MAKING COMPLEX EASY
A TETRA TECH COMPANY

CLONASLEE FLOOD RELIEF SCHEME

Environmental Impact Assessment Report
Chapter 14: Noise & Vibration

MDW0867
27 February 2025
S5. P01

Document status

Version	Purpose of document	Authored by	Reviewed by	Approved by	Review date
S5.P01	Issue for Planning	SM	JM/PC/BC	JM	27 Feb 2027

Approval for issue

John Mahon	27 February 2027

Prepared by:

RPS

Prepared for:

Laois County Council

Dublin | Cork | Galway | Sligo | Kilkenny
rpsgroup.com

RPS Group Limited, registered in Ireland No. 91911
RPS Consulting Engineers Limited, registered in Ireland No. 161581
RPS Engineering Services Limited, registered in Ireland No. 99795
The Registered office of each of the above companies is West Pier Business Campus, Dun Laoghaire, Co. Dublin, A96 N6T7

Contents

GLOSSARY ..... **IV**

ACRONYMS ..... **IV**

14 NOISE & VIBRATION **1**
14.1 Introduction 1
14.2 Methodology 1
14.2.1 Legislation, Policy and Guidance 1
14.2.2 Zone of Influence 1
14.2.3 Sources of Information to Inform the Assessment 2
14.2.4 Key Parameters for Assessment 2
14.2.5 Assessment Criteria and Significance 2
14.2.6 Operational Noise and Vibration 7
14.2.7 Data Limitations 7
14.2.8 Scoping and Consultation 7
14.3 Description of the Existing Environment 7
14.3.1 Baseline Environment 7
14.3.2 Baseline Survey 7
14.4 Description of the Likely Significant Effects 3
14.4.1 Receptor Sensitivity 3
14.4.2 Do Nothing Scenario 3
14.4.3 Assumed Plant Lists and Construction Phasing 3
14.4.4 Construction Phase Noise 3
14.4.5 Construction Phase Vibration 10
14.4.6 Construction Traffic 11
14.4.7 Operational Phase 11
14.5 Mitigation Measures 12
14.5.1 Construction Phase 12
14.5.2 Operational Phase 13
14.6 Residual Impacts 13
14.7 Monitoring 13
14.7.1 Construction Phase 13
14.7.2 Operational Phase 13
14.8 Interactions and Cumulative Effects 14
14.8.1 Interactions 14
14.8.2 Cumulative Effects 14
14.9 Conclusion 14
14.10 Chapter References 17

Tables

Table 14-1: Summary of Key Datasets 2
Table 14-2: General Categorisation of Receiver Sensitivity 3
Table 14-3: Guidance on Human Perception of Vibration Levels (BSI, 2009) 3
Table 14-4: Transient Vibration Guide Values for Cosmetic Damage (BSI, 2009), (DIN, 2016) 4
Table 14-5: Construction Vibration – Initial Significance Rating of Effects 5
Table 14-6: Threshold of Potential Significant Effect at NSLs (BSI, 2009) 5
Table 14-7: Construction Noise – Initial Significance Rating of Effects 6
Table 14-8: Measurement Equipment 8
Table 14-9: Baseline Noise Survey Measurement Locations 8
Table 14-10: Baseline Survey Results 2
Table 14-11: Baseline Survey Results and BS 5228 ABC Method Noise Thresholds 3

Table 14-12: Construction Compounds – Site Enabling – Construction Plant List 4
Table 14-13: Construction Compounds – Site Enabling – Construction Noise Predictions at the Nearest NSL....4
Table 14-14: Area 1 Construction Plant List....5
Table 14-15: Area 1 Construction Noise Predictions at the Nearest NSL....6
Table 14-16: Area 2 Construction Plant List....6
Table 14-17: Area 2 Construction Noise Predictions at the Nearest NSL....7
Table 14-18: Area 3 Construction Plant List....9
Table 14-19: Area 3 Construction Noise Predictions at the Nearest NSL....9
Table 14-20: Vibration Source Levels for Construction Equipment (Quagliata, 2018) 10
Table 14-21: Predicted Vibration Levels at the Nearest NSL in Area 2 11
Table 14-22: Typical Vibration Levels in a Modern Residence (New, 1986) 11
Table 14-23: Summary of Likely Significant Effects and Environmental Commitments 15

Figures

Figure 14-1: Map of Baseline Noise Survey Measurement Locations 1

GLOSSARY

Term	Meaning
A-weighting	A spectrum adaption that is applied to measured noise levels to represent human hearing. A-weighted levels are used as human hearing does not respond equally at all frequencies.
dB	Decibel—a unit of measurement used to express sound level. It is based on a logarithmic scale which means a sound that is 3 dB higher has twice as much energy. We typically perceive a 10 dB increase in sound as a doubling of loudness.
dB(A)	Units of the A-weighted sound level.
Frequency (Hz)	The number of times a vibrating object oscillates (moves back and forth) in one second. Fast movements produce high frequency sound (high pitch/tone), but slow movements mean the frequency (pitch/tone) is low. 1 Hz is equal to 1 cycle per second.
$L_{eq,\ t}$	Equivalent Noise Level—Energy averaged noise level over the measurement time (t).
L_{AFmax}	Equivalent A-weighted Noise Level—Energy averaged, a-weighted noise level over the measurement time (t).
L_{A90}	The highest fast time-weighted noise level recorded during the measurement.
L_w	The noise level exceeded during 90 % of the measurement duration. This is generally referred to as the background noise level.
SPL	Sound pressure level.

ACRONYMS

Term	Meaning
BPM	Best Practicable Means
BSI	British Standards Institute
CEMP	Construction Environmental Management Plan
CIRIA	Construction Industry Research & Information Association
DIN	Deutsches Institut für Normung
DMRB	Design Manual for Roads and Bridges
EC	European Communities
EIAR	Environmental Impact Assessment Report
EPA	Environmental Protection Agency
HGV	Heavy Goods Vehicle
ITM	Irish Transverse Mercator
NSL	Noise Sensitive Locations
NSP	Noise Sensitive Premises
OSI	Ordnance Survey Ireland
PPV	Peak Particle Velocity
TII	Transport Infrastructure Ireland
UK	United Kingdom

14 NOISE & VIBRATION

14.1 Introduction

This chapter of the Environmental Impact Assessment Report (EIAR) identifies, describes, and presents an assessment of the likely significant effects which may arise due to noise and vibration from the construction, operation and maintenance (as detailed in **Chapter 5: Project Description**) of the Proposed Scheme. Mitigation measures to reduce effects are identified where necessary and any residual effects which may remain are described.

14.2 Methodology

14.2.1 Legislation, Policy and Guidance

The following national legislation applies to noise:

- Environmental Noise Regulations (Minister for the Environment, Heritage and Local Government, 2006)
- Environmental Protection Agency Act (Government of Ireland, 1992)

Local policy has been referred to as necessary, including:

- Laois County Development Plan 2021 – 2027 (Laois County Council, 2022)
- Laois County Council Noise Action Plan 2019 – 2022 (Laois County Council, 2019)
- Laois County Council Draft Noise Action Plan 2024 – 2028 (Laois County Council, 2024)

The assessment of impacts has been undertaken, as appropriate, in accordance with, or with reference to, the following guidance documents:

- Guidelines on the information to be contained in Environmental Impact Assessment Reports (EPA, 2022)
- Guidance Note for Noise: Licence Applications, Surveys and Assessments in Relation to Scheduled Activities (NG4) (EPA, 2016)
- Good Practice Guidance for the Treatment of Noise during the Planning of National Road Schemes (TII, 2014)
- Guidelines for the Treatment of Noise and Vibration in National Road Schemes (TII, 2004)
- British Standard BS 5228:2009+A1:2014 Code of practice for noise and vibration control on construction and open sites – Parts 1 and 2: Noise and Vibration (BSI, 2009)
- Calculation of Road Traffic Noise (CRTN) (Department of Transport Welsh Office, 1988)
- British Standard BS 7385-2:1993 Evaluation and measurement for vibration in buildings. Guide to damage levels from groundborne vibration (BSI, 1993)
- Design Manual for Roads and Bridges (DMRB) LA 111 Noise and Vibration (Highways England, 2020)
- DIN 4150-3 Vibrations in buildings – Part 3: Effects on structures (DIN, 2016)
- ISO 1996-1:2016 Acoustics – Description, measurement and assessment of environmental noise. Part 1: Basic quantities and assessment procedures (ISO, 2016)
- ISO 1996-2:2017 Acoustics – Description, measurement and assessment of environmental noise. Part 2: Determination of sound pressure levels (ISO, 2017)
- World Health Organisation (WHO) Environmental Noise Guidelines for the European Region (2018)

14.2.2 Zone of Influence

There is no guidance or legislation in Ireland regarding the extent/size of the noise and vibration study area to adopt for the assessment of noise and vibration effects. The noise and vibration study areas for

construction and operational activities in this chapter have been set with consideration of the guidance contained in BS 5228-1 and BS 5228-2 (collectively referred to as BS 5228) (BSI, 2009) and Transport Infrastructure Ireland (TII) Guidelines (TII, 2014). Professional judgment has been used to determine the distances over which noise impacts may occur during construction and operation along with consideration of the likely magnitude and duration of impact and the sensitivity of receptors.

During the construction phase, the noise and vibration study area considers noise sensitive locations (NSLs) up to 300 m from elements of the Proposed Scheme. No study area has been set for operational noise due to the activities likely to occur (see **Section 14.2.6**).

