Clyde MSF - Endeavor Energy Works Hamilton Street

Project:	SMW WTP - Clyde MSF	Teambiner No:	
Client:	Gamuda Laing O'Rourke Consortium	SMWSTWTP-GLO-CLJ-NV-PLN-000001	
Assessment Date:	February 2024	Assessment Id:	Clyde Endeavor Energy
Proposed start date:	04/03/2024	Proposed end date:	31/03/2024

Date	Revision	Contents	Reviewer
01/03/24	A	First Draft of the DNVIS submitted for review	Snr Approvals Advisor (GLC)
04/03/24	A	Update in response to ER/AA Comments	Snr Approvals Advisor (GLC)

Acoustic terms and acronyms

AA	Acoustic Advisor
AMM	Additional mitigation measures – applicable where standard measures have been implemented and NML is still expected to be exceeded.
dB(A)	Unit used to measure 'A-weighted' sound pressure levels. A-weighting is an adjustment made to sound-level measurement to approximate the response of the human ear.
DPHI	NSW Department of Planning Housing and Infrastructure
EIS	Environmental Impact Statement
ICNG	Interim Construction Noise Guideline (Department of Environment and Climate Change 2009)
NCA	Noise Catchment Area
Noise level statistics	L_{A90} - The A-weighted sound pressure level exceeded 90% of the monitoring period. This is considered to represent the background noise. L_{Aeq} - The equivalent continuous A-weighted noise level—the level of noise equivalent to the energy average of noise levels occurring over a measurement period. L_{A1} – The A-weighted sound pressure level exceeded 1% of the monitoring period. L_{Amax} – The maximum A-weighted noise level associated with the measurement period.
NML	Noise Management Level
PPV	Peak Particle Velocity – Measurement of ground-borne vibration in units of mm/s
RBL	Rating Background Level - a single figure that represents the background noise level for assessment purposes
ROL	Road Occupancy Licence – granted by Transport for NSW and required for any activity likely to impact on traffic flow.
SWL	Sound Power Level - The A-weighted sound power level is a logarithmic ratio of the acoustic power output of a source relative to 10-12 watts and expressed in decibels. Sound power level is calculated from measured sound pressure levels and represents the level of total sound power radiated by a sound source.
SPL	Sound pressure level - This is the level of noise, usually expressed in dB(A), as measured by a standard sound level meter with a pressure microphone. The sound pressure level in dB(A) gives a close indication of the subjective loudness of noise. A technical definition for the sound pressure level, in decibels, is 20 times the logarithm (base 10) of the ratio of any two quantities related to a given sound pressure to a reference pressure (typically 20 µPa equivalent to 0 dB).
Tonal noise	Noise with perceptible and definite pitch or tone
VDV	Vibration dose value – used when assessing intermittent vibration as it is sensitive to peaks in vibration acceleration and accumulates the vibration energy received over the daytime and night-time periods

1 Introduction

1.1 Overview

The Sydney Metro Western Tunnelling Package is being delivered by the Gamuda Australia and Laing O'Rourke Consortium (GLC) and includes twin nine-kilometre tunnels between Sydney Olympic Park and Westmead, excavation of two new metro stations, and a stabling and maintenance facility at Clyde (the Project).

During the Project, there is potential for nearby sensitive receivers to experience adverse impacts relating to noise and vibration. The project's Noise and Vibration Management Sub Plan (NVMP) was developed to satisfy the project's Conditions of Approval (CoA) and addresses the assessment and management of noise and vibration impacts during construction.

Under the NVMP, KNOWnoise™, a project-specific noise prediction tool, has been developed to prepare a Detailed Noise and Vibration Impact Statement (DNVIS) for site and activity-specific noise works and provide ongoing risk analysis during project delivery and for when out-of-hours work is proposed.

This DNVIS has been prepared using KNOWnoise™ and addresses activities related to the Endeavor Energy Works at the Clyde MSF Construction Site.

The structure of this DNVIS includes:

- Section 1.2 – Construction works and hours with justification for these works in Section 1.3
- Section 2 – Existing environment
- Section 3 – Assessment framework including noise and vibration management levels
- Section 4 – Construction noise assessment
- Section 5 – Mitigation and management, including consultation

1.2 Planned works

GLC plans to carry out the Endeavor Energy Works during standard working hours. The works have been split into 3 stages which are described in detailed in Appendix A, which lists each assessed activity, its timing and proposed equipment. The 3 stages are:

1) Site Investigations: Site investigation required prior to excavation to confirm locations of existing infrastructure without damage and to inform design.

2) Cable Pulling: Cable pulling during standard working hours to pull through new LV/HV cables.

3) Further Site Investigations: to excavation to confirm locations of existing infrastructure without damage and to inform design.

All stages of works are proposed to occur during standard hours.

1.3 Justification of the works

In line with the MCoA D43, GLC have undertaken this DNVIS for works that may exceed the NMLs, vibration criteria and / or ground-borne noise levels specified in Conditions D39 and D40 of this schedule at any residence outside construction hours identified in Condition D35 of this schedule, or where receivers will be h**ighly noise affected**.

Given works are part of critical Utility related works, it is assumed that the completion of these works outside the Project EIS boundary remain consistent with the Approved Project (Chapter 9). No further Environmental Approvals are required. GLC will implement all mitigation measures as nominated in this DNVIS and in accordance with our EPL (21676)

2 Existing environment

2.1 Sensitive receivers

The Hamilton Street study area is located west of the Clyde MSF construction site. It is bordered by several major road networks and land uses, ranging from industrial commercial, through to residential.

Existing noise levels in this study area are generally controlled by transportation noise from the surrounding road network and existing land uses, including the Clyde MSF construction site.

2.2 Noise catchment areas

To facilitate the assessment of noise impacts from the project and to apply representative Noise Management Levels (NMLs) to all receivers, receivers adjacent to the Clyde MSF construction site has been divided into Noise Catchment Areas (NCAs). The Clyde MSF construction site contains three main catchments (NCA05 and NCA06 and NCA07).

NCAs group individual sensitive receivers by representative traits such as existing noise environment and potential exposure to noise and vibration from the Project.

