

Community Consultation and Agreement Report

Micro-tunnelling Extended Working Hours - Elizabeth Dr & Cross Street, Kemps Creek.



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1. Introduction

1.1. Project Background

Sydney Water is constructing infrastructure to support the future population and economic growth of Western Sydney. This includes the delivery of 6.8km of dual wastewater pressure mains from the SP1211 sewage pumping station at Gurner Avenue, Austral to the Upper South Creek Advanced Water Recycling Centre (AWRC) at Kemps Creek, which is being built by John Holland Trility Joint Venture. The project is expected to be completed in July 2025 and is critical to the commissioning of the AWRC.

The Kemps Creek Pressure Mains (KCPM) project will improve wastewater services in the South-Western Growth Area (SWGA), one of the NSW State Government's three designated growth areas in South Western Sydney. This area will see substantial growth over the coming years, increasing from 2,300 dwellings in 2022 to approximately 38,000 dwellings by 2056.

KCPM will do this by transferring wastewater that is collected from homes and businesses in Austral, East Leppington, Leppington North, parts of Catherine Fields North, Rossmore, and Kemps Creek (known as the Kemps Creek catchment area) to the AWRC to be treated there.

The AWRC is Sydney Water's largest infrastructure investment in Western Sydney. It will be a sophisticated wastewater treatment and resource recovery centre that will produce recycled water, renewable energy, and bio-resources. The AWRC will use reverse osmosis - the same technology used by the desalination plant - to treat water to a high-quality.

When completed in early 2026, the AWRC and associated pipelines will deliver sustainable wastewater services and high-quality recycled water to support a cooler, greener Western Parkland City.

Quickway are working under Sydney Waters Environmental Protection Licence (EPL 21886) from the NSW Protection Authority for the construction of the project. Quickway have developed this document for submission to the EPA as Quickway are proposing to undertake works outside of the approved construction hours following community consultation and agreement (EPL condition E1).

1.2. Purpose

This report has been prepared to describe how Quickway has sought agreement with the affected community and to demonstrate compliance with respective EPL Conditions.



2. Scope of proposed works

2.1. Out of hours works summary

As part of the project, Quickway are installing the two pipes under Elizabeth Drive using a method called micro-tunnelling.

This technique uses a small Tunnel Boring Machine (TBM) which is a remotely controlled, guided system designed to bore through soil and rock while simultaneously installing the 650-millimeter diameter pipes behind it.

These TBMs will be launched from pits located at 1383 – 1411 Elizabeth Drive & 150 Cross St, Kemps Creek, 2178, on the northern or southern side of Elizabeth drive respectively. The TBM has already started drilling from north of Elizabeth Drive. The locations of the launch pits is provided in Figure 1.

Works will include the following plant and equipment use at each site:

- 1 x Generator to run hydraulic micro tunnelling machine during operation and small electric water pump (if required).
- 1 x 40T Excavator to remove spoil from the pit, and transfer Pipes when required.
- 1 x Bogie truck to transfer spoil / pipes within the immediate area (i.e. Stockpiling adjacent on site no haulage).



Figure 1: Location of Micro-tunnelling works.





Figure 2: Typical Example of Micro-tunnelling works.

2.2. Justification:

Quickway has encountered unexpected challenging geological conditions during tunnelling operations which has adversely affected progress, in turn extending the overall duration of the micro-tunnelling operation, and associated impacts to surrounding residents.

As such, Quickway are proposing to extend our working hours for these Microtunnelling activities to recover lost time and most importantly minimising the overall duration of impacts to surrounding residents.

2.3. OOHW Extended Hours Proposal

Extended working hours are proposed for:

- Monday to Friday 6:00pm 8:30pm, and
- Saturday 1:00pm 6:00pm.

Out of hours works are proposed for a duration of approximately 20 weeks commencing 04/11/2024 (date subject to approval timeframes). No work will occur on Sundays or Public Holidays.



3. EPL Condition Compliance

The Community consultation for Agreement Report has been developed in accordance with the EPL Condition E1.3.

Table 1 demonstrates compliance with applicable conditions relating to OOHW Community Agreements (E1.2 and E1.3).

EPL	Requirement	Where addressed
Condition		
E1.3	<u>Community Consultation EPA Reporting</u> The licensee must report to the EPA the community consultation and agreement process that was undertaken with the Community Affected Catchments. This report to the EPA must be:	This Report
(a)	prepared in writing;	This Report
(b)	detail the steps taken to fulfil the requirements of condition E1.2;	Section 3.1
(c)	demonstrate that the Noise Sensitive Receivers understood the nature of the works and any predicted impacts, including that consideration was made of additional requirements relevant to the needs of culturally and linguistically diverse Noise Sensitive Receivers;	<u>Section 3.1</u> <u>Appendix B – Consultation</u> <u>Script</u>
(d)	provide the script used during the community consultation with Noise Sensitive Receivers;	Appendix B – Consultation Script
(e)	report community response and consent rates (including where no contact could be made) against the total community affected catchments, and must be broken down into response and consent rates based on sub- catchments that are delineated by affectation levels;	Section 4
E1.3 (f)	include a noise validation monitoring plan as required by E1.4;	Section 5

Table 1. EDI	Condition	Complianco	Table - Consultation	Poport requirements
		Compliance		Nepul l'equilentente



3.1. Condition E1.2 Compliance

The following section describes how the requirements of EPL E1.2 have been fulfilled during the community consultation and agreement process.

