Awel y Môr Offshore Wind Farm

Category 6: Environmental Statement

Volume 3, Chapter 10: Noise and Vibration

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Offshore Wind Farm

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Glossary of Terms

TERM	DEFINITION
Array	The area where the wind turbines will be located.
Order Limits	The area within which the development will be carried out including all works, access routes, TCCs and visibility splays.
Export Cable Corridor (ECC)	The area(s) where the export cables will be located connecting Landfall to the OnSS and the OnSS to the existing National Grid Bodelwyddan substation .
Maximum Design Scenario (MDS)	The maximum design parameters of the combined project assets that result in the greatest potential for change in relation to each impact assessed.
Mitigation	Mitigation measures are commitments made by the project to reduce and/ or eliminate the potential for significant effects to arise as a result of the project. Mitigation measures can be embedded (part of the project design) or secondarily added to reduce impacts through the assessment process.
Onshore Export Cable Corridor (onshore ECC)	The proposed cable route which represents a corridor, typically 40 m to 60 m wide, within which the cable trenching, haul road and stockpiling areas associated with cable construction, will be undertaken and the cables will be installed.
Onshore Substation (OnSS)	Where the power supplied from the wind farm is transformed to 400 kV and the power quality and power factor are adjusted as required to meet the UK System-Operator Transmission-Owner Code (STC) for supply to the National Grid OnSS.
PEIR	Preliminary Environmental Information Report. The PEIR was written in the style of a draft Environmental Statement (ES) and formed the basis of statutory consultation. Following that consultation, the PEIR documentation was updated into the final ES that

TERM	DEFINITION
	accompanies the applications for the Development Consent Order (DCO) and Marine Licence. .
Route section	A defined section of the route.
OnSS access zone	The area which contains the final OnSS access route(s) (both construction and operational) – The route(s) of the construction and operational accesses within the OnSS Access Zone will be confirmed following detailed design (post consent).
OnSS construction area	The area within which the OnSS construction would take place. This area incorporates both the OnSS Footprint and areas of cut and fill required to construct the OnSS platform.
OnSS Footprint	The footprint for the OnSS which would incorporate either Air Insulated Switchgear or Gas Insulated Switchgear technology.
OnSS Cable Corridor Zone	The area which will contain the final cable connection into and out of the OnSS. The route of the cable connections to the OnSS will be confirmed following detailed design (post consent). The cable route will be either east or west of the pond located immediately south of the OnSS.
The Applicant	Awel y Môr Offshore Wind Farm Limited.

Abbreviations and Acronyms

TERM	DEFINITION
AAWT	Annual Average Weekly Traffic
AIS	Air Insulated Switchgear
AQTAG09	Air Quality Technical Advisory Group 09
AyM	Awel y Môr Offshore Wind Farm
BNL	Basic Noise Level
BPM	Best Practicable Means
CCBC	Conwy County Borough Council
CoCP	Code of Construction Practice
CoPA	Control of Pollution Act 1974
CRTN	Calculation of Road Traffic Noise
DCC	Denbighshire County Council
DCO	Development Consent Order
DRMB	Design Manual for Roads and Bridges
EIA	Environmental Impact Assessment
EPA	The Environmental Protection Act 1990
ES	Environmental Statement (the documents that collate the processes and results of the EIA)
ETG	Expert Topic Group
GFPS	Gas Fired Power Station
GIS	Gas Insulated Switchgear
HDD	Horizontal Directional Drilling
HGV	Heavy Goods Vehicle

TERM	DEFINITION
IEMA	Institute of Environmental Management and Assessment
MDS	Maximum Design Scenario
MHWS	Mean High Water Springs
NPPF	The National Planning Policy Framework
NSPE	Noise Policy Statement for England
NSR	Noise Sensitive Receptor
NVMP	Noise and Vibration Management Plan
OL	Order Limits
PINS	The Planning Inspectorate
SAC	Special Area of Conservation
SPA	Special Protection Area
SWL	Sound Power Level
TAN 11	Technical Advice Note (Wales) 11
TCC	Temporary Construction Compound
TJB	Transition Joint Bay
UKAS	United Kingdom Accreditation Service
VSR	Vibration Sensitive Receptor

Units

UNIT	DEFINITION
Decibel (dB)	The scale on which sound pressure level is expressed. It is defined as 20 times the logarithm of the ratio between the root-mean-square pressure of the sound field and a reference pressure (2x10-5Pa).
dB(A)	A-weighted decibel. This is a measure of the overall level of sound across the audible spectrum with a frequency weighting (i.e. 'A' weighting) to compensate for the varying sensitivity of the human ear to sound at different frequencies
L_{Aeq}	LA_{eq} is defined as the notional steady sound level which, over a stated period of time, would contain the same amount of acoustical energy as the A - weighted fluctuating sound measured over that period.
L_{10} & L_{90}	If a non-steady noise is to be described, it is necessary to know both its level and the degree of fluctuation. The Ln indices are used for this purpose, and the term refers to the level exceeded for n% of the time. Hence L_{10} is the level exceeded for 10% of the time and as such can be regarded as the 'average maximum level'. Similarly, L_{90} is the 'average minimum level' and is often used to describe the background noise. It is common practice to use the L10 index to describe traffic noise.
L_{Amax}	L_{Amax} is the maximum A - weighted sound pressure level recorded over the period stated. L_{Amax} is sometimes used in assessing environmental noise where occasional loud noises occur, which may have little effect on the overall L_{eq} noise level but will still affect the noise environment. Unless described otherwise, it is measured using the 'fast' sound level meter response.
PPV	Peak Particle Velocity - Vibration is an oscillatory motion. The magnitude of vibration can be defined in terms of

UNIT	DEFINITION
	displacement (how far from the equilibrium position that something moves), velocity (how fast something moves), or acceleration (the rate of change of velocity). Standards for the assessment of building damage are usually given in terms of peak velocity (usually referred to as Peak Particle Velocity, or PPV) in mms-1.
Hr	Hour
Km	Kilometre
m	Metre
mm-1	Millimetres per second
MPH	Miles Per Hour
Km/h	Kilometres Per Hour
m/s	Metres per second

10 Noise and Vibration

10.1 Introduction

1 This chapter of the Environmental Statement (ES) considers the potential for the construction and operation of the onshore elements of the proposed Awel y Môr Offshore Wind Farm (AyM) impact upon the noise and vibration environment at the nearest sensitive receptors to the project. This chapter describes the scope, relevant legislation, assessment methodology, and the baseline conditions existing at the site and its surroundings. It considers any potential significant environmental effects the proposed development would have on this baseline environment; the mitigation measures required to prevent, reduce or offset any significant adverse effects; and the likely residual effects after these measures have been employed. Cumulative noise and/or vibration effects with other proposed developments that may also have an impact on the sensitive receptors close to the AyM are also considered.

2 The chapter is complemented with the following technical annexes:

- Volume 5, Annex 10.1: Calibration Certificates (application ref: 6.5.10.1).
- Volume 5, Annex 10.2: Survey Results (application ref: 6.5.10.2).
- Volume 5, Annex 10.3: Construction Plant (application ref: 6.5.10.3).
- Volume 5, Annex 10.4. Noise Model outputs (application ref: 6.5.10.4).

3 This chapter has been informed by the following ES chapters:

- Volume 3, Chapter 1: Onshore Project Description (application ref: 6.3.1)
- Volume 3, Chapter 9: Traffic and Transport (application ref: 6.3.9)

10.2 Statutory and policy context

10.2.1 Legislation

4 There are two legislative instruments which address the effects of environmental noise with regard to construction noise and vibration and nuisance. The Environmental Protection Act 1990 (EPA) and the Control of Pollution Act 1974 (CoPA).

5 The EPA provides a requirement for local authorities to investigate noise from industrial, trade or business premises, or vehicles, machinery or equipment in the street, and to determine if the noise is detrimental to health or constitutes a statutory nuisance. If the local authority determines that noise is detrimental to health or constitutes a statutory nuisance, the EPA gives the local authority the power to issue an abatement notice that requires the person responsible for producing the noise to prevent the noise from occurring (see Table 1 for the section in which these are considered further).

6 The CoPA provides two means of controlling construction noise and vibration. Section 60 provides local authority with the power to impose, at any time, operating conditions on the development site. Section 61 allows the developer to negotiate a set of operating procedures with local authority prior to commencement of site works (see Table 1 for the section in which these are considered further).

7 The assessment work completed in this Chapter will inform the Secretary of State (SoS) and DCC and CCBC as to benchmark baseline sound levels and construction sound levels which may be referred to in a Section 60 or 61 application.

10.2.2 Policy

8 Planning policy on offshore renewable energy Nationally Significant Infrastructure Projects (NSIPs) is provided by the National Policy Statements (NPSs) EN-1 '*Overarching National Policy Statement for Energy*' (Department of Energy and Climate Change (DECC) 2011a) and EN-3 'National Policy Statement for Renewable Energy Infrastructure' (DECC, 2011b) and 'National Policy Statement for Electricity Networks Infrastructure (EN-5) (2011c).

9 The NPS are a series of principal decision-making documents to appropriately assess Nationally Significant Infrastructure Projects (NSIP). As such, this assessment has made explicit reference to the relevant NPS requirements.

10 In addition to the current NPS, draft NPSs were consulted upon between September and November 2021. The draft NPSs have been reviewed to determine the emerging expectations and changes from previous iterations of the NPSs. This includes the Draft Overarching NPSs EN-1 (2021a), Draft EN-3 (2021b) and Draft EN-5 (2021c).

11 Details of the policies of relevance to this assessment are provided in Table 1 together with an indication of where each requirement is addressed.

12 Planning Policy Wales (PPW) (Edition 11) sets out the land use planning policies of the Welsh Government. It is supplemented by a series of Technical Advice Notes (TAN), Welsh Government Circulars, and policy clarification letters, which together with PPW provide the national planning policy framework for Wales.

13 The primary objective of PPW is to ensure that the planning system contributes towards the delivery of sustainable development and improves the social, economic, environmental and cultural well-being of Wales, as required by the Planning (Wales) Act 2015, the Well-being of Future Generations (Wales) Act 2015 and other key legislation.

14 Planning Guidance (Wales), Technical Advice Note (Wales) 11, Noise (TAN 11); *'provides advice on how the planning system can be used to minimise the adverse impact of noise without placing unreasonable restrictions on development or adding unduly to the costs and administrative burdens of business'.* TAN 11 provides general guidance with respect to matters to be taken into account in determining planning applications both for noise-sensitive developments and for those activities that will generate noise. However, the principal purpose of TAN 11 is to determine the suitability of land for residential development where land is affected by noise from transportation or industrial sources.

15 The Denbighshire County Council Local Development Plan (LDP) was adopted by Denbighshire County Council (DCC) in June 2013 and is supported by several adopted and draft Supplementary Planning Guidance (SPG) documents. Although the LDP does not contain a specific policy on noise, noise is references as consideration with regard to Policy RD 1 - Sustainable development and good standard design and in consideration of renewable energy technologies.

16 Each of the above policy guidance documents identify a number of issues relevant to this chapter as outlined in Table 1.

Table 1: Legislation and policy context.

LEGISLATION/ POLICY	KEY PROVISIONS	SECTION WHERE COMMENT ADDRESSED
EPA	Part III of the EPA provides powers for Local authorities to issue abatement notices where a statutory nuisance exists.	Statutory nuisance cannot be assessed at this stage of the development and therefore is not considered further in this Chapter. The control of significant effects would be expected to minimise the risk of nuisance.
CoPA	Sections 60 and 61 of Part III of the CoPA provide powers to Local authorities for controlling noise from construction activities.	Construction noise impacts are considered in Section 10.11
EN-1 Paragraph 5.11.4	The following should be included in the noise assessment: a description of the noise generating aspects of the proposal, including identification of the type of noise impacts; identification of the Noise Sensitive Receptors (NSRs); description of the existing noise environment; prediction of how the noise environment will be affected (during the	The assessment has considered all the aspects identified as shown in Sections 10.11 to 10.15

LEGISLATION/ POLICY	KEY PROVISIONS	SECTION WHERE COMMENT ADDRESSED
	construction and operational phases); and mitigation measures.	
EN-1 Paragraph 5.11.5	The noise impact of ancillary activities associated with the development, such as increased road and rail traffic movements, or other forms of transportation, should also be considered.	Sections 10.11.10 and 10.11.11 consider the noise impact of increased traffic levels on the local road network and the ORAR's.
EN-1 Paragraph 5.11.6	Operational noise, with respect to human receptors, should be assessed using the principles of the relevant British Standards and other guidance, for example BS4142. For the prediction, assessment and management of construction noise, reference should be made to any relevant British Standards and other guidance which also give examples of mitigation strategies, for example BS5228.	The assessment has been undertaken in accordance with the principles in the relevant British Standards as outlined in Section 10.3.

LEGISLATION/ POLICY	KEY PROVISIONS	SECTION WHERE COMMENT ADDRESSED
EN-1 Paragraph 5.11.7	The applicant should consult EA and Natural England (NE), or the Countryside Council for Wales (CCW), as necessary and in particular with regard to assessment of noise on protected species or other wildlife. The results of any noise surveys and predictions may inform the ecological assessment. The seasonality of potentially affected species in nearby sites may also need to be taken into account	Section 10.5.10 makes reference to the potential noise impacts on ecological receptors.
EN-1 Paragraph 5.11.8	The project should demonstrate good design through the selection of the quietest cost-effective plant available. Measures should be taken to minimise noise, such as landscaping, bunds or noise barriers.	The siting of the proposed OnSS has taken into account the locations of the nearest sensitive receptors. The measures adopted to avoid and mitigate effects are set out in Section 10.12.2. The operational and construction noise assessments have mitigated (see Sections 10.10 and 10.12.2)and reduced to a minimum the potential adverse impacts, so to avoid noise giving rise to significant adverse impacts on health and the quality

LEGISLATION/ POLICY	KEY PROVISIONS	SECTION WHERE COMMENT ADDRESSED
		of life as per the aims of the Noise Policy Statement for England (NPSE).
EN-1 Paragraph 5.11.9	The proposal should avoid and mitigate adverse impacts on health and quality of life from noise and if possible, contribute to improvements in the above.	The measures adopted to avoid and mitigate effects are set out in Sections 10.10 and 10.12.2.
Draft NPS EN-1 Paragraph 5.12.4	The following should be included in the noise assessment: a description of the noise generating aspects of the proposal, including identification of the type and temporal characteristics of noise impacts; identification of the NSRs; description of the existing noise environment; prediction of how the noise environment will be affected (during the construction and operational phases); and mitigation measures.	The assessment has considered all the aspects identified as shown in Sections 10.1 to 10.15.

LEGISLATION/ POLICY	KEY PROVISIONS	SECTION WHERE COMMENT ADDRESSED
Draft NPS EN-1 Paragraph 5.12.6	The noise impact of ancillary activities associated with the development, such as increased road and rail traffic movements, or other forms of transportation, should also be considered.	Sections 10.11.10 and 10.11.11 consider the noise impact of increased traffic levels on the local road network and the ORAR's.
Draft NPS EN-1 Paragraph 5.12.7	Operational noise, with respect to human receptors, should be assessed using the principles of the relevant British Standards and other guidance, for example BS4142. For the prediction, assessment and management of construction noise, reference should be made to any relevant British Standards and other guidance which also give examples of mitigation strategies, for example BS5228	The assessment has been undertaken in accordance with the principles in the relevant British Standards as outlined in Section 10.3.
EN-1 Paragraph 5.12.8	Notes that some noise impacts will be controlled through environmental permits and parallel tracking is encouraged where noise impacts determined by an environmental permit interface with planning issues (i.e. physical	Section 10.5.10 makes reference to the potential noise impacts on ecological receptors.

LEGISLATION/ POLICY	KEY PROVISIONS	SECTION WHERE COMMENT ADDRESSED
	design and location of development). The applicant should consult EA and Natural England (NE), or the Countryside Council for Wales (CCW), as necessary and in particular with regard to assessment of noise on protected species or other wildlife. The results of any noise surveys and predictions may inform the ecological assessment. The seasonality of potentially affected species in nearby sites may also need to be taken into account	
Draft NPS EN-1 Paragraph 5.12.9	The project should demonstrate good design through the selection of the quietest or most acceptable cost-effective plant available. Measures should be taken to minimise noise, such as landscaping, bunds or noise barriers. A development must be undertaken in accordance with statutory requirements for noise. Due regard must be given to the relevant sections of the Noise Policy Statement for	The siting of the proposed OnSS has taken into account the locations of the nearest sensitive receptors. The measures adopted to avoid and mitigate effects are set out in Section10.10. The operational and construction noise assessments have mitigated (see Section 10.11 and 10.12)and reduced to a minimum the potential adverse impacts, so to avoid noise giving rise to significant adverse impacts on health and the quality of life as

LEGISLATION/ POLICY	KEY PROVISIONS	SECTION WHERE COMMENT ADDRESSED
	England, the NPPF, and the government's associated planning guidance on noise.	per the aims of the Noise Policy Statement for England (NPSE). The assessments have been undertaken in conjunction with the relevant planning guidance on noise as outlined in Section 10.3.
Draft NPS EN-1 Paragraph 5.12.10	The proposal should avoid and mitigate adverse impacts on health and quality of life from noise and if possible, contribute to improvements in the above.	The measures adopted to avoid and mitigate effects are set out in Section 10.10.
EN-3 Paragraph 2.7.54	The ES should include a noise assessment as set out in Section 5.11 of EN-1. However, the noise created by wind turbines in operation is related to wind speed and is different to general industrial noise and an additional assessment of this noise should be made.	The assessment has considered all the aspects identified as shown in Sections 10.3 to 10.16. Consideration of noise created by wind turbines is provided in Section 10.5.2
EN-3 Paragraph 2.7.56	The applicant's assessment of noise from the operation of the wind turbines should use ETSU-R-97, taking account of the latest industry good	Section 10.5.2 considers the noise created by wind turbines with reference to ETSU-R-97.

LEGISLATION/ POLICY	KEY PROVISIONS	SECTION WHERE COMMENT ADDRESSED
	practice. This should include any guidance on best practice that the Government may from time to time publish.	
Draft NPS EN-3, Paragraph 2.20.4	The extent to which generic impacts set out in EN-1 are relevant may depend upon the phase of the proposed development being considered. For example, land-based traffic and transport and noise issues may be relevant during the construction and decommissioning periods only, depending upon the specific proposal	The assessment has considered all the aspects identified as shown in Sections 10.3 to 10.16.
Planning Policy Wales Paragraph 5.9.20	Planning authorities should also identify and require suitable ways to avoid, mitigate or compensate adverse impacts of renewable and low carbon energy development. The construction, operation, decommissioning, remediation and aftercare of proposals should take into account:	The assessment has considered the impact of construction and operational noise on both human and ecological receptors, as shown in Sections 10.3 to 10.16. The assessment has considered the cumulative noise impact of other proposed developments in the area, as shown in Section 10.14.

LEGISLATION/ POLICY	KEY PROVISIONS	SECTION WHERE COMMENT ADDRESSED
	▲ the need to minimise impacts on local communities, such as from noise and air pollution, to safeguard quality of life for existing and future generations; ▲ the impact on the natural and historic environment; ▲ cumulative impact; and ▲ the capacity of, and effects on, the transportation network.	The assessment has considered the potential noise effects of construction related traffic on the road network, as shown in Section 10.11.10.
TAN 11	TAN 11 cites the use of BS 4142 to assess noise from industrial and commercial developments and BS5228 for assessing noise and vibration from construction sites.	The operational and construction noise assessments have been undertaken in accordance with the latest versions of BS4142 and BS5228, as shown in Section 10.3.
DCC Local Development Plan Policy VOE 10	Development proposals which promote the provision of renewable energy technologies may be supported providing they are located so as to minimise visual, noise and amenity impacts and demonstrate no unacceptable impact upon the interests of nature conservation, wildlife, natural and cultural	The construction and operational noise assessments have considered the impacts on both human and ecological receptors, as shown in Sections 10.11and 10.12.

LEGISLATION/ POLICY	KEY PROVISIONS	SECTION WHERE COMMENT ADDRESSED
	heritage, landscape, public health and residential amenity.	

10.3 Standards and Guidance

17 A summary of the relevant British Standards and guidance utilised within this Chapter is given below.

10.3.1 British Standards 5228:2009 + A1:2014 Part 1: Noise

18 The impact of construction noise from both onshore and offshore sources, arising from AyM, upon residential receptors will be determined with reference to BS5228:2009+A1:2014 Part 1.

19 BS5228-1:2009+A1:2014 *Code of practice for noise and vibration control on construction and open sites – Part 1: Noise,* sets out a methodology for predicting noise levels arising from a wide variety of construction and related activities and contains tables of sound power levels generated by a wide variety of mobile and fixed plant equipment.

20 Compliance with BS5228-1:2009+A1:2014 is expected as a minimum standard when assessing the impact of construction noise upon the existing noise environment at nearby sensitive receptors.

21 Noise levels generated by construction operations and experienced at local receptors will depend upon a number of variables, the most significant of which are likely to be:

- the amount of noise generated by plant and equipment being used at the development site, generally expressed as a sound power level;
- the periods of operation of the plant at the development site, known as the "*on-time*";
- the distance between the noise source and the receptor, known as the "*stand-off*";
- the attenuation due to ground absorption or barrier screening effects; and
- reflections of noise due to the presence of hard vertical faces such as walls.

22 BS5228-1:2009+A1:2014 gives several examples of acceptable noise limits for construction or demolition noise. For this assessment, as baseline noise data is available, it is proposed that the ABC method will be used to determine the threshold value at the receptor locations.

23 Under the ABC method, a threshold value noise level is determined by establishing the existing ambient noise level at each location. This measured ambient noise level is then rounded to the nearest whole 5 dB(A) and the threshold noise value for each receptor is then established from Table E.1 of BS5228-1:2009+A1:2014. This threshold value is the $L_{Aeq,T}$ noise level that should not be exceeded at the receptor location by operations at the site.

24 If the threshold value is exceeded, then the effect of construction noise upon nearby receptors may be significant. BS5228-1:2009+A1:2014 states that the significance of the effect will depend upon *"other project-specific factors, such as the number of receptors affected and the duration and character of the impact."* Professional judgement will be used to determine whether an effect is considered to be significant, and commentary explaining the reasons for this judgement will be provided. In accordance with this method, the threshold noise levels for a potentially significant effect are as detailed in Table 2.

Table 2: Construction noise residential receptors – example threshold values.

ASSESSMENT CATEGORY AND THRESHOLD VALUE PERIOD (LAEQ)	THRESHOLD VALUE, IN DECIBELS (DB)		
	CATEGORY A A)	CATEGORY B B)	CATEGORY C C)
Night-time (23.00-07.00)	45	50	55
Evenings and weekends (Note D below)	55	60	65
Daytime (07.00-19.00) and Saturdays (07.00-13.00)	65	70	75

ASSESSMENT CATEGORY AND THRESHOLD VALUE PERIOD (LAEQ)	THRESHOLD VALUE, IN DECIBELS (DB)		
	CATEGORY A A)	CATEGORY B B)	CATEGORY C C)

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 the 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 the ambient noise levels (when rounded to the nearest 5 dB) are higher than category A values.

D) 19.01-23.00 weekdays, 13.01-23.00 Saturdays and 07.01-23.00 Sundays.

25 Note that the targets in Table 2 above are considered to be noise level limits externally at the closest noise sensitive window. They are not considered as internal noise targets within the relevant building.

10.3.2 British Standard 5228:2009 + A1:2014 Part 2: Vibration

26 The impact of construction vibration from onshore sources, arising from AyM, upon residential receptors will be determined with reference to BS5228:2009+A1:2014 Part 2.

27 BS5228:2009+A1:2014 *Code of practice for noise and vibration control on construction and open sites – Part 2: Vibration* gives recommendations for basic methods of vibration control relating to construction and open sites where work activities/ operations generate significant vibration levels.

28 The majority of people are known to be very sensitive to vibration, the threshold of perception being typically in the peak particle velocity (PPV) range of between 0.14 mms-1 and 0.30 mms-1. Vibration levels above these values can cause disturbance. BS5228-2:2009+A1:2014 provides guidance on the effects of vibration shown in Table 3.

Table 3: Risk of complaints from vibration levels.

VIBRATION LEVEL, MMS^{-1}	EFFECT
0.14	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.
0.30	Vibration might be just perceptible in residential environments.
1.00	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.
10.00	Vibration is likely to be intolerable for any more than a very brief exposure to this level.

29 High vibration levels generally arise from 'heavy' construction works such as piling, deep excavation, dynamic ground compaction or drilling.

30 Annex E of BS 5228-2:2009+A1:2014 contains empirical formulae derived by Hiller and Crabb (2000) from field measurements relating to resultant peak particle velocity (PPV), with a number of other parameters for vibratory compaction, dynamic compaction, percussive and vibratory piling, the vibration of stone columns and tunnel boring operations. These prediction equations are based on the energy approach. Use of these empirical formulae enables resultant PPV to be predicted and for some activities (vibratory compaction, vibratory piling and vibrated stone columns) they can provide an indicator of the probability of these levels of PPV being exceeded.

31 The empirical equations for predicting construction-related vibration provide estimates in terms of PPV. Therefore, the consequences of predicted levels in terms of human perception and disturbance can be established through direct comparison with the BS 5228-2:2009+1A:2014 guidance vibration levels shown in Table 3.

10.3.3 BS4142:2014+A1:2019

32 The impact of operational noise from the OnSS on residential receptors will be determined with reference to BS4142:2014+A1:2019.

33 BS4142:2014+A1:2019 *Methods for rating and assessing industrial and commercial soun*d is intended to be used to assess the potential adverse impact of sound, of an industrial and/ or commercial nature, at nearby sensitive receptor locations within the context of the existing sound environment.

34 Where the specific sound contains tonality, impulsivity and/ or other sound characteristics, corrections should be applied depending on the perceptibility. For tonality, a correction of either 0, 2, 4 or 6 dB should be added; for impulsivity, a correction of either 0, 3, 6 or 9 dB should be added and if the sound contains specific sound features which are neither tonal nor impulsive a penalty of 3 dB should be added.

35 In addition, if the sound contains identifiable operational and non-operational periods that are readily distinguishable against the existing sound environment, a further correction of 3 dB may be applied.

36 The assessment of impacts contained in BS4142:2014+A1:2019 is undertaken by comparing the sound rating level, i.e. the specific sound level of the source plus any character corrections, to the measured representative background sound level immediately outside the sensitive receptor location. Consideration is then given to the context of the existing sound environment at the sensitive receptor location to assess the potential impact.

37 Once an initial estimate of the impact is determined, by subtracting the measured background sound level from the rating sound level, BS4142:2014+A1:2019 states that the following should be considered:

- typically, the greater the 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. It is an indication that the specific sound source has a low impact when the rating level does not exceed the background sound level, depending on the context.

38 BS4142:2014+A1:2019 notes that:

"Those that result from additive impacts caused by other past, present or reasonably foreseeable actions together with the plan, programme or project itself and synergistic effects (in combination) which arise from the reaction between impacts of a development plan, programme or project on different aspects of the environment."

39 BS4142:2014+A1:2019 outlines guidance for the consideration of the context of the potential impact, including consideration of the existing residual sound levels, location and/ or absolute sound levels.

10.3.4 World Health Organisation

40 The World Health Organisation 2018 Environmental Noise Guidelines for the European Region, published in 2018, do not cover industrial noise. However, the previous 1999 Community Noise Guidelines remain valid for industrial noise, i.e. "*… all CNG indoor guideline values and any values not covered by the current guidelines (such as industrial noise and shopping areas) should remain valid*".

41 The 1999 guidelines are therefore still valid when referring to external daytime (07:00 – 23:00) ambient noise level limits, with an upper limit of 55 dB $L_{Aeq,16hour}$ considered acceptable. External night-time (2300 – 0700) level of 45 dB $L_{Aeq,8hour}$ is when sleep disturbance, with windows open, starts to occur.

42 The 2018 guidelines also "complement" the WHO Night Noise Guidelines from 2009.

43 The WHO Night Noise Guidelines 2009 define effect thresholds or '*lowest observed adverse health effect levels*' for both immediate physiological reactions during sleep and long-term adverse health effects. The Guidelines state:

- An $L_{night,outside}$ level of less than 30 dB(A): No effects expected to occur.
- An $L_{night,outside}$ level of 40 dB(A): Adverse effects start to occur. $L_{night,outside}$ 40 dB is equivalent to the lowest observed adverse effect level (LOAEL) for night noise.
- An $L_{night,outside}$ level of 55 dB(A): Adverse effects such as sleep disturbance are likely and occur frequently.

10.3.5 Guidelines for Environmental Noise Impact Assessment

44 The Institute of Environmental Management and Assessment (IEMA) '*Guidelines for Environmental Noise Impact Assessment*', Version 1.2 published in November 2014, addresses the key principles of a noise impact assessment and are applicable to *"all development proposals where noise effects are likely to occur" and "are relevant to all types of projects, regardless of size"*.

45 The guidelines provide specific support on how noise impact assessments fit within the Environmental Impact Assessment (EIA) process but can also apply to developments which do not require an EIA. They cover:

- how to scope a noise assessment;
- issues to be considered when defining the baseline noise environment;
- prediction of changes in noise levels as a result of implementing development proposals; and
- definition and evaluation of the significance of the effect of changes in noise levels.

10.3.6 Calculation of Road Traffic Noise

46 The former Department of Transport and Welsh Office memorandum *Calculation of Road Traffic Noise* (CRTN) published in 1988 sets out standard methods and procedures to predict and measure road traffic noise. These procedures were primarily intended to enable entitlement under the Noise Insulation Regulations 1975 to be determined, but they also provide guidance appropriate to the calculation of traffic noise for more general applications, for example the haul route under assessment in this Chapter.

47 Road traffic noise is predicted and measured in terms of a statistical measure. Termed the L_{A10}, this measure of noise is equivalent to the noise level exceeded for 10% of the measurement period. Most legislation that refers to road traffic noise uses this noise index over an 18-hour period, from 06:00 hours to 00:00 hours.

48 However, in the assessment of AyM, the methodology presented in CRTN cannot be used, as the standard states that the calculation algorithms presented in the guidance are not reliable when traffic flows are less than 50 movements per hour.

49 Therefore, the haul route methodology presented in BS5228-1:2009+A1:2014 will be used when predicting noise levels from construction traffic associated with the development proposals.

10.3.7 ETSU-R-97

50 ETSU-R-97 sets out the findings of the Working Group on Noise from Wind Turbines, which was set up in 1993 by the (former) Department of Trade and Industry (DTI) to consider the available methods of noise assessment for wind farms and to derive a method and criteria suitable for future assessments.

51 For the purpose of this assessment the operational noise from the Array will be undertaken in conjunction with the 'simplified' assessment presented within ETSU-R-97 (page 66), whereby if an appropriate fixed noise limit can be achieved regardless of the wind speed, then this is considered sufficient for the protection of residential amenity without the measurement of background noise levels. In this regard, ETSU-R-97 states the following:

"If the developer can demonstrate that noise conditions would be met even if there was no increase in background noise with speed until quite high wind speeds, then a simplified approach can be adopted. We are of the opinion that if the noise is limited to an $L_{A90,10min}$ of 35 dB up to wind speeds of 10 m/s at 10 height, then this condition alone would offer sufficient protection of amenity and background noise surveys would be unnecessary. We feel that, even in sheltered areas when the wind speed exceeds 10 m/s on the wind farm site, some additional background noise will be generated which will increase background noise levels at the property."

52 All noise limits in ETSU-R-97 are expressed in terms of a 10-minute L_{A90} noise level. This approach has been adopted to avoid extraneous transitory events unduly affecting the noise generated by wind farms when attempting to measure their noise emission level.

10.3.8 Institute of Acoustics' Good Practice Guide to ETSU-R-97

53 The Institute of Acoustics (IoA) Good Practice Guide (GPG) does not replace the limits within ETSU-R-97, but it does provide good practice guidance on the use of the ETSU document in relation to background noise surveys and on the prediction of wind turbine noise. This is on the proviso that the appropriate input parameters and correction factors are used for the prediction of wind turbine noise.

54 However, the GPG states the guidance does not cover long-distance propagation over sea as will be relevant to offshore wind farms.

55 Predictions undertaken in accordance with the ISO9613-2 methodology would underpredict wind turbine noise due to multiple reflections which occur over large distances and over reflective surfaces such as water. This phenomenon is often termed cylindrical spreading.

10.4 Consultation and scoping

56 Consultation with regards to the scope of the noise and vibration assessment to date was outlined within the Scoping Report (Innogy, 2020) and has been undertaken through the AyM Evidence Plan (Noise and Vibration Expert Topic Group (ETG)) process, comprising discussion with Denbighshire County Council (DCC) and Conwy County Borough Council (CCBC).

57 A Scoping Opinion for AyM was sought from the Secretary of State (SoS), this included responses to the proposed assessment methodology for further consideration.

58 In addition, a Scoping document (Scoping Noise Assessment for Onshore Development) was submitted to the Environmental Health Department of both DCC and CCBC in March 2021. Following a review of this document, an ETG was held with both DCC and CCBC on 31 March 2021.

59 AyM statutory consultation, under Section 42 of the Planning Act 2008, ran from 31 August to 11 October 2021, a period of six weeks. A Preliminary Environmental Information Report (PEIR) was published as part of formal consultation which provided preliminary information on Noise within Volume 3, Chapter 10: Airborne Noise and Vibration.

60 Further statutory consultation was undertaken in February 2022 on areas where the Order Limits (OL) extend beyond those included in the PEIR that were consulted on in Autumn 2021.

61 Following a review of the Airborne Noise and Vibration PIER chapter (Volume 3, Chapter 10) further feedback was provided by a number of stakeholders within their Section 42 responses.

62 Based on CCBC's feedback further consultations were made with the principal Environmental Health Officer (EHO) at CCBC, via emails and telephone conversations in December 2021 and January 2022 and an agreement was made on the methodologies for further baseline monitoring at the nearest NSRs to the Array.

63 Table 4 provides a summary of consultation comments received to date relating to Noise and Vibration, and associated responses.

Table 4: Summary of consultation relating to noise and vibration.

DATE AND CONSULTATION PHASE/ TYPE	CONSULTATION AND KEY ISSUES RAISED	SECTION WHERE COMMENT ADDRESSED
SoS Scoping Opinion, July 2020	Not enough evidence has been provided regarding the proposal to scope out an operational vibration assessment of the OnSS. Therefore, this should be included within the ES.	Section 10.12.5 provides further evidence to justify the reasons why an operational vibration assessment of the OnSS has not been undertaken.
SoS Scoping Opinion, July 2020	An operational noise and vibration assessment of the underground cable can be scoped out.	Operational assessment of the underground cable has not been included within this chapter.
SoS Scoping Opinion, July 2020	The ES should explain how the cumulative assessment has identified those projects or activities which overlap with the zone of influence of the Proposed Development and how all potential contributions have been considered.	Section 10.14 describes the cumulative assessment including how the projects/ activities which have influence on the AyM have been identified.
ETG meeting with DCC and CCBC on 31 March 2021	DCC requested that baseline noise monitoring Location C1 should be representative of the residential buildings	Table 56 describes the baseline monitoring positions along the onshore ECC and shows that Location C1 was

DATE AND CONSULTATION PHASE/ TYPE	CONSULTATION AND KEY ISSUES RAISED	SECTION WHERE COMMENT ADDRESSED
	(Rhydwen Farm Mews) of the south of the New Pines Holiday Home Park.	representative of both the holiday park and Rhydwen Farm Mews.
	DCC requested that 1/3 octave band data should be utilised for the operational noise assessment of the OnSS.	1/3 octave band data will not be available until detailed design (post-consent), consequently tonal penalties have been applied to the predicted specific noise levels from the OnSS as described in Section 10.12.
	CCBC requested that the offshore piling operations associated with the Array are considered within the construction noise assessment.	Section 10.11.8 assesses the noise impact of offshore pilling operations.
Section 42 Response from DCC, October 2021	DCC has concerns the construction phase has the potential to generate adverse noise and vibration with HDD a particular concern, particularly at the landfall which is in close proximity to residential areas.	An outline Noise and Vibration Management Plan (NVMP) is provided as Appendix 2 to the Code of Construction Practice (COCP) (application ref: 8.13.2) and sets out the noise and environment management techniques which may (subject to the final design of the

DATE AND CONSULTATION PHASE/ TYPE	CONSULTATION AND KEY ISSUES RAISED	SECTION WHERE COMMENT ADDRESSED
	DCC requested that the noise and vibration needs to be fully assessed and abatement plans must be included in the Code of Construction Practice, which should be devised in consultation with the Council's Public Protection department.	proposed project) be implemented by the Applicant and its contractors during the construction of the onshore works. The outline NVMP sets out the key elements that will be secured in the detailed NVMP which the Applicant will be required to submit to DCC the relevant planning authority for approval as a requirement of the Development Consent Order (DCO)
	The Council do not agree to the working hours of 7am -7pm in locations close to residential properties, and working hours should instead be restricted to 8am – 6pm where working areas are close to residential receptors, with no working on Sundays or Bank Holidays. Where exceptional circumstances require construction works to be carried out outside of approved hours of operational,	The construction working hours of 7am - 7pm have been used as part of the Maximum Design Scenario for the assessment of construction impacts, such as construction noise, within the ES. The final construction working hours are fixed within the DCO. Amendments to working hours in specific locations could be agreed with DCC through agreement of the final Code of Construction Practice

DATE AND CONSULTATION PHASE/ TYPE	CONSULTATION AND KEY ISSUES RAISED	SECTION WHERE COMMENT ADDRESSED
	this should be agreed in writing by the local planning authority at least 48 hours in advance and such provision should be embedded in the Requirements.	(CoCP), that would need to be approved by DCC in advance of construction works commencing.
Section 42 Response from DCC, October 2021	The Council also consider community engagement should be a priority throughout the construction phase. A communications plan should be required to be submitted as part of the Code of Construction Practice, which should set out a protocol for communicating with affected local communities throughout the construction phase, including proposals to notify affected residents in advance of noise / vibration generating works commencing, and a complaints management and resolution procedure should be established. A single point of contact should be provided for the local	An outline Construction Communications Plan has been provided as Appendix 12 to the outline CoCP (application ref: 8.13.12).

DATE AND CONSULTATION PHASE/ TYPE	CONSULTATION AND KEY ISSUES RAISED	SECTION WHERE COMMENT ADDRESSED
	community to contact throughout the construction phase.	
Section 42 Response from DCC, October 2021	In terms of operational noise from the OnSS, the noise levels at the closest noise sensitive receptors need to be clearly assessed, and maximum noise levels needs to be clearly defined and embedded in requirements.	The potential impact of operational noise arising from the OnSS is assessed in Section 10.12. A defined noise rating level limit arising from the OnSS is also specified within the DCO Requirements.
Section 44 Response from Glyndwr Innovations Limited, October 2021	Glyndwr Innovations Limited ("GIL") has significant concerns regarding the potential detrimental impact that prolonged, groundborne, low frequency (sub-micron level) vibrations arising from any subsequent onshore development, including that pertaining to the proposed OnSS and cable corridor within close proximity of their building. The building is highly sensitive to vibration levels due to the fact they produce high-	Section 10.11.9 Provides details of vibration limits, considerations and further actions to taken regarding vibration being generated during construction operations. Discussion with Glyndwr University confirmed that concerns were primarily regarding vibration associated with construction. Engagement with the University also highlighted the importance of early communication with users of St

DATE AND CONSULTATION PHASE/ TYPE	CONSULTATION AND KEY ISSUES RAISED	SECTION WHERE COMMENT ADDRESSED
	level opto-electronics and precision optical systems which utilises metrology and relies heavily on vibration-sensitive machinery. GIL have requested that that the above be taken into consideration as part of the consultation process.	Asaph Business Park (SABP) regarding the scheduling construction activity. Subsequent to engagement with the University in October 2021, the decision was made to select the westernmost crossing of the A55, which would place HDD (or other trenchless technology techniques), equipment further to the west and away from the SABP. In addition, an outline construction communications plan has been included within Appendix 12 of the outline CoCP (application ref: 8.13.12), through which RWE would provide early notice of indicative construction programmes near SABP to allow early scheduling of vibration sensitive activities. Regular updates will be provided to SABP users of the timing and type of construction activities in the vicinity during the construction period.

DATE AND CONSULTATION PHASE/ TYPE	CONSULTATION AND KEY ISSUES RAISED	SECTION WHERE COMMENT ADDRESSED
Section 42 Response from CBCC	CBCC have stated concern that the draft Requirement lacks clarity in respect of the maximum noise levels arising from WTG construction, the periods during which they would apply, and the location of the measurements. Furthermore, the draft Requirement does not require the developer to carry out monitoring either proactively or in response to complaints, and does not specify a reporting procedure for monitoring activities. CBCC also strongly recommend that, should consent be granted, the developer/contractor provides and advertises contact details so that members of the public could approach them directly to discuss concerns or issues they might experience during the construction phase.	Section 10.8.5 describes the additional baseline noise monitoring that has been carried out in response to the feedback from CBCC and the associated noise limits during different weather conditions for NSR in Conwy area. Section 10.11.9 sets out the WTG piling assessment against the specified limits The wording of the DCO, has been in line with the response provided by CBCC.

DATE AND CONSULTATION PHASE/ TYPE	CONSULTATION AND KEY ISSUES RAISED	SECTION WHERE COMMENT ADDRESSED
Telephone and email communications with the environmental health department of CBCC, December 2021 and January 2022	Conversations and clarifications of additional monitoring to be undertaken in conjunction with their Section 42 comments.	Section 10.8.5 describes the additional monitoring which was undertaken.

10.5 Scope and methodology

10.5.1 Study area

64 The study area for the noise and vibration assessments has been divided into four separate areas:

- the Array;
- the landfall;
- the export cable corridor (onshore ECC); and
- the OnSS.

10.5.2 The Array

65 AyM will comprise of up to 50 Wind Turbine Generators (WTGs) and will include infrastructure that is required to transmit the power generated at the turbines to the offshore substation via inter-Array cables, before then being transmitted via export cables to the existing National Grid Bodelwyddan onshore substation. AyM will also comprise infrastructure required for the operation and maintenance of the wind farm for both offshore and onshore components.

66 The nearest turbine associated with the Array is located approximately 10.6 km from Penrhyn Bay in Conwy, therefore the noise and vibration study area for the Array extends from Penrhyn Bay to the nearest turbine locations.

67 As detailed in Section 10.3.8, noise predictions for operational offshore wind turbines falls outside the scope of the IoA GPG due to the large separation distances across reflective surfaces resulting in cylindrical spreading.

68 Predictions of operational noise from the array have therefore been undertaken in accordance with the propagation models presented in the Danish regulations[i] which include a correction for multiple reflections.

[i] Statutory Order on Noise from Wind Turbines: Statutory Order no.1284 of 15. December 2011 (in Danish)

69 A paper was presented at the 9th International Conference on Wind Turbine Noise titled '*Long distance noise propagation over water for an elevated height-adjustable sound source*' which concluded that the Danish method better captures the effect of possible multiple reflections.

70 The propagation model can be summed as:

$$LpA = L_{WA,ref} - 10\log_{10}[l^2 + h^2] - 11 + \Delta L_g - \Delta L_a + \Delta L_m$$

Where:

l is the distance from the base of the turbine to the calculation point

11 dB correction for distance 10 * log 4π

ΔL_g is correction for terrain (1.5 dB for onshore turbines and 3 dB for offshore turbines)

ΔL_a is air absorption

ΔL_m is correction for multiple reflections

71 The exact model of turbine to be used at the site will be the result of a future tendering process and therefore an indicative candidate turbine model has been assumed for this noise assessment. This operational noise assessment is based upon the noise specification of the GE Haliade-X wind turbine.

72 The candidate turbine is a variable speed, pitch regulated machine with a rotor diameter of 220 m. Due to its variable speed operation the sound power output of the candidate turbine varies with wind speed, being quieter at the lower wind speeds when the blades are rotating more slowly.

73 Calculations have been performed for the two indicative WTG scenarios that are under consideration in the EIA:

- **Larger WTG:** The largest WTGs within the design envelope. For the purposes of assessment this is assumed to be up to 34 of the largest possible WTGs with a Rotor Diameter (RD) of up to 306 m and a hub-height of 179 m; and

- **Smaller WTG:** The greatest number of WTGs within the design envelope. For the purposes of assessment this is assumed to be up to 50 smaller WTGs with a RD of up to 250 m and a hub-height of 157 m.

74 GE have supplied noise emission data for the Haliade-X turbine, a further correction factor of +2 dB has been added to account for uncertainty. The sound power data has been supplied for hub height wind speeds of 4 ms^{-1} to 15 ms^{-1}. The corresponding wind speeds v_{10m} at 10 m height above ground level have been derived assuming a logarithmic wind profile, as follows:

$$v_{10m} = v_{HH} \frac{\ln\left({10m}/{z_{0,ref}}\right)}{\ln\left({hub\ height}/{z_{0,ref}}\right)}$$

75 Where:

v_{10m} is the standardised 10 m wind speed

v_{HH} is the wind speed at hub height

$z_{0,ref}$ is the reference surface roughness according to IEC 61400-11 of 0.05 m

76 In addition, octave band data for the turbine has been provided for a wind speed corresponding to the loudest condition. Table 5 and Table 6 present these data, including uncertainty.

Table 5: Wind Turbine Sound Power Level.

STANDARDISED WIND SPEED (MS^{-1})	SOUND POWER LEVEL DB L_{AEQ}	
	HUB = 157 M	HUB = 179 M
4	107.3	107.6
5	112.0	112.4
6	115.9	116.0

STANDARDISED WIND SPEED (MS^{-1})	SOUND POWER LEVEL DB L_{AEQ}	
	HUB = 157 M	HUB = 179 M
7	117.0	117.0
8 +	117.0	117.0

Table 6: Wind Turbine Octave Band Sound Power Spectrum at Max SWL.

OCTAVE BAND CENTRE FREQUENCY (HZ)	SOUND POWER LEVEL DB(A)
63	96.3
125	101.9
250	107.9
500	112.1
1000	112.6
2000	108.3
4000	98.7
8000	77.0

77 Table 7 shows predicted noise emission levels at the closest point of land at Little Ormes Head (281942, 382901). All wind farm noise emission levels are presented in terms of the $L_{A90,T}$ noise indicator in accordance with the recommendations of the ETSU-R-97 report, obtained by subtracting 2 dB(A) from the calculated $L_{Aeq,T}$ noise levels based on the turbine sound power levels presented in Table 5 and Table 6. Two scenarios are presented, the potential 50 turbine array with a hub height of 157 m and the potential 34 turbine array with a hub height of 179 m.

Table 7: Wind Turbine Noise Immission Level.

STANDARDISED WIND SPEED (MS^{-1})	WIND TURBINE NOISE IMMISSION LEVEL DB L_{A90}	
	50 TURBINE ARRAY HUB = 157 M	**34 TURBINE ARRAY HUB = 179 M**
4	18.2	16.3
5	23.0	21.1
6	26.8	24.7
7	27.9	25.7
8 +	27.9	25.7

78 It can be seen from Table 7 that the absolute lower fixed limits set by ETSU-R-97 of 35 dB L_{A90} at the closest receptor to the development, i.e. the simplified assessment limit as detailed in ETSU-R-97, would not be exceeded. Therefore, the consideration of operational noise from the wind turbines is not considered further in this assessment.

10.5.3 At Landfall

79 The landfall denotes the location where the offshore export cables are brought ashore and jointed to the onshore export cables in the Transition Joint Bays (TJB). There is a clear overlap in the offshore and onshore study area at the intertidal area of the landfall, as described in the onshore project description (Volume 3, Chapter 1: Onshore Project Description (application ref: 6.3.1)).

80 The noise and vibration study area for the landfall extends from the Mean High Water Spring (MHWS) to an area approximately 400 m to the south of the North Wales Coast Line railway in a north/south direction, and from the residential properties located on Garford Road to the residential properties located on Ffordd Idwal in an east/west direction as shown in Figure 2.

10.5.4 Export cable corridor

81 The onshore ECC shall operate at a voltage of up to 400 kV and connects the landfall to the OnSS (located to the west of SABP), where the power quality and power factor are adjusted as required to meet the System-Operator Transmission-Owner Code. There will also be an onwards link from the OnSS to the National Grid Bodelwyddan Substation. The onshore ECC will have a length of approximately 12 km and will require the use of trenchless crossing techniques such as Horizontal Directional Drilling (HDD).

82 The noise and vibration study area for the onshore ECC extends from an area approximately 100 m south of the landfall HDD compound to the northern boundary of the OnSS. A second study area for the onshore ECC extends from the southern boundary of the OnSS to the National Grid Bodelwyddan substation and shown in Figure 3.

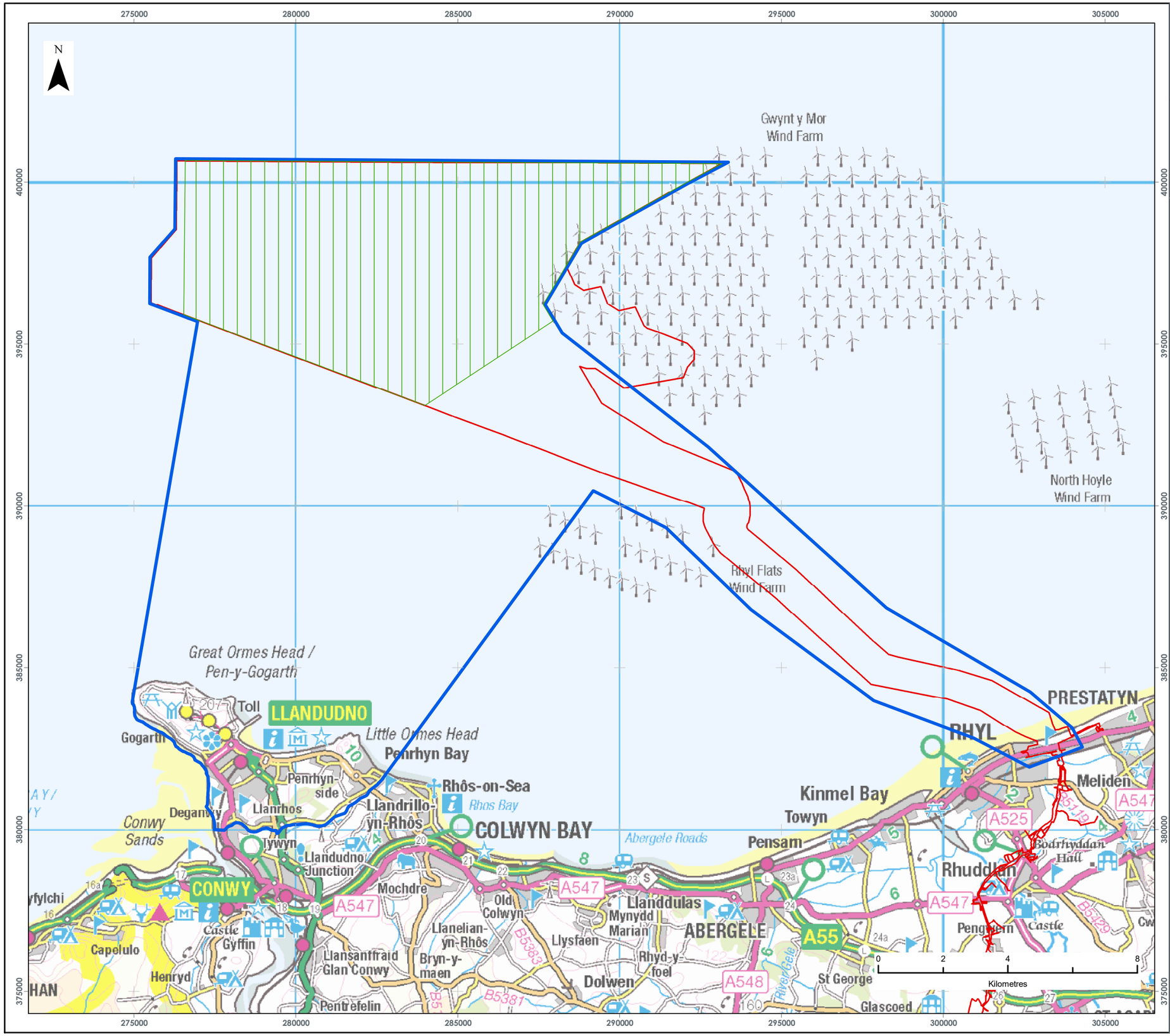
83 The study area for the onshore ECC includes the nearest noise-sensitive receptors to east and west of the onshore ECC; at their closest approach these are located approximately 10 m from the onshore ECC. The study area includes noise-sensitive receptors up to approximately 315m from the onshore ECC.

