Memorandum

To: Dolores McCague
Senior Planning Inspector

From: Robert Speer
Planning Inspector

Date: 29th July, 2014

Re: PA0029: Proposed Oweninny Wind Farm and associated works, Bellacorrick, Co. Mayo.

Further to your memo of 26th April, 2014 please find attached my assessment of those matters pertaining to noise, shadow flicker, air quality, traffic and transport with regard to the aforementioned application as previously agreed.

1.0 Noise:

1.1 Construction Noise:

1.1.1 In relation to the predicted noise impact arising during the construction of the proposed development, in the first instance, it must be acknowledged that due to the nature of the construction activity to be conducted on site there is an inherent potential for the generation of increased levels of noise. Similarly, the flow of traffic transporting material to and from the site is also likely to be a potential source of increased noise. In this respect I would refer the Board to Section 7.4.2 of the EIS which identifies the principle sources of noise arising during the construction (and decommissioning) of the proposed development with the noisiest construction activities likely to be those associated with piling for turbine foundations, the excavation and pouring of the turbine bases, and the extraction and crushing of stone from the borrow pits (*N.B.* With regard to the aforementioned activities it is perhaps of particular relevance to note that the EIS has indicated that pile-based foundations are the most likely to be utilised on site and that, depending on ground conditions, the individual piles will be of the reinforced concrete type and will be 17m in length. In addition, it is expected that

each turbine base will necessitate an average of 30 No. piles with the piling operations to take approximately three days per turbine base, although elsewhere in the EIS these works are estimated as requiring approximately one week. Similarly, the EIS has suggested that the excavation of a turbine base will take 1-2 days with the main concrete pours usually conducted in one continuous pour which will be completed within a day, although it is accepted that this could extend into the evening time).

1.1.2 Therefore, considering the scale of the development proposed (112 No. turbines and associated works including the construction / upgrading of access roads), the nature of some of the construction works involved as previously outlined, and the construction schedule for the proposed development as set out in Section 3.3.2 of the EIS (wherein it is stated that the wind farm will be constructed in a series of three phases over an 8-year construction period), it is apparent that the construction of the development will impact to some degree on noise levels in the surrounding area.

1.1.2 In its assessment of the likely noise impacts arising from the construction of the proposed development the EIS has stated that whilst the construction works will involve standard construction techniques using standard equipment it is acknowledged that a certain amount of noise is inherent in all types of building work which can never be completely eliminated. It proceeds to emphasise that unlike operational noise, construction activities are both short-lived and typically only occur during the daytime and in this respect it has been submitted that in general all construction activity will take place during daytime hours only, although it should be noted that some works such as continuous concrete pours at turbine bases may continue into the evening time whilst other activities which do not involve the use of heavy equipment, such as the pumping of water, the treatment of fresh concrete, and the use of security lighting, will be required to operate on a round the clock basis. With regard to noise emanating from construction traffic the EIS further anticipates that the daily increase in traffic flow along the local road network will be within 10% of the roads carrying capacity and that the corresponding increase in noise levels arising from same will be no more than marginal. Furthermore, construction traffic movements are expected to be limited to daytime hours, although some large deliveries may take place outside of these hours if required by the relevant authorities (e.g. turbine component delivery in order to minimise traffic disruption). Finally, it has also been suggested in the EIS that construction noise will not result in any significant impacts, particularly in light of the separation distances between the proposed turbine locations and nearby noise sensitive receptors (e.g. dwelling houses). In

this respect I would refer the Board to Table 7-12 of the EIS which details the typical noise levels likely to be experienced at various distances from earth moving and concreting operations as derived from the relevant sound power data and expressed as dB(A)LAeq (12 hour) equivalent continuous noise levels (the standard for construction noise). For example, it has been submitted that at a distance of 500m from source the noise level associated with earth moving equipment will be 45dB(A) whereas at distances of 1,000m, 1,500m and 2,000m it will have dropped to 37.7dB(A), 33.3dB(A) & 30.2dB(A) respectively due to the effect of noise dispersion over the increased distance. At this point it is of relevance to note that all of the proposed wind turbines will be in excess of 1,000m from the nearest Noise Sensitive Location and, therefore, on the basis of figures provided in Table 7-12, it would seem that the impact of construction noise associated with the erection of the turbines themselves will be within acceptable limits.

1.1.3 In terms of mitigating the noise impact arising during the construction stage of the development, it was clarified during questioning at the oral hearing that all construction work will be carried out in accordance with the guidance set out in *BS 5228-1: 2009: 'Code of Practice for Noise and Vibration Control on Construction and Open Sites'* as per best practice. This would entail the implementation of various practical noise reduction measures such as avoiding the unnecessary revving of engines, switching off equipment when not in use, the maintenance of internal haul routes, and limiting the working hours of noisy activities to avoid interference with neighbouring residential amenities. It is also proposed to adopt the construction noise limits used by the National Roads Authority as set out in Table 7.13 of the EIS which purportedly represent best international practice and will form the core of the noise measures to be adopted for both the construction and decommissioning phases of the development.

1.1.4 During the course of the oral hearing various concerns were raised with regard to certain aspects of the noise impacts likely to arise during the construction of the proposed development. Particular reference was made by an observer to the possibility of tonal noise arising as a result of any cleaning of the auger used for the rotary drilling as part of the piling operations given that any loud intermittent noise associated with the cleaning could serve to be particularly intrusive yet the average noise levels when taken over a prolonged period of time would nevertheless remain within acceptable limits. In response, the applicant acknowledged that it is not unusual to apply penalties with regard to tonal noise, however, it was reiterated that the development would adhere to the maximum construction noise limits published by the National Roads Authority as per Table

7.13. Further concerns were raised as regards the appropriateness of applying noise limits used by the NRA during the construction of its road schemes to a development of the nature proposed given that construction activity associated with a roads project will gradually move over a certain distance in a linear fashion unlike the subject proposal which will remain in a fixed location for a considerable period of time. By way of a response to same, the applicant reiterated that the NRA's construction noise limits were the only standards published by a State agency in Ireland and also requested that cognisance be taken of the overall size and extent of the application site in that it was c.13km in width and as the proposed construction activities would move throughout the site to and from each turbine location.

1.1.5 With regard to the potential cumulative noise impacts when taken in conjunction with the construction of the Corvoderry and Cludduan wind farms, I would refer the Board to Section 7.5 of the EIS and I am in general agreement with the conclusions outlined in same. Furthermore, I would suggest that the applicant will nevertheless be required to adhere to the applicable standards and best practice construction management in order to mitigate any such cumulative impacts.

1.1.6 Having considered the available information, whilst acknowledging the scale and construction schedule of the development proposed, on balance, considering that the construction works will be temporary in nature, I am satisfied that the varying intermittent noise impacts arising from same can be satisfactorily mitigated by way of condition and adherence to best practice site management so as to avoid any undue impact on the amenities of nearby dwelling houses. In this respect I would refer the Board to the mitigation measures outlined in Section 7.6 of the EIS in addition to the '*Schedule of Mitigation Measures'*, the *'Schedule of Proposed Conditions'* and the proposal to compile a *'Construction Environmental Management Plan'* as presented at the oral hearing which I envisage will provide for various means to reduce noise levels during the construction period such as the use of mobile machinery with an inherently low potential for noise generation fitted with effective well-maintained silencers and the restriction of construction activity to day-time hours in order to minimise any noise impact arising during unsociable hours.

1.2 Operational Noise:

1.2.1 In assessing the impact of noise levels arising as a result of the proposed development I would refer the Board in the first instance to Chapter 7 of the EIS which details the results of noise monitoring surveys carried out at identified

Noise Sensitive Locations (NSLs) in the vicinity of the proposed development site. In this respect it should be noted that whilst a total of 46 No. properties which had the potential to be impacted by the proposed development were identified within the surrounds of the application site, it was considered sufficient to undertake background noise monitoring at a series of 9 No. representative noise sensitive locations drawn from these properties in order to establish baseline noise conditions (*N.B.* This monitoring was undertaken between March / April / May, 2012 with some additional measurements having been taken during November / December, 2012). Having reviewed the siting of these monitoring locations relative to surrounding housing in the vicinity of the site, and following a site inspection of the wider area, I am generally satisfied with the applicants submission that the locations chosen for the monitoring of background noise levels are suitably representative of the various individual dwelling houses and those groups of housing likely to be impacted by the proposed development (refer to Figure 7.2 & Table 7.4 of the EIS).

1.2.2 Section 7.2 of the EIS details the methodology used in the monitoring of background noise levels and states that noise measurements were taken over a minimum of a two week period (at 10 minute intervals) with the timing of same synchronised with wind speed measurements recorded at 3 No. wind monitoring masts located on site. In this respect I note that wind speeds were recorded at each of the masts by anemometers located at a height of 10m above ground level in line with the recommendations of ETSU-R-97 *('The Rating and Assessment of Noise from Wind Farms'*, UK Dept. of Trade and Industry, 1996) whilst background noise levels were determined using the LA_{90} criterion as specified in the *'Wind Energy Development, Guidelines for Planning Authorities'* published by the Department of the Environment, Heritage and Local Government in 2006 with the 'A' suffix denoting the fact that the sound levels had been 'A-weighted' in order to account for the non-linear nature of human hearing. The data gathered from each noise monitoring location was then related to the wind speed data collected from the nearest wind mast within the site as shown in Table 7.5 of the EIS.

1.2.3 At this point it is of relevance to note that background noise in the surrounding area is already influenced by an existing wind farm on the Oweninny site which is proposed for decommissioning / removal as part of the subject application (i.e. the Bellacorick Wind Farm which comprises 20 No. 300kW turbines and 1 No. 450kW turbine). Accordingly, the applicant has sought to make an allowance for the contribution of this wind farm to the existing noise environment in order to determine background noise levels in the absence of

same thereby avoiding a misrepresentation of the likely noise impact of the proposed development. In this respect I note that modelling of the existing wind farm was undertaken by Biospheric Engineering Ltd. using the same methodology and parameters as the noise prediction modelling completed for the proposed wind turbines. This entailed carrying out modelling for wind speeds in the range of 4m/s to 8m/s at the 9 No. noise monitoring locations for comparison against background levels at those locations at the same wind speeds. A correction factor for the total noise level was then calculated on the basis of logarithmic addition of noise levels and applied to the relevant NSLs as set out in Table 7.7 of the EIS. For example, it has been calculated that the background noise level at NSL H19 for a wind speed of 4m/s will need to be corrected by –1.0dB to take account of the loss of noise emanating from the Bellacorick Wind Farm.

1.2.4 Section 7.3 of the EIS proceeds to outline the nature of the receiving environment and the results of the noise monitoring as regards existing baseline noise levels at the 9 No. NSLs at wind speeds of between 1m/s and 15m/s during both daytime periods (07:00-23:00 hours) and night-time periods (23:00-07:00 hours), as corrected for existing wind turbine noise, are shown in Tables 7-8 and 7-9 respectively (*N.B.* The background noise data for each of the monitoring locations is presented in Appendix 7 of the EIS in a series of scatter graphs with the data subsequently averaged for each 0.5m/s interval in wind speed and a trend line / 'best-fit' curve plotted along with correlation factors).

1.2.5 At this point it should be noted that the *'Wind Energy Development, Guidelines for Planning Authorities'* state that in general a lower fixed limit of 45dB(A) or a maximum increase of 5dB(A) above background noise at nearby noise sensitive locations is considered appropriate to provide protection to wind energy development neighbours, however, in low noise environments where background noise is less than 30 dB(A), it is recommended that the daytime level of the $L_{A90, 10min}$ of the wind energy development noise be limited to an absolute level within the range of 35-40 dB(A). The Guidelines also advise that separate noise limits should apply for day-time and night-time and that a fixed limit of 43dB(A) will protect sleep inside properties during the night. Furthermore, it is stated that noise arising from wind turbines is typically unlikely to be a significant problem where the distance from the nearest turbine to any noise sensitive property such as a dwelling house is in excess of 500m.

1.2.6 The EIS has concluded that in general the prevailing noise climate in the vicinity of the application site is typical of a rural environment and in some areas

is influenced by traffic movements along the N59 and local roads, the existing substation at Bellacorick, and various farming activities. It has also been acknowledged that certain natural sounds such as the Oweninny and Owenmore Rivers, birdsong and animal calls similarly contribute to background noise levels in the area. Having conducted a site inspection, I am in broad agreement with the applicant's description of the background noise environment within the study area, however, it is nevertheless necessary to consider the specifics of the baseline noise conditions within the site surrounds and in this respect I would refer the Board to the background noise levels set out in Tables 7-8 & 7-9 of the EIS as derived from the results of the background noise monitoring surveys included in Appendix 7 of that same document.