Any community consultation and agreement undertaken with respect to the proposed out of hours works (OOHW) must:

a) be prepared and implemented in accordance with the Interim Construction Noise Guidelines (DEC 2009), the Noise Policy for Industry (EPA, 2017) and AS2436-2010: Guide to noise and vibration control on construction, demolition and maintenance sites;

The consultation and negotiated agreement process was undertaken in accordance with the overarching key principles of relevant sections of the ICNG and NPfI.

The Community was engaged in an open and transparent manner, informing them with accurate detailed consistent information works through the use of a script detailing the proposal in detail to ensure they are well informed.

Through effective open community engagement, the community team has established good working relationships with stakeholders, while considering their feedback in the agreement process.

They have sought feedback and approval on how to best re-engage with the community over the extended period and how to engage with us in the event they have a complaint.

b) include consultation of all noise sensitive receivers within the Community Affected Catchments. This includes Noise Sensitive Receivers that have declined to participate in previous agreements unless a community member has explicitly requested not to be involved in any future consultation about future OOHW;

Noise Impact Assessments were completed using KNOWnoise noise modelling software to establish the extent to which noise from the proposed OOHW would affect surrounding receivers. These are shown in _Appendix C - KNOWnoise Noise Assessments.

Each assessment produced a list of impacted receivers based on noise level exceedance of the two different Noise Management Levels (NMLs) applicable to the two sites.

The list of impacted receivers from the two assessments was consolidated, with any overlapping receivers removed. The impacted receivers were further consolidated through ground truthing during the consultation process.

It was determined that a total of **fifty-three (53)** occupied residential receivers were predicted to be impacted by the OOHW based on noise modelling (>5dB above RBL) and ground truthing of occupied dwellings (i.e. Vacant properties not counted).



The Community Stakeholder Engagement Team commenced community consultation with all affected receivers.

- Up to **three (3) attempts** were made to contact each resident through **Door Knocks** and **Phone Calls** on differing dates and times to make all reasonable attempts to engage and consult with each receiver.
- Residents were consulted using the script attached in <u>Appendix B</u> <u>Consultation Script</u> to ensure consistency of information was conveyed.
- From the community consultation engagement with the **fifty-three (53)** occupied properties:

Refer to <u>Appendix A – Community Consultation Records</u> which describes the outcomes of the community consultation and agreement process.

As this was the first consultation on this OOHW proposal, there have been no community members who have explicitly requested not to be involved in any future consultation about future OOHW;

The substantial majority of the agreed to the proposed OOHW.

c) ensure that the noise sensitive receivers understand the nature of the works and any predicted impacts, including that consideration is made of additional requirements relevant to the needs of culturally and linguistically diverse Noise Sensitive Receivers, and include details for interpreting services for languages other than English where required.

To ensure consistent accurate information was conveyed, a script was developed in collaboration with the Environment Team.

The community relations team has not required the need to engage a translator for any linguistically diverse or culturally sensitive receivers, however provision was made for this service if needed. Refer to <u>Appendix B – Consultation Script.</u>

- d) include in the community consultations with Noise Sensitive Receivers the following information:
 - *i. the actual works proposed;*

The Script developed for the community consultation clearly described the actual works proposed. Refer to <u>Appendix B – Consultation Script</u>

ii. any expected impacts in clear, plain English based on noise modelling; The Script developed for the community consultation explained the predicted impacts. The Script included a prompt for the engagement team to describe the resident's specific predicted noise impacts against commonly known noise sources. The predicted noise impact was populated in the Community Agreement Register as shown in <u>Appendix A – Community Consultation Records</u> to ensure that the community team could convey resident specific impacts.

Refer to Appendix B – Consultation Script.

iii. the expected duration of the works;

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The Script developed for the community consultation clearly described the duration of the works.

Refer to Appendix B – Consultation Script.

iv. any expected benefits for receivers;

The Script developed for the community consultation described the expected benefits for receivers agreeing for the OOHW to be undertaken including reducing the overall duration of impacts.

Refer to Appendix B - Consultation Script.

v. any other known concurrent OOHW that will be occurring; and

The Script developed for the community consultation described that no other known concurrent OOHW will be occurring.

Refer to Appendix B - Consultation Script.

vi. any other OOHW that will be occurring on the nights preceding and following the proposed works or, if the proposed work precedes or follows a weekend period, any other OOHW that will be occurring on the weekend.

The Script developed for the community consultation described the days and times OOHW proposed for the duration.

Refer to Appendix B – Consultation Script.

e) request consent from the Noise Sensitive Receiver for their responses to be provided to the EPA;

The Script developed for the community consultation requests the consent from the Noise Sensitive Receiver for their responses to be provided to the EPA.

Refer to Appendix B – Consultation Script.

f) ensure that a record is kept when a licensee is unable to contact a noise sensitive receiver after three attempts, including leaving "sorry I missed you" cards explaining the reason for the visit and requesting a return phone call; and

As shown in <u>Appendix A – Community Consultation Records</u>, "Sorry I missed you" calling cards were left whenever residents were not able to be contacted via door knock. As shown within the register, often residents returned calls.

g) demonstrate, where the OOHW is predicted to go on longer than 28 calendar days, that the licensee has consulted the community in relation to re-engagement periods for the purpose of determining agreement from the community is maintained and continuing.

