HyNet North West

ENVIRONMENTAL STATEMENT (VOLUME II)

Chapter 15 Noise and Vibration (Tracked Change)

HyNet Carbon Dioxide Pipeline DCO

Planning Act 2008

The Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009 – Regulations 5(2)(a)

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15.1. INTRODUCTION

15.1.1. This Chapter reports the assessment of the likely significant effects of the DCO Proposed Development from Noise and Vibration and describes:

- Relevant, legislation, policy and guidance;
- Consultation undertaken;
- Scope of the assessment;
- Assessment methodology;
- Baseline conditions;
- Sensitive receptors;
- Design development and embedded mitigation;
- Assessment of likely impacts and effects;
- Mitigation and enhancement measures;
- Residual effects;
- Monitoring; and
- Next steps.

15.1.2. This Chapter (and its associated figures (**Volume IV**) and appendices (**Volume III**)) is intended to be read as part of the wider Environmental Statement (ES).

15.1.3. This Chapter has been prepared by competent experts with relevant and appropriate experience, as outlined in **Appendix 5.1 Relevant Expertise and Competency (Volume III).**

15.2. LEGISLATIVE AND POLICY FRAMEWORK

15.2.1. A summary of the international, national, and local legislation, planning policy and guidance relevant to the Noise and Vibration assessment for the DCO Proposed Development is set out below.

LEGISLATIVE FRAMEWORK

National

The Control of Pollution Act (1974)

15.2.2. The principal legislation covering demolition and construction noise is the Control of Pollution Act 1974, Part III (**Ref. 15.1**). Sections 60 and 61 of the Act give the local authority special powers for controlling noise arising from construction and demolition works, regardless of whether a statutory nuisance has been caused or is likely to be caused. Works within the scope of these provisions include repair and maintenance work and road works. These powers may be exercised either before works start or after they have started.

The Environmental Noise (Wales) (Amendment) Regulations 2009

15.2.3. The Environmental Noise (Wales) (Amendment) Regulations (**Ref. 15.2**) relate to the assessment and management of environmental noise in Wales as stipulated in the Directive 2002/49/EC of the European Parliament.

The Environmental Noise (England) (Amendment) Regulations 2018

15.2.4. The Environmental Noise (England) (Amendment) Regulations (**Ref. 15.3**) relate to the assessment and management of environmental noise in Wales as stipulated in the Directive 2002/49/EC of the European Parliament.

POLICY

National

Overarching National Policy Statement for Energy (EN-1) (DECC, 2011)

15.2.5. The current Overarching National Policy Statement for Energy (Overarching NPS) (**Ref. 15.4**) sets out that operational noise including ancillary activities associated with development, such as increased road and rail traffic movements, or other forms of transportation should be assessed using the principles of the relevant British Standards (BS 4142, BS 6472 and BS 8233) where appropriate. The Applicant is aware that the Government is currently updating the Energy NPSs.

National Planning Policy Framework (Ministry of Housing, Communities and Local Government, 2021)

15.2.6. First published in 2012 and most recently updated in July 2021, the NPPF (**Ref. 15.5)** sets out the Government's planning policies for England and how these are expected to be applied.

National Planning Practice Guidance (Ministry of Housing, Communities and Local Government, 2019)

15.2.7. This web-based resource was issued for use by the Department for Communities and Local Government (DCLG). The purpose of the guidance is to complement the NPPF **(Ref. 15.6)** and provide advice on how to deliver its policies.

Planning Policy Wales, Edition 11 (Welsh Government, 2021)

15.2.8. Planning Policy Wales (PPW) **(Ref. 15.7)** sets the land use policies of the Welsh Government. It is supplemented by the Technical Advice Notes (TANs) and other documents to provide a policy framework for Wales.

Noise and Soundscape Action Plan, 2018-2023, Welsh Government

15.2.9. The Noise and Soundscape Action Plan (**Ref.15.8**) sets the plans to meet the obligations described in in the Environmental Noise (Wales) (Amendment) Regulations 2009 (**Ref. 15.2**). It includes national well-being goals related to noise and soundscapes.

Technical Advice Note (TAN) 11: Noise, 1997, Welsh Government

15.2.10. TAN 11 (**Ref. 15.9**) outlines some of the main considerations which local planning authorities should consider when determining planning applications for development, which will either generate noise or be exposed to existing noise sources.

Noise Policy Statement for England (Defra, 2010)

15.2.11. The NPSE (**Ref. 15.10**) seeks to ensure that noise issues are considered at the right time during the development of policy and decision making, and not in isolation. It highlights the underlying principles on noise management already found in existing legislation and guidance.

15.2.12. The NPSE sets out the long-term vision of Government noise policy as follows:

"Promote good health and a good quality of life through the effective management of noise within the context of Government policy on sustainable development".

15.2.13. This long-term vision is supported by the following aims:

"Through the effective management and control of environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development:

- Avoid significant adverse impacts on health and quality of life;
- Mitigate and minimise adverse impacts on health and quality of life; and
- Where possible, contribute to the improvement of health and quality of life".

Local

Cheshire West and Chester Local Plan (Adopted 2015)

15.2.14. The Cheshire West and Chester Local Plan (**Ref. 15.11**) consists of two parts; Part One Strategic Policies and Part Two Land Allocations and Detailed Policies. It contains policies relevant for the DCO Proposed Development: Policy SOC 5 on Health and Wellbeing and Policy DM30 on Noise.

~~15.2.15.~~ Flintshire Local Development Plan 2015-2030 **(Ref.15.27)** ~~Flintshire Unitary Development Plan 2000 – 2015 (Adopted 2011)~~

~~15.2.16.~~15.2.15. The Flintshire Local Development Plan was adopted 24 January 2023. The relevant policy is EN18 on Pollution and Nuisance ~~Flintshire Unitary Development Plan (**Ref. 15.12**) provides a framework for land use with focus on sustainable development. It contains policies relevant for the DCO Proposed Development: Policy GEN 1 on General Requirements for Development and EWP13 on Nuisance~~.

Flintshire Local Development Plan 2015 - 2030 (draft September 2019)

~~15.2.17.~~15.2.16. Flintshire Local Development Plan (**Ref. 15.13**) is currently in draft form and it is intended to promote sustainable development for 15 years. It contains policies relevant for the DCO Proposed Development: Policy STR14 on Climate Change and Environmental Protection and EN18 on Pollution and Nuisance.

GUIDANCE

International

ISO 9613 (1996): Acoustics - Attenuation of sound during propagation outdoors - Part 2: General method of calculation

~~15.2.18.~~15.2.17. ISO 9613 (**Ref. 15.14**) specifies methods of calculating the attenuation of sound propagating outdoors in order to predict the level of environmental noise at distant locations from various sound sources.

~~15.2.19.~~15.2.18. Part 2 specifies an engineering method for calculating the attenuation of sound during propagation outdoors in order to predict the levels of environmental noise at a distance from a variety of sources.

National

BS 7445 (2003): Description and Measurement of Environmental Noise

~~15.2.20.~~15.2.19. BS7445:2003 (**Ref. 15.5**) defines and prescribes best practice during recording and reporting of environmental noise. It is inherently applied in all instances when making environmental noise measurements and is applicable to the baseline noise measurements taken to inform this Chapter.

BS 4142 (2014) + A1 (2019): Methods for rating and assessing industrial and commercial sound

~~15.2.21.~~15.2.20. BS 4142 (**Ref. 15.16**) provides a method by which to determine the significance of sound of an industrial nature (e.g., the 'specific sound' from proposed new plant units) at nearby noise sensitive receptors.

BS 5228, Parts 1&2 (2009) + A1 (2014): Noise and Vibration Control on Construction and Open Sites

~~15.2.22.~~15.2.21. Part 1 of this BS5228 (**Ref.15.17**) provides the latest recommendations for basic methods of noise control where there is a need for the protection of persons living and working in the vicinity of, and those working on, construction and open sites. Part 2 of the Standard provides the latest recommendations for basic methods of vibration control where there is a need for the protection of persons living and working in the vicinity of, and those working on, construction and open sites.

BS 7385 (1993) Part 2: Evaluation and Measurement for Vibration in Buildings

~~15.2.23.~~15.2.22. BS 7385 Part 2 (**Ref. 15.18**) provides guidance on the assessment of the possibility of vibration-induced damage in buildings due to a variety of sources. Only the direct effect of vibration on buildings is considered. The indirect effects on the building structure due to ground movement, the movement of loose objects within buildings, the possibility of damage to sensitive equipment and the effect of vibration on people are outside the scope of this Part of BS 7385.

~~15.2.24.~~15.2.23. The guidance in this document has been used to assess construction impacts due to construction sources.

BS ISO 4866 (2010): Mechanical Vibration and Shock – vibration of fixed structures – Guidelines for the measurement of vibrations and evaluation of their effects on structures

~~15.2.25.~~15.2.24. BS ISO 4866 (**Ref.15.19**) establishes principles for carrying out vibration measurement and processing data with regard to evaluating vibration effects on structures. The evaluation of the effects of structural vibration is primarily obtained from the response of the structure, using appropriate analytical methods by which the frequency, duration and amplitude can be defined. ISO 4866 only deals with the measurement of structural vibration and excludes the measurement of airborne sound pressure and other pressure fluctuations, although response to such excitations is taken into consideration.

BS 8233:2014 Guidance on sound insulation and noise reduction for buildings

~~15.2.26.~~15.2.25. BS 8233 (**Ref. 15.20**) provides guidance for the control of noise for new buildings, or refurbished buildings undergoing a change of use. The guidance provided includes appropriate internal and external noise level criteria, which are applicable to dwellings for steady external noise sources.

Design Manual for Roads and Bridges (2020): DMRB LA111 Noise and Vibration

~~15.2.27.~~15.2.26. LA111 (**Ref. 15.21**) sets out the requirements for noise and vibration assessments from road projects. The document presents scoping assessment criteria for operational road traffic noise levels to gain an understanding of the need to undertake a further noise assessment. DMRB advises that the Calculation of Road Traffic Noise (CRTN) (Department of Transport, 1988) method should be used to predict road noise emissions.

Department of Transport (1988) Calculation of Road Traffic Noise (CRTN)

~~15.2.28.~~15.2.27. CRTN (**Ref. 15.22**) memorandum describes the methodology to calculate the road traffic noise at a given distance from the highway. This is referred to as the Basic Noise Level (BNL). The methodology takes into account the intervening ground cover, road configuration and road layout. The calculation assumes typical traffic (i.e., free flowing) and noise propagation conditions. Noise levels are presented in terms of the noise descriptor $L_{A10,18h}$ which is the noise level exceeded for just 10 % of the time between 06:00 and 24:00 hours.