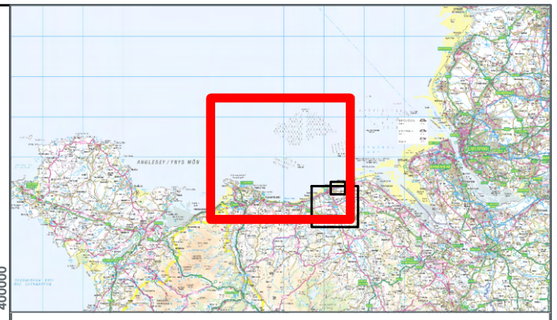
84 The study area for the onshore ECC also includes the locations of the Temporary Construction Compounds (TCCs) and the potential HDD (or other trenchless crossing technique) compounds.

10.5.5 OnSS

85 One OnSS will be required for AyM and will be sited to the west of SABP in order to facilitate ease of connection with the National Grid (to the south of SABP).

86 The noise and vibration study area of the OnSS extends to the nearest noise and vibration sensitive receptors to the north, south, east and west of the OnSS; at their furthest extents, these are located approximately 1 km from the OnSS as shown in Figure 3.





LEGEND

- Order Limits
- Proposed Turbine Array Area
- Array Noise Assessment Study Area

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PROJECT TITLE:

AWEL Y MÔR OFFSHORE WINDFARM

FIGURE TITLE:

STUDY AREA FOR THE ARRAY

VER	DATE	REMARKS	Drawn	Checked
1	26/02/2022	ES Issue	JRS	MF

FIGURE NUMBER:

FIGURE 1

SCALE:	PLOT SIZE:	DATUM:	COORDINATE SYSTEM:
1:120,000	A3	ODN	British National Grid

Fferm Wynt Alltraeth
AWEL Y MÔR
Offshore Wind Farm

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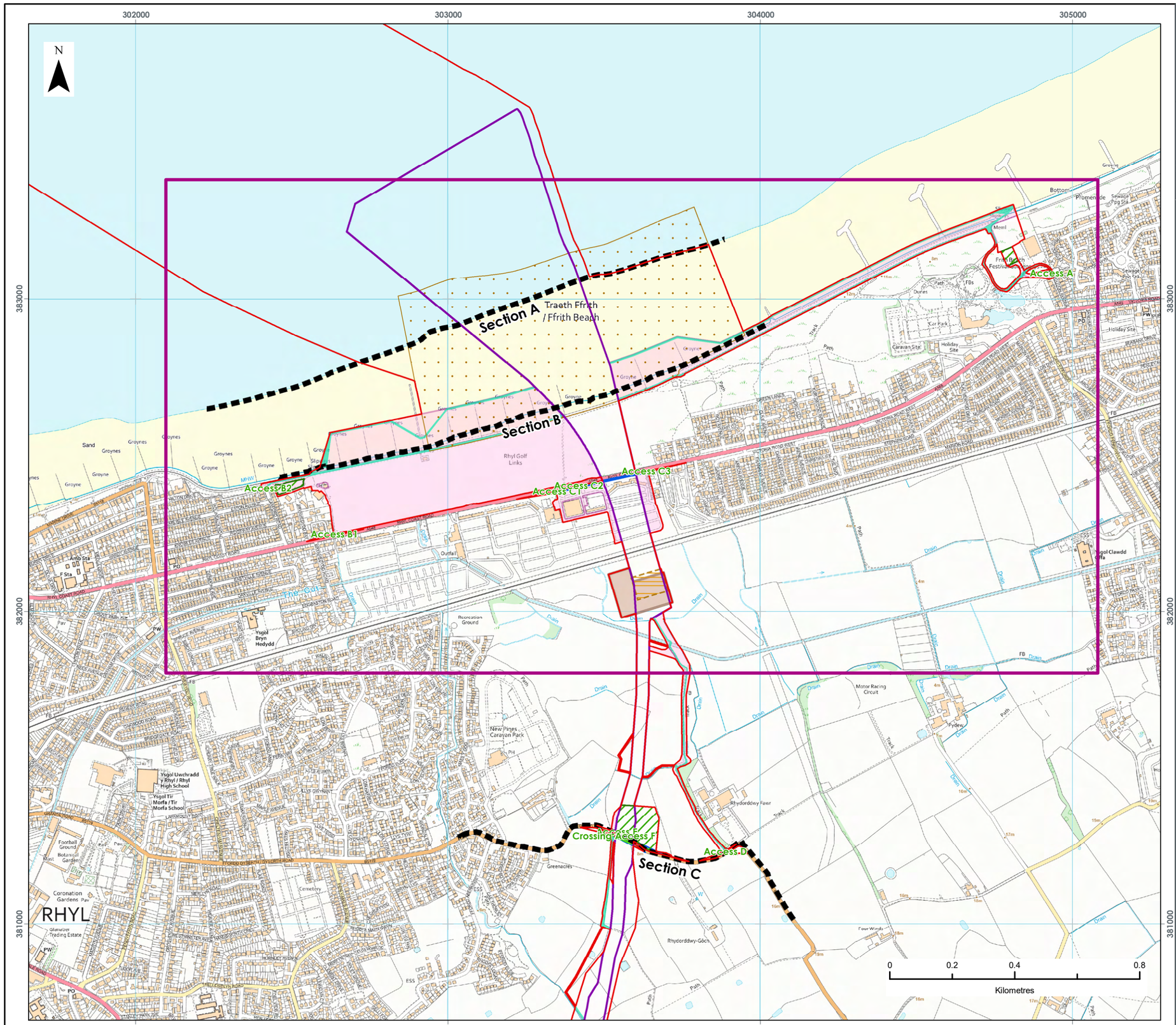

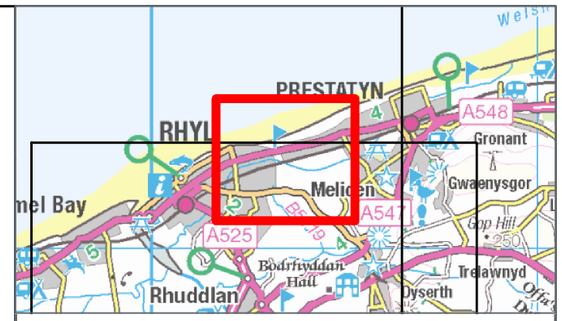

LEGEND

- Order Limits
- Onshore Cable Route Section Breaks
- Proposed Onshore Export Cable Corridor
- Proposed Indicative Trenchless Crossing Compound
- Proposed Temporary Construction Compound
- Proposed Transition Joint Bay Construction Compound
- Proposed Access Location
- Proposed Crossing Location
- Proposed Operational Access Route
- Proposed Construction Access Area
- Anchoring Zone
- Proposed Major Road Crossing Visibility Splay
- Landfall Noise Assessment Study Area

Data Source:
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PROJECT TITLE:

AWEL Y MÔR OFFSHORE WINDFARM

FIGURE TITLE:

STUDY AREA FOR THE LANDFALL

VER	DATE	REMARKS	Drawn	Checked
1	26/02/2022	ES Issue	JRS	MF

FIGURE NUMBER:

FIGURE 2
Page 2 of 3

SCALE:	PLOT SIZE:	DATUM:	COORDINATE SYSTEM:
1:12,500	A3	ODN	British National Grid

Fferm Wynt Alltraeth
AWEL Y MÔR
Offshore Wind Farm

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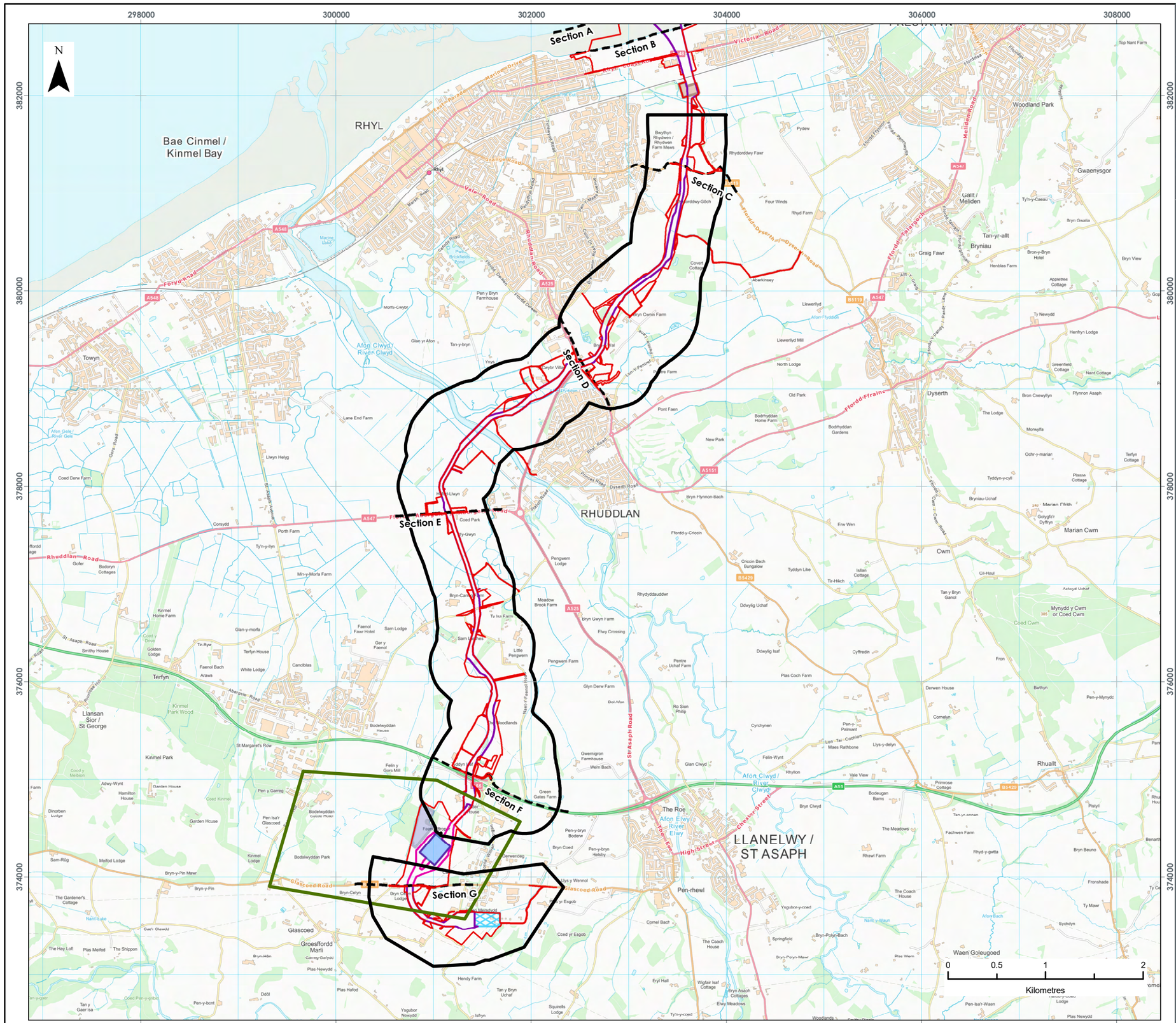

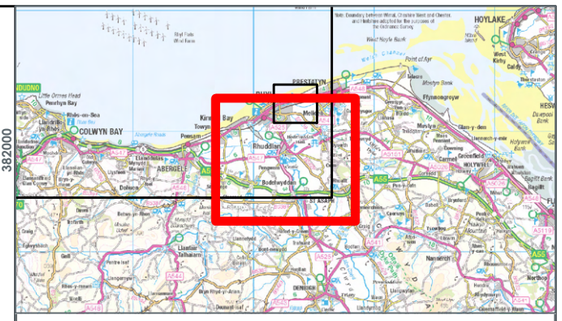

LEGEND

- Order Limits
- Onshore Cable Route Section Breaks
- Proposed Onshore Export Cable Corridor
- Proposed Substation Cable Corridor Zone
- Proposed Transition Joint Bay Construction Compound
- Unlicenced Work Zone
- Proposed Onshore Substation (OnSS) Footprint
- Proposed Substation Indicative Temporary Construction Compound Area
- Export Cable Corridor Noise Assessment Study Area
- Substation Noise Assessment Study Area

PROJECT TITLE:

AWEL Y MÔR OFFSHORE WINDFARM

FIGURE TITLE:

STUDY AREA FOR THE ECC AND SUBSTATION

VER	DATE	REMARKS	Drawn	Checked
1	26/02/2022	ES Issue	JRS	MF

FIGURE NUMBER:

FIGURE 3
Page 3 of 3

SCALE:	PLOT SIZE:	DATUM:	COORDINATE SYSTEM:
1:40,000	A3	ODN	British National Grid

Fferm Wynt Alltraeth
AWEL Y MÔR
Offshore Wind Farm

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10.5.6 Baseline data collection

87 It was agreed with DCC that to establish the existing noise environment, baseline sound surveys would be undertaken at the nearest noise-sensitive receptors to the Landfall, onshore ECC and OnSS over representative daytime and night-time periods. Further information on the baseline noise survey is provided in Section 10.8.

88 Owing to COVID lockdown the baseline noise levels that have been recorded to inform this assessment may be quieter than outside periods of lockdown. The baseline sound levels were measured during a period when the Covid-19 pandemic was still having an impact on road, rail and aircraft traffic flows, therefore it is considered that when traffic flows return to a 'normal' situation there is potential for the baseline sound levels to increase.

89 Further to the above, following the Section 42 response from CBCC a further baseline sound survey was undertaken at locations representative of the noise-sensitive receptors to the (revised) Array in January 2022, these locations were agreed with the environmental health department of CBCC. Further information on this baseline sound survey is also provided in Section 10.8.

10.5.7 Assessment methodologies

90 The Noise and Vibration assessment methodologies were discussed with DCC and CCBC during the ETG meeting on 31 March 2021 and relevant email communications and conversations in December 2021 and January 2022, and the assessment methodologies, set out in the following sections, have been agreed.

10.5.8 Construction noise and vibration assessments

91 Construction noise and vibration assessments have been undertaken for the landfall area, the cable route, OnSS and piling operations associated with the Array. The assessments have been undertaken in conjunction with BS5228:2009+A1:2014, *Code of Practice for Noise and Vibration Control on Construction and Open Sites Part 1 Noise and Part 2 Vibration*.

92 Construction noise limits have been set at the identified NSRs in conjunction with the measured baseline levels and the ABC Method contained in BS5228:2009+A1:2014.

93 Construction noise levels have been predicted at the identified NSRs using the Cadna/A noise modelling software and the calculation algorithms contained in BS5228:2009+A1:2014, Part 1 and assessed against the specified limits.

94 The assessment includes consideration of noise from the construction activities, including the use of plant and machinery, construction delivery traffic and excavation works at each of the landfall, OnSS and landfall areas. In addition, drilling activities at landfall and construction of the OnSS have been included.

95 Construction related traffic using the local road network have been assessed accordance with the *Design Manual for Roads and Bridges (DMRB)*. The assessment undertaken includes all roads where it is anticipated that noise levels may change from construction traffic.

96 For each link, the Basic Noise Level (BNL) has been established for the "*With Construction Traffic*" and "*Without Construction Traffic*" scenarios. The BNL is the $L_{A10, T}$ dB noise level at 10 m from the kerb of the road assessed.

97 The BNL results for each link have been tabulated and the impact and significance would be determined.

98 It is noted that DMRB has since been superseded by *LA 111 – Noise and* Vibration; however, as the calculations associated with the assessment are being undertaken in conjunction with CRTN and the impact significance contained within LA 111 is identical to the one contained within DMRB, this method remains valid.

99 Where adverse impacts have been identified, specific mitigation measures, a suite of measures, or further design refinement have been proposed for consideration. The design refinement and/or mitigation options will be applied to reduce any adverse impact to a level that is not significant.

10.5.9 Operational noise

100 Noise generated by the OnSS has been predicted at the nearest residential NSRs using the Cadna/A noise modelling software and the methodology in ISO 9613-2:1996, *Acoustics – Attenuation of Sound during Propagation Outdoors*, and assessed at any identified residential receptors in accordance with BS4142:2014+A1:2019 (*Methods for Rating and Assessing Industrial and Commercial Sound*), whereby sound levels associated with the operation of the OnSS are compared to measured daytime and night-time background and, where applicable, the absolute sound levels at the closest receptors.

101 A subjective opinion of the potential acoustic features has also been included, and this considers corrections for tonal, impulsive and/ or intermittent characteristics.

102 The results of the assessment have been used to determine whether noise levels generated by the operation of the OnSS would lead to adverse impacts at the nearest NSRs.

103 With regards to any identified commercial receptors, noise levels from the OnSS have been predicted at the nearest NSRs using the Cadna/A noise modelling software and the methodology in ISO 9613-2:1996, *Acoustics – Attenuation of Sound during Propagation Outdoors*, and assessed at any identified commercial receptors in accordance with The Institute of Environmental Management and Assessment (IEMA) '*Guidelines for Environmental Noise Impact Assessment*'.

104 The assessments indicate whether additional mitigation is required to reduce any identified impacts. As with construction noise, where adverse impacts have been identified, specific mitigation measures are detailed. It is expected that design refinement and/or mitigation options can be applied to the design presented within the ES to reduce the impact to a level that is not significant.

10.5.10 Assessment of Ecological receptors

105 It has been determined that, with the exception of the landfall area, there are no International or National ecological sites situated near to the identified cable route and the nearest ecological receptor to the OnSS is a SAC (Coedwigoedd Dyffryn Elwy / Elwy Valley Woods) located approximately 1.5 km to the south. Consequently, it is considered that an assessment of noise impacts upon ecological receptors is not required for the cable route or OnSS.

106 A SPA (Liverpool Bay / Bae Lerpwl (Wales)) for birds has been identified to the north of the beach area. The impact upon the SPA is considered in the Report to Inform Appropriate Assessment (application Ref: 5.2).

10.5.11 Cumulative impact assessment

107 The impact of the construction operations associated with the landfall and cable route and the construction and operation of the OnSS are assessed cumulatively with any other planned developments in the vicinity.

10.6 Assessment criteria, assignment of significance and magnitude

108 The criteria for the construction and operational noise and vibration assessments and the associated assignment of significance is outlined in the Table 8 to Table 15.

10.6.1 Sensitivity of the environment

109 The sensitivity/ importance of the environment is defined in Table 8. The sensitivity/importance of the receptor is a major consideration within the assessment and will be used to inform the significance of effect, as shown in Table 15.

Table 8: Sensitivity/ importance of the environment.

RECEPTOR SENSITIVITY/ IMPORTANCE	DESCRIPTION/ REASON
High	Residential properties (night-time), schools and healthcare building (daytime).
Medium	Residential properties (daytime), leisure facilities, SAC, SPA, SSSI (or similar areas of special interest).
Low	Offices and other non-noise producing employment areas.
Negligible	Industrial areas.

10.6.2 Overall impact magnitude

110 The overall magnitude of impact is defined in Table 9. The impact magnitude categories outlined below will be used to inform the significance of effect, as shown in Table 15.

Table 9: Overall impact magnitude definitions and effects.

IMPACT MAGNITUDE	EFFECT
High	Fundamental, permanent/ irreversible changes over the whole receptor, and/ or fundamental alteration to key characteristics or features of the particular receptors character or distinctiveness.
Medium	Considerable, permanent/ irreversible changes over the majority of the receptor, and/ or discernible alteration to key characteristics or features of the particular receptors character or distinctiveness.
Low	Discernible, temporary (throughout project duration) change over a minority of the receptor, and/ or limited but

IMPACT MAGNITUDE	EFFECT
	discernible alteration to key characteristics or features of the particular receptors character or distinctiveness.
Negligible	Discernible, temporary (for part of the project duration) change, or barely discernible change for any length of time, over a small area of the receptor, and/ or slight alteration to key characteristics or features of the particular receptor's character or distinctiveness.

10.6.3 Construction noise impact magnitude

111 The impact of construction noise upon existing residential receptors will be determined with reference to the ABC method presented in BS5228-1:2009+A1:2014. The impact of construction noise upon existing residential receptors is as detailed in Table 10.

Table 10 : Construction noise impact magnitude.

IMPACT MAGNITUDE	EXCEEDANCE IN THE $L_{AEQ,T}$ NOISE LEVEL
High	Threshold value exceeded by 5 dB or more.
Medium	Threshold value exceeded by a maximum of 4 dB.
Low	Threshold value exceeded by a maximum of 2 dB.
Negligible	Threshold value not exceeded.

10.6.4 Construction traffic noise impact magnitude

112 The impact of the change in noise level will be determined with reference to the classification of magnitude of impacts used in short-term traffic noise assessments presented in the DMRB Volume 11 Section 3 Part 7 Noise and Vibration and is shown in Table 11.

Table 11 : Construction traffic noise impact magnitude.

IMPACT MAGNITUDE	DESCRIPTION
High	Change in $L_{A10,18hr}$ noise level of 5 dB or more.
Medium	Change in $L_{A10,18hr}$ noise level between 3.0 and 4.9 dB.
Low	Change in $L_{A10,18hr}$ noise level between 0.1 and 2.9 dB.
Negligible	No change in $L_{A10,18hr}$ noise level.

10.6.5 Construction vibration impact magnitude

113 The impact of construction vibration upon existing residential receptors will be determined with reference to BS5228-2:2009+A1:2014. The impact of construction vibration upon residential receptors is as detailed in Table 12.

Table 12: Construction vibration impact magnitude.

IMPACT MAGNITUDE	PREDICTED PPV LEVEL MMS^{-1}
High	10.0 mms^{-1} or more
Medium	Between 1.0 to 9.9 mms^{-1}
Low	Between 0.3 to 0.9 mms^{-1}
Negligible	Between 0.01 and 0.3 mms^{-1}

10.6.6 Operational noise impact magnitude

Residential receptors

114 The impact of operational noise from the OnSS upon existing residential receptors will be determined with reference to BS4142:2014+A1:2019 and absolute noise levels recommended by the World Health Organisation

115 Based on the guidance presented in BS4142:2014+A1:2019, and absolute noise levels recommended by the World Health Organisation, the impact of operational noise upon existing residential receptors is detailed in Table 13.

Table 13: Operational noise impact magnitude – residential receptors.

IMPACT MAGNITUDE	DESCRIPTION
High	Rating level is 10 dB(A) or more above the background sound level, or change in ambient noise level (L_{Aeq}) of 10 dB or more.
Medium	Rating level is between 6 and 9 dB(A) above the background sound level, or change in ambient noise level (L_{Aeq}) of between 6 and 9 dB.
Low	Rating level is between 1 and 5 dB(A) above the background sound level, or change in ambient noise level (L_{Aeq}) of between 1 and 5 dB.
Negligible	Rating level is equal to or below the background sound level, or no change in ambient noise level (L_{Aeq}).

Commercial receptors impact magnitude

116 The impact of operational noise from the OnSS upon existing commercial receptors will be determined with reference to the IEMA guidelines.

117 Based on Table 7-10 within the guidelines, the impact of operational noise upon existing commercial receptors is detailed in Table 14.

Table 14: Operational noise impact magnitude – commercial receptors.

IMPACT MAGNITUDE	DESCRIPTION
High	Change in ambient sound level ($L_{Aeq,T}$) of 10 dB or more.
Medium	Change in ambient sound level ($L_{Aeq,T}$) between 5.0 and 9.9 dB.
Low	Change in ambient sound level ($L_{Aeq,T}$) between 3 and 4.9 dB.
Negligible	No change in ambient sound level ($L_{Aeq,T}$) of 2.9 dB or less

10.6.7 Significance of effect

118 Sensitivity of the receptor and magnitude of impact have then been considered collectively to determine the potential effect and its significance. The collective assessment represents a 'considered assessment' by the assessor, based on the likely sensitivity of the receptor to the change (e.g. is a receptor present which would be affected by the change), and then the magnitude of that change.

119 Table 15 is used as a guide to determine the level of effect; **major** and **moderate** effects are considered to be 'significant' in terms of the Infrastructure Planning (Environmental Impact Assessment) Regulations 2017 (EIA Regulations);

120 It is considered that the AyM would not lead to any beneficial noise and vibration effects; therefore, this has not been considered within Table 15.

121 Assessment of the level of effect is qualitative and reliant on professional experience, interpretation and judgement. The matrix should therefore be viewed as a framework to aid understanding of how a judgement has been reached, rather than as a prescriptive, formulaic tool.

122 In addition, based on professional judgement, it is considered that, for the construction phase, operational phase and decommissioning phase, short-term is defined as less than one-month, medium-term is defined as one month to two years, and long-term is defined as greater than three years.

Table 15: Matrix to determine effect significance.

		RECEPTOR SENSITIVITY			
		HIGH	MEDIUM	LOW	NEGLIGIBLE
ADVERSE IMPACT MAGNITUDE	HIGH	Major	Major	Moderate	Minor
	MEDIUM	Major	Moderate	Minor	Negligible
	LOW	Moderate	Minor	Minor	Negligible
	NEGLIGIBLE	Minor	Minor	Negligible	Negligible

Note: Effects of 'moderate' significance or greater are defined as significant with regards to the EIA Regulations 2017[ii]

[ii] The Infrastructure Planning (Environmental Impact Assessment) Regulations 2017.

10.7 Uncertainty and technical difficulties encountered

123 The main uncertainties and technical difficulties encountered during the completion of the noise and vibration assessment are outlined below. For the purposes of this chapter, they have been divided into:

- Baseline Survey; and
- Construction Noise and Vibration Assessment.

10.7.1 Baseline survey

124 As advised in BS 4142:2014+A1:2019, areas of uncertainty associated with measurements of sound include:

- the complexity and level of variability of the residual acoustic environment;
- the location(s) selected for taking the measurements;
- the distance between sources of sound and the measurement location and intervening ground conditions;
- the number of measurements taken;
- the measurement time intervals;
- the range of times when the measurements have been taken;
- the range of suitable weather conditions during which measurements have been taken;
- the measurement method and variability between different practitioners in the way the method is applied;
- the level of rounding of each measurement recorded; and
- the instrumentation used.

125 With reference to the above, the measurement uncertainty was minimised during the baseline sound survey as follows:

- baseline sound measurements were taken at positions representative of the noise-sensitive receptors to the landfall, cable route, OnSS and array;
- the measurement positions were located away from reflecting surfaces and as far as reasonably practicable leafy vegetation;

- the long-term measurements included daytime and night-time periods for typical midweek and weekend periods;
- the short-term daytime measurements were only completed at the receptors which are not going to be impacted by night-time operations;
- appropriate weather websites were consulted for the duration of the survey in April 2021 so any unsuitable weather conditions could be identified and these periods excluded from the monitoring results;
- a weather station was installed at one of the monitoring locations for the entirety of the baseline survey undertaken in January 2022 so the prevailing weather conditions could be determined and help inform the assessment;
- the instrumentation was suitable according to BS EN 61672-1; and
- *As noted earlier, d*ue to COVID lockdown the baseline noise levels may be quieter, however, as the construction threshold limits would then be lower, this is robust.

10.7.2 Construction noise and vibration assessment

126 Construction noise and vibration predictions are based on the anticipated programme and construction methods. It has been necessary to make assumptions with the advice of the design team regarding some aspects of the construction process. These are considered to be precautionary and reflect the level of information that is typically available at this stage in the development of the proposed development noting that only indicative equipment layouts were available to inform assessment. Further information on the anticipated construction programme is provided in Volume 3, Chapter 1: onshore Project Description (application ref: 6.3.1).

10.8 Existing environment

127 The existing baseline sound environment has been determined with baseline sound surveys which were undertaken in April 2021 and January 2022. The survey methodologies and a summary of the results are outlined below.

128 The baseline sound levels were measured during April 2021 were in a period when the Covid-19 pandemic was still having an impact on road, rail and aircraft traffic flows, therefore it is considered that when traffic flows return to a 'normal' situation there is potential for these baseline sound levels to increase.

129 For the purposes of this chapter, the baseline environment has been divided into four separate areas:

- the Landfall;
- the Export Cable Corridor (onshore ECC);
- the OnSS; and
- the Array.

10.8.1 Weather conditions

130 Baseline sound measurements were completed at the nearest noise-sensitive receptors to the landfall, onshore ECC and OnSS between 8 – 20 April 2021, as described in Sections 10.8.2 to 10.8.4. As described in this section, the surveys consisted of both unattended and attended measurements.

131 During this period, the weather conditions within the study area, were settled with no precipitation and low wind speeds predominately below 5 m/s, therefore it is considered that the prevailing weather conditions were suitable throughout the survey period.

132 To support the above, the *timeanddate.com* weather website was consulted for the survey period between 8 – 20 April 2021 for the town of Rhyl.

133 With reference to the above, a summary of the weather conditions during the survey period can be seen in Table 16.

Table 16: Summary of weather conditions – April 2021.

DATE	AVERAGE TEMPERATURE °C	PRECIPITATION MM	AVERAGE WIND SPEED	PREDOMINANT WIND DIRECTION
08 April 2021	9.5°C	0.0	11.7 mph	SW
09 April 2021	6.5°C	0.0	7.8 mph	W
10 April 2021	3.5°C	0.0	4.8 mph	NW
11 April 2021	4.0°C	0.0	6.0 mph	SW
12 April 2021	6.0°C	0.0	6.5 mph	SW
13 April 2021	9.5°C	0.0	5.5 mph	SW
14 April 2021	10.5°C	0.0	6.5 mph	SW
15 April 2021	11°C	0.0	5.5 mph	SE
16 April 2021	10.5°C	0.0	6.0 mph	S
17 April 2021	12°C	0.0	5.5 mph	S
18 April 2021	11°C	0.0	5.0 mph	N
19 April 2021	14°C	0.0	5.5 mph	S
20 April 2021	11.5°C	0.0	6.0 mph	NW

134 It is considered that the weather conditions shown in Table 16 were suitable for undertaking baseline sound measurements throughout the survey period.

135 Baseline sound measurements were completed at the nearest noise-sensitive receptors to the Array between 7 – 11 January 2022, as described in 10.8.5. As described in this section, this survey consisted of unattended measurements. These measurement locations were agreed with CBCC.

136 During this period the prevailing weather conditions were recorded using a Larson Davis weather station and are shown in Table 17, the table also indicates which weather conditions were considered inclement, this is based on the fact that noise monitoring should not be undertaken if wind speeds are above 5 m/s (11mph) or during periods of precipitation.

137 The weather station was installed at Location A1 as shown on Figure 11.

Table 17: Summary of Weather Conditions – January 2022.

DATE	PERIOD	AVERAGE TEMPERATURE OC	PRECIPITATION MM	MAX WIND SPEED	PREDOMINANT WIND DIRECTION	CONSIDERED INCLEMENT
07 January 2022	Daytime	5.7	0.3	12.8 mph	WNW	Yes
	Evening	5.6	0.0	12.5 mph	WNW	Yes
	Night-time	8.1	0.5	10.0 mph	WNW	No
08 January 2022	Daytime	8.4	8.1	21.9 mph	WNW	Yes
	Evening	6.3	0.0	14.1 mph	WNW	Yes
	Night-time	5.8	0.0	15.0 mph	WNW	Yes
09 January 2022	Daytime	7.2	0.3	15.0 mph	WNW	Yes
	Evening	8.0	0.0	6.9 mph	WNW	No
	Night-time	7.9	0.0	6.0 mph	WNW	No

DATE	PERIOD	AVERAGE TEMPERATURE OC	PRECIPITATION MM	MAX WIND SPEED	PREDOMINANT WIND DIRECTION	CONSIDERED INCLEMENT
10 January 2022	Daytime	10.3	0.0	6.9 mph	WNW	No
	Evening	10.7	1.0	6.0 mph	WNW	No
	Night-time	8.7	0.8	6.0 mph	WNW	No
11 January 2022	Daytime	6.4	0.0	13 mph	WNW	Yes

138 It can be seen from Table 17 that there were a number of periods of inclement weather during the monitoring period. Generally, these conditions would be considered unsuitable for undertaking baseline sound measurements. However, the measured sound levels will be to determine suitable noise limits for the construction of the array during a variety of weather conditions and not just when the weather conditions are dry and calm. It is envisaged that this approach will help inform relevant planning conditions for the construction of the array, it also should be noted that this approach has been undertaken in conjunction with CBCC's Section 42 response.

10.8.2 Landfall

139 The local environment in the vicinity of the landfall can be characterised as a suburban environment between the towns of Rhyl and Prestatyn.

140 The Rhyl Golf Club is located directly to the south of the landfall location and the Robin Hood Holiday camp is located between the golf club and a railway. The main noise sources in the area are road traffic noise from the Rhyl Coast Road and the noise of trains using the railway line located directly to the south of the Robin Hood Holiday camp.

Monitoring locations

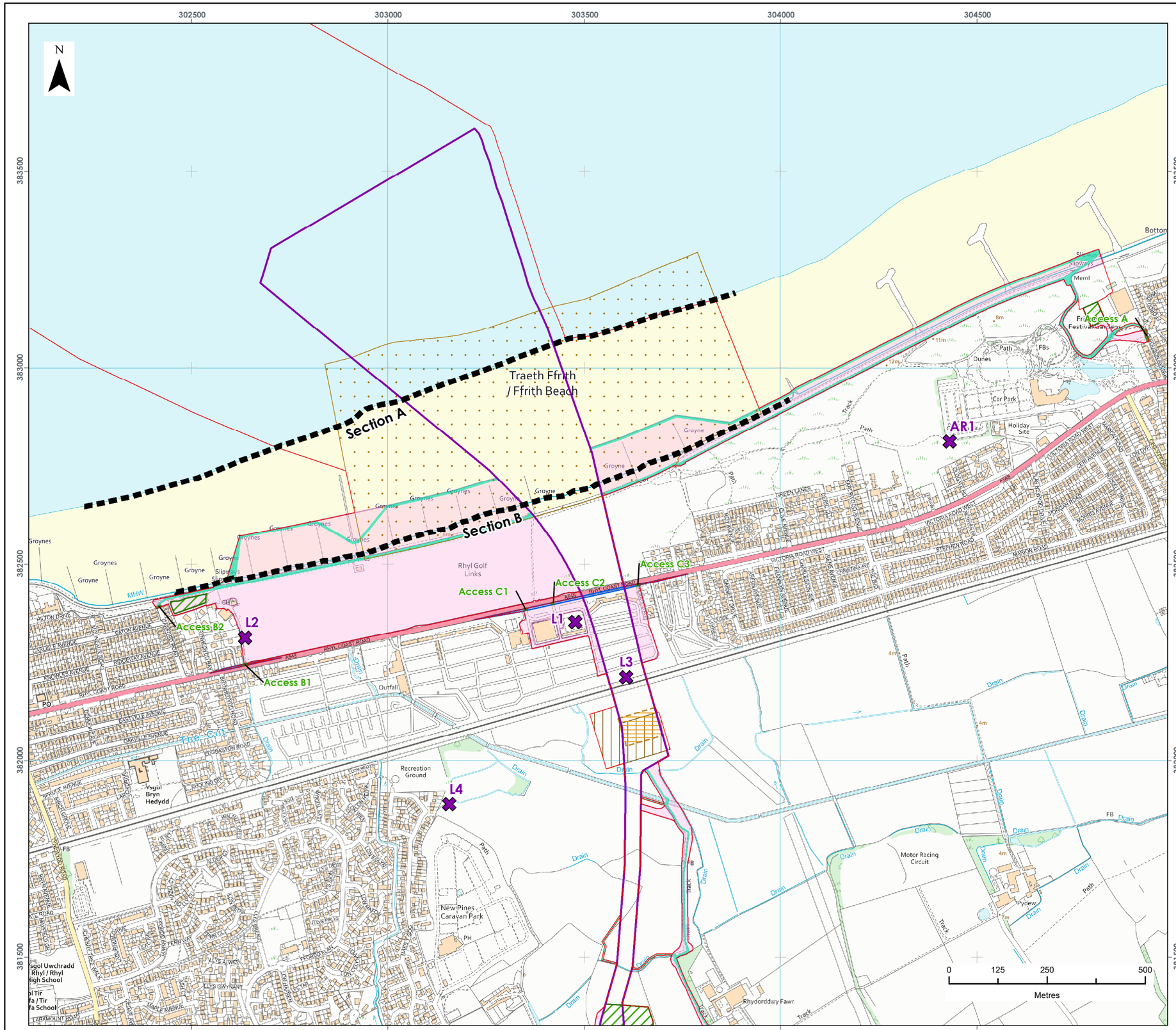
141 Baseline sound levels were measured at four representative locations around the landfall area. Noise levels were also measured at an additional monitoring location to the east of the landfall area (Location AR1) to gain baseline data from a location representative of the proposed off route access road for the landfall area. These locations are described in Table 18.

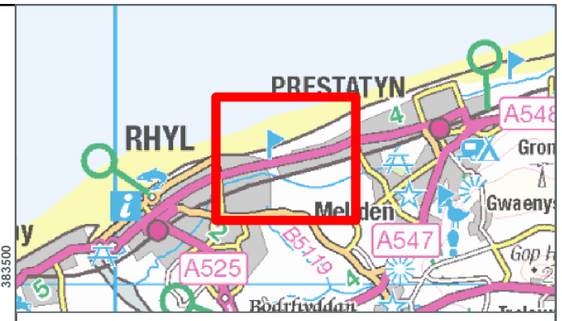
Table 18: Landfall monitoring locations.

LOCATION	DESCRIPTION	ORDNANCE SURVEY (OS) GRID COORDINATES
L1	In the northern boundary of the Robin Hood Holiday Park, representative of the	X = 303477 Y = 382352

LOCATION	DESCRIPTION	ORDNANCE SURVEY (OS) GRID COORDINATES
	caravans themselves and the residential properties located on Rhyl Coast Road.	
L2	On western extents of the Rhyl Golf Club, representative of the clubhouse and the residential properties located on Rhyl Coast Road.	X = 302636 Y = 382312
L3	On the south-east corner of the Robin Hood Holiday Park, representative of the caravans themselves and the residential properties located on Cherry Close.	X = 303606 Y = 382212
L4	To the west of the HDD construction compound representative of the residential properties on Maes Y Gog.	X = 303155 Y = 381889
AR1	On an area of land representative of the residential properties on Oldgate Road to the east of Landfall area.	X = 304430 Y = 382812

142 The locations described above are shown in Figure 4.





LEGEND

- Order Limits
- Onshore Cable Route Section Breaks
- Proposed Onshore Export Cable Corridor
- Proposed Indicative Trenchless Crossing Compound
- Proposed Temporary Construction Compound
- Proposed Transition Joint Bay Construction Compound
- Proposed Access Location
- Proposed Operational Access Route
- Proposed Construction Access Area
- Anchoring Zone
- Noise Monitoring Location

PROJECT TITLE:

AWEL Y MÔR OFFSHORE WINDFARM

FIGURE TITLE:

LANDFALL MONITORING LOCATIONS

VER	DATE	REMARKS	Drawn	Checked
1	08/04/2022	ES Issue	JRS	MF

FIGURE NUMBER:

FIGURE 4

SCALE:	PLOT SIZE:	DATUM:	COORDINATE SYSTEM:
1:10,000	A3	ODN	British National Grid

Fferm Wynt Alltraeth
AWEL Y MÔR
Offshore Wind Farm

P:\05356 - GoBe Consultants Ltd\00009 Awel y Mor\Tech\GIS\Dwgs\Wking\202201 Environmental Statement\Chapter 3.10 - Noise\05356.00009.0271.0 Landfall Baseline Monitoring Locations.mxd

Monitoring equipment and indices measured.

143 The measurements were carried out utilising the equipment listed in Table 19.

144 The sound level meters were calibrated before taking the measurements using an acoustic calibrator and the calibration was checked upon completion of the survey. No significant drift in readings was observed. The calibration chain is traceable via the United Kingdom Accreditation Service (UKAS) to National Standards held at the National Physical Laboratory.

145 The calibration certificates for all the noise monitoring equipment utilised are shown in Annex 5.10.1: Calibration Certificates (application ref: 6.5.10.1).

Table 19: Baseline sound monitoring equipment – landfall.

LOCATION	EQUIPMENT	SERIAL NUMBER
L1	Cirrus CR:171B Type 1 Sound Level Meter	G301839
	Cirrus CR:515 Acoustic Calibrator	93674
L2	Cirrus CR:171B Type 1 Sound Level Meter	G301839
	Cirrus CR:515 Acoustic Calibrator	93674
L3	Rion NL-52 Type 1 Sound Level Meter	00331823
	Rion NC-74 Acoustic Calibrator	34336013
L4	Rion NL-52 Type 1 Sound Level Meter	00331823
	Rion NC-74 Acoustic Calibrator	34336013
AR1	Cirrus CR: 171B Type 1 Sound Level Meter	G079816
	Rion NC-75 Acoustic Calibrator	35002725

146 At the monitoring locations, the microphone was placed 1.5 m above the ground in free-field conditions, i.e., at least 3.5 m from the nearest vertical, reflecting surface, with the following noise level indices being recorded:

- $L_{Aeq,T}$: The A-weighted equivalent continuous noise level over the measurement period;
- L_{A90}: The A-weighted noise level exceeded for 90% of the measurement period. This parameter is often used to describe background noise;
- L_{A10}: The A-weighted noise level exceeded for 10% of the measurement period. This parameter is often used to describe road traffic noise; and
- L_{Amax}: The maximum A-weighted noise level during the measurement period.

Measurement duration

147 At Locations L2 and L4, the prevailing sound levels were measured continuously between 8 – 14 April 2021, with noise levels being logged every 15-minutes.

148 At Locations L1 and L3, the prevailing sound levels were measured continuously between 15 – 20 April 2021, with noise levels being logged every 15-minutes.

149 At Location AR1, the prevailing sound level measurements consisted of a 1-hour fully attended measurements during a midweek daytime period, with noise levels being logged every 1-minute.

Survey results

150 A summary of the survey results is included in Table 20 to Table 23 and are shown in full in Annex 5.10.2: Survey Results (application ref: 6.5.10.2).

151 It should be noted that the survey results have been divided into daytime (07:00 to 19:00), evening (19:00 to 23:00) and night-time (23:00 to 07:00) periods to be consistent with BS5228:2009+A1:2014.

152 The $L_{Aeq,T}$ level is the average ambient noise level in each period, the L_{A10} and L_{A90} levels shown are the median levels in each indices during each measurement period.

Table 20: Summary of baseline survey results – location L1.

DATE	PERIOD	$L_{AEQ,T}$	MEDIAN L_{A90}	MEDIAN L_{A10}	L_{AMAX}
15 April 2021	Daytime*	52.3	45.5	53.3	79.8
	Evening	50.9	41.1	51.3	84.1
	Night-time	43.9	28.5	42.1	74.4
16 April 2021	Daytime	52.9	46.8	54.6	82.1
	Evening	49.9	44.3	52.4	79.3
	Night-time	45.9	29.4	43.7	85.7
17 April 2021 (weekend)	Daytime	63.8	47.3	53.9	91.8
	Evening	49.4	43.8	50.9	78.0
	Night-time	41.1	27.2	40.0	71.1
18 April 2021 (weekend)	Daytime	52.0	45.4	52.7	87.1
	Evening	48.1	40.8	49.9	71.4
	Night-time	46.7	30.9	38.5	80.2
19 April 2021	Daytime	51.6	44.5	52.6	84.5
	Evening	47.6	39.5	49.9	80.6
	Night-time	42.2	29.5	40.2	70.3
20 April 2021	Daytime**	51.6	42.9	52.7	71.7

*Daytime period started at 12:00. **Daytime period stopped at 09:30.

Table 21: Summary of baseline survey results – location L2.

DATE	PERIOD	$L_{AEQ,T}$	MEDIAN L_{A90}	MEDIAN L_{A10}	L_{AMAX}
08 April 2021	Daytime*	51.8	48.4	53.5	72.3
	Evening	48.6	43.4	50.8	71.0
	Night-time	46.0	41.6	48.0	72.3
09 April 2021	Daytime	54.6	45.7	50.7	89.7
	Evening	48.2	46.0	49.9	67.5
	Night-time	46.7	42.8	48.2	61.7
10 April 2021 (weekend)	Daytime	46.3	41.9	47.6	69.2
	Evening	47.8	43.0	49.6	78.4
	Night-time	43.2	35.4	46.7	65.7
11 April 2021 (weekend)	Daytime	45.5	38.5	46.7	70.6
	Evening	45.6	42.4	47.0	70.3
	Night-time	43.4	33.2	42.5	67.5
12 April 2021	Daytime	47.1	40.3	46.8	74.1
	Evening	44.5	35.2	47.5	65.1
	Night-time	43.2	28.3	42.5	64.7
13 April 2021	Daytime	50.5	41.8	49.6	75.3
	Evening	45.0	36.3	47.1	71.4
	Night-time	43.7	29.9	43.6	72.3
14 April 2021	Daytime	54.8	46.7	54.9	77.1

*Daytime period started at 12:15. **Daytime period stopped at 11:00.

Table 22: Summary of baseline survey results – location L3.

DATE	PERIOD	$L_{AEQ,T}$	MEDIAN L_{A90}	MEDIAN L_{A10}	L_{AMAX}
15 April 2021	Daytime*	52.7	33.7	45.0	86.4
	Evening	51.5	33.0	45.9	81.6
	Night-time	47.9	24.4	32.3	82.2
16 April 2021	Daytime	53.4	38.2	49.4	84.8
	Evening	50.4	36.3	44.9	84.6
	Night-time	47.6	26.1	32.5	83.1
17 April 2021 (weekend)	Daytime	52.2	39.5	49.2	91.1
	Evening	50.4	36.4	44.4	82.4
	Night-time	49.3	24.0	34.0	77.7
18 April 2021 (weekend)	Daytime	50.0	37.1	47.5	82.5
	Evening	49.9	34.0	42.8	82.1
	Night-time	50.2	25.5	32.8	89.4
19 April 2021	Daytime	52.4	35.2	48.6	89.8
	Evening	51.2	33.2	46.6	82.7
	Night-time	50.3	25.8	31.7	82.1
20 April 2021	Daytime**	53.6	35.1	48.6	84.3

*Daytime period started at 11:30. **Daytime period stopped at 09:45.

Table 23: Summary of baseline survey results – L4.

DATE	PERIOD	$L_{AEQ,T}$	MEDIAN L_{A90}	MEDIAN L_{A10}	L_{AMAX}
08 April 2021	Daytime*	47.9	41.2	50.3	77.4
	Evening	40.8	34.1	42.7	62.4
	Night-time	45.9	34.6	38.0	76.6
09 April 2021	Daytime	49.7	40.8	52.5	71.5
	Evening	45.0	32.5	42.9	70.6
	Night-time	45.4	32.2	35.5	71.5
10 April 2021 (weekend)	Daytime	48.3	38.3	51.4	74.5
	Evening	44.2	33.0	42.3	78.9
	Night-time	44.6	29.3	35.1	68.4
11 April 2021 (weekend)	Daytime	47.5	36.7	50.7	70.8
	Evening	44.4	31.9	37.1	76.4
	Night-time	44.9	24.2	31.1	70.6
12 April 2021	Daytime	47.4	36.3	50.7	70.8
	Evening	48.0	27.6	38.3	82.1
	Night-time	44.8	23.7	31.6	73.6
13 April 2021	Daytime	49.6	37.9	50.3	82.5
	Evening	43.6	29.4	43.2	66.9
	Night-time	45.2	24.6	31.2	66.9
14 April 2021	Daytime	53.5	38.6	52.4	87.8

*Daytime period started at 13:30. **Daytime period stopped at 11:45.

Table 24: Summary of baseline survey results – AR1.

DATE	PERIOD	$L_{AEQ,T}$	MEDIAN L_{A90}	MEDIAN L_{A10}	L_{AMAX}
12 April 2021	Daytime	47.2	37.2	47.8	64.7

Soundscape

153 The general soundscape at the measurement locations was recorded during equipment installation and collection and is shown in Table 25.

Table 25: General soundscape.

LOCATION	SOUNDSCAPE
L1	Birdsong, road traffic noise, noise from construction site (heavy plant).
L2	Birdsong, distant road traffic, rail works audible (excavators) high altitude aircraft.
L3	Birdsong, occasional passing car, pedestrians passing, occasional trains using railway to the south of the monitoring location.
L4	Birdsong, distant road traffic, high altitude aircraft, distant railway noise audible.
AR1	Birdsong, distant road traffic from Victoria Road West, local activity

Evaluation of landfall baseline sound levels

154 The noise-sensitive receptors situated close to the landfall would potentially be impacted from daytime, evening and night-time from HDD (or other trenchless technology techniques), and other construction operations, therefore it is necessary to evaluate the measured baseline levels in conjunction with the ABC Method contained in BS5228:2009+A1:2014 to calculate the daytime and night-tine construction noise threshold limits.

155 With reference to Table 2 of this chapter and the lowest measured average ambient level at each monitoring location during the daytime and night-time, the calculated threshold limits are shown in Table 26.

156 It should be noted that the measured ambient sound levels have been rounded to the nearest decibel.

Table 26: Calculated construction noise threshold noise limits dB.

