CABRAMATTA LOOP PROJECT

AUSTRALIAN RAIL TRACK CORPORATION

CONSTRUCTION MONITORING REPORT

November 2022 to April 2023

Contents

		Signed	Date
Completed by	[redacted]	[redacted]	
Approved by FH	[redacted]	[redacted]	
Approved by ARTC	[redacted]	[redacted]	07/06/23
	[redacted]	[redacted]	07/06/23

1. Introduction

Australian Rail Track Corporation (ARTC) is constructing a passing loop for up to 1,300m length trains on the Southern Sydney Freight Line (SSFL), which will allow freight trains travelling in opposite directions to pass and provide additional rail freight capacity along the SSFL. The project is referred to as the Cabramatta Loop Project. The project has been assessed under Division 5.2 (State significant infrastructure) of the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act). The project is State Significant Infrastructure (SSI #9186) and was declared Critical State Significant Infrastructure (CSSI) on 15 May 2020. The Minister for Planning and Public Spaces granted approval of the CSSI on 28 July 2020.

ARTC has contracted Fulton Hogan to construct the Cabramatta Loop Project. The construction works commenced in November 2021 and are being performed under the provisions of the Ministers Conditions of Approval and Environment Protection Licence 3142. In accordance with Condition of Approval C13, the following report details all required monitoring to be undertaken during the reporting period.

C13 The results of the **Construction Monitoring Programs** must be made publicly available in the form of a **Construction Monitoring Report** at the frequency identified in the relevant **Construction Monitoring Program**.

Note: *Where a relevant CEMP Sub-Plan exists, the relevant Construction Monitoring Program may be incorporated into that CEMP Sub-Plan.*

2. Site Activities and Rainfall

Weather conditions were favourable in November, allowing productivity to increase across all work areas. The BoM only recorded 57.4mm from 4 rain days which is under the November mean of 76.3mm and the median of 67.8mm. These drier conditions were a welcome respite from the previous reporting period's high rainfall. This allowed the construction team to achieve important progress in piling, retaining wall FRP and embankment earthworks in JOR.

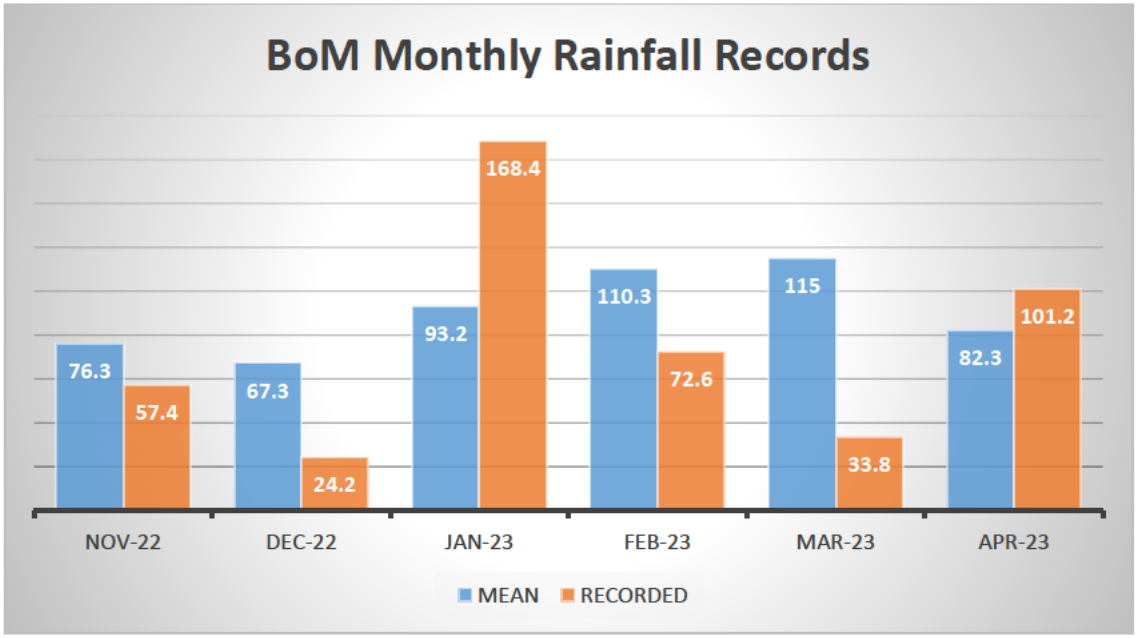
Weather conditions were very favourable in December, allowing productivity to continue well across all work areas. The BoM only recorded 24.2mm with only 4 rain days receiving more than 2mm precipitation. This was significantly less than the December mean of 66.5mm and the median of 55.4mm. These drier conditions allowed the construction team to achieve important milestones for piling, FRP and bridge construction in addition to preparing the site for extended closure.

January weather presented some challenges with heavy summer storms at times during the month. Total rainfall recorded for January was 168.4mm, higher than the mean of 94.6mm and median of 77.6mm. Given the extended site closure, much of January involved a soft relaunch into retaining wall FRP and bridge-related construction works. Site water management was key to maintain momentum in all activities across the site including the gravity sewer installation in JOR.

Weather conditions were reasonable during February, allowing productivity to continue in key areas. The BoM recorded 72.6mm with only 6 rain days receiving more than 2mm precipitation. This was less than the mean of 109.6mm and the median of 78.8mm. The environment team focused on housekeeping, dust and sediment control and preparing for bridge girder installation with works around Cabramatta Creek. No water quality impacts were evident in Cabramatta Creek proving that mitigation measures and site controls had been implemented and maintained effectively.

Weather conditions were reasonable during March, allowing productivity to continue in key areas. The BoM recorded 33.8mm with only 4 rain days receiving more than 2mm precipitation. This was less than the mean of 115mm and the median of 86.5mm. This allowed momentum to continue in key areas particularly around the higher risk area of Cabramatta Creek and both retaining walls.

Weather conditions were generally average in April, with 8 days where more than 1mm of rain fell. The BoM recorded 101.2mm from 8 rain days, which is above the 82.3mm average. Fortunately, two of the most significant rainfall events occurred on a no-work Sunday (49.4mm combined), which meant that momentum of works in key areas continued -- particularly around the closed Sussex Street area, FRP/Capping beam continuation and noise panel relocation.



Above: Rainfall data from the nearest Bureau of Meteorology station at Bankstown Airport vs statistical mean records

Above: Upstream Cabramatta Creek during a minor rainfall event in November 2022

Above: Excavations holding water following a minor rainfall event in January 2023

Above: Progression of bridge works at Cabramatta Creek following a minor rainfall event in February 2023.

Above: Storage of site water within treatment basins at Jacqui Osmond Reserve following rainfall in February 2023.

Above: Progression of bridge works at Cabramatta Creek during March 2023.

3. Cabramatta Creek Water Quality Monitoring

The purpose of water quality monitoring during the construction phase is to determine impacts resulting from construction of the project only (i.e. road/ rail construction) and not other unrelated sources, such as upstream urban development, agricultural operations, sewage overflows, or runoff of nutrient rich fertilisers from nearby landscaped parks/ recreational areas such as playing fields or golf courses. Sampling parameters have been assessed for consistency with the following NSW Water Quality Objective Criteria:

Turbidity - Lowland Rivers: 6-50 NTU
pH - Lowland Rivers: 6.5 – 8.5
Oil and Grease: No visual evidence

The GHD study titled Australian Rail Track Corporation – Cabramatta Loop Water Quality Monitoring Report (September 2020), provides the following insights to the two In situ tested physico-chemical indicators and significance :
Turbidity: "*High turbidity is typical of disturbed catchments and during high flow events. Not toxic, but can affect ecosystems and biota*"….*"Turbidity, directly measured in situ by the water quality probe, provides readings which express how light is scattered by suspended particulate material in the water. These results, given in Nephelometric Turbidity Units (NTU), generally provide a good correlation with the concentration of particles in the water that affect water clarity and phytoplankton productivity. Although high turbidity is often a sign of poor water quality and land management, crystal clear water does not always guarantee healthy water. Extremely clear water can signify very acidic conditions, or high levels of salinity. The ANZECC (2000) Freshwater Guidelines give a trigger value of 6-50 NTU for turbidity in lowland rivers".*

pH*: "Extremes of pH can be directly toxic to biota, and can modify the effect of other stressors (eg release metals)*"…. *"Most of the adverse effects of pH in water are associated with low pH values*

(acidic), effectively when pH of less than 6.5 is recorded. ANZECC (2000) states that almost all water quality guidelines around the world recommend that pH should be maintained in the range 6.5 to 9.0 to protect freshwater aquatic organisms. The ANZECC (2000) Guidelines for pH are 6.5 - 8.0 for freshwater lakes and reservoirs, and 6.5 – 8.5 for NSW lowland rivers."

During the reporting period, surface water quality in Cabramatta Creek has been monitored immediately upstream and downstream of the bridge works at Cabramatta Creek so that any impacts directly related to construction activities can be identified and addressed.

The two construction water quality monitoring locations are indicated below as SW1 (Upstream) and SW2 (Downstream). The sampling sites were moved from those recommended by GHD in advance of construction occurring based on the following assessments:

SW1 (Upstream) was identified as the safest access immediately west of the existing rail bridge over Cabramatta Creek. This is downstream of GHD's recommended location and picks up additional major urban inflows from a box culvert draining from the west adjacent Cabramatta Sports Grounds containing runoff from parts of Sussex Street (west), Jasmine Crescent and Begonia Avenue and two pipe culverts draining to a headwall just west of the rail bridge crossing, draining parts of Sussex Street (west), Church Street and Railway Parade. Without relocating this upstream monitoring location, any pollutants associated with urban runoff may have been thought attributable to the construction phase of the project.

SW2 (Downstream) was identified as the safest access immediately east of the existing shared user culvert crossing over Cabramatta Creek. Firstly, the site nominated by GHD as Downstream (Broomfield Street cycleway) did not adequately capture potential runoff that could drain into Cabramatta Creek from the piling and crane pads associated with construction of the Cabramatta Creek rail bridge or the potential runoff from the laydown area adjoining Jacqui Osmond Reserve. During a previous reporting period, the project identified a potential new downstream location that took advantage of a previously cleared section of embankment associated with a pumping station to provide safe access to the waterway where potential hazards such as steep embankment, rock and woody debris trips and snakes can be easily identified without impacts to riparian flora. Following a major flooding event, along with antisocial behaviour of a vagrant living at the pumping station, it was determined unsafe to continue monitoring at this location and a contingency location was identified further downstream for times when safety of monitoring staff could not be guaranteed. See Figure 1 and below images for details.

Figure 1 – Indicative water quality monitoring locations

Above:
Upstream Surface Water Sampling Point SW1
Latitude: -33.90260 º
Longitude: 150.93804
November 2021

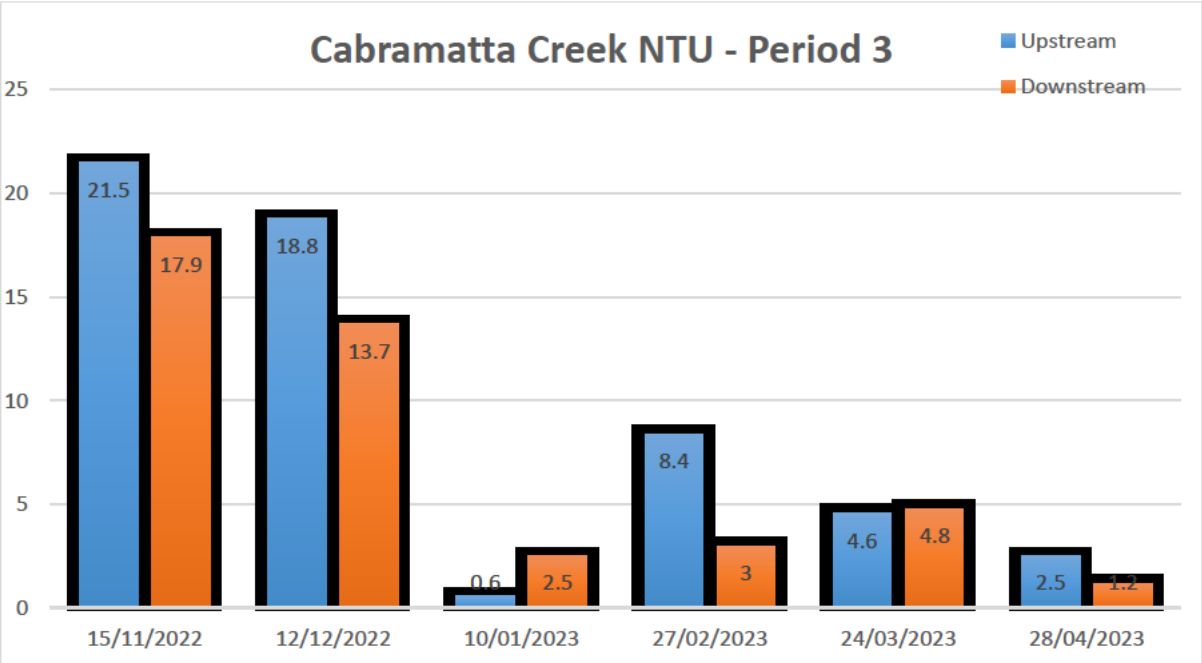
Above:
Downstream Surface Water Sampling Point SW2
Latitude: - 33.541814°
Longitude: 150.562122°
May 2022

Monitoring sites were sampled opportunistically on a monthly basis. At each site, grab samples were collected for field analysis. In addition, relevant site descriptions and notes were taken for each site and visual observations made. Visual observations included: Visual oil and grease; Stream flows; Water clarity; Water colour, odour and any other notable observations. Photos of each water quality sample site were taken to record the visual appearance of the site at the time of sampling. Where appropriate, photos of stream banks were taken providing a digital record of bank stability, geomorphology and riparian vegetation condition.

