

4a. Noise Levels and Methodology

Reason for rejection last time:

*1. The applicants have failed to demonstrate that there would not be an **unacceptable impact on the amenity of nearby residents by virtue of the noise** generated by the proposed turbines, and the proposed development would therefore be contrary to Policies DVT11 and DVT13 of the Torrridge District Local Plan and Policy CO16 of the Devon Structure Plan.*

This chapter shows that there are a number of flaws, inaccuracies and invalid assumptions in the noise predictions in the revised application. A noise level prediction method which lies outside ETSU-R-97, the government's approved methodology, has been used. This method does not have any official standing, has received negative peer-review and allows developers to underestimate the noise levels of the turbines at nearby properties. The applicant calls this 'best practice'. Some of the 40 dwellings within 1km of the site have been missed out of the assessment altogether. Of those which remain, only 10 are shown in the applicant's tables, giving the impression that not many properties will be affected. DTOG has put all missing properties back into the tables to show the real situation. Conflicting assessments for background noise levels and ground conditions are revealed. The applicant has been forced to model the turbines running in various degrees of noise-suppression mode (with lower power output as a consequence) in order to stay within predicted noise limits. Even then, predicted noise levels at a number of properties are either just below or exactly on the limit. With the figures corrected for errors and invalid assumptions, the noise limits are breached. County Policies CO16 and ST1 and Local Plan policies DVT11, DVT12 and DVT13 are all shown to be in conflict with this application. National guidelines PPS22, PPG24 and ETSU-R-97 and the Environmental Protection Act 1990 (Part III) are also discussed.

This chapter has 9 sub-sections:

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4a.1 Foreword

4a.1.1 In October 2009, the Inspector at the Public Inquiry into the Den Brook Wind Farm (an application to West Devon BC) asked Dr. Lee Moroney, an expert in raw data analysis with the Renewable Energy Foundation, if she thought that local authority planning officers and EHO's are ever out of their depth when considering noise issues in wind power applications. Dr. Moroney replied that she thought they were and added that they were unable to enforce noise conditions or cure noise problems caused by operational wind turbines sited in inappropriate places. Her comments were endorsed by Mrs. Jane Davis at the same inquiry.

4a.1.2 Mrs. Davis and her husband are well-known as the Lincolnshire couple who had to leave their home at night to sleep in rented accommodation 5 miles away in order to escape the noise of wind turbines 930 metres away from their property. They sued the wind farm landowner and

developer for compensation for loss of amenity. After a five year legal battle, during which their Council Tax band was reduced in recognition of the problems, the Davis' case finally reached the High Court in London on 4th July, 2011. After a couple of weeks the case was adjourned when evidence presented to the court made it necessary for the two acousticians, one representing the complainant and the other the defendants, to return to the site to undertake further noise measurements with selected turbines being turned on and off as required. These readings obviously confirmed that the noise nuisance and the distress it caused were real, because on the day the hearing reconvened, 30th November, 2011, the case was settled out-of-court. The Davises had been claiming £2.5 million for the loss of use and value of their property and £400,000 for legal fees accrued to date. As part of the settlement, the developer and landowner insisted on a gagging clause to make sure the details were never revealed.

4a.1.3 No one can be in any doubt that the Davises won this case. If the defendants had any hope of winning they would not have settled out-of-court. The use of gagging clauses when wind farm developers buy-out adversely affected residents is relatively new in the UK, but is already widespread in other parts of the world, in particular Canada, USA and Australia. It shows that predictions of no noise nuisance when turbines are placed too close to properties, as is the case at Dunslund Cross, cannot be trusted. This is especially so when a phenomenon known as Amplitude Modulation is involved, as in the Davis' case. This is discussed further in Chapter 4c: *Amplitude Modulation (AM) and Low Frequency Noise (LFN)* of this report.

4a.1.4 Planning officers cannot be expected to have the necessary expertise to understand fully all of the material they are asked to consider and evaluate in planning applications. This is especially so in the specialist, complex and imprecise subject of Wind Turbine Acoustics. It is now the norm to seek advice and guidance from acknowledged experts in the field. The following high-profile acousticians, all Fellows or Members of the Institute of Acoustics (IOA), frequently produce reports for government, developers, councils and opposition groups and appear at many public inquiries and conferences in the UK and abroad:

Mr. Dick Bowdler, BSc FIOA (Independent consultant, formerly with New Acoustics, Clydebank)
 Dr. Andrew Bullmore, PhD BSc MIOA (Hoare Lee Acoustics, Bristol)
 Mr. Bob Davis, BSc(Eng) MIOA (Robert Davis Associates, Hampshire)
 Mr. Malcolm Hayes, BSc MIOA (Hayes McKenzie Partnership, Machynlleth)
 Mr. Mark Jiggins, MSc MIOA (Hoare Lee Acoustics, Castle Douglas)
 Dr. Geoff Leventhall, PhD, HonFIOA (Independent Noise and Vibration consultant)
 Dr. Andy McKenzie, PhD BSc MIOA (Hayes McKenzie Partnership, Salisbury)
 Mr. Mike Stigwood, MIOA, FRSPH (MAS Environmental) FRSPH = Fellow of the Royal Society for Public Health)

4a.1.5 Reference will be made to these expert professionals in this chapter. The two acousticians from Hoare Lee Acoustics and the two from the Hayes McKenzie Partnership (HMP) usually represent wind farm developers. HMP has also won a number of Government contracts for wind-farm related work. Mr. Bowdler, Mr. Davis and Mr. Stigwood usually represent Councils and Opposition Groups. DTOG notes that all of these acousticians, whilst in agreement with each other much of the time, are known to hold differing views on certain contentious issues. Such is the nature of the subject. A case in point: Mr. Stigwood represented Mr. & Mrs Davis in the High Court case mentioned above and Dr. Bullmore represented the wind farm owners/developers. Mr. Stigwood's assessment prevailed and the Davises were paid a large sum of money.

4a.1.6 DTOG welcomed the involvement of Mr. Bob Davis from the list above to oversee the background noise monitoring part of the current application. Mr. Davis advised TDC for the last application at Dunslund Cross in December 2008. DTOG recognises and respects Mr. Davis' standing in the industry.

4a.1.7 DTOG commissioned Mr. Dick Bowdler from the list above to examine the last application in 2008, which was found to be deeply flawed. The advice given and the lessons learned have been used once again in this analysis of the applicant's noise submission for this current application.

4a.2 ETSU-R-97 and The IOA Bulletin Methodology

4a.2.1 PPS22 requires that ETSU-R-97, *'The Assessment and Rating of Noise from Wind Farms'* be used in wind farm applications. ETSU-R-97 has been heavily criticised as being out-of-date and not fit for purpose when modern, very tall and more powerful turbines are being proposed for wind farms. It was written at a time when turbines were barely half the height and power they are now.

4a.2.2 Inspectors at public inquiries have sympathised with these concerns but have noted that the basic ideas in ETSU-R-97 still offer a usable framework for noise predictions. However, there is one issue on which all sides of the noise debate are in agreement: ETSU-R-97 does not offer the guidance needed to deal adequately with wind shear, the increase of wind speed with altitude, at the new turbine heights. It addresses the issue of wind shear as if it was caused by topographical ground features alone. This is now known to be incorrect.

4a.2.3 ETSU-R-97 implies that rolling landforms such as Dunslund Cross should not have significant wind shear. Evidence submitted at the Shipdham and Den Brook Public Inquiries shows that this is not the case. Rolling landform sites, common in Devon, do have significant wind shear. This is because there are two causes of wind shear, not just one as suggested in ETSU-R-97.

4a.2.4 Wind shear is caused by a combination of ground roughness *and* atmospheric factors. Wind shear caused by ground roughness is calculated by the equation:

$$V_U = V_L \times (\log(H_U/Z_0)/\log(H_L/Z_0))$$

where V_U and V_L are the wind speeds at heights U (upper) and L (lower). H represents the actual heights of U and L. Z_0 is the ground roughness length, with $Z = 0.05$ metres being the value used for farmland with some vegetation like that found at Dunslund Cross.

4a.2.5 Wind shear caused by atmospheric effects is calculated using the equation:

$$V_U = V_L \times (H_U/H_L)^m$$

By rearranging this equation the wind shear exponent can be calculated from measurable values using a tall anemometer mast on site:

$$m = (\log(V_L/V_U)/\log(H_L/H_U))$$

4a.2.6 The values of 'm' are described by a five-point Pasquill classification. Class A (very unstable air) or Class B (moderately unstable air) has a shear exponent of 0.21 or less. For Class C (neutral air) 'm' is greater than 0.21 and less than or equal to 0.25. Class D (slightly stable air) or Class E (moderately stable air) has values for 'm' greater than 0.25 but less than or equal to 0.4. Class F (stable air) has values greater than 0.4.

4a.2.7 No single value of site-specific wind shear can be defined because no fixed value of Z_0 , ground roughness, or m, shear exponent, can be used to define the increase in speed from one height to another. No mathematical expression can account for site-specific wind shear *at all times*. The ground roughness could be different from one side of the site to the other. The fact that wind shear varies with atmospheric conditions means it also varies with weather, wind speed and direction. It also varies with the time of day.

4a.2.8 Measurable wind shear is present almost all of the time in all wind speeds. Even in calm, quiet conditions at ground level there can be enough wind at hub-height to turn wind turbine blades and generate noise. Wind shear is greatest at night and typically might be double that measured in the middle of the day. For wind speeds of 1.5 - 2.5 m/s, measured at 10 metres above ground level (agl), the shear exponent might increase from around 0.15 in the middle of the day to over 0.4 at night. As wind speed increases, the change in shear exponent becomes less pronounced. At wind speeds of 7.5 - 8.5 m/s (measured at 10 metres agl) the shear exponent barely changes from 0.16 in the middle of the day to 0.2 at night.

4a.2.9 Successive Governments have steadfastly refused to update ETSU-R-97 to deal with the issue of wind shear. Early in 2009, concerned about inaccurate noise predictions for wind farms (or prompted by the Department for Energy and Climate Change (DECC)), the first seven acousticians named above in paragraph 4a.1.4 made their own recommendations as to how to deal with the problem. They produced a paper entitled '*Prediction and assessment of wind turbine noise (Agreement about relevant factors for noise assessment from wind energy projects)*' and published it in the IOA Bulletin, Vol. 34, No. 2, in March/April 2009.

4a.2.10 It has to be said at this point that **this paper is not official IOA policy**. It has the status only of a technical contribution from the seven signatories. No data or scientific evidence is presented in the article to endorse the conclusions drawn. **Nor is it Government policy**. It does, however, represent a departure from ETSU-R-97, which runs contrary to Government guidance as PPS22 states that ETSU-R-97 should be followed in wind farm noise assessments.

4a.2.11 PPS22 will be replaced in 2012 by a new PPS, '*Planning for a Low Carbon Future in a Changing Climate*'. This is still currently in draft form but it indicates the expectation that for wind energy projects the new National Policy Statement (NPS) for Renewable Energy Infrastructure should be adhered to. This brings into play the new renewable energy policies EN1 and EN3. EN1 is the over-arching policy detailing the targets to be met. EN3 will give more detailed guidance about specific types of renewable energy for decision-makers.

4a.2.12 Whilst it was still subject to consultation, EN3 was stating that, for onshore wind farm proposals, ETSU-R-97 must still be used, saying that ETSU-R-97 '*sets noise limits to safeguard the amenity of all dwellings*' and that if those limits are met then the noise impact is automatically acceptable. **ETSU-R-97 actually says neither of these things**. The National Alliance of Windfarm Action Groups (NAWAG) has responded to the consultation saying that ETSU-R-97 actually suggests '*indicative noise levels thought to offer a reasonable degree of protection to wind farm neighbours*'.

4a.2.13 Aware of the IOA Bulletin paper (see paragraph 4a.2.9 above), DECC assumed that it would automatically be adopted as a supplementary method for predicting wind farm noise alongside ETSU-R-97. Despite still being subject to consultation, EN3 already had it written in:

'The applicant's assessment of noise from the operation of the wind turbines should use ETSU-R-97 in accordance with latest industry good practice which should reflect any updated guidance issued in relation to ETSU-R-97 and accepted by Government.'

4a.2.14 Having put the cart before the horse, DECC now needed to make it look as if the inclusion of the IOA Bulletin Method had evolved naturally. So it announced, on 27th July, 2010, that it had commissioned fresh research into the consideration of noise impacts in the determination of wind farm planning applications in England.

4a.2.15 The contract for the research had been put out to 'open' tender in May 2010, in the period immediately after the General Election whilst there was, technically, no Parliament. It was allegedly initiated by a person who primarily works for wind farm developers who was seconded to DECC at that time. The 'open' invitation to tender for the work was restricted to 3 carefully chosen candidates only.

4a.2.16 To no one's surprise, the contract was awarded to the Hayes McKenzie Partnership following what DECC called '*a standard tendering process*'. The announcement added:

'The project will seek to establish best practice in assessing and rating wind turbine noise by investigating previous planning inspectorate decisions, to ensure that the ETSU-R-97 guidance is applied in a consistent and effective manner. The project will not revisit ETSU itself. Results are expected around the end of the year.'

4a.2.17 The result was expected to be a foregone conclusion, with HMP recommending that the IOA Bulletin method be accepted as an addendum to the ETSU-R-97 methodology. This would not have been surprising since Mr. Hayes and Dr. McKenzie are two of the authors of the IOA Bulletin method. However, it was not as clear cut as DECC expected.

4a.2.18 The HMP report was delivered on 6th April 2011. (*Analysis of How Noise Impacts are Considered in the Determination of Wind Farm Planning Applications' HM:2293/R1 Research Contract 01.08.09.01/492A (Analysis)*) The first half was simply a review of approximately 50 wind farm applications submitted between 2004 and 2009 to see how they had conducted the noise assessment, what they had included, what they had left out and how they had undertaken the measurements and predictions. There were no Public Inquiry decisions or Inspector comments.

4a.2.19 The second half looked more closely at each measurement and prediction criterion and assessed its relevance and importance. It was noted that wind shear only featured in about half of the applications and they were all more recent ones. Heavy plugs were made for the IOA Bulletin Method but the point was made several times that it was not official guidance and further review of it was necessary.

*'Of particular importance is the way noise propagation from wind turbines is modelled since this is not covered by the ETSU-R-97 guidance which only deals with assessment of any such predicted noise levels. This issue was covered by a recent statement on agreed practice by a number of consultants acting for wind farm developers, local authorities and third party groups in an article published in the Institute of Acoustics Bulletin in 2009 together with the related issue of wind shear **although this document has no official status and the recommendations it makes should be subject to further review.**'*
(Paragraph 2.4)

*'... Although this method was identified as an agreed practice in the Institute of Acoustics Bulletin article referred to at Paragraph 2.4 (above) and means that limits specified in planning conditions can be set relative to wind speeds measured at hub height such that compliance with such limits can be predicted without making any assumptions about wind shear at the site, **there is still some debate about the principles of the method and whether it should be universally applied.**'*
(Paragraph 5.38)

*'Some variation was also found in the prediction methodology used including the assumed temperature and relative humidity factors, ground effects, receiver heights and barrier attenuation. These are usefully covered in the 2009 Institute of Acoustics Bulletin Article **although this document has no official status and the recommendations it makes should be subject to further review.**'*
(Paragraph 7.4)

4a.2.20 The report stopped short of giving any precise recommendations and just said in several places that more detailed guidance should be issued, without saying exactly what that guidance should be. However, it did end by saying in para 7.13 that:

*'Guidance should also review, or at least acknowledge, the changes which have been made to some of the documents referred to in ETSU-R-97; such as the replacement of IEC651 with BS EN 61672, the update of BS4142 from the 1990 version, **and the latest WHO guidance on noise limits to prevent sleep disturbance.**'*
(Paragraph 7.13, the final paragraph of the report)

4a.2.21 Following receipt of the HMP Report, DECC announced:

'The Government is in discussions with the Institute of Acoustics, which has offered to lead a working group on establishing best practice guidance.'
(http://www.decc.gov.uk/en/content/cms/meeting_energy/wind/onshore/comms_planning/noise/noise.aspx)

4a.2.22 The guidance has not yet been published, so the current application for Dunslund Cross falls under the auspices of ETSU-R-97 alone. As at 1st March, 2012, the standing advice from DECC as published on the web page given in the paragraph above is:

'The Government continues to support ETSU-R-97. Current methods used in practice to implement the ETSU-R-97 guidance continue to apply until supplementary best practice guidance is published.'

This is obviously a big disappointment for the current applicant at Dunslund Cross, who has used the IOA Bulletin Methodology and who had expected its use to have been sanctioned by this time.

4a.2.23 Since its publication, the methodology suggested in the IOA Bulletin has been adopted by a number of acousticians working for wind farm developers, who invariably describe it incorrectly as 'best practice'. This is not surprising since it creates a situation more favourable to noise-limit compliance than existed previously. It is another example of the goalposts being moved to the benefit of the wind farm developers and the detriment of local residents. It has now reached the stage whereby the use of the IOA Bulletin methodology is being tested at public inquiries. (This is not surprising as the authors of the paper are the ones who appear most frequently as expert witnesses at these inquiries.)

4a.2.24 One of the main criticisms of ETSU-R-97 is that it provides an 'average' approach to baseline noise measurements instead of a worst-case scenario. This is because it uses a best-fit procedure in the graphs plotted from background noise readings to derive a background noise level at all relevant wind speeds. The IOA Bulletin method makes this derived noise level even less accurate because it creates more 'scatter' around the trend line through the plotted data points.

4a.2.25 Speaking as an expert witness at the Den Brook Inquiry, Mr. Stigwood, an acoustician with the benefit of 19 years experience as an Environmental Health Officer, told the Inspector that the IOA Bulletin methodology does not stand up to scrutiny and robust analysis. He said **the new methodology results in predicted noise levels at nearby properties which are 1.0 - 2.9dB too low, ignores two error factors of 2dB and 3dB and can potentially lead to a noise impact shortfall of up to 9dB.**

4a.2.26 Mr. Stigwood's criticism was developed at his attendance at the Environmental Protection UK (EPUK) Noise Management Conference in Birmingham in 2009, reported in the November edition of Noise Bulletin:



4a.2.27 Since then, Mr. Stigwood has properly peer-reviewed the IOA Bulletin Method. The 56-page report is dated 27th September, 2011, and is published on the MAS Environmental website under the title, *'The effect of a common wind shear adjustment methodology on the assessment of wind farms when applying ETSU-R-97'*. A shorter 10-page summary is also available. (<http://www.masenv.co.uk/publications>)

4a.2.28 In the Executive Summary at the start of the paper Mr. Stigwood states:

'The 2009 [IOA] article method for assessing wind shear was not based on research and was developed following some widely stated, but now shown to be incorrect, assumptions about the effects of wind shear.

This paper investigates the differences in turbine noise assessment as recommended in the article method and as recommended in ETSU-R-97, the current guidance for assessing wind farm noise. Using data measured at a number of wind farm sites around the country comparison is made between the difference in margin between predicted turbine noise level and associated limits as calculated by the article method and by the application of ETSU-R-97 as written. This paper explores whether there are any benefits to using the article method, however small, and reviews the consequences for local communities in adopting this change.

*The study concluded that the desired benefit using the article method at all wind speeds, and especially at 5-7 m/s where the article method was expected to perform best, is not realised. Where standardised wind shear conditions as implemented by the article, which do not relate to those conditions causing complaint, were substituted for the actual wind shear conditions likely to cause complaint, more turbine noise was allowed. Further, the comparison showed that **in all cases analysed there was a loss of community protection when adopting the article method.'***

4a.2.29 The specific conclusions in Part V of the report make this clearer:

'Adoption of the article method increases the permitted impact from noise upon communities that was not intended by ETSU-R-97.'

'The increase in noise impact was significant in all cases analysed.'

'When the article method is compared to ETSU-R-97 as written it consistently permits increased noise and as a result allows turbines to be located closer to dwellings in all situations assessed.'

'There is loss of protection both at mid and low 10m wind speeds using the article method which represents the most important amenity periods.'

'Any individual combination of wind speed and location where the article method shifts the limit downwards slightly is outweighed by much larger upward shifts in permitted noise for the majority of circumstances.'

4a.2.30 In the recommendations which follow the conclusions Mr. Stigwood notes:

'All historical cases where the article method has been applied and as a consequence results in a loss of protection of the community in effect means that the only recourse to protection is through the application of nuisance provisions (where applicable) or through the voluntary restriction of turbines by the operators.'

4a.2.31 The current applicant has used the IOA Bulletin Method for the assessment of likely turbine noise levels at properties around the Dunsland Cross site. This means that, until the new IOA Guidance becomes Government policy, the application must automatically be refused. No council planning officer or planning committee member has the authority or mandate to re-interpret or overrule Government policy. Current Government policy PPS22 requires that ETSU-R-97 should be used to predict wind farm noise and this applicant has departed from that requirement. It is a matter for the Planning Inspectorate alone to instruct its inspectors with regard to how much material consideration is given to a wind farm application relying on a noise assessment which has departed from ETSU-R-97. It is not the remit of a local authority planning officer or planning committee to do so.

4a.3 Errors and Omissions in the List of Properties

4a.3.1 It is fairly fundamental in any wind farm predictive noise assessment to have all of the nearest properties correctly identified and included in the assessment. This requirement has not been satisfied by the applicant at Dunsland Cross.

4a.3.2 In paragraph 11.3.1 of the ES the applicant states that he has identified and located the 'permanent residential' properties within 1 km of any turbine using the Ordnance Survey Mastermap Address Layer 2 data, a geographical database which correlates Royal Mail address data with buildings and other features shown on Ordnance Survey large-scale mapping and provides descriptions and addresses for each. It is also a database which is inevitably not 100% accurate, is usually out-of-date and incomplete. The applicant should have validated each property by touring the local area with GPS in hand.

4a.3.3 DTOG questions the exclusion of non-permanent residences. On whose authority has the applicant been allowed to exclude such properties? **All** residential properties have the right

to be protected from wind farm noise, even if they are only slept-in one night per year. Is the applicant saying that any holiday accommodation, be it a second home, static caravan or lodge park, in the vicinity of a wind farm should be excluded from all noise assessments?

4a.3.4 DTOG has identified the following errors in the list of properties:

Manor Farm has been omitted from the list. This is most interesting, because it belongs to the land owner and is situated on the wind farm site itself! It was formerly known as Warren Farm (in the days when there was a large rabbit warren nearby). It comprises outbuildings and barns and a caravan occupied by the land owner and/or his son during lambing time. (DTOG notes that with certain breeds of sheep, eg Poll Dorset, lambing is a year-round activity). These buildings are 350 metres from the nearest turbine. At this distance the noise impact of the turbines will be very high, but as a financially-involved property the limits will be higher too.

Manor Farm was included in the 2008 application at Dunsland Cross by the current applicant, but it was suspiciously 'moved' several hundred metres north so that it appeared to be beyond New Buildings, some 824 metres from the nearest turbine. This kept it safely out of the noise assessment. To the applicant's relief, no one noticed at the time.