1.2.7 In most rural areas the background noise environment is primarily influenced by the interaction of wind on items of foliage / vegetation with the result that the greater the wind speed the higher the noise level generated. This would seem to find support in Tables 7-8 & 7-9 of the EIS where it is apparent that the background noise environment is inherently linked to wind speed. From a review of these baseline conditions, it would appear that in the majority of cases the use of a lower fixed limit of 45dB(A) or a maximum increase of 5dB(A) above background noise at nearby noise sensitive locations would be appropriate, however, it is noteworthy that in several instances the background noise levels recorded at some of the representative noise monitoring locations (i.e. H19, H23, H38, H42 & H46) were less than 30dB(A) and thus would correspond to the definition of a *'low noise environment'* as per the *'Wind Energy Development, Guidelines for Planning Authorities'*. Typically, in those instances when the recorded background noise conditions were less than 30dB(A) the prevailing wind speeds were particularly low and in some cases were below the cut-in speed (3 - 3.5m/s) of the representative wind turbines detailed in Table 7-6 of the EIS (*N.B.* When wind speeds are below the cut-in speed of the proposed turbines there can be no concerns as regards potential for turbine noise), however, at several of the monitoring locations (i.e. H19, H23, H38 H42 and H46) the background noise environment was recorded as measuring less than 30dB(A) at wind speeds of between 3m/s and 7m/s when the proposed turbines would be in operation. In this respect it is of relevance to note that the *'Wind Energy Development, Guidelines for Planning Authorities'* recommend that the daytime level of the $LA_{90\ 10min}$ for wind energy development noise be limited to an absolute level within the range of 35-40dB(A) and therefore the applicant has sought to impose a fixed noise limit of 37.5dB(A) at those Noise Sensitive Locations when the prevailing background conditions could be considered as constituting a *'low noise environment'*.

1.2.8 During the course of the oral hearing it was queried as to why a limit of 37.5dB(A) had been specifically selected for the aforementioned 'low noise environments' as opposed to a lower noise limit. In response, it was subsequently clarified by Mr. Eugene McKeown on behalf of the applicant that a mid-point within the identified range of 35-40dB(A) had been chosen on the basis of his previous dealings with planning authorities in N. Ireland and as he had been unable to identify any previous Board decisions which had imposed a limit of less than 43dB(A). Whilst I would acknowledge the applicants submission in this regard I am inclined to suggest that in order to determine whether or not the application of a 37.5dB(A) limit would be appropriate in this instance it is necessary to have regard to *'ETSU-R-97 - The Assessment & Rating of Noise for Wind Farms'* as published by the UK Department of Trade and Industry as this document has formed much of the technical basis for the assessment of turbine noise in Ireland to date. Indeed, ETSU-R-97 is referenced in both the EIS and the 'Wind Energy Development, Guidelines for Planning Authorities'. In this respect I would also refer the Board to Paragraph 3.2.2 of *'A Good Practice Guide to the Application of ETSU-R-97 for the Assessment and Rating of Wind Turbine Noise'* as published by the Institute of Acoustics in 2013 which references the following criteria set out in ETSU-R-97 to be considered when fixing a limit within the range of 35 dB to 40dB$_{LA90}$ during periods of quiet:

i) the number of noise-affected properties;
ii) the potential impact on the power output of the wind farm; and
iii) the likely duration and level of exposure.

1.2.9 In assessing the subject proposal against the foregoing criteria, in the first instance I would advise the Board that it would seem that a total of 11 No. properties which are primarily to the east of the application site (i.e. NSL Nos. H36-45, with the exception of H46 which is to the northeast) could potentially be categorised as experiencing a 'low noise environment' at low wind speeds and thus could possibly be affected by turbine noise in certain conditions. With regard to the second criterion, the magnitude of any impact arising from the omission or de-rating of those turbines in the vicinity of these receptors on the overall power output of the wind farm is unclear and whilst any such impact may be perceived as low by the occupants of nearby properties this is not to say that the applicant would not object to same. In relation to the likely duration and level of exposure, it is of relevance to note that the NSLs in question only experience background noise levels of less than 30dB(A) at wind speeds of 7m/s or less whilst the cut-in speed of the prospective turbines will be 3-3.5 m/s. Similarly, it should also be

taken into account that all of the affected NSLs (with the exception of H46) are located due east of the application site whereas the prevailing wind direction is from the southwest.

1.2.10 Following a review of previous Board decisions as regards proposals for wind energy development, and having considered the foregoing criteria as per ETSU-R-97, including the limited instances at individual properties when background noise levels at wind speeds in excess of the cut-in speed of the proposed turbines would be such as to correspond with the definition of a 'low noise environment' set out in the Guidelines, I am amenable to the adoption of the 37.5dB(A) fixed limit as proposed by the applicant and such a provision would seem to adhere to current guidance. In addition, it should be noted that the imposition of a 37.5dB(A) fixed limit in such circumstances would be a somewhat more onerous requirement than the 40dB(A) limit imposed in respect of the wind energy development previously permitted on site by the Board under ABP Ref. No. PL16.131260 and that the noise prediction modelling subsequently detailed in the EIS is based on a 'worst-case' scenario.

1.2.11 At this point I would advise the Board that Point No. 43 of the document entitled *'Schedule of Proposed Conditions'* as presented by the applicant to the oral hearing includes the following provision:

> *'Noise levels emanating from operation of the wind farm when measured externally at a noise sensitive location shall not exceed 43dB(A)L90 at any time; or a fixed lower level of 37.5dB(A) in low noise environments at low wind speeds as indicated in Table 7-15 in the EIS during the hours 07:00 to 23:00 in accordance with the Planning Guidelines for Wind Energy'.*

1.2.12 Whilst I note that the possible wording of this suggested condition includes reference to a fixed lower level of 37.5dB(A) in low noise environments at low wind speeds, I would suggest that the proposed limitation of same to the daytime hours of 07:00 to 23:00 hours should be omitted from any condition imposed by the Board in the event of a grant of permission.

1.2.13 Having regard to the foregoing, I would refer the Board to Table 7-15 of the EIS which sets out the background noise levels recorded at the various representative noise monitoring locations at different wind speeds with the applicable noise limit to be applied in respect of same. Notably, it is also of relevance to highlight that the applicant has adopted the more stringent fixed limit value of 43dB(A) (as opposed to a lower fixed limit of 45dB(A) or a maximum

increase of 5dB(A) above background noise) throughout the entirety of the 24-hour day despite such a limit more typically only applying during night-time hours.

1.2.14 Having established the baseline noise environment and the appropriate noise limits to be applied at the various NSLs (as per Table 7-15 of the EIS), the applicant subsequently utilised noise prediction modelling in accordance with ISO9613-2 – *Acoustics – Attenuation of sound during propagation outdoors – Part 2: General method of calculation* (ISO9613 2:1996) in order to predict the noise impact of the proposed development both in isolation and in combination with the wind turbines planned at Corvoderry and Cluddaun. In this respect it should be noted that modelling was undertaken for 3 No. different makes of turbine (the specifications of which are detailed in Table 7.6 of the EIS) in order to be representative of the range of turbine types which could be considered for the site, pending the selection of a final turbine type, and also to ensure a worst-case scenario in terms of noise generation. The results of this modelling are detailed in the report of the Hayes MacKenzie Partnership contained in Appendix 7 of the EIS and are shown in both tabular form and as noise contour mapping. However, Chapter 7 of the EIS has chosen to simplify this assessment by focusing on the 'worst-case' scenario derived from the noise modelling which has taken the following factors into account:

- The turbine with the highest noise emissions (i.e. Siemens SWT-3-101 with a maximum Sound Power Level of 108dBA at 8m/s wind speed) was assumed for all wind farms.
- Noise levels were modelled for all wind directions in 15 degree intervals and the worst case figure for each location was used in the assessment (*N.B.* Notwithstanding that the wind direction is predominantly from the southwest).
- A wind speed of 8m/s (at 10m height) was used in the modelling as the maximum sound power output for the worst case turbine is reached at this speed with no further increase occurring at higher wind speeds.
- All turbines on all three wind farms were assumed to be acting simultaneously.
- Ground absorption factors have been taken into account in accordance with ISO 9613-2.
- The noise levels were modelled at a receiver height of 4m thereby reducing the mitigating effect of barriers and ground attenuation whereas most of the properties in the surrounding area are of a bungalow construction (*N.B.* A height of 1.5m would be more appropriate and representative of these).

1.2.15 The output from the modelling for the proposed development when acting alone is shown in Table 7.16 of the EIS for a total of 17 No. properties which were selected on the basis that they were representative of the individual dwellings and clusters of housing surrounding the application site (*N.B.* Please be advised that during the course of the oral hearing the applicant submitted amended versions of Table Nos. 7-16 & 7-17 which addressed errors in the corresponding tables within the EIS by providing for the correction of the noise level predictions at the various identified NSLs). In addition, the results of the noise prediction modelling are also presented graphically for the wider area in the form of noise contour mapping as shown in Figure 7.6. From a review of these results, it would appear that the maximum predicted background noise in the 'worst-case' scenario as modelled would be 42.8dBLA_{90} and would occur at House No. H18 located along Local Road No. L52925 in the centre of the site, although House Nos. H16, H17, H19 & H20 would also experience similar or comparable predicted levels (*N.B.* I would again reiterate that amended / corrected versions of Table Nos. 7-16 & 7-17 were presented at the oral hearing). Accordingly, the modelling for the 17 No. representative properties detailed in Table 7-16 (in addition to the modelling carried out for NSL No. H46 which is located on lands in the ownership of Coillte), which reflect the various individual and clusters of houses located within the surrounds of the wind farm site, would seem to confirm that in a worst case scenario the maximum predicted noise output from the proposed development (when acting in isolation) at a wind speed of 8m/s would not breach the adopted noise limit of 43dB(A).

1.2.16 In relation to compliance with those instances when a lower noise limit of 37.5dB(A) is to be applied in respect of 'low noise environments', upon questioning during the oral hearing, it was clarified that whilst noise prediction modelling had not been expressly conducted for such circumstances, the sound power level from the candidate wind turbines would not be at its maximum and thus each turbine would be producing less noise. Reference was subsequently made to the 'Standard Acoustic Emissions' for the Siemens SWT-3.0-101 candidate turbine (with the technical data for same produced at the oral hearing) which indicated that at wind speeds of less than 8m/s (when the sound power of the turbine is warranted to be at its maximum) the sound power level would gradually reduce as wind speed lowered. It was further submitted that the overall scheme had been designed in such a manner that at lower wind speeds (e.g. 4m/s) the maximum noise from any of the individual wind turbines would be less than the 37.5dB(A) limit and that whilst there may have been one instance at a particular wind speed and direction when an individual turbine may need to be

de-rated in order to comply with the noise limit this can be addressed through the pre-programming of the turbine in question in order to ensure that it automatically operates in 'low noise mode' (though with a loss of power output) with no need for direct operator intervention.

1.2.17 In terms of the cumulative noise impact of the proposed development when taken in conjunction with the other wind energy developments at Corvoderry (permitted) and Cluddaun (proposed), I would refer the Board to Table 7.17 of the EIS (as per the revisions submitted at the oral hearing) which details the output of the noise prediction modelling undertaken at the various representative properties. In this respect it is anticipated that the maximum predicted background noise level in a 'worst-case' scenario will be 42.8dBLA90 and will also occur at House No. H18 within the centre of the site. Accordingly, the noise prediction modelling for the 17 No. representative properties detailed in Table 7-17 (in addition to the modelling carried out for NSL No. H46 which is located on lands in the ownership of Coillte) within the surrounds of the wind farm site would seem to confirm that in a worst case scenario the maximum predicted noise output from the proposed development (when taken in conjunction with surrounding planned wind energy development) at a wind speed of 8m/s would not breach the adopted noise limit of 43dB(A). However, it is less clear as to whether or not the cumulative noise impact of the proposal when taken in conjunction with the Corvoderry and Cluddaun planned developments will continue to adhere to the lower 37.5dB(A) threshold imposed in respect of those low noise environments previously identified to the east of the application site i.e. NSL Nos. H36-45 (and H46 to the northeast), although it seems likely that this matter could be addressed by the de-rating of specific turbines in the event that the other planned developments were to proceed.

1.2.18 At this point of my assessment I would advise the Board that during the course of the oral hearing various concerns were raised as regards the wider accuracy of noise prediction modelling with considerable discussion as to whether or not the results of subsequent monitoring of noise levels at any existing wind farm could be shown to support the veracity of the original noise prediction modelling undertaken during the planning / pre-consent phase of that particular development. Some of the observers questioned the accuracy of noise prediction modelling when compared to the reality 'on the ground' once a wind energy development became operational and reference was made to a publication entitled *'Wind Turbine Noise'* (ISBN978-1-90132-30-8) (edited by Mr. R. Bowdler and G. Leventhall and published by Multi-Science Publishing Ltd.) which purportedly lends weight to the observer's submission that current

methodology for modelling the predicted noise impact of wind turbines suffers from certain shortcomings. In response, the applicant has emphasised the conservative approach taken in the noise modelling and has asserted that the methodology used complies with the relevant international standard (ISO9613) for the calculation of noise levels. By way of a further submission the applicant also told the hearing that the current *'Wind Energy Development, Guidelines for Planning Authorities, 2006'* do not contain any specific guidance on the methodology to be employed for noise prediction modelling and that whilst Appendix 1 of the proposed revisions to the guidelines published by the Department of the Environment, Community and Local Government in 2013 (in reference to the targeted review in relation to noise, proximity and shadow flicker) is anticipated to detail 'Best Practice in regard to Noise Assessment' no details of same have been made available to date. Accordingly, the case is put forward by the applicant that the noise prediction modelling as submitted accords with best practice.

