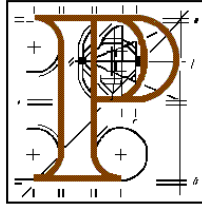


## An Bord Pleanála



### ASSISTING REPORT TO SENIOR INSPECTOR

#### NATURE AND PURPOSE OF REPORT:

To report on the following topics to inform the assessment and recommendation of Senior Planning Inspector, Mary Kennelly, in her report to the Board:

- **Noise and vibration**
- **Shadow flicker**
- **Traffic and transportation (including construction haul routes, turbine delivery routes, cable routes and associated works to the cable routes)**
- **Health and Safety issues**
- **Property value**

**Local Authority :** Kildare County Council and Meath County Council

**Proposed scheme :** The erection of 47no. wind turbines with an overall tip height of 169m, with all associated works to facilitate same, including, inter alia, 9no. site entrances, c.31km site access tracks, upgrade of c.10 of existing access tracks, 3no. borrow pits, 1 electricity substation (and associated facilities), the installation of c.75km MV underground cabling (c.36km within the public road) between proposed wind turbines and proposed on-site substation, the installation of HV underground cabling between the proposed substation and either the existing substation at Woodland, Co.Meath (c.29km, of which c.28km would be within the public road) or Maynooth, Co. Kildare (c.23km of which 17km will be within the public road),

installation of underground communications cables, the erection of a permanent meteorological mast up to 100m in height, temporary alterations to the public road at identified locations to accommodate turbine delivery, tree felling, peat extraction and associated landscaping.

**Dates of Inspection :** 25/01/16, 11/03/16, 04/04/16

**Inspector :** John Desmond

## PART A

### 1.0 Introduction:

1.1 The nature of this report is such that it is confined to consideration of a limited number of topics to assist Senior Inspector Mary Kennelly, the First Inspector, in her recommendation to the Board. In accordance with her memo of 12<sup>th</sup> September 2016, the topics of concern comprise:

- Noise and vibration
- Shadow flicker
- Traffic and transportation (including construction haul routes, turbine delivery routes, cable routes and associated works to the cable routes.)
- Health and safety
- Property value

### 2.0 SITE DESCRIPTION

2.1 The principle part of the proposed development, comprising six isolated and discrete stands of wind turbines<sup>1</sup> dispersed over northwest County Kildare. The sites of the proposed turbines extend from Boolykeagh townland, Co. Meath (in the vicinity of Longwood), c.23.25km south to Glenaree townland, Co. Kildare (in the vicinity of Rathangan); and from the townland of Nurney, Co. Kildare (in the vicinity of Edenderry), in the west, to Derrycrib townland (in the vicinity Donadea Forest Park) c.15km to the east. The said stands of turbines would be interconnected by underground MV cabling. In addition, the original proposal provided for two options<sup>2</sup> for proposed connection to the national electricity grid, including Woodlands substation at Woodlands townland, Co. Meath (in the vicinity of Batterstown), c.18km northeast of the Derrycrib; and Taghadoo, Co. Kildare (in the vicinity of Maynooth), c.11.5km east of Derrycrib. The full site therefore extends c.28km west to east and c.26km north to south.

2.2 From north to south, the proposed wind turbines are located as follows –

- **Ballinakill cluster** - Boolykeagh (T1, T2, borrow pit 1), Calf Field (T3), Ballynakill (T4), Ballyonan (T5), Moyvalley (T6, T7, T8, T9, T10, borrow pit 2). Note, T4 and T5 are located west of the R160, separate from the main body of the site.

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<sup>1</sup> The application describes the proposal as 5 clusters, however there would seem to be little justification for designating the proposed stands at Drehid (to the east) and Hortland (to the west) as a single cluster.

<sup>2</sup> Note, this has been amended by the submission of further information, however the application site boundary remains as originally proposed.

- **Windmill cluster** Nurney (T26), Ballinderry (T25, T24).
- **Drehid Hortland cluster (west)** - Coolree (T11, T12), Killlyon (T13), Kilmurry (T14), Ballynamullagh (T15, T16), Clonkeeran (T17), Drehid (T18, T19, T20, T21, T22, T23), Parsonstown (T47).
- **Drehid Hortland cluster (east)** - Knockanally (T46), Hortland (T41, T43, T44, T45), Derryvaroge (T42) and Derrycrib (T40).
- **Derrybrennan cluster** - Derrybrennan (T27, T28).
- **Cloncumber cluster** - Glenaree (T39, T38, west part borrow pit 3), Feighcullen (T37, T36), Drumsru (T35, T34, east part borrow pit 3), Cloncumber (T33), Ballyteige (T32, T31, T30, T29).

2.3 The Ballynakill and Windmill clusters are located within the North-western Lowlands under the Kildare County Development Plan, with that part of the Ballynakill cluster within County Meath classified as the Central Lowlands landscape character type. The lands are characterised generally by flat topography and agricultural land-use, but with some pockets of blanket bog. The character of the two sites is quite different.

2.4 **Ballynakill cluster** – The site comprises agricultural lands, apparently of good quality and the site is not indicated as blanket bog on the historic maps. The site is subdivided by the R160, with roughly 80% of the site to the east and the balance to the west. The eastern site is contained within a block of land formed by the R160 to the west and north, the Dublin-Galway railway and the Royal Canal to the northeast and east, the R148 to the south (former N4 Dublin-Galway road) and by a local rural road to the southwest. The western section of the site is contained with a block of land enclosed by the R160 to the northeast and east, the R148 to the south and by a local road to the west. The M4 runs to the south of the site, within c.500m of the site boundary. The site is therefore highly accessible from the national road network.

2.5 One-off rural housing is quite extensive, albeit at lower density than evident at some of the other sites. There are no residential dwellings within the 500m contour, however there are two on the contour boundary (#466, WT4 and 443, WT10) and several (c.10) within close vicinity of same. The subject site is the only site which encroaches on an urban settlement, within Longwood within c.1.3m of WT2 and WT7. However there is also extensive one-off housing located along the R160 which bisects the site.

2.6 **Windmill cluster** – This site is located almost entirely within an industrially harvested section of peatland located that the northern extremity of an isolated blanket bog within the North Western Lowlands. The lands to the south appear as virgin blanket bog, excepting small scale harvesting along the perimeter. There is a forestry plantation to the east, between the site and the

public road. The lands to the west and north and to the east of the public road are agricultural in character, apparently grazing land.

- 2.7 The site has access onto the rural local road network. The road onto which it accesses is of favourable horizontal and vertical alignment, although much of the rural road network and junctions thereon are substandard, with particular reference to the nearest junction to the north. However, the R402 is c.3.25km to the south and has been recently upgraded with improved junction with the local road concerned, and improved alignment, width and overall standard of the regional route.
- 2.8 Again, there is significant presence of one-off rural housing on the rural local road network, although it appears somewhat less dense than that evident surrounding some of the other sites. There are no dwellings or other structures noted within or bounding the 500m contour. There are c.36no. dwellings within the 1000m contour, but few are close to the 500m contour line.
- 2.9 Drehid Hortland east, Drehid Hortland west<sup>3</sup>, Derrybrennan and Cloncumber, clusters are situated within that area defined as the 'Western Boglands' under the Kildare County Development Plan. The area is flat and low-lying, poorly drained, with extensive bogland and poor agricultural land. The character varies not insignificantly between and across the individual sites in terms of the nature of the land (bogland versus agricultural land) and vegetation and also in terms of the extent of residential development surrounding the site clusters.
- 2.10 **Drehid Hortland cluster (west)** – The northern end (c. 1/3<sup>rd</sup> of cluster site) is generally under existing mixed plantation forestry, or has been deforested in recent years. The said area corresponds with the extent of former blanket bog on the historic 6" maps. The southern section is largely set out as agricultural grasslands and only the extreme southern end of the site was indicated as blanket bog on the historic maps. The surrounding lands to the west are predominantly agriculture in nature and use, and the lands to the west mainly comprise an extensive area of blanket bog, the vast majority of which has been subjected to industrial scale harvesting.
- 2.11 The vast majority of the site (c.380ha) is confined within a block of land delineated by the R402 to the west and local roads<sup>4</sup> to the north, east, southeast (L1017), south (L5025) and southwest. The southernmost section (c.23ha), is detached from the main body of the cluster site, south of the L5025. The main body of the site has two points of access onto the unnamed

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<sup>3</sup> This is not clear from the Council's Landscape Character Map (chapter 14 of the KCDP) as the boundaries are not defined at sufficient scale relative to landmarks or settlements.

<sup>4</sup> Road numbers stated when known.

local road to the north, and another onto the L5025 to the south. The southernmost section has access onto the L5025. The L5025 is of favourable vertical and horizontal alignment, but is narrow, with soft margins and unlined. The local roads to the north are of unfavourable horizontal alignment, are unlined and appear more confined in width, as are the majority of the local roads in this area.

- 2.12 One off rural housing is prolific along the rural road network, comprising, effectively, low density suburban housing. The level of housing appears lowest along the L5025, probably due to the fact that it runs through the blanket bog. In this regard I would refer the Inspector to fig.11.1.3 which shows distance contours from the proposed turbines relative to the location of the surrounding buildings. There is one residential dwelling located within 500m of a turbine (#983, WT19) and another indicated as derelict (#1157, WT14), with at least three dwellings located effectively on the 500m contour (#945 and #1000, WT47; #982, WT 21), but there are c.28no. other dwellings, or structures that are just outside the 500m boundary and the nature of some of those structures is not entirely clear.
- 2.13 **Drehid Hortland cluster (east)** – The majority of the site of this cluster is under plantation forest, or has been recently harvested for same and was shown as under blanket bog on the historic 6” maps. Only the northernmost section accommodating WT46, and a small section around WT41 comprise poor agricultural land in use for grazing sheep. The area of land where WT41 is to be sited may have been reclaimed from blanket bog since the time of the historic 6” maps.
- 2.14 The site is fully contained within a block enclosed by to the north, west, south and east, but the site is bisected by a number of public roads which become forest tracks onsite. The road network is of varying horizontal alignment, being poor in sections. The network is narrow, unlined, elevated above deep drainage ditches and with narrow soft margins.
- 2.15 Again, one off rural housing is prolific along the rural road network, comprising, effectively, low density suburban housing. The level of housing appears greatest to the south and to the east. In this regard I would refer the Inspector to fig.11.1.4 which shows distance contours from the proposed turbines relative to the location of the surrounding buildings. Two dwellings are located effectively on the 500m contour (#37, WT40, and #56, WT41; #982, WT 21), but there are c.10no. other dwellings, or structures that are just outside the 500m boundary and the nature of some of those structures is not entirely clear.

- 2.16 **Derrybrennan cluster** – The site is in agricultural use, possibly for growing grain. The site formed an isolated area of agricultural land within the surrounding blanket bog at the time of production of the historic 6” maps.
- 2.17 This relatively small site is set out in a single almost regular shaped block. The lands to the north and east comprise industrially harvested peatland. The adjacent land to the south is agricultural grassland, with plantation forest beyond.
- 2.18 The site is at a significant distance to the public road network being accessed by private roadway either through Board na Mona lands to the R403 to the north east, or a private agricultural lane connecting to R414 to the south, both via the local road network.
- 2.19 Whilst there is extensive low-density suburban type one-off rural housing distributed extensively along the rural road network, these are comparatively distant. There are no dwellings within or within close proximity to the 500m contour, nor within the 1000m contour.
- 2.20 **Cloncumber cluster** – The majority of this site is set out in agricultural grassland, presumably for grazing, with only a restricted central section indicated as blanket bog on the historic 6” map. The eastern c.1/3<sup>rd</sup> of the site is currently under plantation forest, or has been harvested of same and is not under transitional woodland scrub, that area principally comprising blanket bog according to the historic maps.
- 2.21 The site comprises a single continuous block of land, not traversed by public roads, although the eastern wooded section is traverse by private tracks. The Grand Canal forms the southern boundary of c.2/3<sup>rd</sup> of the site.
- 2.22 The site accesses onto the local road network, which is of varying horizontal alignment, but is generally narrow, unlined and with narrow soft margins. The R414 is located to the west and the R415 to the east. The regional roads are lined, but are also relatively narrow and of varying horizontal alignment. The R414 appears to have been subject to some upgrade works in recent years, at least south of Lullymore.
- 2.23 One off rural housing proliferates along the local road network, but is somewhat more focused compared to that evident surrounding some of the other sites. There are no houses or structures located within the site, except for a single equine facility adjacent WT33. There is one residential dwelling located on the 500m contour line (#587, WT32) and maybe 17no. other dwellings only a short distance from the contour line.
- 2.24 **Description of road network concerning haulage and turbine delivery routes:**

- 2.25 The M4 (Dublin - Galway) motorway runs east to west across the north of County Kildare, c.300m south of the Ballinakill cluster. Junction 9 (Innfield / Enfield) is located closest to the majority of the site and is proposed as the point of access to the overall site from the national road network. I note that junction 10 (Kinnegad), c.17km to the west of J9, is approximately equidistant to the Ballinakill site and that junction 8 (Kilcock) is c.10km to the east. Access from J9 to **Ballinakill cluster** is via the R148 (former N4), with its two entrances located at a distance of 7.5km and c.10.5km, respectively, west of J9, which is a road of favourable width and alignment, with clear road markings and hard shoulders. This route passes through no settlements (Innfield is bypassed) and there are very few frontage developments and is proposed to accommodate general haulage traffic. However, the turbine delivery route to Ballinakill cluster will depart the M6 for the R148 at J8 (Kilcock) and will traverse the centre of Innfield, travelling on the regional route for c.10km more than that of the intended haulage route.
- 2.26 The main access route south of the M6 (for haulage and turbine delivery) is via the R402, also from J9 for a length of c.10km (in general 80km speed limit applies). The southwest section of the R402 (to Carbury) has recently been upgraded between Kilshanchoe and Edenderry. The route is to a favourable standard. However, the route passes through two villages - Johnstownbridge in proximity to J9 and Kilshanchoe – between J9 and the junction with the R403 at Carbury and there is a significant level of housing and other development fronting onto the route north of the realigned section.
- 2.27 South of Carbury, the proposed site access route (for haulage and TDR) follows the R403 for a length of c.6km. This road is generally of favourable alignment, but with sections of unfavourable vertical alignment, and has clear road markings. It is relatively narrow in width, with no hard should and only narrow soft margins. The R403 passes through the village of Derrinturn, c.1km to the south of the R402, with the settlement extending for c.2km. The access route departs the R403 at Ballybrack / Ballynakill Lower, following a local county road of poor alignment, width and condition, west to the entrance to a private road serving a Bord na Mona premises (there are no signs to indicate the name) and private farmland and a forestry plantation. The private road crosses the Edenderry branch of the Grand Canal with a flat-topped bridge of relatively modern construction. The private road provides access to the proposed **Derrybrennan cluster** and then continues as far south as the townland of Lullymore, at which point the proposed haulage (and cables) route will traverse harvested bogland, nominally following an historical industrial bog harvesting rail line and ultimately reconnecting to the public road network at the R414 (Rathangan to R403 Road), northeast of Lullymore village, at the point of the former industrial rail line crossing.



- 2.28 The R414 is of unfavourable horizontal alignment, which at some points appears very poor, such as at Barnaran, south of Lullymore, where there is a bend of close to 90 degrees. The road is of relatively narrow width, with no hard shoulder and little or no soft margins. The surface is poor in parts. There are worn centre markings, being solid white lines at points. There is extensive frontage development, mainly in the form of one-off rural housing, but this is associated largely with the settlement of Lullymore. The 60km speed limit applies from the point of access to the R414 for a distance c.2km south. Outside of the 60km limit the level of frontage development on the R414 haulage route is comparatively light.
- 2.29 The access route departs the R414 in the townland of Cappanargid, following a local road (L7004) c.0.75km south to the site entrance to the **Cloncumber cluster** in the townland of Glenaree, just north of the Grand Canal. The L7004 is a narrow local road of poor horizontal alignment, without road markings and with very narrow or absent soft margins. The surface is basically sound, although patched up in parts. The short river crossing of the River Foy, at Agar Bridge, is level with the vertical alignment of the road, but the crossing is narrow and would appear capable only of accommodating traffic in one direction at a time. There is a right angle bend on the L7004 c.45m to the south of the proposed site entrance as the road turns to run along the northern bank of the Grand Canal.
- 2.30 The L1005 extends approximately due north from the R402 at Carbury, providing site access for haulage and TDR for the **Windmill cluster**. The L1005 has been extended southward by (I estimate) c.100-200m, with new roundabout junction with the old R402 and a new junction with the recently realigned R403. The extended section of L1005 and its junctions with the surrounding network can reasonably be assumed to be to DMRB standard. The proposed site entrance (an existing entrance to a premises) is located c.3.25km north of the junction with the realigned R402. The L1005, north of the extension, is generally of good alignment. Road markings are extant at the southern end, but missing from some sections to the north and are otherwise faded. The road surface is patchy, but reasonable. It is a narrow road at c.5m in width, without hard shoulder and with narrow soft margins. The southern end of the road traverses blanket bog. Very few properties have direct frontage onto the relevant section of local road.
- 2.31 The L1004 extends south from the R402 at the centre of Johnstownbridge and provides direct access for general haulage for the **Drehid Hortland cluster east** and direct access to the northern end of **Drehid Hortland cluster west**, with an additional access to the said west cluster via the L5012. The L5012 has a junction to the L1004 to the east and to the R402 to the west just north of Kilshanchoe. The relevant section of L1004 is of varying horizontal alignment, is narrow, poorly or absent of road markings and has no hard

shoulders and the surface is variable to poor. The L1004 junction with the R402 appears reasonable, but its junction with L5012 is poor. There is significant frontage development, predominantly residential in nature. The L5012 is of similar standard, but with possibly a higher concentration of one-off housing.

2.32 The L5025, off the R402, c.2.5km northeast of Carbury, provides additional haulage access to the southern end of the Drehid Hortland cluster west (which is, itself, split either side of the L5025) and the L5025 constitutes the TDR for both the west and east Drehid Hortland clusters, the TDR for the eastern cluster continuing along L1017 from the junction at Timahoe. The two access points to the west cluster are within c.3km of the R402. The access to the east cluster is c.12.5km east of the R402 junction, with a little over 5km of the route comprising the lower order road. The western 1.5km section of the L5025 is of less than favourable alignment, is narrow, without road markings and only with soft margins. One off housing is limited to two strips of ribbon development, one at either end and on opposing (but not facing) sides of the road. The junction with the R402 has recently been upgraded and can be expected to be to DMRB standard. The junction with the L5023 appears to reasonable standard. The eastern section of the route is of favourable alignment, although it is narrow, without road markings (except at junctions) or hard shoulder. There is significant one-off housing along the route, albeit somewhat less than is evident on other local roads in the vicinity. The priority junction with L1017 (and L1019 to south) appears to be to a reasonable standard, with good line of sight and demarcated with road markings. The L1017 is generally of favourable alignment, although it is restricted in width and, for the majority of its length to the site access, is not lined. There are wide soft margins along most of its length and the carriageway is above the surface of the surrounding lands, more noticeably at the eastern end. The level of one-off rural housing along this local road is very extensive.

2.33 The M7 (Dublin – Limerick/Cork) motorway runs northeast to southwest through the centre of the County Kildare, south of the site, and junction 12 (Newbridge) and junction 13 (Kildare) are within c.12km and c.10km, respectively, of the Cloncumber site. It is not proposed to provide access to the site from that direction.

2.34 **Description of road network concerning cable routes:**

2.35 The proposed undergrounded cable network comprises medium voltage (MV) cables connecting the individual clusters to the substation at Drehid Hortland Cluster East, and high voltage cables connecting to the national electricity grid.

- 2.36 **From Ballynakill Cluster** in the north, the cable route follows the R148 east from the site entrance to the junction with the L5006, following that road south over the M6 and c.3.5km to L5005 at Cadamstown village. The L5006 would appear to have been upgraded south for a distance of 800m as part the M6 scheme, beyond which it is of very narrow width, without road markings and with a surface of variable quality. There is a moderate level of one-off housing frontage development. Cadamstown National School is adjacent to and is accessed from the L5006 in the rural node<sup>5</sup> of Cadamstown.
- 2.37 The route then follows the L5005, another relatively narrow carriageway, largely unlined and with a deteriorating surface, south and west for c.600m. The route then departs south from the L5005 onto another local road (I could not locate the road number) for 600m up to the L5010. At this junction it is joined from the west by the MV line from the Windmill cluster. There is a moderate level of development along the L5005 and very little along the local road between L5005 and L5010.
- 2.38 The MV line from the **Windmill Cluster** follows L1005 for c.570m north from the site entrance, then north along the L1002 for c.410m and then the L5010 for c.1.85km up to the junction with the MV line from Ballynakill. The combined line continues east along the L5010 for a further c.3km, up to the R402, at the northern end of the rural node of Kilshanchoe. These local routes are all of similar character and standard, with little frontage development except at the eastern end of the L5010 where there is significant one-off housing.
- 2.39 The MV line follows the R402 for north for c.150m, a single carriageway of reasonable width, lined but without hard shoulders. The MV route then turns east along the L5012 for c.2.5km to the site entrance to **Drehid Hortland clusters** to access the electricity substation within the site. The L5012 has a high level of frontage one-off housing development.
- 2.40 From **Cloncumber Cluster** the MV cable route emerges onto the L7004, just north of the Grand Canal, continuing for c.700m up to the R414 (Allenwood to Rathangan Road). The L7004 is single carriage way, with poor horizontal alignment, and of restricted width, most notably at the bridged crossing (Agar Bridge) of the River Slate, and is without road markings. There are a number of frontage properties at near the junction with the R414.
- 2.41 The MV line follow the R414 north for c.6km, traversing the rural node of Lullymore and other sections of road where there are concentrations of frontage development. The MV cable route then departs the public road to connect to the **Derrinturn Cluster** to the north. It re-emerges onto the public road c.3km to the north, onto the L50026-3, a narrow, unlined single

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<sup>5</sup> Rural node is the smallest settlement type in the hierarchy under the Kildare CDP 2011-2017.

carriageway of poor horizontal alignment and very poor surface condition, which has significant frontage development. The MV connects to the R403 c.250m to the east, travelling c.2.8km north to the small town of Derrinturn, but veering off at the southern end of the Derrinturn, at Dreenane, east and north onto the L5022 and then to the L5024, up to the junction with the L5025. The R403 is a single carriageway of reasonable alignment, good surface and is lined. It has limited frontage development except within environs of Derrinturn.

- 2.42 The L5022 and L5024 are of narrow width and unfavourable alignment, is largely unlined and has a surface of variable condition, with almost continuous frontage development in the form of one-off housing at suburban style density, associated with the village of Derrinturn. The MV route heads southeast along the L5025 for c.1.2km to the entrance to the southern end of the **Drehid Hortland Cluster** (west). This section of the L5025 is of favourable horizontal and vertical alignment, with comparatively limited frontage development. The remainder of the MV route to the proposed substation is over private land.

### 3.0 **PROPOSED DEVELOPMENT, as revised by further information received 24/09/15:**

- 3.1 In general, the main elements of the proposed development can be summarised as follows:

- The erection of 47 wind turbines of 169m tip height (max) and all associated works over 6no. separate contiguous stands of turbines, within interconnecting ungrounded MV cables between the proposed turbines and the proposed substation, two potential options for connection to the national grid via undergrounded HV cables from the proposed substation.
- The proposed development at each of the individual sites (in addition to cabling and associated drainage works ) are as follows:
  - **Ballinakill cluster** – 10no. wind turbines (T1-T10; T4 and T5 are located west of the R160, separate from main body of site), 2no. borrow pits (i.e. quarry; c.1.5ha at north and 3.15ha at southern end east site), 2no. existing entrances (onto R148) to be upgraded, c.5.3km new access track (c.1.315km on west site and c.3.96km on east site), c.300m upgraded track (east site only), plus c.190m temporary hardstanding areas adjacent entrances (100m west site and 90m east site), presumably to accommodate access of turbine delivery vehicles. 400m length of undergrounded cable along R160 connecting west and east sites. Temporary construction compound.
  - **Windmill cluster** – 3no. wind turbines (T24, T25, T26), c.1.74km new track, c.680m indicated as existing road upgrade and upgrade to existing entrance (to L1005), plus temporary hardstanding area of

c.80m length at entrance presumably to accommodate access of turbine delivery vehicles.

- **Drehid Hortland cluster west** – 14no. wind turbines (T11-T23 and T47), substation compound (almost 1ha in area), 2no. new entrance to the south of L5025 and the upgrading of existing entrance to north of L5012, and 675m new access track on south site and c.9km new track (in addition there is 1.35km existing road on site for which (no works indicated), plus 180m temporary hardstanding at the existing site entrance to L5012 to accommodate turbine delivery. Entails 3 stream crossings. C.1.65km of the proposed track comprises a floating road structure over peatland.
  - **Drehid Hortland cluster east** – 7no. wind turbines (T40-T46), 2no. entrances (one to L1004 and the other to L1017) and c.3.87km new access track, 2.5km existing track to be upgraded, plus c.140m temporary hardstanding at L1017 site entrance to accommodate turbine delivery.
  - **Derrybrennan cluster** – 2no. wind turbines (T27-T28) and 740m new access track and c.140m upgraded access track within the cluster proper. In addition, access to the site will necessitate the construction of c.3.32km of new track, with new entrance proposed to public road R414, possibly with upgrade of c.40m or so of the regional road, but the drawings are not clear in this regard. Also 720m of upgraded existing track. The EIS indicates the access from the R403 as an access track, whereas it is actually a county road L5026-3.
  - **Cloncumber cluster** – 11no. wind turbines (T29-T39), 1no. entrance to L7004, 1no. borrow pit (in two parts – 0.6ha and 0.224ha), 7.35km new access track, 1.3km of which is indicated as floating track, 2.15km of existing track upgraded, plus c.170m temporary hardstanding to facilitate turbine delivery. Entails 1 stream crossing.
- 75km underground MV cable route.
  - Revised underground HV cable route to comprise c.2.3km cabling within public road from Drehid Hortland cluster west, following the L1017 to the existing electricity substation to the south of the road at Dunfierrth townland.

#### **4.0 OBSERVATIONS FROM PRESCRIBED BODIES**

I have read and noted the observations of the prescribed bodies submitted on file. The said observations are summarised in First Inspector's, excepting responses to SEVESO / COMAH issue, which may be summarised as follows:

##### **Kildare County Council (11/04/16)**

- Directs the Board to section 5.9.2 of the County Development Plan 2011-2017 which addresses the prevention of major accidents and the Major Accidents Directive (policies ECD16 and ECD17 refer).

- The HSA is the designated competent authority for enforcement of SEVESO II Directive.

Meath County Council (05/05/16) – No comment

Transport Infrastructure Ireland (23/03/16) – No comment.

Department of Defence (05/04/16) – No comment.

Department of Justice & Equality (11/04/16) - No comment to make.

Health and Safety Authority (11/04/16) –

- Advises the Board to consult document ‘*Policy & Approach of the Health and Safety Authority to COMAH Risk-based Land-use Planning*’ in order to fully understand HAS advice.
- The Authority **DOES NOT ADVISE AGAINST**<sup>6</sup> the granting of planning permission in the context of Major Accident Hazards.
- The applicant should be made aware of HSE Research Report RR968 ‘Study and development of a methodology of the estimation of risk and harm to persons from Wind Turbines’ to refer to when designing and developing the proposed windfarm.
- Future expansion around COMAH establishments has the potential to impact on the expansion of those establishments.

#### 4.1 OBSERVATIONS FROM OTHER PARTIES

The detailed points of the third party observations, including reference to each of the parties raising those points, have been recorded in the spread sheets appended to the report of the First Inspector. In the interest of clarity and ease of assessment, only the broad grounds of observation raised by observers, as relating to the remit of this report, are summarised below:

TRAFFIC ISSUES
<b>Road network capacity and access</b>
<b><u>Substandard road network</u></b> - cannot safely or structurally accommodate construction works (and cabling) and construction traffic of HGV, cranes and turbine delivery without significant impacts. In particular the L-1004, L5021, L5025, R402 (Kilshanroe NS), R414, R160, L1007, Timahoe to Baltracey Cross, old N4, R414 and <b><u>legacy / bog rampart roads</u></b> unsuitable due to narrow carriageway width, alignment, inadequate structure (including substructure), deteriorating road surfaces and existing traffic levels. <b><u>Physical damage to road network.</u></b>

<sup>6</sup> The HAS’s own emphasis.

**EIS – inadequate information** - indicates that **bog roads/ bog rampart roads** have been avoided where possible - not possible. No indication of proportion of transport to be carried out on these roads. **Inadequate road surveys** and no survey work of legacy roads, which vibrate and move vertically when traversed by heavy loads.

**Restriction of access** - Uncertainty regarding impact on access to/from property and reduced road capacity. Impact on access to / for public transport, emergency services, schools, commuting, businesses and homes.

**Precedence for refusal** – KCC has refused on grounds of inadequate road network serving **minor developments** in the area (e.g. 08/1540, 08/702, 08/1391 and others where details were not provided by observer).

**Road widening** - Irreparable damage to trees, hedgerows and local character from road widening associated with cabling and TDR works - contrary to objectives 1-3 of ch.13 of the KCDP 2011

### **Entrances / sightlines**

**Physical obstructions** at site entrance to Hortland cluster at L1007 are omitted. Removal of same is reliant on third party lands outside of the red line boundary and control of the applicant. **See also lack of legal interest.**

**Entrance sight line analyses are substandard** and do not comply with NRA TD41-42/11. No topographical surveys, inappropriate setback distances for HGVs, reliance on photographic evidence and aerial photos inadequate.

**Traffic hazard** from multiple new entrances is a non-compensatable reason for refusal included in Fourth Schedule of Act.

**Impact on pedestrians** - Proposed service entrances would represent a loss of amenity to pedestrians.

**Site entrance to T47** - There are 2 existing entrances to the site, from main road and one from lane. Permission was previously refused for chalets, a lake and a windmill with photos of chalets, windmill and lake in situ- appendix 6

**Site entrance to T11 -T23** - EIS Section 3-3.5 includes a picture of proposed access. Proposed entrance directly opposite the site of the proposed entrance to T47 was refused by KCC under reg.ref.1264/89. **Same refusal reasons apply** (hydrological and flooding issues).

### **Lack of legal interest - node points**

**Insufficient legal interest** - No demonstration of sufficient legal interest necessary to amend nodes, on third party lands, on road network to facilitate access for delivery of turbines. Many landowners not aware of the impact on their lands - only two consenting in Drehid. **Ref. McCallig v ABP**

**Insufficient legal interest** - Legal interest at nodes NKCLNC003 & NKDERB002 & on access road to Woodlands ESB/EirGrid substation Co. Meath - applicant has neither ownership nor consent required to make application under A.22(2)(g).

**Insufficient legal interest** - Junction of Derrybrennan access road and main road is directly adjacent to layby which IPCC has agreed with Kildare County Council that can be used for visiting tour groups.

### Road safety issues

**Road safety implications** - no consideration of road safety implications, in general and for pedestrians or cyclists, of high volumes of construction traffic and TDRs, with very wide and very heavy loads transporting on narrow local roads which are without pavements or hard shoulders for - **traffic hazard**.

**Road safety implications** - large turbines spinning and shadow flicker are extraordinary visual stimuli and will distract motorists, including on old N4 and on M6 resulting in traffic hazard.

**Precedence** - refusal for landfill adjacent to R160 where many crashes have occurred in past (in vicinity of Rentes Plants).

### Turbine Delivery Routes

**Auto track** - No details Auto track/vehicle turning circles

**Inadequate structural assessment or topographical survey of TDRs in Appendix K** - ELS notes (p.65) that survey work required. Assessment and EIA can't be carried out by the Board.