Miksam Barn has also been omitted from the lists. It is situated between Bickford Cottage and Tembani on the A3072 north east of the site. It is 675 metres from the nearest turbine. In the last application this property was also 'moved' a further 200 metres away from the site, placing it between Tembani and Bradford House further away to the east.

Nos. 1 & 2 The Granary have also been omitted from the lists. These residences are situated immediately south of Lyne Akres to the south west of the site. They are also 675 metres from the nearest turbine. They are included in the Post Office database and Ms. Jo Phillips of OPEN, the applicant's LVIA consultant, called there over the weekend of 22nd October, 2011, during her survey of the site and its environs and included these properties in her own assessment.

Of particular interest is the omission of two potential properties included in the last application but not in this one. A great fuss was made last time of the '**Consented House**' and the '**Amended Consented House**'. The locations of these properties were even given to the nearest millimetre in the ES Noise Appendix A11 (TDC Application No. 1/1263/2008/FUL): the 'Consented House' is at 240920.220 103737.820 and the 'Amended Consented House' is at 240775.940 103785.730. These positions would be 375 metres and 350 metres respectively from the nearest turbine in the current application. Full noise assessments, including graphs, were produced for both properties last time.

The 'Consented House' refers to an initial application for an agricultural worker's dwelling in 1990 in the name of Wilson (1/2073/1990). This was refused by TDC. A subsequent application (1/897/91/10/19) for an agricultural worker's dwelling at Fernlea Park, Brandis Corner was also made in the name of Wilson. This application lapsed in 1996. It exists only on microfiche at Riverbank House. The 'Amended Consented House' has not yet been the subject of a fresh planning application by the current landowner who, it is alleged, claims that the build of the house has already started because he moved the entrance access from the 'Consented House' position to the 'Amended Consented House' position. To date, in 2012, there is no sign of any permanent residential dwelling taking shape on the site. It will be up to the landowner to produce the relevant permissions to clarify this situation. In the meantime, both the 'Consented House' and the 'Amended Consented House' appear in the DTOG noise tables below, along with Manor Farm, as financially-involved properties.

4a.3.5 If planning permission exists for either the 'Consented House' or the 'Amended Consented House' and both it and the wind farm (as currently prescribed) ultimately get constructed, then the house can never be sold or rented out to a non-financially involved person. This is because the night time noise limit at this property would then have to be reduced from 45dB to 43dB and the daytime limit from 45dB to 35 dB. With such a reduction the noise limits and impact would constantly be breached, even with the turbines running in noise-suppressed mode.

4a.3.6 DTOG has not checked the accuracy of the other properties around the site. It is for the applicant to prove that they are in the correct physical place on the ground and not just the product of an inaccurate computer database. Without that proof the application should be rejected as the noise predictions cannot be validated.

4a.4 Errors in the Background Noise Measurements

4a.4.1 Since the applicant has chosen to use the IOA Bulletin method to allow for wind shear, the correlation of background noise measurements with the wind speed apparent on the wind farm site at the same time becomes a key issue. The question is, 'Should these noise measurements be correlated to wind speeds measured at 10 metres agl, a height where most background noise occurs and wind shear is not a prominent feature, or should they be correlated to hub-height wind speeds, where most turbine noise occurs but where there is little background noise and often high wind shear?'

4a.4.2 ETSU-R-97 has always preferred the correlation of background noise readings with wind speeds *measured* on a 10 metres agl anemometer placed on the wind farm site where it will experience the actual wind conditions, not any mathematically calculated ones. If such an anemometer could not be made available then ETSU-R-97 does allow the use of wind speeds from another height, corrected to 10 metres agl, with the correction calculation based on ground roughness alone. Potential developers who already have a tall anemometer on site, such as at Dunslund Cross, would have no difficulty clipping two extra cup anemometers onto the existing mast at 10 metres agl to oblige ETSU-R-97. The applicant in this current application has chosen not to do this.

4a.4.3 The new IOA Bulletin methodology requires the background noise readings to be correlated with the wind speeds at the hub-height of the turbines, which typically may be 64 to 80 metres agl where, because of wind shear, the wind speed may be around 1.5 times greater than it is at 10 metres agl. A tall anemometer must be present on site at the time of the background noise measurements. If the anemometer does not go as high as hub-height, as would be the case at Dunslund Cross if the applicant substitutes the Enercon E70 turbine for the Nordex N80, then the equation mentioned in paragraph 4a.2.5 above must be used to calculate the mean hub-height wind speed for that particular 10-minute period in time, which can then be correlated with the background noise measurement recorded for the same 10-minute period at nearby properties. This ensures, so the supporters of this method say, that the background noise reading obtained relates directly to the true wind experienced simultaneously by the turbines, which directly affects how much noise the turbines make. Since the object of the exercise is ultimately to compare the new turbine noise with the existing background noise-derived limits this makes sense, say the supporters.

4a.4.4 However, although most turbine noise is generated at hub-height, many turbine manufacturers only publish their noise levels after mathematically 'standardising' the hub-height values down to 10 metres agl using the method prescribed in IEC61400-11, which only replicates unstable air conditions with a low wind shear exponent (of the order of 0.15). So, in order to marry up the wind speed readings at hub-height with the manufacturers' noise readings at 10m agl (and to try to satisfy ETSU-R-97), the developers must mathematically extrapolate the wind speed readings calculated for hub-height back to 10 metres agl values as prescribed in ETSU-R-97, using the first equation in paragraph 4a.2.4 with a ground roughness length of 0.05 metres. This approximates to the single wind shear value of 0.15 found in IEC61400-11.

4a.4.5 The mathematical exercise of taking the measured wind speeds up to hub-height first and then bringing them back down to 10 metres agl again is where unacceptable errors are introduced, critics say, and accounts for the 'smoke and mirrors' description of the procedure by Mr. Stigwood in the newspaper article in paragraph 4a.2.26. The calculation on the way up has no consideration of ground roughness-created wind shear. The equation used has no z_0 component. It is entirely atmospheric-created wind shear. The calculation on the way back down, however, is entirely based on ground effect-induced wind shear and has no atmospheric inputs. The 'standardised' IEC61400-11 calculation used by the turbine manufacturers replicates low wind shear conditions only, not the full range of conditions which may have been present in the simultaneous calculation of the hub-height wind speed. Thus there is a weakness in the methodology which gives rise to false readings of the wind speed at 10 metres agl, which in turn leads to inaccurate derived background noise estimations at nearby properties.

4a.4.6 The applicant has demonstrated this clearly in the current application. He has submitted two noise assessments, the main one being for three Nordex N80 turbines together with an alternative one for substitute turbines, Enercon E70s. **These two background noise assessments do not agree, leading to the obvious but ludicrous conclusion that the existing background noise levels at Dunslund Cross are dependent on the future choice of turbines which may or may not ever be erected at this location.** Paragraph 4a.4.39 below shows the anomalies in the background noise readings for each monitoring station.

4a.4.7 As required in ETSU-R-97, background noise measurements were taken from locations near the site. A total of 6 microphones were in use from Tuesday, 19th October until Wednesday, 17th November, 2010. The microphone locations are shown in Figure 4a.1 below. Automatic rain gauges were located alongside microphones 2 and 5. The siting, setting-up and calibration of the microphones and rain gauges were overseen on that first day by Mr. Bob Davis (see paragraph 4a.1.4 above), who accompanied Mr. Neil Dodds, an in-house acoustician from Arcus, the company commissioned by the applicant to produce an ES which will persuade TDC to grant planning permission for this wind farm.

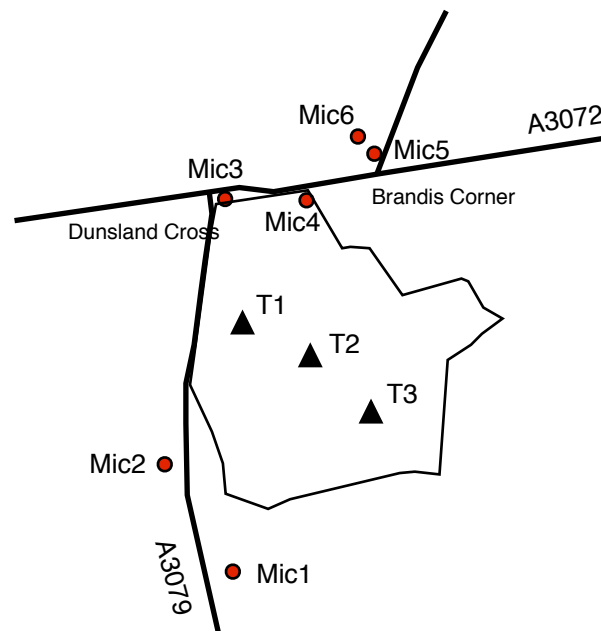


Figure 4a.1

4a.4.8 The applicant chose to undertake the background noise assessment when the crisp autumn leaves were in the trees and blowing around on the ground. The noise from these leaves may have artificially elevated some of the background noise levels obtained from the different microphones, some more so than others, thus making compliance of any predicted wind farm noise with permitted levels at nearby properties easier. If that is the case, the background noise levels obtained will not be truly representative of the lower levels found for the other 11 months of the year.

4a.4.9 According to two other automatic rain gauges sited in Holsworthy, 5 miles west of the site, at Weather Underground stations iENGLAND32 and iENGLAND34, rain events occurred on all but 9 or 10 quiet daytime periods, requiring the removal of between 110 and 122 data points, leaving 1,108 to 1,120 points available for plotting on the background noise graphs. Rain events also occurred on all but 7 or 8 night time periods. This would require the applicant to delete between 192 and 252 data points, leaving between 1,140 and 1,200 usable data points for the night time record. These figures are indicative only. Whether or not they are in agreement with the rain gauges located alongside microphones 2 and 5 would depend on the size, shape, speed and direction of travel of the rain-bearing clouds at the time of the event.

4a.4.10 DTOG notes that the applicant, in paragraph 11.3.4 of the ES, has not been precise about dates and times of specific rain events which resulted in the removal of selected data sets. Without this information, the accurate filtering of the background noise data cannot be verified.

4a.4.11 Despite monitoring the background noise levels for over 4 weeks there are still significant gaps in the data collected. The applicant has given no indication of the complete range of wind speeds and directions for the monitoring period. These readings would have been taken from the on-site anemometer and should still be available. TDC should demand that this analysis is provided.

4a.4.12 Having no access to these on-site readings, DTOG monitored the readings from the nearest official meteorological station, North Wyke Research (Station 99081), part of the international PA Meteo Network, for this same period (See Chapter 6: *The Wind Resource*). North Wyke is situated 16 miles ESE of the Dunslund Cross site. The anemometer height is 10 metres agl. The landform at North Wyke, being rolling farmland with hedges and small deciduous copses, with rising ground to the south, is similar to Dunslund Cross. The North Wyke anemometer site is 180 metres above sea level and the Dunslund Cross turbine positions are 138-159 metres above sea level. The NOABL wind speed database, often used by wind developers in initial searches, has the wind speeds at the two sites within 0.4 m/s of each other.

4a.4.13 The wind speeds and directions at North Wyke should, therefore, correlate well with those obtained by the 60 metres tall Dunslund Cross anemometer, after the latter's adjustment to 10 metres agl, subject to the inaccuracy identified in paragraph 4a.4.5.

4a.4.14 The only significant difference is that the North Wyke readings available to DTOG were hourly whilst those from the on-site anemometer at Dunslund Cross would be for every consecutive ten-minute period.

4a.4.15 DTOG chose not to use wind speed and direction figures from Chivenor airfield (Station 3707), 21 miles NNE of the Dunslund Cross site, as the anemometer there is in an open estuary setting at sea level. This is nothing like the landform at Dunslund Cross. The NOABL database also estimates that the wind speeds at Chivenor are 1 m/s lower than those found at Dunslund Cross. The wind readings from the two Weather Underground stations in Holsworthy were not used because the anemometers are partly shielded by taller buildings in the centre of the town. These buildings do not affect the accuracy of the automatic rain gauges at these two stations, however.

4a.4.16 DTOG is disappointed that the applicant has chosen not to include the wind speed and direction data for the background noise monitoring period in a graphical form as it has done in previous applications elsewhere, e.g., in its first application for a 3-turbine wind farm in Cumwhinton, near Carlisle. Such information is critical in explaining any shortcomings or inaccuracies in the background noise level assessment, which will influence the ability of the scheme to comply with permitted noise limits at nearby properties.

4a.4.17 Because this information is so important, DTOG has supplied it in Figure 4a.2 below. DTOG will be happy to supply TDC with the full set of readings used to create the graphs. The detailed rain event record is also available for this period.

4a.4.18 To produce Figure 4a.2 the readings were filtered to remove the non-quiet daytime periods and the remainder separated into quiet daytime and night time batches. The two graphs show the wind speeds and directions for these two time zones for the noise monitoring period:

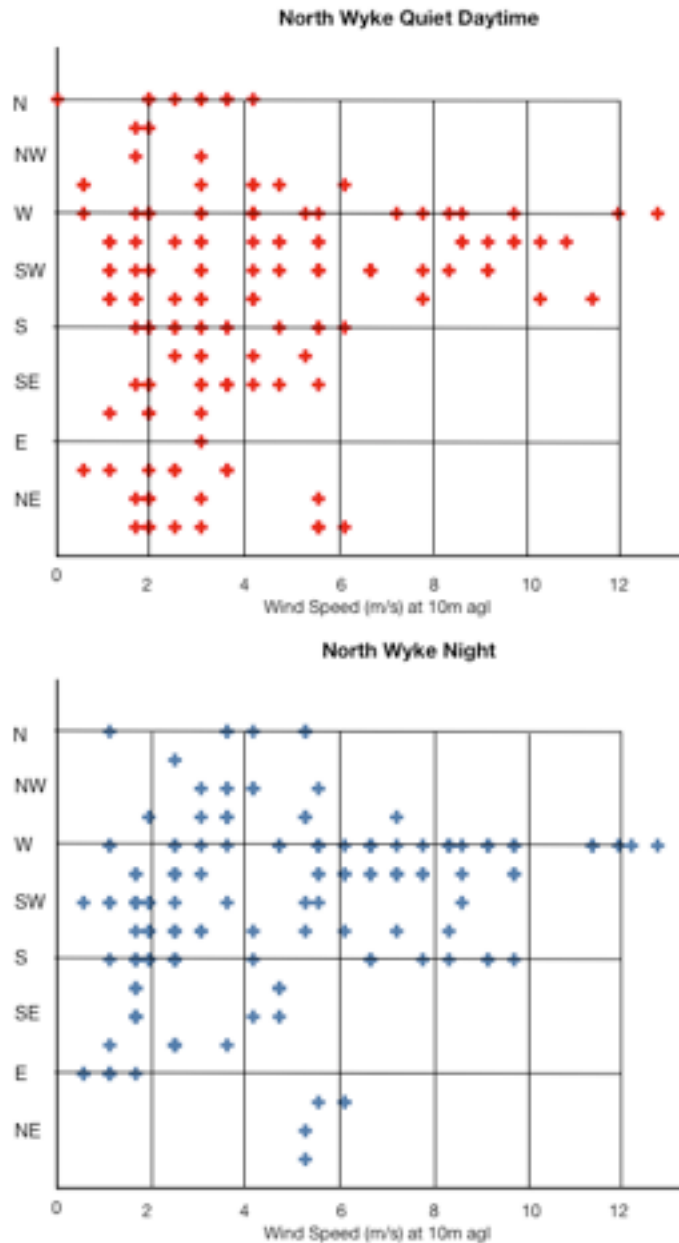


Fig 4a.2

4a.4.19 The critical areas of the graphs are wind speeds above 2.5 m/s at 10 m agl (giving a cut-in speed for wind turbines of approximately 3.5 m/s at hub-height). The turbines would reach their rated power and greatest noise at approximately 8 m/s at 10 m agl (approximately 12 m/s at hub-height). The blank areas show the data gaps. It can be seen clearly that the applicant is likely to have no data for wind speeds over 6 m/s for all directions from NW right round to S (daytime) and from NW right round to SE (night time). If the applicant does not accept that these graphs for North Wyke also represent the situation at Dunsland Cross then the actual equivalent graphs for Dunsland Cross must be produced to prove it.

4a.4.20 These data gaps will affect the accuracy of the day and night time background noise estimations made for all 14 properties to the south and south west of the site and the 5 existing properties to the north and north west of the site for the wind speed range 6 - 12 m/s. The estimations for all 26 properties north west, north and north north east of the site will also be inaccurate for southerly winds over 6 m/s in daytime periods too.

4a.4.21 Wind shear data cannot be transferred from one site to another. Nor is it permissible to retrospectively try to fit data to original microphone readings in order to fill data gaps. The incomplete data collected by the applicant at the time of the background noise measurement exercise means that the applicant simply does not know what the wind shear exponent is for all wind speeds and directions at the Dunslund Cross site. Without that knowledge, the derived background noise levels cannot be considered accurate or reliable.

4a.4.22 DTOG acknowledges that it is not always possible for an applicant to cover all wind speeds and directions in a noise monitoring period without extending that period for weeks or even months. The normal way to cope with such data gaps is to assume that the background noise level does not increase any further than that calculated for the highest wind speed available for any properties in a specific direction downwind of the site. This gives a safer, conservative estimate of the likely background noise levels for such locations and the applicant had to use this procedure last time at Dunslund Cross when faced with a similar shortage of data. Thus for properties covered by microphones 1, 2, 3 & 4 there should be no increase in background noise level beyond that derived for a wind speed of 6 m/s, day or night. For properties covered by microphones 3, 4, 5 & 6 there should be no increase above 6 m/s for daytime levels.

4a.4.23 Examination of the derived background noise levels in the applicant's ES shows that this has not been done (except at Cranmore, daytime at 11 & 12 m/s, but this was for a different reason, not lack of data). Indeed, a number of other points need explanation from the applicant.

4a.4.24 Unless otherwise stated, the discussion which follows in paragraphs 4a.4.25 to 4a.4.36 relates only to the background noise assessment for the Nordex N80 turbines.

4a.4.25 Microphones 1 & 2 covered the southern and south-western edge of the site. The derived background noise readings from Table 11.5 in the ES are shown below:

Microphone		WIND SPEED (m/s) at 10m agl									(N80)
		Quiet Day	4	5	6	7	8	9	10	11	
1	View Farm	28.8	30.3	32.2	34.5	37.2	40.0	42.9	45.9	48.8	
2	Little Copse	30.0	30.9	32.5	34.5	36.9	39.7	42.7	45.8	49.0	
	Night										
1	View Farm	21.8	24.9	28.8	33.1	37.2	41.0	44.1	46.5	48.2	
2	Little Copse	21.6	24.4	28.2	32.5	36.8	41.0	44.6	47.7	50.0	

4a.4.26 There is close agreement between these two microphones which is encouraging. However, there is clearly a problem in wind speeds above 8 m/s. **The night time background noise levels are higher than the daytime background noise levels by as much as 1.9dB.** How can this be? The same strength wind blowing through the same trees will give the same readings night or day, but the lack of human activity outdoors at night will always mean the night will be quieter than the day. Clearly this assessment is wrong.

4a.4.27 One explanation is the lack of higher wind speed readings which means that the conservative approach detailed in paragraph 4a.2.22 should be applied. This flaw in the assessment also shows up on Charts 11.1 and 11.3 in the ES, where the derived prevailing background noise curve has the wrong shape at the higher wind speeds, mainly because there are virtually no data points in this region. The curve should be a flat 'S' shape yet it is straight at the higher levels. This distorts the whole curve and renders the whole assessment unreliable.

4a.4.28 Since this is the assessment which places Fairlawns right on the noise limit, even with the turbines running in single- or double-noise suppression mode, this must be a very strong reason for the rejection of this application.

4a.4.29 Microphones 3 & 4 covered the northern and north western edge of the site. The derived background noise readings (from ES Table 11.5) for these locations are shown below:

Microphone	Quiet Day	WIND SPEED (m/s) at 10m agl									(N80)
		4	5	6	7	8	9	10	11	12	
3	Woodlands	34.8	36.5	38.6	41.2	44.0	47.0	49.8	52.4	54.7	
4	Cranmore	31.6	33.0	35.9	40.1	44.8	48.7	50.0	50.0	50.0	
	Night										
3	Woodlands	23.9	28.0	33.1	38.5	43.4	47.5	50.5	52.4	53.5	
4	Cranmore	22.2	26.9	32.7	38.6	43.9	48.2	51.0	52.3	52.0	

4a.4.30 These two microphones were only 285 metres apart in adjacent fields. Once again we see the phenomenon of the night time readings being higher than the daytime ones at wind speeds over 8 m/s. This is especially peculiar for microphone 3, standing as it was in a small tree/hedge lined-field (in which there is no human activity) next to the Dunsland Cross junction, where traffic noise would be picked up during the daytime but not at night. Microphone 4, positioned at Manor Farm under the control of the site landowner, shows a lower noise reading as the wind speed increases from 11 m/s to 12 m/s at night, thus giving the lie to the belief that as the wind increases, so does the noise. Clearly, this assessment is also wrong.

4a.4.31 There is poor agreement between these two microphones, with microphone 3 recording 3.5dB more than microphone 4 at the lower wind speeds in daytime and up to 1.7dB more at night. This, presumably, is attributable to traffic noise and autumnal leaves in the trees by day and just autumnal leaves in the trees alone at night. The case against background noise readings being taken in Autumn is given above in paragraph 4a.4.8. The readings from microphone 4 would not be representative at this location for the other 11 months of the year.

4a.4.32 Examination of the night time curves for Woodlands (Chart 11.5 in the ES) shows a great deal of scatter in the points and few points at the higher wind speeds. The night time chart for for Cranmore (Chart 11.11) also shows a great deal of scatter. Neither of these plots can be considered robust or reliable. Nor can the background noise levels derived from them.

4a.4.33 Microphones 5 & 6 covered the 22 properties at Brandis Corner, north east of the site. The derived background noise levels (from ES Table 11.5) for these locations are shown below:

Microphone	Quiet Day	WIND SPEED (m/s) at 10m agl									(N80)
		4	5	6	7	8	9	10	11	12	
5	Bickford Lodge	35.0	36.4	38.2	40.3	42.5	44.7	46.9	49.0	50.8	
6	The Laurels	31.1	32.4	34.1	36.1	38.3	40.7	43.2	45.7	48.1	
	Night										
5	Bickford Lodge	27.0	29.6	33.0	36.9	40.8	44.3	47.3	49.5	50.9	
6	The Laurels	21.5	24.7	28.7	33.0	37.3	41.1	44.3	46.6	48.2	

4a.4.34 These two microphones were only 70 metres apart, yet the daytime readings differ by 4dB and the night time ones by 3 - 6dB. The readings taken at Bickford Lodge are clearly not a true reflection of the background noise in the area. **The applicant is right to apply the readings from The Laurels to all of the properties in this area other than Bickford Lodge, but he should also have applied them to Bickford Lodge as well.** DTOG has done this in all of the tables produced for this chapter and Chapter 4b: *Noise Impact*.

