7.4	Hz
Overswing Ratio	3.9	3.7	3.9	

Peak Vector Sum 0.310 mm/s on September 21, 2019 at 19:48:48



Tran: + Vert: x Long: ø



Time Scale: 5 minutes /div Amplitude Scale: Geo: 2.000 mm/s/div



Histogram Start Time 06:06:49 September 22, 2019 Histogram Finish Time 18:00:00 September 22, 2019

Number of Intervals 714.00 at 1 minute Geo:31.75 mm/s Range Sample Rate 1024sps

Serial Number BE13734 V 10.72-8.17 MiniMate Plus

Battery Level 6.4 Volts

Unit Calibration May 13, 2019 by Saros Int. **File Name**

O734I4DN.ND0

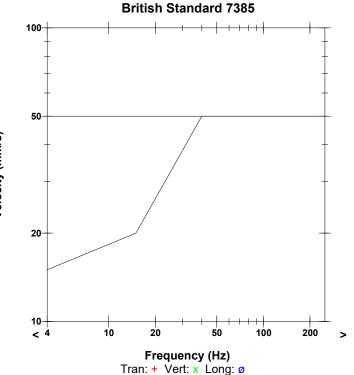


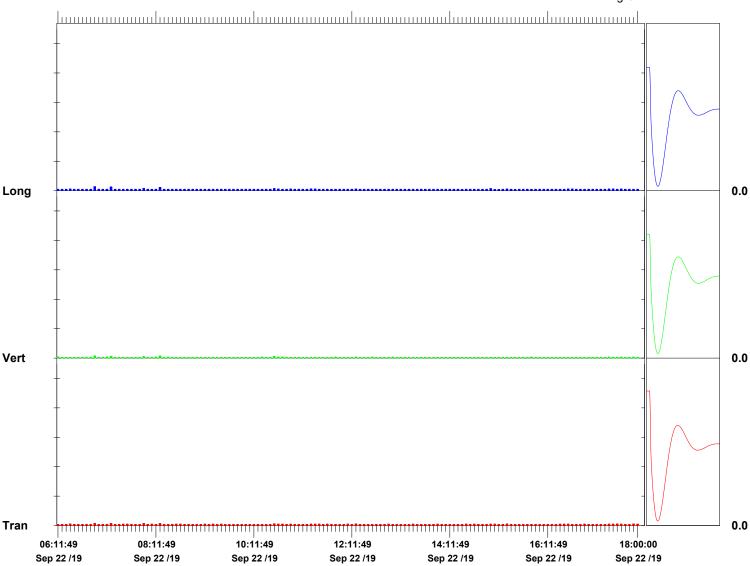
Location: Client: User Name: General:

Extended Notes

	Tran	Vert	Long	
PPV	0.159	0.143	0.270	mm/s
ZC Freq	32	43	37	Hz
Date	Sep 22 /19	Sep 22 /19	Sep 22 /19	
Time	06:53:49	06:53:49	06:53:49	
Sensor Check	Passed	Passed	Passed	
Frequency	7.5	7.5	7.4	Hz
Overswing Ratio	3.9	3.7	4.0	

Peak Vector Sum 0.283 mm/s on September 22, 2019 at 06:53:49





Time Scale: 5 minutes /div Amplitude Scale: Geo: 2.000 mm/s/div



Histogram Start Time 18:06:48 September 22, 2019 Histogram Finish Time 06:00:01 September 23, 2019