For assessment of the potential for cumulative effects with other projects, a Zone of Influence of twice the study area distance is set, i.e., projects up to 600 m from elements of the Proposed Scheme boundary.

14.2.3 Sources of Information to Inform the Assessment

Data sources utilised during the assessment include those listed in **Table 14-1** below.

Table 14-1: Summary of Key Datasets.

Title	Source	Year	Author(s)
OSI	Ordnance Survey Ireland	2023	Ordnance Survey Ireland
Google Earth Imagery	Google Earth	1984 – 2023	Google LLC
GeoDirectory	An Post	2024	An Post and Ordnance Survey Ireland
Historic Environment Viewer	Historic Environment Viewer (archaeology.ie)	2023	National Monuments Service
Noise Modelling	RPS	Q1 2024	RPS
Baseline Noise Survey	RPS	Q4 2023	RPS

14.2.4 Key Parameters for Assessment

The following key parameters were identified as having the potential to result in significant effects on NSLs:

- Noise impacts due to construction activities.
- Noise impacts due to activities at site compounds during the construction phase.
- Noise impacts due to increased traffic during the construction phase.
- Vibration impacts due to construction activities.

14.2.5 Assessment Criteria and Significance

This chapter follows the assessment methodology set out in **Chapter 1: Introduction**.

The significance of the effect of noise and vibration is determined by considering the magnitude of the impact and the sensitivity of the receptor in accordance with EPA Environmental Impact Assessment Report (EIAR) guidance (EPA, 2022). In referring to noise sensitive receptors, the term Noise Sensitive Location or NSL is most commonly used in Ireland as it is the terminology used in EPA guidance for noise. Hereafter in this chapter, NSL will be used to refer to noise and vibration sensitive receptors. NSLs are typically residential premises but can also include schools, places of worship and other NSLs. Site and project specific considerations play a part in determining the sensitivity of a receptor and noise assessment standards in general include implicit considerations of sensitivity, e.g., through consideration of background noise levels.

Table 14-2 presents general categorisations of NSL sensitivities for use in Ireland. The table has been developed based on professional judgement and experience in completing noise assessments.

Table 14-2: General Categorisation of Receiver Sensitivity

Sensitivity	Description	Examples of Receptors	Modifiers
High	Receptors where people or operations are particularly susceptible to noise	Residential, including private gardens where appropriate. Hospitals/residential care homes. Schools during the daytime. Quiet outdoor areas used for recreation. Places of worship.	Modifiers are factors that can change the sensitivity of receivers. These include: Magnitude and character of baseline noise, period of occupancy, noise insulation of buildings.
Medium	Receptors moderately sensitive to noise, where it may cause some distraction or disturbance	Offices. Bars/Cafes/Restaurants where external noise may be intrusive. Community facilities and amenity areas. Sports grounds when spectator noise is not a normal part of the event and where quiet conditions are necessary (e.g., tennis, fishing and golf). Wildlife refuges. Recording studios and concert halls are also included in this category.	
Low	Receptors where distraction or disturbance from noise is low	Buildings not occupied during the daytime. Sports grounds when spectator noise is a normal part of the event. Night clubs.	
Negligible	Receptors where distraction or disturbance from noise is negligible.	All other areas such as those used primarily for industrial or agricultural purposes. All other.	

While the above table is useful, the specific categorisations of magnitudes and sensitivities are determined using applicable standards, which are detailed in the following sections, and professional judgement. For noise and vibration, consideration of magnitudes and sensitivities are inherent to the assessment process for most categories of emissions.

14.2.5.1 Construction Vibration

There is no statutory Irish guidance relating to the maximum permissible vibration level that may be generated during the construction phase of a project. In the absence of specific vibration limits, appropriate vibration emission criteria relating to permissible construction vibration levels for a development of this scale may be found in BS5228 (BSI, 2009).

Human beings are known to be sensitive to vibration, the threshold of perception being typically in the Peak Particle Velocity (PPV) range of 0.14 mm/s to 0.3 mm/s. Vibrations above these values can disturb, startle, cause annoyance or interfere with work activities. At higher PPV levels (>15 mm/s), vibrations can lead to concerns about possible (not probable) structural damage. Guidance regarding effects of vibration levels on humans is set out in **Table 14-3**.

Table 14-3: Guidance on Human Perception of Vibration Levels (BSI, 2009)

Vibration Level	Effect
0.14 mm/s	Vibration might be just perceptible in the most sensitive situations for most vibration frequencies associated with construction. At lower frequencies, people are less sensitive to vibration.
0.3 m/s	Vibration might be just perceptible in residential environments.
1.0 mm/s	It is likely that vibration of this level in residential environments will cause complaint but can be tolerated if prior warning and explanation has been given to residents.
10 mm/s	Vibration is likely to be intolerable for any more than a very brief exposure to this level.

Limits of transient vibration, above which cosmetic damage to property could occur, are presented numerically in **Table 14-4** (BSI, 2009). Where the dynamic loading caused by continuous vibration is such as

to give rise to dynamic magnification due to resonance, especially at the lower frequencies where lower guide values apply, then the guide values in **Table 14-4** may need to be reduced by up to 50%. On a cautious basis, therefore, continuous vibration limits are set as 50% of those for transient vibration across all frequency ranges. Minor damage is possible at vibration magnitudes which are greater than twice those given in **Table 14-4** and major damage to a building structure can occur at values greater than four times the tabulated values.

Table 14-4: Transient Vibration Guide Values for Cosmetic Damage (BSI, 2009), (DIN, 2016)

Type of Building	Peak Particle Velocity (PPV) (mm/s) in Frequency Range of Predominant Pulse	
	4 Hz to 15 Hz	15 Hz and Above
Reinforced or framed structures. Industrial and heavy commercial buildings.	50 mm/s at 4 Hz and above	50 mm/s at 4 Hz and above
Unreinforced or light framed structures. Residential or light commercial buildings.	15 mm/s at 4 Hz increasing to 20 mm/s at 15 Hz	20 mm/s at 15 Hz increasing to 50 mm/s at 40 Hz and above
Guideline limit values for premises with machinery that is highly sensitive to vibration or historic buildings that may be in poor repair.	7 mm/s at 4 Hz increasing to 10 mm/s at 15 Hz	10 mm/s at 15 Hz increasing to 25 mm/s at 40 Hz and above
Limit values for historic buildings that have been assessed on a case-by-case basis to be structurally unsound (DIN, 2016).	3 mm/s*	8 mm/s at 50 Hz Increasing to 10 mm/s at 100 Hz and above*

* Continuous or transient vibration.

14.2.5.1.1 Sensitivity

Sensitivity of NSLs is assessed in line with **Table 14-2**.

14.2.5.1.2 Magnitude

Magnitudes of impacts are assessed in line with the guidance stated in **Table 14-3** and **Table 14-4** and the impact magnitude levels are stated in **Table 14-5**. Predictions of vibration levels are limited to the nearest NSL on the basis that more distant NSLs will have lower vibration levels due to increased distance attenuation. This approach aligns with best practice.

14.2.5.1.3 Significance of Effects

Guidance has been listed in **Table 14-3** and **Table 14-4** on effects of vibration levels on humans and limits of transient vibration above which cosmetic damage could occur. For assessing the significance of effect, reference is made to the EPA Guidelines (EPA, 2022) and specifically the DMRB (Highways England, 2020) which states:

> *"Construction vibration shall constitute a significant effect where it is determined that a major or moderate magnitude of impact will occur for a duration exceeding:*
>
> *1) 10 or more days or nights in any 15 consecutive days or nights;*
>
> *2) A total number of days exceeding 40 in any 6 consecutive months."*

Table 14-5 presents the construction vibration significance rating.

Table 14-5: Construction Vibration – Initial Significance Rating of Effects

Vibration Level	EPA Initial Magnitude of Impact	Initial Significance Rating	Modifiers
Less than 0.3 mm/s	Negligible	Imperceptible / Not Significant	Modifiers are factors that can change the magnitude of impact or significance rating. These include: Duration, frequency and likelihood of occurrence. Public attitudes to, and acceptability of, the project itself.
Greater than or equal to 0.3 mm/s and less than 1.0 mm/s	Low	Slight / Moderate	
Greater than or equal to 1.0 mm/s and less than 10 mm/s	Medium	Moderate / Significant	
Greater than or equal to 10 mm/s	High	Very Significant / Profound	

14.2.5.2 Construction Noise

The ABC method outlined in section E3.2 of BS 5228 (BSI, 2009) has been used for the purposes of controlling noise. The approach adopted calls for the designation of an NSL into a specific category (A, B or C) based on existing ambient noise levels in the absence of construction noise. This then sets a threshold noise value that, if exceeded at this location, indicates a potential significant noise impact is associated with the construction activities.

Table 14-6 outlines the applicable noise threshold of potential significant effect at the nearest NSLs. The determination of what category to apply is dependent on the existing ambient (L_{Aeq}) noise level (rounded to the nearest 5 dB) at the nearest NSL. For weekday daytime, if the ambient noise level is less than the Category A threshold limit, the Category A threshold limit (i.e., 65 dB) applies. If the ambient noise level is the same as the Category A threshold limit, the Category B threshold limit (i.e., 70 dB) applies. If the ambient noise level is more than the Category A threshold limit, the Category C threshold limit (i.e., 75 dB) applies.