4a.4.35 Once again we see the anomaly of the higher derived background noise values at night rather than day for the higher wind speeds. The reason is the same; lack of data at the higher wind speeds resulting in a night time curve (Charts 11.7 & 11.9 in the ES) which is too flat. This has distorted the whole of the curves and in turn this has led to an unreliable assessment of background noise levels.

4a.4.36 Accepting that the background noise levels are unreliable, DTOG will, nevertheless continue with this assessment to check if predicted noise levels will still be compliant. The derived background noise levels to be used are as shown in the Tables 4a.3 and 4a.4 below:

Background Noise Levels L_{A90} - Quiet Day Time - Nordex N80

Microphone	PROPERTY	WIND SPEED (m/s) at 10m agl									(N80)
		4	5	6	7	8	9	10	11	12	
2	Fairlawns	30.0	30.9	32.5	34.5	36.9	39.7	42.7	45.8	49.0	
2	Little Copse	30.0	30.9	32.5	34.5	36.9	39.7	42.7	45.8	49.0	
2	The Vale	30.0	30.9	32.5	34.5	36.9	39.7	42.7	45.8	49.0	
2	*Moyles Moor	30.0	30.9	32.5	34.5	36.9	39.7	42.7	45.8	49.0	
2	*6 Station Cottages	30.0	30.9	32.5	34.5	36.9	39.7	42.7	45.8	49.0	
1	*Lyne Akres	28.8	30.3	32.2	34.5	37.2	40.0	42.9	45.9	48.8	
2	*5 Station Cottages	30.0	30.9	32.5	34.5	36.9	39.7	42.7	45.8	49.0	
2	*4 Station Cottages	30.0	30.9	32.5	34.5	36.9	39.7	42.7	45.8	49.0	
2	*3 Station Cottages	30.0	30.9	32.5	34.5	36.9	39.7	42.7	45.8	49.0	
2	*2 Station Cottages	30.0	30.9	32.5	34.5	36.9	39.7	42.7	45.8	49.0	
2	*1 Station Cottages	30.0	30.9	32.5	34.5	36.9	39.7	42.7	45.8	49.0	
1	*1 The Granary	28.8	30.3	32.2	34.5	37.2	40.0	42.9	45.9	48.8	
1	*2 The Granary	28.8	30.3	32.2	34.5	37.2	40.0	42.9	45.9	48.8	
1	View Farm	28.8	30.3	32.2	34.5	37.2	40.0	42.9	45.9	48.8	
4	*'Consented' House**	31.6	33.0	35.9	40.1	44.8	48.7	50.0	50.0	50.0	
4	*'Am Cons' House**	31.6	33.0	35.9	40.1	44.8	48.7	50.0	50.0	50.0	
4	*Manor Farm**	31.6	33.0	35.9	40.1	44.8	48.7	50.0	50.0	50.0	
4	Cranmore	31.6	33.0	35.9	40.1	44.8	48.7	50.0	50.0	50.0	
3	Woodlands	34.8	36.5	38.6	41.2	44.0	47.0	49.8	52.4	54.7	
3	*New Buildings	34.8	36.5	38.6	41.2	44.0	47.0	49.8	52.4	54.7	
3	*Longfield	34.8	36.5	38.6	41.2	44.0	47.0	49.8	52.4	54.7	
6	Bickford Cottage	31.1	32.4	34.1	36.1	38.3	40.7	43.2	45.7	48.1	
6	*Bickford Arms	31.1	32.4	34.1	36.1	38.3	40.7	43.2	45.7	48.1	
6	*Old Post Office	31.1	32.4	34.1	36.1	38.3	40.7	43.2	45.7	48.1	
6	*The Nook	31.1	32.4	34.1	36.1	38.3	40.7	43.2	45.7	48.1	
6	*The Firs	31.1	32.4	34.1	36.1	38.3	40.7	43.2	45.7	48.1	
6	Bickford Lodge	31.1	32.4	34.1	36.1	38.3	40.7	43.2	45.7	48.1	
6	*Miksam Barn	31.1	32.4	34.1	36.1	38.3	40.7	43.2	45.7	48.1	
6	*6 The Gardens	31.1	32.4	34.1	36.1	38.3	40.7	43.2	45.7	48.1	
6	The Laurels	31.1	32.4	34.1	36.1	38.3	40.7	43.2	45.7	48.1	
6	*5 The Gardens	31.1	32.4	34.1	36.1	38.3	40.7	43.2	45.7	48.1	
6	*The Retreat	31.1	32.4	34.1	36.1	38.3	40.7	43.2	45.7	48.1	
6	Temhani	31.1	32.4	34.1	36.1	38.3	40.7	43.2	45.7	48.1	
6	*Freshfields	31.1	32.4	34.1	36.1	38.3	40.7	43.2	45.7	48.1	
6	*Eden Park	31.1	32.4	34.1	36.1	38.3	40.7	43.2	45.7	48.1	
6	*4 The Gardens	31.1	32.4	34.1	36.1	38.3	40.7	43.2	45.7	48.1	
6	*1 The Gardens	31.1	32.4	34.1	36.1	38.3	40.7	43.2	45.7	48.1	
6	*2 The Gardens	31.1	32.4	34.1	36.1	38.3	40.7	43.2	45.7	48.1	
6	*3 The Gardens	31.1	32.4	34.1	36.1	38.3	40.7	43.2	45.7	48.1	
6	*Oakfield	31.1	32.4	34.1	36.1	38.3	40.7	43.2	45.7	48.1	
6	*Old Chapel	31.1	32.4	34.1	36.1	38.3	40.7	43.2	45.7	48.1	
6	*Carley	31.1	32.4	34.1	36.1	38.3	40.7	43.2	45.7	48.1	
6	*Moorfield House	31.1	32.4	34.1	36.1	38.3	40.7	43.2	45.7	48.1	
	* = not in applicant's tables										
	** = financially involved										

Table 4a.3

Background Noise Levels L_{A90} - Night Time - Nordex N80

Microphone	PROPERTY	WIND SPEED (m/s) at 10m agl									(N80)
		4	5	6	7	8	9	10	11	12	
2	Fairlawns	21.6	24.4	28.2	32.5	36.8	41.0	44.6	47.7	50.0	
2	Little Copse	21.6	24.4	28.2	32.5	36.8	41.0	44.6	47.7	50.0	
2	The Vale	21.6	24.4	28.2	32.5	36.8	41.0	44.6	47.7	50.0	
2	*Moyles Moor	21.6	24.4	28.2	32.5	36.8	41.0	44.6	47.7	50.0	
2	*6 Station Cottages	21.6	24.4	28.2	32.5	36.8	41.0	44.6	47.7	50.0	
1	*Lyne Akres	21.8	24.9	28.8	33.1	37.2	41.0	44.1	46.5	48.2	
2	*5 Station Cottages	21.6	24.4	28.2	32.5	36.8	41.0	44.6	47.7	50.0	
2	*4 Station Cottages	21.6	24.4	28.2	32.5	36.8	41.0	44.6	47.7	50.0	
2	*3 Station Cottages	21.6	24.4	28.2	32.5	36.8	41.0	44.6	47.7	50.0	
2	*2 Station Cottages	21.6	24.4	28.2	32.5	36.8	41.0	44.6	47.7	50.0	
2	*1 Station Cottages	21.6	24.4	28.2	32.5	36.8	41.0	44.6	47.7	50.0	
1	*1 The Granary	21.8	24.9	28.8	33.1	37.2	41.0	44.1	46.5	48.2	
1	*2 The Granary	21.8	24.9	28.8	33.1	37.2	41.0	44.1	46.5	48.2	
1	View Farm	21.8	24.9	28.8	33.1	37.2	41.0	44.1	46.5	48.2	
4	*'Consented' House**	22.2	26.9	32.7	38.6	43.9	48.2	51.0	52.3	52.0	
4	*'Am Cons' House**	22.2	26.9	32.7	38.6	43.9	48.2	51.0	52.3	52.0	
4	*Manor Farm**	22.2	26.9	32.7	38.6	43.9	48.2	51.0	52.3	52.0	
4	Cranmore	22.2	26.9	32.7	38.6	43.9	48.2	51.0	52.3	52.0	
3	Woodlands	23.9	28.0	33.1	38.5	43.4	47.5	50.5	52.4	53.5	
3	*New Buildings	23.9	28.0	33.1	38.5	43.4	47.5	50.5	52.4	53.5	
3	*Longfield	23.9	28.0	33.1	38.5	43.4	47.5	50.5	52.4	53.5	
6	Bickford Cottage	21.5	24.7	28.7	33.0	37.3	41.1	44.3	46.6	48.2	
6	*Bickford Arms	21.5	24.7	28.7	33.0	37.3	41.1	44.3	46.6	48.2	
6	*Old Post Office	21.5	24.7	28.7	33.0	37.3	41.1	44.3	46.6	48.2	
6	*The Nook	21.5	24.7	28.7	33.0	37.3	41.1	44.3	46.6	48.2	
6	*The Firs	21.5	24.7	28.7	33.0	37.3	41.1	44.3	46.6	48.2	
6	Bickford Lodge	21.5	24.7	28.7	33.0	37.3	41.1	44.3	46.6	48.2	
6	*Miksam Barn	21.5	24.7	28.7	33.0	37.3	41.1	44.3	46.6	48.2	
6	*6 The Gardens	21.5	24.7	28.7	33.0	37.3	41.1	44.3	46.6	48.2	
6	The Laurels	21.5	24.7	28.7	33.0	37.3	41.1	44.3	46.6	48.2	
6	*5 The Gardens	21.5	24.7	28.7	33.0	37.3	41.1	44.3	46.6	48.2	
6	*The Retreat	21.5	24.7	28.7	33.0	37.3	41.1	44.3	46.6	48.2	
6	Temhani	21.5	24.7	28.7	33.0	37.3	41.1	44.3	46.6	48.2	
6	*Freshfields	21.5	24.7	28.7	33.0	37.3	41.1	44.3	46.6	48.2	
6	*Eden Park	21.5	24.7	28.7	33.0	37.3	41.1	44.3	46.6	48.2	
6	*4 The Gardens	21.5	24.7	28.7	33.0	37.3	41.1	44.3	46.6	48.2	
6	*1 The Gardens	21.5	24.7	28.7	33.0	37.3	41.1	44.3	46.6	48.2	
6	*2 The Gardens	21.5	24.7	28.7	33.0	37.3	41.1	44.3	46.6	48.2	
6	*3 The Gardens	21.5	24.7	28.7	33.0	37.3	41.1	44.3	46.6	48.2	
6	*Oakfield	21.5	24.7	28.7	33.0	37.3	41.1	44.3	46.6	48.2	
6	*Old Chapel	21.5	24.7	28.7	33.0	37.3	41.1	44.3	46.6	48.2	
6	*Carley	21.5	24.7	28.7	33.0	37.3	41.1	44.3	46.6	48.2	
6	*Moorfield House	21.5	24.7	28.7	33.0	37.3	41.1	44.3	46.6	48.2	
* = not in applicant's tables		** = financially involved									

Table 4a.4

4a.4.37 As noted in paragraph 4a.4.6 above, the applicant has submitted two separate noise assessments based on two different turbine models and has managed to produce two conflicting sets of figures for a single entity, namely the true level of background noise at Dunslund Cross.

4a.4.38 In the ES Technical Appendix, paragraph A11.3.1 the applicant states:

'The prevailing background noise levels on which limits have been based have been re-analysed to reflect the change in hub-height from 60m to 64m for the Enercon and revised noise limits applied.'

4a.4.39 The anomalies in the readings are shown in the Table 4a.5 below, the figures being the applicant's background noise levels for the Nordex N80 minus the background noise levels for the Enercon E70 (ES Table 11.5 and ES Technical Appendix Table A11.3 respectively):

Background Noise Levels (L_{A90}) Anomalies - Nordex N80 cf. Enercon E70

Microphone	Quiet Day	WIND SPEED (m/s) at 10m agl								
		4	5	6	7	8	9	10	11	12
1	View Farm	0.0	0.2	0.2	0.2	0.4	0.4	0.4	0.4	0.3
2	Little Copse	0.0	0.0	0.2	0.3	0.3	0.4	0.4	0.4	0.3
3	Woodlands	0.0	0.2	0.2	0.2	0.3	0.4	0.3	0.2	0.2
4	Cranmore	0.0	0.1	0.3	0.5	0.4	0.2	-0.3	-0.3	-0.3
5	Bickford Lodge	0.1	0.1	0.1	0.2	0.3	0.2	0.2	0.3	0.2
6	The Laurels	0.0	0.1	0.2	0.2	0.2	0.2	0.3	0.3	0.2
	Night									
1	View Farm	0.0	0.3	0.4	0.4	0.3	0.3	0.1	-0.1	-0.3
2	Little Copse	0.1	0.2	0.3	0.4	0.3	0.3	0.2	0.1	0.0
3	Woodlands	0.2	0.4	0.4	0.5	0.4	0.4	0.3	0.1	0.0
4	Cranmore	0.2	0.4	0.5	0.5	0.4	0.2	-0.1	-0.3	-0.4
5	Bickford Lodge	0.2	0.3	0.3	0.3	0.3	0.2	0.2	0.1	0.0
6	The Laurels	0.1	0.3	0.3	0.3	0.4	0.3	0.2	0.0	-0.1

Table 4a.5

4a.4.40 As stated in paragraph 4a.4.6 this situation bears no resemblance to reality. It is another example of total reliance on computer models to produce a desired outcome depending upon which turbine is finally selected. The background noise level is independent of the choice of future turbine. It has nothing to do with whatever structure might or might not be erected in a field nearby at some future date.

4a.4.41 The modelling mathematics of the IOA Bulletin Method has shown that a difference in hub height of just 4 metres (N80 = 60m, E70 = 64m) produces an anomaly of up to 0.5dB. Nor is there any consistency in the direction of the anomaly. Sometimes it is higher, sometimes it is lower.

4a.4.42 The applicant has stated in ES paragraph 3.5.1 that the final choice of turbine will fall into the 95m - 100m range. A 95m turbine with 40m blades means that the hub-height will be 55m. This extends the range of hub heights from 64m down past 60m to 55m, meaning that **the anomalies shown in Figure 4a.5 could comfortably be doubled to 1dB**. In addition, if turbines of hub-height 55m are used, the predicted noise levels at nearby properties would then be increased, because the direct air distance between the turbine hub/blade assembly and nearby properties is reduced, when compared with the 60m hub-height used for the Nordex N80 assessment or the 64m hub-height used in the Enercon E70 assessment.

4a.4.43 Since, according to the applicant's own calculations, the predicted noise at one property (Fairlawns) is already on the ETSU-R-97 noise limit and other properties are just below the limit, the inaccuracy of the background noise assessment shown in Table 4a.5 is enough on its own for this application to be rejected.

Setting the noise limits

4a.4.44 When background noise levels are low, as is the case at Dunslund Cross, ETSU-R-97 requires a fixed day time limit of between 35dB and 40dB be set and the permitted noise level at nearby properties will be this limit or 5dB above the prevailing background noise level, whichever is greater. The chosen limit will, therefore, be left behind when the wind speed increases to such an extent that the wind in the trees creates an extra 5dB of noise, typically at around 7-8 m/s wind speed (lower 35dB limit) or 10-11 m/s (upper 40dB limit) at 10 metres agl.

4a.4.45 Exactly where the day time limit is set depends on the following 3 factors: the number of dwellings in the neighbourhood of the site, the effect of the noise limits on the number of kWh of electricity generated and the duration and level of exposure to the new noise.

4a.4.46 At Dunslund Cross there are 40 noise sensitive properties around the site, a significant number. It is shown in *Chapter 6: The Wind Resource*, that the amount of electricity which will be generated, even when the turbines are working normally, will be relatively small. As a result the imposition of the lower daytime limit will not result in any significant amount of electricity generation being lost. The duration and level of exposure will depend upon wind speed and direction. Analysis of the North Wyke wind data for the 12 months from 6th October, 2010 to 5th October, 2011 shows that the wind blew from the WSW to SE quadrant for 39% of the time and from the NNW to E quadrant for 21% of the time. This suggests that the 22 houses in the Brandis Corner area will have the longest duration and level of exposure to the new noise whilst the 14 houses in the Station Cottages area will also be significantly exposed. The wind direction quadrants selected relate to the use of 45° guide bars on the turbines to define their 'downwind' zones in relation to the main clusters of residential properties around the site.

4a.4.47 Taken together, these three factors show that the lower daytime limit of 35dB must be chosen for Dunslund Cross, and DTOG is pleased to see that the applicant has done this.

4a.4.48 The night time limit is more contentious (see section 4a.6 below). ETSU-R-97 perversely sets 43dB as a minimum night time limit on non-financially involved properties (the day and night minimum limit for financially involved properties is 45dB). ETSU-R-97 therefore sets the night limit higher than the day limit, arguing that people are more likely to be indoors and sheltered from the noise. ETSU-R-97 suggests that the noise drops by 10dB when it goes through an open bedroom window, so occupants will still be able to sleep even with their windows open. This is now known to be wrong, because the characteristics of wind turbine noise, namely Amplitude Modulation (AM) and Low Frequency Noise (LFN), are not always attenuated (reduced) by solid walls, let alone open windows (see Chapter 4c).

4a.4.49 Nevertheless, DTOG will continue with this assessment, based at this stage on the Nordex N80 turbine, as the applicant has done, by using the values of 35dB for the minimum daytime limit and 43dB for the minimum night time limit for the 40 non-financially involved properties around the site.

4a.4.50 Superimposing these values onto the figures shown in Tables 4a.3 and 4a.4 gives rise to Tables 4a.6 and 4a.7 below:

Noise Limits LA90 - Quiet Day Time - Nordex N80

Microphone	PROPERTY	WIND SPEED (m/s) at 10m agl									(N80)
		4	5	6	7	8	9	10	11	12	
2	Fairlawns	35.0	35.9	37.5	39.5	41.9	44.7	47.7	50.8	54.0	
2	Little Copse	35.0	35.9	37.5	39.5	41.9	44.7	47.7	50.8	54.0	
2	The Vale	35.0	35.9	37.5	39.5	41.9	44.7	47.7	50.8	54.0	
2	*Moyles Moor	35.0	35.9	37.5	39.5	41.9	44.7	47.7	50.8	54.0	
2	*6 Station Cottages	35.0	35.9	37.5	39.5	41.9	44.7	47.7	50.8	54.0	
1	*Lyne Akres	35.0	35.3	37.2	39.5	42.2	45.0	47.9	50.9	53.8	
2	*5 Station Cottages	35.0	35.9	37.5	39.5	41.9	44.7	47.7	50.8	54.0	
2	*4 Station Cottages	35.0	35.9	37.5	39.5	41.9	44.7	47.7	50.8	54.0	
2	*3 Station Cottages	35.0	35.9	37.5	39.5	41.9	44.7	47.7	50.8	54.0	
2	*2 Station Cottages	35.0	35.9	37.5	39.5	41.9	44.7	47.7	50.8	54.0	
2	*1 Station Cottages	35.0	35.9	37.5	39.5	41.9	44.7	47.7	50.8	54.0	
1	*1 The Granary	35.0	35.3	37.2	39.5	42.2	45.0	47.9	50.9	53.8	
1	*2 The Granary	35.0	35.3	37.2	39.5	42.2	45.0	47.9	50.9	53.8	
1	View Farm	35.0	35.3	37.2	39.5	42.2	45.0	47.9	50.9	53.8	
4	**Consented' House**	45.0	45.0	45.0	45.1	49.8	53.7	55.0	55.0	55.0	
4	*'Am Cons' House**	45.0	45.0	45.0	45.1	49.8	53.7	55.0	55.0	55.0	
4	*Manor Farm**	45.0	45.0	45.0	45.1	49.8	53.7	55.0	55.0	55.0	
4	Cranmore	36.6	38.0	40.9	45.1	49.8	53.7	55.0	55.0	55.0	
3	Woodlands	39.8	41.5	43.6	46.2	49.0	52.0	54.8	57.4	59.7	
3	*New Buildings	39.8	41.5	43.6	46.2	49.0	52.0	54.8	57.4	59.7	
3	*Longfield	39.8	41.5	43.6	46.2	49.0	52.0	54.8	57.4	59.7	
6	Bickford Cottage	36.1	37.4	39.1	41.1	43.3	45.7	48.2	50.7	53.1	
6	*Bickford Arms	36.1	37.4	39.1	41.1	43.3	45.7	48.2	50.7	53.1	
6	*Old Post Office	36.1	37.4	39.1	41.1	43.3	45.7	48.2	50.7	53.1	
6	*The Nook	36.1	37.4	39.1	41.1	43.3	45.7	48.2	50.7	53.1	
6	*The Firs	36.1	37.4	39.1	41.1	43.3	45.7	48.2	50.7	53.1	
6	Bickford Lodge	36.1	37.4	39.1	41.1	43.3	45.7	48.2	50.7	53.1	
6	*Miksam Barn	36.1	37.4	39.1	41.1	43.3	45.7	48.2	50.7	53.1	
6	*6 The Gardens	36.1	37.4	39.1	41.1	43.3	45.7	48.2	50.7	53.1	
6	The Laurels	36.1	37.4	39.1	41.1	43.3	45.7	48.2	50.7	53.1	
6	*5 The Gardens	36.1	37.4	39.1	41.1	43.3	45.7	48.2	50.7	53.1	
6	*The Retreat	36.1	37.4	39.1	41.1	43.3	45.7	48.2	50.7	53.1	
6	Tembani	36.1	37.4	39.1	41.1	43.3	45.7	48.2	50.7	53.1	
6	*Freshfields	36.1	37.4	39.1	41.1	43.3	45.7	48.2	50.7	53.1	
6	*Eden Park	36.1	37.4	39.1	41.1	43.3	45.7	48.2	50.7	53.1	
6	*4 The Gardens	36.1	37.4	39.1	41.1	43.3	45.7	48.2	50.7	53.1	
6	*1 The Gardens	36.1	37.4	39.1	41.1	43.3	45.7	48.2	50.7	53.1	
6	*2 The Gardens	36.1	37.4	39.1	41.1	43.3	45.7	48.2	50.7	53.1	
6	*3 The Gardens	36.1	37.4	39.1	41.1	43.3	45.7	48.2	50.7	53.1	
6	*Oakfield	36.1	37.4	39.1	41.1	43.3	45.7	48.2	50.7	53.1	
6	*Old Chapel	36.1	37.4	39.1	41.1	43.3	45.7	48.2	50.7	53.1	
6	*Carley	36.1	37.4	39.1	41.1	43.3	45.7	48.2	50.7	53.1	
6	*Moorfield House	36.1	37.4	39.1	41.1	43.3	45.7	48.2	50.7	53.1	
	* = not in applicant's tables					** = financially involved					

Table 4a.6

4a.5 Errors in the Predicted Noise Levels at Nearby Properties

4a.5.1 The unofficial use of the IOA Bulletin method by the current applicant also has implications for the prediction of turbine noise levels at properties around the site. Applicants usually use the ISO9613-2 propagation model for predicting turbine immissions at nearby properties and the IOA Bulletin endorses this. (N.B. 'Immissions' means noise arriving at a receiver as opposed to 'emissions', the noise being sent out by the turbines at source.) **For ISO9613-2 to give accurate results, however, the correct combination of input parameters must be used. There is some disagreement over what these combined factors should be.**

4a.5.2 The ISO propagation model calculates the predicted sound pressure level by taking the source sound power level for each turbine in separate octave bands and subtracting a number of attenuation (reduction) factors according to the following equation:

$$\text{Predicted Octave Band Noise Level} = L_w + D - A_{geo} - A_{atm} - A_g - A_{bar} - A_{misc}$$

where L_w = Sound Source Power Level
 D = Directivity Factor (*Downwind always used - worst case*)
 A_{geo} = Geometrical Divergence ($20 \log d + 11$)
 A_{atm} = Atmospheric Absorption (*low attenuation values should be used*)
 A_g = Ground Effect (*Hard ground should be used - worst case*)
 A_{bar} = Barrier Attenuation (*Zero always used - worst case*)
 A_{misc} = Miscellaneous Other Effects (*e.g. Downwind Bending - zero usually used*)

4a.5.3 For wind turbine noise predictions the contentious factors are L_w , A_{atm} and A_g . L_w is contentious because acousticians must decide whether to use *measured* turbine sound power levels or *warranted* sound power levels. A_{atm} relies on the product of the distance travelled by the sound and the absorption coefficient (which is frequency dependent - low sounds travel further). Acousticians seem to agree that atmospheric conditions of 10°C and 70% relative humidity, under standard atmospheric pressure, give the most consistent results. A_g depends on source, receiver and propagation heights, but it is contentious because it also depends on the characteristics of the ground in between the source and the receiver. A decision must be made as to whether the ground between the turbines and the nearby properties is hard and reflective, mixed, or soft and noise attenuating. This component of A_g is normally expressed as a variable 'G'. A value of $G=0$ is used for hard ground such as paving, water, ice, concrete or any low porosity soils. $G=0.5$ represents mixed ground. $G=1$ represents soft ground which may be covered by grass, trees or other vegetation. $G=1$ is never used in practice.

