

9. Chapter 9 Noise

9.1 Introduction

9.1.1 This chapter considers the likely significant effects of noise associated with the construction, operation and decommissioning of the Proposed Development. The specific objectives of the chapter are to:

- describe the noise baseline;
- describe the assessment methodology and significance criteria used in completing the assessment;
- describe the potential effects, including cumulative effects;
- describe the mitigation measures proposed to address likely significant effects; and
- assess the residual effects remaining following the implementation of mitigation.

9.1.2 This chapter is supported by the following figures and technical appendices:

- Volume 3a: Figures:
 - **Figure 9.1: Construction Study Areas and Baseline Monitoring Locations;**
 - **Figure 9.2: Residential Receptors**
 - **Figure 9.3: Predicted Wind Turbine Noise Levels from the Proposed Development at 4 m Height; and**
 - **Figure 9.4: Predicted Cumulative Wind Turbine Noise Levels at 4 m Height.**
- Volume 4: Technical Appendices:
 - **Technical Appendix 9.1: Assessment Methodology;**
 - **Technical Appendix 9.2: Baseline Noise Survey;**
 - **Technical Appendix 9.3: Noise Calculations and Predictions; and**
 - **Technical Appendix 9.4: Noise Curtailment Strategy.**

9.1.3 Figures and technical appendices are referenced in the text where relevant.

9.2 Consultation

9.2.1 Consultation undertaken prior to and during the EIA Scoping stage has been described in the EIA Scoping Report and the Gatecheck 1 Report. The Gatecheck 1 Report summarises relevant consultee responses to the EIA Scoping Report and confirms how those responses would be addressed as part of the EIA process.

9.2.2 Further direct consultation was undertaken with East Ayrshire Council (EAC), through its acoustics adviser (ACCON UK Ltd), following submission of the Scoping Report. Consultation with relevant bodies for this technical topic, following Scoping report and prior to the submission of the Gatecheck 1 Report is summarised in **Table 9-1**.



Table 9-1: Summary of Post-Scoping Consultation

Consultation Details	Consultee Comments	Applicant Response
ACCON UK Ltd, on behalf of East Ayrshire Council	ACCON confirmed its general agreement with the proposed noise assessment methodology set out in the consultation letter dated 23 March 2026, reference 3842_L01_EXT1, subject to the specific comments summarised in the following rows.	The assessment has generally followed the methodology set out in the consultation letter. The letter also confirmed that any updated guidance published during preparation of the application would be reviewed and incorporated where relevant. Following publication of <i>Assessment and Rating of Wind Turbine Noise</i> (ARWTN), the assessment methodology has therefore been updated as appropriate, with the resulting changes identified and explained in this chapter and the supporting technical appendices.
ACCON UK Ltd, on behalf of East Ayrshire Council	For monitoring position M2, where either Stonebriggs or Boghead was proposed, Stonebriggs was considered likely to be affected by noise from a nearby watercourse. Boghead may therefore be the preferable location. Alternatively, if Stonebriggs was used, careful consideration would be required as to whether and how the data could be used as a proxy for nearby locations. ACCON also presumed that Nether Guelt had been selected because it was further from the watercourse than other nearby properties.	Noise monitoring was undertaken at both Stonebriggs and Boghead, as well as at Nether Guelt, Springhill Farm and Whiteholm. The suitability and representativeness of the data from each location are considered in Technical Appendix 9.2 .
ACCON UK Ltd, on behalf of East Ayrshire Council	The statement that no operational, consented or live submitted wind farm applications had been identified as requiring cumulative noise consideration appeared inconsistent with the subsequent indication that Lethans Wind Farm and Lethans Extension Wind Farm might need to be considered. As both developments were consented, their potential cumulative operational noise effects should be considered.	At the time of consultation, initial predictions indicated that Lethans Wind Farm and Lethans Extension Wind Farm would make negligible contributions at the identified noise-sensitive receptors within the initially defined Study Area. It was, however, recognised that they could become relevant if the Study Area were extended. Final designs confirm that both of these developments contribute negligibly to cumulative noise levels, including combined, and have therefore not been included.



9.3 Assessment Methodology and Significance Criteria

General Approach

- 9.3.1 The construction noise assessment is undertaken in accordance with BS 5228-1:2009+A1:2014 Code of practice for noise and vibration control on construction and open sites – Part 1: Noise.
- 9.3.2 Construction traffic noise is assessed in accordance with a combination of BS 5228, *Calculation of Road Traffic Noise* (CRTN) and the *Design Manual for Roads and Bridges* (DMRB), as appropriate.
- 9.3.3 The operational wind turbine noise assessment is undertaken in accordance with *Assessment and rating of wind turbine noise* (ARWTN), published by the Department for Energy Security and Net Zero (DESNZ) in June 2026 and superseding the previous wind turbine noise assessment guidance ETSU-R-97 *The assessment and rating of noise from wind farms*.
- 9.3.4 ARWTN does not prescribe a detailed methodology for the prediction of wind turbine noise or provide comprehensive guidance on all aspects of good practice. The assessment is therefore also undertaken with reference to the Institute of Acoustics (IOA) *A Good Practice Guide to the Application of ETSU-R-97 for the Assessment and Rating of Wind Turbine Noise (GPG)* (IOA, 2013), insofar as its recommendations remain applicable and consistent with ARWTN.
- 9.3.5 Noise effects are considered to be not significant where predicted noise levels are at or below the relevant noise limits or assessment criteria. Where predicted noise levels exceed the relevant limits or criteria, a potentially significant effect is identified unless further contextual assessment demonstrates that the exceedance would not give rise to a significant adverse effect.
- 9.3.6 Where relevant, the evaluation of the context of the predicted noise levels includes the generating capacity of the development, the duration and timing of potential effects, the margin by which the relevant criterion is met or exceeded, the character of the noise, the existing acoustic environment, and the likely effectiveness and practical implications of mitigation.
- 9.3.7 Operational noise related to ancillary electrical equipment is assessed in accordance with BS 4142:2014+A1:2019 *Methods for rating and assessing industrial and commercial sound*.
- 9.3.8 Full details of the assessment methodology are set out in **Technical Appendix 9.1: Assessment Methodology**.

Proposed Development

- 9.3.9 The Proposed Development comprises 14 wind turbines with a combined generating capacity of approximately 80 MW, together with associated infrastructure including access tracks, crane hardstandings, underground electrical cabling, a substation and a battery energy storage system (BESS) with a power capacity of up to 40 MW.
- 9.3.10 The turbine layout and maximum turbine dimensions assessed are presented in **Technical Appendix 9.3: Noise Calculations and Predictions**.
- 9.3.11 Nine turbines would have a maximum tip height of 200 m and a rotor diameter of 162 m, while five turbines would have a maximum tip height of 149.9 m and a rotor diameter of 136 m. Further detail is provided in **Chapter 2: Project Description**.



- 9.3.12 The final turbine model has not yet been selected. For the purposes of the operational noise assessment, candidate turbine models have therefore been selected to represent the maximum turbine dimensions and a reasonable worst-case acoustic specification for the Proposed Development. The candidate turbines are Vestas V162 7.2 MW STE turbines where the maximum tip height is 200 m, and Vestas V136 4.5 MW STE turbines where the maximum tip height is 149.9 m.
- 9.3.13 The assessment uses the maximum warranted sound power levels, including any applicable uncertainty, for each applicable wind speed. The sound power data and operating modes used in the assessment are set out in **Technical Appendix 9.3**.
- 9.3.14 The assessment is based on the turbines operating concurrently and assumes downwind propagation from each turbine to each noise-sensitive receptor.
- 9.3.15 Where noise-reduced operating modes are required to meet the applicable noise limits, these are identified in the assessment and detailed in **Technical Appendix 9.4**.
- 9.3.16 The substation and BESS would be located in the southern part of the Site. The turbines would be connected to the substation by underground electrical cables.
- 9.3.17 No on-site borrow pits are proposed and all stone required for construction has been assumed to be imported to the Site.
- 9.3.18 Details of the assumed construction activities, plant and vehicle movements are provided in **Technical Appendix 9.3** and, where relevant, **Chapter 10: Access, Traffic and Transport**.

Study Areas

- 9.3.19 The Study Areas for the noise assessment have been defined with reference to the potential for noise from the Proposed Development to give rise to significant effects at noise-sensitive receptors. The Study Areas are shown on **Figure 9.1**. The assessment focuses on residential properties in the vicinity of the Proposed Development, as these are the receptors most sensitive to potential noise effects.

Construction and Decommissioning Noise

- 9.3.20 For construction and decommissioning noise, the Study Area comprises land within 300 m of the main construction works and Proposed Development infrastructure. This provides a conservative screening margin beyond the distances of approximately 150 m to 200 m at which noise from typical wind turbine construction activities would generally be expected to meet the relevant assessment criteria. No residential receptors are located within this Study Area. Detailed receptor-specific predictions for every construction activity have therefore not been undertaken. However, a conservative screening assessment is presented for the closest receptors to demonstrate that the relevant construction noise criteria would be met.
- 9.3.21 The shortest distances between residential receptors and the main construction works are approximately 330 m between Dalvene Cottage and A70 access track junction construction in the northern part of the Site, and approximately 350 m between Glenview Cottage and access track construction close to the BESS, substation and construction compound in the southern part of the Site.
- 9.3.22 On the basis of these separation distances, significant construction noise effects are not anticipated at receptors outside the Study Area. Indicative construction noise predictions are nevertheless presented for the closest receptors to demonstrate the anticipated noise levels against the relevant assessment criteria.



The receptors, Proposed Development infrastructure and construction noise Study Area are shown on **Figure 9.1**.

- 9.3.23 Noise from decommissioning activity would be expected to be similar to or less than construction noise. Therefore, no specific assessment of decommissioning noise is required. In addition, the assessment of decommissioning impacts was scoped out of the EIA at Scoping stage.

Construction Traffic Noise

- 9.3.24 Noise associated with vehicle movements on the public road network is considered separately from noise arising from construction works at the site access and along access tracks.
- 9.3.25 The Study Area for construction traffic noise comprises the public roads expected to be used by construction traffic and noise-sensitive receptors located alongside those routes. The extent of the assessed road network is consistent with that considered in **Chapter 10: Access, Traffic and Transport**. The construction traffic noise Study Area is shown on **Figure 9.1**.

Overhead Line Construction Noise

- 9.3.26 The assumed overhead line (OHL) route corridor contains several residential properties that could be located in relatively close proximity to construction works. The final OHL alignment, pole locations and associated construction areas have not yet been determined. The Study Area for OHL construction noise therefore comprises the proposed route corridor and surrounding residential receptors with the potential to be affected by construction activities.
- 9.3.27 In the absence of a final OHL alignment, receptor-specific predictions cannot be undertaken for definitive construction locations. The assessment instead provides a qualitative assessment based on the likely construction activities, their duration and the potential range of separation distances. Further details, including the identified receptors, are given in **Technical Appendix 9.1**.

Operational Noise

- 9.3.28 For operational and cumulative operational wind turbine noise, the Study Area includes receptors at which predicted noise from the Proposed Development has the potential to make a material contribution to the applicable total noise assessment criteria (TNAC). Receptors are screened out where predicted noise from the Proposed Development is at least 10 dB below the applicable TNAC, as the contribution of the Proposed Development would not materially affect compliance with the TNAC, including cumulatively.
- 9.3.29 All identified residential receptors within the operational noise Study Area have been reviewed. Where several receptors are geographically clustered and would experience similar baseline noise conditions and predicted turbine noise levels, representative receptors have been selected for detailed reporting. The representative receptor is selected conservatively, taking account of the highest predicted noise level within each cluster. Noise effects at other receptors in the cluster would therefore be no greater than those reported for the representative receptor. The receptors identified for the purposes of the assessment are given in **Table 9-2**.



Table 9-2: Operational Wind Turbine Noise Receptors

Receptor ID	Receptor Name	Representative Baseline Location	Easting	Northing	Financial Involvement Status
R1	Boghead	M3	263554	624717	Not Financially Involved
R2	Dalvene Cottage	M3	263434	624658	Not Financially Involved
R3	Stonebriggs	M4	262423	623927	Not Financially Involved
R4	Carbello	M3	261166	622875	Not Financially Involved
R5	Sharif House	M3	261014	622559	Not Financially Involved
R6	Sunnyside	M2	261023	621973	Not Financially Involved
R7	Laigh Glenmuir	M1	261709	620412	Not Financially Involved
R8	Glenview Cottage	M1	262364	620072	Not Financially Involved
R9	Whiteholm	M1	262481	619944	Financially Involved
R10	Low Garleffan	M1	262461	619497	Not Financially Involved
R11	Dornal	M5	263343	619522	Financially Involved
R12	Nether Guelt	M5	263611	619278	Not Financially Involved
R13	Springhill Farm	M2	264178	619985	Not Financially Involved
R14	Darmalloch	M2	260998	620282	Not Financially Involved
R15	Riverside Gardens	M2	260427	622669	Not Financially Involved
R16	Braehead	M2	259925	621786	Not Financially Involved
R17	Wallaceton	M2	260303	621550	Not Financially Involved
R18	Knocknaib	M2	259778	621073	Not Financially Involved
R19	Crosslar	M2	260201	619878	Not Financially Involved
R20	Avisyard	M2	260953	618902	Not Financially Involved
R21	Guelt Cottage	M5	264022	618945	Not Financially Involved



Receptor ID	Receptor Name	Representative Baseline Location	Easting	Northing	Financial Involvement Status
R22	Dalbalair	M5	264445	619273	Not Financially Involved
R23	Kyle	M5	265102	619177	Not Financially Involved

- 9.3.30 A further existing residential property, High Glenmuir, will be taken out of residential use as part of the Proposed Development prior to construction works and will remain unoccupied for the duration of the Proposed Development operation. This property is therefore not assessed.

