

## Chapter 9: Noise and Vibration



# Chapter 9

## Noise and Vibration

### Introduction

**9.1** This chapter presents the findings of the assessment of likely significant effects with respect to noise and vibration associated with the construction, operation and decommissioning of the Proposed Development. The specific objectives of the chapter are to:

- Describe the existing baseline;
- Describe the assessment methodology and significance criteria used in completing the impact assessment;
- Describe the potential effects, including cumulative effects;
- Describe the mitigation measures proposed to address likely significant effects (if required); and
- Assess the residual effects remaining following the implementation of mitigation (if required).

**9.2** This chapter is supported by the following figure and appendices which are references throughout the text:

- **EIA Report Volume 3a: Figures**
  - **Figure 9.1: Noise Assessment Receptors;**
- **EIA Report Volume 4: Appendices**
  - **Appendix 9.1: Environmental Noise Assessment.**

**9.3** Assessment of the operational noise effects accounts for the cumulative effects of the Proposed Development with other nearby wind farms including the operational Fallago Rig Wind Farm. Although the application for the Newlands Hill Wind Farm has not yet been submitted, an indicative cumulative assessment is presented based on preliminary information for that development. Other, more distant wind farms were not considered as they do not make an acoustically relevant contribution to cumulative noise levels (see details in **Appendix 9.1**).

**9.4** For the construction and decommission phase, details of relevant working practices, traffic routes, and proposed working hours are considered, with the assessment of noise and vibration from traffic associated with the construction work based on the assessment presented in **Chapter 10: Access, Traffic & Transport**. Full details of the construction noise assessment are provided in **Appendix 9.1**.

**9.5** Further details and explanation of chapter-specific terminology are provided in **Appendix 9.1**.

### Methodology

#### Effects Scoped Into the Assessment

**9.6** This assessment focusses on the effects of construction, operation and decommissioning of the Proposed Development upon noise-sensitive residential receptors identified during the review of desk-based information and field surveys (the extents of the study areas are set out in the Method of Baseline Characterisation section below).

**9.7** When assessing the effects of construction noise, the temporary nature of the associated works is considered. The main work locations for construction of the proposed turbines would be distant from the nearest noise sensitive residences and would therefore be unlikely to cause significant effects. The construction and use of access tracks may, however, occur at lesser separation distances from residential receptors. Assessment of the temporary effects of construction noise is primarily aimed at understanding the need for dedicated noise management measures and, if so, the types of measures that are required.

**9.8** Once constructed and operating, wind turbines may emit two types of noise. Firstly, aerodynamic noise is a 'broad band' noise, sometimes described as having a characteristic modulation, or 'swish', which is produced by the movement of the rotating blades through the air. Secondly, mechanical noise may emanate from components within the nacelle of a wind turbine. This is a less natural sounding noise which is generally characterised by its tonal content. Traditional sources of mechanical noise comprise gearboxes or generators. Due to the acknowledged lower acceptability of tonal noise in otherwise 'natural' noise settings such as rural areas, modern turbine designs have evolved to minimise mechanical noise radiation from wind turbines. Aerodynamic noise tends to be perceived when the wind speeds are low, although at very low wind speeds the blades do not rotate or rotate very slowly and so, at these wind speeds, Negligible aerodynamic noise is generated. In higher winds, aerodynamic noise is generally masked by the normal sound of wind blowing through trees and around buildings. The level of this natural 'masking' noise relative to the level of wind turbine noise determines the subjective audibility of the Proposed Development. The relationship between wind turbine noise and the naturally occurring masking noise at residential dwellings located around the Site will therefore generally form the basis of the assessment of the levels of noise against accepted standards.

**9.9** On the basis of the above, the following effects have been assessed in full:

- The potential effect of noise and vibration from activities onsite during the construction of the Proposed Development;
- Noise effects of offsite and onsite construction traffic, for the Proposed Development (including cumulative traffic if relevant);
- The potential effect of noise during operation of the Proposed Development wind turbines including cumulative noise effects with the operational Fallago Rig Wind Farm and the Newlands Hill Wind Farm (based on indicative information); and
- Decommissioning effects.