4a.5.4 The IOA Bulletin suggests two acceptable parameter mixes:

- a) use $G=0$ with measured sound power levels or
- b) use $G=0.5$ together with warranted sound power levels (or measured sound power levels plus an allowance for measurement uncertainty) and a receptor height of 4 metres at the nearby properties.

The 4 metres receptor height is meant to simulate the position of a first floor bedroom window.

4a.5.5 Acousticians working for wind farm developers are increasingly using Option b) from the paragraph above but are not always applying the full uncertainty allowance. The applicant at Dunslund Cross has used both options. He has used option a) for the Nordex N80 assessment but option b) for the Enercon E70 assessment.

4a.5.6 This shows that, as with the background noise assessment, the applicant's acoustician is simply immersed in the virtual world of his computer, changing parameters as required until he achieves the desired outcome, whilst totally ignoring the real world beyond his computer screen.

4a.5.7 The ground at Dunslund Cross is going to be the same no matter which turbine may or may not be erected in the future. It cannot be hard in one assessment (G=0, Nordex N80) and mixed in the other (G=0.5, Enercon E70).

4a.5.8 DTOG believes that the case for hard, reflective ground (G=0) at Dunslund Cross is strong and so it endorses the applicant's decision to use G=0 in the Nordex N80 assessment, but rejects the applicant's use of G=0.5 in the Enercon E70 assessment. The agricultural land on and around the site is low grade, being shallow topsoil on impervious clay/shale. It is usually waterlogged. Much of the time it is not possible to stand on the lower parts of the wind farm site itself without going ankle/shin deep in water. Water is a reflective medium. In cold winter weather this ground water freezes. Ice is reflective. In prolonged dry spells in summer the ground sets hard and cracks open. This baked ground is reflective. Between the wind farm site and the properties are tarmac road surfaces and the properties themselves have much paving and hard standing. These are all reflective. G=0 is the correct choice.

4a.5.9 The applicant was told to use G=0 in the Scoping Opinion, pages 65 and 66, in a letter of response from Bradford & Cookbury Parish Council to which the case officer drew attention. Mr. Dodds, the acoustician, was told to use G=0 when he visited Little Copse to set up the microphone there.

4a.5.10 The need to use Option a) (G=0) is reinforced by a comment made by Dr. Moroney at the Den Brook Inquiry, namely that the error margin on the general warranted turbine sound power level figure issued to everyone cannot be relied upon because it needs to be site-specific. This figure is critical whenever Option b) (G=0.5) is used.

4a.5.11 In the paper '*Windfarm Noise Predictions - the Risk of Conservatism*' presented at the 2nd International Meeting on Wind Turbine Noise in Lyon, September 2007, Dr. Bullmore, Mr. Jiggins et al showed that accurate results for wind turbine noise propagation can be obtained using ISO9613-2 provided the parameters used are G=0, lowest air absorption levels and measured sound power levels of turbines rather than warranted sound power levels. At the third meeting in Aalborg in June 2009 the same authors presented a paper entitled '*Wind Farm Noise Predictions and Comparison with Measurements*' which tried to compare predicted with measured noise values at three large operational wind farms. When G=0 was used with measured turbine sound power values (ie no uncertainty added) the predicted noise levels at nearby receptors were equal to or slightly greater than the measured values, depending on the distance between the turbines and the receptor. When G=0.5 was used, however, any such safety margin reduced or disappeared. In some cases the measured noise exceeded the predicted noise by up to 3dB, with the possibility of 1dB of that being background noise which might need to be isolated from the actual turbine noise, leaving an under-prediction of turbine noise of 2dB. This paper shows that the use of G=0.5 leaves no room for error in wind turbine noise predictions. (Dr. Bullmore and Mr. Jiggins were members of the Noise Working Group that wrote ETSU-R-97. The Lyon and Aalborg research is acknowledged by the authors as needing further work and it is ongoing.)

4a.5.12 In his Consolidated Proof of Evidence (PoE) for the Den Brook Inquiry, dated 5th October, 2009, in paragraphs 5.16 to 5.20, Dr. McKenzie argues that using G=0 and measured turbine sound power levels as a worst-case scenario is unnecessary and overly-conservative. Under examination at the inquiry Dr. McKenzie said that the worst-case scenario of G=0 rarely occurs in practice. This is disputed. In his PoE Dr. McKenzie says that HMP now uses G=0.5 with measured sound power levels which gives 'good results'. This is an interesting shift in position from a man who was one of the authors of the IOA Bulletin method and who regularly represents and protects the wind industry's interests. However, to be fair to Dr. McKenzie, he also gives a caveat that site-specific conditions are still an important consideration in deciding the value of 'G'. This is especially relevant at Dunslund Cross.

4a.5.13 Despite using option a) however, the applicant comes unstuck by the comments made in footnote 18 for paragraph 11.2.4 in the ES and elaborated upon in the Nordex N80 data sheet, '*Noise Optimised Mode 2300kW*' in the ES Technical Appendices. The full footnote is:

*'The manufacturer's sound power level data is **not warranted but expected**. For the purpose of noise modelling this information has been **treated as measured** data and has therefore been used with hard ground. This is considered a conservative approach.'*

4a.5.14 With G=0 the applicant is supposed to be using *measured* data, but he has none because he is being forced to model the turbines working in one of two noise-suppression modes. Nor does he seem to be able to obtain *warranted* data for this modus operandi, so he has used data described as *expected*, data which Nordex will not itself call *measured* or *warranted*. This has not stopped the applicant himself calling the *expected* data *measured*.

4a.5.15 The actual note on the Nordex sheet is:

*'The specified sound power levels are expected values in terms of statistics. Results of single measurements will be **within the confidence interval** according to IEC 61400-14.'*

4a.5.16 No two supposedly identical turbines coming off a production line can ever be guaranteed to emit exactly the same sound power levels. That is why Nordex will only commit to a margin of error which it is saying is the *'confidence interval according to IEC 61400-14.'* So what, exactly, is this confidence interval, or error margin?

4a.5.17 In the abstract to the paper, *'Comparison of Wind Turbine Manufacturers' Noise Data for Use in Wind Farm Assessments'*, presented at the Aalborg Conference in 2009, Sylvia Broneske of HMP states:

'Input data for wind farm noise assessments are provided by the turbine manufacturers in the form of sound power level values for 'standardised' 10 m height wind speeds. The format, in which sound power levels are provided, together with possible uncertainties, differs from manufacturer to manufacturer. Some specifications recommend the use of an additional safety margin to allow for measurement uncertainties. Others state measurement uncertainties from test reports, standard deviation from averaging several test reports, K-values depending on the extent of the confidence level (according to IEC/TS 61400-14:2005) or no information about uncertainties at all. An overview of different methods of publishing wind turbine sound power levels and the result of comparing different wind turbine types for the same development site is given.'

4a.5.18 The *K-values* mentioned above are the confidence levels. Ms. Broneske arrives at a usable confidence level which leads her to conclude with a probability of 95% that the apparent sound power level, derived from a turbine test in accordance with IEC 61400-11, at a wind turbine of a certain batch, does not exceed the declared value for this batch. She then applies this confidence level to a single turbine measurement and then to a set of three turbine measurements and displays her findings graphically. Her graphs, Figures 1, 2 and 3 in her report, show that **to change a measured sound power level to a level which can be used in wind farm noise assessments, you should add a safety margin of +1dB**. She concludes with a caveat:

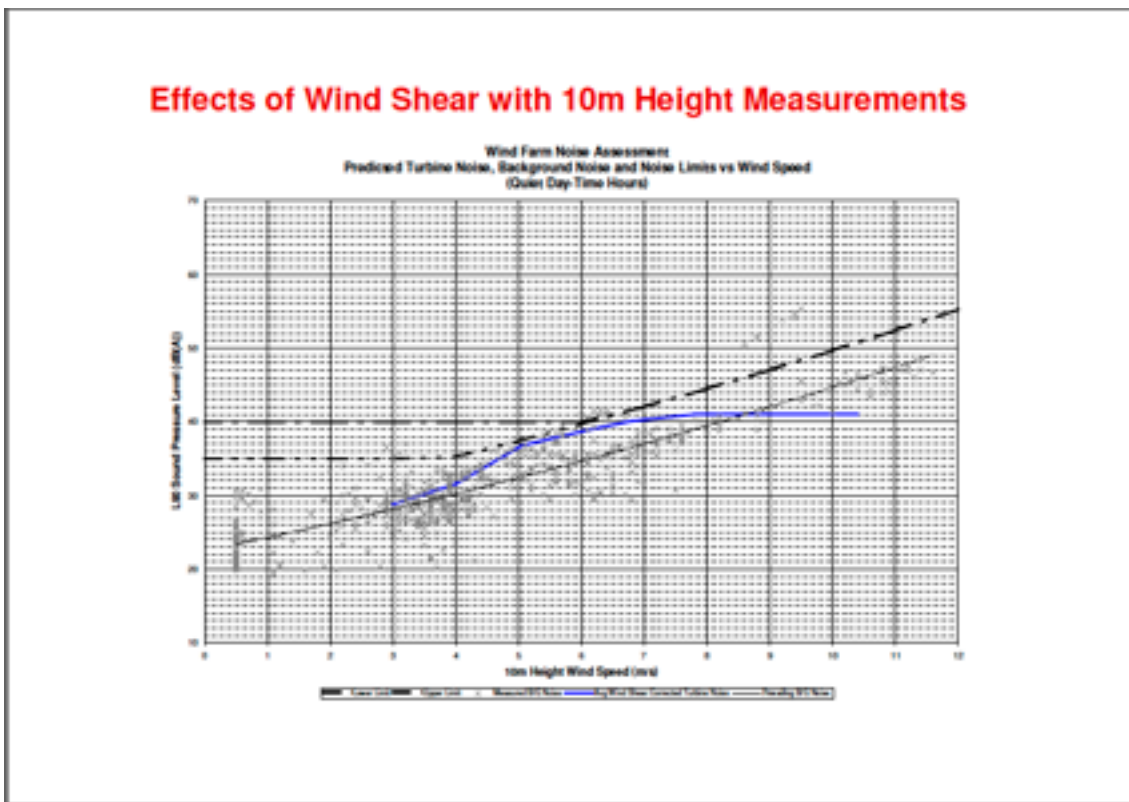
'To gain confidence in manufacturer's noise data, it is important to know how they are derived. Full measurement reports, including measurement uncertainty to verify the stated noise data, are desirable if not essential. If no measurement reports of a turbine model are available, the noise data should be handled with care.'

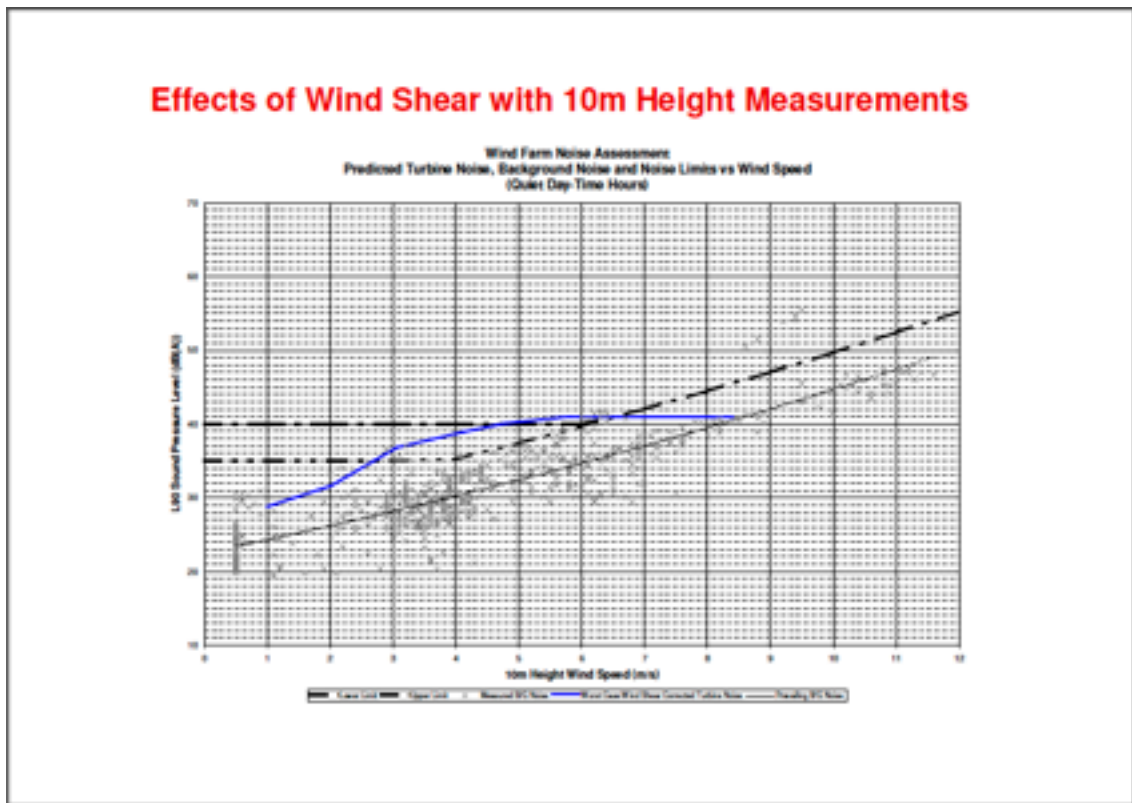
4a.5.19 In renaming the *expected* sound power level of the Nordex N80, running in noise-suppressed mode, as a *measured* level, the applicant has not added the 1dB correction identified above by Ms. Broneske.

4a.5.20 Nor has the applicant allowed for any uncertainty in the use of ISO9613-2. He has not mentioned the accuracy of this method in the 2011 ES, but he did mention it in the 2008 ES. In paragraph 11.2.3 of that document the applicant stated that the error associated with the ISO9613-2 method is $\pm 3\text{dB}$ within 1000 metres of the turbines. But even this is not correct. ISO9613-2 is only valid with this error margin for turbines up to 30 metres hub-height and for wind speeds up to 5 m/s. Both of these values are exceeded at Dunslund Cross. The margin of error is greater for taller turbines in higher winds.

4a.5.21 In addition to the above, the lack of wind shear information caused by the data gaps identified in paragraph 4a.4.18 can have further consequences for the prediction of turbine noise levels at nearby properties.

4a.5.22 The graphs below show typical noise assessment plots for a wind farm application. The blue line shows the noise from the turbines. In the first graph it is below the permitted levels, shown by the black lines. (Whilst this shows compliance with ETSU-R-97 levels the noise **impact** may still be unacceptable. See Chapter 4b: *Noise Impact*.) The second graph shows the same data but with an increase in the wind shear of 2 m/s. The effect is to move the blue line to the left. It can be seen that the wind farm is no longer compliant with the ETSU-R-97 permitted limits. Without knowing all the wind shear values for any specific site, such breaches can never be confidently dismissed. This is the situation with the current applicant's noise assessment.





4a.5.23 Examination of the applicant's predicted turbine noise graphs for Dunslund Cross (Charts 11.1 to 11.12 in the ES) shows that an error of only 0.1 - 0.2 m/s in the wind shear value would result in non-compliance of ETSU-R-97 limits at Fairlawns. If the wind shear error is then increased steadily up to 2 m/s, more and more properties fail the ETSU-R-97 test. As Mr. Bowdler stated in paragraph 7.3 of his report for the previous application at Dunslund Cross:

'ETSU-R-97 has already built in a balance between the impact on neighbours and the need for renewable energy. It is therefore an absolute test and any single failure means that the development must be refused.'

4a.5.24 Since the applicant does not know all of the on-site wind shear values at the time of the background noise measurements then no claim of compliance can ever be verified in advance of the turbines being built and becoming operational. Having chosen to use the IOA Bulletin methodology to incorporate wind shear into the noise predictions this means that the applicant's noise assessment is fundamentally flawed. For this reason the noise assessment as a whole must be rejected and the application must be refused.

4a.5.25 For the purposes of completing the Nordex N80 assessment for all 40 of the non-financially involved properties, not just the 10 properties shown in the applicant's tables, DTOG has re-run the computer propagation model using the same parameters. The predicted noise levels are shown in Table 4a.8 below. When these predicted noise levels are compared to the noise limits in Tables 4a.6 and 4a.7 they confirm the applicant's assertions that, with the turbines running in noise-suppression modes, the noise level does not exceed the day or night time limits at any properties with the exception of Fairlawns in daytime, where the noise level is actually on the limit. This compliance does not extend to the noise **impact**, however, just the noise **level** (see Chapter 4b). (See also paragraph 4a.6.16 below - Very Important.)

4a.5.26 The important thing to realise is that the predicted noise levels in Table 4a.8 are uncorrected. They need to have correction factors applied before they can be used realistically to predicted the noise levels at nearby properties.

UNCORRECTED Turbine Noise Levels - Nordex N80

Location relative to Site	PROPERTY	Nearest Turbine (m)	WIND SPEED (m/s) at 10m agl									(N80)
			4	5	6	7	8	9	10	11	12	
SW	Fairlawns	506	33.2	35.7	37.5	38.0	38.5	39.0	39.5	39.5	39.5	
SW	Little Copse	545	32.7	35.2	37.0	37.5	38.0	38.5	39.0	39.0	39.0	
SW	The Vale	597	32.8	35.3	37.1	37.6	38.1	38.6	39.1	39.1	39.1	
SW	*Moyles Moor	602	32.0	34.5	36.3	36.8	37.3	37.8	38.3	38.3	38.3	
SW	*6 Station Cottages	643	31.6	34.1	35.9	36.4	36.9	37.4	37.9	37.9	37.9	
SW	*Lyne Akres	647	31.9	34.4	36.2	36.7	37.2	37.7	38.2	38.2	38.2	
SW	*5 Station Cottages	649	31.5	34.0	35.8	36.3	36.8	37.3	37.8	37.8	37.8	
SW	*4 Station Cottages	655	31.4	33.9	35.7	36.2	36.7	37.2	37.7	37.7	37.7	
SW	*3 Station Cottages	661	31.3	33.8	35.6	36.1	36.6	37.1	37.6	37.6	37.6	
SW	*2 Station Cottages	667	31.2	33.7	35.5	36.0	36.5	37.0	37.5	37.5	37.5	
SW	*1 Station Cottages	673	31.1	33.6	35.4	35.9	36.4	36.9	37.4	37.4	37.4	
SW	*1 The Granary	675	31.1	33.6	35.4	35.9	36.4	36.9	37.4	37.4	37.4	
SW	*2 The Granary	675	31.1	33.6	35.4	35.9	36.4	36.9	37.4	37.4	37.4	
SSW	View Farm	846	29.1	31.6	33.5	34.0	34.5	35.0	35.5	35.5	35.5	
N	*'Cons' House**	375	36.0	38.5	40.3	40.8	41.3	41.8	42.3	42.3	42.3	
N	*'Am Cons' House**	350	35.7	38.2	40.0	40.5	41.0	41.5	42.0	42.0	42.0	
N	*Manor Farm**	350	35.7	38.2	40.0	40.5	41.0	41.5	42.0	42.0	42.0	
N	Cranmore	501	33.5	36.0	37.8	38.3	38.8	39.3	39.8	39.8	39.8	
NNW	Woodlands	548	31.6	34.1	35.8	36.3	36.8	37.3	37.8	37.8	37.8	
NNW	*New Buildings	625	30.2	32.7	34.4	34.9	35.4	35.9	36.4	36.4	36.4	
NNW	*Longfield	685	29.0	31.5	33.2	33.7	34.2	34.7	35.2	35.2	35.2	
NNE	Bickford Cottage	625	31.8	34.3	36.1	36.6	37.1	37.6	38.1	38.1	38.1	
NNE	*Bickford Arms	635	31.8	34.3	36.1	36.6	37.1	37.6	38.1	38.1	38.1	
NNE	*Old Post Office	648	31.5	34.0	35.8	36.3	36.8	37.3	37.8	37.8	37.8	
NNE	*The Nook	659	31.3	33.8	35.6	36.1	36.6	37.1	37.6	37.6	37.6	
NNE	*The Firs	662	31.2	33.7	35.5	36.0	36.5	37.0	37.5	37.5	37.5	
NNE	Bickford Lodge	671	31.2	33.7	35.6	36.1	36.6	37.1	37.6	37.6	37.6	
NNE	*Miksam Barn	675	31.0	33.5	35.3	35.8	36.3	36.8	37.3	37.3	37.3	
NNE	*6 The Gardens	702	30.9	33.4	35.3	35.8	36.3	36.8	37.3	37.3	37.3	
NNE	The Laurels	715	30.6	33.1	35.0	35.5	36.0	36.5	37.0	37.0	37.0	
NNE	*5 The Gardens	717	30.6	33.1	35.0	35.5	36.0	36.5	37.0	37.0	37.0	
NNE	*The Retreat	718	30.5	33.0	34.9	35.4	35.9	36.4	36.9	36.9	36.9	
NNE	Tembani	719	30.5	33.0	34.9	35.4	35.9	36.4	36.9	36.9	36.9	
NNE	*Freshfields	721	30.5	33.0	34.9	35.4	35.9	36.4	36.9	36.9	36.9	
NNE	*Eden Park	724	30.4	32.9	34.8	35.3	35.8	36.3	36.8	36.8	36.8	
NNE	*4 The Gardens	732	30.3	32.8	34.7	35.2	35.7	36.2	36.7	36.7	36.7	
NNE	*1 The Gardens	739	30.1	32.6	34.5	35.0	35.5	36.0	36.5	36.5	36.5	
NNE	*2 The Gardens	739	30.1	32.6	34.5	35.0	35.5	36.0	36.5	36.5	36.5	
NNE	*3 The Gardens	740	30.1	32.6	34.5	35.0	35.5	36.0	36.5	36.5	36.5	
NNE	*Oakfield	752	30.0	32.5	34.4	34.9	35.4	35.9	36.4	36.4	36.4	
NNE	*Old Chapel	759	29.9	32.4	34.3	34.8	35.3	35.8	36.3	36.3	36.3	
NNE	*Carley	771	29.8	32.3	34.2	34.7	35.2	35.7	36.2	36.2	36.2	
NNE	*Moorfield House	886	27.7	30.2	32.1	32.6	33.1	33.6	34.1	34.1	34.1	
* = not in applicant's tables			** = financially involved									

Table 4a.8

4a.5.27 The correction factors are needed to allow for all of the uncertainty in the prediction method. The factors which need to be taken into consideration are itemised below with a conservative nominal value suggested for the correction to be applied:

Nordex N80 Uncertainty	Correction
Incomplete wind shear profile at time of background noise measurement leading to inaccurate assessment of background noise levels (paragraph 4a.4.42)	1dB
Uncertainty of true noise emissions from turbines running in one of two reduced power modes (paragraph 4a.5.18)	1dB
Use of ISO9613-2 for turbines taller than 30 metres and in wind speeds greater than 5 m/s (paragraph 4a.5.20)	>3dB
TOTAL	>5dB

4a.5.28 In Table 11.1 of the ES the N80 sound power levels used by the applicant are shown. Turbines 2 & 3 will be running in single noise-suppressed mode (max. electrical power output 2.3MW) and turbine 3 in double noise-suppressed mode (max. electrical power output 2.0MW), for the purposes of the predictions of noise levels at nearby properties. The table below shows the figures from Table 11.1 of the ES together with the full power values for the N80 running unsuppressed (max. electrical power output 2.5MW).