As described in <u>Appendix B – Consultation Script</u> the community team will reengage with the affected community each 60 days to ensure they still consent to the extended Saturday hours from 1pm to 6pm. This re-engagement period was agreed with all residents.



4. Community Response and Consent Rates

A total of **fifty-three (53)** occupied residential receivers identified to be impacted by the OOHW based on noise modelling (>5dB above RBL) and ground truthing of occupied dwellings (i.e. Vacant properties not counted).

From the community consultation engagement with the **fifty-three (53)** occupied properties:

- Forty-Eight (49) agreed to the OOHW proposal (92.6%).
- Four (4) were not contactable after three attempts, therefore did not agree (7.4%).
- Zero (0) disagreed with the OOHW proposal (0%).

The distribution of agreements is shown in <u>Appendix A – Community Consultation</u> <u>Records.</u>

5. Noise Validation Monitoring Plan

E1.4 - A noise validation monitoring plan must be submitted to the EPA for approval as part of the community agreement documentation prior to any OOHW occurring.

- Noise monitoring will be undertaken in accordance with the projects Noise and Vibration Management Plan.
- Monitoring will be undertaken during the evening period on Saturdays (1pm-6pm) at both the nearest properties to the Micro-tunnel exit pits on the first two occasions where noise sensitive receivers are predicted to be impacted.
- Noise monitoring will be undertaken by Quickway Environmental Advisors who have demonstrated experience in construction noise monitoring. They all meet the definition of a Competent Person in the EPL Special Dictionary (E2.1).
- Monitoring will be undertaken at multiple locations around the entry pit and exit pit sites, at the most affected receivers. Noise samples will be taken in 15-minute intervals with detailed notes being taken during the recording period.
- Monitoring will also be undertaken in the unlikely event that the works methods change which may result in greater impact than previously monitored. There are no works proposed or approved to occur during the night time period.
- Environmental noise monitoring (excluding spot checks of plant and equipment) will be recorded over 15-minute sample intervals, excluding periods of extraneous noise, until a representative sample has been obtained.
- A representative sample will be determined by the person monitoring, who will be competent, suitability trained and experienced in undertaking noise measurements. Noise monitoring will be undertaken by Quickway Environmental Advisors who have demonstrated experience in construction noise monitoring. They all meet the definition of a Competent Person in the EPL Special Dictionary (E2.1).
- All environmental noise monitoring will be undertaken with a fast time constant (i.e. 125 milliseconds), and A-weighted frequency weighting. The minimum



range of noise metrics to be stored in the memory for later retrieval include the following A-weighted noise levels: LA90, LAeq, LA10, LA (max).

- All outdoor noise measurements will be undertaken with a windscreen over the microphone and measurements of noise will be disregarded when it is raining and/or the wind speed is greater than 5 m/s (18 km/h).
- Where possible, noise monitoring is to be carried out at least 3.5 m from any reflective surface other than the ground and the preferred microphone/measurement height is 1.2-1.5 m above the ground.
- All noise monitoring data will be retained and will be provided to the EPA upon request.

6. Conclusion

Quickway are proposing to extend working hours from early November 2024:

- Monday to Friday 6:00pm 8:30pm, and
- Saturday 1:00pm 6:00pm.

Quickway have undertaken consultation and an agreement in accordance with EPL condition E1.1.

49 of the 53 residents were contactable after 3 attempts. All 49 contacted receivers have agreed for the works to proceed. This equates to 92.6% of the impacted receiver's agreed to the works, based on accurate consistently conveyed information.

Quickway will continue to engage with the community to ensure agreement is maintained.



Appendix A – Community Consultation Records



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Appendix B – Consultation Script



Community Consultation and Agreement Script

Proposed extended work hours - Micro-tunnelling Works

Introduction:

Hello (Resident Name),

My name is (Suzanna Jolak / Brooke Taylor) and I am the Community & Stakeholder Engagement (Officer/Manager) from Quickway Constructions. We are working on the Kemps Creek Pressure Mains Project in Kemps Creek for Sydney Water. I am calling to discuss work we are proposing to complete outside of standard working hours.

Background:

This Project includes the construction of two 6.8km wastewater pipes from a recently constructed sewage pumping station on Gurner Avenue in Austral to the Upper South Creek Advanced Water Recycling Centre (AWRC) currently under construction in Kemps Creek. The Kemps Creek Pressure Mains will transfer wastewater to the AWRC for treatment and recycling.

Micro-tunnelling works summary:

As part of the project, we are installing the two pipes under Elizabeth Drive using a method called microtunnelling.

This technique uses a small Tunnel Boring Machine (TBM) which is a remotely controlled, guided system designed to bore through soil and rock while simultaneously installing the 650-millimeter diameter pipes behind it.

These TBMs will be launched from pits located at 1383 – 1411 Elizabeth Drive & 150 Cross St, Kemps Creek, 2178, on the northern or southern side of Elizabeth drive respectively.

Justification:

Quickway has encountered unexpected challenging geological conditions during tunnelling operations which has adversely affected progress, in turn extending the overall duration of the micro-tunneling operation, and associated impacts to surrounding residents.