### Effects Scoped Out of the Assessment

**9.10** The following effects have been 'scoped out' of detailed assessment:

- The results of previous research (set out in **Annex A of Appendix 9.1**) have demonstrated that low frequency noise resulting from the operation of wind turbines is imperceptible at typical separation distances. Therefore, these effects during operation do not warrant detailed assessment and have not been considered further as part of this assessment.
- Noise associated with routine maintenance visits and operational traffic is likely to be Negligible and therefore was scoped out of the noise assessment;
- Cumulative onsite construction effects were scoped out given that the construction works associated with the nearest proposed wind farms will be at a large distance from the nearest residential dwellings;
- No onshore wind farm construction developments or other potentially significant traffic generating developments were identified in the vicinity of the Proposed Development, that should be considered as part of the cumulative assessment. Therefore, cumulative construction activity and construction traffic have been scoped out of the assessment.
- It is recognised that ground-borne vibration resulting from the operation of wind farms is imperceptible at typical separation distances. Therefore, vibration produced during the operation of the Proposed Development is scoped out the assessment.
- Other, more distant wind farms beyond 5 kilometres (km) from the Proposed Development were not considered in the operational cumulative analysis as they represent a Negligible contribution to predicted noise levels;
- Effects associated with decommissioning will be similar to construction effects and are scoped out of the assessment, as this would be covered by a future method statement to be agreed with relevant consultees; and
- The proposed substation and battery storage areas will include electrical plant such as inverters and transformers which will generate noise during operation. However due to the separation distance of more than 4 km from the nearest residential receptors, operational noise from these sources is likely to have a Negligible impact therefore this was scoped out of the assessment.

## Legislation, Policy and Guidance

**9.11** This assessment is carried out in accordance with the principles contained within the following legislation, policy and guidance:

- Control of Pollution Act (CoPA) UK Government (1974);
- Scottish National Planning Framework 4. Scottish Government (2023);
- Planning Advice Note PAN1/2011, Planning & Noise. Scottish Government (2011);
- Scottish Government’s Online Renewables Planning Advice on Onshore wind turbines. Scottish Government (2014);
- Onshore wind - policy statement 2022. Scottish Government (2022);
- The Assessment and Rating of Noise from Wind Farms (ETSU-R-97). The Working Group on Noise from Wind Turbines (1997);
- A Good Practice Guide to the Application of ETSU-R-97 for the Assessment and Rating of Wind Turbine Noise (IOA GPG). Institute of Acoustics (2013);
- British Standard BS 5228 ‘Noise control on construction and open sites’, Parts 1 & 2. British Standards Institution (2014);
- Calculation of Road Traffic Noise (CRTN). Department of Transport (1988); and
- Design Manual for Roads and Bridges (DMRB). Transport Scotland (2020).

**9.12** A full discussion of the above legislation and guidance is included in **Appendix 9.1**.

## Consultation

**9.13** In undertaking the assessment, consideration has been given to the Scoping responses and other consultation which has been undertaken as detailed in **Table 9.1**.

**Table 9.1: Consultation responses**

| Consultee and Date                                   | Scoping/Other Consultation | Issue Raised  | Response/Action Taken   |
|--|----------------------------|---|---|
| East Lothian Council – 9 <sup>th</sup> April 2022    | Scoping                    | <p>“It is recommended by the Scottish Ministers that the final list of receptors in respect of noise assessment should be agreed following discussion between the Company, East Lothian Council and Scottish Borders Council.</p> <p>The noise assessment should be carried out in line with relevant legislation and standards as detailed in chapter 9 of the Scoping Report. The noise assessment report should be formatted as per Table 6.1 of the IOA “A Good Practice Guide to the Application of ETSU-R-97 for the Assessment and Rating of Wind Turbine Noise”.”</p> | <p>Letter issued to Scottish Borders Council (SBC) and East Lothian Council (ELC) on 27<sup>th</sup> April 2022 outlining the proposed measurement and assessment locations identified within the study area surrounding the Proposed Development. Responses received from both local authorities and agreement reached.</p> <ul style="list-style-type: none"> <li>- ELC agreement on 30/06/2022</li> <li>- SBC agreement on 08/06/2022</li> </ul> <p>Noise assessment methodology in line with ETSU-R-97 Good Practice Guidance presented in <b>Appendix 9.1</b>.</p> |
| Scottish Borders Council – 8 <sup>th</sup> June 2022 | Post-Scoping consultation  | <p>Prior to undertaking the background surveys, a summary of the likely proposed monitoring locations was forwarded to the Environmental Health Department of SBC on 27<sup>th</sup> April 2022. One of the two proposed survey locations (Byrecleugh Farm) was located in the SBC area.</p>  | <p>A joint site visit to Byrecleugh Farm with SBC Environmental Health Officer and SBC’s appointed noise consultant was undertaken on 17<sup>th</sup> August 2022 and the final survey location at 2 Byrecleugh Farm (the neighbouring property to Byrecleugh Farm) was agreed.</p>   |