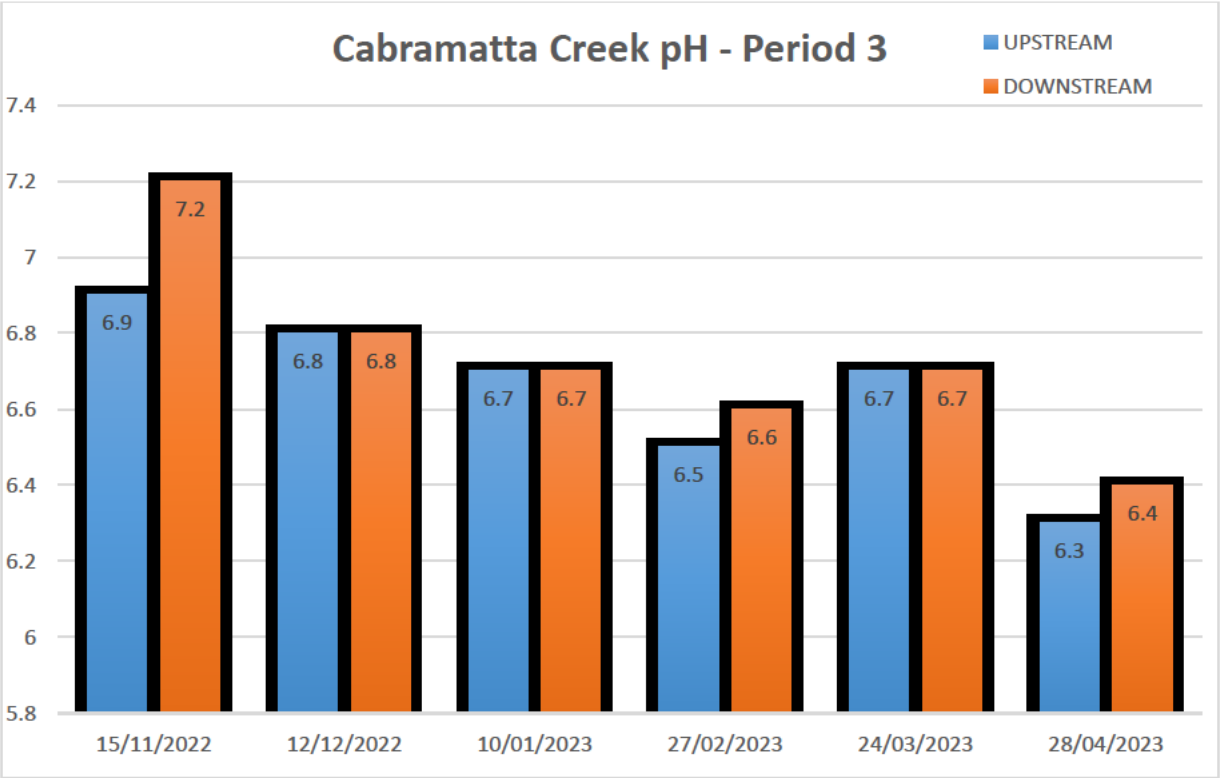
Water quality sampling was performed in accordance with Australian Standard A*S/NZS 5667-1998 "Water Quality – Sampling"* and "*Approved methods for the sampling and analysis of water pollutants in NSW"* (EPA, 2022) only when safe for personnel to get close enough to the live waterway. Therefore the data is not reflective of peak worst case water quality conditions, but is representative of general flow parameters at the time of sampling. This data is provided in Table 1 and monthly trends may be interpreted in the following graphs.

Table 1. Water quality monitoring results – November 2022 – April 2022

Date	Location	Co-ordinates	pH	NTU (Field)	Oil & Grease
15/11/2022	Cabramatta Creek Upstream	-33.90260º 150.93804º	6.9	21.5	Not visible
15/11/2022	Cabramatta Creek Downstream	-33.90531º 150.93942º	7.2	17.9	Not visible
12/12/2022	Cabramatta Creek Upstream	-33.90260º 150.93804º	6.8	18.8	Not visible
12/12/2022	Cabramatta Creek Downstream	-33.90531º 150.93942º	6.8	13.7	Not visible
10/01/2023	Cabramatta Creek Upstream	-33.90260º 150.93804º	6.7	0.6	Not visible
10/01/2023	Cabramatta Creek Downstream	-33.90531º 150.93942º	6.7	2.5	Not visible
27/2/2023	Cabramatta Creek Upstream	-33.90260º 150.93804º	6.5	8.4	Not visible
27/2/2023	Cabramatta Creek Downstream	-33.90531º 150.93942º	6.6	3	Not visible
24/3/2023	Cabramatta Creek Upstream	-33.90260º 150.93804º	6.7	4.6	Not visible
24/3/2023	Cabramatta Creek Downstream	-33.90531º 150.93942º	6.7	4.8	Not visible
28/4/23	Cabramatta Creek Upstream	-33.90260º 150.93804º	6.3	2.5	Not visible
28/4/23	Cabramatta Creek Downstream	-33.90531º 150.93942º	6.4	1.2	Not visible



Above: Turbidity data from Table 1 graphed demonstrating monthly trends



Above: pH data from Table 1 graphed demonstrating monthly trends

Prior to construction GHD was engaged by ARTC to prepare the baseline water quality monitoring program for the project titled '*Australian Rail Track Corporation Cabramatta Loop: Water Quality Monitoring Report*' dated September 2020. This baseline monitoring of surface water quality commenced in May 2019 at various sites upstream and downstream from the project and monitored baseline conditions for twelve months between May 2019 and April 2020.

Any further direct comparison of the construction phase water quality to baseline parameters beyond the discussion below is difficult due to seasonal disparities and in particular the prominence of the La Nina effect experienced during 2021 and 2022. The GHD report stating "*Whilst the overall amount of rainfall was similar to the long term average, the distribution of rainfall was different. Rainfall was extremely light throughout most of the reporting period, with the exception of two wet weather events in September 2019 and February 2020. Eight of the twelve months in the period were drier than the corresponding long-term median. Most of the rainfall recorded fell during the February 2020 event; 328 millimetres fell between 7 and 10 February, and 160 millimetres was recorded on 10 February alone. As described, one wet weather sampling event was performed in February 2020. Additional wet weather sampling would have been preferable to better establish wet weather water quality conditions, however such sampling is of course weather-dependent, and was not able to be performed in the monitoring timeframe.*"

During the period November 2022 – April 2023 the following observations have been made:

- No oil or grease was observed as visible during any sampling event.
- In all months, the turbidity recorded at both the upstream and downstream sites was below the 50 NTU NSW Water Quality Objective Criteria. In January, February, March and April, turbidity was recorded below the lower guideline of 6 NTU. Extremely clear water can signify very acidic conditions or high levels of salinity however these results are consistent with baseline monitoring

data where GHD previously reported "*A number of samples at all sites were below the lower guideline, this was attributed to the salinity of the sites as recorded in the EC present. Whilst these samples are regarded as outside the guideline range, the low turbidity can be expected due to natural processes present at the sites*." In relation to levels ranging from 0.6 to 21.5 NTU, these values are consistent with baseline maximums where GHD has commented "*these results are as expected in wet weather flows through areas where urbanisation through the catchment has occurred, as it has in much of the Cabramatta Creek catchment."*

- During the months from November to March (inclusive), pH was always within the ANZECC guideline range, with a high end of 7.2pH and a lower end of 6.5pH. April samples indicated a pH of 6.3pH upstream and 6.4pH downstream, which is slightly below the guideline range for lowland rivers. However, April's sample echoes the results observed by GHD during baseline monitoring.
- Based on the available data and field observations, the construction phase environmental controls and management measures implemented during the six month period have been effective in meeting the project's water quality objectives and minimising impacts to the Cabramatta Creek and Georges River ecosystems.

Above: Upstream sampling of Cabramatta Creek during April.

4. Noise Monitoring Results

Chapter 9 of the EIS assessed the potential extent and magnitude of noise impacts generated from construction of the project. This included a detailed assessment documented in EIS Volume 2 – Technical Report 2 – Cabramatta Loop Project: Noise and Vibration Impact Assessment (GHD, August 2019). As a result of this study, the area of potential noise sensitive receivers has been divided into four noise catchment areas (NCAs). These NCAs are based on ambient noise characteristics with respect to major roads and rail corridors in the project area as described and represented in Figure 2 below:

- NCA 1: The area to the North of Jacquie Osmond Reserve and west of the rail corridor. The area comprises of commercial and residential land uses. Rail noise, road traffic noise from Railway Parade and noise from commercial premises along Railway Parade dominate the noise environment in NCA01.
- NCA 2: The area to the North of Jacqui Osmond Reserve and east of the rail corridor. The area comprises of residential land uses. Road traffic noise from Broomfield Street and local roads in the area dominate the noise environment with Hume Highway operations contributing to background noise levels. An existing noise wall along Broomfield Street attenuates rail noise.
- NCA 3: The area to the South of Jacqui Osmond Reserve and West of the rail corridor. The area comprises of primarily residential land uses. Rail noise and traffic along the Hume Highway and local roads dominate the noise environment in NCA03.
- NCA 4: The area to the South of Jacqui Osmond Reserve and East of the rail corridor. The area comprises of primarily industrial and commercial land uses. Rail noise and industrial activities dominate the noise environment in NCA04.

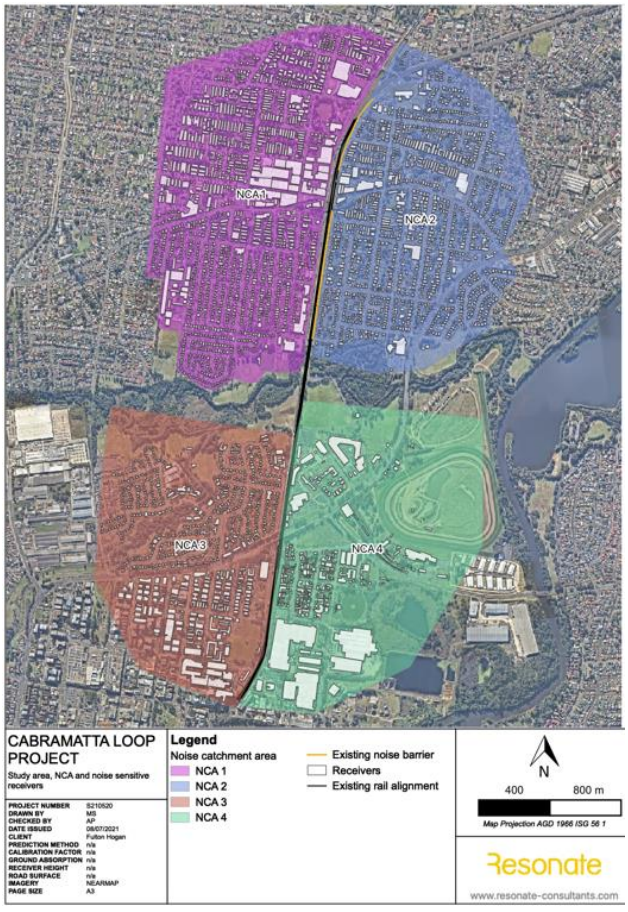


Figure 2: Noise Catchment Areas

The nominated monthly attended noise monitoring locations are shown in Figure 3 and listed below:

- Location 1: 225 Railway Parade, Cabramatta
- Location 2: 150 Broomfield Street, Cabramatta
- Location 3: Corner of Station Street and Lawrence Hargrave Road
- Location 4: In railway corridor north of Warwick Farm Station

The monitoring locations were selected to cover each NCA and proximity to key construction zones and most potentially affected sensitive receivers.

Figure 3 – Indicative noise monitoring locations

A summary of the baseline noise monitoring including a description of the ambient noise environment at each location is provided in the table below.