Operational Ancillary Infrastructure Noise

- 9.3.31 The Study Area for operational noise from ancillary electrical infrastructure includes residential receptors at which noise from the substation, BESS and associated equipment could result in an adverse effect. No fixed separation-distance cut-off has been applied. Potential noise effects have been assessed qualitatively at the closest receptors, adopting a limits-led approach, and assessing the potential requirements and achievability of noise mitigation.

Desk Study

- 9.3.32 A desk study was undertaken to identify noise-sensitive receptors, relevant existing noise information and other developments with the potential to contribute to cumulative noise levels. The desk study included a review of:
- Ordnance Survey and address mapping;
 - aerial and street-level photography;
 - available planning and Energy Consents Unit records;
 - noise assessments and baseline noise data prepared for relevant nearby developments;
 - the Proposed Development layout and infrastructure information; and
 - available manufacturer and project-specific noise source data.
- 9.3.33 The desk study identified operational, consented and proposed developments for consideration in the cumulative assessment.
- 9.3.34 Residential receptors were identified and reviewed to determine their status and suitability for inclusion in the assessment.
- 9.3.35 Details of the cumulative development information relied upon are provided in **Technical Appendix 9.3**.

Field Surveys

- 9.3.36 A baseline noise survey was undertaken between April and May 2026 at five residential locations: Boghead, Stonebriggs, Nether Guelt, Springhill Farm and Whiteholm. The monitoring locations were selected to represent the range of residential receptors and existing acoustic environments surrounding the Proposed Development, taking account of consultation with EAC's acoustic adviser.



- 9.3.37 Background noise levels were analysed in relation to standardised wind speed in accordance with ARWTN and, where applicable, the IOA GPG. Representative background noise relationships were derived for the relevant assessment periods and assigned to noise-sensitive receptors within the Study Area. Full details of the survey methodology, instrumentation, data validation, exclusions, analysis and derived background noise relationships are provided in **Technical Appendix 9.2**.

Assessment of Potential Effect Level and Significance

- 9.3.38 The assessment applies topic-specific noise criteria derived from the relevant standards and guidance. Residential properties are inherently noise-sensitive receptors. Their sensitivity is therefore incorporated within the applicable assessment criteria, and a generic matrix combining receptor sensitivity and magnitude of impact has not been applied.
- 9.3.39 Predicted noise levels are compared with the relevant criteria to determine the likelihood and significance of an effect. Where a standard or guidance document requires contextual considerations or professional judgement, these are taken into account before determining the level and significance of the effect.

Construction and Decommissioning Noise

Proposed Development Construction and Decommissioning Works

- 9.3.40 Construction and decommissioning noise is assessed using the 'ABC method' set out in BS 5228-1 Annex E Table E.1, which sets a series of noise thresholds depending on the existing ambient sound levels and the applicable time-period. The relevant details of this method are set out in **Technical Appendix 9.1**.
- 9.3.41 The lowest baseline noise categories are assumed, resulting in the most conservative construction noise criteria of 65 dB for the daytime working. No requirement for evening or night-time works has been identified.
- 9.3.42 Where predicted construction noise levels do not exceed the applicable threshold, the resulting effect is considered to be not significant. In accordance with BS 5228-1, an exceedance of the applicable threshold for an equivalent period of one month or more is considered to represent a potentially significant effect.
- 9.3.43 Where an exceedance would occur for less than one month, significance is determined with reference to the margin and duration of the exceedance, the time of day, the existing acoustic environment, the nature of the activity and the availability of practicable mitigation. Particularly high or repeated short-term exceedances may therefore still be considered significant.
- 9.3.44 The same criteria are applied to decommissioning activities. As decommissioning activities would generally be similar to, or less intensive than, the corresponding construction activities, the construction assessment is considered representative of reasonable worst-case decommissioning effects.

Construction Vehicles on Access Tracks

- 9.3.45 Where construction traffic movements occur along access tracks, indicative absolute noise level calculations are conducted for receptors using the method set out in BS 5228 Annex F. Combined construction noise is assessed against the same criteria, 65 dB, for the day. Further details of the calculation methods and criteria are provided in **Technical Appendix 9.1**.



Construction Traffic Noise

- 9.3.46 Construction traffic noise is assessed by comparing the calculated Basic Noise Level for the future baseline traffic flows with that including construction traffic, using the methods of CRTN and the assessment principles of DMRB. Further details are set out in **Technical Appendix 9.3**.
- 9.3.47 The criteria presented in **Table 9-3** are used to classify the short-term change in road traffic noise.

Table 9-3: Construction Traffic Noise Criteria

Short-Term Change in Noise Level	Magnitude of Impact	Level and Significance of Effect
Less than 1 dB $L_{A10,18h}$	Negligible	Negligible adverse (not significant)
1 dB to less than 3 dB $L_{A10,18h}$	Low	Minor adverse (not significant)
3 dB to less than 5 dB $L_{A10,18h}$	Medium	Moderate adverse (significant)
5 dB $L_{A10,18h}$ or greater	High	Major adverse (significant)

- 9.3.48 A short-term increase of 3 dB $L_{A10,18h}$ or greater is normally considered significant. Where traffic flows are below the range for which CRTN calculations provide a reliable indication of noise change, effects would normally be considered not significant, although wider context is considered, such as the absolute number and timing of vehicle movements, receptor proximity, existing traffic conditions, duration of the works and the temporary nature of the effect.

Operational Wind Turbine Noise

- 9.3.49 Operational wind turbine noise is assessed against total noise assessment criteria (TNAC) derived in accordance with ARWTN. The TNAC are defined as the greater of:
- the applicable lower limiting value (LLV); or
 - 5 dB above the representative background noise level.
- 9.3.50 Separate TNAC normally apply during the day and night. The daytime LLV is selected within the range of 35 dB to 40 dB L_{A90} , while the night-time LLV is specified as 43 dB L_{A90} . At receptors whose occupiers are financially involved with the Proposed Development, the LLV may be increased to 45 dB L_{A90} during both day and night-time periods.
- 9.3.51 The TNAC apply to the cumulative noise from all relevant wind turbines. Site-specific noise limits (SSNLs) are subsequently derived to control noise attributable to the Proposed Development alone and to ensure that cumulative operational noise levels remain within the TNAC.
- 9.3.52 Where predicted cumulative wind turbine noise levels comply with the TNAC and predicted noise from the Proposed Development complies with the corresponding SSNLs, the operational wind turbine noise effect is considered not significant.
- 9.3.53 Where predicted noise exceeds the applicable TNAC or SSNL, a potentially significant effect is identified and mitigation is considered. The significance of any residual exceedance is evaluated with reference to its magnitude, the wind speeds



and periods over which it would occur, the number of receptors affected and the practical effectiveness of available mitigation.

- 9.3.54 ARWTN identifies changes below 0.5 dB as negligible. On this basis, noise levels that are 10 dB below a noise criterion are considered to negligibly contribute and are excluded.
- 9.3.55 ARWTN further states that character corrections should generally be applied to compliance measurements and controlled through suitably worded planning conditions, rather than applied to planning predictions. This is because these characteristics cannot normally be reliably predicted. No adjustment has therefore been made for potential tonality or elevated amplitude modulation. Proposed planning condition wording is presented in **Technical Appendix 9.1**.

Selection of the Daytime Lower Limiting Value

- 9.3.56 ARWTN requires the daytime LLV to be determined on a project-specific basis, taking account of:
- the generating capacity of the wind farm and the consequences of the LLV for renewable energy generation;
 - the number of dwellings and magnitude of the noise levels to which they would be exposed; and
 - the duration and level of exposure.
- 9.3.57 These factors are listed in priority order, with generating capacity receiving the greatest weight, followed by the number of dwellings and then the duration and level of exposure. The generating capacity is to be evaluated in the relevant national context. The relevant factors for the Proposed Development are summarised in **Table 9-4**.

Table 9-4: Daytime LLV Considerations

Factors	Generating Capacity	Number of receptors	Duration and level of exposure
Factor description	Approx. 80 MW generating capacity. 87.3 MW based on candidate turbine capacities.	11 non-involved noise sensitive receptor locations predicted to experience >35 dB from the Proposed Development	All receptors upwind or crosswind for the prevailing wind direction. Some elevated background noise levels at R1 to R3 due to A70 and nearby industrial facility.
Factor discussion	Large generating capacity in the national context	Relatively low number of properties in comparison with the scale and generating capacity of the Proposed Development.	Receptors would only experience the highest predicted noise levels during less frequent wind conditions. Some receptors have occasionally elevated background noise levels.
Overall discussion	A large-scale development with a handful of properties in the vicinity, none of which are downwind of the Proposed Development in the prevailing wind direction.		



Factors	Generating Capacity	Number of receptors	Duration and level of exposure
	Large scale development and favourable receptor context indicates a LLV towards the upper end of the range would be appropriate. The closest illustrative example in Appendix C of ARWTN is Case Study 5, comprising a 100 MW wind farm with 20 isolated properties above 35 dB L_{A90}. That example identifies a daytime LLV range of 38 dB to 40 dB L_{A90}, despite most receptors being downwind under prevailing conditions. Case Study 4, for a 40 MW development with 12 affected properties, identifies a range of 36 dB to 38 dB L_{A90}, while Case Study 6, for a 150 MW development with 20 properties generally located away from the prevailing downwind direction, identifies a range of 39 dB to 40 dB L_{A90}. Other case study examples not applicable to determination of the LLV for the Proposed Development due to low generating capacity. Considering all the applicable factors, a 39 dB LLV is considered appropriate for the Proposed Development. The consequences of adopting higher or lower LLVs are considered through within the noise assessment, including the extent of any requirements for noise-reduced operation and associated reduction in energy generation.		
Resulting Day TNAC LLV		39 dB L_{A90}	

- 9.3.58 An initial daytime LLV of 39 dB L_{A90} is adopted based on the site-specific factors summarised in **Table 9-4**. The implications of applying lower and higher values within the justified range are subsequently considered as a sensitivity and proportionality review.
- 9.3.59 The review takes account of the predicted noise effects and the consequences for renewable energy generation. A lower LLV may be preferred where the additional receptor protection can be achieved without a material operational constraint. A higher LLV may be appropriate where it would result in a disproportionate improvement to energy generation and where the balance of the other ARWTN factors continues to support the higher value.
- 9.3.60 The same day LLV is initially used to derive the individual and cumulative TNAC. The cumulative day LLV is reviewed having regard to the combined generating capacity of the relevant wind farms and any material differences in the number, level or duration of receptor exposure. A different cumulative LLV would only be adopted where those factors materially alter the overall balance of considerations, with any difference clearly identified and justified.
- 9.3.61 This approach is highlighted as representing a notable change from the methodology discussed during pre-application consultation, which preceded publication of ARWTN.

Operational Ancillary Infrastructure Noise

- 9.3.62 Operational noise from the substation, BESS and associated electrical equipment is assessed in accordance with BS 4142 by comparing the rating level of the specific sound with the representative background sound level.
- 9.3.63 The principal threshold for identifying a significant effect is a rating level more than 5 dB above the representative background sound level, subject to consideration of the absolute level and other relevant contextual factors.



- 9.3.64 Where background sound levels and rating levels are low, their absolute values may be as relevant as, or more relevant than, the numerical difference between them.
- 9.3.65 For this assessment, rating levels at or below 35 dB $L_{A,r,Tr}$ are considered low in absolute terms, with levels below 25 dB $L_{A,r,Tr}$ contributing negligibly even to potential cumulative effects.
- 9.3.66 The initial indication of impact is interpreted as set out in **Table 9-5**.

Table 9-5: Operational Ancillary Infrastructure Noise Criteria

Difference Between Rating Level and Background Sound Level	Initial Indication and EIA Interpretation
Rating level below 25 dB $L_{A,r,Tr}$	Contextually judged to be a very low impact; negligible effect (not significant)
Rating level at or below 35 dB $L_{A,r,Tr}$	Contextually judged to be a low impact; negligible or minor adverse effect depending on other factors (not significant)
Rating level at or below background sound level	Indication of low impact; negligible or minor adverse effect depending on other factors (not significant)
Rating level above background by up to 5 dB	Indication of an adverse impact may arise; normally a minor adverse effect (not significant) where supported by context
Rating level more than 5 dB but less than 10 dB above background	Adverse impact increasingly likely; potential moderate adverse effect (significant) depending on context
Rating level 10 dB or more above background	Indication of a significant adverse impact; normally a moderate or major adverse effect (significant)

- 9.3.67 The final assessment takes account of both the relevant noise levels and the context in which the sound would occur, including:
- the absolute rating and specific sound levels;
 - the character and existing level of the residual sound environment;
 - the time of day and duration of operation;
 - any tonality, impulsivity, intermittency or other distinctive acoustic characteristics;
 - the number and use of affected receptors; and
 - the noise mitigation incorporated into the equipment specification and design.
- 9.3.68 A rating level no more than 5 dB above the representative background sound level may therefore be assessed as either a negligible or a minor adverse effect (not significant) where absolute noise levels are modest, distinctive acoustic characteristics are absent or appropriately controlled, and reasonable noise-reduction measures have been incorporated.

Committed Mitigation and Enhancement

- 9.3.69 The assessment initially takes account of the embedded and standard mitigation measures described in **Section 9.5**. Where the assessment identifies a potentially



significant effect, additional mitigation is developed and the residual effect is assessed taking account of that mitigation.