| Consultee and Date                                | Scoping/Other Consultation | Issue Raised   | Response/Action Taken   |
|---|----------------------------|--|---|
|   |                            | <p>Response from the SBC was received on 8<sup>th</sup> June 2022. Agreement on the proposed survey locations was confirmed and a joint site visit was recommended to seek agreement on precise positioning of the equipment at Byrecleugh Farm.</p> <p>SBC outlined in response that care should be taken to avoid the possibility of elevated background noise levels due to the possible influence of turbine noise from Fallago Rig Wind Farm.</p> | <p>Data within wind direction sectors where the two measurement properties lay downwind of the Fallago Rig Wind Farm were excluded from the analysis, to minimise the potential influence from the existing turbines on the noise measurements.</p>   |
| East Lothian Council – 30 <sup>th</sup> June 2022 | Post-Scoping consultation  | <p>Prior to undertaking the background surveys, a summary of the likely proposed monitoring locations was forwarded to the Environmental Health Department of ELC on 27<sup>th</sup> April 2022. One of the two proposed survey locations (Killpallet Cottage) was located in the ELC area.</p> <p>ELC requested photos of the chosen installation position at the East Lothian receptor.</p>  | <p>Proposed methodology and survey location agreed by ELC Environmental Health Officer on 30<sup>th</sup> June 2022.</p> <p>Installation location photos were provided to ELC on 10<sup>th</sup> August 2022 of the logger at Killpallet Cottage and no adverse comments were received.</p> |

### Committed Design Considerations

#### Project Design Assumptions, Good Practice Measures and Embedded Design

**9.14** The turbine layout of the Proposed Development has been iteratively developed to avoid significant operational noise effects, based on a representative candidate turbine model, whilst maintaining, as far as possible, the generation capacity of the Proposed Development (in addition to other design considerations). This included consideration of the cumulative effects of the neighbouring Fallago Rig Wind Farm.

**9.15** Specifically, the process involved the calculation of noise emission levels for the Scoping layout, and layout design advice was provided on this basis to the design team to demonstrate compliance of the design freeze layout, based on the derived ETSU-R-97 noise limits described below. Cumulative effects from the operation of the Fallago Rig wind farm were also taken into account. The final turbine model to be installed for the Proposed Development will be such that the specific derived noise limits can be achieved in practice.

**9.16** To minimise the potential effects of construction noise, the following good practice measures are proposed:

- Those activities that may give rise to audible noise at the surrounding properties and heavy goods vehicle (HGV) deliveries to the Site will be limited to the hours of 07:00 to 19:00 Monday to Friday and 07:00 to 12:00 on Saturdays;
- Turbine deliveries would only take place outside these times with the prior consent of the SBC and Police Scotland. Those activities that are unlikely to give rise to noise audible at the Site's boundary will continue outside of the stated hours.
- All construction activities will adhere to good practice as set out in BS 5228;
- All equipment will be maintained in good working order and any associated noise attenuation such as engine casing and exhaust silencers shall remain fitted at all times;
- Where flexibility exists, activities will be separated from residential neighbours by the maximum possible distances;
- A Site management regime will be developed to control the movement of vehicles to and from the Site;

- Construction plant capable of generating significant noise and vibration levels will be operated in a manner to restrict the duration of the higher magnitude levels;
- If blasting is used at the proposed borrow pits:
  - blasting should take place under controlled conditions with the agreement of the relevant local authority (SBC or ELC);
  - good practices during the setting and detonation of charge should be followed, in order to control air overpressure, in line with guidance set out in PAN50 (Scottish Government, 1996) and British Standard BS 5228-2; and
  - vibration levels at the nearest sensitive properties are best controlled through onsite testing processes, with progressively increased charges, carried out in consultation with the relevant local authority.

**9.17** The above measures will be implemented as part of the Construction Environmental Management Plan (CEMP) which will be secured through a planning condition and include measures to control construction noise as set out above. An Outline CEMP is presented in **Appendix 3.1**.

### Method of Baseline Characterisation

#### Extent of the Study Area

**9.18** The study area for the assessment of operational noise includes the noise-sensitive residential properties nearest to the proposed location of the wind turbines. The locations considered are listed in **Table 9.2** and shown on the map of **Figure 9.1**.

**9.19** In addition, properties slightly further away were initially considered as part of the cumulative operational noise analysis and it was determined that either total levels were low (outside of the  $L_{A90}$  35 dB cumulative noise prediction contour) or that the contribution from the Proposed Development in terms of operational noise was acoustically Negligible. For example, at the residential location denoted as West Hopes (approximate easting and northing 355772 / 662722), the Proposed Development was found to be acoustically Negligible, therefore this property was not considered further in the assessment.

