Ballyteige Solar Farm

Amended Acoustic Impact Assessment

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Contents

Revision History

Issue	Date	Name	Latest changes
01	15 Nov 2024	Lucy Connor	First created
02	19 Sept 2025	Lucy Connor	Amended due to layout changes & updated to current template
03	20 Nov 2025	Lucy Connor	Amendments to Section 4

1 Introduction & Scope

This report contains an assessment of the acoustic impact of the amended site layout of the consented Ballyteige solar farm (Offaly County Council Planning Application Ref:2198). One Member and an Associate of the Institute of Acoustics have been involved in its production. Details of their experience and qualifications can be found in **Appendix A**.

The scope includes predicting sound levels due to the proposed re-designed site layout in order to assess whether relevant limits are met.

Construction noise is discussed and will be further managed through a final construction environmental management plan (CEMP) which will be submitted post consent of the amended application.

2 Methodology

2.1 Propagation

The ISO 9613-2[1] propagation model shall be used to predict the specific sound levels due to the proposed development at nearby receivers. The propagation model takes account of sound attenuation due to geometric spreading and atmospheric absorption. The assumed temperature and relative humidity are 10 ˚C and 70 % respectively.

Ground effects are also taken into account by the propagation model, with a ground factor of 1 adopted to reflect a porous ground between the site and the assessment locations. A 4 m receiver height shall be used. Terrain shall be considered but the effect of surface features such as buildings and trees shall not be included in the model. There is a degree of conservatism built into the model as a result of the adoption of these settings.

ISO 9613-2 is a downwind propagation model. Where conditions less favourable to sound propagation occur, such as when the assessment locations are crosswind or upwind of the proposed development, the sound levels would be expected to be less and the downwind predictions presented here would be regarded as conservative, i.e. greater than those experienced in practice.

2.2 Assessment Guidance

The Guidance Note for Noise Action Planning[2], issued by the Environmental Protection Agency in 2009, refers to guidance produced under the auspices of the World Health Organisation (WHO)[3]. The Guidelines for Community Noise recommend sound levels intended to minimise health impacts in specific environments.

[1] International Organisation for Standardisation (2024) Acoustics - Attenuation of Sound During Propagation Outdoors, Part 2: General Method of Calculation
[2] Environmental Protection Agency (July 2009) Guidance Note for Noise Action Planning
[3] World Health Organisation (March 1999) Guidelines for Community Noise

The WHO Guidelines for Community Noise recommend that outside sound levels at dwellings should not exceed 45 dB L_{Aeq} so that people may sleep with the windows open and not be disturbed. During the daytime the sound level should not exceed 50 dB L_{Aeq} to protect the majority of people from being moderately annoyed. The predicted sound levels due to the proposed development shall be assessed against these limits.

In addition to the Guidelines for Community Noise the WHO subsequently published the Night Noise Guidelines[4]. These guidelines are described as complementary to the Guidelines for Community Noise and recommend a limit of 40 dB $L_{night, outside}$. This is a yearly average night-time sound level so could potentially be exceeded on some nights of the year such that it is not necessarily inconsistent with the Guidelines for Community Noise if the sound levels do not exceed 45 dB L_{Aeq} on those nights. The predicted sound levels from the proposed development shall also be assessed against the limit recommended by the Night Noise Guidelines.

BS 4142[5] describes methods for rating and assessing sound of an industrial or commercial nature. Whilst the specific procedures and assessment requirements of BS 4142 are not considered to be applicable here, a general discussion has been provided for reference and completeness, with specific regard to the rating level.

The 'rating' level is defined as the 'specific' sound level (dB $L_{Aeq, T}$ – the average sound level) plus any corrections for the presence of tones (i.e. whines, whistles or hums) or other impulsive character (i.e. banging, crashing or tapping) in the sound generated by the source in question. In instances where the source is unlikely to have a specific character at the assessment location then the 'rating' level can be assumed to equal to the 'specific' sound level. Where tones are present a correction of 2 to 6 dB can be added to the 'specific' sound level to determine the 'rating' level and a further addition of up to 9 dB maybe added where the source is highly impulsive.

The predicted daytime and night-time rating levels ($L_{Ar, T}$) are calculated by adding 2 dB to the predicted specific sound levels at the receptor to account for the potential tonal character of sound generated by the proposed development.