N80/2500				Wind	Speed	m/s				
Mode		4	5	6	7	8	9	10	11	12
2.5MW	dB	98.0	100.5	102.5	103.0	103.5	104.0	104.0	104.5	105.0
2.3MW	dB	95.5	98.0	100.0	100.5	101.0	101.5	102.0	102.0	102.0
2.0MW	dB	95.5	98.0	99.5	100.0	100.5	101.0	101.5	101.5	101.5

4a.5.29 This table shows that the noise suppression modes give the applicant another 2.5dB - 3.0dB to play with in trying to keep the noise levels below the ETSU-R-97 limits at nearby properties. Since, by the applicant's own uncorrected figures, this still results in the noise level being on the limit at Fairlawns and just under the limit at a number of other properties, it is clear that there is simply not enough separation distance available between these large, noisy, more powerful turbines and the houses at the Dunslund Cross site. **It is not desirable, nor should it be necessary, to have to run turbines in noise-suppressed modes to satisfy noise limits.**

4a.5.30 The >5dB correction identified in paragraph 4a.5.27 and the 2.5dB-3dB margin identified in paragraph 4a.5.29 take the uncertainty level inherent in the noise predictions most of the way towards the maximum 9dB error identified by Mr. Stigwood in paragraph 4a.2.25.

4a.5.31 It is not necessary to apply more than 5dB of correction to the applicant's figures to show that this wind farm development is non-compliant with ETSU-R-97. DTOG will, therefore, apply only a small 2dB correction, which is even less than the minimum 3dB correction for the use of ISO9613-2. This, therefore, will by no means reflect the worst-case scenario for the residents of Dunslund Cross.

4a.5.32 The corrected Nordex N80 predicted noise levels are shown in Table 4a.9 below. Table 4a.10 follows and shows the corrected figures assessed against the daytime ETSU-R-97 limit. The figures in Table 4a.10 show the margins over and under the ETSU-R-97 limit, with red cells showing a breach of the limit and orange cells showing that the noise level is actually on the limit:

CORRECTED Turbine Noise Levels - Nordex N80

Location relative to Site	PROPERTY	Nearest Turbine (m)	WIND SPEED (m/s) at 10m agl									(N80)
			4	5	6	7	8	9	10	11	12	
SW	Fairlawns	506	35.2	37.7	39.5	40.0	40.5	41.0	41.0	41.5	41.5	
SW	Little Copse	545	34.7	37.2	39.0	39.5	40.0	40.5	41.5	41.0	41.0	
SW	The Vale	597	34.8	37.3	39.1	39.6	40.1	40.6	41.1	41.1	41.1	
SW	*Moyles Moor	602	34.0	36.5	38.3	38.8	39.3	39.8	40.8	40.3	40.3	
SW	*6 Station Cottages	643	33.6	36.1	37.9	38.4	38.9	39.4	40.4	39.9	39.9	
SW	*Lyne Akres	647	33.9	36.4	38.2	38.7	39.2	39.7	40.7	40.2	40.2	
SW	*5 Station Cottages	649	33.5	36.0	37.8	38.3	38.8	39.3	40.3	39.8	39.8	
SW	*4 Station Cottages	655	33.4	35.9	37.7	38.2	38.7	39.2	40.2	39.7	39.7	
SW	*3 Station Cottages	661	33.3	35.8	37.6	38.1	38.6	39.1	40.1	39.6	39.6	
SW	*2 Station Cottages	667	33.2	35.7	37.5	38.0	38.5	39.0	40.0	39.5	39.5	
SW	*1 Station Cottages	673	33.1	35.6	37.4	37.9	38.4	38.9	39.9	39.4	39.4	
SW	*1 The Granary	675	33.1	35.6	37.4	37.9	38.4	38.9	39.9	39.4	39.4	
SW	*2 The Granary	675	33.1	35.6	37.4	37.9	38.4	38.9	39.9	39.4	39.4	
SSW	View Farm	846	31.1	33.6	35.5	36.0	36.5	37.0	37.5	37.5	37.5	
N	*'Cons' House**	375	38.0	40.5	42.3	42.8	43.3	43.8	44.3	44.3	44.3	
N	*'Am Cons' House**	350	37.7	40.2	42.0	42.5	43.0	43.5	44.0	44.0	44.0	
N	*Manor Farm**	350	37.7	40.2	42.0	42.5	43.0	43.5	44.0	44.0	44.0	
N	Cranmore	501	35.5	38.0	39.8	40.3	40.8	41.3	41.8	41.8	41.8	
NNW	Woodlands	548	33.6	36.1	37.8	38.3	38.8	39.3	39.8	39.8	39.8	
NNW	*New Buildings	625	32.2	34.7	36.4	36.9	37.4	37.9	38.4	38.4	38.4	
NNW	*Longfield	685	31.0	33.5	35.2	35.7	36.2	36.7	37.2	37.2	37.2	
NNE	Bickford Cottage	625	33.8	36.3	38.1	38.6	39.1	39.6	40.1	40.1	40.1	
NNE	*Bickford Arms	635	33.8	36.3	38.1	38.6	39.1	39.6	40.1	40.1	40.1	
NNE	*Old Post Office	648	33.5	36.0	37.8	38.3	38.8	39.3	39.8	39.8	39.8	
NNE	*The Nook	659	33.3	35.8	37.6	38.1	38.6	39.1	39.6	39.6	39.6	
NNE	*The Firs	662	33.2	35.7	37.5	38.0	38.5	39.0	39.5	39.5	39.5	
NNE	Bickford Lodge	671	33.2	35.7	37.6	38.1	38.6	39.1	39.6	39.6	39.6	
NNE	*Miksam Barn	675	33.0	35.5	37.3	37.8	38.3	38.8	39.3	39.3	39.3	
NNE	*6 The Gardens	702	32.9	35.4	37.3	37.8	38.3	38.8	39.3	39.3	39.3	
NNE	The Laurels	715	32.6	35.1	37.0	37.5	38.0	38.5	39.0	39.0	39.0	
NNE	*5 The Gardens	717	32.6	35.1	37.0	37.5	38.0	38.5	39.0	39.0	39.0	
NNE	*The Retreat	718	32.5	35.0	36.9	37.4	37.9	38.4	38.9	38.9	38.9	
NNE	Tembani	719	32.5	35.0	36.9	37.4	37.9	38.4	38.9	38.9	38.9	
NNE	*Freshfields	721	32.5	35.0	36.9	37.4	37.9	38.4	38.9	38.9	38.9	
NNE	*Eden Park	724	32.4	34.9	36.8	37.3	37.8	38.3	38.8	38.8	38.8	
NNE	*4 The Gardens	732	32.3	34.8	36.7	37.2	37.7	38.2	38.7	38.7	38.7	
NNE	*1 The Gardens	739	32.1	34.6	36.5	37.0	37.5	38.0	38.5	38.5	38.5	
NNE	*2 The Gardens	739	32.1	34.6	36.5	37.0	37.5	38.0	38.5	38.5	38.5	
NNE	*3 The Gardens	740	32.1	34.6	36.5	37.0	37.5	38.0	38.5	38.5	38.5	
NNE	*Oakfield	752	32.0	34.5	36.4	36.9	37.4	37.9	38.4	38.4	38.4	
NNE	*Old Chapel	759	31.9	34.4	36.3	36.8	37.3	37.8	38.3	38.3	38.3	
NNE	*Carley	771	31.8	34.3	36.2	36.7	37.2	37.7	38.2	38.2	38.2	
NNE	*Moorfield House	886	29.7	32.2	34.1	34.6	35.1	35.6	36.1	36.1	36.1	
* = not in applicant's tables			** = financially involved									

Table 4a.9

Corrected Turbine Noise Levels referenced to ETSU-R-97 Daytime Limit of 35dB - Nordex N80

PROPERTY	Nearest Turb		WIND SPEED (m/s) at 10m agl									(N80)
			4	5	6	7	8	9	10	11	12	
Fairlawns	506m	T1	0.2	1.8	2.0	0.5	-1.4	-3.7	-6.7	-9.3	-12.5	
Little Copse	545	T1	-0.3	1.3	1.5	0.0	-1.9	-4.2	-6.2	-9.8	-13.0	
The Vale	597	T1	-0.2	1.4	1.6	0.1	-1.8	-4.1	-6.6	-9.7	-12.9	
*Moyles Moor	602	T1	-1.0	0.6	0.8	-0.7	-2.6	-4.9	-6.9	-10.5	-13.7	
*6 Station Cottages	643	T1	-1.4	0.2	0.4	-1.1	-3.0	-5.3	-7.3	-10.9	-14.1	
*Lyne Akres	647	T2	-1.1	1.1	1.0	-0.8	-3.0	-5.3	-7.2	-10.7	-13.6	
*5 Station Cottages	649	T1	-1.5	0.1	0.3	-1.2	-3.1	-5.4	-7.4	-11.0	-14.2	
*4 Station Cottages	655	T1	-1.6	0.0	0.2	-1.3	-3.2	-5.5	-7.5	-11.1	-14.3	
*3 Station Cottages	661	T1	-1.7	-0.1	0.1	-1.4	-3.3	-5.6	-7.6	-11.2	-14.4	
*2 Station Cottages	667	T1	-1.8	-0.2	0.0	-1.5	-3.4	-5.7	-7.7	-11.3	-14.5	
*1 Station Cottages	673	T1	-1.9	-0.3	-0.1	-1.6	-3.5	-5.8	-7.8	-11.4	-14.6	
*1 The Granary	675	T2	-1.9	0.3	0.2	-1.6	-3.8	-6.1	-8.0	-11.5	-14.4	
*2 The Granary	675	T2	-1.9	0.3	0.2	-1.6	-3.8	-6.1	-8.0	-11.5	-14.4	
View Farm	846	T3	-3.9	-1.7	-1.7	-3.5	-5.7	-8.0	-10.4	-13.4	-16.3	
*'Cons' House**	375	T1	-7.0	-4.5	-2.7	-2.3	-6.5	-9.9	-10.7	-10.7	-10.7	
*1Am Cons' House**	350	T1	-7.3	-4.8	-3.0	-2.6	-6.8	-10.2	-11.0	-11.0	-11.0	
*Manor Farm**	350	T1	-7.3	-4.8	-3.0	-2.6	-6.8	-10.2	-11.0	-11.0	-11.0	
Cranmore	501	T1	-1.1	0.0	-1.1	-4.8	-9.0	-12.4	-13.2	-13.2	-13.2	
Woodlands	548	T1	-6.2	-5.4	-5.8	-7.9	-10.2	-12.7	-15.0	-17.6	-19.9	
*New Buildings	625	T1	-7.6	-6.8	-7.2	-9.3	-11.6	-14.1	-16.4	-19.0	-21.3	
*Longfield	685	T1	-8.8	-8.0	-8.4	-10.5	-12.8	-15.3	-17.6	-20.2	-22.5	
Bickford Cottage	625	T2	-2.3	-1.1	-1.0	-2.5	-4.2	-6.1	-8.1	-10.6	-13.0	
*Bickford Arms	635	T2	-2.3	-1.1	-1.0	-2.5	-4.2	-6.1	-8.1	-10.6	-13.0	
*Old Post Office	648	T2	-2.6	-1.4	-1.3	-2.8	-4.5	-6.4	-8.4	-10.9	-13.3	
*The Nook	659	T2	-2.8	-1.6	-1.5	-3.0	-4.7	-6.6	-8.6	-11.1	-13.5	
*The Firs	662	T2	-2.9	-1.7	-1.6	-3.1	-4.8	-6.7	-8.7	-11.2	-13.6	
Bickford Lodge	671	T2	-2.9	-1.7	-1.5	-3.0	-4.7	-6.6	-8.6	-11.1	-13.5	
*Miksam Barn	675	T2	-3.1	-1.9	-1.8	-3.3	-5.0	-6.9	-8.9	-11.4	-13.8	
*6 The Gardens	702	T2	-3.2	-2.0	-1.8	-3.3	-5.0	-6.9	-8.9	-11.4	-13.8	
The Laurels	715	T2	-3.5	-2.3	-2.1	-3.6	-5.3	-7.2	-9.2	-11.7	-14.1	
*5 The Gardens	717	T2	-3.5	-2.3	-2.1	-3.6	-5.3	-7.2	-9.2	-11.7	-14.1	
*The Retreat	718	T2	-3.6	-2.4	-2.2	-3.7	-5.4	-7.3	-9.3	-11.8	-14.2	
Tem bani	719	T2	-3.6	-2.4	-2.2	-3.7	-5.4	-7.3	-9.3	-11.8	-14.2	
*Freshfields	721	T2	-3.6	-2.4	-2.2	-3.7	-5.4	-7.3	-9.3	-11.8	-14.2	
*Eden Park	724	T2	-3.7	-2.5	-2.3	-3.8	-5.5	-7.4	-9.4	-11.9	-14.3	
*4 The Gardens	732	T2	-3.8	-2.6	-2.4	-3.9	-5.6	-7.5	-9.5	-12.0	-14.4	
*1 The Gardens	739	T2	-4.0	-2.8	-2.6	-4.1	-5.8	-7.7	-9.7	-12.2	-14.6	
*2 The Gardens	739	T2	-4.0	-2.8	-2.6	-4.1	-5.8	-7.7	-9.7	-12.2	-14.6	
*3 The Gardens	740	T2	-4.0	-2.8	-2.6	-4.1	-5.8	-7.7	-9.7	-12.2	-14.6	
*Oakfield	752	T2	-4.1	-2.9	-2.7	-4.2	-5.9	-7.8	-9.8	-12.3	-14.7	
*Old Chapel	759	T2	-4.2	-3.0	-2.8	-4.3	-6.0	-7.9	-9.9	-12.4	-14.8	
*Carley	771	T2	-4.3	-3.1	-2.9	-4.4	-6.1	-8.0	-10.0	-12.5	-14.9	
*Moorfield House	886	T2	-6.4	-5.2	-5.0	-6.5	-8.2	-10.1	-12.1	-14.6	-17.0	
* = not in applicant's tables		** = financially involved										

Table 4a.10

4a.5.33 It can be seen that the noise is now over the ETSU-R-97 limit at 11 properties and is on the limit at two more. There are no night time breaches.

4a.6 The ETSU-R-97 Fixed Night Time Limit

4a.6.1 The ETSU-R-97 fixed night time limit had its origins in the World Health Organisation's (WHO) recommendation for undisturbed sleep inside a bedroom which was pertinent at the time the ETSU-R-97 report was first written. WHO said 35dB was the maximum permitted noise level in bedrooms if sleep disturbance was not to occur. ETSU-R-97 reasoned that it would be permissible to add 10dB to this figure to allow for the fact that the noise would be outside the bedroom rather than in it and then subtracted a further 2dB to allow for the fact that the WHO guideline was measured in L_{eq} rather than L_{90} . So the result was $35 + 10 - 2 = 43$ dB and that became the ETSU-R-97 night time noise limit.

4a.6.2 Since then WHO has revised its recommended inner bedroom noise limit to prevent sleep disturbance from 35dB down to 30dB, but ETSU-R-97 has not followed suit. In 2006, a report by the Hayes McKenzie Partnership for the Government, *'The Measurement of Low Frequency Noise at Three UK Wind Farms'* recommended that the ETSU-R-97 night time limit also be revised downward by 5dB (or 10dB if AM was present - see Chapter 4c) to accommodate the new advice from WHO, but the recommendation was removed by a civil servant before the report was published. This revelation appeared in *The Sunday Times* on 13th December 2009:

Officials cover up wind farm noise report

Jonathan Leake and Harry Byford

*Civil servants have suppressed warnings that wind turbines can generate noise damaging people's health for several square miles around. The guidance from consultants indicated that the sound level permitted from spinning blades and gearboxes had been set so high — 43 decibels — that local people could be disturbed whenever the wind blew hard. The noise was also thought likely to disrupt sleep. **The report said the best way to protect locals was to cut the maximum permitted noise to 38 decibels, or 33 decibels if the machines created discernible "beating" noises as they spun.***

It has now emerged that officials removed the warnings from the draft report in 2006 by Hayes McKenzie Partnership (HMP), the consultants. The final version made no mention of them.

It means that hundreds of turbines at wind farms in Britain have been allowed to generate much higher levels of noise, sparking protests from people living near them.

Among those affected is Jane Davis, 53, a retired National Health Service manager, who has had to abandon her home because of the noise. It lies half a mile from the Deeping St Nicholas wind farm in south Lincolnshire whose eight turbines began operating in 2006. "Our problems started three days after the turbines went up and they've carried on ever since. It's like having helicopters going over the top of you at times — on a bad night it's like three or four helicopters circling around," she said. "We abandoned our home. We rent a house about five miles away — this is our fourth Christmas out of our own home. We couldn't sleep. It is torture — my GP describes it as torture. Three hours of sleep a night is torture."

The HMP report was commissioned by the business department whose responsibilities for wind power have since been taken over by Ed Miliband's Department of Energy and Climate Change (DECC). The decision to stick with existing noise limits became official guidance for local authorities ruling

on planning applications from wind farm developers. It has also been used by ministers and officials to support the view that there was no need to revise official wind farm noise guidelines and that erecting turbines near homes posed no threat to people's health and wellbeing.

In 2007 Mike Hulme of the Den Brook Judicial Review Group, a band of residents opposing a wind turbine development close to their houses in Devon, submitted a Freedom of Information request asking to see all draft versions of the study. Officials refused the request, claiming it was not in the public interest for them to be released. Hulme appealed to the information commissioner's office, which has ordered Miliband's department to release the documents.

The drafts show that HMP originally recommended that the night-time wind turbine noise limit should be reduced from 43 decibels to 38, or 33 if they made any kind of swishing or beating noise – known as “aerodynamic modulation”.

The HMP researchers had based their recommendations on evidence. They took noise measurements at houses close to three wind farms: Askam in Cumbria, Bears Down in Cornwall and Blaen Bowi in Carmarthenshire. They found that the swish-swish signature noise of turbines was significantly greater around most wind farms than had been foreseen by the authors of the existing government guidelines, which date from 1996. They also found that the beating sound is particularly disruptive at night, when other background noise levels are lower, as it can penetrate walls.

In their draft report the HMP researchers recommended that “Consideration be given to a revision of the night-time absolute noise criterion”, noting that this would fit with World Health Organisation recommendations on sleep disturbance.

However, an anonymous government official then inserted remarks attacking this idea because it would impede wind farm development. He, or she, wrote: “What will the impact of this be? Are we saying that this is the situation for all wind farms ... I think we need a sense of the scale of this and the impact.” The final report removed any suggestion of cutting the noise limits or adding any further penalty if turbines generated a beating noise – and recommended local authorities to stick to the 1996 guidelines.

Hulme said: “This demonstrates the conflict of interests in DECC, because it has the responsibility for promoting wind farm development while also having responsibility for the wind farm noise guidance policy ... meant to protect local residents.”

4a.6.3 Examples of the actual text removed are:

'The analysis of the external and internal noise levels indicates that it may be appropriate to re-visit the issue of the absolute night-time noise criterion specified within ETSU-R-97. To provide protection to wind farm neighbours, it would seem appropriate to reduce the absolute noise criterion for periods when background noise levels are low. In the absence of high levels of modulation, then a level of 38dB LA90 (40db LAeq) will reduce levels to an internal noise level which lies around or below 30dB LAeq with windows open for ventilation. In the presence of high levels of aerodynamic modulation of the incident noise, then a correction for the presence of the noise should be considered.'

4a.6.4 References to WHO guidance for the protection of sleep, which supported HMP's recommendations for a reduction in the ETSU-R-97 night-time noise limits, were also removed:

'If one takes the guidance within the WHO for the protection against sleep disturbance of 30dB L_{Aeq} , and apply a 5dB correction for the presence of [aerodynamic] modulation within the incident noise, then this gives rise to an internal noise criterion of 25dB L_{Aeq} . Based upon the measured building attenuation performances at Site 1 & 2, then an external level between 35 - 40dB L_{Aeq} (33 - 38db L_{A90}) would provide sufficient protection to neighbouring occupants to minimise the risk of disturbance from the modulation of aerodynamic noise.'

4a.6.5 In 2007, Mr. Malcolm Hayes (see paragraph 4a.1.4 above) of HMP, spoke about the New Zealand Standard 6808 and said that its intent was *'not to ensure inaudibility but the prevention of severe annoyance'*. The relevant section of that standard states:

'4.4.2 Acceptable limit

'As a guide to the limits of acceptability, the sound level from the WTG [wind turbine generator] (or windfarm) should not exceed, at any residential site, and at any of the nominated wind speeds, the background sound level (L_{95}) by more than 5dB(A), or a level of 40dB(A) L_{95} , whichever is the greater.'

4a.6.6 This makes it obvious that Mr. Hayes concedes that the noise level above which **severe** annoyance occurs is 40dB(A). It is reasonable to assume, therefore, that a new night-time noise limit of 38dB(A), as suggested by HMP before the civil servant abridged its 2006 report, would still be annoying to wind farm neighbours.