LOCATION	PERIOD	LOWEST MEASURED AVERAGE AMBIENT LEVEL $L_{AEQ,T}$	CALCULATED THRESHOLD VALUE $L_{AEQ,T}$
Noise sensitive receptors representative of Location L1	Daytime	52	65
	Evening	48	55
	Night-time	41	45
	Weekends	52	55
Noise sensitive receptors representative of Location L2	Daytime	46	65
	Evening	45	55
	Night-time	43	50
	Weekends	45	55
Noise sensitive receptors representative of Location L3	Daytime	50	65
	Evening	50	55
	Night-time	48	55
	Weekends	50	55
Noise sensitive receptors representative of Location L4	Daytime	47	65
	Evening	41	55
	Night-time	45	50
	Weekends	48	55

LOCATION	PERIOD	LOWEST MEASURED AVERAGE AMBIENT LEVEL $L_{AEQ,T}$	CALCULATED THRESHOLD VALUE $L_{AEQ,T}$
Noise sensitive receptors representative of Location AR1	Daytime	47	65

10.8.3 The Onshore Export Cable Corridor (Onshore ECC)

157 Volume 3, Chapter 1: Onshore Project Description (application ref: 6.3.1) provides a detailed description of the onshore ECC, including a description of the Route Sections (Sections A to G) that sub-divide the cable connection; however, a brief summary with regards to the local environment and existing noise sources is given below.

158 The local environment in the vicinity of the onshore ECC can be characterised as a predominantly rural environment with a limited number of individual residential properties located within 50 m of the cable route. The route of the onshore ECC does pass more urban environments, namely Rhyl to the west of the route and Rhuddlan to the south of the route. The onshore ECC crosses two major roads, namely the A525 to the north of Rhuddlan and the A55 between Bodelwyddan and St. Asaph. The major existing noise sources along the route are road traffic noise from the A55, A525 and other surrounding roads.

Monitoring locations

159 Baseline sound levels were measured at 15 representative locations along the onshore ECC. The locations are described in Table 27.

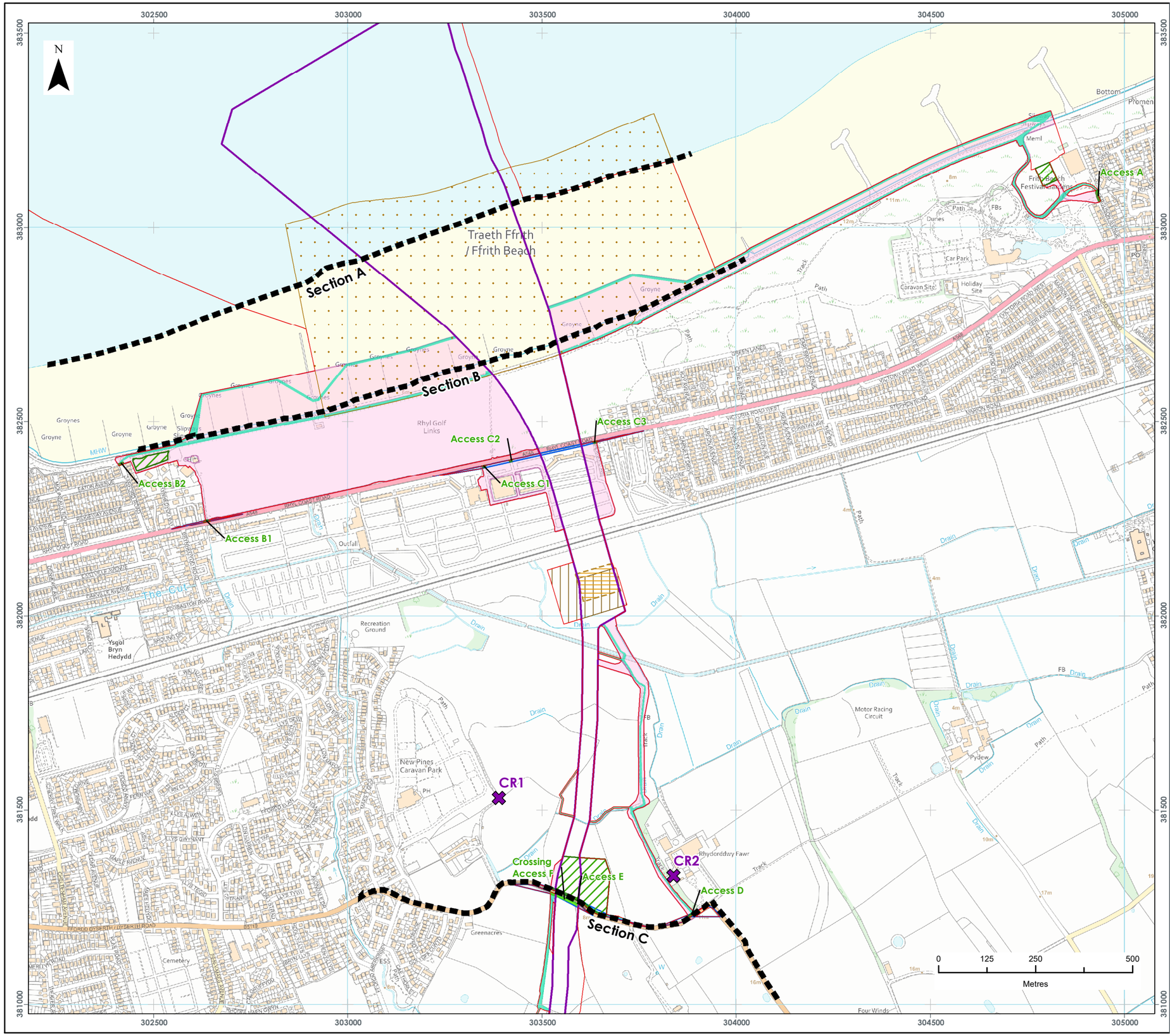
Table 27: Onshore ECC monitoring locations.

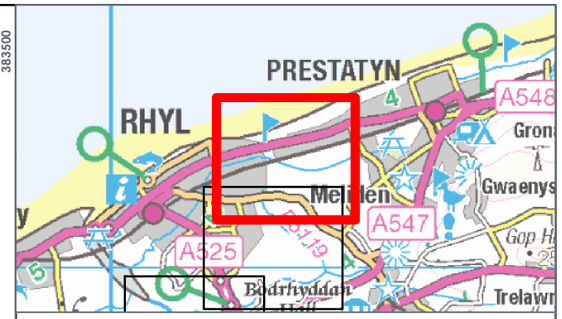
LOCATION	DESCRIPTION	OS GRID COORDINATES
CR1	On area of land located directly to the east of The New Pines Holiday Home Park	X = 303389 Y = 381531

LOCATION	DESCRIPTION	OS GRID COORDINATES
	to the west of the onshore ECC, within Route Section B.	
CR2	On an area of land representative of the farm to the east of the onshore ECC, within Route Section B.	X = 303838 Y = 381331
CR3	On an area of land representative of the residential properties on the new housing estate to the north-west of the onshore ECC, within Route Section C.	X = 303121 Y = 380670
CR4	On an area of land representative of the residential properties on Rachel Drive to the west of the onshore ECC, within Route Section C.	X = 302854 Y = 380167
CR5	On an area of land representative of Bryn Cwnin Farm	X = 380167 Y = 379680
CR6	On an area of land representative of the residential properties located to the east of the A525 within Route Section C.	X = 302526 Y = 379351
CR7	On an area of land representative of the residential properties located on Ffordd Ffynnon to the south of the A525 and ECC, within Route Section D.	X = 302372 Y = 378995
CR7A	On an area of land located within the Sun Valley Caravan Park to the south-east of the onshore ECC and west of an off-route access road, within Route Section D.	X = 301794.05 Y = 378252.94
CR8	On an area of land located to the west of the residential properties on the A547 to	X = 301440 Y = 377721

LOCATION	DESCRIPTION	OS GRID COORDINATES
	the east of the onshore ECC, within Route Section E.	
CR9	On an area of land representative of Bryn-Carrog Farm to the west of the onshore ECC, within Route Section E.	X = 301157 Y = 376810
CR10	On an area of land representative of Tylsa Farm to the east of the onshore ECC, within Route Section E.	X = 301560 Y = 376769
CR11	On an area of land representative of Tyddyn Isaf to the north of the A55 to the west of the onshore ECC, within Route Section E.	X = 301219 Y = 375188
CR12	On an area of land representative of Waen Meredydd to the north of the onshore ECC, within Route Section G.	X = 301240 Y = 373654
CR13	On an area of land representative of the farm to the south of the onshore ECC, within Route Section G.	X = 300900 Y = 373260

160 The monitoring locations and the onshore ECC route sections described above are shown in Figure 5 to Figure 9.





LEGEND

- Order Limits
- Onshore Cable Route Section Breaks
- Proposed Onshore Export Cable Corridor
- Proposed Indicative Trenchless Crossing Compound
- Proposed Temporary Construction Compound
- Proposed Transition Joint Bay Construction Compound
- Proposed Access Location
- Proposed Crossing Location
- Proposed Operational Access Route
- Proposed Construction Access Area
- Anchoring Zone
- Proposed Major Road Crossing Visibility Splay
- Noise Monitoring Location

PROJECT TITLE:

AWEL Y MÔR OFFSHORE WINDFARM

FIGURE TITLE:

ECC MONITORING LOCATIONS

VER	DATE	REMARKS	Drawn	Checked
1	08/04/2022	ES Issue	JRS	MF

FIGURE NUMBER:

FIGURE 5
Page 1 of 5

SCALE:	PLOT SIZE:	DATUM:	COORDINATE SYSTEM:
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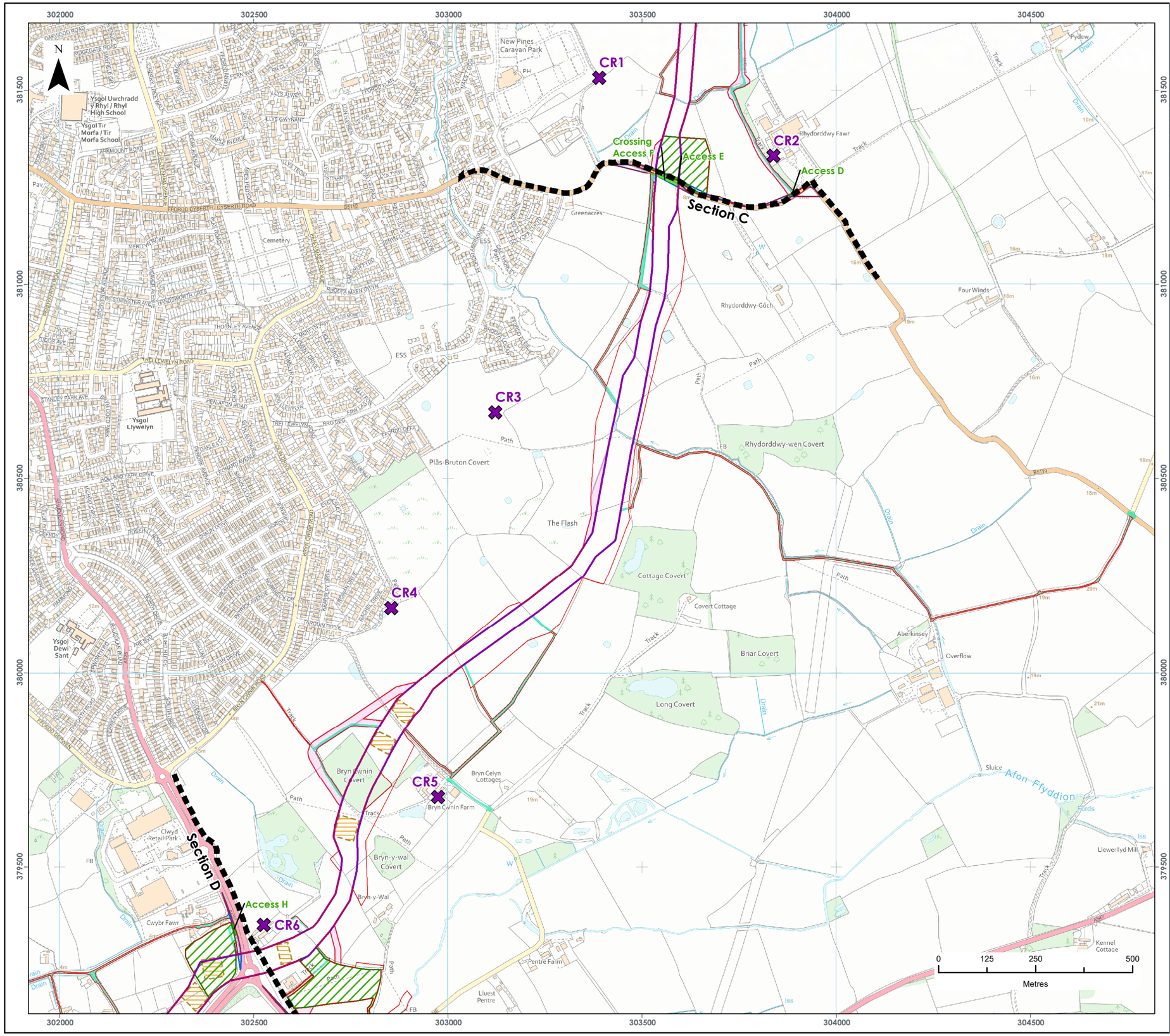

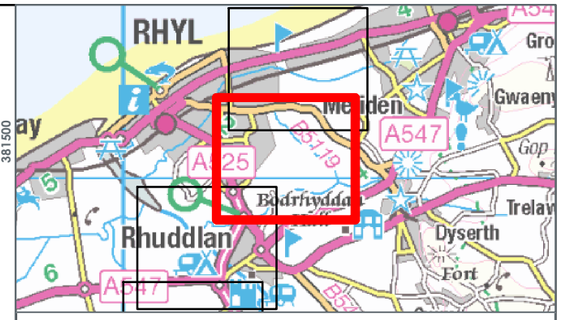

LEGEND

- Order Limits
- Onshore Cable Route Section Breaks
- Proposed Onshore Export Cable Corridor
- Proposed Indicative Trenchless Crossing Compound
- Proposed Temporary Construction Compound
- Proposed Access Location
- Proposed Crossing Location
- Proposed Operational Access Route
- Proposed Construction Access Area
- Proposed Major Road Crossing Visibility Splay
- Noise Monitoring Location

PROJECT TITLE:

AWEL Y MÔR OFFSHORE WINDFARM

FIGURE TITLE:

ECC MONITORING LOCATIONS

VER	DATE	REMARKS	Drawn	Checked
1	08/04/2022	ES Issue	JRS	MF

FIGURE NUMBER:

FIGURE 6
Page 2 of 5

SCALE:	PLOT SIZE:	DATUM:	COORDINATE SYSTEM:
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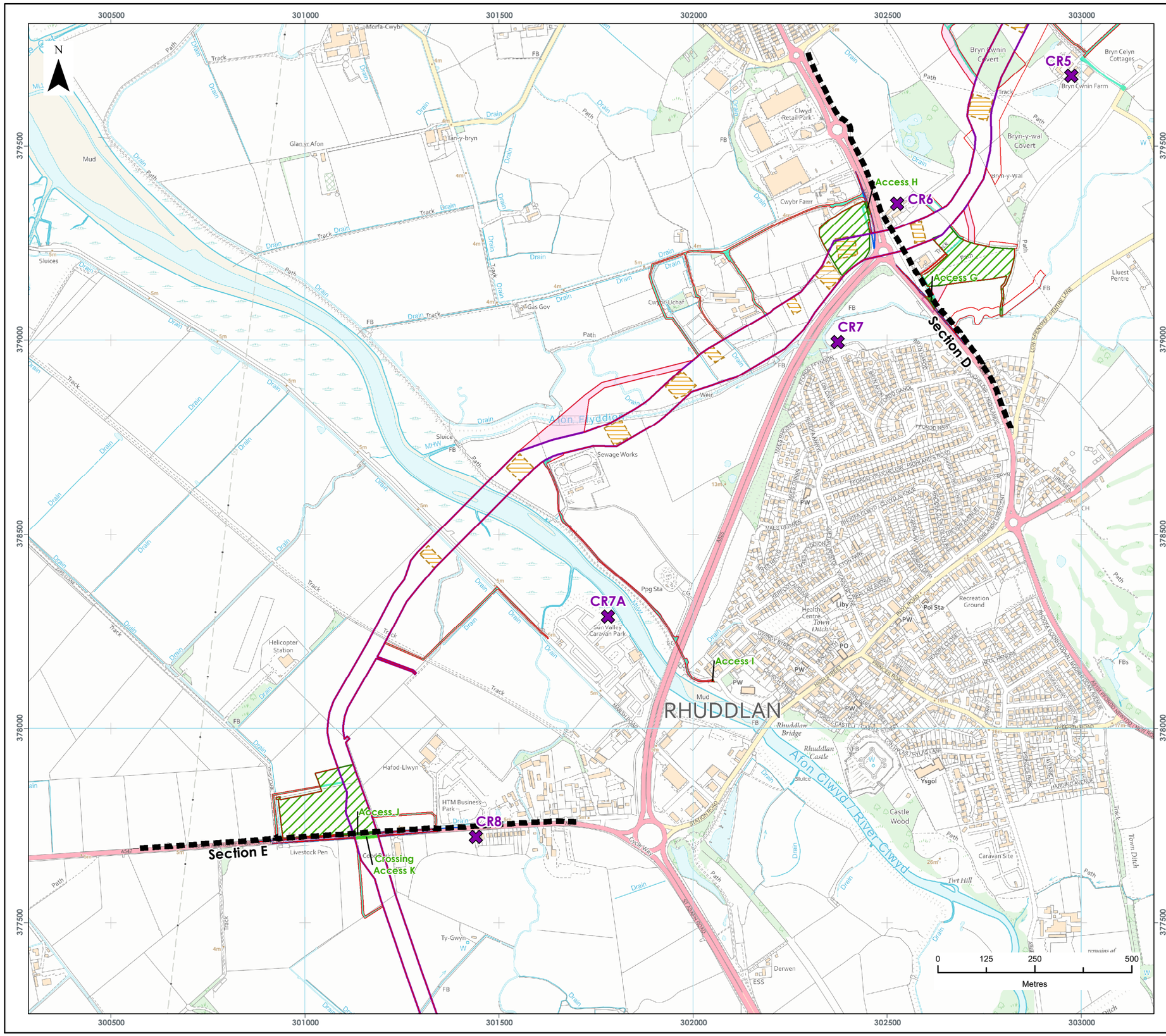

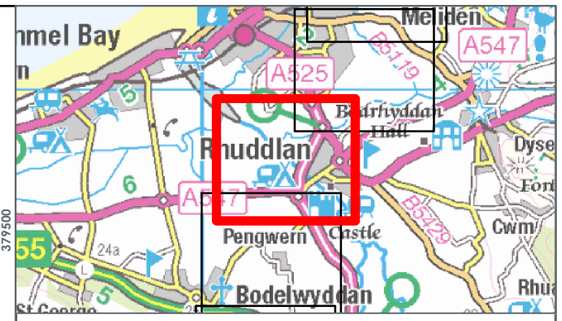

LEGEND

- Order Limits
- Onshore Cable Route Section Breaks
- Proposed Onshore Export Cable Corridor
- Proposed Indicative Trenchless Crossing
- Proposed Temporary Construction
- Proposed Access Location
- Proposed Crossing Location
- Proposed Operational Access Route
- Proposed Construction Access Area
- Proposed Major Road Crossing Visibility
- Noise Monitoring Location

PROJECT TITLE:

AWEL Y MÔR OFFSHORE WINDFARM

FIGURE TITLE:

ECC MONITORING LOCATIONS

VER	DATE	REMARKS	Drawn	Checked
1	08/04/2022	ES Issue	JRS	MF

FIGURE NUMBER:

FIGURE 7

SCALE:	PLOT SIZE:	DATUM:	COORDINATE SYSTEM:
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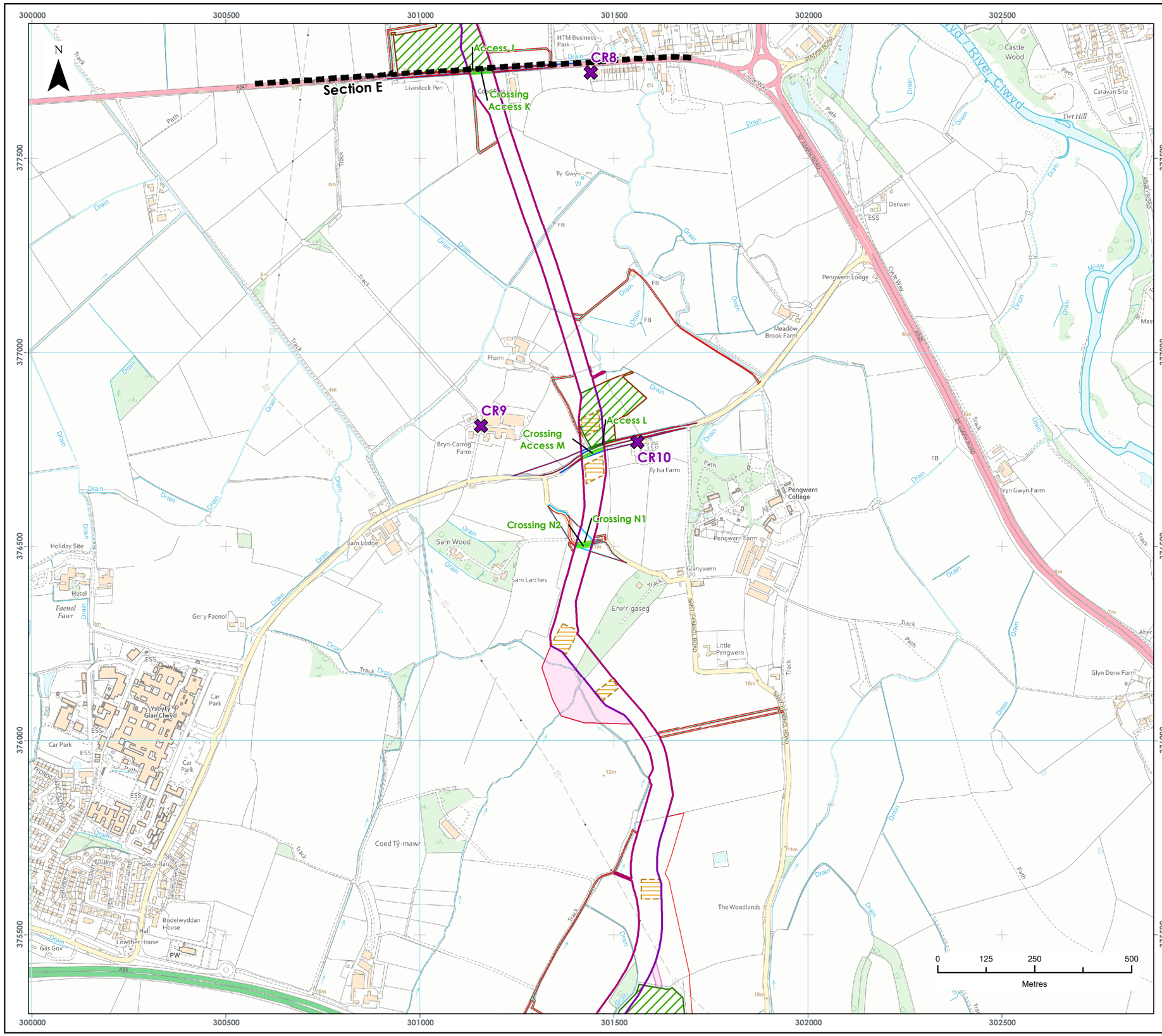

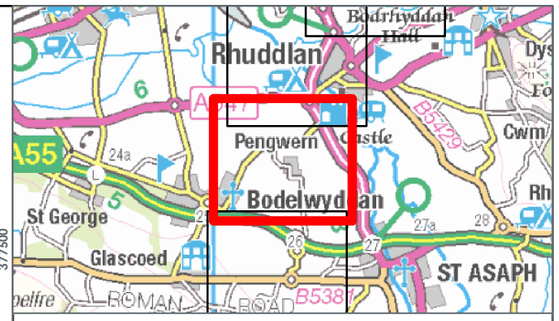

LEGEND

- Order Limits
- Onshore Cable Route Section Breaks
- Proposed Onshore Export Cable Corridor
- Proposed Indicative Trenchless Crossing
- Proposed Temporary Construction
- Proposed Access Location
- Proposed Crossing Location
- Proposed Operational Access Route
- Proposed Construction Access Area
- Proposed Major Road Crossing Visibility
- Proposed Minor Road Crossing Visibility
- Noise Monitoring Location

PROJECT TITLE:

AWEL Y MÔR OFFSHORE WINDFARM

FIGURE TITLE:

ECC MONITORING LOCATIONS

VER	DATE	REMARKS	Drawn	Checked
1	08/04/2022	ES Issue	JRS	MF

FIGURE NUMBER:

FIGURE 8
Page 4 of 5

SCALE:	PLOT SIZE:	DATUM:	COORDINATE SYSTEM:
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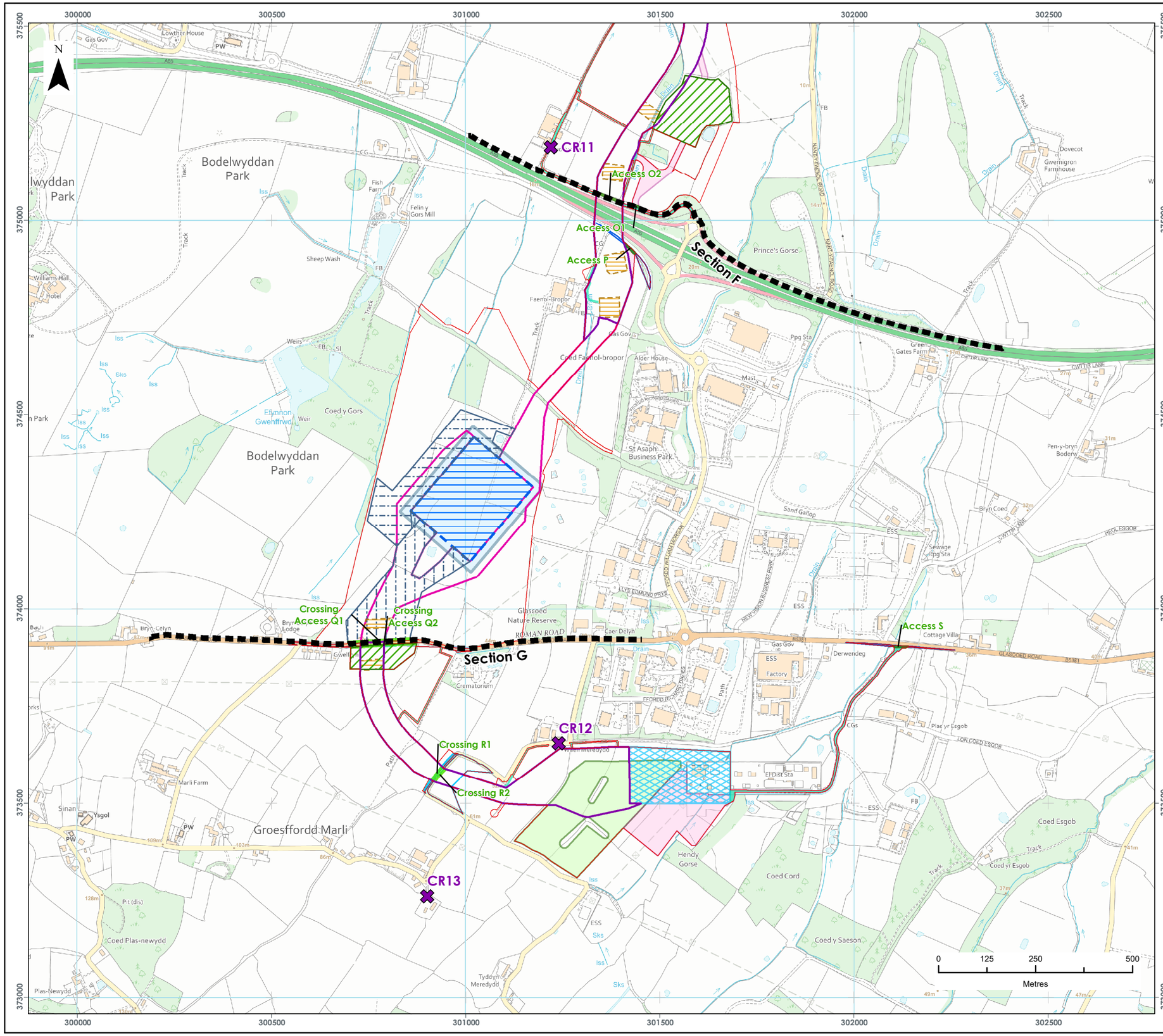

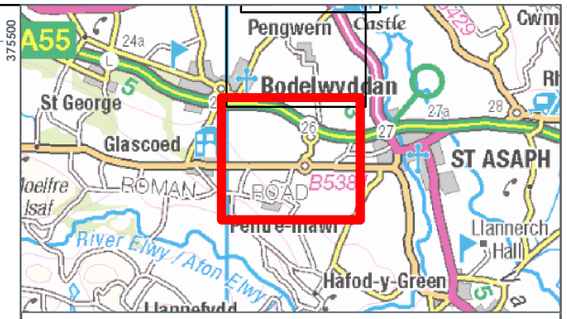

LEGEND

- Order Limits
- Onshore Cable Route Section Breaks
- Proposed Onshore Export Cable Corridor
- Proposed Substation Cable Corridor Zone
- Proposed Indicative Trenchless Crossing Compound
- Proposed Temporary Construction Compound
- Proposed Temporary Construction Compound Zone
- Proposed Access Location
- Proposed Crossing Location
- Proposed Operational Access Route
- Proposed Construction Access Area
- Unlicenced Work Zone
- Proposed Major Road Crossing Visibility Splay
- Proposed Minor Road Crossing Visibility Splay
- Proposed Onshore Substation (OnSS) Footprint
- Proposed Substation Construction Area
- Substation Construction Access Zone
- Substation Temporary Construction Access Zone
- Substation Access Visibility Splay
- Noise Monitoring Location

PROJECT TITLE:

AWEL Y MÔR OFFSHORE WINDFARM

FIGURE TITLE:

ECC MONITORING LOCATIONS

VER	DATE	REMARKS	Drawn	Checked
1	08/04/2022	ES Issue	JRS	MF

FIGURE NUMBER:

FIGURE 9

SCALE:	PLOT SIZE:	DATUM:	COORDINATE SYSTEM:
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Monitoring Equipment and Indices Measured

161 The measurements were carried out utilising the equipment listed in Table 28.

162 The sound level meters were calibrated before taking the measurements using an acoustic calibrator, and the calibration was checked upon completion of the survey. No significant drift was observed. The calibration chain is traceable via the UKAS to National Standards held at the National Physical Laboratory.

163 The calibration certificates for all the noise monitoring equipment utilised are shown in Annex 5.10.1: Calibration Certificates (application ref: 6.5.10.1).

Table 28: Baseline sound monitoring equipment – Onshore ECC.

LOCATION	EQUIPMENT	SERIAL NUMBER
CR1 to CR 7A	Cirrus CR: 171B Type 1 Sound Level Meter	G079816
	Rion NC-75 Acoustic Calibrator	35002725
CR8, CR9, CR10 and CR13	Cirrus CR: 171B Type 1 Sound Level Meter	G301839
	Cirrus CR: 515 Acoustic Calibrator	83349
CR11 and CR 12	Cirrus CR: 171B Type 1 Sound Level Meter	G300561
	Cirrus CR: 515 Acoustic Calibrator	87922

164 At the monitoring locations, the microphone was placed 1.5 m above the ground in free-field conditions, i.e., at least 3.5 m from the nearest vertical, reflecting surface, with the following noise level indices being recorded:

- $L_{Aeq,T}$: The A-weighted equivalent continuous noise level over the measurement period;
- L_{A90}: The A-weighted noise level exceeded for 90% of the measurement period. This parameter is often used to describe background noise;

- L_{A10}: The A-weighted noise level exceeded for 10% of the measurement period. This parameter is often used to describe road traffic noise; and
- L_{Amax}: The maximum A-weighted noise level during the measurement period.

Measurement duration

165 The baseline sound survey at all the locations associated with the onshore ECC consisted of a 1-hour fully attended measurement during a midweek daytime period, with noise levels being logged every 1-minute. Measurements were only taken during the daytime as it is understood that construction works associated with the ECC would only take place during normal daytime hours, this monitoring protocol was agreed with DCC.

Survey results

166 A summary of the survey results is included in Table 29 and are shown in full in Annex 5.10.2: Survey Results (application ref: 6.5.10.2).

167 The $L_{Aeq,T}$ level is the logarithmic average ambient noise level in each period, the L_{A10} and L_{A90} levels shown are the median levels in each indices during each measurement period.

Table 29: Summary of baseline survey results dB – Onshore ECC.

DATE	LOCATION	$L_{AEQ,T}$	MEDIAN L_{A90}	MEDIAN L_{A10}	L_{AMAX}
12 April 2021	CR1	48.9	33.7	38.1	85.5
	CR2	43.8	36.2	44.9	63.4
	CR3	43.0	33.2	40.9	61.6
13 April 2021	CR4	46.5	40.7	47.7	64.0
	CR5	47.7	41.2	49.0	71.2
	CR6	53.1	48.8	53.3	79.8
	CR7	61.4	57.5	63.5	70.8

DATE	LOCATION	$L_{AEQ,T}$	MEDIAN L_{A90}	MEDIAN L_{A10}	L_{AMAX}
	CR7A	48.6	45.8	50.7	61.8
14 April 2021	CR8	69.0	53.3	71.5	99.0
	CR9	70.6	45.7	75.1	92.3
	CR10	52.3	39.7	44.3	83.1
15 April 2021	CR11	63.9	60.5	65.8	74.8
	CR12	44.4	34.9	38.7	73.3
20 April 2021	CR13	44.7	38.4	45.6	69.9

Soundscape

168 The general soundscape at the measurement locations was recorded during the attended survey and is shown in Table 30.

Table 30: General soundscape.

LOCATION	SOUNDSCAPE
CR1	Birdsong, distant train noise, local activity, high altitude aircraft
CR2	Birdsong. Distant road traffic, farm activity
CR3	Birdsong distant road traffic
CR4	Birdsong, distant road traffic from A525, high altitude aircraft
CR5	Birdsong, nearby construction works, high altitude aircraft
CR6	Birdsong, distant road traffic from A525 high altitude aircraft
CR7	Birdsong, road traffic using A525 dominant
CR7A	Birdsong distant road traffic from A55

LOCATION	SOUNDSCAPE
CR8	Birdsong, road traffic noise (constant)
CR9	Birdsong, road traffic noise (constant), farm activity
CR10	Birdsong, road traffic noise (constant), farm activity
CR11	Birdsong, road traffic noise dominant
CR12	Birdsong, road traffic noise, farm activity
CR13	Birdsong, road traffic noise, farm activity

Evaluation of onshore ECC baseline sound levels

169 The noise-sensitive receptors situated close to the onshore ECC would potentially be impacted from daytime construction operations, therefore it is necessary to evaluate the measured baseline levels in conjunction with the ABC Method contained in BS5228:2009+A1:2014 to calculate the daytime and night-tine construction noise threshold limits.

170 With reference to Table 3 of this chapter and the measured average ambient level at each monitoring location during the daytime, the calculated threshold limits are shown in Table 31.

171 It should be noted that the measured ambient sound levels have been rounded to the nearest decibel.

Table 31: Calculated construction noise threshold noise limits dB.

LOCATION	PERIOD	MEASURED AVERAGE AMBIENT LEVEL $L_{AEQ,T}$	CALCULATED THRESHOLD VALUE $L_{AEQ,T}$
Noise sensitive receptors representative of Location CR1	Daytime	49	65

LOCATION	PERIOD	MEASURED AVERAGE AMBIENT LEVEL $L_{AEQ,T}$	CALCULATED THRESHOLD VALUE $L_{AEQ,T}$
Noise sensitive receptors representative of Location CR2	Daytime	44	65
Noise sensitive receptors representative of Location CR3	Daytime	43	65
Noise sensitive receptors representative of Location CR4	Daytime	47	65
Noise sensitive receptors representative of Location CR5	Daytime	48	65
Noise sensitive receptors representative of Location CR6	Daytime	53	65
Noise sensitive receptors representative of Location CR7	Daytime	61	65
Noise sensitive receptors representative of Location CR7A	Daytime	49	65
Noise sensitive receptors representative of Location CR8	Daytime	69	75
Noise sensitive receptors representative of Location CR9	Daytime	71	75

LOCATION	PERIOD	MEASURED AVERAGE AMBIENT LEVEL $L_{AEQ,T}$	CALCULATED THRESHOLD VALUE $L_{AEQ,T}$
Noise sensitive receptors representative of Location CR10	Daytime	52	65
Noise sensitive receptors representative of Location CR11	Daytime	64	70
Noise sensitive receptors representative of Location CR12	Daytime	44	65
Noise sensitive receptors representative of Location CR13	Daytime	45	65

10.8.4 The OnSS

172 The local environment in the vicinity of the proposed OnSS can be characterised as a rural environment with open agricultural land located to the north, west and south. The SABP is located to the east of the OnSS. There are a small number of residential properties and farms located to the north and south of the OnSS, with the Denbighshire Memorial Park and Crematorium also being located to the south. The main existing noise sources include road traffic noise from the A55 and B5381 Glascoed Road.

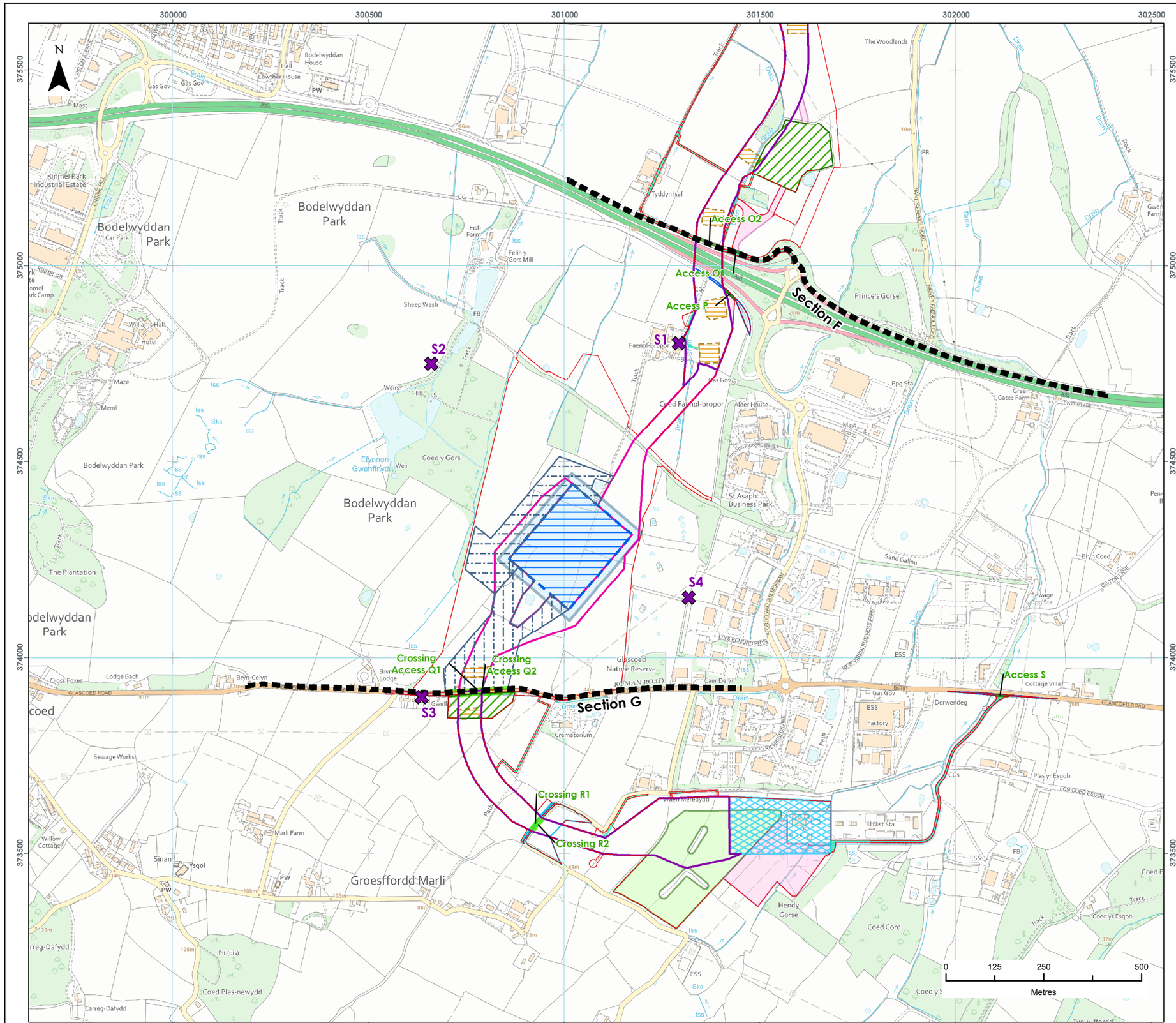
Monitoring locations

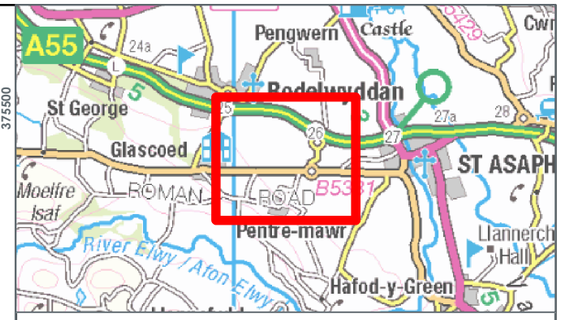
173 Baseline sound levels were measured at four representative locations around the OnSS. The locations are described in Table 32.

Table 32: OnSS monitoring locations.

LOCATION	DESCRIPTION	OS GRID COORDINATES
S1	On an area of the land representative of Faenol Bropor, to the north of the OnSS.	X = 301293 Y = 374802
S2	On an area of land to the west of the OnSS considered representative of the soundscape at Bodelwyddan Castle Hotel.	X = 300660 Y = 374749
S3	Within the front garden of Number 5 Glascoed Road to the south-west of the OnSS, representative of the residential properties on Glascoed Road and the adjacent crematorium.	X = 300635 Y = 373899
S4	On an area of the land representative of the commercial units on the SABP to the east of the OnSS.	X = 301318 Y = 374153

174 The locations described above, are shown in Figure 10.





LEGEND

- Order Limits
- Onshore Cable Route Section Breaks
- Proposed Onshore Export Cable Corridor
- Proposed Indicative Trenchless Crossing Compound
- Proposed Temporary Construction Compound
- Proposed Temporary Construction Compound Zone
- Proposed Access Location
- Proposed Crossing Location
- Proposed Operational Access Route
- Proposed Construction Access Area
- Unlicenced Work Zone
- Proposed Major Road Crossing Visibility Splay
- Proposed Minor Road Crossing Visibility Splay
- Proposed Onshore Substation (OnSS) Footprint
- Proposed Substation Construction Area
- Substation Construction Access Zone
- Substation Temporary Construction Access Zone
- Substation Access Visibility Splay
- Noise Monitoring Location

PROJECT TITLE:

AWEL Y MÔR OFFSHORE WINDFARM

FIGURE TITLE:

SUBSTATION ZONE MONITORING LOCATIONS

VER	DATE	REMARKS	Drawn	Checked
1	08/04/2022	ES Issue	JRS	MF

FIGURE NUMBER:

FIGURE 10

SCALE:	PLOT SIZE:	DATUM:	COORDINATE SYSTEM:
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Monitoring equipment and indices measured.

175 The measurements were carried out utilising the equipment listed in Table 33.

176 The sound level meters were calibrated before taking the measurements using an acoustic calibrator and the calibration was checked upon completion of the survey. No significant drift above 1 dB(A) was observed. The calibration chain is traceable via the UKAS to National Standards held at the National Physical Laboratory.

177 The calibration certificates for all the noise monitoring equipment utilised are shown in Annex 5.10.1: Calibration Certificates (application ref: 6.5.10.1).

Table 33: Baseline sound monitoring equipment – OnSS zone.

LOCATION	EQUIPMENT	SERIAL NUMBER
S1	Cirrus CR: 171B Type 1 Sound Level Meter	G300561
	Cirrus CR: 515 Acoustic Calibrator	87922
S2	Cirrus CR: 171B Type 1 Sound Level Meter	G080288
	Cirrus CR: 515 Acoustic Calibrator	83349
S3	Cirrus CR: 171B Type 1 Sound Level Meter	G080284
	Cirrus CR: 515 Acoustic Calibrator	83349
S4	Cirrus CR: 171B Type 1 Sound Level Meter	G0302667
	Cirrus CR: 515 Acoustic Calibrator	84806

178 At the monitoring locations, the microphone was placed 1.5 m above the ground in free-field conditions, i.e., at least 3.5 m from the nearest vertical, reflecting surface, with the following noise level indices being recorded:

- $L_{Aeq,T}$: The A-weighted equivalent continuous noise level over the measurement period;

- L_{A90}: The A-weighted noise level exceeded for 90% of the measurement period. This parameter is often used to describe background noise;
- L_{A10}: The A-weighted noise level exceeded for 10% of the measurement period. This parameter is often used to describe road traffic noise; and
- L_{Amax}: The maximum A-weighted noise level during the measurement period.

Measurement duration

179 At all locations, the prevailing sound levels were measured continuously between 16 – 20 April 2021, with noise levels being logged every 15-minutes.

Survey results

180 A summary of the survey results is included in Table 34 to Table 37, and are shown in full in Annex 5.10.2: Survey Results (application ref: 6.5.10.2). It must be noted that the survey results have been divided into daytime (07:00 to 23:00) and night-time (23:00 to 07:00) periods to be consistent with BS5228:2009+A1:2014.

181 The $L_{Aeq,T}$ level is the logarithmic average ambient noise level in each period; the L_{A10} and L_{A90} levels shown are the median levels in each indices during each measurement period.

Table 34: Summary of baseline survey results – location S1.

DATE	PERIOD	$L_{AEQ,T}$	MEDIAN L_{A90}	MEDIAN L_{A10}	L_{AMAX}
16 April 2021	Daytime*	56.1	53.2	58.2	80.1
	Night-time	48.6	39.1	50.2	63.0
17 April 2021 (weekend)	Daytime	54.6	50.2	56.5	74.3
	Night-time	46.9	36.0	47.7	65.2
	Daytime	62.2	50.9	56.5	93.6

DATE	PERIOD	$L_{AEQ,T}$	MEDIAN L_{A90}	MEDIAN L_{A10}	L_{AMAX}
18 April 2021 (weekend)	Night-time	50.6	38.4	49.2	75.7
19 April 2021	Daytime	54.8	49.6	56.1	83.7
	Night-time	49.6	38.1	49.9	67.0
20 April 2021	Daytime**	53.5	49.5	54.1	74.8

*Daytime period started at 10:30. **Daytime period stopped at 11:45.

Table 35: Summary of baseline survey results – location S2.

DATE	PERIOD	$L_{AEQ,T}$	MEDIAN L_{A90}	MEDIAN L_{A10}	L_{AMAX}
16 April 2021	Daytime*	53.3	48.7	52.5	67.5
	Night-time	49.0	37.6	43.5	74.5
17 April 2021 (weekend)	Daytime	50.2	43.5	51.1	76.1
	Night-time	50.2	34.1	39.3	74.5
18 April 2021 (weekend)	Daytime	51.9	49.1	53.5	70.1
	Night-time	48.1	36.3	43.8	74.2
19 April 2021	Daytime	57.3	44.8	52.6	86.7
	Night-time	50.5	36.9	45.3	73.9
20 April 2021	Daytime**	49.1	46.5	51.1	67.3

*Daytime period started at 12:45. **Daytime period stopped at 12:00.

Table 36: Summary of baseline survey results – location S3.

DATE	PERIOD	$L_{AEQ,T}$	MEDIAN L_{A90}	MEDIAN L_{A10}	L_{AMAX}
16 April 2021	Daytime*	58.5	41.9	59.4	87.8
	Night-time	47.6	34.8	43.1	83.7
17 April 2021 (weekend)	Daytime	59.0	40.0	56.1	94.7
	Night-time	44.6	30.9	39.3	77.3
18 April 2021 (weekend)	Daytime	58.6	40.6	56.2	98.2
	Night-time	47.9	34.2	41.8	81.8
19 April 2021	Daytime	58.4	38.5	59.4	88.0
	Night-time	47.2	34.3	42.7	78.5
20 April 2021	Daytime**	60.9	41.0	61.9	82.6

*Daytime period started at 10:00. **Daytime period stopped at 11:00.

Table 37: Summary of baseline survey results – location S4.

DATE	PERIOD	$L_{AEQ,T}$	MEDIAN L_{A90}	MEDIAN L_{A10}	L_{AMAX}
16/04/21	Daytime*	48.3	46.1	49.9	78.3
	Night-time	45.9	32.2	42.5	79.9
17/04/21 (weekend)	Daytime	46.9	40.3	47.3	78.3
	Night-time	42.1	28.7	36.7	73.3
18/04/21 (weekend)	Daytime	48.1	42.9	47.9	83.7
	Night-time	43.6	31.9	42.2	75.7
	Daytime	49.1	38.1	47.1	87.7

DATE	PERIOD	$L_{AEQ,T}$	MEDIAN L_{A90}	MEDIAN L_{A10}	L_{AMAX}
19 April 2021	Night-time	47.0	31.6	44.8	78.3
20 April 2021	Daytime**	50.0	43.9	48.2	74.8
*Daytime period started at 12:00. **Daytime period stopped at 11:15.					

Soundscape

182 The general soundscape at the measurement locations was recorded during the equipment installation and collection and is shown in Table 38.

Table 38: General soundscape.

LOCATION	SOUNDSCAPE
S1	Birdsong, road traffic noise, farm activities including animal noise (sheep, cows)
S2	Birdsong, distant road traffic noise
S3	Birdsong, road traffic using Glascoed Road, local activity
S4	Birdsong, road traffic noise

Evaluation of OnSS baseline sound levels

183 The noise-sensitive receptors situated close to the OnSS would potentially be impacted from both construction and operational noise, therefore it is necessary to evaluate the measured baseline levels in conjunction with:

- the ABC Method contained in BS5228:2009+A1:2014 to calculate the daytime, evening and night-tine construction noise threshold limits;

- BS4142:2014+A1:2019 to calculate the background sound levels to be utilised for the operational assessment at the residential receptors; and
- the IEMA Guidelines to calculate the ambient noise levels to be utilised for the operational assessment at the commercial receptors.