**Uncertainty** - delivery routes only '*likely*' to be from Dublin.

**TDR** - inadequate to accommodate transportation of, e.g. Vestas V112

### Haul routes

**EIS inadequate - underestimation of HGV traffic** - no accurate basis for volume of material to be extracted / hauled due to lack of survey work and therefore level of HGV traffic grossly underestimated. Proposal to confirm details post decision through detailed site investigations **prevents assessment of merits of the entire**



**application and carrying out of EIA by the Board.** Errors and discrepancies in appendix K2 in HGV assessment.

**EIS inadequate - underestimation of HGV traffic** – in reality 56670 HGV movements will be generated - 18800 loads of concrete @9cu.m, 235 loads of steel, 9300 HGV for service roads @93000cu.m (aggregates), excluding turbine delivery.

**EIS inadequate - underestimation of HGV traffic** - EIS figure of 1250m<sup>3</sup> concrete per turbine for support structure us incorrect. It will be 1500-2000m<sup>3</sup>. EIS does not take account of aggregate material required for access roads and hardstanding areas to facilitate construction. Implications for consequential fuel use and CO<sup>2</sup> emissions would be enormous.

**Enforcement** – many HGVs depart M4 at Kilcock and travel on R148.

#### **Site access tracks**

**Track for T47** - Existing track (referred to in Chapter 14 EIS, p.49) is a dirt track requiring significant upgrade and infilling to accommodate construction traffic, but the proposed track is at a distance to same. Consequential runoff may cause flooding to adjoining lands. Will cross a river, around the back of new homes and alongside of third party land and behind derelict building intended for redevelopment.

#### **Traffic Impact Assessment**

**TIA inadequate** - lacking in appropriate traffic assessment methodology, vague in projections and impacts, contains no standard traffic content to enable a standard traffic assessment to be undertaken.

**No capacity assessments** on the operational impact of the development on the surrounding road network, particularly on local roads.

**No mitigation measures** are identified along any route being used for laying cables, or for haul routes or TDRs

**Significance of traffic impact** – disputes that the significance of traffic impact (in EIS) can be determined as ‘medium’ on basis of dispersed nature of development, given scale of development in small rural nature of the areas.

#### **Nuisance / Disruption**

**Impact of construction traffic and operations** – nuisance from noise, dust, exhaust fumes, etc., to housing and communities along haulage routes. **Duration?**

**Serious disruption to traffic** – impact on commuter traffic, residents, businesses, tourist traffic and local economy during construction and turbine delivery over 20km radius.

**Specific disruption issue** - temporary closure/restricted access to R148 would have an irreparable negative economic impact on **Mother Hubbard's Restaurant**. Financial compensation is therefore sought for future losses in revenue.

**Construction traffic management plan** - necessary pre (not post) decision. Not workable to subject local community to up to 8000 truck movement per month, 4000 on average over 2 year period, on roads with very few passing points and which usually carry no more than 100 movements per month.

#### **FURTHER INFORMATION OBSERVATIONS**

Applicant claims that the planning precedents referred to by the observer are not relevant as deficiency in the local road network was not the primary reason for refusal in each case. However, **there is no hierarchy in refusal reasons**, with each reason having equal weight.

Response that the Board's refusal for CHP Plant at Toghers Industrial estate having regard to impact on Leinster Outer Orbital Route (LOOR) is not relevant, but **the Board's decision is relatively recent (2011) and the LOOR had same status at that time as now**.

#### **CONSTRUCTION**

##### **Construction and Environmental Management Plan**

**Lack of detailed CEMP** – A detailed CEMP determines how a construction project is managed with respect to potential impacts from noise, vibration, dust, traffic, sensitive neighbours interface with public (dealing with complaints), ecology (including disturbing of vermin), hazardous materials, waste management, effluent discharge / disposal / treatment.

**Lack of detailed CEMP: dust** - lack of detail for mitigation of construction and operational dust (from constant spinning of W.T.s over bogs) and decommissioning of temporary construction roads to protect air quality. Dust control plan needed to address dust impacts from all aspects of construction, construction traffic (wheel-wash) from proposed aggregate roads, borrow pits and stockpiles, strong winds. Existing details too vague and / or impractical. Dust from decommissioning phase not adequately addressed.

**Lack of detailed CEMP : noise** – lack of detail for noise mitigation measures to address best practice guidelines (BS5228 -liaising with neighbours, monitoring,

hours, plant & machinery selection etc.) and the exceeding NRA 'Guidelines for the treatment of noise and vibration in national road schemes' in terms of noise limit (80dB LAeq) and hours of operation. Mitigation in appendix B.1 inadequate in details and too flexible (in terms of restriction of hours and exceptions to same), doesn't take account of all noise sources, duration or night-time impacts and underestimates impacts.

**Lack of detailed CEMP : vibration** – appendix D 'vibration mitigation' omitted.

**Vibration** - impact of vibration caused by heavy loads, with most delivery over bog roads (e.g. of road at Hortland cluster that visibly dips when traversed by heavy tractor) needs to be addressed.

**Lack of detailed CEMP** - Lack of drawings and information on road construction crossing watercourses and MV&HV cable routes crossing motorway, watercourses plus impacts arising from same and proposed mitigation. 'Typical section' drawings LE1473104\_FIG\_007 does not show how MV/HV cables ducts cross watercourse or M4 (e.g. Moyvalley Fig 2.1.1 and junction 9 Johnstown 2.1.6).

### **Supporting geological & hydrogeological conditions**

**EIS Section 8 'Geology' & Appendices G1-G3: site investigation lack detail & scope** - Desk-based and absent basic site specific information on existing ground and groundwater conditions to inform turbine bases and substructure construction techniques. This information is required for assessment of: i) structural foundations for WTs and associated excavations with implications for HGV movements; ii) appropriate foundation structures for the extensive roadways throughout the site; iii) groundwater for hydrological impact including dewatering during construction. Only investigations for Drehid / Hortland were 4 shallow trial pits adjacent proposed substation and WT11.

**EIS Section 8 'Geology' & Appendices G1-G3: site investigation inadequate** - No window sample to determine soil stratification at depth. Trial holes insufficient to assess foundation solutions. Use of hand held shear vane testing equipment for peat stability to determine peat depth is not appropriate for assessment of formation level for wind turbine bases. No ground information presented to depth below. No dynamic probing Standard Penetration Tests. No information to determine whether piled foundations required and formation level cannot be determined from site investigations undertaken. No recording of groundwater levels to enable hydrological assessment of this bog area. No laboratory soil samples. Not in keeping with Eurocode 7: Part 2 - Ground investigation and Testing, or the previous relevant code BS5959 Code of practice for Site Investigations

Peat depths are up to 4m in places and underlain by soft silt (above rock at depth of 10-14m), **unsuitable for bearing foundations for turbine bases** where

allowable ground bearing pressures of 200kN/m<sup>2</sup> to 300kN/m<sup>2</sup> are generally required.

**Lack of information** prevents adequate hydrological assessment, and assessment of material volumes to be excavated and disposed of which affects traffic assessment and the development **cannot be assessed properly due to lack of geotechnical information.**

### **Pollution & emissions**

**Construction dust, noise, emissions** - from construction activities and related traffic, plant and machinery. Significant nuisance, danger and disruption over 2 year period.

**Impact of runoff** from construction on hydrology of area.

### **Safety issues**

**Traffic hazard** - Risk of road traffic accidents from construction traffic.

### **Sustainability issues**

Quantum of concrete, aggregate and resources is unsustainable - **questions EIS figures for concrete required by turbine** (1500-200m<sup>3</sup> required not 1250m<sup>3</sup>).

**Environmental destruction and pollution** from use of rare earth materials for turbine magnet construction results in human rights issues - inflicting hardship and degrading environment elsewhere. Excavation, construction works, use of concrete and resources. Unsustainable use of resources.

CO<sup>2</sup> from **vast quantity of concrete** and from **peat extraction** – unsustainable.

**Disputes sustainability of project** - windfarm has limited lifespan (30 years), the turbines are not recyclable, the concrete support pads and tracks will remain in situ and the future amenities for tourism and residential will be compromised.

### **Decommissioning**

**Borrow pits** – site restoration / rehabilitation. Left open to become landfills?

Decommissioning - **the developer is a company with no financial substance.** A very considerable bond required to ensure proper decommissioning.

No decommissioning of proposed **41km of track or support pads**

<b>CABLE ROUTES</b>
<b>Impacts</b>
<b><u>Direct sterilisation</u></b> - no details provided. How much of a sterilisation strip will result and would it impact on private property. Extent of impact along 75km of cable route. Affected landowners not informed. <b><u>Indirect sterilisation</u></b> – preventing of site access and/or access to underground services. Preventing of planning permission generally and for family members with local need.
<b><u>Impact on access</u></b> – impact on access to residential, commercial properties, agricultural lands, stud farms and tourist facilities and impacting on operation of businesses. Inadequate detail.
<b><u>Impacts during construction</u></b> – disruption and nuisance (noise, etc.) from construction due to close proximity (too close) to homes; impeding of access during trench cutting; risk to residents from HGV traffic; impact from noise and nuisance on adjacent stud farms.
<b>Inadequate structure and condition of roads</b>
<b><u>Impact on structural condition</u></b> of substandard local roads
<b>Impact on services / utilities / infrastructure</b>
<b><u>Practical and cost implications</u></b> for local authorities, utility providers and private land owners of future servicing and/or infrastructure development
<b><u>Practical design issues</u></b> - how they will cross watercourses and bridges; impact on private land drainage. No detailed mitigation measures provided.
<b>Uncertainty of cable route</b>
<b><u>Uncertainty</u></b> of route proposal (can't carry out EIA).
Concern regarding change to over ground cables and potential impacts of same.
<b>Precedent / capacity to accommodate future WFs</b>
Grid access would accommodate or encourage <b><u>further development</u></b> .
<b>Disruption / Nuisance / health implications</b>
<b><u>Noise and disruption</u></b> from cabling construction over 74km

Health Impact of **EMF**

**Impact on ecology**

Impact on **trees and hedgerows** roots along entire route

IPCC - **no consideration of alternatives** to underground cabling between Cloncumber and Derrybrennan clusters.

**Impact on heritage**

**Constraints of heritage structures** at Taghadoo and environs which extend up to road - impact of trenches on heritage contrary to government policy

**FURTHER INFORMATION OBSERVATIONS**

Notwithstanding the reduction in road opening for cables, impact of widespread road opening **construction works still a concern.**

**Is the substation (and the 110kv line) adequate** to handle the proposed level of power to be generated. Have the **necessary permission / agreements** to connect to the grid via the said substation obtained.

**NOISE (& vibration)**

**Noise impacts - amenity**

**EIS acknowledges that operational noise will exceed normal daytime and night time limits** of 45dB and 43dB respectively imposed by s.5.6 of WEG. These dwellings have not been identified but should be. Any breach in noise limits should result in refusal of permission.

**Proposed noise limits excessive for quiet rural area** - Daytime limit of 45dB LA90 far too high and should not exceed 35dB in this quiet rural area with daytime noise level of 30dBA. Why has upper level of WEG 2006 35-40dBA been chosen by the applicant; night-time level of 43dBA is too high; why has developer used 40/45dB(A) daytime limit, without justification, for this quiet rural area, a low noise environment (WEG 2006) of <30dB(A)

**Adverse impacts on residential amenities of people's homes** – intrusive quality and character of noise generated and constant (day and night) nature of operational noise over at least 1.5km.

As the **Marshall Day report** indicates that a 5dB increase in sound level can be described as easily noticeable, then 5dB is at the upper limit of what any

reasonable person could be expected to accept.

**Impact of noise disturbance at night and on sleep** - impact will be more significant and detrimental at night due to potential for sleep disturbance. Consequential impacts on quality of life, health, work and education.

**Extent of noise impacts** - audible impacts up to 2km; excess of 950 houses within 500m which will be subject to excess of 43dB(A)Leq, excess of 3000 houses within 1.6km (less than 10 X turbine height) subjected to excess of 36dB(A)Leq. Impact on residents, schools, workplaces, etc.

**Severity of adverse impacts** – evidence of people been driven from their homes due to noise impacts.

Environmental noise pollution destroys the enjoyment of home and private life in **violation of A.8 of the European Court of Human Rights Act.**

**EIA by the Board** - obliged (s.34(2)(c)) to carry out a full and precise evaluation of possible harmful effects of noise prior to its decision. That the applicant used altogether different measurements to those specified by the WHO cannot possibly satisfy the Board that there will not be nuisance or endangerment. Any condition under s34(4) to address noise issues should eliminate all risk. The Board may refuse the application on the ground that it will cause serious noise and light pollution in light of the number of homes affected.

### **Noise impact - infrasound**

**Impact of infrasound / low frequency sound (LFS / LFN) on residences must be considered** given the proximity to hundreds of homes - infrasound is an inaudible but deeply troubling and more difficult to ignore than audible sound of same decibel level; penetrates buildings; stress, sleep deprivation, blood pressure, etc., and carries over long distances. No measurement of low frequency noise. Increased sleep impact on those suffering from existing conditions including fibromyalgia

**Impacts of noise and infrasound on concentration** - Adverse effects on short-term memory, concentration, maths, reading, multi-tasking, sleep disruption, balance disturbances

Issue of infrasound **not properly discussed with local residents**

**No health studies on infrasound in Ireland** - list of 78no. specialists who've spoken of possible impacts and calling for further research - **precautionary principle** applies; no precautionary measures are in place in public or private child care centres, schools or other such institutions; premature pending evaluation of risks and adverse effects on children.

**Concern about impact of infrasound and wind turbine syndrome** - also includes ear popping, tinnitus, high blood pressure, anxiety, lessened ability to hear with background noise / also short term memory loss, balance disturbance; health impacts into the future

**Infrasound / LFN is important consideration as wind turbines have significant percentage of noise in low frequency spectrum.** The normal industrial and traffic type noise is reflective when you analyse noise using 'A' weighting, i.e. dB(A), however the whoosh type low frequency noise of a wind turbine needs to be assessed by conducting measurements which are also 'C' weighted. When the 'A' weighted factors are applied; the significant contribution from the LF whoosh is masked out [in the 'A' weighted assessment]. WEG NLs are out of date, are based on dB(A), ignore LFN.

There is good scientific evidence that infrasound has real impacts. It is **necessary to predict and measure sound pressure levels across the full spectrum of frequencies**. This is the aerodynamic noise which has a large low frequency and infrasound component. It penetrates walls, roofs and loft spaces, causing stress and health problems. There is still no measure of low frequency sound. Extends to 1.5km, with some studies recording at a distance of 10km.

### **Noise impacts - health**

**Noise induced stress** - regarding **adverse impact** of windfarm noise and infrasound (& low frequency sound) **on physical and mental health** through impact on health.

**Health hazards** - especially affecting children and those with special needs who are highly susceptible to wind turbine noise effects. Not adequately assessed.

**Impact on persons dependent on hearing aids, cochlear implants** - certain high pitched tones found unbearable. Severely inhibits the ability of a person to process sounds, especially speech.

**Impact on people with particular conditions** - epilepsy, Meniere's disease, tinnitus, vertigo, dizziness and those with sensorineural hearing problems.

**Impact on business premises** – will render childcare facilities (Longwood Playgroup), special needs facilities, hotels (e.g. Hamlet Court Hotel), etc., unviable.

### **EIS Noise Assessment – baseline survey**

**The baseline noise survey is non-compliant** - survey is not compliant with the Good Practice Guide to the Application of ETSU-R-97, regarding proximity to roads and demonstration that the survey locations are representative, and there is no



detail regarding the duration of the test period, what kind of fit was utilised and whether wind direction analysis was carried out which is particularly relevant.

**Baseline noise survey not representative** - Background noise levels should be measured at representative neighbouring dwellings up to 2km distant, having regard to assessments of noise annoyance by Dr Chris Channing and by Japanese researcher 'Yano'. Ignoring background noise is contrary to EIA Directive (and ENO Directive for protection of Designated Quiet Areas).

**Baseline noise levels** - Most of the baseline noise survey measurements confirm baseline night-time levels of <30dB

**Baseline noise levels** - measurements of the baseline noise should be carried by the Board.

**Location of noise monitors** - Noise monitors (e.g. T29/30/31) are not located at dwellings/areas nearest the turbines; Monitors CL1/CL5/CL6 are distant from WF and in noisier locations. Noise results are therefore questionable.

**EPA standards** - Guidance note for Noise Assessment of Wind Turbine Operations at EPA Licensed Sites (NG3), 2011 - for rotational speed of 20 revolutions per minute '*...The equivalent tip speed for a 90m blade diameter turbine would be 340km/jr approaching speed of sound. As a result, aerodynamic noise from large wind turbines can be fairly significant..*'(p.10). ....wind shear effect [refers to the difference between wind speed at hub height and ground level, resulting in significant noise level with little screening] *...it is important to quantify background noise in terms of measured or derived hub height wind speed.'*

#### **EIS Noise Assessment – general**

**No turbine model selected** - Without a selected turbine model how do they know that it will have the noise reduced modes of operation required to meet the noise limits - uncertainty; EIS based on 'typical model' - no indication whether it is intended to erect 'pitch regulated variable speed' turbines or 'stall regulated' turbines.

**Impact of Sub-station transformer** - noise levels (table 6.11) under high operational mode sound power level dB LwA of 108. No details of how proposed Operation Mode will be achieved.

**Omission of data from EIS** - EIS fundamentally flawed due to serious omissions. Missing key information (from appendix E) on (a) survey data re background level in Drehid/Hortland area which EIS acknowledges as 'relatively low' (relative to what) and (b) Predicted noise emission levels from D/H cluster and (c) a properly reasoned assessment of likely impact. In absence of these, impossible to

undertake a reasonable critique of EIS re operation phase or determine the impact on people's homes; or the potential impact on individual properties; or the cumulative impact. (Specialist Report by Noise Consultant Doug Sharps - engaged by Donadea Against Turbines (Submission no. 43, Appendix D)). E11 of Vol.3 EIS has not been provided.

**Inadequate noise assessment in EIS** - Chapter 6 provides only a brief summary position, supported by information in the appendices. Significant omissions include: i) '*prevailing background noise levels and derived limits for*' each of the clusters (appendices E1-E5 inclusive); ii) The omission of '*results of noise predictions/ results...for dwelling locations*' (from appendices E6 & E7; omission of appendices E8-E12. No identification of NSLs. Only part provided baseline noise measurements for some representative locations. No allocation of baseline noise measurements at affected properties; iii) No calculations of WT noise levels at sensitive properties; iv) Only summary, no details, of comparison WT noise with noise limits at noise sensitive properties. Effectively no noise assessment is provided to enable a third party review (EIS noise section reviewed (11/05/15) by Mr Dick Bowdler, acoustic consultant). EIS deficient as **noise analysis incomplete.**

**EIS flawed** - Section 4.2 Noise and Vibration fails to note in the description of the area that the rural environment is highly populated with houses - 950 houses within 440m to the tip of the blade

**EIS flawed as inadequate noise assessment** of audible and sub-audible noise impacts on dwellings from operational noise.

**EIS flawed as assessment takes account of out of date studies** - The assessment of noise effects relied on a 20 year old study 'The Assessment and Rating of Noise from Wind Farms (1996).

**Noise impact assessment not independent** - An Independent assessment of noise impacts is required.

The noise assessment **deals with average noise not the constant noise** arising and it is important that a different measure is used.

**Noise survey** - no reference to section 3.2.8 of the '*Good Practice Guide to the Application of ETSU-R-97*' (p.63) regarding the application of a single lower fixed limit of 35-40dB(A0 where there is little variation in amenity and night-time periods as would seem to apply in the subject area.

**Assessment of cumulative noise impact on low noise environment** - Rural background noise levels in the order of 35 dB. Cumulative noise from 5 clusters must be considered and assessed. E.g. assessment takes account of impact of T47 in Drehid but T21, T22 and T23 also very close. The prevailing winds must be taken into account as noise travels in the direction of the wind. Not possible to

determine cumulative impact based on information provided.

**Threat of legal actions due to inadequate noise assessment** - e.g. Shiven & Ors V Enercon Wind Farm Services Ltd & Anor 2011/9955P in which the Shiven family initiated HC procedures after abandoning their home because of wind turbine noise levels.

**Vibration** - impact of vibration caused by heavy loads, with most delivery over bog roads (e.g. of road at Hortland cluster that visibly dips when traversed by heavy tractor) needs to be addressed.

**Vibration** - no appendix to CEMP included for vibration mitigation. Significant critical information mission means the application can be in no way be assessed adequately.

#### **EIA - Noise assessment: infrasound**

**No assessment or account taken of infrasound levels in EIS** – There is good scientific research of impact on inner ear which detect this infrasound at a much lower intensity than normal sound; infrasound can carry over 10km and have significant impact on humans and animals. Low frequency sound impacts on the vestibular sensory system.

**EIS inadequate** - Infrasound - potential for noise pollution, **including low frequency sound**, and subsequent damage to both human and animal health caused by large wind turbines has not been adequately studied and presented in the EIS. No measurement for infrasound currently. The noise from a wind turbine has a significant percentage in the low frequency spectrum. "A" weighted rating more appropriate to industrial/traffic noise. "C" weighted rating needed w.r.t. whoosh type low frequency noise of a wind turbine. The application of "A" weighted rating masks out the low frequency whoosh.

#### **Setback / separation distance**

**Assessment of infrasound and low frequency noise** - EIS section 6.2.2.2 Infrasound & low frequency noise. It has been internationally recognised that there is a lack of studies on sound near industrial wind turbines. Proposals such as this development highlight the **need for a minimum safety distance to be defined**.

#### **Need for definition of minimum acoustic safety distance**

**Arbitrary setback noise setback distance** - Ignores rapid innovation and the potential for future designs to be noisier or quieter. Ignores cumulative impact with other noise sources, either other wind turbines or other sources, and ignores prevailing environmental conditions which vary the direction and distance over

which noise propagates.

**Site specific setback distance required** - Setback distance should be modelled via a thorough, transparent noise model constructed for the range of Irish landscapes. Setback should be determined by factors identified in the sustainability assessment - e.g. the social costs of a development, including the lowering of land and housing property values, as well as noise, SF, loss of amenities and visual destruction of the landscape.

**Minimum of 10 R setback** distance required to ensure noise from wind turbines not heard.

Setback from housing is the **critical to address potential impact from noise and associated sleep impact and health concerns.**

**Separation distances from residential properties inadequate** - low noise environment means nuisance would be inevitable.

**500m setback not appropriate for the flat landscape** - The open landscape provides no protection from the effects of noise and shadow flicker.

**Setback of 10 rotor diameters insufficient** to mitigate noise, visual, etc. Just under 1000 homes within 10 rotor diameter distance; the setback is only 2.6 times the height of the turbines instead of 10 times as outlined in the Wind Turbine Regulation Bill 2014 and is insufficient

**Moratorium within 1.5km pending research** - France's National Académie Nationale De Médecine recommended suspending development within 1.5km of housing pending investigation of health impacts; acoustic safety distance of 1.31km for night-time (2000 homes within 1.31km radius of site); quality of the sound is the problem

**Horizontal setback** as a control measure **disregards cumulative effect from the clusters.**

**WEG (2006) 500m setback standard** is based on ETSU-R-97 (UK guidance) which is based on 10R diameter setback for 50m high turbines and **does not take account of the increase in turbine height.** Differences between county councils on setbacks. 500m setback inadequate. A huge majority of objections to wind turbine development are associated with turbines being too close to people's homes (SEE ALSO POLICY SN 50M); SF at a distance of 500m is not limited to 30 min p.d contrary to section 5.12 of the WEG

### **Mitigation measures**

**Mitigation** - Appendix E11 Vol.3 of EIS indicates that noise *limits may be met by operating the potential turbines in the noise modes specified at Table 1,*

but **provides no technical information on the 'Noise Modes' referred to in the document and how this will work.** B1 also states *'the proposed mitigation measures only apply to the assumed turbine considered...it may be that mitigation would not be required for the turbine ...selected; there are several other configurations/alternatives that would allow noise limits to be met and that an appropriate mitigation strategy may be specified for the procured turbine model prior to construction. ...the finalised mitigation measures to be implemented ...will be chosen to ensure that the relevant noise limits set in this chapter are met.'* **The applicant hasn't chosen a turbine model and the mitigation measures of B1 are inadequate and not definitive.** The mitigation measures should be based on worst case scenario.

**Speed reduction** - Mitigation measure to reduce speed is inadequate as WHO Guideline is 30dB. Implies that bigger turbines are inappropriate in close proximity to houses.

**The only measure available is "de-tuning"** - as this reduces power output, the end result is reduced benefits with little corresponding reduction in dis-benefits which would effectively undermines the justification for the proposal.

**Compliance with noise monitoring impossible** - no proven methodology to monitor the presence of ambient sound. It should be noted that sound monitoring levels are useless unless tied to human perception.

**Proposal to mitigate noise impact by reduced speed is inadequate** - WHO Guideline is 30dB. Implies that bigger turbines are inappropriate in close proximity to houses; non-compliance with WHO noise guidelines

**Mitigation by condition** - any conditions to restrict noise should await the revised guidelines.

**Mitigation by condition** - at minimum should require compliance with the thresholds in national guidelines.

**Inadequate communication on mitigation** proposed to address noise.

Should **locate wind farms off shore** to address / mitigate noise impacts

**Construction noise limit need to be addressed by condition** (short-term works daytime) - Proposed limit of LAeq1hr +70dB is inappropriate and a more stringent limit of 65dB should be applied. Works should be confined to 5.5 day standard working week.

## Noise standards / guidelines

**WEPG 2006 Noise - in Low Noise environment**, where background levels <30dB(A), daytime level of the LA90, 10min, of the development noise be limited to an absolute level of 35-40dB(A). Night time level to be a fixed limit of 43dB(A). Turbines should be 500m from noise sensitive receptors. Maighne does not comply with these guidelines and nuisance would be inevitable in this low noise environment.

**EPA standards** - The proposed noise limits (table 6.5 43dBL90 night-time and 45dBLA90 daytime) **exceed EPA limits ('Guidance Note on Noise Assessment of Wind Turbine Operations at EPA Licensed Sites' (NG3))** for quiet daytime environments (e.g. including in the vicinity of the Royal Canal where daytime environment is c.35dB(A)).

**Draft RWEG** - expected to require daytime and night-time noise levels of no more than 40dBA at boundary (i.e. at outdoor areas within curtilage of noise sensitive properties) of residential sites to provide no more than 30dBA indoor noise levels. Chapter 6 of EIS provides for 43dBA night-time and 45dBA daytime noise limit at dwellings neighbouring the site, which is very different from RWEG. **Premature pending adoption of the RWEG.**

WEG 2006 are only guidelines, **the statutory function of the planning authority, having regard to s.108 of EPA Act, is to protect residents from noise nuisance** which is '*so loud, so continuous, so repeated, of such duration or pitch or occurring at such times to give reasonable cause for annoyance to a person in any premises in the neighbourhood or to a person lawfully using any public place*'.

**WEG 2006 43bD night-time level is based ETSU-R-97, based on old WHO guidelines and is out of date.** The updated WHO reduced internal noise level at which sleep disturbance takes place from 35dB to 30dB. This is equivalent to external noise reduction from 43bD to 38dB or 40dB, yet Chp 6 of the EIS applies a 43dB night time noise limit (NNL) to all the cluster. How can an area like Cloncumber, with a daytime NL of <30dB absorb NNL of 43bD? WEG NLs are out of date, are based on dB(A), ignore LFN.

**WHO Guidance** - Predicted emissions exceed WHO guidance to protect community health of 40dB(LAeq) night (outside) and 30dB(LAeq) inside bedroom with windows open; **WEG 2006 noise levels are 4 times higher than the WHO recommended levels.** WHO Guidelines would confirm any noise above 40dB (night-time outside) causes adverse health effects. WHO night-time noise limit is 40dB(A), measured using LAeq - if measured with LA90, it would be 38dB(A), therefore it does not compare like with like for emissions relative to actual standards.

**Differential between WHO and DoEHLG guidelines (40dB v 43dB)** - Difference of 3dB. 3dB represents a **doubling** of sound pressure.

Have regard to **WHO (2009) Night Noise Guidelines for Europe.**

**SEAI report 'Examination of the Significant of Noise in Relation to Onshore Wind Farms'** (Marshall Day Acoustics) - recommends that current noise levels around residential properties should be taken into account for daytime and night-time levels.

### **Studies / research findings**

**Lack of studies on windfarm noise impacts** (see health tab also)

**Measuring annoyance** - 'A Proposed Metric for Assessing the Potential of Community Annoyance from Wind Turbine Low-Frequency Noise Emission' (N.D. Kelley, 1987) – 'A' weighted measure for sound was '*not an adequate indicator of annoyance when low frequencies are dominant*'. 'The Australian' (July 2013) despite modern turbines being different to those studied in 1987, modern industry noise testing regulations had been specifically designed to exclude testing inside buildings...and did not concentrate on low-frequency noise.

**Proportion of LFN emissions dependent on size** - 'Other research (not specified by objector) has shown that as WT increase in size, a greater proportion of the sound is emitted in the low frequency range.

**Noise emissions and scale of turbines** - 'Danish study of wind turbine noise (Moller & Pedersen, 2011) proved that the larger the turbine the increased noise.

**Noise impacts on hearing impaired** - Research by Julie Eby B.A.E.A found WT noise to have detrimental effect on those who are severely hearing impaired and have cochlear implant which pick up noise from environment as well as speech and severely inhibit the ability of those persons to process sound and especially speech.

**Need for assessments to be linked to human perception and adverse health effects** - Study by **Dr Bob Thorne, The Society of Wind Vigilance**, October 2010 - no method to accurately measure wind turbine sound in presence of ambient sound '*The problem with Noise Numbers for Wind farm assessment*'. **Noise and numbers and sound character analyses are meaningless if not linked to human perception and adverse health effects.**

**Governments are failing to take account of evidence based research on health impacts** and to favour advice of acoustic engineers and the wind industry - '**Noise Radiation from Wind Turbines installed near Homes: Effects on Health**' January 2012 **Barbara J Frey, Peter J Hadden** - '*...experience of families*

*internationally show conclusively that when wind turbines are built in close proximity to houses, environmental pollution adversely impacts on people's health. Despite evidence-based research...some governments...have instead opted to follow the advice of acoustic engineers from the wind energy industry. This approach favours industrial development, constructing wind turbines in proximity to homes and other sensitive facilities, to the detriment of public health. ...acoustic engineers...acknowledge that predicting acoustic radiation from wind turbines is imprecise....the UK government continues to foster self-regulation by the ...industry...with inadequate standards of protection from environmental noise pollution from neighbouring families.'* **The State Government of Victoria, Australia has increased setback to a minimum of 2km from homes** and Japan has initiated epidemiological study of the impacts of wind turbines on people. There are **potential human rights violations by governments** (UK specifically) in view of awareness of the wind turbines noise guidance.

**Standards merely aim to prevent severe annoyance** - Hanning (2010), Hayes (2007) notes that the intent of NZ Standard 6808 is not inaudibility but prevention of severe annoyance which, he concedes, occurs at 40dB(A) L95. Thorne (2010c) concludes, from his analysis of noise complaints, that unreasonable noise occurs at above 30dB(A) LA90 in the presence of excess amplitude modulation and, with van den Berg states 'annoyance and loss of amenity will be protected when the wind turbine noise limit would be 30dBA L95 in conditions of low wind speed at the dwellings and modulations restricted to 3dB. ETSU-R-97 night-time noise limits are too high to protect receptors from severe annoyance and sleep disturbance - a level of 35dB(A) LA90 is appropriate in the absence of excessive modulation.