1.2.19 Having considered the submitted information, in my opinion, it must be borne in mind that the use of noise prediction modelling is essentially a tool for providing a reasoned estimate of the likely noise impact associated with a particular development. It should not be construed as definitive given the amount of variables involved 'on the ground' and in this respect it is typically based on a conservative or 'worst' case' approach. Whilst I would acknowledge the submissions from all of the concerned parties with regard to the methodology for noise prediction modelling, I would suggest that further clarity as regards best practice can be found in *'A Good Practice Guide to the Application of ETSU-R-97 for the Assessment and Rating of Wind Turbine Noise'* as published by the Institute of Acoustics in 2013. Chapter 4 of this document refers to 'Noise Predictions' and Paragraph 4.1.2 of same notes that the general study of outdoor noise propagation has received extensive attention in the past with additional research having been undertaken specifically on the subject of wind turbine noise propagation in recent years and since the publication of ETSU-R-97 (Notably, the publication *'Wind Turbine Noise'* referenced by the observers is included as a reference source in this document). Paragraph 4.1.3 proceeds to acknowledge that wind turbines are elevated large sources and that calculations are often required at distances of 1 km or more which may fall outside of the stated scope of well-recognised standards such as ISO 9613-2. However, Paragraph 4.1.4 of this Good Practice Guide subsequently states the following:

> *'The outcome of this research has demonstrated that the ISO 9613-2 standard in particular, which is widely used in the UK, can be applied to*

obtain realistic predictions of noise from on-shore wind turbines during worst case propagation conditions (i.e. sound speed gradients due to downwind conditions or temperature inversions), but only provided that the appropriate choice of input parameters and correction factors are made. In particular, the use of "soft-ground" factor should be avoided, and the full theoretical effects of terrain screening will usually not be achieved'.

1.2.20 Therefore, whilst there are limitations with regard to noise prediction modelling, it would seem that accepted best practice involves the use of the ISO 9613-2 standard as has been adopted by the applicant. At this point I would refer the Board to Appendix A of the report by the Hayes McKenzie Partnership Ltd. which is appended to the Noise Monitoring Report contained in Appendix 7 of the EIS as this document specifically sets out the noise prediction methodology used in the modelling undertaken for the subject proposal. From a review of the various input parameters used in the modelling as set out in the aforementioned report it would seem to accord with the recommendations of the 'Good Practice Guide'. For example, a ground factor of G=0.5 was utilised, a receiver height of 4.0m was adopted, and atmospheric conditions of 10^{o}C and 70% humidity assumed, in order to represent a reasonably low level of air absorption. Therefore, in the absence of any evidence to the contrary it would appear that the noise prediction modelling undertaken by the applicant in this instance accords with accepted best practice.

1.2.21 On the basis of the foregoing, it would seem that the applicant has undertaken sufficient monitoring at representative locations in the vicinity of the site to establish the prevailing background noise environment thereby allowing the determination of appropriate noise limit values at said locations pursuant to the recommendations of the 'Wind Energy Development, Guidelines for Planning Authorities, 2006'. Furthermore, the results of the noise prediction modelling undertaken for the proposed Oweninny development, both in isolation and when taken in conjunction with the Corvoderry and Cluddaun wind farms, suggest that the contributing noise levels generated by the proposal will not exceed the relevant noise limits imposed pursuant to the aforementioned guidelines. It is further emphasised that the noise modelling / predictions represent a 'worst case scenario' in that it assumes the noise locations are downwind of all turbines at all times, which will not be the case in practice. Therefore, on the basis of the submitted information, and noting the separation distances between the proposed turbines and nearby occupied NSLs (in excess of 1,000m in all cases), it would appear that in all instances the predicted noise levels during the operational phase of the development will be below the recommended fixed

noise levels of 43d(B)A (and 37.5dB(A) in the case of low noise environments) and, therefore, should not give rise to any significant impact on the amenities of nearby Noise Sensitive Receptors / dwelling houses. However, it is nevertheless considered appropriate to include suitable conditions in any grant of permission which specify the applicable noise limits and which also require the applicant / developer to undertake a programme of post-construction noise monitoring with the provision that in instances where noise levels are shown to exceed the limit, mitigation will be provided to address same such as through the de-rating of turbines or the programming of some turbines to have a higher cut-in wind speed and / or reduced output at lower wind speeds to reduce potential noise levels.

1.3 Infrasound & Low Frequency Sound:

1.3.1 With regard to the issue of infrasound and low frequency sound generated by wind turbines, the alleged effects of same on human health were discussed at length during the course of the oral hearing with various reference sources being provided by each of the concerned parties to support their particular position or argument. At the outset, it is perhaps of relevance to note that the current *'Wind Energy Development, Guidelines for Planning Authorities'* published by the Department of the Environment, Heritage and Local Government in 2006 contain no reference to either infrasound or low-frequency sound or any alleged health impacts associated with same and in this respect it could be assumed that national guidance deems the aforementioned phenomena to be a 'non-issue' in the context of assessing the noise implications associated with wind energy developments. Nevertheless, given the concerns raised at the oral hearing I propose to consider the issue of infrasound and low frequency sound in the context of relevant national guidance and accepted best practice.

1.3.2 Section 7.4.1 of the EIS acknowledges that some debate has arisen in literature (largely fuelled by publications on the internet) as to the potential impacts of low frequency sound which can be defined as noise in the frequency range of 16Hz to 125Hz (or 20Hz to 200Hz depending on the definition). It also notes that noise at frequencies below 20Hz is generally referred to as infrasound and is regarded as inaudible. It is then conceded that there is a growing concern amongst some members of the public that new larger wind turbines may have a greater impact on the environment as a result of significantly increased levels of low frequency noise than that experienced from earlier generation smaller scale wind turbines. By way of an examination of the available evidence the EIS subsequently refers to a study on low frequency noise conducted in 2010 by DELTA Acoustics and Electronics on behalf of the Danish Energy Authority which compared the sound power outputs from small (2.0MW or under) with those of

large (greater than 2.0MW) wind turbines and purportedly concluded that emitted low frequency sound power levels increased with wind turbine size and that low frequency noise emissions increased slightly more with wind turbine size than the 'A'-weighted total sound power level. No further comment of note is provided in the EIS as regards either infrasound or low-frequency sound other than a statement that *'Noise which is inaudible has not been shown to have any health impact in any peer reviewed health effects study'*.

1.3.3 At the oral hearing reference was made by the observers to an editorial by Mr. C. Hanning & Mr. Alun Evans titled *'Wind Turbine Noise'* which was published in the British Medical Journal in June, 2012 and which referred to studies that suggested that the infrasound and low frequency sound component of the aerodynamic noise generated by wind turbines could adversely affect human health by way of nausea, headaches, sleep deprivation etc. This was in response to the witness statement of Dr. Martin Hogan given on behalf of the applicant which referenced an Australian publication issued in December, 2013 and prepared by the University of Adelaide on behalf of the National Health and Medical Research Council titled a *'Systematic Review of the Human Health Effects of Wind Farms'*. The aforementioned document also considered the issue of infrasound and low-frequency noise as part of a wider review into the available evidence pertaining to the possible impact of wind turbines (such as by way of noise, shadow flicker and electromagnetic radiation) on human health. It found no consistent evidence that noise from wind turbines, whether estimated in models or using distance as a proxy, was associated with self-reported human health effects and ultimately concluded that the evidence considered did not support the conclusion that wind turbines have direct adverse effects on human health, as the criteria for causation have not been fulfilled, although it was acknowledged that indirect effects of wind farms on human health through sleep disturbance, reduced sleep quality, quality of life and perhaps annoyance were possible. There then followed an extensive discussion of the merits and reliability of the various studies and information sources with a particular emphasis placed on 'peer-reviewed' research.

(*N.B.* I would advise the Board that the aforementioned systematic review would seem to have formed the basis of the Consultation Draft '*Information Paper: Evidence on Wind Farms and Human Health'* issued by the Australian National Health and Medical Research Council in February, 2014 which states that there is no direct evidence that specifically considered possible health effects of infrasound or low-frequency noise from wind turbines and that noise from wind turbines, including its content of low-frequency noise and infrasound, is similar to

noise from many other natural and human-made sources. It proceeds to state that there is no evidence that health or health-related effects from wind turbine noise would be any different to those from other noise sources at similar levels and that there is no reliable or consistent evidence that wind farms directly cause adverse health effects in humans).

1.3.4 Having considered the submitted information, I am not in a position to undertake an extensive in-depth analysis of the wider debate as regards the alleged impact of wind turbines (with particular reference to noise) on human health nor do I consider it to be within the remit of the Board to undertake such an exercise. Instead, I would suggest that it is more appropriate to consider the issue of infrasound and low-frequency sound having regard to the applicable standards in an Irish context. In this respect I would again reiterate that these issues are not presently referenced in the 'Wind Energy Development, Guidelines for Planning Authorities, 2006', however, the Environmental Protection Agency's *'Guidance Note on Noise Assessment of Wind Turbine Operations at EPA Licensed Sites (NG3)'* published in 2011 does comment on same. Section 3.3.3 of this Guidance Note states that whilst the aerodynamic noise associated with wind turbines is broadband in nature and spread across the audible frequency range, there is a common misconception that there is a significant component of low frequency noise which is not the case. It subsequently states that as distance increases from a noise source, the noise spectrum becomes more biased towards the low frequencies as a result of the greater attenuation of middle to high frequencies by atmospheric effects, with reduced attenuation of low frequencies (which is considered to be true of any broadband noise such as road traffic or the sound of the sea) and, accordingly, this may be a significant characteristic for a large wind farm site when heard from a distance, although close to the turbines it would not be significant. With regard to high level sound at frequencies below 20Hz the guidance asserts that there is no significant infrasound arising from wind turbines before explaining that whilst this was *'a prominent feature of passive yaw 'downwind' turbines where the blades were positioned downwind of the tower which resulted in a characteristic 'thump' as each blade passed through the wake caused by the turbine tower. With modern active yaw turbines (i.e. the blades are upwind of the tower and the turbine is turned to face into the wind by a wind direction sensor on the nacelle activating a yaw motor) this is no longer a significant feature'* (*N.B.* Section 7.2.2 of the EIS confirms that the 3 No. candidate turbines selected for the noise prediction modelling were all of an 'upwind' variety). Notably, the EPA guidance makes no specific reference to either infrasound or low frequency sound as having an adverse impact on human health.

1.3.5 In addition to the foregoing, I would draw the Board's attention to the *'Proposed Revisions to the Wind Energy Development, Guidelines for Planning Authorities: Targeted Review in relation to Noise, Proximity and Shadow Flicker'* published by the Department of the Environment, Community and Local Government in December, 2013 and, in particular, to the introduction to same which expressly states that *'Concerns of possible health impacts in respect of wind energy infrastructure are not matters which fall within the remit of these guidelines as they are more appropriately dealt with by health professionals'*. This would seem to suggest that matters pertaining to the alleged impact of wind turbines on human health are outside of the remit of the planning system. However, I note that it is envisaged that Appendix 1 (which is yet to be made available) of these revisions will contain a best practice guide to the assessment and modelling of wind turbine noise that will include consideration of special audible characteristics which can be associated with both aerodynamic and mechanical wind turbine noise such as amplitude modulation, low frequency noise and infrasound. Regrettably, no further information is available at this time with regard to this aspect of the proposed revisions although it would appear to be intended to address the methodology for the assessment of infrasound etc. as opposed to drawing any conclusions as regards its alleged impact on human health.

1.3.6 Finally, I refer to the *'Examination of the Significance of Noise in relation to Onshore Wind Farms, (November, 2013)'* prepared by Marshall Day Acoustics and commissioned by the Sustainable Energy Authority of Ireland which has informed the current targeted review of the 'Wind Energy Development, Guidelines for Planning Authorities'. Whilst the alleged health impacts of noise, including sleep disturbance and the direct physiological effects of noise, are outside the scope of this study and thus are not considered directly, Section 3.4 of the report does provide a general synopsis of recent investigations into the areas of infrasound and low-frequency sound with reference made to opposing sides of the argument in terms of their alleged impact on human health. For example, with respect to infrasonic noise levels below the hearing threshold, it notes that the World Health Organization has stated that *'There is no reliable evidence that infrasounds below the hearing threshold produce physiological or psychological effects'* whilst a public statement issued in 2010 titled *'Wind Turbines and Health'* issued by the Australian Government's National Health and Medical Research Council supported the view that there was no published scientific evidence to positively link wind turbines with direct health impacts. However, the Marshall Day Acoustics report also notes that a cooperative study

into infrasound and low frequency noise at a wind farm in Wisconsin, USA, by four acoustic consulting firms considered that there was enough evidence and hypotheses to classify low frequency noise and infrasound as a serious issue, possibly affecting the future of the industry. In essence, it is apparent that infrasound remains a comparatively high profile issue in some jurisdictions and is the subject of on-going research.

1.3.7 Whilst I would acknowledge the concerns raised by the various third party observers with regard to the alleged impact of wind turbine noise, with particular reference to infrasound and low-frequency noise, on human health, the current national planning guidelines with regard to wind energy development do not specifically address the matter whilst the recently published targeted review of same expressly states that such any impacts are beyond the remit of the guidelines. Accordingly, it is my opinion that the Board is restricted to considering the subject proposal in the context of the applicable current guidance and in this respect the submitted information serves to clarify that the development as proposed complies with the applicable noise limit values and thus will not give rise to any overt loss of amenity. The wider debate as regards the alleged health impact of infrasound etc. arising from wind turbines is not a matter for the Board and I do not propose to comment further on same.

1.4 The 'Proposed Revisions to the Wind Energy Development Guidelines: Targeted Review in relation to Noise, Proximity and Shadow Flicker', December, 2013:

1.4.1 The Department of the Environment, Community and Local Government is currently undertaking a targeted review of the *'Wind Energy Development, Guidelines for Planning Authorities, 2006'* in relation to noise, proximity and shadow flicker with a view to updating the relevant sections of the existing guidelines and in this respect it should be noted that a consultation draft of the proposed revisions was published on 11th December, 2013 and that written submissions on same were invited up until 21st February, 2014. At the time of writing, these 'proposed revisions' remain at draft stage only and have not been finalised nor have they been incorporated into the existing guidelines.