OnSS ambient levels and threshold limits for construction noise assessment

184 With reference to Table 2 of this chapter and the lowest measured average ambient level at each monitoring location during the daytime, the calculated threshold limits are shown in Table 39 below.

185 It should be noted that the measured ambient sound levels have been rounded to the nearest decibel.

Table 39: Calculated construction noise threshold noise limits dB.

LOCATION	PERIOD	LOWEST MEASURED AVERAGE AMBIENT LEVEL $L_{AEQ,T}$	CALCULATED THRESHOLD VALUE $L_{AEQ,T}$
Noise sensitive receptors representative of Location S1	Daytime	54	65
	Weekend	55	60
Noise sensitive receptors representative of Location S2	Daytime	49	65
	Weekend	51	55
Noise sensitive receptors representative of Location S3	Daytime	58	65
	Weekend	59	65
	Daytime	47	65

LOCATION	PERIOD	LOWEST MEASURED AVERAGE AMBIENT LEVEL $L_{AEQ,T}$	CALCULATED THRESHOLD VALUE $L_{AEQ,T}$
Noise sensitive receptors representative of Location S4	Evening	47	55

OnSS operational noise – residential receptor background noise levels

186 The representative daytime and night-time background sound levels (L_{A90}) which will be utilised as the bases for the operational noise assessment of the OnSS on the residential receptors are shown in Table 40.

187 The representative background levels are the lowest daytime and night-time median L_{A90} levels measured at locations S1 to S3.

188 It should be noted that the measured background sound levels have been rounded to the nearest decibel.

Table 40: Representative background sound levels dB.

LOCATION	PERIOD	LOWEST MEASURED MEDIAN BACKGROUND LEVEL L_{A90}
Noise sensitive receptors representative of Location S1	Daytime	50
	Night-time	36
Noise sensitive receptors representative of Location S2	Daytime	44
	Night-time	34
Noise sensitive receptors representative of Location S3	Daytime	39
	Night-time	31

OnSS Operational noise – commercial receptor background noise levels

189 The representative daytime and night-time ambient sound levels ($L_{Aeq,T}$) which will be utilised as the bases for the operational noise assessment of the OnSS on the commercial receptors are shown in Table 41.

190 The representative ambient levels are the lowest daytime and night-time average $L_{Aeq,T}$ levels measured at Location S4.

191 It should be noted that the measured ambient sound levels have been rounded to the nearest decibel.

Table 41: Representative ambient sound levels dB.

LOCATION	PERIOD	LOWEST MEASURED AVERAGE AMBIENT LEVEL $L_{AEQ,T}$
Noise sensitive receptors representative of Location S4	Daytime	47
	Night-time	42

10.8.5 The Array

192 The local environment located at the closest approach to the array can be characterised as a predominantly suburban environment with the nearest noise-sensitive receptors located in the outlying areas of the towns of Llandudno and Penrhyn Bay.

193 The main noise sources in the area are road traffic noise from the main roads and the local roads within each town, and the noise of the sea (waves) on the shoreline.

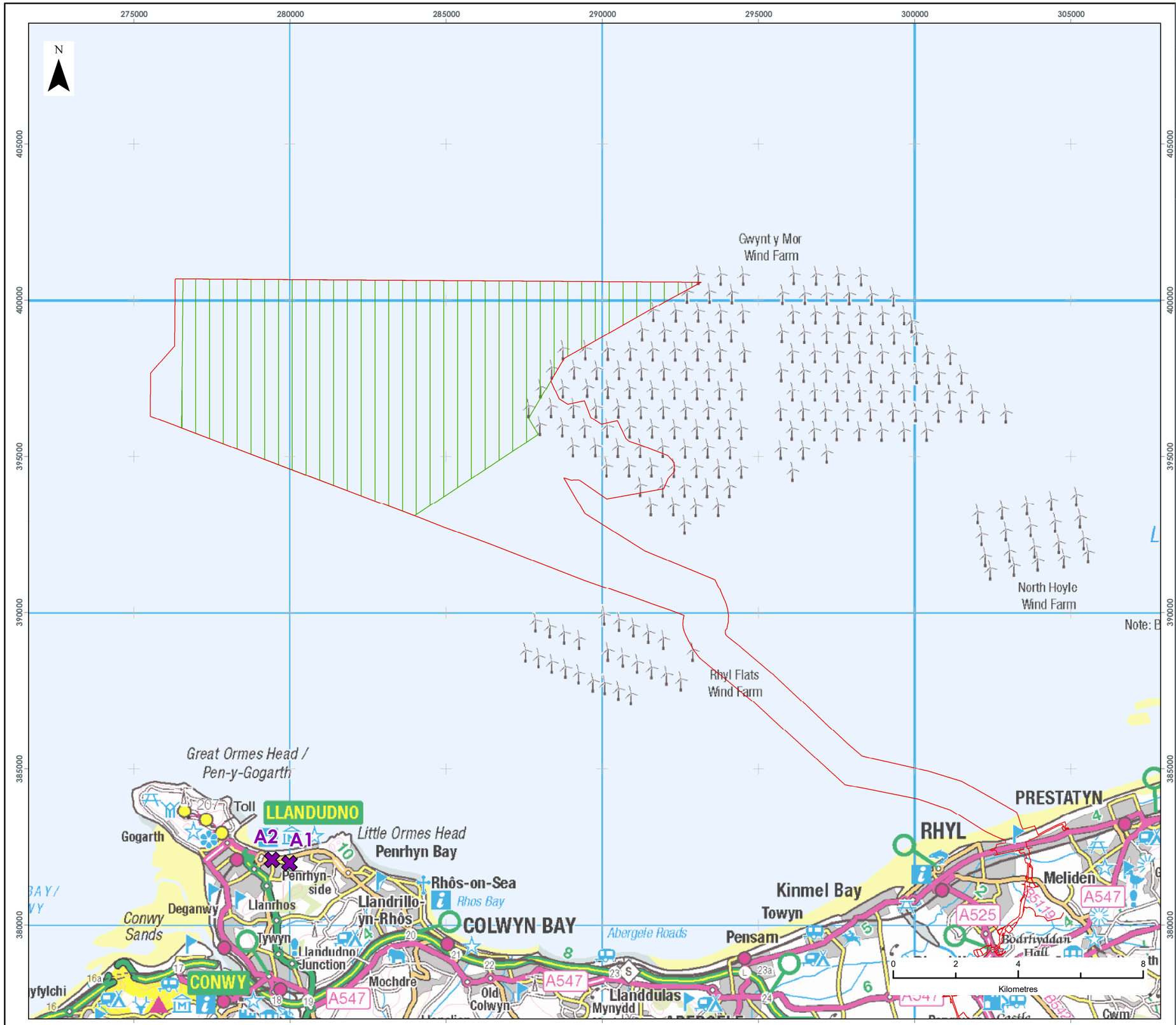
Monitoring locations

194 Baseline sound levels were measured at two locations representative of the nearest noise-sensitive receptors to the array. The locations are described in Table 42.

Table 42: The array monitoring locations.

LOCATION	DESCRIPTION	OS GRID COORDINATES
A1	Within grounds of Ysgol Y Gogarth School located on the roof at a height of approximately 25m and approximately 200m from the beach.	X = 279979.8 Y = 381976.6
A2	On the first-floor balcony of the County Hotel in Llandudno facing the seafront at a height of approximately 4m and approximately 40m from the beach.	X = 279423.5 Y = 382090.9

195 The locations described above, are shown in Figure 11.



LEGEND

- Order Limits
- Proposed Turbine Array Area
- Noise Monitoring Location

Data Source:
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PROJECT TITLE:

AWEL Y MÔR OFFSHORE WINDFARM

FIGURE TITLE:

ARRAY MONITORING LOCATIONS

VER	DATE	REMARKS	Drawn	Checked
1	26/02/2022	ES Issue	JRS	MF

FIGURE NUMBER:

FIGURE 11

SCALE:	PLOT SIZE:	DATUM:	COORDINATE SYSTEM:
1:125,000	A3	ODN	British National Grid

Fferm Wynt Alltraeth
AWEL Y MÔR
Offshore Wind Farm

P:\05356 - GoBe Consultants Ltd\00009 Awel y Mor\Tech\GIS\Dwgs\Wking\202201 Environmental Statement\Chapter 3.10 - Noise\05356.00009.0278.0 Array Baseline Monitoring Locations.mxd

Monitoring equipment and indices measured.

196 The measurements were carried out utilising the equipment listed in Table 43.

197 The sound level meters were calibrated before taking the measurements using an acoustic calibrator and the calibration was checked upon completion of the survey. No significant drift above 1 dB(A) was observed. The calibration chain is traceable via the UKAS to National Standards held at the National Physical Laboratory.

198 The calibration certificates for all the noise monitoring equipment utilised are shown in Annex 5.10.1: Calibration Certificates (application ref: 6.5.10.1).

Table 43: Baseline sound and weather monitoring equipment – the array.

LOCATION	EQUIPMENT	SERIAL NUMBER
A1	RION NL-52 Class 1 Sound Level Meter	00710358
	RION NC-75 Acoustic Calibrator	34713324
	Davis Instruments – Vantage Vue Weather Station: 6250UK	MT210602031
A2	RION NL-52 Class 1 Sound Level Meter	00710359
	RION NC-75 Acoustic Calibrator	34713324

199 At monitoring location A1, the microphone of the sound level meter was placed on the roof of a school building at a height of approximately 1.5 m above the roof in free-field conditions, i.e., at least 3.5 m from the nearest vertical, reflecting surface, at location A2 the microphone was located on a balcony approximately 1m away from the building façade.

200 The following noise level indices being recorded at both locations:

- $L_{Aeq,T}$: The A-weighted equivalent continuous noise level over the measurement period;

- L_{A90}: The A-weighted noise level exceeded for 90% of the measurement period. This parameter is often used to describe background noise; and
- L_{Amax}: The maximum A-weighted noise level during the measurement period.

Measurement duration

201 At both locations, the prevailing sound levels were measured continuously between 7 – 11 January 2022, with noise levels being logged every 15-minutes.

Survey results

202 A summary of the survey results is included in Table 44 and Table 45and are shown in full in Annex 5.10.2: Survey Results (application ref: 6.5.10.2). It must be noted that the survey results have been divided into daytime (07:00 to 19:00), evening (19:00 to 23:00) and night-time (23:00 to 07:00) periods to be consistent with BS5228:2009+A1:2014.

203 The $L_{Aeq,T}$ level is the logarithmic average ambient noise level in each period; the L_{A10} and L_{A90} levels shown are the median levels in each indices during each measurement period.

Table 44: Summary of baseline survey results – location A1.

DATE	PERIOD	$L_{AEQ,T}$	MEDIAN L_{A90}	L_{AMAX}
7 January 2022	Daytime*	57.7	54.7	84.0
	Evening	51.1	47.4	68.4
	Night-time	44.7	38.8	76.9
8 January 2022 (weekend)	Daytime	56.4	52.6	84.4
	Evening	54.3	50.7	83.6
	Night-time	49.3	46.3	70.5
	Daytime	53.0	49.9	82.9
	Evening	47.4	40.3	68.9

DATE	PERIOD	$L_{AEQ,T}$	MEDIAN L_{A90}	L_{AMAX}
9 January 2022 (weekend)	Night-time	41.8	32.9	64.9
10 January 2022	Daytime	53.4	49.7	79.7
	Evening	48.0	38.3	67.8
	Night-time	43.5	34.6	64.4
11 January 2022	Daytime**	55.0	50.7	80.2

*Daytime period started at 12:02. **Daytime period stopped at 10:02.

Table 45: Summary of baseline survey results – location A2.

DATE	PERIOD	$L_{AEQ,T}$	MEDIAN L_{A90}	L_{AMAX}
7 January 2022	Daytime*	68.9	63.9	82.1
	Evening	64.9	59.3	83.4
	Night-time	56.6	45.0	83.2
8 January 2022 (weekend)	Daytime	67.9	60.6	100.0
	Evening	68.1	60.5	108.1
	Night-time	60.3	55.2	79.3
9 January 2022 (weekend)	Daytime	66.4	58.3	85.1
	Evening	60.9	49.1	79.5
	Night-time	55.9	43.0	78.1
10 January 2022	Daytime	67.2	59.6	84.1
	Evening	62.2	42.2	77.9
	Night-time	56.1	41.7	78.4

DATE	PERIOD	$L_{AEQ,T}$	MEDIAN L_{A90}	L_{AMAX}
11 January 2022	Daytime**	67.5	55.1	86.3

*Daytime period started at 14:45. **Daytime period stopped at 09:15.

Soundscape

204 The general soundscape at the measurement locations was recorded during the equipment installation and collection and is shown in Table 38.

Table 46: General soundscape.

LOCATION	SOUNDSCAPE
A1	Wind most dominating noise source. Sound of cars passing from nearby roads, distant noise from the sea
A2	Cars using the B5115, Colwyn Road in front of the hotel most dominant noise source Wind whistling, trees rustling in wind. Sound of waves hitting rocks on beach

Evaluation of array baseline sound levels

205 The nearest noise-sensitive receptors situated to the array would potentially be impacted from daytime and night-time construction operations, therefore it is necessary to evaluate the measured baseline levels in conjunction with the ABC Method contained in BS5228:2009+A1:2014 to calculate the daytime and night-tine construction noise threshold limits.

206 With reference to Table 3 of this chapter and the measured average ambient level at each monitoring location during the daytime, the calculated threshold limits are shown in Table 47. At the request of CCBC the table also sets different threshold limits during differing weather conditions. The measured ambient levels shown for each 'type' of weather condition have been calculated by logarithmically averaging the measured noise levels from periods where the weather was considered 'inclement' and when it was considered 'suitable' for undertaking noise measurements. The weather conditions experienced during the survey are shown in Table 17.

207 It should be noted that the ambient sound levels measured at location A2 include a 3dB reduction to account for the façade reflection from the external wall of the County Hotel and all levels have been rounded to the nearest decibel.

Table 47: Calculated construction noise threshold noise limits dB.

LOCATION	WEATHER CONDITIONS	PERIOD	MEASURED AVERAGE AMBIENT LEVEL $L_{AEQ,T}$	CALCULATED THRESHOLD VALUE $L_{AEQ,T}$
Noise sensitive receptors representative of Location A1	Inclement – winds speed above 11 mph and prolonged periods of precipitation	Daytime	56	65
		Evening	53	60
		Night-time	49	55
	Suitable for noise monitoring – winds speed below 11 mph and minor periods of precipitation	Daytime	53	65
		Evening	48	55
		Night-time	44	50

LOCATION	WEATHER CONDITIONS	PERIOD	MEASURED AVERAGE AMBIENT LEVEL $L_{AEQ,T}$	CALCULATED THRESHOLD VALUE $L_{AEQ,T}$
Noise sensitive receptors representative of Location A2	Inclement – winds speed above 11 mph and prolonged periods of precipitation	Daytime	65	70
		Evening	64	65
		Night-time	57	55
	Suitable for noise monitoring – winds speed below 11 mph and minor periods of precipitation	Daytime	64	70
		Evening	59	65
		Night-time	56	55

10.8.6 Baseline data limitations and uncertainty

208 The measures taken to minimise the uncertainty regarding the baseline sound levels are outlined in paragraph 125 of this chapter.

209 Further to these, and following the completion of the baseline monitoring, the following has been noted:

- baseline sound levels were measured at all the locations, or proxy locations, and periods agreed with DCC during the ETG meeting on 31 March 2021;
- the weather conditions throughout the survey period in April 2021 were suitable for undertaking environmental sound measurement, this was determined through observations made by the surveyors and studying relevant weather websites for the survey periods;

- regarding the baseline survey for the array undertaken in January 2022, at the request of CCBC baseline sound levels were measured during a variety of differing weather conditions, which were recorded utilising a weather station.
- the sound level meters were field calibrated before the start of relevant measurement period and at the end of the measurement and no significant drifts in calibration were observed;
- all the sound level meters utilised for the measurements operated normally throughout the survey period and to the best of The Applicant's knowledge were not interfered with; and
- following analysis of the data, it is considered that the measured baseline sound levels throughout the survey were representative of the prevailing sound climate at the nearest noise-sensitive receptors to the landfall, onshore ECC, OnSS and array.

210 With reference to the above, it is therefore considered that the uncertainty and limitations regarding the baseline data were kept to a minimum as far as reasonably practicable.

10.8.7 Worst-case approach to establish baseline

211 As outlined within this section, the baseline data has been utilised to calculate limits for both the construction and operational assessments. The limits have been based on:

- the lowest average ambient sound levels measured at the relevant locations for the construction noise threshold limits;
- the lowest median background sound levels measured at the relevant locations for the operational noise from the OnSS (residential receptors); and
- the lowest measured ambient sound levels measured at the relevant location for the operational noise from the OnSS (commercial receptors).

212 With reference to the above, it is therefore considered a worst-case approach has been adopted regarding the baseline data.

10.8.8 Evolution of the baseline

213 The baseline noise conditions are not expected to evolve significantly between now and the point of impact over the project lifetime.

214 The baseline sound levels in both April 2021 and January 2022 were measured during a period when the Covid-19 pandemic was still having an impact on road, rail and aircraft traffic flows, therefore it is considered that when traffic flows return to a 'normal' situation there is potential for the baseline sound levels to increase.

215 It is also considered that the other proposed developments in the area, considered within the cumulative assessment, would not have a significant impact on the evolution of the baseline sound levels.

10.9 Key parameters for assessment

216 The maximum design scenarios (MDS) identified in Table 48 have been selected as those having the potential to result in the greatest effect on an identified receptor or receptor group. These scenarios have been selected from the details provided in the project description (Volume 3, Chapter 1 (application ref: 6.3.1)). Effects of greater adverse significance are not predicted to arise should any other development scenario, based on details within the project Design Envelope, be taken forward in the final design scheme.

Table 48: Maximum design scenario.

POTENTIAL EFFECT	MAXIMUM ADVERSE SCENARIO ASSESSED	JUSTIFICATION
CONSTRUCTION		
Temporary noise effects of construction of landfall (human receptors)	Assumed all elements of plant used in each activity operating in the same location at the same time. Resultant noise level for each activity compared and the noisiest selected. Area source of the combined sound power level for the noisiest	Construction activities at the closest approach will result in greater noise impacts. Piling rig operating simultaneously will

POTENTIAL EFFECT	MAXIMUM ADVERSE SCENARIO ASSESSED	JUSTIFICATION
	activity (site preparation works) placed at closest approach to receptor closest to the relevant construction area. Construction activities also assume piling rig associated with the cofferdam will be working simultaneously with noisiest construction activity.	result in greater noise impacts.
	HDD drilling works modelled as an area source within the drilling compound. The area source would generate the total noise level from all HDD operations.	MDS as the exact location of drilling works with the HDD drilling zone cannot be defined.
	With regards to the construction of the off-route access roads, the assessment has assumed the grader equipment is operating at its closest approach to each NSR.	Not all the plant associated with site preparation works will be required for the off-route access road construction. The grader equipment is the noisiest item of equipment and therefore represents an MDS.
	Assessment assumes that impact piling will be required to construct a cofferdam at the MHWS (closest approach the northern extents of the beach).	Impact piling is likely to generate relatively high levels of noise compared to other types of cofferdam

POTENTIAL EFFECT	MAXIMUM ADVERSE SCENARIO ASSESSED	JUSTIFICATION
		construction methods. Closest approach will result in greater noise impacts.
	Weekend assessment undertaken for landfall construction operations. HDD operations at the landfall have been assessed based on 24/7 working.	Saturday afternoon (13:00 to 19:00 hours) construction operations are proposed (no evening or night-time construction operations are proposed) Evening and night-time HDD operations are proposed.
Temporary noise effects of construction of the onshore ECC	Assumed all elements of plant used in each activity operating in the same location at the same time. Resultant noise level for each activity compared and the noisiest selected. Area source measuring 100 m long by 40 m wide generating the combined sound power level for the noisiest activity placed at closest approach to receptor closest to each onshore ECC construction area. Noise assessment assumes that construction activity from noisiest phase is located at the extremity	Considered an MDS as plant associated with the nosiest phase (site preparation) of onshore ECC construction works operating within a relatively small area. Construction activities at the extremity of the onshore ECC or TCC will result in greater noise impacts.

POTENTIAL EFFECT	MAXIMUM ADVERSE SCENARIO ASSESSED	JUSTIFICATION
	of the onshore ECC or TCC closest to NSRs.	
	Weekend assessment undertaken for onshore ECC construction operations. HDD operations at specified locations have been assessed based on 24/7 working.	Saturday afternoon (13:00 to 19:00 hours) construction operations are proposed (no evening of night-time construction operations are proposed) Evening and night-time HDD operations are proposed.
	With regards to the construction of the off-route access roads, the assessment has assumed the grader equipment is operating at its closest approach to each NSR.	Not all the plant associated with site preparation works will be required for the construction of the off-route access roads. The grader equipment is the noisiest item of equipment and therefore represents an MDS.
	HDD drilling works modelled as an area source within each drilling compound. The area source would generate the total noise level from all HDD operations.	MDS as the exact location of drilling works with the HDD drilling zone cannot be defined.

POTENTIAL EFFECT	MAXIMUM ADVERSE SCENARIO ASSESSED	JUSTIFICATION
Temporary noise effects of construction of onshore OnSS	Assumed all elements of plant used in each phase operating in the same location at the same time. Resultant noise level for each phase compared and the noisiest phase for each workflow selected. Area source of the combined sound power level for the noisiest phase placed at closest approach to receptor closest to the OnSS zone. Each area source approximately 25% of the total area of the OnSS zone.	Construction activities at the extremity of the OnSS construction zone will result in greater noise impacts.
	Weekend assessment undertaken for OnSS construction operations.	Saturday afternoon (13:00 to 19:00 hours) construction operations are proposed.
	The construction noise and vibration assessments assume that impact piling will be required to construct OnSS the foundations.	Impact piling is likely to generate relatively high levels of noise and vibration compared to other types of foundation construction methods.

POTENTIAL EFFECT	MAXIMUM ADVERSE SCENARIO ASSESSED	JUSTIFICATION
Temporary noise effects of construction traffic	Maximum flows expected on each link within the study area assessed.	The values presented will result in the highest noise impact which would occur during the busiest month for each link. During the majority of the period of the construction works the noise impacts will therefore be lower.
	Worst-case hourly movements assessed on each of the off-route access roads.	Values presented will result in the highest noise impact.
Temporary construction noise effects of offshore piling operations associated with the Array	Piling (monopile and pin pile) operations being undertaken at their closest approach to the onshore receptors. Assessment assumes two pin piles would be undertaken simultaneously at their closest approach to the onshore receptors.	Two pin piles being undertaken simultaneously at their closest approach would result in worst-case noise impacts, when compared to the monopile scenario.
Temporary vibration effects of construction of the cofferdam	Impact piling will be required for the cofferdam at its closest location.	Impact piling is likely to generate relatively high levels of vibration compared to other types of foundation construction methods.

POTENTIAL EFFECT	MAXIMUM ADVERSE SCENARIO ASSESSED	JUSTIFICATION
		Closest approach will lead to greater vibration impacts.
Temporary vibration effects of HDD drilling	HDD drilling and vibratory piling will be carried out at the landfall and various locations along the onshore ECC. Assessment assumes drilling and piling rig will be positioned at its closest approach to each Vibration Sensitive Receptor (VSR).	Closest approach will lead to greater vibration impacts.
Temporary vibration effects of the construction of the OnSS foundations	Impact piling will be required for the OnSS foundations at each boundary of the OnSS zone closest to each VSR.	Impact piling is likely to generate relatively high levels of vibration compared to other types of foundation construction methods. Closest approach will lead to greater vibration impacts.
OPERATION		
Operational noise effects of the OnSS	Predictions of operational noise have assumed an Air Insulated Switchgear (AIS) OnSS layout and that all the plant associated with the OnSS is operating 100% of the time at locations shown on an layout plan provided (see Figure 30 in Volume 3, Chapter 1: Onshore Project Description	AIS technology, with equipment located outside of buildings, and plant operating 100% of the time will lead to greater noise impacts, compared to a Gas Insulated

POTENTIAL EFFECT	MAXIMUM ADVERSE SCENARIO ASSESSED	JUSTIFICATION
	(application ref: 6.3.1)). The assessed layout avoids placing buildings between noise emitting equipment and NSRs in order to present a worst case for assessment.	Switchgear (GIS) technology layout.
DECOMMISSIONING		
Noise and vibration effects of all decommissioning activities	Decommissioning activities are not anticipated to exceed the construction phase worst case criteria assessed. In addition, it is also recognised that policy, legislation and local sensitivities constantly evolve, which will limit the relevance of undertaking an assessment at this stage.	Decommissioning considered less intense than construction operations. Assumed that no night-time or piling operations would be associated with decommissioning works.
CUMULATIVE EFFECTS		
Cumulative noise and vibration effects from temporary concurrent construction activities	Maximum design parameters/ extents of any proposed construction areas have been used for the purposes of defining potential noise and vibration impacts.	This ensures that all potential scenarios and associated impacts have been assessed for the purposes of providing a worst-case cumulative assessment.
Cumulative noise and vibration effects from the concurrent operational developments	Maximum design parameters/ extents of any proposed operational developments have been used for the purposes of defining potential noise and vibration impacts.	

10.10 Mitigation measures

217 Mitigation measures that were identified and adopted as part of the evolution of the project design (embedded into the project design) and that are relevant to noise and vibration are listed in Table 49. The mitigation includes embedded measures such as design changes and applied mitigation which is subject to further study or approval of details; these include avoidance measures that will be informed by pre-construction surveys, and necessary additional consents where relevant. The composite of embedded and applied mitigation measures apply to all parts of the AyM development works, including pre-construction, construction, O&M and decommissioning.'

Table 49: Mitigation measures relating to noise and vibration.

PARAMETER	MITIGATION MEASURES
GENERAL	
Project design	Routing of the onshore cable route and locations of the TCCs and OnSS to avoid key areas of sensitivity.
	Number of offshore turbines reduced to 50 from 107 at scoping and 91 at PIER; this will have a >50% reduction in the number of construction piling events and subsequently reducing potential noise impacts.
CONSTRUCTION	
Construction noise and vibration all onshore elements	All construction work will be undertaken in accordance with a Noise and Vibration Management Plan (NVMP). An outline version is provided as Appendix 2 to the outline CoCP (application ref: 8.13.2). Approval of the final NVMP by DCC is secured as a requirement of the DCO. The outline version of the NVMP sets out the principles to be followed when the final NVMP is finalised.

PARAMETER	MITIGATION MEASURES
Construction Noise – Landfall	Construction of a 2.4 m high hoarding/fence around the perimeter of the HDD compound.
Construction Noise – ECC	Construction of a 2.4 m high hoarding/fence around the perimeter of the HDD entry compounds to the east of the A525 crossing and at the A55 crossing.
OPERATION	
Operational noise from the OnSS	OnSS sited at a location to avoid key areas of sensitivity
DECOMMISSIONING	
Noise and vibration levels generated by decommissioning operations	Not anticipated that any further mitigation measures would be required, other than those associated with construction operations.

218 During the detailed design, additional mitigation measures can be specified (and agreed with DCC through approval of the final NVMP), to further reduce the noise impact of AyM. These measures relate to the specifics of the detailed design, and so cannot be accurately included in the assessment at this stage. However, examples of what these mitigation measures may be, and an indication of how much mitigation they may provide, are given in Table 50 below.

Table 50: Potential detailed design mitigation measures relating to noise and vibration.

MITIGATION MEASURE	INDICATIVE NOISE LEVEL REDUCTION	JUSTIFICATION FOR INDICATIVE NOISE LEVEL REDUCTION
Localised acoustic screening providing partial line of sight between noise source and receiver	Up to 5 dB(A)	Section F.2.2.2 of BS5228:2009+A1:2014 states:

MITIGATION MEASURE	INDICATIVE NOISE LEVEL REDUCTION	JUSTIFICATION FOR INDICATIVE NOISE LEVEL REDUCTION
Localised acoustic screening preventing any line of sight between noise source and receiver	Up to 10 dB(A)	*'if there is a barrier or other topographic feature between the source and the receiving position, assume an approximate attenuation of 5 dB when the top of the plant is just visible to the receiver over the noise barrier, and of 10 dB when the noise screen completely hides the sources from the receiver'*
Fitting more efficient exhaust sound reduction equipment to earth moving plant	5 to 10 dB(A)	Table B.1 of BS5228:2009+A1:2014
Enclose breakers and rock drills in portable or fixed acoustic enclosures with suitable ventilation	Up to 20 dB(A)	Table B.1 of BS5228:2009+A1:2014
Use rotary drills and boring plant inside acoustic shed with adequate ventilation	Up to 15 dB(A)	Table B.1 of BS5228:2009+A1:2014
Reduction of simultaneous use of plant	Up to 3 dB(A)	Halving the amount of plant being utilised simultaneously thus halving the sound

MITIGATION MEASURE	INDICATIVE NOISE LEVEL REDUCTION	JUSTIFICATION FOR INDICATIVE NOISE LEVEL REDUCTION
		energy being generated could provide a 3dB reduction.
Re-positioning plant as far away from NSRs as reasonably practicable	Up to 6 dB(A)	Doubling the distance between a noise source and a receiver can provide up to a 6dB reduction.
Not using particularly noisy items of plant pieces at night as far as reasonably practicable	Up to 3 dB(A)	Halving the amount of plant being utilised simultaneously, thus halving the sound energy being generated, could provide a 3dB reduction.
Limiting or eliminating certain works during more sensitive periods	Varies	Would depend on what works/plant was limited or eliminated.
Use of electric or hybrid construction plant	Varies	Dependant on item of plant.

219 Final mitigation measures would be informed by detailed design post consent and included within the final NVMP which would be submitted for approval by DCC as part of the final CoCP that is secured within the DCO.

10.11 Environmental assessment: construction phase

220 A development of this nature has the potential to generate noise and vibration during the construction phases, should appropriate mitigation not be employed. However, disruption due to construction-related noise and vibration is a localised phenomenon and is both temporary and intermittent in nature. The techniques available to predict the likely noise and vibration effects from construction sites are necessarily based on quite detailed information on the type and number of plant being used, their location within the site and the length of time they are in operation.

10.11.1 Construction noise

221 During the construction of the AyM, noise from construction activities will inevitably be generated and will, during certain phases of construction, be audible at residential receptors in the vicinity of construction activities. The purpose of this section of the Chapter is therefore to:

- quantify the likely levels of construction noise that can be expected at the nearest residential receptor locations to construction works;
- provide comment as to the magnitude of the potential construction noise impacts, the resulting level of effect and whether this is significant in EIA terms; and
- where relevant, identify those impacts that would require specific mitigation measures in order for the potential noise effects to be reduced to a level considered acceptable.

10.11.2 Construction plant and associated noise levels

222 A detailed list of indicative construction plant, operational noise levels and associated on-times for all the construction activities/operations have been provided; the full list of plant is included within Annex 5.10.3: Construction Plant (application ref: 6.5.10.3).

223 Based on this list, the combined sound power level (SWL) has been calculated for each construction activity taking into account the number of plant and associated on-times, as shown in Table 51 and Table 52.

Table 51: Combined sound power levels landfall and onshore ECC, dB.

ACTIVITY	COMBINED SOUND POWER LEVEL (SWL)
1. Establish Access and TCC (including HDD compounds)	120
2. Site Preparation, Including Fencing, Haul Road Construction and Topsoil Strip	120
3. Transition Bay Excavation	116
4. Transition Bay Wall and Base Construction	114
5. Connection of Cables in Transition Bays	115
6. Roof and Backfill over Transition Bay	118
7. Trench Excavation and duct installation	118
8. Trench Backfill	119
9. Jointing Bay Excavation	116
10. Jointing Bay Base Construction	114
11. Pulling and Connection of Cables	114
12. Backfill over Jointing Bay	118
13. TCC Operations	109
14. HDD Compound Operations (including piling)	116
15. Night-time HDD Operations (excluding piling)	114

Table 52: Combined sound power levels OnSS, dB.

ACTIVITY	COMBINED SOUND POWER LEVEL (SWL)
1. Ground Works	123
2. Building Foundation	115
3. Access Road and Carparks	116
4. Building Fabric and HV Plant	118

224 For the purpose of this chapter, the construction noise assessment has been divided into the following phases:

- the landfall;
- the onshore ECC;
- the OnSS; and
- the Array.

10.11.3 Landfall

225 A summary of the construction works associated with the landfall is given below:

- construction of the landfall TCC area(s);
- HDD works ((or other trenchless technology techniques) including temporary construction of HDD exit pits in the intertidal or shallow subtidal;
- intertidal trenching;
- construction of Transition Joint Bays (TJBs).
- installation of offshore export cables (cable pulling);
- installation of and jointing to onshore export cables; and
- backfilling and re-instatement works.

226 With regards to the TJB's these will be located to the south of the North Coast railway line.

227 Access to the beach area will be:

- from the east via the A548 Rhyl coast road and Ferguson Avenue using an existing access track onto the promenade where there is an existing slipway onto the beach;
- from the west via Garford Road and an existing access onto Rhyl Golf Course and the promenade where there is an existing slipway onto the beach; or
- from the west via the existing Rhyl Golf Course site entrance.

228 The predicted construction noise levels for the landfall have therefore assumed the following:

- all the plant associated with Site Preparation (noisiest activity) would be located across the total area of the HDD/TJB;
- the piling rig associated with the cofferdam will be operating at the MHWS simultaneously with the noisiest activity described above;
- a 2.4 m high hoarding/barrier would be erected around the perimeter of the HDD compound;
- Average Source height of 2 m, receptor height of 1.5 m for daytime assessments and night-time ground floor (bungalows), 4 m for night-time first floor;
- ground absorbency factor of 0.5 between the source and the receivers;
- downwind propagation between the source and the receivers;
- HDD drilling modelled as an area source across the HDD drilling compound; and
- during evening and night-time periods, only HDD operations would be undertaken.

229 A weekend daytime assessment has been undertaken to account for the proposed construction period between 13:00 and 19:00 on a Saturday.

230 With regards to night-time HDD operations, it has been confirmed that the vibratory piling rig would not be utilised during the night-time, consequently the night-time predictions have utilised the noise level shown as item 15 in Table 51.

231 The predictions also take into account the relevant mitigation measures outlined in Table 49.

232 Based on the above, the worst-case noise levels from construction operations associated with the landfall have been predicted at the nearest NSRs.

233 The NSRs considered are shown in Table 53. These NSRs have been considered as they are the receptors located closest to each working area considered and therefore would be subject to the greatest potential impacts. It must be noted however that in the majority of cases these receptors are located in close proximity to other NSRs which could also be subject to potential impacts, though not as great.

234 Table 53 also provides the grid co-ordinates, the representative baseline monitoring location (as shown in Table 18), the closest working area and distance from the receptor to the closest working area.

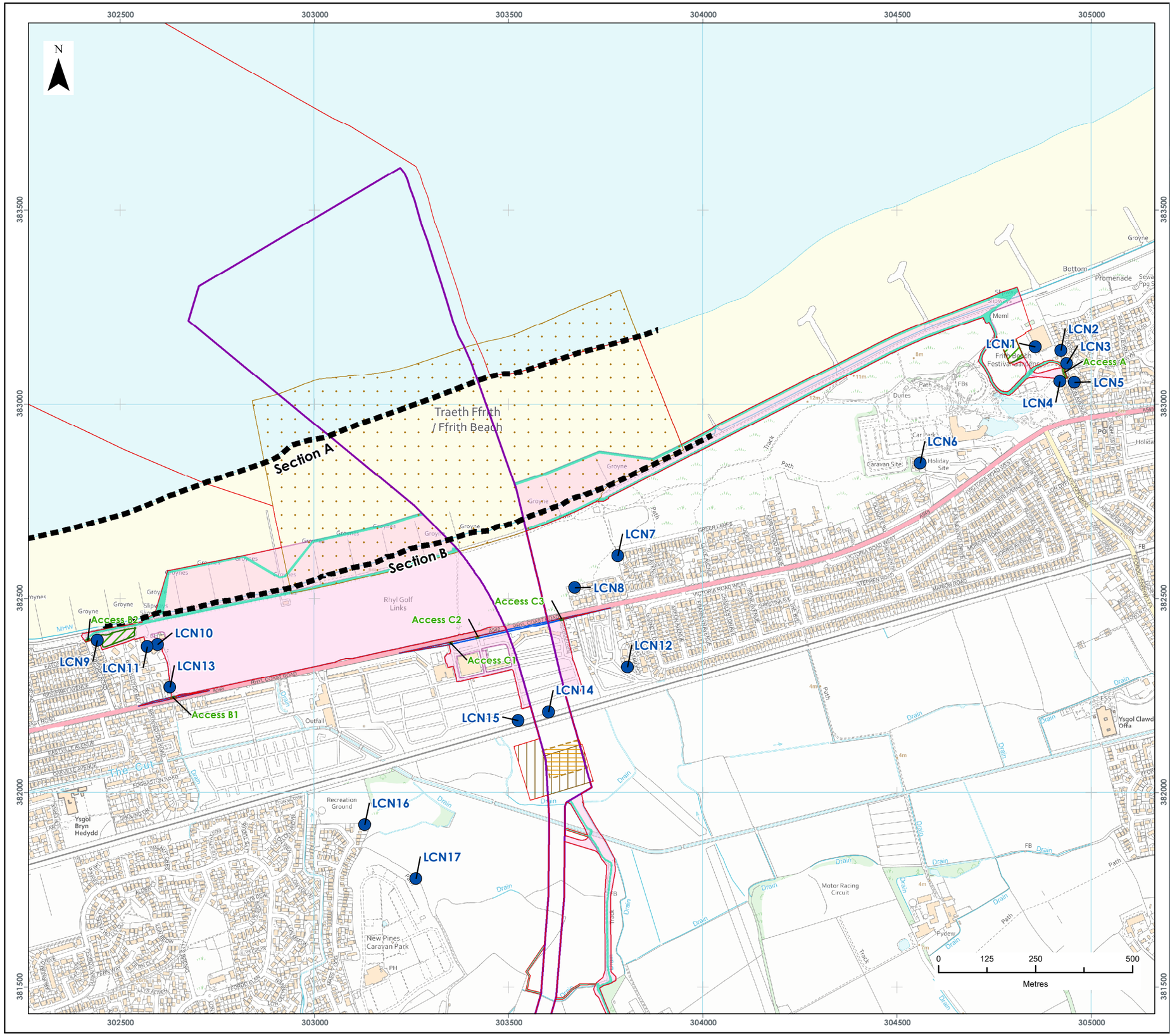
Table 53: NSRs considered – landfall construction noise.

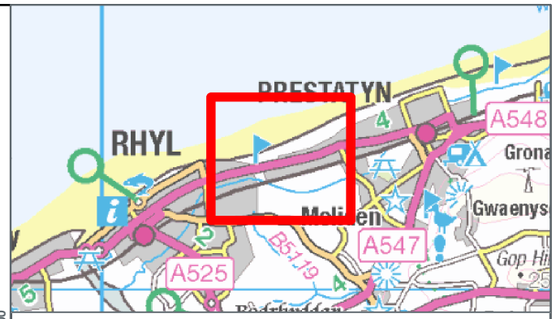
NSR NAME	REPRESENTATIVE BASELINE MONITORING LOCATION	OS GRID CO-ORDINATES	CLOSEST WORKING AREA	DISTANCE TO WORKING AREA (M)
North Wales Bowling Centre – LCN1	Landfall Monitoring AR1	304856.4, 83147.2	North-east TCC	37
154 Ffordd Idwal – LCN2	Landfall Monitoring AR1	304921.8, 383138.2	North-east TCC	97
164 Ffordd Idwal – LCN3	Landfall Monitoring AR1	304937.7, 383104.1	North-east TCC	115
15 Ferguson	Landfall Monitoring AR1	304920.0, 383058.6	North-east TCC	117

NSR NAME	REPRESENTATIVE BASELINE MONITORING LOCATION	OS GRID CO-ORDINATES	CLOSEST WORKING AREA	DISTANCE TO WORKING AREA (M)
Avenue – LCN4				
12 Ferguson Avenue – LCN5	Landfall Monitoring AR1	304957.1, 383056.4	North-east TCC	150
40 Victoria Road W – LCN6	Landfall Monitoring AR1	304559.7, 382847.7	North-east TCC	345
61 Green Lanes – LCN7	Landfall Monitoring Location L1	303781.9, 382609.8	HDD area	480
Terifyn Pella Avenue – LCN8	Landfall Monitoring Location L1	303670.3, 382527.4	HDD area	385
31 Garford Road – LCN9	Landfall Monitoring Location L2	302441.0, 382392.0	North-west TCC	10
Rhyl Golf Club NE façade – LCN10	Landfall Monitoring Location L2	302596.3, 382381.2	North-west TCC	60
Rhyl Golf Club NW façade – LCN11	Landfall Monitoring Location L2	302570.1, 382375.9	North-west TCC	60
6 Cherry Close – LCN12	Landfall Monitoring Location L3	303805.8	382323.1	225

NSR NAME	REPRESENTATIVE BASELINE MONITORING LOCATION	OS GRID CO-ORDINATES	CLOSEST WORKING AREA	DISTANCE TO WORKING AREA (M)
190 Rhyl Coast Road – LCN13	Landfall Monitoring Location L2	302628.3, 382270.8	North-west TCC	160
Robin Hood Holiday Park - Caravan 52 – LCN14	Landfall Monitoring Location L3	303603.2, 382207.7	TJB area	70
Robin Hood Holiday Park - Caravan 70 – LCN15	Landfall Monitoring Location L3	303525.2, 382185.4	TJB area	60
98 Maes-Y-Gog – LCN16	Landfall Monitoring Location L4	303129.6, 381917.3	TJB area	420
New Pines Holiday Home Park – LCN17	Landfall Monitoring Location L4	303261.5, 381778.8	TJB area	350

235 The locations of the NSRs described above are shown on Figure 12.





LEGEND

- Order Limits
- Onshore Cable Route Section Breaks
- Proposed Onshore Export Cable Corridor
- Proposed Indicative Trenchless Crossing Compound
- Proposed Temporary Construction Compound
- Proposed Transition Joint Bay Construction Compound
- Proposed Access Location
- Proposed Operational Access Route
- Proposed Construction Access Area
- Anchoring Zone
- Proposed Major Road Crossing Visibility Splay
- Noise Sensitive Receptor Considered

LCN1: North Wales Bowling Centre
LCN2: 154 Ffordd Idwal
LCN3: 164 Ffordd Idwal
LCN4: 15 Ferguson Avenue
LCN5: 12 Ferguson Avenue
LCN6: 40 Victoria Road W
LCN7: 61 Green Lanes
LCN8: Terifyn Pella Avenue
LCN9: 31 Garford Road
LCN10: Rhyl Golf Club NE façade
LCN11: Rhyl Golf Club SW façade
LCN12: 6 Cherry Close
LCN13: 190 Rhyl Coast Road
LCN14: Robin Hood Holiday Park - Caravan 52
LCN15: Robin Hood Holiday Park - Caravan 70
LCN16: 98 Maes-Y-Gog
LCN17: New Pines Holiday Home Park

PROJECT TITLE:

AWEL Y MÔR OFFSHORE WINDFARM

FIGURE TITLE:

LOCATION OF NSRS CONSIDERED - LANDFALL CONSTRUCTION NOISE

VER	DATE	REMARKS	Drawn	Checked
1	08/04/2022	ES Issue	JRS	MF

FIGURE NUMBER:

FIGURE 12

SCALE:	PLOT SIZE:	DATUM:	COORDINATE SYSTEM:
1:10,000	A3	ODN	British National Grid

Fferm Wynt Alltraeth
AWEL Y MÔR
Offshore Wind Farm

P:\05356 - GoBe Consultants Ltd\00009 Awel y Mor\Tech\GIS\Dwgs\Wking\202201 Environmental Statement\Chapter 3.10 - Noise\05356.00009.0274.0 NSRs Considered - Landfall Construction Noise.mxd

236 The predicted noise levels from worst-case daytime, evening and night-time landfall construction operations are shown in Table 54 and Table 55. The Tables also compare the predicted noise levels to the calculated threshold limits and with reference to Table 8, Table 10 and Table 15 define the level of effect and significance.

237 It must be noted that Table 54 does not include an evening or night-time assessment as construction operations, excluding HDD (or other trenchless technology techniques), are anticipated to be between 07:00 hours and 19:00 hours Monday to Saturday, in view of the this all the receptors included in Table 54 are of a **medium** sensitivity.

238 It must also be noted that Table 55 relates to HDD operations and only includes the most impacted NSRs from daytime, evening and night-time operations, i.e. the other NSRs considered in Table 54 would be less impacted than the NSRs considered in Table 55; therefore a MDS has been presented.

239 It must also be noted that where no baseline sound data is available at a receptor location for an assessment period the threshold limits are based on the Category A limits contained in Table 2 as it is considered that this represents a worst-case scenario.

240 With regards to the sensitivity of the NSRs in Table 55, they are of a **medium** sensitivity during the daytime and evening periods and of a **high** sensitivity during the night-time period.

241 With regards to the cofferdam piling operations it has been assumed that these are being undertaken at edge of the offshore ECC (i.e. closest approach to the NSRs) at the MHWS, approximately 230 m away from the nearest NSRs, these operations have been referenced in Table 54 if they are the main contributor to the predicted noise level or are within 10 dB of the total predicted noise levels at any relevant NSR.

Table 54: Landfall construction noise – daytime assessment, dB.

NSR NAME	WORST-CASE CONSTRUCTION ACTIVITY	PREDICTED NOISE LEVEL $L_{AEQ,T}$	PERIOD	THRESHOLD LIMIT, $L_{AEQ,T}$	DIFFERENCE	IMPACT MAGNITUDE	LEVEL OF EFFECT AND SIGNIFICNACE
North Wales Bowling Centre – LCN1	Site preparation in north-east TCC	71	Daytime	65	+6	**High**	***Major*** (significant)
			Weekend	55	+16	**High**	***Major*** (significant)
154 Ffordd Idwal – LCN2	Site preparation in north-east TCC	62	Daytime	65	-3	**Negligible**	***Minor*** (not significant)
			Weekend	55	+7	**High**	***Major*** (significant)
61 Green Lanes – LCN7	Cofferdam piling	55	Daytime	65	-10	**Negligible**	***Minor*** (not significant)
			Weekend	55	0	**Negligible**	***Minor*** (not significant)
	Cofferdam piling	58	Daytime	65	-7	**Negligible**	***Minor*** (not significant)

NSR NAME	WORST-CASE CONSTRUCTION ACTIVITY	PREDICTED NOISE LEVEL $L_{AEQ,T}$	PERIOD	THRESHOLD LIMIT, $L_{AEQ,T}$	DIFFERENCE	IMPACT MAGNITUDE	LEVEL OF EFFECT AND SIGNIFICNACE
Terifyn Pella Avenue – LCN8			Weekend	55	+3	**Medium**	***Moderate*** (Significant)
31 Garford Road – LCN9	Site preparation in north-west TCC	77	Daytime	65	+12	**High**	***Major*** (significant)
			Weekend	55	+22	**High**	***Major*** (significant)
Rhyl Golf Club NE facade – LCN10	TJB operations	44	Daytime	65	-21	**Negligible**	***Minor*** (not significant)
			Weekend	55	-11	**Negligible**	***Minor*** (not significant)
Rhyl Golf Club NW facade – LCN11	Site preparation in north-west TCC	68	Daytime	65	+3	**Medium**	***Moderate*** (Significant)
			Weekend	55	+13	**High**	***Major*** (significant)

NSR NAME	WORST-CASE CONSTRUCTION ACTIVITY	PREDICTED NOISE LEVEL $L_{AEQ,T}$	PERIOD	THRESHOLD LIMIT, $L_{AEQ,T}$	DIFFERENCE	IMPACT MAGNITUDE	LEVEL OF EFFECT AND SIGNIFICNACE
6 Cherry Close – LCN12	TJB operations	54	Daytime	65	-11	**Negligible**	***Minor*** (not significant)
			Weekend	55	-1	**Negligible**	***Minor*** (not significant)
190 Rhyl Coast Road – LCN13	TJB operations	45	Daytime	65	-20	**Negligible**	***Minor*** (not significant)
			Weekend	55	-10	**Negligible**	***Minor*** (not significant)
Robin Hood Holiday Park - Caravan 52 – LCN14	TJB operations	65	Daytime	65	0	**Negligible**	***Minor*** (not significant)
			Weekend	55	+10	**High**	***Major*** (significant)
Robin Hood Holiday	TJB operations	66	Daytime	65	+1	**Low**	***Minor*** (not significant)

NSR NAME	WORST-CASE CONSTRUCTION ACTIVITY	PREDICTED NOISE LEVEL $L_{AEQ,T}$	PERIOD	THRESHOLD LIMIT, $L_{AEQ,T}$	DIFFERENCE	IMPACT MAGNITUDE	LEVEL OF EFFECT AND SIGNIFICNACE
Park - Caravan 70 – LCN15			Weekend	55	+11	**High**	***Major*** (significant)
98 Maes-Y-Gog – LCN16	TJB operations	53	Daytime	65	-12	**Negligible**	***Minor*** (not significant)
			Weekend	55	-2	**Negligible**	***Minor*** (not significant)
New Pines Holiday Home Park – LCN17	TJB operations	53	Daytime	65	-12	**Negligible**	***Minor*** (not significant)
			Weekend	55	-2	**Negligible**	***Minor*** (not significant)

Table 55: Landfall construction noise – HDD daytime, evening and night-time assessment, dB.

