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Appendix 12-1

Construction Noise Report

Glenora Wind Farm

Glenora Wind Farm DAC

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TNEI Services Ltd
Company Registration Number: 03891836 **VAT Registration Number: 239 0146 20**

Registered Address		
Bainbridge House	7th Floor West One	7th Floor
86-90 London Road	Forth Banks	80 St. Vincent Street
Manchester	Newcastle upon Tyne	Glasgow
M1 2PW	NE1 3PA	G2 5UB
Tel: +44 (0)161 233 4800	Tel: +44 (0)191 211 1400	Tel: +44 (0)141 428 3180

TNEI Ireland Ltd
Registered Address: 104 Lower Baggot Street, Dublin 2, DO2 Y940
Company Registration Number: 662195 **VAT Registration Number: 3662952IH**

Unit S12, Synergy Centre
TU Dublin Tallaght Campus
Tallaght
D24 A386
Tel: +353 (0)190 36445

TNEI Africa (Pty) Ltd
Registered: Mazars House, Rialto Rd, Grand Moorings Precinct,7441 Century City, South Africa
Company Number: 2016/088929/07

Unit 514 Tyger Lake
Niagara Rd & Tyger Falls Blvd
Bellville, Cape Town
South Africa, 7530

Executive Summary

TNEI was commissioned by Glenora Wind Farm DAC ('the Applicant') to undertake a construction noise assessment for the proposed Glenora Wind Farm (hereinafter referred to as 'the Proposed Development'). The aim of this was to assess the potential impact of noise attributable to the construction of the Proposed Development on the occupiers of nearby noise sensitive receptors.

The noise impact assessment was undertaken using guidance contained in BS 5228: Part 1 2009+A1:2014 *'Noise and vibration control on construction and open sites- Noise'* and the calculation methodology in ISO9613: 1996 *'Acoustics - Attenuation of sound during propagation outdoors' -Part 2: General Method of Calculation*'.

There are 24 Noise Sensitive Receptors (NSRs) in proximity (~3 km search area) of the Proposed Development and adjacent to the site access track. Five representative Construction Noise Assessment Locations (CNALs) were chosen and predictions of the construction noise levels for each of the CNALs has been presented within the main body of this report. The assessment of all 24 NSRs, however, has also been included within an Annex to the report. For clarity, all NSRs are also labelled with 'H##', to ensure consistency with the labelling used within the rest of the Environmental Impact Assessment Report (EIAR).

Predictions have been made assuming that all items of plant are operating continually throughout the assessment period to provide a worst-case scenario. In addition, the noise model assumes that noise sources would be located within the areas closest to the receptor of the anticipated activity; in reality plant would move around the site and only a proportion of the plant may be operating at any one time. As such, the calculations will tend to over-predict the actual sound levels that are likely to be experienced.

The assessment is made against guideline threshold levels, exceedance of which indicates the potential for a significant effect.

During the initial period of construction, when the access road is being upgraded and junction improvements are taking place, the noise levels at the nearest receptors may temporarily exceed the threshold levels, however, with due consideration of the duration of exposure no significant effects are anticipated.

The results indicate that there will be temporary increases in noise levels at the nearest receptors during the remaining construction of the wind farm but these will remain below the threshold levels and no significant effects are anticipated.

A series of recommendations to minimise noise impacts at all receptors have been included. These have been derived in accordance with current good practice.

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1 Introduction

1.1 Brief

1.1.1 TNEI was commissioned by SSE Renewables to undertake a construction noise assessment for the proposed Glenora Wind Farm (hereinafter referred to as the Proposed Development). The following steps summarise the noise assessment process:

- Establish typical ambient noise levels at sensitive receptors located closest to the anticipated construction activities and derive appropriate noise threshold levels in accordance with BS 5228-1:2009 +A1:2014 [(1)];
- Undertake predictions of noise from different construction activities that would be incident at the nearest sensitive receptors;
- Compare the predicted noise levels with the derived threshold values; and,
- Identify any requirements for mitigation measures, if needed.

1.2 Nomenclature

1.2.1 The following terms and definitions are used throughout this report;

- **Emission** refers to the sound level emitted from a sound source, expressed as either a sound power level or a sound pressure level;
- **Immission** refers to the sound pressure level received at a specific location from a noise source(s);
- **SWL** indicates the sound power level in decibels (dB);
- **SPL** indicates the sound pressure level in decibels (dB);
- **NSR** (Noise Sensitive Receptor) are identified receptors that are sensitive to noise;
- **NML** (Noise Monitoring Location) refers to any location where baseline or specific noise levels have been measured; and
- **CNAL** (Construction Noise Assessment Location) refers to any location where the noise immission levels are calculated and assessed.

1.2.2 Unless otherwise stated, all noise levels refer to free field levels i.e. noise levels without influence from any nearby reflective surfaces.

1.3 Site Description

1.3.1 The Proposed Development is located in an area of Coillte forestry approximately 5 km south west of Ballycastle in County Mayo. The approximate Irish Transverse Mercator (ITM) reference for the centre if the site is 503298, 834174 and the proposed layout is shown on Figure A1.1b in Annex A.

1.3.2 Construction of the Proposed Development would require felling, the laying of tracks across the site, establishing five construction compounds, the opening of up to three borrow pits, excavation of turbine foundations, construction of turbine bases, installation of turbines, and the installation of a substation and other infrastructure.

1.3.3 During the construction period the Proposed Development would be accessed through an existing entrance off the R314, in the townland of Ballyglass. The existing road will be widened to accommodate turbine component deliveries, HGVs, and abnormal loads during the construction phase. Construction noise impacts associated with track upgrading, construction activities from the site entrance, road widening, and vehicles using this access track have been considered within the construction noise assessment alongside the construction of the wind farm itself.

1.3.4 *Chapter 4: Description of the Proposed Development* of the EIAR provides descriptions of the likely construction activities that would be undertaken and the type of plant that would be used.

1.3.5 Construction is expected to last for 12-18 months. An indicative construction schedule is provided in EIAR Chapter 4, which has been replicated here as Table 1.1. Activities denoted with blue cells have been included in the noise assessment. Periods denoted with grey cells have not been considered within the assessment, as they are not expected to generate high levels of noise.

