



Wind Turbine Development

Planning Submission Guidance Note

This note details information required for an Assessment of the Noise Impact of Proposed Wind Turbine Developments to be undertaken in Connection with a Planning Application.

This note is intended to provide guidance to applicants who intend to submit a planning application for (either small or large) wind turbine developments. This note details the minimum information that is required by Environmental Health to be submitted with any such full planning application. Failure to do so will mean that Environmental Health will make a recommendation for refusal due to insufficient information being provided to adequately assess the impact of noise, or on grounds of insufficient noise information to satisfy the local planning authority that the proposal would not adversely affect the amenity of nearby residents or other noise sensitive receptors.

South Ayrshire Council has determined that noise from all large wind turbine developments shall be restricted to the following limits at all relevant noise sensitive receptors:-

- 35dB LA90, 10 min for all wind speeds up to 10 m/s for single turbines (where appropriate) or wind farms with very large separation distances between the development and the nearest noise sensitive receptors
- 35dB LA90, 10 min day time hours and 38dB LA90, 10 min night time hours or ETSU derived limits of background noise level plus 5dB (whichever is greater) for all wind speeds up to 12m/s.
- 40dB LA90, 10 min or ETSU derived limits of background noise level plus 5dB (whichever is greater) for all wind speeds up to 12m/s, at properties with valid financial interest .
- 45dB LA90, 10 min or ETSU derived limits of background noise level plus 5dB (whichever is greater) for all wind speeds up to 12m/s, at properties with valid financial interest where there are also cumulative noise impacts.

In the case of small turbines, (i.e., a wind turbine of 50kW or less with a rotor swept area 200m² or less, which equates to a rotor diameter of 16m) where the noise immissions are calculated having regard to BWEA/Renewable UK guidelines, it will be permissible to compare the LAeq, 1 min noise levels with the Typical Background Noise Levels for Rural South Ayrshire detailed on page 5 of this document. Where a financial involvement exists the lower fixed limit will be 40dB LAeq, 1 min or where there is a cumulative impact 45dB LAeq, 1 min.

The above restrictions must take account of all wind turbines consented and/or proposed (in the planning process) within the study area. Where there are already a number of turbines consented and/or proposed in the area, this is likely to result in a noise limit for an individual wind turbine development of less than 35dB LA90, 10 min on the planning consent.

Definitions:

Small turbine: The definition provided by Renewable UK as stated in British Wind Energy Association Small Wind Turbine Performance and Safety Standard (29 Feb 2008) has been adopted by South Ayrshire Council, i.e., a wind turbine with a rotor swept area 200m² or less, which equates to a rotor diameter of 16m.

Large turbine: any turbine outwith the scope of the definition for small turbine.

Note: the descriptions “Small turbine” and “Large turbine” in these contexts are relevant for the purposes of assessing noise impact only – not visual nor any other impacts.

Noise sensitive receptor: in general, any residential use (including nursing homes and accommodation blocks), although applicants should note that there will be instances where non-residential uses should be considered depending on how/when the buildings are used and the nature of the impact. (For example, caravan and camp sites and holiday lets in separate ownership would comprise noise sensitive receptors. This is mentioned again, below.) For the avoidance of doubt, “noise sensitive receptor” includes those developments, not yet constructed, with live planning permissions; and live planning permissions include those applications which have been refused but which may be open to appeal.

Financial interest: either, owning the land on which the turbines are to be sited, or, leasing the land on a long (greater than 20 year) lease, or, being a shareholder or owner of the development company. Where property is owned by someone with a financial interest in the development, but is leased to a third party, the occupiers of the property do not have any legal interest in the site and may be protected against amenity intrusions.

Curtilage: A domestic garden boundary.

Note – a nominal distance of 15m from the façade will normally be assumed; however, in certain circumstances the amenity area may extend beyond this.

The applicant must be aware that specific definitions in regard to noise sensitive receptors, curtilage, financial interest etc., will ultimately be determined by the Planning Case Officer or Planning Committee. Applicants are therefore advised to direct any queries regarding these issues to the relevant Planning Case Officer.

A. Undertaking the Noise Impact Assessment

All planning applications for wind turbine development must be accompanied by a site specific noise impact assessment. It is expected that the noise impact assessment will be undertaken in accordance with ETSU-R-97, the IoA Good Practice Guide to the Application of ETSU (May 2013) and the IoA Supplementary Guidance Notes that accompany these documents.