OOHW Proposal:

As such, we are seeking your agreement to extend our working hours for these Micro-tunneling activities to recover lost time and most importantly minimising the overall duration of impacts to surrounding residents. Extended working hours are proposed for:

- Monday to Friday 6:00pm 8:30pm, and
- Saturday 1:00pm 6:00pm.

Out of hours works are proposed for a duration of approximately **20 weeks** commencing **04/11/2024**. No work will occur on Sundays or Public Holidays.



Transport & Utilities Infrastructure

Tasks and equipment used outside of standard working hours include:

- A Generator operating to run the hydraulic micro-tunnelling machine.
- Use of an excavator to remove spoil from the pit when required.
- A truck to transfer pipes to excavator when required.
- Excavator to place pipes into the pit when required.

Noise impacts:

The works will generate construction noise which can be categorised between quiet and noisy depending on the distance the residential receiver is from the works. Based on our modelling based on your location you may experience noise levels similar to: (Refer to *Noise Impacts Category and Comparison* column in *Door knocking register Oct24 and describe to respective resident*. FYI - This is based on the below illustration).



Benefits

With longer working hours, the overall duration of the works will be reduced. A shorter timeline means that any noise, or other impacts associated with the work will be experienced for a reduced period, ultimately reducing the impacts associated with the works.

Other concurrent OOHW

There are no other concurrent additional OOHW occurring around this area.

EPA Consultation

The Environmental Protection Authority (EPA) is an independent environmental protection regulator for the project who issued an Environmental Protection License for the Project which has specific requirements associated with the community consultation process.

As such, do you consent for your responses and details to be passed on to the EPA as part of the Out of Hours application process?

Re-engagement

As this OOHW is proposed for a period of 20 weeks, we will re-engage with you **every 60 days** to ensure consent and agreement is maintained for the duration of the Out of hours works.

Complaints

If you have a complaint relating to this work, you can make a complaint by contacting the 24hr complaints line on XX.

If you require a translator, please contact <u>**13 14 50.**</u> Any complaints will be recorded and sent to the EPA who will access and determine if any action is required or revoke the OOHW application.



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Appendix C - KNOWnoise Noise Assessments

Construction noise and vibration impact assessment

Proposed works Proponent	Cross Quickway	150 Cross Street Micro-Tunnelling	
Assessment Date	26/09/2024		
Prepared by	Jh	Assessment Id	Cross

Introduction

This report has been prepared using the construction noise self-assessment platform KNOWnoise: *Minor Works* and presents an assessment of the likely noise impacts related to proposed works associated with the above project. Where possible, these works would be completed during standard construction hours; however, there may be a need to work outside these hours due to technical, community or access limitations. The location of the proposed works is illustrated in Appendix A.

Planned works

A description of the proposed works is as follows.

Cross St Microtunnel

Proposed activities and equipment for the works are summarised in Appendix B.

Though subject to change, the works are expected to commence around 27/10/2024 and would be completed by 28/04/2025.

Assessment criteria and mitigation requirements

Noise

The Interim Construction Noise Guideline (ICNG) (DECC 2009) describes noise more than 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 LAeq, 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.

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.

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). Table 2 presents NMLs from the ICNG for sensitive land uses based on the principle that the characteristic activities for each of these land uses should not be unduly disturbed.

Table 1 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

Vibration

Effects of vibration from construction may be segregated into:

- Human exposure disturbance to building occupants: vibration in which the occupants or users of the building are inconvenienced or possibly disturbed.
- Effects on building contents vibration where the building contents may be affected.
- Effects on building structures vibration in which the integrity of the building or structure itself may be prejudiced.

Vibration criteria relating to human comfort applicable to this project are taken from the DEC (2006) document Assessing Vibration – A Technical Guideline for intermittent vibration – such as from drilling, compacting or activities that would result in continuous vibration if operated continuously. Intermittent vibration is assessed as a vibration dose value (VDV) and relates to the level of vibration over time (cumulative over the night or day period). VDVs that may result in adverse comment from receivers are summarised in Table 5.

Table 2 Summary of vibration dose values which might result in adverse comment

Time	Low probability of adverse comment (m/s ^{1.75})	Adverse comment possible (m/s ^{1.75})	Adverse comment probable (m/s ^{1.75})
Day			
(6am to 10pm)	0.2 to 0.4	0.4 to 0.8	0.8 to 1.6
Night			
(10pm to 6am)	0.1 to 0.2	0.2 to 0.4	0.4 to 0.8

Guidance for the consideration of potential building damage from construction vibration is in line with BS 7385-1 Evaluation and measurement for vibration in buildings - Guide for measurement of vibration and evaluation of their effects on buildings. These guideline values are presented in Table 3.

Table 3 Building damage vibration guidelines (BS 7385-1)

Type of building	Guideline values for vibration (PPV mm/s)		
	4Hz to 15Hz	15Hz to 40Hz	40Hz and above
Reinforced or framed structures / Industrial and		50	
heavy commercial buildings			
Un-reinforced or light framed structures /	15 - 20	20 - 50	50
Residential or light commercial type buildings			

For heritage structures, criteria are in line with the German Standard *DIN 4150-3: Structural Vibration- effects of vibration on structures*, as summarised in Table 4.

Table 4 Guideline values for vibration velocity to be used when evaluating the effects of short-term vibration on heritage structures (DIN 4150-3).