**Table 9.2: Noise assessment properties in the vicinity of the Proposed Development**

| Property           | Easting | Northing | Approximate Distance to Closest Turbine (m) | Closest Turbine (ID) | Representative baseline survey location |
|--------------------|---------|----------|---|----------------------|---|
| Byrecleugh Farm    | 362821  | 658010   | 1531  | 15                   | 2 Byrecleugh Farm                       |
| Killpallet Cottage | 362880  | 660551   | 1163  | 3                    | Killpallet Cottage                      |
| Faseny Cottage     | 360968  | 663362   | 3191  | 2                    | N/A: Simplified assessment undertaken   |

**9.20** The assessment of construction noise has considered the same residential properties as the operational assessment, as well as dwellings located alongside the proposed routes for access to the Site such as public roads and at the Site's access route.

#### Desk Study

**9.21** The following data sources have informed the assessment:

- Ordnance Survey information concerning the locations of all noise sensitive receptors in the vicinity of the Site;
- British Standard (BS-5228) reference material for the sound emission characteristics of various construction activities associated with the Proposed Development;
- Manufacturer data for the Vestas V172 7.2 megawatts (MW) candidate wind turbine as set out in **Annex B of Appendix 9.1**;

- Environmental Statement (Fallago Rig 2 Wind Farm ES Volume 2, December 2015) and deemed planning permission conditions (9<sup>th</sup> November 2010) for the Fallago Rig wind farm considered in the cumulative assessment (see **Annex B of Appendix 9.1**); and
- Likely wind farm layout and representative turbine model for the Newlands Hill Wind Farm as indicated by the developer of that scheme.

## Field Survey

**9.22** The following field surveys were carried out to inform the assessment:

- A background noise survey at two nearby noise-sensitive receptor locations was completed (**Figure 9.1**), with measurement positions agreed in consultation with SBC and ELC (see **Table 9.1**). The baseline survey took place between 4<sup>th</sup> August 2022 and 12<sup>th</sup> September 2022.

**9.23** Full details of the survey locations and analysis of background noise are presented in **Appendix 9.1**. The results of the baseline background noise surveys are considered to be representative for the purposes of an ETSU-R-97 assessment and consistent with ETSU-R-97 and IOA GPG requirements (see **Sections 4.2-4.3, Annex C and Annex D of Appendix 9.1**).

## Criteria for the Assessment of Effects

### Criteria for Assessing Sensitivity of Receptors

**9.24** Sensitivity has been determined on the basis that all noise sensitive receptors considered in this chapter are residential and therefore of high sensitivity.

### Criteria for Assessing Magnitude of Change

**9.25** Assessment of construction noise has been completed in accordance with BS 5228-1; predicting construction noise levels using reference emissions data for typical construction plant and activities, at fixed locations (e.g. the wind turbines, Site compounds or substations etc.) as well as haul routes within the Site. The BS 5228 calculated levels are then compared with the construction noise criteria. Assessment of construction related traffic on public roads has been completed using the methodology provided by CRTN and the guidance of the DMRB. For low flow conditions on public roads, the assessment has been completed in line with BS 5228 methodology. The relevant magnitude criteria are set out in **Section 3.3 of Appendix 9.1**, with an impact scale from Negligible through Minor to Moderate and Major, where **Moderate** and **Major** are significant in EIA terms. The duration and nature of the construction activities was also taken into account.

**9.26** Operational wind turbine noise has been assessed using the methodology contained in ETSU-R-97, which considers total cumulative noise from all wind turbines at each noise sensitive receptor location and compares these to noise limits derived from baseline background noise levels. Predicted noise levels are provided following best practice guidance in the IOA GPG. For operational wind turbine noise, the assessment in **Appendix 9.1** determines whether noise levels (including cumulative contributions from other wind farms) are below or above the ETSU-R-97 criteria.

### Criteria for Assessing Significance

**9.27** For construction noise, the magnitude of impacts translate directly to their significance, given all receptors are of high sensitivity, with a scale of significance from Negligible, through Minor to Moderate and Major. **Major** and **Moderate** effects are considered Significant in the context of the Environmental Impact Assessment (EIA) under The Electricity Works (Environmental Impact Assessment) (Scotland) Regulations 2017 (as amended) - the EIA Regulations.

**9.28** For operational wind turbine noise, acceptable limits for wind turbine noise are clearly defined in ETSU-R-97; accordingly, predicted operational noise levels which are below the ETSU-R-97 criteria are considered Not Significant in the context of the EIA Regulations. If predicted noise levels are above the ETSU-R-97 criteria, effects are considered to be Significant in the context of the EIA Regulations.