NSR NAME	CONSTRUCTION ACTIVITY	PREDICTED NOISE LEVEL $L_{AEQ,T}$	PERIOD	THRESHOLD LIMIT, $L_{AEQ,T}$	DIFFERENCE	IMPACT MAGNITUDE	LEVEL OF EFFECT AND SIGNIFICANCE
61 Green Lanes – LCN7	HDD Operations	48	Daytime	65	-17	**Negligible**	***Minor*** (not significant)
		48	Evening / Weekend	55	-7	**Negligible**	***Minor*** (not significant)
		46	Night-time	45	+1	**Low**	***Moderate*** *(significant)*
Terifyn Pella Avenue – LCN8	HDD Operations	50	Daytime	65	-15	**Negligible**	***Minor*** (not significant)
		50	Evening / Weekend	55	-5	**Negligible**	***Minor*** (not significant)
		48	Night-time	45	+3	**Medium**	***Major*** *(significant)*
	HDD Operations	53	Daytime	65	-12	**Negligible**	***Minor*** (not significant)

NSR NAME	CONSTRUCTION ACTIVITY	PREDICTED NOISE LEVEL $L_{AEQ,T}$	PERIOD	THRESHOLD LIMIT, $L_{AEQ,T}$	DIFFERENCE	IMPACT MAGNITUDE	LEVEL OF EFFECT AND SIGNIFICANCE
6 Cherry Close – LCN12		53	Evening / Weekend	55	-2	**Negligible**	***Minor*** (not significant)
		51	Night-time	55	-4	**Negligible**	***Minor*** (not significant)
Robin Hood Holiday Park - Caravan 52 – LCN14	HDD Operations	61	Daytime	65	-4	**Negligible**	***Minor*** (not significant)
		61	Evening / Weekend	55	+6	**High**	***Major*** *(significant)*
		59	Night-time	55	+4	**Medium**	***Major*** *(significant)*
Robin Hood Holiday Park - Caravan 70 – LCN15	HDD Operations	59	Daytime	65	-6	**Negligible**	***Minor*** (not significant)

NSR NAME	CONSTRUCTION ACTIVITY	PREDICTED NOISE LEVEL $L_{AEQ,T}$	PERIOD	THRESHOLD LIMIT, $L_{AEQ,T}$	DIFFERENCE	IMPACT MAGNITUDE	LEVEL OF EFFECT AND SIGNIFICANCE
		59	Evening / Weekend	55	+4	**Medium**	***Moderate*** *(significant)*
		57	Night-time	55	+4	**Medium**	***Major*** *(significant)*
98 Maes-Y-Gog – LCN16	HDD Operations	48	Daytime	65	-17	**Negligible**	***Minor*** (not significant)
		48	Evening / Weekend	55	-7	**Negligible**	***Minor*** (not significant)
		47	Night-time	50	-3	**Negligible**	***Minor*** (not significant)

NSR NAME	CONSTRUCTION ACTIVITY	PREDICTED NOISE LEVEL $L_{AEQ,T}$	PERIOD	THRESHOLD LIMIT, $L_{AEQ,T}$	DIFFERENCE	IMPACT MAGNITUDE	LEVEL OF EFFECT AND SIGNIFICANCE
New Pines Holiday Home Park – LCN17	HDD Operations	50	Daytime	65	-15	**Negligible**	***Minor*** (not significant)
		50	Evening / Weekend	55	-5	**Negligible**	***Minor*** (not significant)
		48	Night-time	50	-2	**Negligible**	***Minor*** (not significant)

242 It can be seen from Table 54 that:

- during the midweek daytime and weekends before 13:00 hours, the magnitude of impact for the majority of receptors would be **negligible** or **low** for **medium** sensitivity receptors giving rise to a worst-case level of effect at the nearest NSRs from construction operations would be temporary ***'minor adverse'*** which is not significant in terms of the EIA Regulations;
- during the midweek daytime and weekends before 13:00 hours, the magnitude of impact would be **medium** for **medium** sensitivity receptors giving rise to a temporary, medium term ***'moderate adverse'*** level of effect at one (Rhyl Golf Club NW façade) of the nearest sensitive receptors, which is significant in terms of the EIA Regulations;
- during the midweek daytime and weekends before 13:00 hours, the magnitude of impact would be **high** for **medium** sensitivity receptors giving rise to a temporary, medium term **'major adverse'** level of effect at two (North Wales Bowling Centre and 31 Garford Road) of the nearest sensitive receptors, which is significant in terms of the EIA Regulations;
- during the weekend daytime periods between 13:00 and 19:00, there is a temporary **medium** magnitude of impact for **medium** sensitivity receptors giving rise to a ***'moderate adverse'*** level of effect at one of the nearest NSRs considered which is significant in terms of the EIA Regulations; and
- during the weekend daytime periods between 13:00 and 19:00, there is a temporary **high** magnitude of impact for **medium** sensitivity receptors giving rise to a ***'major adverse'*** level of effect at six of the nearest NSRs considered which is significant in terms of the EIA Regulations.

243 The ***'major adverse'*** impacts predicted at North Wales Bowling Centre and 31 Garford Road and the **'moderate adverse'** impact predicted at the Rhyl Golf Club NW façade in the daytime and weekend before 13:00 hours periods are due to the receptors' close proximity to the proposed north-east and north-west TCC locations respectively. These impacts are experienced during site preparation works, which are relatively short-term activities. It should also be noted that there is already an area of hardstanding at the location of the north-west TCC; consequently much of the plant associated with site preparation works may not be required for this TCC, which would reduce the impacts identified at 31 Garford Road and Rhyl Golf Club.

244 Further to the above, it should be noted that the noise levels generated by the operation of the TCC would equate to a negligible magnitude of impact during the daytime and weekend before 13:00 hours periods.

245 It must be noted, however, that the daytime predictions have assumed a worst-case scenario where the loudest construction activity (site preparation) is being undertaken at their closest approach to each NSR.

246 In reality, for much of the time construction operations would be undertaken at greater distances away from NSRs. For most of the construction phase noise from construction would be lower and the noise impact and associated effect would therefore be reduced.

247 With regards to the identified adverse impacts identified during the Saturday afternoon periods, these would be relatively short-term in nature and the predicted noise levels could be reduced further through the use of the potential detailed design mitigation shown in Table 50; however, these additional mitigation measures would be determined once the exact HDD/TJB construction methods have been confirmed.

248 It is considered that with the implementation of the relevant detailed design mitigation measures set out in Table 50, the magnitude of impact would reduce to **negligible** or **low** for **medium** sensitivity receptors whereby the level of effect could be reduced to temporary ***'minor adverse'*** which is not significant in terms of the EIA Regulations.

249 It can be seen from Table 55 that:

- during the daytime HDD operations, the magnitude of impact would be **negligible** for **medium** sensitivity receptors giving rise to a temporary ***'minor adverse'*** level of impact at the nearest NSRs considered which is not significant in terms of the EIA Regulations;
- during the evening HDD operations, the magnitude of impact would be **negligible** for **medium** sensitivity receptors giving rise to a temporary ***'minor adverse'*** level of effect at the nearest NSRs considered which is not significant in terms of the EIA Regulations, with the exception of the receptors representative of the caravans in the Robin Hood Holiday Park, at which the magnitude of impact would be up to **high** for **medium** sensitivity receptors giving rise to a temporary ***'major adverse'*** level of effect which is significant in terms of the EIA Regulations;
- during night-time HDD operations, there is a temporary and **low** magnitude of impact for **high** sensitivity receptors giving rise to a ***'moderate adverse'*** level of effect at one of the nearest NSRs considered, 61 Green Lanes, which is significant in terms of the EIA Regulations; and
- during night-time HDD operations, there is a temporary **medium** magnitude of impact for **high** sensitivity receptors giving rise to a ***'major adverse'*** level of effect at two of the nearest NSRs considered, the caravans on the Robin Hood Holiday Park and Terifyn Pella Avenue, which is significant in terms of the EIA Regulations.

250 With regards to the identified adverse impacts from evening and night-time HDD operations, it is considered that these could be reduced using the relevant detailed design mitigation measures outlined in Table 50.

251 However, these mitigation measures would be determined once the exact HDD drilling details and methods have been confirmed. Final mitigation measures would be informed by detailed design post consent and included within the final NVMP which would be submitted for approval by DCC as part of the final CoCP that is secured within the DCO.

252 It is considered that with the implementation of relevant mitigation measures in Table 50, the magnitude would be reduced to **negligible** or **low** for **medium** sensitivity receptors and **negligible** for **high** sensitivity receptors whereby the level of effect could be reduced to temporary '***minor adverse'*** which is not significant in terms of the EIA Regulations.

10.11.4 The onshore ECC

253 Cable construction works are anticipated to take place over an 18-month period, and a summary programme of works is described in Volume 3, Chapter 1: Onshore Project Description (application ref: 6.3.1).

254 Further to this, a summary of the construction works associated with the onshore ECC works is given below.

255 Site enabling works are required before construction within each cable route section can commence. These may include:

- fencing;
- upgrade of existing or installation of new access from the public highway where required;
- utility diversions where required;
- archaeological and ecological survey and mitigation works as necessary; and
- establishment of TCCs offices, welfare facilities, security, wheel wash, lighting and signage.

256 Construction activities for each section of the onshore ECC may include:

- topsoil removal (to edge of working area);
- temporary haul road installation along all sections of the route;
- trenchless duct installation below obstacles (roads, railways, rivers and drains) incorporating HDD drilling (or other trenchless technology techniques);
- installation of header or interceptor drains at cable corridor boundaries;
- trench excavation (up to two, one for each circuit);
- duct and tile installation;

- trench backfilling;
- existing field drainage repairs (where disruption occurs);
- jointing pit installation (including French drains to prevent water pooling above jointing pit);
- cable installation (pulled through ducts from each joint pit);
- cable jointing; and
- cable testing and commissioning.

257 With regards to the HDD drilling operations (or other trenchless technology techniques), along the onshore ECC, these have been considered separately within Section 10.11.5.

258 The predicted construction noise levels for the onshore ECC have therefore assumed the following:

- all the plant associated with Site Preparation (noisiest activity) have been modelled as area source measuring 100 X 40 m which is positioned at its closest approach to each NSR at the extents of the onshore ECC or a TCC area, whichever is closer;
- a weekend daytime assessment has been undertaken to account for the proposed construction period between 13:00 and 19:00 on a Saturday;
- average source height of 2 m, receptor height of 1.5 m for daytime assessments and night-time ground floor (bungalows), 4 m for night-time first floor;
- ground absorbency factor of 0.5 between the source and the receivers; and
- downwind propagation between the source and the receivers.

259 It should also be noted that the off-route access roads which are located outside the onshore ECC, but within the Order Limits (OL), have also been considered separately in Section 10.11.6.

260 The predictions also take into account the relevant mitigation measures outlined in Table 49.

261 Based on the above, the worst-case noise levels from construction operations associated with the onshore ECC have been predicted at the nearest NSRs.

262 The NSRs considered are shown in Table 56. These NSRs have been considered as they are the receptors located closest to each working area considered and therefore would be subject to the greatest potential impacts. It must be noted however that in the majority of cases these receptors are located in close proximity to other NSRs which could also be subject to potential impacts, though not as great.

263 Table 56 also shows the grid co-ordinates, the representative baseline monitoring location (as shown in Table 27), the closest working area and distance from the receptor to the closest working area.

Table 56: NSRs considered onshore ECC construction noise.

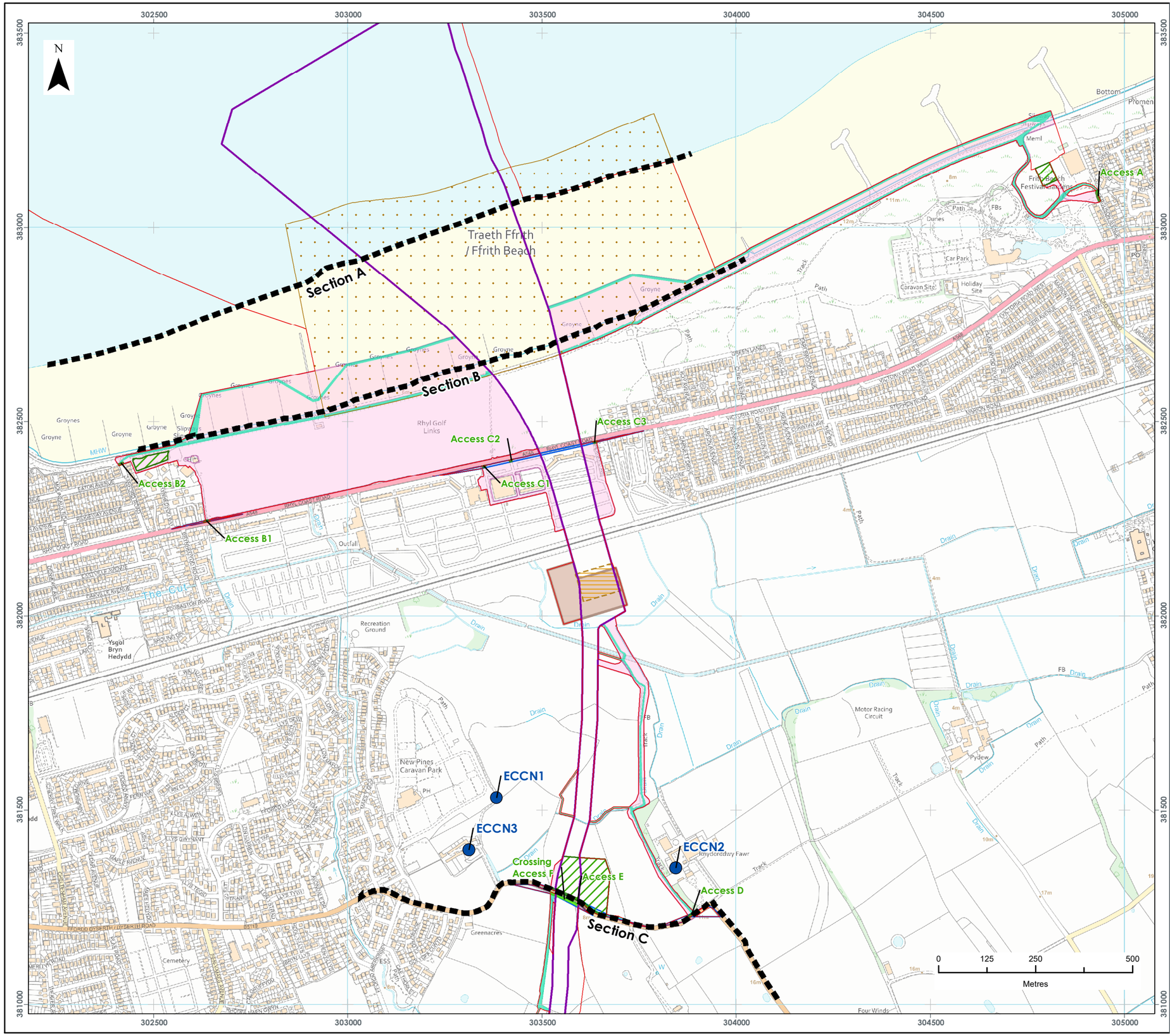
NSR NAME	REPRESENTATIVE BASELINE MONITORING LOCATION	CO-ORDINATES	CLOSEST WORKING AREA	DISTANCE TO CLOSEST WORKING AREA (M)
New Pines Holiday Home Park – onshore ECCN1	Cable Route CR1	303382.8, 381532.0	Cable Route – Section B	200
Rhydorddwy Fawr – onshore ECCN2	Cable Route CR2	303844.6, 381351.0	TCC – Section B	165
Rhydwen Farm Mews – onshore ECCN3	Cable Route CR1	303311.8, 381398.0	Cable Route – Section B	235
Parc Aberkinsey Plot 197 – onshore ECCN4	Cable Route CR3	303274.0, 380825.8	Cable Route – Section C	185
1 Rachel Drive – onshore ECCN5	Cable Route CR4	302787.3, 380113.2	Cable Route – Section C	185
Bryn Cwnin Farm – onshore ECCN6	Cable Route CR5	302934.7, 379699.0	Cable Route – Section C	120
Cwbr- bâch – onshore ECCN7	Cable Route CR6	302530.1, 379323.2	Cable Route – Section C	30

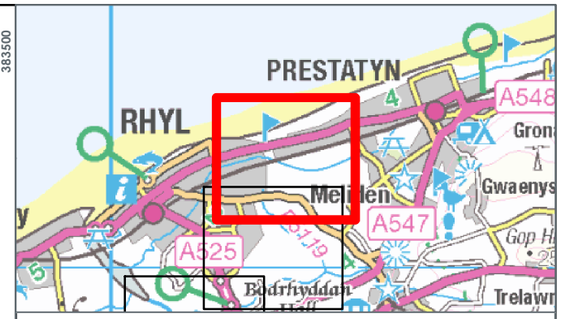
NSR NAME	REPRESENTATIVE BASELINE MONITORING LOCATION	CO-ORDINATES	CLOSEST WORKING AREA	DISTANCE TO CLOSEST WORKING AREA (M)
Plas Lorna – onshore ECCN8	Cable Route CR6	302594.7, 379212.3	Cable Route – Section C	30
Bryn-Y-Wal – onshore ECCN9	Cable Route CR6	302821.1, 379375.9	Cable Route – Section C	80
16 Highlands Close – onshore ECCN10	Cable Route CR7	302634.2, 378996.6	TCC - Section C	140
35 Ffordd Ffynnon – onshore ECCN11	Cable Route CR7	302298.5, 378920.7	Cable Route - Section D	80
Sun Valley Caravan Park N97 – onshore ECCN12	Cable Route CR7A	301631.8, 378282.7	Cable Route - Section D	280
Plas Newydd, Ffordd Abergele – onshore ECCN13	Cable Route CR8	301447.6, 377722.0	Cable Route - Section D & E	245
Bryn-Carrog Farm – onshore ECCN14	Cable Route CR9	301209.4, 376780.8	Cable Route - Section E	200
Ty Isa Farm – onshore ECCN15	Cable Route CR10	301576.7, 376723.0	TCC - Section E	90

NSR NAME	REPRESENTATIVE BASELINE MONITORING LOCATION	CO-ORDINATES	CLOSEST WORKING AREA	DISTANCE TO CLOSEST WORKING AREA (M)
Fferm – onshore ECCN16	Cable Route CR9	301239.1, 376976.0	Cable Route - Section E	140
Glanywern – onshore ECCN17	Cable Route CR10	301664.9, 376432.2	Cable Route - Section E	230
Little Pengwern – onshore ECCN18	Cable Route CR10	301741.0, 376234.8	Cable Route - Section E	230
Tyddyn Isaf – onshore ECCN19	Cable Route CR11	301212.2, 375198.5	Cable Route - Section E	135
Faenol-Bropor – onshore ECCN20	OnSS Monitoring Location S1	301297.6, 374784.3	Cable Route - Section F	10
North Wales NHS Trust – onshore ECCN21	OnSS Monitoring Location S1	301451.4, 374629.8	Cable Route - Section F	70
Carbon Zero Renewables Ltd – onshore ECCN22	OnSS Monitoring Location S4	301278.4, 373973.9	Cable Route - Section F	260
Caer Delyn – onshore ECCN23	OnSS Monitoring Location S3	301339.0, 373959.5	Cable Route - Section F	315

NSR NAME	REPRESENTATIVE BASELINE MONITORING LOCATION	CO-ORDINATES	CLOSEST WORKING AREA	DISTANCE TO CLOSEST WORKING AREA (M)
Gwelfryn (Glascoed Road) – onshore ECCN24	OnSS Monitoring Location S3	300653.9, 373888.7	TCC - Section G	50
Crematorium – onshore ECCN25	OnSS Monitoring Location S3	300988.0, 373829.9	TCC - Section G	130
Waen Meredydd – onshore ECCN26	Cable Route CR12	301238.9, 373657.7	Cable Route - Section G	15
Ysguboriau – onshore ECCN27	Cable Route CR13	300903.4, 373322.6	Cable Route - Section G	225
Graig Lwyd – onshore ECCN28	Cable Route CR13	300757.2, 373372.9	Cable Route - Section G	235

264 The locations of the NSRs described above are shown in Figure 13 to Figure 17.





LEGEND

- Order Limits
- Onshore Cable Route Section
- Proposed Onshore Export Cable
- Proposed Indicative Trenchless Crossing
- Proposed Temporary Construction
- Proposed Transition Joint Bay Construction
- Proposed Access Location
- Proposed Crossing Location
- Proposed Operational Access Route
- Proposed Construction Access Area
- Anchoring Zone
- Proposed Major Road Crossing Visibility
- Noise Sensitive Receptor Considered

ECCN1: New Pines Holiday Home Park
ECCN2: Rhydorddwy Fawr
ECCN3: Rhydwen Farm Mews

PROJECT TITLE:

AWEL Y MÔR OFFSHORE WINDFARM

FIGURE TITLE:

LOCATION OF NSRS CONSIDERED FOR ECC CONSTRUCTION NOISE

VER	DATE	REMARKS	Drawn	Checked
1	08/04/2022	ES Issue	JRS	MF

FIGURE NUMBER:

FIGURE 13

SCALE:	PLOT SIZE:	DATUM:	COORDINATE SYSTEM:
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Offshore Wind Farm

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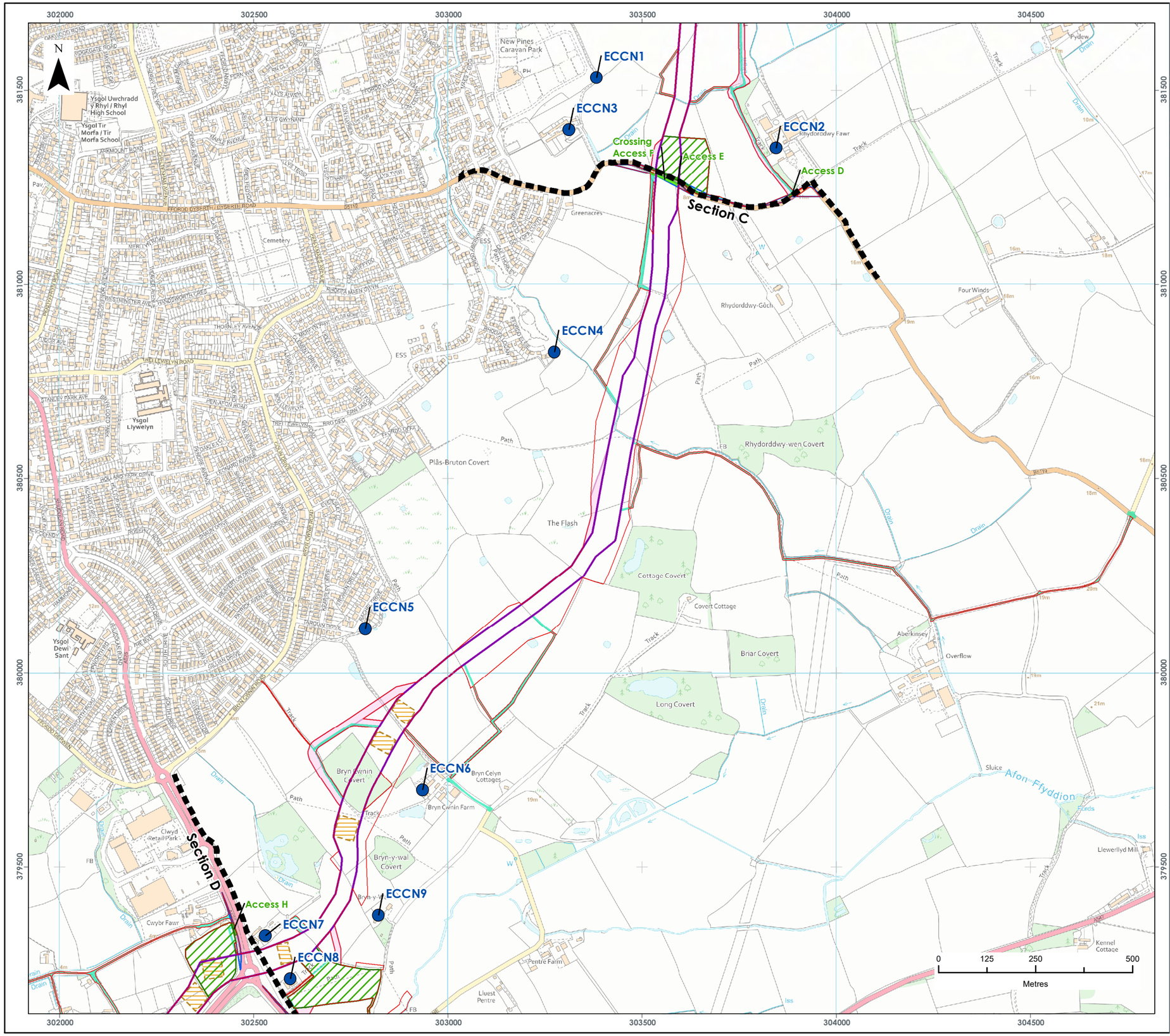

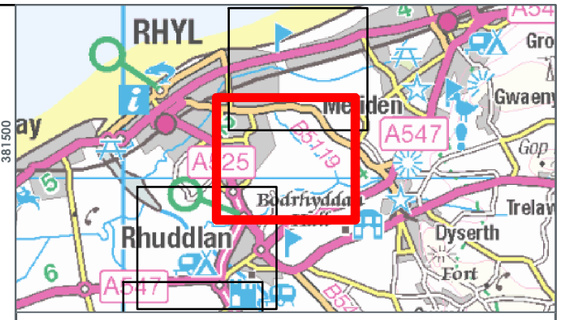

LEGEND

- Order Limits
- Onshore Cable Route Section
- Proposed Onshore Export Cable
- Proposed Indicative Trenchless Crossing
- Proposed Temporary Construction
- Proposed Access Location
- Proposed Crossing Location
- Proposed Operational Access Route
- Proposed Construction Access Area
- Proposed Major Road Crossing Visibility
- Noise Sensitive Receptor Considered

ECCN1: New Pines Holiday Home Park
ECCN2: Rhydorddwy Fawr
ECCN3: Rhydwen Farm Mews
ECCN4: Parc Aberkinsey Plot 197
ECCN5: 1 Rachel Drive
ECCN6: Bryn Cwnin Farm
ECCN7: Cwbr- bâch
ECCN8: Plas Lorna
ECCN9: Bryn-Y-Wal

PROJECT TITLE:

AWEL Y MÔR OFFSHORE WINDFARM

FIGURE TITLE:

LOCATION OF NSRS CONSIDERED FOR ECC CONSTRUCTION NOISE

VER	DATE	REMARKS	Drawn	Checked
1	08/04/2022	ES Issue	JRS	MF

FIGURE NUMBER:

FIGURE 14

SCALE:	PLOT SIZE:	DATUM:	COORDINATE SYSTEM:
1:10,000	A3	ODN	British National Grid

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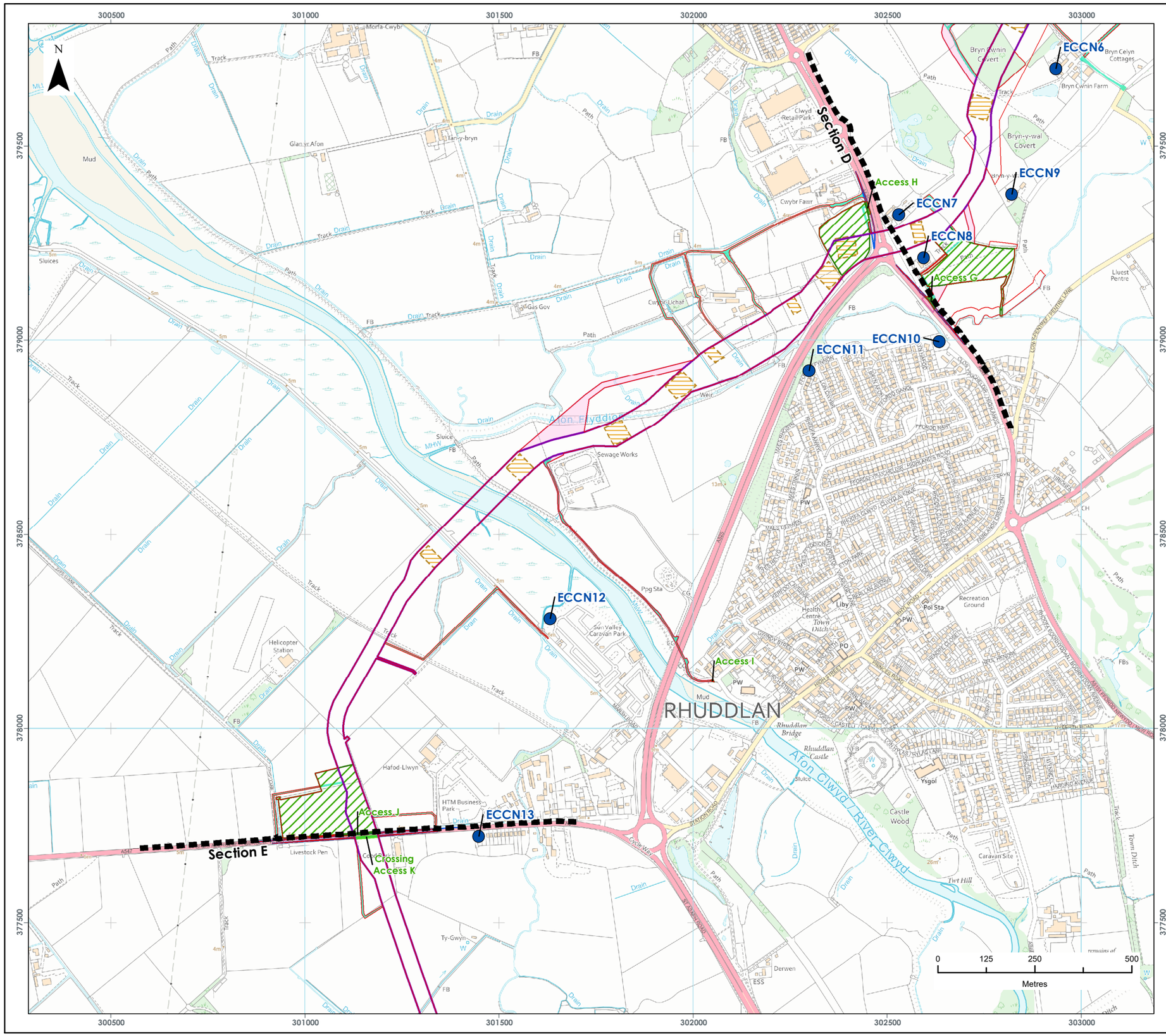

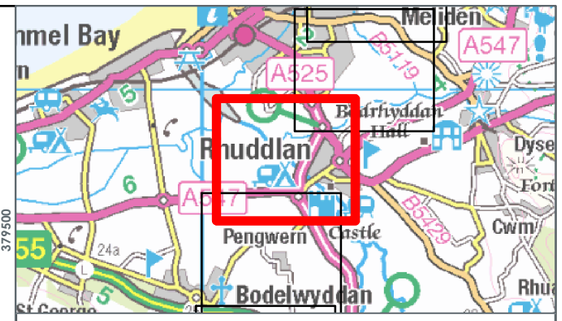

LEGEND

- Order Limits
- Onshore Cable Route Section Breaks
- Proposed Onshore Export Cable Corridor
- Proposed Indicative Trenchless Crossing Compound
- Proposed Temporary Construction Compound
- Proposed Access Location
- Proposed Crossing Location
- Proposed Operational Access Route
- Proposed Construction Access Area
- Proposed Major Road Crossing Visibility Splay
- Noise Sensitive Receptor Considered

ECCN6: Bryn Cwnin Farm
ECCN7: Cwbr- bâch
ECCN8: Plas Lorna
ECCN9: Bryn-Y-Wal
ECCN10: 16 Highlands Close
ECCN11: 35 Ffordd Ffynnon
ECCN12: Sun Valley Caravan Park N97
ECCN13: Plas Newydd, Ffordd Abergele

PROJECT TITLE:

AWEL Y MÔR OFFSHORE WINDFARM

FIGURE TITLE:

LOCATION OF NSRS CONSIDERED FOR ECC CONSTRUCTION NOISE

VER	DATE	REMARKS	Drawn	Checked
1	08/04/2022	ES Issue	JRS	MF

FIGURE NUMBER:

FIGURE 15

SCALE:	PLOT SIZE:	DATUM:	COORDINATE SYSTEM:
1:10,000	A3	ODN	British National Grid

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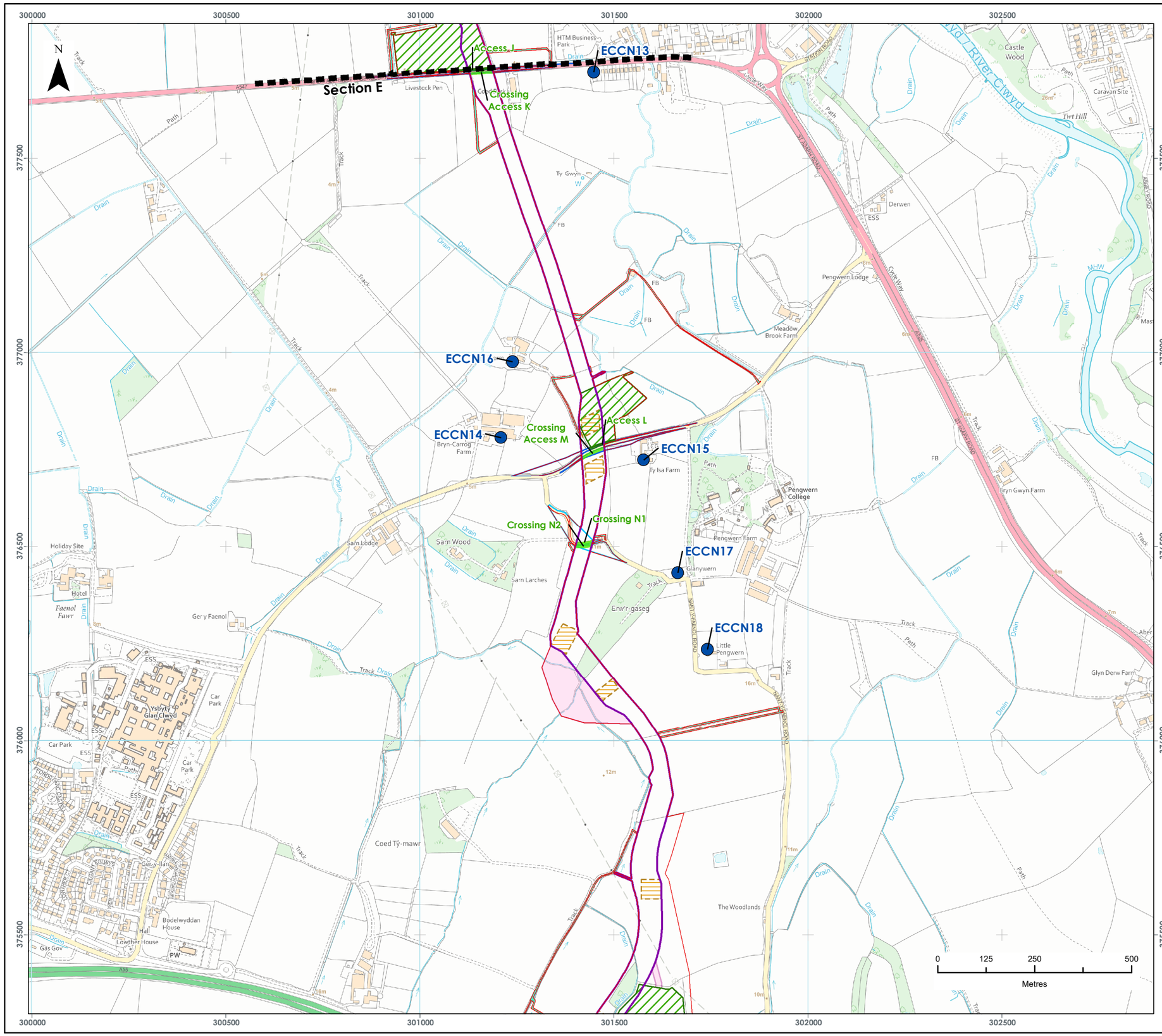

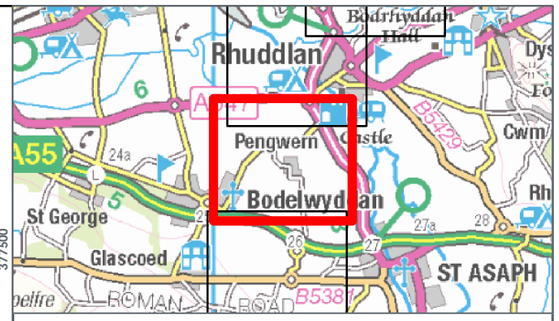

LEGEND

- Order Limits
- Onshore Cable Route Section Breaks
- Proposed Onshore Export Cable Corridor
- Proposed Indicative Trenchless Crossing Compound
- Proposed Temporary Construction Compound
- Proposed Access Location
- Proposed Crossing Location
- Proposed Operational Access Route
- Proposed Construction Access Area
- Proposed Major Road Crossing Visibility Splay
- Proposed Minor Road Crossing Visibility Splay
- Noise Sensitive Receptor Considered

ECCN13: Plas Newydd, Ffordd Abergele
ECCN14: Bryn-Carrog Farm
ECCN15: Ty Isa Farm
ECCN16: Fferm
ECCN17: Glanywern
ECCN18: Little Pengwern

PROJECT TITLE:

AWEL Y MÔR OFFSHORE WINDFARM

FIGURE TITLE:

LOCATION OF NSRS CONSIDERED FOR ECC CONSTRUCTION NOISE

VER	DATE	REMARKS	Drawn	Checked
1	08/04/2022	ES Issue	JRS	MF

FIGURE NUMBER:

FIGURE 16
Page 4 of 5

SCALE:	PLOT SIZE:	DATUM:	COORDINATE SYSTEM:
1:10,000	A3	ODN	British National Grid

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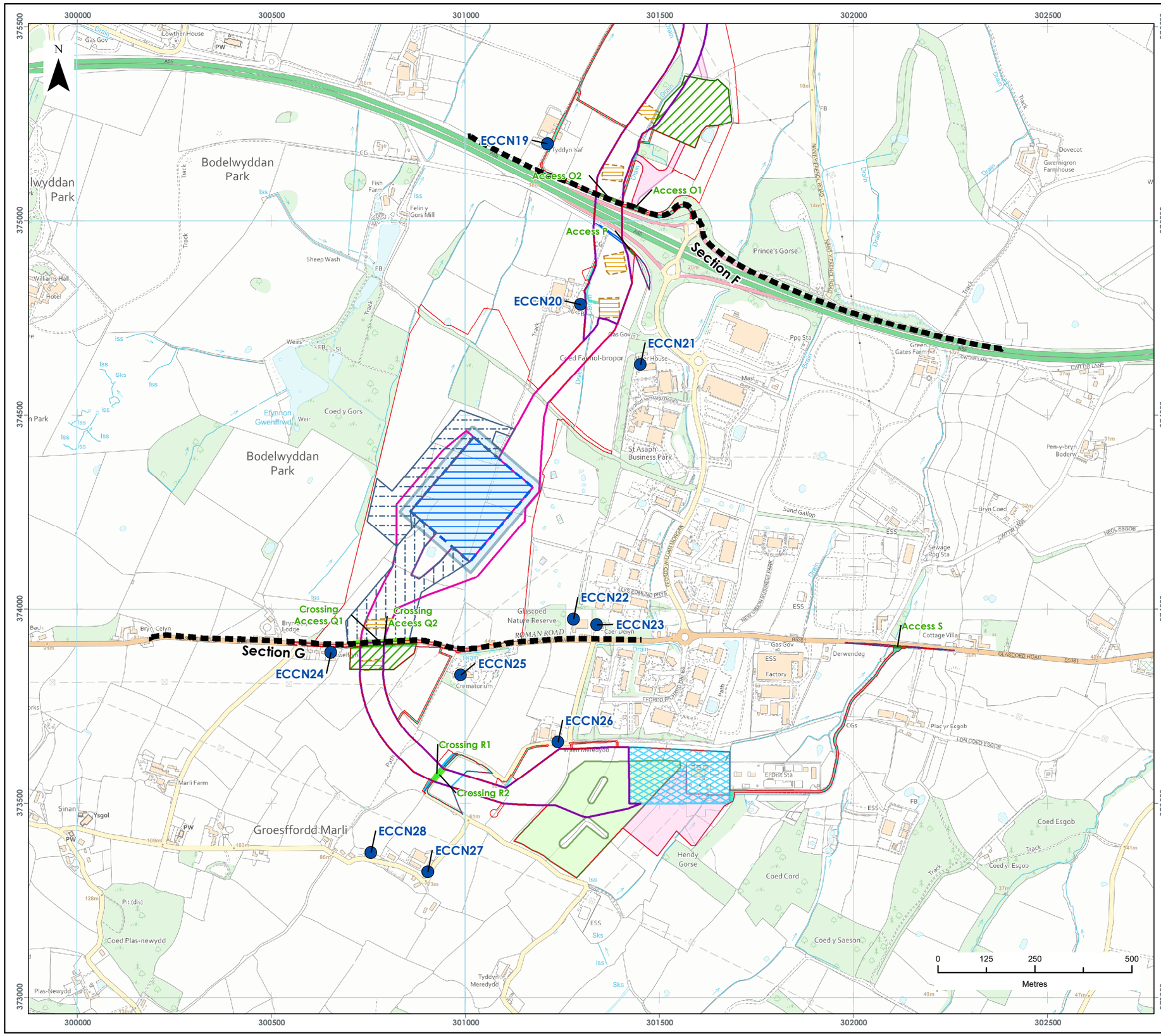
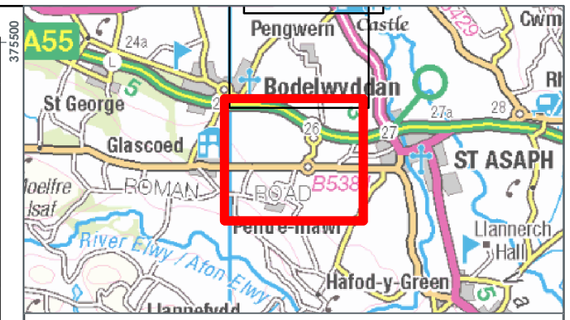
Offshore Wind Farm





LEGEND

- Order Limits
- Onshore Cable Route Section Breaks
- Proposed Onshore Export Cable Corridor
- Proposed Substation Cable Corridor Zone
- Proposed Indicative Trenchless Crossing Compound
- Proposed Temporary Construction Compound
- Proposed Temporary Construction Compound Zone
- Proposed Access Location
- Proposed Crossing Location
- Proposed Operational Access Route
- Proposed Construction Access Area
- Unlicenced Work Zone
- Proposed Major Road Crossing Visibility Splay
- Proposed Minor Road Crossing Visibility Splay
- Proposed Onshore Substation (OnSS) Footprint
- Proposed Substation Construction Area
- Substation Construction Access Zone
- Substation Temporary Construction Access Zone
- Substation Access Visibility Splay
- Noise Sensitive Receptor Considered

ECCN19: Tyddyn Isaf
ECCN20: Faenol-Bropor
ECCN21: North Wales NHS Trust
ECCN22: Carbon Zero Renewables Ltd
ECCN23: Caer Delyn
ECCN24: Gwelfryn (Glascoed Road)
ECCN25: Crematorium
ECCN26: Waen Meredydd
ECCN27: Ysguboriau
ECCN28: Graig Lwyd

PROJECT TITLE:

AWEL Y MÔR OFFSHORE WINDFARM

FIGURE TITLE:

LOCATION OF NSRS CONSIDERED FOR ECC CONSTRUCTION NOISE

VER	DATE	REMARKS	Drawn	Checked
1	08/04/2022	ES Issue	JRS	MF

FIGURE NUMBER:

FIGURE 17

SCALE:	PLOT SIZE:	DATUM:	COORDINATE SYSTEM:
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265 The predicted noise levels from worst-case daytime and weekend onshore ECC construction operations are shown in Table 57. The Table also compares the predicted noise levels to the calculated threshold limits and with reference to Table 8, Table 10 and Table 15 defines the level of effect and significance.

266 The predictions also take into account the relevant mitigation measures outlined in Table 49.

267 It must be noted that an evening or night-time assessment has not been undertaken as onshore ECC construction operations, excluding HDD (or other trenchless technology techniques), are anticipated to be between 0700 hours and 1900 hours Monday to Saturday.

268 In addition, all of the NSRs considered have a **medium** sensitivity during the daytime, evening, and weekend periods.

269 It must also be noted that where no baseline sound data is available at a receptor location for an assessment period the threshold limits are based on the Category A limits contained in Table 2 as it is considered that this represents a worst-case scenario.

Table 57: Onshore ECC construction noise – daytime assessment, dB.

NSR NAME	CONSTRUCTION ACTIVITY	PREDICTED NOISE LEVEL $L_{AEQ,T}$	PERIOD	THRESHOLD LIMIT, $L_{AEQ,T}$	DIFFERENCE	IMPACT MAGNITUDE	LEVEL OF EFFECT AND SIGNIFICANCE
New Pines Holiday Home Park – ECCN1	Site preparation associated with cabling works	57	Daytime	65	-8	**Negligible**	***Minor*** (not significant)
			Weekend	55	+2	**Low**	***Minor*** (not significant)
Rhydorddwy Fawr – ECCN2	Site preparation associated with cabling works	56	Daytime	65	-9	**Negligible**	***Minor*** (not significant)
			Weekend	55	+1	**Low**	***Minor*** (not significant)
Rhydwen Farm Mews – ECCN3	Site preparation associated with cabling works	58	Daytime	65	-7	**Negligible**	***Minor*** (not significant)
			Weekend	55	+3	**Medium**	***Moderate*** (significant)
Parc Aberkinsey		58	Daytime	65	-7	**Negligible**	***Minor*** (not significant)

NSR NAME	CONSTRUCTION ACTIVITY	PREDICTED NOISE LEVEL $L_{AEQ,T}$	PERIOD	THRESHOLD LIMIT, $L_{AEQ,T}$	DIFFERENCE	IMPACT MAGNITUDE	LEVEL OF EFFECT AND SIGNIFICANCE
Plot 197 – ECCN4	Site preparation associated with cabling works		Weekend	55	+3	**Medium**	***Moderate*** (significant)
1 Rachel Drive – ECCN5	Site preparation associated with cabling works	58	Daytime	65	-7	**Negligible**	***Minor*** (not significant)
			Weekend	55	+3	**Medium**	***Moderate*** (significant)
Bryn Cwnin Farm – ECCN6	Site preparation associated with cabling works	60	Daytime	65	-5	**Negligible**	***Minor*** (not significant)
			Weekend	55	+5	**High**	***Major*** (significant)
Cwybr-bâch – ECCN7	Site preparation associated with cabling works	69	Daytime	65	+4	**Medium**	***Moderate*** (significant)
			Weekend	55	+14	**High**	***Major*** (significant)

NSR NAME	CONSTRUCTION ACTIVITY	PREDICTED NOISE LEVEL $L_{AEQ,T}$	PERIOD	THRESHOLD LIMIT, $L_{AEQ,T}$	DIFFERENCE	IMPACT MAGNITUDE	LEVEL OF EFFECT AND SIGNIFICANCE
Plas Lorna – ECCN8	Site preparation associated with cabling works	69	Daytime	65	+4	**Medium**	***Moderate*** (significant)
			Weekend	55	+14	**High**	***Major*** (significant)
Bryn-Y-Wal – ECCN9	Site preparation associated with cabling works	65	Daytime	65	0	**Negligible**	***Minor*** (not significant)
			Weekend	55	+10	**High**	***Major*** (significant)
16 Highlands Close – ECCN10	Site preparation associated with TCC works	60	Daytime	65	-5	**Negligible**	***Minor*** (not significant)
			Weekend	55	+5	**High**	***Major*** (significant)
		63	Daytime	65	-2	**Negligible**	***Minor*** (not significant)

NSR NAME	CONSTRUCTION ACTIVITY	PREDICTED NOISE LEVEL $L_{AEQ,T}$	PERIOD	THRESHOLD LIMIT, $L_{AEQ,T}$	DIFFERENCE	IMPACT MAGNITUDE	LEVEL OF EFFECT AND SIGNIFICANCE
35 Ffordd Ffynnon – ECCN11	Site preparation associated with cabling works		Weekend	55	+8	**High**	***Major*** (significant)
Sun Valley Caravan Park N97 – ECCN12	Site preparation associated with cabling works	52	Daytime	65	-13	**Negligible**	***Minor*** (not significant)
			Weekend	55	-3	**Negligible**	***Minor*** (not significant)
Plas Newydd, Ffordd Abergele – ECCN13	Site preparation associated with TCC works	53	Daytime	75	-22	**Negligible**	***Minor*** (not significant)
			Weekend	55	-2	**Negligible**	***Minor*** (not significant)
Bryn-Carrog Farm – ECCN14	Site preparation associated with TCC works	54	Daytime	75	-21	**Negligible**	***Minor*** (not significant)
			Weekend	55	-1	**Negligible**	***Minor*** (not significant)

NSR NAME	CONSTRUCTION ACTIVITY	PREDICTED NOISE LEVEL $L_{AEQ,T}$	PERIOD	THRESHOLD LIMIT, $L_{AEQ,T}$	DIFFERENCE	IMPACT MAGNITUDE	LEVEL OF EFFECT AND SIGNIFICANCE
Ty Isa Farm – ECCN15	Site preparation associated with cabling works	64	Daytime	65	-1	**Negligible**	***Minor*** (not significant)
			Weekend	55	+9	**High**	***Major*** (significant)
Fferm – ECCN16	Site preparation associated with cabling works	56	Daytime	75	-19	**Negligible**	***Minor*** (not significant)
			Weekend	55	+1	**Low**	***Minor*** (not significant)
Glanywern – ECCN17	Site preparation associated with cabling works	54	Daytime	65	-11	**Negligible**	***Minor*** (not significant)
			Weekend	55	-1	**Negligible**	***Minor*** (not significant)
		57	Daytime	65	-8	**Negligible**	***Minor*** (not significant)

NSR NAME	CONSTRUCTION ACTIVITY	PREDICTED NOISE LEVEL $L_{AEQ,T}$	PERIOD	THRESHOLD LIMIT, $L_{AEQ,T}$	DIFFERENCE	IMPACT MAGNITUDE	LEVEL OF EFFECT AND SIGNIFICANCE
Little Pengwern – ECCN18	Site preparation associated with cabling works		Weekend	55	+2	**Low**	***Minor*** (not significant)
Tyddyn Isaf – ECCN19	Site preparation associated with cabling works	60	Daytime	70	-10	**Negligible**	***Minor*** (not significant)*)*
			Weekend	5	+5	**High**	***Major*** (significant)
Faenol-Bropor – ECCN20	Site preparation associated with cabling works	69	Daytime	65	+4	**Medium**	***Moderate*** (significant)
			Weekend	60	+9	**High**	***Major*** (significant)
North Wales NHS Trust (commercial receptor) – ECCN21	Site preparation associated with cabling works	61	Daytime	65	-4	**Negligible**	***Minor*** (not significant)
			Weekend	60	+1	**Low**	***Minor*** (not significant)

NSR NAME	CONSTRUCTION ACTIVITY	PREDICTED NOISE LEVEL $L_{AEQ,T}$	PERIOD	THRESHOLD LIMIT, $L_{AEQ,T}$	DIFFERENCE	IMPACT MAGNITUDE	LEVEL OF EFFECT AND SIGNIFICANCE
Carbon Zero Renewables Ltd (commercial receptor) – ECCN22	Site preparation associated with cabling works	56	Daytime	65	-9	**Negligible**	***Minor*** (not significant)
			Weekend	55	+1	**Low**	***Minor*** (not significant)
Caer Delyn – ECCN23	Site preparation associated with cabling works	51	Daytime	65	-14	**Negligible**	***Minor*** (not significant)
			Weekend	55	-4	**Negligible**	***Minor*** (not significant)
Gwelfryn (Glascoed Road) – ECCN24	Site preparation associated with TCC works	67	Daytime	65	+2	**Low**	***Minor*** (not significant)
			Weekend	65	+2	**Low**	***Minor*** (not significant)
Crematorium – ECCN25		60	Daytime	65	-5	**Negligible**	***Minor*** (not significant)

NSR NAME	CONSTRUCTION ACTIVITY	PREDICTED NOISE LEVEL $L_{AEQ,T}$	PERIOD	THRESHOLD LIMIT, $L_{AEQ,T}$	DIFFERENCE	IMPACT MAGNITUDE	LEVEL OF EFFECT AND SIGNIFICANCE
	Site preparation associated with TCC works		Weekend	65	-5	**Negligible**	***Minor*** (not significant)
Waen Meredydd – ECCN26	Site preparation associated with cabling works	74	Daytime	65	+9	**High**	***Major*** (significant)
			Weekend	55	+19	**High**	***Major*** (significant)
Ysguboriau – ECCN27	Site preparation associated with TCC works	53	Daytime	65	-1	**Negligible**	***Minor*** (not significant)
			Weekend	55	-2	**Negligible**	***Minor*** (not significant)
Graig Lwyd – ECCN28	Site preparation associated with cabling works	56	Daytime	65	-9	**Negligible**	***Minor*** (not significant)
			Weekend	55	+1	**Low**	***Minor*** (not significant)

270 It can be seen from Table 57 that:

- during the midweek daytime and weekends before 13:00 hours, the magnitude of impact for the majority of receptors would be **negligible** or **low** for **medium** sensitivity receptors giving rise to a worst-case level of effect from construction operations of ***'minor adverse'***, which is not significant in terms of the EIA Regulations;
- during the midweek daytime and weekends before 13:00 hours, the worst-case magnitude of impact would be **medium** for a **medium** sensitivity receptor for three receptors, Cwybr-bâch, Plas Lorna and Faenol-Bropor. The resulting level of effect would be temporary, medium term ***'moderate adverse'*** which is significant in terms of the EIA Regulations;
- during the midweek daytime and weekends before 13:00 hours, the worst-case magnitude of impact would be **high** for a **medium** sensitivity receptor for one receptor, Waen Meredydd. The resulting level of effect would be temporary, medium term ***'major adverse'*** which is significant in terms of the EIA Regulations;
- during the weekend periods between 13:00 and 19:00, there is a temporary **medium** magnitude of impact for a **medium** sensitivity receptor at three receptors, Rhydwen Farm Mews, Parc Aberkinsey Plot 197, and 1 Rachel Drive. This magnitude of impact gives rise to a medium term ***'moderate adverse'*** level of effect which is significant in terms of the EIA Regulations;
- during the weekend periods between 13:00 and 19:00, there is a temporary, **high** magnitude of impact for the **medium** sensitivity receptor at 10 receptors, Bryn Cwnin Farm, Cwybr-bâch, Plas Lorna, Bryn-Y-Wal, 16 Highlands Close, 35 Ffordd Ffynnon, Ty Isa Farm, Tyddyn Isaf, Faenol-Bropor, and Waen Meredydd. This magnitude of impact gives rise to a medium term ***'major adverse'*** level of effect which is significant in terms of the EIA Regulations.