Type of building		Guideline val	ues for vibration (PPV	' mm/s)
	1 Hz to 10 Hz	10 Hz to 50 Hz	50 Hz to 100 Hz	Vibration at horizontal plane of highest floor at all frequencies
Structures that, because of their sensitivity to vibration, cannot be classified under lines 1 and 2 and are of great intrinsic value (e.g. listed buildings under preservation order)	3	3 to 8	8 to 10	8

The safe working distances presented in Table 5 are indicative and will vary depending on the item of plant and local geotechnical conditions. The cosmetic damage thresholds apply to typical buildings under typical geotechnical conditions and vibration monitoring is recommended at specific sites. Where structures are more sensitive, such as heritage items, more stringent conditions are applicable and should be considered individually.

In relation to human response, the safe working distances relate to continuous vibration. For most construction activities, vibration emissions are intermittent and higher vibration levels over shorter periods are acceptable. Additional assessment should be undertaken where the human response criteria are exceeded.

Plant item	Rating/description	Safe working distance	
		Cosmetic damage	Human response
		(BS 7385-1)	(DECCW)
Vibratory roller	<50 kN (typically 1-2 t)	5 m	15 m to 20 m
	<100 kN (typically 2-4 t)	6 m	20 m
	<200 kN (typically 4-6 t)	12 m	40 m
	<300 kN (typically 7-13 t)	15 m	100 m
	>300 kN (typically 13-18 t)	20 m	100 m
	>300 kN (> 18 t)	25 m	100 m
Small hydraulic hammer	300 kg – 5 to 12 t excavator	2 m	7 m
Medium hydraulic hammer	900 kg – 12 to 18t excavator	7 m	23 m
Large hydraulic hammer	1600 kg – 18 to 34 t excavator	22 m	73 m
Vibratory pile driver	Sheet piles	2 m to 20 m	20 m
Pile boring	≤800 mm	2 m	n/a
Jackhammer	Hand held	1 m	Avoid contact with
			structure

Table 5 Safe working distances for vibration intensive plant

Existing environment and noise management levels

The proposed works would be undertaken in a predominantly Rural / Suburban, characterised as:

Areas with negligible transportation or very limited local traffic, typically light vehicles only.

100m or more from the road.

Background noise levels adopted for the project area and associated noise management levels (NMLs) are summarised in Table 6. NMLs have been established in line with the ICNG.

Table 6 Construction NMLs

Land use	Rural / Suburban	l	Using custom backgrour	id noise data?	Yes
Criterion	Day	Weekend Day	Evening	Night	Sleep
RBL	35	35	34		31
NML	45	40	39	35	65

Sleep disturbance

The ICNG recommends where construction works are planned to extend over more than two consecutive nights, the maximum noise level should be considered for the purposes of establishing the likelihood of sleep disturbance. The Road Noise Policy suggests that 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.

Based on this, a sleep awakening criterion of 55 dB(A) (internal) is typically adopted for works. Given that noise attenuation of 10 dB(A) is typically provided by an open window, a sleep awakening criterion of LAmax 65 dB(A) (external) has been applied to residential bedroom façades.

Assessment methodology

Based on the nominated works area (illustrated in Appendix A), proposed equipment and the minimum distance from the works to each sensitive receiver, noise levels were calculated based on ISO9613: 2 *Acoustics - Attenuation of sound during propagation outdoors.*

This method considers geometric spreading, atmospheric absorption, ground effects and is valid for meteorological conditions of a gentle breeze from source to receiver and stable atmosphere (temperature inversion).

KNOWnoise: Minor works is a 2-Dimensional assessment platform and does not consider terrain effects (e.g. hills, valleys) or the presence of solid structures such as homes or noise barriers. This will result in a conservative prediction, suitable for the project being assessed.

Considering the nature of the works and the type of surrounding land uses, sensitive receivers up to a radius of 900 metres from the works have been included in the assessment.

Sound power levels and predicted noise levels depend on the number of plant items operating at any one time and their precise location relative to a sensitive receiver. Equipment was assumed to be working at the worst-case location relative to each receiver and represents a worst-case assessment. Where the activity is further away from receivers or less equipment is used the predicted levels will decrease.

Sound power levels for plant and equipment expected to be used for each activity has been estimated based on guidance in the following standards and guidelines as well as typical measured noise levels for specific equipment.

- ⁴⁴ AS2436-2010: Guide to noise and vibration control on construction, demolition and maintenance sites
- ⁶⁶ British Standard 5228-1:2009 Code of practice for noise and vibration control on construction and open sites
- ⁴⁴ United Kingdom Department for Environment, Food and Rural Affairs (DEFRA) Noise database for prediction of noise on construction and open sites

Construction noise sources and associated sound power levels are listed in Appendix B. The maximum predicted LAeq noise level within the work area was identified for each receiver.

Predicted noise levels

Detailed predicted noise levels for each potentially affected receiver are presented Appendix C.

A summary of predicted noise levels in comparison with ICNG assessment criteria for the Period2 period is presented in Table 4.

Table 7 Summary of predicted noise levels with comparison against ICNG criteria for the Period2 period.

Criterion	Predicted number of receivers
Maximum cumulative predicted L _{Aeq, 15 minute} noise level	59 dB(A)
Number of highly noise affected receivers (>75 dB)	0
1 – 10 dB above NML	44
10 – 20 dB above NML	11
20+ dB above NML	0

Predicted impact classes for the Period2 period are illustrated graphically in Appendix C. Each identified receiver in the study area has been coloured to highlight the predicted level of impact.