Advisory Council (1978). A guide to measurement and prediction of sound level L_{eq}.

~~15.2.29.~~15.2.28. Advisory Council (**Ref. 15.23**) provides guidance on the evaluation and control of environmental noise in the UK using the noise description equivalent continuous sound level L_{eq}. The document gives general procedures for measurement and prediction of noise.

15.3. SCOPING OPINION AND CONSULTATION

RESPONSE TO THE SCOPING OPINION

15.3.1. An EIA Scoping Opinion (**Appendix 1.2 EIA Scoping Opinion, Volume III**) was received by the Applicant from the Planning Inspectorate (The Inspectorate) on 14 July 2021, including formal responses from Statutory Consultees. A full list of the responses from The Inspectorate and how these requirements have been addressed by the Applicant are set out in **Appendix 1.3 EIA Scoping Opinion Response Tracker (Volume III)**.

CONSULTATION UNDERTAKEN TO DATE

15.3.2. **Table 15.1** provides a summary of the consultation undertaken to inform the Noise and Vibration assessment to date.

Table 15.1 - Summary of Consultation Undertaken

Stakeholder	Date	Summary of outcome of discussions
Environmental Health Officer at Cheshire and Cheshire West County Council (CWCC) (Apologies received from Flintshire County Council (FCC).	Teleconference held on 15 September 2021	The overall approach to the baseline noise monitoring and locations was discussed and agreed. The methodology for the construction noise and vibration assessment was discussed and it was agreed that guidance in BS5228, including use of the ABC method, will be followed. The methodology for the operational noise assessment was discussed and it was agreed that guidance in BS4142:2014 will be followed. CWCC confirmed that the assessment methodologies were appropriate and also pointed to Planning Policy DM 30 where standard construction hours are set. If there are any construction activities outside these hours, then there would need to be a critical reason. Minutes of the meeting were circulated on 30 September 2021 to all invitees and FCC responded to confirm agreement with the methodologies proposed.

15.4. SCOPE OF THE ASSESSMENT

15.4.1. The scope of this assessment has been established through a scoping process. Further information can be found in **Chapter 5 EIA Methodology (Volume II)** of this ES.

15.4.2. This section provides an update to the scope of the assessment and re-iterates the evidence base for scoping out elements following further iterative assessment.

ELEMENTS SCOPED OUT OF THE ASSESSMENT

15.4.3. The elements shown in **Table 15.2** are not likely to cause significant effects as a result of the DCO Proposed Development and have therefore not been subject to detailed assessment.

Table 15.2 - Elements Scoped Out of the Assessment

Element Scoped Out	Justification
Operational Vibration	The operation of the new equipment included in the Above Ground Installations (AGIs) and Block Valve Stations (BVSs) is not expected to give rise to a significant effect at the nearest sensitive receptor in terms of vibration. The requirement for an operational vibration assessment was not discussed with CWCC and FCC. However, there is no rotating equipment / machinery within the AGIs and BVSs. Vibration levels due to construction activities are a worst-case compared to any vibration arising from the operation of the DCO Proposed Development. Therefore, a comparison between vibration levels expected for construction and operation in this context is a conservative approach and it has been used below as the justification for scoping this matter out. This Chapter presents the typical distances at which a significant adverse effect is likely for vibration during construction due to activities such as vibratory piling and ground compaction, in **Table 15.20** and **Table 15.21**. Relative to the locations for the AGIs and BVSs, there are no sensitive receptors within the distances for construction vibration as indicated in **Table 15.20** and **Table 15.21** for 67% level of confidence. Therefore, this matter has not been assessed further in this Chapter. This approach has been shared with FCC and CWCC in advance of DCO submission.

Element Scoped Out	Justification
Operational Traffic Noise	This matter has been agreed with The Inspectorate as part of the **Scoping Opinion** (**Appendix 1.2, Volume III**). The Inspectorate agreed that the level of traffic associated with the operation and maintenance of the DCO Proposed Development is unlikely to give rise to significant effects and agrees this matter can be scoped out of further assessment.
Existing Flint Connection to Point of Ayr (PoA) Terminal Pipeline	Construction noise and vibration arising from the existing Flint Connection to PoA Terminal Pipeline. There are no construction activities associated with this pipeline, therefore an assessment for this has been scoped out.

ELEMENTS SCOPED INTO THE ASSESSMENT

Construction Stage

15.4.4. The following elements are considered to have the potential to give rise to significant effects during the construction of the DCO Proposed Development and have therefore been considered within this assessment:

- Airborne noise effects arising from construction traffic; and
- Noise and vibration effects arising from the construction of the DCO Proposed Development.

Operation Stage

15.4.5. Noise effects arising from the operation of the AGIs and BVSs are considered to have the potential to give rise to significant effects and have therefore been considered within this assessment.

Decommissioning Stage

15.4.6. For the purposes of this assessment, it has been assumed that noise and vibration sources associated with the Decommissioning Stage are equivalent to those assessed for the Construction Stage of the AGIs and BVSs.

15.5. ASSESSMENT METHODOLOGY AND SIGNIFICANCE CRITERIA

STUDY AREA

15.5.1. The Study Area considered in the noise assessment for the Construction Stage of the DCO Proposed Development is 300m from the Newbuild Infrastructure Boundary. BS 5228:2009+A1:2014 (**Ref. 15.17**) states that at distances over 300m noise predictions have to be treated with caution. Therefore, the Study Area for construction has been limited to this distance.

15.5.2. The Study Area in the vibration assessment for the Construction Stage of the DCO Proposed Development is 100m from the Newbuild Infrastructure Boundary. It is anticipated that vibration effects as a result of the construction activities would not be significant beyond these distances, based on professional judgement and results presented later in the Chapter.

15.5.3. The Study Area for the operational noise assessment, related to any noise effects arising from the AGIs and BVSs, has been limited to 500m from the Newbuild Infrastructure Boundary.

15.5.4. The Study Areas were agreed with CWCC and FCC as indicated in **Section 15.3**.

15.5.5. A desktop study has been undertaken to identify Noise Important Areas (IAs) (**Ref. 15.24**) and Noise Action Plan Priority Areas (NAPPAs) (**Ref. 15.25**) within 500m from the Newbuild Infrastructure Boundary.

METHOD OF BASELINE DATA COLLATION

Desk Study

15.5.6. A desktop study has been undertaken to identify IAs (**Ref. 15.24**) and Noise Action Plan Priority Areas (NAPPAs) (**Ref. 15.25**) based on the 3rd round noise mapping for the Environmental Noise Directive (END) (**Ref. 15.26**), legally in force in Wales and England through the Environmental Noise (Wales) Regulations (**Ref. 15.2**) and Environmental Noise (England) Regulations (**Ref. 15.3**).

15.5.7. The following IAs and NAPPAs have been identified within 500m from the Newbuild Infrastructure Boundary:

- IA ID 8912, road noise source next to the M56, owned by National Highways (NH);
- IA ID 7021, road noise source next to the A494, owned by NH;
- IA ID 7023 & 7024, road noise source next to the A41, owned by CWCC;
- IA ID 7024, road noise source next to the A41, owned by CWCC;
- IA ID 10784, road noise source next to the A540, owned by CWCC;
- NAPPA ID 400, road noise source next to the A494, owned by FCC;

- NAPPA ID 397, road noise source next to the A55, owned by FCC;
- NAPPA ID 399, road noise source next to the A494, owned by FCC;
- NAPPA ID 1507, road noise source next to the A494, owned by FCC;
- NAPPA ID 1318, road noise source next to the A494, owned by FCC; and
- NAPPA ID 403, road noise source next to the A494, owned by FCC.

15.5.8. Analysis of an address database has been undertaken to assist the identification of noise sensitive receptors. The following noise sensitive receptors have been considered in the assessment:

- Dwellings; and
- Hospitals, schools, nurseries, elderly homes, places of worship.

15.5.9. Locations representative of biodiversity receptors have been considered as part of the noise level predictions for the Construction Stage. The locations of these biodiversity receptors and results of the noise predictions are presented in **Appendix 15.3 Noise and Vibration Assessment Results (Volume III)**. A description of the biodiversity receptors is presented in **Chapter 9 Biodiversity (Volume II)**.

Site Visit and Surveys

15.5.10. A baseline noise survey was undertaken between 14 October 2021 and 17 March 2022 at representative locations near the DCO Proposed Development. The purpose of the noise survey was to establish the existing noise climate at locations representative of the noise sensitive receptors potentially affected by the DCO Proposed Development. All survey locations are within the Study Area.

15.5.11. The baseline noise survey was undertaken in accordance with BS 7445:2003 (**Ref. 15.15**), BS 4142:2014+A1:2019 (**Ref. 15.16**) and BS 5228:2009+A1:2014 (**Ref. 15.17**).

15.5.12. A combination of long-term (LT) and short-term (ST) noise measurements were taken across 30 locations at 1.2m above the ground level in free field conditions. Monitoring locations are shown in **Figure 15.1 - Environmental Noise Survey Locations and Noise Constraints (Volume IV)**.

15.5.13. **Table 15.3** and **Table 15.4** present the lists of LT and ST noise monitoring locations and their associated Ordnance Survey (OS) coordinates. A description of the location has been included with information on their spatial context in relation to the sections defined in **Chapter 3 Description of the DCO Proposed Development (Volume II)** and shown on **Figure 3.2 - DCO Proposed Development (Volume IV)**.

Table 15.3 - List of Long Term Noise Survey Locations

Location	X Coordinate	Y Coordinate	Description
LT 1	346321	375272	East of Ellesmere Port, approximately 30 m east of Ash Road, within section 1.
LT 2	345262	375060	East of Ellesmere Port, in the rear garden of 5 Lime Grove, approximately 160 m east of Pool Lane, within section 1.
LT 3	344571	373210	South-east of Ellesmere Port, approximately 160 m south of the M56, within section 2.
LT 4	342018	371484	South of Ellesmere Port and north of Chester, approximately 220 m west of Wervin Road and 530 m west of the M53, within section 2.
LT 5	340434	371266	South of Ellesmere Port and north of Chester, approximately 500m east of Liverpool Road, within section 2.
LT 6	338592	371094	South of Ellesmere Port and north of Chester, approximately 190m south of Station Road and 460m west of Liverpool Road, within section 3.
LT 7	337523	369799	North-west of Chester approximately 30m west of Grove Road, within section 3.
LT 8	335003	367584	West of Chester, approximately 55m east of Townfield Lane, within section 4.