3 Assessment

The main sources of sound within the revised solar development are the string inverters and associated transformer stations. The string inverters are assumed not to be operational during the night-time and are therefore excluded from the model during this period. In practice, the transformer stations may not always be audible/perceptible to nearby receptors at night-time, however as an indicative and conservative approach, these have been included in the model.

Sound power level data for the proposed equipment is detailed in **Table 1**. The data corresponds to the maximum sound power level for each unit as advised by the manufacturer. Predictions based on this data therefore represent the worst case and the sound levels would be expected to be less when the site is not operating at maximum capacity.

[4] World Health Organisation (2009) *Night Noise Guidelines for Europe*
[5] BS 4142:2014+A1:2019 (2019) *Methods for rating and assessing industrial and commercial sound*

Table 1 - Acoustic Emission Data

Equipment	Sound Power Level, dB L_{WA}
String Inverter	84
Transformer Station	79

Predicted sound levels at nearby properties during daytime and night-time are detailed in **Table 2** and an illustrative sound footprint for the proposed development is provided in **Figure 1** and **Figure 2** (**Appendix B**). Coordinates of the properties are given according to the Irish Transverse Mercator system (EPSG code 2157). The maximum predicted specific sound level due to the proposed facility is 36 dB $L_{Aeq,\ T}$, with the corresponding rating level being 38 dB $L_{Ar,\ T}$.

Table 2 - Predicted Sound Levels

House ID	Co-ordinate X	Co-ordinate Y	Predicted Specific Level, dB $L_{Aeq,\ T}$		Predicted Rating Level, dB $L_{Ar,\ T}$	
			Daytime	Night-time	Daytime	Night-time
H1	640244	727751	20	7	22	9
H2	640615	727165	24	9	26	11
H3	638573	726298	26	11	28	13
H4	638878	725548	27	12	29	14
H5	638400	725611	22	8	24	10
H6	640703	725674	29	13	31	15
H7	639991	725674	34	17	36	19
H8	641334	727053	20	5	22	7
H9	641546	726784	19	4	21	6
H10	639090	727615	25	10	27	12
H11	638160	727481	17	3	19	5
H12	637706	727199	13	0	15	1
H13	638260	726028	22	8	24	10
H14	638687	726620	27	12	29	14
H15	639612	727106	32	16	34	18
H16	639630	727023	32	17	34	19
H17	639994	726402	36	22	38	24
H18	640077	726483	34	19	36	21
H19	639720	727497	25	11	27	13
H20	639518	727640	25	10	27	12
H21	639518	727598	25	11	27	13
H22	640120	726611	32	17	34	19
H23	639371	727719	24	10	26	12
H24	639238	727789	22	8	24	10
H25	639227	727900	21	7	23	9

House ID	Co-ordinate X	Co-ordinate Y	Predicted Specific Level, dB $L_{Aeq, T}$		Predicted Rating Level, dB $L_{Ar, T}$	
			Daytime	Night-time	Daytime	Night-time
H26	638958	727796	21	7	23	9
H27	638743	728000	17	4	19	6
H28	640371	727324	24	9	26	11
H29	641170	726986	22	7	24	9

The limits recommended by the WHO Guidelines for Community Noise are met by significant margins of greater than or equal to 12 dB(A) during the daytime and 21 dB(A) at night-time. The limit recommended by the WHO Night Noise Guidelines is met by a margin of 16 dB(A), noting that this is a conservative assessment as the maximum predicted sound level is being compared to an annual average limit.

A level of conservatism, in the form of propagation model settings which are expected to result in predicted sound levels greater than those experienced for the majority of the time in practice, has been built into the assessment to compensate for the potential impact of uncertainty.

4 Cumulative Assessment

The nearby proposed Colehill 110kV substation (Strategic Infrastructure Development application) will be submitted at the same time as this application) and consented Derrygrogan solar farm (Ref: 22378) are to be included in a cumulative assessment.

The proposed Derrygrogan Little solar farm (Offaly County Council planning application) is located approximately 2km Northeast of the proposed development. This site does not have receptors in common with the proposed development and therefore has not been included in this cumulative assessment.

The main sources of sound are the proposed grid transformers located in Colehill 110kV substation, the string inverters and associated transformer stations at the proposed revised layout of Ballyteige solar farm, and the inverters and associated transformers at the consented Derrygrogan solar farm.