### Limitations and Assumptions

**9.29** For noise and vibration from construction and decommission, predicted noise levels are based on assuming standard machinery and equipment are used and that these are operated in the way intended by their manufacturers. It is also assumed that these items of equipment are all used at the closest point to receptor locations, which is considered to be a precautionary assumption, with noise/vibration levels lower than predicted for much of the construction period.

**9.30** For operational wind turbine noise, the assessment is based upon a candidate wind turbine (the Vestas V172 7.2 MW model). This candidate was selected as typical (on a robust basis) of the type and size of turbine that would be used for the Proposed Development, therefore likely to result in noise immission levels similar to those presented.

**9.31** Whilst some assumptions have been identified, it is considered that there is sufficient information to enable an informed decision to be taken in relation to the identification and assessment of likely significant noise and vibration effects.

### Baseline Conditions

**9.32** The Proposed Development is located in an area of low population density. The noise environment in the surrounding area is generally characterised by 'natural' sources, such as wind disturbed vegetation, birds, farm animals. Other sources of noise observed include watercourses at Byreclough Farm and a diesel generator operating continuously at Killpallet Cottage. Noise from the operational Fallago Rig Wind Farm during survey site visits at the measurement properties was not observed.

### Existing Baseline Conditions

**9.33** A total of two noise monitoring locations were selected as being representative of the background noise environment for the nearest dwellings to the Proposed Development. The measurement locations are listed in **Table 2 of Appendix 9.1**, referenced in **Table 9.2** above and also shown on the plan in **Figure 9.1**. Full details of the measurement positions, as well as details of equipment used are provided in **Annex C of Appendix 9.1**. The influence on the survey of localised sources such as watercourse noise or the diesel generator at Killpallet Cottage were minimised. Survey data were analysed in accordance with the methodology in ETSU-R-97 and guidance on good practice (IOA GPG) (and presented in **Annex D and Annex E of Appendix 9.1**) to determine typical background noise levels and how these varied with wind speed conditions on the Proposed Development.

**9.34** ETSU-R-97 noise limits were derived for both day-time and night-time periods, applicable to two of the assessment locations based on the survey data. A simplified ETSU-R-97 assessment was applicable to the third assessment location (Faseny Cottage). A full description of the ETSU-R-97 assessment methodology and derivation of the ETSU-R-97 noise limits is provided in **Section 3 of Appendix 9.1**. Tables of the noise limits applicable to the assessment locations are shown in **Table 4 and Table 5 of Appendix 9.1** for day-time and night-time periods respectively.

### Future Baseline in the Absence of the Proposed Development

**9.35** In the absence of the Proposed Development, environmental noise levels in the area are likely to remain largely similar to those currently experienced in the short term, with the exception of any major developments (including Wind Farms) which would affect these levels.

**9.36 Chapter 12: Other Issues** provides details of the climate change projections in the east of Scotland for the 2060s, when the operational period of the Proposed Development is likely to end. In summary, the projections highlight that in the 2060s, summer and winter temperatures are likely to be greater than the current baseline (greater for summer), with winter rainfall increasing and summer rainfall decreasing.

**9.37** The consequences of the projected climate change scenario are unlikely to substantially affect baseline noise conditions for the purpose of the assessment in this chapter, given that periods of rainfall are excluded and the variation with wind speed was taken into account, in line with requirements of ETSU-R-97 and current good practice.

### Assessment of Likely Significant Effects

**9.38** The assessment of effects is based on the project description as outlined in **Chapter 3: Development Description** and the embedded mitigation by design described in **Chapter 2: Site Selection and Design Strategy**. An Outline Construction Environmental Management (CEMP) has also been prepared and is included in **Appendix 3.1**.

### Potential Construction Effects

**9.39** Predicted noise levels at the closest noise-sensitive receptors for each of the key activities during construction of the Proposed Development are presented in **Table 6 of Appendix 9.1**. Most of the proposed construction activities would generally occur at large distances from the residential properties considered, such that the resulting predicted noise levels would not exceed 54 dB  $L_{Aeq}$ . With reference to the construction noise criteria set out in **Table 1 of Appendix 9.1**, the noise impacts from these activities would be considered temporary and Negligible.

**9.40** Activities associated with the upgrade of the existing Fallago Rig access road will occur at closer distances at times, resulting in noise levels of 64 to 89 dB  $L_{Aeq}$  predicted on a worst-case basis. These noise levels are however likely to represent those which could occur for a short-term period of a few hours at most. Noise levels would quickly diminish as road upgrading progresses, quickly moving the activity further from properties along the existing access track such as Byrecleugh Keepers House property. Considering the short duration of the work, along with the likelihood of the levels being lower in practice and the construction noise criteria, these activities are predicted to result in a temporary Minor impact magnitude.