Table 2. Summary of Baseline Noise Monitoring

NCA	Address	Free-field or façade	Rating background level (RBL)			Ambient noise levels, $L_{Aeq(period)}$					Ambient noise observations
			Day	Evening	Night	Day	Evening	Night	Day (15 hour)	Night (9 hour)	
-	In rail corridor (North of Warwick Farm Station)	Free field	-	-	-	65	64	63	65	63	Rail noise dominant
-	In rail corridor (South of Cabramatta Station)	Free field	43	41	33	68	68	66	68	66	Rail noise dominant
01	225 Railway Parade, Cabramatta	Free field	45	44	33	61	61	59	61	59	Rail noise dominant, road traffic noise along Railway Parade
02	150 Broomfield Street, Cabramatta	Façade	39	38	31	56	56	52	56	52	Rail noise dominant, road traffic noise along Broomfield Street, construction works at residence along Broomfield Street
02	46a National Street, Cabramatta	Free field	38	37	31	53	48	46	51	46	Rail noise faintly audible, road traffic noise along National Street
01	41 Church Street, Cabramatta	Free field	38	39	30	55	53	50	54	50	Road traffic noise along Church Street, rail passbys in background
03	25 Lawrence Hargrave Road, Warwick Farm	Free field	37	38	32	52	50	47	50	47	Rail noise dominant, car passbys and bird noise

As a result of this baseline monitoring, the below noise management levels were determined and are used to ensure that impacts to noise and vibration are minimised and within the scope permitted by the project approval through the employment of reasonable and feasible attenuation and management measures:

Table 3. Summary of residential noise management levels

NCA	Standard hours, $L_{Aeq,15min}$	OOHW Period 1, $L_{Aeq,15min}$		OOHW Period 2, $L_{Aeq,15min}$	Sleep disturbance, L_{AFmax}
		Day	Evening	Night	Night
NCA01	48	43	42	36	52
NCA02	48	43	43	35	52
NCA03	47	42	42	37	52
NCA04	47	42	42	37	52

The following noise monitoring has been performed:

- Monthly noise monitoring at sensitive receiver locations identified as Noise Monitoring Locations 1 to 4 from November 2022 to April 2023;
- Where Out of Hours Works have been performed, monitoring has also been undertaken at the closest receivers and at random locations for the purpose of verification within the catchment. This has occurred during weekend track closures known as “possessions”. Such activities are permitted by ARTC’s Environmental Protection Licence to provide a safe working environment and the works are assessed in accordance with the OOHW Protocol approved by the Department of Planning and Environment.

- During this reporting period the following possessions have taken place:
  - WE20 - 11th - 13th November 2022
  - WE29 - 14th - 15th January 2023
  - WE32 - 4th - 5th February 2023
  - WE38 - 18th - 19th March 2023
  - WE43 - 22nd - 23rd April 2023

No complaints were received in relation to acoustic impacts within the four noise catchments during the reporting period.

Attended measurements were conducted using the following instrumentation:

- Sound Level Meter - Rion NA-28 sound level meter serial number: 01270688
- Sound Calibrator – Pulsar Model 106 serial number 83428

The sound level meter holds a current calibration certification. The Rion NA-28 was manufactured before 2019 and complies with Australian Standard IEC 61672.1:2013. The Pulsar 106 complies with the requirements set out in IEC 60942:2017 Electroacoustics: sound calibrators. The attended measurement events were guided by the methods described in Australian Standard 1055:2018 Acoustics: description and measurement of environmental noise and Approved methods for the measurement and analysis of environmental noise in NSW (EPA, 2022).

Field calibration of the sound level meter was checked both prior and post measurement and no noise level drift was observed. All monitoring locations have been established to ensure outdoor free-field noise level measurements where the influence of reflecting structures (other than the ground) is minimised ie: measurements have been undertaken at least 3.5m from any reflecting structure and at a height of 1.2m above ground level mounted on a tripod. There were no instances where the nearest residence was more than 30m away from the monitoring location.

Although the project formally entered “construction commencement” 30 days after approval of the Construction Environmental Management Plan, minimal enabling work activities beyond compound establishment in Jacqui Osmond Reserve occurred in November 2021, hence the attended monitoring data for November (as reported in Period 1 report) is very useful in terms of context and comparison against the baseline established in 2018/19 during the EIS planning phase. No construction impacts were audible during this time at any of the noise monitoring locations and on each occasion, the recorded minimums were above the rated background levels for each catchment. This has been a trend throughout the construction period, indicating some change in ambient acoustics has likely occurred during the past few years. Frequent monitoring in noise catchments 3 and 4 also provide insights to current ambient conditions with minimal project work occurring outside of possession weekends.

During this monitoring period, with the exception of possession weekends, almost always ambient acoustics are dominated by background noise in all catchments except for NCA 2 where Broomfield Street enabling work such as utility diversions and street realignment civil works are the primary noise source. Significant contributions to background levels are attributed to common noise sources including passenger and freight trains within the rail corridor, light and heavy vehicles on local roads and the Hume Highway bridge over the rail corridor at Warwick Farm (to the South for NCAs 3 and 4) and Cabramatta Road bridge over the rail at Cabramatta (to the North for NCAs 1 and 2), overhead aircraft including jet and propeller thrusted aircraft as well as helicopters departing and approaching Bankstown Airport.

Each month of attended monitoring data and observations are represented in Tables 4 to 9.

Table 4. Attended noise monitoring results – November 2022

<table>
<tr><th>ID# / NCA</th><th>Location</th><th>Reason for monitoring</th><th>Date/Time</th><th>RBL dB(A)</th><th>$L(A)_{eq(15min)}$ dB(A)</th><th>Comments</th></tr>
<tr><td>NML1
NCA1</td><td>Location 1 – 225 Railway Parade, Cabramatta</td><td>Monthly Monitoring - Assessment of potential noise impacts</td><td>17/11/2022</td><td>45</td><td>67</td><td>
<table>
<tr><th>$L(A)_{eq(15min)}$</th><th>$L(A)_{max}$</th><th>$L(A)_{10(15min)}$</th><th>$L(A)_{90(15min)}$</th><th>$L(A)_{min}$</th></tr>
<tr><td>67</td><td>94</td><td>71</td><td>49</td><td>46</td></tr>
</table>
Construction noise from works along Broomfield Street was inaudible. The catchment was dominated by light and heavy vehicles, with a notably high Lmax of 94 being recorded from a LV horn. Noise from passing trains is also considerable given the lack of noise wall.
- 100+ LVs @56-76dB for 3-5 secs.
- 3 x HVs @65-80dB for 3-5 secs.
- 5 x Syd Trains @55-78dB for 5-10 secs.
- 1 x freight train @60-70dB for 50 secs.
- Hume Hwy constant at 55-56 dB.
- Nearby LV horn @94dB for 1-2 secs (max).
</td></tr>
</table>

<table>
<tr><th>ID# / NCA</th><th>Location</th><th>Reason for monitoring</th><th>Date/Time</th><th>RBL dB(A)</th><th>$L(A)_{eq(15min)}$ dB(A)</th><th>Comments</th></tr>
<tr><td>NML2
NCA2</td><td>Location 2 – 150 Broomfield Street, Cabramatta</td><td>Monthly Monitoring - Assessment of potential noise impacts</td><td>17/11/2022</td><td>39</td><td>73</td><td>
<table>
<tr><th>$L(A)_{eq(15min)}$</th><th>$L(A)_{max}$</th><th>$L(A)_{10(15min)}$</th><th>$L(A)_{90(15min)}$</th><th>$L(A)_{min}$</th></tr>
<tr><td>73</td><td>92</td><td>75</td><td>65</td><td>62</td></tr>
</table>
Monitoring occurred during piling works being conducted opposite, within 15 metres from the device. FRP works were also being undertaken further south of the monitoring location. The revving engine of the nearby piling rig was the most dominant noise source during the 15 minutes of monitoring.

- 5 x LVs @65-67dB for 2-3 secs.
- 1 x HV @68-80dB for 5-6 secs.
- 2 x Syd Trains @63-65dB for 5 secs.
- Piling rig engine constant @64-72dB.
- 3 x piling rig whirring/drilling @72-82dB for 10-12 secs.
- 3 x piling rig shaking dirt off drill @70-85dB for 3-5 secs.
- 2 x nearby pedestrians chatting/walking @60-62dB for 5 secs.
- Passing street sweeper @66-85dB for 30 secs.
- 1 x reversing concrete agitator truck (engine + quacker) @66-68dB for 5 secs.
- 3 x excavator clanging/fitting bucket @80-82dB for 2-3 secs.
</td></tr>
</table>

<table>
<tr><th>ID# / NCA</th><th>Location</th><th>Reason for monitoring</th><th>Date/Time</th><th>RBL dB(A)</th><th>$L(A)_{eq(15min)}$ dB(A)</th><th>Comments</th></tr>
<tr><td>NML3
NCA3</td><td>Location 3 - Corner of Station Street and Lawrence Hargrave Road, Warwick Farm</td><td>Monthly Monitoring - Assessment of potential noise impacts</td><td>17/11/2022</td><td>37</td><td>60</td><td>
<table>
<tr><th>$L(A)_{eq(15min)}$</th><th>$L(A)_{max}$</th><th>$L(A)_{10(15min)}$</th><th>$L(A)_{90(15min)}$</th><th>$L(A)_{min}$</th></tr>
<tr><td>60</td><td>87</td><td>61</td><td>49</td><td>47</td></tr>
</table>
No construction noise audible during monitoring. All noise relates to ambient conditions.
- 6 x LVs @53-68dB for 3-5 secs.
- 2 x HVs @54-87dB for 5-6 secs.
- 2 x overhead aircraft @53-66dB for 15-20 secs.
- 3 x Syd Trains @52-74dB for 6-10 secs.
- Hume Hwy constant in background @51-53dB.
- Sirens from firetruck on Hume Hwy audible @53-57dB for 20-30 secs.
- Birds chirping constantly in background @51-54dB.
- 5 x horns from Peter Warren Automotive @54-56dB for 1 sec.
</td></tr>
<tr><td>NML4
NCA4</td><td>Location 4 - Warwick Farm Station Car Park</td><td>Monthly Monitoring - Assessment of potential noise impacts</td><td>17/11/2022</td><td>37</td><td>60</td><td>
<table>
<tr><th>$L(A)_{eq(15min)}$</th><th>$L(A)_{max}$</th><th>$L(A)_{10(15min)}$</th><th>$L(A)_{90(15min)}$</th><th>$L(A)_{min}$</th></tr>
<tr><td>52</td><td>69</td><td>55</td><td>48</td><td>45</td></tr>
</table>
Construction noise not audible. All noise relates to ambient conditions.
- 5 x LVs (in carpark) @55-65dB for 3-5 secs.
- 1 x overhead aircraft @53-60dB for 30 secs.
- 4 x Syd Trains @53-66dB for 10-12 secs.
- Hume Hwy constant background @50-53dB.
- Birds constantly chirping @50-54dB.
</td></tr>
</table>

NB: OOHW monitoring was undertaken by an acoustic consultant (Resonate) on Sunday 13 November 2022 (WE22 Possession). Results are presented in the tables below.

Resonate

Acoustics • EMF • Structural Dynamics • Vibration

Table 1 Noise Measurement Locations

ID	Location	Description of Works
AM01	1-109 Stage 4 of 4 Riverpark Drive, Liverpool	Concrete pour via mini-pump truck and concrete agitator
AM02	Footpath outside of 2 Lawrence Hargrave Road, Warwick Farm	WF18 Signal installations Warwick Farm Station (north) B. Stockpile operations Warwick Farm Station (South) C. Trench & Install CSR trench and conduits (33.890 to 33.920km) D. Track Formation widening works (33.630 to 33.800km) E. Inter track Drainage Works (33.432 to 33.630km) F. Track Underbore & pit installations (33.900km) G. Main compound logistical activities and stockpile operations in Jacqui Osmond Reserve
AM03	Footpath outside of 13 Station Street, Warwick Farm	WF18 Signal installations Warwick Farm Station (north) B. Stockpile operations Warwick Farm Station (South) C. Trench & Install CSR trench and conduits (33.890 to 33.920km) D. Track Formation widening works (33.630 to 33.800km) E. Inter track Drainage Works (33.432 to 33.630km) F. Track Underbore & pit installations (33.900km) G. Main compound logistical activities and stockpile operations in Jacqui Osmond Reserve
AM04	Western end of walkway between Warwick Street and Manning Street, Warwick Farm	WF18 Signal installations Warwick Farm Station (north) Stockpile operations Warwick Farm Station (South) Trench & Install CSR trench and conduits (33.890 to 33.920km) Track Formation widening works (33.630 to 33.800km) Inter track Drainage Works (33.432 to 33.630km) Track Underbore & pit installations (33.900km) Main compound logistical activities and stockpile operations in Jacqui Osmond Reserve
AM05	Footpath outside of100 Broomfield Street, Cabramatta	Backfill around Loc & pathway, hand mix concrete, install ballast on trackside of LOC slab, clean up
AM06	Footpath outside of 225 Railway Parade, Cabramatta	Backfill around Loc & pathway, hand mix concrete, install ballast on trackside of LOC slab, clean up

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3 Noise Measurement Results

The measured noise levels and discussion of key observations is presented in Table 2.

Table 2 Noise Measurement Results

ID/Meas no.	Time	Duration (minutes)	Predicted $L_{Aeq\ (15\ minute)}$ dB(A)	Estimated (Measured) $L_{Aeq\ (15\ minute)}$ dB(A) Construction Noise	Measured $L_{Aeq\ (15\ minute)}$ dB(A) Total Noise	Measured L_{A90} dB(A) Total Noise	Comment
AM01 1 (60)	10:36	15	66	49	52	47	• Works were typically around 47 dB(A) discernible over ambient. • Road traffic on main Newbridge Road was audible. • Non-tonal reversing alarms 49 dB(A). • Impact noise at times 50 – 52 dB(A). • Airplane flyover. • Infrequent local traffic.
AM01 2 (61)	10:55	15	66	49	50	47	• Works were discernible over ambient, typically 49 dB(A). • Occasional impact noises 54 dB(A). • Metal on metal 61 dB(A) • Road traffic on main Newbridge Road was audible. • Infrequent local traffic.
AM02 (62)	11:29	15	57	47	49	43	• Light rain. • Idling plant 44 – 46 dB(A). • Non-tonal reversing alarms 50 - 52 dB(A). • Amplified music from residence was audible at times 44 dB(A).