Predicted sound levels at nearby properties for the cumulative effect of the Ballyteige solar farm, Colehill 110kV substation, and Derrygrogan solar farm at both daytime and night-time are detailed in **Table 3** and **Table 4**, respectively. The maximum predicted cumulative sound level is 37 dB L_{Aeq} during the daytime and 36 dB L_{Aeq} at night-time, with the corresponding rating levels being 39 dB L_{Ar} and 38 dB L_{Ar} respectively.

Note that the Derrygrogan acoustic assessment has only 20 receptors in common with Ballyteige and Colehill.

Table 3 - Cumulative Predicted Sound Levels - Daytime

House ID	Daytime Specific Level, dB $L_{Aeq, T}$				Cumulative Daytime Rating Level, dB $L_{Ar, T}$
	Ballyteige Solar Farm	Colehill Substation	Derrygrogan Solar Farm	Cumulative	
H1	20	20	36	36	38
H2	24	17	28	30	32

H3	26	17	16	27	29
H4	27	13	12	27	29
H5	22	9	11	23	25
H6	29	0	15	30	32
H7	34	13	16	34	36
H8	20	0	21	23	25
H9	19	0	18	22	24
H10	25	32	26	34	36
H11	17	18	17	22	24
H12	13	15	13	18	20
H13	22	14	12	23	25
H14	27	20	17	28	30
H15	32	28	26	34	36
H16	32	27	26	34	36
H17	36	18	20	37	39
H18	34	18	21	35	37
H19	25	28	35	36	38
H20	25	31	32	35	37
H21	25	32	-	33	35
H22	32	18	-	32	34
H23	24	31	-	32	34
H24	22	29	-	30	32
H25	21	27	-	28	30
H26	21	27	-	28	30
H27	17	22	-	23	25
H28	24	19	-	25	27
H29	22	12	-	22	24

Table 4 - Cumulative Predicted Sound Levels - Night-time

House ID	Night-time Specific Level, dB $L_{Aeq, T}$				Cumulative Night-time Rating Level, dB $L_{Ar, T}$
	Ballyteige Solar Farm	Colehill Substation	Derrygrogan Solar Farm	Cumulative	
H1	7	20	36	36	38
H2	9	17	28	28	30
H3	11	17	16	20	22
H4	12	13	12	17	19
H5	8	9	11	14	16
H6	13	0	15	17	19
H7	17	13	16	20	22
H8	5	0	21	21	23
H9	4	0	18	18	20
H10	10	32	26	33	35

H11	3	18	17	21	23
H12	0	15	13	17	19
H13	8	14	12	17	19
H14	12	20	17	22	24
H15	16	28	26	30	32
H16	17	27	26	30	32
H17	22	18	20	25	27
H18	19	18	21	24	26
H19	11	28	35	36	38
H20	10	31	32	35	37
H21	11	32	-	32	34
H22	17	18	-	21	23
H23	10	31	-	31	33
H24	8	29	-	29	31
H25	7	27	-	27	29
H26	7	27	-	27	29
H27	4	22	-	22	24
H28	9	19	-	19	21
H29	7	12	-	14	16

The limits recommended by the WHO Guidelines for Community Noise are met by significant margins of greater than or equal to 11 dB(A) during the daytime and 7 dB(A) at night-time. The limit recommended by the WHO Night Noise Guidelines is met by a margin of 2 dB(A), noting that this is a conservative assessment as the maximum predicted sound level is being compared to an annual average limit.

A level of conservatism, in the form of propagation model settings which are expected to result in predicted sound levels greater than those experienced for the majority of the time in practice, has been built into the assessment to compensate for the potential impact of uncertainty.

5 Construction

5.1 Scope

A qualitative assessment of the acoustic impact associated with the construction of the solar farm has been undertaken with reference to BS 5228-1:2009[6] in order to predict the likely impact upon the nearest residential properties and adjacent church during the construction period. The properties considered are the same as those detailed in **Section 3.**

The sources of sound during the construction period are temporary and will vary both in location and duration. Sound will arise through the operation of large items of plant and due to traffic movements entering and travelling on the site itself. Further details of the activities during the construction period are

[6] The British Standards Institution (February 2014) BS 5228-1:2009 + A1:2014 Code of Practice for Noise and Vibration Control on Construction and Open Sites – Part 1: Noise

provided in the Outline Construction Environmental Management Plan (OCEMP) and Construction Traffic Management Plan (CTMP). Primary activities creating sound during the construction period include the construction of the site tracks, the creation of temporary construction compound, the construction of hard standings for the transformers, piling for the PV array supports and excavation of trenches. Sound from vehicles on local roads and site tracks would also arise due to the delivery of components and construction materials. Activities and traffic movements will be limited to the hours of 07:00-18:00 Monday to Friday and 08:00 - 16.00 on Saturdays (except for remedial works required in an emergency).