- 9.3.70 Additional mitigation measures are presented as firm commitments and the mechanism through which each measure will be secured is identified. Depending on the effect concerned, this may include incorporation within the Construction Environmental Management Plan (CEMP) or Construction Traffic Management Plan (CTMP), specification through the detailed design process, an appropriately worded planning condition, or implementation of an operational noise management or curtailment strategy to meet the SSNLs specified by planning condition.
- 9.3.71 Potential measures may include activity-specific construction noise controls, temporary acoustic screening, revised equipment specifications, acoustic enclosures or attenuators, and operation of turbines in noise-reduced modes under defined conditions.
- 9.3.72 No noise-specific enhancement measures are proposed. The measures considered within this chapter are intended to avoid or reduce adverse noise effects rather than to create a beneficial change in the existing acoustic environment.

Assessment of Residual Effect Level and Significance

- 9.3.73 The assessment of residual effects follows the same process and criteria as the assessment of potential effects but takes account of all committed additional mitigation measures. Residual effects are reported using the topic-specific significance criteria set out in this section, with a clear conclusion as to whether each effect is significant in EIA terms.

Limitations, Difficulties and Uncertainties

- 9.3.74 The principal uncertainties relevant to the noise assessment concern the final construction methods and programme, the detailed OHL design, selection of the turbine model, specification of the BESS and substation equipment, natural variability in background noise levels, and the evolving status and design of other developments considered cumulatively. These matters have the potential to affect predicted noise levels, the duration or location of effects, and the extent of mitigation required. They have therefore been addressed through conservative assessment assumptions, representative reasonable worst-case scenarios and defined acoustic performance requirements for the detailed design.
- 9.3.75 The precise construction plant, sequencing and working locations will be determined by the Principal Contractor. Construction noise has therefore been assessed using representative activities and plant based on typical wind farm construction methods, together with conservative assumptions regarding concurrent operation and receptor separation distances. The OHL assessment is necessarily more general because the final alignment and working locations are not yet fixed. Location-specific assessment and controls will be required where substantive works are subsequently proposed close to residential receptors.
- 9.3.76 The final turbine model has not yet been selected. Predictions have been undertaken using candidate turbine sound power data representing a reasonable worst-case acoustic specification, including applicable allowance for uncertainty. The selected turbine and operating strategy will be required to comply with the site-specific noise limits derived for the Proposed Development.
- 9.3.77 The final equipment selection and detailed design of the BESS, substation and associated electrical infrastructure are also not yet fixed. The assessment consequently adopts a limits-led approach to establishing the acoustic performance



- that the completed infrastructure will be required to achieve. The effects of uncertainty are thereby controlled through equipment procurement, layout design and the provision of enclosures, attenuators or other mitigation where necessary.
- 9.3.78 Background noise levels vary naturally with wind conditions, season, time of day and local sound sources. The survey data have therefore been screened to remove rainfall, dawn chorus birdsong, atypical events and periods otherwise affected by elevated or unrepresentative noise, providing a robust estimate of the underlying background noise conditions relevant to the assessment. Daytime background noise relationships are derived from the defined quiet daytime periods, comprising evenings and weekends, rather than from all daytime data. Separate relationships have been derived for the night period. Monitoring locations and the assignment of representative background relationships have been selected to reflect the range of receptor environments, with conservative assumptions applied where uncertainty remains.
- 9.3.79 The cumulative assessment is based on the planning status, design information, noise data and other information reasonably available at the time of writing. Other developments may subsequently change in status, layout, turbine selection or operating parameters, and additional proposals may emerge. Such changes could alter the cumulative noise environment where they make a material contribution at the assessed receptors. The assessment nevertheless provides a robust representation of the cumulative position relevant to the application.
- 9.3.80 Wind turbine noise predictions necessarily simplify the range of meteorological conditions that would occur during operation. Favourable propagation is assumed from every turbine to every receptor simultaneously, irrespective of wind direction. This provides a conservative estimate of the highest expected noise levels and is likely to overstate the frequency with which those levels would occur.
- 9.3.81 Overall, the identified limitations and uncertainties have been accounted for through conservative source data, reasonable worst-case operating assumptions, representative assessment locations and enforceable acoustic design requirements. The assessment is therefore considered robust and suitable for evaluating the likely significant noise effects of the Proposed Development. Subject to the identified design and compliance requirements, the conclusions presented in this chapter remain applicable.

9.4 Baseline Conditions

Background Noise Levels

- 9.4.1 Residential properties are the principal noise-sensitive receptors considered in the assessment. Residential receptors are inherently sensitive to noise; this sensitivity is reflected in the topic-specific assessment criteria and is not separately graded using a generic sensitivity classification.
- 9.4.2 The existing acoustic environment is characteristic of a rural area with scattered residential properties. Background noise levels are generally influenced by wind-induced noise from vegetation, rainfall, flowing water, birdsong, livestock and intermittent agricultural, industrial, or road traffic activity. The relative influence of these sources varies between locations, with watercourses and local roads contributing more noticeably at some receptors.
- 9.4.3 A baseline noise survey was undertaken between April and May 2026 at Boghead (R1), Stonebriggs (R3), Nether Guelt (R12), Springhill Farm (R13) and Whiteholm (R9). The locations were selected to represent the range of residential receptors



and acoustic environments surrounding the Proposed Development. Full details of the monitoring locations, equipment, meteorological data, data exclusions and analysis are provided in **Technical Appendix 9.2**.

- 9.4.4 The measured noise data were reviewed to exclude periods affected by rainfall, atypical events and elevated or unrepresentative local noise. Separate background noise relationships were then derived for the quiet daytime and night-time assessment periods by relating measured $L_{A90,10min}$ noise levels to standardised wind speed.
- 9.4.5 The derived background noise relationships show the typical variation in quieter background noise levels with wind speed at each monitoring location. These relationships have been assigned to assessed receptors based on geographical proximity, similarity of exposure, local acoustic conditions and professional judgement. Where more than one monitoring location could reasonably represent a receptor, the relationship resulting in the more stringent noise assessment criteria has been adopted unless there is a clear justification for an alternative assignment.
- 9.4.6 The background noise levels relative to wind speeds are given for each survey location in **Table 9-6** and **Table 9-7** for the day and night respectively.

Table 9-6: Day Background Noise Levels, dB L_{A90}

Measurement Location & ID	Standardised 10 m height wind speed (ms^{-1})							
	3	4	5	6	7	8	9	10
M1 – Whiteholm	27.0	28.3	29.8	31.5	33.0	34.4	35.5	36.1
M2 – Springhill	23.1	24.9	26.9	29.0	31.0	32.6	33.5	33.6
M3 – Boghead	33.0	33.6	34.2	34.8	35.3	35.9	36.5	37.1
M4 – Stonebriggs	34.2	35.3	35.6	35.5	35.1	34.7	34.5	34.9
M5 – Nether Guelt	23.0	24.2	25.9	28.2	30.8	33.7	36.9	40.2

Table 9-7: Night Background Noise Levels, dB L_{A90}

Measurement Location & ID	Standardised 10 m height wind speed (ms^{-1})							
	3	4	5	6	7	8	9	10
M1 – Whiteholm	22.7	23.9	25.8	28.2	31.1	34.3	37.7	41.3
M2 – Springhill	18.1	19.4	21.4	24.1	27.4	31.1	35.3	39.9
M3 – Boghead	26.8	27.7	28.8	30.1	31.7	33.6	35.7	38.0
M4 – Stonebriggs	22.2	23.6	25.2	26.8	28.5	30.3	32.3	34.3
M5 – Nether Guelt	20.5	22.6	25.4	28.7	32.2	35.8	39.4	42.6

- 9.4.7 The receptor locations represented by each measurement location are shown in **Table 9-2**.

Traffic Flows

- 9.4.8 Baseline traffic flows have been obtained from **Chapter 10: Access, Traffic and Transport**, with the future baseline data being applicable to the calculation of potential traffic noise changes. Representative data are given in **Table 9-8** for the



future baseline scenario, split into all vehicles and heavy goods vehicles (HGVs). Further information about traffic flows can be found in **Chapter 10**. Further details of construction traffic noise calculations are presented in **Technical Appendix 9.3**.

Table 9-8: Estimated 2030 Baseline Vehicle Movements

Road Link	Average 07:00 – 19:00 Weekday Vehicle Movements	
	All Vehicles	HGVs Only
A70 between access to Proposed Development and Muirkirk	2,619	663 (25.3%)
A70 in Muirkirk west of B743	2,619	663 (25.3%)
A70 in Muirkirk east of B743	2,027	593 (29.3%)
A70 between Muirkirk and Glenbuck	2,027	593 (29.3%)
A70 between access to Proposed Development and Lugar	2,619	663 (25.3%)
A70 through Lugar	2,619	663 (25.3%)
A70 between Lugar and Cumnock	2,619	663 (25.3%)
A70 between Ayr Road and eastern edge of Cumnock	5,262	697 (13.2%)
A70 between Ayr Road in Cumnock and A76	8,236	912 (11.1%)
A76 between Templeton and Dettingen roundabouts	5,933	830 (14.0%)
A76 between Dettingen and Skerrington roundabouts	7,829	1,389 (17.7%)

Future Baseline in Absence of Proposed Development

- 9.4.9 In the absence of the Proposed Development, the existing acoustic environment would be expected to remain broadly rural in character. Background noise levels would continue to vary naturally with wind speed, wind direction, rainfall, vegetation, seasonal conditions, agricultural and industrial activity, and local traffic.
- 9.4.10 Noise from existing or future wind turbines is not incorporated into the background noise relationships used to derive the wind turbine noise criteria. Relevant operational, consented and proposed wind farms are instead considered separately within the cumulative operational noise assessment. This avoids treating wind turbine noise as part of the underlying acoustic baseline against which additional wind turbine development is assessed.
- 9.4.11 Climate change could result in gradual changes to the frequency or seasonal distribution of wind, rainfall and vegetation-related sound. The nature and magnitude of any resulting change in background noise at individual receptors cannot be predicted reliably. Such changes are not expected to alter the validity of the assessment, which is based on measured relationships between background noise and wind speed, fixed lower limiting values and conservative operational noise predictions.



- 9.4.12 Other changes in land use, road traffic or nearby development could also alter the future acoustic environment. Where another development has the potential to make a material noise contribution at the assessed receptors, it is considered through the relevant cumulative assessment rather than assumed as part of the future baseline. On the information available at the time of writing, no change to the future baseline has been identified that would materially alter the conclusions of the noise assessment.

9.5 Embedded and Standard Mitigation

- 9.5.1 The assessment takes account of mitigation incorporated into the design of the Proposed Development and standard good-practice measures that would be implemented during construction, operation and decommissioning. These measures are treated as part of the Proposed Development and are therefore included in the assessment of potential effects.

Embedded Mitigation

- 9.5.2 Noise has been considered during the iterative design of the Proposed Development as described in **Chapter 3: Design Evolution and Alternatives**. The turbine layout has been developed taking account of separation from residential receptors and predicted operational wind turbine noise, alongside other environmental and technical constraints. The resulting layout avoids residential properties within 300 m of the main construction works and Proposed Development infrastructure.
- 9.5.3 The BESS, substation and associated electrical infrastructure are located in the southern part of the Site. Their detailed design will incorporate acoustic performance requirements for individual items of equipment and the combined installation. The layout is designed to reasonably maximise distance between noise-generating equipment and receptors, and will retain the ability to incorporate measures such as low-noise equipment, acoustic enclosures, attenuators, barriers and appropriate equipment orientation, where required.
- 9.5.4 The final turbine model will be selected such that the selected turbine can comply with the site-specific noise limits established for the Proposed Development.

Standard Mitigation

- 9.5.5 Standard best practicable means (BPM) mitigation measures will be secured principally through the CEMP (see **Technical Appendix 11.1: Outline CEMP**), CTMP (described in **Section 10.5 of Chapter 10: Access, Traffic and Transport**) and appropriately worded planning conditions. The following measures are particularly relevant to noise:
- Construction working hours – routine works will normally be restricted to the agreed daytime construction periods, with exceptional works undertaken outside these hours only where necessary and subject to appropriate notification and controls. Proposed construction working hours are described in **Section 2.6 of Chapter 2: Proposed Development**.
 - Construction plant and working methods – plant will be appropriately sized, maintained and operated in accordance with manufacturers' instructions; silencers, covers and acoustic enclosures will be kept in effective working order; and equipment will be switched off when not required.



- Siting of construction activities – fixed and semi-fixed plant, generators, compounds and material-handling activities will be located and orientated to reduce noise at nearby receptors where reasonably practicable.
- Screening and temporary controls – existing landform, site buildings, material stockpiles and temporary acoustic barriers will be used where practicable to screen particularly noisy or prolonged activities.
- Construction traffic management – construction vehicles will use designated access routes, adhere to agreed delivery periods and avoid unnecessary engine idling. Measures for managing vehicle numbers, routing and driver behaviour will be set out in the CTMP.
- OHL construction works – detailed working locations and methods will be reviewed before construction, with location-specific noise controls applied where works would occur close to residential receptors.
- Community liaison and complaints – nearby residents will be informed of particularly noisy and any out-of-hours activities, if required, and a procedure will be maintained for recording, investigating and responding to noise complaints.
- Operational turbine noise control – operational wind turbine noise will be controlled through site-specific noise limits secured by planning condition, including procedures for investigating justified complaints and applying corrections for relevant acoustic characteristics.
- Ancillary infrastructure noise control – the final BESS, substation and electrical equipment specification will be required to meet the acoustic performance requirements established by the assessment. Compliance will be demonstrated through detailed design information and, where required, commissioning measurements.
- Decommissioning controls – decommissioning works will be subject to equivalent good-practice noise controls through a Decommissioning Environmental Management Plan.