The Good Practice Guide and Supplementary Guidance Notes can be found within the “Publications” section of the Institute of Acoustics (IoA) website: <http://www.ioa.org.uk/publications/good-practice-guide>

A desktop site specific noise impact assessment is acceptable in circumstances where it is expected that the fixed limit of 35dB LA90, 10 min for all wind speeds up to 10 m/s can be met by the proposed turbine(s), including any cumulative impacts. Where this fixed limit cannot be met, a background noise survey will be required to be undertaken and a detailed site specific noise impact assessment submitted.

A detailed site specific noise impact assessment will be required, at all times, where limits are to be set having regard to the measured background noise level.

The site specific noise impact assessment must provide predicted noise levels at the curtilage of identified noise sensitive premises and, where appropriate, financially involved properties in the vicinity of the proposed location of the turbine.

In the case of small turbines it will be permissible to carry out a desktop noise assessment using South Ayrshire Council's Typical Background Noise Levels in rural South Ayrshire as detailed on page 5 of this document.

Printouts from modelling software used in noise predictions or to produce noise contour maps are not sufficient by themselves and must be accompanied by a site specific noise impact assessment.

South Ayrshire Council requires predictions to be based on the sound power level of the turbine having regard to paragraph 4.3.6 and Supplementary Guidance Note 3 of the Institute of Acoustics Good Practice Guide to the Application of ETSU (May 2013) including penalties for any identified tonality in accordance with ETSU-R-97. Octave band data should be used as input to the predictions. The appropriate prediction methodology should be applied as follows:

- Small turbines – please refer to Equation A.2 in the British Wind Energy Association Small Wind Turbine Performance and Safety Standard (29 Feb 2008) (ie, basic hemispherical sound propagation). The equation should be based upon the declared apparent sound power level at 8 m/s at hub height.
- Large turbines – predictions will be accepted using ISO 9613–2 following the IoA Good Practice Guide on input parameters. The noise assessment must be undertaken by a competent person, and all the data inputs, justification for use of these values, assumptions made, and margins of error must also be included in the assessment.

Cumulative Impacts

As a rough guide, the presence of any other proposed, consented or existing turbine development within a search area of 5km radius from the proposed wind turbine development should be established. Once this other turbine development has been identified, cumulative noise impacts must be considered where the proposed turbine produces noise levels within 10dB of the noise levels of any turbines existing, consented or in the planning process at the same receptor locations.

Because of the nature of turbine development within the South Ayrshire Council area (being numerous single and 2-3 turbine sized developments rather than larger wind farms), South Ayrshire Council expects that existing and consented wind turbine developments will be operating to full capacity of their consented noise limits. Predicted noise levels may only be used where adjacent wind turbine development has not yet been consented. Measured noise levels (i.e., levels measured during a sample period from existing wind turbine development) will not be accepted, as there is no guarantee those measured levels will be sustained over the lifetime of the consented development.

However, it is accepted, there may be some circumstances where an alternative approach is more appropriate. If you wish to use an alternative approach then please contact Environmental Health to discuss.

Extensions to Wind Energy Developments

Where a Planning Consultation relates to an application for an extension to an existing development, it will be assumed that the existing development will be operating such that noise immissions from the development will equate to its consented noise limits. Measured noise levels will not be countenanced. This may mean, that in order to permit the development to proceed, the existing planning consent may need to be revisited by further planning application process.

Other Considerations:

Candidate Turbines

In the event that an alternative turbine to that contained in the submitted noise assessment is chosen for installation, then a new desktop site specific noise assessment of the proposed turbine will be required to be submitted to and approved in writing by the Local Planning Authority.

Noise Sensitive Receptors

Please note that caravan and camp sites and holiday lets in separate ownership are classed as noise sensitive receptors and any noise assessment must provide predicted turbine noise levels at these locations.

Background Noise Monitoring

For applications that require background noise monitoring, the monitoring locations must be agreed in writing with Environmental Health in advance. Two weeks' notice must be given of the intended start date to provide the opportunity for an Officer from Environmental Health to attend, where appropriate, during the installation of the equipment. The noise assessment should state the name of the Officer with whom the locations were agreed.

Care should be taken to choose appropriate monitoring locations for background noise monitoring, and avoid taking measurements during unrepresentative noisy periods such as local events, peak holiday times near main roads, or following unusually heavy rainfall events near streams etc. Refer to the IoA Good Practice Guide for further information.