Annex E of BS 5228-1:2009 discusses the 'ABC method', which sets daytime, evening/weekend and night-time limits of 65, 55 and 45 dB $L_{Aeq,\,T}$ respectively, for instances where existing ambient sound levels are relatively low.

The movement of vehicles associated with the site's construction, including heavy goods vehicles (HGVs), along site tracks, local roads and access routes may be noticeable to residents adjacent to these in terms of sound. These movements are highly unlikely to exceed the threshold values defined as part of the 'ABC method'. However, the individual events may well be noticeable to residents, with resulting levels for individual events being similar to that created by existing HGV movements.

The exact methodology and timing of construction activities have not yet been defined, and a reliable assessment of expected construction noise levels is not possible as a result. Where relatively intense construction activities are expected and/or are to be undertaken near neighbouring residences, specific attention to potential for enhanced mitigation measures to reduce the level of noise from these activities will be considered as and when necessary. Typical construction noise mitigation measures are provided in **Section 5.2**.

5.2 Mitigation Measures

For all activities, measures will be taken to reduce construction sound levels with due regard to practicality and cost as per the concept of 'best practicable means' as defined in Section 72 of the Control of Pollution Act 1974[7].

BS 5228-1:2009 states that the 'attitude of the contractor' is important in minimising the likelihood of complaints and therefore consultation with the local authority along with letter drops are advised to inform residents of intended activity. Non-acoustic factors, which influence the overall level of complaints such as mud on roads and dust generation, would also be controlled through construction practices adopted on the site and managed via a Construction Environmental Management Plan (CEMP). Furthermore, the following noise mitigation options could be implemented where appropriate to ensure non-exceedance of the threshold values and to minimise noise as far as reasonably practicable and/or reasonable:

- Consideration would be given to acoustic emissions when selecting plant and equipment to be used at the site;

[7] (1974) Control of Pollution Act: Section 72

- All plant and equipment should be used in accordance with the manufacturer's instructions, maintained in good working order and fitted with the appropriate silencers, mufflers or acoustic covers where applicable;
- Steps would be taken to control sound at source. For example, by avoiding unnecessary engine revving, switching off equipment when not required, using rubber linings to minimise impact sound, minimising the drop height of materials, starting up plant sequentially rather than simultaneously and consideration of alternative reversing alarms and procedures;
- Where sound generated from a specific activity is expected to be directional, steps would be taken to orientate the equipment such that sound is directed away from any noise sensitive areas;
- Consideration would be given to reducing the number of construction activities occurring simultaneously;
- Stationary sound sources would be sited as far away as reasonably possible from residential properties and consideration given as to whether it is necessary to install acoustic barriers to provide screening;
- The movement of vehicles to and from the site would be controlled and employees instructed to ensure compliance with the noise control measures adopted; and
- Consideration would be given to restricting activities being performed within a certain distance of noise sensitive locations.

There are many strategies to reduce construction sound by the limitation of activities that would result in the sound levels being lower than the threshold values. Any strategy that would reasonably be expected to reduce the level of construction noise by the required amount should be considered adequate rather than the options being limited to the measures suggested here. Appropriate noise mitigation measures and construction practices will be included within the final CEMP.

6 Conclusions

An assessment of the acoustic impact of the proposed revised layout of Ballyteige solar site in isolation and in a cumulative sense has been undertaken. The results show that relevant limits would be met during both daytime and night-time periods.

7 Appendix A – Experience & Qualifications

Author:

Name	Lucy Connor
Experience	Acoustic Specialist, Renewable Energy Systems (RES), 2024-Present
Qualifications	AMIOA, Associate Member of the Institute of Acoustics MSc Acoustics and Music technology, University of Edinburgh BSc Mathematics and Statistics, University of Strathclyde

Checker:

Name	Stuart Hill
Experience	Senior Acoustic Specialist, Renewable Energy Systems (RES), 2024-Present Senior Acoustic Consultant, Mabbett, 2022-2024 Senior Environmentalist (Acoustics), Amey, 2021-2022 Associate Consultant – Acoustics, Noise & Vibration, SLR Consulting, 2017-2020 Technical Analyst/Senior Acoustic Analyst, RES, 2013-2017
Qualifications	MIOA, Member of the Institute of Acoustics MInstP, Member of the Institute of Physics MSc Principles and Applications of Radiation in Industry, the Environment and Medicine, University of St Andrews BEng Electronics Engineering, University of Aberdeen