Sleep disturbance

In the event works are planned for more than two consecutive nights, sleep disturbance is considered. Table 8 summarises the number of residents predicted to exceed the sleep disturbance screening criterion. Further analysis is also provided to indicate the number of receivers expected to be woken, at LAmax noise levels greater than 65 dBA.

Where exceedances of the awakening criteria are predicted, additional care should be taken and mitigation measures implemented in the with the CNVG.

Table 8 Summary of predicted exceedances of sleep disturbance screening criterion and awakening criterion.

Criterion	Predicted number of receivers
Potentially Sleep Disturbed (exceed RBL + 15 screening criterion)	0
Sleep Disturbed (exceed 65 dBA awakening criterion)	0

Predicted vibration impacts

The level of vibration impact on sensitive receivers (buildings and human comfort) will largely depend on the type of machinery in use and the distance from source to receiver.

Based on the proposed work locations and selected equipment, the following level of vibration impact is expected. A summary of vibration impacts is provided for each sensitive receiver in Appendix C.

act classification Number of potentially affected receiv	
Human comfort	0
Cosmetic damage	0
Heritage structure	0

Proposed noise mitigation measures

The safeguards and controls listed in Table 6 will be implemented where reasonable and feasible with the intention of achieving the project noise criteria and to maintain noise impacts at a practical minimum.

Table 9 Safeguards and controls

Action	Description
Community consultation or notification	Notify the affected community. The notification will detail work activities, dates and hours, impacts and mitigation measures, indication of work schedule over the night time period, any operational noise benefits from the works (where applicable) and contact telephone number.
	Notification should be a minimum of 7 calendar days prior to the start of works. For projects other than maintenance works more advanced consultation or notification may be required.
Site inductions	All employees, contractors and subcontractors are to receive an environmental induction. The induction would at least include:
	 all project specific and relevant standard noise and vibration mitigation measures
	relevant licence and approval conditions
	permissible hours of work
	any limitations on high noise generating activities
	location of nearest sensitive receivers
	construction employee parking areas
	designated loading/unloading areas and procedures
	site opening/closing times (including deliveries) environmental incident procedures
Behaviour	No swearing or unnecessary shouting or loud stereos/radios on site.
	Limit compression braking at night in residential areas.
	No dropping of materials from height, throwing of metal items and slamming of doors.
Verification	Where indicated in Appendix C, a noise verification program would be undertaken for the duration of the works.
Construction hours	Where feasible and reasonable, construction should be carried out during the standard daytime working hours. Work generating high noise and/or vibration levels should be scheduled during less sensitive time periods.
Respite for out-of-hours works	Respite would be scheduled as indicated in Appendix C and described in the CNVG.
Equipment selection	Use quieter construction methods where feasible and reasonable.
	Ensure plant including the silencer is well maintained.
	Plant noise levels will have an operating noise emission level compliant with Appendix F of the CNVG
Use and siting of plant	The offset distance between noisy plant and adjacent sensitive receivers is to be maximised.
	Plant used intermittently to be throttled down or shut down.
	Noise-emitting plant to be directed away from sensitive receivers.

Action	Description
Plan worksites and activities to minimise noise and vibration.	Locate compounds away from sensitive receivers and discourage access from local roads.
	Plan traffic flow, parking and loading/unloading areas to minimise reversing movements within the site.
	Where additional activities or plant may only result in a marginal noise increase and speed up works, consider limiting duration of impact by concentrating noisy activities at one location and move to another as quickly as possible.
	Very noise activities should be scheduled for normal working hours. If the work can not be undertaken during the day, it should be completed before 11:00pm.
	Where practicable, work should be scheduled to avoid major student examination periods when students are studying for examinations such as before or during Higher School Certificate and at the end of higher education semesters.
Non-tonal reverse 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.
Shield stationary noise sources such as pumps, generators, and compressors	These should be enclosed or shielded where reasonable and feasible.
Implement any project specific mitigatio	n measures
1	None

Appendix A Project location and predicted level of impact



Appendix B Proposed activities and equipment

Cross

Equipment	Quantity	Usage	Reduction	SWL
Bogies	1	30%	0	95
Excavator (40 tonne)	1	50%	0	111
Generator ¹	1	100%	5	105

Activity Sound Power Level: 112

Appendix C Detailed noise predicted for each receiver

Noise

Vibration

NCA	Receiver	Address	Vibration Impact

Construction noise and vibration impact assessment

1383-14411 Elizabeth Drive Micro-Tunnelling				
Proposed works	C/E Microtunnel			
Proponent	Quickway			
Assessment Date	26/09/2024			
Prepared by	Jh	Assessment Id	CE	

Introduction

This report has been prepared using the construction noise self-assessment platform KNOWnoise: *Minor Works* and presents an assessment of the likely noise impacts related to proposed works associated with the above project. Where possible, these works would be completed during standard construction hours; however, there may be a need to work outside these hours due to technical, community or access limitations. The location of the proposed works is illustrated in Appendix A.

Planned works

A description of the proposed works is as follows.

C/E Microtunnel

Proposed activities and equipment for the works are summarised in Appendix B.

Though subject to change, the works are expected to commence around 27/10/2024 and would be completed by 28/04/2025.