ID/Meas no.	Time	Duration (minutes)	Predicted $L_{Aeq\ (15\ minute)}$ dB(A)	Estimated (Measured) $L_{Aeq\ (15\ minute)}$ dB(A) Construction Noise	Measured $L_{Aeq\ (15\ minute)}$ dB(A) Total Noise	Measured L_{A90} dB(A) Total Noise	Comment
AM03 (63)	11:49	15	59	53	54	50	• Heavier rain at times during this measurement period. • Non-tonal reversing alarms and road traffic from overpass clearly audible. • Excavator 57 – 59 while under load. • Local road traffic not contributing to period L_{eq}. • Excavator reversing alarm 64 dB(A) when directly opposite measurement location.
AM04 (64)	12:17	15	52	Not directly measurable	51	47	• Works were not visible or audible during measurement period.
AM05 (65)	12:49	15	60	53	58	51	• Contribution from local traffic and on overpass. • Amplified music from residence. • Conversation from residences 54 dB(A). • Works audible infrequently however not the dominant noise source. • Light aircraft flyover 65 dB(A). • 61 dB(A) typical local car pass by. • Infrequent grinding/pneumatic equipment at times 60 dB(A).

ID/Meas no.	Time	Duration (minutes)	Predicted $L_{Aeq\ (15\ minute)}$ dB(A)	Estimated (Measured) $L_{Aeq\ (15\ minute)}$ dB(A) Construction Noise	Measured $L_{Aeq\ (15\ minute)}$ dB(A) Total Noise	Measured L_{A90} dB(A) Total Noise	Comment
AM061 (66)	13:15	15	48	Not directly measurable	64	52	• Noise environment dominated by train replacement buses and local traffic.
AM062 (67)	13:32	15	48	Not directly measurable	65	52	• Noise environment dominated by train replacement buses and local traffic.

4 Summary and General Observations

Noise levels were below those predicted of for the works. The noise measurements confirmed that the noise mitigation implemented in accordance with the Construction Noise and Vibration Management Plan was appropriate. Whilst the use of a mini-pump and concrete agitator was required for the Liverpool Station works, the noise levels were not of sufficient magnitude to require additional mitigation measures over and above that which was implemented at any of the measurement locations.

Please let me know if you have any queries or wish to discuss the above.

Yours sincerely,

Andrew Parker
Technical Director
p +61 2 8355 4888
m +61 432 602 803
andrew.parker@resonate-consultants.com

Above: Attended monitoring at 150 Broomfield St (NML2) during November 2022.

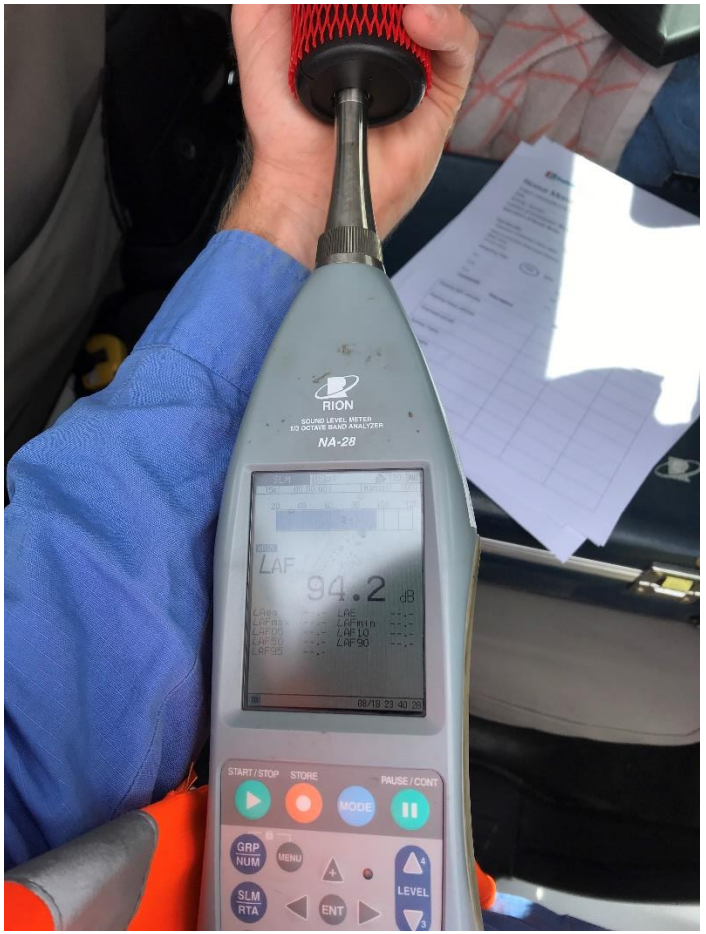
Above: Attended monitoring at 2 Lawrence Hargrave Dr (NML3) during November 2022.

Table 5. Attended noise monitoring results – December 2022

ID# / NCA	Location	Reason for monitoring	Date/Time	RBL dB(A)	$L(A)_{eq(15min)}$ dB(A)	Comments
NML1 NCA1	Location 1 – 225 Railway Parade, Cabramatta	Monthly Monitoring - Assessment of potential noise impacts	19/12/2022	45	65	$L(A)_{eq(15min)}$: 65; $L(A)_{max}$: 87; $L(A)_{10(15min)}$: 69; $L(A)_{90(15min)}$: 51; $L(A)_{min}$: 47 No construction noise was audible during monitoring. The catchment was dominated by passing LVs, with over 200 recorded within the 15 minute monitoring period. - 200+ passing LVs @60-86dB for 2-3 secs. - 2 x overhead aircraft @55-72dB for 7-10 secs. - 4 x Syd Trains @52-75dB for 8-10 secs. - Hume Hwy constant @51-53dB (background). - Nearby car starting/departing @59-61dB for 3-5 secs.
NML2 NCA2	Location 2 – 150 Broomfield Street, Cabramatta	Monthly Monitoring - Assessment of potential noise impacts	19/12/2022	39	61	$L(A)_{eq(15min)}$: 61; $L(A)_{max}$: 79; $L(A)_{10(15min)}$: 55; $L(A)_{90(15min)}$: 47; $L(A)_{min}$: 44 Trenching ongoing on western side of Broomfield St opposite Junction St intersection. - Passing light vehicles @ 52-67dB - Sydney Trains x 5 for 5-10 each@56-64dB - 1 x Freight train for 90secs @56-64dB – Horn – 74dB - Cabramatta Road overpass constant typically@ 49-50dB - Overhead aircraft x 2 @ 51-58dB - Construction plant movement alarms (quackers) @ 52-55 dB for 3-5 secs – x 6

<table>
<tr><th>ID# / NCA</th><th>Location</th><th>Reason for monitoring</th><th>Date/Time</th><th>RBL dB(A)</th><th>$L(A)_{eq(15min)}$ dB(A)</th><th>Comments</th></tr>
<tr><td>NML3
NCA3</td><td>Location 3 - Corner of Station Street and Lawrence Hargrave Road, Warwick Farm</td><td>Monthly Monitoring - Assessment of potential noise impacts</td><td>19/12/2022</td><td>37</td><td>62</td><td>
<table>
<tr><th>$L(A)_{eq(15min)}$</th><th>$L(A)_{max}$</th><th>$L(A)_{10(15min)}$</th><th>$L(A)_{90(15min)}$</th><th>$L(A)_{min}$</th></tr>
<tr><td>62</td><td>80</td><td>64</td><td>50</td><td>46</td></tr>
</table>
Construction noise not audible. All noise relates to ambient conditions.
- Sydney Train (x 3 @ 58-74dB) and Hume Hwy constant typically@ 50-56dB.
- Overhead aircraft @57-61dB (15secs)
- Passing light vehicles (x6)@60-68dB (3-5secs)
- Passing heavy vehicle@60-79dB (5-6secs)
- Leaves in nearby trees rustling in wind constant @ 52-58dB
- Horns from Peter Warren @ 55-56dB
</td></tr>
<tr><td>NML4
NCA4</td><td>Location 4 - Warwick Farm Station Car Park</td><td>Monthly Monitoring - Assessment of potential noise impacts</td><td>19/12/2022</td><td>37</td><td>61</td><td>
<table>
<tr><th>$L(A)_{eq(15min)}$</th><th>$L(A)_{max}$</th><th>$L(A)_{10(15min)}$</th><th>$L(A)_{90(15min)}$</th><th>$L(A)_{min}$</th></tr>
<tr><td>61</td><td>79</td><td>55</td><td>47</td><td>44</td></tr>
</table>
Construction noise not audible. No work in this area. All noise relates to ambient conditions.
- Sydney Trains (x6 @ 52-58dB).
- Freight train x 1 @52-79dB
- Hume Hwy constant typically @ 47-51dB.
- Birds chirping constant @ 48-50dB
- Passing light vehicles x 4 @55-60 dB
- Passing heavy vehicle @55-67 dB
</td></tr>
</table>

Above: Monitoring at 225 Railway Pde (NML1) during December 2022.



Above: Calibrating the machine at 94 dB(A) before monitoring in December 2022.

Table 6. Attended noise monitoring results – January 2023

ID# / NCA	Location	Reason for monitoring	Date/Time	RBL dB(A)	$L(A)_{eq(15min)}$ dB(A)	Comments
NML1 NCA1	Location 1 – 225 Railway Parade, Cabramatta	Monthly Monitoring - Assessment of potential noise impacts	31/01/2023	45	62	$L(A)_{eq(15min)}$ / $L(A)_{max}$ / $L(A)_{10(15min)}$ / $L(A)_{90(15min)}$ / $L(A)_{min}$: 62 / 81 / 65 / 49 / 47 No construction noise audible from monitoring location. All noise relevant to ambient conditions. Dominated by LVs and buses turning off Railway St. - 300+ LVs @52-78dB for 3-5 secs. - 6 x HVs (all buses) @52-79 dB for 6-8 secs. - 2 x overhead aircraft @61-74dB for 10-12 secs. - 6 x Syd Trains @53-70dB for 8-10 secs. - Hume Hwy constantly audible at 50-51dB in background. - 1 x helicopter overhead @54-68dB for 15 secs.

ID# / NCA	Location	Reason for monitoring	Date/Time	RBL dB(A)	$L(A)_{eq(15min)}$ dB(A)	Comments
NML2 NCA2	Location 2 – 150 Broomfield Street, Cabramatta	Monthly Monitoring - Assessment of potential noise impacts	31/01/2023	39	55	$L(A)_{eq(15min)}$ | $L(A)_{max}$ | $L(A)_{10(15min)}$ | $L(A)_{90(15min)}$ | $L(A)_{min}$ 55 | 73 | 58 | 50 | 43 Monitoring captured some acoustics associated with works on the Broomfield St retaining wall. On this occasion, the Hume Hwy was not audible due to the idling of nearby plant. - 3 x passing LVs for 6-8 secs @53-72dB1 x overhead aircraft for 20 secs @55-63dB. - Gusts of wind were frequent @57db. - Nearby sucker truck idling for entire monitoring period @52-53dB. - Nearby street sweeper at Junction St for 90 secs @53-55dB. - FH Truck idling at Junction St for 90 secs @54-55 before departing.
NML3 NCA3	Location 3 - Corner of Station Street and Lawrence Hargrave Road, Warwick Farm	Monthly Monitoring - Assessment of potential noise impacts	31/01/2023	37	55	$L(A)_{eq(15min)}$ | $L(A)_{max}$ | $L(A)_{10(15min)}$ | $L(A)_{90(15min)}$ | $L(A)_{min}$ 59 | 73 | 59 | 58 | 56 Construction noise not audible. No work in this area. All noise relates to ambient conditions. - 4 x passing LVs @55-65dB. - 1 x passing HV (Bus) @55-70. - 3 x overhead aircraft for 12-15 secs @58-71dB. - Hume Hwy @constant 50-52dB background. - Frequent chirping birds (Lorikeet) @52-54dB. - Usual horns from Peter Warren ramp @60dB.

<table>
<tr><th>ID# / NCA</th><th>Location</th><th>Reason for monitoring</th><th>Date/Time</th><th>RBL dB(A)</th><th>$L(A)_{eq(15min)}$ dB(A)</th><th>Comments</th></tr>
<tr><td>NML4
NCA4</td><td>Location 4 - Warwick Farm Station Car Park</td><td>Monthly Monitoring - Assessment of potential noise impacts</td><td>31/01/2023</td><td>37</td><td>59</td><td>
<table>
<tr><th>$L(A)_{eq(15min)}$</th><th>$L(A)_{max}$</th><th>$L(A)_{10(15min)}$</th><th>$L(A)_{90(15min)}$</th><th>$L(A)_{min}$</th></tr>
<tr><td>59</td><td>73</td><td>59</td><td>58</td><td>46</td></tr>
</table>
Construction noise not audible. All noise relates to ambient conditions.
- 9 x passing LVs in carpark for 3-4 secs @58-64dB.
- 1 x Syd train for 20 secs @60-69dB.
- Constant ~54dB background noise coming from Hume Hwy traffic.
- Occasional commuters walking and chatting through carpark @57-61dB.
- Cicadas constantly calling at approx. 58dB during monitoring. Comes in lengthy waves.
- A nearby resident was scratching a shovel on concrete for 8-10 sec increments @ 58-60dB.
- 5-15 sec gusts of wind in surrounding trees picking up 58-60dB.
</td></tr>
</table>

Above: Monitoring at Warwick Farm Station (NML4) during January 2023.