**9.41** Activities associated with the construction of the new access track to turbines (2, 3 and 5) would occur at distances of approximately 210 metres (m) to 510 m of the nearest property (Byrecleugh Farm), resulting in noise levels of up to 64 dB  $L_{Aeq}$  predicted on a worst-case basis. Within this distance these noise levels are however likely to represent those which could occur for a short-term period of a no more than four weeks at most. Noise levels would also diminish as track construction progresses, quickly moving the activity further from the nearest property. Considering the short duration of the work, the construction noise criteria and along with the likelihood of the levels being lower in practice, these activities are predicted to result in a Negligible impact magnitude.

**9.42** In addition to onsite activities, construction-related traffic passing to and from the Proposed Development would also represent a potential source of noise to surrounding properties.

**9.43** Construction traffic movements on existing offsite local surrounding roads represents a potential source of noise effects to surrounding residential properties. On the basis of the projected worst-case changes in traffic flow set out in **Chapter 10** (Month 11), and using the methodology set out in CRTN, **Appendix 9.1** predicts a maximum potential increase of 0.2 dB for properties along the A68 North of Lauder. This represents a Negligible effect according to the CRTN criteria.

**9.44** For locations adjoining the B6456 at Westruther, the relative increase in traffic during some phases of the construction would be larger; however, the overall traffic volumes remain low (even based on worst-case assumptions) such that overall noise levels at properties along these roads would not exceed 65 dB  $L_{Aeq}$ , corresponding to a Minor impact magnitude at most.

**9.45** Based on the prediction methodology in BS 5288, the worst-case predicted noise level due to heavy vehicles moving on the D52 site access road, at the closest dwelling (Byrecleugh Keepers House) is of 56 dB  $L_{Aeq}$ . This assumes 6 HGV per hour travelling at 20 mph as a worst case. This is below the level of 65 dB  $L_{Aeq}$  which represents a Minor impact magnitude. Further details of these predictions are set out within **Appendix 9.1**.

**9.46** Overall, the noise effects from construction traffic will be Minor at most. These effects are not significant in the context of the EIA Regulations.

**9.47** If blasting is employed to quarry the proposed borrow pits, this is best controlled through a monitoring programme and following the use of good practice during the setting and detonation of charges, as set out as part of the embedded mitigation discussed earlier in this Chapter.

**9.48** The construction activities are therefore predicted to result in temporary Negligible to Minor impacts at most on highly sensitive receptors, which equate to worst-case temporary Minor effects, which are Not Significant in EIA terms.

### Potential Operational Effects

**9.49** The exact model of wind turbine to be used for the Proposed Development will be the result of a future tendering process and therefore a representative turbine model has been assumed for this noise assessment. This operational noise assessment is based upon the noise specifications of the Vestas V172 7.2 MW wind turbine model, with turbines having a hub height of 134 m and a maximum blade tip height of 220 m. The modelled layout is specified in **Annex B of Appendix 9.1** and illustrated on **Figure 9.1**.

**9.50** The candidate turbines are variable-speed, pitch regulated machines: as a result, the sound power output of the turbine varies considerably with wind speed, being quieter at the lower wind speeds when the blades are rotating more slowly. The candidate wind turbines have been modelled assuming all operate in their standard and noisiest mode except for selective use of one reduced noise operational mode ('Mode SO1') for four of the turbines (8, 11, 13, 15), to demonstrate the candidate turbines can meet the ETSU-R-97 proposed noise limit of 38 dB at Byrecleugh Farm.

**9.51** Predictions of operational wind turbine noise for the Proposed Development in isolation at the two assessment locations are detailed in **Table 9 of Appendix 9.1**. These vary between 25-28 dB(A) at low wind speeds and 34-36 dB(A) at high wind speeds.

**9.52** ETSU-R-97 also requires consideration of cumulative noise levels. The Proposed Development noise levels were added to predictions from the adjacent operational Fallago Rig wind farm, including an additional uplift of +5 dB applied to noise emissions for the installed turbine model, on a precautionary basis, in line with relevant good practice. The resulting cumulative predictions are set out in **Table 10 in Appendix 9.1**. An indicative assessment of potential cumulative impacts from the Newlands Hill Wind Farm, based on preliminary information, was also determined to result in Negligible effects (see cumulative section below).

**9.53** At Faseny Cottage, the predicted maximum noise level (on this conservative basis) is 35dB(A) and therefore complies with the simplified criterion of ETSU-R-97. At the other two properties, the cumulative predictions are compared in **Section 5.7 of Appendix 9.1** with the relevant noise limits determined in line with ETSU-R-97. The derived ETSU-R-97 limits are based on a fixed lower limit of 38 dB(A) for day-time period: the choice of this limit in the range of 35 to 40 dB(A) is justified in **Section 5.7 of Appendix 9.1** on the basis of the relevant factors set out in ETSU-R-97: the number of noise-affected properties, the likely duration and level of exposure and the potential power generating capability of the wind farm.