Location	X Coordinate	Y Coordinate	Description
LT 9	332592	367412	East of Deeside, approximately 160m east of Kingswood Lane, within section 4.
LT 10	330841	366911	Hawarden, approximately 70m west of Hermitage Road, within section 5.
LT 11	326724	367604	West of Northop Hall AGI, approximately 40m south of Deeside Lane, within section 5.
LT 12	325737	371129	South-east of Flint, adjacent to the western edge of Chester Road B5129, within section 6.
LT 13	322506	372116	West of Flint, approximately 35m south of Lower Aston Hill BVS Lane, within section 7.
LT 14	321717	372588	West of Flint, approximately 25m east of Brookside and 110 m north of the A55, within section 7.
LT 15	317364	373449	South of Brynford, approximately 200m west of Leadbrook Drive, within section 7.
LT 16	314868	374547	West of Brynford approximately 400m south of Cornist Lane, within section 7.

Table 15.4 - List of Short Term Noise Survey Locations

Location	X Coordinate	Y Coordinate	Description
ST 1	347221	374457	East of Ellesmere Port, approximately 120m north of the A5117 and 530m south of the M56, within section 1.
ST 2	344280	374610	South of Ellesmere Port, approximately 150m south of the A5117, within section 2.
ST 3	339614	371258	North of Chester, adjacent to the northern boundary of Station Road, within section 3.
ST 4	338610	370979	North of Chester, approximately 70m from Grove Road, within section 3.
ST 5	333647	366130	West of Chester, approximately 120m from Chester Road B5129, within section 4.
ST 6	332280	367182	East of Deeside, adjacent to Hawarden Way, within section 4.
ST 7	332009	367573	North of Deeside, approximately 60m from Marnel Drive, within section 4.
ST 8	330918	366710	South of Deeside, approximately 20m from Upper Aston Hill BVS Lane, within section 5.
ST9	329759	367091	West of Deeside, approximately 150m from Old Aston Hill, within section 5.
ST10	328791	366800	West of Deeside, approximately 350m from B5125, within section 5.
ST11	327310	367575	South of Northop Hall AGI, approximately 90m from

Location	X Coordinate	Y Coordinate	Description
			Chester Road and 300m from A55, within section 5.
ST12	326435	367960	West of Northop Hall AGI, approximately 70m from B5125, within section 5.
ST13	325210	369676	East of Flint, approximately 55m from Starkey Lane, within section 6.
ST14	325197	371229	South of Flint, approximately 55m from Coed Onn Road, within section 6.

15.5.14. The noise parameters measured included L_{10}, L_{90}, L_{eq} and L_{max} over 15-minute logging intervals. Weather conditions were suitable for noise measurements during the short term attended measurements.

15.5.15. Weather data was logged throughout the noise monitoring using a weather station. Data from the unattended monitoring during periods of precipitation and in which wind speed exceeded 5 ms^{-1} have been excluded from the analysis.

15.5.16. Noise monitoring forms including time periods, time history graphs, statistical analysis, details of the equipment and photographs of the Site are included in **Appendix 15.1 Baseline Noise Data (Volume III)**. Calibration certificates are also available on request. A calibration check on site was undertaken before and after measurements with no significant drift observed.

IMPACT ASSESSMENT METHODOLOGY

Construction Noise and Vibration

15.5.17. A quantitative assessment has been undertaken of potential construction noise impacts following the guidance set out in BS 5228-1:2009+A1:2014 (**Ref. 15.17**).

15.5.18. A 3D computer noise model built using CadnaA 2021 software and ArcGIS 10.8.1 has been used to determine the predicted construction noise levels associated with the DCO Proposed Development. Modelling scenarios were prepared with a typical configuration of plant items for key activities of the Construction Stage. The configuration of plant items and associated noise levels assumed for the key construction activities are presented in **Appendix 15.2 Assumptions for Construction Noise and Vibration Assessment (Volume III)**. The configuration of plant including noise levels and 'on-time' duration for each of the key construction activities assessed in the ES is also presented the appendix.

15.5.19. Noise levels associated with the construction of the following key elements have been included in the noise model:

- Open cut trenches: daytime only;
- Trenchless installation techniques: daytime, evening and night-time;
- Centralised and localised construction compounds: daytime only;
- AGIs and BVSs: daytime only; and
- Access and exit points for heavy vehicles: daytime only.

15.5.20. The trenchless installation techniques noise assessment has been based on the use of horizontal directional drilling (HDD) method, as the reasonable worst case for noise implications. This is the only activity that has been included in the evening and night-time periods.

15.5.21. The assessment has been based on an indicative centre line for the open cut trenches of the Newbuild Carbon Dioxide Pipeline. Deviations of this location to either side of the Newbuild Infrastructure Boundary (but within the Permanent Acquisition of Subsurface Area) have also been taken into account and variations in the potential adverse impacts are discussed.

15.5.22. Topographical data in LiDAR 1m grid format has been used within the Study Area. An address database accessed in 2021 and 2022 was incorporated to define the noise sensitive receptors.

15.5.23. Construction noise levels are predicted based on sound pressure levels at 10m from plant likely to be used for construction. The noise propagation is then calculated at each sensitive receptor as an equivalent continuous noise level averaged over a one-hour period ($L_{Aeq,1h}$), and then subsequently averaged over a 10-hour working day to account for the variations in noise due to plant-on and plant-off time throughout a full working day, the final value is provided as an $L_{Aeq,10h}$. The assessment has been based on façade noise levels. The distance between the geometrical centre of the noise source and the assessment location is taken into account in the calculations.

15.5.24. The noise predictions for the open cut trenches have been undertaken allowing for a progress of working approximately 100m per day.

15.5.25. Construction noise levels at the sensitive receptors have been assessed over the daytime, evening and night-time period using the ABC method described in BS 5228-1:2009+A1:2014 (**Ref. 15.17**) to determine the significance of effect at each receptor. All noise predictions in the assessment correspond to noise levels at 4m high.

15.5.26. The ABC method defines thresholds of potentially significant effects based on the baseline ambient noise level, categories for which are presented in **Table 15.5**.

Table 15.5 - Threshold of Potential Significant Effect at Dwellings

Evaluation Period	Assessment Category (dB L_{Aeq})		
	A	**B**	**C**
Night-time (23:00-07:00)	45	50	55
Evening and Weekends*	55	60	65
Daytime (07:00-19:00)	65	70	75

** 19:00-23:00 weekdays, 13:00-23:00 Saturdays and 07:00-23:00 Sundays.*

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

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

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

The Category (A, B or C) is to be determined separately for each time period and the lowest Noise category is then used throughout the 24-hour cycle, for example, a site which is category A by day and category B or C in the evening and night will be treated as category A for day, evening, and night.

15.5.27. The Noise Policy Statement for England (NPSE) (**Ref. 15.10**) uses two established concepts from toxicology currently applied to noise impacts, which are as follows:

- No Observed Effect Level (NOEL): the level below which no effect can be detected. In simple terms, below this level, there is no detectable effect on health and quality of life due to the noise; and
- Lowest Observed Adverse Effect Level (LOAEL): the level above which adverse effects on health and quality of life can be detected.

15.5.28. The NPSE extends these to the concept of a Significant Observed Adverse Effect Level (SOAEL): The level above which significant adverse effects on health and quality of life occur.

15.5.29. For residential receptors, exceedance of the ABC threshold relates to the SOAEL, and the LOAEL can be considered as the baseline noise levels. Given these criteria, the magnitude of impact can be defined as described in **Table 15.6**.

Table 15.6 - Construction Noise Magnitude of Impact Criteria

Magnitude of Impact	Construction Noise Level
High	Above or equal to SOAEL + 5dB
Medium	Above and equal to SOAEL and below SOAEL +5dB
Low	Above or equal to LOAEL and below SOAEL
Negligible	Below LOAEL

15.5.30. Construction noise may be considered significant where it is determined that a medium or high magnitude of impact will occur for a duration longer than:

- 10 or more days or nights in any 15 consecutive days or nights; or
- A total number of days exceeding 40 in any six consecutive months.

15.5.31. The methodologies described in BS 5228-2 (**Ref. 15.17**) have been used to predict the propagation of vibration from construction activities relating to the DCO Proposed Development. BS 5228-2 describes significance criteria for determining effects on human receptors, and refers to BS 7385: Part 2, 1993 (**Ref. 15.18**) to determine the impact on structures.

15.5.32. For human receptors the threshold of perception is typically in the range of 0.14 millimetre/second (mm/s) to 0.3 mm/s. As vibration increases above this threshold they may disturb, cause annoyance, or interfere with work activities. **Table 15.7** presents the magnitude of impact for construction vibration and relates to vibration levels at which minimal adverse comment is likely as described in BS 5228-2 (**Ref. 15.17**).

Table 15.7 - Construction Vibration (Human) Magnitude of Impact

Magnitude of Impact	Construction Vibration Level
High	Above or equal to 10 mm/s Peak Particle Velocity (PPV)
Medium	Above and equal to SOAEL and below 10 mm/s PPV
Low	Above or equal to LOAEL and below SOAEL
Negligible	Below LOAEL

15.5.33. The LOAEL relates to the lowest observable effect and in this case relates to the level of vibration which is perceptible (≥ 0.3 mm/s). Adverse health impacts relating to a significant effect is more difficult to quantify and BS5228-2 (**Ref. 15.17**) notes the following:

"*Guidance on the effects on physical health of vibration at sustained high levels is given in BS 6841, although such levels are unlikely to be encountered as a result of construction and demolition activities.*"

15.5.34. Significance of effect is therefore related to the duration and frequency of construction activities as well as the time period the activities would be experienced. The SOAEL has been defined as a PPV level of above 1 mm/s.

15.5.35. Construction vibration may be considered significant where it is determined that a medium or high magnitude of impact will occur for a duration longer than:

- 10 or more days or nights in any 15 consecutive days or nights; or
- A total number of days exceeding 40 in any six consecutive months.

15.5.36. BS 5228-2 (**Ref. 15.17**) references BS 7385-2 'Evaluation and measurement for vibration in buildings. Guide to damage levels from ground borne vibration'. (**Ref. 15.18**). The criteria shown in **Table 15.8** relates to the thresholds of cosmetic damage due to vibration and is based upon systematic studies using a carefully controlled vibration source in the vicinity of buildings.