NCAs established as part of the EIS are summarised in Table 1 and depicted in Figure 1 below

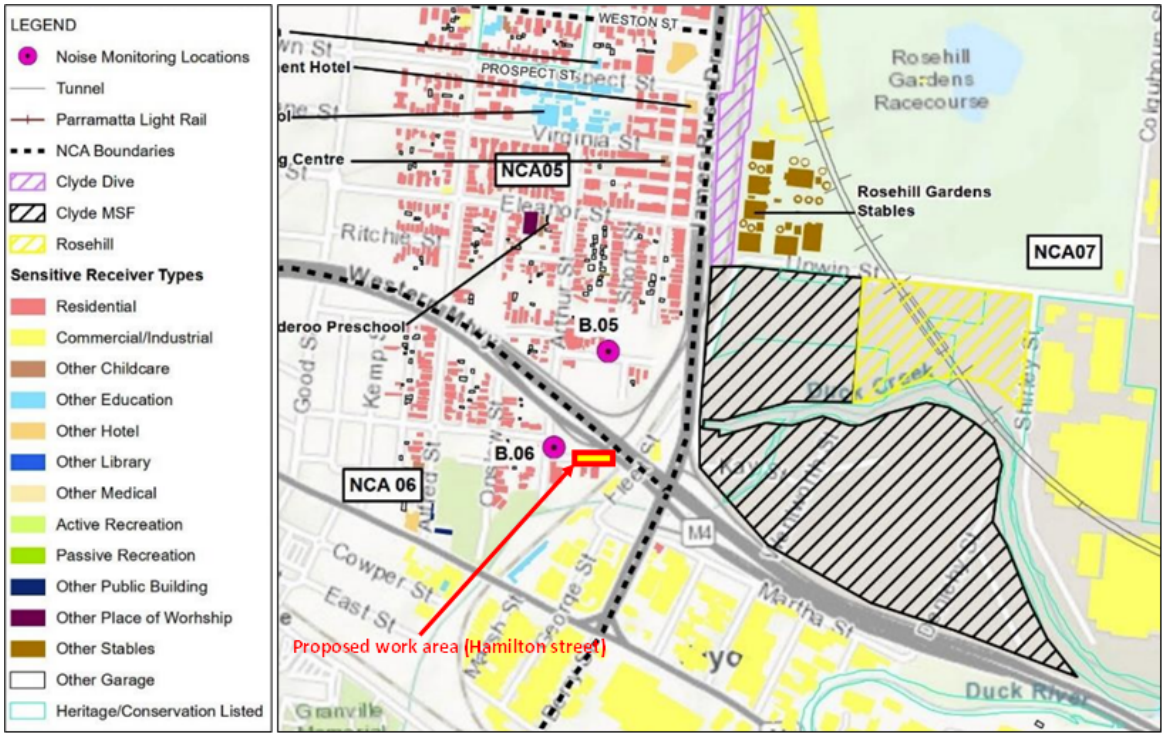


Figure 1 - depicts the main NCA's bordering the Clyde MSF construction Site

Table 1 Summary of work areas, Noise Catchment Areas and land uses

NCA	Description
05	North of the M4 Motorway and west of James Ruse Drive. The catchment is mainly residential. 'Other sensitive' receivers include Rosehill Public School and a number of hotels and child care centres.
06	South of the M4 Motorway in Granville. The catchment is mostly residential adjacent to the motorway, with some commercial use in the south-east.
07	East of James Ruse Drive, this catchment is mostly commercial and covers Rosehill Gardens racecourse, the Clyde commercial/industrial area, and Silverwater and Newington. Residential receivers and Newington Public School are in the south-east. This catchment is included in both the Clyde and Silverwater precincts.

3 Assessment framework

3.1 Approved construction hours

Working hours are set by CoA D35 to D36 as summarised in Table 2. Use of power saws, rock breakers, drills and other tonal or impulsive activities are defined as annoying under the Interim Construction Noise Guideline (ICNG) and are 'highly noise intensive works'.

Table 2 Approved construction hours

CoA	Construction activity	Monday to Friday	Saturday	Sunday / Public holiday
D35	Approved construction	7:00 am to 6:00 pm	8:00 am to 6:00 pm	No work (unless approved under EPL or out-of-hours work protocol)
D36	Highly noise intensive works	8:00 am to 6:00 pm[1]	8:00 am to 1:00 pm[1]	No work (unless approved under EPL or out-of-hours work protocol)

Notes:

1. if continuously, then not exceeding three hours, with a minimum cessation of work of not less than one hour.

3.2 Noise assessment criteria

3.2.1 Construction noise

The ICNG describes noise in excess of the background level as potentially having an adverse impact on sensitive receivers and increasing the likelihood of complaint. During standard construction hours, where construction noise is within 10 dB(A) of the RBL, impacts would be acceptable.

Where construction noise is more than 10 dB(A) above the RBL during standard construction hours, a residential receiver is considered noise affected and the proponent should undertake all reasonable and feasible steps necessary to manage the impact and consult with the affected community.

Above a $L_{Aeq,\ 15\ minute}$ noise level of 75 dB(A), a receiver is highly affected, requiring consideration of additional mitigation measures including alternative accommodation in the night period.

Outside standard construction hours, construction noise at a residential receiver more than 5 dB(A) above the RBL is taken to be noise affected. Table 1 (reproduced from Table 2 of the ICNG) sets out the NMLs for residences and how they are to be applied.

In addition, annoying noise such as rock hammers, impact piling, or other impulsive noise sources usually result in greater annoyance than continuous construction noise. A 5 dB(A) penalty is applicable to such activities prior to comparison with the NMLs.

3.2.2 Sleep disturbance

The Construction Noise and Vibration Standard (CNVS, TfNSW 2019) requires maximum noise levels to be analysed in terms of the extent and number of times the maximum noise exceeds specific noise trigger levels, in general accordance with the Noise Policy for Industry (NPfI) (EPA 2017). These triggers are:

- LAeq, 15 minute 40 dBA or the prevailing RBL plus 5 dB, whichever is greater, and the
- LAmax 52 dBA or the prevailing RBL plus 15 dB, whichever is greater.