**Impact of infrasound within dwellings** - M.A. Swinbanks at 6th International Meeting on WT Noise Glasgow 20-23 April 2015 (appended by 3rd party observer) - upwind WT can sometimes give rise to impulsive low frequency infrasound, but perception of same can be suppressed by effect of wind-induced airflow over ears when exposed to outside breezy conditions. The effects within a residence are much more readily perceptible and cannot be ignored, with severe direct health effects experienced where no such adverse effects were anticipated.

#### **FURTHER INFORMATION OBSERVATIONS**

Did not address issue of WHO recommended maximum year-round outside night-time noise in Europe of an average of 40dB to avoid sleep disturbance and related ill health. The background noise in the rural area is c.<30dB (indicated by Keith Longtin of GE Renewable Energy) and is likely to be exceeded within 1600m.

FI response submits that the level of **infrasound** is lower than people would normally be exposed to in urban environments. It is **not lower than normal exposure level in a rural environment**. Cumulative impact should be considered



Further to applicant's response (p.251) addressing concerns raised in report of Acoustic Consultant, Dick Bowdler, **the noise assessment methodology does not comply with the WEG 2006 or the Institute of Acoustics Good Practice Guide**, i.e. that the method of assessing turbine noise is that baseline background noise measurements are made and plotted against wind speed; turbine noise levels are calculated and the two are compared. WEG '*Noise limits should be applied to external locations, and should reflect the variation in both turbine source noise and background noise with wind speed.*'

**Acoustic Consultant, Dick Bowdler**, submits that the **noise assessment does not accord with the EIS Guidelines** as the methodology could not be scrutinised as they were not available, is incomplete (90%) information omitted) and the public were not made fully aware of the environmental impacts.

**Baseline measurements & noise limits** - An average of 17 days noise monitoring does not appear to have been done for each location. No description of non-proprietary windscreen is provided contrary to IOAGPG. Use of 10m mast for wind speed measurements is contrary to IOAGPG (s.2.6.5) which suggest that a tall met mast or deployment of SODAR or LIDAR system is justified for larger scale development - accuracy of baseline noise graphs are therefore questionable. At monitoring point L02, it is not clear whether noise levels dropped below 30dB or not as analysis not provided (applicant states they '*were not considered to drop below...30dBL<sub>90</sub>*' (p.8 FIR). Considers the fact that no directional filtering was carried out at Windmill, Derrybrennan, Drehid-Hortland or Cloncumber (p.208 FIR) to be unjustified and has not been supported by trial filtering (e.g. DR4 at Kilmurray is c.3km from M4) - if filtering shows the level is significantly lower, this would completely change the assessment (Bowdler).

**Turbine noise** - Calculations appear to comply with good practice except that App.E11 does not state wind speed at which turbine noise is quoted. Turbine noise varies with wind speed, as does background level and consequent limits. The tables or graphs required to enable comparison between turbine noise, background noise and limits are not provided (Bowdler).

**Assessment** - The baseline measurements are not used in the assessment except in a simplistic way in the Cloncumber houses. Fixed limits used instead. WEG 2006 indicates there should be no significant increase in ambient noise. As ambient noise varies with wind speed, it is essential that graphs or tables are provided for comparison. As set out in Sn.6.4.2.1 of EIS - turbine noise graph has to be shifted to the left and this effect cannot be verified without such graphs and tables (Bowdler).

**Mitigation** - The turbines are designed to operate just within the limit. If the turbines had been designed to meet the limits without reduced mode, then only residents downwind would only be affected by noise when close to the noise limit. The mitigation approach results in residences being subject to noise at the limit in a greater range of wind directions and a greater range of wind speeds, with no respite from certain wind directions. Need for such mitigation (1033 properties form part of consideration of such measures) demonstrates the wind farm is too large or in the wrong place (Bowdler).

Sn.6.7 EIS states '*It should be noted that whilst turbine and construction noise levels can meet the proposed noise limits, this compliance does not necessarily strictly provide an indication of the potential significance of a noise impact and does not demonstrate that the potential wind turbines will be inaudible*'. **No assessment of the impact of noise of the scheme on people**, contrary to requirement of EIS. Not possible to judge whether the noise section of the EIS is correct or wrong, only that it is inadequate in terms of guidance, good practice and EIS regulations (Bowdler).

**Review by Mr Doug Sharp of Sharp Acoustics LLp (SAL)** re the applicant's response that research into amplitude modulation is still on-going and it would therefore be premature to attach a condition to control excessive AM noise, but that turbine management systems could be used to mitigate same if it proved excessive. **AM noise is** a real cause for concern and is **probably the most potentially disturbing aspect of wind farm noise** and that such conditions have been agreed for WFs in Wales.

The applicant does not address the issue of proposed **construction noise limits being too high** (SAL)

The applicant misstates the appellant's original submission. SAL **does not agree that a daytime limit of LA90 = 45dB is appropriate** or stringent enough to protect residential amenities in a quiet rural area (SAL).

Appendix E8 shows that at lower wind speeds there is a substantial difference between background sound level regression line and the applicants proposed limit which indicates **a significant noise impact, not acceptable for other noise sources** (day or night limit) (SAL).

Although the impacts were described in the EIS, the **noise levels were not provided in a way that allowed proper assessment** (SAL).

## SHADOW FLICKER

### Impacts of concern

**Adverse impact of shadow flicker** - nuisance, health and safety impacts, impact on residential amenities, the amenities of the area, including villages, roads and public spaces and business premises and impacts on external areas and external activities including residential, work including and leisure spaces. Concern for potential severe disturbance and serious injury to residential amenities.

**Severity of shadow flicker** - like a high powered light switched on/off; will occur in in sun and strong moonlight. E.g. house of Mr Philip Hickey, Ballindaggin, Co.Wexford 370m from 120m high WT reported to the Irish Independent (2014) hit by SF from October to February, 'like strobe lighting'.

**Extent of shadow flicker impact** – scale and number of turbines in proximity to almost 1000no. dwellings within 10 rotor diameters would inevitably result in unacceptable impacts with respect to shadow flicker.

**Impact on agriculture and equine industry** - no account take of impact on open countryside and livestock and wildlife. Risk to horses and riders when startled.

**Impact on traffic safety** - impact on roads and drivers (note traffic tab)

**Impact on particular business premises** - particular concerns raised by Schram Plants, Rentes Plants, Longwood crèche.

**Impact on epilepsy** - can trigger epileptic fits particularly where multiple turbines are in operation (frequencies of 2.5Hz). 2 cases reported to UK authorities in 2007; Risk of 2.5Hz frequency being reached is increasing with scale and extent of wind turbines.

**Impact on stress** - shadow flicker and stress impact (Pohle et al 2000 study) - exposure of even 60 minute duration can cause stress reaction.

**Impact on sleep** - an issue for shift-workers who need to sleep during daylight hours.

**Whole property issue** – nuisance to view-shed of residential property.

### Policy / guidelines

**WEG 2006** - shadow flicker is a concern within 10 rotor diameters. Setback is best way to mitigated impact, as defined by P-WIN6 Setback need to be closer to 2000m / 2km from homes given increase in scale of turbines. WEG 2006 provides that it not exceed 30 hours p.a. and 30 minutes p.d. for properties within 500m (section 5.12).

**Other jurisdictions** - 30 hours shadow flicker per annum is excessive; occurs

indoors and outdoors (Minnesota Department of Health, 2009)

WEG 2006 does not take account of **moon shadow flicker**.

### **Shadow Flicker Assessment**

**Single turbine assessment only** - provided **no cumulative impact assessment** of turbines on each residence, but only the impact of the nearest wind turbine.

Assessment **confined to theoretical analysis** (chapter 12 of EIS) - inappropriate given proximity of turbines to 1000 homes within 10R diameter. Lack of factual studies. **Impacts are uncertain**.

**Omission of key information (EIS deficient)** - i) building co-ordinates , ii) specific shadow flicker data for each Turbine, iii) start/end times and dates of shadow flicker at each building, iv) the number of days per annum when shadow flicker would exceed 30 minutes/day for each building. The calculations cannot therefore be independently verified. **Relies on inappropriate assumptions** - assessment only of properties where the annual shadow flicker results exceed 30hours/p.a. **based on 31% sunshine (assumption not provided for under WEG 2006 or European Guidance)** and the maximum daily criteria of 30min has not been considered adequately. **Extent of breach of WEG 2006** - 528 buildings potentially experience  $\geq 30$ mins SF for  $\geq 1$  day, 389 buildings potentially experience  $> 30$  hours/p.a, 553 buildings predicted to breach one of metrics and 719 buildings determined to be potentially at risk of some SF impacts. **Environmental impacts - No discussion of actual environmental impacts** of shadow flicker in terms of time of day/ number of days impacts would occur, and **no verifiable quantification of the loss of renewable output due to mitigation** measures proposed.

**Description / presentation of impacts** - KCC committee submitted to RWEF consultations that **solar projection and scattering models** should be used to demonstrate how shadow flicker will occur and how it will be prevented at existing dwellings or other affected properties within 10 R diameter of wind turbines

**Disputes shadow flicker prediction** - Those living on east-west axis between the two clusters will get shadow flicker twice a day, receiving more than 30 hours/p.a. or 30 minutes/p.d. and are at greatest risk.

**Concern about specific predicted impacts** - 9no. Buildings surrounding WT30 will exceed WEG of 30h.p.a SF (697-663, 733 & 878); 130 out of 280 homes in Drehid would experience more than 30 minutes; 110 out of 260 homes in Hortland would experience more than 30 minutes - not 17 houses; 9no. Buildings surrounding WT30 will exceed WEG of 30h.p.a SF (697-663, 733 & 878)

## Mitigation measures

**Mitigation measures inadequate** - do not take into account revised shadow flicker guidelines. Proposal to turn off turbines **not realistic, feasible, workable or enforceable**, particularly as Element Power have committed to ownership up to point of generation only and cannot commit to the implementation of mitigation after that. Potential impacts of shadow flicker and proposed mitigation measures poorly communicated to the community.

**Best way of ameliorating shadow flicker** is to ensure an adequate set back distance from homes and outdoor work spaces, which should be at least 10 RD; proposed setback inadequate

**500m setback not appropriate for the flat landscape** of Co. Kildare compared to upland areas. The open landscape provides no protection from the effects of noise and shadow flicker

## FURTHER INFORMATION OBSERVATIONS

Inadequate response.

Shadow Flicker FI response - review by Dr. Lee Moroney of UK Renewable Energy Foundation on behalf of Donadea Against Turbines (Submission No. 43A, Appendix C) - provides more information but not all highlighted as omitted in the original observation and the information does not resolve original concerns. The shadow flicker impacts are dire compared to other sites, if the applicant's calculations are correct.

The wording of the 'commitment' to provide shadow flicker mitigation is such that it provides wriggle room to avoid meaningful mitigation (p.76 & p.248 refer) and may limit that commitment only to buildings within 500m. Developing an automatic system not to exceed 30m.p.d and 30h.p.a for dwellings affected would imply that actual minutes and hours of shadow flicker would be monitored for each dwelling and the turbines turned off when the level is exceeded - this would not be possible and differs from common 'timing' methods. Section 3.2.5 suggests that the applicant do not want a shadow flicker condition and the planning condition proposed by the applicant would not mitigate all buildings from shadow flicker.

## HEALTH and SAFETY IMPACTS

**Health impacts not adequately considered** - Given the scale of the development in proximity to housing, health impact must be considered, with particular reference to adverse health impacts arising from noise, shadow flicker, nuisance and etc.

**Health impacts not adequately understood** – No research carried out by the Department of Health on potential health impact. Given the scale of the

development in proximity to housing, health impact must be considered, or suspended until further research carried out to provide certainty on the potential health impacts.

**Premature** – Pending review of actual performance of existing wind farms in Ireland in respect of health impacts, safety, noise, infrastructure, sleep disruption, etc.,.

**Wind turbine noise and sleep disturbance and consequential health and quality of life impacts** – Turbines cause sleep disturbance (not conducive to healthy lifestyle), headaches and irritability and have effects on short-term memory, concentration, maths, reading and multi-tasking, etc., (e.g. - Dr Martin Shain 2001 and others). The majority of objectors have raised concern about the potential sleep disturbance from noise, having regard to proposed separation distance.

**Wind turbine noise and sleep disturbance and consequential health and quality of life impacts** – People who experience noise-induced sleep disturbance are at greater risk of suffering depression, migraines and high blood pressure (WHO 2004).

**Wind turbine noise, sleep disturbance and consequential health and quality of life impacts** – The WHO '*Noise facts and figures*' (December 2012) - noise is an underestimated threat and can cause sleep disturbance, cardiovascular effects, poor school performance, etc., affecting some groups, such as children, more than others, on whom it can have lifelong effects through academic performance (e.g. of study of chronic exposure to aircraft noise. The WHO recognises sleep disturbance as one of the major health concerns of the 20th C.

**Wind turbine noise impacts** – The WHO training package '*Children and Noise*' notes vulnerable groups (e.g. foetuses, children with dyslexic) and the potential for direct effects (ear damage) and indirect effects (physiological and psychological damage).

**Wind turbine noise and health impacts** - Above 40 decibels '*Adverse health effects are observed*' (WHO 2009 '*Night Noise Level Guidelines for Europe*'). WHO **definition of 'health'** - '*a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity*' and '*the extent to which an individual or a group is able, on the one hand, to realize aspirations and to satisfy needs and on the other, to change or cope with the environment*' (1999)

**WHO 1999 guidelines for community noise** - 30dBLAeq indoors necessary to avoid negative effects on sleep, with lower limit preferred for sensitive people, but special attention to be given to sources with low frequency components as disturbances can occur even though sound levels are below 30dB(A). Submits that LF noise diminishes at lower rate than HF noise.

**Wind turbine noise and health impacts** – According to National Institute of Health and The US Dept., Health and Human resources, wind turbines will

undoubtedly create noise, which **increases stress and in turn increases risk of cardiovascular disease and cancer.**

**Uncertainty of impacts** - Germany's medical profession has called for its leaders to support a halt to further wind farm development near housing until more research undertaken into the possible **health impacts of low-frequency noise** from WTs; Australian Senate has called for inquiry into wind project health impacts

**Infringement of constitutional rights** - right to health and bodily integrity under Articles 40-44 of Constitution, which obliges the state and its bodies to protect persona rights and unenumerated rights of the citizen in all circumstances. Impact of Wind turbine Syndrome. **Doctrine of Proportionality** - any impinging activity undertaken by state or its agents must be of sufficient importance to warrant overriding a constitutionally protected right.

**Noise assessment** – **Dr Bob Thorne** of Society of Wind Vigilance submits that noise and sound character **analysis is meaningless if not linked to human perception and health impacts.**

**Wind turbine noise and consequential health impacts** - Studies show wind turbine noise / infrasound causes or is linked to health complaints related to stress (depression, anxiety, headaches and sleep disorders).

**Noise / sound and health impacts** - Study of Manjil Windfarm Northern Iran by **Milad Abbasi** found health risks associated with sound

**Impact of shadow flicker on stress** – Stress and anxiety from wind farms may lead to increased suicide rate in vicinity.

### **Wind turbine syndrome**

The **Department of Health** has acknowledged the threat to human health from WF (30/10/14), listing symptoms described as '*sleep problems, headaches, dizziness, exhaustion, problems with concentration and learning and tinnitus*' (**Heagle et al., 2011**) and concludes '*there is a consistent cluster of symptoms relating to living in close proximity to wind turbines which occur in a number of people in the vicinity of industrial wind turbines....can be very debilitating*'. Also lessened ability to hear with background noise.

**Dr Bonner 2013 submission to RWE for Department of Health** - acknowledged, based on the Australian government's NHMRC review there is no reliable or consistent evidence to provide that wind farms cause adverse health effects, however she indicated (11/11/13) that there is a cluster of symptoms in people surrounding wind turbines referred to as wind turbine syndrome. Many recognised mental health problems listed in the DSM4 are a result of indirect experiences.

**Dr Nina Pierpoint**, John Hopkins University - '*Wind Turbine Syndrome*' and report '*Wind turbine Syndrome: A report on a Natural Experiment*' – WTS is caused by wind turbines with symptoms including sleep disturbance, headache, tinnitus, ear pressure, dizziness, vertigo, nausea, visual blurring, tachycardia, irritability, problems with concentration and memory and panic episodes (and, with respect to LFN, deceiving the body into thinking it is moving). '*it is irresponsible ... to continue to building wind turbines close to where people live until there is a proper epidemiological investigation on the full impact of human health.*'

**Alun Evans, Professor Emeritus** Belfast University, & **Christopher D. Hanning, Honorary Consultant in Sleep Medicine** (who discusses impacts on sleep up to 2km) - studies on sleep deprivation which reported that sleep deprived children more likely to become obese; impaired memory, impaired learning; sleep deprived adults at risk of heart attacks, heart failure, stroke, cognitive dysfunction and mental problems. Professor Evans identifies **loud noise in auditory range and low frequency noise**, particularly infrasound from wind turbines as **main culprit for sleep deprivation** and is a particular problem in quiet rural settings at night. He also determined that as turbines get bigger, so does the impact of infrasound and low frequency sound and that sleep disturbance and impaired health results from wind turbines at distances and external noise limits permitted in most jurisdictions.

**Impact of noise and infrasound on health and mental health** - Studies by Alun Evans (QUB) and Dr Chris Hanning on sleep deprivation (WF likely to disturb sleep) which reported that sleep deprived children more likely to become obese; impaired memory, impaired learning; sleep deprived adults at risk of heart attacks, heart failure, stroke, cognitive dysfunction and mental problems. E.g. UN Committee against torture identified prolonged sleep deprivation as a method of torture resulting in impaired memory and cognitive functioning, hallucinations, psychosis, etc. Hanning recommends 2km setback from WT of 125m+ to avoid non-noise impacts from air-pressure variations (refer to Alun Evans & Chris Hanning - British Medical Journal April 2012).

**Prof Alun Evans** submits that wind turbine syndrome is real and that it also **includes impact from shadow flicker and from stress** related to being unable to sell your home due to WTs. He calls for further proper evaluation and monitoring and for the government to carry out a full economic appraisal of wind turbines.

UN Committee Against Torture (CAT) highlights the **impact of sleep deprivation.**

**Infrasound and scale of turbines** - Prof Alun Evans (Epidemiology) states that as turbines get bigger, so does the impact on infrasound and low frequency sounds



**Impact of night-time noise on health** - Submission to Australian Senate Select Committee on Wind Turbines (February 2015) from Profession Emeritus Alun Evans (submission no.80 - copy appended to 3rd party observation) - **WHO recognises night-time noise as one of the major public health concerns**; case control study found those living were sleepier and had lower mental component scores compared to those outside 1.4km; in systematic review of 154 published studies, all 18 relevant studies on association of WT and human distress found levels of evidence of 4 and 5 (Bradford Hill Criteria) and a dose response relationship between distance and distress; the sleep deprived are vulnerable to variety of health problems and chronic diseases; associated with increased bodyweight in children (predisposing them to adult disease); associated with increased risk of road traffic accidents and accidents operating machinery. International consensus emerging for separation distance of 2km, with some opting for 3km.

**Impact of night-time noise on health** - Wind Turbine Noise (British Medical Journal 2012) '...large body of evidence...WT disturb sleep and impair health at distance and noise levels...permitted in most jurisdictions...'.

**Setback distances for mitigation** - Dr Chris Hanning submission (no.55 - copy appended to 3rd party observation) to Australian Senate Select Committee on Wind Turbines (Feb 2015) - Safe setback for larger turbines must be at least 5km and maybe 10Km in some circumstances. Has no doubt that WT noise has adverse effects on sleep and health at the distances permitted by Australian regulations

**Issues of equity / inequity** - Krogh & Horner (2012) Open Letter Peer Review, Health Canada Wind Turbine Noise and Health Study - issue of inequity between those would agree and are compensated for ill effects and those who are not; Hansard (2009, Apr 15) ' Standing Committee on Green Energy and Green Economy Act' - adverse effects on children.

**Impact of wind turbines on health** - '*Consequences of Wind Energy for Health*' (German Federal Environmental Agency (Umweltbundesamt), 2013) - recognised that annoyance and sleep disturbance cannot be ruled out and HIA is needed to evaluate systematically the direct and indirect risks as well as benefits of substitution of fossil fuel with WE [note - Is this is SEA related to German WE policy document?]. It noted that noise emissions are comparatively very low, but that, based on existing scientific reports, noise nuisance and sleep disturbance cannot be dismissed; and that studies point to comparatively high nuisance potential even at low levels from WFs but the causes are yet unclear. Further studies of impact on sleep would be helpful.

**Dr Amanda Harry** - '*Wind Turbines, Noise & Health*' – '*evident that there are people living near wind turbines genuinely suffering from health effects from noise produced by wind turbines ... developers say noise is not a problem. Clearly this*

cannot be the case'.

**Stansfeld & Matheson Study 2003** - children in general are particularly vulnerable to non-auditory (infrasound) effects of noise. "In view of the fact that children are still developing both physically and cognitively, there is a possible risk that exposure to an environmental stressor such as noise may have an irreversible negative consequence for this group.

**Frey, BJ and Hadden, PJ** – '*Noise radiation from wind turbines*' (2012) - conclusive evidence that turbines built in close proximity to houses results in serious health impacts. Reliance on advice/analysis from acoustic engineers from the wind industry has led to inadequate standards for the protection of public health from environmental noise from wind turbines. Also refers to Victoria State Government (Australia) which has increased setback distances to 2km from homes and to Japanese study on impacts

**N.D. Kelley (1987)** - Standard A-weighted measure for sound was not an adequate indicator of annoyance when low frequencies are dominant. Confirmed in a later article in The Australian (9/07/13) - modern industry noise testing regulations specifically designed to exclude testing inside buildings and the modern regulations do not concentrate on low frequency noise

**German Federal Environment Agency** - high nuisance from infrasound associated with wind turbines acknowledged - cannot dismiss nuisance and sleep disturbance from this type of noise.

**Pohl et al, University of Kiel** - Lab study completed by Pohl et al 2000, University of Kiel, stated even a one-off exposure to 60 min. duration can cause stress reaction.

**University of Southern Denmark** - Jesper Hvass Schmidt, Institute of Clinical Research & Mads Klokke Copenhagen University - noise, both audible and Low Frequency, will have an adverse impact on our health.

### **Infrasound and health impacts**

**Nature of infrasound and health impacts - Alec N. Salt PhD of Cochlear Fluids Research Laboratory**, Washington University '*Wind turbines can be hazardous to Human Health*' – Low frequency sound, generated when wind drives wind turbines, is turbulent but dependent on a number of factors including the presence of nearby turbines (increasing the when the wake from one turbine enters the blades of another). Infrasound is believed to cause certain breathing and digestive problems and is primary cause for WTS.

**Hearing impacts - Drexel (2014)** found that living close to wind farms may lead to

severe hearing damage or even deafness caused by low frequency noise [LFN / infrasound]. Found the physical composition of the inner ear was 'drastically' altered following exposure to LFN like that emitted by WTs.

**Physiological response** - Research by **Salt & de Mott (1999) and Salt & Lichtenhan (2013)** found that experimental measurements showed robust electrical responses from the cochlea in response to infrasound.

**Waubra Foundation** - Turbines generate vibrations even when shut down. Periodic pressure pulses are created by each blade passing the upright supporting pylon and the effect of these **energy pulses** on people living near them is "like living inside a drum". **Larger turbines produce a greater proportion of their noise as low frequency/infrasound which is exacerbated by wake interference.**

Scientific **evidence suggests that some parts of the human body may be sensitive to LFN.**

#### **Research findings on health related quality of life impacts**

**Impact of noise on sleep and mood** - **Dr Michael Nissenbaum** study found adverse effect of noise on sleep and mood within 5km, decreasing with increasing distance; studies show changes in people living within 5km.

**Wind turbine noise and annoyance / quality of life** - *'The effect of wind turbine noise on sleep and quality of life: a systematic review and meta-analysis of observational studies'* (Onakpoyaa et al, April 2013) - found annoyance and sleep disturbance increased by wind turbines and quality of life reduced. Advised that community preferences should be a priority during construction, and that objective outcome-measures, which separate auditory and visual effects of wind turbines, be developed.

**Wind turbine noise and annoyance / quality of life** - Several studies (peer reviewed) document wind turbine impact on reduced sleep quality and / or sleep disturbance and / or lower quality of life –

Krogh, CME 2011 *'Industrial Wind Turbine Development and Loss of Social Justice?'*, Bulletin of Science Technology & Society 30(1) 31:321;

Krogh CME, Gillis L, Kouwen N & Aramini J (2011) *'Windvoice, a self-reporting survey: adverse Health Effects, Industrial Wind Turbines and the Need for Vigilance Monitoring'* Bulletin of ST&S (2011) 31:334;

Shepherd D, McBride D, Welch D, Dirks KN, Hill EM, *'Evaluating the impact of wind turbine noise on health-related quality of life'* (2011) Noise Health 13@3333-9;

Nissenbaum Michael A, Aramini Jeffrey J, Hanning C (July 24-28 2011) *'Adverse health effects of industrial wind turbines: a preliminary report 10th International*

Congress on Noise as a Public Health Problem' (ICBEN) 2011;

Nissenbaum Michael A, Aramini Jeffrey J, Hanning Christopher D, 'The effects of industrial wind turbine noise on sleep and health', Noise & Health, September - October 2012, vol.14 p.243

**Wind turbine noise and annoyance / quality of life** - US study of wind farms found those living within 375-1400m of a wind turbine reported worse sleep, more daytime sleepiness and had lower summary scores on mental component of health survey, than those living 3-6.6km. Supported by modelled dose-response curve for sleep & health against distance controlled for age, sex, and housing clustering, with show an increase in effects between 1-2km.

**Wind turbine noise and annoyance / quality of life** - New Zealand survey found lower health related quality of life, especially sleep disturbance, in people who lived <2km from a wind turbine.

**Wind turbine noise and annoyance / quality of life** - Controlled clinical study (no reference given) found residents within 1.4km exhibited greater sleep disturbance and poorer mental health than those living greater than 3.3km away and correlated well with noise exposure levels. Another study found lower quality of life in residents living within 2km of turbine installation than those more distant.

**Wind turbine noise and annoyance and morbidity** - Niemann H, Bonnefoy X, Braubach M, Hecht K, Maschke C, Rodrigues C, Robell N., 'Noise-induced annoyance and morbidity results from Pan European LARES study, Noise Health, 2006 Apr/Jun 8(31):(63-79) – found increased risk of illness in children, with evidence that noise-induced annoyance effects respiratory which does not seem to be caused primarily by pollutants but rather, as the results for neighbourhood noise demonstrate, by emotional stress.

**Minimum separation distance** - Japanese researcher Yano 'Wind Noise' assessing severity of annoyance on residents in 750 homes - determined that a minimum of 1.5km separation distance is required to minimise severe annoyance. Current larger turbines require a correspondingly greater setback.

### **Health impacts on people with pre-existing conditions**

**Noise impact** – Noise and LFN may impact on (and cause distress) to people with **autism** or any neuro-development disorder, those with special needs, ADHD or ADD who may be unable to filter noises. **People with such conditions may exhibit pain and panic reactions related to sound.** Will result in loss of quality of life, difficulty concentrating, and also increased aggression.

**Noise impact** - Noise and LFN may impact on (and cause distress) to people with **cochlear implants** or with **hearing aids** and those who have suffered various conditions, including **strokes**, which leave them particularly sensitive to noise.

**Noise impact** - People with **sensory processing difficulties** (hyper or hypo-sensitivity) experience pain and discomfort related to exposure and overstimulation of vestibular sensory system due to change frequency of noise and vibrations created by turbines as they spin. There has been no assessment of impact on people with hearing loss.

**Noise impact** – Concern that children with pre-existing medical conditions, including those with autistic spectrum disorders, are at increased risks of adverse effects. Gilboad T. Epilspia 2011 Dec 9 '*Emotional Stress induced seizures: Another reflex epilepsy (asthma, migraine, bronchitis and epilepsy)*' - vulnerability to effects of noise and / or sleep disturbance and stress.

**Shadow flicker impact** – Concern that children with pre-existing medical conditions, including those with autistic spectrum disorders, are at increased risks of adverse effects. Cristina Becchio, Morena Mari, Umberto Castiello (2010) '*Perception of Shadows in Children with Autism Spectrum Disorders*' PloS One, May 2010, vol5 e10582. **Autistic spectrum** children can fixate on spinning items and may be impacted, disproportionately so, by shadow flicker.

**Extent of impact** - Professors Anthony Staines (UCD) Research found that 1:100 people are Ireland diagnosed with autism. The impact of noise and infrasound, which can cause sense of panic, and the impact of spinning blades, which can cause a change in light as well as vibrations resulting in inner ear problems, to those with autism. The impact would therefore extensive given that there are c.1000 dwellings within 10 R diameter distance of a proposed wind turbine.

**Impact on autistic / special needs facilities** - Dunfirth Farm / Dunfiarth House run by the Irish society for Autism is 1.75km north of T11 and caters 34 persons with autism. Special needs unit between Knockanally and Johnstown bridge. Autism centre in Enfield. ISAC residential home and school within 1.5km of Drehid cluster. No assessment of impacts on those facilities has been carried out.

**Impact on autistic / special needs facilities** - Blossoms Pre-School, catering for children with special needs, located close to the turbines [possibly T11]. Clocha' Rince N.S. hosts an ASD, with 12 children enrolled and 6 on a waiting list.

**Impact on autistic / special needs facilities** – Kilshanroe School accommodates a number of students with sensory difficulties.

**Impact on autistic / special needs people in the community** - Impact on families within vicinity who have autistic family members living within them / visiting. Risk to individual's within the vicinity, including children, who are suffering from brain injury, from such brain injury being triggered in fatal way from noise and / or shadow flicker due to proximity, according to opinion of medical team caring for one individual

**Health impacts are contrary to the rights of disable people and of children** - Ireland is signatory to **UN Convention on the Rights of Persons with Disabilities** (UNCRPD) 2006, 'to promote, protect and ensure full and equal enjoyment of all human rights and fundamental freedoms by all persons with disabilities and to promote respect, for their inherent dignity'. A.16(1) requires state to 'take all appropriate legislative administrative, social, educational and other measures to protect persons with disabilities both within and outside the home, from all forms of exploitation, violence and abuse'.

Ireland has ratified **UN Convention on the Rights of the Child** which states "childhood is entitled to special care and assistance".

**Health impact assessment** – Given the extent of potential adverse health impacts relating to those with autistic spectrum disorders, in particular, the precautionary principle should be applied and **health impact assessment** (HIA) carried out. The WHO states 'HIA is a means of assessing the health impacts of policies, plans and projects in diverse economic sectors using quantitative, qualitative and participatory techniques..[and] helps decision-makers make choices about alternatives and improvements to prevent disease/injury and to actively promote health. WHO supports tools and initiative in HIA to dynamically improve health and well-being across sectors.'

**Precedence for refusal on grounds of impacts on those with autistic spectrum disorders** - UK inspectors and planning authorities have been sufficiently convinced of effects of wind turbines on children with autistic spectrum disorders to refuse permission for several wind energy facilities (no examples given). Wind energy facility rejected in UK in 2010 due to the serious effect it would have on twin boys living nearby with autism. Similar case in Aberdeenshire, Scotland in 2011.

#### **Other health impacts (including indirect effects)**

**Impact of electromagnetic fields** - Health risk impact of electromagnetic fields of 220 cables and / or of wind turbines not adequately addressed.

**Risk of groundwater contamination** - Potential impact on groundwater through contamination with risk to human health, business enterprises, etc.