Table 15.8 - Transient Vibration Guide Values for Cosmetic Damage

Type of building	**Peak Component Particle Velocity 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
NOTE 1: Values referred to are at the base of the building. *NOTE 2: For un-reinforced or light framed structures and residential or light commercial buildings, a maximum displacement of 0.6 mm (zero to peak) is not to be exceeded.*		

15.5.37. BS 7385-2 (**Ref. 15.18**) states that the probability of damage from transient vibration tends towards zero at 12.5 mm/s peak component particle velocity. For continuous vibration, such as from vibratory rollers, the threshold is around half this value.

15.5.38. BS 7385-2 (**Ref. 15.18**) states that minor damage is possible at vibration magnitudes that are greater than twice those given in **Table 15.8**, and major damage to a building structure can occur at values greater than four times the tabulated values. The descriptions to these damage categories are described in BS ISO 4866:2010 (**Ref. 15.19**):

- Cosmetic: The formation of hairline cracks on drywall surfaces, or the growth of existing cracks in plaster or drywall surfaces; in addition, the formation of hairline cracks in mortar joints of brick / concrete block construction.
- Minor: The formation of large cracks or loosening and falling of plaster or drywall surfaces, or cracks through bricks / concrete blocks.
- Major: The damage to structural elements of the structure, cracks in support columns, loosening of joints, splaying of masonry cracks, etc.

15.5.39. **Table 15.9** describes the magnitude of impact for continuous vibration given the descriptions provided in BS 7385-2 (**Ref. 15.18**) and BS ISO 4866 (**Ref. 15.19**).

Table 15.9 - Construction Vibration (Building) Magnitude of Impact

Magnitude of Impact	Peak Particle Velocity (PPV) level (mm/s)	Damage category
High	≥ 30	Major
Medium	≥ 15	Minor
Low	≥ 7.5	Cosmetic
Negligible	< 7.5	-

15.5.40. A scoping assessment was undertaken to determine the likely significance of the traffic generated by the DCO Proposed Development during the Construction Stage. This methodology has been based upon advice in DMRB LA111 (**Ref. 15.21**). The scoping assessment has been based on noise predictions at source as a first step to understand the likely effects.

15.5.41. The scoping assessment was based on a comparison of Basic Noise Levels (BNLs) for road links, which is the noise level at 10 m calculated from traffic flows. On links where the flows were outside the scope of CRTN (**Ref. 15.22**), then the noise levels were calculated using advice on the document Noise Advisory Council: A guide to measurement and prediction of the equivalent sound level L_{eq} (**Ref. 15.23**). The assessment is based on a peak year of construction traffic activity which is assumed to commence in June 2024 and end in May 2025. It compared the noise levels with and without construction traffic, with results compared against the short-term magnitude of noise impact described in **Table 15.10**.

Table 15.10 - Magnitude of Road Traffic Impact in the Short Term

Noise change, $L_{A10,18h}$ dB	**Magnitude of Impact**
0	No change
0.1 – 0.9	Negligible
1 – 2.9	Minor
3 – 4.9	Moderate
5+	Major

15.5.42. For reference, DMRB LA111 (**Ref. 15.21)** sets up the LOAEL and SOAEL for operational traffic as 55 dB $L_{A10,18hr}$ and 68 dB $L_{A10,18hr}$, respectively.

Operational Noise

15.5.43. A quantitative noise assessment has been undertaken in line with guidance described in BS 4142:2014+A1:2019 (**Ref. 15.16**) to assess the potential impact of the AGIs and BVSs on nearby sensitive receptors. The method in this standard uses outdoor sound levels to assess the likely effects of sound on people due to the operation of industrial or commercial premises.

15.5.44. A CadnaA noise model has been prepared to determine the likely noise impacts arising from the AGIs and BVSs of the DCO Proposed Development shown in **Table 15.11**. The noise source data within the model has been ascertained through consultation with the Applicant's design team. The only constant noise sources from the DCO Proposed Development will be the air conditioning units and fans on the electric and instrumentation kiosks (E&I kiosks). The table shows the elements proposed in each of the sections which are further defined in **Chapter 3 Description of the DCO Proposed Development (Volume II)** and shown on **Figure 3.2 - DCO Proposed Development (Volume IV)**.

Table 15.11 - Proposed AGIs and BVSs

Sections	Proposed Element
Section 1	Ince AGI
	Stanlow AGI
Section 2	Rock Bank BVS
Section 3	Mollington BVS
Section 4	None proposed
Section 5	Northop Hall AGI
	Aston Hill BVS
Section 6	Flint AGI
Section 7	Cornist Lane BVS
	Babell BVS
	Pentre Halkyn BVS

15.5.45. The mitigation embedded in the assessment requires that the rating noise levels for normal mode of operation predicted at 1m from the façade of noise sensitive receptors as listed in **Table 15.242** and **Table 15.235** will not be exceeded.

15.5.46. The assumed noise levels presented in **Table 15-12**, or a similar configuration of values as appropriate to comply with the DCO requirement on operational noise (**Draft DCO** (**Document Reference: D.3.1**)), will be achieved through mitigation defined during Detailed Design. It is anticipated that these will be achieved through measures such as selection of low noise plant, orientation of noise sources, acoustic enclosures, acoustic louvres among others. The assumed noise levels in **Table 15.12** correspond to permanent noise sources. There will be noise arising from maintenance activities such as pigging and this has not been assessed on the basis that they will occur very infrequently and during daytime only.

Table 15.12 - Operational Noise Level Assumptions

Plant	Location	Noise Level $L_{Aeq,T}$ dB
One air conditioning unit per kiosk	1m from unit	65
One extraction fan per kiosk	1m from unit	65

15.5.47. The noise propagation has been calculated in line with ISO 9613 Part 2 (**Ref. 15.14**) and assessed against guidance in BS 4142:2014+A1:2019 (**Ref. 15.16**) for human receptors. Noise predictions have been undertaken at the nearest residential receptor to the AGIs and BVSs.

15.5.48. The method described in BS 4142 (**Ref. 15.16**) compares the rating level of the sound source with the background sound level. Typical background noise levels have been determined from the baseline data presented in **Appendix 15.1 Baseline Noise Data (Volume III)**.

15.5.49. The standard refers to the rating level, which describes the specific source level corrected by acoustic features, where appropriate.

15.5.50. The difference in levels established is taken as an initial estimate of the magnitude of the impact:

- "Typically, the greater this difference, the greater the magnitude of the impact;
- A difference of around +10 dB or more is likely to be an indication of a significant adverse impact, depending on the context;
- A difference of around +5 dB is likely to be an indication of an adverse impact, depending on the context; and
- The lower the rating level is relative to the measured background sound level, the less likely it is that the specific sound source will have an adverse impact or a significant adverse impact. Where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact, depending on the context.".

15.5.51. Certain acoustic characteristics can increase the significance of the impact over that expected from a direct comparison between the specific sound level of the source and the background sound level. Characteristics that may attract attention include tonality, impulsivity, and intermittency.

15.5.52. **Table 15.13** describes the magnitude of impact for operational noise based on the initial estimate of the impact of the specific sound by subtracting the measured background sound level.

Table 15.13 - Operational Noise Magnitude of Impact

Magnitude of Impact	BS 4142 descriptor	Excess of rating over background sound level
High	Indication of a significant adverse impact, depending on the context.	Around +10 dB
Medium	Indication of an adverse impact, depending on the context.	Around +5 dB
Low	Not defined in BS4142	Between 0 and 5 dB
Negligible	Indication of a low impact, depending on the context	≤0

15.5.53. The magnitudes of impact described in **Table 15.13** have not been linked to the LOAEL and SOAEL since the method in BS 4142 (**Ref. 15.16**) refers to the context. The significance is dependent on both the margin by which the rating level of the specific sound source exceeds the background sound level and also the context in which the sound occurs.

15.5.54. Factors taken into consideration for the context may include:

- The absolute sound level at the individual receptor;
- The character and level of the residual sound compared to the character and level of the specific sound; and
- The sensitivity of the receptor and whether dwellings already incorporate noise mitigation measures.

15.5.55. For residential receptors, indoor ambient noise criteria for dwellings BS 8233:2014 (**Ref. 15.20**) can be used to provide absolute sound levels for context as part of the assessment. These levels have been derived from exposure-response studies involving transportation noise, however they serve as a useful means of providing context to assessments of similar broadband noise sources.

SIGNIFICANCE CRITERIA

Construction Noise and Vibration

15.5.56. Construction noise and vibration effects may be considered significant where it is determined that a medium or high magnitude of impact will occur at a sensitive receptor for a duration longer than:

- 10 or more days or nights in any 15 consecutive days or nights; or
- A total number of days exceeding 40 in any six consecutive months.

Operational Noise

15.5.57. Operational noise effects may be considered significant depending on both the margin by which the rating level of the specific sound source exceeds the background sound level and also the context in which the sound occurs. Magnitude of impacts described as medium or high in **Table 15.13** may be considered significant, depending on the context.

ASSUMPTIONS AND LIMITATIONS

Assumptions

15.5.58. The construction of the DCO Proposed Development assessed in this Chapter comprise various stages in sequence. The assessment has been based on a single activity resulting in the highest noise level at 10m. It is acknowledged that sensitive receptors will be exposed to the predicted construction noise levels for a short period of time. Most of the time during the construction period, the noise level and associated impacts are expected to be lower than those predicted in this study.

15.5.59. It has been assumed that the secondary noise mitigation during the Construction Stage will achieve an attenuation of 10dB(A) at all sensitive receptors. This could be achieved through localised screening and Best Practicable Means (BPM).

15.5.60. The assessment is based upon a reasonable worst-case regarding the Newbuild Carbon Dioxide Pipeline going anywhere within the Permanent Acquisition of Subsurface Area to ensure that likely significant effects are assessed.

Limitations

15.5.61. Noise surveys undertaken for this assessment have been caried out on the basis that the noise climate during the EIA process will be representative of the typical baseline conditions in the future.