271 It must be noted, however, that the daytime predictions have assumed a worst-case scenario where the loudest construction activity (site preparation) is being undertaken to the extents of the onshore ECC that is closest to each NSR.

272 In reality and for the majority of the time, less intrusive or quieter construction operations would be undertaken within the extents of the ECC.

273 The predicted noise levels could be reduced further through the use of relevant detailed design mitigation shown in Table 50; however, these mitigation measures would be determined once the exact construction details and methods have been confirmed. Final mitigation measures would be informed by detailed design post consent and included within the final NVMP which would be submitted for approval by DCC as part of the final CoCP that is secured within the DCO.

274 It is considered that with the implementation of the relevant mitigation measures in Table 50, the magnitude of impact could be reduced to **low** or **negligible** for **medium** sensitivity receptors such that the level of effect could be reduced to temporary '***minor adverse***' which is not significant in terms of the EIA Regulations.

10.11.5 HDD drilling operations along the onshore ECC

275 The noise level generated by HDD (or other trenchless technology techniques) operations has been assessed in conjunction with the following:

- HDD operations being undertaken within defined HDD compounds, including the HDD operations being undertaken during night-time periods at two defined locations along the onshore ECC route (the River Clwyd crossing and the A55 Crossing); and

- HDD operations potentially being undertaken at a number of other crossing points along the onshore ECC route where either HDD or open trenching would be used (see Volume 5, Annex 1.1: Crossing Schedule (application ref 6.5.1.1) for further information on potential crossing options).

Defined HDD compounds along the onshore ECC

276 The predicted construction noise levels for defined HDD compounds along the onshore ECC (shown as trenchless crossing compounds on Figure 13 to Figure 17), have assumed the following:

- all the plant associated with the HDD drilling would be located across the total area of the HDD compound.
- average source height of 2 m, receptor height of 1.5 m for daytime, evening, and weekend assessments and night-time ground floor (bungalows), 4 m for night-time first floor;
- ground absorbency factor of 0.5 between the source and the receivers; and
- downwind propagation between the source and the receivers.

277 The assessment has been undertaken for the daytime and weekend periods at all considered receptors and additionally during the evening and night-time at receptors close to the River Clwyd and A55 crossings.

278 It has been confirmed that the vibratory piling rig would not be utilised during the night-time, consequently the night-time predictions have utilised the noise level shown as item 15 in Table 51.

279 The predictions also take into account the relevant mitigation measures outlined in Table 49.

280 Based on the above, the worst-case noise levels from construction operations associated with the HDD (or other trenchless technology techniques), operations along the onshore ECC have been predicted at the nearest NSRs.

281 Details of the NSRs assessed are shown in Table 56. The receptors considered are those that are closest to the defined HDD compounds and therefore would be subject to the greatest potential impacts. It must be noted however that in the majority of cases these receptors are located in close proximity to other NSRs which could also be subject to potential impacts, though not as great.

282 It should be noted that all but one of the NSRs considered are residential properties, and therefore have a **medium** sensitivity during the daytime, evening, and weekend periods and **high** sensitivity during the night-time. The commercial receptor (North Wales NHS Trust offices) has not been included as part of the evening and night-time HDD assessment as it is considered that it would not be occupied during these periods.

283 It must also be noted that where no baseline sound data is available at a receptor location for an assessment period the threshold limits are based on the Category A limits contained in Table 2 as it is considered that this represents a worst-case scenario.

284 The predicted noise levels from worst-case HDD (or other trenchless technology techniques), drilling operations are shown in Table 58. The Table also compares the predicted noise levels to the calculated threshold limits and with reference to Table 8, Table 10 and Table 15 which is used as a guide to determine the level of effect and significance.

Table 58: HDD drilling noise along the onshore ECC – Defined Compounds assessment, dB.

NSR NAME	CONSTRUCTION ACTIVITY	PREDICTED NOISE LEVEL $L_{AEQ,T}$	PERIOD	THRESHOLD LIMIT, $L_{AEQ,T}$	DIFFERENCE	IMPACT MAGNITUDE	LEVEL OF EFFECT AND SIGNIFICANCE
1 Rachel Drive – ECCN5	HDD drilling	58	Daytime	65	-7	**Negligible**	***Minor*** (not significant)
			Weekend	55	+3	**Medium**	***Moderate*** (significant)
Bryn Cwnin Farm – ECCN6	HDD drilling	61	Daytime	65	-4	**Negligible**	***Minor*** (not significant)
			Weekend	55	+6	**High**	***Major*** (significant)
Cwybr-bâch – ECCN7	HDD drilling	61	Daytime	65	-4	**Negligible**	***Minor*** (not significant)
			Weekend	55	+6	**High**	***Major*** (significant)
Plas Lorna – ECCN8	HDD drilling	61	Daytime	65	-4	**Negligible**	***Minor*** (not significant)

NSR NAME	CONSTRUCTION ACTIVITY	PREDICTED NOISE LEVEL $L_{AEQ,T}$	PERIOD	THRESHOLD LIMIT, $L_{AEQ,T}$	DIFFERENCE	IMPACT MAGNITUDE	LEVEL OF EFFECT AND SIGNIFICANCE
			Weekend	55	+6	**High**	***Major*** (significant)
Bryn-Y-Wal – ECCN9	HDD drilling	50	Daytime	65	-15	**Negligible**	***Minor*** (not significant)
			Weekend	55	-5	**Negligible**	***Minor*** (not significant)
35 Ffordd Ffynnon – ECCN11	HDD drilling	60	Daytime	65	-5	**Negligible**	***Minor*** (not significant)
			Weekend	55	+5	**High**	***Major*** (significant)
Sun Valley Caravan Park N97 – ECCN12	HDD drilling (River Clwyd Crossing includes night-time operations)	53	Daytime	65	-12	**Negligible**	***Minor*** (not significant)
			Evening / Weekend	55	-2	**Negligible**	***Minor*** (not significant)

NSR NAME	CONSTRUCTION ACTIVITY	PREDICTED NOISE LEVEL $L_{AEQ,T}$	PERIOD	THRESHOLD LIMIT, $L_{AEQ,T}$	DIFFERENCE	IMPACT MAGNITUDE	LEVEL OF EFFECT AND SIGNIFICANCE
		51	Night-time	45	+6	**High**	***Major*** (significant)
Plas Newydd, Ffordd Abergele – ECCN13	HDD drilling	46	Daytime	75	-29	**Negligible**	***Minor*** (not significant)
			Weekend	55	-9	**Negligible**	***Minor*** (not significant)
Bryn-Carrog Farm – ECCN14	HDD drilling	55	Daytime	75	-20	**Negligible**	***Minor*** (not significant)
			Weekend	55	0	**Negligible**	***Minor*** (not significant)
Ty Isa Farm – ECCN15	HDD drilling	64	Daytime	65	-1	**Negligible**	***Minor*** (not significant)
			Weekend	55	+9	**High**	***Major*** (significant)

NSR NAME	CONSTRUCTION ACTIVITY	PREDICTED NOISE LEVEL $L_{AEQ,T}$	PERIOD	THRESHOLD LIMIT, $L_{AEQ,T}$	DIFFERENCE	IMPACT MAGNITUDE	LEVEL OF EFFECT AND SIGNIFICANCE
Fferm – ECCN16	HDD drilling	58	Daytime	75	-17	**Negligible**	***Minor*** (not significant)
			Weekend	55	+3	**Medium**	***Moderate*** (significant)
Glanywern – ECCN17	HDD drilling	54	Daytime	65	-11	**Negligible**	***Minor*** (not significant)
			Weekend	55	-1	**Negligible**	***Minor*** (not significant)
Little Pengwern – ECCN18	HDD drilling	55	Daytime	65	-10	**Negligible**	***Minor*** (not significant)
			Weekend	55	0	**Negligible**	***Minor*** (not significant)

NSR NAME	CONSTRUCTION ACTIVITY	PREDICTED NOISE LEVEL $L_{AEQ,T}$	PERIOD	THRESHOLD LIMIT, $L_{AEQ,T}$	DIFFERENCE	IMPACT MAGNITUDE	LEVEL OF EFFECT AND SIGNIFICANCE
Tyddyn Isaf – ECCN19	HDD drilling (A55 Crossing includes night-time operations)	58	Daytime	70	-12	**Negligible**	***Minor*** (not significant)*)*
			Evening / Weekend	55	+3	**Medium**	***Moderate*** (significant)
		56	Night-time	45	+11	**High**	***Major*** (significant)
Faenol-Bropor – ECCN20	HDD drilling (A55 Crossing includes night-time operations)	65	Daytime	65	0	**Negligible**	***Minor*** (not significant)*)*
			Evening	55	+10	**High**	***Major*** (significant)
		64	Night-time	45	+19	**High**	***Major*** (significant)
		65	Weekend	60	+5	**High**	***Major*** (significant)

NSR NAME	CONSTRUCTION ACTIVITY	PREDICTED NOISE LEVEL $L_{AEQ,T}$	PERIOD	THRESHOLD LIMIT, $L_{AEQ,T}$	DIFFERENCE	IMPACT MAGNITUDE	LEVEL OF EFFECT AND SIGNIFICANCE
North Wales NHS Trust (commercial receptor) – ECCN21	HDD drilling	59	Daytime	65	-4	**Negligible**	***Minor*** (not significant)
			Weekend	60	-1	**Negligible**	***Minor*** (not significant)
Gwelfryn (Glascoed Road) – ECCN24	HDD drilling	64	Daytime	65	-1	**Negligible**	***Minor*** (not significant)
			Weekend	65	-1	**Negligible**	***Minor*** (not significant)
Crematorium – ECCN25	HDD drilling	58	Daytime	65	-7	**Negligible**	***Minor*** (not significant)
			Weekend	65	-7	**Negligible**	***Minor*** (not significant)

285 It can be seen from Table 58 that:

- during the midweek daytime and weekends before 13:00 hours, the magnitude of impact for all receptors would be **negligible for medium** sensitivity receptors giving rise to a worst-case level of effect at the nearest NSRs of temporary ***'minor adverse'*** which is not significant in terms of the EIA Regulations;
- during the weekend daytime periods between 13:00 and 19:00, there is a temporary **medium** magnitude of impact for **medium** sensitivity receptors giving rise to a ***'moderate adverse'*** level of effect at three (1 Rachel Drive, Fferm, and Tyddyn Isaf) of the nearest NSRs considered which is significant in terms of the EIA Regulations;
- during the weekend daytime periods between 13:00 and 19:00, there is a temporary **high** magnitude of impact for **medium** sensitivity receptors giving rise to a ***'major adverse'*** level of effect at six (Bryn Cwnin Farm, Cwybr-bâch, Plas Lorna, 35 Ffordd Ffynnon, Ty Isa Farm, and Faenol-Bropor) of the nearest NSRs considered which is significant in terms of the EIA Regulations;
- during the evening periods between 19:00 and 23:00, there is a temporary **negligible** magnitude for **medium** sensitivity receptors giving rise to a ***'minor adverse'*** level of effect at one (Sun Valley Caravan Park) of the nearest NSRs considered which is not significant in terms of the EIA Regulations.
- during the evening periods between 19:00 and 23:00, there is a temporary **medium** magnitude of impact for **medium** sensitivity receptors giving rise to a ***'moderate adverse'*** level of effect at one (Tyddyn Isaf) of the nearest NSRs considered which is significant in terms of the EIA Regulations;
- during the evening periods between 19:00 and 23:00, there is a temporary **high** magnitude of impact for **medium** sensitivity receptors giving rise to a ***'major adverse'*** level of effect at one (Faenol-Bropor) of the nearest NSRs considered which is significant in terms of the EIA Regulations; and

- during the night-time periods between 23:00 and 07:00, there is a temporary **high** magnitude of impact for **high** sensitivity receptors giving rise to a ***'major adverse'*** level of effect at three (Tyddyn Isaf, Sun Valley Caravan Park and Faenol-Bropor) of the nearest NSRs considered which is significant in terms of the EIA Regulations.

286 With regards to the identified adverse impacts from evening, night-time and weekend HDD operations, it is considered that these could be reduced using the relevant detailed design mitigation shown in Table 50. Final mitigation measures would be informed by detailed design post consent and included within the final NVMP which would be submitted for approval by DCC as part of the final CoCP that is secured within the DCO.

287 It is considered that with the implementation of the relevant mitigation measures shown in Table 50, the magnitude would be reduced to **negligible** or **low** for **medium** sensitivity receptors and **negligible** for **high** sensitivity receptors whereby the level of effect could be reduced to temporary '***minor adverse'*** which is not significant in terms of the EIA Regulations.

Other Crossing Points where HDD could be used along the onshore ECC

288 There is an option for HDD (or other trenchless technology techniques), to be utilised at a number of other locations along the onshore ECC, as an alternative methodology to open-cut trenching to cross significant environmental and physical features (such as watercourses, utilities and roads). The final crossing methodology will be determined through detailed design (post consent) and so at the time of writing this chapter the exact locations of these potential HDD operations are not known.

289 Depending on their location in relation to the nearest NSRs there is the potential for temporary, **medium** or **high** magnitude of impact for **medium** sensitivity receptors resulting in ***'moderate or major adverse'*** effects at NSRs located to in close proximity to the HDD compounds.

290 As night-time HDD operations will only be undertaken at major crossings, it is considered that any additional HDD operations would only take place during the less sensitive daytime and weekend periods, thus limiting the potential for adverse impacts.

291 However, as with the defined HDD locations, it is considered that subject to the final project any identified impacts could be reduced through the use of the relevant detailed design mitigation shown in Table 50; however, these mitigation measures would be determined once the exact HDD drilling locations, details and methods have been confirmed. Final mitigation measures would be informed by detailed design post consent and included within the final NVMP which would be submitted for approval by DCC as part of the final CoCP that is secured within the DCO.

292 It is considered that with the implementation of the additional mitigation measures in Table 50, the magnitude of impact would reduce to **low** or **negligible** for **medium** sensitivity receptors so that the level of effect could be reduced to temporary ***'minor adverse'*** which is not significant in terms of the EIA Regulations.

10.11.6 Off-route access road construction

293 Off-route access roads (ORAR) are access roads used to access the haul road and working area that will be required at various positions at the landfall, along the onshore ECC and OnSS. A number of these off-route access routes are significantly closer to the nearest NSRs than the extents of the onshore ECC, though still within the DOL, and therefore need to be considered separately.

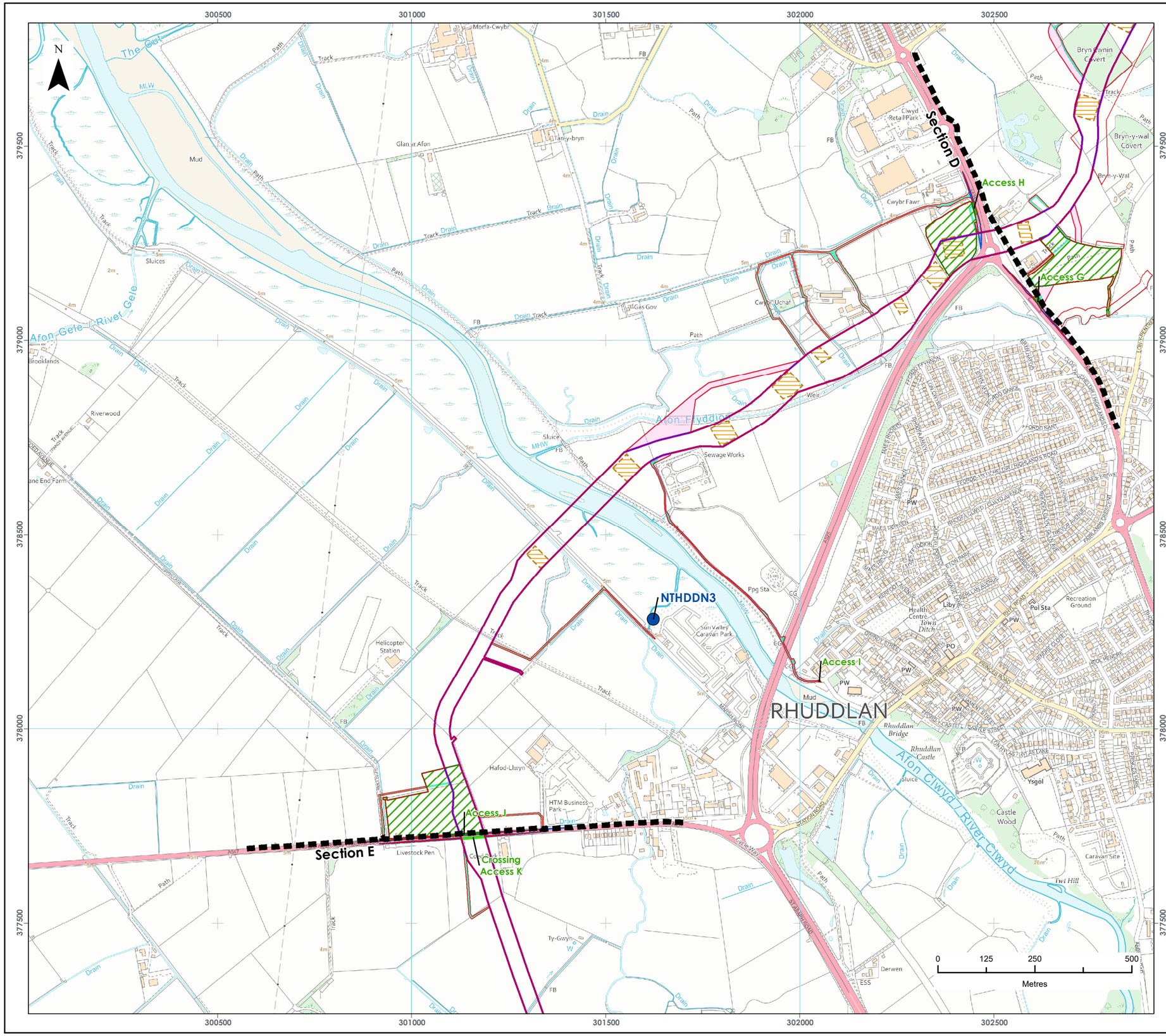
294 In addition to the above, a number of the ORARs would utilise the existing access roads currently in-situ and therefore no additional construction activities would be required.

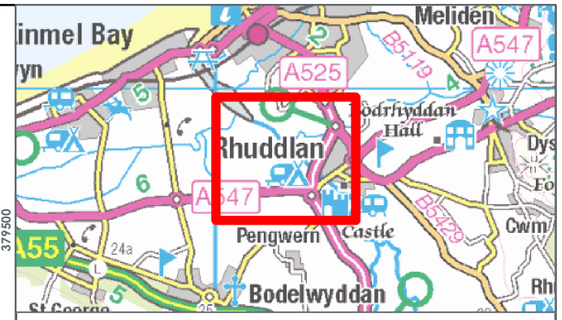
295 However, additional activities would be required to install/upgrade a small number of the ORARs located close to NSRs, as shown in Table 59. The receptors considered are those that are closest to the identified ORARs and therefore would be subject to the greatest potential impacts. It must be noted however that in the majority of cases these receptors are located in close proximity to other NSRs which could also be subject to potential impacts, though not as great.

Table 59: NSRs considered for ORAR construction noise.

NEAREST NSR	REPRESENTATIVE BASELINE MONITORING LOCATION	OS GRID CO-ORDINATES	ORAR	DISTANCE TO WORKING AREA (M)
164 Ffordd Idwal – ORARN1	Landfall Monitoring AR1	304937.7, 383104.1	ORAR A – Access to Landfall Beach Area	20
Rhydorddwy Fawr – ORARN2	Cable Route CR2	303844.6, 381351.0	ORAR D – Haul route to Landfall HDD/TJB	35
1 Rachel Drive – ORARN3	Cable Route CR4	302787.3, 380113.2	ORAR E – West of Route Section C	165
Plas Lorna – ORARN4	Cable Route CR6	302594.7, 379212.3	ORAR F – North of A525 Route Section C	50
Residence on Tan-Yr-Eglwys Road – ORARN5	Cable Route CR7A	302007.5, 378149.9	ORAR I – North of the River Clwyd Crossing	16

296 The locations of the ORAR and nearest NSRs considered are shown in Figure 18 and Figure 19.





LEGEND

- Order Limits
- Onshore Cable Route Section Breaks
- Proposed Onshore Export Cable Corridor
- Proposed Indicative Trenchless Crossing Compound
- Proposed Temporary Construction Compound
- Proposed Access Location
- Proposed Crossing Location
- Proposed Operational Access Route
- Proposed Construction Access Area
- Proposed Major Road Crossing Visibility Splay
- Noise Sensitive Receptor Considered

NTHDDN3: Sun Valley Caravan Park N97

PROJECT TITLE:

AWEL Y MÔR OFFSHORE WINDFARM

FIGURE TITLE:

LOCATION OF NSRS CONSIDERED NIGHT-TIME HDD OPERATIONS

VER	DATE	REMARKS	Drawn	Checked
1	08/04/2022	ES ISSUE	JRS	MF

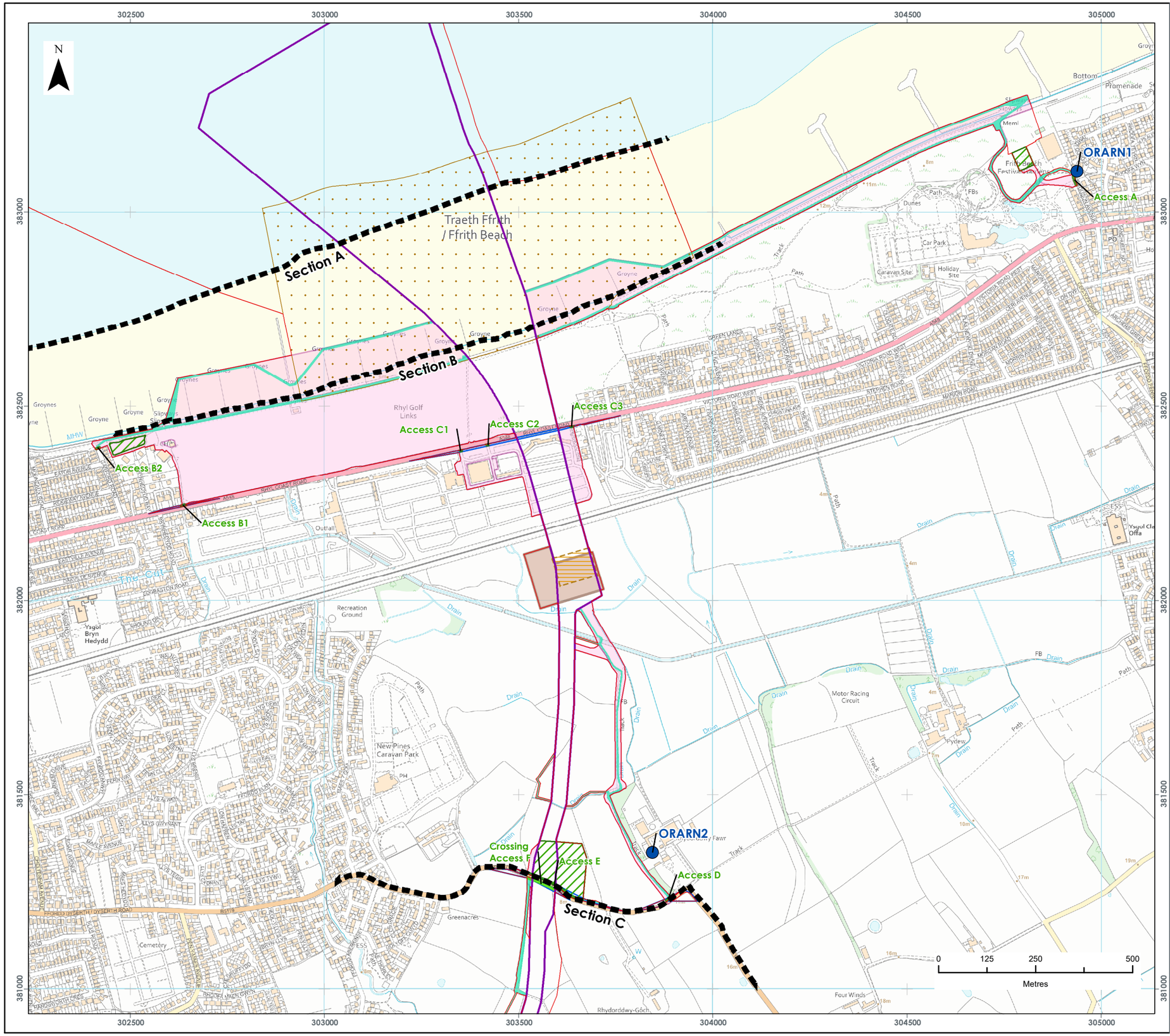
FIGURE NUMBER:

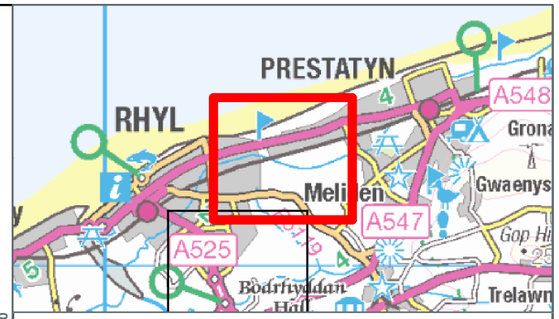
FIGURE 18

SCALE:	PLOT SIZE:	DATUM:	COORDINATE SYSTEM:
1:10,000	A3	ODN	British National Grid

Fferm Wynt Alltraeth
AWEL Y MÔR
Offshore Wind Farm

P:\05356 - GoBe Consultants Ltd\00009 Awel y Mor\Tech\GIS\Dwgs\Wking\202201 Environmental Statement\Chapter 3.10 - Noise\05356.00009.0277.0 NSRs Considered - Night-Time Operations.mxd





LEGEND

- Order Limits
- Onshore Cable Route Section Breaks
- Proposed Onshore Export Cable Corridor
- Proposed Indicative Trenchless Crossing Compound
- Proposed Temporary Construction Compound
- Proposed Transition Joint Bay Construction Compound
- Proposed Access Location
- Proposed Crossing Location
- Proposed Operational Access Route
- Proposed Construction Access Area
- Anchoring Zone
- Proposed Major Road Crossing Visibility Splay
- Noise Sensitive Receptor Considered

ORARN1: Access to Landfall Beach Area
ORARN2: Haul route to Landfall HDD/TJB

PROJECT TITLE:

AWEL Y MÔR OFFSHORE WINDFARM

FIGURE TITLE:

LOCATIONS OF THE ORAR AND NEAREST NSRS

VER	DATE	REMARKS	Drawn	Checked
1	08/04/2022	ES Issue	JRS	MF

FIGURE NUMBER:

FIGURE 19
Page 1 of 2

SCALE:	PLOT SIZE:	DATUM:	COORDINATE SYSTEM:
1:10,000	A3	ODN	British National Grid

Fferm Wynt Alltraeth
AWEL Y MÔR
Offshore Wind Farm

297 The total noise level for site preparation, including haul route construction, is shown in Table 51; however, as outlined in MDS (Table 48) not all the plant associated with site preparation will be utilised for the haul route upgrading/construction, and therefore the assessment that the grader equipment (noisiest item of plant associated with the haul route construction) will be operating at its closest approach to each NSR considered.

298 The predicted noise levels from worst-case daytime ORAR construction operations are shown in Table 60. The Table also compares the predicted noise levels to the calculated daytime threshold limits and with reference to Table 8, Table 10 and Table 15 defines the level of effect and significance.

299 The assessment has been undertaken for the midweek and weekend daytime periods. It should be noted that all of the NSRs considered are residential properties, and therefore have a **medium** sensitivity during the daytime, evening, and weekend periods. Where no baseline sound data is available at a receptor location for an assessment period the threshold limits are based on the Category A limits contained in Table 2 as it is considered that this represents a worst-case scenario.

Table 60: ORAR construction noise – daytime assessment, dB.

NSR NAME	CONSTRUCTION ACTIVITY	PREDICTED NOISE LEVEL $L_{AEQ,T}$	PERIOD	THRESHOLD LIMIT, $L_{AEQ,T}$	DIFFERENCE	IMPACT MAGNITUDE	LEVEL OF EFFECT AND SIGNIFICNACE
164 Ffordd Idwal – ORARN1	ORAR Construction (Grader)	80	Daytime	65	+15	**High**	***Major*** *(significant)*
			Weekend	55	+25	**High**	***Major*** *(significant)*
Rhydorddwy Fawr – ORARN2	ORAR Construction (Grader)	74	Daytime	65	+9	**High**	***Major*** *(significant)*
			Weekend	55	+19	**High**	***Major*** *(significant)*
1 Rachel Drive – ORARN3	ORAR Construction (Grader)	59	Daytime	65	-6	**Negligible**	***Minor*** (not significant)
			Weekend	55	+4	**Medium**	***Moderate*** *(significant)*
Plas Lorna – ORARN4		65	Daytime	65	0	**Negligible**	***Minor*** (not significant)

NSR NAME	CONSTRUCTION ACTIVITY	PREDICTED NOISE LEVEL $L_{AEQ,T}$	PERIOD	THRESHOLD LIMIT, $L_{AEQ,T}$	DIFFERENCE	IMPACT MAGNITUDE	LEVEL OF EFFECT AND SIGNIFICNACE
	ORAR Construction (Grader)		Weekend	55	+10	**High**	***Major*** *(significant)*
Residence on Tan-Yr-Eglwys Road – ORARN5	ORAR Construction (Grader)	81	Daytime	65	+16	**High**	***Major*** *(significant)*
			Weekend	55	+26	**High**	***Major*** *(significant)*

300 It can be seen from Table 60 that:

- during the midweek daytime and weekends before 13:00 hours, the worst-case magnitude of impact would be **negligible** for a **medium** sensitivity receptor at two locations (1 Rachel Drive and Plas Lorna) and the level of effect would be, temporary ***'minor adverse'*** which is not significant in terms of the EIA Regulations;
- during the midweek daytime and weekends before 13:00 hours, the worst-case magnitude of impact would be **high** for a **medium** sensitivity receptor at three locations (164 Ffordd Idwal, Rhydorddwy Fawr, and the residence on Tan-Yr-Eglwys Road) and the level of effect would be, temporary ***'major adverse'*** which is significant in terms of the EIA Regulations;
- during the weekends between 13:00 and 19:00 hours, the worst-case magnitude of impact would be **medium** for a **medium** sensitivity receptor at one location (1 Rachel Drive) and the level of effect would be, temporary ***'moderate adverse'*** which is significant in terms of the EIA Regulations; and
- during the weekends between 13:00 and 19:00 hours, the worst-case magnitude of impact would be **high** for a **medium** sensitivity receptor at four locations (164 Ffordd Idwal, Rhydorddwy Fawr, Plas Lorna, and the residence on Tan-Yr-Eglwys Road) and the level of effect would be, temporary ***'major adverse'*** which is significant in terms of the EIA Regulations.

301 At the access to the Landfall Beach Area, the proposed ORAR spurs perpendicularly off the end of Ferguson Avenue. Consequently, it is not possible to shield all receptors represented by 164 Ffordd Idwal using acoustic screens, as the screens would need to be located across the access to the ORAR. This is the case for a very limited number of receptors for the initial part of this ORAR, and the ***'major adverse'*** impact would consequently only occur for a very limited time period.

302 Additional acoustic screens should be used wherever practicable on this ORAR between the access point and the north-east TCC in addition limiting the use of the grader to the less sensitive periods of the day (i.e. during periods where the majority of people are at work) or the use of less noisy construction methods where practicable would also be beneficial; however the nature of additional mitigation measures would be determined once the exact ORAR construction details and methods have been confirmed.

303 It is understood that ORARs D and G are located along existing partially made roads. It is likely that not all the construction processes proposed will be necessary to prepare the ORAR and therefore the resultant noise levels from ORAR construction at Rhydorddwy Fawr and the residence on Tan-Yr-Eglwys Road may be significantly reduced.

304 In addition, the construction noise may be mitigated by the relevant mitigation measures outlined in Table 50; however, these mitigation measures would be determined once the exact construction methods have been confirmed. Final mitigation measures would be informed by detailed design post consent and included within the final NVMP which would be submitted for approval by DCC as part of the final CoCP that is secured within the DCO.

305 With consideration of all of the above, and with the implementation of the relevant mitigation measures in Table 50, the magnitude of impact would reduce to **low** or **negligible** for **medium** sensitivity receptors so that the level of effect could be reduced to temporary ***'minor adverse'*** which is not significant in terms of the EIA Regulations.

10.11.7 The OnSS

306 A summary programme of the OnSS construction works is described in Volume 3, Chapter 1 (application ref: 6.3.1).

307 A summary of the construction works associated with the OnSS is given below.

308 The likely sequence of activities at the OnSS are:

- site investigation works, pre-construction archaeological and ecological surveys and mitigation;
- site enabling works, including:
  - site clearance;
  - site mobilisation, fencing and the establishment of the TCCs;
  - the construction of temporary and permanent access roads;
  - ground works including cable ducting and new site drainage; and
  - ground raising and establishment of the stoned site platform.
- installation of the OnSS, including:
  - permanent security fencing;
  - the GIS building (if required) and other structures such as control and welfare buildings and lightning rods; and
  - electrical equipment such as switchgear, busbars, capacitors, reactors, reactive power compensation equipment, filters and cooling equipment.

309 As described in Volume 3, Chapter 1 (application ref 6.3.1), the construction of the OnSS will include the establishment of temporary construction compound located to the north west of the OnSS.

310 With reference to the above, the predicted construction noise levels for the OnSS have therefore assumed the following:

- all the plant associated with Ground Works (noisiest activity, see Table 52) would be located within the nearest 25% of the area of the OnSS closest to each NSR;
- All the plant associated with Site Preparation (noisiest activity, see Table 51) has been modelled as area source measuring approximately 100 X 40 metres which is positioned within the TCC at its closest approach to each NSR.
- average source height of 2 m, receptor height of 1.5 m; and
- ground effect: 0.5.

311 The predictions also take into account the relevant mitigation measures outlined in Table 49.

312 Based on the above, the worst-case noise levels from construction operations associated with the OnSS have been predicted at the nearest NSRs.

313 The NSRs considered are shown in Table 61. The Table also shows the grid co-ordinates, the representative baseline monitoring location, the closest working area and distance from the receptor to the closest working area.

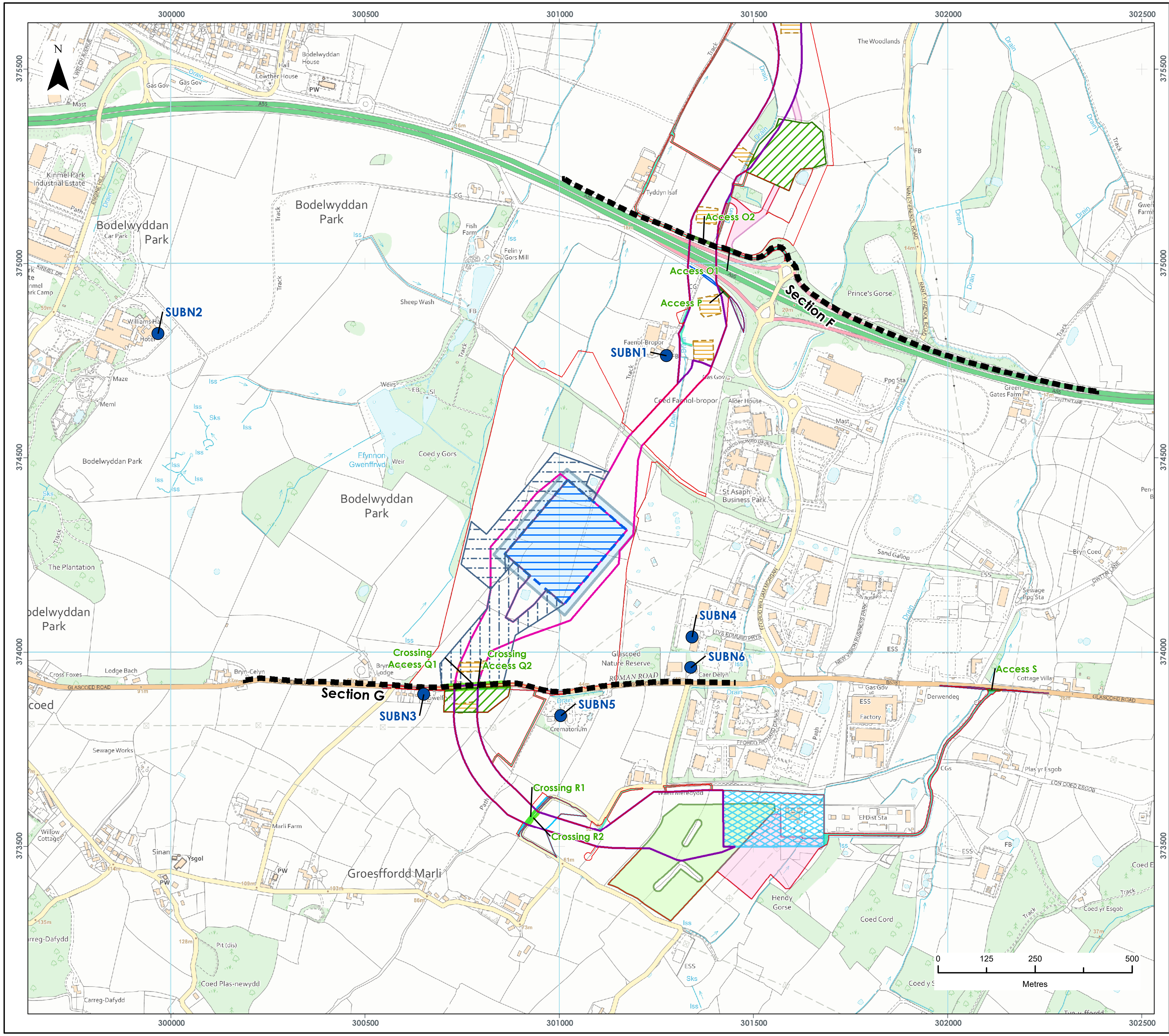
314 The receptors considered are those that are closest to the OnSS and therefore would be subject to the greatest potential impacts. It must be noted however that in the majority of cases these receptors are located in close proximity to other NSRs which could also be subject to potential impacts, though not as great.

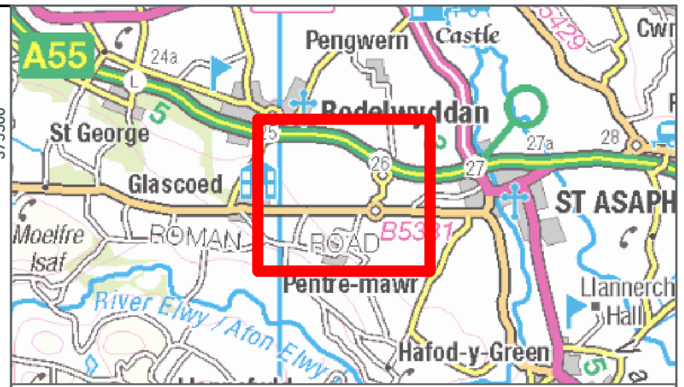
Table 61: NSRs considered – OnSS construction noise.

NSR NAME	REPRESENTATIVE BASELINE MONITORING LOCATION	OS GIRD CO-ORDINATES	CLOSEST WORKING AREA	DISTANCE TO CLOSEST WORKING AREA (M)
Faenol Bropor – SUBN1	OnSS Monitoring Location S1	301276.0, 374762.4	OnSS TCC	290
Bodelwyddan Castle Hotel – SUBN2	OnSS Monitoring Location S2	299967.1, 374819.1	OnSS	890
Gwelfryn (Glascoed Road) – SUBN3	OnSS Monitoring Location S3	300651.3, 373891.1	OnSS	410
Nearest Commercial Units on the St.	OnSS Monitoring Location S4	301341.9, 374038.9	OnSS	300

NSR NAME	REPRESENTATIVE BASELINE MONITORING LOCATION	OS GIRD CO-ORDINATES	CLOSEST WORKING AREA	DISTANCE TO CLOSEST WORKING AREA (M)
Asaph Business Park – SUBN4				
Crematorium – SUBN5	Cable Route CR12	301004.4, 373836.4	OnSS	290
Caer Delyn – SUBN6	OnSS Monitoring Location S4	301339.0, 373959.5	OnSS	350

315 The locations of the NSRs described above are shown on Figure 20.





LEGEND

- Order Limits
- Onshore Cable Route Section Breaks
- Proposed Onshore Export Cable Corridor
- Proposed Substation Cable Corridor Zone
- Proposed Indicative Trenchless Crossing Compound
- Proposed Temporary Construction Compound
- Proposed Temporary Construction Compound Zone
- Proposed Access Location
- Proposed Crossing Location
- Proposed Operational Access Route
- Proposed Construction Access Area
- Unlicenced Work Zone
- Proposed Major Road Crossing Visibility Splay
- Proposed Minor Road Crossing Visibility Splay
- Proposed Onshore Substation (OnSS) Footprint
- Proposed Substation Construction Area
- Substation Construction Access Zone
- Substation Temporary Construction Access Zone
- Substation Access Visibility Splay
- Noise Sensitive Receptor Considered

SUBN1: Faenol Bropor
SUBN2: Bodelwyddan Castle Hotel
SUBN3: Gwelfryn (Glascoed Road)
SUBN4: Nearest Commercial Units on the St. Asaph Business Park
SUBN5: Crematorium
SUBN6: Caer Delyn

Data Source:

PROJECT TITLE:

AWEL Y MÔR OFFSHORE WINDFARM

FIGURE TITLE:

LOCATION OF NSRS CONSIDERED - SUBSTATION CONSTRUCTION NOISE

VER	DATE	REMARKS	Drawn	Checked
1	08/04/2022	ES Issue	JRS	MF

FIGURE NUMBER:

FIGURE 20

SCALE:	PLOT SIZE:	DATUM:	COORDINATE SYSTEM:
1:10,000	A3	ODN	British National Grid

Fferm Wynt Alltraeth AWEL Y MÔR Offshore Wind Farm

P:\05356 - GoBe Consultants Ltd\00009 Awel y Mor\Tech\GIS\Dwgs\Wking\202201 Environmental Statement\Chapter 3.10 - Noise\05356.00009.0276.0 NSRs Considered - Substation Construction Zone.mxd

316 The predicted noise levels from worst-case daytime and weekend OnSS construction operations are shown in Table 62. The Table also compares the predicted noise levels to the calculated threshold limits and with reference to Table 8, Table 10 and Table 15 defines the level of effect and significance.

Table 62: OnSS construction noise – daytime assessment, dB.

NSR NAME	CONSTRUCTION ACTIVITY	PREDICTED NOISE LEVEL $L_{AEQ,T}$	PERIOD	THRESHOLD LIMIT, $L_{AEQ,T}$	DIFFERENCE	IMPACT MAGNITUDE	LEVEL OF EFFECT AND SIGNIFICANCE
Faenol Bropor	Groundworks within OnSS	53	Daytime	65	-12	**Negligible**	***Minor*** (not significant)
			Weekend	60	-7	**Negligible**	***Minor*** (not significant)
	Site Preparation within TCC area	52	Daytime	65	-13	**Negligible**	***Minor*** (not significant)
			Weekend	60	-8	**Negligible**	***Minor*** (not significant)
Bodelwyddan Castle Hotel	Groundworks within OnSS Zone	45	Daytime	65	-20	**Negligible**	***Minor*** (not significant)
			Weekend	55	-10	**Negligible**	***Minor*** (not significant)
	Site Preparation within TCC area	44	Daytime	65	-21	**Negligible**	***Minor*** (not significant)
			Weekend	55	-11	**Negligible**	***Minor*** (not significant)
Gwelfryn (Glascoed Road)	Groundworks within OnSS	53	Daytime	65	-12	**Negligible**	***Minor*** (not significant)
			Weekend	65	-12	**Negligible**	***Minor*** (not significant)
		50	Daytime	65	-15	**Negligible**	***Minor*** (not significant)

NSR NAME	CONSTRUCTION ACTIVITY	PREDICTED NOISE LEVEL $L_{AEQ,T}$	PERIOD	THRESHOLD LIMIT, $L_{AEQ,T}$	DIFFERENCE	IMPACT MAGNITUDE	LEVEL OF EFFECT AND SIGNIFICANCE
	Site Preparation within TCC area		Weekend	65	-15	**Negligible**	***Minor*** (not significant)
Commercial Units	Groundworks within OnSS	55	Daytime	65	-10	**Negligible**	***Minor*** (not significant)
			Weekend	55	0	**Negligible**	***Minor*** (not significant)
	Site Preparation within TCC area	47	Daytime	65	-18	**Negligible**	***Minor*** (not significant)
			Weekend	55	-8	**Negligible**	***Minor*** (not significant)
Crematorium	Groundworks within OnSS	54	Daytime	65	-11	**Negligible**	***Minor*** (not significant)
			Weekend	55	-1	**Negligible**	***Minor*** (not significant)
	Site Preparation within TCC area	48	Daytime	65	-17	**Negligible**	***Minor*** (not significant)
			Weekend	55	-7	**Negligible**	***Minor*** (not significant)
Caer Delyn	Groundworks within OnSS	54	Daytime	65	-11	**Negligible**	***Minor*** (not significant)
			Weekend	55	-1	**Negligible**	***Minor*** (not significant)

NSR NAME	CONSTRUCTION ACTIVITY	PREDICTED NOISE LEVEL $L_{AEQ,T}$	PERIOD	THRESHOLD LIMIT, $L_{AEQ,T}$	DIFFERENCE	IMPACT MAGNITUDE	LEVEL OF EFFECT AND SIGNIFICANCE
	Site Preparation within TCC area	46	Daytime	65	-19	**Negligible**	***Minor*** (not significant)
			Weekend	55	-9	**Negligible**	***Minor*** (not significant)

317 It can be seen from Table 62 that:

- the worst-case noise magnitude of impact would be **negligible** for **medium** sensitivity receptors so that the level of effect at the nearest NSRs from OnSS construction operations would be temporary ***'minor adverse'*** which is not significant in terms of the EIA Regulations.

10.11.8 The Array

318 The consideration of proposed offshore piling operations associated with the Array, is based upon the following parameters:

- maximum hammer energy of 5000(KJ) for monopiles, where only a single piling operation would be undertaken at any one time; or
- a maximum hammer energy of 3000(KJ) for pin piles where two adjacent piling operations will be undertaken simultaneously anywhere within the Array.

319 With reference to the above desktop noise predictions have been made for both scenarios; however it is considered that the simultaneous piling of the pin piles would represent a MDS as it has been assumed that an increase in hammer energy is proportional to the increase in sound energy, (i.e. a doubling of hammer energy equates to a 3dB increase in sound); therefore in this case the pin pile scenario would generate slightly higher noise levels due to two piling operations being undertaken simultaneously.