**Long-term indirect impacts** - traffic impacts may make it too dangerous to walk / cycle resulting in obesity and health problems

**Long-term indirect impacts from spread of disease** - Impact of dead birds (from collision with WTs) which are a serious source of salmonella, e-coli and botulism, posing a threat to community at Longwood c.1200m away from being carried on the prevailing winds or through contamination of the aquifer, impacting on source of local water bottling plant.

**Long term indirect impacts** – Impact of operational dust from the on-going generation of electricity in the cluster adjacent cutaway bog, and exhaust emissions not assessment in EIS.

**Safety risk - structural and ice issues**

**Safety risk** - According to Occupational Safety and Health in Wind Sector, European Risk Observatory Report, operational issues associated with wind turbines include **tower collapse, blade failure, fire, lightning strike, ice-throw / ice-fall** from blades can be extremely dangerous (Morgan et al., 1998; Harsh Weather Testing Network, 2012; Sieffert et al., 2003)

**Safety risk from structural failure, blade failure and blade throw** - evidence of blade throw up to 1.3km in Germany. Blade detached at WF at Tursilage/Turslliagh (near Tralee) in January 2015; a collapse at Screggagh and Fintona wind farms in Co.Tyrone; claims of similar in Donegal and Cork (note - articles appended to observation); in 2011 Renewable UK admitted there had been 1500 reported incidents with WT in UK in previous 5 years resulting in death and serious injury; 28.05.09 a wind turbine blade landed on a highway at 5.30pm rush hour, possibly after being struck by. EIS does not address these and other health and safety impacts.

**Safety risk from ice-throw** - project developers often represent that ice-throw as unlikely. Iberdrola renewables made such a claim in 2010 for Groton Wind Facility, New Hampshire, but the 2015 Iberdrola Emergency Plan for employees state '*shedding ice may be thrown a significant distance as a result of the rotor spinning or wind blowing ice fragments*'. Ice accumulation and ice-throw of several hundred meters may occur under the right conditions (Wahl & Gigure, 2006). Reports claims that risks are low are not unbiased and are in the interest of the developer. An independent report should be commissioned

**Fire safety risk** - risk of blade failure debris **setting fire to bogs, woods, or surrounding residences** or to the **Drehid landfill** (360,000 tons p.a., with its gas emissions burnt off evidence of its combustible nature) not considered. **No emergency response protocol** provided for fires, and **no major emergency management plan**.

**Risk to raised canal structure and/or railway** (near Longwood) - threat from blade failure or structural collapse or through vibration. Drawings do not show rail and canal clearly (LE1473104-003 sheet-2) within 500m of T1, T2, T7 & T8; also risk to public road

**Safety risk assessment needed** - According to William Palmer, utility reliability engineer analysing public safety at nuclear facility in Ontario, Canada, a 'deterministic risk assessment' provides a more accurate understanding of risk and

necessary mitigation measures. This assumes a person is permanently standing at the limit of risk (edge of safety zone) during accident and therefore risk of being hurt is high ([www.windaction.org/posts/40729-wind-setbacks-safety-first-unless-you-re-a-wind-developer#.VWtjwPIViko](http://www.windaction.org/posts/40729-wind-setbacks-safety-first-unless-you-re-a-wind-developer#.VWtjwPIViko)). The principle of deterministic risk should be used.

**Traffic safety issues** – Driver distraction on M4 and road network and from risks associated with construction, including cabling works, haulage traffic and turbine deliveries on substandard rural network.

**Aviation safety** – Risk of collision with helicopters and light planes in proximity to housing.

### **Safety risks – specific risk to explosives factory**

**Safety risk to Irish Industrial Explosives factory** - WT45 is within 500m of a **SEVESO site**. The **Health and Safety Authority has not been notified** and there has been **no analysis of the potential interaction with the SEVESO site**.

**Safety risk to Irish Explosives factory** - Windfarm sited 500m from Irish Industrial Explosives plant at Cloonagh and the potential for flying debris interacting with the premises could have disastrous effects.

**Safety risk to Irish Explosives factory from power surges** - Yuki Tsuruta demonstrated in Japan will not drink from metal containers or walk on metal grids due to power surges caused by wind turbines. All areas of the explosives factories are earthed to avoid risk from power surges to detonator and etc., which are very volatile. However detonators and etc. are not earthed when in transport. **The risk arising from power surges has not been considered by the developer.**

### **Separation distance**

**500m separation distance from turbine to residence is inadequate** - implemented by some County Councils, but varies between counties in Ireland and there is no clear minimum distance set. The French Académie Nationale De Médecine report deplored the lack of studies to inform minimum acoustic safety distance and minimum safety distance in general.

**10 R diameter minimum distance** - Wind Energy Development Guidelines Target revision 12/12/13 - default 10 x base to tip height is very least separation distance required based on findings of Dr Chris Hanning and by Yano.

**1500m separate distance** - The Irish Doctors Association have stated that 500m is not enough and that at least 1500m required.



**10 rotor diameter setback** from houses, rail, roads and schools is necessary for safety.

**Safe setback distance** - Leading Wind Turbine manufacturers, Vestas, recommend that workers stay 400m from WT whenever possible for health and safety reasons. Concern about impact on farmers whose lands are within this separation distance. Failure of WT operator to recognise their true responsibility towards others to whom the WF will pose health and safety threat (NOTE - Economy tab also)

**Safe setback distance** - There is no research to inform a safety setback distance.

**Separation distance from residences** - The majority of objections are concerned with the proposed wind turbines being built too close to people's homes.

#### **FURTHER INFORMATION OBSERVATIONS**

**No health impact assessment** submitted, only a review of the literature by Dr Martin Hogan, an authority on HIA. Given the potential impact on over 1000 dwellings within 10 R diameters and the support of the WHO for HIA, a HIA should have been submitted.

**Steigler and Davis (2010)** study highlighted negative impact of wind turbines on children with **autism**

Study by **Howell et al (2015)** on noise impact on persons with **autism** claims that these vulnerable individuals are more affected than the general population.

**Castelo Branco & Alves-Pereira (2004)** - i) **Wind turbine syndrome** is mediated by the vestibular system - by disturbed sensory input to eyes, ears, inner ears and stretch and pressure receptors in a variety of body locations, feeding back neurologically into a person's sense of position and motion in space. Evidence suggests that the amplitude (power or intensity) of LFN and vibration needed to create these effects may be lower than the auditory threshold at the same low frequencies.

ii) **Vibroacoustic disease** - hypothesized as caused by direct tissue damage, thickening support structures and pathological damage to organs. Issue of 'dirty electricity' affecting health through 'high frequency transient spikes contribute to poor power quality' at Ripley, Ontario (Havas & Colling, 2011), including exacerbation of MS symptoms and blood sugar levels in diabetics (Havas, 2006) and increase risk of various cancers among teachers in Californian school (Milham & Morgan, 2008).

Will result in serious **breach of Safety, Health and Welfare Act** (part 5, section 8) obligations due to no fault of the employer Rentes Plants.

## SEVESO/COMAH FURTHER OBSERVATIONS

**Inequitable** in terms of time given for observers to address new issue. Role of Board is to adjudicate, not take sides by giving one-sided opportunities.

**Cumulative risk** of turbines and use of area by Irish Air Corps, which should be avoided through refusal of permission

**British HSE** document '*Study and development of a methodology for the estimation of the risk and harm to persons from wind turbines*'.

**Accidents (and risk) may be under-reported** - not obliged to fill in IR3 forms for reporting near misses to HSA

**Caithness Wind Farms Accident Report** advises on a cautious best estimate of risk to persons in the vicinity of wind turbines.

**Duty of care on state** to ensure HSA enforces the requirements of the Machinery Directive through market surveillance on all machinery regulated by the Directive.

**Requirements not fulfilled** - Dept. of Justice, Equality and Law Reform not listed by applicant on list of prescribed bodies to be notified.

The **Board is assisting the applicant to remedy a defect** in the application when it should be refused if flawed.

**Regulation 28** requires notice to be sent (2) as soon as may be after receipt of the application for relevant development. The reasonable period of time has elapsed and there is no means by which this fundamental flaw can be remedied and the Board has failed in its statutory obligation and cannot now grant permission.

**Regulation 137(3)(a)** requires that the notice sent by a planning authority under 137(1) shall issue within 3 weeks of receipt of the application. There is no discretionary period. This breach in planning procedure cannot be remedied and is a fundamental flaw.

Threat of **judicial review**.

## OTHER RESIDENTIAL AMENITY RELATED ISSUES

### Impact on property value

**Material reduction in property value** – value of people's homes, businesses and agricultural property. The Board is entitled to take account of consequential diminution of property value and would risk of legal liability if it fails to vindicate the constitutional property rights of the local community (State (Boyd) v Cork County Council [1930] IEHC8).

**Direct impacts on value** – direct **sterilisation** of lands due to setback required from turbines and from cables, and through **effective sterilisation** resulting from prevention of access to public road or services due to cable route. **Indirect impacts on** –increased cost imposed on property owners to insure property against increased flood risk. **Long term impact** - Abandoned and defunct systems will increase impact on landscape property devaluation.

Property rights are **protected under Art. 40.3.2 of the constitution** - *'The state shall, in particular, by its laws protect as best it may from unjust attack...[the] property rights of every citizen.'* (also a.43)

**Non-compensatable reason for refusal** - Reason No. 10c PDA 2000 relates to a structure/extension to a structure which would seriously injure the amenities or depreciate the value of property in the vicinity.

**Evidence from the UK** - indicates a reduction in value by up to 30% - 60% and has been acknowledged by the British Government, through reduced property related taxes on some homes (Davis 2008) due to devaluation by wind farms, and by UK Courts London **School of Economics** (2013) - house prices reduced in postcodes where turbines are visible relative to those where not visible, in the order of 12%.

**Evidence from the USA** - review of 11 previous US studies concluded properties within 2km lost between 25-40% value (McCann, 2013); LBNL report (2013) funded by US Department of ECNR claimed property-value effect of WF was likely to be small on average, if present at all, but its data found that homes within 1 mile of WT decreased by 28% comparative to those 3-10 miles distance (biased study implied). Mc Cann explains that many industry supported reports tended to play down the impact by pooling data from multiple diverse locations ... that conceal impacts.

**Evidence from elsewhere** - Denmark -compensation model based on its recognition of the issue; Australia - Victorian government accepts that windfarms affect property value); Germany - reduces property value of 9-11% in rural areas, with visibility having largest impact, (Sunak and Madler, (2013)).

**Contrary research findings** - Contrary research findings (i.e. those finding not adverse impact on property value) are funded by or linked to the Wind Industry. Misleading reports in Ireland where developers use entire counties as a basis for comparing property.

**Compensation** - The 'Near Neighbour Fund' will not adequately compensate for diminution of property values which are not properly explored in the EIS and are so vague as to be irrelevant.

<b>Extent of impacts</b>
<b>Residential density</b> - densely populated rural area with almost 1000 houses (994) within 10 rotor diameters of the proposed turbines; 618no. within 1km. Unprecedented development in an area of this residential density. 440 houses within 1.2km of Drehid/Hortland cluster, or 530no. within 10 R. 240 within 10 R in Hortland area. Donadea 18.5% population increase to 2006 and 10.5% increase to 2011 (CSO data). No longer rural.
<b>EIS is flawed</b> - it refers 618 houses rather than the 994 houses within 10 rotor diameters. It excludes Johnstown House Hotel (4km distant), Tirmonghan National School (3km), Johnstown GAA (3.5km) and Knockanally Golf Club (750m). Appendix R – many properties not included
<b>Depopulation</b> – will prevent planning permission for housing for local people and inward migrants, etc., resulting in depopulation / arresting of population growth and will displace existing population. Will prevent access to services and utilities along cable route. Consequently will prevent improvement of services and facilities dependent on minimum population further dissuading population growth.
<b>Impact on businesses</b> - may prevent future business development and expansion, including for tourism.
<b>Impact on villages</b> - sterilisation of Kilshanroe, a rural node. The entire village within 1km of a turbine.
<b>Impact on provision of facilities</b> - obstruct the provision of new school for Ballyna Parish and redevelopment or expansion of other schools, including at Longwood and Scoil Treasa, Kilshanroe.
<b>Overall residential amenity issues</b>
<b>Significant negative impact on quality of life</b> and residential amenity – visual intrusion, recreation and heritage, loss of peace and tranquillity, shadow flicker, noise and vibration, nuisance, sleep disturbance, operational dust and emissions to air, safety risks (e.g. ice throw, traffic impacts, etc.), and from the nature and significant scale of the development proposal which is incompatible with the high density of residential dwellings in the area.
<b>Mitigation</b> - a 500m buffer zone is inadequate (section 15.11.3 EIS).
<b>Impact on telecommunications</b> - adverse impact on television signals and security setups; internet; business / domestic satellite services reception.
<b>Cumulative impacts</b> - e.g. Drehid cluster area already accommodate landfill (cumulative impact), Mount Lucas wind farm.

**Community Gain/general community impact**

**Divisive and inequitable** - Some landowners gain financially, the rest of the community suffer adverse, resulting in splitting of the community and social fabric.

**Community gain** - Need for a more comprehensive and all-embracing approach to community gain based on models in other countries such as Denmark, Germany.

**Employment gain** - No gain to community unlike jobs from Bord Na Mona.

**Imbalanced assessment of community impacts** under sn.5.0 EIS, a **qualitative assessment** of community perceptions about development is an equally important ('*Community Guide to Development Impact Analysis*', Mary M. Edwards, 2000).

**Impact on community facilities** - Adverse impact on GAA pitches

**Precedence for revoking permission on grounds of impacts on communities** - revoked after a few years due to detrimental effect upon local communities in parts of France, Germany and Denmark.

**FURTHER INFORMATION OBSERVATIONS**

**Does not address the studies on property value impacts** cited by observers. The applicant's **examples do not take account of the unique rural characteristic** of the area concerned. The applicant's consultants do not operate in Kildare or Meath and their conclusions are disputed.

**Very selective response to issue of property devaluation**, deliberately excluding studies that were no peer reviewed, such as the London School of Economics study [by Stephen Gibbons (2014)]. Peer review is not a prerequisite to prove accuracy. Replicability of findings through repeatable methodology is what matters.

Response incorrectly asserts that the derelict building is over 500m from T47, when it is not more than 400m distant. **The applicant's figures cannot therefore be relied upon.**

**Danish study** on impact of wind turbines on house prices (Jordal-Jorgensen, 1996) reported that houses near single turbine were €2,174 cheaper than other houses in vicinity and that houses neat wind farms of 12 or more turbines were €12,614 cheaper (Sime et al., 2008).

Notwithstanding revised proposed grid connection point, the overall negative impact on residents over a wide area remains.

**Inadequately addresses residential amenity.** Does not include the Residential Amenity Assessment (prepared by FTC) and the Visual Amenity Assessment (carried out by AECOM) referred to in the response. **The RAA is lacking in its methodology and is dismissive of the issue as being subjective and nebulous.** The issues of residential amenity have previously been defined by the Board to include noise, shadow flicker, etc. (ref.03.PA0025 and PL02.243630).

Re Residential Amenity Assessment - **the visibility of 1-5 turbines at such a significant scale to be reasonable given their proximity.** A number of single

turbines have been refused on the basis of visual impact (e.g. **PL16.241598 and PL10.242559**) including on basis of visual dominance and impact on landscape character, which supports that the visual impact from even one turbine can be material.

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## PART B

### ASSESSMENT

The purpose of this report is to inform the assessment of Senior Planning Inspector, Mary Kennelly (First Inspector) on this Strategic Infrastructure Development Application, having regard to the remit issued to me, as Second Inspector, on 12/09/15, on the following issues:

- 1 Traffic and transport
- 2 Noise and vibration
- 3 Shadow flicker
- 4 Health and safety
- 5 Property value
- 6 Conclusion and recommendations

#### **1 Traffic and Transport:**

##### **1.0 Introduction**

- 1.0.1 The potential for adverse impacts on the physical road infrastructure from construction traffic is noted under section 7.18 (Development Contributions) of WEG, 2006. These may be considered indirect impacts. In this instance, potential for direct impacts on road infrastructure also arise from cable trenching works in the public road.
- 1.0.2 The issue of the adequacy of local access road network to facilitate construction of the project, including the transportation of large machinery and turbine parts to site are also noted under section 4.5 (General Considerations) of the guidelines. Direct impacts will occur where it is necessary for the network (and/or lands adjacent thereto) to be physically altered to accommodate turbine delivery, including the provision of new entrances from the public road. Indirect impacts may occur where the physical structure of the road is damaged during deliveries.
- 1.0.3 Indirect impacts may occur where road safety issues arise through the provision of new entrances, both during construction and during operation, where additional turning movements are generated at access points to the site, in addition to the risks associated with generated traffic, in particular HGV traffic, on the network during construction.
- 1.0.4 The applicant's assessment is contained in chapter 13 'Traffic and Transportation', EIS Vol.2, with supplementary data included in appendix K1-K3 and additional relevant information in chapter 2 of the EIS and in appendix D (Outline CEMP). Relevant further information is contained within the main document 'Response to Submissions' and in appendices 6 (Addendum to

CEMP), 14 (Geotechnical and Pavement Design), 21 (Structures Survey), 22 (Typical Entrance Photographs) and 24 (NRA Response Maps).

## 1.1 Physical impacts on road (and in-road) infrastructure

1.1.0 Description of physical works - The initial development proposal provided for the construction of up to 28km of High Voltage cable (operating up to 220kV) laying in public roads to provide for grid connection between the proposed substation at Drehid-Hortland and an existing substation, either at Woodland, Co. Meath (total length HV cable c.29km, of which c.28km would be within the public road) or Maynooth, Co. Kildare (total length of c.23km of which 17km would be within the public road). In response to concerns raised by Kildare County Council Transportation Department and numerous observers about the failure to include the proposed final grid connection as part of the application (many making reference to the judgement in the O’Grianna case), the applicant submitted revised proposals as further information. The current proposal provides for c.1.1km HV cable laying within public road (2.3km total length but balance is off-road), which would run within the L1004 from the proposed substation at Drehid-Hortland cluster east to the existing electricity substation to the south of the L1004 at Dunfiirth townland, which is the proposed point of connection to the national grid.

1.1.1 The provision of a grid connection in close proximity to the development is welcomed, however the applicant has not demonstrated that the substation is suitable and has the capacity to accommodate the proposed development. It is somewhat surprising that it was not included in initial application (or considered as an alternative) and one would be concerned that whatever reason previously ruled it out has not demonstrably been resolved. The applicant states *‘the Transmission System Operator [TSO], EirGrid plc, is currently processing a grid connection application in relation to the Maighne wind farm development’*, but it is not stated that any such application relates to the proposed substation at Dunfiirth and no copy of receipt of application or as to what it actually concerns has been submitted. I therefore consider there to remain some uncertainty in respect of the final grid connection.

1.1.2 The proposed Medium Voltage cable (operating up to 33kV) laying within the public road amounts to c.36km (of a total of c.75km MV underground cabling) necessary to connect each of the wind turbine clusters to the proposed substation at Drehid Hortland Cluster (west). The cable trenching details are set out in section 2.4.5 (chapter 2) of the EIS (this refers *‘typical cable trench detail’*), with the same cross sections illustrated in drawing LE1473104\_FIG\_008. The trench types are to comply with ESB specification



for 33kv cables (specifications for 38kv cable-laying will actually apply<sup>7</sup>) and for EirGrid requirements for 110kV or 220kV circuits. Two proposed trench options are shown in cross section in plate 2.1 (p.25/40) but are stated as relating to specifically to MV cables.

- 1.1.3 The first trench option is a 600mm wide with cable ducts laid in trefoil formation. The second is 1100mm wide to accommodate cable ducts in flat formation. The trenches would have a depth of 1250mm below road surface (inclusive of road surface layers), with depth of cover to the MV cable ducts generally 950mm, but a shallower depth may be used, for example, when crossing bridges with shallow cover<sup>8</sup>. Section 2.4.5.2 of the EIS states that cables are, in general, laid in a 'trefoil' formation but that an allowance has been made for 5km of flat formation. No explanation is given as to under what circumstances a flat formation would be required, rather than trefoil, and the total length of cabling referred to (in that section) is almost 5km short of the length actually proposed<sup>9</sup>. Failure to take account of the full length and width of cable trenches proposed in the public road has implications regarding the assessment of impacts on the road network and traffic, but also in terms of indirect impacts on human beings (extent and duration of noise, dust, disruption), air (dust), water.
- 1.1.4 I could find no details specifically for High Voltage cable trenches on file. The HV trench cross sections contained ESBI publication '*HV Cables – General Construction Methodology*' (report no. PE424-F7001-R00-001-001)<sup>10</sup> indicate that either the flat formation or trefoil arrangements are applicable to HV cables of up to 110kv, with flat arrangement only for 220kv<sup>11</sup>. According to the outline CEMP (Appendix D, EIS Vol.3) where there is more than one set of cables they will be separated as per cable manufacturers and ESB/EirGrid requirements, therefore creating greater potential for adverse impacts on the road structure and in terms of traffic disruption. Under the revised scheme there will be an overlap of 1.1km for MV and HV cables along the L1004 (c.4km in initial application), but the EIS does not appear to have any regard to same.

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<sup>7</sup> This document is available to view at <https://www.esbnetworks.ie/docs/default-source/publications/standard-specification-for-esb-38kv-networks-ducting-cabling.pdf?sfvrsn=4> (20/05/16).

<sup>8</sup> In which case steel plates or reinforced concrete may be necessary, subject to agreement of ESB or EirGrid, as appropriate, in consultation with the relevant Local Authority.

<sup>9</sup> Section 2.4.5 of the EIS refers to a total of 31.189km cable trenches (26.189km trefoil and 5km flat formation) in the public road.

<sup>10</sup> [http://www.eirgridlaoisilkenny.ie/media/pdf/21%20The%20Final%20Planning%20Application%20\(Jan%202013\)/Vol%203B%20Environmental%20Supplemental%20Documents/Supplementary%20Environmental%20Documents/4%20Underground%20Cables%20Construction%20Methodology.pdf](http://www.eirgridlaoisilkenny.ie/media/pdf/21%20The%20Final%20Planning%20Application%20(Jan%202013)/Vol%203B%20Environmental%20Supplemental%20Documents/Supplementary%20Environmental%20Documents/4%20Underground%20Cables%20Construction%20Methodology.pdf) (18/05/16).

<sup>11</sup> Drawing nos. PE424-D7001-001-003-005 and PE424-D7001-001-005-002 refer.

- 1.1.5 Joint bays are required to enable lengths of cable to be connected. They are typically 4.5m X 2m and c.1m<sup>12</sup> in depth for MV cables and require communication chambers (similar to manholes and required to facilitate the connection of the fibre optic communications cables) of c1.1m X 1.52m, from which they must be separated by 0.5m<sup>13</sup>. These would be located within or adjacent the public road. Larger joint bays measuring 6m X 2.5M X2m are required for HV cables according to ESBI guidance. The number, general location (or exact siting) of joint bays are not specified in the application, EIS or in further information, notwithstanding that this omission was identified in the initial reports from KCC. Based on 600m cable lengths<sup>14,15</sup>, it can be assumed that joint bays will be required at least every 600m, or less depending on site circumstances<sup>16</sup>, resulting in c.60no. such structures on the public road network to accommodate MV cables, with at least one joint-bay required for the HV line.
- 1.1.6 Additional physical works include the provision and/or upgrading of entrances to the public road network to facilitate site access, and alterations to the road network or adjacent lands to facilitate turbine delivery. I will address these issues in greater detail in subsequent sections of my report.
- 1.1.7 General impacts on road and in-road networks - Kildare County Council's Transportation Department raised concerns about the proposed cabling on the grounds of the additional costs imposed to the County Council in providing, maintaining or upgrading existing or future services and utilities within the public road, and safety risks to its service personnel. Similar concerns were raised by Meath County Council in respect of impact of HV cables, but these have now been omitted from Meath County. Irish Water also raised similar concerns in regarding the potential for the proposed HV cabling to prevent it from carrying out its statutory obligations in respect of existing water services infrastructure and requested further information, however the vast majority of the HV cabling has been omitted<sup>17</sup> and Irish Water have subsequently indicated that it has no objection subject to conditions. These concerns have also been echoed by many observers, in addition to concerns about the effective sterilisation of lands from future development through physical obstruction of access, or additional cost

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<sup>12</sup><sup>12</sup> This is not fully clear from ESB specification document.

<sup>13</sup> <https://www.esbnetworks.ie/docs/default-source/publications/standard-specification-for-esb-38kv-networks-ducting-cabling.pdf?sfvrsn=4> (24/05/16)

<sup>14</sup> As referred to in Table C of Appendix K2.

<sup>15</sup> Although ESBI publication '*HV Cables – General Construction Methodology*' (p.1 of report no. PE424-F7001-R00-001-001) indicates that lengths of 600m, 750m and 900m are available for HV cables and it may also be the case for MV cables.

<sup>16</sup> For sake of clarity, ESBI publication '*HV Cables – General Construction Methodology*' indicates that joint bays are required for all jointing of cables.

<sup>17</sup> The applicant did not respond to the further information requested by Irish Water or to Meath County Council for this reason.

entailed in accessing existing in road services / utilities. KCC's Transportation Department advised that a master plan approach was necessary to determine the optimum cable arrangement (whether over-ground / underground) and layout to accommodate the future potential for wind energy development for Kildare, Offaly and Meath (as identified in Fig.1.8 of Appendix C of the EIS) to minimise overall impact on the network into the future.

- 1.1.8 In response the applicant submitted that Section 1.2.17 of Chapter 1 of the EIS as well as Appendix C (Site Selection and Appraisal Report) of Volume 3 of the EIS, considered the alternatives to placing cables under the public road network. This included the consideration of the use of overhead lines and the use of Bord Na Móna infrastructure (roads and railway lines). The applicant correctly points out that subsurface cabling is favoured in lieu of overhead cables under Council General Energy Policy ER5 of the Kildare County Development Plan.
- 1.1.9 The applicant notes that the report from the Transportation Department acknowledged that the applicant has endeavoured to minimise the impacts of the proposed development by significantly modifying the initial proposed cable routes to utilise regional roads where possible and to minimise the laying of cables in bog rampart roads following consultation with Kildare County Council. The Applicant has secured a commercial Right of Way and Wayleave agreement with Bord na Móna to remove approximately 8km of a cable route and haul routes from the public road, but was unable to secure further rights of way and wayleaves due to the impact the installation of cables would have on the Bord na Móna activities in these areas. The applicant submits that it refined the original intended layout, removing 10no. turbines (following consultation with Kildare County Council, as described in Chapter 1 of the EIS and in Figures 1.12 to 1.17), significantly reducing the extent of in-road cabling required. In this regard, I would draw the attention of the Board to Drawing SKH-0042, in chapter 1 of the EIS, detailing the alternative cable routes that were explored and the overview of the process of consideration of alternative cable routes detailed under section 1.2.17.
- 1.1.10 It is the applicant's position that it only has authority to prepare a master plan for lands under its control and that it can only consider alternative sites for the project, as has been done in this instance. It is submitted that it would be the responsibility of any future developer to ensure that any future developments in the area would be assessed cumulatively with the proposed development if the subject application were to be consented.
- 1.1.11 I am satisfied that the applicant has considered the available options for cabling associated with the proposed development. I am satisfied that the proposed cable layout has been adequately justified by the applicant and that the proposed cable layout may be considered optimal, under the specific

circumstances and context of the site, to accommodate the wind energy development subject of this application.

1.1.12 In terms of cost, practical access to existing in-road services / utilities and safety implications for the Council, the applicant submits that electricity cables have been successfully put in place under the road network in Ireland for many years and the proposed cabling (MV) will comply with ESB specifications for 38kV cable-laying and (for HV) EirGrid requirements for the 110kV or 220kV circuits. Safety marker strips will be used to identify electricity cables in accordance with standard practice, as an early warning to any person carrying out excavations, and the location of cables will be accurately recorded on as-constructed drawings during construction to assist in preventing third party interference.

1.1.13 Technical compliance with recognised safety standards for carrying out cable works should be sufficient to address the Council's safety concerns, but it does not mean that the location of proposed cable trenching will not impose additional costs imposed to the County Council (and other service providers where relevant) in providing, maintaining or upgrading existing or future services and utilities within the public. The Local Authority has not provided any estimate of the additional costs it is likely to incur where in-road services / utility infrastructure is located within the vicinity of the proposed cables. I am therefore unable to ascribe a level of significance to the potential impact. The Local Authority (and no other utility provider, such as Irish Water) has provided no indication of where the possible conflict may arise between its in-road services / utilities and the routes of the proposed cables. I expect that this general information is readily available to the Authority.

1.1.14 The applicant has not submitted any details of the location of any existing in-road services along the intended cable routes, but has indicated that they already have access to at least some relevant information in this regard. In the absence of the submission of this survey information (a recurring feature of this application), the scale of potential for conflict to occur between different services / utilities along the route cannot be properly assessed.

1.1.15 I note from the Outline CEMP that new cables *usually* are laid below the level of existing services with a 300mm separation distance *desirable*. It would seem probable that laying cables beneath existing services and providing the 300mm separation distance would be sufficient to resolve potential conflict with existing services, but the wording used by the applicant is somewhat vague. I expect that it should be possible to mitigate the potential conflict through the agreement of the detailed cable locations (relative to existing in-road services / utilities) with the local authority prior to commencement of development, but this is not certain. Should the Board decide to grant permission, this issue should be addressed by condition.

1.1.16 The applicant has not addressed the issue of obstruction third party access to existing in-road services / utilities. In the absence of details of existing in-road services / utilities it is not possible to determine where obstruction of access may occur, or whether the presence of cables actually prevents of access and whether this can be resolved through appropriate mitigation. This issue would be of particular concern where the cable works would prevent access to services from zoned lands and/or from lands within designated settlements. Although I would assume that this issue can be mitigated, the potential for significant impacts is uncertain as it has not been adequately addressed by the applicant.

1.1.17 Direct impacts on road structure - Kildare County Council's Transportation Department raised concern about the proposed cabling in terms of the potential impact on the structural stability of the road network, with particular reference to legacy / bog roads, and consequential additional costs to the local authority in terms of maintaining the road network into the future. KCC's Transportation Department indicated that the following information was required in respect of the proposed cable works to enable an informed decision to be made:

- Full structural assessment (including Falling Weight Deflectometer (FWD), Ground Penetrating Radar (GPR), cores and Road Condition Data (RCD)) of all roads proposed to accommodate cables, with testing carried out in accordance with NRA and DTTAS guidance and in both directions on roads two lane roads, were required to inform a baseline for reinstatement works.
- Reinstatement designs based on different road types.
- Topographical survey to identify the best location of cables and joint bays, location of which is to be presented in plan and cross section to enable assessment.
- All existing services (water, sewerage, telecommunications, ESB, gas, broadband) to be identified.
- The capacity of the cabling in relation to the power generated by the wind turbines to be stated.
- And a traffic management plan for cabling works is required.

1.1.18 In response the applicant submits that it is committed to completing detailed site investigations and road pavement design work during the detailed design phase of the project, and that this approach is usual for such projects having been agreed with Meath County Council and Offaly County Council in the past. Whilst MCC required similar investigations be carried out, in addition to direct testing through use of slit trenches, (FI request item no.13 MCC), as no cabling is now proposed in that county the applicant has only addressed the investigations requested by KCC.