Table 1.1: Indicative Construction Schedule

Task	Month																	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Site Health and Safety																		
Site Compound																		
Site Roads																		
Turbine Hardstands																		
Turbine Foundations																		
Substation Construction & Electrical Works																		
Backfilling & Landscaping																		
Bolts/ Cans Delivery																		
Turbine Delivery & Erection																		
Substation Commissioning																		

Task	Month																	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Turbine Commissioning																		

1.3.6 TNEI has undertaken noise propagation modelling for months 2, 4, 6, 11, and 13, on the assumption that activities undertaken during these periods would generate the highest noise levels when considering the likely plant and activity locations. The modelling undertaken for each of these months is hereafter referred to as Scenario 01 (month 2) through to Scenario 05 (month 13). An additional night-time scenario, Scenario 06, has been modelled to consider any potential noise from the operation of generators and other types of plant, that might be left on over-night outwith the normal construction hours.

2 Noise Planning Policy and Guidance

2.1 Overview of Noise Planning Policy and Guidance

2.1.1 There is no published Irish guidance that contains suggested noise limits or assessment methods for construction activities other than a 2014 document published by the National Roads Authority (NRA), which relates to noise from road developments only. The Association of Acoustic Consultants of Ireland, however, have published *Environmental Noise Guidance for Local Authority Planning & Enforcement Departments* (2), which states; *"The chief guidance document applied in the assessment of construction phase noise impacts is British Standard BS 5228:2009+A1:2014 Code of practice for noise and vibration control on construction and open sites Part 1: Noise (2014).* Accordingly, in the absence of any other applicable legislation or guidance, this assessment is undertaken in accordance with BS 5228.

2.2 BS 5228:2009+A1:2014

2.2.1 The BS 5228 standard provides useful guidance on practical noise control. Part 1 provides recommendations for basic methods of noise control including sections on community relations, training, occupational noise effects, neighbourhood nuisance and project supervision. The annexes provide information on noise sources, noise calculation procedures, mitigation measures and their effectiveness.

2.2.2 Part 1 also contains noise emission data for a variety of construction plant. This data was obtained from field measurements of actual plant operating on construction and open sites and is therefore appropriate to use as source level data for construction noise predictions.

3 Potential Impacts

3.1 Construction Noise Sources

3.1.1 Noise levels from construction activities will vary continually over time as activities and plant start and stop and move around the site. To assess the potential impacts of construction noise the noise models assume all construction plant and activities are working continually and in locations closest to the nearest NSRs for specific construction activities.

3.2 Modelled Construction Scenarios

3.2.1 To consider the variation in noise levels that would occur throughout the construction period a series of scenarios have been modelled based on the combination of construction tasks detailed in the indicative timetable (see Table 1.1), the details provided in *Chapter 4: Description of the Proposed Development* and TNEI's knowledge and experience of other similar sites and construction schedules.

3.2.2 The assessment does not consider the noise impacts associated with decommissioning, as the plant and activities used for that phase are assumed to be similar in nature (and noise output) to those already considered in the modelled construction scenarios. Accordingly, if noise levels during the construction phases are acceptable, they should also be acceptable during decommissioning.

4 Methodology

4.1 Methodology for the Prediction of Noise

4.1.1 To predict the noise immission levels for each scenario, noise propagation models are produced using the propriety noise modelling software CadnaA. Within the software, complex models can simulate the propagation of noise according to a range of international calculation standards. For this assessment the immission levels have been predicted in accordance with ISO9613-2:1996 *'Acoustics – Attenuation of sound during propagation outdoors: General method of calculation'*. [(2)]

4.1.2 The ISO 9613 propagation model was chosen in preference to the calculation method presented in BS 5228, primarily because of some of the significant distances from source to receptor evident on this site. Specifically, BS 5228 notes in F 2.2.2.2, that at distances over 300 m noise predictions using the BS 5228 methodology should be treated with caution, especially where a soft ground correction factor has been applied because of the increasing importance of meteorological effects; whereas ISO 9613-2 provides equations that have been validated up to 1,000 m.

4.1.3 The ISO 9613 model can take account of the following factors that influence sound propagation outdoors:

- geometric divergence;
- air absorption;
- reflecting obstacles;
- screening;
- vegetation; and
- ground reflections.

4.1.4 The model uses the octave band sound power output of the proposed plant as its acoustic input data, and calculates on an octave band basis, attenuation due to geometric spreading, atmospheric absorption and ground effects.

4.1.5 For the purposes of this assessment, all noise level predictions have been undertaken using a receiver height of 1.5 m above local ground level. Mixed ground (G=0.5) attenuation has been assumed at all locations and air absorption is based on a temperature of 10°C and 70 % relative humidity.

4.2 Limitations of the Noise Model

4.2.1 The noise propagation models are intended to give a good approximation of the specific noise level and the contribution of each individual source. However, it is expected that actual levels are unlikely to be matched exactly with modelled values and the following limitations in the model should be considered:

- In accordance with ISO 9613-2, all assessment locations are modelled as downwind of all noise sources and propagation calculations are based on a moderate ground-based temperature inversion, such as commonly occurs at night;

- The predicted barrier attenuation provided by local topography, embankments, walls, buildings and other structures in the intervening ground between source and receiver can only be approximated and not all barrier attenuation will have been accounted for;
- Unless specifically stated, the models assume all noise sources are operating continuously and simultaneously, estimating a worst-case source noise level; and
- All mobile plant assumed to be working on tracks (excavators, dozers, rollers etc) have been modelled as moving point sources along their anticipated movement paths and the sound power level of the source is effectively averaged out across the length of the entire line. This will give an approximation of the overall noise levels from mobile plant at receptor locations; however, in reality noise levels would fluctuate as construction plant and activities move around in their activity areas.

4.3 Assessing Construction Noise Effects

4.3.1 Annex E, part E.3.2 of BS 5228 provides example criteria for assessing the potential significance of construction noise effects and acceptable limits for construction noise.

4.3.2 Table E.1 of BS 5228 (represented here as Table 4.1) contains an example of the significance criteria that can be used to assess construction activities.