Specific Considerations for Small Wind Assuming the information contained in the noise label/consumer label has been obtained in accordance with the BWEA/Renewable UK Standard, then the apparent declared sound power level given in respect of the turbine(s) can be used to calculate the sound pressure level due to the operation of the turbine(s) at surrounding noise sensitive receptors, at wind speeds from 3m/s to 10m/s. The calculation assumes hemispherical propagation. The expected noise immissions due to the operation of the turbine are then compared with notional background noise levels, detailed in the table below. These background noise levels are considered representative of rural South Ayrshire:

Table 1: Typical Background Noise Levels in rural South Ayrshire

Wind Speed (m/s)	3	4	5	6	7	8	9	10
Daytime Background Noise Level (dBA)	28.7	29.2	30.2	31.6	33.4	35.7	38.3	41.5
Night Time Background Noise Level (dBA)	22.3	23.4	25.0	27.0	29.6	32.7	36.2	40.3

B. Reporting Results of the Noise Impact Assessment

It is expected that the noise report will contain the appropriate key elements stated in Chapter 6, Table 1, of the IoA Good Practice Guide, reproduced here for reference:

Table 2: Suggested key points for inclusion in a wind turbine noise assessment report

Consultations	Consultation with Local Planning Authority EHO input into selection of Background Noise Measurement Equipment
Background Measurements	Number of Monitoring Locations Map Showing Monitoring Locations; Description of Monitoring Locations Description of Noise Environment; Photos of Monitoring Locations Monitoring Period; Description of Noise Measurement Equipment Wind Shield; Certification/Calibration of all Equipment Used and any Calibration Drift; Wind (speed and direction) & Rainfall Measurement Data Sources Clear Representation of Excluded Data in Time Histories or Scatter Plots; Chart Showing Distribution of Wind Speeds & Direction; Cumulative Issues in Background Measurements
Noise Predictions	Prediction Methodology; Candidate Turbine Model Turbine Source Noise Data (including noise-reduced modes if used) Turbine Source Octave Band Noise Levels Description of Noise Propagation/Attenuation Factors Atmospheric Attenuation – Assumed Temperature and Relative Humidity Ground Effects – Assumed Ground Factor Assumed Receiver Height; Barrier/Screening Attenuation Wind Direction Filtering (if considered); Noise Contours
Assessment	Wind Shear Assessment Method, Derivation of Prevailing Background Noise Type, Order and Coefficients of Regression Line Scatter Data Shown on Plots; Derivation of Noise Limits & Numerical Values Amenity Noise Limit; Justification for Amenity Noise Limit if Chosen Night-Time Noise Limit; Financially Involved Noise Limit Capping of Noise Limits at Highest Wind Speed Measured Comparison of Predicted Noise Level with Derived Noise Limits Correction from LAeq to LA90; Potential Tonal Content Properties Covered by Assessment Incorporated Mitigation (Turbines Running in Low Noise Mode) (if relevant) Cumulative Issues

Please note, in addition to the appropriate key elements listed above, South Ayrshire Council requires the following information to be included in the noise report:

- (a) Accurate twelve digit grid references for the turbine(s);
- (b) Accurate twelve digit grid references for the noise sensitive receptors;
- (c) Elevations of turbines and receptors;
- (d) Details of any financial involvement at noise sensitive receptors;
- (e) Sound power level details for the turbine(s). Broadband and A- weighted octave band data is required, together with uncertainty figures and any tonal penalty;
- (f) Information regarding any valley effect. It will be necessary to demonstrate whether or not, a 3dB correction is required in respect of the valley/significantly sloping ground effect.

C. Planning Conditions

Due to the increasing number of wind turbines in the South Ayrshire Council area, please note that site specific noise limits will be set that are based on predicted turbine noise levels rather than the application of the whole fixed or ETSU derived limits at each noise sensitive receptor. Detailed below are examples of noise conditions and informative comments normally recommended by South Ayrshire Council Environmental Health Service following a Planning Consultation .

Large Wind

1. The turbine shall be designed to permit individually controlled operation, or cut-out, at specified wind speeds in order to enable, and ensure, compliance with the noise level criteria stated in these conditions.

2. Details from the turbine supplier and/or manufacturer regarding the tonality assessment carried out on the turbine require to be provided. A copy of the standard detailing the assessment method shall be submitted for approval by the Planning Authority. Where the tone level above audibility is 2dB or greater then a tonal penalty shall be applied to the permitted noise levels in accordance with figure 16 in the document “The Assessment and Rating of Noise from Wind Farms” (ETSU-R-97).