Above: Monitoring at 150 Broomfield St (NML2) during January 2023.

Table 7. Attended noise monitoring results – February 2023

ID# / NCA	Location	Reason for monitoring	Date/Time	RBL dB(A)	$L(A)_{eq(15min)}$ dB(A)	Comments
NML1 NCA1	Location 1 – 225 Railway Parade, Cabramatta	Monthly Monitoring - Assessment of potential noise impacts	24/02/2023	45	66	$L(A)_{eq(15min)}$ / $L(A)_{max}$ / $L(A)_{10(15min)}$ / $L(A)_{90(15min)}$ / $L(A)_{min}$ 66 / 88 / 70 / 53 / 47 No notable construction noise audible from monitoring location. All noise relevant to ambient conditions. LVs and Hvs once again dominate the catchment. A street sweeper was heard during a moment of quiet from the Hume Hwy, but nothing else related to the project. - 300+ LVs @53-76dB for 3-5 secs. - 6 x HVs @60-88dB (max) for 3-5 secs. - 2 x overhead aircraft @60-66dB for 10-15 secs. - 4 x Syd Trains @ 60-74dB for 10-12 secs. - Hume Hwy constant at 51-52dB. - 1 x Street sweeper @53-54dB for 15-20 secs. - 1 x conversation with nearby pedestrian during monitoring @65-67 dB for 30 secs.

<table>
<tr><th>ID# / NCA</th><th>Location</th><th>Reason for monitoring</th><th>Date/Time</th><th>RBL dB(A)</th><th>L(A)eq(15min) dB(A)</th><th>Comments</th></tr>
<tr><td>NML2
NCA2</td><td>Location 2 – 150 Broomfield Street, Cabramatta</td><td>Monthly Monitoring - Assessment of potential noise impacts</td><td>24/02/2023</td><td>39</td><td>69</td><td>
<table>
<tr><th>L(A)eq(15min)</th><th>L(A)max</th><th>L(A)10(15min)</th><th>L(A)90(15min)</th><th>L(A)min</th></tr>
<tr><td>69</td><td>87</td><td>67</td><td>57</td><td>53</td></tr>
</table>
Excavation and backfill behind noise wall capping beam ongoing on western side of Broomfield St opposite Junction St intersection.

- 5 x passing light vehicles @ 52-68dB for 3-5 secs
- Sydney Trains x 6 for 5-10 each @59-63dB
- Whacker Packer in use for 13mins of monitoring period directly adjacent @ 56-59 dB constant (intermittent breaks)
- Excavator loading (with bucket@ 58-60dB on and off during the period.
- Movement alarm – 60-64dB for 2-3secs a time
- Overhead aircraft x 2 @ 59-64dB
</td></tr>
<tr><td>NML3
NCA3</td><td>Location 3 - Corner of Station Street and Lawrence Hargrave Road, Warwick Farm</td><td>Monthly Monitoring - Assessment of potential noise impacts</td><td>27/02/2023</td><td>37</td><td>57</td><td>
<table>
<tr><th>L(A)eq(15min)</th><th>L(A)max</th><th>L(A)10(15min)</th><th>L(A)90(15min)</th><th>L(A)min</th></tr>
<tr><td>57</td><td>77</td><td>53</td><td>44</td><td>42</td></tr>
</table>
Construction noise not audible. All noise relates to ambient conditions including:

- Sydney Train (x 6 @ 51-75dB) and Hume Hwy constant @ 47-56dB.
- Overhead aircraft @52-57dB (15-20secs)
- Passing light vehicle @52-60dB (3-5secs)
- Birds in nearby trees constant @ 46-49dB
- Horns from Peter Warren @ 50dBx >30
</td></tr>
</table>

<table>
<tr><th>ID# / NCA</th><th>Location</th><th>Reason for monitoring</th><th>Date/Time</th><th>RBL dB(A)</th><th>$L(A)_{eq(15min)}$ dB(A)</th><th>Comments</th></tr>
<tr><td>NML4
NCA4</td><td>Location 4 - Warwick Farm Station Car Park</td><td>Monthly Monitoring - Assessment of potential noise impacts</td><td>28/02/2023</td><td>37</td><td>64</td><td>
<table>
<tr><th>$L(A)_{eq(15min)}$</th><th>$L(A)_{max}$</th><th>$L(A)_{10(15min)}$</th><th>$L(A)_{90(15min)}$</th><th>$L(A)_{min}$</th></tr>
<tr><td>64</td><td>87</td><td>57</td><td>49</td><td>46</td></tr>
</table>
- Construction noise not audible. No work in this area. All noise relates to ambient conditions.
- Sydney Trains (x3 @ 51-60dB);
- Freight train x 1@55-87dB (max)
- Hume Hwy constant typically@ 48-55dB.
- Passing light vehicles x 6@53-60 dB
</td></tr>
<tr><td>Verification</td><td>2 Lawrence Hargrave Dr, Warwick Farm</td><td>Possession WE32</td><td>4/02/2023</td><td></td><td>60</td><td>
<table>
<tr><th>$L(A)_{eq(15min)}$</th><th>$L(A)_{max}$</th><th>$L(A)_{10(15min)}$</th><th>$L(A)_{90(15min)}$</th><th>$L(A)_{min}$</th></tr>
<tr><td>60</td><td>73</td><td>62</td><td>54</td><td>47</td></tr>
</table>
Possession WE32. Monitoring of Peter Warren drainage. Excavator and hydrema operating. Construction noise barely audible. Catchment dominated by Syd Trains and a lawn mower nearby.
- 3 x LVs @53-58dB for 3-5 secs.
- 7 x Syd Trains @58-71dB for 6-8 secs.
- Hume Hwy constant @48-49dB.
- 2 x excavator shaking bucket @58-62dB for 2-3 secs.
- Neighbour's lawn mower (dominant) @56-62dB for ~13 mins.
- Hydrema in JOR visible but inaudible during monitoring.
</td></tr>
</table>

ID# / NCA	Location	Reason for monitoring	Date/Time	RBL dB(A)	$L(A)_{eq(15min)}$ dB(A)	Comments
Verification	2 Nicholls St, Warwick Farm	Possession WE32	4/02/2023		59	$L(A)_{eq(15min)}$: 59; $L(A)_{max}$: 78; $L(A)_{10(15min)}$: 60; $L(A)_{90(15min)}$: 46; $L(A)_{min}$: 43 **Possession WE32.** Monitoring of Peter Warren drainage. Excavator and hydrema operating. Construction noise barely audible. Passing LVs and Syd Trains dominant. - 10 x LVs @50-60dB for 3-5 secs. - 3 x overhead aircraft @51-55dB for 15-20 secs. - 6 x Syd Trains @ 50-76dB for 8-10 secs. - Hume Hwy constant @47-49dB, with 1 x particularly loud car audible @59dB for 2-3 secs. - 4 x quacker from excavator @51db for 2-3 secs. - 3 x clanging of bucket @50-51dB For 1-2 secs. - 4 x flock of chirping birds nearby @50-60dB for 3-5 secs.
Verification	10 Sussex St, Cabramatta	Possession WE32	4/02/2023		60	$L(A)_{eq(15min)}$: 60; $L(A)_{max}$: 78; $L(A)_{10(15min)}$: 64; $L(A)_{90(15min)}$: 50; $L(A)_{min}$: 45 **Possession WE32.** Monitoring of RW10 backfill works. Excavator and dump truck operating during period. LVs dominated the catchment. - >150 x LVs @50-67dB for 3-5 secs. - 6 x overhead aircraft @52-65dB for 15-20 secs. - 5 x Syd Trains @52-62dB for 5-7 secs. - 4 x movement quackers @56-58dB for 2-3 secs. - 20 x excavator tracking back and forth + scooping material @62-67dB for 3-5 sec bursts. - 8 x pedestrians passing by @54-58dB for 3-5 secs.

<table>
<tr><th>ID# / NCA</th><th>Location</th><th>Reason for monitoring</th><th>Date/Time</th><th>RBL dB(A)</th><th>$L(A)_{eq(15min)}$ dB(A)</th><th>Comments</th></tr>
<tr><td>Verification</td><td>158 Broomfield St, Cabramatta</td><td>Possession WE32</td><td>4/02/2023</td><td></td><td>59</td><td>
<table>
<tr><th>$L(A)_{eq(15min)}$</th><th>$L(A)_{max}$</th><th>$L(A)_{10(15min)}$</th><th>$L(A)_{90(15min)}$</th><th>$L(A)_{min}$</th></tr>
<tr><td>59</td><td>76</td><td>60</td><td>48</td><td>45</td></tr>
</table>
Possession WE32. Monitoring of steel fixing for the Broomfield St retaining wall. Workers primarily utilising hand tools during period.

6 x LVs @51-67dB for 5-7 secs.
5 x overhead aircraft @55-70dB for 15-25 secs.
4 x Syd Trains @52-73dB for 5-7 secs.
5 x hammering of steel reo (hand tool) @52-54dB for 2-3 secs.
Franna idling and lifting reo @48-54dB constant.
4 x flock of cockatoos passing overhead @54-74dB for 3-5 secs.
3 x Syd Train horn @65-67dB for 1-2 secs.

</td></tr>
</table>

Above: Attended monitoring at 10 Sussex St, Cabramatta during WE32 possession in February 2023.

Above: A closer view of the works monitored at 10 Sussex St (RW10 backfill) during WE32 possession in February 2023.

Table 8. Attended noise monitoring results – March 2023

<table>
<tr><th>ID# / NCA</th><th>Location</th><th>Reason for monitoring</th><th>Date/Time</th><th>RBL dB(A)</th><th>L(A)eq(15min) dB(A)</th><th>Comments</th></tr>
<tr><td>NML1
NCA1</td><td>Location 1 – 225 Railway Parade, Cabramatta</td><td>Monthly Monitoring - Assessment of potential noise impacts</td><td>30/3/2023</td><td>45</td><td>63</td><td>
<table>
<tr><th>L(A)eq(15min)</th><th>L(A)max</th><th>L(A)10(15min)</th><th>L(A)90(15min)</th><th>L(A)min</th></tr>
<tr><td>63</td><td>83</td><td>67</td><td>46</td><td>43</td></tr>
</table>
Passing LVs and Sydney Trains dominate the acoustics. Construction noise is not audible.
- >250 Light vehicles @ 52-75dB for 3-5 secs.
- 7 x Passing HVs (all buses turning onto Boundary Ln) @48-72dB for 5-7 secs.
- 2 x Overhead aircraft @ 50-58dB for 15-20 secs.
- 5 x Syd Trains @52-82dB for 8-10 secs.
- Cabramatta Rd overbridge is constant at 46-48dB.
</td></tr>
<tr><td>NML2
NCA2</td><td>Location 2 – 150 Broomfield Street, Cabramatta</td><td>Monthly Monitoring - Assessment of potential noise impacts</td><td>30/3/2023</td><td>39</td><td>61</td><td>
<table>
<tr><th>L(A)eq(15min)</th><th>L(A)max</th><th>L(A)10(15min)</th><th>L(A)90(15min)</th><th>L(A)min</th></tr>
<tr><td>61</td><td>80</td><td>67</td><td>44</td><td>41</td></tr>
</table>
Capping beam formwork opposite the monitoring location dominated the acoustics. Hammering and loading out material at northern end was inaudible.
- 3 x LVs @50-66dB for 3-5 secs.
- 1x HV (FH 2-tonne tipper) @50-68dB for 5-7 secs.
- 4 x overhead aircraft @50-55dB for 15-20 secs.
- Installation of formwork (clanging tools, chatting, hand hammering) @45-72dB for ~ 60 secs combined.
</td></tr>
</table>

<table>
<tr><th>ID# / NCA</th><th>Location</th><th>Reason for monitoring</th><th>Date/Time</th><th>RBL dB(A)</th><th>$L(A)_{eq(15min)}$ dB(A)</th><th>Comments</th></tr>
<tr><td>NML3
NCA3</td><td>Location 3 - Corner of Station Street and Lawrence Hargrave Road, Warwick Farm</td><td>Monthly Monitoring - Assessment of potential noise impacts</td><td>30/3/2023</td><td>37</td><td>64</td><td>
<table>
<tr><th>$L(A)_{eq(15min)}$</th><th>$L(A)_{max}$</th><th>$L(A)_{10(15min)}$</th><th>$L(A)_{90(15min)}$</th><th>$L(A)_{min}$</th></tr>
<tr><td>64</td><td>87</td><td>66</td><td>46</td><td>43</td></tr>
</table>
Nearby landscaping works at Lawrence Hargrave School and Sydney Trains dominated the acoustics. CLP construction noise not audible.
- 3 x LVs @52-70dB for 3-4 secs.
- 1 x HV @52-79dB for 6-8 secs.
- 5 x overhead aircraft @47-53dB for 10-20 secs.
- 6 x Syd Trains @48-73dB for 10-12 secs.
- 1 x freight train (including horn) @57-87dB for 30 secs.
- Hume Hwy constant @42-49dB.
- Workers at LH High School (talking, shovelling, generator, grinding/cutting steel) fairly constant over ~6 mins @45-70dB.
- >20 Horns at Peter Warren @57dB for 1-2 secs.
</td></tr>
</table>