15.5.62. Construction working methodologies are indicative at this stage. Variations in the location of construction activities and changes in techniques will influence the potential for significant effects from the DCO Proposed Development. Therefore, noise mitigation assumed as 10dB(A) at all locations is indicative at this stage. A Noise and Vibration Management Plan is included as a Requirement of the **Draft DCO (Document Reference: D.3.1)**. This management plan will outline the specific locations and means of mitigation measures which will be produced once the working methodologies are known (**D-NV-001** of the **Register of Environmental Actions and Commitments (REAC)**, **Document reference: D.6.5.1**).

15.6. BASELINE CONDITIONS

EXISTING BASELINE

15.6.1. **Table 15.14** presents the representative ambient noise levels (L_{Aeq}) at each long-term noise monitoring location. The data have been used to determine the ABC threshold category in accordance with BS 5228-1 (**Ref. 15.17**).

15.6.2. **Table 15.15** presents the background noise level (L_{A90}), selected based on a statistical analysis of the measured sound levels during the monitoring period. Generally, the selection process aimed at choosing low background noise level events which occurred for a reasonable proportion of the measurement period.

15.6.3. Data have been processed to remove any events occurring during unsuitable weather conditions or localised noise climate events that was not considered representative, such as fireworks and intensive periods of farming.

15.6.4. Daytime, evening and night-time periods are as follows:

- Daytime: 07:00 – 19:00;
- Evening: 19:00 – 23:00; and
- Night-time: 23:00 – 07:00.

Table 15.14 - Long Term Summary of Ambient Noise Levels

Location	Average $L_{Aeq, T}$ (dB)		
	Daytime	**Evening**	**Night-time**
LT 1	65	58	56
LT 2	55	51	55
LT 3	61	59	56
LT 4	57	51	49

Location	Average $L_{Aeq, T}$ (dB)		
	Daytime	Evening	Night-time
LT 5	57	50	45
LT 6	52	42	40
LT 7	47	41	40
LT 8	51	46	49
LT 9	52	52	44
LT 10	53	50	46
LT 11	63	59	57
LT 12	46	43	40
LT 13	50	43	44
LT 14	51	46	49
LT 15	53	50	48
LT 16	49	42	41

Table 15.15 - Summary of Background Noise Levels

Location	Period, T	Typical $L_{A90, T}$ (dB)
LT 1	Daytime (07:00 – 23:00)	54
	Night-time (23:00 – 07:00)	47
LT 2	Daytime (07:00 – 23:00)	44
	Night-time (23:00 – 07:00)	45
LT 3	Daytime (07:00 – 23:00)	52
	Night-time (23:00 – 07:00)	44
LT 4	Daytime (07:00 – 23:00)	46

Location	Period, T	Typical $L_{A90, T}$ (dB)
	Night-time (23:00 – 07:00)	38
LT 5	Daytime (07:00 – 23:00)	45
	Night-time (23:00 – 07:00)	36
LT 6	Daytime (07:00 – 23:00)	39
	Night-time (23:00 – 07:00)	31
LT 7	Daytime (07:00 – 23:00)	38
	Night-time (23:00 – 07:00)	32
LT 8	Daytime (07:00 – 23:00)	40
	Night-time (23:00 – 07:00)	34
LT 9	Daytime (07:00 – 23:00)	43
	Night-time (23:00 – 07:00)	36
LT 10	Daytime (07:00 – 23:00)	45
	Night-time (23:00 – 07:00)	35
LT 11	Daytime (07:00 – 23:00)	58
	Night-time (23:00 – 07:00)	44
LT 12	Daytime (07:00 – 23:00)	39
	Night-time (23:00 – 07:00)	32
LT 13	Daytime (07:00 – 23:00)	38
	Night-time (23:00 – 07:00)	30
LT 14	Daytime (07:00 – 23:00)	43
	Night-time (23:00 – 07:00)	34
LT 15	Daytime (07:00 – 23:00)	37
	Night-time (23:00 – 07:00)	31

Location	Period, T	Typical $L_{A90, T}$ (dB)
LT 16	Daytime (07:00 – 23:00)	37
	Night-time (23:00 – 07:00)	29

FUTURE BASELINE

15.6.5. Variations in the existing baseline conditions will depend on the local road network and changes in the operation of local industrial developments. It is expected that the baseline sound climate will not change significantly in the future.

15.6.6. The traffic data for the 2021 baseline and future baseline year 2025 have been compared. The BNL have been calculated in **Appendix 15.3 Noise and Vibration Assessment Results (Volume III)** at road links within the Study Area and the results indicate that there will be a negligible change in road traffic noise levels between these two years.

15.7. SENSITIVE RECEPTORS

15.7.1. The following noise sensitive receptors have been assessed during the Construction Stage and are displayed in **Table 15.16**. The table shows the number of sensitive receptors in each of the sections as defined in **Chapter 3 Description of the DCO Proposed Development** and shown on **Figure 3.2 - DCO Proposed Development (Volume IV)**.

Table 15.16 - Noise Sensitive Receptors

Value / Sensitivity	Receptor
High	Section 1: 504 dwellings and no other sensitive receptors
High	Section 2: 107 dwellings and one other sensitive receptor
High	Section 3: 322 dwellings and two other sensitive receptors
High	Section 4: 1153 dwellings and six other sensitive receptors
High	Section 5: 1710 dwellings and six other sensitive receptors
High	Section 6: 31 dwellings and no other sensitive receptors

Value / Sensitivity	Receptor
High	Section 7: 12 dwellings and no other sensitive receptors

~~Value / Sensitivity~~	~~Receptor~~
~~High~~	~~Section 1: 504 dwellings and no other sensitive receptors~~
~~High~~	~~Section 2: 107 dwellings and one other sensitive receptor~~
~~High~~	~~Section 3: 322 dwellings and two other sensitive receptors~~
~~High~~	~~Section 4: 1153 dwellings and six other sensitive receptors~~
~~High~~	~~Section 5: 1710 dwellings and six other sensitive receptors~~
~~High~~	~~Section 6: 31 dwellings and no other sensitive receptors~~
~~High~~	~~Section 7: 16 dwellings and no other sensitive receptors~~

15.7.2. It can be seen from the table that the majority of sensitive receptors are concentrated in sections 4 and 5. These sections correspond to the residential areas in Sandycroft, Ewloe, Ewloe Green and Northop Hall AGI.

15.7.3. A subset of the receptors above within 100m from the Newbuild Infrastructure Boundary has been assessed for likely vibration effects. For the Operational Stage, a single noise sensitive receptor nearest to an AGI or BVS has been included in the noise assessment.

15.8. DESIGN DEVELOPMENT, IMPACT AVOIDANCE, AND MITIGATION

15.8.1. Mitigation during the Construction and Decommissioning Stages of the DCO Proposed Development will include Best Practicable Means (BPM).

15.8.2. Examples of such measures are presented below:

- Consultation will be undertaken with the Local Authorities. Prior consent agreement for any works outside core hours, where there is potential for significant adverse effects (**D-NV-002** and **D-NV-012** of the **REAC**, **Document reference: D.6.5.1**);
- Contact details for nominated site contact for local residents to deal with complaints and engaging with local residents (**D-NV-003** of the **REAC**, **Document reference: D.6.5.1**);
- Selection of quiet and low noise equipment and methodologies (**D-NV-004** of the **REAC**, **Document reference: D.6.5.1**);
- Optimal location of acoustic screening to minimise noise adverse effects (**D-NV-005** of the **REAC**, **Document reference: D.6.5.1**);
- Optimal location of equipment on site to minimise noise disturbance (**D-NV-006** of the **REAC**, **Document reference: D.6.5.1**);
- The provision of acoustic enclosures around static plant, where necessary (**D-NV-007** of the **REAC**, **Document reference: D.6.5.1**); and
- Use of less intrusive alarms, such as broadband vehicle reversing warnings, wherever possible (**D-NV-008** of the **REAC**, **Document reference: D.6.5.1**).

15.8.3. During the Operational Stage, the noise levels of the equipment in each of the AGIs and BVSs will be limited to avoid the potential for adverse significant effects at the nearest noise sensitive receptors. This Chapter presents in **Table 15.12** an example of how this will be achieved. A Noise and Vibration Management Plan will indicate the details of the mitigation and is included as a Requirement of the **Draft DCO** (**Document Reference: D.3.1**).

15.9. ASSESSMENT OF LIKELY IMPACTS AND EFFECTS

15.9.1. This Section details the preliminary assessment of predicted impacts and effects for the DCO Proposed Development during both the construction, Operational and Decommissioning Stages.

CONSTRUCTION STAGE

15.9.2. The likely significant noise and vibration effects associated with the Construction Stage are set out below.

15.9.3. **Table 15.17**, **Table 15.18** and **Table 15.19** show the likely number of noise sensitive receptors subject to a magnitude of noise impact of either medium or high as a result of all construction activities during the day, evening and night respectively, corresponding to a noise level equal or higher than the SOAEL. The tables show the number of sensitive receptors potentially affected in each of the sections defined **Chapter 3 Description of the DCO Proposed Development (Volume II)** and shown on **Figure 3.2 - DCO Proposed Development (Volume IV)**.

Table 15.17 - Number of Receptors Subject to Medium or High Daytime Noise Impact – without Secondary Mitigation ~~Number of Receptors Subject to Medium or High Daytime Noise Impact~~

Section	Magnitude of impact	
	Medium	High
1	9	5
2	28	7
3	90	41
4	180	133
5	186	82
6	6	7
7	3	1

15.9.4. **Table 15.17** indicates that some receptors in all sections are likely to experience either a medium or a high adverse noise impact at some point during the Construction Stage. Sections 3, 4 and 5 will have the highest number of receptors potentially affected. Residential areas of Mollington, Sandycroft, Aston, Ewloe and Northop Hall AGI would be affected. Typically, the first row of receptors overlooking the DCO Proposed Development are likely to experience either a medium or high adverse noise impact. This magnitude of impact is considered to be a ***significant effect (significant)***. For this, it has been assumed that receptors will be subject to either a medium or high adverse noise impact for a duration longer than:

- 10 or more days or nights in any 15 consecutive days or nights; or
- A total number of days exceeding 40 in any six consecutive months.