4a.6.7 TDC Planning Officers and decision-makers are under no obligation to adhere to the 43dB(A) ETSU-R-97 fixed night-time limit. UK Government policy is that ETSU-R-97 **should** be used for the assessment of the likely impact of wind turbine noise and this was restated in a 2007 policy document. However, the word **should** is critical. It does not say **must**.

4a.6.8 In a judicial review in 2007 (CO/9686/2007) Mr. Justice Mitting stated:

'It will always be open to any objector to an application for permission to develop a site as a windfarm, to contend that the Statement [ETSU-R-97] is technically inadequate or erroneous.'

4a.6.9 At a renewable energy seminar on 1st October, 2008, Mr. David Forsdick, a leading barrister (Landmark Chambers) with particular expertise in planning matters stated:

'..., general policy and guidance cannot prevent consideration of: a) the specific facts of an individual case; b) scientific information which suggests that the general methodology may need to be adjusted on the facts of an individual case; or c) actual experience elsewhere on the ground which shows that the government approved methodology does not always accurately predict the impacts.'

Thus whilst it is undoubtedly true that it is not for parties to an inquiry to question the merits of government policy, their evidence on the matters in the previous paragraph is plainly capable of constituting "other material considerations" which the decision maker has to take into account and, in an appropriate case, reach a conclusion on.' (http://www.landmarkchambers.co.uk/_data/assets/pdf_file/0004/32539/3.2_Noise_and_Wind_Turbines.pdf)

4a.6.10 The IOA Bulletin Methodology cannot be included as a valid material consideration as it is not official policy, has been negatively peer-reviewed and is not supported by empirical evidence in the field. The reduction of the ETSU-R-97 fixed night-time limit to 38dB(A) can be, as there is no shortage of empirical evidence to support Mr. Forsdick's reasons a, b and c.

4a.6.11 The effect of correcting the ETSU-R-97 night time fixed limit to 38dB on the current application for Dunsland Cross is shown in Table 4a.11 below.

Corrected Turbine Noise Levels referenced to ETSU-R-97 Night Time Limit of 38dB - Nordex N80

PROPERTY	Nearest Turb		WIND SPEED (m/s) at 10m agl									(N80)
			4	5	6	7	8	9	10	11	12	
Fairlawns	506m	T1	-2.8	-0.3	1.5	2.0	-1.3	-5.0	-8.6	-11.2	-13.5	
Little Copse	545	T1	-3.3	-0.8	1.0	1.5	-1.8	-5.5	-8.1	-11.7	-14.0	
The Vale	597	T1	-3.2	-0.7	1.1	1.6	-1.7	-5.4	-8.5	-11.6	-13.9	
*Moyles Moor	602	T1	-4.0	-1.5	0.3	0.8	-2.5	-6.2	-8.8	-12.4	-14.7	
*6 Station Cottages	643	T1	-4.4	-1.9	-0.1	0.4	-2.9	-6.6	-9.2	-12.8	-15.1	
*Lyne Akres	647	T2	-4.1	-1.6	0.2	0.6	-3.0	-6.3	-8.4	-11.3	-13.0	
*5 Station Cottages	649	T1	-4.5	-2.0	-0.2	0.3	-3.0	-6.7	-9.3	-12.9	-15.2	
*4 Station Cottages	655	T1	-4.6	-2.1	-0.3	0.2	-3.1	-6.8	-9.4	-13.0	-15.3	
*3 Station Cottages	661	T1	-4.7	-2.2	-0.4	0.1	-3.2	-6.9	-9.5	-13.1	-15.4	
*2 Station Cottages	667	T1	-4.8	-2.3	-0.5	0.0	-3.3	-7.0	-9.6	-13.2	-15.5	
*1 Station Cottages	673	T1	-4.9	-2.4	-0.6	-0.1	-3.4	-7.1	-9.7	-13.3	-15.6	
*1 The Granary	675	T2	-4.9	-2.4	-0.6	-0.2	-3.8	-7.1	-9.2	-12.1	-13.8	
*2 The Granary	675	T2	-4.9	-2.4	-0.6	-0.2	-3.8	-7.1	-9.2	-12.1	-13.8	
View Farm	846	T3	-6.9	-4.4	-2.5	-2.1	-5.7	-9.0	-11.6	-14.0	-15.7	
*'Cons' House**	375	T1	-7.0	-4.5	-2.7	-2.2	-5.6	-9.4	-11.7	-13.0	-12.7	
*'Am Cons' House**	350	T1	-7.3	-4.8	-3.0	-2.5	-5.9	-9.7	-12.0	-13.3	-13.0	
*Manor Farm**	350	T1	-7.3	-4.8	-3.0	-2.5	-5.9	-9.7	-12.0	-13.3	-13.0	
Cranmore	501	T1	-2.5	0.0	1.8	-3.3	-8.1	-11.9	-14.2	-15.5	-15.2	
Woodlands	548	T1	-4.4	-1.9	-0.3	-5.2	-9.6	-13.2	-15.7	-17.6	-18.7	
*New Buildings	625	T1	-5.8	-3.3	-1.7	-6.6	-11.0	-14.6	-17.1	-19.0	-20.1	
*Longfield	685	T1	-7.0	-4.5	-2.9	-7.8	-12.2	-15.8	-18.3	-20.2	-21.3	
Bickford Cottage	625	T2	-4.2	-1.7	0.1	0.6	-3.2	-6.5	-9.2	-11.5	-13.1	
*Bickford Arms	635	T2	-4.2	-1.7	0.1	0.6	-3.2	-6.5	-9.2	-11.5	-13.1	
*Old Post Office	648	T2	-4.5	-2.0	-0.2	0.3	-3.5	-6.8	-9.5	-11.8	-13.4	
*The Nook	659	T2	-4.7	-2.2	-0.4	0.1	-3.7	-7.0	-9.7	-12.0	-13.6	
*The Firs	662	T2	-4.8	-2.3	-0.5	0.0	-3.8	-7.1	-9.8	-12.1	-13.7	
Bickford Lodge	671	T2	-4.8	-2.3	3.9	0.1	-3.7	-7.0	-9.7	-12.0	-13.6	
*Miksam Barn	675	T2	-5.0	-2.5	-0.7	-0.2	-4.0	-7.3	-10.0	-12.3	-13.9	
*6 The Gardens	702	T2	-5.1	-2.6	-0.7	-0.2	-4.0	-7.3	-10.0	-12.3	-13.9	
The Laurels	715	T2	-5.4	-2.9	-1.0	-0.5	-4.3	-7.6	-10.3	-12.6	-14.2	
*5 The Gardens	717	T2	-5.4	-2.9	-1.0	-0.5	-4.3	-7.6	-10.3	-12.6	-14.2	
*The Retreat	718	T2	-5.5	-3.0	-1.1	-0.6	-4.4	-7.7	-10.4	-12.7	-14.3	
Temhani	719	T2	-5.5	-3.0	-1.1	-0.6	-4.4	-7.7	-10.4	-12.7	-14.3	
*Freshfields	721	T2	-5.5	-3.0	-1.1	-0.6	-4.4	-7.7	-10.4	-12.7	-14.3	
*Eden Park	724	T2	-5.6	-3.1	-1.2	-0.7	-4.5	-7.8	-10.5	-12.8	-14.4	
*4 The Gardens	732	T2	-5.7	-3.2	-1.3	-0.8	-4.6	-7.9	-10.6	-12.9	-14.5	
*1 The Gardens	739	T2	-5.9	-3.4	-1.5	-1.0	-4.8	-8.1	-10.8	-13.1	-14.7	
*2 The Gardens	739	T2	-5.9	-3.4	-1.5	-1.0	-4.8	-8.1	-10.8	-13.1	-14.7	
*3 The Gardens	740	T2	-5.9	-3.4	-1.5	-1.0	-4.8	-8.1	-10.8	-13.1	-14.7	
*Oakfield	752	T2	-6.0	-3.5	-1.6	-1.1	-4.9	-8.2	-10.9	-13.2	-14.8	
*Old Chapel	759	T2	-6.1	-3.6	-1.7	-1.2	-5.0	-8.3	-11.0	-13.3	-14.9	
*Carley	771	T2	-6.2	-3.7	-1.8	-1.3	-5.1	-8.4	-11.1	-13.4	-15.0	
*Moorfield House	886	T2	-8.3	-5.8	-3.9	-3.4	-7.2	-10.5	-13.2	-15.5	-17.1	
* = not in applicant's tables		** = financially involved										

Table 4a.11

4a.6.12 It is clear from Table 4a.11 that if this wind farm gains consent then the sleep of the occupants (humans and pets) of at least 15 of the properties will be disturbed by the noise of the turbines, which exceeds the 38dB threshold by as much as 3.9dB (at Bickford Lodge, the property at which the applicant was keen to retain the higher than normal background noise levels). The residents in these properties (coloured red in the table) can expect to be **annoyed** or **severely annoyed** by the noise at night (see paragraph 4a.6.6 above). Complaints are inevitable. This matter needs to be considered together with the night time noise impact of the turbines, which is a separate issue dealt with in Chapter 4b of this report.

Why the applicant cannot model the turbines running at full power in daytime

4a.6.13 Despite being forced to model the turbines running in noise-suppressed mode for the purposes of trying to show compliance with ETSU-R-97 limits at nearby properties, the applicant will inevitably run them at full power all of the time if the wind farm ever gains planning permission and is subsequently built.

4a.6.14 When noise complaints are received, as they will be (see Chapter 4b, *Noise Impact*) then TDC will be forced to launch an investigation to see if planning conditions are being breached. For the duration of this investigation the wind farm operator will quietly arrange for the turbines to be switched back into noise-suppressed mode (they are controlled remotely from mainland Europe) in the hope that the noise levels get back below the ETSU-R-97 limits, thus enabling the operator to claim that the wind farm is compliant. Once the investigation is over, the turbines will be switched back up to full power all of the time until the next complaints come in and the investigation process will have to be repeated. This will happen several times. There will be nothing the council or the residents adversely affected can do about it, other than resorting to long, expensive battles in the courts citing statutory nuisance and loss of amenity.

4a.6.15 The table below shows the full power noise levels for the applicant's preferred turbine, the Nordex N80 2.5MW. These are the figures genuine, responsible wind farm developers would be using when screening sites for suitability.

				Wind	Speed	m/s				
		4	5	6	7	8	9	10	11	12
N80 2.5MW	dB	98.0	100.5	102.5	103.0	103.5	104.0	104.0	104.5	105.0

4a.6.16 DTOG notes that, in trying to portray this unsuitable site in the best possible light, all of the applicant's claims for the number of houses supplied and CO₂ saved are based on the turbines operating at full power all of the time. The noise assessments are not. If Dunslund Cross was such a good site there would be no need to reduce the power of the turbines, but the applicant cannot do this because the daytime noise levels would be breached at 30 nearby properties as shown in Table 4a.12 below.

4a.6.17 No night time non-compliance is apparent, however, because the applicant is totally ignoring the noise **impact** of the turbines and instead is only considering the noise **levels**. He believes he has sufficient headroom between the predicted turbine noise levels and the ETSU-R-97 night time limits. (This would not be the case if the full >5dB correction identified in paragraph 4a.5.27 was applied.) The effect of running the turbines at full power on the night time noise impact is shown in Chapter 4b, Table 4b.6.

Corrected Turbine Noise Levels referenced to ETSU-R-97 Daytime Limit of 35dB
Turbines running at full power - Nordex N80

PROPERTY	Nearest Turb		WIND SPEED (m/s) at 10m agl									(N80)
			4	5	6	7	8	9	10	11	12	
Fairlawns	506	T1	2.7	4.3	4.5	3.0	1.1	-1.2	-4.2	-6.8	-10.0	
Little Copse	545	T1	2.2	3.8	4.0	2.5	0.6	-1.7	-3.7	-7.3	-10.5	
The Vale	597	T1	2.3	3.9	4.1	2.6	0.7	-1.6	-4.1	-7.2	-10.4	
*Moyles Moor	602	T1	1.5	3.1	3.3	1.8	-0.1	-2.4	-4.4	-8.0	-11.2	
*6 Station Cottages	643	T1	1.1	2.7	2.9	1.4	-0.5	-2.8	-4.8	-8.4	-11.6	
*Lyne Akres	647	T2	1.4	3.6	3.5	1.7	-0.5	-2.8	-4.7	-8.2	-11.1	
*5 Station Cottages	649	T1	1.0	2.6	2.8	1.3	-0.6	-2.9	-4.9	-8.5	-11.7	
*4 Station Cottages	655	T1	0.9	2.5	2.7	1.2	-0.7	-3.0	-5.0	-8.6	-11.8	
*3 Station Cottages	661	T1	0.8	2.4	2.6	1.1	-0.8	-3.1	-5.1	-8.7	-11.9	
*2 Station Cottages	667	T1	0.7	2.3	2.5	1.0	-0.9	-3.2	-5.2	-8.8	-12.0	
*1 Station Cottages	673	T1	0.6	2.2	2.4	0.9	-1.0	-3.3	-5.3	-8.9	-12.1	
*1 The Granary	675	T2	0.6	2.8	2.7	0.9	-1.3	-3.6	-5.5	-9.0	-11.9	
*2 The Granary	675	T2	0.6	2.8	2.7	0.9	-1.3	-3.6	-5.5	-9.0	-11.9	
View Farm	846	T3	-1.4	0.8	0.8	-1.0	-3.2	-5.5	-7.9	-10.9	-13.8	
*'Cons' House**	375	T1	-4.5	-2.0	-0.2	0.2	-4.0	-7.4	-8.2	-8.2	-8.2	
*'Am Cons' House**	350	T1	-4.8	-2.3	-0.5	-0.1	-4.3	-7.7	-8.5	-8.5	-8.5	
*Manor Farm**	350	T1	-4.8	-2.3	-0.5	-0.1	-4.3	-7.7	-8.5	-8.5	-8.5	
Cranmore	501	T1	1.4	2.5	1.4	-2.3	-6.5	-9.9	-10.7	-10.7	-10.7	
Woodlands	548	T1	-3.7	-2.9	-3.3	-5.4	-7.7	-10.2	-12.5	-15.1	-17.4	
*New Buildings	625	T1	-5.1	-4.3	-4.7	-6.8	-9.1	-11.6	-13.9	-16.5	-18.8	
*Longfield	685	T1	-6.3	-5.5	-5.9	-8.0	-10.3	-12.8	-15.1	-17.7	-20.0	
Bickford Cottage	625	T2	0.2	1.4	1.5	0.0	-1.7	-3.6	-5.6	-8.1	-10.5	
*Bickford Arms	635	T2	0.2	1.4	1.5	0.0	-1.7	-3.6	-5.6	-8.1	-10.5	
*Old Post Office	648	T2	-0.1	1.1	1.2	-0.3	-2.0	-3.9	-5.9	-8.4	-10.8	
*The Nook	659	T2	-0.3	0.9	1.0	-0.5	-2.2	-4.1	-6.1	-8.6	-11.0	
*The Firs	662	T2	-0.4	0.8	0.9	-0.6	-2.3	-4.2	-6.2	-8.7	-11.1	
Bickford Lodge	671	T2	-0.4	0.8	1.0	-0.5	-2.2	-4.1	-6.1	-8.6	-11.0	
*Miksam Barn	675	T2	-0.6	0.6	0.7	-0.8	-2.5	-4.4	-6.4	-8.9	-11.3	
*6 The Gardens	702	T2	-0.7	0.5	0.7	-0.8	-2.5	-4.4	-6.4	-8.9	-11.3	
The Laurels	715	T2	-1.0	0.2	0.4	-1.1	-2.8	-4.7	-6.7	-9.2	-11.6	
*5 The Gardens	717	T2	-1.0	0.2	0.4	-1.1	-2.8	-4.7	-6.7	-9.2	-11.6	
*The Retreat	718	T2	-1.1	0.1	0.3	-1.2	-2.9	-4.8	-6.8	-9.3	-11.7	
Temhani	719	T2	-1.1	0.1	0.3	-1.2	-2.9	-4.8	-6.8	-9.3	-11.7	
*Freshfields	721	T2	-1.1	0.1	0.3	-1.2	-2.9	-4.8	-6.8	-9.3	-11.7	
*Eden Park	724	T2	-1.2	0.0	0.2	-1.3	-3.0	-4.9	-6.9	-9.4	-11.8	
*4 The Gardens	732	T2	-1.3	-0.1	0.1	-1.4	-3.1	-5.0	-7.0	-9.5	-11.9	
*1 The Gardens	739	T2	-1.5	-0.3	-0.1	-1.6	-3.3	-5.2	-7.2	-9.7	-12.1	
*2 The Gardens	739	T2	-1.5	-0.3	-0.1	-1.6	-3.3	-5.2	-7.2	-9.7	-12.1	
*3 The Gardens	740	T2	-1.5	-0.3	-0.1	-1.6	-3.3	-5.2	-7.2	-9.7	-12.1	
*Oakfield	752	T2	-1.6	-0.4	-0.2	-1.7	-3.4	-5.3	-7.3	-9.8	-12.2	
*Old Chapel	759	T2	-1.7	-0.5	-0.3	-1.8	-3.5	-5.4	-7.4	-9.9	-12.3	
*Carley	771	T2	-1.8	-0.6	-0.4	-1.9	-3.6	-5.5	-7.5	-10.0	-12.4	
*Moorfield House	886	T2	-3.9	-2.7	-2.5	-4.0	-5.7	-7.6	-9.6	-12.1	-14.5	
* = not in applicant's tables		** = financially involved										

Table 4a.12

4a.7 The Alternative Noise Assessment using the Enercon E70

4a.7.1 The assessment carried out by DTOG for the Nordex N80 turbine above will now be repeated for the applicant's alternative turbine, the Enercon E70.

4a.7.2 The applicant's figures for the 're-analysed' E70 background noise levels from the ES Technical Appendix Table A11.3 will be used, with the table augmented to show all 40 non-involved properties, not just the applicant's chosen 10. The rationale which was applied in the Nordex N80 assessments in the preceding section will also apply in this section.

4a.7.3 Mode 2 power levels will be used. This is the applicant's choice. These are shown in the table below, with 1dB added to all figures as per the manufacturer's recommendation for the modification of the original values prior to any use of the figures in propagation calculations.

ENERCON E70/2300				Wind	Speed	m/s			
	4	5	6	7	8	9	10	11	12
Mode 2	89.4	94.6	99.8	102.4	104.1	105.5	105.5	105.5	105.5
Mode 3	89.4	92.9	97.7	102.1	105.2	107.0	107.0	107.0	107.0

4a.7.4 A 3dB correction for the E70 running in Mode 2 will be added to the applicant's predicted (uncorrected) noise levels as a conservative gesture, based on the >6dB correction which could be applied in accordance with the table below. This keeps this Enercon assessment in line with the 2dB correction applied to the Nordex N80 calculations, where >5dB error was identified.

Enercon E70 Noise Assessment Uncertainty	Correction
Incomplete wind shear profile at time of background noise measurement leading to inaccurate assessment of background noise levels (paragraph 4a.4.42)	1dB
Use of IOA Bulletin Method with G=0.5 (paragraph 4a.5.11)	2dB
Use of ISO9613-2 for turbines taller than 30 metres and in wind speeds greater than 5 m/s (paragraph 4a.5.20)	>3dB
TOTAL	>6dB

4a.7.5 The corrected figures will then be used to compare predicted noise levels with noise limits derived from the background noise levels, to see if any breaches of the limits occur.

4a.7.6 Tables 4a.13 - 4a.20 below show the results. It can be seen that the daytime limits will be breached at 9 properties to the south west of the site. At a tenth property the noise will be on the limit (Table 4a.19). Table 4a.20 shows that sleep disturbance which will lead to annoyance and complaints is very likely at 29 properties around the site. This shows that the second turbine of choice fares little better than the first when it comes to compliance with ETSU-R-97 noise limits. Both makes of turbine will breach the limits because they will be situated too close to the nearest properties.

4a.7.7 Micrositing of the turbines will not be possible without increasing the noise levels further at certain dwellings, leading to even greater non-compliance.

4a.7.8 DTOG has not modelled the worse-case scenario in this chapter. Only 2dB of a shortfall of >5dB has been added back into the Nordex assessment and only 3dB of a >6dB shortfall to the Enercon assessment. This was enough to show non-compliance.