Table 14-6: Threshold of Potential Significant Effect at NSLs (BSI, 2009)

Assessment Category and Threshold Value Period (L_{Aeq})	Noise Threshold Value (dB)		
	Category A[A]	Category B[B]	Category C[C]
Night-time (23:00 – 07:00)	45	50	55
Evenings and Weekends[D]	55	60	65
Daytime (07:00 – 19:00) and Saturdays (07:00 – 13:00)	65	70	75

NOTE 1: A potential significant effect is indicated if the $L_{Aeq,T}$ noise level arising from the site exceeds the threshold level for the category appropriate to the ambient noise level.

NOTE 2: If the ambient noise level exceeds the Category C threshold values given in the table (i.e., the ambient noise level is higher than the above values), then a potential significant effect is indicated if the total $L_{Aeq,T}$ noise level for the period increases by more than 3 dB due to site noise.

NOTE 3: Applied to residential locations only.

A) Category A: threshold values to use when ambient noise levels (when rounded to the nearest 5 dB) are less than these values.

B) Category B: threshold values to use when ambient noise levels (when rounded to the nearest 5 dB) are the same as category A values.

C) Category C: threshold values to use when ambient noise levels (when rounded to the nearest 5 dB) are higher than category A values.

D) 19:00 – 23:00 weekdays, 13:00 – 23:00 Saturdays and 07:00 – 23:00 Sundays.

14.2.5.2.1 Sensitivity

Sensitivity of NSLs is assessed in line with **Table 14-2**.

14.2.5.2.2 Magnitude

As a consequence of the 65 dBA lower cut-off for Category A, where existing noise levels are low, construction criteria are independent of the precise noise levels, i.e., unless daytime average ambient noise levels at NSLs are in excess of 62.5 dBA, the lower daytime noise threshold will default to 65 dBA. In

general, only NSLs close to existing sources of high levels of noise, such as busy roads, have existing noise levels of sufficient magnitude to justify a threshold value higher than 65 dBA.

Predictions of noise levels are limited to the nearest NSL on the basis that more distant NSLs will have lower noise levels due to increased distance attenuation. This approach aligns with best practice.

14.2.5.2.3 Significance of Effects

Table 14-7 presents the construction noise initial significance rating of effects. The table provides an initial indication of the significance of effect which is then modified based upon the duration and frequency of the construction activity and other relevant modifiers.

Table 14-7: Construction Noise – Initial Significance Rating of Effects

Noise Level	EPA Initial Magnitude of Impact	Initial Significance Rating	Modifiers
≤ Baseline noise level or ≤ BS 5228 threshold - 10 dB	Negligible	Imperceptible / Not Significant	Modifiers are factors that can change the magnitude of impact or significance rating. These include: Baseline noise levels, duration, frequency and likelihood of occurrence. Public attitudes to, and acceptability of, the project itself.
> Baseline noise level and ≤ BS 5228 threshold	Low	Slight / Moderate	
> BS 5228 threshold to ≤ BS 5228 threshold + 5 dB	Medium	Moderate / Significant	
> BS 5228 threshold +5 to + 10 dB	High	Significant / Very Significant	
> BS 5228 threshold + 10 dB		Very Significant / Profound	

In many circumstances, the most important modifier of significance of effects for construction noise is the duration of the activities, with regard to which BS5228 states the following:

> *"c) Duration of site operations. In general, the longer the duration of activities on a site, the more likely it is that noise from the site will prove to be an issue, assuming NSPs* [noise sensitive premises] *are likely to be significantly affected. In this context, good public relations and communication are important. Local residents might be willing to accept higher levels of noise if they know that such levels will only last for a short time. It is then important that construction activities are carried out in accordance with the stated schedule and that the community is informed of their likely durations."*

In general, significant effects are not expected where the BS5228 thresholds will be exceeded for a period of only two or three days, with the likelihood of significant effects increasing proportionally to the duration of any exceedances of the noise thresholds.

For assessing the significance of effect, reference is made to the EPA Guidelines (EPA, 2022) and specifically the DMRB (Highways England, 2020) which states:

> *"Construction noise shall constitute a significant effect where it is determined that a major or moderate magnitude of impact will occur for a duration exceeding:*
>
> *1) 10 or more days or nights in any 15 consecutive days or nights;*
>
> *2) A total number of days exceeding 40 in any 6 consecutive months."*

Another very important modifier is the attitude of affected parties to the Proposed Scheme. Generally, people exposed to noise and vibration from construction activities will be far more tolerant of these impacts where it is perceived that the project is to the benefit of the community, with regard to which BS5228 states the following:

> *"It is well established that people's attitudes to noise can be influenced by their attitudes to the source or activity itself. Noise from a site will tend to be accepted more readily by local residents if they consider that the contractor is taking all possible measures to avoid unnecessary noise. The attitude to the contractor can also be improved through good community liaison and information distribution and the provision of a helpline to respond to queries or complaints. The acceptability of the project itself can also be a factor in determining community reaction."*

Projects such as flood relief schemes have obvious and immediate benefits for local residents who in many cases have experienced past flood events. It is therefore assumed that a positive community attitude to the project will be prevalent, provided that communities are made aware of the purpose of works.

In summary, exceedance of the BS5228 threshold is not a firm indication that significant effects will occur and other factors, particularly duration of the noisiest activities and community attitude to the project, must be considered in determining the likelihood of significant effects due to noise and vibration.

14.2.6 Operational Noise and Vibration

Operational noise and vibration emissions will be limited to periodic maintenance works such as occasional debris removal from the proposed debris trap, bi-annual back drainage improvements and vermin control at the proposed embankments, annual vegetation control at the proposed flood walls and embankments, removal of waste and vegetation from an existing culvert on a quarterly basis and general repairs as required.

As such, operational noise and vibration effects would be negligible and magnitudes would be low, given that the occurrence of maintenance works would be rare and durations brief. Detailed assessment of operational noise and vibration effects is therefore scoped out of this assessment.

14.2.7 Data Limitations

There were no difficulties or limitations encountered when carrying out this assessment.

14.2.8 Scoping and Consultation

Meetings and follow up consultations were arranged with stakeholders at all phases of the project. No specific noise and vibration comments and queries were raised during those meetings and consultations. Refer to **Chapter 3 Consultation** for details of all meetings and public consultation undertaken for the Proposed Scheme.

14.3 Description of the Existing Environment

14.3.1 Baseline Environment

The village of Clonaslee lies in the upstream Brosna catchment with the Clodiagh River passing through it to the west and the Gorragh River passing through it to the east. It is situated on two intersecting roads, the R422 (travelling east to west) and the Chapel St/Tullamore Road (travelling north to south). Brittas Wood and the associated Brittas Loop Walk trail lie south of the town. As the R422 enters the village centre of Clonaslee, residential properties line either side of the street. A line of residential properties is also sited along the west of Chapel St while the Clodiagh River runs parallel to the east. Access to a church, a GAA pitch and a drop-off collection area for the local primary school is also available from Chapel St. Continuing north out of the village centre, there are several two-storey residential properties located in the Clodiagh Way estate and further north, a series of one-storey residential properties are situated near the Uisce Éireann Integrated Constructed Wetlands (ICW) wastewater treatment facility.

There are no notable sources of noise or vibration in the town of Clonaslee outside of local road traffic noise, distant road traffic noise and river flow noise. There are no specific references to noise or vibration in relation to Clonaslee in the Laois County Council Noise Action Plan 2019 – 2022, Draft Noise Action Plan 2024 – 2028 or Development Plan 2021 – 2027 (Laois County Council, 2019) (Laois County Council, 2024) (Laois County Council, 2022). Furthermore, there are no noise and vibration-related datasets published by the EPA for the area.

14.3.2 Baseline Survey

In order to characterise the existing soundscape in the vicinity of the proposed works, a baseline noise survey was carried out on the 13 December 2023. A 30-minute attended noise measurement was taken at five noise monitoring locations (NMLs) representative of prevailing baseline noise levels at the nearest NSLs.

These locations are tabulated in **Table 14-9** and shown in **Figure 14-1**. All measurements were undertaken in accordance with ISO 1996-2:2017 (ISO, 2017).

In addition to the baseline noise survey, areas adjacent to the proposed works were walked in order to identify the presence of any vibration sensitive structures. No such structures were identified.

14.3.2.1 Instrumentation

A Class 1 Sound Level Meter in accordance with IEC 61672-1:2013 was used for all measurements. **Table 14-8** summarises the measurement equipment used.

Table 14-8: Measurement Equipment

Description	Manufacturer	Model	Serial Number
Sound Level Meter	Brüel & Kjær	2250	2690265
Acoustic Calibrator	Brüel & Kjær	4231	2389038

Laboratory calibration certificates for the equipment used are provided in **Appendix 14-1 Noise Calibration Certs**. A calibration check of the Sound Level Meter was conducted before and after the survey with a 0.0 dB calibration drift observed, well below the 0.5 dB permitted drift for valid measurements (ISO, 2017).

14.3.2.2 Measurement Procedure

Noise measurements at the various NMLs were undertaken in accordance with the following:

- The microphone of the sound level meter was at a height of approximately 1.2 m.
- One 30-minute measurement was conducted at each noise monitoring location.
- Care was taken to avoid any effect on the measurement of extraneous noise, acoustic vibration or electrical interference.
- A Brüel & Kjær UA-0237 windshield was used during all measurements.

At NML2 it was not possible to take free-field measurements (i.e., measurements at least 3.5 m from reflecting surfaces) due to the close proximity of passing traffic. In this instance, measured noise levels were corrected post-survey for façade reflections and proximity to the passing traffic. At NML4 measurements were corrected for proximity to passing traffic.