Table 4.1: Example of Threshold of Potential Significant Effect at Dwellings ($dB_{(A)}$)

Assessment Category and Threshold Value Period	Threshold Value $L_{Aeq,T}$ dB		
	Category $A_{(A)}$	Category $B_{(B)}$	Category $C_{(C)}$
Night-Time (23:00 – 07:00)	45	50	55
Evenings and Weekends [(D)]	55	60	65
Daytime (07:00 – 19:00) and Saturdays (07:00 to 13:00)	65	70	75

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

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

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

(D) 19.00-23.00 weekdays, 13.00-23.00 Saturdays and 07.00-23.00 Sundays.

4.3.3 The values can be considered thresholds for the construction noise levels (quantified using the $L_{Aeq(t)}$ noise metric). The values in each category are to be used where the existing noise

level at each location, rounded to the nearest 5 dB, is below the level given for a particular time of day.

4.3.4 BS5228 provides the following advice regarding the threshold levels:

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

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

Note 3: Applied to residential receptors only."

4.3.5 Therefore, the assessment of construction noise reflects a specific noise threshold for the locality (set relative to the existing ambient noise levels) for a particular period of the day, rather than an absolute noise level.

4.3.6 It is noted that construction activities are likely to be limited to between 07:00 and 19:00 on weekdays and 07:00 – 13:00 on Saturdays. No working would be undertaken on Sundays or Public Holidays without prior agreement with Mayo County Council. Accordingly, the *Daytime (07:00 – 19:00) and Saturdays (07:00 to 13:00)* threshold levels are the most appropriate to use for this assessment, although comparison is made between the predicted immission levels and all time periods detailed within Table 4.1

4.3.7 It should be noted that exceedance of the limit does not in itself indicate a significant effect, rather, the standard states *"If the site noise level exceeds the appropriate category value, then a potential significant effect is indicated. The assessor then needs to consider other project-specific factors, such as the number of receptors affected and the duration and character of the impact, to determine if there is a significant effect".*

4.4 Study Area

4.4.1 NSRs are properties, people or fauna that are sensitive to noise and, therefore, may require protection from nearby noise sources. There are 14 residential Noise Sensitive Receptors (NSR's) identified within the ~3 km search area defined from the proposed turbine locations within the Wind Farm Site. In addition a further 10 NSR's have been included to account for the potential impacts associated with the access track road widening works to the north east of the site. The NSR's are generally located in clusters of dwellings due south, east and north east of the Proposed Development, although a single NSR has been identified just to the south.

4.4.2 A building (H3) included within the buildings originally identified has subsequently been classified as derelict. This location was not considered to be noise sensitive for the purposes of this assessment and has not been considered further.

4.4.3 Of the 24 identified NSRs, a total of five have been chosen as Construction Noise Assessment Locations (CNALs). The CNALs represent the closest NSRs or clusters of NSRs to the Proposed Development, or Proposed Development access track. The modelling results for the CNALs has been presented within the main body of this report, however, an assessment that includes all 24 NSRs has been included within Annex C for completeness.

4.4.4 For clarity all NSRs are labelled as 'H##', to ensure consistency with the labelling used within the rest of the EIAR.

4.4.5 Table 4.2 details the CNALs, which are also shown on Figure A1.1a in Annex A alongside all 24 NSRs.

Table 4.2: Construction Noise Assessment Locations

CNAL Name	ITM Coordinates		Distance to Closest Construction Activity (m)
	Eastings	Northings	
CNAL01 – H01	501398	832178	1,132
CNAL02 – H04	502850	829722	2,550
CNAL03 – H07	508401	833437	1,825
CNAL04 – H18	509806	837855	16
CNAL05 – H23	510111	837909	15

4.5 Baseline Noise Levels

4.5.1 Baseline noise level monitoring was undertaken as part of the operational noise assessment for Glenora Wind Farm and therefore ambient sound levels were measured in the area at several locations over an extensive time period. Following a review of the measured noise levels, it was found that at all locations the ambient sound levels were below the Category A Threshold Values detailed in Table 4.1.

4.6 Construction Noise Level Thresholds

4.6.1 Having due regard to the existing ambient noise levels around the Proposed Development, the BS 5228 Category A Threshold Values have been considered appropriate for the construction noise assessment at all NSRs. Category A is the most constraining threshold and other Categories B and C typically only apply in noisy urban environment or near busy roads where existing noise levels are high.

4.6.2 Accordingly, the assessment is made against the following noise level limits;

- Daytime weekdays 07:00 – 19:00: 65 dB $L_{Aeq\ (12\ hours)}$
- Saturday 07:00 – 13:00: 65 dB $L_{Aeq\ (6\ hours)}$
- Evenings and weekends: 55dB $L_{Aeq\ (t)}$
- Night-time: 45 dB $L_{Aeq\ (8\ hours)}$

5 Noise Impact Assessment

5.1 Modelling of Individual Sound Sources

5.1.1 At this stage a detailed plant list is not available, therefore, a generic plant list based upon experience of similar projects has been used. All modelled noise sources and associated sound power level (SWL) and sound pressure level (SPL) data is included in Annex B: Noise Model Data.

5.1.2 For felling activities broadband noise level data for a harvester, a forwarder and a skidder has been taken from *Noise Hazards in Forestry Operations and Selection of Personal Protective Equipment* [3] (Forestry Commission). No octave band data is available, therefore modelling has been undertaken using the 500 Hz octave band data, as recommended in ISO 9613. Noise levels for the harvester and forwarder are given at the operator position inside a Q Cab. In order to estimate external levels 10 dB has been added to the quoted levels and the SWL for each item of plant has been calculated within CadnaA assuming the quoted SPL have been measured at a distance of 1 m.

5.1.3 For all other construction activities source noise level data is taken from Annex C of BS 5228, which provides octave band SPL levels for a wide variety of construction plant and activities suitable for the estimation of noise immission levels.

5.1.4 Construction noise sources for any given activity will generally comprise a mix of both moving and static sources. Mobile sources include mobile construction plant and Heavy Goods Vehicles (HGVs), while static construction plant could include generators, lighting rigs and pumps. Static equipment is usually located at a fixed location for an extended period of time.