9.6 Scope of Assessment

- 9.6.1 The scope of the assessment has been informed by the EIA Scoping Report, the Scoping Opinion (**Technical Appendix 1.3**), subsequent consultation and the assessment work undertaken for the Proposed Development. The noise-sensitive receptors considered are identified in the Study Area section and shown on **Figure 9.1**. **Table 9-9** summarises the noise and vibration effect pathways that have been taken forward for assessment or scoped out.

Table 9-9: Summary of Assessment Scope

Effect Pathway	Scoped In?		Comments
	Construction	Operation	
Noise associated with wind turbines	Yes	Yes	Construction noise associated with turbine foundations, crane hardstandings, turbine delivery and erection is considered as part of the construction noise assessment. Operational wind turbine noise from the Proposed Development, together with



Effect Pathway	Scoped In?		Comments
	Construction	Operation	
			relevant cumulative wind turbine noise, is assessed against the applicable ARWTN TNAC and SSNLs.
Noise associated with the BESS, substation and other electrical infrastructure	Yes	Yes	Noise from construction of the BESS, substation and associated infrastructure is included within the construction noise assessment. Operational noise from fixed electrical equipment is assessed in accordance with BS 4142 at the closest or otherwise potentially most affected residential receptors.
Noise from the overhead line	Yes	No	Construction noise is assessed on a qualitative basis because the final alignment and working locations are not fixed. Operational noise from the completed overhead line is not expected to represent a material source at residential receptors and is scoped out.
Noise from traffic on public roads	Yes	No	Construction traffic noise is assessed where construction vehicle flows could result in a material change in road traffic noise at receptors alongside the public road network. Operational traffic would be limited to routine inspection and maintenance visits and occasional deliveries, and would be too infrequent to result in a material change in road traffic noise.
Noise from vehicles on access tracks	Yes	No	Construction movements on access tracks are assessed as construction activity noise using BS 5228. Operational movements would be intermittent and principally associated with routine inspection and maintenance, and would not have the potential to result in significant effects at residential receptors.
Noise from construction compounds	Yes	No	Noise from temporary compounds, generators, material handling and other construction plant is included within the construction noise assessment. These sources would not remain during operation.
Vibration	No	No	Significant construction vibration effects are not anticipated because residential receptors are remote from the principal works and no substantial vibration-generating activities are proposed close to receptors.



Effect Pathway	Scoped In?		Comments
	Construction	Operation	
			Operational ground-borne vibration from modern wind turbines and electrical infrastructure would be substantially below levels associated with adverse effects at typical receptor distances.
Infrasound and low-frequency sound	No	No	No separate construction assessment is applicable. During operation, infrasound and low-frequency sound are scoped out in accordance with ARWTN, which concludes that infrasound from modern upwind turbines is below the threshold of perception at typical receptor distances and that low-frequency sound is suitably controlled through the A-weighted operational noise criteria. A similar justification applies to noise from BESS and ancillary electrical infrastructure.
Tonality and elevated amplitude modulation	No	No	These characteristics cannot normally be predicted reliably at the application stage and are not subject to a separate planning-stage assessment. They would be controlled through the operational noise condition and the application of character corrections during compliance assessment, where applicable.

Decommissioning

- 9.6.2 Effects associated with the construction phase can be considered to be representative of reasonable worst-case decommissioning effects, therefore no separate assessment of the decommissioning phase is presented in this chapter. Furthermore, as mentioned in **Technical Appendix 1.1**, the assessment of decommissioning effects was scoped out of the EIA.
- 9.6.3 Any decommissioning works would be undertaken in accordance with the standards and good-practice controls applicable at that time and secured through a Decommissioning Environmental Management Plan (DEMP).

9.7 Assessment of Potentially Significant Effects

- 9.7.1 This section assesses the potential noise effects of the Proposed Development during construction and operation. The assessment takes account of the embedded and standard mitigation measures described in **Section 9.5**, but does not take account of any additional mitigation.
- 9.7.2 Residential properties are inherently sensitive to noise. Their sensitivity is incorporated within the topic-specific assessment criteria set out in **Section 9.3** and **Technical Appendix 9.1**. Predicted noise levels are compared with the applicable criteria and interpreted in the context of the nature, duration and frequency of the effect.



- 9.7.3 Construction effects would be direct, temporary and reversible. Operational effects would be direct and long-term, but would cease following decommissioning. The assessment identifies whether each effect is significant in EIA terms, with detailed calculations and supporting information provided in **Technical Appendix 9.3**.

Construction

Main Construction Works

- 9.7.4 No residential receptors are located within 300 m of the main construction works. The closest identified relationships are approximately:
- 350 m between Glenview Cottage and access track construction near the BESS, substation and construction compound; and
 - 330 m between Dalvene Cottage and access track construction in the northern part of the Site.
- 9.7.5 Indicative worst-case predictions are presented in **Table 9-10** for the identified receptors.
- 9.7.6 The calculations adopt the nearest relevant working location and reasonable worst-case construction plant for typical relevant construction activity and conservative propagation assumptions. Detailed plant schedules and calculation details are presented in **Technical Appendix 9.3**.

Table 9-10: Predicted Worst-case Construction Noise Levels

Receptor	Distance to Construction Works Area	Predicted Façade Noise Level, dB $L_{Aeq,T}$
Glenview Cottage (R8)	350 m	62.1
Dalvene Cottage (R2)	330 m	62.6

- 9.7.7 The predicted noise levels are below the daytime criterion of 65 dB, as set out in **Technical Appendix 9.1**. As such, due to the temporary and intermittent nature of the works, the construction noise effects for the main infrastructure would result in a **negligible to minor adverse effect (not significant)**, subject to the adoption of standard BPM mitigation measures.

Construction of the Overhead Line

- 9.7.8 The final OHL alignment, support locations and associated working areas have not yet been determined. A definitive receptor-specific assessment cannot therefore be completed at this stage. A bounding assessment has instead been undertaken using representative OHL construction activities and the range of potential separation distances between the route corridor and nearby residential receptors. Details of the predictions are set out in **Technical Appendix 9.3**.
- 9.7.9 OHL construction would progress along the route and works at any individual location would normally be of relatively short duration. The principal potential noise sources would include access preparation, excavation, foundation or support installation, lifting operations, conductor installation and vehicle movements.
- 9.7.10 The assessment indicates that the construction noise criterion would be met where works are located at least 139 m from a residential receptor. The final alignment and working areas will be reviewed before construction but are anticipated to apply



a 150 m avoidance buffer to residential properties. Where substantive works are proposed within this distance, a location-specific assessment will be undertaken and appropriate controls incorporated into the CEMP.

- 9.7.11 Subject to these controls, OHL construction is anticipated to result in a **negligible to minor adverse effect (not significant)**.

Construction Traffic Noise

- 9.7.12 Construction traffic flows for the worst-case month are obtained from **Chapter 10 Table 10-14**, indicating that the highest levels of construction traffic would result in a daily average of 232 HGVs and 77 light vehicles on the identified public roads.
- 9.7.13 Based on these construction traffic flows and the future baseline traffic in **Table 9-8**, the change in road traffic noise levels is calculated and set out in **Table 9-11**.
- 9.7.14 The average 07:00-19:00 weekday vehicle movements represent an underestimate of the 18-hour (06:00-00:00) annual average weekday traffic flows for which noise change calculations are normally undertaken. This results in a worst-case prediction for calculating the noise-change due to the additional construction vehicles.

Table 9-11: Change in Road Traffic Noise Levels

Road Link	Existing Baseline Traffic Flow		Baseline + Construction Traffic Flow		Predicted Relative Change in Traffic Noise Level	Impact Significance
	Total Traffic Flow	Total HGV	Total Traffic Flow	Total HGV		
A70 between access to Proposed Development and Muirkirk	2619	663 (25%)	2928	895 (31%)	+1.1 dB(A)	Minor
A70 in Muirkirk west of B743	2619	663 (25%)	2928	895 (31%)	+1.2 dB(A)	Minor
A70 in Muirkirk east of B743	2027	593 (29%)	2336	825 (35%)	+1.4 dB(A)	Minor
A70 between Muirkirk and Glenbuck	2027	593 (29%)	2336	825 (35%)	+1.3 dB(A)	Minor
A70 between access to Proposed Development and Lugar	2619	663 (25%)	2928	895 (31%)	+1.1 dB(A)	Minor
A70 through Lugar	2619	663 (25%)	2928	895 (31%)	+1.2 dB(A)	Minor
A70 between Lugar and Cumnock	2619	663 (25%)	2928	895 (31%)	+1.1 dB(A)	Minor
A70 between Ayr Road and eastern edge of Cumnock	5262	697 (13%)	5571	929 (17%)	+0.9 dB(A)	Negligible



Road Link	Existing Baseline Traffic Flow		Baseline + Construction Traffic Flow		Predicted Relative Change in Traffic Noise Level	Impact Significance
	Total Traffic Flow	Total HGV	Total Traffic Flow	Total HGV		
A70 between Ayr Road in Cumnock and A76	8236	912 (11%)	8545	1144 (13%)	+0.5 dB(A)	Negligible
A76 between Templeton and Dettingen roundabouts	5933	830 (14%)	6242	1062 (17%)	+0.6 dB(A)	Negligible
A76 between Dettingen and Skerrington roundabouts	7829	1389 (18%)	8138	1621 (20%)	+0.4 dB(A)	Negligible

- 9.7.15 Changes in road traffic noise levels result in a **negligible** or **minor adverse effect (not significant)** for all relevant road links.

Operation

- 9.7.16 Operational noise effects would arise principally from the wind turbines and from fixed electrical equipment associated with the BESS and substation. These effects would be direct and long-term but reversible, as they would cease following decommissioning. Noise levels would vary with turbine operating conditions, wind speed and the operating state of the electrical infrastructure.
- 9.7.17 Operational noise from maintenance vehicles, movements on access tracks and the completed OHL has been scoped out, as described in **Section 9.6**. Cumulative operational wind turbine noise is considered separately in **Section 9.8**.

Operational Wind Turbine Noise

- 9.7.18 Operational wind turbine noise predictions have been undertaken for the candidate turbine models. Predictions have been calculated at the representative residential receptors and assume favourable sound propagation from every turbine to every receptor simultaneously. In practice, the maximum predicted levels would occur only when the turbines are operating at or close to their maximum sound output and meteorological conditions favour propagation towards the receptor.
- 9.7.19 The assessment considers standardised wind speeds up to 10 m/s and compares predicted noise with the applicable day and night criteria.
- 9.7.20 Predicted noise levels for the Proposed Development in isolation are presented in **Table 9-12**. Further details of the prediction assumptions and results are presented in **Technical Appendix 9.3**. The results are also presented as a noise contour plot assuming downwind propagation and a standardised wind speed of 10 m/s at **Figure 9.3**.



Table 9-12: Predicted Proposed Development Noise Levels, dB L_{A90}

Receptor ID	Standardised 10 m height wind speed (ms ⁻¹)							
	3	4	5	6	7	8	9	10
R1	24.2	26.1	30.8	34.8	35.6	35.6	35.6	35.6
R2	24.7	26.7	31.4	35.4	36.2	36.2	36.2	36.2
R3	27.6	29.6	34.3	38.3	39.1	39.1	39.1	39.0
R4	24.6	26.3	31.0	35.1	36.0	36.0	36.0	36.1
R5	24.2	25.8	30.5	34.5	35.5	35.5	35.6	35.7
R6	24.8	26.3	30.9	35.0	36.0	36.1	36.2	36.3
R7	27.9	29.4	34.0	38.1	39.1	39.1	39.2	39.4
R8	30.2	32.1	36.8	40.8	41.7	41.7	41.7	41.7
R9	30.2	32.2	36.9	40.8	41.6	41.7	41.6	41.6
R10	26.6	28.6	33.3	37.3	38.1	38.1	38.1	38.1
R11	27.6	29.7	34.4	38.4	39.2	39.2	39.1	39.1
R12	24.5	26.4	31.0	35.1	35.9	35.9	35.9	35.9
R13	25.1	26.7	31.3	35.4	36.3	36.4	36.5	36.6
R14	23.3	24.8	29.4	33.5	34.5	34.5	34.6	34.8
R15	21.2	22.8	27.5	31.6	32.5	32.6	32.6	32.7
R16	19.7	21.2	25.8	30.0	30.9	31.0	31.0	31.2
R17	20.7	22.1	26.7	30.9	31.9	31.9	32.0	32.2
R18	18.9	20.4	25.1	29.2	30.2	30.2	30.3	30.4
R19	19.0	20.4	25.1	29.2	30.2	30.2	30.3	30.5
R20	19.0	20.6	25.2	29.3	30.3	30.3	30.4	30.4
R21	21.3	23.1	27.7	31.8	32.7	32.7	32.7	32.8
R22	21.1	22.7	27.4	31.5	32.4	32.4	32.5	32.5
R23	18.8	20.3	25.0	29.1	30.0	30.1	30.2	30.3

- 9.7.21 Predicted noise levels increase with wind speed before reaching the maximum sound output of the candidate turbines. The highest predicted noise levels are 41.7 dB L_{A90} at R8 Glenview Cottage and R9 Whiteholm. Predicted levels at the remaining receptors are lower, reflecting their greater separation from the Proposed Development and the turbine layout.

Total Noise Assessment Criteria

- 9.7.22 The day and night TNAC have been derived for each receptor using the background noise relationship and financial involvement status set out in **Table 9-2**, and based on the background noise levels set out in **Table 9-6** and **Table 9-7**.
- 9.7.23 In accordance with ARWTN, the day TNAC are the greater of 39 dB L_{A90} or 5 dB above the representative quiet day background noise level. The night TNAC are the greater of 43 dB L_{A90} or 5 dB above the representative night background noise level.