The NPfI also recommends the DECCW (2011) Road Noise Policy (RNP) be reviewed for further risk assessment. The RNP recommends maximum internal noise levels below 50–55 dB(A) are unlikely to awaken people from sleep and one or two noise events per night, with maximum internal noise levels of 65–70 dB(A), are not likely to affect health and wellbeing significantly.

Table 3 Residential noise management levels

Time of day	NML $L_{Aeq\ (15\ min)}$ *	How to apply
Standard hours: Monday to Friday 7 am to 6 pm Saturday 8 am to 1 pm	Noise affected RBL + 10 dB	The noise affected level represents the point above which there may be some community reaction to noise. Where the predicted or measured $L_{Aeq\ (15\ min)}$ is greater than the noise affected level, the proponent should apply all feasible and reasonable work practices to meet the noise affected level. The proponent should also inform all potentially impacted residents of the nature of works to be carried out, the expected noise levels and duration, as well as contact details.
	Highly noise affected 75 dB(A)	The highly noise affected level represents the point above which there may be strong community reaction to noise. Where noise is above this level, the relevant authority may require respite periods by restricting the hours that the very noisy activities can occur, taking into account: - times identified by the community when they are less sensitive to noise (such as before and after school for works near schools, or mid-morning or mid-afternoon for works near residences); - if the community is prepared to accept a longer period of construction in exchange for restrictions on construction times.
Outside recommended standard hours	Noise affected RBL + 5 dB	A strong justification would typically be required for works outside the recommended standard hours. The proponent should apply all feasible and reasonable work practices to meet the noise affected level. Where all feasible and reasonable practices have been applied and noise is more than 5 dB(A) above the noise affected level, the proponent should negotiate with the community.

* Noise levels apply at the property boundary that is most exposed to construction noise, and at a height of 1.5 m above ground level. If the property boundary is more than 30 m from the residence, the location for measuring or predicting noise levels is at the most noise-affected point within 30 m of the residence. Noise levels may be higher at upper floors of the noise affected residence.

Other sensitive land uses, such as schools and offices, typically find noise from construction disruptive when the properties are being used (such as during work and school times). The noise management levels for non-residential receivers set in accordance with the Interim Construction Noise Guideline are provided in Table 4. These levels apply only during hours when the non-residential premises are being used.

The difference between an internal noise level and the external noise level is about 10 dB(A), which provides a conservative assumption that windows are open for ventilation. Buildings where windows are fixed or cannot otherwise be opened may achieve a greater noise level performance.

Table 4 Non-residential sensitive land uses noise management levels

Land use	Noise assessment location	NML ($L_{Aeq,15min}$)
Classrooms at schools and other educational institutions	Internal	45
Places of worship		
Active recreation areas (such as sporting activities and activities which generate their own noise or focus for participants)	External	65
Passive recreation areas (contemplative activities that generate little noise and where benefits are compromised by external noise intrusion, for example, reading, meditation)	External	60
Industrial premises	External	75
Office, retail outlets	External	70

3.3 Project construction noise management levels

The Project specific construction noise management levels for residential receivers have been established in line with the ICNG, based on the RBLs relevant to each NCA. These are presented in Table 5. NMLs for non-residential sensitive receivers are described in Table 4.

Table 5 Project specific construction NMLs

NCA	Noise Management Level, $L_{Aeq\ 15\ minute}$						
	Approved hours		Outside approved hours				
	Noise affected	Highly noise affected	Day	Evening	Night	Sleep disturbance (CNVS)	
						$L_{Aeq,\ 15\ minute}$	L_{Amax}
5	60	75	55	54	50	50	60
6	62	75	57	56	49	49	59
7	56	75	51	49	46	46	56

As part of planning for out of hours works, standard mitigation measures, as described in the CNVMP, are implemented where reasonable and feasible. However, after these measures have been applied, noise and vibration levels may continue to exceed the NMLs.

In this case, additional mitigation measures outlined in the CNVS, which largely focus on engagement with affected sensitive receivers, should be implemented where reasonable and feasible, unless other agreements are in place with the impacted receiver.

Triggers and additional mitigation measures for airborne noise are taken from the Project's OOHW Protocol and summarised in Table 6. Further details of specific additional mitigation measures are described in the CNVS.

Table 6 Triggers for additional mitigation measures – Airborne noise (Sydney Metro 2020)

Construction hours	Class	dB above NML	Additional management measures
Approved hours Monday – Friday: 7am – 6pm Saturday: 8am to 6pm	N	0 to 10	-
	CA	10 to 20	LB
	MI	20 to 30	LB, M, SN
	HI	>30	LB, M, SN
Evening Monday – Friday: 6pm – 10pm Saturday: 7am – 8am, 6pm – 10pm Sunday / PH: 8am – 6pm	N	0 to 10	LB
	CA	10 to 20	LB, M
	MI	20 to 30	LB, M, SN, RO
	HI	> 30	LB, M, SN, IB, PC, RO
Night Monday – Saturday: 10am – 7am Saturday: 10pm –8am) Sunday / PH: 6pm –7am	N	0 to 10	LB
	CA	10 to 20	LB, M, SN, RO
	MI	20 to 30	LB, M, SN, IB, PC, RO, AA
	HI	> 30	LB, M, SN, IB, PC, RO, AA

Notes: PC = Phone Calls and emails; M = Monitoring; IB = Individual briefings; AA = Alternative accommodation; SN = Specific notification; LB = Letterbox drops; RO = Project specific respite offer

N = Noticeable CA = Clearly audible MI Moderately intrusive HI = Highly intrusive

3.4 Vibration management

3.4.1 Human comfort

When assessing human exposure to construction-related vibration, the CNVS requires vibration goals to be established using *Environmental Noise Management Assessing Vibration: A Technical Guideline* (DECC 2006), which provides criteria for the assessment of vibration impacts on humans.

Construction activities typically generate vibration of an intermittent nature, which is assessed using a Vibration Dose Value (VDV). Acceptable values of vibration doses are presented in Table 7 for sensitive receivers.