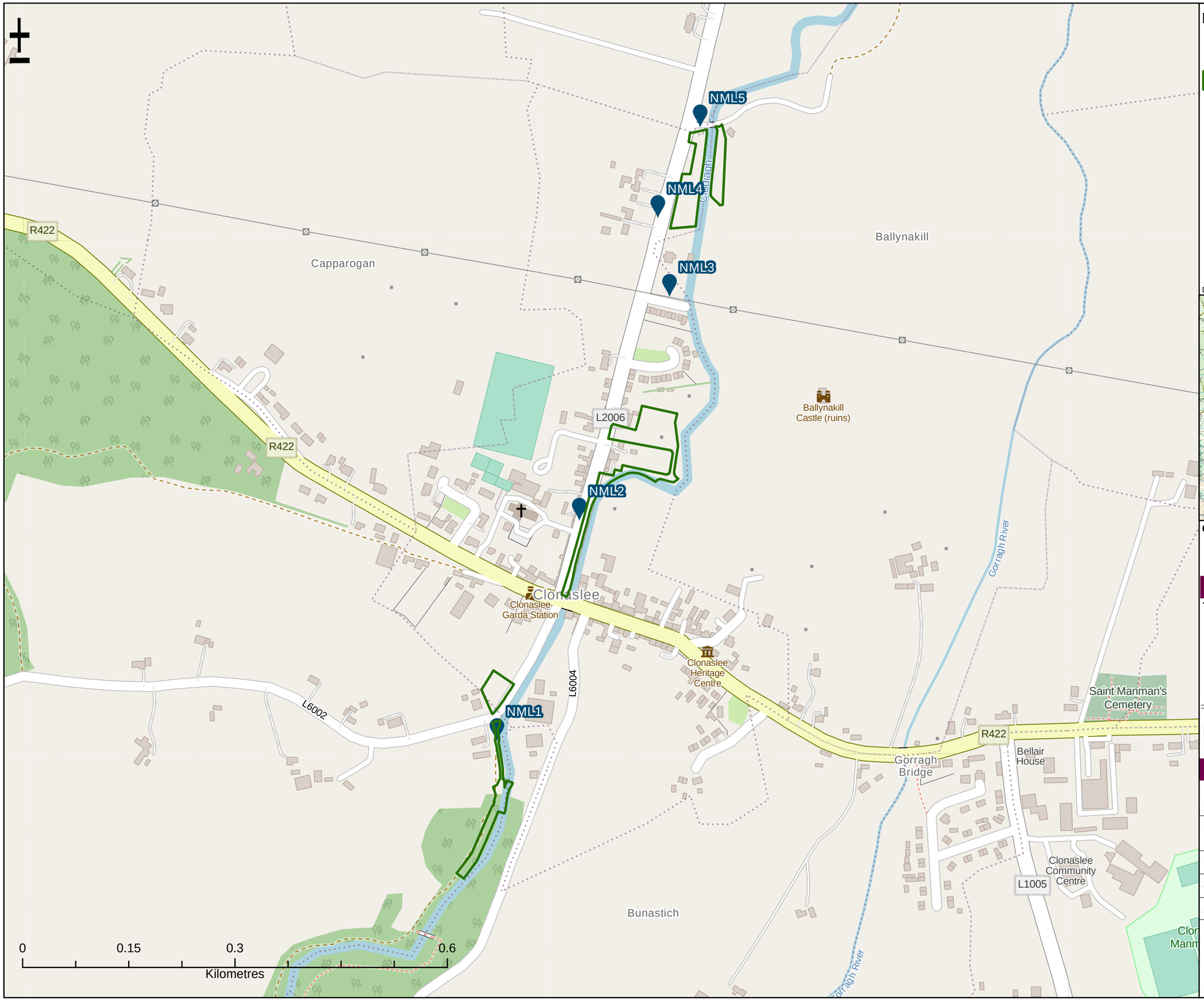
14.3.2.3 Measurement Locations

The Irish Traverse Mercator (ITM) coordinates of each NML are presented below in **Table 14-9**. Photographs taken at each NML are provided in **Appendix 14-2. Monitoring Locations**.

Table 14-9: Baseline Noise Survey Measurement Locations

Location	ITM Coordinates		Description
	Easting	Northing	
NML1	631663	710821	Free-field position at the entrance to Brittas Wood
NML2	631779	711133	~2 m from the façade of a property on the footpath along Chapel Street. St Manman's Catholic Church and Scoil Bhride are located nearby.
NML3	631906	711449	Free-field position on the green area at Clodiagh Way.
NML4	631890	711560	2 m from the front wall (low height) of a property along Tullamore Road.
NML5	631950	711689	Free-field position at the entrance to the Uisce Éireann ICW grounds.

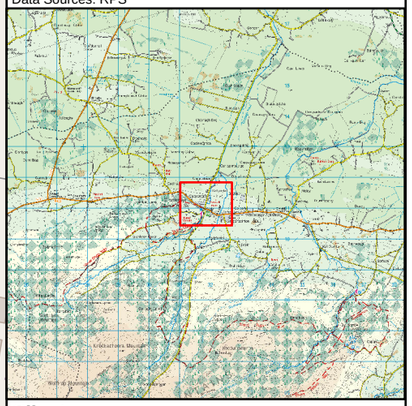
Figure 14-1 presents a map of the baseline noise survey measurement locations.



Legend

- Noise Monitoring Locations
- Works Area

Data Sources: RPS



Client

Laois County Council

Clonaslee FRS

Title

Figure 14 1: Map of Baseline Survey Measurement Locations

RPS A TETRA TECH COMPANY
Innishmore
Ballincollig,
Co Cork, Ireland.
P31 KR68

T +353 (0) 21 466 5900
E ireland@rpsgroup.com
W rpsgroup.com/ireland

Issue Details

File Identifier:
MDW0867-RPS-AP-XX-R-EN-1500

Status:	Rev:	Model File Identifier:
S1	P03	

Drawn: PK	**Date:** 30/09/2024
Checked: SM	**Scale:** 1:5,000 (A3)
Approved: JM	**Projection:** ITM

NOTE:

1. This drawing is the property of RPS Group Ltd. It is a confidential document and must not be copied, used, or its contents divulged without prior written consent.
2.

14.3.2.4 Meteorological Conditions

The weather conditions during the noise survey were calm with temperatures ranging from 5 ˚C to 7 ˚C. Cloud cover was less than 10% throughout the survey and average wind speeds of 2 m/s or less were measured at all locations with no extreme gusts. No precipitation or wind speeds above 5 m/s were observed during any part of the survey.

14.3.2.5 Survey Results

Table 14-10 summarises the baseline noise survey results and observations. The results show that all locations are classified as Category A using the BS 5228 ABC method (BSI, 2009). The noise threshold value for each location is therefore 65 dB L_{Aeq}.

Table 14-10: Baseline Survey Results

Location	Start Time	Duration	Measured Level (dB)			Subjective Observations
			L_{Aeq}	L_{AFmax}	L_{A90}	
NML1	09:58	30 min	52	66	51	River flow noise was dominant with some contributions from occasional traffic passing at low speed on the nearby local road. Other noise sources included: distant road traffic noise (RTN) light birdsong, light vegetation rustle and occasional local activity at a nearby facility.
NML2*	10:36	30 min	60	80	39	Local RTN was dominant with cars passing close to NML2. Traffic was sporadic with river flow noise being the main noise source in the absence of passing vehicles. Other noise sources included: distant RTN, light birdsong, light vegetation rustle, occasional local activity and distant dogs barking.
NML3	11:13	30 min	52	75	39	Local RTN was dominant when present but river flow noise was clearly audible in the frequent absences of traffic. Other noise sources included: distant RTN, light birdsong, occasional local activity, distant dogs barking and distant sound of children shouting.
NML4**	11:46	30 min	60	83	32	Local RTN was dominant with cars passing close to NML4. Traffic was sporadic with frequent absences making distant RTN, light birdsong, light vegetation rustle, distant machinery and distant church bells audible.
NML5	12:24	30 min	57	90	41	Local RTN was dominant when present, with river flow noise being the main noise source in the absence of passing vehicles. Other noise sources included: distant RTN, light birdsong and an intermittent distant chainsaw. Noise from the Uisce Éireann ICW treatment plant was inaudible.

* Results corrected for façade reflection effect and proximity to road.

** Results corrected for proximity to road.

14.3.2.6 BS 5228 Noise Thresholds

For clarity and ease of reference, the baseline noise survey results, BS 5228 ABC method category and corresponding BS 5228 daytime noise thresholds are presented in **Table 14-11**.

Table 14-11: Baseline Survey Results and BS 5228 ABC Method Noise Thresholds

Location	Start Time	Duration	Measured L_{Aeq} (dB)	BS 5228 ABC Category	BS 5228 Noise Threshold	Applicable Hours
NML1	09:58	30 min	52	A	65	Daytime (07:00 – 19:00) And Saturdays (07:00 – 13:00)
NML2	10:36	30 min	60	A	65	
NML3	11:13	30 min	52	A	65	
NML4	11:46	30 min	60	A	65	
NML5	12:24	30 min	57	A	65	

Where possible, plant operation will be limited to daytime hours. However, water management may need to be utilised on a 24 hour basis and in that instance, the construction noise threshold is 45 dB L_{Aeq}.

14.4 Description of the Likely Significant Effects

This section describes the significant effects which are likely to arise due to noise and vibration from the Proposed Scheme.