Background Noise Levels L_{A90} - Quiet Day Time - Enercon E70

Microphone	PROPERTY	WIND SPEED (m/s) at 10m agl									(E70)
		4	5	6	7	8	9	10	11	12	
2	Fairlawns	30.0	30.9	32.3	34.2	36.6	39.3	42.3	45.4	48.7	
2	Little Copse	30.0	30.9	32.3	34.2	36.6	39.3	42.3	45.4	48.7	
2	The Vale	30.0	30.9	32.3	34.2	36.6	39.3	42.3	45.4	48.7	
2	*Moyles Moor	30.0	30.9	32.3	34.2	36.6	39.3	42.3	45.4	48.7	
2	*6 Station Cottages	30.0	30.9	32.3	34.2	36.6	39.3	42.3	45.4	48.7	
1	*Lyne Akres	28.8	30.1	32.0	34.3	36.8	39.6	42.5	45.5	48.5	
2	*5 Station Cottages	30.0	30.9	32.3	34.2	36.6	39.3	42.3	45.4	48.7	
2	*4 Station Cottages	30.0	30.9	32.3	34.2	36.6	39.3	42.3	45.4	48.7	
2	*3 Station Cottages	30.0	30.9	32.3	34.2	36.6	39.3	42.3	45.4	48.7	
2	*2 Station Cottages	30.0	30.9	32.3	34.2	36.6	39.3	42.3	45.4	48.7	
2	*1 Station Cottages	30.0	30.9	32.3	34.2	36.6	39.3	42.3	45.4	48.7	
1	*1 The Granary	28.8	30.1	32.0	34.3	36.8	39.6	42.5	45.5	48.5	
1	*2 The Granary	28.8	30.1	32.0	34.3	36.8	39.6	42.5	45.5	48.5	
1	View Farm	28.8	30.1	32.0	34.3	36.8	39.6	42.5	45.5	48.5	
4	*'Consented' House**	31.6	32.9	35.6	39.6	44.4	48.5	50.3	50.3	50.3	
4	*'Am Cons' House**	31.6	32.9	35.6	39.6	44.4	48.5	50.3	50.3	50.3	
4	*Manor Farm**	31.6	32.9	35.6	39.6	44.4	48.5	50.3	50.3	50.3	
4	Cranmore	31.6	32.9	35.6	39.6	44.4	48.5	50.3	50.3	50.3	
3	Woodlands	34.8	36.3	38.4	41.0	43.7	46.6	49.5	52.2	54.5	
3	*New Buildings	34.8	36.3	38.4	41.0	43.7	46.6	49.5	52.2	54.5	
3	*Longfield	34.8	36.3	38.4	41.0	43.7	46.6	49.5	52.2	54.5	
6	Bickford Cottage	31.1	32.3	33.9	35.9	38.1	40.5	42.9	45.4	47.9	
6	*Bickford Arms	31.1	32.3	33.9	35.9	38.1	40.5	42.9	45.4	47.9	
6	*Old Post Office	31.1	32.3	33.9	35.9	38.1	40.5	42.9	45.4	47.9	
6	*The Nook	31.1	32.3	33.9	35.9	38.1	40.5	42.9	45.4	47.9	
6	*The Firs	31.1	32.3	33.9	35.9	38.1	40.5	42.9	45.4	47.9	
6	Bickford Lodge	31.1	32.3	33.9	35.9	38.1	40.5	42.9	45.4	47.9	
6	*Miksam Barn	31.1	32.3	33.9	35.9	38.1	40.5	42.9	45.4	47.9	
6	*6 The Gardens	31.1	32.3	33.9	35.9	38.1	40.5	42.9	45.4	47.9	
6	The Laurels	31.1	32.3	33.9	35.9	38.1	40.5	42.9	45.4	47.9	
6	*5 The Gardens	31.1	32.3	33.9	35.9	38.1	40.5	42.9	45.4	47.9	
6	*The Retreat	31.1	32.3	33.9	35.9	38.1	40.5	42.9	45.4	47.9	
6	Temhani	31.1	32.3	33.9	35.9	38.1	40.5	42.9	45.4	47.9	
6	*Freshfields	31.1	32.3	33.9	35.9	38.1	40.5	42.9	45.4	47.9	
6	*Eden Park	31.1	32.3	33.9	35.9	38.1	40.5	42.9	45.4	47.9	
6	*4 The Gardens	31.1	32.3	33.9	35.9	38.1	40.5	42.9	45.4	47.9	
6	*1 The Gardens	31.1	32.3	33.9	35.9	38.1	40.5	42.9	45.4	47.9	
6	*2 The Gardens	31.1	32.3	33.9	35.9	38.1	40.5	42.9	45.4	47.9	
6	*3 The Gardens	31.1	32.3	33.9	35.9	38.1	40.5	42.9	45.4	47.9	
6	*Oakfield	31.1	32.3	33.9	35.9	38.1	40.5	42.9	45.4	47.9	
6	*Old Chapel	31.1	32.3	33.9	35.9	38.1	40.5	42.9	45.4	47.9	
6	*Carley	31.1	32.3	33.9	35.9	38.1	40.5	42.9	45.4	47.9	
6	*Moorfield House	31.1	32.3	33.9	35.9	38.1	40.5	42.9	45.4	47.9	
* = not in applicant's tables		** = financially involved									

Table 4a.13

Background Noise Levels L_{A90} - Night Time - Enercon E70

Microphone	PROPERTY	WIND SPEED (m/s) at 10m agl									(E70)
		4	5	6	7	8	9	10	11	12	
2	Fairlawns	21.5	24.2	27.9	32.1	36.5	40.7	44.4	47.6	50.0	
2	Little Copse	21.5	24.2	27.9	32.1	36.5	40.7	44.4	47.6	50.0	
2	The Vale	21.5	24.2	27.9	32.1	36.5	40.7	44.4	47.6	50.0	
2	*Moyles Moor	21.5	24.2	27.9	32.1	36.5	40.7	44.4	47.6	50.0	
2	*6 Station Cottages	21.5	24.2	27.9	32.1	36.5	40.7	44.4	47.6	50.0	
1	*Lyne Akres	21.8	24.6	28.4	32.7	36.9	40.7	44.0	46.6	48.5	
2	*5 Station Cottages	21.5	24.2	27.9	32.1	36.5	40.7	44.4	47.6	50.0	
2	*4 Station Cottages	21.5	24.2	27.9	32.1	36.5	40.7	44.4	47.6	50.0	
2	*3 Station Cottages	21.5	24.2	27.9	32.1	36.5	40.7	44.4	47.6	50.0	
2	*2 Station Cottages	21.5	24.2	27.9	32.1	36.5	40.7	44.4	47.6	50.0	
2	*1 Station Cottages	21.5	24.2	27.9	32.1	36.5	40.7	44.4	47.6	50.0	
1	*1 The Granary	21.8	24.6	28.4	32.7	36.9	40.7	44.0	46.6	48.5	
1	*2 The Granary	21.8	24.6	28.4	32.7	36.9	40.7	44.0	46.6	48.5	
1	View Farm	21.8	24.6	28.4	32.7	36.9	40.7	44.0	46.6	48.5	
4	*'Consented' House**	22.0	26.5	32.2	38.1	43.5	48.0	51.1	52.6	52.4	
4	*'Am Cons' House**	22.0	26.5	32.2	38.1	43.5	48.0	51.1	52.6	52.4	
4	*Manor Farm**	22.0	26.5	32.2	38.1	43.5	48.0	51.1	52.6	52.4	
4	Cranmore	22.0	26.5	32.2	38.1	43.5	48.0	51.1	52.6	52.4	
3	Woodlands	23.7	27.6	32.7	38.0	43.0	47.1	50.2	52.3	53.5	
3	*New Buildings	23.7	27.6	32.7	38.0	43.0	47.1	50.2	52.3	53.5	
3	*Longfield	23.7	27.6	32.7	38.0	43.0	47.1	50.2	52.3	53.5	
6	Bickford Cottage	21.4	24.4	28.4	32.7	36.9	40.8	44.1	46.6	48.3	
6	*Bickford Arms	21.4	24.4	28.4	32.7	36.9	40.8	44.1	46.6	48.3	
6	*Old Post Office	21.4	24.4	28.4	32.7	36.9	40.8	44.1	46.6	48.3	
6	*The Nook	21.4	24.4	28.4	32.7	36.9	40.8	44.1	46.6	48.3	
6	*The Firs	21.4	24.4	28.4	32.7	36.9	40.8	44.1	46.6	48.3	
6	Bickford Lodge	21.4	24.4	28.4	32.7	36.9	40.8	44.1	46.6	48.3	
6	*Miksam Barn	21.4	24.4	28.4	32.7	36.9	40.8	44.1	46.6	48.3	
6	*6 The Gardens	21.4	24.4	28.4	32.7	36.9	40.8	44.1	46.6	48.3	
6	The Laurels	21.4	24.4	28.4	32.7	36.9	40.8	44.1	46.6	48.3	
6	*5 The Gardens	21.4	24.4	28.4	32.7	36.9	40.8	44.1	46.6	48.3	
6	*The Retreat	21.4	24.4	28.4	32.7	36.9	40.8	44.1	46.6	48.3	
6	Tembani	21.4	24.4	28.4	32.7	36.9	40.8	44.1	46.6	48.3	
6	*Freshfields	21.4	24.4	28.4	32.7	36.9	40.8	44.1	46.6	48.3	
6	*Eden Park	21.4	24.4	28.4	32.7	36.9	40.8	44.1	46.6	48.3	
6	*4 The Gardens	21.4	24.4	28.4	32.7	36.9	40.8	44.1	46.6	48.3	
6	*1 The Gardens	21.4	24.4	28.4	32.7	36.9	40.8	44.1	46.6	48.3	
6	*2 The Gardens	21.4	24.4	28.4	32.7	36.9	40.8	44.1	46.6	48.3	
6	*3 The Gardens	21.4	24.4	28.4	32.7	36.9	40.8	44.1	46.6	48.3	
6	*Oakfield	21.4	24.4	28.4	32.7	36.9	40.8	44.1	46.6	48.3	
6	*Old Chapel	21.4	24.4	28.4	32.7	36.9	40.8	44.1	46.6	48.3	
6	*Carley	21.4	24.4	28.4	32.7	36.9	40.8	44.1	46.6	48.3	
6	*Moorfield House	21.4	24.4	28.4	32.7	36.9	40.8	44.1	46.6	48.3	
* = not in applicant's tables		** = financially involved									

Table 4a.14

Noise Limits L_{A90} - Quiet Day Time - Enercon E70

Microphone	PROPERTY	WIND SPEED (m/s) at 10m agl									(E70)
		4	5	6	7	8	9	10	11	12	
2	Fairlawns	35.0	35.9	37.3	39.2	41.6	44.3	47.3	50.4	53.7	
2	Little Copse	35.0	35.9	37.3	39.2	41.6	44.3	47.3	50.4	53.7	
2	The Vale	35.0	35.9	37.3	39.2	41.6	44.3	47.3	50.4	53.7	
2	*Moyles Moor	35.0	35.9	37.3	39.2	41.6	44.3	47.3	50.4	53.7	
2	*6 Station Cottages	35.0	35.9	37.3	39.2	41.6	44.3	47.3	50.4	53.7	
1	*Lyne Akres	35.0	35.1	37.0	39.3	41.8	44.6	47.5	50.5	53.5	
2	*5 Station Cottages	35.0	35.9	37.3	39.2	41.6	44.3	47.3	50.4	53.7	
2	*4 Station Cottages	35.0	35.9	37.3	39.2	41.6	44.3	47.3	50.4	53.7	
2	*3 Station Cottages	35.0	35.9	37.3	39.2	41.6	44.3	47.3	50.4	53.7	
2	*2 Station Cottages	35.0	35.9	37.3	39.2	41.6	44.3	47.3	50.4	53.7	
2	*1 Station Cottages	35.0	35.9	37.3	39.2	41.6	44.3	47.3	50.4	53.7	
1	*1 The Granary	35.0	35.1	37.0	39.3	41.8	44.6	47.5	50.5	53.5	
1	*2 The Granary	35.0	35.1	37.0	39.3	41.8	44.6	47.5	50.5	53.5	
1	View Farm	35.0	35.1	37.0	39.3	41.8	44.6	47.5	50.5	53.5	
4	*'Consented' House**	45.0	45.0	45.0	44.6	49.4	53.5	55.3	55.3	55.3	
4	*'Am Cons' House**	45.0	45.0	45.0	44.6	49.4	53.5	55.3	55.3	55.3	
4	*Manor Farm**	45.0	45.0	45.0	44.6	49.4	53.5	55.3	55.3	55.3	
4	Cranmore	36.6	37.9	40.6	44.6	49.4	53.5	55.3	55.3	55.3	
3	Woodlands	39.8	41.3	43.4	46.0	48.7	51.6	54.5	57.2	59.5	
3	*New Buildings	39.8	41.3	43.4	46.0	48.7	51.6	54.5	57.2	59.5	
3	*Longfield	39.8	41.3	43.4	46.0	48.7	51.6	54.5	57.2	59.5	
6	Bickford Cottage	36.1	37.3	38.9	40.9	43.1	45.5	47.9	50.4	52.9	
6	*Bickford Arms	36.1	37.3	38.9	40.9	43.1	45.5	47.9	50.4	52.9	
6	*Old Post Office	36.1	37.3	38.9	40.9	43.1	45.5	47.9	50.4	52.9	
6	*The Nook	36.1	37.3	38.9	40.9	43.1	45.5	47.9	50.4	52.9	
6	*The Firs	36.1	37.3	38.9	40.9	43.1	45.5	47.9	50.4	52.9	
5	Bickford Lodge	36.1	37.3	38.9	40.9	43.1	45.5	47.9	50.4	52.9	
6	*Miksam Barn	36.1	37.3	38.9	40.9	43.1	45.5	47.9	50.4	52.9	
6	*6 The Gardens	36.1	37.3	38.9	40.9	43.1	45.5	47.9	50.4	52.9	
6	The Laurels	36.1	37.3	38.9	40.9	43.1	45.5	47.9	50.4	52.9	
6	*5 The Gardens	36.1	37.3	38.9	40.9	43.1	45.5	47.9	50.4	52.9	
6	*The Retreat	36.1	37.3	38.9	40.9	43.1	45.5	47.9	50.4	52.9	
6	Tembani	36.1	37.3	38.9	40.9	43.1	45.5	47.9	50.4	52.9	
6	*Freshfields	36.1	37.3	38.9	40.9	43.1	45.5	47.9	50.4	52.9	
6	*Eden Park	36.1	37.3	38.9	40.9	43.1	45.5	47.9	50.4	52.9	
6	*4 The Gardens	36.1	37.3	38.9	40.9	43.1	45.5	47.9	50.4	52.9	
6	*1 The Gardens	36.1	37.3	38.9	40.9	43.1	45.5	47.9	50.4	52.9	
6	*2 The Gardens	36.1	37.3	38.9	40.9	43.1	45.5	47.9	50.4	52.9	
6	*3 The Gardens	36.1	37.3	38.9	40.9	43.1	45.5	47.9	50.4	52.9	
6	*Oakfield	36.1	37.3	38.9	40.9	43.1	45.5	47.9	50.4	52.9	
6	*Old Chapel	36.1	37.3	38.9	40.9	43.1	45.5	47.9	50.4	52.9	
6	*Carley	36.1	37.3	38.9	40.9	43.1	45.5	47.9	50.4	52.9	
6	*Moorfield House	36.1	37.3	38.9	40.9	43.1	45.5	47.9	50.4	52.9	
	* = not in applicant's tables										
	** = financially involved										

Table 4a.15

Noise Limits L_{A90} - Night Time - Enercon E70

Microphone	PROPERTY	WIND SPEED (m/s) at 10m agl									(E70)
		4	5	6	7	8	9	10	11	12	
2	Fairlawns	43.0	43.0	43.0	43.0	43.0	45.7	49.4	52.6	55.0	
2	Little Copse	43.0	43.0	43.0	43.0	43.0	45.7	49.4	52.6	55.0	
2	The Vale	43.0	43.0	43.0	43.0	43.0	45.7	49.4	52.6	55.0	
2	*Moyles Moor	43.0	43.0	43.0	43.0	43.0	45.7	49.4	52.6	55.0	
2	*6 Station Cottages	43.0	43.0	43.0	43.0	43.0	45.7	49.4	52.6	55.0	
1	*Lyne Akres	43.0	43.0	43.0	43.0	43.0	45.7	49.0	51.6	53.5	
2	*5 Station Cottages	43.0	43.0	43.0	43.0	43.0	45.7	49.4	52.6	55.0	
2	*4 Station Cottages	43.0	43.0	43.0	43.0	43.0	45.7	49.4	52.6	55.0	
2	*3 Station Cottages	43.0	43.0	43.0	43.0	43.0	45.7	49.4	52.6	55.0	
2	*2 Station Cottages	43.0	43.0	43.0	43.0	43.0	45.7	49.4	52.6	55.0	
2	*1 Station Cottages	43.0	43.0	43.0	43.0	43.0	45.7	49.4	52.6	55.0	
1	*1 The Granary	43.0	43.0	43.0	43.0	43.0	45.7	49.0	51.6	53.5	
1	*2 The Granary	43.0	43.0	43.0	43.0	43.0	45.7	49.0	51.6	53.5	
1	View Farm	43.0	43.0	43.0	43.0	43.0	45.7	49.0	51.6	53.5	
4	*'Consented' House**	45.0	45.0	45.0	45.0	48.5	53.0	56.1	57.6	57.4	
4	*'Am Cons' House**	45.0	45.0	45.0	45.0	48.5	53.0	56.1	57.6	57.4	
4	*Manor Farm**	45.0	45.0	45.0	45.0	48.5	53.0	56.1	57.6	57.4	
4	Cranmore	43.0	43.0	43.0	43.1	48.5	53.0	56.1	57.6	57.4	
3	Woodlands	43.0	43.0	43.0	43.0	48.0	52.1	55.2	57.3	58.5	
3	*New Buildings	43.0	43.0	43.0	43.0	48.0	52.1	55.2	57.3	58.5	
3	*Longfield	43.0	43.0	43.0	43.0	48.0	52.1	55.2	57.3	58.5	
6	Bickford Cottage	43.0	43.0	43.0	43.0	43.0	45.8	49.1	51.6	53.3	
6	*Bickford Arms	43.0	43.0	43.0	43.0	43.0	45.8	49.1	51.6	53.3	
6	*Old Post Office	43.0	43.0	43.0	43.0	43.0	45.8	49.1	51.6	53.3	
6	*The Nook	43.0	43.0	43.0	43.0	43.0	45.8	49.1	51.6	53.3	
6	*The Firs	43.0	43.0	43.0	43.0	43.0	45.8	49.1	51.6	53.3	
6	Bickford Lodge	43.0	43.0	43.0	43.0	43.0	45.8	49.1	51.6	53.3	
6	*Miksam Barn	43.0	43.0	43.0	43.0	43.0	45.8	49.1	51.6	53.3	
6	*6 The Gardens	43.0	43.0	43.0	43.0	43.0	45.8	49.1	51.6	53.3	
6	The Laurels	43.0	43.0	43.0	43.0	43.0	45.8	49.1	51.6	53.3	
6	*5 The Gardens	43.0	43.0	43.0	43.0	43.0	45.8	49.1	51.6	53.3	
6	*The Retreat	43.0	43.0	43.0	43.0	43.0	45.8	49.1	51.6	53.3	
6	Tem bani	43.0	43.0	43.0	43.0	43.0	45.8	49.1	51.6	53.3	
6	*Freshfields	43.0	43.0	43.0	43.0	43.0	45.8	49.1	51.6	53.3	
6	*Eden Park	43.0	43.0	43.0	43.0	43.0	45.8	49.1	51.6	53.3	
6	*4 The Gardens	43.0	43.0	43.0	43.0	43.0	45.8	49.1	51.6	53.3	
6	*1 The Gardens	43.0	43.0	43.0	43.0	43.0	45.8	49.1	51.6	53.3	
6	*2 The Gardens	43.0	43.0	43.0	43.0	43.0	45.8	49.1	51.6	53.3	
6	*3 The Gardens	43.0	43.0	43.0	43.0	43.0	45.8	49.1	51.6	53.3	
6	*Oakfield	43.0	43.0	43.0	43.0	43.0	45.8	49.1	51.6	53.3	
6	*Old Chapel	43.0	43.0	43.0	43.0	43.0	45.8	49.1	51.6	53.3	
6	*Carley	43.0	43.0	43.0	43.0	43.0	45.8	49.1	51.6	53.3	
6	*Moorfield House	43.0	43.0	43.0	43.0	43.0	45.8	49.1	51.6	53.3	
	* = not in applicant's tables					** = financially involved					

Table 4a.16

UNCORRECTED Turbine Noise Levels - Enercon E70

Location relative to Site	PROPERTY	Nearest Turbine (m)	WIND SPEED (m/s) at 10m agl									(E70)
			4	5	6	7	8	9	10	11	12	
SW	Fairlawns	506	25.2	30.4	35.6	38.2	39.9	41.3	41.3	41.3	41.3	
SW	Little Copse	545	24.7	29.9	35.1	37.7	39.4	40.8	40.8	40.8	40.8	
SW	The Vale	597	24.7	29.9	35.1	37.7	39.4	40.8	40.8	40.8	40.8	
SW	*Moyles Moor	602	24.0	29.2	34.4	37.0	38.7	40.1	40.1	40.1	40.1	
SW	*6 Station Cottages	643	23.6	28.8	34.0	36.6	38.3	39.7	39.7	39.7	39.7	
SW	*Lyne Akres	647	23.9	29.1	34.3	36.9	38.6	40.0	40.0	40.0	40.0	
SW	*5 Station Cottages	649	23.5	28.7	33.9	36.5	38.2	39.6	39.6	39.6	39.6	
SW	*4 Station Cottages	655	23.4	28.6	33.8	36.4	38.1	39.5	39.5	39.5	39.5	
SW	*3 Station Cottages	661	23.3	28.5	33.7	36.3	38.0	39.4	39.4	39.4	39.4	
SW	*2 Station Cottages	667	23.2	28.4	33.6	36.2	37.9	39.3	39.3	39.3	39.3	
SW	*1 Station Cottages	673	23.1	28.3	33.5	36.1	37.8	39.2	39.2	39.2	39.2	
SW	*1 The Granary	675	23.1	28.3	33.5	36.1	37.8	39.2	39.2	39.2	39.2	
SW	*2 The Granary	675	23.1	28.3	33.5	36.1	37.8	39.2	39.2	39.2	39.2	
SSW	View Farm	846	21.0	26.2	31.4	34.0	35.7	37.1	37.1	37.1	37.1	
N	*'Cons' House**	375	28.0	33.2	38.4	41.0	42.7	44.1	44.1	44.1	44.1	
N	*'Am Cons' House**	350	27.7	32.9	38.1	40.7	42.4	43.8	43.8	43.8	43.8	
N	*Manor Farm**	350	27.7	32.9	38.1	40.7	42.4	43.8	43.8	43.8	43.8	
N	Cranmore	501	25.5	30.7	35.9	38.5	40.2	41.6	41.6	41.6	41.6	
NNW	Woodlands	548	23.5	28.7	33.9	36.5	38.2	39.6	39.6	39.6	39.6	
NNW	*New Buildings	625	22.1	27.3	32.5	35.1	36.8	38.2	38.2	38.2	38.2	
NNW	*Longfield	685	20.9	26.1	31.3	33.9	35.6	37.0	37.0	37.0	37.0	
NNE	Bickford Cottage	625	23.7	28.9	34.1	36.7	38.4	39.8	39.8	39.8	39.8	
NNE	*Bickford Arms	635	23.7	28.9	34.1	36.7	38.4	39.8	39.8	39.8	39.8	
NNE	*Old Post Office	648	23.4	28.6	33.8	36.4	38.1	39.5	39.5	39.5	39.5	
NNE	*The Nook	659	23.2	28.4	33.6	36.2	37.9	39.3	39.3	39.3	39.3	
NNE	*The Firs	662	23.1	28.3	33.5	36.1	37.8	39.2	39.2	39.2	39.2	
NNE	Bickford Lodge	671	23.1	28.3	33.5	36.1	37.8	39.2	39.2	39.2	39.2	
NNE	*Miksam Barn	675	22.9	28.1	33.3	35.9	37.6	39.0	39.0	39.0	39.0	
NNE	*6 The Gardens	702	22.8	28.0	33.2	35.8	37.5	38.9	38.9	38.9	38.9	
NNE	The Laurels	715	22.5	27.7	32.9	35.5	37.2	38.6	38.6	38.6	38.6	
NNE	*5 The Gardens	717	22.5	27.7	32.9	35.5	37.2	38.6	38.6	38.6	38.6	
NNE	*The Retreat	718	22.4	27.6	32.8	35.4	37.1	38.5	38.5	38.5	38.5	
NNE	Temhani	719	22.4	27.6	32.8	35.4	37.1	38.5	38.5	38.5	38.5	
NNE	*Freshfields	721	22.4	27.6	32.8	35.4	37.1	38.5	38.5	38.5	38.5	
NNE	*Eden Park	724	22.3	27.5	32.7	35.3	37.0	38.4	38.4	38.4	38.4	
NNE	*4 The Gardens	732	22.2	27.4	32.6	35.2	36.9	38.3	38.3	38.3	38.3	
NNE	*1 The Gardens	739	22.0	27.2	32.4	35.0	36.7	38.1	38.1	38.1	38.1	
NNE	*2 The Gardens	739	22.0	27.2	32.4	35.0	36.7	38.1	38.1	38.1	38.1	
NNE	*3 The Gardens	740	22.0	27.2	32.4	35.0	36.7	38.1	38.1	38.1	38.1	
NNE	*Oakfield	752	21.9	27.1	32.3	34.9	36.6	38.0	38.0	38.0	38.0	
NNE	*Old Chapel	759	21.8	27.0	32.2	34.8	36.5	37.9	37.9	37.9	37.9	
NNE	*Carley	771	21.7	26.9	32.1	34.7	36.4	37.8	37.8	37.8	37.8	
NNE	*Moorfield House	886	19.6	24.8	30.0	32.6	34.3	35.7	35.7	35.7	35.7	
* = not in applicant's tables			** = financially involved									