5.1.5 For both mobile and static plant, activity noise levels would be transient in nature due to changes in location (mobile plant only), on/off periods, and fluctuations of load on any individual machine.

5.1.6 All static items of plant and activities have been modelled as single point sources. All mobile plant (excavators, dozers, dumpers etc.) have been modelled as either a moving point source (line source) along their anticipated movement paths or as a stationary point source located at the closest point of its anticipated work area to any given CNAL.

5.2 Modelling of Construction Activities.

5.2.1 The assessment considers five construction scenarios based on the indicative timetable. In addition, a sixth scenario has been modelled assuming some plant is left running during the evening and night-time to provide power for site cabins, lighting etc.

5.2.2 It has been assumed that the construction activities associated with the closest turbines to NSR's are modelled for each particular phase within the assessment. In reality fewer activities will be undertaken simultaneously, and as such noise levels will be lower than those indicated in the modelling results.

5.2.3 Noise propagation modelling has been undertaken considering the key activities that are likely to occur throughout the construction period. Details of the items of plant assumed to

be operating in each modelled scenario, as well as the noise data for each modelled noise source, are included in Annex B: Noise Model Data.

5.2.4 The modelled scenarios represent the following construction activities:

- Scenario 01: Assumes that felling, temporary road widening, and access track upgrades are underway from the site entrance to each of the construction compounds. The borrow pits will also have been opened with rock excavation assumed to have begun in the three proposed borrow pits. The Substation construction and associated electrical works has begun and the five proposed construction compounds are being constructed. Junction improvement works are also being carried out.
- Scenario 02: Borrow pits are in operation, with lorries moving from borrow pits to construction compounds. Substation and cabling works are still underway, with felling and road upgrades being carried out up to, and around, turbines 2, 6, 12, and 18. Turbine hardstanding works being carried out for the same turbines.
- Scenario 03: Borrow pits are in operation, with lorries moving from borrow pits to construction compounds. Substation and cabling works still underway, with felling and road upgrades being carried out up to, and around, turbines 3, 4, 10, 13, 16, 22. Turbine hardstanding works occurring for the same turbines.
- Scenario 04: Borrow pits are in operation, with lorries moving from borrow pits to construction compounds. Substation and cabling works still underway, with Turbine foundation works being carried out at turbines 3, 4, 10, 13, 16, 22.
- Scenario 05: Borrow pits are in operation, with lorries moving from borrow pits to construction compounds. Substation and cabling works are completed, as are the road upgrade works. Turbine delivery and erection at turbines 3, 4, 10, 13, 16, 22. Backfill and landscaping is occurring across the site.
- Night-time: 2x diesel generators operating to power the cabin and lighting at all construction compounds.

5.2.5 For much of the working day the noise associated with construction activities would be less than predicted, as the assessment assumes all equipment is continually operating at full power and in locations closest to the NSRs, whereas in practice, equipment load and precise location may vary throughout the day. This approach has been adopted to represent a worst-case assessment.

5.3 Calculated Noise Immission Levels

5.3.1 Table 5.1 presents the calculated noise immission levels at each CNAL for all modelled scenarios. Additionally, Table C3.2 in Annex C presents the calculated immission levels at each NSR for all modelled scenarios.

Table 5.1: Predicted Construction Noise Immission Levels, dB $L_{Aeq(t)}$

CNAL	Scenario					
	1	2	3	4	5	Night
CNAL01 – H01	34	33	36	36	37	16
CNAL02 – H04	30	28	28	30	27	10
CNAL03 – H07	28	27	28	31	28	10
CNAL04 – H18	62	26	26	50	51	2
CNAL05 – H23	**68**	25	25	46	46	1

5.3.2 Table 5.1 indicates that the predicted construction noise levels during Scenario 01 exceed the Category A Threshold value of 65dB at CNAL05 by 3dBA. This indicates the potential for a significant noise impact.

5.3.3 For all other CNALs the predicted noise levels for all scenarios are well below the weekday and Saturday daytime threshold value of 65 dBA.

5.3.4 At CNAL05 the noise level exceedance is due to the presence of mobile plant operating in the vicinity of the receptor. This will be required for the road junction improvement works and road upgrades leading to the site. It should be noted, however, that the predicted level assumes that all plant will be operating continuously, however, this will not be the case in reality; mobile plant will move throughout the day and will not be active all of the time. Accordingly, actual noise levels will fluctuate and are likely to be lower than are predicted at the nearest NSRs.

5.3.5 It is important to note that the threshold levels include an assessment time period; they are not 'limits' that can never be exceeded. Rather they represent an equivalent sound level spread across a particular assessment period. For the majority of the time this assessment time is for a 12 hour day (07:00 – 19:00). Although noise levels at CNAL5 may temporarily exceed 65dBA during the daytime, this is unlikely to occur across the full daytime or weekend periods.

5.3.6 Noise from the junction improvements will be a short-term, temporary impact similar in nature to typical 'road works'. With due regards to the number of receptors affected and the duration and character of the impact, the predicted noise levels at CNAL05 during Scenario 01 (and all other scenarios) is deemed to not have a significant effect.

5.3.7 No construction activities are anticipated during the night-time, however, some generation plant or similar may operate during night-time hours within the construction compounds. The predicted noise levels for the modelled night-time scenario are below the night-time threshold levels of 45 dBA.

6 Mitigation

6.1.1 There are no specific requirements for mitigation to lessen noise levels to avoid significant effects as no significant effects are anticipated, however, careful consideration will be given to the type, number and location of plant to be used, specifically when undertaking road and junction improvement works in the vicinity of CNAL05 and the use of temporary construction noise barriers could be employed to help reduce noise levels at the receptors.

6.1.2 The use of a barrier can typically achieve up to 10 dB when in optimum locations. However, given the restrictions with space limitation and access, the actual amount of barrier attenuation likely to be achieved in this situation might be as low as 3 dB. Nonetheless, this could still be a useful means of noise control and would be sufficient to reduce noise levels to below the BS5228 noise levels.

6.1.3 The use of barriers could include the erection of temporary boarding in the vicinity of construction activities related to the road junction and road upgrades or the use of 'acoustic blanket panels' to hang from heras fencing or similar. This should be installed as close to the activities as is practicable and fitted to interrupt any direct line of site between the construction plant and the closest residential receptors. Examples of appropriate products include Echo Noise Defender and Soundex DeciBloc.