14.4.1 Receptor Sensitivity

All works locations are adjacent to residential locations. Consequently, all NSLs assessed for noise and vibration effects from the Proposed Scheme are considered to be high sensitivity.

14.4.2 Do Nothing Scenario

In the scenario where the Proposed Scheme does not proceed, none of the described construction noise and vibration effects would occur and the baseline conditions described in **Section 14.3.1** would continue. An imperceptible increase in road traffic noise as a result of population growth is expected.

14.4.3 Assumed Plant Lists and Construction Phasing

It is not possible at this stage to predict the exact equipment that will be used by the Contractor during the construction of the Proposed Scheme. Consequently, an assumed list of plant and equipment for each of the construction sites during various phases of the construction has been assembled in consultation with the project team and based on experience of similar projects and the information provided in **Chapter 5: Project Description**.

14.4.4 Construction Phase Noise

The Proposed Scheme is divided into three discreet works areas where construction is to take place:

- Area 1 – Brittas Wood: Debris trap installation with access slipway, culvert remediation and embankment construction.
- Area 2 – Chapel Street: Reinforced concrete wall construction.
- Area 3 – Tullamore Road and ICW: Embankment construction and reinforced concrete wall construction.

The three work areas will be supported by 2 no. temporary construction site compounds.

Short-term increases in noise levels will occur during the construction phase of the Proposed Scheme due to the requirements to use heavy plant and machinery and pumps operating 24 hours a day in some locations.

Assumed construction plant, construction phases and likely significant effects at each of the three works areas and the site enabling works for the site compounds are described in the following sections. Construction noise predictions has been undertaken using the methodology outlined in BS5228 (BSI, 2009).

The noise model has assumed that Best Practice Mitigation (BPM) will be implemented at all works locations. Implementation of BPM is required to ensure that construction noise levels are properly controlled. Further details on Best Practicable Means (BPM) to minimise noise and vibration are described in BS5228 (BSI, 2009).

14.4.4.1 Construction Compounds

Assumed Plant and Construction Phases

Two site compounds are proposed as part of the Proposed Scheme. Further details on the site compound locations are presented in **Chapter 5 Project Description**. At the compound locations, the time with the greatest potential to generate noise is during the site enabling works. The assumed plant list is presented in **Table 14-12.**

Table 14-12: Construction Compounds – Site Enabling – Construction Plant List

Equipment	Notes	No.	BS 5228 Ref.	L_{wA} (dB)	On-time (%)
Tracked excavator		1	C.2.3	104	50
Road Lorry (full)*	10 trips per day	1	C.6.21	109	-
Dump Truck (Tipping fill)		1	C.2.30	107	10
Lorry with lifting boom		1	C.4.53	105	25
Dozer		1	C.5.12	105	50
Vibratory roller		1	C.5.27	95	50

* Drive-by maximum sound pressure level in L_{Amax} (overall level).

Noise Predictions

The predicted noise levels and initial magnitudes of impact for at each site compound are shown in **Table 14-13.**

Table 14-13: Construction Compounds – Site Enabling – Construction Noise Predictions at the Nearest NSL

Phase	Distance to Activity (m)	BS 5228 Threshold Value (dB L_{Aeq})	Predicted Noise Level (dB L_{Aeq})	Initial Magnitude of Impact
Site Enabling Works – Compound A	6	65	69	Medium
Site Enabling Works – Compound B	2–6	65	77	High

Predicted Significance of Effects

Without mitigation, the predicted impacts for the site enabling works at compound A is **medium** in magnitude, indicating **moderate** or **significant** significance of effects due to noise for this phase of construction.

Without mitigation, the predicted impacts for the site enabling works at compound B is **high** in magnitude, indicating **significant** or **very significant** significance of effects due to noise for this phase of construction.

The following is not accounted for when determining the above significance of effects:

- The duration of the construction works will be short.
- The intensity of the construction activity will vary over this period.
- The noise levels presented are conservative noise levels.
- Not all construction plant will be located at the modelled minimum distances to NSLs.

- Noise effects will reduce as the linear construction activities move further away from NSLs.

As such, when factoring in the above variables, the predicted noise levels will be lower than those presented in **Table 14-13.** Furthermore, the positive attitude of receptors to the Proposed Scheme reduces the predicted significance of effect due to noise from these construction phases to **short term moderate** and **significant** for NSLs adjacent to Compounds A and B, respectively. Mitigation measures are outlined in **Section 14.5**.

14.4.4.2 Area 1 – Brittas Wood

Assumed Plant and Construction Phases

The Area 1 works area footprint is along the existing access pathway on the Brittas Wood Loop. The assumed phases of construction for Area 1 are:

1. Debris Trap and Culvert Remediation: Removal of vegetation, excavation below the riverbed, pouring concrete foundations, installation of debris trap, culvert headwall installation.
2. Embankment Construction: Embankment formation and road re-pavement.

The assumed plant list for the Area 1 works area is provided in **Table 14-14**:

Table 14-14: Area 1 Construction Plant List

Equipment	Notes	No.	BS 5228 Ref.	L_{wA} (dB)	On-time (%)	Use in Phase	
						1	2
Petrol-driven chainsaw	Confined to the start of the works	1	D.2.14	114	60	Y	
Telescopic handler		1	C.2.35	99	25	Y	
Tracked excavator		1	C.2.3	106	90	Y	Y
Dumper*	30 trips a day	1	C.4.6	107	6 trips	Y	Y
Diesel generator for submersible pump		1	C.8.23	90	50	Y	Y
Water pump (diesel)	Operating 24 hrs a day	1	C.4.88	96	100[1]	Y	
Hand-held electric circular saw		2	D.7.76	109	75	Y	
Poker vibrator		1	C.4.34	97	20	Y	
Small cement mixer	No pumping envisaged	1	C.4.23	89	20	Y	
Angle grinder (grinding steel)		2	C.4.93	108	25	Y	
Lump hammer	Formwork pan assembly	1	C.1.19	97	20	Y	
Core drill (electric)		2	C.4.69	113	10	Y	
Vibratory roller	Bomag 120 roller	1	C.5.27	95	50		Y
Asphalt paver (+ tipper lorry)	Limited to one day at the end of the works	1	C.5.30	103	90		Y
Road sweeper	Maintaining public roads	1	C.4.90	104	2 trips		Y
Petrol hand-held circular saw		1	C.5.36	115	25		Y

* Drive-by maximum sound pressure level in L_{Amax} (overall level).

[1] The most conservative assumption. Pumping may not be required for 24 hours a day throughout phase 1.

Noise Predictions

The predicted reasonable worst-case noise levels and initial magnitudes of impact for each phase of construction at Area 1 are shown in **Table 14-15**.

Table 14-15: Area 1 Construction Noise Predictions at the Nearest NSL

Phase	Distance to Activity (m)	BS 5228 Threshold Value (dB L_{Aeq})	Predicted Noise Level (dB L_{Aeq})	Initial Magnitude of Impact
1. Debris Trap and Culvert Remediation	80	65	65	Low
2. Embankment Construction	70	65	63	Low

Predicted Significance of Effects

For the debris trap installation and culvert remediation phase, the predicted noise level of 65 dB L_{Aeq} at the nearest noise sensitive location is equal to the BS5228 threshold value during daytime periods at the nearest NSL. The plant item with the greatest potential to generate noise is chainsaw. However, the chainsaw is likely to be in use for only 2 or 3 days at the beginning of the works, as the extent of the vegetation removal is small. When the chainsaw is not in use, the predicted level for this phase is 64 dB L_{Aeq}, which is below the BS5228 threshold value. Given the short duration of the high noise levels from the chainsaw and the positive attitude of receptors to the Proposed Scheme, the predicted significance of effect for the debris trap installation and culvert remediation phase is **moderate**.

For the embankment construction phase, the predicted noise level at the nearest NSL of 63 dB L_{Aeq} are below the BS5228 threshold value during daytime periods. The plant item with the greatest potential to generate noise is concrete saw. However, the concrete saw is likely to be used intermittently. When the concrete saw is not in use, the predicted level for this phase is 61 dB L_{Aeq}. Therefore, predicted impacts are **low** in magnitude, indicating a **slight** to **moderate** significance of effects depending on the plant items in operation.

In summary, there are **no significant** effects predicted for construction noise from activities at the Area 1 works area.

14.4.4.3 Area 2 – Chapel Street

Assumed Plant and Construction Phases

The Area 2 works area is located on Chapel Street and focuses on works to the existing wall along the Clodiagh River. This wall extends into private property as it curves around the river bend. The assumed phases of construction for Area 2 are:

1. Enabling Works: Clearing works area.
2. Trench Works: Trench excavation, dewatering and backfilling with concrete.
3. Reinforced Concrete Wall Construction: Pouring concrete, shuttering, fixing the wall steel.
4. Road Reinstatement Works: Road planing, paving, rolling, compaction.

The assumed plant list for the Area 2 works area is provided in **Table 14-16**.