Number of Intervals 714.00 at 1 minute Geo:31.75 mm/s Range

Sample Rate 1024sps Serial Number BE13734 V 10.72-8.17 MiniMate Plus

Battery Level 6.2 Volts

Unit Calibration May 13, 2019 by Saros Int. **File Name**

O734I4EK.ZC0

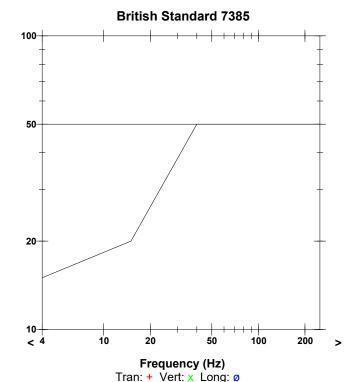


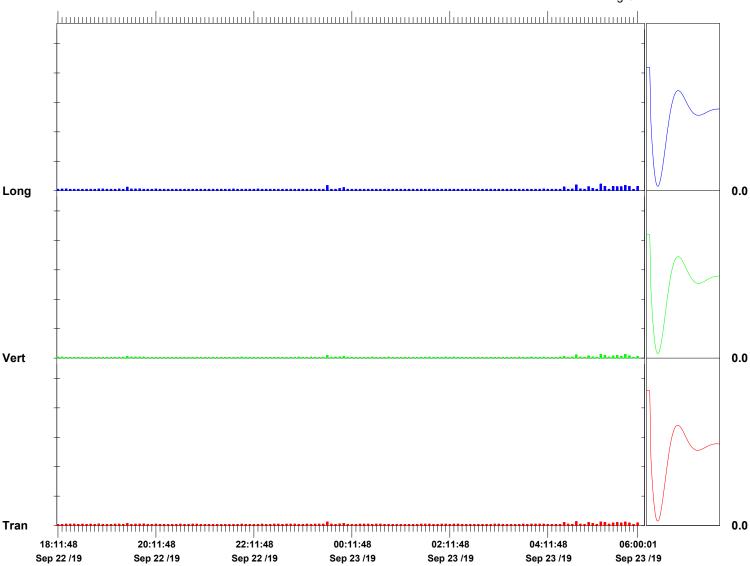
Location: Client: User Name: General:

Extended Notes

	Tran	Vert	Long	
PPV	0.270	0.254	$0.44\bar{4}$	mm/s
ZC Freq	27	43	26	Hz
Date	Sep 23 /19	Sep 23 /19	Sep 23 /19	
Time	04:44:48	05:13:48	05:13:48	
Sensor Check	Passed	Passed	Passed	
Frequency	7.6	7.5	7.4	Hz
Overswing Ratio	3.9	3.7	3.9	

Peak Vector Sum 0.470 mm/s on September 23, 2019 at 05:13:48





Time Scale: 5 minutes /div Amplitude Scale: Geo: 2.000 mm/s/div



Histogram Start Time 06:03:59 September 21, 2019 Histogram Finish Time 18:00:00 September 21, 2019

Number of Intervals 717.00 at 1 minute Range Geo:31.75 mm/s Sample Rate 1024sps

Serial Number **Battery Level**

File Name

BE12733 V 10.72-8.17 MiniMate Plus

6.7 Volts

Unit Calibration May 13, 2019 by Saros Int.

N733I4BS.UN0H

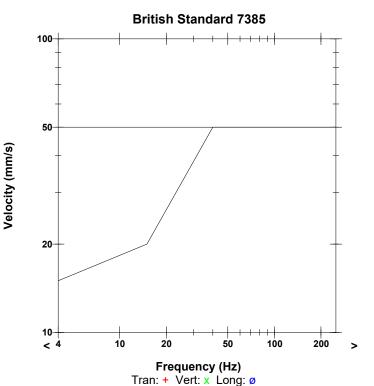


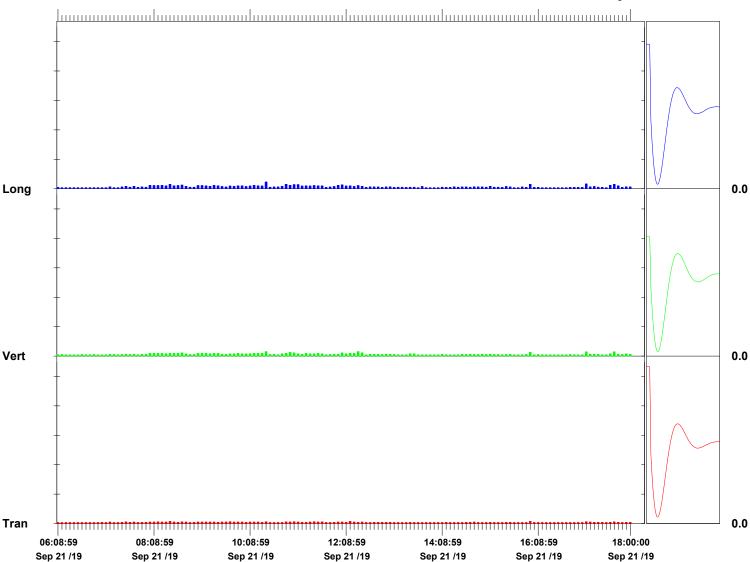
Location: Client: User Name: General:

Extended Notes

	Tran	Vert	Long	
PPV	0.143	0.302	$0.44\bar{4}$	mm/s
ZC Freq	21	32	24	Hz
Date	Sep 21 /19	Sep 21 /19	Sep 21 /19	
Time	08:24:59	10:26:59	10:26:59	
Sensor Check	Passed	Passed	Passed	
Frequency	7.6	7.6	7.7	Hz
Overswing Ratio	3.9	3.5	3.8	

Peak Vector Sum 0.533 mm/s on September 21, 2019 at 10:26:59





Time Scale: 5 minutes /div Amplitude Scale: Geo: 2.000 mm/s/div



File Name

Histogram Start Time 18:04:01 September 21, 2019 Histogram Finish Time 06:00:01 September 22, 2019

Number of Intervals 716.00 at 1 minute Range Geo:31.75 mm/s

Sample Rate 1024sps Serial Number BE12733 V 10.72-8.17 MiniMate Plus **Battery Level**

6.8 Volts

Unit Calibration May 13, 2019 by Saros Int. N733I4CQ.6P0H

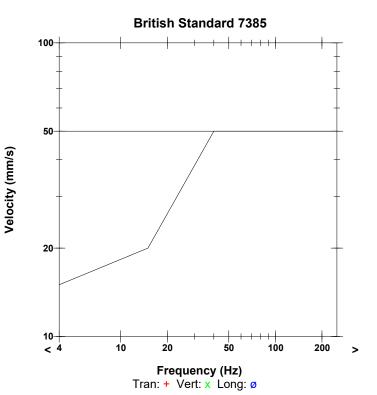
Notes

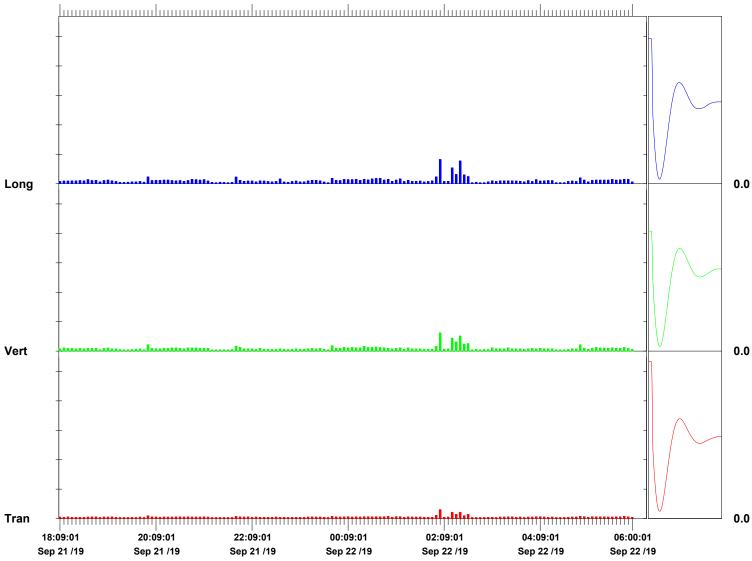
Location: Client: User Name: General:

Extended Notes

	Tran	Vert	Long	
PPV	0.603	1.238	1.635	mm/s
ZC Freq	28	28	32	Hz
Date	Sep 22 /19	Sep 22 /19	Sep 22 /19	
Time	02:02:01	02:01:01	02:01:01	
Sensor Check	Passed	Passed	Passed	
Frequency	7.6	7.6	7.7	Hz
Overswing Ratio	3.8	3.5	3.8	

Peak Vector Sum 1.931 mm/s on September 22, 2019 at 02:01:01





Time Scale: 5 minutes /div Amplitude Scale: Geo: 2.000 mm/s/div



Histogram Start Time 06:04:00 September 22, 2019 Histogram Finish Time 18:00:00 September 22, 2019