Table 15.18 - Number of Receptors Subject to Medium or High Evening Noise Impact – without Secondary Mitigation ~~Number of Receptors Subject to Medium or High Evening Noise Impact~~

Section	Magnitude of impact	
	Medium	High
1	2	2
2	13	16
3	66	81
4	95	178
5	188	90
6	2	7
7	0	0

Table 15.19 - Number of Receptors Subject to Medium or High Night Noise Impact ~~Number of Receptors Subject to Medium or High Night Noise Impact~~

Section	Magnitude of impact	
	Medium	High
1	20	23

Section	Magnitude of impact	
	Medium	High
2	9	26
3	63	181
4	296	263
5	246	332
6	4	9
7	0	0

15.9.5. For construction activities associated with the trenchless installation techniques, **Table 15.18** and **Table 15.19** show that some receptors within sections 1 to 6 are likely to experience an adverse noise impact of either medium or high magnitude. However, it is acknowledged that, at the majority of crossings, this activity will occur occasionally and for a short period of time and less than the period defined in **paragraph 15.5.56**. As described in **Chapter 3 Description of the DCO Proposed Development (Volume II)**, at some longer crossings with difficult ground conditions, the duration of the evening and night-time working is expected to last up to four weeks. Therefore, it is considered to be a not significant effect (not significant) at most locations and a **significant effect (significant)** at six locations where the estimated duration of continuous 24h drilling for trenchless installation techniques exceeds the duration defined in **paragraph 15.5.56**~~For construction activities associated with the trenchless installation techniques, **Table 15.18** and **Table 15.19** show that some receptors within sections 1 to 6 are likely to experience an adverse noise impact of either medium or high magnitude. However, it is acknowledged that, at the majority of crossings, this activity will occur occasionally and for a short period of time and less than the period defined in **paragraph 15.5.56**. As described in **Chapter 3 Description of the DCO Proposed Development (Volume II),** at some locations with difficult ground conditions, the duration of the evening and night-time working is expected to last up to four weeks. Therefore, it is considered to be a *not significant effect* (*not significant)* at most locations and a ***significant effect (significant)*** at specific locations where the period exceeds the duration defined in **paragraph 15.5.56**~~.

Table 15.20 - Number of Receptors near the six trenchless crossing locations subject to a Significant Effect during Evening – without Secondary Mitigation

Section	Magnitude of impact	
	Medium	High
1	2	2
2	0	0
3	0	0
4	60	97
5	35	19
6	0	0
7	0	0

Table 15.21 - Number of Receptors near the six trenchless crossing locations subject to a Significant Effect during Night – without Secondary Mitigation

Section	Magnitude of impact	
	Medium	High
1	20	23
2	0	0
3	0	0
4	98	151
5	86	84
6	0	0
7	0	0

~~15.9.5.~~15.9.6. Quantification of the number of properties subject to negligible and low noise impacts per section and potential variations due to change in the location of the

open trench cut alignment is presented in **Appendix 15.3 Noise and Vibration Assessment Results (Volume III)**.

~~15.9.6.~~ **Table 15.2~~0~~** and **Table 15.2~~1~~** present the likely set back distances at which steady state vibration levels at the nearest sensitive receptor are expected to reach the SOAEL set for human vibration perception as defined in **paragraph 15.5.17**.

Table 15.22 - Predicted Set Back Distances for Vibratory Piling

Magnitude of Impact	Distance from activity (m)		
	95% Confidence Level	67% Confidence Level	50% Confidence Level
High	10	6	3
Medium	55	30	15

Table 15.23 - Predicted Set Back Distances for Ground Compaction

Magnitude of Impact	Distance from activity (m)		
	95% Confidence Level	67% Confidence Level	50% Confidence Level
High	8	5	2
Medium	45	30	15

15.9.8. Based on a 67% of confidence level, considered to be a reasonable worst-case, significant effects due to vibratory piling or ground compaction are not likely if these activities are not undertaken closer than 30m from any property.

15.9.9. The results in **Table 15.202** and **Table 15.213** show the likely set back distances at which vibration levels at the nearest sensitive receptors are expected to reach the SOAEL set for human vibration perception, which is more onerous than the criteria for buildings. The criteria for buildings would be exceed at distances closer than approximately 6m and there are no buildings within this proximity. Based on the criteria for both humans and buildings presented in **Table 15.7** and **Table 15.9**, at greater distances than shown above, the magnitude of impact would be negligible or low. Furthermore, it is expected that any vibratory piling and compaction activities will not be undertaken for a period longer than:

- 10 or more days or nights in any 15 consecutive days or nights; or
- A total number of days exceeding 40 in any six consecutive months.

15.9.10. Therefore, vibration impacts during the Construction and Decommissioning Stage would be *not significant*.

15.9.11. Results of the peak particle velocity vibration values at distances within the Study Area due to ground compaction and vibratory piling are presented in **Appendix 15.3 Noise and Vibration Assessment Results (Volume III)**.

15.9.12. The likely change in noise levels due to the generation of additional traffic movements during construction has been assessed. Guidance in the DMRB LA111, short-term noise impact as presented in **Table 15.10**, has been followed for an assessment in the peak year of construction traffic activity.

15.9.13. The results of the assessment, which are provided in **Appendix 15.3 Noise and Vibration Assessment Results (Volume III)**, indicate that traffic noise levels are likely to increase by up to 1 dB, which is classified as a minor magnitude of impact as described in **Table 15.10**. For a limited number of road links, the changes in noise levels are higher than 1dB. In these instances, the absolute noise levels are considered to be low. Therefore, the construction traffic noise effect would be *not significant*.

OPERATIONAL STAGE

15.9.14. The likely significant noise and vibration effects associated with the Operational Stage are set out below.

15.9.15. **Table 15.2~~2~~4** and **Table 15.2~~3~~5** show the magnitude of operational noise impact at each representative noise sensitive receptor (NSR) with reference to BS 4142:2014+A1:2019 (**Ref. 15.16**) during the daytime and night-time respectively. The tables present the representative background noise levels associated with each noise sensitive receptor and the predicted rating level. The latter allows for a +5 dB correction to account for the potential of tonality and intermittency in the operational noise arising from the DCO Proposed Development. The final column presents the difference between the rating level and the representative background noise level, to facilitate the initial estimate in accordance with BS 4142:2014+A1:2019 (**Ref. 15.16)**.

Table 15.24 - Operational Noise Assessment - Daytime

NSR	X Coordinate	Y Coordinate	Background Noise Level $L_{A90,\ 15\ min}$ dB	Predicted Rating Level, $L_{Ar,Tr}$ dB	Difference dB
1	315152	374454	37	23	-14
2	317363	373383	37	29	-8
3	321792	372565	43	24	-19
4	324874	371018	39	21	-18

NSR	X Coordinate	Y Coordinate	Background Noise Level $L_{A90,\ 15\ min}$ dB	Predicted Rating Level, $L_{Ar,Tr}$ dB	Difference dB
5	325987	368124	45	27	-18
6	331199	366849	45	32	-13
7	338206	370042	39	29	-10
8	341121	371522	46	28	-19
9	344232	374694	54	13	-41

~~NSR~~	~~X Coordinate~~	~~Y Coordinate~~	~~Background Noise Level $L_{A90,\ 15\ min}$ dB~~	~~Predicted Rating Level, $L_{Ar,Tr}$ dB~~	~~Difference dB~~
~~1~~	~~315152~~	~~374454~~	~~37~~	~~23~~	~~-14~~
~~2~~	~~317363~~	~~373383~~	~~37~~	~~29~~	~~-8~~
~~3~~	~~321782~~	~~372564~~	~~43~~	~~30~~	~~-13~~
~~4~~	~~324874~~	~~371018~~	~~39~~	~~21~~	~~-18~~
~~5~~	~~326027~~	~~368123~~	~~45~~	~~25~~	~~-20~~
~~6~~	~~331199~~	~~366849~~	~~45~~	~~32~~	~~-13~~
~~7~~	~~338206~~	~~370042~~	~~39~~	~~29~~	~~-10~~
~~8~~	~~341121~~	~~371522~~	~~46~~	~~28~~	~~-19~~
~~9~~	~~344232~~	~~374694~~	~~54~~	~~13~~	~~-41~~

Table 15.25 - Operational Noise Assessment – Night-time

NSR	X Coordinate	Y Coordinate	Background Noise Level $L_{A90,\ 15\ min}$ dB	Predicted Rating Level, $L_{Ar,Tr}$ dB	Difference dB
1	315152	374454	29	23	-6
2	317363	373383	31	29	-2
3	321792	372565	34	24	-10
4	324874	371018	32	21	-11
5	325987	368124	35	27	-8
6	331199	366849	35	32	-3
7	338206	370042	31	29	-2
8	341121	371522	38	28	-11
9	344232	374694	47	13	-34

~~NSR~~	~~X Coordinate~~	~~Y Coordinate~~	~~Background Noise Level $L_{A90,\ 15\ min}$ dB~~	~~Predicted Rating Level, $L_{Ar,Tr}$ dB~~	~~Difference dB~~
~~1~~	~~315152~~	~~374454~~	~~29~~	~~23~~	~~-6~~
~~2~~	~~317363~~	~~373383~~	~~31~~	~~29~~	~~-2~~
~~3~~	~~321782~~	~~372564~~	~~34~~	~~30~~	~~-4~~
~~4~~	~~324874~~	~~371018~~	~~32~~	~~21~~	~~-11~~
~~5~~	~~326027~~	~~368123~~	~~35~~	~~25~~	~~-10~~
~~6~~	~~331199~~	~~366849~~	~~35~~	~~32~~	~~-3~~
~~7~~	~~338206~~	~~370042~~	~~31~~	~~29~~	~~-2~~
~~8~~	~~341121~~	~~371522~~	~~38~~	~~28~~	~~-11~~

~~NSR~~	~~X Coordinate~~	~~Y Coordinate~~	~~Background Noise Level $L_{A90, 15\ min}$ dB~~	~~Predicted Rating Level, $L_{Ar,Tr}$ dB~~	~~Difference dB~~
~~9~~	~~344232~~	~~374694~~	~~47~~	~~13~~	~~-34~~

15.9.16. Based on the initial estimate described in BS4142:2014+A1:2019 (**Ref. 15.16**), The predicted rating levels at the nearest noise sensitive receptors to the AGIs and BVSs are below the typical background noise levels. Using the criteria in **Table 15.13**, this equates to a negligible magnitude of noise impact.

15.9.17. Contextual considerations have also been taken into account, including information relating to the likely change in ambient noise levels and further analysis on the absolute noise levels.

15.9.18. **Table 15.246** and **Table 15.257** present the likely change in ambient noise levels expected when the DCO Proposed Development is in operation. This is derived by logarithmically adding the measured noise levels for daytime (16 hours) and night-time (8 hours) to the specific sound source of the DCO Proposed Development and then comparing the resulting value against the measured noise levels. It can be seen from both daytime and night-time comparisons, that the ambient noise levels will continue to be dominated by the existing sound climate. Therefore, no significant change in ambient noise levels is expected due to the operation of the DCO Proposed Development at any sensitive receptor.