Table 14-16: Area 2 Construction Plant List

Equipment	Notes	No.	BS 5228 Ref.	L_{wA} (dB)	On-time (%)	Use in Phase			
						1	2	3	4
Wheeled excavator*		1	C.4.12	105	90	Y	Y	Y	
Dumper*	30 trips per day	1	C.4.6	107	100	Y	Y		
Mini excavator with hydraulic breaker		1	C.5.2	111	20	Y	Y		

Equipment	Notes	No.	BS 5228 Ref.	L_{wA} (dB)	On-time (%)	Use in Phase 1	2	3	4
Hand-held circular saw (petrol)	Road saw or hand-held	1	C.5.36	115	10	Y			
Vibratory plate (petrol)	Plate compactor	1	C.2.41	108	75	Y	Y		
Vibratory roller	Bomag 120 roller	1	C.5.27	95	10	Y			
Road sweeper		1	C.4.90	104	20	Y	Y		
Diesel generator for submersible pump	2" submersible electric pumps	1	C.8.23	90	100	Y[1]	Y[2]	Y	
Hand-held circular saw (petrol)	5% on-time during phase 2, 20% during phase 3	1	C.5.36	115	5		Y	Y	
Hand-held electric circular saw		1[3]	D.7.76	109	50			Y	
Poker vibrator		1	C.4.34	97	20			Y	
Small cement mixer	No pumping envisaged	1	C.4.23	89	20			Y	
Diesel generator	For lighting tower	1	C.4.86	93	25			Y	
Telescopic handler	For lighting tower	1	C.2.35	99	25			Y	
Angle grinder (grinding steel)		1[3]	C.4.93	108	25			Y	
Lump hammer	Formwork pan assembly	1	C.1.19	97	20			Y	
Core drill (electric)	Limited to 1 – 2 days	1	C.4.69	113	10			Y	
Mini planer		1	C.5.9	96	30				Y
Asphalt paver (+ tipper lorry)		1	C.5.30	103	30				Y
Tracked excavator		1	C.2.7	98	30				Y
Dumper*		1	C.4.6	107	100				Y
Vibratory roller		1	C.5.27	95	30				Y
Vibratory plate (petrol)		1	C.2.41	108	20				Y

* Drive-by maximum sound pressure level in L_{Amax} (overall level).

[1] Two pumps operating during the daytime period.

[2] One pump operating 24 hours a day.

[3] Multiple items on site but only one operating at the closest distance.

Noise Predictions

The predicted noise levels and initial magnitudes of impact for each phase of construction at Area 2 are shown in **Table 14-17**. The predicted noise levels are for the scenario are when plant items are 7 m away from the nearest NSLs.

Table 14-17: Area 2 Construction Noise Predictions at the Nearest NSL

Phase	Distance to Activity (m)	BS 5228 Threshold Value (dB L_{Aeq})	Predicted Noise Level (dB L_{Aeq})	Initial Magnitude of Impact
1. Enabling Works	7	65	78	High
2. Trench Works	7	65	77	High
3. Reinforced Concrete Wall Construction	7	65	86	High
4. Road Reinstatement Works	7	65	72	High

Phase	Distance to Activity (m)	BS 5228 Threshold Value (dB L_{Aeq})	Predicted Noise Level (dB L_{Aeq})	Initial Magnitude of Impact
5. Water Management	13	45	56	High

Predicted Significance of Effects

Due to the close proximity to NSLs along Chapel Street, the predicted noise levels from all activities at the Area 2 works area, with the exception of the water management, exceed the BS5228 threshold value by 7 dB or more during daytime periods. Therefore, predicted impacts for these phases are **high** in magnitude. However, the predicted noise impacts represent reasonable worst-case scenarios when NSLs are 7 m away from construction plant. Given the linear nature of the works, construction activities will be progressing along Chapel Street and these elevated noise levels will be temporary. It is anticipated that the worst-case predicted noise levels will be experienced at each NSL for approx. eight weeks at a time before gradually decreasing as works progress.

The plant items with the greatest potential for noise are road saws, concrete saws, timber saws and the hydraulic breaker. However, the use of the hydraulic breaker is anticipated to be required only in exceptional circumstances, if at all. When these plant items are not operating, predicted noise levels can be up to 10 dB lower.

For the enabling and trenching construction phases, the most conservative noise level predictions at the nearest NSL of 78 and 77 dB L_{Aeq} are above the BS5228 threshold value during daytime periods. These noise levels will not be experienced for the durations of the works but when works are occurring in close proximity to NSLs with the noisiest plant items operating. Therefore, predicted impacts are **high** in magnitude, indicating a temporary **very significant** significance of effect, but this will reduce quickly as the works progress away from the NSL.

For the wall construction phase, the predicted most conservative noise level at the nearest NSL of 86 dB L_{Aeq} is above the BS5228 threshold value during daytime periods. These noise levels will not be experienced for the durations of the works but when works are occurring in close proximity to NSLs with the noisiest plant items such as concrete saws and electric saws (to a lesser extent) operating. Therefore, predicted impacts are **high** in magnitude, indicating a temporary **very significant** significance of effect but this will reduce quickly as the works progress away from the NSL.

For the road reinstatement works phase, the predicted noise levels are above the BS5228 threshold value. However, these noise levels are expected when the works are in close proximity to the NSL. Given the expected short duration of these works (one to two days), works as part of this phase indicate a **moderate** significance of effect.

For the water management, predicted noise levels when the generator is at a distance of 20 m from NSLs exceed the BS5228 night-time threshold value by 11 dB. The use of a water pump will be mainly required during the trenching works phase. The predicted impact is **high** in magnitude, indicating a **very significant** effect without mitigation.

Works associated with the enabling works, trench works and reinforced concrete wall construction phases result in **very significant** significance of effects when in close proximity to NSLs. However, it is important to note that these predictions have not taken into account any proposed mitigation measures and have assumed the most conservative scenario for each phase, where all relevant items of plant are assumed to be operational at the same time and distance to NSLs. Mitigation measures are outlined in **Section 14.5**, which reduce the significance of effect to **moderate to significant**, depending on the distance of NSLs to the works.

14.4.4.4 Area 3 – Tullamore Road and ICW

Assumed Plant and Construction Phases

The Area 3 works area is located along the western and eastern banks of the Clodiagh River, downstream of the town centre. The assumed phases of construction for Area 3 are:

1. Embankment Construction: Stripping topsoil, excavation of the cut-off trench, embankment formation.

2. Retaining Flood Wall Construction: Stripping of topsoil, removal of existing footpath/asphalt and vegetation, excavation, concrete pouring, shuttering, steel fixing.

The assumed plant list for the Area 3 works area is provided in **Table 14-18**.

Table 14-18: Area 3 Construction Plant List

Equipment	Notes	No.	BS 5228 Ref.	L_{wA} (dB)	On-time (%)	Use in Phase 1	Use in Phase 2
Tracked excavator		1	C.2.3	106	90	Y	
Vibratory roller	Bomag 120 roller	1	C.5.27	95	50	Y	
Dumper*	30 trips per day	1	C.4.6	107	–	Y	
Road sweeper	Maintaining public roads	1	C.4.90	104	10	Y	
Diesel generator for submersible pump		1	C.8.23	90	50	Y	Y
Wheeled excavator*		1	C.4.12	105	90		Y
Petrol hand-held circular saw		1	C.5.36	115	20		Y
Hand-held electric circular saw		1**	D.7.76	109	75		Y
Poker vibrator		1	C.4.34	97	20		Y
Small cement mixer	No pumping envisaged	1	C.4.23	89	20		Y
Diesel generator	For lighting tower	2	C.4.86	93	25		Y
Telescopic handler	For lighting tower	1	C.2.35	99	25		Y
Angle grinder (grinding steel)		2	C.4.93	108	25		Y
Lump hammer	Formwork pan assembly.	1	C.1.19	97	20		Y
Core drill (electric)		2	C.4.69	113	10		Y
Asphalt paver (+ tipper lorry)		1	C.5.30	103	90		Y

* Drive-by maximum sound pressure level in L_{Amax} (overall level).

** Multiple items on site but only one operating at the closest distance

Noise Predictions

The predicted noise levels and initial magnitudes of impact for each phase of construction at Area 3 are shown in **Table 14-19**.

Table 14-19: Area 3 Construction Noise Predictions at the Nearest NSL

Phase	Distance to Activity (m)	BS 5228 Threshold Value (dB L_{Aeq})	Predicted Noise Level (dB L_{Aeq})	Initial Magnitude of Impact
1. Embankment Construction	40	65	66	Medium
2. Reinforced Concrete Wall Construction	95	65	64	Low

Predicted Significance of Effects

The predicted impacts for the embankment construction works are **medium** in magnitude, indicating **moderate** or **significant** effects due to noise for this phase of construction.

The predicted impacts for the reinforced concrete wall construction works are **low** in magnitude, indicating **slight** or **moderate** significance of effects due to noise for this phase of construction.

The following is not accounted for when determining the above significance of effects:

- The duration of the construction works will be short.
- The intensity of the construction activity will vary over this period.
- The noise levels presented are reasonable worst-case noise levels.
- Not all construction plant will be located at the modelled minimum distance to the NSLs.

As such, when factoring in the above variables, the predicted noise levels will be lower than those presented in **Table 14-19**. Furthermore, the positive attitude of receptors to the Proposed Scheme reduces the predicted significance of effect due to noise from the embankment construction phase to **moderate**. Likewise, the significance of effect due to noise from the reinforced concrete wall construction phase is reduced to **slight**.

In summary, there are **no significant** effects predicted for construction noise from activities at the Area 3 works area.

14.4.5 Construction Phase Vibration

Construction vibrations arise during rock breaking and use of heavy construction equipment close to sensitive properties. Construction vibrations propagate through the ground to a receiver by means of surface and, to a lesser extent, by shear and compressional waves. The amplitude of the waves decreases rapidly with distance from the source. This attenuation is due to geometrical spreading and energy losses within the ground (material damping).