9.7.24 At any receptors where the occupier is financially involved with the Proposed Development, the TNAC is given by the greater of 45 dB L_{A90} or 5 dB above the applicable background noise level for both the day and night. Receptors R9 and R11 are confirmed to be financially involved with the Proposed Development.

9.7.25 The TNAC applied for each receptor is set out in **Table 9-13**.

Table 9-13: Operational Wind Turbine TNAC, dB L_{A90}

Receptor ID	Time Period	Standardised 10 m height wind speed (ms^{-1})							
		3	4	5	6	7	8	9	10
R1	Day	39.0	39.0	39.2	39.8	40.3	40.9	41.5	42.1
R2	Day	39.0	39.0	39.2	39.8	40.3	40.9	41.5	42.1
R3	Day	39.2	40.3	40.6	40.5	40.1	39.7	39.5	39.9
R4	Day	39.0	39.0	39.2	39.8	40.3	40.9	41.5	42.1
R5	Day	39.0	39.0	39.2	39.8	40.3	40.9	41.5	42.1
R6	Day	39.0	39.0	39.0	39.0	39.0	39.0	39.0	39.0
R7	Day	39.0	39.0	39.0	39.0	39.0	39.4	40.5	41.1
R8	Day	39.0	39.0	39.0	39.0	39.0	39.4	40.5	41.1
R9	Day	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0
R10	Day	39.0	39.0	39.0	39.0	39.0	39.4	40.5	41.1
R11	Day	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.3
R12	Day	39.0	39.0	39.0	39.0	39.0	39.0	41.9	45.3
R13	Day	39.0	39.0	39.0	39.0	39.0	39.0	39.0	39.0
R14	Day	39.0	39.0	39.0	39.0	39.0	39.0	39.0	39.0
R15	Day	39.0	39.0	39.0	39.0	39.0	39.0	39.0	39.0
R16	Day	39.0	39.0	39.0	39.0	39.0	39.0	39.0	39.0
R17	Day	39.0	39.0	39.0	39.0	39.0	39.0	39.0	39.0
R18	Day	39.0	39.0	39.0	39.0	39.0	39.0	39.0	39.0
R19	Day	39.0	39.0	39.0	39.0	39.0	39.0	39.0	39.0
R20	Day	39.0	39.0	39.0	39.0	39.0	39.0	39.0	39.0
R21	Day	39.0	39.0	39.0	39.0	39.0	39.0	41.9	45.3
R22	Day	39.0	39.0	39.0	39.0	39.0	39.0	41.9	45.3
R23	Day	39.0	39.0	39.0	39.0	39.0	39.0	41.9	45.3
R1	Night	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0
R2	Night	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0
R3	Night	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0
R4	Night	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0
R5	Night	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0
R6	Night	43.0	43.0	43.0	43.0	43.0	43.0	43.0	44.9
R7	Night	43.0	43.0	43.0	43.0	43.0	43.0	43.0	46.3



Receptor ID	Time Period	Standardised 10 m height wind speed (ms ⁻¹)							
		3	4	5	6	7	8	9	10
R8	Night	43.0	43.0	43.0	43.0	43.0	43.0	43.0	46.3
R9	Night	45.0	45.0	45.0	45.0	45.0	45.0	45.0	46.3
R10	Night	43.0	43.0	43.0	43.0	43.0	43.0	43.0	46.3
R11	Night	45.0	45.0	45.0	45.0	45.0	45.0	45.0	47.6
R12	Night	43.0	43.0	43.0	43.0	43.0	43.0	44.4	47.6
R13	Night	43.0	43.0	43.0	43.0	43.0	43.0	43.0	44.9
R14	Night	43.0	43.0	43.0	43.0	43.0	43.0	43.0	44.9
R15	Night	43.0	43.0	43.0	43.0	43.0	43.0	43.0	44.9
R16	Night	43.0	43.0	43.0	43.0	43.0	43.0	43.0	44.9
R17	Night	43.0	43.0	43.0	43.0	43.0	43.0	43.0	44.9
R18	Night	43.0	43.0	43.0	43.0	43.0	43.0	43.0	44.9
R19	Night	43.0	43.0	43.0	43.0	43.0	43.0	43.0	44.9
R20	Night	43.0	43.0	43.0	43.0	43.0	43.0	43.0	44.9
R21	Night	43.0	43.0	43.0	43.0	43.0	43.0	44.4	47.6
R22	Night	43.0	43.0	43.0	43.0	43.0	43.0	44.4	47.6
R23	Night	43.0	43.0	43.0	43.0	43.0	43.0	44.4	47.6

9.7.26 The TNAC apply to the combined noise from all relevant wind turbines. Comparison of the Proposed Development alone with the TNAC is presented here as an initial assessment of its potential noise effects. The cumulative assessment and derivation of appropriate site-specific noise limits are presented in **Section 9.8**.

Comparison with TNAC

9.7.27 Predicted noise from unrestricted operation of the Proposed Development has been compared with the daytime and night-time TNAC at each receptor and wind speed. **Table 9-14** presents the minimum margin between predicted noise and the applicable criterion. A negative margin denotes that predicted levels exceed the TNAC.

Table 9-14: Proposed Development Wind Turbine Noise Assessment Against TNAC

Receptor ID	Maximum Predicted Proposed Development Noise Level, dB L _{A90}	Minimum Margin to Day TNAC, dB	Minimum Margin to Night TNAC, dB	Wind speeds and time periods for which the TNAC is exceeded
R1	35.6	4.7	7.4	None
R2	36.2	4.1	6.8	None
R3	39.1	0.4	3.9	None
R4	36.1	4.3	6.9	None
R5	35.7	4.8	7.3	None



Receptor ID	Maximum Predicted Proposed Development Noise Level, dB L _{A90}	Minimum Margin to Day TNAC, dB	Minimum Margin to Night TNAC, dB	Wind speeds and time periods for which the TNAC is exceeded
R6	36.3	2.7	6.8	None
R7	39.4	-0.1	3.9	Day: 7 m/s; Night: None
R8	41.7	-2.7	1.3	Day: 6-10 m/s; Night: None
R9	41.7	3.3	3.3	None
R10	38.1	0.9	4.9	None
R11	39.2	5.8	5.8	None
R12	35.9	3.1	7.1	None
R13	36.6	2.4	6.5	None
R14	34.8	4.2	8.4	None
R15	32.7	6.3	10.4	None
R16	31.2	7.8	12.0	None
R17	32.2	6.8	11.0	None
R18	30.4	8.6	12.7	None
R19	30.5	8.5	12.7	None
R20	30.4	8.6	12.6	None
R21	32.8	6.3	10.3	None
R22	32.5	6.6	10.6	None
R23	30.3	8.9	12.9	None

- 9.7.28 Predicted noise from unrestricted operation complies with the daytime TNAC at all receptors except R7 at 7 m/s, where an exceedance of 0.1 dB is predicted, and R8 at 6-10 m/s, where exceedances of up to 2.7 dB are predicted. The isolated exceedance at R7 is negligible and would not result in a significant effect. In contrast, the exceedances at R8 represent a **moderate adverse effect (significant)** in the absence of mitigation and are taken forward to the cumulative assessment and recommendations for additional mitigation.
- 9.7.29 Predicted noise from unrestricted operation complies with the night-time criteria at all receptors throughout the applicable range of wind speeds.
- 9.7.30 Consideration of cumulative operational noise, final selection of the daytime LLV, and derivation of the SSNLs for the Proposed Development are considered in **Section 9.8**.

Operational BESS and Substation Noise

- 9.7.31 The BESS, substation and associated electrical infrastructure would contain fixed plant capable of producing operational noise. Potential sources may include battery-container cooling systems, inverters, transformers, auxiliary transformers and other electrical, cooling or ventilation equipment.



- 9.7.32 The final equipment manufacturers, plant layout and detailed acoustic specifications have not yet been selected. A source-specific noise prediction cannot therefore be undertaken at this stage. The assessment has instead adopted a limits-led approach defining acceptable combined rating levels.
- 9.7.33 R8 Glenview Cottage is the closest residential receptor to the proposed BESS and substation and is expected to provide the controlling assessment location. Representative background sound levels of 28 dB L_{A90} during the daytime and 24 dB L_{A90} during the night have been adopted based on professional judgement from the low-wind-speed survey results at 3-5 m/s for Whiteholm, which is representative of R8 (see **Table 9-6** and **Table 9-7**). These conditions represent quiet low wind speed evenings/weekend periods for the day and quiet low-wind speed periods at night.
- 9.7.34 The background sound levels correspond to background +5 dB reference levels of 33 dB during the daytime and 29 dB during the night. However, BS 4142 also requires consideration of the context, including the absolute values of the background sound level and rating level where both values are low.
- 9.7.35 A fixed rating-level limit of 35 dB $L_{A,r,Tr}$ is adopted during both the daytime and night-time periods. This represents a low absolute external sound level. During the day, the limit provides protection to outdoor residential amenity. During the night, residents would predominantly experience the sound indoors. Allowing for an indicative reduction of approximately 13 dB through a partially open window, an external level of 35 dB would correspond to an indicative internal level of 22 dB.
- 9.7.36 These reference levels and fixed limits are set out in **Table 9-15** and are applicable at all noise-sensitive receptors.

Table 9-15: BESS and Substation Rating-Level Limits

Assessment Period	Representative Background Sound Level, dB L_{A90}	Background +5 dB Reference Level, dB $L_{A,r,Tr}$	Adopted Rating-Level Limit, dB $L_{A,r,Tr}$
Day	28	33	35
Night	24	29	35

- 9.7.37 At the adopted limit, the rating level would be 7 dB above the representative daytime background sound level and 11 dB above the representative night-time background sound level. Although these differences indicate the potential for adverse impacts when considered in isolation, the absolute external rating level would remain low.
- 9.7.38 The adopted limits apply to the combined simultaneous operation of all BESS, substation and associated fixed plant, including corrections applicable under BS 4142 for tonality, impulsivity, intermittency or other distinctive acoustic characteristics. Where such characteristics are present, the allowable specific sound level is correspondingly lower.
- 9.7.39 The final plant selection and layout will be subject to detailed acoustic design, including consideration of plant sound power levels, operating duty, simultaneous maximum operation, equipment enclosures, building attenuation, transformer specification, ventilation attenuation, equipment orientation and screening.
- 9.7.40 Given the separation distances to the nearest receptors, compliance with the adopted limits is anticipated to be achievable through appropriate plant selection, layout, acoustic enclosures, attenuated ventilation and localised screening.



- 9.7.41 An acoustic design report will be prepared prior to installation to demonstrate compliance with the limits at the closest receptors or suitably representative locations.
- 9.7.42 Taking account of the low absolute external rating level, indoor and outdoor exposure contexts, and the inclusion of acoustic character corrections, operation at up to 35 dB $L_{A_{r,Tr}}$ would result in a **minor adverse effect (not significant)**. Any design unable to comply with these limits would fall outside the assessed design envelope and would require further mitigation or reassessment.
- 9.7.43 Compliance would be secured through a suitably worded planning condition requiring submission and approval of a fixed-plant acoustic design report before installation of the BESS, substation and associated plant.
- 9.7.44 An example planning condition is provided in **Technical Appendix 9.1**.

9.8 Cumulative Assessment

Cumulative Construction Noise

- 9.8.1 Construction of the Proposed Development could potentially overlap with construction of the Glen Water development. Simultaneous construction activity could therefore result in noise from both developments being audible at some shared receptors.
- 9.8.2 The principal construction areas would, however, be spatially separated, and the highest noise levels from each development would occur close to its own work fronts. It is therefore unlikely that the reasonable worst-case construction activities for both developments would occur simultaneously at their closest position to the same receptor. Any periods of coincident construction noise would also be temporary and would vary as the respective work fronts progressed.
- 9.8.3 Construction noise from each development would be controlled through its own CEMP and the application of good practice measures based on BS 5228. For the Proposed Development, these would include restricted working hours, use of suitable and well-maintained plant, appropriate siting of stationary equipment, screening where practicable and management of particularly noisy activities.
- 9.8.4 Taking account of the temporary nature of the works, the substantial separation between the principal construction areas and the individual controls applicable to each development, simultaneous construction would not be expected to materially alter the construction noise effects identified for the Proposed Development alone. The worst case cumulative construction noise effect would be **minor adverse (not significant)**.

Cumulative Construction Traffic Noise

- 9.8.5 Construction of the Proposed Development and Glen Water could generate traffic on parts of the local road network during overlapping periods. Where construction routes coincide, this could temporarily increase the frequency of HGV and other construction vehicle movements beyond that associated with either development individually.
- 9.8.6 Any cumulative increase would be limited to the period during which the construction programmes overlap and would not represent a permanent change in traffic noise. Peak vehicle movements for the two developments would not necessarily occur concurrently, and construction traffic would vary considerably according to the activities being undertaken.



- 9.8.7 Each development would be subject to its own CTMP, including controls over approved routes, delivery scheduling, hours of movement, driver behaviour and liaison with the roads authority.
- 9.8.8 Given the temporary and intermittent nature of the movements and the control measures applicable to each development, cumulative construction traffic would not be expected to result in materially greater noise effects than that assessed for the Proposed Development alone. The worst case cumulative construction traffic noise effect would be **minor adverse (not significant)**.