Table 7 VDV Vibration criteria

Receiver type	Low probability of adverse comment ($m/s^{1.75}$)	Adverse comment possible ($m/s^{1.75}$)	Adverse comment probable ($m/s^{1.75}$)
Residential buildings – 16 hour day (7am to 11pm)[1]	0.2 to 0.4	0.4 to 0.8	0.8 to 1.6
Residential buildings – 8 hour night (11pm to 7am)[1]	0.13	0.26	0.51

Note 1: Day time and night time as described in BS6472:1992 (as referenced in the CNVS), i.e. a daytime period of 16 h or a night time period of 8 h, for example 23.00 h to 07.00 h.

3.4.2 Buildings

Potential building damage from construction vibration requires the application of values in BS 7385 Part 2-1993 *Evaluation and measurement for vibration in buildings* Part 2. These values are presented in Table 8 and relate to transient vibration which does not give rise to resonant responses in structures, and to low-rise buildings.

Table 8 Guideline values for vibration velocity for the effects of short-term vibration on structures (BS 7385).

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

Where vibration may give rise to magnification due to resonance, especially at lower frequencies where lower guide values apply, the guide values may be reduced by 50%. The CNVS describes rock breaking/hammering and sheet piling activities as having potential to cause dynamic loading in some structures (e.g. residences).

For activity involving rock breakers, piling rigs, vibratory rollers, excavators, vibration predominantly occurs at frequencies in the 10 Hz to 100 Hz range. On this basis, a conservative vibration damage screening level is:

- Reinforced or framed structures: 25.0 mm/s
- Unreinforced or light framed structures: 7.5 mm/s

3.4.3 Heritage

Heritage buildings and structures would be assessed under a conservative cosmetic damage objectives of 2.5 mm/s peak component particle velocity (from DIN 4150). Where vibration levels at heritage items are identified as exceeding this screening level, structural assessment would be completed by the Project team to confirm the structure's sensitivity to vibration. If a heritage building or structure is found to be structurally unsound (following inspection) the conservative criterion would stand. Where the structure is suitably sound, the guideline values from Table 8 would be applicable.

3.4.4 Additional mitigation measures

The CNVS recommends additional mitigation measures where all standard mitigation measures to minimise vibration at the nearest receivers have been implemented and vibration is still predicted to exceed the maximum guideline values. The Additional Mitigation Measures Matrix (AMMM) for vibration from the CNVS is presented in Table 9.

Table 9 Additional Vibration Mitigation Measures (CNVS)

Construction hours	Mitigation measures where predicted vibration levels exceed maximum levels
Approved hours Monday – Friday: 7am – 6pm, Saturday: 8am to 6pm	LB, M, RO
Evening Monday – Friday: 6pm – 10pm; Saturday: 7am – 8am, 6pm – 10pm; Sunday / PH: 8am – 6pm	LB, M, IB, PC, RO, SN
Night Monday – Saturday: 10am – 7am Saturday: 10pm –8am); Sunday / PH: 6pm –7am	LB, M, IB, PC, RO, SN, AA

4 Impact assessment

4.1 Modelling method

Predictions of noise impacts were performed using KNOWnoise™, a project-specific noise assessment tool developed by Hutchison Weller for the WTP Project. KNOWnoise calculates the maximum $L_{Aeq,15minute}$ noise level for each identified receiver for each proposed activity using predictions from SoundPlan noise modelling software. Predictions include geometric spreading, air and ground absorptions as well as topographical and structural screening and reflection.

The following components were incorporated in the model:

- Topography – Based on terrain data of 1 m resolution.
- Individual sensitive receivers – Worst-affected façade of each building to 700 metres from the works
- Construction noise sources –Activities and equipment provided by GLC were included in the noise model as individual sources across the nominated work areas for each activity. The maximum predicted LAeq noise level within each work area was identified for each receiver.
- Cumulative impacts – all activities with overlapping time periods are included in cumulative results
- Source height – construction noise sources assumed to be at 1.5 metres above ground level.
- Ground Absorption – Ground assumed to be mixed hard and soft with absorption factor of 0.5
- Meteorology –worst-case meteorological conditions (gentle breeze from source to receiver and stable conditions).
- Residential building structures are included in the model, meaning screening provided by neighboring houses is considered.
- Results are shown for all floors of assessed buildings with the worst-case façade result assumed for the whole floor.

Equipment proposed to be used for OOHW activities together with estimated sound power levels for each item are summarised in Appendix A.

The sound power levels and ultimate predicted noise levels will depend on the number of plant items operating at any one time and their precise location relative to a sensitive receiver. In practice, the predicted levels will vary due to plant moving around the site and not operating intensively or concurrently for a 15 minute assessment period. Shielding and reflection provided by buildings will also vary as plant moves around the site. Therefore, predicted noise levels are conservative.

4.2 Predicted noise and vibration levels for all Stages

4.2.1 - Predicted Noise Levels - Stage 1 - 3

Predicted impact classes the proposed works are illustrated graphically in Appendix B-1. Each identified receiver in the study area has been coloured to highlight the predicted level of impact.

Detailed predicted noise and vibration levels for each potentially affected receiver are presented in Appendix C-1.

Table 10 presents the worst-case predicted noise level of 81 dB(A) during the works, resulting in 2 receivers classed as highly noise affected.

Table 10 Summary of maximum predicted noise level and highly affected receivers for the Night period.

Maximum cumulative predicted $L_{Aeq,\ 15\ minute}$ noise level	81 dB(A)
Number of highly noise affected receivers (>75 dB)	2

With reference to the CNVS, the number of sensitive receivers classified in each impact class for each assessment period are summarised in the following tables.

Table 11 Summary of NML exceedance ranges for standard hours - Stage 1

Impact class	Predicted noise level	Predicted number of receivers
Noticable	0 <= 10 dB above NML	4
Clearly Audible	10 <= 20 dB above NML	3
Moderately Intrusive	20 <= 30 dB above NML	0
Highly Intrusive	> 30 dB above NML	0

Table 12 Summary of NML exceedance ranges for standard hours - Stage 2

Impact class	Predicted noise level	Predicted number of receivers
Noticable	0 <= 10 dB above NML	1
Clearly Audible	10 <= 20 dB above NML	2
Moderately Intrusive	20 <= 30 dB above NML	0
Highly Intrusive	> 30 dB above NML	0

Table 13 Summary of NML exceedance ranges for standard hours - Stage 3.