<table>
<tr><th>ID# / NCA</th><th>Location</th><th>Reason for monitoring</th><th>Date/Time</th><th>RBL dB(A)</th><th>$L(A)_{eq(15min)}$ dB(A)</th><th>Comments</th></tr>
<tr><td>NML4
NCA4</td><td>Location 4 - Warwick Farm Station Car Park</td><td>Monthly Monitoring - Assessment of potential noise impacts</td><td>30/3/2023</td><td>37</td><td>73</td><td>
<table>
<tr><th>$L(A)_{eq(15min)}$</th><th>$L(A)_{max}$</th><th>$L(A)_{10(15min)}$</th><th>$L(A)_{90(15min)}$</th><th>$L(A)_{min}$</th></tr>
<tr><td>73</td><td>55</td><td>53</td><td>48</td><td>44</td></tr>
</table>
Construction noise is not audible.
- 3 x LVs (carpark) @52-65dB for 3-5 secs.
- 2 x Overhead aircraft @51-56dB for 30 secs
- 5 x Syd Trains @53-58dB for 6-8 secs. Mostly stopped at station for ~20 secs.
- Hume Hwy constant @46-54dB. Occasional loud trucks and sirens audible towards 56dB.
- ~10 x Station announcements and beeping from train doors @51-56dB for 2-5 secs.
- 2x passing groups of pedestrians @51-56dB for 5-7 secs.
- Birds in background fairly constant @48-51dB.
- Lmax was a nearby sneeze @72dB.
</td></tr>
</table>

<table>
<tr><th>ID# / NCA</th><th>Location</th><th>Reason for monitoring</th><th>Date/Time</th><th>RBL dB(A)</th><th>$L(A)_{eq(15min)}$ dB(A)</th><th>Comments</th></tr>
<tr><td>Verification</td><td>10 Sussex St, Cabramatta</td><td>OOHW23 Plank Landing for Cab Ck.</td><td>03/03/2023</td><td></td><td>55</td><td>
<table>
<tr><th>$L(A)_{eq(15min)}$</th><th>$L(A)_{max}$</th><th>$L(A)_{10(15min)}$</th><th>$L(A)_{90(15min)}$</th><th>$L(A)_{min}$</th></tr>
<tr><td>55</td><td>69</td><td>58</td><td>45</td><td>43</td></tr>
</table>

OOHW23 Plank Landing for Cab Ck. Monitoring at ~6am during plank landing works. 10 Sussex St most sensitive receiver, however works were barely audible during monitoring. Catchment was dominated by LVs passing under the Sussex St bridge and passing commuter trains.

- >100 x LVs @47-63dB for 3-7 secs.
- 1 x overhead aircraft @51-66dB for 30 secs.
- 5 x Syd Trains @48-68dB for 5-7 secs.
- 5 x cyclists @46-56dB for 5-7 secs.
- 4 x pedestrians on crunchy gravel footpath @46-54dB for 5-10 secs.
- Whirring of crane audible at ~45-46dB numerous times throughout monitoring.
- Birds and insects nearby audible at 44-47dB multiple times.
</td></tr>
</table>

<table>
<tr><th>ID# / NCA</th><th>Location</th><th>Reason for monitoring</th><th>Date/Time</th><th>RBL dB(A)</th><th>$L(A)_{eq(15min)}$ dB(A)</th><th>Comments</th></tr>
<tr><td>Verification</td><td>150 Broomfield St, Cabramatta</td><td>OOHW23 Plank Landing for Cab Ck.</td><td>03/03/2023</td><td></td><td>52</td><td>
<table>
<tr><th>$L(A)_{eq(15min)}$</th><th>$L(A)_{max}$</th><th>$L(A)_{10(15min)}$</th><th>$L(A)_{90(15min)}$</th><th>$L(A)_{min}$</th></tr>
<tr><td>52</td><td>73</td><td>55</td><td>41</td><td>39</td></tr>
</table>
OOHW23 Plank Landing for Cab Ck. Time: 6:55am - 7:10am. No construction noise from plank landing works was audible during monitoring. From 7am, some noise was audible from nearby hand tools -- separate to the OOHW. Acoustic catchment was generally dominated by Sydney Trains and LVs.

5 x LVs @55-72dB for 10-12 secs.
1 x overhead aircraft @53-60dB for 15-20 secs.
6 x Syd Trains @43-54dB for 10-12 secs.
10 x steel fixing tools @42-46dB for 1-2 secs.
Cabramatta Rd audible @40-42dB constantly.
1 x sneeze nearby @69dB (max).
Crickets/insects @41-43dB constantly.
4 x occurrences of nearby workers chatting (after 7am) @43-56dB for 3-5 secs.

</td></tr>
</table>

<table>
<tr><th>ID# / NCA</th><th>Location</th><th>Reason for monitoring</th><th>Date/Time</th><th>RBL dB(A)</th><th>$L(A)_{eq(15min)}$ dB(A)</th><th>Comments</th></tr>
<tr><td>Verification</td><td>172 Broomfield St, Cabramatta</td><td>OOHW23 Plank Landing for Cab Ck.</td><td>03/03/2023</td><td></td><td>52</td><td>
<table>
<tr><th>$L(A)_{eq(15min)}$</th><th>$L(A)_{max}$</th><th>$L(A)_{10(15min)}$</th><th>$L(A)_{90(15min)}$</th><th>$L(A)_{min}$</th></tr>
<tr><td>52</td><td>70</td><td>54</td><td>44</td><td>42</td></tr>
</table>

OOHW23 Plank Landing for Cab Ck. Time: 6:35am - 6:50am. Very minimal construction noise from plank landing works was audible during monitoring. Catchment dominated by LVs passing under Sussex St bridge.
- ~100 LVs @46-68dB for 3-4 secs.
- 6 x slow Syd Trains @50-60dB for 5-7 secs.
- 1 x loud motorbike heard from Cabramatta Rd @46-49dB for 3-5 secs.
- 1 x handheld grinder @46-49dB for 30 secs.
- Constant bursts of birds screeching (Cockatoos mainly) @45-64dB for 2-3 secs.
</td></tr>
<tr><td>Verification</td><td>7 Station St, Warwick Farm</td><td>Possession WE38</td><td>18/03/2023</td><td></td><td>61</td><td>
<table>
<tr><th>$L(A)_{eq(15min)}$</th><th>$L(A)_{max}$</th><th>$L(A)_{10(15min)}$</th><th>$L(A)_{90(15min)}$</th><th>$L(A)_{min}$</th></tr>
<tr><td>61</td><td>94</td><td>55</td><td>48</td><td>46</td></tr>
</table>

Possession WE38. Nearest works were at Peter Warren. None of the construction was audible during monitoring. The maximum recorded noise source was a horn from a commuter train. This occured twice within the 15 minute monitoring period @88-94dB.
- 4 x LVs @53-71dB for 3-5 secs.
- 2 x Syd Trains @58-76dB for ~10 secs each.
- Hume Hwy dominating the background levels @ between 51-53dB.
</td></tr>
</table>

ID# / NCA	Location	Reason for monitoring	Date/Time	RBL dB(A)	$L(A)_{eq(15min)}$ dB(A)	Comments
Verification	2 Lawrence Hargrave Dr, Warwick Farm	Possession WE38	18/03/2023		58	$L(A)_{eq(15min)}$ / $L(A)_{max}$ / $L(A)_{10(15min)}$ / $L(A)_{90(15min)}$ / $L(A)_{min}$: 58 / 81 / 60 / 50 / 45 **Possession WE38.** Monitoring taken place during excavation works at Peter Warren, approximately 40 metres away from the device, across the eastern side of the railway. - 8 x LVs @60-64dB for ~3 seconds each. - 2 x Syd Trains @60-72dB for 8-10 secs. - Hume Hwy constant at 51-53dB. - Safety quacker on plant audible twice for approx 2-3 secs @57dB. - Lmax attributed to Syd Train horn @79-81dB for 2 secs.

<table>
<tr><th>ID# / NCA</th><th>Location</th><th>Reason for monitoring</th><th>Date/Time</th><th>RBL dB(A)</th><th>$L(A)_{eq(15min)}$ dB(A)</th><th>Comments</th></tr>
<tr><td>Verification</td><td>10 Sussex St, Cabramatta</td><td>Possession WE38</td><td>19/03/2023</td><td></td><td>57</td><td>
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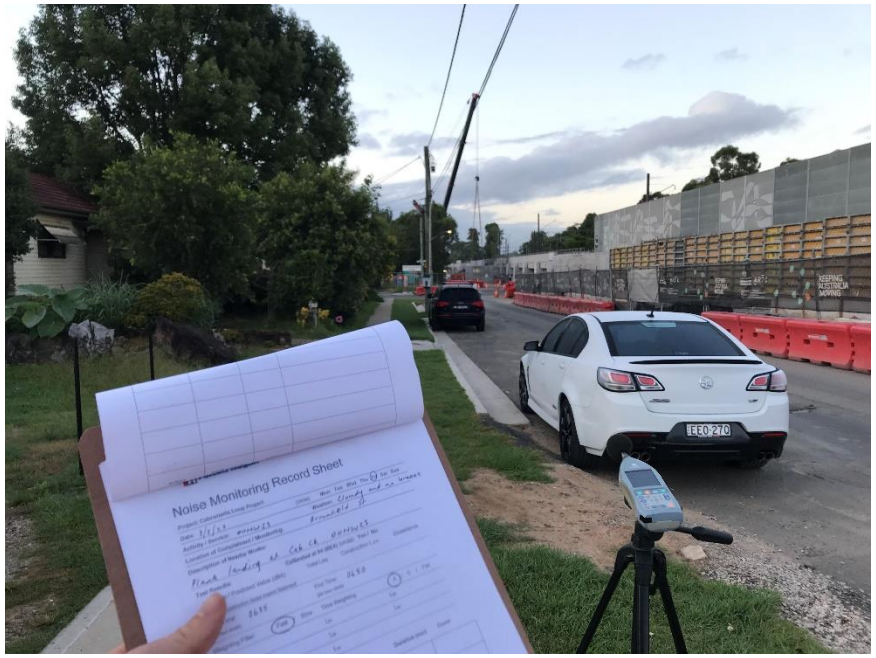
<tr><td>57</td><td>75</td><td>59</td><td>48</td><td>45</td></tr>
</table>
Possession WE38. Monitoring taken place during rail formation at RW10 retaining wall area. LVs dominated the area, with construction noise minimal.
- >50 x LVs @ 51-72dB for 5 secs.
- 3 x HVs @51 dB for 10 secs.
- 5 x Syd Trains @66-68dB for 10-12 secs.
- 1 x slow moving freight train @62-66dB for 40 secs.
- Watercart operating @ 60dB for approx 30 secs.
</td></tr>
</table>



Above: Monitoring at 172 Broomfield St during OOH girder lift on the 3rd of March 2023.

Above: Monitoring at 150 Broomfield St during OOH girder lift on the 3rd of March 2023.

Table 9. Attended noise monitoring results – April 2023

<table>
<tr><th>ID# / NCA</th><th>Location</th><th>Reason for monitoring</th><th>Date/Time</th><th>RBL dB(A)</th><th>$L(A)_{eq(15min)}$ dB(A)</th><th>Comments</th></tr>
<tr><td>NML1
NCA1</td><td>Location 1 – 225 Railway Parade, Cabramatta</td><td>Monthly Monitoring - Assessment of potential noise impacts</td><td>28/04/2023</td><td>45</td><td>62</td><td>
<table>
<tr><th>$L(A)_{eq(15min)}$</th><th>$L(A)_{max}$</th><th>$L(A)_{10(15min)}$</th><th>$L(A)_{90(15min)}$</th><th>$L(A)_{min}$</th></tr>
<tr><td>62</td><td>78</td><td>66</td><td>45</td><td>43</td></tr>
</table>
Passing LVs and buses dominated the acoustics. CLP construction not audible during monitoring.
- >300 LVs @50-72dB for 3-5 secs.
- 8 x Passing HVs (mainly buses) @55-75dB for 3-5 secs.
- 2 x overhead aircraft @48-57dB for 15-20 secs.
- 5 x Syd Trains @50-78dB for 7-10 secs.
- Cabramatta Rd constantly audible in background @46-48dB aside from very brief moments.
- 2 x pedestrians chatting @56-60dB for 5-7 secs.
</td></tr>
<tr><td>NML2
NCA2</td><td>Location 2 – 150 Broomfield Street, Cabramatta</td><td>Monthly Monitoring - Assessment of potential noise impacts</td><td>28/04/2023</td><td>39</td><td>70</td><td>
<table>
<tr><th>$L(A)_{eq(15min)}$</th><th>$L(A)_{max}$</th><th>$L(A)_{10(15min)}$</th><th>$L(A)_{90(15min)}$</th><th>$L(A)_{min}$</th></tr>
<tr><td>70</td><td>88</td><td>74</td><td>53</td><td>50</td></tr>
</table>
Monitoring occurred during works associated with noise panel relocation south of the NML and capping wall formwork directly opposite. Acoustics were generally dominated by these works during standard hours.
- 1 x passing street sweeper @53-86dB for 40 secs.
- 1 x overhead aircraft @52-68dB for 20 secs.
- 2 x Syd Trains @50-60dB for 5-7 secs.
- 1 x freight train @52-72dB for 60 secs.
- Hand tools, franna and general noise associated with formwork audible @50-77dB (loud clanging at times) for approx. 5 mins (accumulated).
- Fixing of noise panel beams/brackets using drill @50-54dB constant during monitoring period.
</td></tr>
</table>

<table>
<tr><td></td><td></td><td></td><td></td><td></td><td></td><td>- 10 x power saw cuts during formwork @82dB for 3-5 secs each.
- 10 x uses of hand tool (hammer) to fit formwork @60-80dB for 3-5 secs each.</td></tr>
<tr><td>NML3
NCA3</td><td>Location 3 - Corner of Station Street and Lawrence Hargrave Road, Warwick Farm</td><td>Monthly Monitoring - Assessment of potential noise impacts</td><td>28/04/2023</td><td>37</td><td>58</td><td>
<table>
<tr><th>$L(A)_{eq(15min)}$</th><th>$L(A)_{max}$</th><th>$L(A)_{10(15min)}$</th><th>$L(A)_{90(15min)}$</th><th>$L(A)_{min}$</th></tr>
<tr><td>58</td><td>75</td><td>47</td><td>56</td><td>45</td></tr>
</table>
Nearby compaction/proof rolling works at Peter Warren area (opposite) were slightly audible during monitoring. Acoustics were dominated by Syd Trains, a whacker packer and overhead aircraft.