Cumulative Operational Wind Turbine Noise

- 9.8.9 ARWTN requires the TNAC to apply to the cumulative operational noise from all acoustically relevant wind turbines. This section therefore considers the combined contribution of the Proposed Development and relevant existing, consented and proposed (in planning or under construction) wind energy developments. Relevant identified cumulative developments are given in **Table 9-16**. The locations of the identified cumulative developments can be seen on **Figure 4.7**.

Cumulative Developments

Table 9-16: Cumulative Wind Energy Developments

Development	Distance to Proposed Development Turbines	Status	Included	Reason
The Drum	0.3 km	Refused (Appeal Submitted)	Additional Potential Scenario	Development application refused. Methodology agreed with Local Authority. Successful appeal included as an additional potential scenario.
Glen Water	1.3 km	Application	Yes	Material contribution to cumulative noise levels at R7-R12 and R20-R23
Lethans	5.6 km	Consented	No	Negligible noise contribution at all relevant receptors
Lethans Extension	8.0 km	Consented	No	Negligible noise contribution at all relevant receptors
Greenburn	8.6 km	Under Construction	No	Negligible noise contribution at all relevant receptors
Hare Hill	9.9 km	Operational	No	Negligible noise contribution at all relevant receptors

- 9.8.10 A potential future scenario is further considered in which The Drum appeal is successful and The Drum forms part of the cumulative scenario.
- 9.8.11 The cumulative assessment is used to confirm the appropriate daytime LLV, establish the final TNAC and derive SSNLs applicable to noise from the Proposed Development alone. These limits subsequently form the basis for identifying any additional operational mitigation requirements.



Cumulative Predictions

- 9.8.12 Predicted noise from the Proposed Development and relevant cumulative developments are presented in **Table 9-17**. The predictions assume favourable propagation from all relevant developments to each receptor simultaneously and therefore provide a conservative assessment of cumulative noise. The results are also presented as a noise contour plot assuming downwind propagation and a standardised wind speed of 10 m/s at **Figure 9.4**.

Table 9-17: Predicted Cumulative Noise Levels, dB L_{A90}

Receptor ID	Standardised 10 m height wind speed (ms ⁻¹)							
	3	4	5	6	7	8	9	10
R1	24.2	26.2	30.9	34.9	35.7	35.7	35.7	35.7
R2	24.8	26.8	31.5	35.5	36.3	36.3	36.2	36.2
R3	27.6	29.6	34.3	38.3	39.1	39.1	39.1	39.1
R4	24.7	26.4	31.1	35.2	36.1	36.1	36.1	36.2
R5	24.3	25.9	30.6	34.7	35.6	35.6	35.7	35.8
R6	25.0	26.4	31.1	35.2	36.2	36.2	36.3	36.5
R7	28.2	29.7	34.3	38.4	39.4	39.4	39.5	39.7
R8	30.5	32.4	37.1	41.1	42.0	42.0	42.0	42.0
R9	30.5	32.5	37.2	41.2	42.0	42.0	42.0	42.0
R10	27.9	29.8	34.5	38.6	39.4	39.4	39.4	39.4
R11	28.8	30.8	35.5	39.6	40.4	40.4	40.3	40.3
R12	27.3	29.1	33.8	38.0	38.9	38.9	38.9	38.9
R13	26.0	27.6	32.3	36.5	37.3	37.4	37.5	37.5
R14	23.9	25.4	30.0	34.2	35.1	35.2	35.3	35.4
R15	21.4	23.0	27.7	31.8	32.7	32.8	32.8	32.9
R16	20.0	21.5	26.2	30.4	31.3	31.4	31.4	31.5
R17	21.1	22.5	27.1	31.3	32.3	32.3	32.4	32.6
R18	19.5	21.0	25.7	29.9	30.8	30.8	30.9	31.0
R19	20.1	21.6	26.3	30.5	31.4	31.4	31.5	31.6
R20	21.9	23.5	28.3	32.5	33.4	33.4	33.4	33.5
R21	27.0	28.6	33.4	37.7	38.5	38.5	38.5	38.5
R22	24.5	26.2	30.9	35.2	36.0	36.0	36.0	36.1
R23	22.4	24.0	28.7	33.0	33.9	33.9	33.9	34.0

Comparison with the TNAC

- 9.8.13 Predicted cumulative noise levels have been compared with the day and night TNAC at each receptor and wind speed. **Table 9-18** presents the minimum margin between predicted noise and the applicable criterion. A negative margin denotes that predicted levels exceed the TNAC.



Table 9-18: Cumulative Wind Turbine Noise Assessment Against TNAC

Receptor ID	Maximum Predicted Cumulative Noise Level, dB L _{A90}	Minimum Margin to Day TNAC, dB	Minimum Margin to Night TNAC, dB	Wind speeds and time periods for which the TNAC is exceeded
R1	35.7	4.6	7.3	None
R2	36.3	4.0	6.7	None
R3	39.1	0.4	3.9	None
R4	36.2	4.2	6.8	None
R5	35.8	4.7	7.2	None
R6	36.5	2.5	6.7	None
R7	39.7	-0.4	3.5	Day: 7 m/s; Night: None
R8	42.0	-3.0	1.0	Day: 6-10 m/s; Night: None
R9	42.0	3.0	3.0	None
R10	39.4	-0.4	3.6	Day: 7 m/s; Night: None
R11	40.4	4.6	4.6	None
R12	38.9	0.1	4.1	None
R13	37.5	1.5	5.5	None
R14	35.4	3.6	7.7	None
R15	32.9	6.1	10.2	None
R16	31.5	7.5	11.6	None
R17	32.6	6.4	10.6	None
R18	31.0	8.0	12.1	None
R19	31.6	7.4	11.5	None
R20	33.5	5.5	9.6	None
R21	38.5	0.5	4.5	None
R22	36.1	3.0	7.0	None
R23	34.0	5.1	9.1	None

- 9.8.14 At most receptors, the available margin is several decibels or more. The smallest positive margin is 0.1 dB at R12 Nether Guelt at standardised wind speeds of 7 m/s and 8 m/s.
- 9.8.15 Marginal exceedances of 0.4 dB are predicted at R7 Laigh Glenmuir and R10 Low Garleffan at 7 m/s.
- 9.8.16 At R8 Glenview Cottage, the TNAC is exceeded for wind speeds 6 to 10 m/s by margins of 0.9 dB to 3.0 dB, with the maximum margin of 3.0 dB occurring at 7 m/s.



- 9.8.17 In the absence of mitigation, the predicted exceedances at R7, R8 and R10 represent **potentially significant adverse effects** and are taken forward for consideration in the review of the daytime LLV and identification of potential mitigation requirements with respect to meeting derived SSNLs.
- 9.8.18 At all other receptors, cumulative operational wind turbine noise would remain within the levels considered reasonable under ARWTN and would result in a **minor adverse effect (not significant)**.

Review of the Daytime LLV

- 9.8.19 The site-specific considerations indicate that a daytime LLV of 39 dB L_{A90} is appropriate, recognising the large generating capacity of the Proposed Development in the national context but acknowledging that the Proposed Development is smaller than the examples most clearly supporting a 40 dB LLV.
- 9.8.20 The potential consequences of adopting higher or lower daytime LLVs are reviewed and presented in **Table 9-19**. This review considers the balance between the degree of noise protection afforded to nearby receptors and the operational restrictions required to achieve compliance.
- 9.8.21 The precise energy-generation consequences cannot be quantified until the final turbine model and its available noise-reduced modes are known. The review is therefore qualitative, informed primarily by the relative scale of the potential reductions required.

Table 9-19: Comparison of Candidate Daytime LLVs

Day LLV	Assessment Implications	Discussion / Commentary
Below 38 dB L_{A90}	Notably greater receptor protection. Unrestricted operation would exceed noise limits at substantially more receptors and wind speeds, and by greater margins. Rapidly increasing requirements for greater noise-reduced operation over a wider range of wind conditions.	Additional constraints are considered disproportionate to the additional protection achieved.
38 dB L_{A90}	Slightly greater receptor protection. Unrestricted operation would exceed noise limits at more receptors by greater margins. Notably greater noise-reduced operation required; no change to applicable range of wind conditions where noise-reductions are required.	Additional constraints are considered disproportionate to the additional protection achieved.
39 dB L_{A90}	Some noise-reduced operation required, primarily due to one non-involved receptor in relatively close proximity (R8 Glenview Cottage).	Justified based on generating capacity and receptor context.
40 dB L_{A90}	Slightly reduced receptor protection. Unrestricted operation would exceed noise limits at fewer receptors by smaller margins. Notably reduced noise-reduced operation required; no change to applicable range of wind conditions where noise-reductions are required.	Modest operational benefit does not provide sufficient justification for reduced receptor protection.

- 9.8.22 The operational restrictions under each candidate LLV are strongly influenced by predicted noise at R8 Glenview Cottage, where unrestricted predicted noise levels



of up to 41.7 dB are predicted (see **Table 9-12**). A qualifying financial involvement arrangement at that property would change the applicable criterion and materially reduce the requirement for noise-reduced operation. However, no such arrangement is currently committed to or relied upon. R8 is therefore assessed as a non-financially involved receptor, with financial involvement considered separately as a potential alternative measure.

- 9.8.23 The review does not identify sufficient justification to depart from the initially selected daytime LLV of 39 dB L_{A90} . Lowering the LLV to 38 dB or lower would result in a rapid and disproportionate increase in noise-reduced operation relative to the additional receptor protection achieved. Increasing it to 40 dB would provide some reduction in operational restrictions but would not remove the requirement for mitigation.
- 9.8.24 A daytime LLV of 39 dB L_{A90} is therefore retained. This represents a balanced application of the ARWTN factors, giving appropriate weight to the large generating capacity of the Proposed Development, the relatively low number of affected receptors and the limited duration and extent of noise exposure.

Derivation of SSNLs

- 9.8.25 The TNAC apply to cumulative operational wind turbine noise. SSNLs have therefore been derived to control noise attributable to the Proposed Development alone while ensuring that the combined contribution from all relevant developments remains within the TNAC.
- 9.8.26 The SSNLs take account of the contribution from other wind farms and the guidance in ARWTN concerning the appropriate allocation of the available noise budget. Full derivation of the limits is provided in **Technical Appendix 9.3**. The SSNLs are presented in **Table 9-20**.

Table 9-20: Site-Specific Noise Limits by Receptor, dB L_{A90}

Receptor ID	Time Period	Standardised 10 m height wind speed (ms^{-1})							
		3	4	5	6	7	8	9	10
R1	Day	39.0	39.0	39.2	39.7	40.3	40.9	41.5	42.1
R2	Day	39.0	39.0	39.2	39.7	40.3	40.9	41.5	42.1
R3	Day	39.2	40.3	40.6	40.5	40.0	39.6	39.5	39.9
R4	Day	39.0	39.0	39.2	39.7	40.3	40.9	41.5	42.1
R5	Day	39.0	39.0	39.2	39.7	40.3	40.9	41.5	42.1
R6	Day	39.0	39.0	39.0	38.9	38.9	38.9	38.9	38.9
R7	Day	39.0	39.0	38.9	38.7	38.7	39.1	40.3	40.9
R8	Day	39.0	38.9	38.8	38.5	38.4	38.9	40.1	40.7
R9	Day	45.0	45.0	44.9	44.9	44.8	44.8	44.8	44.8
R10	Day	38.9	38.9	38.6	37.8	37.5	38.1	39.5	40.3
R11	Day	45.0	45.0	44.9	44.7	44.6	44.6	44.6	44.9
R12	Day	38.9	38.8	38.3	36.8	36.2	36.2	40.7	44.8
R13	Day	39.0	38.9	38.8	38.4	38.3	38.3	38.3	38.3
R14	Day	39.0	39.0	38.9	38.8	38.8	38.8	38.8	38.8



Receptor ID	Time Period	Standardised 10 m height wind speed (ms ⁻¹)							
		3	4	5	6	7	8	9	10
R15	Day	39.0	39.0	39.0	39.0	38.9	38.9	38.9	38.9
R16	Day	39.0	39.0	39.0	38.9	38.9	38.9	38.9	38.9
R17	Day	39.0	39.0	39.0	38.9	38.9	38.9	38.9	38.9
R18	Day	39.0	39.0	39.0	38.9	38.9	38.9	38.9	38.9
R19	Day	39.0	39.0	38.9	38.8	38.8	38.8	38.8	38.8
R20	Day	39.0	38.9	38.8	38.5	38.3	38.3	38.3	38.3
R21	Day	38.8	38.7	38.0	35.5	34.3	34.3	40.1	44.5
R22	Day	38.9	38.9	38.6	37.8	37.6	37.6	41.2	45.0
R23	Day	38.9	38.9	38.8	38.3	38.1	38.1	41.5	45.1
R1	Night	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0
R2	Night	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0
R3	Night	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0
R4	Night	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0
R5	Night	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0
R6	Night	43.0	43.0	43.0	43.0	43.0	43.0	43.0	44.9
R7	Night	43.0	43.0	43.0	42.9	42.9	42.9	42.9	46.3
R8	Night	43.0	43.0	42.9	42.8	42.8	42.8	42.8	46.2
R9	Night	45.0	45.0	44.9	44.9	44.8	44.8	44.8	46.2
R10	Night	43.0	42.9	42.8	42.6	42.5	42.5	42.5	46.1
R11	Night	45.0	45.0	44.9	44.7	44.6	44.6	44.6	47.4
R12	Night	42.9	42.9	42.7	42.3	42.1	42.1	43.7	47.3
R13	Night	43.0	43.0	42.9	42.8	42.7	42.7	42.7	44.7
R14	Night	43.0	43.0	43.0	42.9	42.9	42.9	42.9	44.8
R15	Night	43.0	43.0	43.0	43.0	43.0	43.0	43.0	44.9
R16	Night	43.0	43.0	43.0	43.0	43.0	43.0	43.0	44.9
R17	Night	43.0	43.0	43.0	43.0	43.0	43.0	43.0	44.9
R18	Night	43.0	43.0	43.0	43.0	43.0	43.0	43.0	44.9
R19	Night	43.0	43.0	43.0	42.9	42.9	42.9	42.9	44.8
R20	Night	43.0	43.0	42.9	42.8	42.7	42.7	42.7	44.7
R21	Night	42.9	42.9	42.6	41.9	41.7	41.7	43.5	47.2
R22	Night	43.0	43.0	42.9	42.6	42.5	42.5	44.0	47.5
R23	Night	43.0	43.0	42.9	42.7	42.7	42.7	44.1	47.5



Comparison with the SSNLs

9.8.27 Predicted noise from unrestricted operation of the Proposed Development has been compared with the derived SSNLs. **Table 9-21** identifies the minimum margin at each receptor and the wind speeds at which any exceedance is predicted.