Impact class	Predicted noise level	Predicted number of receivers
Noticable	0 <= 10 dB above NML	4
Clearly Audible	10 <= 20 dB above NML	3

Impact class	Predicted noise level	Predicted number of receivers
Moderately Intrusive	20 <= 30 dB above NML	0
Highly Intrusive	> 30 dB above NML	0

4.2.2 Predicted Vibration Levels - Stage 1

The CNVS requires attended vibration measurements at commencement of vibration generating activities to confirm vibration levels satisfy the criteria for that activity.

Where there is potential for exceedances of the criteria further vibration site law investigations would be undertaken to determine the site-specific safe working distances for that vibration generating activity. Continuous vibration monitoring with audible and visible alarms would be conducted at the nearest sensitive receivers whenever vibration generating activities need to take place inside the calculated safe-working distances.

Based on the proposed work locations and selected equipment, indicative exceedances of the vibration criteria are summarised in Table 14. The exceedances are based on recommended minimum working distances from vibration intensive plant given in Appendix D of the CNVS (Transport for NSW 2019). Vibration impacts for each sensitive receiver are listed in Appendix C-1

Table 14 Predicted exceedances of vibration criteria

Impact classification	Number of potentially affected receivers
Human comfort	0
Cosmetic damage	0
Heritage structure	0

5 Controls and safeguards

The Project represents a risk of adverse impacts on sensitive receivers, particularly when working close to the project boundary and outside approved hours.

Where short term noise impacts are unavoidable, mitigation measures described in the project construction environment management plan should be implemented together with the recommendations in Table 17

Additional mitigation measures for each receiver are identified in Appendix B and summarised in Table 17.

Table 17 Standard mitigation measures

Community consultation	• Potentially affected receivers will be notified of OOH works in accordance with project requirements. • Where practicable, works will be scheduled to not conflict with major student examination periods, church congregation times, and other sensitive periods identified through community consultation.
Site induction	• All workers will be inducted to the project prior to commencing work and will be cognisant of their noise and vibration obligations under the CNVMP.
Behavioural practices	• Avoid swearing and unnecessary shouting or loud radios onsite. • Avoid dropping materials from height.
Equipment selection	• Priority given to the use of quieter and less vibration emitting construction methods and plant alternatives where feasible and reasonable. • The noise levels of plant and equipment would meet the maximum noise requirements of the CNVS.
Use and siting of plant	• Locate compounds away from sensitive receivers and discourage access from local roads. • Plant used intermittently to be throttled down or shut down. • Noise-emitting plant to be directed away from sensitive receivers where possible. • Stationary plant should be located behind a structure or enclosed if practicable. • Deliveries should be made as far as practical from sensitive receivers. Dedicated loading/unloading sites should be shielded where possible, if close to receivers. • Plan traffic flow, parking and loading/unloading areas to minimise reversing. • Avoid compression breaking on approach to the site. • Where additional activities or plant may result in marginal noise increases and speed works up, consider concentrating activities at one location and complete works as quickly as possible.
Non-tonal reversing alarms.	• Non-tonal reversing beepers (or an equivalent mechanism) must be fitted and used on all construction vehicles and mobile plant regularly used on site and for any out of hours work.
Noise monitoring	• Monitoring should be completed to verify the assumptions of this CNVIS regarding estimated equipment noise emissions and to ensure compliance with the CNVS.
Vibration monitoring	• Attended vibration measurements should be completed at commencement of vibration generating activities predicted to occur within safe working distances for cosmetic damage. • Where monitoring demonstrates maximum levels exceeded, consider alternative methodologies/equipment
Implement any project specific mitigation measures	
- Noise blankets will be placed around highly noise intensive activities - Activities would occur in discreet stages and not simultaneously among the stages as detailed in this DNVIS	

Table 32 Additional mitigation measures

Code	Measure	Description
AA	Alternative accommodation	Alternative accommodation options may be provided for residents living in close proximity to construction works that are likely to incur unreasonably high impacts over an extended period of time. Alternative accommodation will be determined on a case-by-case basis.
M	Monitoring	Where it has been identified that specific construction activities are likely to exceed the relevant noise or vibration goals, noise or vibration monitoring may be conducted at the affected receiver(s) or a nominated representative location (typically the nearest receiver where more than one receiver have been identified). Monitoring can be in the form of either unattended logging or operator attended surveys. The purpose of monitoring is to inform the relevant personnel when the noise or vibration goal has been exceeded so that additional management measures may be implemented.
IB	Individual briefings	Individual briefings are used to inform stakeholders about the impacts of high noise activities and mitigation measures that will be implemented. Communications representatives from the contractor would visit identified stakeholders at least 48 hours ahead of potentially disturbing construction activities. Individual briefings provide affected stakeholders with personalised contact and tailored advice, with the opportunity to comment on the project.
LB	Letterbox drops	For each Sydney Metro project, a newsletter is produced and distributed to the local community via letterbox drop and the project mailing list. These newsletters provide an overview of current and upcoming works across the project and other topics of interest. The objective is to engage and inform and provide project-specific messages. Advanced warning of potential disruptions (e.g. traffic changes or noisy works) can assist in reducing the impact on the community. Content and newsletter length is determined on a project-by-project basis. Most projects distribute notifications on a monthly basis. Each newsletter is graphically designed within a branded template.
RO	Respite offer	The purpose of a project specific respite offer is to provide residents subjected to lengthy periods of noise or vibration respite from an ongoing impact.
PC	Phone calls	Phone calls and/or emails detailing relevant information would be made to identified/affected stakeholders within 7 days of proposed work. Phone calls and/or emails provide affected stakeholders with personalised contact and tailored advice, with the opportunity to provide comments on the proposed work and specific needs etc.
SN	Specific notifications	Specific notifications would be letterbox dropped or hand distributed to identified stakeholders no later than 7 days ahead of construction activities that are likely to exceed the noise objectives. This form of communication is used to support periodic notifications, or to advertise unscheduled works.

Consultation summary to date

• Tuesday 27/02 the Clyde Communication team door knocked residents adjacent to and in line of visibility to the work site to discuss utility works occurring in Hamilton Street including proposed date of works including contingency, estimated duration of day works, type of works and noise impacts. Sorry we missed you cards were left for residents who were not available at the time of the doorknock, including specific information regarding the work, the monthly notification and the offer to contact us if they had any further questions. .
• 23 February 2024 – the monthly notification was distributed to the area including information regarding utility works in surrounding streets.