Table 15.26 - Ambient Daytime Noise Assessment

NSR	Predicted Specific Noise Level from AGI/BVS $L_{Aeq, T}$ dB	Measured Noise Level, $L_{Aeq, 16\ h}$ dB	Predicted Noise Level + Measured Noise Level, $L_{Aeq, 16\ h}$ dB	Difference dB
1	18	47	47	0
2	24	53	53	0
3	19	50	50	0
4	16	51	51	0
5	22	53	53	0

NSR	Predicted Specific Noise Level from AGI/BVS $L_{Aeq, T}$ dB	Measured Noise Level, $L_{Aeq, 16\ h}$ dB	Predicted Noise Level + Measured Noise Level, $L_{Aeq, 16\ h}$ dB	Difference dB
6	27	53	53	0
7	24	50	50	0
8	23	54	54	0
9	8	60	60	0

~~NSR~~	~~Predicted Specific Noise Level from AGI/BVS $L_{Aeq, T}$ dB~~	~~Measured Noise Level, $L_{Aeq, 16\ h}$ dB~~	~~Predicted Noise Level + Measured Noise Level, $L_{Aeq, 16\ h}$ dB~~	~~Difference dB~~
~~1~~	~~18~~	~~47~~	~~47~~	~~0~~
~~2~~	~~24~~	~~53~~	~~53~~	~~0~~
~~3~~	~~25~~	~~50~~	~~50~~	~~0~~
~~4~~	~~16~~	~~51~~	~~51~~	~~0~~
~~5~~	~~20~~	~~53~~	~~53~~	~~0~~
~~6~~	~~27~~	~~53~~	~~53~~	~~0~~
~~7~~	~~24~~	~~50~~	~~50~~	~~0~~
~~8~~	~~23~~	~~54~~	~~54~~	~~0~~
~~9~~	~~8~~	~~60~~	~~60~~	~~0~~

Table 15.27 - Ambient Night-time Noise Assessment

NSR	Predicted Specific Noise Level from AGI/BVS $L_{Aeq, T}$ dB	Measured Noise Level, $L_{Aeq, 8\ h}$ dB	Predicted Noise Level + Measured Noise Level, $L_{Aeq, 8\ h}$ dB	Difference dB
1	18	41	41	0
2	24	51	51	0
3	19	49	49	0
4	16	41	41	0
5	22	53	53	0
6	27	53	53	0
7	24	41	41	0
8	23	48	48	0
9	8	56	56	0

~~NSR~~	~~Predicted Specific Noise Level from AGI/BVS $L_{Aeq, T}$ dB~~	~~Measured Noise Level, $L_{Aeq, 8\ h}$ dB~~	~~Predicted Noise Level + Measured Noise Level, $L_{Aeq, 8\ h}$ dB~~	~~Difference dB~~
~~1~~	~~18~~	~~41~~	~~41~~	~~0~~
~~2~~	~~24~~	~~51~~	~~51~~	~~0~~
~~3~~	~~25~~	~~49~~	~~49~~	~~0~~
~~4~~	~~16~~	~~41~~	~~41~~	~~0~~
~~5~~	~~20~~	~~53~~	~~53~~	~~0~~
~~6~~	~~27~~	~~53~~	~~53~~	~~0~~

NSR	Predicted Specific Noise Level from AGI/BVS $L_{Aeq, T}$ dB	Measured Noise Level, $L_{Aeq, 8\ h}$ dB	Predicted Noise Level + Measured Noise Level, $L_{Aeq, 8\ h}$ dB	Difference dB
7	24	41	41	0
8	23	48	48	0
9	8	56	56	0

15.9.19. Secondly, absolute noise levels have been assessed against guidance in Section 7.7 Specific Types of Buildings in BS8233:2014 (**Ref. 15.20**). The predicted specific noise level at NSR 6 from the operation of the AGI/BVS is the highest as can be seen from **Table 15.246** above. Therefore, this level has been used as a worst-case assessment against the BS8233 internal night-time guideline values within bedrooms, as shown in **Table 15.268**. The table assumes a noise reduction through a partially open window of 15 dB accordance with advice in BS8233.

Table 15.28 - Internal Night-time Noise Assessment

NSR	Predicted Specific Noise Level from AGI/BVS $L_{Aeq, T}$ dB	Partially open Window Attenuation dB	Internal Noise Level, $L_{Aeq, 8\ h}$ dB	BS8233 Night Bedroom, $L_{Aeq, 8\ h}$ dB
6	27	15	12	30

15.9.20. The results in **Table 15.268** show that internal noise level at NSR 6 is predicted to be below guideline values during the night-time. This further confirms the conclusion that the noise impact from the operation of the AGIs/BVSs will not be significant at nearby noise sensitive receptors.

DECOMMISSIONING STAGE

15.9.21. The number of receptors near the AGIs and BVSs potentially experiencing a significant adverse noise effect, without mitigation, are presented in **Appendix 15.3 Noise and Vibration Assessment Results (Volume III)**.

15.10. MITIGATION AND ENHANCEMENT MEASURES

15.10.1. Mitigation measures for construction will be defined as part of the development of the Detailed Design. Further information relating to mitigation measures will be contained within the detailed Construction Environment Management Plan (CEMP) to be produced by the Construction Contractors, as included as a Requirement of the **Draft DCO** (**Document Reference: D.3.1**).

15.10.2. After Detailed Design, and before the commencement of the construction period, a Noise and Vibration Management Plan will be produced and agreed with the Local Authorities setting out the requirements for noise and vibration mitigation measures (**D-NV-001** and **D-NV-002** of the **REAC, Document reference: D.6.5.1**). The Noise and Vibration Mitigation Plan will seek to avoid significant effects (daytime, evening and night-time), where reasonably practicable. As part of the Noise and Vibration Management Plan, trenchless installation activities during evening and night-time at locations where the period exceeds the duration defined in **paragraph 15.5.56** will require careful consideration to include secondary mitigation including measures such as acoustic enclosures for ancillary equipment which is kept above ground for the whole duration of the activity. The production of a Noise and Vibration Management Plan and agreement with the Local Authorities is included as a Requirement of the **Draft DCO** (**Document Reference: D.3.1**).

~~15.10.3.~~ As previously discussed, it has been assumed that a package of secondary mitigation measures will be able to achieve a noise level reduction of 10dB(A). It is expected that this could be achieved by the use of temporary noise barriers, enclosures at specific locations and selection of quiet plant, where possible and practicable (**D-NV-009** of the **REAC**, **Document reference: D.6.5.1**).

~~15.10.5.~~15.10.4. The construction programme will seek to minimise the duration of high noise generating construction activities, as far as practicably possible. Where construction activities near sensitive areas are expected to affect residents with a magnitude of medium and high and exceed the durations of 10 or more days or nights in any 15 consecutive days or nights, or a total number of days exceeding 40 in any 6 consecutive months, then a set of enhanced mitigation measures will be discussed and agreed with the Local Authority. Temporary re-housing will be also considered through consultation with the Local Authority for specific locations where other mitigation measures do not provide sufficient attenuation to prevent sleep disturbance during activities in the night-time period (**D-NV-010** of the **REAC**, **Document reference: D.6.5.1**).

~~15.10.6.~~15.10.5. For the Operational Stage, this Chapter assumes that the noise levels of the equipment in each of the AGIs and BVSs will be limited to avoid the potential for adverse significant effects at the nearest noise sensitive receptors. Rating noise levels for normal mode of operation predicted at 1m from the façade of noise sensitive receptors as listed in **Table 15.22** and **Table 15.23** will not be exceeded (**D-NV-011** of the **REAC**, **Document reference: D.6.5.1**), the securing mechanism in relation to this is a Requirement of the **Draft DCO (Document Reference: D.3.1)**.

15.11. RESIDUAL EFFECTS

CONSTRUCTION STAGE

15.11.1. This section discusses the potential residual noise effects during the Construction Stage only.

15.11.2. Potential residual significant effects once mitigation has been applied have been identified and these are set out in **Table 15.2~~7~~9**. The table shows the number of receptors likely to experience a noise magnitude classified as either medium or high during the Construction Stage.

Table 15.29 - Number of Receptors Subject to Medium or High Daytime Noise Impact – with Secondary Mitigation ~~Number of Receptors Subject to Medium or High Daytime Noise Impact~~

Section	Medium	High
1	1	0
2	1	0
3	7	0
4	15	5

Section	Medium	High
5	12	0
6	1	0
7	0	0

15.11.3. ~~Predicted~~ Predicted noise levels are shown in **Figure 15.2 - Predicted Construction Noise Levels – Mitigated (Volume IV)**. Receptors identified in **Table 15.27**, particularly those within section 4 and section 5, have the potential to experience medium and high adverse noise impacts after secondary mitigation is implemented. Based on **Table 5.1** of **Chapter 5 EIA Methodology (Volume II)**, these are considered to be **moderate** and **major significant effects (significant)**. It has been assumed that daytime activities would exceed the duration criteria in **paragraph 15.5.56.**

Potential residual noise effects for evening and night-time, once mitigation has been applied, have been identified as either medium or high and these are set out in **Table 15.30** and **Table 15.31** below.

Table 15.30 - Number of Receptors Subject to Medium or High Evening Noise Impact – with Secondary Mitigation

Section	Medium	High
1	0	0
2	13	0
3	29	10
4	65	19
5	22	21
6	2	1
7	0	0

Table 15.31 - Number of Receptors Subject to Medium or High Night Noise Impact – with Secondary Mitigation

Section	Medium	High
1	0	0
2	13	0
3	34	78
4	94	84
5	59	50
6	2	6
7	0	0

15.11.4. The locations of the noise sensitive receptors in **Tables 15.31**,~~, Table~~ **15.32** and ~~**Table**~~ **15.33** are shown in **Figure 15-3 Magnitude of Construction Noise Impacts – Mitigated (Volume IV)**.

15.11.5. The numbers presented within **Table 15.30** and **Table 15.31** above relate to all trenchless crossings works. All other construction works associated with the DCO Proposed Development are expected to be active during daytime only.

Most of the noise sensitive receptors, shown in **Table 15.30** and **Table 15.31**, subject to an adverse noise effect during evening and night-time periods will be classified as not significant as generally these activities will not exceed the duration criteria in **paragraph 15.5.56**.