- 1.1.19 A specialised team from Arup was engaged by the applicant to carry out additional site assessments (see Appendix 14 of response submission). The assessments comprised a desk study review of landscape and geomorphology using OSI maps, of background geology using GSI 1:100,000 scale bedrock geological map and GSI Teagasc subsoils map drawing nos.G-001 to G001d and the GSI groundwater database. This was followed by a visual site inspection of pavement surface and geotechnical considerations along the route where MV cables are proposed. The routes were driven and visually assessed using guidance outlined in the 'Rural Flexible Roads Manual' (DTTS, 2013), which details four major categories of common road surface defects on rural flexible roads, with the extent of same rated using a Pavement Surface Condition Index on a scale of 1 (extensive structural distress) to 10 (no visible defects).
- 1.1.20 Two non-intrusive assessments, FWD and GPR (but not the RCD), were carried out by PMS Ltd on test sections of the road network concerned. The sample locations included sections of road where the pavement was visually inspected and found to be generally in a good condition (R403 1.6km south of L5022 junction, for a 180m length at 20m intervals in southbound direction; and L5025 from Drehid Crossroads to entrance to WF at WT23, 1.2km length at 50m intervals eastbound on both lanes) and sections where the pavement was visually inspected and defects were identified (L5006 from golf club entrance for 1.5km at 50m intervals southbound; and L1004 from golf club access road to proposed windfarm entrance, 700m at 25m intervals in eastbound direction). Justification for the selection is provided in each case.
- 1.1.21 FWD provides an indication of the overall structural condition of the pavement, the condition of the upper pavement layers and the subgrade strength (see table 15 of Appendix 14). The results show the R403 to be very good on all counts; the L5006 and L1004 generally to be very poor / failed on all counts and to be on built over peat; and the L5025 to be very variable on each count but to be constructed over solid ground. GPR is used to determine the as constructed thickness of the existing pavement layers (see table 16 of Appendix 14). This found that the pavement construction was based on surface based granular material, except for the R403 which had upper layer depth of c.150mm bituminous material.
- 1.1.22 The applicant has obtained details of the water and wastewater network in the study area to inform the selection of cable routes but has not presented these details within the context of the cable route proposals. The applicant intends completing detailed desk studies and site investigations to find the optimal location to place the cables within the public roads in advance of construction, with records of services, including watermains, sewers, gas mains, and etc., forming a key input into same. Investigations will comprise use of records of

services and use of cable detection tools, ground penetrating radar and slit trenches to find the exact location of services.

1.1.23 Kildare County Council (report received 25/11/16) is not satisfied with the scope testing carried out, which does not encompass all the testing listed in the original report of the Transportation Department. KCC submits that such information should be provided to inform the design of the cable route prior to any decision to grant permission being issued. It has also expressed its dissatisfaction with the limited geographical extent of the testing carried out, which it considered should be carried out for all roads along the proposed cable routes. I note that the presence of existing services within or adjacent the public road may dictate the location of cables due to the ESBI requirement to maintain 300mm separation distances from MV cables, increasing the potential for adverse impacts. Although I consider a sample survey approach not unreasonable, particularly to inform the general approach to reinstatement (see below), I consider the geographical scope of the exercise to be unduly limited given the extent and nature of road network that would be affected.

1.1.24 Given the extent of the cable works and the availability of the relevant data, I would agree with the Local Authority that the relevant data should have been provided at an appropriate scale to identify all likely significant constraints along the proposed cable routes with implications for positioning of cables and joint-bays, to enable the applicant to propose appropriate mitigation measures addressing same prior to any decision issuing from the Board and to enable the Board to make an informed assessment of the potential impacts. The failure to provide even basic locational details of existing in-road services (i.e. which roads carry in-road services and the nature of those services) to highlight potential constraints, and to provide even a limited topographical survey of the route to necessarily inform the location of the 60+ joint bays (not to mention actual cables routes within the carriageway), means that it is not possible to carry out any meaningful assessment of the potential impact on the road network and services and the potential to impact on third party lands, or to provide for suitable mitigation measures to address same. Where there are existing services the possible location of the cables and joint-bays will be constrained, possibly requiring them to be located in a less than optimum within the carriageway, or necessitating encroachment on third party lands, and / or resulting in trenching works of extended duration and of increased disruption. The absence of this information undermines the traffic and transport assessment as there cannot be confidence that it takes due account of the true potential likely impact for traffic disruption on the road network in terms of the duration and extent of works. This prevents the Board from carrying out an informed assessment of the potential impacts arising from the extensive works proposed.

- 1.1.25 It is KCC's firm position that extensive further investigative works outlined in its initial reports should be carried out prior to a decision being made on the application. KCC's Transportation Department (report of SEE) submits that the detailed design and mitigation measure required cannot be controlled by the Road Opening License and is not possible or appropriate that the Local Authority would design the detail of the project and set it out in a Road Opening License. Furthermore, it submits that that the amount of documentation that would be required to be submitted before an agreement on detailed design could be given by KCC would be significant and would add another 9 months in total.
- 1.1.26 Road reinstatement - Based on the investigations, the applicant proposes four types of trench reinstatement taking account of the differing road structure conditions evident, the aim of which is to provide a pavement structure that will improve or equal the existing residual life of the pavement post construction. The details of the reinstatement works and their location on the chainage of the roads subject of the investigation works is set out under section 7 of Appendix 14 of the response, however for the purposes of this assessment it is pertinent to note that Type 1 and 2 are 'standard' reinstatement and Type 3 and 4 are of 'strengthening' design. It is acknowledged by the applicant that further design work will be required at detailed design stage with further iterations possible depending on the effect the proposed construction traffic has on these roads.
- 1.1.27 Three of the proposed reinstatement designs types are based on DTTAS '*Guidelines for the Opening and Backfilling and Reinstatement of Trenches in Public Roads*'. Type 4, 'strengthening' in areas where there is soft ground (i.e. peat) is not stated to any design standard, but include three design options (see Figure T4 of Appendix B to Appendix J PML Level 2 report in Appendix 14 of the response) dependent on the depth of the soft ground. The applicant is willing to provide full width surface course restoration on local roads and half-width on regional roads, an approach that the applicant submits has been acceptable to other local authorities. Although this is reasonable, in the absence of relevant survey information (see above) the alignment of cabling within the carriageway is uncertain. The applicant has indicated that it is agreeable to funding the cost of a Council Resident Engineer for the duration of construction works in order to monitor the works on behalf of the Council during the construction stage.
- 1.1.28 KCC Transportation Department has not commented favourably or negatively on the proposed reinstatement designs, only that the full extent of the required investigative works have not been completed. I consider the proposed reinstatement designs Type 1, 2 and 3 to be reasonable and likely to minimise any adverse impact on the road network, particularly in combination of the proposals for resurfacing. The monitoring of works on behalf of the Council



by a Resident Engineer, funded by the applicants, will also reduce potential for adverse effects on the road network and is to be welcomed. The attaching of a bond for completion of the trenching works to the satisfaction of the local authority would help ensure the standard of works within the public road are completed to a suitable standard.

1.1.29 I have serious reservations about the proposed Type 4 design for roads over peat (including legacy roads). It would seem to me that providing a fixed base (to bedrock) to the cable trench result in a portion of the carriageway being, whilst the rest of the carriageway would move on the flexible peat base. Differential settling could be expected to across the carriageway as the peat expands and contracts depending on the level of saturation. Type 4 reinstated is proposed for the northern end of the L5006 and the eastern end of the L1004 (see Table 1 of PMS Level 1 & Level 2 Report, in Appendix 14). The subsoil geology maps in Appendix B (of Geotechnical and Pavement Assessment Report, Appendix 14) would indicate that the relevant section of the R414 (to Cloncumber) is located almost entirely on cutover peat, with the L7004 on alluvium and therefore it is a reasonable assumption that they will also require Type 4 reinstatement (over c.5km). The extent of the potential impact on network is significant.

1.1.30 The southern section of the R414 route appears to have been improved in recent years, therefore any adverse impact on the road structure would undermine the Council's expenditure. Whilst KCC has not specifically commented in the proposed reinstatement plans, the impact of the proposed development on legacy / bog roads has been a concern from the outset.

1.1.31 There is no issue, in principle, to locating the proposed cabling adjacent or within the road network, however the level of information submitted by the applicant is inadequate to facilitate an informed assessment of the potential impact on the road network to be carried out and appropriate mitigation measures to be determined.

1.1.32 Impact on structures – KCC advised that a full structural analysis was required for each structure were direct drilling is proposed (16no. identified in section 9.3.6 of EIS). Concerns were also raised by numerous parties about the potential impacts on such structures. In response, a specialist team from ARUP completed an assessment of the condition of the existing structures located along the proposed cable routes, contained in Appendix 21. 25no. structures were identified. The proposed methodology for cable crossings at structures is described in section 2.4.5.2 of the EIS, which details a number of options.

- Option (i) - horizontal directional drilling (HDD), whereby a surface rig is used to drill an arc beneath the watercourse with minimal impact on surrounding area.
- Option (ii) – alternative trenchless option involved digging two pits (an entrance and receiving pit) on either side of the watercourse to be connected by ducts installed by either ramming or drilling.
- Option (iii) – cables laid by excavating trench and laying cables in the bed of the watercourse. Note, this option may have implications for Nature 2000 sites due to source-pathway-receptor routes.

1.1.33 However, in-road laying, or laying cables in the verge where there is sufficient cover (in accordance with ESB Guidance for 38kv ducting<sup>18</sup>) is proposed as the first option in most cases, with trenchless techniques suggested as the alternative.

1.1.34 Detailed engineering assessment and consultation with the relevant authorities will inform the selection of the technique to be used in crossing watercourses. In general, I consider the level of detail and the suggested design approach to be acceptable<sup>19</sup>, except that the applicant has not carried out a detailed topographical survey to determine whether there is actual potential to carry out works in the road verge. It would be appropriate for the final detailed approach for crossing each structure to be agreed with the Local Authority prior to commencement of development.

1.1.35 Other issues – There is potential for direct adverse impacts on the structural integrity of the public road from general haulage and turbine delivery due to wear and tear from additional heavy vehicles, in addition to the impact (from abrasion of the road surface) of deposition of dirt, soil and other material being deposited on public roads during overall construction works. There is potential for cumulative impacts on road structure where haulage and turbine delivery is proposed along the proposed cable routes. This may be an issue on legacy / bog roads in particular. I am not satisfied that the applicant has addressed the issue of potential impact on road structures from the additional heavy traffic in itself, or taken cumulatively with cabling works. Potential impacts from dirt, soil, etc., is proposed to be mitigated.

1.1.36 **Mitigation measures** - The applicant proposes 18 individual measures to mitigate impacts at construction stage. Those of particular relevance to impacts on road structure from cable trenching are as follows:

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<sup>18</sup> Attached as appendix 22.

<sup>19</sup> The watercourse network, in particular the Blackwater and tributaries, are connected to the River Boyne and River Blackwater SAC. Consideration of the potential impacts of such works, as part of overall works should be considered as part of the Appropriate Assessment.

3. **Road pre-condition survey** will be carried out on all public roads used on connection to the works to record the condition of same prior to commencement of works.
4. All **roads will be reinstated** to their pre-works condition or better subject to agreement of the roads authority.
12. Will comply with requirements of **Road Opening License**.
13. **Route proofing**, including use of slit trenching, will be carried out to define the precise alignment of cables to be laid in order to avoid, where possible, existing in-road services.
16. Appropriate steps taken to maintain **road cleanliness** and prevent soil/dirt being transported on the public road during trenching.
17. **Reinstatement of trenches on public roads shall be implemented without delay**, once backfilled, to the satisfaction of the roads authority.
18. The **local roads along cable route shall be resurfaced** in line with specification and timing to be discussed with the roads authority, at the applicant's own expense. Note, in its further information submission, the applicant clarified that resurfacing would be implemented on the full width of local roads and half width of regional roads.

Other measures that are relevant to the protection of road surface from abrasion during cabling and site construction works (but primarily to road safety) include:

10. **Temporary wheel washing** facilities at each site entrance.
11. Utilisation of **road sweepers** to maintain public roads especially during earthwork stages.

1.1.37 The proposed mitigation measures are generally acceptable.

1.1.38 Impact on physical road network – Conclusion: – The revised proposals omit the vast majority of HV cabling from the public road network and therefore significantly reduce the potential for adverse impacts on the road network from cabling works. 36km of MV cabling and 1.1km of HV cabling remain proposed within the public road and the potential for impacts remains significant, particularly so in the case of legacy (or bog) roads.

1.1.39 I am satisfied the applicant's proposals for road reinstatement following trench works are appropriate, in the case of proposed Types 1, 2 and 3 designs. I am satisfied that the applicant's funding of a Resident Engineer to monitor the works on behalf of the County Council has the potential to ensure adequate

oversight of the trenching and reinstatement works, subject to the agreement of the required detailed with the Local Authority.

1.1.40 I have serious reservations about the proposed Type 4 trench reinstatement plans for roads over peat due to risk of differential settlement over the carriageway. The Type 4 trench reinstatement plans are not stated to DTTS standards. The proposed cable works may have serious long term impacts on extensive areas of the network, including the L5006 and the L1004, with long term implications for maintenance cost of the network for the roads authority. In the absence of detailed investigative work demonstrating to the contrary, this would be of particular concern for the R414 (from Rathangan), which traverses an extensive area of cutover peat, and the L7004 which is on alluvium.

1.1.41 No adequate details have been provided for proposed joint-bays. There is no indication of how many would be required (I estimate 60no.) or where and how they would be accommodated along the route. The EIS does not take account of the impact of joint-bays and communications chambers required along the cable route, nor does it take account of likely constraints to the location of the proposed infrastructure arising from topography or the location of inroad services and the implications of same on the factors of the environment. The EIS does not take account of the full length and width of cabling trenches proposed within the public road and does not take account of the full extent of potential impact on the road network. Concern also arises as to whether the EIS has have taken due account of the full extent of potential significant indirect impacts on human beings (noise, dust, disturbance), on air (dust, etc.) and water (runoff) arising from the said cabling works. The EIS takes no account of the potential impeding of accesses to existing in-road services / utilities by other parties, which would be a concern where this would impede development of zoned lands and/or lands within settlements.

1.1.42 Based on the foregoing, I consider there to be insufficient information on file regarding the nature and extent of the proposed development, specifically concerning details the full extent of all cabling works (inclusive of joint bays), regarding the baseline environmental conditions, specifically concerning the nature and conditions of all roads concerned through appropriate investigative works, the location of existing in-road services / utilities and topographical survey details (where relevant). In the absence of the necessary information it is not possible for the Board to carry out a full assessment, or to carry out a proportionate environmental impact assessment of the proposed development on the road network and existing in-road services / utilities as material assets, but also the possible impact on development land (in terms of access to services / utilities) and temporary impacts on businesses during works, and on human beings (noise, disruption), air (dust generation) and water (runoff).

## 1.2 Impacts on traffic from construction works:

1.2.0 Introduction – The potential for traffic impacts arise from the construction of the proposed development as follows:

1. Impacts on network capacity during the carrying out of cable trenching works
2. Impacts of additional construction traffic
3. Impacts on physical network from construction traffic.

1.2.1 Critical considerations in the assessment of potential for significant impacts to include:

- The significance of the routes affected in (quantitative) terms of the level of traffic carried (AADT may be indicative) and, in (qualitative) terms of the origins and destinations served by such routes (i.e. is it an important route in terms of providing access to settlements, schools, hospitals or as a commuter route).
- Peak traffic time and flow relative to capacity of route concern.
- Whether road closure or lane closure is proposed.
- The duration of works on any one section of road, in particular such as to necessitate a diversion off that route (i.e. the duration of diversions).
- The length of relevant diversions.
- The population affected.

1.2.2 Description of baseline – The EIS provides a description of the road network concerned, including the relevant classification, width and estimated traffic levels, although it omits the R160 which would carry a c.200m length of MV cabling<sup>20</sup>. Apart from a vague reference to L5024 and L5025 serving multiple dwellings, the assessment provides no details of the number of dwellings and other premises accessed by the routes concerned, which is relevant to consideration of the level of significance of traffic impacts.

1.2.3 Overall traffic flow (AADT, which is provided) does provide some indication of the significance of the routes affected, but the EIS provides no qualitative data in terms of the origin and destination of the traffic flows. Qualitative data, in terms of whether access to significant trip attractors (hospitals, schools, employers, commuter routes or settlements) would be affected would be appropriate to determine the significance of impact. The AADT data obtained from TII data, Local Authority data and the applicant's own traffic counts<sup>21</sup>. The EIS does not include the traffic count data and it does not indicate how

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<sup>20</sup> The R160 subdivides the Ballinakill Cluster and along which MV cable appears to be proposed for a length of c.200m, but is referred to as an '*internal*' cable route.

<sup>21</sup> The applicant's traffic count took place in December 2014 (06<sup>th</sup>-12<sup>th</sup> inclusive), during the school term. December is a heavier traffic month and therefore a traffic survey during this period can be considered acceptable.

the AADT was extrapolated from the survey traffic data<sup>22</sup>, which prevents a full assessment of the baseline data, however I note that neither County Council raised concern in this regard.

- 1.2.4 Whilst AADT provides an indication of the significance of a route in terms of traffic flows, the EIS does not provide details of weekday AM and PM peak flows. The AM/PM peak is the critical period of concern (see '*Traffic and Transport Assessment Guidelines*' (NRA, 2014)) in terms of assessing the significance of the impact of generated traffic on route capacity, being the period when the network will be carrying its heaviest traffic flows. The EIS provides no assessment of the existing capacity of the routes concerned. .

### **1. Impacts on network capacity during carrying out of extensive cable trenching works**

- 1.2.5 Cable construction: description of works – According to Chapter 2 of the EIS cable trenches will be excavated, electricity cable ducting laid and surrounded in either cement bound material (or more flexible material in bog roads), with 2no. communications cables above, and the trench backfilled and the surface reinstated. Section 13.5 Residual Impacts indicates that cable works are estimated to last 10 months and that the overall construction programme is estimated at 23 months.
- 1.2.6 More detailed information on the duration and phasing of MV cable trenching works is found contained in table C, Appendix K2, Vol.3 of the EIS, which provide a comprehensive breakdown of the estimated traffic over a period of up to 14 months for MV cable works (works carried out between months 1-12 inclusive). The information is presented in the table per cluster, not by route, with the routes relevant to each cluster referred to under section 13.2.2<sup>23</sup>. These works, by their nature, must be carried out sequentially, which would enable them (and their associated impacts) to progress along any one route in a systematic manner (as is stated in section 13.3 of the EIS).
- 1.2.7 The detailed information on duration and sequencing of the cable works, provided in Table C (in Appendix K2), only indicates that, in general, the works will be carried out over a period of months on the roads associated with each cluster - 8 months for Ballynakill, 2 months for Windmill, 8 months for Drehid-Hortland, 6 months for Cloncumber and 6 months for Derrybrennan<sup>24</sup>. The EIS provide no schedule of the estimation of duration of works along any

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<sup>22</sup> A standard equation can be applied to do this, which should be presented in support.

<sup>23</sup> Note, c.200m of cabling on the R160 is not referred to but is indicated on the drawings as 'internal' to the cluster.

<sup>24</sup> There would appear to be errors in Table C relating to the Drehid-Hortland site, with trenching carried out over 4 months, but with ducting, backfilling and reinstatement works commencing a month later and continuing for 5 months after excavation works have been completed.

particular route. Nor does it provide an estimated duration of trenching works per km-length of road (half or full width), in general, or for specific road condition types. It is not possible to determine the potential impacts on the subject routes, on the wider network, or on particular users without this information.

- 1.2.8 The level of detail of the proposed development is inadequate to enable any realistic assessment of the actual impact on any section of the network at any particular time and the implications for traffic on the network as a whole. There is nothing to indicate that the assessment takes account of the proposed joint-bays, of which there may be 60no. installed on the road network. Appendix 6 (Addendum to CEMP) of the further information submission includes a section on proposed junction bays, but this relates to the actual method of construction (either pre-fabricated or constructed in-situ) and the investigations<sup>25</sup> that will be undertaken to determine the siting of joint bays and it does not refer to the number, dimensions or proposed location of joint bays.
- 1.2.9 The EIS does not include the basic assumptions that informed the estimated duration of proposed works. There is no indication as to whether the predicted duration is a best case, mean, or worst case scenario or that any allowance is made for a realistic risk of overrun in the carrying out of these works. The consideration of potential traffic impacts arising must be viewed in the context, the opacity regarding baseline assumptions informing the predicted duration of cabling construction works.
- 1.2.10 **Impacts of cabling works** - Chapter 13 of EIS acknowledges that traffic impacts will arise from road/lane closures in terms of delay and disruption of road users, with the cabling works necessitating a combination of temporary road closures and traffic diversions for local roads, and rolling lane closures along regional route.
- 1.2.11 Under section 13.3.5 (HV and MV Cable Route Roadworks) the applicant submits that the impact of traffic diversions and land/road closures on a particular stretch of road will depend on the location and volume of traffic which use that road. It anticipates that cable installations along regional roads will entail rolling lane closures (subject to the provisions of a Road Opening Licence and the requirements of the roads authority), with traffic permitted in both directions but restricted by stop/go signs or temporary traffic signals. This will constitute a direct negative impact on road users from road works. It anticipates that works on local roads will, for the most part, be carried out using temporary road closures and traffic diversions, depending on the width

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<sup>25</sup> Entailing detailed desk studies and site investigations to find the optimal location to place the joint bays within the public roads, including engagement with service providers.

of the road. The impacts on road user is noted as increased journey times for the duration of diversions / road works. It is asserted that the impacts will move as cable installation works advance along the network.

1.2.12 The majority of cable laying works will take place on local roads, but with extensive cable laying on regional roads also – the R414 between Derrinturn and Cloncumber and limited stretches on R148 and R402, but also on a short section of the R160<sup>26</sup> which is not taken into account in the EIS.

1.2.13 The EIS does not justify its assumption that regional roads will entail rolling lane closures and local roads rolling road closures. The R414 between Lullymore and Rathangan is constructed over peat and is relatively narrow in parts and, in the absence of the provision of justification to the contrary, there is a risk that it would not be capable of safely accommodating traffic during trenching works. This serves to illustrate the need for detailed topographical and road survey works to inform the proposed development and the EIS (as has been requested by KCC) which is absent from the initial application and has only been partly addressed in the applicant's further information submission. Should it prove necessary to temporarily close the R414, significant diversions of traffic on the network would result. The route can be considered locally significant in terms, serving the village of Rathangan, with an AADT of 1,279 vehicles in 2012<sup>27</sup>.

1.2.14 I would accept the applicant's submission that there is a significant network of roads in the area to facilitate diversions, but the availability of suitable alternative routes varies across the site. Accordingly the level of disruption, length of diversion and, hence, the significance of impact will vary accordingly. For example, the closure of the L5025 (separating T47 from T23 at Drehid-Hortland west) would result in diversions of substantial length, whereas the closure of the L5024 or L5022 would result in relatively minor diversions. The applicant's assessment does not refer to the likely duration of diversions on specific routes and no clarity was provided on this issue in the further information response, other than an assertion that the timing and duration of the works will be agreed with the roads authority prior to the construction works commencing on site<sup>28</sup>. In the absence of this information it is not possible to carry out an assessment of the likely significant impacts.

1.2.15 The applicant's assessment assumes that impacts associated with cabling will move as trenching works advance along the route. At first glance this seems logical and implies impacts of localised and very short duration, however I consider it misleading. The disruption and delay to traffic caused by the

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<sup>26</sup> Not identified as part of the works description in chapter 13 of EIS but assumed as internal cable works on the site maps.

<sup>27</sup> It can be expected to increase with the improving economic situation.

<sup>28</sup> P.12/264 Response to Submissions



closure of any section<sup>29</sup> of road or lane will last for the duration of cabling works along that complete section of road, regardless of where the works are being carried out within that section at any one time. For example, if it takes 5-6 months to complete cable works on the R414 (between L7004 and south access to Derrybrennan), or 4 months to complete them on the L1004 between Knockanally and Dunfirth Crossroads, the traffic impact on the surrounding network will be effectively the same for the entire duration of those works regardless of the exact location<sup>30</sup>.

1.2.16 Potential impacts are not quantified in terms of duration, the population affected, the disruption of important or critical access routes (i.e. more heavily trafficked routes, and / or access routes to significant destinations, such as to settlements, employment zones, hospitals, schools, etc., and significant commuter routes affected), if any, and the significance of the impact both in terms of the quantity of journeys disrupted, the anticipated level of delay and the length of proposed diversions. Therefore, whilst the EIS is correct to conclude that the works will likely result in a direct impact on road users owing to delays caused by roadworks, this is a conclusion that can be surmised at scoping stage of the EIA process and there is no adequate assessment of the likely significant impacts. The applicant's assessment of cumulative impacts and direct impacts is similarly facile. There is bald statement that cumulative impact from non-cable related construction traffic using cable routes has the potential to magnify the impact on the road network and users, but no assessment of same; another statement refers to the potential for indirect impacts on local businesses arising from potential customers not being able to use a certain route during roadworks<sup>31</sup>, but the EIS provides no assessment of same.

1.2.17 **Mitigation measures** – Of the 18no. proposed mitigation measures (see section 13.4.2 of the EIS), I consider the following to be of particular relevance to minimising the impact of **cable works** on traffic to be:

#### 1. Preparation of a **Traffic Management Plan**

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<sup>29</sup> I.e. between junctions facilitating reasonable diversions.

<sup>30</sup> In the further information response (p.11/264) it is indicated that the in the worst case scenario it can be assumed that a temporary road closure will be required to construct the cable works (and the associated jointing bays) along all the local roads with temporary lane closures being required along the regional roads. However, the applicant notes that given the nature of the works it is anticipated that 'rolling' road closures will be adequate as the cable installation works advance along the local roads along which the MV cable route will follow. In this regard 'sections' of the local road will be closed instead of the full length of the local roads being closed. In practical terms there may be little difference between a temporary road closure and a rolling road closure unless the applicant is suggesting the temporary closure of the entire length of the road concerned, including that where no cabling works are proposed, which would clearly be unacceptable to the roads authority and an unlikely proposition for the applicant to make.

<sup>31</sup> In this regard, a number of observers raised concern about the impact on their business, including the owner of Mother Hubbard's Restaurant location on the R148.

2. Provision of a dedicated **Traffic Management Co-ordinator**,
5. Provision of **Site Induction** for workers on guidance on routes to be used / not used,
6. **24 hour emergency phone number** to be noted on temporary signage in vicinity of works (including cable works) and site entrances.
7. **Orderly Traffic Management** to follow NRA<sup>32</sup> / Departmental guidance,
8. Issuing of **Letter Drops** advising local residents,
9. Erecting of **Clear Signage**, (13) undertaking of **Route Proofing** to expedite cable works,
14. **No cable works to overlap with concrete pours** unless otherwise agreed with the LA
15. To **maintain local access during diversions / closures**,
17. To **Reinstate** public roads as soon as possible.

These measures can be regarded as a good practice approach and would reasonably be expected to be implemented as a matter of course.

1.2.18 Traffic impact of cable works: conclusion: The applicant's assessment of the potential impacts of cable works on traffic is inadequate and insufficient to enable a determination of the realistic extent, nature and significance of impacts on road users. There is no assessment of the existing traffic capacity of routes concerned; there is no estimated schedule of duration of works on any particular route; there is no estimation of duration of works per km length; the assumptions underlying the overall estimated duration of cable works are not stated; and the assessment does not take account of the full extent of cabling works in terms of length and width of trenches or the provision of up to 60no. joint bays and communication chambers in the public road. The impact assessment does not justify the assumption that regional roads will be subject of lane closures having regard to absence of a topographical survey of the routes concerns and the failure to take account of the full extent of works. The assessment provides no estimate of the likely duration route diversions required, or the availability and suitability of alternative routes. The potential impacts are not quantified in terms of duration, the road users affected or the significance of routes affected. In my opinion the EIS fails to provide an adequate assessment of the likely significant impacts arising from cabling works but provides only general conclusion on impacts that are appropriate to the scoping assessment stage.

## 2. Impacts on traffic from construction traffic

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<sup>32</sup> Now TII.

1.2.19 Trip generation - The estimates for construction generated traffic (including cable-trenching generated traffic) is set out in tables A, B, C, D, E and F in Appendix K2. Observers have claimed that there is no accurate basis for volume of material to be extracted / hauled due to lack of survey work and therefore the level of HGV traffic is grossly underestimated and that there are errors and discrepancies in appendix K2 in HGV assessment. Responding to this issue, specifically in respect of the report of Donnachagh O'Brien & Associates Consulting Engineers, the applicant submits that the observer has provided no specific information is to demonstrate these points and that the applicant confirms that the estimates provided in the EIS including Chapter 13 of Volume 2 and Appendix K of Volume 3 are accurate.

1.2.20 Table C (of appendix K2) provides an estimate of the total level of HGV traffic per month for each cluster for each stage of the cabling works based on the following assumptions:

- Plant deliveries to generate 15 HGV one-way trips, based on 15no. plant generating 1 delivery.
- Cable trenching to generate 1 load per 20m length.

1.2.21 The calculations are based on a total length of cable trenching in the public road of 33,887m, falling short of the 36km total length of trenching proposed on the public road. No justification is given for use of the shorter distance and the HGV calculations must therefore be regarded as erroneous and an underestimate.

1.2.22 It is also not stated under chapter 13 or in Appendix K2 whether the calculations are based on the 600mm wide trench for trefoil cable arrangement, or the 1100mm trench required for flat cable arrangement. An almost doubling of trench width would clearly have implications for the quantity of excavated material that would have to be transported and hence the number of HGV trips generated. It would also have implications for the duration of works. In Chapter 2 it is indicated that 26.189 km of MV cable trenching will be 600mm wide, with a 5km allowance made for 1000mm trenching. Not only does this result in a total figure of 31.189km, far shorter than the 36km of MV cable trenching proposed, it is also inconsistent with the cable trenching length taken into account in the traffic generation estimates under Table C. This creates further uncertainty in the applicant's calculations.

1.2.23 There is no evidence in Table C, or elsewhere, that the assessment takes account of the excavation of joint-bays (I have referred to dimensions previously) and communication chambers. Based on 600m cable lengths it can be assumed that joint bays will be required every 600m, or less depending on site circumstances. This would result 60no. such structures on the public road network, entailing significant additional excavation and

construction evidently not accounted for in the calculation of HGV traffic. This would indicate that the applicant's calculations are an underestimate and erroneous.

- 1.2.24 Looking at Table C in detail, it is unclear how the total of 1130 HGV trips for cable trenching is arrived at ( $33887/0.03=1061$ , not 1130). Based on  $33887/1130 = 29.98$ , I assume that quantity / load stated as 0.03 relates 0.03km length or 30m in length. This would therefore appear to contradict the details in the first column which indicates that 1 load is generated per 20m, which suggests that the traffic generated is underestimated.
- 1.2.25 Delivery of cable drums are estimated to generate 21 HGV one-way trips, based on 600m/drum, with a total quantity of 169 drums and the generation of traffic at a rate of 0.1. From the calculations, it can be deduced that the total of 169 drums is derived from 3 parallel cables over a total length of 33.887km length. As the total length of MV cabling in the public road is proposed at 36km, the total length of cabling required would appear to be incorrect, with 180 drums actually required. Again, the predicted level of traffic generated can be seen to be underestimated.
- 1.2.26 The delivery of ducting is estimated to generate 85 HGV one-way trips, based on 2000m ducting per load. Again, the length of ducting in the public road appears to be based on 5 ducts over 33.887km (amounting to 169,435m ducting) not the 36km proposed, which would entail 180,000m of ducting. The generation of 85 HGV trips is consistent with  $169435/0.0005$ , but the estimation of HGV trips is underestimated based on incorrect overall length of cable works in the public road.
- 1.2.27 The importation of backfill is predicted to generate 1130 HGV one-way trips based on  $0.5\text{m}^3/\text{m}$  over 33,887m. Assuming 1100m wide trench (1.14 deep, excluding road surface layer), backfill would amount to  $1.254\text{m}^3/\text{m}$  not  $0.5\text{m}^3/\text{m}$ . Assuming a 600m wide trench is acceptable backfill would amount to  $0.684\text{m}^3/\text{m}$ . The use of  $0.5\text{m}^3/\text{m}$  therefore would appear to result in a significant underestimation of the quantity of backfill required and consequentially the level of HGV traffic that would be generated and also contradicts the estimated backfilled requirements presented under section 2.4.5.2 of the EIS. The issue of underestimation of backfill also applies to the construction of joint-bays which have not been expressly included for in the traffic and transport assessment.
- 1.2.28 Road reinstatement (in-situ road recycling) is estimated to generate 678 HGV one-way trips, based on 0.02 trips per km over 33,887km. As the actual length of cabling proposed in public roadway is stated at 36km, the level of traffic generated by such works is an underestimate.