Assessment criteria and mitigation requirements

Noise

The Interim Construction Noise Guideline (ICNG) (DECC 2009) describes noise more than 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 LAeq, 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.

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.

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). Table 2 presents NMLs from the ICNG for sensitive land uses based on the principle that the characteristic activities for each of these land uses should not be unduly disturbed.

Table 1 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		.5	
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	

Vibration

Effects of vibration from construction may be segregated into:

- Human exposure disturbance to building occupants: vibration in which the occupants or users of the building are inconvenienced or possibly disturbed.
- Effects on building contents vibration where the building contents may be affected.
- Effects on building structures vibration in which the integrity of the building or structure itself may be prejudiced.

Vibration criteria relating to human comfort applicable to this project are taken from the DEC (2006) document Assessing Vibration – A Technical Guideline for intermittent vibration – such as from drilling, compacting or activities that would result in continuous vibration if operated continuously. Intermittent vibration is assessed as a vibration dose value (VDV) and relates to the level of vibration over time (cumulative over the night or day period). VDVs that may result in adverse comment from receivers are summarised in Table 5.

Table 2 Summary of vibration dose values which might result in adverse comment

Time	Low probability of adverse comment (m/s ^{1.75})	Adverse comment possible (m/s ^{1.75})	Adverse comment probable (m/s ^{1.75})
Day			
(6am to 10pm)	0.2 to 0.4	0.4 to 0.8	0.8 to 1.6
Night			
(10pm to 6am)	0.1 to 0.2	0.2 to 0.4	0.4 to 0.8

Guidance for the consideration of potential building damage from construction vibration is in line with BS 7385-1 Evaluation and measurement for vibration in buildings - Guide for measurement of vibration and evaluation of their effects on buildings. These guideline values are presented in Table 3.

Table 3 Building damage vibration guidelines (BS 7385-1)

Type of building	Guideline values for vibration (PPV mm/s)			
	4Hz to 15Hz	15Hz to 40Hz	40Hz and above	
Reinforced or framed structures / Industrial and	50			
heavy commercial buildings				
Un-reinforced or light framed structures /	15 - 20	20 - 50	50	
Residential or light commercial type buildings				

For heritage structures, criteria are in line with the German Standard *DIN 4150-3: Structural Vibration- effects of vibration on structures*, as summarised in Table 4.

Table 4 Guideline values for vibration velocity to be used when evaluating the effects of short-term vibration on heritage structures (DIN 4150-3).

Type of building	Guideline values for vibration (PPV mm/s)			
	1 Hz to 10 Hz	10 Hz to 50 Hz	50 Hz to 100 Hz	Vibration at horizontal plane of highest floor at all frequencies
Structures that, because of their sensitivity to vibration, cannot be classified under lines 1 and 2 and are of great intrinsic value (e.g. listed buildings under preservation order)	3	3 to 8	8 to 10	8

The safe working distances presented in Table 5 are indicative and will vary depending on the item of plant and local geotechnical conditions. The cosmetic damage thresholds apply to typical buildings under typical geotechnical conditions and vibration monitoring is recommended at specific sites. Where structures are more sensitive, such as heritage items, more stringent conditions are applicable and should be considered individually.

In relation to human response, the safe working distances relate to continuous vibration. For most construction activities, vibration emissions are intermittent and higher vibration levels over shorter periods are acceptable. Additional assessment should be undertaken where the human response criteria are exceeded.

Plant item	Rating/description	Safe working distance	
		Cosmetic damage	Human response
		(BS 7385-1)	(DECCW)
Vibratory roller	<50 kN (typically 1-2 t)	5 m	15 m to 20 m
	<100 kN (typically 2-4 t)	6 m	20 m
	<200 kN (typically 4-6 t)	12 m	40 m
	<300 kN (typically 7-13 t)	15 m	100 m
	>300 kN (typically 13-18 t)	20 m	100 m
	>300 kN (> 18 t)	25 m	100 m
Small hydraulic hammer	300 kg – 5 to 12 t excavator	2 m	7 m
Medium hydraulic hammer	900 kg – 12 to 18t excavator	7 m	23 m
Large hydraulic hammer	1600 kg – 18 to 34 t excavator	22 m	73 m
Vibratory pile driver	Sheet piles	2 m to 20 m	20 m
Pile boring	≤800 mm	2 m	n/a
Jackhammer	Hand held	1 m	Avoid contact with
			structure

Table 5 Safe working distances for vibration intensive plant

Existing environment and noise management levels

The proposed works would be undertaken in a predominantly Rural / Suburban, characterised as:

Areas with negligible transportation or very limited local traffic, typically light vehicles only.

100m or more from the road.

Background noise levels adopted for the project area and associated noise management levels (NMLs) are summarised in Table 6. NMLs have been established in line with the ICNG.

Table 6 Construction NMLs

Land use	Rural / Suburban		/ Suburban Using custom background noise data?		Yes
Criterion	Day	Weekend Day	Evening	Night	Sleep
RBL	54	49	48		37
NML	64	59	53	42	65

Sleep disturbance

The ICNG recommends where construction works are planned to extend over more than two consecutive nights, the maximum noise level should be considered for the purposes of establishing the likelihood of sleep disturbance. The Road Noise Policy suggests that 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.