6.1.4 In addition, good site practices can be implemented across the site to minimise any noise effects. Section 8 of BS 5228-1 recommends a number of simple control measures as summarised below.

6.1.5 Generally construction activities will be confined to the core hours periods 7am - 7pm Monday to Friday and 7am – 1pm Saturday. The principal contractor will:

- keep local residents informed of the proposed working schedule, where appropriate, including the times and duration of any abnormally noisy activity that may cause concern;
- ensure site work is within core hours and any required work outside core hours shall be programmed carefully with consideration to noise and nearby local residents;
- ensure all vehicles and mechanical plant will be fitted with effective exhaust silencers and be subject to programmed maintenance;
- select inherently quiet plant where appropriate - all major compressors will be 'sound reduced' models fitted with properly lined and sealed acoustic covers, which will be kept closed whenever the machines are in use;
- ensure all ancillary pneumatic percussive tools will be fitted with mufflers or silencers of the type recommended by the manufacturers;
- instruct that machines will be shut down between work periods or throttled down to a minimum;
- regular maintenance of all equipment used on site, including maintenance related to noise emissions;
- vehicles will be loaded carefully to ensure minimal drop heights to minimise noise during this operation; and
- ensure all ancillary plant such as generators and pumps will be positioned to cause minimum noise disturbance and, if necessary, temporary acoustic screens or enclosures should be provided.

7 Summary

7.1.1 The noise impact assessment has considered the existing noise environment at local residential receptors to determine appropriate noise threshold levels for construction activities.

7.1.2 Noise propagation modelling has been undertaken in accordance with ISO 9613-2:1996 and the anticipated noise immission levels presented for scenarios likely to occur throughout the construction period of the Proposed Development. The modelled scenarios consider the 'noisiest' activities that are likely to occur during the construction period and the modelling assumes that the construction activities are occurring at locations within the development site that are closest to the NSRs.

7.1.3 Predicted construction noise levels occurring during Scenario 01 exceed the Category A Threshold value of 65dB at CNL05 by 3dBA, which has the potential to cause a significant noise impact during the day. This will be a short-term temporary impact associated with the construction, upgrading, and widening of the access road.

7.1.4 This impact will cease once the initial access road works have been completed (during the first three months). Mitigation / good practice measures have been highlighted to minimise the potential effects during these (and all) periods of construction activity.

7.1.5 For all other construction scenarios, the predicted noise impacts at all receptors are below acceptable guidelines and are therefore deemed to be not significant. All predictions assume that plant is operating in full operational mode on the access tracks and within the site itself to provide a worst case scenario. In reality only a proportion of the plant may be operating.

7.1.6 It should be noted that proposed construction phases are short term and temporary in nature and are not likely to cause any long term impacts. The total period of construction for the wind farm is estimated to last up to eighteen months.

8 References

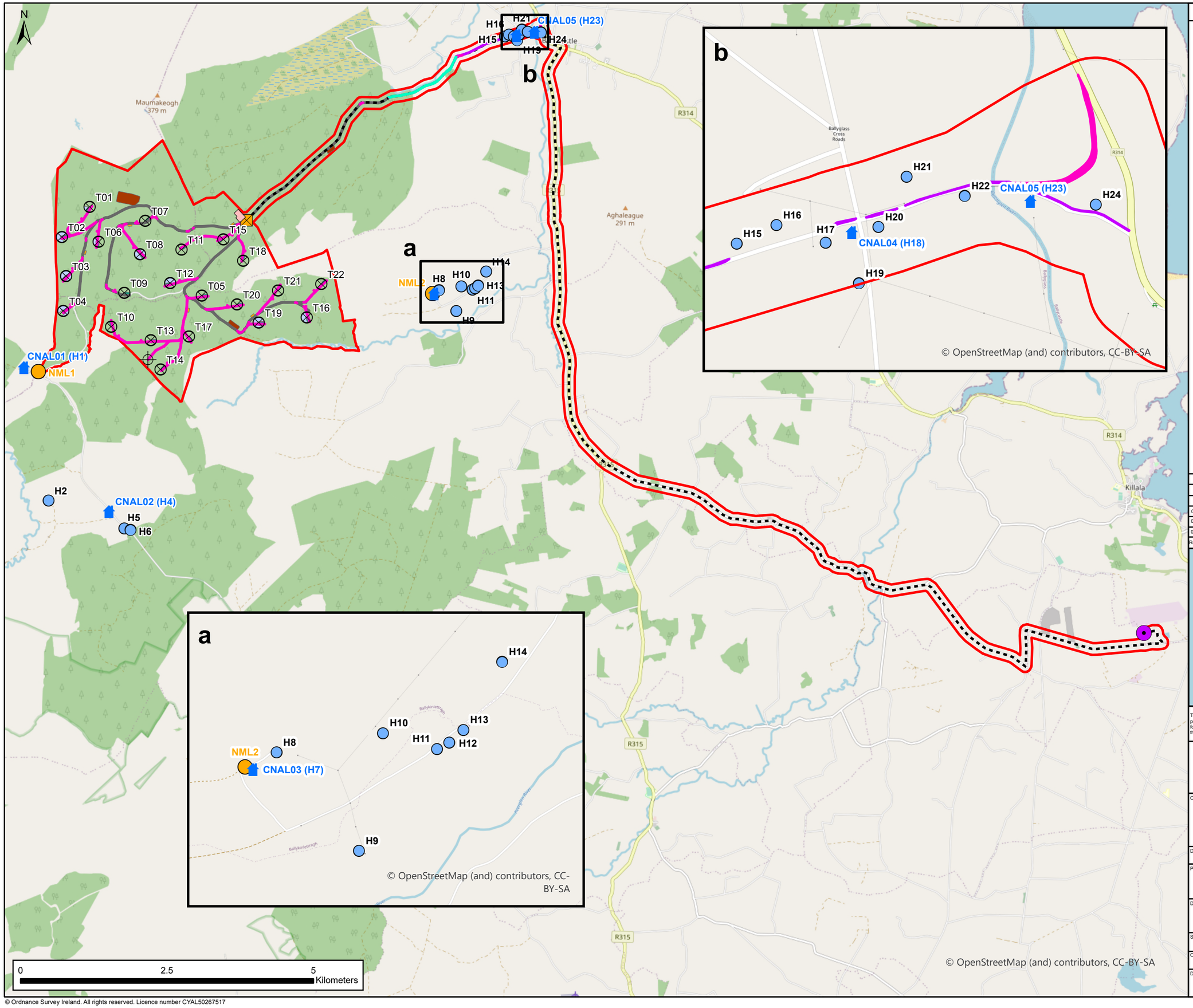
1. **British Standards Institute.** *Code of practice for noise and vibration control on construction and open sites. Noise.* UK : BSI, 2014. BS 5228-1:2009+A1:2014 .