- 1.2.29 It is more difficult to determine the appropriateness of the estimated traffic generation for other construction activities, referred to in tables A, B, D, E and F of Appendix K2, due to the way the applicant has tabulated the information. For example, in table B, the total material to be transported for roads capping is stated as 18,540m<sup>3</sup>, the quantity per load is stated as 0.1 and the total number of loads as 1854 HGV trips (one way). 0.1 does not mean 0.1m<sup>3</sup> and, in itself, it means nothing. As 18,540x0.1=1854, it can be seen that 0.1 must represent 10m<sup>3</sup>, which equates to approximately 19.2 tonnes<sup>33</sup>.
- 1.2.30 The applicant does not explain or justify its assumptions for quantity / load for each category of works. The Road Safety Authority guidance sets out the maximum transport weights per HGV based on the number and design of axels<sup>34</sup> on that vehicle, which I have reviewed in order to gain a better understanding of HGV capacity. The maximum weight per HGV type ranges from 11.5 tonnes to 46 tonnes and therefore it is not possible to determine the likely construction traffic generated per construction activity (say, for example, the delivery of general fill for site compound construction) without knowing the actual capacity of the HGV that deliver this material. In the absence of such information being clearly stated, there can be no certainty in the predicted traffic figures.
- 1.2.31 There would appear to be some errors in the figures. For example, in Table B, a total number of 40 loads (HGV trips) are predicted but only 28no. are included in the total / split and only 26no. in the monthly columns. For construction formwork a total of 20 HGV loads are predicted, but 28no. are included in the total / split and in the monthly columns. This introduces uncertainty into the predicted traffic figures.
- 1.2.32 The applicant assumes that no traffic will be generated on the public road by general fill imports to Ballynakill due to the location of a borrow pit within that cluster. This assumption is incorrect as the Ballynakill cluster is divided in two and any fill required in the western side of the cluster (T4 and T5) will necessitate delivery via the public road. It can be assumed that general fill import will be equivalent with that required for the two turbines at Derrybrennan (315 HGV trips, each way, per month for three months) via the R148 (the entrances to both sections of the cluster are onto the R148). This is not insignificant, although it is the timing of the movements that will determine the actual significance of traffic impact.
- 1.2.33 Observers have disputed the EIS figure for concrete required per turbine for support used in the traffic generation estimates and/or that the EIS does not take account of aggregate material required for access roads and

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<sup>33</sup> <http://www.myersgroup.co.uk/nm/technicalpage.asp?pageID=15> (07/06/16).

<sup>34</sup> <http://www.rsa.ie/Documents/Vehicle%20Std%20Leg/Vehicle%20regs/Weights%20and%20Dimensions%20Leaflet%2013th%20November%202015.pdf> (07/06/16)

hardstanding areas required to facilitate construction, resulting in incorrect trip generation prediction (and consequentially erroneous CO<sup>2</sup> emissions). Whilst Appendix K2 provides total quantities of materials to be transported, it does not make clear the extent or length of access roads and areas of hardstanding taken into account in calculating these total quantities, which makes it difficult to determine whether they are accurate<sup>35</sup>. It cannot be safely assumed that these areas / lengths accord with the planning drawings and development description given the discrepancies already noted in this regard in respect of proposed cable trenching works.

- 1.2.34 Development of the scale proposed will necessarily adversely impact on traffic flow on the network for the duration of works. The total number of trips (HGV and LGV) added to the network from MV cabling and site development works are predicted to reach a maximum in month 14 with 7794no. trips, ranging, generally, between 5000 and 7600 over the first 14 months, then dropping off significantly to between 1000-2000 trips in months 15-19 inclusive, with insignificant trips thereafter.
- 1.2.35 The generated trips data is aggregated per month, per cluster, albeit with an estimate of the average daily trips. It is not possible to determine the impact on the road network capacity without reference to the actual increase in traffic on specific roads during peak periods (AM and PM peak)<sup>36</sup>. This information is not provided by the applicant. The use of AADT is insufficient other than to gauge the overall level of traffic on a route.
- 1.2.36 In terms of routes affected, the haulage routes are identified on fig.13.1 of Vol.2a of the EIS. This shows that haulage of all material (including turbines) for all proposed clusters, excepting Ballynakill, will travel via the R402 and therefore it can be seen that the greatest potential for adverse traffic impacts and associated impacts will occur along that route. The EIS offers no assessment of the impact of the additional traffic on this route by reference to the significance of this route (if any) having regard to the nature of the traffic currently carried, the population centres it serves, the capacity of the route, its current traffic loading at AM/PM peak travel times and the maximum level of development traffic predicted on this route at these times.
- 1.2.37 The R402 has been realigned and upgraded to a good standard single carriageway with hard-shoulder between Carbury (now bypassed) and south of the settlement of Kilshanchoe. It runs through the village of Johnstownbridge, a tier 5 (of 7) settlement under the Kildare County Development Plan 2011-2017, and Kilshanchoe, a rural node (tier 7)

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<sup>35</sup> Note, in contrast the details relating to cable trenching works were provided in terms of length, which made obvious any errors.

<sup>36</sup> Traffic volumes on the network are typically greatest on weekday morning and evening peaks and the assessment should identify trip impacts during peak periods for the local network (*Guidelines on Traffic and Transport Assessment*, NRA, 2014)

settlement. All haulage to the 4 clusters south of the M4 will pass through Johnstownbridge. Some haulage will divert off at Johnstownbridge to access Drehid-Hortland Cluster, lessening the impact on Kilshanchoe. The impact on the two settlements will be likely be significant and adverse, in terms of the nature and scale of additional traffic and its duration. In addition, the proposed MV cable route will cross over a short section of the R402 at the northern end of Kilshanchoe, resulting in cumulative impacts from additional cable construction traffic and reduced road capacity during the period of cable laying works. The proposed HV cable route through Johnstownbridge has been omitted by further information and no cumulative impacts will arise in this regard.

1.2.38 Chapter 13 of the EIS includes an appraisal of the proposed haul routes (section 13.3.4). My review of the applicant's appraisal is as follows:

- M4 – No significant impact on the motorway or on junction 9.

I note that the TII has indicated, in its observation subsequent to receipt of further information submission, that it has no objections. I am satisfied that the proposed construction traffic can be accommodated subject to good practice and receipt of appropriate licensing / agreement of the Roads Authority. There would be no impact on settlements.

- R148<sup>37</sup> - maximum daily trips amount to 91no.<sup>38</sup>, equivalent to 1% of the AADT.

The number of haulage trips are underestimated and do not take account of transport of aggregates along the R148 from borrow pits in the east of the site to that part of the site west of the R160. The haulage route bypasses Enfield so no settlements are affected. The absolute level of increase is relatively minor, however it is the additional number of turning movements to/from the R148, particularly at AM/PM peak, that will be of critical concern in terms of capacity and road safety on the R148. This issue has not been addressed.

The cumulative impact of haulage traffic and cable works on the R148 is not assessed, although I note that the length of cabling is restrictive.

- R402 – The applicant indicates that were all haulage traffic to use the R402 (Ballynakill haulage will not) then an average of 4002 trips would be added to the network per month, or 154 per day, which amounts to a 5% increase in traffic. In the peak month, this would amount to 300 trips per day, or 9.8% increase on the routes AADT of 3069.

The R402 haulage route passes through the rural node of Kilshanchoe and the village of Johnstownbridge. All haulage traffic, bar that for

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<sup>37</sup> Mislabelled R146.

<sup>38</sup> A review of the applicant's figures indicates that the applicant assumes a 30 day month.

Ballynakill, will pass through Johnstownbridge. A significant proportion will also travel through Kilshanchoe. The appraisal does not address the significance of impacts on these centres, either as capacity constraints on the network at AM/PM peak (including the accommodation of turning movements at Johnstownbridge), or in terms of the potential for adverse impacts on their inhabitants.

Excluding Ballynakill traffic, in the peak traffic month (11), based on the applicant's figures, 7,199no. additional trips will pass through Johnstownbridge, 1663no. per week (or 1800 if 4 week month assumed), or c.277 per day (or 300 if 4 week month assumed), or c.28 trips per hour (based on 10 hour day). Given the nature of the traffic – 50% HGV and 50% LGV – the impact on the settlement will clearly be very significant and adverse. The impact on Kilshanchoe will be a little less as the applicant predicts that 40no. trips per day will divert east from the R402 along the L1004. The impact of traffic on these two settlements has been raised by a large number of observers.

The cumulative impact of haulage traffic and cabling works on the R402 at the northern end of Kilshanchoe is not assessed.

- R403 – Additional traffic of, on average, 843no. trips per month, or 34 per day, is predicted. It is submitted that this is less than 1% of AADT for the R403. At peak month (11), 2792no. additional trips are predicted, or 108no. per day, an increase of c.2.5% per day.

The R403 runs through Derrinturn village but the EIS provides no assessment of impact in terms of capacity at AM/PM peak having regard to any the capacity constraints as the route passes through the settlement, or an assessment of the actual impact on the settlement and its residents.

There is no assessment of the cumulative impact of haulage traffic and cable works on the R403. The cumulative impact has the potential to be significant on this route.

- R403 to Abbeylough Bridge (L5026-3) – Traffic estimated to be low (no figure) and the additional maximum additional trips per day is estimated to be 108no. and not to have a significant impact over this short section of road.

This road is very narrow and is of unfavourable alignment and surface condition. A number of residential properties front there-onto. There is no assessment of the impact, including cumulative impact of cabling works and haulage traffic.

- R414 – The AADT is stated as 1279. It is predicted that, on average, the additional traffic generated will result in 27no. additional trips per day, or



2% increase. Peak traffic (month 11) will generate 77no. additional trips per day, or 6% increase.

The appraisal provides no assessment of the significance of the impact on this route. No reference is made to the additional traffic on this route on days of concrete pours (as is referred to for L7005). No assessment of the potential cumulative impact of cabling works and haulage traffic is provided.

- L7005 – Peak traffic (month 11) will generate 77no. additional trips per day, or 23% increase. On the day of a concrete pour at least 135no. HGV trips will be generated on this route. Note 135no. is separate from LGV trips, which are assumed to account for 50% of the trips in general. It is not stated whether there would be a commensurate increase in LGV traffic with concrete pours. It is not stated how many concrete pour days there will be per site, or per turbine. There is no assessment of the actual impact or implications for same. No assessment of cumulative impact of cabling works and haulage traffic is provided.

1.2.39 Impact of construction traffic: Conclusion - The existing road network is varied in the standard of its design, its capacity and its structural capability to accommodate traffic, ranging from motorway standard roads (M4), high capacity single carriageway, lower capacity roads and roads of poor structural condition. The applicant's assessment of traffic impact is imparted without any reference to the actual capacity of the routes concerned, any capacity constraints that may exist (such as where these routes traverse settlements), the structural capability of the routes to accommodate the level of HGV traffic predicted particularly on legacy / bog road and/or where cabling works are proposed. There is no reference to the reduced capacity on the network (and on particular routes) from cabling works, which will exacerbate any impact from generated traffic during construction.

1.2.40 The EIS provides a cursory overview of potential impact having regard to the predicted percentage increase in AADT, however AADT is of little relevance to the assessment of impacts on capacity. Of critical importance is the existing peak traffic flows (usually AM and PM) on the routes likely to be affected and the predicted level of traffic to be generated by the development on those routes at those critical times. This information is not provided by the applicant. There is no consideration of delays on specific routes, the length of delays and the period over which such delays would be expected to occur. There is no assessment of the possible and / or proposed diversion routes to accommodate traffic during road closures, the suitability of such routes and any potential impacts arising. There is no consideration of the significance of any of the routes effected – e.g. are they significant commuter routes, or do they provide access to particular facilities (schools, hospitals, employers,

retail, etc.) or the particular road users and populations that would likely be affected during this extensive development over a prolonged period of time.

1.2.41 There is no assessment of the effect of development traffic impacts in terms of the implications of the additional traffic on the road network as a material asset (general wear and tear and potential for structural damage on roads of poorer structural capability). Given the scale and extent of the proposed development, the nature of much of the road network which includes legacy / bog roads (including R414) there is a realistic risk of long term damage to the road network. Although it is generally reasonable to address this issue by condition, in this instance there is a risk of cumulative impacts arising with in-road cable trenching works overlapping the proposed haulage routes, the impact of which has not been adequately addressed in the EIS.

1.2.42 There is no assessment of the impact of development traffic on human beings (general amenities, disturbance, etc.) in terms of the populations affected – e.g. the additional traffic traversing villages and rural settlements - or on businesses located within the area. Given the scale and extent of the proposed development, the dispersed pattern of development accessing on to the county road network and the location of settlements along the regional network, the additional traffic has the potential to significantly impact on residential amenities for a significant period of time (over a period of at least 1½ years for residents of Johnstownbridge), in addition to increasing risk of road safety for all road users and for pedestrians (within the settlements primarily). I am satisfied that the applicant has not addressed these issues to any adequate degree and that the EIS is deficient.

1.2.43 **Mitigation measures** – All of the 18no. mitigation measures proposed under section 13.4.2 of the EIS are relevant to mitigating adverse impact on traffic during construction and after completion. I consider the proposed measures to be reasonable and can be regarded as a good practice approach that would be implemented as a matter of course. They will not be sufficient to prevent adverse impacts as such development will necessarily temporarily adversely impact on traffic flows during the period of construction, but they will reduce the level of impact. No mitigation measures are proposed to address the potential for locational specific impacts.

1.2.44 **Traffic and Transport Assessment: Overall Conclusion** – In my professional opinion the traffic and transport assessment carried out by the applicant, forming part of the Environmental Impact Statement, is seriously deficient. There is no proper assessment of the actual impact on traffic flows on the network at AM/PM peak traffic times on specific routes, having regard to the generation of traffic by the development at those times, to the capacity of individual routes (including, in particular, pinch points, such as where those

routes traverse settlements, where capacity may be restricted) and the reduced capacity of routes during cabling works. There is no consideration of likely disruption and delays that would result, having regard to the actual capacity and significance (e.g. commuter routes, access to facilities such as schools, hospitals, employers, retail, etc.) of the routes affected, or the suitability of the possible diversion routes available and indirect impacts that may arise in such diversions.

1.2.45 The implications of the additional traffic on the road network as a material asset (short term general wear and tear and potential for long term structural damage on roads of poorer structural capability), has not been assessed. Given the scale and extent of the proposed development, the nature of much of the road network which includes legacy / bog roads (including R414) there is a realistic risk of long term damage to the road network. In this regard, there is risk of cumulative impacts with cabling works along cabling routes, particularly on legacy / bog roads. I am not satisfied that the proposed mitigation measure comprising the proposed 'type 4' reinstatement on legacy / bog roads is sufficient to prevent / mitigate the potential for long-term structural damage of legacy / bog roads.

1.2.46 The EIS assessment of impacts on the physical network and on traffic does not take account of the full extent (and width) of cabling trenches proposed, with inadequate information provided regarding the location, number and scale of joint bays and communication chambers necessary on the cable route. The EIS assessment is based on inadequate information regarding the location of existing in-road services, both generally on the road network and specifically within any route, and the topography along the cable routes and the implications for siting of cables and associated bays / chambers within or adjacent the carriageway. The assumptions regarding duration of the cable construction works, upon which the applicant's assessment of impacts are based, are unsupported and unclear. There is insufficient information on file to carry out an informed assessment of likely significant impacts on the physical road network, on network capacity / traffic flow and on road users. However this may also have implications for the assessment of impacts on human beings (extent and duration of noise, dust and disruption), air (dust) and water (runoff).

1.2.47 Given the scale and extent of the proposed development, the dispersed pattern of settlement along much of the county road network and settlements along the regional network, the potential construction traffic generated has the potential to significantly impact on amenities for a significant period of time (e.g., over a period of at least 1½ years for residents of Johnstownbridge). There is no adequate assessment of the impact on human beings arising from physical works to the network and from generated traffic, or on economic activity in terms of restriction on access to businesses. Similarly, that the

additional traffic and diversions on the network may be likely to increase risk of road accident on the network for all road users, including pedestrians, but this has not been addressed adequately in the EIS.

1.2.48 According to the '*Traffic and Transport Assessment Guidelines*' (TII/NRA, May 2014) 'a TTA is a comprehensive review of all the potential traffic impacts of a proposed development, with an agreed plan to mitigate any adverse consequences. In my professional opinion the assessment carried out by the applicant does not accord with the said guidelines.

### 1.3 **Turbine delivery:**

1.3.1 The EIS (section 13.3.1 Potential Impacts) indicates that the delivery of turbine components, including blades, tower sections and nacells is a specialist transport operation. Such transportation, which is often carried out at night when traffic is lightest, can only be done following extensive route selection, route proofing and consultation with An Garda Síochána and the road authorities, the Garda Traffic Corp and generally requires special permits. Temporary accommodation works are often required, such as the relocation of power lines / poles, lampposts, road signage and local road widening, and also tree and hedge cutting.

1.3.2 The EIS proper does not contain any assessment of likely significant impacts along the proposed turbine delivery route. A Delivery Route Selection and Assessment Report, prepared by ELS, a specialist in route surveys and traffic management, is attached as Appendix K to the report. The EIS includes the proposed turbine delivery route under section 13.4.1 Mitigation by Design (Route Selection).

1.3.3 The scope of the Delivery Route Selection and Assessment Report was to identify all alterations needed at bends and junctions required for Turbine Component delivery to the Maighne wind farm clusters between the port of entry (Dublin) and the various site entrances. The report is based on 60m turbine blades and the alterations needed for the delivery of the largest turbine component using extendable rear steer trailer<sup>39</sup>. The report identifies all points where upgrades are required as node points. There are 23no. node points:

- 10no. under KCC control (2no. under TII)
- 2no. under MCC control (2no. under TII)
- 8no. in private ownership
- 1no. involving Waterways Ireland
- 2no. involving Bord na Mona

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<sup>39</sup> P.62 ELS Report (Appendix K1, EIS)

1.3.4 The report identifies the area of hard-core required to be laid, and the area of oversail at each of the node points, highlighting where the land concerned is in private ownership. I consider the level of detail to be reasonable.

1.3.5 Nodes indicated as entailing intrusion on private lands are as follows:

- NKHRTL001 – Lands at L5025 to L1017/L1019 junction at Timahoe Crossroads to access Drehid-Hortland Cluster east. Three options are provided.
- NKDERB002 – Lands at R403 / L5026-3 junction to access Derrybrennan Cluster, near Abbeylough Bridge. Two options provided. The area of private lands affected are shown in the photograph (not aerial) but are not indicated in the plan.
- NKDERB002a – Lands at R403 / L5026-3 junction to access Derrybrennan Cluster, near Abbeylough Bridge. 3 options provided, each entailing encroachment on private land.

1.3.6 A significant number of observers have pointed out that the applicant has not demonstrated adequate legal interest required to amend roads to facilitate delivery of turbines<sup>40</sup>. This is raised in particular with regard to node NKCLNC003 and NKDERB002, where it is submitted that the owners have not given consent for the accommodation works. At NKCLNC003, the ELS report shows extensive accommodation works on lands, but does not highlight the relevant lands as private. At NKDERB002, the ELS report shows extensive accommodation works, but does not highlight the relevant lands as private in the aerial or plan drawing, but does so on the standard photograph. This is insufficient. It is claimed by observers that landowners not aware, or were not made aware, of how TDR proposal impacts on their lands. A review of the drawings, photographs and maps would suggest that far more of the accommodation works are located on private, rather than public land than is indicated in the report. In addition the details of the drawings are neither based on nor shown in the context of a detailed topographical survey and I am therefore not at all satisfied that the indicated extent of accommodation works and oversailing is accurate – see for example node NKCLNC007. In the case of NKCLNC007, the redline boundary is not fully shown. Whilst the report states that 8 of the nodes involve private landowners, only three are addressed in the report.

1.3.7 It is claimed that the applicant has neither landownership nor consent required to make an application under A.22(2)(g)<sup>41</sup> and the entire Cloncumber cluster is therefore unusable. Reference is made to Herbert J in *McCallig v An Bord*

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<sup>40</sup> Note, similar issues may arise with achieving of sightlines at proposed entrances.

<sup>41</sup> *A planning application referred to in sub-article (1) shall be accompanied by - (g) where the applicant is not the legal owner of the land or structure concerned, the written consent of the owner to make the application.*

*Pleanála* (24/01/13) which found that consent should comprise an individual consent bearing the personal signature of the owner (or by a stated agent on their behalf) which identifies the land concerned by reference to parcels drawn and distinguished on a map or plan submitted by the applicant for permission. As this is an application for Strategic Infrastructure Development rather than a standard application for permission, article 22(2)(g) does not apply, however I consider the principle at issue to be relevant regarding the applicant's ability to implement the entirety of proposed development as described in the drawings and documents (including the EIS and NIS) submitted.

- 1.3.8 In this instance the applicant has attached a letter from P.J.O'Driscolls Solicitors to confirm that Element Power Ltd is the beneficial owner of the Grantee's interest in the Option Agreements for Grants of Right of Way & Wayleave, the Option Agreements for Compound Leases, Met Mast Licence and Borrow Pit Licences with the landowners listed in the Second Schedule. It is further stated that pursuant to the terms of the said Option Agreements for the Grants of Right of Way & Wayleave and Compound Leases and to the terms of the Borrow Pit Licences, and Met Mast Licence, the said landowners (12no.) have consented to an application for planning permission for the above windfarm and ancillary works on, inter alia, the lands the subject matter of the Grants of Right of Way & Wayleave, Borrow Pit Licences, Met Mast Licence and Compound Leases.
- 1.3.9 The applicant has not identified the lands concerning this agreement in map form, or even by Folio number, and does not indicate in any form the lands concerning each of the individuals mentioned in schedule 2, and thus, do not accord with the principles for same set out by Herbert J.<sup>42</sup> In response, the applicant, although referring to observations from KCC (p.16 of the response) and from multiple submissions (p.180 of the response), does not actually address the issue of '*sufficient legal interest*' to carry out works on private lands outside their ownership other than to refer back to the details contained in the ELS report and does not address the specific observations concerning the impact on private lands at node NKCLNC003 and NKDERB002. Instead the applicant refers back to the alternative delivery methods explored in the ELS report.
- 1.3.10 The ELS report identifies two alternative delivery methods to minimise the impact on the existing environment during turbine component deliveries. The first is the use of multi-adapt blade trailers which have retractable axle assembly (which helps reduced the turning area of the trailer), with pendle axle steering (rear axle steering offers a tighter turning radius and therefore requires less hard-core area, and height adjustable trailer which can be raised

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<sup>42</sup> A similar issue would appear to pertain to the landowners referred to under Schedule 1 of P.J.O'Driscoll Solicitors, however this has not been raised by the parties.

1.2m above FRL). The example given is the Nooteboom Mega Wing Blade Transporter currently in use on wind farm sites. The second is the blade adaptor. Where the context is such that the blade cannot be delivered in the conventional horizontal position, a blade adaptor is connected to a specially adapted motorised unit, tilted 60-degrees into the air, which effectively reduces the length of the blade to 30m. These options are identified by ELS as minimising the impact on the existing environment during turbine component deliveries. In its response, the applicant indicates that a blade adaptor trailer can be used to transport through restricted areas. The applicant does not illustrate what implications, if any, this has in terms of reduction of encroachment at any of the nodes concerned considering all the components that need to be delivered, or whether the indicated accommodation works already take account of these possible mitigations.

1.3.11 The ELS report indicates that a detailed topographical survey is required to ensure that the public road is capable of taking the load in the adapted position and the transport company must ensure that all overhead utilities are locally diverted or temporarily lowered. Despite the request for same by the local authorities, no topographical surveys of the TDR route has been submitted.

1.3.12 In a related issue, I note that the lands identified for turbine delivery accommodating works (laying of hard-core materials to support transport vehicles) are not included within the redline (or blue line) boundary for the application.

1.3.13 **Turbine Delivery Route: Conclusion** – The application is not accompanied by the written consent of the relevant landowners to make the application in order to carry out the development concerned, including the accommodation works adjacent the public road network identified in the ELS Report (Appendix K of the EIS) to the standard as set out in the judgement of Herbert J in *McCallig v An Bord Pleanála* (24/01/13). The ability of the applicant to implement the proposed development, in its entirety, in accordance with drawings and documentation (including the EIS and NIS) submitted on file is therefore at question. In addition, the full extent of the works required to accommodate the proposed turbine delivery have not been identified through the carrying out of a detailed topographical survey, noted as necessary in the ELS report, and much of the identified accommodating works are not contained within the redline (or blue line) application boundary.

#### 1.4 **Vehicular entrances and operational traffic**

1.4.0 Sight lines - The EIS indicates that the each of the entrances to the wind farm clusters was inspected on site to verify that appropriate sightlines were available for those vehicles using the entrances and for other road users and

that a report on the on-site survey carried out on the entrances is provided in Appendix K3. I have reviewed the visibility assessments under section 3 of the said appendix and would advise the Board that they are seriously inadequate and unorthodox. There is no assessment of the proposed new entrance to the R414 from the Derrybrennan Cluster, instead it reviews the proposed entrance onto a private internal road serving agricultural and Bord na Mona lands where the requirements of DMRB does not apply.

1.4.1 The sightline assessment in Appendix K3 of the EIS concludes that 7 of the 9 proposed/modified entrances achieve the required sightline distances but that road geometry restricts the sightlines for the remaining two entrances: to the Cloncumber cluster and to the Drehid Hortland access to turbines T40 to T45. The traffic and transport assessment within chapter 13 of the EIS notes that the location and layout of new or modified entrances to the wind farm clusters have the potential to adversely impact on the flow of traffic and local road safety if they do not conform to acceptable junction/entrance design standards, but does not assess the implications of proposed substandard entrances. I therefore consider the EIS to be inadequate.

1.4.2 The KCC Area Engineer Report (Transportation Section) confirmed that the sightline assessment was not of an acceptable method<sup>43</sup> and advised that further information was necessary concerning site access, as follows:

- Topographical survey required of full extent of sightlines, with setback distance and full extent of sightlines shown in plan in accordance with DMRB.
- Written agreement of relevant third parties where requirement to setback boundaries impacts on third party land.
- The proposed new access road entrance to the R414 from Derrybrennan Cluster to be included in assessment.
- Full detailed design of proposed entrances including width, turning radii, setback and construction, with written agreement from third parties as appropriate.

1.4.3 In response the applicant submitted details of the entrances and submitted that the each entrance was visited and an assessment of available sightlines carried out in accordance with NRA TD 41/42 (Geometric design of major/minor priority junctions and vehicular access to National Roads) and that sightlines are achieved at all entrances. The applicant submits that Section 7.7(c) of TD 41/42 allows a relaxation in setback (x) distance to 2.0m in difficult circumstances, for simple junctions on regional and local roads, where the access will be lightly used. As outlined above, the entrances will be manned during the construction phase. During the operation period of the

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<sup>43</sup> These concerns were echoed by many observers.



wind farm, the entrances will be lightly used. Accordingly, the sightline assessment presented in on Drawings LE14-731-04-120 and LE14-731-04-121 uses a setback distance of 2.0 m. In general I would accept the applicant's argument that the entrances will be lightly used during operation and manned during construction, however the applicant has not demonstrated that each of the entrances, which are diverse in their context, are '*in difficult circumstances*' and warranting of a relaxation of the standard.

- 1.4.4 The detail of entrances are not based on topographical site surveys but on use of OSI base maps, which are not to an adequate scale and do not contain sufficient detail to enable sightlines to be accurately determined and to enable identification of the full extent of works required, including over third party lands, to achieve same, or to support the applicant's assertion of difficult circumstances. In her report, the KCC Area Engineer confirms that a topographical survey is still required in respect of the proposed entrances.
- 1.4.5 The details of the proposed entrances are sufficient, and do not include the width, turning radii, setback and construction details as reasonably requested by the Area Engineer. KCC maintains that these details are still required.
- 1.4.6 The applicant's drawings purport to indicate sightline distance to NRA TD 41/42 standard (see Fig.1, below), with the sightline (y-distance) along the major road measured from a point setback (x-distance) along the minor road (or entrance). The y-distance and x-distance depend on the nature and character of the major road (generally equating to its design speed) and the frequency and character of use of the minor road and also the difficulties in achieving the required standard.

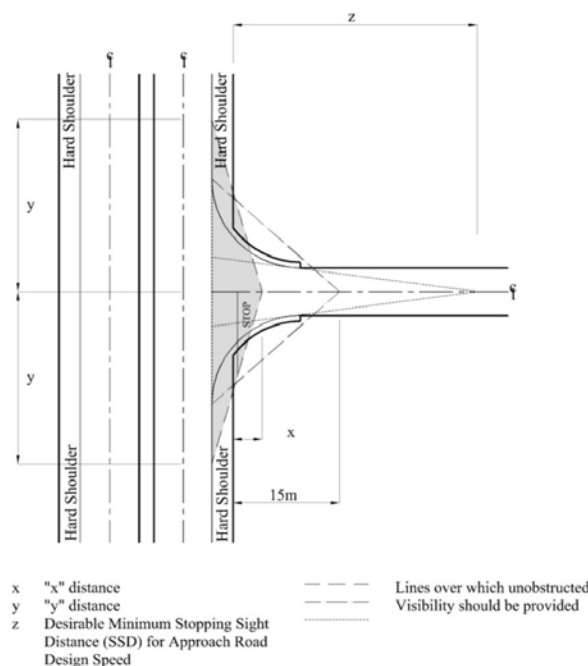


Fig.1: NRA TD41/42-11 Visibility Standards (Figure 7/1)

1.4.7 Entrance junction 1 - (Ballynakill east entrance to the R148) shows 160m sightline distance in each directions, measured to the centre line of the major road (R148) rather than to the nearside of the carriageway. The applicant interprets TD41/42 as allowing a relaxation of the standard, with y-distance measured to the centreline to the left hand side of the access where there are restrictions on overtaking (continuous white line) applying to the major road. Para.7.11 of the standard states:

*At junctions onto regional and local **urban**<sup>44</sup> roads where there is a constraint on overtaking on the approach from the left to the junction, the visibility splay to the left may, as a Relaxation, be taken to the nearside edge of the lane for oncoming traffic rather than to the nearside edge of the road: see Figure 7/3. A constraint on overtaking occurs where the layout or visibility on the approach is such that a continuous white line is required to prevent overtaking.*

1.4.8 The wording of paragraph 7.11 is such that it applies specifically to urban roads and it is my interpretation that the relaxation cannot therefore apply in this instance as the roads concerned are rural<sup>45</sup>. I would, however, note that the KCC Area Engineer report responding to the applicant's further information response does not raise this concern. Regardless, the relaxation does not apply to the right hand side (this is also the opinion of the KCC Area Engineer). This is for obvious reasons, as traffic from the right hand side will be travelling towards the entrance on the nearside lane and therefore the view of the nearside lane must be visible. In this instance the restriction on overtaking does not extend to the right hand side of the entrance to the full length of the sightline (it does so only to the left hand side) and therefore the relaxation couldn't apply to that area regardless. This would have implications for the extent of vegetation (and structures, such as poles) that would have to be maintained at a lower level or removed to accommodate the proposed entrance.