- 2 x overhead aircraft @51-60dB for 15-20 secs.
- 4 x Syd trains passing @52-68dB for 5-7 secs each, plus 2 x honks of train horn audible for 1-2 secs @74-75dB (max).
- Hume Hwy constantly audible @46-49dB.
- Whacker packer constant @48-53dB.
- 2 x operator sneezes @75dB for 1 sec.
</td></tr>
<tr><td>NML4
NCA4</td><td>Location 4 - Warwick Farm Station Car Park</td><td>Monthly Monitoring - Assessment of potential noise impacts</td><td>28/04/2023</td><td>37</td><td>50</td><td>
<table>
<tr><th>$L(A)_{eq(15min)}$</th><th>$L(A)_{max}$</th><th>$L(A)_{10(15min)}$</th><th>$L(A)_{90(15min)}$</th><th>$L(A)_{min}$</th></tr>
<tr><td>50</td><td>65</td><td>53</td><td>45</td><td>41</td></tr>
</table>
No construction noise audible during monitoring. Consistent with usual monitoring results. Catchment dominated by Syd Trains.

- 5 x Syd Trains @50-70dB for 5-7 secs.
- Hume Hwy constant @46-53dB. Trucks and motorbikes loudest.
- 7 x train announcments @51-52dB for 5-7 secs.
- Birds chirping in nearby trees constant @43-48dB.
</td></tr>
</table>

<table>
<tr>
<td>Verification</td>
<td>122 Broomfield St, Cabramatta</td>
<td>Hammering of existing retaining wall</td>
<td>19/04/2023</td>
<td></td>
<td>64</td>
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<table>
<tr><th>L(A)eq(15min)</th><th>L(A)max</th><th>L(A)10(15min)</th><th>L(A)90(15min)</th><th>L(A)min</th></tr>
<tr><td>64</td><td>84</td><td>66</td><td>46</td><td>41</td></tr>
</table>
Pre-possession WE43 spot test of hammering at existing retaining wall along Broomfield St. Monitoring taken place directly opposite the works, with the plant turning off ~12 mins into monitoring. Rock hammering dominated the acoustics, with an estimated 6 minutes of hammering and 6 minutes of engine whirring. Results:

4 x LVs @55-60dB for 2-3 secs.
2 x overhead aircraft @48-52dB for 30 secs.
3 x Syd Trains @60-70dB for 7-10 secs.
Cumberland Hwy audible during periods of no hammering @42-48dB.
Rock hammer engine whirring when moving demolished concrete @60-63dB for ~6 mins.
Rock hammer audible @70-85dB for 6 mins.
Tracking/movement of plant audible (incl quacker) @60-68dB for 45 secs.

</td>
</tr>
<tr>
<td>Verification</td>
<td>106 Broomfield St, Cabramatta</td>
<td>OOHW Noise monitoring WE43</td>
<td>23/04/2023</td>
<td></td>
<td>59</td>
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<tr><th>L(A)eq(15min)</th><th>L(A)max</th><th>L(A)10(15min)</th><th>L(A)90(15min)</th><th>L(A)min</th></tr>
<tr><td>59</td><td>77</td><td>63</td><td>52</td><td>49</td></tr>
</table>
WE43 Possession. Monitoring of intertrack drainage installation opposite sensitive receiver. The acoustics were dominated by LVs, the Cumberland Hwy overpass and rain hitting the helmet of the monitoring attendant.

10 x LVs @60-77dB for 5-7 secs.
1 x overhead aircraft @60-65dB for 15 secs.
Cumberland Hwy constant @60-62dB.
1 x street sweeper @66dB for 10 secs.

</td>
</tr>
</table>

<table>
<tr><td></td><td></td><td></td><td></td><td></td><td></td><td>- Rain hitting helmet @66dB for ~5 mins.</td></tr>
<tr><td>Verification</td><td>225 Railway Pde, Cabramatta</td><td>OOHW Noise monitoring WE43</td><td>23/04/2023</td><td></td><td>63</td><td>
<table>
<tr><th>L(A)eq(15min)</th><th>L(A)max</th><th>L(A)10(15min)</th><th>L(A)90(15min)</th><th>L(A)min</th></tr>
<tr><td>63</td><td>80</td><td>66</td><td>54</td><td>52</td></tr>
</table>
WE43 Possession. Monitoring of track excavation for ULX connection. LVs and small 6T digger dominated the background acoustics, with passing HVs (buses) notably loud.
- ~50 x passing LVs @55-80dB (max) for 2-3 secs.
- 7 x HVs (buses) @55-75dB for 3-5 secs.
- 1 x overhead aircraft @60-70dB for 10-12 secs. Cabramatta Rd constant @53-60dB.
- 15 x digger bucket shakes @54-58dB for 2-3 secs.
- Digger engine revving @55-56dB constantly.
- 3 x hydrema tracking across rail @58-60dB for 10-15 secs.
- ~20 x honks of excavator horn during loading @68-70dB for 1-2 secs.
- ~20 x plant movement quacker @56-57dB for 2-5 secs.
</td></tr>
<tr><td>Verification</td><td>Cnr Nicholls & Freeman St, Warwick Farm</td><td>OOHW Noise monitoring WE43</td><td>23/04/2023</td><td></td><td>51</td><td>
<table>
<tr><th>L(A)eq(15min)</th><th>L(A)max</th><th>L(A)10(15min)</th><th>L(A)90(15min)</th><th>L(A)min</th></tr>
<tr><td>51</td><td>68</td><td>53</td><td>47</td><td>43</td></tr>
</table>
WE43 Possession. Monitoring of Rhomberg works at Southern turnout. 12:43am - 12:58am.
- 1 x passing LV (Rhomberg) recorded @52-68dB (max) for 3-5 secs.
- Drott engine sounds audible @49-52dB constantly.
- Roller audible @50-52dB constantly.
- Several moxys unloading @47-50dB for 10-15 secs.
</td></tr>
</table>

<table>
<tr>
<td>Verification</td>
<td>98-100 Broomfield St, Cabramatta</td>
<td>OOHW Noise monitoring WE43</td>
<td>23/04/2023</td>
<td></td>
<td>52</td>
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<table>
<tr><th>L(A)eq(15min)</th><th>L(A)max</th><th>L(A)10(15min)</th><th>L(A)90(15min)</th><th>L(A)min</th></tr>
<tr><td>52</td><td>66</td><td>55</td><td>47</td><td>43</td></tr>
</table>
WE43 Possession. Monitoring of drainage/ULX at Broomfield West. Time: 1:20am - 1:35am. Acoustics dominated by Cabramatta Rd overbridge and movement alarms from construction plant.

- 1 x passing LV on Broomfield St @52-66dB for 3 secs.
- Cabramatta Rd @51-60dB constant ~10 sec bursts.
- 1 x Fairfield Council street sweeper on Railway Pde @52-58dB for 20 secs.
- Wacker packer @50-51dB for 5 mins.
- >20 x quackers @54-55dB for 3-5 secs.
- Neighbourhood dogs barking from the north constantly @50dB.
</td>
</tr>
<tr>
<td>Verification</td>
<td>2 Lawrence Hargrave Dr, Warwick Farm</td>
<td>OOHW Noise monitoring WE43</td>
<td>23/04/2023</td>
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<tr><th>L(A)eq(15min)</th><th>L(A)max</th><th>L(A)10(15min)</th><th>L(A)90(15min)</th><th>L(A)min</th></tr>
<tr><td>60</td><td>70</td><td>62</td><td>56</td><td>53</td></tr>
</table>
WE43 Possession. Monitoring of Rhomberg works at Southern turnout. Unloading, spreading and compaction of material for track widening. Time: 8:23pm - 8:38pm. Construction noise dominated acoustics.

- Bobcat driving back and forth @53-62dB constant.
- Drott back and forth spreading material @54-60dB constant.
- 3 x moxys unloading @56-68dB for 5-10 secs.
- 12T roller back and forth @58-61dB constant.
- >50 x reverse movement alarm on Bobcat @58-62dB for 3-5 secs.
</td>
</tr>
<tr>
<td>Verification</td>
<td>Cnr Station St and Nicholls St, Warwick Farm</td>
<td>OOHW Noise monitoring WE43</td>
<td>23/04/2023</td>
<td></td>
<td>62</td>
<td>
<table>
<tr><th>L(A)eq(15min)</th><th>L(A)max</th><th>L(A)10(15min)</th><th>L(A)90(15min)</th><th>L(A)min</th></tr>
<tr><td>62</td><td>68</td><td>65</td><td>57</td><td>54</td></tr>
</table>
</td>
</tr>
</table>

<table>
<tr><td></td><td></td><td></td><td></td><td></td><td></td><td>WE43 Possession. Monitoring of Rhomberg works at Southern turnout. Unloading, spreading and compaction of material for track widening. Time: 10:05pm - 10:20pm. Construction noise audible.

- 4 x LVs @55-62dB for 3-5 secs.
- 1 x overhead aircraft @57-59dB for 20 secs.
- ~15 x plant quackers @58-59dB for 3-10 secs.
- Drott spreading material back and forth very frequently @60-68dB (3-4 sec bursts).
- Roller compacting @58-62dB for 2 mins.
- Day-maker lighting tower audible @54dB constantly.</td></tr>
<tr><td>Verification</td><td>106 Broomfield St, Cabramatta</td><td>OOHW Noise monitoring WE43</td><td>23/04/2023</td><td></td><td>52</td><td>
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<tr><th>$L(A)_{eq(15min)}$</th><th>$L(A)_{max}$</th><th>$L(A)_{10(15min)}$</th><th>$L(A)_{90(15min)}$</th><th>$L(A)_{min}$</th></tr>
<tr><td>52</td><td>75</td><td>52</td><td>47</td><td>41</td></tr>
</table>
WE43 Possession. Monitoring of ULX works outside residence of potential complainant (Vince). Most of works behind existing noise wall. Noise blankets also erected. Time: 9:07pm - 9:22pm.

- 9 x passing LVs @51-75dB (max) for 3-5 secs.
- 1 x overhead aircraft @48-50dB for 20 secs.
- Cabramatta Rd and Railway Pde audible @44-50dB constantly.
- 3 x plant quacker @49-51dB for 1-3 secs.
- 3 x drilling with hand tool @59-61dB.
- 2 x wacker packer @50-52dB for 30 secs.
- Excavater bucket scraping @47-56dB for 2-3 secs.
- Crickets/insects constant in background @47-49dB.
</td></tr>
<tr><td>Verification</td><td>5 Station St, Warwick Farm</td><td>OOHW Noise monitoring WE43</td><td>23/04/2023</td><td></td><td>60</td><td>
<table>
<tr><th>$L(A)_{eq(15min)}$</th><th>$L(A)_{max}$</th><th>$L(A)_{10(15min)}$</th><th>$L(A)_{90(15min)}$</th><th>$L(A)_{min}$</th></tr>
<tr><td>60</td><td>73</td><td>63</td><td>57</td><td>54</td></tr>
</table>
</td></tr>
</table>

						WE43 Possession. Monitoring of Rhomberg works at Southern turnout. Construction noise audible for entire monitoring period. Works included delivery and placement of material (Drott + Moxy) and compaction with a 12T roller. Time: 9:46pm - 10:01pm. - Drott spreading material constant @57-65dB. - Roller compacting @58-60dB for ~7 mins. - 20 x quacker @56-57dB for 3-10 secs. - 4 x moxy dumping material and scraping the tub @60-72dB (max) for 5-10 secs.

Top left:

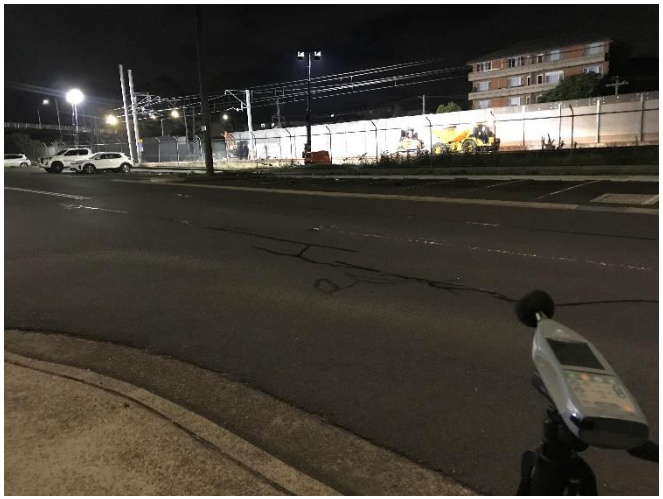
OOH monitoring of Southern turnout works looking north from 2 Lawrence Hargrave Dr, Warwick Farm during WE43 possession in April.