1.4.2 During the course of the oral hearing, it was suggested by a number of observers that the subject proposal should be considered to be premature pending the adoption of the aforementioned revisions, although such a proposition was rejected by the applicant primarily on the basis that the revisions as proposed were essentially unworkable.

1.4.3 In summary, the proposed revisions seek to introduce a fixed outdoor noise limit of 40dB(A) which should not be exceeded at noise sensitive properties at any wind speed within the operational range of any turbine during both the day and night-time. Furthermore, this limit is to apply to the combined sound of all turbines in the area, irrespective of which wind farm development they may be associated with. Therefore, the proposed revision represents a considerable change from the current 2006 guidelines which typically permit a lower fixed limit of 45dB(A) or a maximum increase of 5dB(A) above background noise at nearby noise sensitive locations and thus imposes a noticeably more onerous requirement on prospective wind energy developments (*N.B.* I note that the introduction of some form of 40dB(A) noise limit would seem to revert to the *'Wind Farm Development, Guidelines for Planning Authority'* issued by the Department of the Environment in 1996). Notably, from a review of the applicants noise prediction modelling it is apparent that compliance with a fixed noise limit of 40dB(A) will prove to be problematic whilst in several instances the background noise conditions at some of the representative noise sensitive locations already exceed this level.

1.4.4 Having considered the matter, in my opinion, it is entirely appropriate to assess the subject proposal having regard to the current *'Wind Energy Development, Guidelines for Planning Authorities, 2006'* issued pursuant to Section 28 of the Planning and Development Act, 2000, as amended. Whilst I would acknowledge that the existing guidelines may be subject to revision at some date in the future I do not propose to engage in speculation as regards the contents of any final drafting of same. Furthermore, it is my understanding that only after consideration of the submissions made during the period of public consultation will any revisions to the Guidelines be finalised and issued to planning authorities under Section 28 of the Act. Indeed, I would suggest that any implementation of the proposed revisions in their current form would simply serve to undermine the purpose of the consultative process.

2.0 Shadow Flicker:

2.1 The effect known as shadow flicker occurs when the blades of a wind turbine cast a shadow over a window in a nearby house and the rotation of the blades causes the shadow to flick on and off. This effect lasts only for a short period and happens only during a specific set of combined circumstances such as when the sun is shining at a low angle, the turbine is positioned directly between the sun and the affected property, and there is enough wind energy to ensure that the turbine blades are rotating.

2.2 Section 5.12 of the *'Wind Energy Development, Guidelines for Planning Authorities'* states that shadow flicker at neighbouring dwellings within 500m of proposed turbines should not exceed 30 hours per year or 30 minutes per day and that at distances greater than 10 No. rotor diameters from a turbine the potential for shadow flicker is very low. In this respect I would refer the Board to Chapter 8 of the EIS which details how computer modelling (WINDPro) was utilised to predict the occurrence of shadow flicker at a total of 46 No. identified receptors in the vicinity of the site. These calculations were based on a notional window measuring 2m x 1m which faced directly towards any turbine within a distance of 10 No. rotor diameters with the bottom edge of the window assumed to be 4m above ground level (i.e. approximately equivalent to the height of an upstairs window in a two-storey dwelling house). In addition, it was assumed that the windows in question would be orientated in such a manner that they could potentially be affected and that there were no intervening features such as vegetation between the turbines and the receptor. Accordingly, the submitted shadow flicker analysis should provide for a robust assessment of the likely impact given that many of the identified receptors are only of a single storey construction whereas properties with upstairs windows would be more likely to be exposed to a view of wind turbines and less likely to be screened by vegetation.

2.3 In order to provide for a comprehensive analysis of the extent of shadow flicker consequent on the proposed development, and pending the selection of a final turbine type, the submitted impact assessment has considered two scenarios both of which have assumed a maximum tip height of 176m as follows:

a) A hub height of 120m with a maximum rotor diameter of 112m
b) A hub height of 116m with a maximum rotor diameter of 120m

2.4 The results for each of these scenarios are set out in Tables 8.1 and 8.2 respectively in the EIS and include the *'Worst Case Shadow Hours per Year'*, the *'Worst Case Shadow Hours per Day'* and the *'Expected Shadow Hours per Year'*, however, it should be noted that the 'worst-case' results represent a theoretical maximum wherein it has been assumed that the sun will be shining all year round, the wind is always blowing and the turbines rotating, and that the windows in the receptors face directly towards each and every wind turbine. Accordingly, it has been submitted that in order to provide for a more accurate representation of the likely impact of shadow flicker on identified receptors in the vicinity of the application site it is necessary to make an allowance for instances when the prevailing meteorological conditions would not result in the occurrence of shadow flicker by taking cognisance of historical sunshine hours in addition to

wind speed and directional data as recorded on site. In this respect I would refer the Board to Section 8.3.1 of the EIS which outlines those factors which have been taken into consideration in determining the actual / expected shadow flicker hours per year (as opposed to potential shadow flicker). In the first instance it is stated that it would be highly unusual for the plane of a turbine rotor to continually track the sun and that it is far more likely, for the majority of the time, that the rotor plane would not face the sun and thus there would be a corresponding decrease in the potential for shadow flicker during these periods. Accordingly, the likely orientation of the rotor plane of each turbine has apparently been factored into the calculation of the 'expected' results on the basis of measurements taken on site, although the precise basis for same is not entirely clear (*N.B.* Reference has also been made to an alternative assumption of a random rotor position leading to a reduction of approximately 63% of the theoretical results). With regard to actual sunshine hours, it has been submitted that the long-term mean value is typically less than 30% of daylight hours and thus consideration has been given to records available from the nearest meteorological station at Belmullet which indicate that the average daily sunshine hours range between 0.9 hours in December and 5.79 hours in May. Finally, account has been taken of the prevailing wind regime at the subject site through reference to records yielded by the existing meteorological mast on site.

2.5 In relation to the calculation of the number of shadow hours per day at a given receptor, it is of relevance to note that unlike the prediction of the number of shadow hours per year, the 'worst-case' results derived from the computer modelling have not been subjected to any reduction in order to estimate an actual or 'expected' number of shadow flicker hours per day. This is because whilst it would be possible to reduce the annual sunshine hours based on average data collected at meteorological stations or to utilise a mean value, it would nevertheless remain theoretically possible to receive the majority of the sunshine hours on a given day.

2.6 Accordingly, from a review of Table 8.1 (i.e. Option 'A' whereby the constructed turbines would have a hub height of 120m and a maximum rotor diameter of 112m) it is evident from the calculations that a total of 12 No. receptors will be subjected to some degree of shadow flicker, although only three of these properties (House Nos. H16, H18 & H19) will experience in excess of 30 shadow hours per year in a 'worst case' scenario whilst the 'expected' number of shadow hours per year (when adjusted to take account of likely meteorological conditions) will all be below the recommended guideline limit of 30 hours. In addition, it has been calculated that the recommended daily limit of 30 minutes of

shadow flicker per day will potentially be exceeded in a worst case scenario at a single property (i.e. House No. H19) on up to 33 days in any given year, although it has been noted that these days are all between 27th January – 12th February and 30th October – 14th November during times of the year at which the sun is statistically less likely to be shining.

2.7 With regard to Table 8.2 (i.e. Option 'B' whereby the constructed turbines would have a hub height of 116m and a maximum rotor diameter of 120m) it has been calculated that 14 No. receptors will experience some degree of shadow flicker with five of these properties (House Nos. H16, H17, H18, H19 & H20) receiving in excess of 30 shadow hours per year in a 'worst case' scenario, although in no instance will the 'expected' number of shadow hours per year (as adjusted) exceed the recommended limit of 30 hours. In terms of the 'worst-case' shadow flicker predictions per day at the various receptors it has been calculated that 2 No. properties (i.e. House Nos. H17 & H19) will experience levels which will either equal or exceed the guideline limit of 30 minutes per day, however, the theoretical maximum of 30 minutes shadow flicker at House No. H17 will only occur on a single day (12th September) and does not actually amount to an exceedance of the guideline limit whereas at House No. 19 there will be in excess of 30 minutes of shadow flicker in a worst case scenario on up to 36 days of the year between 26th January - 12th February and 30th October - 16th November (i.e. when the sun is statistically less likely to be shining).

2.8 Therefore, on the basis of the foregoing, it would seem that the total number of shadow hours 'expected' to be experienced at each of the identified receptors per year will not exceed the recommended limit of 30 hours as set out in the *'Wind Energy Development, Guidelines for Planning Authorities'*, although it has also been calculated that the 'worst-case' shadow flicker predictions per day at House No. H19 will be in excess of the recommended limit of 30 minutes.

2.9 At this point of my assessment I propose to consider the difference between 'expected' and 'worst-case' shadow hours per year as is not entirely clear from current guidance whether the recommended limits relate to the outputs directly arising from the modelling process (i.e. potential 'worst-case' shadow flicker) or whether they are intended to apply to the 'expected' predictions when adjusted to take account of the prevailing meteorological conditions. This is of relevance as there are potentially 5 No. receptors (House Nos. H16, H17, H18, H19 & H20) located alongside Local Road No. L52925 which could receive in excess of 30 shadow hours per year in a 'worst case' scenario whereas in no instance will the

'expected' number of shadow hours per year (as adjusted) exceed the recommended limit.

2.10 The shadow flicker limits as set out in the current 'Wind Energy Development, Guidelines for Planning Authorities' have been derived from the document *'Spatial Planning of Wind Turbines, Guidelines & Comparison of European Experiences'* (2004) prepared by Predac, a European Union sponsored organisation promoting best practice in energy use and supply which draws on experience from Belgium, Denmark, France, the Netherlands and Germany, which recommends that at neighbouring dwellings and offices flickering shadows should not exceed 30 hours per year or 30 minutes per day with normal variation in wind directions and a clear sky. This is reiterated in the *'Update of UK Shadow Flicker Evidence Base, Final Report, 2011'* prepared by Parsons Brinckerhoff for the UK Department of Energy and Climate Change which confirms that the Predac report recommends that shadow flicker should not exceed an astronomic worst case figure of 30 hours per year or 30 minutes per day at neighbouring offices and dwellings. Therefore, whilst I would acknowledge that there is perhaps a need to address both 'worst-case' and realistic shadow flicker in assessments, it would seem that contrary to accepted practice in some quarters, the limits recommended in current national guidance are intended to apply to the 'worst case' scenario in the absence of any adjustment or reduction for climatic factors. Accordingly, without mitigation it is apparent that the predicted number of shadow hours per year will exceed the maximum permissible at a total of 5 No. receptors.

2.11 In relation to the 'worst-case' shadow flicker predictions per day at House Nos. H17 & H19, which will either equal or exceed the acceptable limit, whilst I would acknowledge that these results represent a theoretical maximum and do not take account of a variety of considerations including the possible non-occupation of affected rooms, the use of blinds in windows, or the presence of intervening features such as vegetation, in my opinion, a reliance on the use of such factors, several of which would be outside of the applicants control, is not conducive to a robust form of mitigation against the impacts of shadow flicker.

2.12 Therefore, having established that the levels of shadow casting at 5 No. identified receptors will exceed the recommended limits, it is necessary to review the options for the elimination or mitigation of said impacts. In this respect, I would suggest in the first instance that it would be preferable to consider mitigation by avoidance through the omission of those turbines which contribute to the excessive levels of shadow flicker. Accordingly, from a review of the

results of the computer modelling it is apparent that Turbine Nos. 45, 51, 66, 67, 68, 78, 79, 82, 87, 91, 92, 101 & 111 will contribute in some respect to the wider levels of shadow flicker arising consequent on the proposed development (as calculated for the two different turbine types outlined in scenarios 'A' and 'B'), however, it should be acknowledged that not all of these turbines will result in a level of shadow flicker which will exceed the limits set out in the Guidelines. Notably, the applicant has not chosen to suggest the omission of any of these turbines as a means of mitigation presumably on the basis that the 'expected' number of shadow hours per year (when adjusted for climatic factors) is less than the limit of 30 hours. Similarly, with regard to those instances when the 'Worst Case Shadow Hours per Day' will exceed the daily limit of 30 minutes at House No. H19, it appears that the applicant is satisfied that since these will occur at times when the sun is statistically less likely to be shining, and in light of other considerations including the separation distances involved, the possible non-occupation of the affected rooms and the potential presence of intervening features etc., the omission of the relevant turbines is not warranted. Whilst I would acknowledge that the instances of excessive shadow flicker are limited (i.e. a total of 5 No. properties), in my opinion, it would have been preferable if the applicant had sought to address these concerns by repositioning the offending turbines so as to reduce their impact, or alternatively, by omitting the turbines in their entirety. Nevertheless, I am amenable to the suggestion set out in Section 8.5 of the EIS that potential instances of excessive shadow flicker could be satisfactorily mitigated by pre-programming selected turbines to prevent their operation on the dates and times when shadow flicker could cause a nuisance. However, I note that the aforementioned proposal to programme certain turbines to shut-down at specified times appears to be conditional on the production of validated records indicating a significant shadow flicker impact, although no details have been provided as who will be responsible for the production and subsequent validation of these records (i.e. the affected property owner / third party, the wind farm operator or the Planning Authority).