Based on this, a sleep awakening criterion of 55 dB(A) (internal) is typically adopted for works. Given that noise attenuation of 10 dB(A) is typically provided by an open window, a sleep awakening criterion of LAmax 65 dB(A) (external) has been applied to residential bedroom façades.

Assessment methodology

Based on the nominated works area (illustrated in Appendix A), proposed equipment and the minimum distance from the works to each sensitive receiver, noise levels were calculated based on ISO9613: 2 *Acoustics - Attenuation of sound during propagation outdoors.*

This method considers geometric spreading, atmospheric absorption, ground effects and is valid for meteorological conditions of a gentle breeze from source to receiver and stable atmosphere (temperature inversion).

KNOWnoise: Minor works is a 2-Dimensional assessment platform and does not consider terrain effects (e.g. hills, valleys) or the presence of solid structures such as homes or noise barriers. This will result in a conservative prediction, suitable for the project being assessed.

Considering the nature of the works and the type of surrounding land uses, sensitive receivers up to a radius of 900 metres from the works have been included in the assessment.

Sound power levels and predicted noise levels depend on the number of plant items operating at any one time and their precise location relative to a sensitive receiver. Equipment was assumed to be working at the worst-case location relative to each receiver and represents a worst-case assessment. Where the activity is further away from receivers or less equipment is used the predicted levels will decrease.

Sound power levels for plant and equipment expected to be used for each activity has been estimated based on guidance in the following standards and guidelines as well as typical measured noise levels for specific equipment.

- ⁴⁶ AS2436-2010: Guide to noise and vibration control on construction, demolition and maintenance sites
- British Standard 5228-1:2009 Code of practice for noise and vibration control on construction and open sites
 United Kingdom Department for Environment, Food and Rural Affairs (DEFRA) Noise database for prediction of
- noise on construction and open sites

Construction noise sources and associated sound power levels are listed in Appendix B. The maximum predicted LAeq noise level within the work area was identified for each receiver.

Predicted noise levels

Detailed predicted noise levels for each potentially affected receiver are presented Appendix C.

A summary of predicted noise levels in comparison with ICNG assessment criteria for the Period2 period is presented in Table 4.

Table 7 Summary of predicted noise levels with comparison against ICNG criteria for the Period2 period.

terion Predicted number of receivers		
Maximum cumulative predicted LAeq, 15 minute noise level	72 dB(A)	
Number of highly noise affected receivers (>75 dB)	0	
1 – 10 dB above NML	3	
10 – 20 dB above NML	1	
20+ dB above NML	0	

Predicted impact classes for the Period2 period are illustrated graphically in Appendix C. Each identified receiver in the study area has been coloured to highlight the predicted level of impact.

Sleep disturbance

In the event works are planned for more than two consecutive nights, sleep disturbance is considered. Table 8 summarises the number of residents predicted to exceed the sleep disturbance screening criterion. Further analysis is also provided to indicate the number of receivers expected to be woken, at LAmax noise levels greater than 65 dBA.

Where exceedances of the awakening criteria are predicted, additional care should be taken and mitigation measures implemented in the with the CNVG.

Table 8 Summary of predicted exceedances of sleep disturbance screening criterion and awakening criterion.

Criterion	Predicted number of receivers		
Potentially Sleep Disturbed (exceed RBL + 15 screening criterion)	0		
Sleep Disturbed (exceed 65 dBA awakening criterion)	0		

Predicted vibration impacts

The level of vibration impact on sensitive receivers (buildings and human comfort) will largely depend on the type of machinery in use and the distance from source to receiver.

Based on the proposed work locations and selected equipment, the following level of vibration impact is expected. A summary of vibration impacts is provided for each sensitive receiver in Appendix C.

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

Proposed noise mitigation measures

The safeguards and controls listed in Table 6 will be implemented where reasonable and feasible with the intention of achieving the project noise criteria and to maintain noise impacts at a practical minimum.

Table 9 Safeguards and controls

Action	Description	
Community consultation or notification	Notify the affected community. The notification will detail work activities, dates and hours, impacts and mitigation measures, indication of work schedule over the night time period, any operational noise benefits from the works (where applicable) and contact telephone number.	
	Notification should be a minimum of 7 calendar days prior to the start of works. For projects other than maintenance works more advanced consultation or notification may be required.	
Site inductions	All employees, contractors and subcontractors are to receive an environmental induction. The induction would at least include:	
	 all project specific and relevant standard noise and vibration mitigation measures 	
	relevant licence and approval conditions	
	permissible hours of work	
	any limitations on high noise generating activities	
	location of nearest sensitive receivers	
	construction employee parking areas	
	designated loading/unloading areas and procedures	
	site opening/closing times (including deliveries) environmental incident procedures	
Behaviour	No swearing or unnecessary shouting or loud stereos/radios on site.	
	Limit compression braking at night in residential areas.	
	No dropping of materials from height, throwing of metal items and slamming of doors.	
Verification	Where indicated in Appendix C, a noise verification program would be undertaken for the duration of the works.	
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Shield stationary noise sources such as pumps, generators, and compressors	These should be enclosed or shielded where reasonable and feasible.	
Implement any project specific mitigation measures		
1	None	

Appendix A Project location and predicted level of impact



Appendix B Proposed activities and equipment

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Equipment	Quantity	Usage	Reduction	SWL
Bogies	1	30%	0	95
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Activity Sound Power Level: 112

Vibration

NCA	Receiver	Address	Vibration Impact