3. At wind speeds not exceeding 12m/s, (referenced to a height of 10m above ground level, at the location of the turbines), the wind turbine noise level at each noise sensitive property shall not exceed the levels in Table 3, except where the level in the table exceeds the lower fixed limit (35dB LA90,10min. for daytime and quiet daytime hours, and 38dB LA90,10min. for night hours), and also exceeds the measured background noise level, LA90,10min by 5dB or more, in which case the permitted level will be the lower fixed limit or the background noise level plus 5 dB, whichever is the greater

Table 3

Location		Standardised Wind Speed at 10m height in m/s averaged over 10 minute periods, Sound Pressure Levels in dB, LA90 10min								
Property Name	Map Ref	4	5	6	7	8	9	10	11	12
H1										
H2										
H3										
H4										
H5										
H6										
Note: for all properties not specified above the predicted noise from the turbine will be calculated using the propagation model in ISO 9613-Part 2 incorporating the recommendations contained in the Institute of Acoustics Good Practice Guide dated May 2013.										

Note – In certain circumstances separate tables will be required for daytime and night time

4. The Wind Turbine Operator shall log wind speed and wind direction data continuously and shall retain the data which has been obtained for a period of no less than the previous 12 months. The data shall include the average wind speed in metres per second for each 10 minute period. The measuring periods shall be set to commence on the hour and in 10 minute increments thereafter. The wind speed data shall be made available to the Planning Authority on request. The data shall be provided on a Microsoft Excel spreadsheet in electronic format

or other format agreed with the Planning Authority. The wind speed shall also be normalised to a 10m reference height.

5. The Wind Turbine Operator shall employ an independent consultant, approved by the Planning Authority, to measure, at the operator's own expense, the level of noise emissions from the wind turbines within the first year of the operation of the turbines, and every two years thereafter, unless and until the Planning Authority extend the period or determine that continued compliance monitoring is no longer required. The measurement procedures, which may include filtering data according to wind direction, shall be agreed with the Planning Authority prior to commencement, (see 'Informative' section below for further detail). The results of any measurement exercise shall be forwarded to the Planning Authority as soon as practicable after the completion of the monitoring exercise. Unless otherwise agreed with the Planning Authority the turbines shall be switched off during part of the monitoring period to permit reliable background noise level data to be determined at the range of wind speeds from 4m/s to 12m/s.

6. At the request of the Planning Authority, following a verified complaint to South Ayrshire Council relating to noise emissions from the wind turbines, the Wind Turbine Operator shall shut down the turbines no later than 24 hours after the receipt of the request and, at his own expense, employ an independent consultant, approved by the Planning Authority, to assess the level of noise emissions from the wind turbines (inclusive of existing background noise). This condition shall not prevent the turbines from being operated temporarily for acoustic testing and measurement in a manner agreed with the Planning Authority and outlined below

An assessment of amplitude modulation of noise from the turbines may be also be required, and shall be carried out in accordance with the terms specified by the Planning Authority and shall also be carried out at the expense of the Wind Turbine Operator. For noise other than amplitude modulation the LA90 index shall be used over a minimum of 20 periods each of 10 minutes duration. At least 10 of the periods of measurement shall be made at wind speeds between a wind speed specified by the Council and a wind speed of not more than 2 metres per second above the wind speed(s) specified by the Council. At least 10 measurements shall be made at wind speeds between the wind speed specified by the Council and a wind speed not less than 2 metres per second below the wind speed(s) specified by the Council. Measurements of noise emissions shall, so far as is reasonably practicable, be made in consecutive 10-minute periods provided that they fall within the wind speed range defined in this clause. Sufficient data points are required for the determination of the sound pressure levels at each of the required wind speeds and at wind directions agreed with the Planning Authority for each receptor location.

The LA90, 10min noise level from the wind turbines (inclusive of existing background noise) shall be correlated with wind speed and derived using a Best Fit Curve and, where appropriate, allowing for a correction for the influence of the background noise level as described on page 88 of the ETSU-R-97 document, which will necessitate measurement of the background noise level in the absence of the turbine operating. Measured wind turbine noise levels and background noise levels shall be referenced to derived 10 metre height wind speeds. The measurement procedures, including any data filtering parameters, shall be agreed with the Planning Authority prior to commencement, (see 'Informative' section below for methodology).

Unless otherwise agreed with the Planning Authority the assessment shall be completed and report submitted to the Planning Authority within 3 months from the date of notification by the Planning Authority that monitoring is required. Should the Wind Turbine Operator fail to demonstrate to the satisfaction of the Planning Authority that noise levels referred to in these conditions have not been exceeded, the turbines shall remain shut down, or operated in accordance with a mitigation scheme agreed with the Authority until such time as compliance with the noise limits has been demonstrated to the satisfaction of the Authority.