Appendix A-1 Proposed activities and associated sound power levels - Stage 1

Site investigation required prior to excavation to confirm locations of existing infrastructure without damage and to inform design.

Equipment	Quantity	Usage	Reduction	SWL
Suction Truck / Super sucker	1	100 %	0	112
Ute	1	100 %	0	85

Activity Sound Power Level: 112

Appendix A-2 Proposed activities and associated sound power levels - Stage 2

Cable pulling during standard working hours to pull through new LV/HV cables

Equipment	Quantity	Usage	Reduction	SWL
Cable winch	1	50 %	0	104
Ute	1	40 %	0	81

Activity Sound Power Level: 104

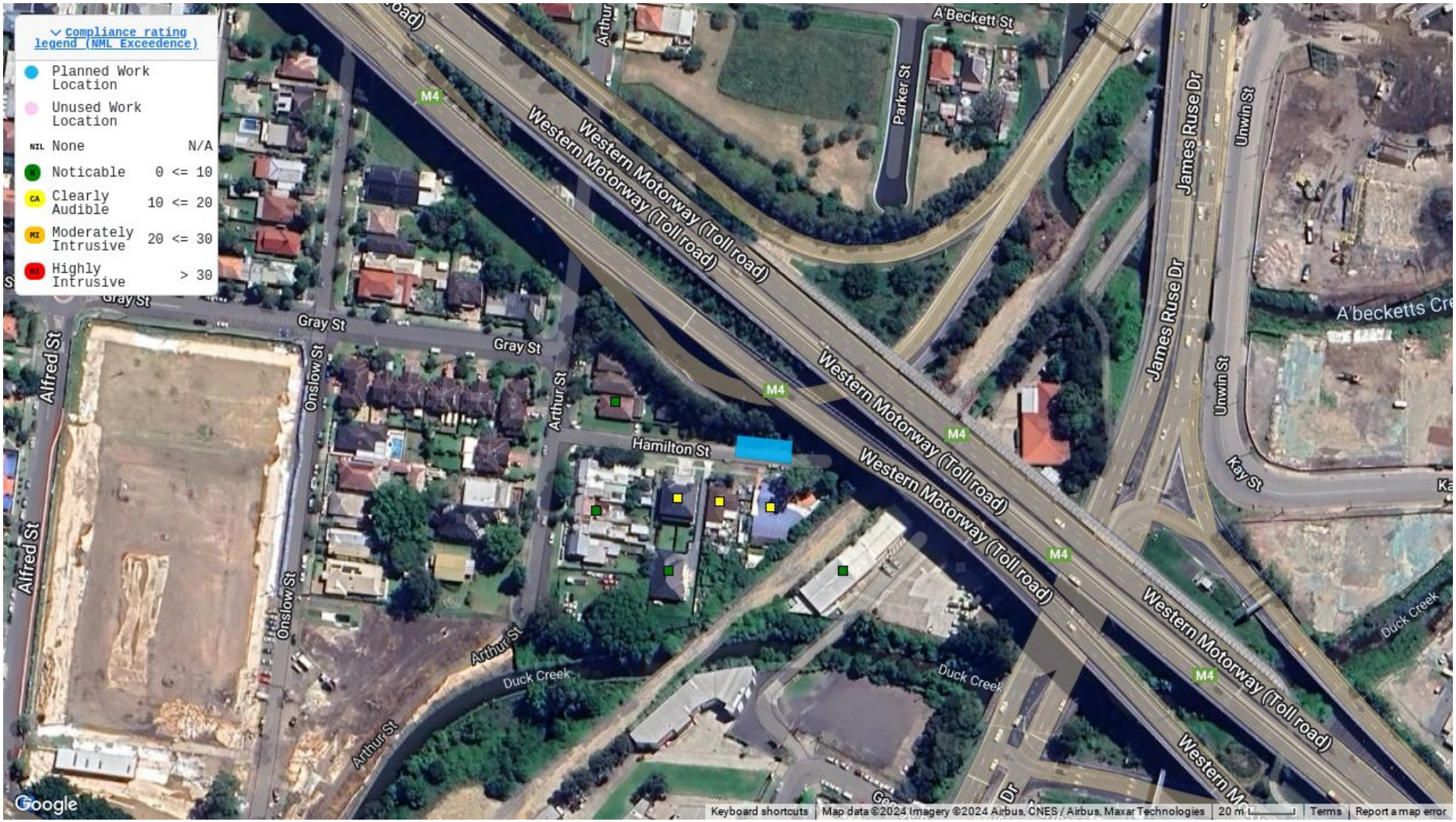
Appendix A-3 - Proposed activities and associated sound power levels - Stage 3

Site investigation required prior to excavation to confirm locations of existing infrastructure without damage and to inform design.