2.13 During the course of the oral hearing it was subsequently clarified in the evidence of Mr. David Murphy that a shadow detection and control system will be installed on all those wind turbines within 10 No. rotor diameters of any existing dwelling which has the potential to experience shadow flicker and that this system will be implemented as required during the operational phase of the development. Furthermore, a commitment was given that if it was determined that the annual guidance limits could have been reached at a residence at any point during the lifetime of the wind farm, the developer would take immediate steps to shut down the relevant turbines at further times when shadow flicker

could potentially occur in the relevant 12 month period (*N.B*. This would seem to amount to some form of on-going monitoring, although the responsibility for the production of validated records of instances of shadow flicker remain somewhat unclear).

2.14 Accordingly, I would suggest that in order to ensure that any instances of shadow flicker are within the recommended limits set by Department Guidelines thereby preserving the residential amenity of surrounding properties, a condition should be imposed in any decision to grant permission whereby cumulative shadow flicker arising from the proposed development should not exceed 30 minutes in any day or 30 hours in any year at any dwelling whilst all the relevant turbines (i.e. Turbine Nos. 45, 51, 66, 67, 68, 78, 79, 82, 87, 91, 92, 101 & 111 as derived from the computer modelling) should be fitted with appropriate equipment and software to control shadow flicker at nearby receptors. In addition, provision should be included for the implementation of a wind farm shadow flicker monitoring programme, the details of which, including the proposed monitoring equipment, the methodology to be used and a reporting schedule, should be agreed with the Planning Authority.

2.15 In terms of the potential cumulative impact of the proposed development when taken in conjunction with the two other wind farms planned in the area at Corvoderry (10 No. turbines as approved under PA Ref. No. 11/838) and Cluddaun (a proposal for 48 No. turbines presently under consideration by the Board pursuant to ABP Ref. No. PA0031), it would seem that due to the positioning of these turbines relative to the subject proposal and the separation distances involved, the cumulative shadow flicker analysis undertaken by the applicant yielded virtually identical results to those obtained for the Oweninny Wind Farm when considered in isolation. Therefore, the proposed development when considered in conjunction with the developments planned at both Corvoderry and Cluddaun will not give rise to any notable cumulative impact in terms of the levels of shadow flicker experienced at nearby receptors.

2.16 At this point I would advise the Board that at the time of writing the Department of the Environment, Community and Local Government has published *'Proposed Revisions to Wind Energy Development Guidelines, 2006 – Targeted Review in relation to Noise, Proximity and Shadow Flicker'* (with the consultation period on same having closed on 21st February, 2014) and that these seek to impose a significantly more onerous standard with regard to the control of shadow flicker than the present guidelines given that they require no shadow flicker at any existing dwelling or other affected property within 10 No.

rotor diameters of any wind turbine. In this respect it should be noted that the revisions seek the cessation of the use of maximum limits for shadow hours and place a greater emphasis on the need to review the site design in the first instance which may involve the relocation of turbines to explore the possibility of eliminating or substantially reducing the occurrence of shadow flicker. Following such a review, if shadow flicker is not eliminated for any dwelling or other potentially affected property, the proposed revisions state that the measures which provide for the turbine to be shut down to eliminate shadow flicker are to be clearly specified.

2.17 Whilst the subject proposal will adhere to the current requirements of the 'Wind Energy Development, Guidelines for Planning Authorities' as regards the control of shadow flicker provided that appropriate mitigation and monitoring measures are put in place (in the event of a grant of permission), I would advise the Board that it would be prudent to review the status of the proposed revisions to this guidance prior to any decision being made on the application in order to allow any changes to same to be given due consideration as part of the assessment process.

2.18 Finally, during the course of the oral hearing, various concerns were raised by a number of observers as regards the potential impact of shadow flicker on those members of the public who would be sensitive to changes in light and, in particular, sufferers of photosensitive epilepsy, in addition to those incidences of 'shadow flicker' occurring outdoors (as opposed to within an internal space) with specific reference being made to the example of repeating shadows being cast against an external wall. With regard to the latter, I would advise the Board that the 'Update of UK Shadow Flicker Evidence Base, Final Report, 2011' prepared by Parsons Brinckerhoff for the UK Department of Energy and Climate Change refers to various UK guidance documents, namely, England's Companion Guide to PPS22 (2004), Northern Ireland's Best Practice Guidance to PPS18 (2009) and Scotland's PAN45 (2002), which all state categorically that shadow flicker impacts are limited to the interior of buildings. In an Irish context it is my understanding that the term 'shadow flicker' when used in reference to the development of wind energy has consistently been interpreted as referring solely to the flickering effect of shadows cast by the rotation of the blades of a wind turbine on people inside buildings exposed to light from a narrow window source. Indeed, this has been the approach employed by various planning authorities, including the Board, in the assessment of applications for similar forms of development. Therefore, whilst I would acknowledge that in an international context other jurisdictions have suggested that shadow flicker assessments may

need to be extended to include outdoor locations, in the interests of consistency, I am inclined to conclude that for the purposes of assessing the subject application, the effect known as 'shadow flicker' should be construed as referring solely to the interior of a dwelling house / building in line with current national guidance.

2.19 In relation to the concerns raised as regards the potential health impact of shadow flicker on those members of the public who are sensitive to changes in light, including sufferers of photosensitive epilepsy, I would further reiterate that I am not in a position to undertake an extensive analysis of the wider debate as regards the alleged impact of wind turbines on human health nor do I consider it to be a function of the Board to engage in such an exercise. Whilst I would acknowledge the concerns raised by observers in this regard, it is of relevance to note that the current national planning guidelines with regard to wind energy development do not specifically address such matters whilst the recently published targeted review of same expressly states that such any impacts are beyond the remit of the guidelines. Accordingly, I do not propose to comment further on the matter.

3.0 Traffic:

3.1 The Principle of the Proposed Access Arrangements:

3.1.1 The proposed development site will be accessed directly from the N59 (Ballina – Belmullet) National Secondary Road via a series of 3 No. existing entrances which presently serve the Bellacorick Wind Farm (Entrance No. 1), the Bord na Mona lands which comprise the western part of the application site (Entrance No. 2) and an existing Bord na Mona workshop / maintenance facility (Entrance No. 3). Therefore, it is necessary to assess whether or not the subject proposal is acceptable in terms of traffic safety and whether it accords with accepted policy as regards development management along the national road network.

3.1.2 In the first instance, and from a policy perspective, I would draw the Board's attention to the *'Spatial Planning and National Roads, Guidelines for Planning Authorities'* published by the Department of the Environment, Community and Local Government in 2012 which replaced the *'Policy and Planning Framework for Roads'* issued by the Department of the Environment in 1985 and the NRA's *'Policy Statement on Development Management and Access to National Roads'* published in May, 2006. In particular, I refer to the plan-led approach advocated by the Guidelines with specific reference to the stated requirement for all Development Plans to include policies which seek to maintain and protect the

safety, capacity and efficiency of national roads and associated junctions, avoiding the creation of new accesses and the intensification of existing accesses to national roads where a speed limit greater than 50kph applies. In this respect it is of particular relevance to note that whilst a planning authority may identify stretches of national roads where a less restrictive approach may be applied (i.e. in the case of developments of national and regional strategic importance or along lightly-trafficked sections of National Secondary Routes), this can only be done as part of the process of reviewing or varying the relevant development plan and having consulted and taken on board the advice of the NRA. Accordingly, it would appear that the current guidelines exclude any application of the foregoing exceptions on a case-by-case basis during the development management process. Therefore, in the context of the subject application, the case could be put forward that the intensification of use of the existing entrances onto the national road which would arise during the construction stage of the proposed development would be contrary to the stated provisions of the *'Spatial Planning and National Roads, Guidelines for Planning Authorities'*, however, I am inclined to suggest that in this instance consideration must be given to the wider planning history of the application site with specific reference to the grant of permission issued in respect of ABP Ref. No. PL16.131260 and the subsequent implementation of same.

3.1.3 At this point I would reiterate to the Board that a total of 180 No. wind turbines have already been approved on site pursuant to ABP Ref. No. PL16.131260 and that the construction of same is reliant on the use of the existing Bellacorick Wind Farm entrance onto the N59 (i.e. Proposed Entrance No. 1) in order to serve the eastern part of the site and the existing entrance c.1.4km west of the junction of the Srahnakilly Road onto the N59 (i.e. Proposed Entrance No. 2) in order to serve the western part of the site. Furthermore, it would appear that the existing entrance serving the Bord na Mona workshop was also to be retained as part of that proposal although it would not be used for construction purposes.

3.1.4 In my opinion, it is entirely reasonable in the assessment of the subject proposal to have regard to the development previously approved on site under ABP Ref. No. PL16.131260 for comparison purposes, particularly as that grant of permission has been implemented and as construction works are presently underway. In this respect it is apparent from a review of ABP Ref. No. PL16.131260 that the subject proposal will effectively involve the retention or utilisation of the same (existing) entrances as the approved development and thus will not necessitate the opening of any new access points onto the N59

National Road. Furthermore, I would suggest that the relative volume of construction materials to be utilised in both the approved and proposed developments is generally comparable despite the differences in the scale of development and construction timetables. For example, in Section 3.6.1 of the witness statement of Mr. Paul Moran & Mr. Julian Keenan as presented on behalf of the applicant to the oral hearing it is stated that the proposed development will necessitate the delivery of some 1,120 No. turbine components over the course of a 7-year construction program whereas by comparison the permitted scheme is estimated to require some 1,080 No. turbine components over an estimated 5-year construction program. Similarly, I note from the Inspector's Report prepared in respect of ABP Ref. No. PL16.131260 that 420,000m^3 of crushed stone was to be imported to the site for the construction of turbine foundations and site access roads (albeit for a total of 210 No. turbines as was initially proposed) whereas the subject development will purportedly only require the importation of approximately 396,870m^3 of fill material (as derived from Table 2-7: *'Estimates of Material Quantities'* of the EIS) as a result of the proposal to win c. 340,000m^3 of material from an on-site borrow pit for use in the construction of the site access roads (Section 2.5.15 of the EIS). Whilst I would accept that there are more notable differences between the permitted and proposed developments as regards the respective volumes / weights of concrete and reinforcing steel / rebar to be imported to the site, on balance, I would suggest that the overall volume of construction materials to be imported to the site in both instances is generally comparable and thus will give rise to similar levels of traffic movements along the national road during the construction phase (*N.B.* The witness statement of Mr. Moran & Mr. Keenan also concludes that, when an allowance is made for the difference in the forecast duration of construction, the proposed development has the potential to generate broadly similar daily HGV traffic volumes as the permitted 180 No. turbine development). I would also expect the levels of operational traffic accessing the proposed development (including patrons of the visitor centre) to be relatively comparable given the differing scales of development.

3.1.5 Having considered the foregoing, I am inclined to conclude that the traffic impacts of both the permitted and proposed developments on the national road network are comparatively similar and therefore it would seem somewhat unjust to refuse the proposed development on the basis that it does not strictly adhere to the provisions of the *'Spatial Planning and National Roads, Guidelines for Planning Authorities'* when a directly comparable development (which would seem to generate a similar volume of traffic and would also utilise the same general access arrangements) has already been approved on site with

construction having commenced. Furthermore, there would seem to be a case that the submitted proposal will represent an improvement in terms of traffic safety given that all 3 No. of the existing access points will be upgraded (as shown on Drg. Nos. QR320201-P-000-083, QR320201-P-000-084 and QR320201-P-000-085) in line with the Road Safety Audit which accompanied the application as part of the overall works unlike the development approved under ABP Ref. No. PL16.131260 which only involved the widening of the public road and the provision of deceleration lanes in the vicinity of the 2 No. proposed construction access points pursuant to Condition No. 10(c) of that grant of permission. In this respect it is also of relevance to note that the applicant is amenable to complying with the conditions suggested by the Planning Authority in its submission on file with regard to the compilation of a Road Safety Audit and the carrying out of specified road improvement works at the 3 No. existing site entrances (as per the *'Schedule of Proposed Conditions'* submitted by the applicant at the oral hearing). In addition, it should be noted that the subject application includes a proposal whereby one of the existing site entrances will be closed and used for emergency access purposes only thereby reducing the multiplicity of access points in regular use onto the national road in line with the Road Safety Strategy, 2013-2020 which aims to reduce the number of access points outside speed limit areas onto national roads.

3.1.6 By way of further consideration, it is worth noting that the proposed development would seem to adhere to the criteria specified in Section 2.6 of the *'Spatial Planning and National Roads, Guidelines for Planning Authorities'* with regard to the identification of stretches of national roads by planning authorities where a less restrictive approach may be applied as part of the process of reviewing or varying the relevant development plan following consultation with the NRA. In this respect I specifically refer to the provision whereby developments of national and regional strategic importance *'which by their nature are most appropriately located outside urban areas, and where the locations concerned have specific characteristics that make them particularly suitable for the developments proposed'* can be given dispensation from the stricter policy objectives of the Guidelines. Similarly, I would submit that the subject proposal also accords with *'the National Spatial Strategy, Regional Planning Guidelines and other Guidelines issued by the Minister for the Environment, Community and Local Government under the provisions of section 28 of the Planning Acts'* with particular reference to *the 'Wind Energy Development, Guidelines for Planning Authorities, 2006'.*

3.1.7 Whilst I would acknowledge the concerns of the National Roads Authority as expressed in its submission on file that the subject proposal will involve the intensification of a direct access onto a national road at a point where a speed limit of 100kph applies and that the Mayo County Development Plan, 2014-2020, does not include any provision pursuant to Section 2.6 of the *'Spatial Planning and National Roads, Guidelines for Planning Authorities'* whereby a less restrictive approach may be applied in respect of wind energy development accessing national roads subject to such a speed limit, on the basis that the traffic impact of the proposed development is comparable to that already permitted on site and in light of the mitigation measures proposed, including the road improvement works at the various site entrances, in addition to the wider strategic contribution of the proposal to the achievement of Ireland's international, European and national commitments as regards the reduction of greenhouse gas emissions and the provision of energy from renewable sources, it is my opinion that in this instance the development as proposed is acceptable in terms of its traffic impact on the national road network.