Table 4a.17

CORRECTED Turbine Noise Levels - Enercon E70

Location relative to Site	PROPERTY	Nearest Turbine (m)	WIND SPEED (m/s) at 10m agl									(E70)
			4	5	6	7	8	9	10	11	12	
SW	Fairlawns	506	28.2	33.4	38.6	41.2	42.9	44.3	44.3	44.3	44.3	
SW	Little Copse	545	27.7	32.9	38.1	40.7	42.4	43.8	43.8	43.8	43.8	
SW	The Vale	597	27.7	32.9	38.1	40.7	42.4	43.8	43.8	43.8	43.8	
SW	*Moyles Moor	602	27.0	32.2	37.4	40.0	41.7	43.1	43.1	43.1	43.1	
SW	*6 Station Cottages	643	26.6	31.8	37.0	39.6	41.3	42.7	42.7	42.7	42.7	
SW	*Lyne Akres	647	26.9	32.1	37.3	39.9	41.6	43.0	43.0	43.0	43.0	
SW	*5 Station Cottages	649	26.5	31.7	36.9	39.5	41.2	42.6	42.6	42.6	42.6	
SW	*4 Station Cottages	655	26.4	31.6	36.8	39.4	41.1	42.5	42.5	42.5	42.5	
SW	*3 Station Cottages	661	26.3	31.5	36.7	39.3	41.0	42.4	42.4	42.4	42.4	
SW	*2 Station Cottages	667	26.2	31.4	36.6	39.2	40.9	42.3	42.3	42.3	42.3	
SW	*1 Station Cottages	673	26.1	31.3	36.5	39.1	40.8	42.2	42.2	42.2	42.2	
SW	*1 The Granary	675	26.1	31.3	36.5	39.1	40.8	42.2	42.2	42.2	42.2	
SW	*2 The Granary	675	26.1	31.3	36.5	39.1	40.8	42.2	42.2	42.2	42.2	
SSW	View Farm	846	24.0	29.2	34.4	37.0	38.7	40.1	40.1	40.1	40.1	
N	*'Cons' House**	375	31.0	36.2	41.4	44.0	45.7	47.1	47.1	47.1	47.1	
N	*'Am Cons' House**	350	30.7	35.9	41.1	43.7	45.4	46.8	46.8	46.8	46.8	
N	*Manor Farm**	350	30.7	35.9	41.1	43.7	45.4	46.8	46.8	46.8	46.8	
N	Cranmore	501	28.5	33.7	38.9	41.5	43.2	44.6	44.6	44.6	44.6	
NNW	Woodlands	548	26.5	31.7	36.9	39.5	41.2	42.6	42.6	42.6	42.6	
NNW	*New Buildings	625	25.1	30.3	35.5	38.1	39.8	41.2	41.2	41.2	41.2	
NNW	*Longfield	685	23.9	29.1	34.3	36.9	38.6	40.0	40.0	40.0	40.0	
NNE	Bickford Cottage	625	26.7	31.9	37.1	39.7	41.4	42.8	42.8	42.8	42.8	
NNE	*Bickford Arms	635	26.7	31.9	37.1	39.7	41.4	42.8	42.8	42.8	42.8	
NNE	*Old Post Office	648	26.4	31.6	36.8	39.4	41.1	42.5	42.5	42.5	42.5	
NNE	*The Nook	659	26.2	31.4	36.6	39.2	40.9	42.3	42.3	42.3	42.3	
NNE	*The Firs	662	26.1	31.3	36.5	39.1	40.8	42.2	42.2	42.2	42.2	
NNE	Bickford Lodge	671	26.1	31.3	36.5	39.1	40.8	42.2	42.2	42.2	42.2	
NNE	*Miksam Barn	675	25.9	31.1	36.3	38.9	40.6	42.0	42.0	42.0	42.0	
NNE	*6 The Gardens	702	25.8	31.0	36.2	38.8	40.5	41.9	41.9	41.9	41.9	
NNE	The Laurels	715	25.5	30.7	35.9	38.5	40.2	41.6	41.6	41.6	41.6	
NNE	*5 The Gardens	717	25.5	30.7	35.9	38.5	40.2	41.6	41.6	41.6	41.6	
NNE	*The Retreat	718	25.4	30.6	35.8	38.4	40.1	41.5	41.5	41.5	41.5	
NNE	Temhani	719	25.4	30.6	35.8	38.4	40.1	41.5	41.5	41.5	41.5	
NNE	*Freshfields	721	25.4	30.6	35.8	38.4	40.1	41.5	41.5	41.5	41.5	
NNE	*Eden Park	724	25.3	30.5	35.7	38.3	40.0	41.4	41.4	41.4	41.4	
NNE	*4 The Gardens	732	25.2	30.4	35.6	38.2	39.9	41.3	41.3	41.3	41.3	
NNE	*1 The Gardens	739	25.0	30.2	35.4	38.0	39.7	41.1	41.1	41.1	41.1	
NNE	*2 The Gardens	739	25.0	30.2	35.4	38.0	39.7	41.1	41.1	41.1	41.1	
NNE	*3 The Gardens	740	25.0	30.2	35.4	38.0	39.7	41.1	41.1	41.1	41.1	
NNE	*Oakfield	752	24.9	30.1	35.3	37.9	39.6	41.0	41.0	41.0	41.0	
NNE	*Old Chapel	759	24.8	30.0	35.2	37.8	39.5	40.9	40.9	40.9	40.9	
NNE	*Carley	771	24.7	29.9	35.1	37.7	39.4	40.8	40.8	40.8	40.8	
NNE	*Moorfield House	886	22.6	27.8	33.0	35.6	37.3	38.7	38.7	38.7	38.7	
	* = not in applicant's tables		** = financially involved									

Table 4a.18

Corrected Turbine Noise Levels referenced to ETSU-R-97 Daytime Limit of 35dB - Enercon E70

PROPERTY	Nearest Turb		WIND SPEED (m/s) at 10m agl									(E70)
			4	5	6	7	8	9	10	11	12	
Fairlawns	506	T1	-6.8	-2.5	1.3	2.0	1.3	0.0	-3.0	-6.1	-9.4	
Little Copse	545	T1	-7.3	-3.0	0.8	1.5	0.8	-0.5	-3.5	-6.6	-9.9	
The Vale	597	T1	-7.3	-3.0	0.8	1.5	0.8	-0.5	-3.5	-6.6	-9.9	
*Moyles Moor	602	T1	-8.0	-3.7	0.1	0.8	0.1	-1.2	-4.2	-7.3	-10.6	
*6 Station Cottages	643	T1	-8.4	-4.1	-0.3	0.4	-0.3	-1.6	-4.6	-7.7	-11.0	
*Lyne Akres	647	T2	-8.1	-3.0	0.3	0.6	-0.2	-1.6	-4.5	-7.5	-10.5	
*5 Station Cottages	649	T1	-8.5	-4.2	-0.4	0.3	-0.4	-1.7	-4.7	-7.8	-11.1	
*4 Station Cottages	655	T1	-8.6	-4.3	-0.5	0.2	-0.5	-1.8	-4.8	-7.9	-11.2	
*3 Station Cottages	661	T1	-8.7	-4.4	-0.6	0.1	-0.6	-1.9	-4.9	-8.0	-11.3	
*2 Station Cottages	667	T1	-8.8	-4.5	-0.7	0.0	-0.7	-2.0	-5.0	-8.1	-11.4	
*1 Station Cottages	673	T1	-8.9	-4.6	-0.8	-0.1	-0.8	-2.1	-5.1	-8.2	-11.5	
*1 The Granary	675	T2	-8.9	-3.8	-0.5	-0.2	-1.0	-2.4	-5.3	-8.3	-11.3	
*2 The Granary	675	T2	-8.9	-3.8	-0.5	-0.2	-1.0	-2.4	-5.3	-8.3	-11.3	
View Farm	846	T3	-11.0	-5.9	-2.6	-2.3	-3.1	-4.5	-7.4	-10.4	-13.4	
Cons' House	375	T1	-14.0	-8.8	-3.6	-0.6	-3.7	-6.4	-8.2	-8.2	-8.2	
*1 Am Cons' House**	350	T1	-14.3	-9.1	-3.9	-0.9	-4.0	-6.7	-8.5	-8.5	-8.5	
*Manor Farm**	350	T1	-14.3	-9.1	-3.9	-0.9	-4.0	-6.7	-8.5	-8.5	-8.5	
Cranmore	501	T1	-8.1	-4.2	-1.7	-3.1	-6.2	-8.9	-10.7	-10.7	-10.7	
Woodlands	548	T1	-13.3	-9.6	-6.5	-6.5	-7.5	-9.0	-11.9	-14.6	-16.9	
*New Buildings	625	T1	-14.7	-11.0	-7.9	-7.9	-8.9	-10.4	-13.3	-16.0	-18.3	
*Longfield	685	T1	-15.9	-12.2	-9.1	-9.1	-10.1	-11.6	-14.5	-17.2	-19.5	
Bickford Cottage	625	T2	-9.4	-5.4	-1.8	-1.2	-1.7	-2.7	-5.1	-7.6	-10.1	
*Bickford Arms	635	T2	-9.4	-5.4	-1.8	-1.2	-1.7	-2.7	-5.1	-7.6	-10.1	
*Old Post Office	648	T2	-9.7	-5.7	-2.1	-1.5	-2.0	-3.0	-5.4	-7.9	-10.4	
*The Nook	659	T2	-9.9	-5.9	-2.3	-1.7	-2.2	-3.2	-5.6	-8.1	-10.6	
*The Firs	662	T2	-10.0	-6.0	-2.4	-1.8	-2.3	-3.3	-5.7	-8.2	-10.7	
Bickford Lodge	671	T2	-10.0	-6.0	-2.4	-1.8	-2.3	-3.3	-5.7	-8.2	-10.7	
*Miksam Barn	675	T2	-10.2	-6.2	-2.6	-2.0	-2.5	-3.5	-5.9	-8.4	-10.9	
*6 The Gardens	702	T2	-10.3	-6.3	-2.7	-2.1	-2.6	-3.6	-6.0	-8.5	-11.0	
The Laurels	715	T2	-10.6	-6.6	-3.0	-2.4	-2.9	-3.9	-6.3	-8.8	-11.3	
*5 The Gardens	717	T2	-10.6	-6.6	-3.0	-2.4	-2.9	-3.9	-6.3	-8.8	-11.3	
*The Retreat	718	T2	-10.7	-6.7	-3.1	-2.5	-3.0	-4.0	-6.4	-8.9	-11.4	
Tembani	719	T2	-10.7	-6.7	-3.1	-2.5	-3.0	-4.0	-6.4	-8.9	-11.4	
*Freshfields	721	T2	-10.7	-6.7	-3.1	-2.5	-3.0	-4.0	-6.4	-8.9	-11.4	
*Eden Park	724	T2	-10.8	-6.8	-3.2	-2.6	-3.1	-4.1	-6.5	-9.0	-11.5	
*4 The Gardens	732	T2	-10.9	-6.9	-3.3	-2.7	-3.2	-4.2	-6.6	-9.1	-11.6	
*1 The Gardens	739	T2	-11.1	-7.1	-3.5	-2.9	-3.4	-4.4	-6.8	-9.3	-11.8	
*2 The Gardens	739	T2	-11.1	-7.1	-3.5	-2.9	-3.4	-4.4	-6.8	-9.3	-11.8	
*3 The Gardens	740	T2	-11.1	-7.1	-3.5	-2.9	-3.4	-4.4	-6.8	-9.3	-11.8	
*Oakfield	752	T2	-11.2	-7.2	-3.6	-3.0	-3.5	-4.5	-6.9	-9.4	-11.9	
*Old Chapel	759	T2	-11.3	-7.3	-3.7	-3.1	-3.6	-4.6	-7.0	-9.5	-12.0	
*Carley	771	T2	-11.4	-7.4	-3.8	-3.2	-3.7	-4.7	-7.1	-9.6	-12.1	
*Moorfield House	886	T2	-13.5	-9.5	-5.9	-5.3	-5.8	-6.8	-9.2	-11.7	-14.2	
* = not in applicant's tables		** = financially involved										

Table 4a.19

Corrected Turbine Noise Levels referenced to ETSU-R-97 Night Time Limit of 38dB - Enercon E70

PROPERTY	Nearest Turb		WIND SPEED (m/s) at 10m agl									(E70)
			4	5	6	7	8	9	10	11	12	
Fairlawns	506	T1	-9.8	-4.6	0.6	3.2	1.4	-1.4	-5.1	-8.3	-10.7	
Little Copse	545	T1	-10.3	-5.1	0.1	2.7	0.9	-1.9	-5.6	-8.8	-11.2	
The Vale	597	T1	-10.3	-5.1	0.1	2.7	0.9	-1.9	-5.6	-8.8	-11.2	
*Moyles Moor	602	T1	-11.0	-5.8	-0.6	2.0	0.2	-2.6	-6.3	-9.5	-11.9	
*6 Station Cottages	643	T1	-11.4	-6.2	-1.0	1.6	-0.2	-3.0	-6.7	-9.9	-12.3	
*Lyne Akres	647	T2	-11.1	-5.9	-0.7	1.9	-0.3	-2.7	-6.0	-8.6	-10.5	
*5 Station Cottages	649	T1	-11.5	-6.3	-1.1	1.5	-0.3	-3.1	-6.8	-10.0	-12.4	
*4 Station Cottages	655	T1	-11.6	-6.4	-1.2	1.4	-0.4	-3.2	-6.9	-10.1	-12.5	
*3 Station Cottages	661	T1	-11.7	-6.5	-1.3	1.3	-0.5	-3.3	-7.0	-10.2	-12.6	
*2 Station Cottages	667	T1	-11.8	-6.6	-1.4	1.2	-0.6	-3.4	-7.1	-10.3	-12.7	
*1 Station Cottages	673	T1	-11.9	-6.7	-1.5	1.1	-0.7	-3.5	-7.2	-10.4	-12.8	
*1 The Granary	675	T2	-11.9	-6.7	-1.5	1.1	-1.1	-3.5	-6.8	-9.4	-11.3	
*2 The Granary	675	T2	-11.9	-6.7	-1.5	1.1	-1.1	-3.5	-6.8	-9.4	-11.3	
View Farm	846	T3	-14.0	-8.8	-3.6	-1.0	-3.2	-5.6	-8.9	-11.5	-13.4	
*'Consented' House**	375	T1	-14.0	-8.8	-3.6	-1.0	-2.8	-5.9	-9.0	-10.5	-10.3	
*'Am Cons' House**	350	T1	-14.3	-9.1	-3.9	-1.3	-3.1	-6.2	-9.3	-10.8	-10.6	
*Manor Farm**	350	T1	-14.3	-9.1	-3.9	-1.3	-3.1	-6.2	-9.3	-10.8	-10.6	
Cranmore	501	T1	-9.5	-4.3	0.9	-1.6	-5.3	-8.4	-11.5	-13.0	-12.8	
Woodlands	548	T1	-11.5	-6.3	-1.1	-3.5	-6.8	-9.5	-12.6	-14.7	-15.9	
*New Buildings	625	T1	-12.9	-7.7	-2.5	-4.9	-8.2	-10.9	-14.0	-16.1	-17.3	
*Longfield	685	T1	-14.1	-8.9	-3.7	-6.1	-9.4	-12.1	-15.2	-17.3	-18.5	
Bickford Cottage	625	T2	-11.3	-6.1	-0.9	1.7	-0.5	-3.0	-6.3	-8.8	-10.5	
*Bickford Arms	635	T2	-11.3	-6.1	-0.9	1.7	-0.5	-3.0	-6.3	-8.8	-10.5	
*Old Post Office	648	T2	-11.6	-6.4	-1.2	1.4	-0.8	-3.3	-6.6	-9.1	-10.8	
*The Nook	659	T2	-11.8	-6.6	-1.4	1.2	-1.0	-3.5	-6.8	-9.3	-11.0	
*The Firs	662	T2	-11.9	-6.7	-1.5	1.1	-1.1	-3.6	-6.9	-9.4	-11.1	
Bickford Lodge	671	T2	-11.9	-6.7	-1.5	1.1	-1.1	-3.6	-6.9	-9.4	-11.1	
*Miksam Barn	675	T2	-12.1	-6.9	-1.7	0.9	-1.3	-3.8	-7.1	-9.6	-11.3	
*6 The Gardens	702	T2	-12.2	-7.0	-1.8	0.8	-1.4	-3.9	-7.2	-9.7	-11.4	
The Laurels	715	T2	-12.5	-7.3	-2.1	0.5	-1.7	-4.2	-7.5	-10.0	-11.7	
*5 The Gardens	717	T2	-12.5	-7.3	-2.1	0.5	-1.7	-4.2	-7.5	-10.0	-11.7	
*The Retreat	718	T2	-12.6	-7.4	-2.2	0.4	-1.8	-4.3	-7.6	-10.1	-11.8	
Temhani	719	T2	-12.6	-7.4	-2.2	0.4	-1.8	-4.3	-7.6	-10.1	-11.8	
*Freshfields	721	T2	-12.6	-7.4	-2.2	0.4	-1.8	-4.3	-7.6	-10.1	-11.8	
*Eden Park	724	T2	-12.7	-7.5	-2.3	0.3	-1.9	-4.4	-7.7	-10.2	-11.9	
*4 The Gardens	732	T2	-12.8	-7.6	-2.4	0.2	-2.0	-4.5	-7.8	-10.3	-12.0	
*1 The Gardens	739	T2	-13.0	-7.8	-2.6	0.0	-2.2	-4.7	-8.0	-10.5	-12.2	
*2 The Gardens	739	T2	-13.0	-7.8	-2.6	0.0	-2.2	-4.7	-8.0	-10.5	-12.2	
*3 The Gardens	740	T2	-13.0	-7.8	-2.6	0.0	-2.2	-4.7	-8.0	-10.5	-12.2	
*Oakfield	752	T2	-13.1	-7.9	-2.7	-0.1	-2.3	-4.8	-8.1	-10.6	-12.3	
*Old Chapel	759	T2	-13.2	-8.0	-2.8	-0.2	-2.4	-4.9	-8.2	-10.7	-12.4	
*Carley	771	T2	-13.3	-8.1	-2.9	-0.3	-2.5	-5.0	-8.3	-10.8	-12.5	
*Moorfield House	886	T2	-15.4	-10.2	-5.0	-2.4	-4.6	-7.1	-10.4	-12.9	-14.6	
* = not in applicant's tables		** = financially involved										

Table 4a.20

4a.8 Policies in Conflict with this Application

4a.8.1 The Environmental Protection Act 1990, Part III: Statutory Nuisances and Clean Air states:

79 Statutory nuisances and inspections therefor

(1) Subject to subsections (2) to (6) below, the following matters constitute "statutory nuisances" for the purposes of this Part, that is to say—

(g) noise emitted from premises so as to be prejudicial to health or a nuisance;

Subsections (2) to (6) do not apply to criterion (g) above.

4a.8.2 Devon County Council Policy CO16: Noise Pollution, states:

'Development should not be located where it would result in a significant increase in the level of noise affecting existing or proposed land uses in the vicinity, and noise sensitive land uses should not be located in areas affected by significant existing noise.'

The first part of this policy is the relevant part in this application.

4a.8.3 DCC Policy ST1: Sustainable Development, part 5 states:

*'5) assessing the impact of proposals against national and regional indicators of sustainable development - **to make positive improvements to quality of life.**'*

The quality of life of nearby residents will not be improved by approval of this application.

4a.8.4 Torridge District Council Policy DVT11: Impact of Development on Amenity, states:

*'Development will be required to secure or maintain amenity appropriate to the locality, **with special regard to the likely impact on:***

*(a) **neighbours** and the operation of neighbouring uses'*

With turbines so close to houses, the impact on neighbours of this application, if approved, will be significant. In the guidelines accompanying this policy is the statement, 'The policy should ensure that neighbourhood amenity is not compromised.' (Paragraph 3.137)

4a.8.5 TDC Policy DVT12: Pollution and Hazardous Substances, states:

'Development that may be liable to cause pollution or that is likely to be hazardous will be permitted only where there is:

*(a) **no unacceptable risk to public health** or environmental safety, to local air quality, or to the quality or quantity of controlled waters; and*

*(b) **no unacceptable risk of nuisance by reason of noise, vibration, smell, gases, fumes, smoke, steam, soot, ash, dust, grit, light, or other pollution.***

This policy applies the Precautionary Principle to potentially polluting development and to the limitation of risk.

4a.8.6 TDC Policy DVT13: Noise Emission and Disturbance, states:

*'(1) Noise sensitive development or noise generating development **will not be permitted where nuisance or significant disturbance could arise unless adequate attenuating measures are included as an integral part of the scheme.***

*'(2) Noise generating development in the open countryside will be permissible **only where it will not affect adversely any recreational, wildlife, or amenity interests.**'*

If excessive audible noise or AM is detected after this development is completed then no adequate mitigation, other than stopping the turbines, will be possible. This application, if approved, will adversely affect wildlife and amenity interests.

4a.9 Summary of this Chapter and Recommendation

The applicant is shown to have departed from the use of ETSU-R-97 which PPS22 says should be used for wind turbine noise assessments.

The applicant has made errors in the identification and location of nearby noise-sensitive properties.

The applicant has been shown not to have acquired enough data to complete a full wind shear assessment for the site. Without this knowledge the applicant simply does not know what the true noise levels at nearby properties will be.

The applicant's background noise measurements are shown to be unreliable.

The applicant's predicted turbine noise levels at nearby properties are shown to be unreliable.

The noise levels at nearby properties are shown to be in breach of the ETSU-R-97 limits.

The application is shown to be in conflict with policies CO16, ST1(pt5), DVT11, DVT12 and DVT13.

Recommendation: REFUSAL

The ETSU-R-97 permitted noise limits will be breached at a minimum of 11 properties around the site during the daytime. Compliance with ETSU-R-97 has not been demonstrated, since one single breach means the application must be refused. This is because ETSU-R-97 already has a built-in balance between the need to protect the amenity of nearby residents and the need to allow renewable energy development. PPS22, therefore, which expects the use of ETSU-R-97, has not been satisfied. The application is also in conflict with policies CO16, ST1 (pt5), DVT11, DVT12 and DVT13.

For these reasons the application should be refused.

The applicant's attention is also drawn to the likely conflict with the Environmental Protection Act 1990. The landowner may also be liable in Tort.

SPECIAL NOTE: TDC should commission acoustician Mr. Bob Davis, or, if he is not available, Mr. Mike Stigwood (as TDC has done for the current Wheeler's Cross application) to review the applicant's noise assessment for Dunslund Cross.