**9.54** The comparisons undertaken confirm that the predicted (cumulative) wind turbine noise levels are compliant with the relevant noise limits at all assessment locations, as outlined in **Table 11 and Table 12 of Appendix 9.1**. Therefore, wind turbine noise from the operational Proposed Development can remain within the ETSU-R-97 noise limits, and the operational effect of the Proposed Development is therefore considered to be **Not Significant** in EIA terms. The potential implications of the Newlands Hill Wind Farm are considered below.

## Potential Cumulative Effects

### Potential Cumulative Construction Effects

**9.55** A review of the SBC online planning portal<sup>1</sup> and the Scottish Government's Energy Consents Unit portal<sup>2</sup> was undertaken within **Appendix 10.1: Transport Assessment** to identify any consented developments within the vicinity of the Proposed Development which would generate significant traffic and should be considered as part of any cumulative construction traffic assessment.

**9.56** No onshore construction of wind farm developments or other potentially significant traffic generating developments were identified in the vicinity of the Proposed Development, that should be considered as part of the cumulative traffic assessment. On this basis, no further cumulative traffic noise assessment is required.

### Potential Cumulative Operational Effects

**9.57** **Table 10 in Appendix 9.1** includes predicted noise levels from the operational Fallago Rig Wind Farm with the Proposed Development. **Annex B of Appendix 9.1** details the robust assumptions made in relation to acoustic emissions from the cumulative Fallago Rig Wind Farm, in line with the good practice guidance in the IOA GPG. Other consented and operational Wind Farms greater than 5 km from the Proposed Development were scoped out of the assessment, as their contributions to cumulative noise levels at the nearest receptors are Negligible.

**9.58** As set out above, predicted noise levels from the Proposed Development operating together with the Fallago Rig Wind Farm are set out in **Table 10 of Appendix 9.1**. These cumulative predictions are then compared in **Section 5.7 of Appendix**

<sup>1</sup> <https://eplanning.scotborders.gov.uk/online-applications/search.do?action=simple&searchType=Application>

<sup>2</sup> <https://www.energyconsents.scot/ApplicationSearch.aspx?T=1>

9.1 with the relevant noise limits determined in line with ETSU-R-97. The comparison undertaken confirms that predicted wind turbine noise levels are compliant with the derived noise limits at all assessment locations.

9.59 Therefore, wind turbine noise from the Proposed Development and the adjacent Fallago Rig Wind Farm, can also remain within the ETSU-R-97 noise limits, and the cumulative effect is therefore considered to be **Not Significant** in EIA terms.

9.60 Specific noise limits for the Proposed Development at the two nearest assessment properties are set out in **Table 13 and Table 14 of Appendix 9.1**; these were determined such that compliance of the Proposed Development with these noise limits would maintain the conclusion of the cumulative assessment and result in cumulative levels of wind turbine noise which do not exceed the derived ETSU-R-97 noise criteria. Satisfactory control of cumulative wind turbine noise immission levels will be achieved through enforcement of the individual limits for each of the individual wind farms.

9.61 Although the Newlands Hill Wind Farm is still at Scoping stage, with limited details available, **section 5.8 of Appendix 9.1** presents an assessment of potential cumulative operational noise implications of the proposal, based on a likely finalised wind turbine layout and a representative wind turbine model (as indicated by the developer of Newlands Hill Wind Farm). This assessment shows that the predicted noise levels from Newlands Hill Wind Farm at properties closest to the Proposed Development (Byreclough Farm and Killpallet Cottage) are considered Negligible. In addition, the predicted contribution from the Proposed Development at Faseny Cottage, which is relatively close to Newlands Hill Wind Farm, is also Negligible. This therefore indicates that the Newlands Hill Wind Farm is considered unlikely to lead to significant cumulative operational effects. This can be confirmed through a cumulative operational noise assessment which would accompany a subsequent planning application for the Newlands Hill Wind Farm, accounting for the Proposed Development.

9.62 In conclusion, wind turbine noise from the Proposed Development, when operated together with adjacent wind farms, can also remain within the ETSU-R-97 noise limits, and the cumulative effect is therefore considered to be **Not Significant** in EIA terms.