3.1.8 In relation to the submission by several of the observers at the oral hearing that the development works presently underway on the site constitute unauthorised development by reason of non-compliance with several of the conditions attached to the grant of permission issued in respect of ABP Ref. No. PL16.131260, I would advise the Board that this particular issue was discussed at length during the course of the hearing with the applicant responding to same by submitting correspondence from Mayo County Council dated 17th April, 2014 (i.e. during the hearing itself) which stated that the Planning Authority was satisfied that Condition Nos. 4, 5, 9, 10(a), 10(d), 13 & 15 had been compiled with to its satisfaction and that the developer was not required to comply with Condition Nos. 6, 10(b), 10(c) & 14 at this stage of the development for a variety of reasons. In response to further concerns which questioned the validity of the extension of duration issued by the Planning Authority in respect of ABP Ref. No. PL16.131260 pursuant to Section 42 of the Planning and Development Act, 2000, as amended, the applicant has rejected same and submitted that it is not within the remit of the Board to revisit matters which were within the sole jurisdiction of the Planning Authority.

3.1.9 With regard to the foregoing concerns and, in particular, to the implications of same as regards the status of those works already carried out on site and the ability of the applicant to avail of the grant of permission issued for ABP Ref. No. PL16.131260, it is my opinion that such matters are beyond the remit of the Board which has no function in terms of enforcement. Accordingly, I would

suggest that the Board would be within its rights to assess the subject proposal on the basis that there is a 'live' permission on site and that the Planning Authority has acted appropriately both in its enforcement of the applicable planning conditions and in its determination of the application for the extension of the duration of the relevant permission.

3.2 Traffic Impact Assessment:

3.2.1 The principle impacts in terms of traffic will arise during the construction of the proposed development and in this respect I would refer the Board to Chapter 14 of the EIS which provides an analysis of same as supplemented by the witness statement of Mr. P. Moran & Mr. J. Keenan.

3.2.2 In terms of forecasting the likely traffic flow characteristics associated with the construction of the proposed development the applicant has assumed a 'worst-case scenario' in order to provide for a robust assessment which has incorporated the following key assumptions as set out in Section 14.3.8.1 of the EIS:

- The importation of all aggregates (rock and gravel fill) from external quarry sources via the N59 with a conservative estimate of $10m^3$ per delivery vehicle (i.e. there will be no winning of aggregates from the proposed on-site borrow pit).
- The importation of all concrete material to the site via the N59 with a conservative estimate of $8m^3$ per delivery vehicle (i.e. the appraisal does not consider the proposal to utilise a batching plant on site).
- All traffic will access and egress the site from one direction only with no consideration given to the possible distribution of traffic to both the east and west.
- All construction activities will be carried out concurrently.
- Miscellaneous construction traffic is assumed to comprise 10% of the total vehicle movements.
- An overall contingency factor of 10% in order to account for the possibility of variability in ground conditions across the extensive area of the site.

3.2.3 With regard to the foregoing, it should be noted that the total trip generation rates arising from the importation of the various materials during the 3 No. phases of construction have been calculated on the basis of the estimated quantities of the materials required and the capacity of the vehicles used to transport same. Accordingly, I would refer the Board to Tables 14-7, 14-8 & 14-9 of the EIS which detail the total number of HGV traffic movements expected to

arise under 'worst-case' conditions during each phase of construction. However, whilst the trip generation figures set out in the aforementioned tables provide a comprehensive overview of the total traffic volumes associated with the overall construction of the proposed development, it is necessary to refine these figures further in order to gauge the likely traffic impact of the proposal in the event of a worst-case traffic scenario which could arise on a given day. In this respect I would draw the Board's attention to Section 14.4.2.7 of the EIS wherein the applicant has detailed that the worst case traffic scenario during construction of the proposed development could occur if the simultaneous construction of turbine piles, foundations, access tracks and crane stands were to be undertaken on the same day (*N.B.* I would concur with the applicant's assertion that abnormal loads would most likely be delivered outside of peak construction traffic times given the need to minimise nuisance and the requirement for an agreed Traffic Management Plan, however, some abnormal load movements have been included in the subsequent calculations in order to further factor worst-case conditions). Table 14-13 of the EIS proceeds to outline the maximum predicted vehicle movements per day and per hour for a series of three different construction scenarios as follows:

- Scenario 'A' (Column 3 of Table 14-13): Extreme Worst Case Capacity Appraisal Values
- Scenario 'B' (Column of 4 Table 14-13): Forecast Upper Value (No foundation concrete import)
- Scenario 'C' (Column 5 of Table 14-13): Forecast Lower Value (No concrete import)

3.2.4 In assessing the potential traffic impact of the proposed development the applicant has adopted Scenario 'A' as set out above which assumes that all site activities including concrete piling, concrete pours for foundations, the construction of access tracks, the provision of hard-standing areas, and the delivery of abnormal (turbine component) loads, will occur on the same day and will involve an estimated maximum of 738 No. vehicle movements per day at peak construction and thus be representative of an extreme worst-case scenario, although it has been suggested that this is unlikely to arise in reality for various reasons of practicality etc. At this point it is of relevance to reiterate that the trip generation rates forecast in the EIS are based on worst-case conditions in that they deliberately exclude any reduction in traffic which would result from the production of concrete on site at the proposed batching plant and the sourcing of aggregates from the proposed on-site borrow pit. For example, although the batching plant would generate the vehicular traffic associated with the

importation of the concrete constituents, it would nevertheless result in a reduction in overall traffic movements with the primary advantage being to reduce the relatively concentrated demand for the import of concrete during the pouring of turbine base foundations. Similarly, the proposed extraction of aggregates from a borrow pit on site will yield 340,000m^3 of suitable materials for the construction of access tracks and hard-standing areas thereby reducing the number of vehicles importing fill material by approximately 46% which would equate to 88 No. fewer HGV traffic movements per day). In addition to the foregoing, it is of relevance to note that the Witness Statement of Mr. P. Moran and Mr. J. Keenan as presented to the oral hearing provides further elaboration on the level of conservatism employed in the assessment of the traffic impact of the proposed development. Furthermore, this document serves to outline a number of perhaps more realistic scenarios whereby the impact of construction traffic from the proposed development could perhaps be reduced. For example, whilst the EIS has assumed that all construction traffic will arrive and depart from the application site in one direction only, the case has put forward that traffic movements will most likely be more evenly distributed to both the east and west. A second possible scenario concerns the use of delivery vehicles with an increased capacity (i.e. greater than the 10m^3 referenced in the EIS) which would also serve to reduce the overall volume of traffic visiting the site (*N.B.* Whilst I would acknowledge that concerns were raised at the oral hearing as regards the legalities etc. of moving larger vehicles and tonnages along the public road, I note that the applicant responded to same by indicating that the details provided were simply an exercise to show what could be achieved in terms of traffic reduction if material deliveries in excess of 10m^3 were to be used).

3.2.5 Having established a 'worst-case' scenario in terms of the maximum estimated traffic movements per day during the peak construction period, it is necessary to consider the impact of same relative to the available carrying capacity of the surrounding road network. In this respect I note that existing traffic conditions were determined from on-site traffic counts undertaken at two locations along the N59 National Road in June / July 2012 and the results of same are summarised in Table 14-2 of the EIS. From a review of same it can be assumed that the difference in the total traffic counts between the western count location and the eastern count location is attributable to traffic using the R312 Regional Road (*N.B.* Table 14-3 of the EIS details additional traffic counts undertaken as part of the proposed Cluddaun wind farm development at a location c. 160m north of the junction of the R312 with the N59). The recorded traffic flows were then validated against long-term traffic flow data gathered from the National Roads Authority's permanent traffic counter at Mulranny

(approximately 6km east of Mulranny) which involved applying an expansion factor in accordance with NRA guidance to derive a representative Annual Average Daily Traffic (AADT) figure at the proposed development site from the survey data. Accordingly, it has been estimated that the AADT for the N59 at the site location is in the order of 1,181 No. two-way vehicles with HGVs accounting for 4.0% of the total traffic volumes.

3.2.6 In terms of estimating the existing flow capacity of the N59 in the vicinity of the application site, Section 14.3.4 of the EIS details that regard was had to the provisions of the NRA's *'Design Manual for Roads and Bridges: Road Link Design TD 9/12 (2012)'* which provides estimates for a number of different rural road types as an approximation of the practical capacity of a road link. In this respect it is stated that as the smallest road type listed in the Manual is a reduced single (7.0m) carriageway with an estimated capacity of 8,600 AADT and as the N59 has a typical carriageway width of only 6.0m, it was considered appropriate to apply a correction factor in the estimated AADT in order to reflect the reduced capacity of the roadway. In establishing the necessary correction factor regard was had to 'RT180: Geometric Design Guidelines' (1986) with a ratio of 0.833 being derived between a 7.0m carriageway and a 6.0m carriageway width. The subsequent application of this ratio resulted in an estimated AADT capacity of 7,183 for the N59 whilst the application of a further 20% reduction in the estimated capacity in order to allow for any pinch points along the route culminated in a final estimated AADT of 5,731. Accordingly, the estimated available capacity of the N59 at the site location, on the basis of an estimated capacity (AADT) of 5,731 and an Estimated Existing Demand (AADT) of 1,181, is presently 79%.

3.2.7 Given that the N59 in the vicinity of the application site has an estimated capacity (AADT) of 5,731 (of which 79% is presently available) and as the Estimated Existing Demand (AADT) is 1,181 with the proposed development estimated to generate an estimated of 738 No. vehicle movements per day at peak construction in a 'worst-case' scenario, it is readily apparent that the national road has ample capacity to accommodate the traffic movements associated with the subject proposal. Indeed, Table 14-14 of the EIS estimates that during the entirety of the construction phase (2015-2022), on the robust assumption that the peak level of construction traffic will be maintained throughout this period, and taking account of the future growth in background traffic levels as derived from the NRA's National Traffic Forecasts, the remaining residual carrying capacity on the N59 will be in the region of 64-66%. Accordingly, whilst I would acknowledge that there are likely to be some localised

impacts, such as the temporary inconvenience to local road users, consequent on the construction of the proposed development, on the basis of the available information, it is clear that the N59 has more than adequate capacity to accommodate any anticipated 'worst-case' increase in traffic flow.

3.2.8 With regard to the potential cumulative traffic impact of the proposed development when taken in conjunction with the two other wind farms planned in the area at Corvoderry (10 No. turbines as approved under PA Ref. No. 11/838) and Cluddaun (a proposal for 48 No. turbines presently under consideration by the Board pursuant to ABP Ref. No. PA0031), Section 14.6 of the EIS states that as both of the latter projects are reliant on Grid West in order to connect to the national grid, it is likely that the construction of same will take place during Phase 3 of the subject proposal. It subsequently states that the 'worst case' potential cumulative traffic impact would occur in the unlikely event that piling and turbine foundation pours were to occur on the same day at Oweninny, Cluddaun and Corvoderry whilst access track and crane stand construction was also progressing. Accordingly, it has been calculated that the cumulative 'worst-case' traffic impact will equate to 2,042 AADT on the basis of the following:

- Oweninny 738 No. two-way traffic movements (including 538 No. HGV two-way movements);
- Corvoderry 344 No. two-way traffic movements (including 144 No. HGV two-way movements);
- Cluddaun 760 No. two-way traffic movements (including 160 No. HGV two-way movements); and
- An estimated 200 No. two-way traffic movements associated with the Visitor Centre.

3.2.9 Notably, the applicant has chosen to emphasise that the foregoing scenario is unlikely to arise as it is questionable as to whether or not concrete suppliers in the area would have the capacity to provide 176m^3 of concrete per hour. Similarly, reference has been made to the likely reduction in overall traffic movements arising as a result of the proposal to win fill material from on-site borrow pits for the Cluddaun project in addition to use of on-site concrete batching.

3.2.10 Nevertheless, on the basis of the 'worst-case' scenario figures, it would appear that the remaining residual carrying capacity on the N59 will be 42% and that the roadway will have sufficient capacity to accommodate any anticipated 'worst-case' cumulative traffic flow.

3.2.11 In respect of the on-going operation and maintenance of the proposed turbines I would anticipate that the traffic levels associated with same would be low and would be unlikely to have any significant impact on the surrounding road network.

3.3 The Proposed Upgrading of the Existing Access Arrangements:

3.3.1 In relation to the proposed upgrading works to the existing 3 No. site entrances as detailed on Drg. Nos. QR320201-P-000-083, QR320201-P-000-084 and QR320201-P-000-085, I note that these have incorporated the recommendations of the accompanying Road Safety Audit and I am satisfied that the proposed access arrangements are generally acceptable and that any refinements to same as suggested in the submission of the Planning Authority can be addressed by way of suitable conditions without giving rise to any further significant impacts.