Noise sensitive receptors near the six trenchless crossing activities where continuous drilling activities will occur for up to four weeks are likely to experience a significant adverse noise effects as these activities will exceed the duration criteria in **paragraph 15.5.56**.

The number of noise sensitive receptors which have the potential to experience a significant adverse effect during evening and night-time due to trenchless crossing after secondary mitigation have been identified. The number of noise sensitive receptors subject to a significant adverse noise effect is provided in new **Table 15.32** and **Table 15.33** below.

Table 15.32 - Number of Receptors near the six trenchless crossing locations subject to a Significant Effect during Evening – with Secondary Mitigation

Section	Medium	High
1	0	0
2	0	0
3	0	0
4	33	12
5	7	0
6	0	0
7	0	0

Table 15.33 - Number of Receptors near the six trenchless crossing locations subject to a Significant Effect during Night – with Secondary Mitigation

Section	Medium	High
1	0	0
2	0	0
3	0	0
4	56	45
5	22	13
6	0	0
7	0	0

Results in **Table 15.32** and **Table 15.33** indicate that 52 and 136 noise sensitive receptors will experience a **significant effect (significant)** during evening and night-time, respectively.

The noise sensitive receptors subject to **significant effects (significant)** during evening and night-time are primarily located in **Section 4** and **Section 5.**~~noise levels are shown in **Figure 15.2 - Predicted Construction Noise Levels – Mitigated Daytime (Volume IV)**. Receptors identified in **Table 15-27**,~~

~~particularly those within section 4, have the potential to experience medium and high adverse noise impacts after secondary mitigation is implemented. The locations of these receptors are shown in **Figure 15.3 - Magnitude of Construction Noise Impacts – Mitigated Daytime (Volume IV)**. Based on **Table 5.1** of **Chapter 5 EIA Methodology (Volume II)**, these are considered to be ***moderate*** and ***major significant effects (significant)***. It has been assumed that daytime activities would exceed the duration criteria in **Section 15.5.**~~

~~It has been assumed that trenchless installation activities during the evening and night-time will not exceed the duration criteria in **paragraph 15.5.56** at the majority of crossing locations and therefore they are considered to be *not significant effects (not significant)*. Some sensitive receptors near crossings where the duration of the evening and night-time working is expected to exceed the criteria **paragraph 15.5.56** are likely to experience a ***moderate*** and ***major significant effect (significant)***. The number of receptors which have the potential to experience a medium or high magnitude of adverse noise impacts due to trenchless installation techniques after secondary mitigation have been identified. Quantification of this is provided in **Appendix 15.3 Noise and Vibration Assessment Results (Volume III)**. The number of receptors identified are considered worst case and are anticipated to be lower than reported.~~

~~15.11.3.~~15.11.6. There is a potential variation in the numbers of properties which could be impacted dependent on the final alignment of the Newbuild Carbon Dioxide Pipeline within the Permanent Acquisition of Subsurface Area. The final alignment of the Newbuild Carbon Dioxide Pipeline will be determined at Detailed Design. The potential variation in the number of properties due to extent of area within which the Detailed Design alignment of the Newbuild Carbon Dioxide Pipeline may be located is presented in **Appendix 15.3 Noise and Vibration Assessment Results (Volume III)**.

DECOMMISSIONING STAGE

~~15.11.4.~~15.11.7. Only one receptor near the AGIs and BVSs would potentially experience a significant adverse noise effect, with mitigation, as presented in **Appendix 15.3 Noise and Vibration Assessment Results (Volume III)**. This is considered to be ***moderate significant effect (significant)***. The receptor experiencing a significant effect is near the BVS proposed on Cornist Lane, south of Bryn Awel.

~~15.11.5.~~15.11.8. **Table 15.~~28~~34** below summarises the residual effects associated with the DCO Proposed Development during construction, operation and decommissioning.

Table 15.34 - Summary of Residual Effects

Description of the effect	Pre-mitigation significance of effects	Mitigation measure	Residual effect
Construction			
Likely noise effects arising from the DCO Proposed Development construction traffic	*Not significant*	None required	*Not significant*
Likely vibration effects arising from the DCO Proposed Development construction activities	*Not significant*	Best Practicable Means	*Not significant*
Likely noise effects arising from the DCO Proposed Development construction activities	***Significant***	Best Practicable Means. Temporary noise barriers, programme management of activities **(D-NV-005, D-NV-007, D-NV-008, D-NV-009 and D-NV-010** of the **REAC, Document Reference: D.6.5.1).** Details of mitigation measures will be confirmed in the Noise and Vibration Management Plan. This will be approved by the Local Authorities **(D-NV-001** of the **REAC, Document Reference: D.6.5.1).**	***Significant****, subject to the implementation of a Noise and Vibration Management Plan*

Description of the effect	Pre-mitigation significance of effects	Mitigation measure	Residual effect
Operation			
Likely noise effects arising from the DCO Proposed Development operation of the AGIs and BVSs	*Not significant*	No additional mitigation measures other than those considered as embedded mitigation. This will be confirmed in the Noise and Vibration Management Plan and approved by the Local Authorities (D-NV-001 of the REAC, Document Reference: D.6.5.1).	*Not significant, subject to the implementation of a Noise and Vibration Management Plan*
Decommissioning			
Likely noise effects arising from the DCO Proposed Development decommissioning traffic	*Not significant*	None required	*Not significant*
Likely vibration effects arising from the DCO Proposed Development decommissioning activities	*Not significant*	Best Practicable Means	*Not significant*

Description of the effect	Pre-mitigation significance of effects	Mitigation measure	Residual effect
Likely noise effects arising from the DCO Proposed Development decommissioning activities	Significant	Best Practicable Means. Temporary noise barriers, programme management of activities (D-NV-005, D-NV-007, D-NV-008, D-NV-009 and D-NV-010 of the REAC, Document Reference: D.6.5.1). Details of mitigation measures will be confirmed in the Noise and Vibration Management Plan. This will be approved by the Local Authorities (D-NV-001 of the REAC, Document Reference: D.6.5.1).	Significant, subject to the Noise and Vibration Management Plan

15.12. IN-COMBINATION CLIMATE CHANGE IMPACTS

15.12.1. The in-combination climate change impact assessment considers the extent to which climate change may alter the effects which have already been identified within this Chapter.

15.12.2. The effects that have been considered within this Chapter have been considered against likely climate hazards, as set out within **Chapter 7 Climate Resilience** (**Volume II**) and the effects identified are not anticipated to change as a result of these hazards.

15.13. MONITORING

15.13.1. Based on the conclusions in this Chapter, the following monitoring will be carried out:

- Noise and vibration monitoring during the Construction Stage at locations stipulated in the Noise and Vibration Management Plan as included as a Requirement of the **Draft DCO** (**Document Reference: D.3.1**). As part of the Plan, a set of representative monitoring locations will be agreed along with actions for the Construction Constructor when the likelihood of significant effect is triggered **(D-NV-013** of the **REAC, Document Reference: D.6.5.1).**

15.14. REFERENCES

Ref. 15.1 UK Government (1974) Control of Pollution Act 1974

Ref. 15.2 UK Government (2009) The Environmental Noise (Wales) (Amendment) Regulations 2009 https://www.legislation.gov.uk/wsi/2009/47/made

Ref. 15.3 UK Government (2018) The Environmental Noise (England) (Amendment) Regulations 2018 https://www.legislation.gov.uk/uksi/2018/1089/made

Ref. 15.4 Department of Energy and Climate Change (2011) Overarching National Policy Statement or Energy EN-1, 2011

Ref. 15.5 Ministry of Housing, Communities and Local Government (2021) National Planning Policy Framework

Ref. 15.6 National Planning Practice Guidance (Ministry of Housing, Communities and Local Government, 2019)

Ref. 15.7 Planning Policy Wales, Edition 11 (Welsh Government, 2021)

Ref. 15.8 Welsh Government (2018) Noise and Soundscape Action Plan, 2018-2023

Ref. 15.9 Welsh Government (1997) Technical Advice Note (TAN) 11: Noise, 1997

Ref. 15.10 Defra (2010) Noise Policy Statement for England

Ref. 15.11 Cheshire West and Chester Local Plan (adopted January 2015)

Ref. 15.12 Flintshire Unitary Development Plan 2000 – 2015 (Adopted 2011)

Ref. 15.13 Flintshire Local Development Plan 2015 - 2030 (draft September 2019)

Ref. 15.14 ISO 9613 (1996): Acoustics - Attenuation of sound during propagation outdoors - Part 2: General method of calculation

Ref. 15.15 BS 7445 (2003): Description and Measurement of Environmental Noise

Ref. 15.16 BS 4142 (2014) + A1 (2019): Methods for rating and assessing industrial and commercial sound

Ref. 15.17 BS 5228, Parts 1&2 (2009) + A1 (2014): Noise and Vibration Control on Construction and Open Sites

Ref. 15.18 BS 7385 (1993) Part 2: Evaluation and Measurement for Vibration in Buildings

Ref. 15.19 BS ISO 4866 (2010): Mechanical Vibration and Shock – vibration of fixed structures – Guidelines for the measurement of vibrations and evaluation of their effects on structures

Ref. 15.20 BS 8233:2014 Guidance on sound insulation and noise reduction for buildings.

Ref. 15.21 Highways England. (2020). Design Manual for Roads and Bridges (2020): LA111 Noise and Vibration.

Ref. 15.22 Department of Transport. (1988). Calculation of Road Traffic Noise.

Ref. 15.23 Advisory Council (1978). A guide to measurement and prediction of sound level L_{eq}

Ref. 15.24 DEFRA (2020) Noise Action Planning Important Areas Round 3 England https://data.gov.uk/dataset/948d6c4c-772e-4f55-9f39-97508e1cc701/noise-action-planning-important-areas-round-3-england

Ref. 15.25 Lle (2017) Environmental Noise Mapping 2017 https://lle.gov.wales/catalogue/item/EnvironmentalNoiseMapping2017/?lang=en

Ref. 15.26 European Commission (2002) Directive 2002/49/EC of the European Parliament relating to the assessment and management of environmental noise http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:32002L0049:en:NOT

Ref.15.27: Flintshire County Council. (2023). Flintshire Local Development Plan 2015–2030. Retrieved from: https://www.flintshire.gov.uk/en/Resident/Planning/Flintshire-Local-Development-Plan.aspx