1.4.9 In terms of y-distance, the applicant applies 160m based on 80kph speed limit and 85kph design speed, however this road was designed as a national road and is of wide width and favourable alignment and I am not convinced that it is of 85kph design speed. The applicant provides no justification for same. A 215m sightline distance would apply for 100kph design speed.

1.4.10 A 2.0m x-distance setback is applied but cannot be determined from the drawings due to scale. The use of the further relaxed standard from the desirable minimum standard (3.0m) or the general relaxed standard (2.4m) on

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<sup>44</sup> My emphasis.

<sup>45</sup> 'Roads, Urban and Rural: - an Urban Road is a road which is in a built up area and has either a single carriageway with a speed limit of 60 km/h or less, or has a dual carriageway (excluding motorways) with a speed limit of 80 km/h or less, or a motorway with a speed limit of 100 km/h or less. All other roads are Rural Roads.' (TD.41-42/11, NRA)

the basis of 'difficult circumstances', has not been justified for this particular entrance. Whilst it is possible the property to the left hand side may interfere with achieving sight distance in that direction, that this is the case isn't raised in the EIS or subsequent response (para.1.2.6.2). If this particular location is difficult, the applicant has not examined appropriate alternatives, such as the relocation of the entrance a short distance westwards along the R148, or explained why an appropriate alternative is not feasible. I am therefore not satisfied that the proposal is the optimum approach in terms of road traffic safety on this road which accommodates significant traffic at relatively high speeds.

1.4.11 Entrance junction 2 - (Ballynakill west entrance to R148) shows 215m y-distance to the right hand side (100kph speed limit applies) from 2.0m setback, and purports to show sightline distance of 160m to the left hand side (where 80kph speed limit applies).

1.4.12 Again, the left hand side sightline is shown to the centre of the carriageway to the left hand side (due to the restriction on overtaking) when the relaxation in the standard (para.7.1 refers) only applies to urban roads. Even if it were applicable, a closer examination of the drawings show that the sightline distance is actually 155m, as the applicant has not measured the distance from the centre of the proposed entrance contrary to the requirements of TD41/42, and therefore the sight distance does not actually comply with the relaxed standard. Furthermore, the applicant has not justified its use of the 85kph design speed on this former national primary route and I am not satisfied that it is justified. The detail of the drawing is inadequate to enable a determination of compliance with the standard. It may be feasible to achieve the required line of sight through relocation of the proposed entrance westwards along the R148 within the site boundary.

1.4.13 To the right hand side the sightline is shown to the nearside of the carriageway, although the detail of the drawing is such that it is not possible to determine whether this is accurately so. The road is of favourable alignment to the right hand side and it would appear feasible to achieve the 215m distance with the removal or cutting back of field boundary vegetation.

1.4.14 Entrance junction 3 - (Windmill access to L1005) does not show any line of sight at the entrance but states '*existing entrance to Carbury facility with existing sightlines to be maintained*'. No works are proposed.

1.4.15 Entrance junction 4 - (Drehid-Hortland (west) access to L5025 from north) shows 160m sightline distance in both directions. This is an existing agricultural type entrance, but is very wide (I estimate double standard width), setback within a splay demarcated by stone walls c.1.2m in height. It is proposed to remove the said walls. The road is of favourable alignment, there

is a grass verge adjacent the road and the roadside boundary of neighbouring residential property has been setback. The drawings indicate 'trees to be trimmed back / thinned' on lands outside the site boundary on lands to the right hand side of the entrance. The vegetation on the property to the left hand side may be more problematic. However, again the detail of the drawing is insufficient to determine whether the required sightline distance can be achieved without encroachment on lands outside the applicant's control.

1.4.16 Observers have queried the need for a new entrance as there are two existing entrances. There appear to be no existing accesses to the public road within the redline boundary that would provide access to T47. I am of the opinion that the proposed entrance can be considered on its own merits. Reference has been made to the decision of KCC to refuse permission for the development of chalets, lakes and windmills in the vicinity of T47. I assume this refers to reg.ref.07/18, which refusal did not include a reason pertaining to traffic grounds.

1.4.17 Entrance junction 5 - (Drehid-Hortland west access to L5025 from south) shows a new entrance with sightlines of 160m. Again, the level of detail is inadequate to determine that the sightlines can be achieved without encroachment on third party lands. However, the road is of favourable alignment and there is nothing obvious to hinder the 160m line of sight in either direction excepting timber utility poles, which may need to be relocated (the drawings do not indicate same).

1.4.18 Entrance junction 6 - (Derrybrennan access to private road). No sightlines are shown. As this is a private road which is of favourable alignment, but of severely substandard road surface, TD41/42 does not apply.

1.4.19 Entrance junction 7 - (Cloncumber access to L7004) indicates sight distance to the right hand side of 120m and 44m to the left hand side. The applicant submits that a 120m distance, which applies to a design speed of 70kph rather than 85kph design speed<sup>46</sup>, may be applied in difficult circumstances in accordance with para.7.7.e of TD41-42. The applicant considers the effective speed limit to be less than 60kph due to the presence of a bend in the road to the west of the entrance, which restricts visibility and the sharp bend c.44m to the east, with two other sharp bends in the road and bridge crossing of the Grand Canal. 7.7.e states:

*'For urban, regional and local roads with a demonstrably effective speed limit of 60kph or less, the „y“ distance may be relaxed by one design speed step in difficult circumstances, see also Para 7.11.'*

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<sup>46</sup> For clarity, roads of 80kph are permitted to be designed to a speed of 85km, but higher speed roads are not.

- 1.4.20 Although I would agree with the applicant that the said road may have an effective design speed below 80kph (possibly significantly well below that), the wording of the relaxation is such that it applies where the subject road has a demonstrably effective *speed limit* of 60kph or less. It does not refer to the *design speed*, but to whether the applicable speed limit (being 60kph or less) is demonstrably effective, which will often not be the case. The reduction in standard is not applicable. Furthermore, the proposed accommodation works for turbine delivery, in addition to the proposed removal of hedgerow to improve sightlines to the right hand side of the entrance, will open up two bends and improve visibility on the westerly approach along the L7004 to the site. Increasing forward visibility will facilitate higher speeds on this section of road, possibly to the 80kph speed limit, and the reduced y-distance is therefore not justified.
- 1.4.21 The detail of the plans is inadequate to enable the entrance and sightlines to be determined. This is made most evident by the proposed entrance being shown sited within the middle of the carriageway. The sightlines would entail encroachment on lands outside the applicant's ownership to the right hand side of the entrance (west).
- 1.4.22 Entrance junction 8 - (Drehid-Hortland (east) access to L1004) is shown with 160 sightline to the left hand and right hand side of the proposed entrance. Again the issue of inadequate detail arises. Due to the curvature of the road, the line of sight to the right hand side extends to lands on the far side of the carriageway and there is a possibility that vegetation on those lands may obscure the line of sight.
- 1.4.23 The drawings indicate that hedgerows to the left hand side and trees to the right will be trimmed / removed within the 160m line of sight. The majority of the trees and vegetation to the left of the entrance do not fall within the red line boundary (or blue line). The level of the land drops off sharply from the road and will need to be raised to ensure that egressing vehicles can obtain the required visibility to exit safely. This is not referred to in the drawings.
- 1.4.24 Entrance junction 9 - (Drehid Hortland (east) access to L1017) shows 120m sightline distance. The applicant selected this relaxed standard based on an effective speed limit of limit of less than 60kph, notwithstanding that the 80kph speed limit applies, given the nature of the existing road with regard to para.7.7.e of TD41/42. I refer to the applicability, or not of the said relaxation, above, in respect of entrance junction 7 and the same issue would apply to this stretch of road. In addition, the subject road is of favourable horizontal and vertical alignment, with very good forward visibility for traffic travelling there-along and there is no justification for a relaxation in the standard.
- 1.4.25 Again, the detail of the drawings is inadequate and is not based on a topographical survey. A large number of observers have made reference to

the existence of physical obstructions in the vicinity of the proposed entrance to Hortland but which are outside the redline boundary and control of the applicant. The observations refer to the L1007, however it is my understanding that the road is actually the L1017, the L1007 being located to the northeast and not abutting the site. Such serve to emphasize the need for adequate topographical surveys.

1.4.26 Other junctions and other issues – The proposed development requires the provision of a new entrance to the R414 to the south of Derrybrennan. This is a significant new entrance. I find it incongruous that the applicant would provide an assessment of the access to Derrybrennan from the private internal road (entrance no.6), but not of the proposed entrance off the R414. The details of the entrance and sightlines were identified as necessary further information in the reports of KCC, yet the applicant has not provided same and the position of the Council has not changed subsequently. In view of the revised grid connection proposal, KCC also requests sightlines and entrance design at Dunfiarth substation. I consider this to be a less pressing matter given that the wide recessed entrance is an existing operational entrance, but the Board may be of the opinion that it is not unreasonable of the Area Engineer to review the matter having regard to the possibility of increased operational traffic at the subject facility.

1.4.27 Regarding the proposed access to the R414, there is nothing on file or in the EIS to suggest that the proposed entrance and 3.5km access road is anything other than permanent and I note the application proposes 9no. new or upgraded entrances to the public road. Whereas the proposed entrance may be justified to accommodate construction works, the applicant has provided no justification for its retention into the future. The proposed entrance and access road would connect to an existing private access road serving a substantial area of land and there would clearly be potential for same to become used for traffic other than access to the Derrybrennan turbines. This is not taken into account in the traffic assessment, which assumed 4no. trips (2no. arrivals and 2no. departures<sup>47</sup>) per day during the operational period.

1.4.28 It is possible that this may also arise at the other proposed entrances. The traffic assessment does not take account of traffic generated at these entrances other than operational traffic. This may have implications for road traffic safety on the network depending on the nature and frequency of traffic using the proposed access points. However, excluding turning movements associated with access and egress to the proposed entrances that have not been proven to meet national standards, I would accept that the level of traffic arising from the operations of the proposed windfarm would not, in itself, have a deleterious impact on the overall road network, in terms of network capacity.

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<sup>47</sup> Section 13.3.6 EIS Vol.2.

1.4.29 I do not agree with observers that the proposed entrances, during the operational period, would materially impact on the amenities enjoyed by pedestrians in the area. During the construction this will be an issue, but only for a temporary period.

1.4.30 **Vehicular Entrances – Conclusion:** The detail of the proposed entrances are inadequate to enable the proposed sightlines to be determined vis-à-vis the applicable standards and to determine the full extent of modifications necessary, including on third party lands, to achieve the line of sight indicated by the applicant. No details have been submitted of the proposed entrance to the R414 from the Derrybrennan Cluster.

1.4.31 The applicant has not demonstrated that it has sufficient interest in lands over which the indicated sightlines traverse to carry out the necessary works to achieve and permanently maintain the indicated line of sight. The KCC report indicates that the written agreement of 3<sup>rd</sup> party landowners to tree / hedgerow trimming necessary to achieve sightlines is required. Such written agreements would have to apply to all necessary works on third party lands. The aforementioned standard for written consent set by Herbert J. in *McCallig v An Board Pleanála* may be appropriate in this regard.

1.4.32 I am satisfied that the relaxation (para.7.7.e refers) in the TD.41/42 standard availed of by the applicant in respect of proposed entrance junction 9, in particular, but also in respect of proposed entrance junction 7, is neither applicable nor justified in the context of the proposed entrances. I am also of the opinion that the relaxation in the said standard under para.7.1 is not applicable to the proposed entrance junctions 1 and 2, being entrances to rural roads not urban roads. Regardless, the said relaxation of standard has been improperly applied in measuring sight distance to the right hand side of entrances, whereas the relaxation only be applied to the left hand side. Therefore, notwithstanding the predicted low levels of operational traffic, the proposed entrances, through failure to meet the required road design standards, will endanger public safety by reason of a traffic hazard. However, excluding risks associated with turning movements to/from the proposed entrances not shown to meet national standards, the level of traffic arising from the operations of the proposed windfarm would not, in itself, have a deleterious impact on the overall road network, in terms of network capacity.

1.4.33 Subject to confirmation that the proposed entrances will be restricted to use for operational purposes related to the subject wind farm, and subject to the undertaking of an appropriately detailed topographical survey and the submission of accurate drawings showing the achievable sightlines and detailing the realistic extent of works and maintenance (such as of vegetation) required to achieve and maintain same, it may be feasible to accommodate at least some of the proposed entrances without resulting in a traffic hazard.

- 1.4.34 I do not consider the proposed access to the R414 from Derrybrennan to be warranted other than during the construction period, given the existing access to the public road (indirectly to the R403) available to the north and the potential for the proposed access route to provide access to extensive lands adjoining the private access road serving the proposed Derrybrennan Cluster. The entrance has not been assessed by the applicant regarding compliance with DMRB TD41/42.
- 1.4.35 Having regard to the foregoing, based on the information submitted with the application and the further information submitted subsequently, it is evident that some of the proposed entrances will not comply with the required standards (NRA/TII TD.41/42) and that insufficient information in terms of survey drawings, detailed proposal drawings and relevant documentation (including written agreements) has been submitted to demonstrate that the proposed entrances can comply with same. In the absence of demonstrable compliance with the relevant national road standards, it must be concluded that the proposed development endanger public safety by reason of a traffic hazard and should therefore be refused.

## 1.5 Other transport and traffic issues

- 1.5.0 Leinster Outer Orbital Route - The NRA (now TII) report (04/06/15) indicates that, at EIS scoping consultation stage, it raised the need for the applicant's EIS to consider the scheme in the context of the Leinster Orbital Route (LOR), identified in the LOR Feasibility Study and which is provided for under County Development Plans for both Kildare and Meath and in the RPPGDA 2010-2022. The application site's relationship to the LOR was not addressed in the EIS or on other documentation in the original submission. The NRA advised that this relationship needed to be addressed prior to any decision to grant permission to ensure the proposed development does not impact on LOR route corridors and to ensure that any common issues, specific requirements or additional costs arising to the national road scheme resulting from the proposed development are fully addressed in accordance with the Spatial Planning and National Roads Guidelines (2012). Numerous observers also raised concern about the impact on the proposed LOR.
- 1.5.1 In its further information submission, the applicant refers to the feasibility study prepared by Roughan O'Donovan – Faber Maunsell Alliance in 2007, and includes in Appendix 24 to the response a copy of the NRA response maps which detail the route option corridor in addition to 3 other route variants. Maps 1.1 and 1.3 show the route option corridor traversing the Drehid Hortland (west) Cluster, with T11 and T13 and the proposed substation falling within the boundaries of that corridor. The applicant notes that the LOR has not been progressed since the feasibility was published and



it quotes sections and measures from the NTA's GDA Draft Transport Strategy 2010-2030. As this document has been superseded subsequent to the applicant's response these direct quotes are no longer directly relevant. However the main point of the response is that the route option corridor, which passes through the application site, also passes through a number of designated sites including Ballynafagh Lake SAC (and pNHA), Ballynafagh Bog SAC (and pNHA) and Hogestown Bog NHA and, as the requirements of the Habitats Directive will apply, the subject route corridor is unlikely to be suitable and is likely to be discounted for environmental reasons. The applicant also points out that even with the proposed development in place, there would remain 1700m of the 2km width corridor in which to locate the proposed LOR.

- 1.5.2 TII had no specific comment to make further to the applicant's response other than to reiterate that the LOR is provided for under the aforementioned County Development Plans, Regional Planning Guidelines and the NTA's draft Transport Strategy
- 1.5.3 The NTA GDA Transport Strategy 2016-2035 was approved by the Minister in April 2016. In respect of the LOR it states:

*The Leinster Orbital Route is an orbital road proposal extending from Drogheda to the Naas / Newbridge area with intermediate links to Navan and other towns. It would provide connections between these towns, currently poorly served by direct linkages, supporting their economic development and improvements in orbital public transport connectivity. While this project is not planned for implementation during the period of the Strategy, the finalisation of the route corridor and its protection from development intrusion is recommended.*  
(p.80)

- 1.5.4 It is an objective (RP15) under the Kildare County Development Plan 2011-2017 to co-operate with the NRA and other local authorities to provide the Leinster Outer Orbital Route proposed in the RPPGDA and to protect zones along the key radial routes from Dublin where junctions with the proposed Leinster Orbital Route may be constructed in accordance with the NRA Corridor Protection Study and, once a route corridor has been identified, to preserve this corridor free from development. The Meath County Development Plan contains a policy (TRAN POL 27) to co-operate with the NRA regarding the provision of the LOR and (TRAN OBJ 21) in clarifying and finalising the route of same.
- 1.5.5 As noted by observers to the application, the Board refused permission (PL09.237777) for a Combined Heat and Power Plant proposed at Togher Industrial Estate, Newbridge, on grounds of the proposed development's

location within a route corridor identified in the LOR Feasibility Study. The Board determined the proposed development to be premature pending the determination by the planning authority, or the road authority, of a road layout for the LOR and contrary to the proper planning and sustainable development of the area. In response (p.223 of 264), the applicant submitted that the LOR has been suspended by the National Roads Authority and that the Maigne Wind Farm will not affect viable routes for the orbital route. It is evident from the applicant's response to the NRA/TII that the applicant is aware that the LOR has not been suspended and that the status remains the same as at the time of the said decision of the Board<sup>48</sup>.

- 1.5.6 I note that, as indicated by the applicant, the route option for the LOR encroaches on two Natura 2000 sites within Kildare, in addition to the River Boyne and River Blackwater SAC and the River Boyne and River Blackwater SPA. The applicant is correct that should the implementation of the LOR be pursued that the requirements of the Habitats Directive regarding Appropriate Assessment will apply. The findings of a future Appropriate Assessment (which is a 4 stage process) in respect of the LOR cannot be prejudged and is not for the consideration of this report. The permitting of development within the route option corridor would, however, prejudice the possibility of future development of the LOR within the identified corridor, would be premature pending the determination by the planning authority, or the road authority, of a road layout for the LOR and would be contrary to the proper planning and sustainable development of the area. Should the First Inspector be minded to recommend that permission be granted, this issue could be resolved through the omission of proposed turbines T11 and T13 and the relocation of the proposed substation by condition.
- 1.5.7 Possible Future development - In the Drehid Hortland cluster, the proposed internal access road to T21 and T22 extends beyond the line of the proposed turbines (by c.120m and c.80m, respectively), up to the redline boundary. The proposed access road to T20 also extends c.120m beyond the proposed turbine but falls short of the site boundary with lands to the east. The proposed track extends beyond T45 by over 100m and up to 135m beyond T35 and T36. There is no obvious purpose to these extended tracks. They do not provide access to turbines or ancillary development, but would suggest the direct facilitation of further wind energy development on surrounding lands (particularly so regarding those tracks extending beyond T21 and T22). Notwithstanding the adjoining lands are not indicated as under the applicant's control, there may be implications in terms of the requirement under EIA and AA to consider possible cumulative impacts and in-combination effects,

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<sup>48</sup> As pointed out by David Mulcahy Planning Consultants Ltd (on behalf of Donadea Against Turbines) in response to the applicant's further information submission.

respectively. Should the Board decide to grant permission, the extended sections of track should be omitted by condition.

- 1.5.8 **Other Transport Issues: Conclusion** – The proposed development encroaches on the route option identified in the NRA's LOR Feasibility Study, would prejudice the future development of the LOR, is premature pending the determination by the planning authority, or the road authority, of a road layout for the LOR and would be contrary to the proper planning and sustainable development of the area. This issue can be resolved by condition through the omission of proposed turbines T11 and T13 and the relocation of the proposed substation should the Board be mindful to grant permission for the proposed development.
- 1.5.9 The proposed access tracks extending beyond the obvious needs of the proposed development, including up to the site boundary in the case of T21 and T22, raising concerns that the subject development proposal may directly facilitate future development within and beyond the site. This may have implications in terms of the consideration of possible specific cumulative impacts and in-combination effects under EIA and AA, respectively, which have not been addressed in the EIS and NIS submitted by the applicant. Should the Board decide to grant permission, the extended sections of track should be omitted by condition.

## **2 Noise and Vibration (Impacts on human beings)**

### **2.0 Introduction**

- 2.0.1 Assessment of potential impacts from noise and vibration are addressed under chapter 6 of the EIS submitted with the application, with details of the predicted background noise levels relative to wind speed (and details of the survey equipment used in the survey) contained in appendix E in Vol.3 of the EIS. The assessment was carried out by Hayes McKenzie Partnership Ltd., based on information provided by the applicant, Element Power, and Fehily Timoney & Company, and noise survey data provided by Enfonic. Noise was further addressed in the applicant's response to submissions, including in appendices 4 and 5 thereto.

### **2.1 Noise impacts**

- 2.1.0 **Operational noise** – The EIS assesses the significance of potential impacts with reference to, inter alia, the '*IWEA Best Practice Guidelines for the Irish Wind Energy Industry*' (Fehily Timoney, 2012), The DoE's Wind Energy Planning Guidelines (2006), the noise assessment methodology used in ETSU-R-97 '*The Assessment and Rating of Noise from Wind Farms*' (UK DTI,

1996) and the UK's IOA 'A Good Practice Guide to the Application of Rating of Wind Turbine Noise' (2013) or the GPG.

2.1.1 The general the applicant has followed the methodology<sup>49</sup> under the GPG, which comprises:

- Predict noise levels from all turbines at the nearest receptors;
- Determine study area and identification of all potentially affected properties;
- Undertake measurement survey consisting of simultaneous measurement of background noise levels at representative properties with wind at speed direction at the proposed turbine site;
- Analyse data to remove rain affected and atypical data and derive noise limits for the scheme;
- Update noise predictions and assess compliance with noise limits for candidate turbine and provide design advise if compliance with limits is considered unlikely.

2.1.2 In the absence of relevant statutory Irish guidelines concerning baseline noise surveys for wind energy proposals, I consider reference to the GPG to be the appropriate basis for carrying out the assessment.

2.1.3 Study area – The study area extends 1.31km from the proposed wind turbines. The noise assessment does not identify the properties likely to be affect, either in the text of chapter 6 of the EIS or on drawings related to noise monitoring (EIS Vol.2A, Fig.6.1 – 6.1.5). Information on the location of built structures<sup>50</sup> within specific noise contour distances (500m, 1000m and 1310m) from the proposed turbines is contained separately in the in the vicinity is contained in separate drawings (EIS Vol.2A, Fig.11.1 – 11.1.6).

2.1.4 Baseline noise survey: general issues – The baseline noise monitoring locations are detailed on Fig.6.1 - 6.1.5 (EIS Vol2A). Noise monitoring took place in multiple locations in the vicinity of the clusters, comprising 5no. at Ballynakill, 1no. at Windmill, 7no. at Drehid-Hortland, 1no. at Derrybrennan and 8no. at Cloncumber. The Wind Energy Guidelines (2006) advise that:

*'Noise impact should be assessed by reference to the nature and character of noise sensitive locations ... [which] includes [inter alia] any occupied dwelling house ... and may include areas of particular scenic quality or special recreational amenity importance' (p.29)<sup>51</sup>.*

<sup>49</sup> That the ordering of the applicant's assessment is set out differently is not of concern.

<sup>50</sup> Including permitted, but as yet not constructed structures.

<sup>51</sup> WEG (2006) does not otherwise advise on the nature of noise assessment methodology.

- 2.1.5 In terms of the selection of NMLs, observers have argued that the NMLs are not representative, their selection has not been justified by the assessor and that they are biased due to proximity to roads and are therefore contrary to the GPG. The surveys are also criticised for NMLs not being located at the dwellings nearest the proposed turbines (specific reference to monitoring locations CL1, CL5 and CL6 and turbines T29/30/31) and that they are sited in noisier locations. Some observers submit that background noise should have been measured at additional distances of up to 2km. In addition, Kildare County Council (EHO report) noted the failure to take account of various noise sensitive receptors (NSRs) in the area, including Cadamstown NS, Broadford NS, Clogherinkoe / Broadford GAA, Dunfiirth Autistic Community Residential Farm and Clane Hospital<sup>52</sup>. On more detailed issues, observers were concerned that the EIS does not include details of noise survey duration or adequate details of the kit used by the assessor.
- 2.1.6 It is not feasible to carry out monitoring at every NSR (dwelling or other), particularly in an area, such as this, with a large number of dwellings, etc., in close proximity to the proposal. The GPG suggests that, in instances where there are groups of housing, that a representative location within the curtilage of one property can be used as a proxy for the others, selected on the basis that it can reasonably be claimed, from inspection and observation, to be representative of the non-surveyed locations. The carrying out of noise measurement surveys up to or at more distant NSRs (as suggested by KCC EHO) is not warranted under the GPG.
- 2.1.7 The GPG does not provide general guidance on the number of NMLs as this a site specific issue. Accordingly one would reasonably expect the assessor to address the issue its report, however the EIS provides no justification for the number of NMLs. In response to observations the applicant submitted that the NMLs were spread around the study area to provide good coverage, but with no reference to the number and coverage of NMLs at any or at each of the clusters. In the absence of some reasonable level of justification for same, I have particular unresolved reservations about the provision of a single NML in the vicinity of Windmill cluster and the provision of a single NML at a distance of c.2km from Derrybrennan cluster.
- 2.1.8 The EIS provides no justification for the siting of its NMLs. The location of NMLs is not shown in context of the surrounding dwelling, making it difficult to determine whether the selected sites appear reasonable. The detailed position of the monitors on individual site are not provided. It is therefore difficult to determine whether the siting of the equipment within individual properties is unbiased.

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<sup>52</sup> This issue was echoed by a significant number of observers.

2.1.9 In its response to observations (section 3.18.1.3), the applicant doesn't justify the actual selection of NMLs, rather the applicant highlighted that, according to the GPG the purpose of noise monitoring is to capture 'representative' noise levels where 'the objective is to measure 'typical' or 'indicative' not 'absolute lower' levels of background noise.' However, regarding NML selection, I note from the GPG that:

*'The overriding consideration is that it can reasonably be claimed, from inspection and observation, that there are no other suitable noise-sensitive locations, in the vicinity of any selected location and close to a dwelling, where background noise levels would be expected to be consistently lower than the levels at the selected position' (p.8/40).*

2.1.10 The validity of the results of noise monitoring is therefore at question if it fails to include dwelling (or other) sites where the background noise levels can reasonably be expected to be consistently lower than at the NMLs selected.

2.1.11 The EIS does not state the duration of noise monitoring. Two weeks is the likely minimum survey period required according to the GPG. In its response, the applicant confirms that noise monitoring took place over an average of 17 days for each location<sup>53</sup>. That the information provided does not include the actual number of survey days per location leaves unnecessary uncertainty as to compliance of all NMLs and raises concerns that the minimum was not achieved at all sites.

2.1.12 In response to observations the applicant has set out the details of noise monitoring instrumentation under table 3.13, purporting to show how same is in compliance with a select number of IOA standards set out in Supplementary Guidance Note 1.

2.1.13 Baseline noise survey: specific issues – The GPG provides detailed guidance on the siting of noise monitoring equipment. Where possible, measurements should be taken in the vicinity of a dwelling (3.5m – 20m therefrom) in an area frequently used for rest and recreation, with equipment placed outdoors where noise levels are representative of typical 'low' levels likely to be experienced in the vicinity of a dwelling (or group of dwellings) and the basis for selection should be that there are no other suitable noise sensitive locations (in the vicinity of the proposal and close to a dwelling) where background noise can be expected to be consistently lower than that chosen. Ideally, the position of the NML should be exposed to noise from the proposed turbines whilst being

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<sup>53</sup> The GPG indicate that in order to acquire sufficient valid data over the range of wind speed, it is unlikely that this can be achieved in less than 2 weeks. This also accords with the EPA's 'Guidance Note on Noise Assessment of Wind Turbine Operations at EPA Licensed Sites (NG3)' (2011).

best-screened from other noise sources such as nearby roads, trees and vegetation<sup>54</sup>, watercourses, farm equipment, boiler flues etc.

2.1.14 In order to ascertain the appropriateness/representativeness of the selected NMLs to characterise the relevant noise environment, I inspected most of the NMLs<sup>55</sup> and also a number of the noise sensitive receptors (NSRs) in the vicinity. The inspections were brief, being not more than 5-10 minutes per NML and can only be used as a very general guide to the noise environment. The weather changed during the course of inspection with wind speed picking up appreciably as the day progressed, thereby increasing the prominence of wind generated vegetation noise at the sites.

2.1.15 *Ballynakill cluster NMLs LO1-LO5* – Only one of the NMLs (LO4) was sited on residential amenity space used for rest and recreation. LO1 and LO2 are agricultural fields, LO3 is to the front of a farm house on a grazing plot fronting onto the public road, and LO5 is associated with a dwellinghouse, but not within recreational space. Whilst it is possible that these were the only accessible locations, the applicant does justify the chosen sites on these grounds.

2.1.16 Four of the five MNLs (LO1, LO2, LO3 and LO5) are located at properties fronting onto the regional road network and would be expected to be strongly dominated by vehicular traffic noise. I found LO2 and LO5 (fronting onto the R148 / former N4) to be dominated by distinct, intermittent but frequent traffic noise from the R148. This was similar at LO4, which although more distant (c.200m) from the R148, was elevated there-above such that it was exposed to traffic noise (distinct, intermittent and frequent) from that road, but also to noise from the M4 (a more constant rumble) further to the south. And the LO3 was also found to be exposed directly to traffic noise from the R160 (frequent, intermittent and distinct). Notwithstanding its location adjacent the R160, LO1 appeared least dominated by traffic noise at time of the inspection, but this may well have arisen by chance.

2.1.17 As the majority of the dwellings front onto the regional road network, these locations would appear, on the face of it, to be representative. However there are a significant number of dwellings located along quieter, low-lying, local roads where background noise levels appeared, as one would expect, to be significantly lower (such as along the L1001-1, between NMLs LO1 and LO2). The noise assessment takes no account of these NSRs contrary to the GPG. In my professional opinion, the siting of monitoring equipment at each of the

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<sup>54</sup> Supplementary Guidance Note 1 (p.7) highlight the potential for trees, in particular, to distort background noise measurements and that care should be taken in this regard, although it notes that high vegetation may be representative of private recreation space for some dwellings.

<sup>55</sup> Some were not feasible to locate due to the poor level of mapped detail provided in terms of their siting, and the exact position on site of others were not possible to pinpoint on site for the same reason. The details did, however, include GPS coordinates.

other NMLs resulted in the monitors being directly exposed to traffic noise. That the survey does not minimise the impact of traffic noise through appropriate siting of equipment on site is contrary to the GPG.

2.1.18 It would appear that monitoring equipment at some of the NMLs was situated in proximity to trees, shrubs and other vegetation. There is no evidence that the assessor tried to minimise the impact of wind generated vegetation noise (trees, shrubs, etc.) through appropriate siting. No reference is made to the proximity to vegetation or to the impact of same in the noise monitoring report attached as Appendix 4 to the applicant's response to observations.

2.1.19 Therefore I am satisfied that the background noise environment determined by the applicant is not reflective of existing background noise of many of the NSRs in the vicinity, such as to the rear of dwellings along the L1001-1 (east of R160), to the rear of dwellings south of the R160 at Bolykeagh, or those setback from R160 (e.g. #383) and proximate to the 500m contour distance from a turbine. On inspection sites in those latter locations, I found traffic noise to be far less intrusive and the background noise to be far quieter.

2.1.20 *Windmill cluster WO1* – Notwithstanding the surrounding area appears quite homogenous in character, I am not satisfied that a single NML is justified for the Windmill cluster. The NML for Windmill cluster (WO1) is located adjacent a farmyard and a field, rather than '*rest and recreation*' space contrary to the GPG. It is not a NSR. The working farmyard, including the presence of many very barking dogs, and its siting close proximity to trees and shrubs, will have resulted in elevated noise levels at this NML. The siting of the monitor is contrary to the GPG.