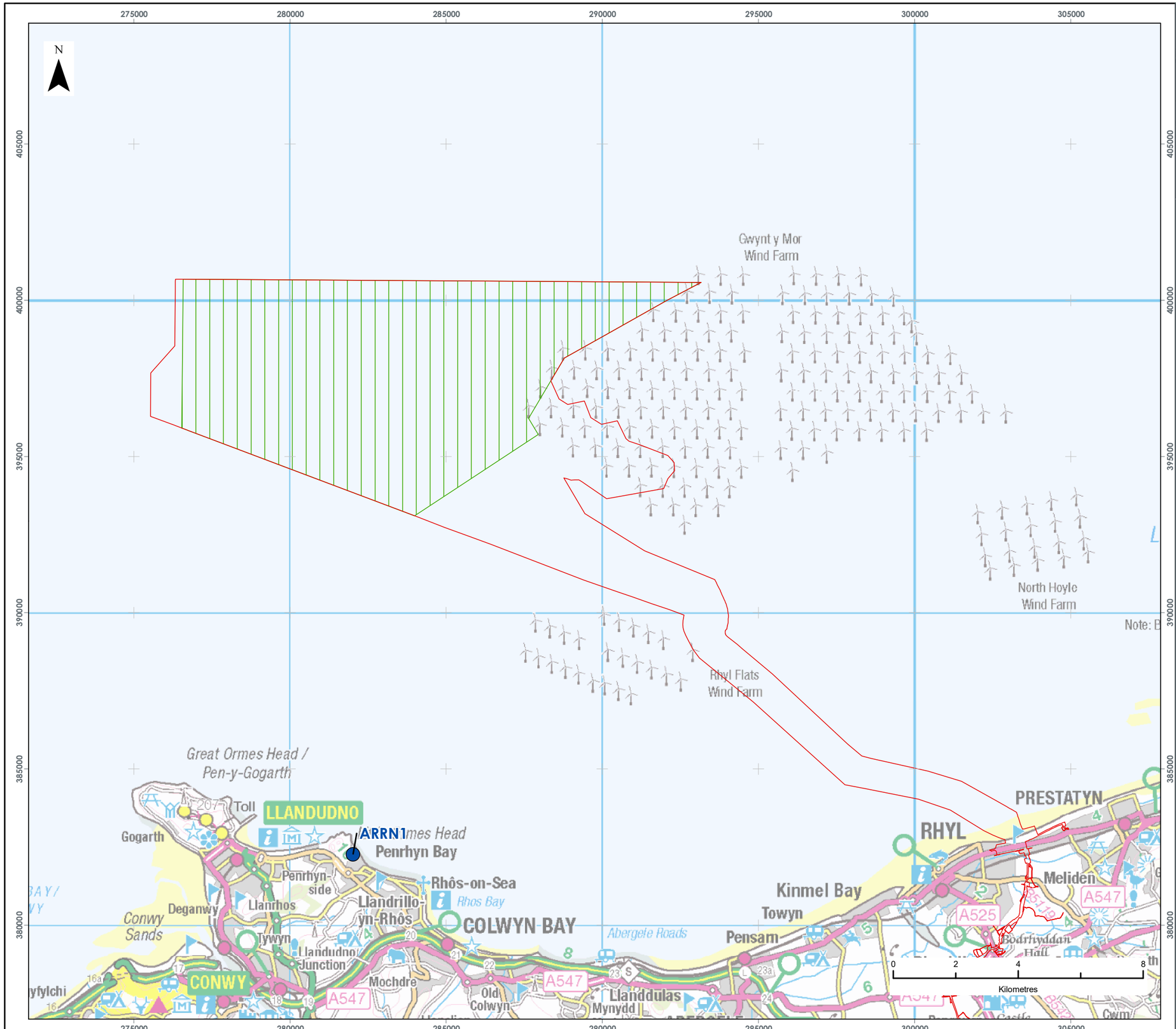
320 A source level (hammer strike) of 139dB(A) $L_{Aeq,\ 1\text{-}sec}$[iii] has been assumed for the 5000(KJ) pile, with reference to paragraph 319 the source level for the 3000(KJ) piles can therefore be calculated to equal 137dB (A) $L_{Aeq,\ 1\text{-}sec}$.

321 Based on all of the above, desktop noise predictions have been undertaken in conjunction with BS5228:2009+A1:2014 and have assumed the following:

[iii] Thanet Wind Farm extension (Ref: EN010084-000621-6.3.10_TEOW_Noise and EN010084-000675-6.5.10.2_TEOW_Noise_Supplement_Baseline).

- a single monopile operation being undertaken at its closest approach nearest NSRs at a distance of 10600 m;
- two pin piling operations being undertaken simultaneously within the Array at their closest approaches to the nearest NSRs at a distance of 10600 m;
- a source level (hammer strike) of 139 dB(A) $L_{Aeq,\ 1\text{-}sec}$ for the monopile and 137 dB(A) $L_{Aeq,\ 1\text{-}sec}$ for the pin plies;
- an on-time for the hammer strikes of 100% in a worst-case hour;
- a source height of 60 m above sea level;
- a ground absorption factor of zero (hard ground/surface of sea); and
- downwind propagation between the source and the receiver.

322 The location of the nearest NSRs to the Array are shown in Figure 21.



LEGEND

- Order Limits
- Proposed Turbine Array Area
- Noise Sensitive Receptor Considered

ARRN1: 116 Penrhyn Beach East

Data Source:
© Crown copyright [and database rights] (2022) OS OpenData.

PROJECT TITLE:

AWEL Y MÔR OFFSHORE WINDFARM

FIGURE TITLE:

LOCATION OF NEAREST NSRS TO THE ARRAY

VER	DATE	REMARKS	Drawn	Checked
1	26/02/2022	ES Issue	JRS	MF

FIGURE NUMBER:

FIGURE 21

SCALE:	PLOT SIZE:	DATUM:	COORDINATE SYSTEM:
1:125,000	A3	ODN	British National Grid

Fferm Wynt Alltraeth
AWEL Y MÔR
Offshore Wind Farm

P:\05356 - GoBe Consultants Ltd\00009 Awel y Mor\Tech\GIS\Dwgs\Wking\202201 Environmental Statement\Chapter 3.10 - Noise\05356.00009.0267.0 NSRs Closest to Array.mxd

323 It has also been confirmed that offshore piling operations could potentially be undertaken on a 24/7 basis. Consequently, daytime, evening and night-time assessments have been carried out.

324 With reference to Table 42 the assessment has considered NSR's representative of baseline monitoring Location A1, which are defined as 'inland' receptors and baseline monitoring Location A2, which are defined as 'seafront' receptors. With reference to Table 47 the assessment has also considered different noise threshold limits during differing weather conditions.

325 Based on the above, the assessments for monopiles and pin piles are shown in Table 63 and Table 64. It should be noted that all levels shown in the table have been rounded to the nearest decibel.

Table 63: Offshore piling noise assessment – pin piles, dB.

NSR NAME	PREDICTED NOISE LEVEL ($L_{AEQ,T}$)	PERIOD	WEATHER	THRESHOLD LIMIT, $L_{AEQ,T}$	DIFFERENCE	IMPACT MAGNITUDE	LEVEL OF EFFECT AND SIGNIFICNACE
Noise sensitive receptors representative of Location A1 (Inland)	51	Daytime	Inclement	65	-14	**Negligible**	***Minor*** (not significant)
		Evening		60	-9	**Negligible**	***Minor*** (not significant)
		Night-time		55	-4	**Negligible**	***Minor*** (not significant)
		Daytime	Suitable/ Neutral	65	-14	**Negligible**	***Minor*** (not significant)
		Evening		55	-4	**Negligible**	***Minor*** (not significant)
		Night-time		50	+1	**Low**	***Moderate*** (significant)
Noise sensitive receptors		Daytime	Inclement	70	-19	**Negligible**	***Minor*** (not significant)

NSR NAME	PREDICTED NOISE LEVEL ($L_{AEQ,T}$)	PERIOD	WEATHER	THRESHOLD LIMIT, $L_{AEQ,T}$	DIFFERENCE	IMPACT MAGNITUDE	LEVEL OF EFFECT AND SIGNIFICNACE
representative of Location A2 (Seafront)		Evening		65	-14	**Negligible**	***Minor*** (not significant)
		Night-time		55	-4	**Negligible**	***Minor*** (not significant)
		Daytime	Suitable/ Neutral	70	-19	**Negligible**	***Minor*** (not significant)
		Evening		65	-14	**Negligible**	***Minor*** (not significant)
		Night-time		55	-4	**Negligible**	***Minor*** (not significant)

Table 64: Offshore piling noise assessment – monopile, dB.

NSR NAME	PREDICTED NOISE LEVEL ($L_{AEQ,T}$)	PERIOD	WEATHER	THRESHOLD LIMIT, $L_{AEQ,T}$	DIFFERENCE	IMPACT MAGNITUDE	LEVEL OF EFFECT AND SIGNIFICNACE
Noise sensitive receptors representative of Location A1 (Inland)	50	Daytime	Inclement	65	-15	**Negligible**	***Minor*** (not significant)
		Evening		60	-10	**Negligible**	***Minor*** (not significant)
		Night-time		55	-5	**Negligible**	***Minor*** (not significant)
		Daytime	Suitable/ Neutral	65	-15	**Negligible**	***Minor*** (not significant)
		Evening		55	-5	**Negligible**	***Minor*** (not significant)
		Night-time		50	0	**Negligible**	***Minor*** (not significant)
Noise sensitive receptors		Daytime	Inclement	70	-20	**Negligible**	***Minor*** (not significant)

NSR NAME	PREDICTED NOISE LEVEL ($L_{AEQ,T}$)	PERIOD	WEATHER	THRESHOLD LIMIT, $L_{AEQ,T}$	DIFFERENCE	IMPACT MAGNITUDE	LEVEL OF EFFECT AND SIGNIFICNACE
representative of Location A2 (Seafront)		Evening		65	-15	**Negligible**	***Minor*** (not significant)
		Night-time		55	-5	**Negligible**	***Minor*** (not significant)
		Daytime	Suitable/ Neutral	70	-20	**Negligible**	***Minor*** (not significant)
		Evening		65	-15	**Negligible**	***Minor*** (not significant)
		Night-time		55	-5	**Negligible**	***Minor*** (not significant)

326 The pin piling assessment shown in Table 63 has indicated that:

- during all time periods at both locations considered where the weather conditions were considered to be inclement, the worst-case magnitude of impact would be **negligible** for **high** sensitivity receptors resulting in a level of effect at the nearest NSRs from offshore piling operations construction operations would be temporary ***'minor adverse'***, which is not significant in terms of the EIA Regulations;
- during the majority of time periods, at both NSR locations considered all periods where the weather conditions were considered to be suitable for undertaking noise measurements (neutral conditions), the worst-case magnitude of impact would be **negligible** for **high** sensitivity receptors resulting in a level of effect at the nearest NSRs from offshore piling operations construction operations would be temporary ***'minor adverse'***, which is not significant in terms of the EIA Regulations; and
- At the noise sensitive receptors representative of Location A1 during the night-time during neutral weather conditions the worst-case magnitude of impact would be **low** for **high** sensitivity receptors resulting in a level of effect at the nearest NSRs from offshore piling operations construction operations would be temporary ***'moderate adverse'***, which is significant in terms of the EIA Regulations.

327 The monopile assessment shown in Table 64 has indicated that:

- during all time periods at both locations considered where the weather conditions were considered to be suitable or inclement, the worst-case magnitude of impact would be **negligible** for **high** sensitivity receptors resulting in a level of effect at the nearest NSRs from offshore piling operations construction operations would be temporary ***'minor adverse'***, which is not significant in terms of the EIA Regulations;

328 With regards to the identified night-time impacts during neutral weather conditions, it is considered that these could be reduced through the use of one, or a combination, of the following mitigation measures:

- reducing the hammer energy where required; and

- as far as reasonably practicable, only undertaking piling operations during the night-time during periods of inclement weather.

329 It also should be noted that the predictions have been based on an MDS where downwind propagation has been assumed between the source and the receiver.

330 The prevailing wind conditions between the nearest NSRs and the Array are from a south-westerly direction, i.e. directing the noise from piling operations away from the nearest NSRs; the assessment is therefore precautionary and when considering the prevailing wind conditions it is considered that it is unlikely that adverse impact will be experienced even in suitable / neutral conditions.

331 With reference to all of the above, it is considered that night-time piling operations would be subject to a DCO Requirement which would specify noise limits at the receptor locations in neutral weather conditions only. Similar control measures were used to control night-time noise for the Gwynt y Môr offshore windfarm that was constructed in 2013. Construction noise was controlled via specified noise limits for the North Hoyle and Rhyl Flats offshore windfarms during their construction (noting that both of these wind farms are nearer to onshore receptors than AyM).

332 When the DCO Requirements are applied, then the worst-case magnitude of impact could be reduced to **negligible** for **high** sensitivity receptors so that the level of effect at the nearest NSRs from night-time offshore piling operations construction operations would be temporary ***'minor adverse'***, which is not significant in terms of the EIA Regulations.

10.11.9 Construction vibration

333 Accounting for the distance between the closest receptor and the assumed location of construction activities (at their closest approach), it is unlikely that the construction phase of the AyM will give rise to significant vibration impacts.

334 Furthermore, ground level plant is not considered to generate significant levels of vibration, with levels below those which would be likely to cause cosmetic damage.

335 Notwithstanding this, the following construction vibration activities have been considered:

- the underground drilling activities associated with the HDD (or other trenchless technology techniques), operations at the Landfall and at various locations along the onshore ECC;
- the vibratory piling activities associated with the HDD operations at the Landfall and at various locations along the onshore ECC; and
- piling associated with the cofferdam and OnSS foundations.

336 The potential vibration impact of these working methods has been assessed upon the closest vibration sensitive receptors (VSRs) to each construction activity.

HDD – Underground drilling

337 Underground drilling will be utilised at the landfall and at a number of locations, used as an alternative methodology to open-cut trenching to cross significant environmental and physical features such as watercourses, utilities and roads.

338 Depending on the progress rates and techniques employed, vibration effects due to tunnelling and drilling are relatively short-lived, in addition, levels of vibration are found to decrease rapidly with distance.

339 Desktop predictions of ground borne vibration due to drilling works have therefore been undertaken. The predictions have been completed in accordance with calculation algorithms associated tunnelling operations included in Table E.1 of BS5228-2:2009+A1:2014 Part 2 Vibration.

Daytime Assessment – Defined HDD Compounds

340 The results of the desktop predictions have shown that at distances more than 55 m away from tunnelling works, the vibration levels generated are unlikely to cause complaints, i.e. with reference to Table 3 peak particle velocity (PPV) vibration levels would be between 0.3 and 1.0 mm/s^{-1}.

341 With reference to Table 8, Table 12 and Table 15, as a worst-case, any VSRs located more than 55 m away from HDD would be subject to a daytime vibration level which would lead to a **low** impact magnitude for **medium** sensitivity receptors, equating to a temporary ***'minor adverse'*** level of effect which is not significant in terms of the EIA Regulations.

342 From the desktop analysis of all the defined HDD drilling compounds and potential HDD field crossing areas, it has been determined that at their closest approach the following VSRs are less than 55 m away from an HDD drilling point:

- Cwybr-bâch within onshore ECC route section C, (see Table 56) approximately 35 m to the north-west from the nearest HDD drilling compound.
- Plas Lorna within onshore ECC route section C, (see) approximately 36 m to the south-west of the nearest HDD drilling compound and
- Faenol Bropor within onshore ECC route section F, (see) approximately 45 m to the west of the nearest HDD drilling compound.

343 The predicted PPV vibration levels at the three VSRs listed above are 1.77 mms^{-1} ,1.71 mms^{-1} and 1.28 mms^{-1} respectively. With reference to Table 3 Table 3these levels are marginally above the level which could cause complaints, but can be tolerated if prior warning has been given.

344 With reference to Table 8, Table 12 and Table 15, these VSRs would be subject to a daytime vibration level which would lead to a **medium adverse** impact magnitude on **medium** sensitivity receptors, equating to a temporary ***'moderate adverse'*** level of effect is significant in terms of the EIA Regulations.

345 However, it is considered that as the drilling would be temporary in nature, the fact that the predictions have been based on the HDD drilling operations operating at their closest approach to each VSR and worst-case vibration levels could be tolerated if prior warning has been given then it is considered that the magnitude of impact would be **negligible** and the level of effect would be ***'minor adverse'*** if the residents of the relevant VSRs are notified prior to the commencement of HDD drilling operations.

Daytime Assessment – Other Crossing Points where HDD Could Be Used

346 As noted in Section 10.11.5, there is an option for HDD (or other trenchless technology techniques), to be utilised at a number of other locations along the onshore ECC, as an alternative methodology to open-cut trenching to cross significant environmental and physical features (such as watercourses, utilities and roads). The locations where either HDD or open trenching would be used (see Volume 5, Annex 1.1: Crossing Schedule (application ref 6.5.1.1) for further information on potential crossing options).

347 The final crossing methodology will be determined through detailed design (post consent) and so at the time of writing this chapter the exact locations of these potential HDD operations are not known. However, from inspection of the onshore ECC, it has been determined that there are no VSRs within 55 m of any crossing points where HDD could be used.

348 As night-time HDD operations will only be undertaken at major crossings, it is considered that any additional HDD operations would only take place during the less sensitive daytime and weekend periods, thus limiting the potential for adverse impacts.

349 The results of the desktop predictions have shown that at distances more than 55 m away from tunnelling works, the vibration levels generated are unlikely to cause complaints, i.e. with reference to Table 3 peak particle velocity (PPV) vibration levels would be between 0.3 and 1.0 mm/s^{-1}.

350 With reference to Table 8, Table 12 and Table 15, any VSRs located more than 55 m away from HDD would be subject to a daytime vibration level which would lead to a **low** impact magnitude for **medium** sensitivity receptors; therefore, vibration from HDD (or other trenchless crossing technique) operations at crossing points not yet defined would equate to a temporary ***'minor adverse'*** level of effect which is not significant in terms of the EIA Regulations.

Night-time Assessment

351 It has been confirmed that night-time HDD (or other trenchless technology techniques), operations will be undertaken within three defined areas;

- At the Landfall;
- The River Clwyd Crossing; and
- The A55 Crossing.

352 The results of the desktop predictions have shown that at distances more than 140 m away from tunnelling works, the vibration levels generated are likely to below the perceivable vibration level, i.e. with reference to peak particle velocity (PPV) vibration levels would be below 0.3 mm/s^{-1}.

353 With reference to Table 8, Table 12 and Table 15, as a worst-case, any VSRs located more than 140 m away from HDD would be subject to a night-time vibration level which would lead to a **negligible** impact magnitude for **high** sensitivity receptors, equating to a temporary ***'minor adverse'*** level of effect which is not significant in terms of the EIA Regulations.

354 From the desktop analysis of all the night-time HDD drilling compounds, it has been determined that at their closest approach the following VSRs are less than 140 m away from an HDD drilling point:

- The caravans located on the Robin Hood Holiday Park (see Table 53), approximately 90 m to the north of the landfall HDD compound;
- Faenol Bropor within onshore ECC route section F, (see Table 56) approximately 45 m to the west of the southern A55 HDD drilling compound.

355 The predicted PPV vibration levels at the two VSRs listed above are 0.52 mms^{-1} and 1.28 mm^{-1} respectively. With reference to Table 3, these levels are marginally above the perceivable level at the Robin Hood Holiday Park and marginally above the levels which could cause complaints, but can be tolerated if prior warning has been given, at Faenol Bropor.

356 With reference to Table 8, Table 12 and Table 15, these VSRs would be subject to night-time vibration levels which would lead to a **low** or **medium** adverse impact magnitude on **high** sensitivity receptors, equating to a temporary ***'moderate or major adverse'*** or level of effect is significant in terms of the EIA Regulations

357 However, it is considered that as the drilling would be temporary in nature, the fact that the predictions have been based on the HDD drilling operations operating at their closest approach to each VSR and worst-case vibration levels could be tolerated if prior warning has been given then it is considered that the magnitude of impact would be **negligible** and the level of effect would be ***'minor adverse'*** if the residents of the relevant VSRs are notified prior to the commencement of the night-time HDD drilling operations.

HDD – Vibratory Piling

358 As part of the HDD (or other trenchless technology techniques), operations vibratory piling will be utilised to install sheet piles; it has also been confirmed that this operation would only take place during the daytime.

359 Depending on the progress rates and techniques employed, vibration effects due to piling installation are relatively short-lived, in addition, levels of vibration are found to decrease rapidly with distance.

360 Desktop predictions of ground borne vibration due to vibratory piling have therefore been completed in accordance with Table E.1 of BS5228-2:2009+A1:2014 Part 2 Vibration.

361 The results of the desktop predictions have shown that at distances more than 75 m away from piling works, the vibration levels generated are unlikely to cause complaints, i.e. with reference to peak particle velocity (PPV) vibration levels would be between 0.3 and 1.0 mm/s-1 (at a 95% confidence level).

362 With reference to Table 8, Table 12 and Table 15, as a worst-case, any VSRs located more than 75 m away from HDD would be subject to a daytime vibration level which would lead to a **low** impact magnitude for **medium** sensitivity receptors, equating to a temporary ***'minor adverse'*** level of effect which is not significant in terms of the EIA Regulations.

363 From the desktop analysis of all the defined HDD drilling compounds and potential HDD field crossing areas, it has been determined that at their closest approach the following VSRs are less than 75 m away from an HDD drilling point:

- Cwybr-bâch within onshore ECC route section C, (see Table 56) approximately 35 m to the north-west from the nearest HDD drilling compound.
- Plas Lorna within onshore ECC route section C, (see Table 56) approximately 36 m to the south-west of the nearest HDD drilling compound and
- Faenol Bropor within onshore ECC route section F, (see Table 56) approximately 45 m to the west of the nearest HDD drilling compound.

364 The predicted PPV vibration levels at the three VSRs listed above from vibratory piling are 2.62 mms^{-1} ,2.52 mms^{-1} and 1.89 mm^{-1} respectively. With reference to Table 3 these levels are within the range which could cause complaints but can be tolerated if prior warning has been given, but well below the level of 10 mm^{-1} where vibration levels would be intolerable.

365 With reference to Table 8, Table 12 and Table 15, these VSRs would be subject to a daytime vibration level which would lead to a **medium** adverse impact magnitude on **medium** sensitivity receptors, equating to a temporary ***'moderate adverse'*** level of effect is significant in terms of the EIA Regulations.

366 However, it is considered that as the vibratory piling operations associated with HDD (or other trenchless technology techniques), operations would be temporary in nature, the fact that the predictions have been based on the piling operations operating at their closest approach to each VSR and worst-case vibration levels could be tolerated if prior warning has been given then it is considered that the magnitude of impact would be **low** and the level of effect would be ***'minor adverse'*** if the residents of the relevant VSR's are notified prior to the commencement of HDD piling operations.

Vibratory Piling – Other Crossing Points where HDD Could Be Used

367 As noted in Section 10.11.5, there is an option for HDD (or other trenchless technology techniques), to be utilised at a number of other locations along the onshore ECC, as an alternative methodology to open-cut trenching to cross significant environmental and physical features (such as watercourses, utilities and roads). The locations where either HDD or open trenching would be used (see Volume 5, Annex 1.1: Crossing Schedule (application ref 6.5.1.1) for further information on potential crossing options).

368 The final crossing methodology will be determined through detailed design (post consent) and so at the time of writing this chapter the exact locations of these potential HDD operations are not known. However, from inspection of the onshore ECC, it has been determined that there are no VSRs within 75 m of any crossing points where HDD could be used.

369 As night-time HDD operations will only be undertaken at major crossings, it is considered that any additional HDD operations would only take place during the less sensitive daytime and weekend periods, thus limiting the potential for adverse impacts.

370 The results of the desktop predictions have shown that at distances more than 75 m away from piling works, the vibration levels generated are unlikely to cause complaints, i.e. with reference to peak particle velocity (PPV) vibration levels would be between 0.3 and 1.0 mms^{-1} (at a 95% confidence level).

371 With reference to Table 8, Table 12 and Table 15, any VSRs located more than 75 m away from HDD would be subject to a daytime vibration level which would lead to a **low** impact magnitude for **medium** sensitivity receptors; therefore, vibration from HDD vibratory piling operations at crossing points not yet defined would equate to a temporary ***'minor adverse'*** level of effect which is not significant in terms of the EIA Regulations.

HDD Vibration – Commercial Receptors

372 With regards to the impact on commercial receptors, the nearest HDD (or other trenchless technology techniques), drilling operations to the SABP are those associated with the A55 crossing which are located approximately 135 m away from the nearest building on SABP (North Wales NHS Trust).

373 Based on a comparison between the desktop predictions of the vibration levels generated by HDD (or other trenchless technique) operations and vibratory piling it has been determined that vibratory piling generates greater vibration levels, therefore these operations have been used as the basis of the vibration assessment for the commercial receptors.

374 At a distance of 135m the predicted PPV vibration levels from vibratory piling would be 0.45 $mm^{-1,}$ at a 95% confidence level, which is well below the level where complaints may be received and with reference to Table 3, at a level which is marginally above the limit of perceptibility within residential environments, which generally are considered more sensitive than commercial offices.

375 It is recognised that SABP contains some commercial organisations, such as Glyndwr University, that undertake work that is particularly sensitive to ground vibration. As noted in Table 4, discussion with Glyndwr University confirmed that concerns raised in response to statutory consultation were primarily regarding vibration associated with construction as well as the importance of early communication with users of SABP regarding the scheduling construction activity.

376 An outline construction communications plan has been included within Appendix 12 of the outline CoCP (application ref: 8.13.12), through which RWE would provide early notice of indicative construction programmes near SABP to allow early scheduling of vibration sensitive activities. Regular updates will be provided to SABP users of the timing and type of construction activities in the vicinity during the construction period.

377 With reference to the above and Table 8, Table 12 and Table 15, as a worst-case, the commercial properties located on the SABP would be subject to vibration levels from HDD operations which would lead to a **low** impact magnitude for **low** sensitivity receptors, equating to a temporary ***'minor adverse'*** level of effect which is not significant in terms of the EIA Regulations.

Cofferdam and OnSS foundations

378 The most significant source of vibration during the construction works will be the potential for percussive piling operations associated with the cofferdam (potentially required during construction of the landfall HDD exit pit) and potentially for the OnSS foundations.

379 BS5228-2:2009+A1:2014 Part 2 Vibration provides guidance for the prediction of an upper estimate of vibration from piling operations which is based on the energy per blow or cycle (determined by the type of piler and ram weight), the distance of the receptor from piling and generalised soil conditions.

380 Based on the calculation formulae provided in Table E.1 in Annex E of BS5228-2:2009+A1:2014 Part 2, percussive pling standoff distances have been calculated from the piling location to achieve a PPV level of 0.3 mm/s i.e., below the level of perceptibility.

381 The standoff distances shown in Table 65 below have been calculated for 200, 300 and 500 KJ hammer energies.

Table 65: Estimated standoff distances from percussive piling.

THRESHOLD VALUE, PPV MM/S	HAMMER ENERGY	STANDOFF DISTANCE M
0.3	200 KJ	66
	300 KJ	78
	500 KJ	95

The standoff distances have been based on percussive piling 'at refusal'.

382 It must be noted, however, that the hammer energies utilised are out of the valid prediction range included within BS5228-2:2009+A1:2014 Part 2 which states that the limit of the equation utilises a maximum hammer energy of 85 KJ.

383 Therefore, the standoff distances shown should be treated with a large degree of caution. It also should be noted that trying to accurately predict the vibration levels generated from large hammer energies through predominately unknown ground conditions over distances over 100 m is extremely difficult.

384 Further to the above, although the standoff distances between the cofferdam and OnSS zones and the nearest VSRs are approximately 230 m and 265 m respectively, and suggest that the PPV levels would be well below 0.3 mm/s, it is not possible to determine this accurately through prediction.

385 As noted in Volume 3, Chapter 1: Onshore Project Description (application ref: 6.3.1), at this stage in the AyM development process, decisions on exact locations of infrastructure and the precise technologies and construction methods that will be employed have not been made. This includes the requirement for percussive piling during construction as well as the type of piler and ram weight (if required). These will be determined during detailed design that will take place between a decision on the application for development consent and the start of construction.

386 It is anticipated that the PPV levels from piling operations would be below 1.0 mm/s at the nearest VSR to the cofferdam and OnSS, and that percussive piling works would only take place during the daytime period. The Final NVMP will include predictions for PPV arising from percussive piling operations that will be informed by detailed design, for approval by DCC (through approval of the Final NVMP and CoCP secured by DCO Requirement), in advance of any percussive piling taking place.

387 On the basis that that levels from piling operations would be below 1.0 mm/s at the nearest VSRs to the cofferdam and OnSS, and the piling works would only take place during the daytime period only, then with reference to Table 8, Table 12 and Table 15, the magnitude of impact would be **low** on **medium** sensitivity receptors and the level of effect from piling operations would be temporary, ***'minor adverse'*** which is not significant in terms of the EIA Regulations.

10.11.10 Construction traffic noise assessment – local road network

388 Construction traffic from the development proposals may temporarily alter noise levels near the affected local road network. In accordance with the Design Manual for Roads and Bridges (DMRB) Volume 11 Section 3 Part 7 Noise and Vibration, a noise assessment has been undertaken to include the identified affected links.

389 The most affected links have been identified within Volume 3, Chapter 9: Traffic and Transport (application ref: 6.3.9) and shown on Drawing 2 in Volume 5, Annex 9.1: Traffic and Transport Baseline Technical Report (application ref 6.5.9.1).

390 With reference to Chapter 9: Traffic and Transport (application ref: 6.3.9), for each link the AAWT and percentage of HGVs have been determined "*With Scheme* (with the development proposals)" and "*Without Scheme* (without the development proposals)".

391 Based on the traffic numbers described above the Basic Noise Level (BNL) has been established for the "*With Scheme*" and "*Without Scheme*. Scenarios for the base year 2021 and base year including the development have been assessed. The BNL is the $L_{A10, 18hr}$ dB noise level at 10 m from the kerb of the road assessed.

392 The assessment of each link is shown in Table 66. The Table also compares the predicted changes in noise levels to the defined threshold limits and with reference to Table 8, Table 11 and Table 15 defines the level of effect and significance.

Table 66: Construction traffic noise assessment, dB.

LINK	WITHOUT SCHEME				WITH SCHEME				CHANGE IN BNL, dB	IMPACT MAGNITUDE	LEVEL OF EFFECT AND SIGNIFICNACE
	AAWT	%HGV	Average Speed km/hr	BNL dB	AAWT	%HGV	Average Speed km/hr	BNL dB			
1	12592	1.4%	60	68.9	12639	1.6%	60	69.0	+0.1	**Low**	***Minor*** (not significant)
2	7059	0.7%	50	65.1	7235	1.7%	50	65.6	+0.5	**Low**	***Minor*** (not significant)
3	15673	2.3%	50	69.2	15747	2.5%	50	69.2	0.0	**Negligible**	***Minor*** (not significant)
4	11179	3.3%	100	72.8	11253	3.6%	100	72.9	+0.1	**Low**	***Minor*** (not significant)
6	23793	2.6%	60	72.1	24023	3.0%	60	72.2	+0.1	**Low**	***Minor*** (not significant)
8	17234	3.3%	100	74.7	17526	4.0%	100	74.9	+0.2	**Low**	***Minor*** (not significant)

LINK	WITHOUT SCHEME				WITH SCHEME				CHANGE IN BNL, dB	IMPACT MAGNITUDE	LEVEL OF EFFECT AND SIGNIFICNACE
	AAWT	%HGV	Average Speed km/hr	BNL dB	AAWT	%HGV	Average Speed km/hr	BNL dB			
9	3311	2.0%	54	62.7	3418	3.6%	54	63.3	+0.6	**Low**	***Minor*** (not significant)
10	3306	1.9%	45	61.8	3413	3.5%	45	62.5	+0.7	**Low**	***Minor*** (not significant)
13	6537	1.8%	60	66.2	6600	2.5%	60	66.5	+0.3	**Low**	***Minor*** (not significant)
14	1105	3.2%	69	59.8	1367	13.1%	69	62.7	+2.9	**Low**	***Minor*** (not significant)
15	4781	1.9%	50	63.9	5057	4.7%	50	65.0	+1.1	**Low**	***Minor*** (not significant)
5 or 11	12799	2.4%	58	69.1	12958	3.0%	58	69.3	+0.2	**Low**	***Minor*** (not significant)
7 or 12	13892	2.5%	72	70.9	13954	2.7%	72	71.0	+0.1	**Low**	***Minor*** (not significant)

393 It can be seen from Table 66 that:

- the worst-case magnitude of impact would be **low** for **medium** sensitivity receptors and the level of effect at the nearest NSRs from noise levels generated by construction related traffic would be temporary ***'minor adverse'***, which is not significant in terms of the EIA Regulations.

10.11.11 Construction traffic assessment – off-route access roads

394 As noted above, a number of the off-route access routes (ORARs) are significantly closer to the nearest NSRs than the extents of the cable corridor, though still within the DOL, and therefore the potential noise impact of construction traffic travelling along them needs to be considered separately.

395 The ORAR considered are listed in Table 67 below. The Table also details the nearest NSR to each access point and the worst-case 1-hour HGV movements for each access route.

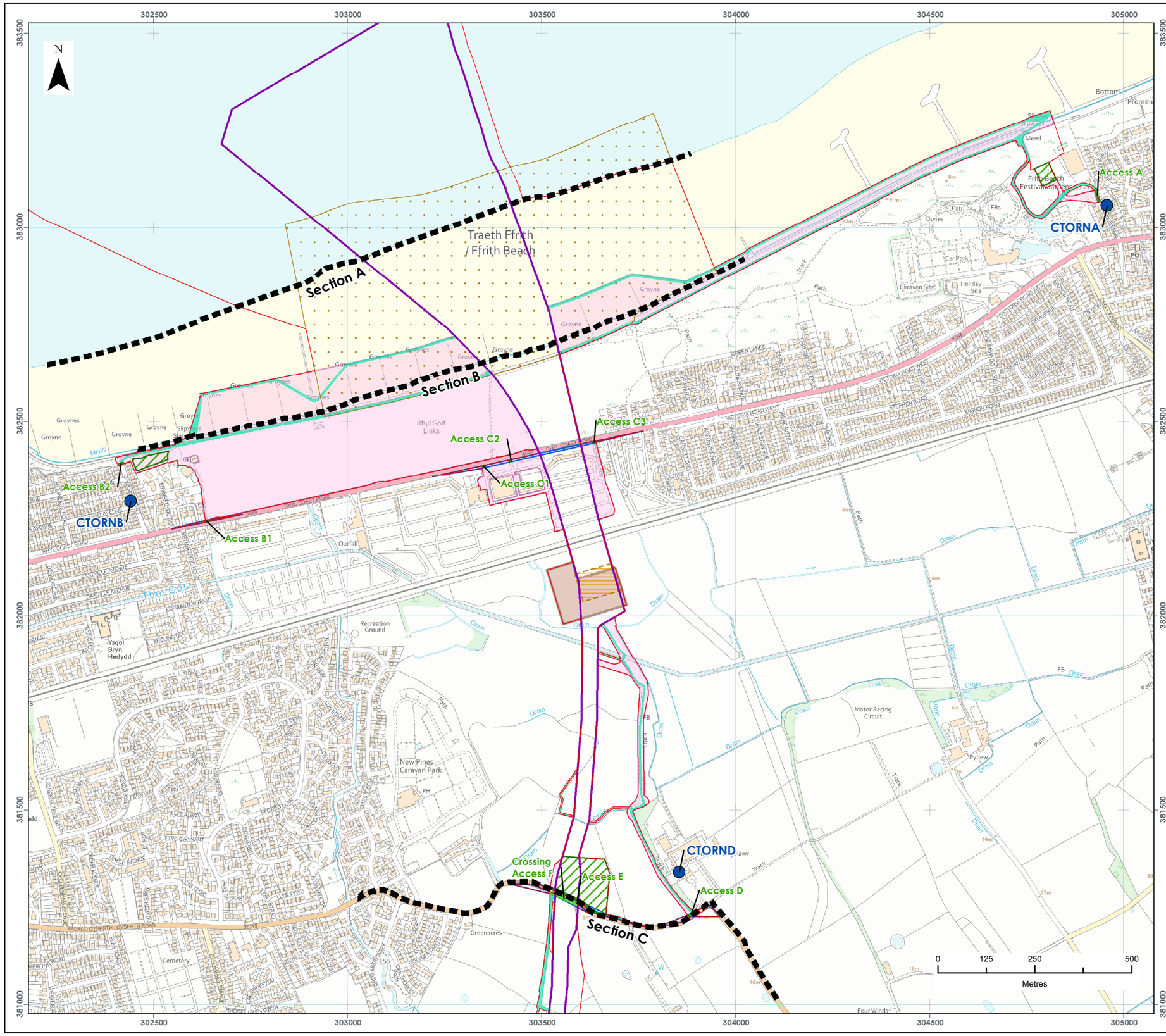
396 It should be noted that peak hour vehicle movements have been identified within Volume 3, Chapter 9 (application ref: 6.3.9).

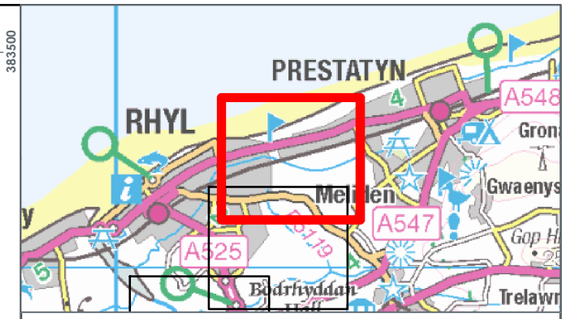
Table 67: Construction traffic ORAR.

NEAREST NSR	REPRESENTATIVE BASELINE MONITORING LOCATION	ORAR	OS GRID CO-ORDINATES	PEAK HOUR HGV MOVEMENTS
12 Ferguson Avenue – CTORNA	Landfall Monitoring AR1	A – Access from A548 Ffrith Arena Park	304957.1, 383056.4	4
32 Ridgeway Avenue – CTORNB	Landfall Monitoring L2	B – Access from A548 Rhyl Golf Club	302441.3, 382295.9	4

NEAREST NSR	REPRESENTATIVE BASELINE MONITORING LOCATION	ORAR	OS GRID CO-ORDINATES	PEAK HOUR HGV MOVEMENTS
Rhydorddwy Fawr – CTORND	Cable Route CR6	D – Haul Route to HDD/TJB Zone A	303854.8, 381340.6	3
Bryn Cwnin Farm – CTORNE	Cable Route CR5	E – West of Route Section C	302934.7, 379699.0	3
Plas Lorna – CTORNG	Cable Route CR5	F – North of A525 Route Section C	302608.2, 379201.4	5
Residence on Tan-Yr-Eglwys Road – CTORNI	Cable Route CR7A	I – Access to Cable Route North of the River Clwyd Crossing	302007.5, 378149.9	1
Tyn-y-Caeau – CTORNS	Cable Route CR12	S – Access to Cable Route South of Existing Substation	302137.7, 373677.5	4

397 The locations of the ORAR and the nearest NSRs are shown in Figure 22 to Figure 25.





LEGEND

- Order Limits
- Onshore Cable Route Section Breaks
- Proposed Onshore Export Cable Corridor
- Proposed Indicative Trenchless Crossing Compound
- Proposed Temporary Construction Compound
- Proposed Transition Joint Bay Construction Compound
- Proposed Access Location
- Proposed Crossing Location
- Proposed Operational Access Route
- Proposed Construction Access Area
- Anchoring Zone
- Proposed Major Road Crossing Visibility Splay
- Noise Sensitive Receptor Considered

CTORNA: Access from A548 Ffrith Arena Park
CTORND: Haul Route to HDD/TJB Zone A

PROJECT TITLE:

AWEL Y MÔR OFFSHORE WINDFARM

FIGURE TITLE:

ORARS AND NEAREST NSR

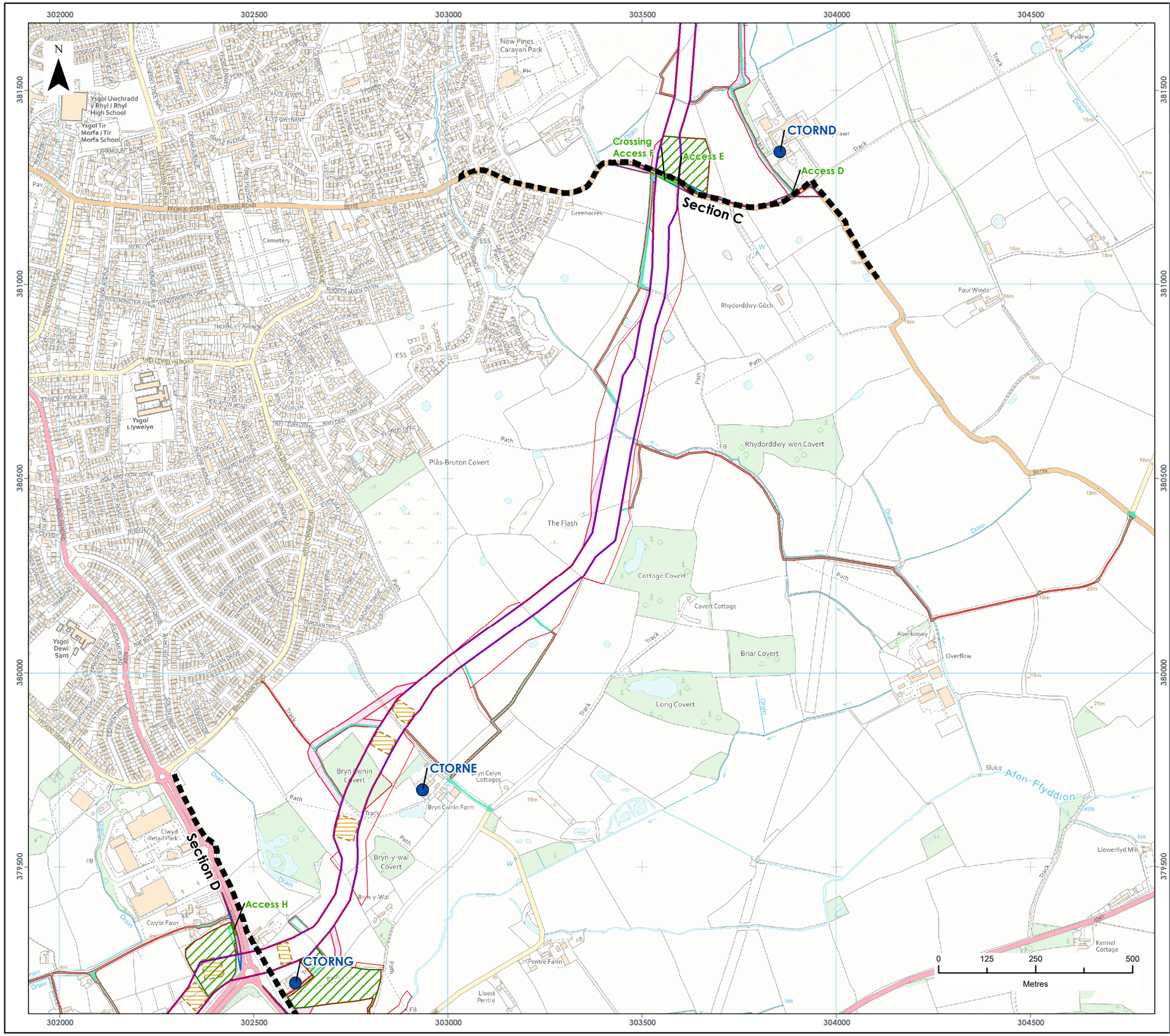
VER	DATE	REMARKS	Drawn	Checked
1	08/04/2022	ES Issue	JRS	MF

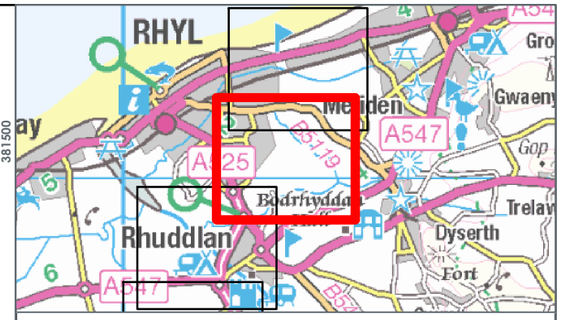
FIGURE NUMBER:

FIGURE 22
Page 1 of 4

SCALE:	PLOT SIZE:	DATUM:	COORDINATE SYSTEM:
1:10,000	A3	ODN	British National Grid

Fferm Wynt Alltraeth
AWEL Y MÔR
Offshore Wind Farm





LEGEND

- Order Limits
- Onshore Cable Route Section Breaks
- Proposed Onshore Export Cable Corridor
- Proposed Indicative Trenchless Crossing Compound
- Proposed Temporary Construction Compound
- Proposed Access Location
- Proposed Crossing Location
- Proposed Operational Access Route
- Proposed Construction Access Area
- Proposed Major Road Crossing Visibility Splay
- Noise Sensitive Receptor Considered

CTORND: Haul Route to HDD/TJB Zone A
CTORNE: West of Route Section C Western Route
CTORNG: North of A525 Route Section C Eastern Option

PROJECT TITLE:

AWEL Y MÔR OFFSHORE WINDFARM

FIGURE TITLE:

ORARS AND NEAREST NSR

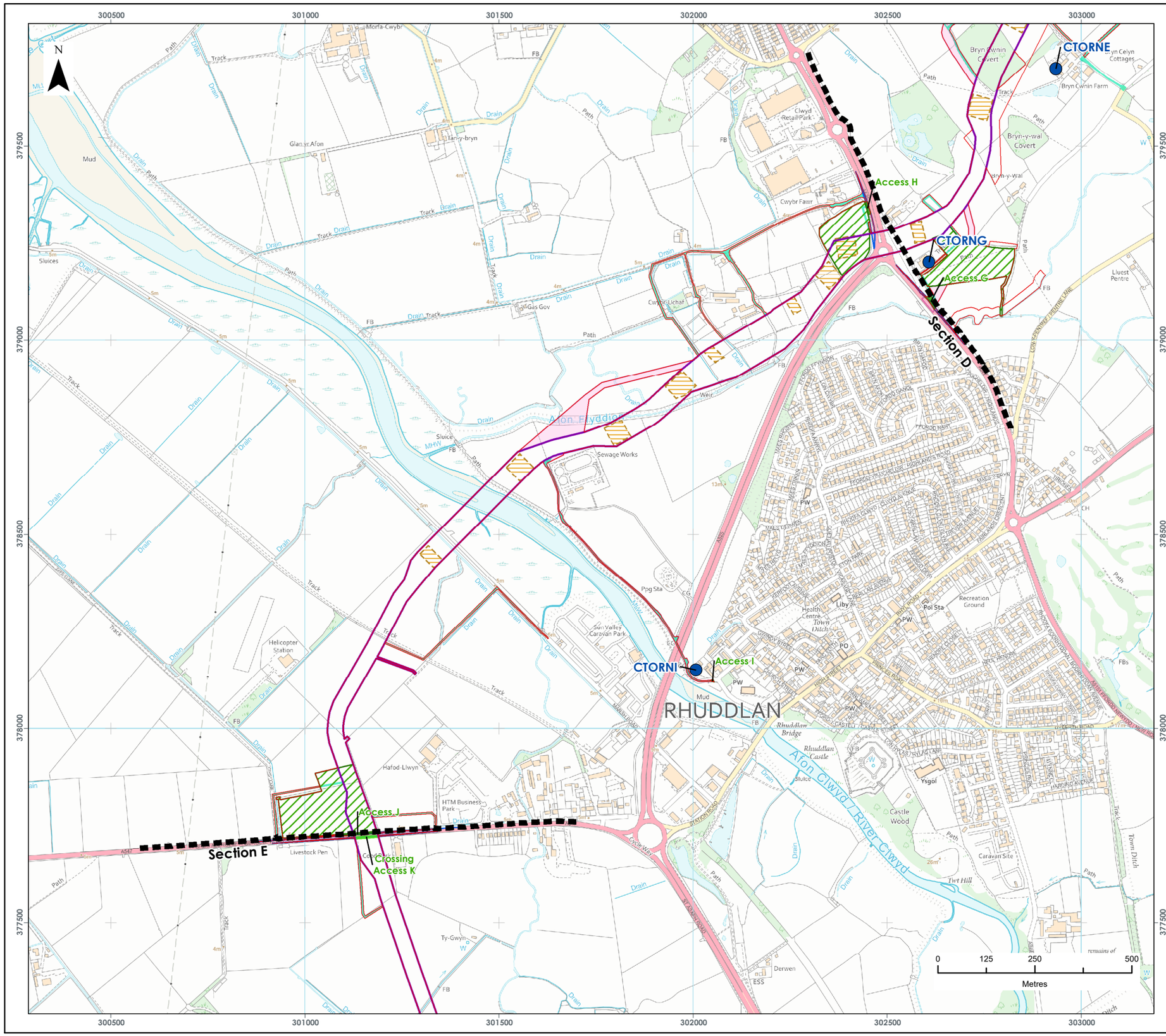
VER	DATE	REMARKS	Drawn	Checked
1	08/04/2022	ES Issue	JRS	MF

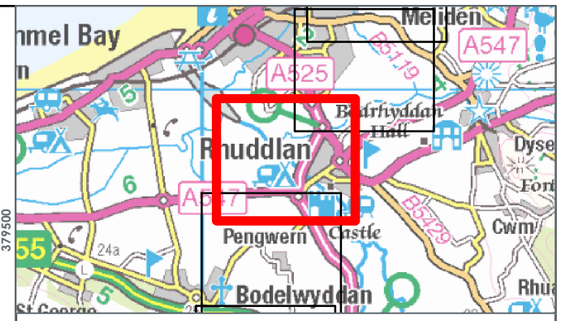
FIGURE NUMBER:

FIGURE 23
Page 2 of 4

SCALE:	PLOT SIZE:	DATUM:	COORDINATE SYSTEM:
1:10,000	A3	ODN	British National Grid

Fferm Wynt Alltraeth
AWEL Y MÔR
Offshore Wind Farm





LEGEND

- Order Limits
- Onshore Cable Route Section Breaks
- Proposed Onshore Export Cable Corridor
- Proposed Indicative Trenchless Crossing Compound
- Proposed Temporary Construction Compound
- Proposed Access Location
- Proposed Crossing Location
- Proposed Operational Access Route
- Proposed Construction Access Area
- Proposed Major Road Crossing Visibility Splay
- Noise Sensitive Receptor Considered

CTORNE: West of Route Section C Western Route
CTORNG: North of A525 Route Section C Eastern Option
CTORNI: Access to Cable Route East of A525

PROJECT TITLE:

AWEL Y MÔR OFFSHORE WINDFARM

FIGURE TITLE:

ORARS AND NEAREST NSR

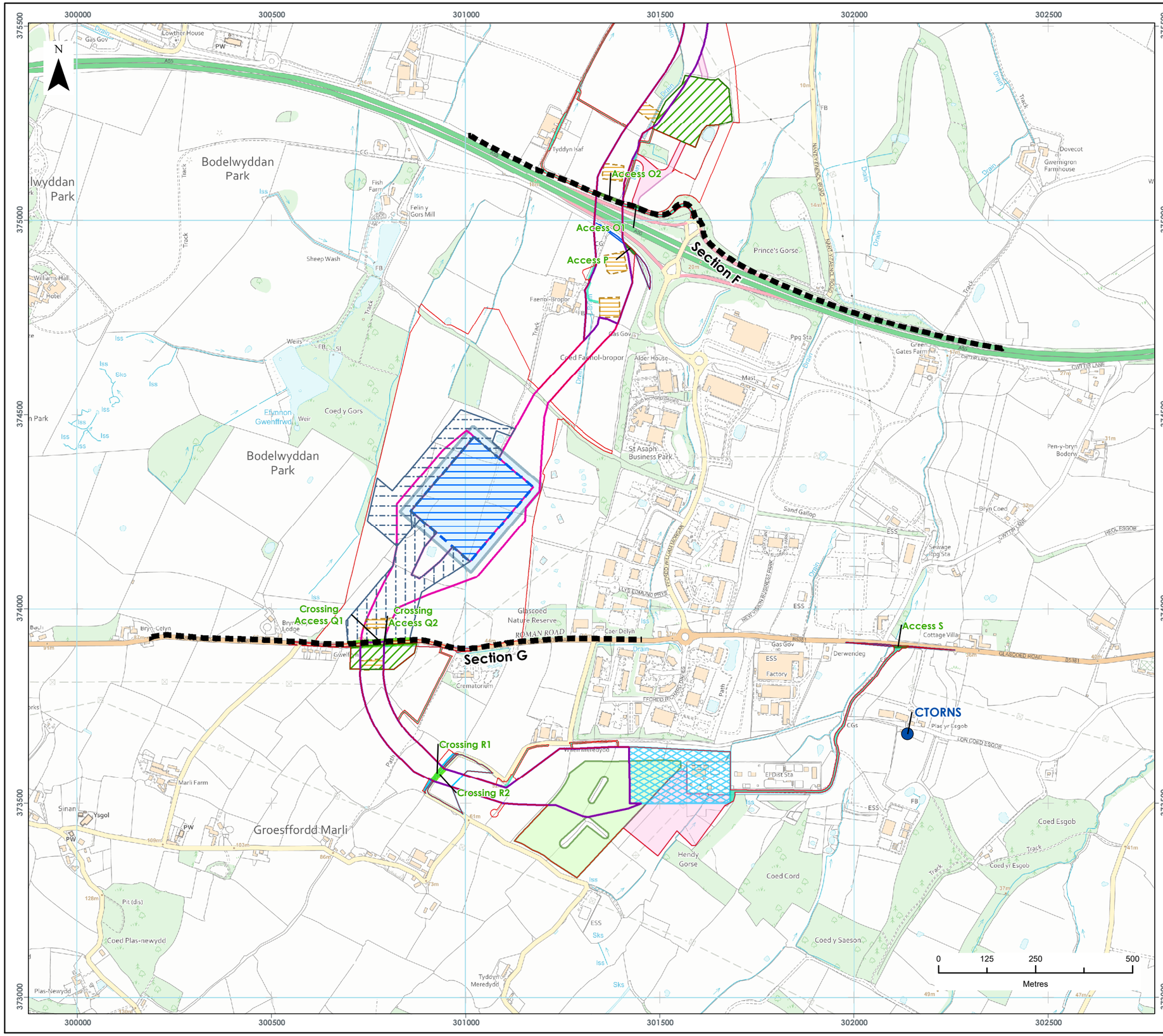
VER	DATE	REMARKS	Drawn	Checked
1	08/04/2022	ES Issue	JRS	MF

FIGURE NUMBER:

FIGURE 24
Page 3 of 4

SCALE:	PLOT SIZE:	DATUM:	COORDINATE SYSTEM:
1:10,000	A3	ODN	British National Grid

Fferm Wynt Alltraeth
AWEL Y MÔR
Offshore Wind Farm



LEGEND

- Order Limits
- Onshore Cable Route Section Breaks
- Proposed Onshore Export Cable Corridor
- Proposed Substation Cable Corridor Zone
- Proposed Indicative Trenchless Crossing Compound
- Proposed Temporary Construction Compound
- Proposed Temporary Construction Compound Zone
- Proposed Access Location
- Proposed Crossing Location
- Proposed Operational Access Route
- Proposed Construction Access Area
- Unlicenced Work Zone
- Proposed Major Road Crossing Visibility Splay
- Proposed Minor Road Crossing Visibility Splay
- Proposed Onshore Substation (OnSS) Footprint
- Proposed Substation Construction Area
- Substation Construction Access Zone
- Substation Temporary Construction Access Zone
- Substation Access Visibility Splay
- Noise Sensitive Receptor Considered

CTORNS: Access to Cable Route South of Existing Substation

PROJECT TITLE:

AWEL Y MÔR OFFSHORE WINDFARM

FIGURE TITLE:

ORARS AND NEAREST NSR

VER	DATE	REMARKS	Drawn	Checked
1	08/04/2022	ES Issue	JRS	MF

FIGURE NUMBER:

FIGURE 25
Page 4 of 4

SCALE:	PLOT SIZE:	DATUM:	COORDINATE SYSTEM:
1:10,000	A3	ODN	British National Grid

Fferm Wynt Alltraeth
AWEL Y MÔR
Offshore Wind Farm

398 Based on the worst-case vehicle movements, noise levels have been predicted at the nearest NSR to each access route. The predictions have been based on the prediction methodology provided in section F.2.5 of BS5228:2009+A1:2014-1 (method for mobile plant using a regular well-defined route).