Table 9-21: Individual Wind Turbine Noise Assessment Against SSNLs

Receptor ID	Maximum Proposed Development Noise Level, dB L_{A90}	Minimum Margin to Day SSNL, dB	Minimum Margin to Night SSNL, dB	Wind speeds and time periods for which the SSNL is exceeded
R1	35.6	4.7	7.4	None
R2	36.2	4.1	6.8	None
R3	39.1	0.4	3.9	None
R4	36.1	4.3	6.9	None
R5	35.7	4.8	7.3	None
R6	36.3	2.6	6.8	None
R7	39.4	-0.4	3.7	Day: 7 m/s; Night: None
R8	41.7	-3.3	1.1	Day: 6-10 m/s; Night: None
R9	41.7	3.1	3.1	None
R10	38.1	-0.6	4.4	Day: 7 m/s; Night: None
R11	39.2	5.4	5.4	None
R12	35.9	0.3	6.2	None
R13	36.6	1.7	6.2	None
R14	34.8	4.0	8.3	None
R15	32.7	6.2	10.4	None
R16	31.2	7.7	12.0	None
R17	32.2	6.7	11.0	None
R18	30.4	8.5	12.7	None
R19	30.5	8.3	12.6	None
R20	30.4	7.9	12.3	None
R21	32.8	1.6	9.0	None
R22	32.5	5.2	10.1	None
R23	30.3	8.0	12.6	None

9.8.28 Unrestricted operation would exceed the derived SSNLs at R7, R8 and R10 over the wind-speed conditions and time periods identified in **Table 9-21**. Additional measures are therefore required to ensure that operational noise from the Proposed Development remains within the limits necessary to protect compliance with the cumulative TNAC.



- 9.8.29 The additional measures, comprising potential financial involvement and noise-reduced turbine operation, are considered in **Section 9.9**.

The Drum Appeal Potential Scenario

- 9.8.30 A potential scenario is identified in which The Drum development, which is currently refused but has lodged an appeal, is ultimately consented.
- 9.8.31 Full predictions and comparisons undertaken for this potential scenario are set out in **Technical Appendix 9.3**.

Revised Site-Specific Noise Limits

- 9.8.32 A potential successful appeal for The Drum would result in less headroom available, and consequently lower SSNLs for the Proposed Development, as presented in **Table 9-22**.

Table 9-22: Potential Revised Site-Specific Noise Limits by Receptor, dB L_{A90}

Receptor ID	Time Period	Standardised 10 m height wind speed (ms ⁻¹)							
		3	4	5	6	7	8	9	10
R1	Day	39.0	38.9	39.0	39.3	39.9	40.5	41.1	41.7
R2	Day	38.9	38.9	39.0	39.3	39.9	40.5	41.1	41.7
R3	Day	39.1	40.2	40.4	39.9	39.3	38.8	38.6	39.0
R4	Day	38.9	38.9	39.0	39.3	39.9	40.5	41.1	41.7
R5	Day	39.0	38.9	39.0	39.3	39.9	40.5	41.1	41.7
R6	Day	38.9	38.9	38.8	38.4	38.3	38.2	38.2	38.1
R7	Day	38.9	38.9	38.6	37.9	37.6	38.2	39.5	40.2
R8	Day	38.9	38.8	38.4	37.2	36.8	37.4	38.9	39.7
R9	Day	45.0	45.0	44.9	44.6	44.5	44.5	44.5	44.4
R10	Day	38.9	38.8	38.3	36.9	36.3	37.0	38.7	39.6
R11	Day	45.0	44.9	44.8	44.4	44.3	44.3	44.3	44.6
R12	Day	38.8	38.7	38.0	35.4	34.3	34.1	40.0	44.5
R13	Day	38.8	38.7	38.1	36.0	35.1	35.0	34.7	34.3
R14	Day	38.9	38.9	38.8	38.4	38.3	38.3	38.2	38.2
R15	Day	39.0	39.0	38.9	38.7	38.6	38.6	38.6	38.6
R16	Day	39.0	39.0	38.9	38.7	38.7	38.7	38.7	38.6
R17	Day	39.0	39.0	38.9	38.7	38.6	38.6	38.6	38.6
R18	Day	39.0	39.0	38.9	38.7	38.7	38.7	38.7	38.7
R19	Day	39.0	39.0	38.9	38.7	38.6	38.6	38.6	38.6
R20	Day	38.9	38.9	38.7	38.3	38.1	38.1	38.1	38.1
R21	Day	38.7	38.6	37.8	34.3	32.1	32.1	39.6	44.3
R22	Day	38.9	38.8	38.4	37.0	36.4	36.4	40.8	44.8
R23	Day	38.9	38.9	38.6	37.7	37.5	37.4	41.2	44.9
R1	Night	43.0	43.0	42.9	42.8	42.8	42.7	42.7	42.7



Receptor ID	Time Period	Standardised 10 m height wind speed (ms ⁻¹)							
		3	4	5	6	7	8	9	10
R2	Night	43.0	43.0	42.9	42.8	42.7	42.7	42.7	42.7
R3	Night	43.0	43.0	42.9	42.7	42.6	42.6	42.6	42.6
R4	Night	43.0	43.0	42.9	42.8	42.7	42.7	42.7	42.7
R5	Night	43.0	43.0	42.9	42.8	42.8	42.8	42.7	42.7
R6	Night	43.0	43.0	42.9	42.8	42.7	42.7	42.7	44.7
R7	Night	43.0	43.0	42.9	42.6	42.5	42.5	42.5	46.1
R8	Night	42.9	42.9	42.8	42.4	42.3	42.2	42.2	45.9
R9	Night	45.0	45.0	44.9	44.6	44.5	44.5	44.5	45.9
R10	Night	42.9	42.9	42.7	42.3	42.1	42.1	42.1	45.9
R11	Night	45.0	44.9	44.8	44.4	44.3	44.3	44.3	47.2
R12	Night	42.9	42.9	42.6	41.9	41.7	41.6	43.4	47.2
R13	Night	42.9	42.9	42.7	42.0	41.8	41.8	41.7	44.1
R14	Night	43.0	43.0	42.9	42.8	42.7	42.7	42.7	44.7
R15	Night	43.0	43.0	43.0	42.9	42.9	42.8	42.8	44.8
R16	Night	43.0	43.0	43.0	42.9	42.9	42.9	42.9	44.8
R17	Night	43.0	43.0	43.0	42.9	42.9	42.9	42.8	44.8
R18	Night	43.0	43.0	43.0	42.9	42.9	42.9	42.9	44.8
R19	Night	43.0	43.0	43.0	42.9	42.8	42.8	42.8	44.8
R20	Night	43.0	43.0	42.9	42.7	42.7	42.7	42.6	44.7
R21	Night	42.9	42.9	42.6	41.7	41.3	41.3	43.2	47.1
R22	Night	42.9	42.9	42.8	42.3	42.1	42.1	43.8	47.3
R23	Night	43.0	42.9	42.8	42.5	42.5	42.4	44.0	47.4

Potential Scenario Comparison with the SSNLs

9.8.33 A revised comparison between Proposed Development predicted noise levels and potential SSNLs is set out in **Table 9-23**.

Table 9-23: Revised Assessment Against Potential Reduced SSNLs

Receptor ID	Proposed Development Noise Level, dB L _{A90}	Minimum Margin to Day SSNL, dB	Minimum Margin to Night SSNL, dB	Wind speeds and time periods for which the SSNL is exceeded
R1	35.6	4.2	7.1	None
R2	36.2	3.6	6.5	None
R3	39.1	-0.5	3.5	Day: 8-9 m/s; Night: None
R4	36.1	3.8	6.6	None
R5	35.7	4.3	7.0	None



Receptor ID	Proposed Development Noise Level, dB L _{A90}	Minimum Margin to Day SSNL, dB	Minimum Margin to Night SSNL, dB	Wind speeds and time periods for which the SSNL is exceeded
R6	36.3	1.8	6.5	None
R7	39.4	-1.5	3.4	Day: 6-8 m/s; Night: None
R8	41.7	-4.9	0.5	Day: 6-10 m/s; Night: None
R9	41.7	2.8	2.8	None
R10	38.1	-1.8	4.0	Day: 6-8 m/s; Night: None
R11	39.2	5.1	5.1	None
R12	35.9	-1.8	5.7	Day: 7-8 m/s; Night: None
R13	36.6	-2.3	5.2	Day: 7-10 m/s; Night: None
R14	34.8	3.4	8.1	None
R15	32.7	5.9	10.2	None
R16	31.2	7.4	11.9	None
R17	32.2	6.4	10.8	None
R18	30.4	8.3	12.6	None
R19	30.5	8.1	12.5	None
R20	30.4	7.7	12.2	None
R21	32.8	-0.6	8.6	Day: 7-8 m/s; Night: None
R22	32.5	4.0	9.7	None
R23	30.3	7.3	12.3	None

- 9.8.34 In the potential scenario that The Drum appeal is successful, the unrestricted operation of the Proposed Development would exceed the SSNLs at R7, R8, R10, R12, R13 and R21 during the day, with the greatest margins of exceedance being up to 4.9 dB at R8.
- 9.8.35 In such a scenario, further additional day mitigation, and/or financial involvement of receptors would be required.
- 9.8.36 Such additional measures, comprising potential financial involvement and noise-reduced turbine operation, are considered in **9.9**.

Cumulative BESS and Substation Noise

- 9.8.37 The Glen Water development includes a substation that could operate concurrently with the Proposed Development BESS and substation. The Glen Water substation would be approximately 1.6 km from the nearest shared receptor, R20 Avisyard, and approximately 2.6 km from the closest receptor to the Proposed Development, R8 Glenview Cottage.



- 9.8.38 At these distances, noise from the Glen Water substation would be substantially attenuated before reaching the shared receptors. At R8, which is expected to be the controlling receptor for the Proposed Development's fixed plant, the Glen Water contribution would be remote and is not expected to materially affect the applicable acoustic design requirements. Similarly, although R20 is the closest shared receptor to the Glen Water substation, the substantial separation would limit the level of any combined fixed-plant noise.
- 9.8.39 Both developments would be subject to their own design requirements and planning controls. Any further assessment for Proposed Development BESS and substation will confirm that rating levels remain within the specified limits.
- 9.8.40 Given the separation distances, the expected low contribution due to distance and the limits-led controls applied to each development, combined BESS and substation noise would not be expected to result in a material increase in noise exposure at shared receptors. The worst case cumulative operational BESS and substation noise effect would therefore be **minor adverse (not significant)**.

9.9 Additional Mitigation and Enhancement

- 9.9.1 No additional mitigation is required for construction noise or construction traffic noise beyond the embedded and standard measures identified in **Section 9.5**.
- 9.9.2 In terms of operational wind turbine noise, the assessment identifies that unrestricted operation of the Proposed Development would exceed the derived SSNLs at R7, R8 and R10 under some wind-speed conditions (see **Table 9-21**). Additional measures are therefore required to ensure that operational wind turbine noise remains within the limits necessary to maintain compliance with the TNAC.
- 9.9.3 Aside from material alterations to the Proposed Development design, there are two primary methods by which the SSNLs can be met, financial involvement of affected receptors, and/or adopting a noise-curtaiment strategy to reduce noise levels for applicable wind speeds and time periods. In some cases, direction-dependent curtailment can also be adopted, but this is not explored in this chapter.

Financial Involvement

- 9.9.4 ARWTN permits a different assessment criterion to apply where the occupier of a dwelling has a qualifying financial involvement with the wind farm. This reflects the different assessment context where the occupier receives a direct and profitable benefit from the operation of the development. For a financially involved receptor, the applicable criterion is the greater of 45 dB L_{A90} or 5 dB above the representative background noise level.
- 9.9.5 Financial involvement does not reduce the noise generated by the Proposed Development. Instead, it changes the receptor's assessment status and the criterion against which operational wind turbine noise is assessed. It is therefore considered here as a potential receptor-based measure rather than as source or propagation-path mitigation.
- 9.9.6 A qualifying financial involvement arrangement at R8 Glenview Cottage would materially reduce the extent of noise-reduced operation required to comply with the applicable criteria. Similar arrangements for R7 and R10 would also reduce requirements for noise-reduced operation, but to a lesser extent. The same would also apply for R3, R12, R13, and R21 if The Drum appeal is successful.



- 9.9.7 No such arrangements are currently committed or relied upon in the assessment. These receptors have therefore been treated as non-financially involved when deriving the SSNLs and identifying the required noise-reduced operation.
- 9.9.8 Should a qualifying financial involvement arrangement subsequently be secured, revised applicable SSNLs as set out in **Table 9-24** would apply. Any revised strategy would remain subject to demonstration of compliance with the applicable criteria at all non-financially involved receptors.