2. **Association of Acoustic Consultants of Ireland (AACI).** *Environmental Noise Guidance for Local Authority Planning & Enforcement Departments.* Ireland : AACI, 2021.

3. **(ISO), International Organisation for Standardisation.** *Acoustics – Attenuation of Sound During Propagation Outdoors: Part 2 – General Method of Calculation.* Geneva : ISO, 1996. ISO 9613-2:1996.

4. **Forestry Commission.** *Noise Hazards in Forestry Operations and Selection of Personal Protective Equipment.* Edinburgh : The Crown, 2003.

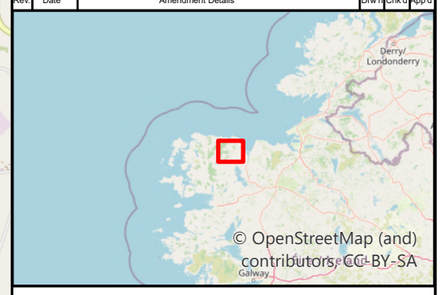
Annex A – Figures



NOTES

- EIAR Site Boundary
- Construction Noise Assessment Locations (CNALs)
- Noise Sensitive Receptors (NSRs)
- Noise Monitoring Locations (NMLs)
- Proposed Met Mast Location
- Proposed Turbine Layout
- Security Cabin Location
- Tawnaghmore Substation
- Alternative Assessed Access Road (Upgrade Proposed)
- Proposed New Roads
- Temporary Road Widending Works
- Proposed Grid Connection Route
- Existing Roads - Upgrade Proposed
- Peat Placement Areas
- Proposed Borrow Pit Locations
- Proposed Construction Compounds
- Proposed Substation Compound
- Proposed Hardstand Footprints

Rev.	Date	Amendment Details	Drw'n	Chk'd	App'd
02	13/10/23	Added Turbine Labels	MT	JB	JB
01	10/10/23	Updated Inset Map	JCM	GC	GC
00	20/07/23	First Issue	JCM	JB	JB



tnei

Client: sse

Drawing Status: FOR INFORMATION

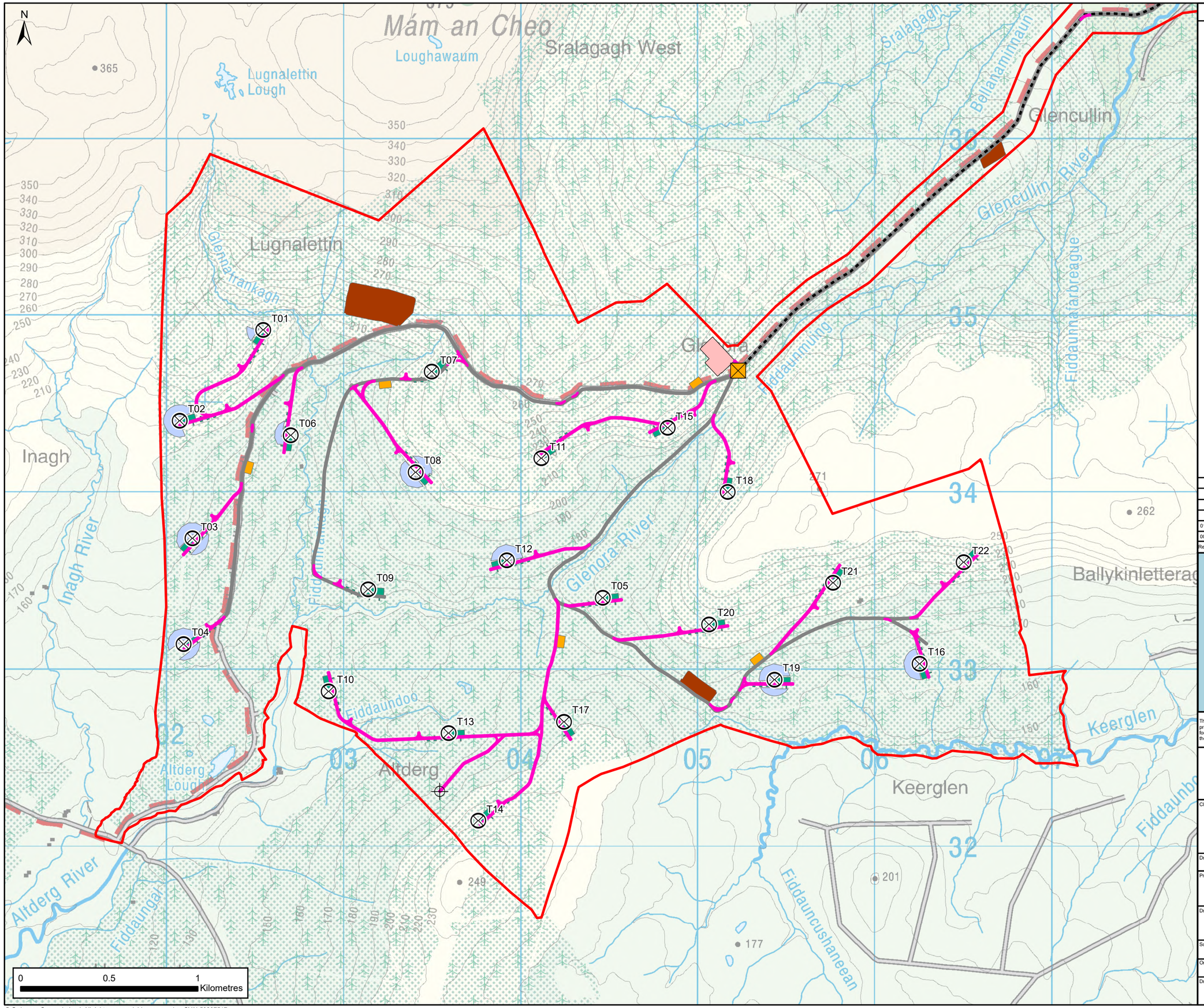
Project Title: Glenora Wind Farm

Drawing Title: Figure A1.1a: Construction Noise Assessment Locations

Scale	Designed	Drawn	Checked	Approved
1:60,000	JCM	MT	JB	JB
Original Size	**Date**	**Date**	**Date**	**Date**
A3	10/10/2023	13/10/2023	13/10/2023	13/10/2023