399 The predictions have assumed:

- sound power level of 108 dB(A)[iv] for a generic HGV and a maximum vehicle speed of 20 km/h;
- construction operations associated with the area of the onshore ECC closest to each NSR will be taking place simultaneously with the vehicle movements on the haul route;
- the HGV movements would be limited to midweek and weekend morning time periods, i.e. no movements after 13:00 on a Saturday with the exception of the access routes which are leading to compounds where night-time HDD operations are taking place, namely routes D and I (see Table 67); and
- on access routes D and I HGV movements may take place 24-hours a day; therefore evening, night-time and weekend assessments have been undertaken for the receptors located close to these routes.

400 It should be noted that all of the NSRs considered are residential properties, and therefore have a **medium** sensitivity during the daytime, evening, and weekend periods and **high** sensitivity during the night-time periods.

401 It must also be noted that where no baseline sound data is available at a receptor location for an assessment period the threshold limits are based on the Category A limits contained in Table 2 as it is considered that this represents a worst-case scenario.

[iv] BS5228:2009+A1:2014 - Table C.11 Ref 5

402 The predicted noise levels are shown in Table 68. The Table also compares the predicted noise levels to the calculated threshold limits and with reference to Table 8, Table 10 and Table 15 defines the level of effect and significance.

Table 68: Construction noise traffic assessment – ORAR.

NSR NAME	CONSTRUCTION ACTIVITY	PREDICTED NOISE LEVEL $L_{AEQ,T}$	PERIOD	THRESHOLD LIMIT, $L_{AEQ,T}$	DIFFERENCE	IMPACT MAGNITUDE	LEVEL OF EFFECT AND SIGNIFICANCE
12 Ferguson Avenue	Construction traffic – HGVs	60	Daytime	65	-5	**Negligible**	***Minor*** (not significant)
			Weekend	55	+5	**High**	***Major*** (significant)
32 Ridgeway Avenue	Construction traffic – HGVs	59	Daytime	65	-6	**Negligible**	***Minor*** (not significant)
			Weekend	55	+4	**Medium**	***Minor*** (not significant)
Rhydorddwy Fawr	Construction traffic – HGVs (including night-time)	49	Daytime	65	-16	**Negligible**	***Minor*** (not significant)
			Evening / Weekend	55	-6	**Negligible**	***Minor*** (not significant)
			Night-time	45	+4	**Medium**	***Major*** (significant)

NSR NAME	CONSTRUCTION ACTIVITY	PREDICTED NOISE LEVEL $L_{AEQ,T}$	PERIOD	THRESHOLD LIMIT, $L_{AEQ,T}$	DIFFERENCE	IMPACT MAGNITUDE	LEVEL OF EFFECT AND SIGNIFICANCE
Bryn Cwnin Farm	Construction traffic – HGVs	39	Daytime	65	-26	**Negligible**	***Minor*** (not significant)
			Weekend	55	-16	**Negligible**	***Minor*** (not significant)
Plas Lorna	Construction traffic – HGVs	48	Daytime	65	-17	**Negligible**	***Minor*** (not significant)
			Weekend	55	-7	**Negligible**	***Minor*** (not significant)
Residence on Tan-Yr-Eglwys Road	Construction traffic – HGVs (including night-time)	49	Daytime	65	-16	**Negligible**	***Minor*** (not significant)
			Evening / Weekend	55	-6	**Negligible**	***Minor*** (not significant)
			Night-time	45	+4	**Medium**	***Major*** (significant)

NSR NAME	CONSTRUCTION ACTIVITY	PREDICTED NOISE LEVEL $L_{AEQ,T}$	PERIOD	THRESHOLD LIMIT, $L_{AEQ,T}$	DIFFERENCE	IMPACT MAGNITUDE	LEVEL OF EFFECT AND SIGNIFICANCE
Tyn-y-Caeau	Construction traffic – HGVs	36	Daytime	65	-29	**Negligible**	***Minor*** (not significant)
			Weekend	55	-19	**Negligible**	***Minor*** (not significant)

403 It can be seen from Table 68 that:

- the worst-case midweek daytime magnitude of impact would be **negligible** for **medium** sensitivity receptors resulting in a level of effect from HGV movements on the ORAR of temporary, ***'Minor Adverse'*** at all the NSRs considered, which is not significant in terms of the EIA Regulations.
- during the weekend periods between 13:00 and 19:00, there is a temporary **medium** magnitude of impact for a **medium** sensitivity receptor at one receptor (32 Ridgeway Avenue). This magnitude of impact gives rise to a medium term ***'moderate adverse'*** level of effect which is significant in terms of the EIA Regulations;
- during the weekend periods between 13:00 and 19:00, there is a temporary **high** magnitude of impact for a **medium** sensitivity receptor at one receptor (12 Ferguson Avenue). This magnitude of impact gives rise to a medium term ***'major adverse'*** level of effect which is significant in terms of the EIA Regulations;
- during the night-time periods between 23:00 and 07:00, there is a temporary **medium** magnitude of impact for **high** sensitivity receptors giving rise to a ***'major adverse'*** level of effect at two (Rhydorddwy Fawr and the residence on Tan-Yr-Eglwys Road) of the nearest NSRs considered which is significant in terms of the EIA Regulations.

404 The construction traffic noise may be mitigated by the relevant mitigation measures outlined in Table 50; however, these mitigation measures would be determined once the exact construction methodology has been confirmed. Final mitigation measures would be informed by detailed design post consent and included within the final NVMP which would be submitted for approval by DCC as part of the final CoCP that is secured within the DCO.

405 It should also be noted that the predicted night-time adverse impacts may not occur depending on the operational need for HGVs accessing the compounds where night-time works will be undertaken.

406 With consideration of all of the above, and with the implementation of the relevant mitigation measures in Table 50, the magnitude of impact would reduce to **low** or **negligible** for **medium** sensitivity receptors and **negligible** for **high** sensitivity receptors so that the level of effect could be reduced to temporary ***'minor adverse'*** which is not significant in terms of the EIA Regulations.

10.12 Environmental assessment: OnSS operational noise phase

10.12.1 Residential receptors and crematorium

407 An assessment has been made in accordance with the guidance contained in BS4142:2014+A1:2019 to determine whether noise emissions associated with the operation of the proposed OnSS is likely to give rise to adverse impacts at the closest residential receptors including the crematorium as this is considered of equal sensitivity as the residential receptors.

408 Noise levels from the OnSS have been predicted at the nearest residential receptors, including the crematorium. The modelling has been undertaken on the basis of the type, quantity and size of plant that is likely to be required at a OnSS of the size in the application. It should, however, be noted that the final design of the OnSS has not been determined and so a maximum envelope has been assessed. In particular, there is the potential for two possible types of OnSS, AIS and GIS, to be utilised.

409 In conjunction with the MDS shown in Table 48, the modelling has assumed that the AIS OnSS would be chosen, as this has the potential to generate higher noise levels as the OnSS equipment is not housed within a building. In addition, as set out in the MDS, a layout for an AIS OnSS that does not place substation buildings between noise emitting equipment and NSRs in order to undertake a worst case assessment.

410 The operational noise levels of the plant associated with the OnSS have been provided by the Applicant and are shown in Table 69 below.

Table 69: Operational plant associated with the OnSS.

ITEM OF PLANT	SOUND POWER LEVEL (SWL) DB	QUANTITY
Power Transformers	95	2
Shunt Reactors	95	2
Statcom – Harmonic Filters	85	6
Statcom – Reactors	85	12
Harmonic Filter	85	6
Coolers	93	2 (banks)

411 The predicted specific noise levels are shown in Table 70 and have been based on the following:

- the sides of the power transformers have been modelled as vertical area sources and the top as an area source, the model has assumed that dimensions of each transformer are approximately 14 m by 5 m wide and 7 m high;
- the sides of the shunt reactors have been modelled as vertical area sources and the top as an area source, the model has assumed that dimensions of each shunt reactor are approximately 15 m by 8 m wide and 7 m high;
- the sides of the statcom harmonic filters have been modelled as vertical area sources and the top as an area source, the model has assumed that dimensions of each harmonic filter are approximately 2.4 m by 2 m wide and 5 m high;
- the sides of the statcom reactors have been modelled as vertical area sources and the top as an area source, the model has assumed that dimensions of each reactor are approximately 2 m by 2 m wide and 5 m high;
- the sides of the harmonic filters have been modelled as vertical area sources and the top as an area source, the model has assumed that dimensions of each harmonic filter are approximately 3.2 m by 3.2 m wide and 11.5 m high;

- the sides of the coolers have been modelled as vertical area sources and the top as an area source, the model has assumed that dimensions of each bank of coolers approximately 13.5 m by 10.5 m wide and 2 m high; and
- the three control buildings located within the OnSS footprint are non-noise generating.

412 The model has also assumed:

- all the plant is operating simultaneously 100% of the time;
- G = 0 hard ground within the OnSS footprint;
- G = 0.9 soft ground between the OnSS footprint and each receptor;
- a daytime receiver height of 1.5 m and a night-time receiver height of 4 m, approximate height of a ground floor and first floor window respectively at all the NSRs considered, with the exception of Caer Delyn;
- at Caer Delyn, a daytime and night-time receptor height of 1.5 m, as the receptor is a residential bungalow; and
- a reflection factor of 2.

413 The following meteorological inputs have also been used:

- downwind propagation between the OnSS and the receiver;
- Relative Humidity = 70%; and
- Air Temperature = 10°C.

414 It must be noted that the NSRs described in the Table 70 have previously been identified in Table 61, and are shown in Figure 10.

415 The noise model outputs are shown in Annex 5.10.4. Noise Model outputs (application ref: 6.5.10.4).

416 The predicted noise levels have been rounded to the nearest decibel.

Table 70: Predicted specific sound level from OnSS, dB.

RECEPTOR	PERIOD	PREDICTED SPECIFIC SOUND LEVEL, $L_{AEQ,TC}$ dB
Faenol Bropor to the north	Daytime	35
	Night-time	36
Gwelfryn to the south-west (Glascoed Road)	Daytime	36
	Night-time	39
Caer Delyn to the south-east	Daytime	37
	Night-time	37
Crematorium to the south	Daytime	37
	Night-time	40
Bodelwyddan Castle Hotel to the west	Daytime	27
	Night-time	31

417 In conjunction with BS4142: 2014+A1:2019, the acoustic character of the sound being generated by the source needs to be considered at the nearest NSRs, which requires corrections for tonal, impulsive or intermittent sounds to be added to the specific levels where required.

418 In the absence of octave band or third octave band operational data for the OnSS, it is considered that a +6 dB character correction would need to be added to the specific sound levels to account for the potential tonal aspects of the sound being generated by the OnSS.

419 However, it is considered that no further character corrections would apply as the sound being generated by the OnSS is neither intermittent nor impulsive in nature. It is also considered that the noise being generated by the OnSS would not be distinguishable above the residual soundscape, therefore the +3dB penalty has not been applied.

420 With reference to the above, 6 dB has been added to the predicted specific sound level shown in Table 70 to calculate the rating level (L_{Ar}) at each NSR.

421 The rating levels have then been compared to the representative daytime and night-time representative background sound levels for the residential properties and Crematorium and assessed in accordance with BS4142:2014+A1:2019. The results of this assessment are shown in Table 71, where the predicted rating levels and background sound levels have been rounded to the nearest decibel.

422 It should be noted that BS4142:2014+A1:2019 states "Where background sound levels and rating levels are low, absolute levels might be as, or more, relevant than the margin by which the rating level exceeds the background. This is especially true at night."

423 The standard does not indicate at what level background and rating levels are low but the previous version of BS4142:1997 stated: *"The method is not suitable for assessing the noise measured inside buildings or when the background and rating noise levels are both very low. NOTE. For the purposes of this standard, background noise levels below about 30 dB and rating levels below about 35 dB are considered to be very low."*

424 With reference to Table 40, it can be seen that the representative background sound level measured at location S3 during the night-time was 31dB, and therefore are considered to be low as defined in conjunction with BS4142:2014+A1:2019.

425 In view of the above and in addition to the rating level, the change in the absolute $L_{Aeq,T}$ sound level is also presented. For the assessment, to be robust, when undertaking the calculation the lowest baseline ambient sound level presented in Table 34 to Table 37 has been used.

426 The absolute $L_{Aeq,T}$ sound level is then this baseline logarithmically added to the specific sound level of the proposed OnSS. The difference between the subsequent absolute $L_{Aeq,T}$ sound level and the lowest baseline ambient sound level is then presented.

Table 71: BS4142:2014+A1:2019 OnSS operational assessment for residential receptors, dB.

RECEPTOR	PERIOD	REPRESENTATIVE BACKGROUND SOUND LEVEL L_{A90}	PREDICTED SPECIFIC SOUND LEVEL, L_{AEQ}	RATING LEVEL, $L_{AR,T}$	DIFFERENCE	BASELINE AMBIENT SOUND LEVEL L_{AEQ}	ABSOLUTE SOUND LEVEL $L_{AEQ,T}$	CHANGE IN AMBIENT NOISE LEVEL $L_{AEQ,T}$
Faenol Bropor to the north	Day time	50	35	41	-9	53	53	0
	Night-time	36	36	42	+6	47	47	0
Gwelfryn to the south-west (Glascoed Road)	Day time	44	36	42	-2	58	58	0
	Night-time	31	39	45	+14	45	46	+1
Caer Delyn to the south-east	Day time	44	37	43	-1	58	58	0
	Night-time	31	37	43	+12	45	46	+1

RECEPTOR	PERIOD	REPRESENTATIVE BACKGROUND SOUND LEVEL L_{A90}	PREDICTED SPECIFIC SOUND LEVEL, L_{AEQ}	RATING LEVEL, $L_{AR,T}$	DIFFERENCE	BASELINE AMBIENT SOUND LEVEL L_{AEQ}	ABSOLUTE SOUND LEVEL $L_{AEQ,T}$	CHANGE IN AMBIENT NOISE LEVEL $L_{AEQ,T}$
Crematorium to the south	Day time	44	37	43	-1	58	58	0
	Night-time	31	40	46	+15	45	46	+1
Bodelwyddan Castle Hotel to the west	Day time	44	27	33	-11	49	49	0
	Night-time	34	31	37	+3	48	48	0

NB, the method for determining the representative background sound levels is shown in Table 40.

427 It can be seen from the sixth column of Table 71 that during the daytime the predicted rating levels are, at worst, 1 dB below the representative background sound level at all the NSRs considered.

428 With reference to Table 8, Table 13 and Table 15, this would, at worst, equate to permanent **negligible** magnitude of impact for **medium** sensitivity receptors resulting in a '***Minor Adverse***' level of effect which is not significant in terms of the EIA Regulations.

429 It can also be seen from the sixth column of Table 71 that during the night-time the predicted rating levels are between +3 and +15 dB above the representative background sound levels at the NSRs considered.

430 With reference to Table 8, Table 13 and Table 15, when referring to the difference between the rating level and the baseline background sound levels, this would equate to **low**, **medium** and **high** magnitude of impact upon **high** sensitivity receptors resulting in a level of effect of a permanent '***Moderate Adverse or Major Adverse***' which is considered significant in terms of the EIA Regulations.

431 However, for all Receptors, when the specific $L_{Aeq,T}$ sound level of the OnSS is added to the existing baseline ambient $L_{Aeq,T}$ sound level, as a worst-case the OnSS is calculated to increase the baseline ambient $L_{Aeq,T}$ sound level by a maximum of 1dB (as shown in the ninth column of Table 71.) With reference Table 8, Table 13 and Table 15 this would equate to **low** magnitude of impact upon **high** sensitivity receptors resulting in a level of effect of a permanent '***Moderate Adverse***' which is considered significant in terms of the EIA Regulations.

432 Further mitigation measures are considered in the following section to reduce the identified impacts from operational noise associated with the OnSS along with the resulting residual effects.

10.12.2 OnSS operational noise mitigation measures

433 The operational noise assessment for the OnSS has indicated that mitigation measures are required to reduce the identified impacts.

434 The noise model allows the contribution from each noise source to be determined at each of the NSRs considered.

435 Table 72 below, outlines the noise reduction required at each of the identified noise sources within the OnSS to reduce the specific noise level at the nearest NSRs to a level where the identified impacts would be significantly reduced.

Table 72: OnSS mitigation requirements, dB.

ITEM OF PLANT	MITIGATION REQUIRED	POSSIBLE MEASURE
Power Transformers	-15	Noise enclosure around equipment
Shunt Reactors	-15	Noise enclosure around equipment
Statcom – Harmonic Filters	-10	Equipment covered/screened
Statcom – Reactors	-10	Equipment covered/screened
Harmonic Filter	-10	Equipment covered/screened
Coolers	-10	Use of low noise fans/silencers or a cooling unit with lower sound power level

436 Mitigation for the operational noise from the OnSS is controlled via a DCO Requirement for operational noise not to exceed a rating level that is no more than 5dB(A) above the measured night-time baseline background sound level (as shown in column 3 of Table 73), and does not result in increase in the overall $L_{Aeq,T}$ sound level at the façade of any noise sensitive location lawfully occupied at the date of the granting of this Order.

10.12.3 Mitigated operational assessment.

437 Table 73 repeats the operational assessment for the OnSS assuming that the mitigation measures shown in Table 72 have been implemented.

Table 73: BS4142:2014+A1:2019 assessment for residential receptors including mitigation, dB.

RECEPTOR	PERIOD	REPRESENTATIVE BACKGROUND SOUND LEVEL L_{A90}	PREDICTED SPECIFIC SOUND LEVEL, L_{AEQ}	RATING LEVEL, $L_{AR,T}$	DIFFERENCE	BASELINE AMBIENT SOUND LEVEL L_{AEQ}	ABSOLUTE SOUND LEVEL $L_{AEQ,T}$	CHANGE IN AMBIENT NOISE LEVEL $L_{AEQ,T}$
Faenol Bropor to the north	Day time	50	23	29	-21	53	53	0
	Night-time	36	24	30	-6	47	47	0
Gwelfryn to the south-west (Glascoed Road)	Day time	44	24	30	-14	58	58	0
	Night-time	31	26	32	+1	45	45	0
Caer Delyn to the south-east	Day time	44	24	30	-14	58	58	0
	Night-time	31	24	30	-1	45	45	0

RECEPTOR	PERIOD	REPRESENTATIVE BACKGROUND SOUND LEVEL L_{A90}	PREDICTED SPECIFIC SOUND LEVEL, L_{AEQ}	RATING LEVEL, $L_{AR,T}$	DIFFERENCE	BASELINE AMBIENT SOUND LEVEL L_{AEQ}	ABSOLUTE SOUND LEVEL $L_{AEQ,T}$	CHANGE IN AMBIENT NOISE LEVEL $L_{AEQ,T}$
Crematorium to the south	Day time	44	25	31	-13	58	58	0
	Night-time	31	27	33	+2	45	45	0
Bodelwyddan Castle Hotel to the west	Daytime	44	15	21	-23	49	49	0
	Night-time	34	18	24	-20	48	48	0

NB, the method for determining the representative background sound levels is shown in Table 40.

438 It can be seen from the sixth column of Table 73, that assuming the mitigation measures have been correctly implemented, the worst-case predicted rating levels are below the representative background sound level during the daytime and the night-time at all the NSRs considered with the exception of Gwelfryn to the south-west and the Crematorium to the south, where the predicted rating levels are +1 and +2 above the representative background sound levels during the night-time respectively.

439 With reference to Table 8, Table 13 and Table 15, when referring to the difference between the rating level and the baseline background sound levels, where the rating levels are below the background sound levels this would equate to a **negligible** magnitude of impact upon **high** sensitivity receptors resulting in a level of effect of a permanent '***Minor Adverse'*** which is not considered significant in terms of the EIA Regulations.

440 With regards to the Crematorium to the south it is considered that this is unlikely to be occupied during the night-time and therefore it is not considered any further within this assessment.

441 As stated in paragraph 438 the predicted rating levels at Gwelfryn to the south-west are +1 dB above the representative background sound levels with reference to Table 8, Table 13 and Table 15, when referring to the difference between the rating level and the baseline background sound levels, this would equate to a **low** magnitude of impact upon **high** sensitivity receptors resulting in a level of effect of a permanent ***'Moderate'*** Adverse' which is considered significant in terms of the EIA Regulations.

442 However, as outlined in paragraphs 422, 423 and 424 the measured background sound levels are considered low and therefore the change in the absolute $L_{Aeq,T}$ sound levels need to be considered.

443 As shown in the ninth column of Table 73, the mitigated noise levels being generated by the OnSS are not causing a change in the baseline ambient noise levels at the NSR's, with reference to Table 8, Table 13 and Table 15, when referring to the change in ambient noise levels this would equate to a **negligible** magnitude of impact upon **high** sensitivity receptors resulting in a level of effect of a permanent ***'Minor Adverse'*** which is not considered significant in terms of the EIA Regulations.

444 Further to the above BS4142:2014+A1:2019, states '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. It is an indication that the specific sound source has a low impact when the rating level does not exceed the background sound level, depending on the context.'

445 The predicted rating level at Gwelfryn only exceeds the background sound level by 1dB and therefore with reference to BS4142:2014+A1:2019 it is considered unlikely that the noise from the OnSS (specific sound source) will have an adverse impact at this receptor.

446 In addition and with reference to the predicted specific noise levels and the WHO Night Noise Guidelines, an external noise level of 26 dB(A) (as predicted at Gwelfryn) is below the $L_{night,outside}$ level of 40 dB(A) where adverse effects start to occur, although it must be noted that the external baseline ambient noise levels are already in excess of 40 dB(A) at Gwelfryn.

447 With reference to all of the above, it is considered that the mitigation measures recommended would be sufficient to reduce the noise from the OnSS so a **negligible** magnitude of impact would be experienced upon all the **high** sensitivity receptors considered, resulting in a level of effect of a permanent ***'Minor Adverse'*** which is not considered significant in terms of the EIA Regulations.

448 Further to the above, whilst the mitigated results demonstrate that the level of effect is not considered to be significant, at this stage it is recommended that the degree of mitigation required will be determined at a later stage when the exact sound level specification of the plant is known and that this is then confirmed with DCC to demonstrate conformity with the proposed DCO Requirement for operational noise. For example, if plant is not tonal, the 6 dB(A) character correction in the BS4142:2014+A1:2019 assessment can be removed. The results of this assessment demonstrate that, if required, it is possible to mitigate noise from the OnSS. It is expected that suitable limits can be agreed with the Local Authority.

449 Further to the above, it is recommended that a suitable noise limit would be a noise rating level ($L_{Ar,T}$) set at a maximum of 5 dB above the prevailing background noise level (L_{A90}).

450 With reference to Table 8, Table 13 and Table 15, a rating level of 5dB above the baseline background sound level would as a worst-case equate to a **low** magnitude of impact upon **high** sensitivity receptors (night-time) resulting in a level of effect of a permanent ***'Moderate' Adverse'*** which is considered significant in terms of the EIA Regulations.

451 However a limit of 5 dB above the prevailing background noise level is unlikely to cause a change in the baseline ambient noise levels at the nearest NSR's, with reference to Table 8, Table 13 and Table 15, when referring to the change in ambient noise levels this would equate to a **negligible** magnitude of impact upon **high** sensitivity receptors resulting in a level of effect of a permanent ***'Minor Adverse'*** which is not considered significant in terms of the EIA Regulations.

452 It also should be noted that setting a limit at this level would mean that the specific night-time noise levels at the nearest NSR's would be below the WHO Night Noise Guidelines $L_{night,outside}$ level of 40 dB(A) where adverse effects start to occur.

453 Based on the above the recommended night-time noise limits at each of the residential receptors considered are shown in Table 74 below. Daytime limits have not been considered as if the night-time noise limits are met then by definition the daytime noise limits would also be met as the prevailing background sound levels are higher during the daytime period.

Table 74: Recommended OnSS Operational Night-time Noise Limits, dB.

RECEPTOR	PERIOD	PREVAILING BACKGROUND SOUND LEVEL (L_{A90})	RECOMMENDED RATING LEVEL LIMIT (L_{AR})
Faenol Bropor to the north	Night-time	36	41
Gwelfryn to the south-west (Glascoed Road)	Night-time	31	36
Caer Delyn to the south-east	Night-time	31	36
Bodelwyddan Castle Hotel to the west	Night-time	34	39

10.12.4 Commercial Receptors

454 The assessment of the noise impact on nearby commercial NSRs located within the SABP in relation to the likely levels of operational noise produced by the OnSS has been undertaken with reference to the IEMA guidelines.

455 The method of the assessment involves logarithmically adding the predicted specific noise levels from the OnSS to the existing daytime ambient ($L_{Aeq,T}$) noise levels and then assessing any changes in noise levels in conjunction with the guidelines. Though it is considered unlikely that the commercial receptors would be occupied during the night-time, a night-time assessment has been undertaken to represent an MDS.

456 The predicted specific levels do not include any corrections for the character of the sound generated as outlined in paragraph 418, as these are associated with the guidance contained in BS4142:2014+A1:2019 and therefore do not apply to the IEMA assessment.

457 The predicted specific levels include the mitigation measures detailed in Section 10.12.2.

458 The assessment is shown in Table 75. The predicted specific noise levels have been determined using the same method described in paragraphs 411 to 413 though daytime and night-time noise levels have been predicted to 4 m above ground level to represent an MDS.

Table 75: IEMA assessment for commercial receptors, dB.

RECEPTOR	PERIOD	EXISTING AMBIENT NOISE LEVEL $L_{AEQ,T}$	PREDICTED SPECIFIC SOUND LEVEL, L_{AEQ}	TOTAL AMBIENT NOISE LEVEL, L_{AEQ}	CHANGE
Nearest commercial units within the SABP (Unit to the north at the end of Llys Edmund Prys	Daytime	47	26	47	0
	Night-time	42	29	42	0

NB, the method for determining the existing ambient sound levels is shown in Table 41.

459 It can be seen from Table 75 that as a worst-case there would be no increase in ambient noise levels at the commercial units during the night-time period.

460 In conjunction with Table 8, Table 14 and Table 15 this would equate to permanent **negligible** magnitude of impact upon **low** sensitivity receptors resulting in a ***'minor adverse'*** level of effect which is not significant in terms of the EIA Regulations.

10.12.5 Operational vibration

461 The minimum distance to the nearest VSR from the boundary of the OnSS zone is 275 m. For vibration to be perceived over this distance a substantial force would need to be applied which can only be achieved through a very high-energy impact, for example the predicted vibration level for percussive piling using a 500 KJ hammer impact would be 0.08 mms^{-1} [v], which with reference to Table 3 is below the level of perceptibility.

462 The OnSS does not contain any mechanically moving parts that are capable of generating a fraction of the energy required to transmit such levels of vibration. Therefore, operational vibration has not been considered any further in this assessment.

10.13 Environmental assessment: decommissioning phase

463 Details surrounding the decommissioning phase are yet to be fully clarified. In addition, it is also recognised that policy, legislation and local sensitivities constantly evolve, which will limit the relevance of undertaking an assessment at this stage. Nevertheless, decommissioning activities are not anticipated to exceed the construction phase worst case criteria which have been assessed in Section 10.11. In addition, there is potential for onshore cables to remain in-situ which would see a reduction in impacts and resulting level of effect and significance in comparison to the assessment of construction effects.

[v] It must be noted, however, that the example hammer energy is out of the valid prediction range included within BS5228-2:2009+A1:2014 Part 2 which states that the limit of the equation utilises a maximum hammer energy of 85 KJ and this should be considered an approximation.

464 Decommissioning activities are expected to occur for up to three years, however this will be driven primarily by offshore works. Landfall infrastructure is expected to be left in-situ where appropriate, to abate potential future impacts. This will be reviewed over the design life of AyM, and adapt to local sensitivities, policy and legalisation.

465 The decommissioning methodology would be finalised nearer to the end of the lifetime of AyM, to be in line with current guidance, policy and legislation. Any such methodology would be agreed with the relevant authorities and statutory consultees. The draft DCO includes a requirement to submit a written scheme of decommissioning for onshore works for approval by DCC six months in advance of decommissioning.

10.14 Environmental assessment: cumulative effects

466 Cumulative effects refer to effects upon receptors arising from the AyM when considered alongside other proposed developments and activities and any other reasonably foreseeable project(s) proposals. In this context, the term 'projects' is considered to refer to any project with comparable effects and is not limited to offshore wind projects.

467 The approach to cumulative assessment for the AyM takes into account the Cumulative Impact Assessment Guidelines issued by RenewableUK in June 2013, together with comments made in response to other renewable energy developments, and the Planning Inspectorate (PINS) 'Advice Note 9: Rochdale Approach'. Further information on the cumulative effects assessment methodology and long list are described in Volume 1, Annex 3.1: Cumulative Effects Assessment (application ref: 6.1.3.1).

468 From a review of the proposed developments, it has been determined that the majority are either,

- small minor residential schemes located at distances away from the landfall, onshore ECC and OnSS where there will be insignificant cumulative noise and vibration impacts, or
- schemes that are already in construction or are likely to be constructed by 2026 when AyM construction is likely to commence.

469 Therefore, the majority have been scoped out of the cumulative assessment.

470 However, there are a number of larger non-residential developments which have the potential to have cumulative noise and vibration impacts, these are presented in Table 76.

471 The operational projects included within the Table are included due to their completion/ commission subsequent to the data collection process for the AyM, and as such are not included within the baseline characterisation.

Table 76: Projects considered within the noise and vibration cumulative effect assessment.

DEVELOPMENT TYPE	PROJECT AND APPLICATION REFERENCE	STATUS	DATA CONFIDENCE ASSESSMENT/ PHASE	TIER
Energy	Gas fired power plant (Ref: 40/2018/1036)	Consented	High - Operational noise assessment submitted	1
Coastal protection works	East Rhyl Coastal Defence Scheme (Ref: 45/2018/1197)	Consented	High - Construction noise assessment submitted	1
Coastal protection works	Central Prestatyn Coastal Defence Scheme (Ref: 45/2021/1248)	Application submitted and under consideration	High - Construction noise assessment submitted	1
Coastal protection works	Central Rhyl Coastal Defence Scheme (Ref: 45/2021/0092)	Screening opinion	No noise assessment submitted	N/A
Energy	Elwy Solar farm (Ref: 46/2020/0156)	Application submitted and under consideration	No noise assessment submitted	1
Energy	Llannerch Hall Solar farm (Ref: 30/2018/0269)	Screening opinion	No noise assessment submitted	N/A

472 With regards to the three applications for the coastal defence schemes, these are located in very close proximity to the AYM landfall location; however

- The construction operations associated with the East Rhyl Coastal Defence Scheme (Ref: 45/2018/1197) are due to be completed by the early summer of 2022;
- The construction operations associated with the Central Prestatyn Coastal Defence Scheme (Ref: 45/2021/1248) are due to be completed between the summer of 2025 and the summer of 2026; and
- The construction operations associated with the Central Rhyl Coastal Defence Scheme (Ref: 45/2021/0092) are due to be completed by March 2024.

473 As AYM construction operations at the landfall are not due to commence until the third quarter (Q3) of 2026, it is unlikely that there would be a period where concurrent construction operations would take place; consequently, the coastal defence schemes have been scoped out of the cumulative assessment.

474 With regards to the two solar farm applications, no formal noise assessments have been submitted as part of the applications; consequently, they have also been scoped out of the cumulative assessment

475 Based on the above and the proposed developments shown in Table 76, it is considered that only the operational impacts of the gas fired power station (Application Ref. 40/2018/1036) needs to be considered within the cumulative noise and vibration assessment.

476 The cumulative MDS is described in Table 77.

Table 77: Cumulative MDS.

DEVELOPMENT	IMPACT	SCENARIO	JUSTIFICATION
Gas Fired Power Station (Ref. 40/2018/1036)	Cumulative operational noise impact on NSRs.	Daytime and night-time cumulative	The OnSS associated with the AyM

DEVELOPMENT	IMPACT	SCENARIO	JUSTIFICATION
		impacts from operational noise.	development, and the gas fired power station would operate on a 24/7 basis.

477 The noise assessment associated with the gas fired power station (GFPS) undertaken by Resource and Environmental Consultants (REC) (Ref. AC106375-1R3, dated October 2018) only considered operational noise; therefore, the cumulative impacts of construction operations have not been considered.

478 The REC assessment has identified two NSRs, a property to the 'north-east' and a property to the 'north-west' of the proposed power station.

479 The identified property to the 'north-west' corresponds with the NSR, named Faenol Bropor within this chapter, which is located to the north of the OnSS as first shown in Figure 10, therefore the cumulative impact needs to be considered at this receptor.

480 As per the operational assessment of the OnSS, the REC assessment of the GFPS was undertaken in conjunction with BS4142:2014+A1:2019.

481 The cumulative impact has therefore been undertaken in conjunction with the following methodology:

- the predicted specific noise levels from the GFPS, and the OnSS (including the mitigation measures outlined in Section 10.12.2) have been logarithmically added to determine the cumulative specific sound level;
- character corrections for the acoustic character of the sound being generated by the OnSS and the GFPS has been added to the cumulative specific sound level to determine the cumulative rating level (L_{Ar}); and

- the cumulative rating level has then been compared to the daytime and night-time background sound levels measured at Faenol Bropor and assessed accordingly.

482 Based on the above, the combined specific sound levels are shown in Table 78.

Table 78: Cumulative specific noise levels, dB.

RECEPTOR	PERIOD	PREDICTED SPECIFIC NOISE LEVEL - GAS FIRED POWER STATION L_{AEQ}	PREDICTED SPECIFIC NOISE LEVEL - ONSS L_{AEQ}	COMBINED SPECIFIC NOISE LEVEL - L_{AEQ}
Faenol Bropor	Daytime	34	23	34
	Night-time	34	24	34

483 The REC assessment has indicated that a +2 dB penalty for tonal content needs to be added to the predicted specific sound levels from the GFPS. The operational noise assessment for the OnSS has also indicated that a +6 dB correction needs to be added for tonal content.

484 However, Section 9.2 of BS4142: 2014+A1:2019 states that the maximum penalty for tonal content is +6 dB, therefore, a total of a +6 dB character correction has been added to the cumulative specific sound levels shown in Table 78 to determine the cumulative rating level (L_{Ar}).

485 With reference to the above, the cumulative operational assessment is shown in Table 79.

Table 79: Cumulative operational assessment, dB.

RECEPTOR	PERIOD	REPRESENTATIVE BACKGROUND SOUND LEVEL L_{A90}	CUMULATIVE SPECIFIC NOISE LEVEL, L_{AEQ}	CUMULATIVE NOISE RATING LEVEL, $L_{AR,T}$	DIFFERENCE
Faenol Bropor	Daytime	50	34	40	-10
	Night-time	36	34	40	+4
NB, the method for determining the representative background sound levels is shown in Table 40.					

486 It can be seen from the fourth column of Table 79 that during the daytime the cumulative predicted rating levels are below the representative background sound level at Faenol Bropor.

487 With reference to Table 8, Table 13 and Table 15, this would equate to a permanent **negligible** magnitude of impact upon a **medium** sensitivity receptor resulting in a ***'Minor Adverse'*** level of effect, which is not significant in terms of the EIA Regulations.

488 It can also be seen from the fourth column of Table 79 that during the night-time the cumulative predicted rating levels are +4 dB above the representative background sound levels Faenol Bropor.

489 With reference to Table 8, Table 13 and Table 15, this would equate to a permanent **low** magnitude of impact upon a **high** sensitivity receptor resulting in a level of effect of permanent ***'Moderate Adverse'*** which is considered significant in terms of the EIA Regulations.

490 The REC assessment concluded that the predicted rating levels from the GFPS were below the background sound levels at Faenol Bropor; however this was based on background sound levels of 46 dB L_{A90} during the daytime and 40 dB L_{A90} during the night-time which were measured within the red-line boundary of the GFPS itself, i.e. not at the receptor location.

491 The background sound levels associated with this assessment were measured within the boundaries of Faenol Bropor and were 50 dB L_{A90} during the daytime and 36 dB L_{A90} during the night-time.

492 Therefore, the identified level of effect is dependant solely on which measured background sound levels are utilised in the assessment. If the cumulative rating levels shown in Table 79 are assessed against the background sound level measured by REC (the same standard by which the GFPS was consented), then the assessment would show a **negligible** magnitude of impact.

493 In conclusion, an assessment of the cumulative rating levels (and thus of the impact of the addition of the OnSS) does not result in any greater level of effect on the nearest NSR than that of the GFPS solely.

494 The addition of the OnSS can therefore be said to have a permanent, **negligible** magnitude of impact upon a **high** sensitivity receptor resulting in a level of effect of permanent ***'Minor Adverse'*** which is not considered significant in terms of the EIA Regulations.

10.15 Transboundary effects

495 There are no national transboundary implications with regards to local noise and vibration.

10.16 Summary of effects

496 This assessment has considered the potential noise and vibration effects arising from onshore activities associated with AyM. Consideration has been given to potential worst-case effects arising from onshore construction, operational and decommissioning activities based upon available information. Worst-case parameters have been adopted to provide a robust assessment.

497 The approach undertaken was based upon the PINS Scoping Opinion (PINS, 2020), which was subsequently agreed with DCC and CBCC at the ETG meeting on 31 March and via emails and telephone conversations in December 2021 and January 2022. The assessment has considered feedback received in response to the Statutory Consultation that was undertaken between August and October 2021.

498 A summary of the impacts, mitigation measures and the resultant residual effects are described in Table 80.

499 It should be noted that the mitigation measures described in Table 80 are in addition to the mitigation measures described in Table 49.

Table 80: Summary of effects.

IMPACT	MAGNITUDE	SENSITIVITY OF RECEPTOR	MITIGATION MEASURES	RESIDUAL MAGNITUDE OF IMPACT	RESIDUAL LEVEL OF EFFECT AND SIGNIFICANCE
CONSTRUCTION					
Noise levels generated from landfall construction	High (daytime) High (weekend)	Medium (daytime, weekend)	Relevant detailed design measures relating to noise mitigation, as outlined in Table 50.	**Negligible** or **Low**	***Minor Adverse*** (not significant)
Noise levels from landfall HDD drilling	Negligible (daytime) High (evening, weekend, night-time)	Medium (daytime, evening, weekend) High (night-time)	Relevant detailed design measures relating to noise mitigation, as outlined in Table 50.	Daytime, evening, weekend – **Negligible** or **Low** Night-time – **Negligible**	***Minor Adverse*** (not significant)
Noise levels generated from onshore ECC construction	High (daytime) High (weekend)	Medium (daytime, evening)	Relevant detailed design measures relating to noise mitigation, as outlined in Table 50.	**Negligible** or **Low**	***Minor Adverse*** (not significant)

IMPACT	MAGNITUDE	SENSITIVITY OF RECEPTOR	MITIGATION MEASURES	RESIDUAL MAGNITUDE OF IMPACT	RESIDUAL LEVEL OF EFFECT AND SIGNIFICANCE
Noise levels generated from onshore ECC HDD drilling	Low (daytime) High (evening, weekend, night-time)	Medium (daytime, evening, weekend) High (night-time)	Relevant detailed design measures relating to noise mitigation, as outlined in Table 50.	Daytime, evening, weekend – **Negligible** or **Low** Night-time – **Negligible**	***Minor Adverse*** (not significant)
Noise levels generated by ORAR construction	High (daytime, weekend)	Medium (daytime, weekend)	Relevant detailed design measures relating to noise mitigation, as outlined in Table 50.	Daytime, weekend – **Negligible** or **Low**	***Minor Adverse*** (not significant)
Noise levels generated by OnSS construction	Negligible	Medium	No further mitigation measures required	**Negligible**	***Minor Adverse*** (not significant)
Noise levels generated by the construction of the Array	Negligible (midweek, evening, weekend)	Medium (daytime, evening, weekend)	Implementation of relevant planning conditions specifying noise limits in	**Negligible**	***Minor Adverse*** (not significant)

IMPACT	MAGNITUDE	SENSITIVITY OF RECEPTOR	MITIGATION MEASURES	RESIDUAL MAGNITUDE OF IMPACT	RESIDUAL LEVEL OF EFFECT AND SIGNIFICANCE
	Negligible (night-time - inclement weather) Low (night-time – neutral weather)	High (night-time)	neutral weather conditions only.		
Vibration levels generated by HDD (or other trenchless technique) operations	Medium	Medium (daytime, evening, weekend) High (night-time)	Notification of HDD (or other trenchless technique) works given to any receptors within 55 m of the HDD drilling operations during the daytime, weekend and evening periods and within 140m during the night-time.	Daytime, evening, weekend **- Low** Night-time **- Negligible**	***Minor Adverse*** (not significant)
Vibration levels generated by HDD	Medium (daytime only)	Medium	Notification of piling works given to any receptors	**Low**	***Minor Adverse*** (not significant)

IMPACT	MAGNITUDE	SENSITIVITY OF RECEPTOR	MITIGATION MEASURES	RESIDUAL MAGNITUDE OF IMPACT	RESIDUAL LEVEL OF EFFECT AND SIGNIFICANCE
vibratory piling operations			within 75 m of the HDD drilling operations.		
Vibration levels generated by cofferdam and OnSS piling operations	Low	Medium	Implementation of NVMP	**Low**	***Minor Adverse*** (not significant)
Noise levels generated by construction traffic on the local road network	Low	Medium	None required.	**Low**	***Minor Adverse*** (not significant)
Noise levels generated by construction traffic on the ORAR	Negligible (daytime) High (evening, weekend) Medium (night-time)	Medium (daytime, evening, weekend) High (night-time)	Relevant detailed design measures relating to noise mitigation, as outlined in Table 50.	Daytime, evening, weekend – **Negligible** or **Low** Night-time – **Negligible**	***Minor Adverse*** (not significant)

IMPACT	MAGNITUDE	SENSITIVITY OF RECEPTOR	MITIGATION MEASURES	RESIDUAL MAGNITUDE OF IMPACT	RESIDUAL LEVEL OF EFFECT AND SIGNIFICANCE
OPERATION					
Operational noise levels generated by the OnSS on residential receptors	Negligible (daytime, evening, weekend) High (night-time)	Medium (daytime, evening, weekend) High (night-time)	Reduction in operational noise levels through the use of acoustic enclosures, silencers and covers.	**Negligible**	***Minor Adverse*** (not significant)
Operational noise levels generated by the OnSS on commercial receptors	Negligible	Low	No further mitigation measures required assuming that the measures for the residential receptors have been implemented.	**Negligible**	***Minor Adverse*** (not significant)
DECOMMISSIONING					
Noise and vibration levels generated by decommissioning activities	Not anticipated to exceed construction phase worst-case criteria. Potential impacts reduced as it is assumed that no night-time or piling decommissioning operations are required.				

IMPACT	MAGNITUDE	SENSITIVITY OF RECEPTOR	MITIGATION MEASURES	RESIDUAL MAGNITUDE OF IMPACT	RESIDUAL LEVEL OF EFFECT AND SIGNIFICANCE
CUMULATIVE EFFECTS					
Noise levels generated from the OnSS and gas fired power station	Low	Medium (daytime, evening, weekend) High (night-time)	No further mitigation measures required as it is concluded that the noise level at the NSR from the OnSS is negligible compared to the gas fired power station.	**Negligible**	***Minor Adverse*** (not significant)

500 It can be seen from Table 80 that assuming that the recommended mitigation measures have been correctly implemented, there would be a ***'minor adverse'*** residual level of effect for all the potential construction and operational noise and vibration impacts considered with the proposed AYM, which is not considered significant in terms of the EIA Regulations.

10.17 References

The Environmental Protection Act 1990 (EPA)

Control of Pollution Act 1974 (CoPA).

Department of Energy and Climate Change (2011a) Overarching National Policy Statement for Energy (EN-1).

Department of Energy and Climate Change (2011b) National Planning Policy Statement for Renewable Energy Infrastructure (EN-3).

Department of Energy and Climate Change (2011c). National Policy Statement for Electricity Networks Infrastructure (EN-5).

Department of Energy and Climate Change (Donshore ECC) (2021a), Draft Overarching National Policy Statement for Energy (EN-1).

Department of Energy and Climate Change (Donshore ECC) (2021b), Draft National Policy Statement for Renewable Energy Infrastructure (EN-3).

Department of Energy and Climate Change (Donshore ECC) (2021c), Draft National Policy Statement for Electricity Networks Infrastructure (EN-5).

Planning Policy Wales (Edition 11, February 2021)

Welsh Assembly Government (1997) Technical Advice Note 11: Noise

Denbighshire Local Development Plan 2006-2021

BS5228-1:2009+A1:2014 Code of practice for noise and vibration control on construction and open sites –Part 1: Noise and Part 2 Vibration

Hiller D. M. and Crabb G. I., Groundborne vibration caused by mechanised construction works, TRL report 429. Wokingham: TRL, 2000

BS4142:2014+A1:2019 Methods for rating and assessing industrial and commercial sound

The Institute of Environmental Management and Assessment (IEMA) 'Guidelines for Environmental Noise Impact Assessment'

The former Department of Transport and Welsh Office memorandum Calculation of Road Traffic Noise (CRTN)

AQTAG09 (Air Quality Technical Advisory Group 09), Guidance on the effects of industrial noise on wildlife

Design Manual for Roads and Bridges (DMRB) Volume 11 Section 3 Part 7 Noise and Vibration

ISO9613-2 Acoustics – Attenuation of sound during propagation outdoors – General method of calculation

BS7445-1:2003 Description and measurement of environmental noise – Part 1 Guide to quantities and procedures Innogy, 2020

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

Errata List

Paragraph 105

In response to ExQ1.2.91, the Applicant would like to make an amendment to paragraph 105 which should read as follows: *"It has been determined that, with the exception of the landfall area, there are no statutorily designated ecological sites situated near to the identified cable route and the nearest ecological receptor to the OnSS is a SAC (Coedwigoedd Dyffryn Elwy / Elwy Valley Woods) located approximately 1.5 km to the south. Consequently, it is considered that an assessment of noise impacts upon ecological designations is not required for the cable route or OnSS."*

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