Table 9-24: Potential SSNLs for Financially Involved R7, R8 and R10, dB L_{A90}

Receptor ID	Time Period	Standardised 10 m height wind speed (ms ⁻¹)							
		3	4	5	6	7	8	9	10
R7	Day	45.0	45.0	45.0	44.9	44.9	44.9	44.9	44.9
R8		45.0	45.0	45.0	44.9	44.9	44.9	44.9	44.9
R10		45.0	45.0	44.9	44.7	44.7	44.7	44.7	44.7
R7	Night	45.0	45.0	45.0	44.9	44.9	44.9	44.9	46.7
R8		45.0	45.0	45.0	44.9	44.9	44.9	44.9	46.6
R10		45.0	45.0	44.9	44.7	44.7	44.7	44.7	46.5

- 9.9.9 The SSNLs set out in **Table 9-24** are predicted to be met for the specified receptors at all wind speeds and time periods.

Noise Curtailment Strategy

- 9.9.10 Where financial involvement is not secured for any one of R7, R8 and R10 (for the scenario that The Drum appeal is unsuccessful), residual mitigation requirements would remain. In these circumstances, noise-reduced operational modes would be applied to selected turbines under the wind-speed conditions for which the predicted noise levels exceed the SSNLs.
- 9.9.11 The extent of mitigation depends on the outcome of the appeal by The Drum against their planning application refusal. If this appeal is successful, mitigation requirements would also be applicable at R3, R12, R13 and R21, although the requirements would remain dominated by those at R7, R8 and R10, absent financial involvement.
- 9.9.12 The detailed operating requirements depend on the final turbine model, its warranted sound power levels and the noise-reduced operating modes available. However, an indicative noise curtailment strategy has been developed based on candidate turbines. Further details of the curtailment strategy are presented in **Technical Appendix 9.4**, including for the potential scenario that The Drum appeal is successful. The strategy identifies the turbines, wind speeds and operational modes required to achieve compliance with the SSNLs set out in **Table 9-20** (or **Table 9-22**, as applicable) at all assessed receptors.
- 9.9.13 The indicative strategy demonstrates that the required limits can be achieved using commercially available noise-reduced operating modes.
- 9.9.14 The final turbine model has not yet been selected. The precise operating modes required may therefore differ from those assumed. The final strategy may also utilise different combinations of turbine modes from those presented, provided that the resulting noise levels do not exceed the applicable SSNLs.



- 9.9.15 Implementation of the final noise curtailment strategy and compliance with the SSNLs will be secured through an appropriately worded planning condition. The turbine control system will be configured to apply the required operating modes automatically according to the relevant wind conditions.

Other Operational Noise Sources

- 9.9.16 The BESS, substation and associated fixed plant will be subject to the limits-led acoustic design requirements identified in **Section 9.7**. These requirements will be incorporated into the detailed plant specification and demonstrated through a pre-installation acoustic assessment.
- 9.9.17 The combined BS 4142 rating level from the Proposed Development's fixed plant will be designed so that it does not exceed 35 dB at any noise-sensitive receptor during the relevant assessment period. The assessment will include any applicable corrections for tonality, impulsivity, intermittency or other distinctive acoustic characteristics.
- 9.9.18 Where necessary, compliance will be achieved through plant selection, acoustic enclosures, attenuated ventilation, equipment orientation, separation distances and localised screening. As these controls form part of the limits-led detailed design, no separate additional mitigation measure is presently identified.

Summary of Additional Measures

- 9.9.19 **Table 9-25** sets out additional mitigation measures (also known as secondary mitigation, comprising measures beyond embedded/standard mitigation) and enhancement measures to which the Applicant has committed. These measures are designed to reduce identified adverse effects.

Table 9-25: Additional (Secondary) Mitigation and Enhancement

Reference	Mitigation/ Enhancement Measure	Description
NOISE1	Operational Wind Turbine Noise Curtailment Strategy	Preparation and implementation of a final operational noise management strategy based on the selected turbine model and warranted acoustic data. The strategy will identify the noise-reduced operating modes required at each relevant turbine and wind speed to meet the day and night SSNLs. Approval and implementation of the strategy, together with ongoing compliance with the SSNLs, can be secured through an appropriately worded planning condition.
NOISE2	BESS and Substation Acoustic Design	Detailed acoustic design of the BESS, substation and associated fixed plant to ensure that the combined BS 4142 rating level does not exceed 35 dB at any noise-sensitive receptor during the relevant assessment period. Compliance will be achieved through appropriate plant selection, enclosures, attenuation, orientation and screening, and secured through an appropriately worded planning condition.



9.10 Residual Effects

- 9.10.1 Residual effects have been assessed taking account of the embedded and standard mitigation identified in **Section 9.5** and the additional mitigation set out in **Section 9.9**.

Construction

Construction of Proposed Development Infrastructure

- 9.10.2 Construction noise would be temporary and would vary as activities progress across the Site. With implementation of the standard construction noise controls, including measures secured through the CEMP, predicted levels would remain below the applicable assessment criteria at residential receptors.
- 9.10.3 The residual construction noise effect would therefore be a **minor adverse effect (not significant)**.

Construction Traffic Noise

- 9.10.4 Construction traffic would result in a temporary increase in vehicle movements on the local road network. Movements would be managed through the CTMP, including controls relating to routing, scheduling, delivery times and driver behaviour.
- 9.10.5 The residual construction traffic noise effect would be a **minor adverse effect (not significant)**.

Overhead Line Construction Noise

- 9.10.6 Noise associated with construction of the overhead line would be temporary, localised and of relatively short duration at any individual receptor. Application of standard construction controls would limit noise from plant, access works, foundation construction, support erection and conductor stringing.
- 9.10.7 The residual overhead line construction noise effect would therefore be a **minor adverse effect (not significant)**.

Operation

Operational Wind Turbine Noise

- 9.10.8 Following implementation of a suitable noise curtailment strategy as described in **Section 9.9** (also see **Technical Appendix 9.4**), predicted operational wind turbine noise would comply with the daytime and night-time SSNLs at all assessed receptors. Cumulative wind turbine noise would consequently not exceed the applicable TNAC as a result of the Proposed Development.
- 9.10.9 Operational wind turbine noise may remain audible under some conditions. However, compliance with the SSNLs would ensure that noise remains within the levels considered reasonable under ARWTN. The residual operational wind turbine noise effect would therefore be a **minor adverse effect (not significant)** at all receptors.

Operational BESS and Substation Noise

- 9.10.10 The BESS, substation and associated fixed plant will be subject to limits-led acoustic design. The residual operational BESS and substation noise effect would therefore be a **minor adverse effect (not significant)**.



Cumulative Construction Noise

- 9.10.11 Potential overlap with construction of Glen Water, if it were to occur, would be temporary and the principal work areas would be substantially separated. Construction activities for each development would also be controlled through their respective CEMPs and project-specific noise mitigation measures.
- 9.10.12 Simultaneous construction would not be expected to materially increase the effects identified for either development individually. The residual cumulative construction noise effect would therefore be a **minor adverse effect (not significant)**.

Cumulative Construction Traffic Noise

- 9.10.13 Where construction programmes and routes overlap, combined traffic movements could result in a temporary increase in traffic noise. The effects would be limited to the construction period and controlled through the respective CTMPs, including coordination of routing and deliveries where necessary.
- 9.10.14 The residual cumulative construction traffic noise effect would therefore be a **minor adverse effect (not significant)**.

Cumulative BESS and Substation Noise

- 9.10.15 The Glen Water substation would be substantially separated from the nearest shared receptors.
- 9.10.16 Combined fixed-plant noise would not be expected to result in a material increase in noise exposure at shared receptors. The residual cumulative BESS and substation noise effect would therefore be a **minor adverse effect (not significant)**.

Cumulative Noise from Wind Turbines and BESS and Substation

- 9.10.17 The potential for combined effects from operational wind turbine noise and noise from the BESS and substation has been considered qualitatively. The two sources are assessed using different metrics and assessment frameworks and are not therefore directly combined numerically. Wind turbine noise would be controlled through compliance with the applicable SSNLs, while the combined rating level from the BESS, substation and associated fixed plant would be limited to 35 dB $L_{A,T,r}$ at noise-sensitive receptors.
- 9.10.18 Fixed-plant noise would be most apparent during low wind speeds, when wind turbine noise levels would generally be lower. At higher wind speeds, increased background sound and wind-related masking would reduce the relative prominence of fixed-plant noise. Taking account of the low absolute fixed-plant limit, inclusion of corrections for distinctive acoustic characteristics, and separate control of wind turbine noise, the combined operational noise effect would be expected to result in a **minor adverse effect (not significant)**.

9.11 Summary and Statement of Significance

- 9.11.1 The assessment has considered potential noise effects arising during construction, operation and decommissioning of the Proposed Development, including cumulative effects with other relevant developments. The assessment has been undertaken using appropriate methodologies and significance criteria, taking account of embedded and standard mitigation.



- 9.11.2 Construction noise associated with the wind turbines, access tracks, electrical infrastructure, temporary compounds and overhead line would be temporary and would vary as works progress across the Site. Construction traffic would also result in temporary increases in vehicle movements on the local road network. With implementation of good-practice controls through the CEMP and CTMP, residual construction noise, construction traffic noise and overhead line construction noise effects would be **minor adverse effects (not significant)**.
- 9.11.3 Operational wind turbine noise has been assessed individually and cumulatively in accordance with ARWTN. Applicable LLVs of 39 dB, 43 dB and 45 dB have been respectively adopted for the day, the night and for both day and night for financially involved receptors. Receptor-specific TNAC and SSNLs have been derived. Following implementation of a noise curtailment strategy, predicted operational wind turbine noise would comply with the daytime and night-time SSNLs at all assessed receptors, and the applicable TNAC would not be exceeded as a result of the Proposed Development. The residual operational wind turbine noise effect would be a **minor adverse effect (not significant)**.
- 9.11.4 Detailed specifications for the BESS, substation and associated fixed plant are not currently available. A limits-led acoustic design approach has therefore been adopted, requiring the combined BS 4142 rating level to remain no more than 35 dB at any noise-sensitive receptor during the relevant assessment period. Subject to compliance with these requirements, the residual operational BESS and substation noise effect would be a **minor adverse effect (not significant)**.
- 9.11.5 Potential cumulative effects associated with overlapping construction, construction traffic and operation of the Proposed Development and Glen Water have also been considered. These effects would be limited by the substantial separation between the principal activity areas, their temporary or low-level nature and the separate control measures applicable to each development. Residual cumulative construction noise, construction traffic noise and fixed-plant noise effects would each be **minor adverse effects (not significant)**.
- 9.11.6 Decommissioning activities would be temporary and broadly similar to, but generally less intensive than, construction.
- 9.11.7 Overall, following implementation of the embedded, standard and additional mitigation measures identified in the assessment, no significant residual noise effects are anticipated during construction, operation or decommissioning of the Proposed Development, either individually or cumulatively.



Table 9-26: Summary Table

Description of Effect	Mitigation/Enhancement Measure(s)	Significance of Residual Effect	
		Level and Significance	Beneficial/ Adverse
During Construction & Decommissioning			
Noise from construction and decommissioning of turbines, access tracks, compounds and electrical infrastructure, including the overhead line	Standard good-practice controls secured through the CEMP and DEMP, including working-hour controls, appropriate plant selection and maintenance, careful siting and orientation of equipment, temporary screening and community liaison. Location-specific assessment and controls where substantive overhead-line works are proposed within 139 m of a residential receptor.	Minor (Not Significant)	Adverse
Noise from construction vehicles on access tracks and the public road network	Construction traffic managed through the CTMP, including controls on routes, delivery periods, vehicle numbers, driver behaviour and unnecessary engine idling.	Minor (Not Significant)	Adverse
During Operation			
Operational wind turbine noise	Selection of a turbine model capable of meeting the site-specific noise limits and preparation and implementation of a final operational noise management and curtailment strategy. Noise-reduced operating modes will be applied automatically under the relevant wind conditions, secured through a planning condition.	Minor (Not Significant)	Adverse
Operational noise from the BESS, substation and associated fixed plant	Limits-led detailed acoustic design, including appropriate plant selection, acoustic enclosures, attenuated ventilation, equipment orientation, separation and localised screening. Compliance with the applicable rating-level limits will be demonstrated through a pre-installation acoustic assessment and secured through a planning condition.	Minor (Not Significant)	Adverse



Description of Effect	Mitigation/Enhancement Measure(s)	Significance of Residual Effect	
		Level and Significance	Beneficial/ Adverse
Cumulative Effects			
Overlapping construction and construction traffic associated with the Proposed Development and Glen Water	Application of the respective CEMPs and CTMPs, with coordination of construction routing, deliveries and particularly noisy activities where required.	Minor (Not Significant)	Adverse
Cumulative operational wind turbine noise	Site-specific noise limits account for noise from other relevant wind developments. The final turbine selection and operational curtailment strategy will ensure that the Proposed Development does not cause the cumulative noise criteria to be exceeded.	Minor (Not Significant)	Adverse
Cumulative operational noise from wind turbines, the BESS and substations	Separate control of wind turbine noise through the site-specific noise limits and of fixed-plant noise through limits-led acoustic design and planning controls.	Minor (Not Significant)	Adverse



9.12 References

British Standards Institution (2014). BS 5228-1:2009+A1:2014 *Code of practice for noise and vibration control on construction and open sites – Part 1: Noise*. BSI, London.

British Standards Institution (2019). BS 4142:2014+A1:2019 *Methods for rating and assessing industrial and commercial sound*. BSI, London.

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