7. At the request of the Planning Authority the Wind Turbine Operator will be required to carry out an assessment for tonal noise in accordance with the procedure recommended in Section 6 of the document "The Assessment & Rating of Noise from Wind Farms" (ETSU-R-97) i.e. the procedure based on the Joint Nordic Method.

Where the tone level above audibility is greater than 2dB a tonal penalty shall be applied to permitted noise levels, in accordance with figure 16 of the document; so that the permitted levels specified in these conditions will be reduced by the tonal penalty.

INFORMATIVE:

1. Determination of LA90

Determination of LA90 index shall be used with integrating periods of at least 1 minute duration. At least 10 periods of measurement are required for each integer wind speed bin from the cut-in wind speed to a wind speed of 11m/s.

The LAeq Wind Turbine Noise Level shall be correlated with wind speed and derived using a Best Fit Line, using linear regression analysis.

The LA90 Background Noise Level shall also be correlated with wind speed and derived using a Best Fit Line, using linear regression analysis.

The assessment of compliance with the above conditions will be determined on the basis of the levels determined from the best fit lines.

The locations of monitoring shall be determined by, or agreed with, the Planning Authority.

2. Rotor height wind speed

Rotor height wind speeds can be determined by direct measurement at hub height or calculated from the measured wind speed at 10m height, using a roughness value, Z0 = 0.05m, from the following equation:

$$V1 = V2 \times \{ \ln (H1/Z0) / \ln (H2/Z0) \}$$

Where V1 = Hub Height wind speed

V2 = Measured 10m height speed

H1 = Hub Height, metres

H2 = 10 metres

LN is the natural logarithm to the base e

3. Noise Measurement Procedure and Interpretation

"Wind Turbine Sound Pressure Level" means the downwind sound pressure level due to the combined effect of all contributing Wind Turbines, excluding the contribution from background noise. The applicant shall be aware that due to the numerical similarity of the background noise level and the wind turbine noise level at some preferred monitoring locations it may be necessary to agree alternative monitoring locations, with the Planning Authority. The agreed location will be closer to the turbine. The turbine noise level can then be calculated for the preferred monitoring location using the formula;

H2										
H3										
H4										
H5										
H6										
Note: for all properties not specified above the predicted noise from the turbine will be calculated using hemispherical propagation with no reduction for air attenuation or ground effect.										

2. At the request of the Planning Authority, following a complaint to South Ayrshire Council relating to noise emissions from the wind turbine(s), the wind turbine operator shall shut down the turbine not later than 24 hours after the receipt of the request and at his own expense, employ an independent consultant, approved by the Planning Authority, to assess the level of noise emissions from the wind turbine(s) (inclusive of existing background noise). The background noise level shall also be measured without the wind turbine(s) operating. The noise from the turbine alone can then be calculated by logarithmic subtraction. If requested by the Planning Authority the assessment of noise emissions shall include an investigation of amplitude modulation in a manner agreed with the Authority.

3. Should the wind turbine sound pressure level exceed the level specified in the above conditions the turbine shall cease operation until such times as it has been demonstrated to the Planning Authority that the sound pressure level, referred to in the condition, can be achieved.

INFORMATIVE:

a) Measurements should be carried out at the complainant’s property, using a sound level meter of EN 60651/BS EN 60804 Type 1, or BS EN 61672 Class 1 quality (or the equivalent UK adopted standard in force at the time of the measurements) set to measure using the fast time weighted response as specified in BS EN 60651/BS EN 60804 or BS EN 61672-1 (or the equivalent UK adopted standard in force at the time of the measurements). This should be calibrated in accordance with the procedure specified in BS 4142: 2014 (or the equivalent UK adopted standard in force at the time of the measurements). Measurements shall be undertaken in such a manner to enable a tonal penalty to be applied in accordance with Guidance Note 3 as detailed above under the planning conditions for Large Wind.

(b) The microphone should be mounted at 1.2 – 1.5 metres above ground level, fitted with a two-layer windshield or suitable equivalent approved in writing by the Local Planning Authority, and placed outside the complainant’s dwelling. Measurements should be made in “free field” conditions. To achieve this, the microphone should be placed at least 3.5 metres away from the building facade or any reflecting surface except the ground at the approved measurement location. In the event that the consent of the complainant for access to his or her property to undertake compliance measurements is withheld, the wind farm operator shall submit for the written approval of the Local Planning Authority details of the proposed alternative representative measurement location prior to the commencement of measurements and the measurements shall be undertaken at the approved alternative representative measurement location.