3.4 Haul Routes:

3.4.1 The principle impacts in terms of traffic will arise during the construction of the proposed development and, in particular, during the transportation of the abnormal loads associated with the delivery of the various wind turbine components to the site along the public road network. In this respect I would refer the Board to Chapter 14 of the EIS which details the various route options considered as part of the development proposal with a view to determining their suitability for transporting the anticipated large-sized loads. Notably, it has been indicated in the Planning Report set out in Volume 1A of the application documentation that each turbine will require about 10 No. deliveries including separate deliveries for the blades, tower components, the hubs and nacelles, and the transformers (*N.B.* blade lengths will not exceed 56m and the maximum tower section length will be 33m). Furthermore, with regard to the possibility of using the rail network as a means of transporting the turbine components, it has been detailed in the EIS that whilst Irish Rail operates a freight service from Dublin Port to Ballina, the height restriction of 2.9m on all bridges over rail lines effectively rules this option out and, therefore, the applicant has concentrated on examining the potential options for haul routes by road.

3.4.2 From a review of the available information it would appear that a preliminary investigation of possible haul routes for the delivery of the various wind turbine components to the application site focussed on the likelihood that the constituent parts of the turbines would be imported into one of four main ports (i.e. Dublin, Cork, Foynes and Killybegs) on the assumption that each of these

ports would have the deep-water facilities necessary for the unloading of components of this size and that temporary on-shore facilities for the storage of turbine blades of up to 56m in length would not be problematic. Notably, the possibility that the turbine parts would be shipped to alternative ports such as Galway, Sligo or Moneypoint was discounted on the basis that these ports were deemed either not to be viable or did not have any advantages over any of the four main ports already listed. Upon further examination the possible route from Foynes Port was dismissed as it did not offer any significant advantages over either Dublin Port or Killybegs and would involve passing through either the Limerick Tunnel at 4.65m high (similar to Dublin Port tunnel) or along the quays with the towns of Clarinbridge, Claregalway and Tuam to be negotiated before merging with the same route proposed from Dublin and Killybegs on the N5 National Road near Charlestown. Similarly, it was held that the option of using Cork Port offered no significant advantage over either Dublin Port or Killybegs. Indeed, I would advise the Board that in light of the travel distances (and routes) involved in the haulage of turbine components from both Cork and Foynes Ports, and the increased likelihood of disruption along the public road network, the elimination of same as options would seem to be entirely reasonable. In addition, it should be noted that the applicant has also indicated that the road infrastructure through the towns of Castlebar and Westport and the routes approaching the site using the N59 from Westport or the R312 (mistakenly referred to as the R112 in Section 14.2.2 of the EIS) from Castlebar were examined in detail, although both these options were considered to be non-viable due to the amount of buildings that impact on the route and the amount of road widening and land take that would be required. Accordingly, the route selection process has culminated in the identification of a series of 3 No. potentially feasible turbine component haul routes from Dublin Port or Killybegs via the road system to the application site which are set out (and mapped) in Table 14.1 of the EIS and can be summarised as follows:

- Route 1 – Delivery from Dublin Port by road via the M50/N4/M4 out of Dublin City towards Longford Town before continuing onto the N5 passing through Strokestown and Ballaghadereen where it continues towards Charlestown and turns onto the N26. It passes through the towns of Swinford and Foxford before turning onto the N59 at Ballina and onwards towards Crossmolina and the site entrance at Bellacorick.
- Route 2 – Delivery from the port at Killybegs by road along the N56 towards Donegal Town turning south onto the N15 towards Sligo bypassing Ballyshannon, Bundoran and Sligo Town. The route then turns westwards south of Sligo Town onto the N17 where it passes through

Tubbercurry before continuing southwards through Charlestown and onto the N5 where it follows the same route as that from Dublin Port (Route 1).

- Route 3 - Delivery from the port at Killybegs by road along the N56 towards Donegal Town turning south onto the N15 towards Sligo bypassing Ballyshannon, Bundoran and Sligo Town. The route then turns westwards south of Sligo Town onto the N59 and passes through Ballisadare before continuing to Ballina where the delivery would turn over the Hamm (Upper) Bridge on the River Moy and continue through the town in a contra-flow direction and onwards towards Crossmolina and the site entrance at Bellacorick.

(*N.B.* In the witness statement of Mr. Paul Moran & Mr. Julian Keenan as presented to the oral hearing it was further submitted that the appraisal of possible haul routes was initially informed by a desk-top study whilst the aforementioned preferred potential routes were further assessed by a drive-over survey).

3.4.3 Section 14.2.4 of the EIS proceeds to state that whilst each of the foregoing routes would be feasible subject to some additional study and modification, Route 3 was initially assessed as the most viable and cost effective option for turbine component delivery to the site. However, whilst this option may comprise the preferred route, the EIS subsequently states that a detailed assessment of the selected haul route will only be carried out when the full wind turbine procurement process has been completed and the selected turbine size and dimensions have been finalised. It also states that the landing port, detailed route assessment and any necessary route modifications will ultimately be determined by the wind turbine supplier with the agreement of the relevant local authorities along the route.

3.4.4 Whilst the selection of a final haul route for the transportation of the wind turbine components may not be possible at this stage of the planning process pending the appointment of a wind turbine supplier, it is clear that no matter which of the 3 No. identified route options is selected, access to the development site will be dependent on a westbound approach along the N59 National Secondary Route. This will necessitate abnormal loads having to pass through Crossmolina whilst the 2 No. routes from Dublin Port will also have to pass through the villages of Swinford and Foxford. In this respect I note that whilst the applicant has indicated in the EIS that some initial field surveys were apparently undertaken at Swinford and Crossmolina to assess potential pinch-points along the haul routes, no details of these surveys accompanied the initial application.

Indeed, from a review of the information set out in the EIS it would appear that no detailed assessment of any of the identified haul routes was carried out with regard to the need, if any, for road widening works to accommodate turbine delivery or for any pull-in bays to allow for the passing of traffic. Similarly, there would appear to have been no survey or appraisal of bridges and the road pavement strength along the likely preferred haul route which would serve to identify any defects or damage to the existing road surface and the precise areas where road widening or strengthening may be required in addition to any requirement for bridge strengthening. However, during the course of the oral hearing the applicant submitted a *'Draft Oweninny Wind Farm Desktop Transport Study'* which serves to elaborate on the extent of the investigations undertaken with regard to the identification of potential / preferred haul routes. This document is described as comprising a desktop study of publicly available information, the purpose of which is to identify any major potential constraints or pinch-points along each of the route options. It states that the main sources of data consulted during the preparation of the study included Ordnance Survey mapping, aerial photography, 'Google Maps' and 'Google Streetview' whilst further investigation involved the driving of the routes and some preliminary measurements to identify items such as river / stream crossings, changes to infrastructure not noted on any mapping, overhead lines and any major removal of street furniture that may be required. Notably, the report does not address structural surveys of bridges, road design, bridge design, land-take requirements or the integrity of existing public roads (including the width or vertical geometry of existing roads or swept-path analysis of potential pinch points).

3.4.5 The *'Draft Oweninny Wind Farm Desktop Transport Study'* reiterates that at this stage of the process Route 3 would seem to be the most viable although it is acknowledged that it would be prudent to give further consideration to a number of the nodes along Routes 1 & 2 in order to determine whether these routes would be suitable alternatives / back-up in the event that Route 3 would prove to be unviable following further investigation. It subsequently provides a summary of the major nodes and potential risks along each of the route options before elaborating on the specifics of same in a more in-depth analysis with accompanying supporting maps and photography included in the attached appendix. I do not propose to reiterate the entire contents of this document although it is of relevance to identify some of the principle nodes which will require further investigation associated with each of the routes as follows:

Route 1 – Dublin Port to Site Entrance:

- Access from Dublin Port to the main road network will be achieved either through the Dublin Port Tunnel and onto the M50 Motorway or onto the South Quays towards the N4 National Road and continuing onto the M4. In the first instance the Dublin Port Tunnel (Node Ref. '1a') is only 4.6m high and it has been acknowledged that this may prove problematic as regards vertical clearance for tower sections and the nacelle. Secondly, with regard to the proposal to exit the Port via the South Quays, it is noted that the bridge on the south exit of the quays is marked as 4.8m high (Node Ref. '1d') and that there is also a 110 degrees right-hand turn (Node Ref. '1e') along the high load route out of Dublin which may not be passable.
- There is a 90 degree left hand turn (Node Ref. '1k') in the centre of Strokestown along the N5 which will need further investigation and swept-path analysis in order to determine the extent of modification required (although it should be passable with the temporary removal of street furniture).
- At present, the main route through Ballaghadereen on the N5 is impassable for wind turbine components due to a series of 90 degree turns in the centre of the town, however, it has been suggested that there may be an alternative route through the town (Node Ref. '1m') although it is noted that this would involve landowner negotiations in addition to swept-path analysis in order to ascertain the amount of modification required if this option were to be considered. Notwithstanding the foregoing, the applicant has also referred to the planned N5 Ballaghaderreen Bypass which will comprise the construction of 13.6km of standard single carriageway to provide a bypass to the north of Ballaghaderreen town (*N.B.* In this respect it is of relevance to note that this particular roads scheme is presently under construction having been approved by the Board in 2008 and that it is anticipated that the road will be open to the public towards the end of 2014).
- Loads being transported through the town of Swinford will have to pass beneath the former Railway Bridge (Node Ref. '1p') (a protected structure) on Main Street and whilst preliminary information obtained by the applicant has suggested that the clearance height of this bridge is adequate further investigation is required in this regard. An alternative route which may be suitable for the tower sections and nacelle, but not the blades, has been identified although it will also require further investigation.
- On travelling towards Foxford there is a significant pinch point at Cloongullaun Bridge (Node Ref. '1s') when crossing the River Moy which

will require analysis and whilst the applicant indicated at the oral hearing that Mayo County Council was in possession of sufficient lands in the vicinity of this node to facilitate any road improvements deemed necessary this was disputed by the observers.

- In Ballina town a 90 degree left-hand turn (Node Ref. '1u') will have to be performed at the junction of the N26 and N59 which will require swept-path analysis and it has been highlighted that the land involved includes a property occupied by a fuel depot.
- The final notable node to be encountered is an 'S'-bend in the middle of Crossmolina (Node ref. '1w') which will necessitate further investigation and swept-path analysis to determine the amount of modification required. Desk-top analysis has apparently indicated that this location will be problematic for blade delivery but will pass for tower and nacelle delivery. Whilst the applicant has identified an alternative option to avoid the centre of Crossmolina, this would involve the upgrading of approximately 8km of local roads to the north of the village and it was highlighted during the oral hearing that this proposal would seem to involve road widening etc. along a route which passed over and through a protected (Natura 2000) site (i.e. the River Moy Special Area of Conservation: Site Code: 002298) and thus it raised concerns as regards the need (if any) for appropriate assessment pursuant to Article 6 of the Habitats Directive.

Route 2 - Killybegs Port to Site Entrance via N56/N15/N4/N17/N5:

- A right-hand bend at Bruckless (Node Ref. '2a') is considered to be impassable at present and will require further investigation on either side of the road to confirm suitability for the delivery of turbine blades.
- In order to avoid a sharp left turn followed by a right turn in succession along the N17 in Tubercurry an alternative route through the town has been proposed although it will require the removal of street furniture and the implementation of suitable traffic management plans so as to ensure that no vehicles are parked along these streets at the time of delivery.

N.B. This route ultimately joins with the existing N5 and continues along Route 1 with the same consequent nodes.

Route 3 - Killybegs Port to Site Entrance via N56/N15/N4/N59 (preferred route):

- Similarly to Route 2, a right-hand bend at Bruckless (Node Ref. '2a') is apparently impassable at present and will require further investigation.
- In the village of Ballisadare it may be necessary to make modifications to 2 No. right-hand bends in order to negotiate same with the second of these turns possibly requiring reversing of the blade trailer.
- There are some concerns as regards the vertical alignment of the N59 on travelling towards Ballina.
- On entering Ballina there are two possible options for crossing the River Moy both of which involve crossing the second bridge (the Ham Bridge) and continuing in a contraflow direction through the town. The first option involves making a right-hand turn directly over the bridge from the N59, although if the blade carrier mid-section cannot overhang the quay wall it may be necessary to remove and reinstate the wall in order to facilitate blade delivery. The second option involves turning left before the bridge onto Bunree Road (Node Ref. '3g') and continuing along same before negotiating a right hand turn onto Abbey Street (A neighbouring car park at this latter turn would need to be free of vehicles on the day of delivery and some street furniture etc. may require removal). Once on Abbey Street the bridge over the River Moy onto Tolan Street can be traversed.

  N.B. This route subsequently continues towards Crossmolina and through the relevant nodes as previously outlined.