## Decommissioning

9.63 Decommissioning effects are considered likely to be of a similar (or less) extent, duration and significance as construction effects and result in equivalent (or less) noise than during construction of the Proposed Development. However, given the uncertainty around the future conditions at the Site, and exact methods that will be employed at the time, a detailed assessment has not been undertaken of the effects associated with decommissioning of the Proposed Development. Notwithstanding this uncertainty, on the basis that the construction phase has been considered to have worst-case Minor noise impacts, decommissioning will, in the worst case, also have Minor noise impacts. Therefore, decommissioning activity is considered to be **Not Significant** in EIA terms.

## Mitigation

### Mitigation During Construction

9.64 No additional mitigation measures are proposed.

### Mitigation During Operation

9.65 No additional mitigation measures are proposed.

## Assessment of Residual Effects

### Residual Construction Effects

9.66 The construction activities will result in temporary Minor effects at most, which are **Not Significant** in EIA terms. The construction traffic activities are predicted to result in a Minor effect at most, which is **Not Significant** in EIA terms.

### Residual Operational Effects

9.67 At some locations under some wind conditions and for a certain proportion of the time, the wind farm noise may be audible; however, operational noise immission levels comply with the criteria of the ETSU-R-97 guidance commended by planning policy for the assessment of wind farm noise. The effect is therefore considered to be **Not Significant** in EIA terms.

### Residual Cumulative Effects

#### Residual Cumulative Construction Effects

9.68 The construction traffic activities are predicted to result in a Minor effect at most, which is **Not Significant** in EIA terms.

9.69 The construction activities are predicted to result in a temporary Minor effect at most, which is **Not Significant** in EIA terms.

#### Residual Cumulative Operational Effects

9.70 Wind turbine noise from the Proposed Development, when operated together with adjacent wind farms, can also remain within the ETSU-R-97 noise limits, and the cumulative effect is therefore considered to be **Not Significant** in EIA terms.

### Monitoring

9.71 It is proposed that if consent is granted for the Proposed Development, conditions attached to the consent will include the requirement that, in the event of a noise complaint, noise levels resulting from the operation of the wind turbines on the Site are measured to demonstrate compliance with the specific conditioned noise limits (based on **Table 13 and Table 14 in Appendix 9.1**). Such monitoring will be done in full accordance with ETSU-R-97 and include penalties for characteristics of the noise (if present). The final turbine model to be installed for the Proposed Development would therefore be chosen such that these noise limits can be achieved in practice.

### Summary

9.72 Construction noise has been assessed by a desk-based study of a potential construction programme and by assuming the Proposed Development is constructed using standard good practice methods. Noise levels have been calculated for two receiver locations closest to the areas of construction work and compared with guideline and baseline values. Noise associated with construction traffic has been considered based on relative changes or absolute traffic levels. It is concluded that noise generated through construction and decommissioning activities would have a Minor effect at most, which is **Not Significant**.

9.73 Operational wind turbine noise levels have been assessed using the ETSU-R-97 guidelines and relevant good practice, on the basis of new baseline survey data and site-specific considerations. This included consideration of relevant cumulative sites comprising the operational Fallago Rig wind farm and Scoping stage Newlands Hill wind farm. It was concluded that turbines of the type and size which would be installed can operate within the derived ETSU-R-97 limits outlined in **Table 4 and Table 5 of Appendix 9.1**, even when including consideration of noise from cumulative sites. Operational wind turbine noise levels are therefore considered to be **Not Significant**.

9.74 No significant residual effects are predicted from the Proposed Development.

### Glossary/Abbreviations

Table 9.3: Glossary and abbreviations

| Term in Full | Abbreviation                      | Meaning/Description   |
|--------------|-----------------------------------|---|
| CRTN         | Calculation of Road Traffic Noise | Reference UK guidance for the calculation of noise from road traffic. |
| dB           | Decibel                           | The unit normally employed to measure the magnitude of sound.         |

| Term in Full     | Abbreviation                                       | Meaning/Description   |
|------------------|--|---|
| DMRB             | Design Manual for Roads and Bridges                | Reference UK guidance for the assessment of traffic noise and vibration impacts.  |
| ELC              | East Lothian Council                               | East Lothian Council  |
| SBC              | Scottish Borders Council                           | Scottish Borders Council  |
| ETSU-R-97        | The Assessment and Rating of Noise from Wind Farms | Reference UK guidance for the assessment of operational noise from wind farms.  |
| HGV              | Heavy Goods Vehicle                                | A large vehicle such as a lorry.  |
| IOA GPG          | Institute of Acoustics Good Practice Guide         | Reference to the Good Practice Guide to the Application of ETSU-R-97 for the Assessment and Rating of Wind Turbine Noise published in 2013. |
| L <sub>Aeq</sub> | Equivalent continuous noise level.                 | The abbreviation of the A-weighted equivalent continuous sound pressure level   |