Drawing Number: 14203-010

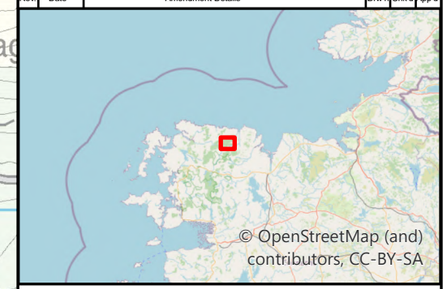
Revision: 2



NOTES

- Proposed Met Mast Location
- Proposed Turbine Layout
- Security Cabin Location
- Proposed New Roads
- Temporary Road Widending Works
- Proposed Grid Connection Route
- Existing Roads - Upgrade Proposed
- Peat Placement Areas
- Proposed Borrow Pit Locations
- Proposed Construction Compounds
- Proposed Hardstand Footprints
- Proposed Substation Compound
- EIAR Site Boundary

Rev.	Date	Amendment Details	Drw'n	Chk'd	App'd
01	13/10/23	Added Turbine Labels	MT	JB	JB
00	20/07/23	First Issue	JCM	JB	JB



Client

Drawing Status: FIRST ISSUE

Project Title: Glenora Wind Farm

Drawing Title: Figure A1.1b: Site Layout

Scale	Designed	Drawn	Checked	Approved
1:20,000	JCM	MT	JB	JB
Original Size	**Date**	**Date**	**Date**	**Date**
A3	20/07/2023	13/10/2023	13/10/2023	13/10/2023

Drawing Number: 14203-011

Revision: 1

Annex B – Noise Model Data

Name	1/3 Octave Spectrum (dB										Source
	63	125	250	500	1000	2000	4000	8000	A	lin	
Lorry	121.0	107.0	104.0	102.0	101.0	100.0	97.0	94.0	106.9	121.4	BS 5228-1:2009+A1:2014: Annex C
Dozer	113.0	102.0	104.0	101.0	100.0	106.0	90.0	84.0	108.7	114.8	BS 5228-1:2009+A1:2014: Annex C
Tracked Excavator	113.0	106.0	105.0	105.0	101.0	99.0	96.0	91.0	107.0	115.1	BS 5228-1:2009+A1:2014: Annex C
Wheeled Excavator	92.0	88.0	91.0	92.0	90.0	85.0	79.0	73.0	93.9	98.1	BS 5228-1:2009+A1:2014: Annex C
Dumper	112.0	109.0	102.0	101.0	100.0	96.0	89.0	81.0	104.3	114.5	BS 5228-1:2009+A1:2014: Annex C
Concrete mixer truck + truck mounted concrete pump + boom arm	101.0	101.0	105.0	104.0	100.0	98.0	93.0	90.0	105.8	110.0	BS 5228-1:2009+A1:2014: Annex C
Mobile telescopic crane	118.0	109.0	106.0	102.0	105.0	104.0	97.0	89.0	109.4	119.2	BS 5228-1:2009+A1:2014: Annex C
Diesel generator	103.0	100.0	104.0	98.0	97.0	93.0	84.0	75.0	101.7	108.3	BS 5228-1:2009+A1:2014: Annex C
Diesel generator	106.0	99.0	94.0	90.0	87.0	83.0	84.0	77.0	93.5	107.2	BS 5228-1:2009+A1:2014: Annex C
Vibratory roller	118.0	110.0	101.0	100.0	98.0	93.0	87.0	82.0	103.0	118.8	BS 5228-1:2009+A1:2014: Annex C
Excavator mounted rock breaker	119.0	117.0	113.0	117.0	115.0	115.0	112.0	108.0	121.0	124.5	BS 5228-1:2009+A1:2014: Annex C
Tracked semi-mobile crusher	119.0	119.0	116.0	115.0	113.0	111.0	106.0	96.0	118.1	124.3	BS 5228-1:2009+A1:2014: Annex C
Rigid dump truck	114.0	117.0	116.0	116.0	114.0	111.0	104.0	98.0	118.5	122.9	BS 5228-1:2009+A1:2014: Annex C
Tracked mobile drilling rig	105.0	111.0	110.0	112.0	113.0	113.0	112.0	107.0	119.0	120.1	BS 5228-1:2009+A1:2014: Annex C
Forwarder				101.0					101.0	104.2	
Harvester				103.0					103.0	106.2	
Skidder				108.0					108.0	111.2	

The numbers of plant included in the table below represent the number of noise sources included in the noise model and do not represent the number of individual items of plant anticipated to be operating at any one time. For example, in Scenario 5, 24 cranes are included in the noise model, however, in reality this is more likely to be two cranes moving between 12 different work locations, or 4 cranes moving between 6 different work locations.