Top right:

OOH monitoring of Southern turnout works looking south from 2 Lawrence Hargrave Dr, Warwick Farm during WE43 possession in April.

***Bottom left*:**

OOH monitoring of northern ULX works from 225 Railway Pde, Cabramatta during WE43 possession in April.



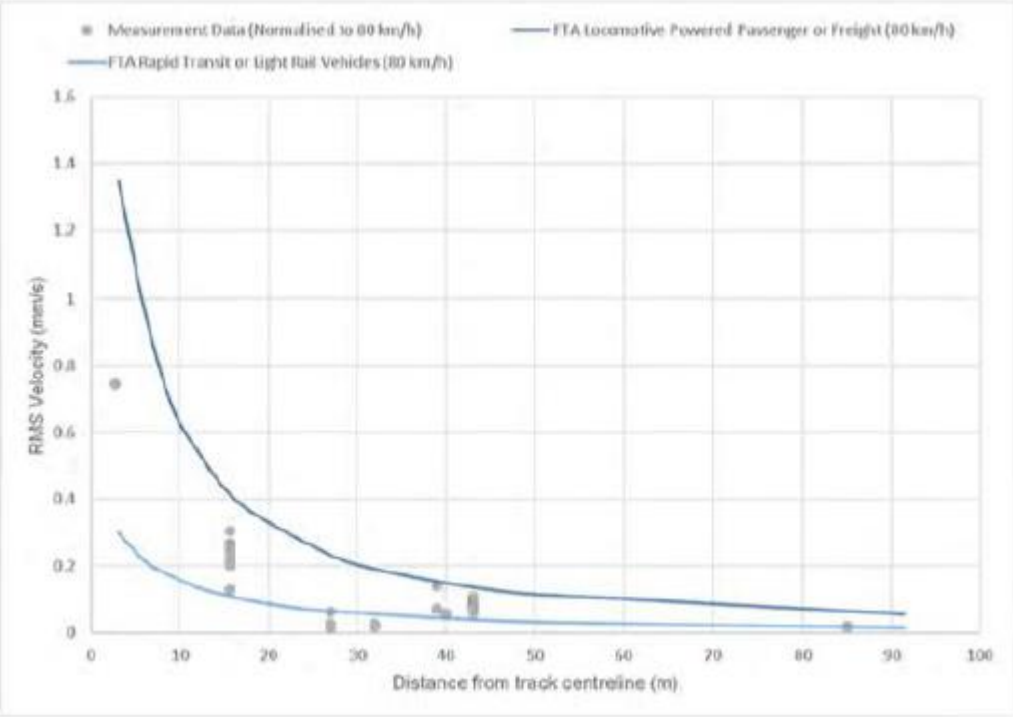
Bottom right:

OOH monitoring of northern ULX works from 106 Broomfield St, Cabramatta during WE43 possession in April.

5. Vibration Monitoring Results

Baseline Vibration Monitoring

During the EIS assessment in 2018, attended and unattended vibration monitoring was undertaken within and outside the rail corridor. The results of the monitoring indicated 4-5 mm/s peak vibration levels 6 metres from the railway tracks and levels between 0.1 mm/s and 0.3 mm/s at the residence (150 Broomfield Street, 31 metres from the SSFL). The vibration environment was dominated by road traffic noise and intermittent rail passbys. The measured vibration levels from train passbys as presented in the EIS is shown in Figure 2. The Construction Noise and Vibration Plan commits to monitoring to confirm that works occur outside of the minimum working distances and to ensure consistency with the approved level of anticipated impacts.



Above: Excerpt from EIS - Figure 2: Baseline Vibration Monitoring Data

Vibration Management

Construction vibration criteria are detailed in the approved Construction Noise and Vibration Management Plan (CNVMP) and have been adopted from the following sources, consistent with the EIS:

- Cosmetic and structural damage to heritage buildings: German Standard DIN 4150-31
- Human comfort: British Standard BS 6472-12 and BS 6472-23
- Human comfort: Assessing Vibration – a technical guideline (the Guideline).
- Ground-borne noise, that is ground vibration re-radiated as noise internally within a building, has also been assessed against the requirements of the ICNG.

The project aims to achieve compliance with the following accepted parameters and well established construction vibration criteria:

■ for structural damage to heritage structures, the vibration limits set out in the German Standard DIN 4150-3: Structural Vibration - effects of vibration on structures:

Type of Structure	Peak Particle Velocity (PPV) mm/s			
	Vibration at the foundation at a frequency of:			Vibration of horizontal plane of highest floor at all frequencies
	1 to 10 Hz	10 to 50 Hz	50 to 100 Hz[1]	
Structures that are particularly sensitive to vibration, e.g. heritage-listed structures.	3	3 to 8	8 to 10	8

(1) For frequencies above 100 Hz, the maximum values specified in this column shall be applied.
Values referred to are at the base of the building

Above: Excerpt from CNVMP Table 12: Structural Damage Criteria – Heritage Structures

■ for damage to other buildings and/or structures, the vibration limits set out in the British Standard BS 7385-2:1993 - Evaluation and measurement for vibration in buildings - Guide for measurement of vibration and evaluation of their effects on buildings (and referenced in Australian Standard 2187.2 – 2006 Explosives –Storage and use – Use of explosives).

Line (see Figure 3)	Type of Building	Peak component particle velocity in frequency range of predominant pulse	
		4 to 15 Hz	15 Hz and above
1	Unreinforced or light framed structures. Residential or light commercial type buildings	15 mm/s at 4 Hz increasing to 20 mm/s at 15 Hz	20 mm/s at 15 Hz increasing to 50 mm/s at 40 Hz and above
2	Reinforced or framed structures. Industrial and heavy commercial buildings	50 mm/s at 4 Hz and above	

Notes 1. Values referred to are at the base of the building

2: For line 1, at frequencies below 4 Hz, a maximum displacement of 0.6 mm (zero to peak) should not be exceeded.

Above: Excerpt from CNVMP Table 13: Transient Vibration Guide Values for Cosmetic Damage

- for human exposure, the acceptable vibration values set out in Environmental Noise Management Assessing Vibration: A Technical Guideline (Department of Environment and Conservation, 2006).

Building type	Preferred VDV ($m/s^{1.75}$)	Maximum VDV ($m/s^{1.75}$)
Residential daytime (7am-10pm)	0.20	0.40
Residential night-time (10pm-7am)	0.13	0.26
Offices, schools, educational institutions and places of worship (day and night-time)	0.40	0.80

Above: Excerpt from CNVMP Table 14: Acceptable Vibration Dose Values for Intermittent Vibration

All plant selection during construction has bene guided by the safe working distances established detailed in Table 25 of the CNVMP below:

Plant item	Rating / Description	Safe working distance, m					
		Cosmetic damage			Human response		
		Heritage structure	Residential structure	Commercial / Industrial	Residence – night	Residence – day	Educational
Vibratory roller	<50 kN (typically 1-2t)	7	5	2	25	15	10
	<50 kN (typically 2-4t)	9	6	2	35	20	13
	<50 kN (typically 4-6t)	22	12	5	65	40	25
	<50 kN (typically 7-13t)	27	15	6	140	110	65
	<50 kN (typically 13-18t)	36	20	8	170	140	70
	<50 kN (typically >18t)	45	25	10	170	140	75
Handheld compactor	Up to 300 kg	7	5	2	30	20	12
Small hydraulic hammer	300 kg – 18-34t excavator	3	2	–	10	7	5
Medium hydraulic hammer	1600 kg – 5-12t excavator	12	7	3	35	23	15
Large hydraulic hammer	1600 kg – 12-18t excavator	30	22	9	100	73	45
Bored piling	< 800 mm	3	2	–	7	4	2
Excavation works	12-18t excavator	3	2	–	15	10	7
Jackhammer	Handheld	2	1	–	5	–*	–*

Above: Excerpt from CNVMP Table 25: Vibration Safe Working Distances

Construction Monitoring:

Construction monitoring was performed during the reporting period utilising the following equipment:

- Equipment: Ground Vibration Monitor
- Manufacturer: Svantek
- Meter type: Svan-958A
- Date of calibration: 9/3/22

Summary:

No vibration complaints regarding property damage or human exposure were received during the reporting period and no vibration limit exceedances were recorded during the period. Naturally, the risk of vibration exceedance reduced during this reporting period with works moving further away from residents for the most part. This contrasts the previous reporting period (May 22 - Oct 22), during which piling proceeded close to heritage bridges and heavy drainage works occurring on the eastern side of Broomfield St -- in some cases within 10 metres of residential property.

Monitoring was undertaken at a potentially sensitive receiver location whilst excavation and pavement preparation activities were being performed in Sussex Street during a 5 week closure over the month of April. Monitoring consisted of two attended trials for activities involving excavation of existing pavement and movement of material across the area adjacent to the property. Aside from these activities, no other considerable vibration-generating works were performed by the construction team during the monitoring period.

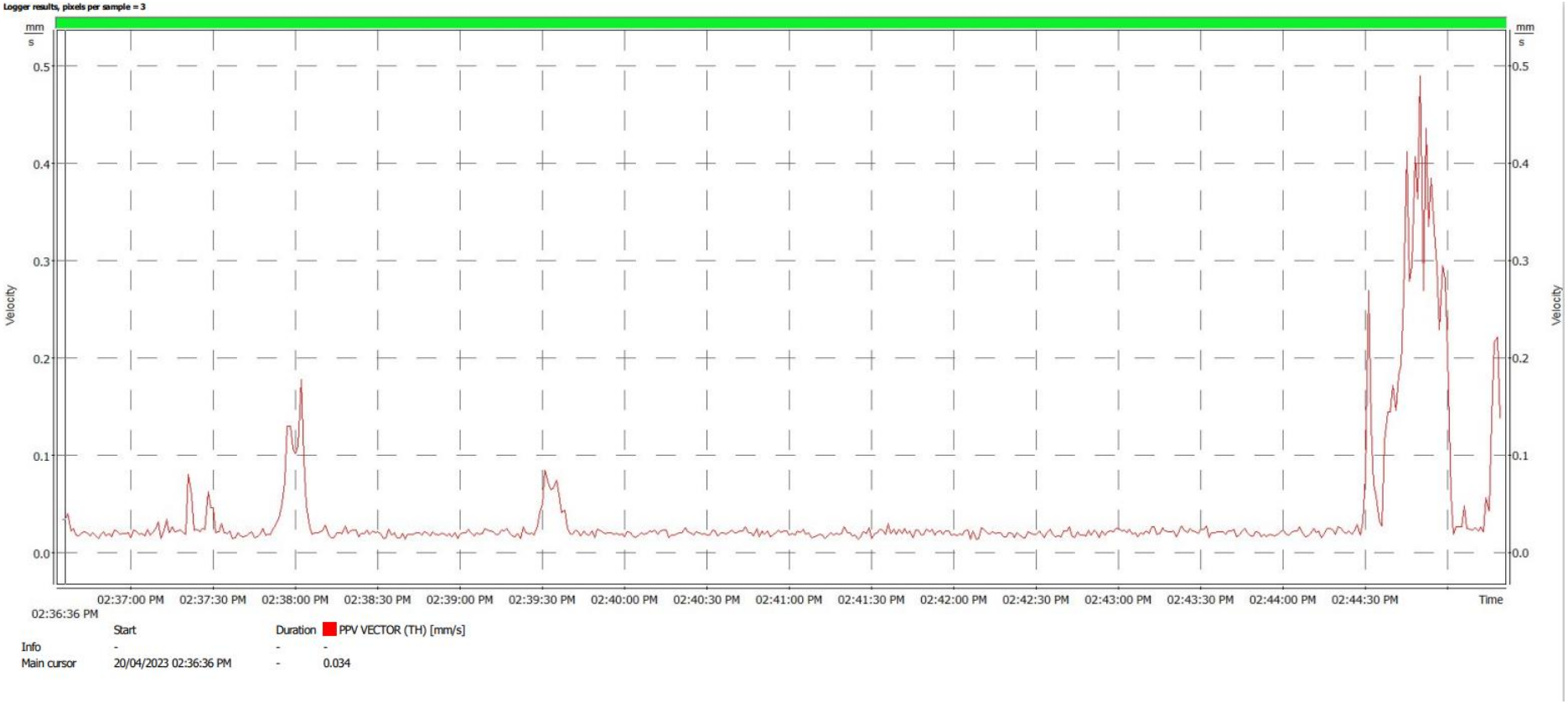
Representative vibration data samples are presented in the graphs below with relevant site photos. Overall, vibration monitoring data was within vibration guidelines outlined in the project construction noise and vibration management plan. Vibration resulting from the 8T excavator works at Sussex Street remained below guidelines during trials, providing confidence that work activities have been performed by conservatively sized equipment at appropriate safe operations distances from sensitive receivers -- in accordance with the project CNVMP.

LOCATION: 10 Sussex St, Cabramatta

ACTIVITY: Excavation activities using an 8 tonne machine during Sussex Street closure – 20th April 2023

Above: Vibration monitoring of works within 5 metres of 10 Sussex St. Vibration peaked at 0.5mm/s during monitoring.

TRIAL #1



TRIAL #2