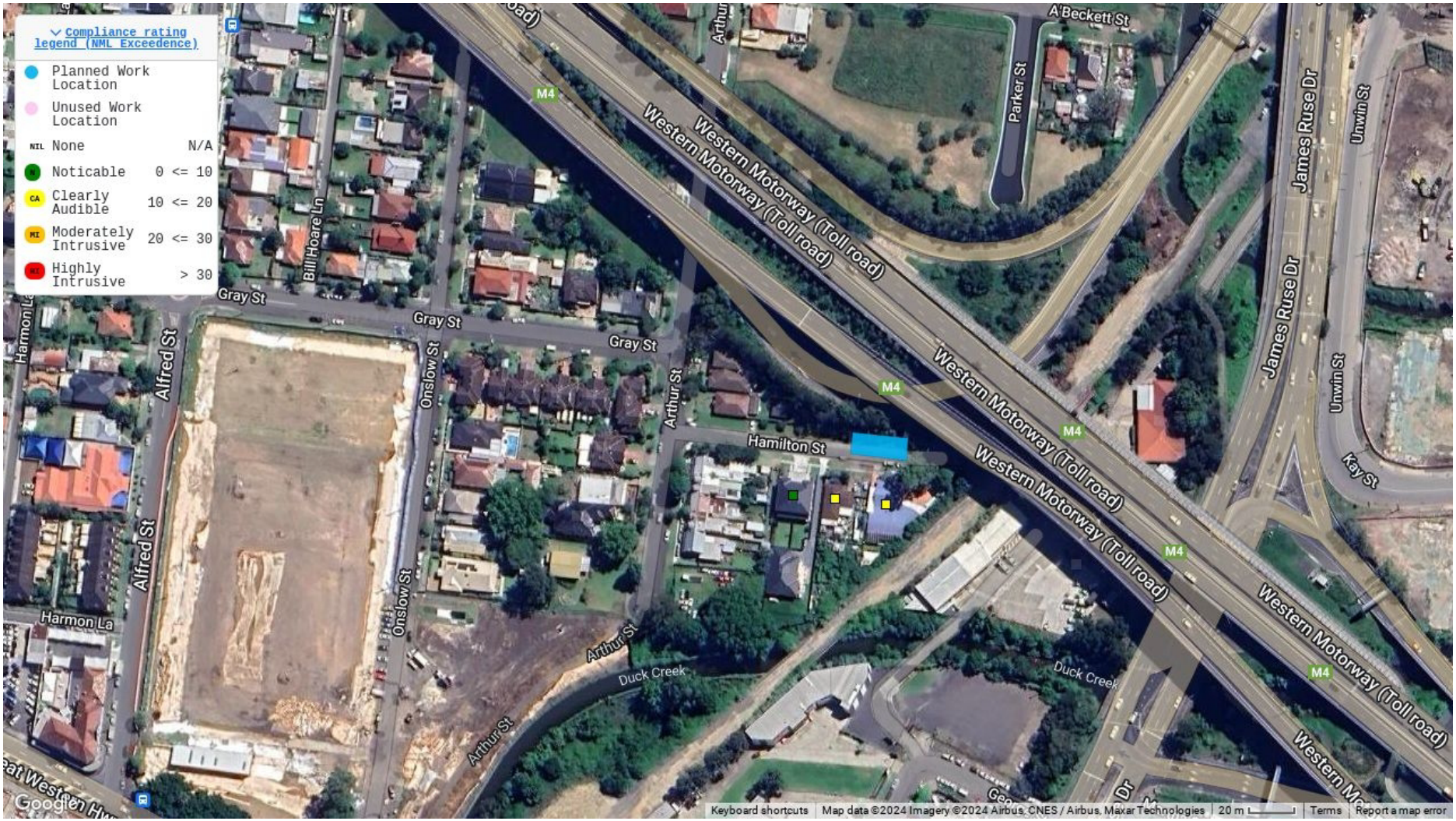
Equipment	Quantity	Usage	Reduction	SWL
Suction Truck / Super sucker	1	100 %	0	112
Ute	1	100 %	0	85

Activity Sound Power Level: 112

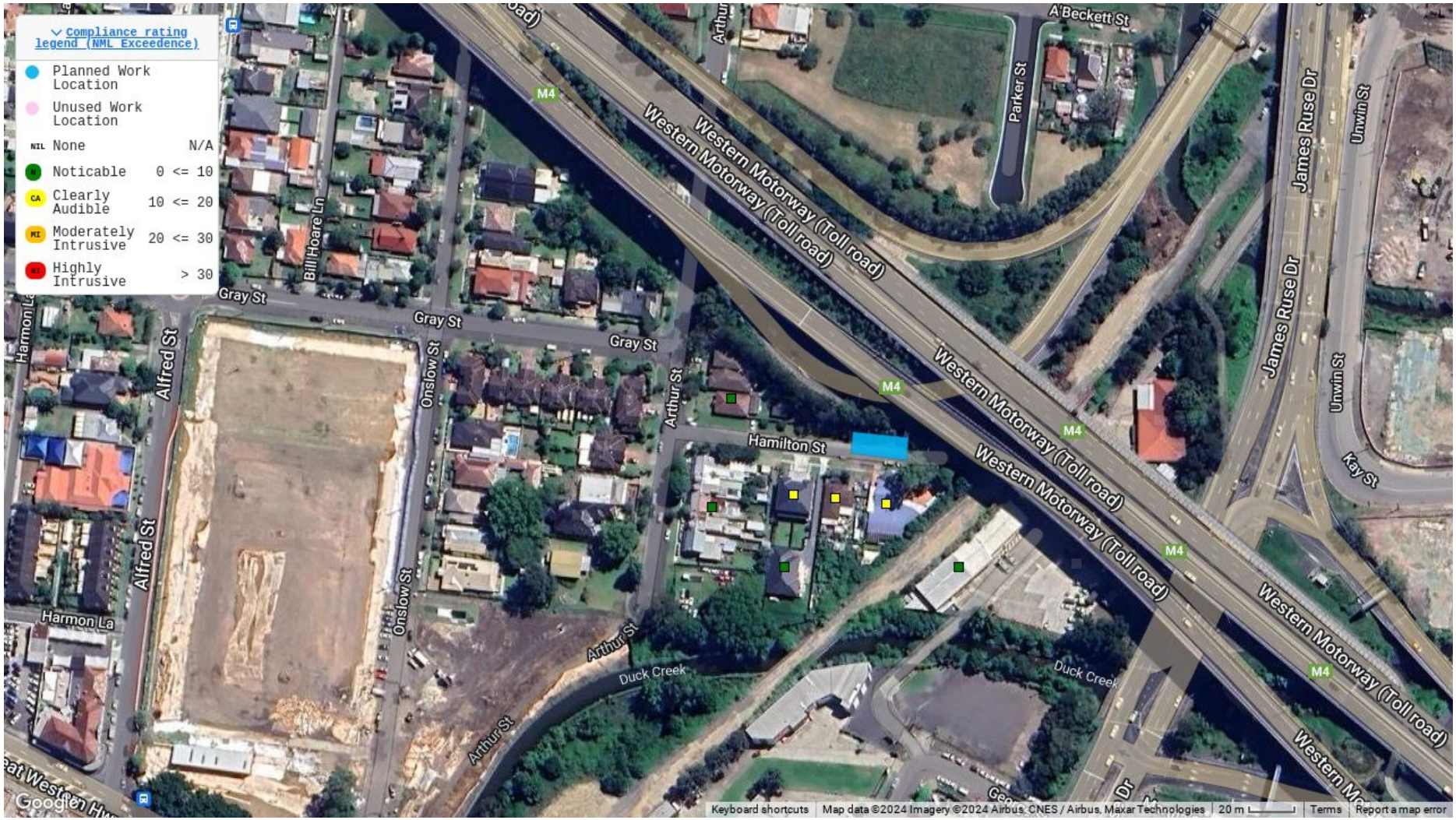
Appendix B-1 - Map showing worst case predicted noise impacts by impact class - Stage 1