Number of Intervals 716.00 at 1 minute Range Geo:31.75 mm/s

Sample Rate 1024sps Serial Number BE12733 V 10.72-8.17 MiniMate Plus

6.7 Volts **Battery Level**

Unit Calibration May 13, 2019 by Saros Int. **File Name** N733I4DN.IO0H

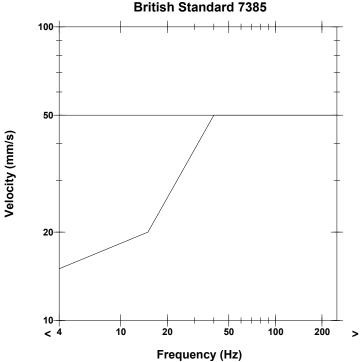


Location: Client: User Name: General:

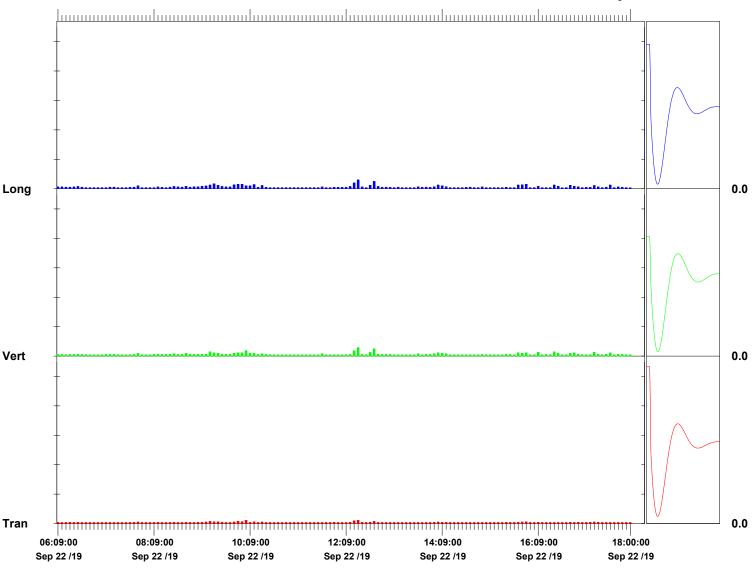
Extended Notes

	Tran	Vert	Long	
PPV	0.222	0.571	0.587	mm/s
ZC Freq	21	39	30	Hz
Date	Sep 22 /19	Sep 22 /19	Sep 22 /19	
Time	10:02:00	12:20:00	12:21:00	
Sensor Check	Passed	Passed	Passed	
Frequency	7.5	7.6	7.7	Hz
Overswing Ratio	3.9	3.5	3.8	

Peak Vector Sum 0.697 mm/s on September 22, 2019 at 12:20:00



Tran: + Vert: x Long: Ø



Time Scale: 5 minutes /div Amplitude Scale: Geo: 2.000 mm/s/div



File Name

Velocity (mm/s)

Histogram Start Time 18:03:53 September 22, 2019 Histogram Finish Time 06:00:01 September 23, 2019

Number of Intervals 717.00 at 1 minute Range Geo:31.75 mm/s Sample Rate 1024sps

BE12733 V 10.72-8.17 MiniMate Plus Serial Number **Battery Level**

6.8 Volts

Unit Calibration May 13, 2019 by Saros Int. N733I4EK.UH0H

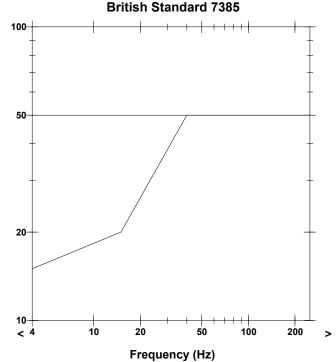
Notes

Location: Client: User Name: General:

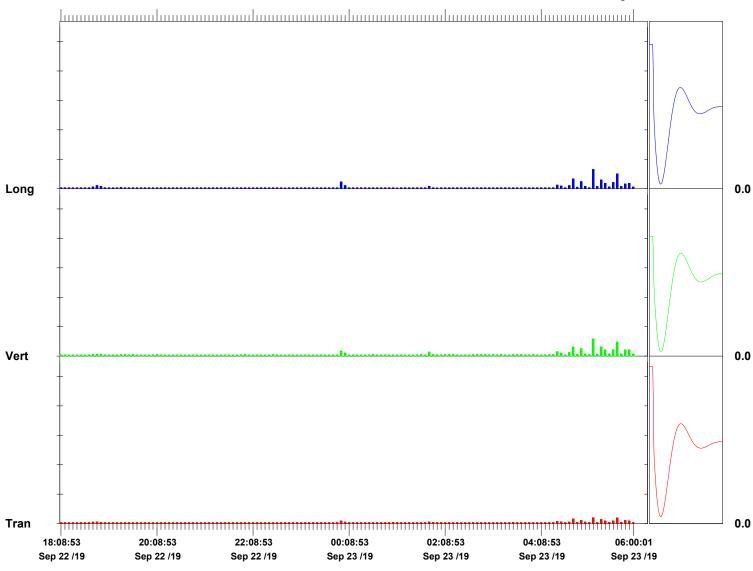
Extended Notes

	Tran	Vert	Long	
PPV	0.397	1.175	1.302	mm/s
ZC Freq	51	47	47	Hz
Date	Sep 23 /19	Sep 23 /19	Sep 23 /19	
Time	05:13:53	05:13:53	05:13:53	
Sensor Check	Passed	Passed	Passed	
Frequency	7.5	7.6	7.7	Hz
Overswing Ratio	3.9	3.5	3.7	

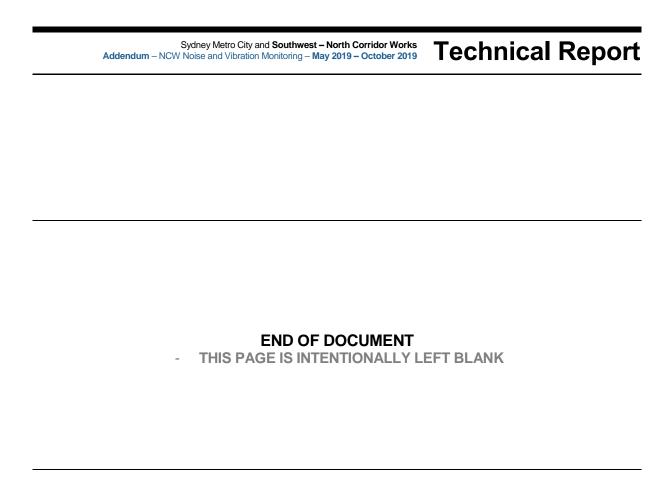
Peak Vector Sum 1.645 mm/s on September 23, 2019 at 05:13:53



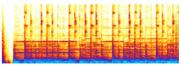
Tran: + Vert: x Long: Ø



Time Scale: 5 minutes /div Amplitude Scale: Geo: 2.000 mm/s/div







acoustic studio

ENDORSEMENT CITY & SOUTHWEST ACOUSTIC ADVISOR

Review of	Laing O'Rourke North Corridor Works	Document reference:	LOR-NCW-Noise and
	Noise and Vibration Monitoring Report		Vibration Monitoring-May19-
	May 2019 – October 2019		Oct19 Summary Report V0.3
Prepared by:	Larry Clark, Alternate Acoustic Advisor		Dated 10 July 2020
Date of issue:	11 August 2020		

As approved Alternate Acoustics Advisor for the Sydney Metro City & Southwest project, I have reviewed and provided comment on the Noise and Vibration Monitoring Report May 2019 – October 2019 for the North Corridor Works (NCW), as required under A27 (d) of the project approval conditions.

I previously reviewed and commented on Version 2 of the Report. Version 3 has been updated to satisfactorily address my comments.

The NCW Noise and Vibration Monitoring Report is to be submitted to the Department of Planning and Environment in accordance with Condition of Approval C16 and the LOR Construction Noise and Vibration Monitoring Plan (CNVMP).

I have reviewed the monitoring report and am satisfied that it meets the requirements for construction noise and vibration monitoring for NCW, as outlined in the NCW CNVMP. I endorse the report.

Larry Clark, City & Southwest Alternate Acoustics Advisor