Construction-related vibration is only significant close to the source as it attenuates rapidly. BS5228-2 includes 174 datasets of ground borne vibration measurements (BSI, 2009). Of the extensive data collated in BS5228-2, only one set was measured over 100 m from the source, with the vast majority of measurements taken within 50 m, thus indicating the limited scale of impact for construction vibrations. Consideration of potential vibration impacts has therefore been limited to properties within 50 m of the site boundary or, in the case of structures of significant intrinsic value, i.e., protected structures, a radius of 300 m has been considered.

Wiss (Wiss, 1981) presented a methodology and typical values for vibrations due to construction activities. Geometric spreading means that vibration levels decrease exponentially as the distance from the source increases. The exponent value lies between 1.0 and 2.0 and Wiss suggests a relatively common value of 1.5. Construction activities with the potential to result in vibration impacts as part of the Proposed Scheme include rock-breaking and compaction. However, the use of the rock breaker is anticipated to be required only in exceptional circumstances, if at all. **Table 14-20** shows typical vibration source levels relevant to the Proposed Scheme at 7.6 m, compiled from Quagliata (2018).

Table 14-20: Vibration Source Levels for Construction Equipment (Quagliata, 2018)

Equipment	PPV at 7.6 m (mm/s)
Vibratory Roller	5.3
Large Rock-Breaker	2.3
Jackhammer	0.9

Using a conservative approach, where losses due to material damping are ignored, vibration levels can therefore be estimated at a distance using the following formula, where *D* = distance from the source to the NSL in metres:

$$PPV_{NSL} = PPV_{Source} \times \left[\frac{7.6}{D}\right]^{1.5}$$

As outlined in **Section 14.2.5.1**, construction vibrations need to be assessed for property damage and the impact on humans. The usual criteria applied for construction vibration effects on buildings from projects such as the Proposed Scheme are those published in BS5228-2 and shown in **Section 14.2.5.1** (BSI, 2009). Given the distance between plant items and NSLs at Areas 1 and 3, construction vibration levels from

activities arising from the Proposed Scheme are below the BS5228 criteria and are likely to be below the threshold of perception at the nearest NSLs.

Construction works at the Area 2 works area occur at short distances to NSLs, with the rock-breaker and vibratory roller being the plant items with the greatest potential to generate vibration associated with these works. Predicted vibration levels at the nearest NSL are provided in **Table 14-21** below:

Table 14-21: Predicted Vibration Levels at the Nearest NSL in Area 2

Vibration Source	Predicted PPV (mm/s) at Nearest NSL
Vibratory roller	6.0
Rock-breaker	1.0

Vibration levels are predicted to be 6 mm/s for the vibratory roller and 1 mm/s for the rock-breaker. The magnitude of impact for these activities is predicted to be **medium** and, given the limited duration, the significance of effect is **moderate**. Vibration of this level in residential environments will require prior warning to residents within 50 m of the proposed works area. No adverse structural impacts to any properties are anticipated as a result of these works. To put the vibration levels presented in **Table 14-20** in context, some examples of PPV levels in a modern masonry dwelling house are presented in New (1969) and are reproduced in **Table 14-22**.

Table 14-22: Typical Vibration Levels in a Modern Residence (New, 1986)

Vibration Source	Resultant PPV (mm/s)
Normal footfalls	0.05 – 0.5
Foot stamping	0.3 – 3.0
Door slams	11 – 17
Percussive drilling	10 – 20

14.4.6 Construction Traffic

Detailed information on anticipated construction traffic movements has been assessed under **Chapter 6: Traffic and Transport**. Indicative daily movements for one construction team operating on site are given below:

- Six vehicles (cars/vans) will arrive on site in the morning (07:00 – 08:00) and depart in the evening (18:00 – 19:00), Monday to Friday; 08:00 to 13:00 Saturday.
- Up to two Heavy Goods Vehicles (HGVs) will arrive and depart the site per hour throughout the typical working day (07:00 – 19:00 Monday to Friday, 08:00 to 13:00 Saturday).

For the purposes of this assessment, a total of four crews operating at all times has been assumed. In all cases, the predicted increase in traffic flows due to construction traffic on the receiving road network is well below 25%, implying a negligible noise level increase of less than 1 dB and therefore below the threshold for more detailed assessment.

As a result, there are **no significant** effects predicted for construction traffic noise or vibration associated with the Proposed Scheme and predicted effects are not significant.

14.4.7 Operational Phase

As stated earlier in this chapter, there are no likely significant effects due to noise and vibration for the operational phase of the Proposed Scheme and operational noise and vibration have been scoped out of the assessment.

14.5 Mitigation Measures

14.5.1 Construction Phase

Noise predictions assumed Best Practice Mitigation (BPM) will be implemented at all works locations. Implementation of BPM is required to ensure that construction noise levels are properly controlled. In addition to BPM, a range of measures will be implemented during construction works to mitigate the noise impacts where possible.

14.5.1.1 General Mitigation

The following general mitigation applies across all aspects of the construction phase:

- Works shall, as a minimum, include the measures set out in this assessment and these measures will be documented in the Construction Environmental Management Plan (CEMP).
- Where works need to be completed outside normal working hours or where proposed works indicate that the noise or vibration levels set out in **Section 14.2.5.1** or **Section 14.2.5.2** may be exceeded, permission for these works must be sought from the Local Authority in advance of any works taking place. The application for such works will require a detailed noise control plan and follow up report to be prepared. This plan will include (i) a justification for the works being carried out in the manner proposed, (ii) an assessment indicating what alternatives have been considered, (iii) a statement of the noise control measures from BS 5228 to be adopted and how Best Practicable Means will be used to control noise, (iv) an activity specific noise monitoring programme including contact details for persons with the authority to cease working if required by the Local Authority. Each follow up report will include details of any complaints received and the action taken to address such complaints.
- A formal stakeholder engagement process shall be put in place for the duration of the construction phase, including the provision of information to local residents about noise and vibration monitoring results, works likely to cause significant noise or vibration and/or works planned to take place outside of core working hours.

14.5.1.2 Area 1 – Brittas Wood Mitigation

The following mitigation applies to the Brittas Wood area works:

- Installation of 2.4 m high site hoarding or temporary noise barriers along the eastern boundary of Compound A adjacent to the nearest NSL to block line of sight and subsequently reduce noise levels experienced by receptors.

14.5.1.3 Area 2 – Chapel Street Mitigation

The following mitigation applies to the Chapel Street area works:

- Installation of 2.4 m high site hoarding or temporary noise barriers along the boundaries of Compound B adjacent to the nearest NSLs.
- Installation of 2.4 m high heras fencing along the boundary of the works taking place along the street. High-grade lightweight noise absorption panels, or similar, will be added to the fencing.
- Site hoarding or temporary noise barriers will be used to block line of sight from rock breaking, timber sawing or consaw activities where NSLs are located within 25 m of these activities.
- In respect of pumps and generators, the following is recommended:
  - Plant such as pumps and generators used near noise sensitive locations will be contained within an acoustic enclosure.
  - Adopt quiet working methods and use plant with lower noise emission levels.
  - Locate plant as far away from noise and vibration sensitive receptors as practicable.
  - Noise levels at the nearest NSL are not to exceed the 45 dB L_{Aeq} construction noise threshold during night-time periods.

- No adverse structural impacts to properties along Chapel Street are anticipated due to vibration from works at Area 2. However, given the close proximity of some of the properties to Area 2, the following is recommended:
  - A pre-construction condition survey will be carried out before any construction works commence at Area 2. A condition survey will also be carried out when all construction works are completed.
  - Vibration monitoring will be undertaken at the nearest sensitive location(s) during key activities at Area 2 to ensure that vibration levels are below the thresholds outlined in **Table 14-4**.

In some instance, the implementation of BPM and specific mitigation measures is not expected to reduce effects to a lower category, e.g., moderate effects reduced to slight. This is due to the very wide variations in noise levels throughout the day captured by the various categories and the inherent variability of construction noise. However, implementation of mitigation measures will reduce the noise levels experienced at NSLs.

14.5.2 Operational Phase

As stated earlier in this chapter, there are no likely significant effects due to noise and vibration for the operational phase of the Proposed Scheme. Consequently, no mitigation measures are necessary, and none are proposed.

14.6 Residual Impacts

Following implementation of construction noise mitigation efforts, some noise impacts will remain. The predicted significance of residual effects at the nearest NSLs due to noise and vibration from elements of the project ranges from **negligible** to **significant** depending on the location and construction activity.

Enabling works at construction Compound B has potential for noise levels to be elevated above the construction noise threshold when activities are occurring within 6 m of the nearest NSL. However, activities within 6 m will be for brief durations and overall, the residual effect is predicted to be **short term, moderate significance**.

There are **no significant** residual effects predicted for noise and vibration from the project due to construction activities at Area 1 – Brittas Wood and Area 3 – Tullamore Road.

Following implementation of construction noise mitigation efforts, there is potential for elevated noise levels above the construction noise threshold for the enabling works, trenching works and construction of the reinforced concrete wall works at Area 2 – Chapel Street. Given the rolling nature of works, the impact will be **temporary** in nature. It is anticipated that the worst-case predicted noise levels will be experienced at each NSL for approx. eight weeks at a time before gradually decreasing as works progress. For NSLs within 25 m of the activities, the residual significance of effect is predicted to be **temporary, significant**. For NSLs located greater than 25 m the residual significance of effect is predicted to be **temporary, moderate**.

Following implementation of construction noise mitigation efforts, the residual significance of effect for the water management activities during night-time periods is predicted to be **slight**.