Modelled Scenario	Construction Activity	Specific Machinery/Activity
1	Construction of New Road section off of R314 to site entrance	Dumper (1 of), Dozer, (1 of), Excavator (1 of) and Lorry (1 of)
1	Construction of New Road section further along existing access track	Dumper (1 of), Dozer, (1 of), Excavator (1 of) and Lorry (1 of)
1	Temporary road widening works along access track	Dumper (1 of), Dozer, (1 of) and Excavator (1 of)
1	Felling (along access track routes to Borrow Pits, Construction Compounds and Substation)	Working across site - Forwarder (4 of), Harvester (4 of) and Skidder (4 of)
1	Road Upgrades and Cabling (to Borrow Pits, Construction Compounds and Substation)	Working across site - Dumper (4 of), Dozer, (4 of) and Excavator (4 of)
1	Construction Compounds (under construction)	Per Construction Compound - Diesel Generator (2 of), Crane (1 of), Wheeled Excavator (1 of) and Lorry (1 of)
1	Borrow Pit (opening and extraction)	Per Borrow Pit – Excavator Rock Breaker (2 of), Drilling Rig (1 of), Rigid Dump Truck (1 of) and Rock Crusher (1 of)
1	Substation (under construction)	Wheeled Excavator (1 of), Crane (1 of) and Lorry (1 of)
1	Lorry movements to Construction Compounds	Per Construction Compound – Lorry (1 of)
2	Borrow Pit (Continuing extraction)	Per Borrow Pit – Excavator Rock Breaker (2 of), Drilling Rig (1 of), Rigid Dump Truck (1 of) and Rock Crusher (1 of)
2	Construction Compound (under operation)	Per Construction Compound - Diesel Generator (2 of) and Wheeled Excavator (1 of)
2	Substation (under construction)	Wheeled Excavator (1 of), Crane (1 of) and Lorry (1 of)
2	Lorry movements to Construction Compounds	Per Construction Compound – Lorry (1 of)
2	Felling (to Turbines 2, 6, 12 and 18)	Working across site - Forwarder (4 of), Harvester (4 of) and Skidder (4 of)
2	Road Upgrades and Cabling (to Turbines 2, 6, 12, 18)	Working across site - Dumper (4 of), Dozer, (4 of) and Excavator (4 of)
2	Hardstanding construction at Turbines 2, 6, 12, 18	Working across site - Dumper (4 of), Roller, (4 of) and Tracked Excavator (4 of)
3	Borrow Pit (Continuing extraction)	Per Borrow Pit – Excavator Rock Breaker (2 of), Drilling Rig (1 of), Rigid Dump Truck (1 of) and Rock Crusher (1 of)
3	Construction Compound (under operation)	Per Construction Compound - Diesel Generator (2 of) and Wheeled Excavator (1 of)
3	Substation (under construction)	Wheeled Excavator (1 of), Crane (1 of) and Lorry (1 of)
3	Lorry movements to Construction Compounds	Per Construction Compound – Lorry (1 of)

Modelled Scenario	Construction Activity	Specific Machinery/Activity
3	Hardstanding construction at Turbines 3, 4, 10, 13, 16, 22	Working across site - Dumper (5 of), Roller, (5 of) and Tracked Excavator (5 of)
3	Felling (to Turbines 3, 4, 10, 13, 16, 22)	Working across site - Forwarder (6 of), Harvester (6 of) and Skidder (6 of)
3	Road Upgrades and Cabling (to Turbines 3, 4, 10, 13, 16, 22)	Working across site - Dumper (6 of), Dozer, (6 of) and Excavator (6 of)
4	Borrow Pit (Continuing extraction)	Per Borrow Pit – Excavator Rock Breaker (2 of), Drilling Rig (1 of), Rigid Dump Truck (1 of) and Rock Crusher (1 of)
4	Construction Compound (under operation)	Per Construction Compound - Diesel Generator (2 of) and Wheeled Excavator (1 of)
4	Substation (under construction)	Wheeled Excavator (1 of), Crane (1 of) and Lorry (1 of)
4	Lorry movements to Construction Compounds	Per Construction Compound – Lorry (1 of)
4	Foundation construction at Turbines 3, 4, 10, 13, 16, and 22	Working across site – Dumper (6 of) and Concrete Pouring (6 of)
5	Construction Compound (under operation)	Per Construction Compound - Diesel Generator (2 of) and Wheeled Excavator (1 of)
5	Lorry movements to Construction Compounds	Per Construction Compound – Lorry (1 of)
5	Turbine Components Delivery and Erection at Turbines 3, 4, 10, 13, 16, and 22	Lorry (1 of) and Crane (12 of, 2x per turbine)
5	Backfilling and Landscaping	Working across site - Dumper (10 of), Dozer, (10 of) and Excavator (10 of)
Night	Construction Compound (under operation)	Per Construction Compound - Diesel Generator (2 of)

Annex C – Noise Sensitive Receptor Results

NSR	ITM Coordinates		Dwelling Status	Scenario					
	Eastings	Northings		1	2	3	4	5	Night
NS01	501398	832178	Dwelling	34	33	36	36	37	16
NSR02	501819	829908	Dwelling	30	28	29	29	28	9
NSR03	502246	832188	Dwelling	34	34	37	38	38	18
NSR04	502850	829722	Dwelling	30	28	28	30	27	10
NSR05	503113	829431	Dwelling	30	27	28	29	26	9
NSR06	503218	829403	Dwelling	30	27	28	29	26	9
NSR07	508401	833437	Dwelling	28	27	28	31	28	10
NSR08	508485	833498	Dwelling	26	25	26	30	27	9
NSR09	508779	833146	Dwelling	32	29	30	31	27	9
NSR10	508865	833567	Dwelling	28	26	27	29	26	8
NSR11	509057	833510	Dwelling	30	28	28	30	26	8
NSR12	509101	833534	Dwelling	30	28	28	30	25	8
NSR13	509151	833578	Dwelling	30	28	28	30	25	8
NSR14	509289	833820	Dwelling	30	28	28	29	24	7
NSR15	509610	837836	Dwelling	60	27	27	51	49	2
NSR16	509677	837868	Dwelling	58	27	27	48	47	2
NSR17	509761	837838	Dwelling	61	26	26	49	50	2
NSR18	509806	837855	Dwelling	62	26	26	50	51	2
NSR19	509818	837768	Dwelling	53	26	26	40	40	2
NSR20	509852	837865	Dwelling	61	26	26	49	50	2
NSR21	509900	837951	Dwelling	57	26	26	45	45	2
NSR22	509999	837918	Dwelling	64	25	25	50	50	1
NSR23	510111	837909	Dwelling	68	25	25	46	46	1
NSR24	510223	837903	Dwelling	66	25	25	43	43	1