Appendix B-2 - Map showing worst case predicted noise impacts by impact class - Stage 2



Appendix B-3 - Map showing worst case predicted noise impacts by impact class - Stage 3



Appendix C -1 Detailed predictions - Stage 1

Noise

Assessment: Endevour_Energy				NML, LAeq, 15 minute				Sleep, LAmax		Predicted noise level, dBA		Exceedance summary										
													Exceed NML by (dB):				Exceed sleep disturbance by (dB):		Impact classification			
NCA	Rec	Address	Land use	Day	O/day	Eve	Night	Screen	Awake	Cumulative LAeq, 15 minute	LMax	Highly Affected?	Day	O/day	Eve	Night	Screen	Awake	Day	O/day	Eve	Night
NCA 1	1358 461	11 ARTHUR STREET GRANVILLE	RES	62	57	56	49			64	69		2	7	8	15	-	2	Noticable	Noticable	Noticable	Clearly Audible
NCA 1	1358 462		RES	62	57	56	49			67	72		5	10	11	18	-	5	Noticable	Clearly Audible	Clearly Audible	Clearly Audible
NCA 1	1358 466	25A ARTHUR STREET GRANVILLE	RES	62	57	56	49			67	72		5	10	11	18	-	5	Noticable	Noticable	Clearly Audible	Clearly Audible
NCA 1	1358 467	28 HAMILTON STREET GRANVILLE	RES	62	57	56	49			66	71		4	9	10	17	-	4	Noticable	Noticable	Noticable	Clearly Audible
NCA 1	1358 472	26 HAMILTON STREET GRANVILLE	RES	62	57	56	49			80	85	Y	18	23	24	31	-	18	Clearly Audible	Moderately Intrusive	Moderately Intrusive	Highly Intrusive
NCA 1	1358 475	28 HAMILTON STREET GRANVILLE	RES	62	57	56	49			75	80		13	18	19	26	-	13	Clearly Audible	Clearly Audible	Clearly Audible	Moderately Intrusive
NCA 1	1358 476	24 HAMILTON STREET GRANVILLE	RES	62	57	56	49			81	86	Y	19	24	25	32	-	19	Clearly Audible	Moderately Intrusive	Moderately Intrusive	Highly Intrusive

Vibration

NCA	Receiver	Address	Vibration Impact

Appendix C-2 Detailed predictions - Stage 2

Noise

Assessment: Endevour_Energy				NML, LAeq, 15 minute				Sleep, LAmax		Predicted noise level, dBA		Exceedance summary										
													Exceed NML by (dB):				Exceed sleep disturbance by (dB):		Impact classification			
NCA	Rec	Address	Land use	Day	O/day	Eve	Night	Screen	Awake	Cumulative LAeq, 15 minute	LMax	Highly Affected?	Day	O/day	Eve	Night	Screen	Awake	Day	O/day	Eve	Night
NCA 1	1358 472	26 HAMILTON STREET GRANVILLE	RES	62	57	56	49			72	80		10	15	16	23	-	10	Clearly Audible	Clearly Audible	Clearly Audible	Moderately Intrusive
NCA 1	1358 475	28 HAMILTON STREET GRANVILLE	RES	62	57	56	49			67	75		5	10	11	18	-	5	Noticable	Noticable	Clearly Audible	Clearly Audible
NCA 1	1358 476	24 HAMILTON STREET GRANVILLE	RES	62	57	56	49			73	81		11	16	17	24	-	11	Clearly Audible	Clearly Audible	Clearly Audible	Moderately Intrusive

Vibration

NCA	Receiver	Address	Vibration Impact

Appendix C-3 Detailed predictions - Stage 3

Noise

Assessment: Endevour_Energy				NML, LAeq, 15 minute				Sleep, LAmax		Predicted noise level, dBA		Exceedance summary										
													Exceed NML by (dB):				Exceed sleep disturbance by (dB):		Impact classification			
NCA	Rec	Address	Land use	Day	O/day	Eve	Night	Screen	Awake	Cumulative LAeq, 15 minute	LMax	Highly Affected?	Day	O/day	Eve	Night	Screen	Awake	Day	O/day	Eve	Night
NCA 1	1358 461	11 ARTHUR STREET GRANVILLE	RES	62	57	56	49			64	69		2	7	8	15	-	2	Noticable	Noticable	Noticable	Clearly Audible
NCA 1	1358 462		RES	62	57	56	49			67	72		5	10	11	18	-	5	Noticable	Clearly Audible	Clearly Audible	Clearly Audible
NCA 1	1358 466	25A ARTHUR STREET GRANVILLE	RES	62	57	56	49			67	72		5	10	11	18	-	5	Noticable	Noticable	Clearly Audible	Clearly Audible
NCA 1	1358 467	28 HAMILTON STREET GRANVILLE	RES	62	57	56	49			66	71		4	9	10	17	-	4	Noticable	Noticable	Noticable	Clearly Audible
NCA 1	1358 472	26 HAMILTON STREET GRANVILLE	RES	62	57	56	49			80	85	Y	18	23	24	31	-	18	Clearly Audible	Moderately Intrusive	Moderately Intrusive	Highly Intrusive
NCA 1	1358 475	28 HAMILTON STREET GRANVILLE	RES	62	57	56	49			75	80		13	18	19	26	-	13	Clearly Audible	Clearly Audible	Clearly Audible	Moderately Intrusive
NCA 1	1358 476	24 HAMILTON STREET GRANVILLE	RES	62	57	56	49			81	86	Y	19	24	25	32	-	19	Clearly Audible	Moderately Intrusive	Moderately Intrusive	Highly Intrusive

Vibration

NCA	Receiver	Address	Vibration Impact