14.7 Monitoring

14.7.1 Construction Phase

Prior to the commencement of the construction, the contractor will set out and agree a schedule of noise monitoring with the Local Authority to include the number of locations at which noise monitoring will be carried out, the frequency and duration of the monitoring and the reporting of results.

Similarly, vibration monitoring will be undertaken at the nearest sensitive location(s) during key activities at Area 2 to ensure that vibration levels are below the thresholds outlined in **Table 14-4**.

14.7.2 Operational Phase

There is no noise or vibration monitoring proposed for the operational phase of the Proposed Scheme.

14.8 Interactions and Cumulative Effects

14.8.1 Interactions

A description of the likely inter-related effects arising from the Proposed Scheme between noise and vibration and other disciplines such as .Traffic and Transport, Human Health, Biodiversity and Cultural Heritage can be found in **Chapter 18 Interactions and Cumulative Effects**.

14.8.2 Cumulative Effects

Other projects which may overlap with the Proposed Scheme are outlined in **Chapter 18: Interactions & Cumulative Effects**. The list of projects with the potential for cumulative effects has been reviewed and the potential for cumulative effects with the Proposed Scheme has been assessed. Most projects are sufficiently remote or screened from this project such that noise or vibration levels will not be cumulative. Where projects are in close proximity to the Proposed Scheme, anticipated works are minor in nature. Similarly, if the projects do not occur at the same time as the Proposed Scheme, there will be no cumulative noise and vibration effect.

14.9 Conclusion

Following implementation of construction noise mitigation efforts, some noise impacts will remain. The predicted significance of residual effects at the nearest NSLs due to noise and vibration from elements of the project ranges from **slight** to **significant** depending on the location and construction activity.

Enabling works at construction Compound B has potential for noise levels to be elevated above the construction noise threshold when activities are occurring within 6 m of the nearest NSL. However, activities within 6 m will be short durations and overall, the residual significance of effect is predicted to be **moderate**.

There are **no significant** residual effects predicted for noise and vibration from the project due to construction activities at Area 1 – Brittas Wood and Area 3 – Tullamore Road.

Following implementation of construction noise mitigation efforts, there is potential for elevated noise levels above the construction noise threshold for the enabling works, trenching works and construction of the reinforced concrete wall works at Area 2 – Chapel Street. Given the linear nature of works, the impact will be temporary in nature. However, for NSLs within 25 m of the activities the residual significance of effect is predicted to be **significant**. For NSLs located greater than 25 m the residual significance of effect is predicted to be **moderate**.

Following implementation of construction noise mitigation efforts, the residual significance of effect for the water management activities during night-time periods is predicted to be **slight**. **Table 14-24** collates all the mitigation and monitoring commitments recommended in this chapter.

Table 14-23: Summary of Likely Significant Effects and Environmental Commitments

Description of Impact	Magnitude of Impact	Importance of Receptor	Significance of Effect	Controls and Mitigation Measures	Residual Effect
Site Enabling Works – Compound A	Medium	High	Moderate (exceedances in construction noise threshold)	Installation of 2.4 m high site hoarding or temporary noise barriers along the eastern boundary of Compound A adjacent to the nearest NSL to block line of sight.	Moderate
Site Enabling Works – Compound B	High	High	Significant	Installation of 2.4 m high site hoarding or temporary noise barriers along the boundaries of Compound B adjacent to the nearest NSLs.	Moderate
Construction Traffic Noise and Vibration	Negligible	High	Not significant	None	Not significant
Area 1 – Construction Works	Low	High	Slight to Moderate	None	Slight to Moderate
Area 2 – Construction Works – Daytime	High	High	Moderate to Very Significant	Site hoarding or temporary noise barriers will be used to block line of site from rock breaking, timber sawing or consaw activities where NSLs are located within 25 m of these activities. 2.4 m high heras fencing will be installed along the boundary of the works taking place along the street. High-grade lightweight noise absorption panels, or similar, will be added to the fencing. In respect of pumps and generators, the following is recommended: Plant such as pumps and generators used near noise sensitive locations will be contained within an acoustic enclosure. Adopt quiet working methods and use plant with lower noise emission levels. Locate plant as far away from noise and vibration sensitive receptors as practicable. Noise levels at the nearest NSL are not to exceed the 45 dB LAeq construction noise threshold during night-time periods. No adverse structural impacts to properties along Chapel Street are anticipated due to vibration from works at Area 2. However, given the close proximity of some of the properties to Area 2, the following is recommended: A pre-construction condition survey will be carried out before any construction works commence at Area 2. A condition survey will also be carried out when all construction works are completed. Vibration monitoring will be undertaken at the nearest sensitive location(s) during key activities at Area 2 to ensure that	Moderate to Significant

Description of Impact	Magnitude of Impact	Importance of Receptor	Significance of Effect	Controls and Mitigation Measures	Residual Effect
				vibration levels are below the thresholds outlined in Table 14-4.	
Area 2 – Construction Works – Night-time	High	High	Very significant	In respect of pumps and generators, the following is recommended: Plant such as pumps and generators used near noise sensitive locations will be contained within an acoustic enclosure. Adopt quiet working methods and use plant with lower noise emission levels. Locate plant as far away from noise and vibration sensitive receptors as practicable. Noise levels at the nearest NSL are not to exceed the 45 dB L_{Aeq} construction noise threshold during night-time periods.	Slight
Area 3 – Construction Works	Low to Medium	High	Slight to Moderate	None	Slight to Moderate
Construction Phase Vibration	Medium	High	Moderate	A formal stakeholder engagement process shall be put in place for the duration of the construction phase, including the provision of information to local residents about noise and vibration monitoring results, works likely to cause significant noise or vibration and/or works planned to take place outside of core working hours. No adverse structural impacts to properties along Chapel Street are anticipated due to vibration from works at Area 2. However, given the close proximity of some of the properties to Area 2, the following is recommended: A pre-construction condition survey will be carried out before any construction works commence at Area 2. A condition survey will also be carried out when all construction works are completed. Vibration monitoring will be undertaken at the nearest sensitive location(s) during key activities at Area 2 to ensure that vibration levels are below the thresholds outlined in Table 14-4.	Moderate
Operational Noise and Vibration	N/A*	N/A*	N/A*	N/A*	N/A*

* Operational noise and vibration have been scoped out of this assessment (see **Section 14.2.6**).

14.10 Chapter References

BSI, 1993. *BS 7385-2:1993 Evaluation and measurement for vibration in buildings. Guide to damage levels from groundborne vibration,* s.l.: s.n.

BSI, 2009. *BS 5228-1:2009+A1:2014 Code of practice for noise and vibration control on construction and open sites - Part 1: Noise and BS 5228-2:2009+A1:2014 Code of practice for noise and vibration control on open sites - Part 2: Vibration,* s.l.: s.n.

Department of Transport Welsh Office, 1988. *Calculation of Road Traffic Noise,* s.l.: s.n.

DIN, 2016. *DIN 4150-3 Vibrations in buildings - Part 3: Effects on structures,* s.l.: s.n.

EPA, 2016. *Guidance Note for Noise: Licence Applications, Surveys and Assessments in Relation to Scheduled Activities (NG4).* [Online]
Available at: https://www.epa.ie/publications/monitoring--assessment/noise/guidance-note-for-noise-licence-applications-surveys-and-assessments-in-relation-to-scheduled-activities-ng4.php

EPA, 2022. *Guidelines on the Information to be Contained in Environmental Impact Assessment Reports,* s.l.: EPA.

Government of Ireland, 1992. *Environmental Protection Agency Act.* [Online]
Available at: https://www.irishstatutebook.ie/eli/1992/act/7/enacted/en/html

Highways England, 2020. *Design Manual for Roads and Bridges LA 111 Noise and Vibration,* s.l.: Highways England.

ISO, 2016. *ISO 1996-1:2016 Acoustics - Description, measurement and assessment of environmental noise. Part 1: Basic quantities and assessment procedures,* s.l.: s.n.

ISO, 2017. *ISO 1996-2:2017 Acoustics - Description, measurement and assessment of environmental noise. Part 2: Determination of sound pressure levels,* s.l.: s.n.

Laois County Council, 2019. *Laois County Council Noise Action Plan 2019-2022.* [Online]
Available at: https://laois.ie/departments/roads/noise-action-plan/

Laois County Council, 2022. *Laois County Development Plan 2021-2027.* [Online]
Available at: https://laois.ie/departments/planning/review-of-laois-county-development-plan-2017-2023-2/

Laois County Council, 2024. *Laois County Council Draft Noise Action Plan 2024-2028.* [Online]
Available at: https://laois.ie/laois-draft-noise-action-plan-2024-2028/

Minister for the Environment, Heritage and Local Government, 2006. *S.I. No. 140/2006 - Environmental Noise Regulations 2006.* [Online]
Available at:
https://www.irishstatutebook.ie/eli/2006/si/140/made/en/print?q=Environmental+Noise+Regulations+2006

New, B. M., 1986. Ground Vibration Caused by Civil Engineering Works. *Transport and Road Research Laboratory Report 53.*

Quagliata, A., 2018. *Transit Noise and Vibration Impact Assessment Manual,* s.l.: Federal Transit Administration.

TII, 2004. *Guidelines for the Treatment of Noise and Vibration in National Road Schemes,* s.l.: s.n.

TII, 2014. *Good Practice Guidance for the Treatment of Noise during the Planning of National Road Schemes,* s.l.: s.n.

Wiss, J. F., 1981. Construction Vibrations: State of the Art. *Journal of Geotechnical and Geoenvironmental Engineering,* Volume 107, pp. 167-181.