3.4.6 From a review of the foregoing, and noting that a variety of other nodes / pinch points will require further in-depth analysis including topographical surveys and swept-path analysis in order to determine their adequacy for turbine component transportation, it is clear that a considerable amount of additional work is required as regards the selection and verification of a final haul route for the various turbine components. In this respect I note that the 'Draft Oweninny Wind Farm Desktop Transport Study' concludes by making a series of recommendations with regard to same including the carrying out of further confirmatory investigations, route evaluation by industry-leading transport companies, and a high level financial assessment of the three route options. In effect, the applicant has put forward the case that whilst a preliminary transport study has suggested an apparently viable 'preferred' haul route (in addition to two other potential alternative routes) with the possible nodes / risks along same having been identified, further in-depth analysis of the specifics of the route configuration will have to be carried out at a later stage by the specialist turbine transport contractor in conjunction with the relevant authorities in order to determine the need for any road alterations, movement of street furniture or

specific traffic management controls etc. Furthermore, it was indicated at the oral hearing that it would commonplace for the specialist transport contractor to conduct a 'dummy-run' along the selected route using a mock-up representative of a turbine component (e.g. the blade), which can be cut up or dismantled as necessary, in order to confirm the suitability of the selected route. Section 14.5.6 of the EIS also states that upon the identification of any landtake requirements arising from road improvement works required along the turbine delivery route the applicant will engage with the affected landowners to provide details of the works required and to negotiate compensation arrangements. In this respect it is anticipated that landowners will complete a Deed of Dedication with the acquired / amended road sections ultimately to be taken over by the Local Authority. Further mitigation is offered by way of the abnormal load deliveries being accompanied by safety vehicles and a Garda escort with the timing of deliveries to be notified to the County Council and local residents along the transport route. A traffic management plan is also to be developed and agreed with Mayo County Council to manage potential impacts from the site.

3.4.7 In response to the foregoing proposals outlined by the applicant it was asserted by a number of the observers to the hearing that there were 'lacunae' or gaps / shortcomings in the information provided which prevented a proper and informed environmental impact assessment of the project in its entirety. It was emphasised that the proposal was not for outline permission and that the use of 'post-consent' surveys was prohibited. In support of their submission that full surveying of the haul routes prior to any decision being made on the application was necessitated, reference was made to an instance during the transportation of the boring machine for the gas pipeline currently under construction in northwest Co. Mayo when it blocked the road for several days to the inconvenience of local residents. Particular concerns were also raised as regards the proposal to transport the turbine components through Crossmolina (and the need to prohibit on-street parking) in addition to the possible impact of the weight of the various turbine components on the structural integrity of those bridges / culverts etc. to be crossed by the transporters.

3.4.8 In relation to the survey or appraisal of bridges and the road pavement strength along the likely preferred haul route which would identify any defects / damage to the existing road surface and the precise areas where road widening or strengthening may be required in addition to any requirement for bridge strengthening, in terms of mitigation, in the first instance I would refer the Board to Section 14.5.4 of the EIS which details that it is proposed to undertake a joint condition survey of public roads prior to the commencement of development to

form the basis for agreeing local road improvements in the vicinity of the site and any remedial works that may be necessary following the completion of construction. It also states that for the delivery route from concrete source to the site entrance the assessment will focus on road strength and is likely to include a Pavement Condition Index Survey. In addition, an Alignment and Width Survey is to compiled by an appropriately qualified transport company in conjunction with both the turbine manufacturer and the site project engineer whilst a full a Structural Survey over any sections of road which appear particularly weak or liable to subside will also be undertaken.

3.4.9 Further elaboration on those measures to be employed to prevent structural damage to roads and bridges etc. was provided at the oral hearing and in this respect I would advise the Board that the submitted *'Outline Traffic Management Plan'* reiterates that the notification and escort requirements for the abnormal loads are based upon the laden vehicle weights and dimensions and that these will be finalised following confirmation of the turbine and haulier selection. The National Roads Authority, Mayo County Council and An Garda Siochana are also to be notified of abnormal transport configuration and associated axle loadings in order to ensure that any unidentified issues with regard to the structural integrity of any road structure can be ascertained and any required remedial works programmed in a timely manner. Similarly, the witness statement of Mr. Paul Moran & Mr. Julian Keenan further commits the applicant to the compilation of an independent road and bridge survey prior to the commencement of development in order to confirm the structural and pavement condition of the extent of the existing N59 National Road to be used for haulage in addition to the preparation of a Traffic Management Plan. Finally, I note that the *'Schedule of Mitigation Measures'* presented to the hearing emphasises that the movement of abnormal loads by road will be subject to the permitting system operated pursuant to the Road Traffic (Permits for Specialised Vehicles) Regulations, 2009 whilst the *'Schedule of Proposed Conditions'* prepared by the applicant also makes reference to the preparation of a Transport Management Plan (which will incorporate details of the road network to be used by construction traffic, including over-sized loads, and detailed arrangements for the protection bridges, culverts or other structures to be traversed) and an independent road, bridge and culvert survey on the structural and pavement condition of the N59 National Road.

3.4.10 At this point it is of relevance to note that the haul route previously approved on appeal under ABP Ref. No. PL16.131260 included for the use of the N59 to access the subject site, although it should also be noted that the turbines

permitted as part of that development were considerably smaller in size than those proposed in the subject application whilst their component parts were probably of a lesser tonnage. In the assessment of that application the reporting inspector acknowledged that whilst it would have been preferable if a road and bridge survey of the haul route had been undertaken prior to the determination of the development proposal, it was accepted that as the port from which the turbine components would be delivered had not yet been finalised it would not necessarily have been appropriate to focus on a particular route at that stage of the planning process. Furthermore, it was also noted by the inspector that Mayo County Council had previously required a pavement condition survey to be compiled as part of an application for a proposed gas terminal at Bellanaboy which included those roadways between Ballina and Belmullet whilst a structural assessment of bridges along that route had also been undertaken. That survey had found that the pavement of the N59 was generally in a reasonable condition and, therefore, the reporting inspector concluded that the Planning Authority had a comprehensive understanding of the condition of the main road serving the appeal site (and the ability of the bridge network to accommodate wide and heavy loads) when it made its decision to grant permission for PA Ref. No. 01/2542 (ABP Ref. No. PL16.131260). Accordingly, those road works identified by the Planning Authority in the immediate vicinity of the site as being necessary to provide adequate access thereto and egress therefrom were to be addressed by way of condition whilst it was also considered acceptable that a roads and bridge survey be undertaken prior to the commencement of development to further inform the planning authority on necessary works to be undertaken on the N59 to permit the development to take place and to consider the suitability of the regional route network to be used (if proposed). The imposition of a financial contribution towards essential road improvement works that would be highlighted by the road and bridge survey was also deemed appropriate whilst the bridge survey would highlight any unforeseen deficiencies in the bridge network on the main roads with suitable mitigation measures to be applied to ensure the protection of bridges of heritage value.

3.4.11 Notably, ground works have already commenced on site in respect of ABP Ref. No. PL16. 131260 and in this regard it is of relevance to note that Condition No. 10(a) of that grant of permission required the completion of an independent road and bridge survey on the structural and pavement condition of the extent of the existing N59 National Secondary Road to be used for haulage (and for the extent of all other proposed haul roads in the administrative area of the planning authority) to be agreed with the Planning Authority prior to the commencement of development. Accordingly, as that development is presently in progress it would

seem reasonable to assume that the applicant would have complied with the foregoing requirement and that the Planning Authority is satisfied in this regard. In this respect I would advise the Board that whilst there was considerable discussion during the course of the oral hearing as to whether or not the applicant had satisfactorily complied with several of the conditions attached to ABP Ref. No. PL16. 131260, it should be noted that the Board has no function in relation to matters of enforcement. Furthermore, whilst the information made available at the hearing in order to demonstrate compliance with said conditions was somewhat sparse, in correspondence issued by the Planning Authority on 17th April, 2014 it was confirmed to the hearing that several conditions, including the requirement for the completion of an independent road and bridge survey on the structural and pavement condition of the N59 National Road, had been complied with. Therefore, it would seem reasonable to conclude that the Planning Authority is satisfied that the existing condition and integrity of the N59 National Road is sufficient to permit its safe use as a haul route to serve the development presently under construction. Accordingly, I would suggest that the Planning Authority is perhaps in the best position to confirm the overall suitability of using the N59 to serve the subject development and in this respect it is notable that there has been no objection to the proposal on any such grounds.

3.4.12 Whilst I would acknowledge that on preliminary observation the overall pavement condition along each of the haul routes serving the application site within the administrative area of the Planning Authority would seem to be in a reasonable condition, I am inclined to suggest that given the length of time that has elapsed since the preparation of the pavement condition report and the bridge survey referenced in ABP Ref. No. PL16. 131260, in addition to the increase in the size of the abnormal loads associated with the subject proposal (*N.B*. The length of the turbine blades at up to 56m is considerably in excess of proposals for wind turbines previously considered in the surrounding area), it would be prudent to require the submission of updated reports in respect of these matters in order to gauge the need for any road strengthening / widening works or other mitigation measures along the road network. For example, it is apparent that each of the three haul routes identified in Table 14.1 of the EIS will pass over a number of bridges in a variety of locations including Ballina, Foxford and Crossmolina and that several of these structures are of heritage value. In this respect I would advise the Board that the Ham (Upper) Bridge in Ballina town has been designated a protected structure by reason of its inclusion in the Record of Protected Structures set out in the Ballina & Environs Development Plan, 2009-2015 whilst Foxford Bridge has also been identified as a protected structure in the Mayo County Development Plan. In addition, it is of relevance to note that

any abnormal loads being transported through the town of Swinford will also have to pass beneath the former Railway Bridge (a protected structure) on Main Street which has a restricted clearance (*N.B.* Traffic travelling along the N5 will also have to pass beneath an overbridge south of Charlestown).

3.4.13 On the basis of the foregoing, and having reviewed the available information, including the various mitigation measures set out in the EIS and the supporting documentation, given the presence of a number of wind energy developments in the wider area, including the existing scheme at Bellacorick and others such as at Carrowleagh, in addition to other approved schemes, it would appear that the wider road network is capable of accommodating the delivery of the various wind turbine components associated with the construction of the proposed development. Indeed, it would be prudent for different wind farms to try and use the same haul routes where possible in order to minimise disruption throughout the wider road network, although I would suggest that the selection of the final haul route for the subject proposal can be best addressed by way of condition in order to permit the review of same closer to the time of construction in conjunction with Mayo County Council, the National Roads Authority and An Garda Siochana etc. thereby providing for the least amount of disruption as possible. In this regard I would suggest that matters such as the completion of a bridge survey and a detailed appraisal of the road pavement strength along the agreed haul route prior to the commencement of development in order to assess the condition of the route and to identify any areas where road / bridge widening or strengthening etc. may be required, can be addressed by way of condition (including a financial contribution towards essential road improvement works identified by the road and bridge survey as regular utilisation of the roads in the area by HGVs during the construction stage of the development could have significant potential to undermine the structure and pavement of these roads). Similarly, the imposition of a requirement for a post-construction road survey would address the remediation of any damage caused by delivery traffic to the wind farm site with any remedial works necessary to repair same to be agreed with the Local Authority. Therefore, on balance, whilst it is apparent that the construction of the proposed development, with particular reference to the movement of abnormal loads, will have a significant impact on traffic movements on the surrounding road network, I am generally satisfied that these impacts can be mitigated to within acceptable limits subject to conditions including the implementation of the identified measures set out in the EIS.

4.0 Air Quality and Climate (Dust):

4.1 During construction of the proposed development the principle impact on air quality will most likely arise from a combination of fugitive dust emissions emanating from the on-site construction activity, with particular reference to excavation works and to the movement of traffic and materials both within the site and along designated haul routes, and exhaust fumes from construction traffic and machinery.

4.2 In relation to dust emissions I would suggest that as the site is primarily composed of cutover bog with a high moisture content, the wet nature of this soil is less likely to result in the release of dust particles during construction works. Furthermore, given the separation distance to nearby housing it would seem unlikely that residential amenity would be affected by dust emissions arising from the construction of the proposed development, although there may be a localised effect on flora and fauna in the immediate vicinity of the site / works. Nevertheless, Section 6.8.4.2 of the EIS has outlined a series of measures which will be implemented on site in order to mitigate for the potential release of dust during the construction phase. These include the carrying out of a dust-monitoring programme to be agreed in advance with the Planning Authority, the dampening down of workings during periods of dry and windy weather, and the installation of a wheel-wash facility at the site exit to clean trucks leaving the site.

4.3 In specific reference to the proposed borrow pit and any fugitive dust emissions likely to arise from the operation of same, it is of relevance to note that this extraction area will be located a significant distance (over 1.0km) from surrounding housing whereas the *'Quarry and Ancillary Activities, Guidelines for Planning Authorities'* published by the Department of the Environment, Heritage and Local Government in 2004 only make reference to residents living within 500m of a quarry as having the potential to be affected by dust with continual or severe concerns about dust most likely to be experienced within c.100m of the dust source.

4.4 With regard to exhaust emissions I would suggest that any adverse impact on air quality as a result of same will be short-term and of no significance.

4.5 Having reviewed the foregoing, given the inherent temporary duration and impact of the proposed construction works, coupled with measures to ensure best practice site management and dust minimisation, I am satisfied that the construction of the proposed development will not result in any significant impact on air quality in the surrounding area. Similarly, given the nature of the

development proposed, I would not anticipate any significant detrimental impact on air quality during the operational phase.

4.6 Climatic Factors:

4.6.1 Whilst the construction of the proposed development will invariably result in the emission of some greenhouse gases, this can be mitigated by adherence to best practice site management including the shutting off of equipment during periods of inactivity and the implementation of a traffic management plan. Accordingly, in my opinion, the impact of any such emissions on climatic considerations will be minimal.

4.6.2 With regard to the operational impact of the proposed development, I would concur with the findings of the EIS that the generation of renewable electricity by the proposed turbines will have a wider positive impact on climatic considerations in terms of reducing carbon emissions thereby contributing to the achievement of national and international emission reduction objectives through the displacement of traditional methods of energy generation by the unsustainable combustion of fossil fuels such as coal and oil.

Signed: _____ Date: _____

Robert Speer
Inspectorate