Approver:

Name	Karen Anne Hutton
Experience	Technical Director, Renewable Energy Systems (RES), 2023–Present Head of Repowering & Life Extension, RES, 2019-2023 Head of Innovation & Optimisation, RES, 2018-2019 Transformation Manager, RES, 2016-2018 Initiatives Manager, RES, 2015-2016 Prospecting & Development Data Manager, RES, 2012-2015 Technical Manager, RES, 2009-2012 Senior Wind Analyst, RES, 2007-2009 Wind Analyst, RES, 2001-2007
Qualifications	MEng Civil Engineering, Heriot-Watt University

8 Appendix B – Figures

Figure 1 – Predicted Sound Footprint - Daytime

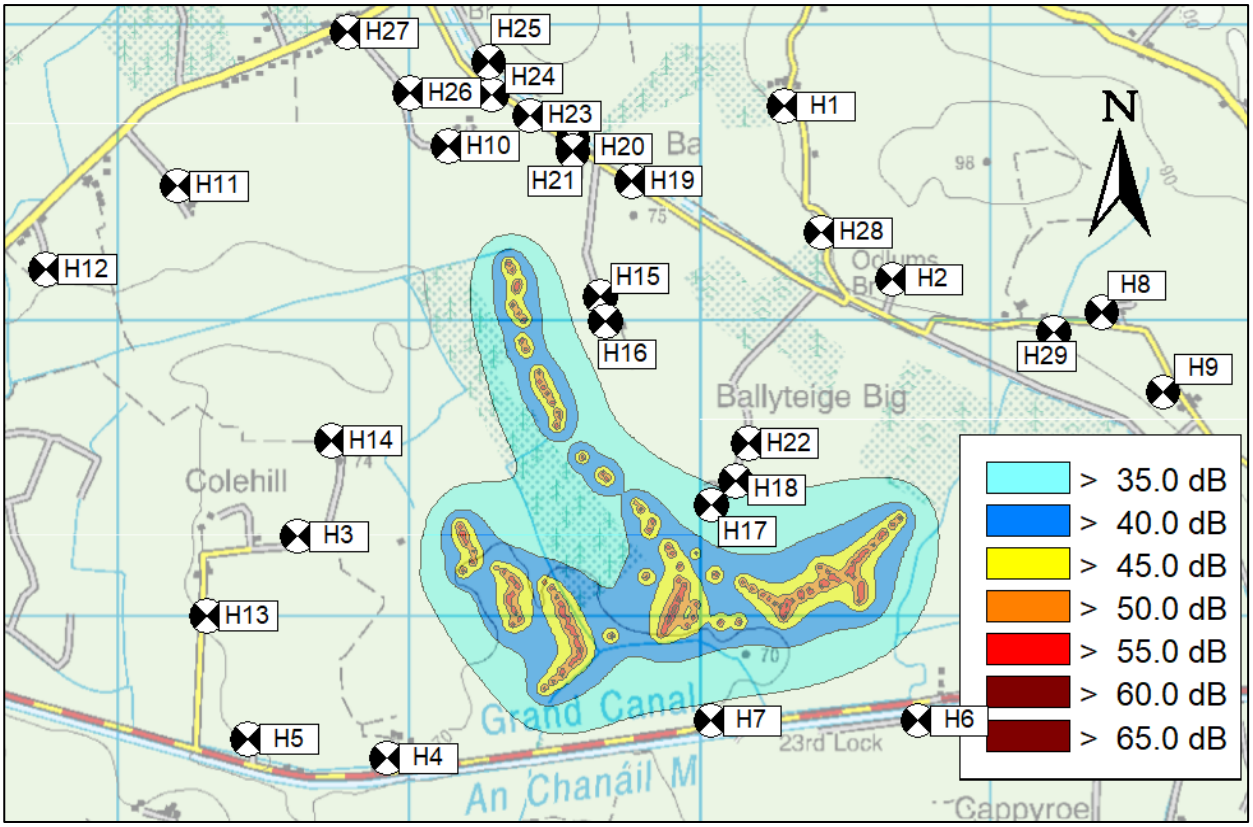

Figure 2 - Predicted Sound Footprint - Night-time