2.1.21 I inspected the nearest dwelling to the 500m contour (#281), which I found to be quiet and peaceful, with very infrequent traffic noise along the L1005 to the east. However I did note a constant tonal noise in the background, which I assume to be associated with the existing industrial development at the Windmill site. I inspected #305 which I found to be quite, dominated by birdsong, wind in trees and very infrequent traffic along the local road to the north.

2.1.22 *Drehid-Hortland cluster DR1-DR4* - Having inspected the NMLs and some of the nearest NSRs (#886, #945 and #1000), in general the location of NMLs for Drehid appear representative of those nearest NSRs at greatest risk from noise impact. However, issues arise regarding the detailed siting of individual monitors which are not in the vicinity of a dwelling in an area frequently used for rest and recreation and also in terms of proximity of monitors to trees and other vegetation. The applicant fails to provide any justification for the siting in this regard.



- 2.1.23 *Drehid-Hortland cluster DR1-DR4 and HO1-HO3* - I have less confidence in the NMLs for Drehid-Hortland cluster (east), HO1-HO3. HO2 relates to Drehid-Hortland (west) cluster, falling within the 1.31km contour for same, and is outside the contour range of the east cluster and is more directly related to the west cluster. The monitoring equipment was located in close proximity to at least one tree. HO3 and HO1 are reasonable in terms of proximity to the proposal, however neither are within in the vicinity of a dwelling in an area frequently used for rest and recreation, HO3 is adjacent a stand of trees / shrubs and HO1 is in proximity to a watercourse (River Blackwater).
- 2.1.24 Two NMLs would seem insufficient to describe the background noise environment for the entire east cluster area. The majority of NSRs at greatest risk from noise impact are located at near the end of unclassified cul-de-sac roads where background from traffic will be even less than on the local road network and overall noise levels may therefore be lower. It may be, however, that the presence of tree plantations in these area may add to the background noise at those NSRs, screening the potential adverse noise impact of the turbines.
- 2.1.25 *Derrybrennan DEB1* - The single NML (DEB1) for the Derrybrennan cluster is not representative of the nearest NSRs, which comprise dwellings to the east and south along the local county roads (both cul-de-sacs), within the 1.31km contour. The separation distance between T27 and the nearest NSRs (#157) is over 1km. It is possible that a significant noise impact would result due to the separation distance, however it is necessary to define the background noise levels at the nearest sensitive receptors so that the correct noise limit is applied under WEG and to enable appropriate noise mitigation strategy to be applied if necessary.
- 2.1.26 The NSL DEB1 is located to the front of a dwellinghouse, overlooking and slightly elevated above the R414 (c.110m distant), adjacent a farmyard complex and adjacent a gravel driveway. Such factors may have elevated the results of monitoring and it may therefore not be representative of the nearest NSRs which are more secluded in their location. The noise monitoring report identifies noise traffic as the predominant noise. Having visited the area of nearest NSRs to the east of Derrybrennan, I found the area very quiet and to be almost entirely absent of road noise.
- 2.1.27 *Cloncumber CLO1-CLO8* – The 8 NMLs cover a variety of locations in the vicinity of the proposed development site. As the monitoring found the location to be a low noise environment, in the interest of expediency, there is little need to review the assessment in any detail.
- 2.1.28 **Baseline noise assessment methodology conclusion** – I am satisfied that the baseline noise survey carried out by the applicant departs materially and

significantly from the recommended methodology set out in the IOA Good Practice Guide, which the applicant purports to follow. In the case of Ballynakill cluster, the NMLs selected, being located along and/or directly exposed to significant traffic noise) do not reflect the background noise environment of a significant number of NSRs at most risk (being located proximate to the 500m contour distance) where background noise levels would reasonably be expected to be consistently lower than those selected.

2.1.29 I am satisfied that the siting of monitoring equipment at each of the monitoring locations, in Ballynakill, being directly exposed to traffic noise (and noise from trees and vegetation and possibly from other local noise sources) is contrary to the GPG and has resulted in elevated prevailing background noise from traffic, in particular. The resultant background noise levels therefore represent the worst case noise baseline at the NMLs, and cannot be taken as representative of the baseline noise levels of (areas of rest and recreation associated with) the majority of NSRs along the regional road network. This is similarly be the case at many of the other NMLs where monitoring equipment was located in proximity to trees and vegetation and possibly watercourses, contrary to the advice of the GPG, which, in the absence of justification to the opposite, is likely to have elevated recorded background noise levels.

2.1.30 In respect of Windmill, Derrybrennan and Drehid-Hortland (east) clusters, I am not satisfied that the number of NMLs is insufficient to characterise the background noise levels of the surrounding NSRs. And in the case of Derrybrennan, I do not consider the siting of the NML remote from the proposed site and remote from those NSRs to provide relevant background noise levels for the NSRs at most risk from noise impact arising.

2.1.31 Accordingly, I would advise the Board that the baseline noise survey is inadequate, contrary to best practice and does not enable the Board to confidently determine the potential impacts arising, to apply appropriate noise limits under the WEG or to condition suitable mitigation measures to address protect the residential amenities of the large number of properties in the vicinity.

2.1.32 Baseline noise data results - The noise monitoring results are attached as appendices E6-E10<sup>56</sup>, which illustrate recorded background noise levels, plotted against recorded wind speeds<sup>57</sup> for daytime (07.00-23.00) and night time periods (23.00-0700). In summary, the graphs show how background noise increases in line with increasing wind speed, reflecting the dominance of

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<sup>56</sup> Some of these were missing from the initial application and submitted as further information. A complete set is contained in Vol.2 Part 2 (response to submissions).

<sup>57</sup> Measured directly at 10m height anemometer.

trees / vegetation as a main noise source in rural areas at higher wind speeds<sup>58</sup>.

2.1.33 The presentation of results generally accords with the approach outlined in the GPG (and WEG 2006)<sup>59</sup>. The EIS indicates that descriptor dB(A)L<sub>90</sub> but fails to clearly state the time interval use, either in chapter 6 or the relevant appendices (a 10 minute interval is required under both sets of guidance), which introduces uncertainty. The applicant does refer to a 10 minute interval under section 3.18.1.3 of the further information in the context of the removal of rain and other inconsistent noise monitoring data, therefore it is reasonable to assume that the correct interval applied. The wind speed is stated to *measured* 10m height, inconsistent with the applicant's use, elsewhere, of *standardised* 10m height wind speeds. For reason that I will elaborate on later in my report, the inconsistent use of different wind speed measurements creates significant confusion in assessing the results and potential impacts and is contrary to the GPG.

2.1.34 The said graphs (E6-E10) indicate, in a dashed line, the noise level limits that the applicant submits would apply at the sites under WEG<sup>60</sup>. At all sites, bar Cloncumber, the limit is shown commencing at 45dB(A)<sub>L90</sub> and rising with increase in background noise to maintain 5dB over same. At Cloncumber, which is defined by the applicant as a low noise environment (<30dB<sub>L90</sub>) the limit is selected at 40dB<sub>L90</sub>, stepping up to 45dB<sub>L90</sub> and subsequently rising to maintain 5dB over background noise levels as they increase.

2.1.35 A review of E10 shows that all the Cloncumber monitoring sites (excluding CL5) presented noise levels of <30dB<sub>L90</sub> at (measured 10m H) wind speeds below 3-4m/s. The only other monitoring site to measure below this level during the daytime was HO3 in Drehid-Hortland, with measured wind speeds at or below 2m/s. The text of the EIS (section 6.4.2.3) indicates that the lower daytime level would apply to Cloncumber, but that the standard limit would apply to Drehid-Hortland as the prevailing background noises are typically above 30dB<sub>L90</sub>.

2.1.36 As outlined above, I have reservations about the comprehensiveness of the noise monitoring of Drehid-Hortland (east), in addition to Windmill and

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<sup>58</sup> P.7/40, GPG

<sup>59</sup> Time-dependent background noise data for the NMLs is not provided, which prevents the reader from gaining a clearer picture of the respective noise environments and whether they might be considered representative or not, however it is not a standard requirement in the assessment of noise impacts on wind farms.

<sup>60</sup> Contrary to observations by third parties, S.108 of the EPA Act 1992 is not useful in the carrying out of an assessment of noise impacts. In addition, whilst observers referenced 'Guidance Note on Noise Assessment of Wind Turbine Operations at EPA Licensed Sites (NG3)' (EPA, 2011), these standards only apply to EPA licensed sites and are not relevant to the case at hand, although I do note that the night time noise standard, set at 45dB(A)<sub>L<sub>Aeq</sub></sub> is more stringent than the WEG standard of 45dB(A)<sub>L<sub>90</sub></sub>,

10min.

Derrybrennan. I am not satisfied that the number and location of NMLs is sufficient to characterise the background noise environment of those areas.

2.1.37 Baseline wind survey – The GPG methodology includes the simultaneous measurement of wind speed direction at the proposed turbine site with the measurement of background noise levels at representative properties. The methodology for wind speed measurements are set out under section 2.6 of the GPG.

2.1.38 The EIS (section 6.4.1) indicates that concurrent wind and rainfall data was measured the various onsite meteorological masts relating to each of the turbine clusters. The location of these masts are not included on the noise monitoring location maps (Fig.6.1 -6.1.5) appended to the EIS (Vol.2A), but the coordinates of the masts are provided in appendix E1-5 (in appendix 4 of the applicant's response to observations). Two meteorological masts were provided for Drehid-Hortland (west and east), with one mast each for the other clusters. The location of the masts are appear reasonably representative. The GPG advises that average 10 minute wind speeds ( $L_{A90, 10min}$ ) should be synchronised to within, at most, one minute over the survey period, however on this the EIS is silent.

2.1.39 The measured 10m height wind speed results are included in appendices E6-E11 (attached as appendix 4 of further information).

2.1.40 *Wind shear effect* - Wind speed varies significantly between ground and elevated levels due to the impact of friction from landform, structures and vegetation existing at ground and lower levels, a phenomenon known as *wind shear*<sup>61</sup>. There may be little or no wind at ground level and, hence, no wind-generated background noise, but wind at hub height level may exceed that of the turbine's cut in speed, with resulting wind-generated turbine noise. In order to facilitate a comparison of wind-speed related background noise and wind-speed related turbine noise generation, the GPG advises it is necessary to reference both sets of noise data to *standardised* 10 meter height wind speed (standardised 10m HWS)<sup>62</sup>. The *standardised* 10 meter height wind speed is derived from turbine hub height wind speed.

2.1.41 The GPGs preferred methods for obtaining hub height wind speed are:

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<sup>61</sup> The difference between wind speed at hub height and that at ground level.

<sup>62</sup> It should be noted that the use of *standardised* rather than *measured* 10m HWS methodology is not without critics among acoustic professionals and has been criticised in the Acoustics Bulletin as allowing for more turbine noise and reduced separation distances between turbines and housing - 'Wind turbine noise – the debate continues' <http://www.ioa.org.uk/sites/default/files/Acoustics%20Bulletin%20Nov%20Dec%202013.pdf> (22/04/16)

- direct measurement by use of a mast to hub height or use of SODAR or LIDAR technology;
- use of a lower met mast (not less than 60% of hub height) with anemometers at two different heights; or

These two methods allow predicted turbine noise levels (which is referenced to standardised 10m height under IEC 61400-11 standard) to be compared with background levels as the wind speeds reference takes wind shear into account directly.

2.1.42 A third method (c), comprising the use of 10m mast with anemometer (with wind shear corrections to be determined)<sup>63</sup>, employed by the applicant, is not a preferred method. The GPG anticipates this approach *'to be used to provide wind speed data for smaller developments'* (recommendation SB9)<sup>64</sup>. As highlighted by observers<sup>65</sup> the use of the 10m mast approach is not appropriate given the large scale nature of the development and is contrary to the GPG. The EIS indicates that only 10m height wind speed was available.

2.1.43 Section 4.5.4 of the GPG provides that the correction factor be applied to the wind speed reference used for the turbine predictions or to the wind speed reference used for derived typical background noise using the methodology under *'Supplementary Guidance Note 4'*, to calculate corrections on the basis of long-term data measured at different heights. It provides typical shear values that may be applied where the long-term data is not available (corrections of 1m/s, 2m/s and 3m/s for hub heights up to 30m, 60m and above 60m, respectively), but the GPG only considers the use of the generic approach *'suitable in the context of a study made using 10m mast to limit cost in the absence of site-specific data'*. The applicant employed the generic wind shear correction factor of 3m/s (based on a turbine height of over 60m) to the surveyed background noise measured at 10m HWS reference to convert same to *'standardised'* wind speed height at 10m (m.s<sup>-1</sup>). The implications of the application of this approach is not entirely obvious to me and the Board may consider it appropriate to seek external expert advice on the applicant's methodology. However, in my opinion, the use of the generic correction rather than determining and using site specific cannot be justified on the grounds of necessity to limit cost given the scale of the development proposed and the applicant's approach serves to add further uncertainty into the equation.

2.1.44 The GPG states that *'Whichever method is employed, it is crucial that the wind speed reference (hub height, standard 10 metre, or measure 10 metre) for noise levels and noise limits is clearly and consistently defined'* (p11/40). In this regard I would point out that the background noise levels (appended to

<sup>63</sup> Method (c), section 2.6 of GPG.

<sup>64</sup> P.11/40, GPG

<sup>65</sup> Mr Dick Bowdler, Noise Consultant on behalf of no.644 in response to further information.

EIS) are stated to *measured* 10m level. Table 6.4 'Wind Speed Conversion' sets out the equivalent *measured* 10m height, the *standardised* 10m height and the hub-height wind speeds for comparison. Table 6.5 Proposed Noise Limits states proposed limits against measured 10m height wind speed. Table 6.8 set out the SPL of the sample model to *measured* and *standardised* 10m height wind speed. The failure to use a single consistent wind speed reference throughout the noise assessment (notwithstanding the provision of a conversion table 6.4) is contrary to the GPG, is confusing and creates uncertainty about the potential impacts arising.

2.1.45 The EIS acknowledges that the use of *measured* rather than *standardised* 10m HWS creates a high uncertainty as to the relative background noise levels and limits compared with predicted turbine noise levels. For this reason the applicant considers it inappropriate to apply the increasing noise limit (5dBA above prevailing background noise) and instead proposes to implement absolute noise limits (45dB<sub>LA90</sub> and 40dB<sub>LA90</sub>) to the development. However the uncertainty that arises applies equally at all wind speeds and it is not at all clear if direct comparisons can be made.

2.1.46 Baseline wind survey conclusion – The methodology employed by the applicant to take account of the impact of wind shear, comprising the use of 10m mast with anemometer (with wind shear corrections to determined standardised 10m wind speed) and the application of a generic correction factor is not justified for a development of the scale proposed, and results in uncertainty and is contrary to the recommended approach for large scale wind farm development under the GPG. In addition, the applicant's inconsistent used of wind speed references across the noise assessment and its appendices is contrary to the approach advised by the GPG and results in unnecessary uncertainty and confusion in the results.

2.1.47 Predicted Noise Immission methodology – According to the GPG:

*Noise propagation prediction is the process of calculating the noise (immission) levels at the nearest receptors, which takes into account the sound power of the turbines, the distances between the turbines and the receptors, and the various propagation factors that influence the spread of sound, such as ground effects and air absorption.*  
(p.19/40)

The noise predictions were carried out using ISO 9613 'Acoustics – Attenuation of Sound During Propagation Outdoors'. This standard model is recognised by the GPG as widely used and the section 4.3 of the GPG provides guidance on the appropriate input parameters.

- 2.1.48 The predicted noise levels are based on a sample turbine model<sup>66</sup>, a GE 2.75-120, rather than a selected candidate model proposed under the application. The applicant submits that the sample model fits the dimensions of the proposed development and its noise output is higher than other turbines of similar dimension, suggesting that the noise output predictions are more robust. The failure of the applicant (and the EIS) to identify a final turbine model has been raised by many observers, including Kildare County Council (Part VII of KCC report and in the report of its Environment Section), as a concern. However, the GPG notes that at planning stage most proposals will not include a selected turbine and that it is standard practice to consider a 'candidate turbine' (paragraph 4.16). The applicant's approach can therefore be considered acceptable.
- 2.1.49 The EIS indicates that the SPL values for the sample turbine model are those provided by the manufacturer, with 2dB added to account for uncertainty in accordance with the provision of the GPG's<sup>67</sup>. This is acceptable. Table 6.8 indicates that this specific (sample) model reaches 99.2dB<sub>Lwa</sub> at 3m/s and reaches maximum SPL<sup>68</sup> of 108.0dB<sub>Lwa</sub> 6m/s *standardised* 10m height wind speed<sup>6970</sup>. The greatest rate of increase in SPL between 4m/s (101.7dB<sub>Lwa</sub>) and 5m/s (107.0dB<sub>Lwa</sub>) standardised 10m HWS. The GPG advises that the data should be chosen for the wind speed corresponding to the highest level of noise emissions (i.e. 6m/s in the case of this model – see table 6.8 EIS)<sup>71</sup>.
- 2.1.50 According to section 6.5.2 of the EIS, the predicted noise levels derive from sound power level measured in a short-term downwind direction (rather than long term average) that corresponds to the worst-case scenario and therefore does not need a correctional factor. The ISO9613 Part 1 atmospheric absorption attenuation rate (relatively low level) have been used. No 'barrier' attenuation is taken into account within the predictions, nor has attenuation arising from foliage or other miscellaneous effects. The 'ground' effect (interference of sound reflected by ground) has been taken account of using factor G=0.5. A receptor height of 4.0m was applied. The noise propagation methodology appears to be in accordance with the GPG.
- 2.1.51 It is stated (section 6.5.2.3) that the predicted noise levels include the effects of the five wind farms clusters (i.e. the cumulative effect of all the proposed

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<sup>66</sup> The actual turbine model would be determined through a procurement process following consent. The noise predictions are for a candidate turbine that fits the dimensions of the proposed development.

<sup>67</sup> Section 4.3.6 of the GPG refers

<sup>68</sup> The Sound Power Level, i.e. the maximum noise output level.

<sup>69</sup> In section 2.4.2.2 of the EIS it is indicated that turbines reach rated sound power (SPL) at wind speeds of between 9 to 17m/s, which I take to hub height wind speed and is consistent with the conversion table 6.4.

<sup>70</sup> According to the GPG, with increasing hub heights a modern pitch-regulated turbine may achieve its maximum sound power level at a *standardised* wind speed of 7-8 m/s. This can be expected to vary between models and with the development of new models over time.

<sup>71</sup> GPG para.4.2.6.

turbines are taken into account). I consider the applicant's approach to prediction of noise source generation prediction to be robust.

2.1.52 Predicted Impacts - The predicted noise immission levels at each NSR are detailed in appendix E11 of the EIS, with the mitigated immission levels in appendix E12 (both submitted as further information having been inadvertently omitted from the initial application documentation)<sup>72</sup>. The EIS (chapter 6) provides no actual evaluation or discussion of the significance, if any, of the likely noise impacts, in terms of potential level of exceedances and the likely frequency of same. This would be related to wind speed and direction. There is no discussion of any uncertainty in the results.

2.1.53 Only a brief summary is provided indicating that mitigation will be required at a number of properties not involved with the development for the relevant periods where exceedances apply.

2.1.54 The predicted noise levels have been corrected by -2dB to convert from  $L_{Aeq}$  to  $L_{A90}$  in accordance with the GPG. Appendix E11 indicates that the relevant noise limits will be exceeded at the following properties in the absence of proposed mitigation measures (note, **emphasis** indicates breach in daytime limit, all others relating to night time limit breach):

**Ballynakill cluster** – H360, H361, H362, H377, H382, H383, H384, H385, H386, H387, H427, H428, H429, H430, H431, H433, H434, H435, H436, H437, H438, H439, H443 and H466. Plus H554, H556, **H557**, H570, H585 being sheds, commercial or derelict.

**Windmill** – none.

**Drehid-Hortland cluster (east)** – H55, H56, H922, H923, H981, H982, **H983** and H1008, H1036 and H1038. Plus H245 and H1157 being a shed or derelict.

**Derrybrennan** – none.

**Cloncumber** – **H587, H588, H589, H593, H594, H595, H596, H597, H598, H599, H600, H601, H606, H607, H608, H609, H610, H612, H614, H615, H616, H617, H618, H619, H620, H621, H623, H624, H625, H626, H627, H628, H629, H630, H631, H632, H633, H645, H647, H648, H649, H655, H656, H657, H658, H659, H660, H661, H662, H663, H664, H666, H667, H681, H682, H683, H684, H685, H686, H687, H688, H689, H690, H691, H692, H693, H694, H695, H696, H697, H698, H699, H700, H701, H702, H703, H704, H705, H706, H707, H708, H709, H711, H712, H713, H714, H715, H716, H719, H722, H723, H730, H733, H858, H872, H874. H2001** planned dwelling. Plus **H602, H611, H613, H622, H710, H721, H731, H859,**

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<sup>72</sup> The omission of this data was raised by numerous observers to the application.



**H860, H862, H863, H873, H875, H878, H879** being commercial, shed, agricultural, derelict or ruinous structure.

- 2.1.55 The predicted noise immission levels in Appendix E11 are not stated referenced to any wind speed. The GPG provides that data should be chosen for the wind speed corresponding to the highest level of emission from the turbines. The mitigated noise impacts, set out in Appendix E12, are referenced to >4.5m/s. One would assume that the same wind speed applied to the unmitigated predicted noise immissions, but the need to make assumptions is far from desirable. Further uncertainty arises as Appendix E12 does not state whether 4.5m/s is to *measured* or *standardised* 10m HWS or hub height wind speed. It is best practice to provide results to standardised 10m HWS.
- 2.1.56 To apply a 4.5m/s *standardised* 10m HWS results in a SPL significantly below the maximum generated by the turbines, generating noise level of between 101.7dB<sub>LWA</sub> and 107.0dB<sub>LWA</sub> compared to maximum if 108.0dB<sub>LWA</sub>. This would result in an underestimating of the maximum noise immission level possible at NSRs.
- 2.1.57 4.5m/s *measured* 10m HWS results in maximum SPL, but as the selected turbine model reaches a maximum at 3m/s at *measured* 10m HWS there is no reason to base predictions on higher wind speed. Furthermore, the predicted noise immissions for Cloncumber (only) are stated at <4.5m/s and at >4.5m/s. Notwithstanding the vagueness regarding what exactly is meant by '<' and '>' in this instance, and assuming it relates to a decrease or increase in the order of 1m/s from the reference wind speed, the difference in SPL between the two levels would likely be hugely significant at *measured* 10m HWS. In contrast, the difference would appear negligible at *standardised* 10m HWS.
- 2.1.58 It is clear from GPG that turbine SPL (at hub height wind speed) can be converted to *standardised* 10m HWS, but it is not clear that the turbine SPL can be accurately converted to equivalent *measured* 10m HWS to predict immission levels. Based on the GPG this would seem improbable.
- 2.1.59 The prevailing background noise levels are stated to *measured* 10m HWS. Whether the predicted noise immission levels are to *standardised* or *measured* 10m HWS, they can be compared to the background noise levels either directly, or converted having regard to table 6.4 of the EIS. Assuming predicted immissions are at *measured* 10m HWS, the impact would have to be compared to background noise levels at 3m/s (*measured*) to determine potential noise impacts as the maximum SPL output commences at that wind speed (see table 6.8 EIS).
- 2.1.60 In terms of the presentation of predicted noise impacts, the applicant has elected only to submit tabulated results rather than predicted noise contour maps. In response to suggestions by Meath County Council and Kildare

County Council that mapped data results would be useful, the applicant responded (section 1.7.4) that there is no requirement for this approach under section 6 of the GPG. On the contrary the GPG (Table 1 of section 6.1.1) note predicted noise contours as one of the key points to be included in the reporting of noise assessments<sup>73</sup>. The inclusion of noise contour mapping for both existing baseline and predicted noise levels, in addition to the tabulated data if necessary, would have greatly assisted all parties in their assessment of the potential impacts. It has proven difficult and particularly tedious to try and grasp the significance of impacts on each cluster using the tabulated data. This is further impeded by the table layout which doesn't provide the results for one entire cluster together. The significance of the impact on individual properties concerns the relative increase in noise levels above existing background noise levels. The determination of this information is not aided by the tabulated presentation approach employed by the applicant.

## 2.2.0 Assessment of impact noise impact significance

2.2.1 I consider the potential significance of impacts on properties at each of the clusters, below, having regard to the proposed mitigated noise limits of 45dB<sub>LA90</sub> daytime for all cluster bar Cloncumber which would be mitigated to 40dB<sub>LA90</sub> (at lower wind speeds only) and the night time noise limit of 43dB<sub>LA90</sub> to apply generally:

2.2.2 *Ballinakill* - Having reviewed the tabulated results against the 3m/s *measured* 10m HWS background noise levels, no significant noise impact would be anticipated for NSRs in Ballinakill as the background noise level either exceeds<sup>74</sup> or is marginally below the 45dB<sub>LA90</sub> daytime noise limit already, except at LO3 where background noise levels are at c.42dB<sub>LA90</sub>. The highest predicted immission level at a residential property is at #383 with 44.2dB<sub>LA90</sub>, which is below that threshold limit. However the significance of the potential impact on #383 is likely to be greater as this would appear to be one of the quieter locations being set back at a distance from the public road and its private amenity space faces directly towards T3 at no more that 500m (possibly 496m at the southernmost corner) from the centre of the turbine, and therefore less than 440m from the tip of the (120m diameter) turbine blade.

2.2.3 Noise limits of structures well within the 500m contours, comprising two commercial properties #557 (46.2dB), #570 (44.4dB) and agricultural buildings #556 (44.5), will be approached or breached. Appendix E12 indicates that mitigation will ensure that the noise limits are complied with at these buildings.

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<sup>73</sup> Under section 2.2.1 it also specifically recommend that the predicted 35dB<sub>L90</sub> contour line pertaining to the proposed development be provided at scoping stage in order to inform the extent of the baseline noise monitoring survey.

<sup>74</sup> Very significantly in the case of LO4 and LO5.

In the case of #557 (Schram Plants), this is not likely to be practical as the buildings on that site extend to within c.250m of T9. It can be assumed that the proposed mitigated noise levels are with reference to the point location indicated for Schram Plant, which is c.390m distant from the turbine. As the subject structures are not noise sensitive locations under WEG (p.29) the impacts may be considered less significant.

- 2.2.4 Prevailing night time background noise levels are lower across the area, with a maximum difference below the 43dB night time noise limit of c.9dB. The noise of the turbines would therefore be noticeable external to buildings, however the limit is designed to only protect internal amenities during night time hours. Mitigation is required to meet the 43dB limit at c.30 properties in the vicinity.
- 2.2.5 *Windmill* – At Windmill, the potential impact would be more significant as the area just exceeds the definition for ‘low noise’ environment. The prevailing background noise levels are only 31dB<sub>LA90</sub> at either 3m/s or 4.5m/s (*measured*), c.14dB below the proposed noise limit. The highest noise levels are predicted at properties #292 (40.6dB), #305 (40.3dB at NML WO1) and #281 (40.2dB), with no other property identified as reaching 40dB. The noise impact is therefore likely to be noticeable over background noise levels. Night time prevailing background noise levels are c.20dB below the 43dB night time noise limit, however the limit is only required to protect internal amenity. No mitigation is required to meet daytime or night time noise limits.
- 2.2.6 *Drehid Hortland (west)* – The prevailing daytime background noise levels (DR1-DR4) are below 35dB (almost the same for 3m/s and 4.5m/s *measured* wind speed), therefore noise at the limit of 45dB will be noticeable above background noise levels. The turbine noise level at a large number of properties would exceed 40dB. The highest levels are predicted at properties #922 (44dB), #923 (43.9dB), #1036 (43.9dB), #1038 (44.2dB), #981 (43.8), #922 (44.8), #983 (46.6), #1008 (43.1). Mitigation is proposed to achieve day time noise limit at only one property (#1008) which is located within the 500m contour – the owner has submitted letter of consent.
- 2.2.7 Prevailing night time background noise levels are in the region of 27-28dB, above which turbine noise (limited to 43dB) will be noticeable in external amenity space. Mitigation is proposed in order comply with the limit at 8no. properties.
- 2.2.8 *Drehid Hortland (east)* – The prevailing daytime background noise levels (at 3m/s *measured*) are c.33dB, even excluding HO2 (rising to 35dB at 4.5m/s *measured*). Noise at the limit of 45db would therefore be very noticeable. The turbine noise level at a large number of properties would exceed 40dB. The highest noise levels are predicted at properties #55 (43.8) and #56 (44.3).

A somewhat surprisingly low level of 41.3dB is predicted for dwelling #37 which is on the 500m contour to T40, when compared to dwellings at similar distances, although it is possible that results of the impact of a single turbine without significant cumulative noise impact. The increase in noise levels would be noticeable over background levels.

2.2.9 Prevailing night time background noise levels are in the region of 27-28dB, above which turbine noise (limited to 43dB) will be noticeable in external amenity space. Mitigation is proposed in order to comply with the limit at 3no. properties.

2.2.10 *Derrybrennan* – The background daytime noise levels are c.34dB and therefore any turbine noise at the 45dB limit will be noticeable. Night time background noise levels are in the region of 27dB, therefore turbine noise at the 43dB limit would also be noticeable. However, the noise levels predicted at the nearest NSR, #157 to the west, is low at 34.7dB, therefore the proposed turbines are unlikely to result in a significant noise impact on property in the vicinity, over day time or night time periods.

2.2.11 *Cloncumber* – The prevailing daytime background noise levels for Cloncumber are below 30dB (at 3m/s measured) for all but CLO5 (which reaches c.33.5dB) with CL4 reaching only just in excess of 25dB. Turbine noise (proposed to comply with more stringent, low noise area level) of 40dB will be noticeable above background noise. The predicted unmitigated noise levels are high, with the highest levels predicted at #594 (45.2dB), #595 (45.1dB), #601 (44.2). But mitigation will be necessary (and is proposed) at a large number of properties in order to meet the proposed 40dB limit. The mitigated turbine noise levels will be almost 15dB higher than the very low prevailing background noise levels evident in parts of the vicinity and therefore the turbine noise will be noticeable.

2.2.12 Prevailing night time background noise levels are extremely low, just in excess of 20dB at CL4, but are between 2-5dB higher at the other NMLs. Turbine noise at the 43dB limit will be noticeable above background levels external to dwellings.

2.2.13 It should be noted the Grand Canal, an area of scenic quality and of special recreational amenity importance, can be regarded as a NSR under WEG and that the noise limits are applicable thereto. The applicant does not address this issue in the EIS. In response to observations (section 3.15.2.2) the applicant submits that the visual impact from the canal is the only impact at question.

2.2.14 **Noise mitigation** - Section 6.6.2 sets out that mitigation measures will be required to address the noise impacts where exceedances of the relevant noise limits have been identified. There are three different noise limits –

daytime limit of 35-40dB<sub>LA90</sub> for low noise environments, and 45dB<sub>LA90</sub> or 5dB(A) above background noise at NSRs for all other environments; and night time limit of 43dB<sub>LA90</sub> night time limit for all environments. The applicant proposes that 40dB<sub>LA90</sub> will apply to the Cloncumber cluster as the only low noise environment. The higher daytime standard of 45dB<sub>LA90</sub> is proposed to apply elsewhere. The applicant did not consider the standard of 5dB(A) above background noise to be appropriate *'as the derivation of prevailing background noise levels with reference to measured, rather than standardised 10m height wind speed creates a high level of uncertainty as to the relative background noise levels and limits compared with predicted noise levels'*( p.6/18).

2.2.15 Regarding compliance with the day time limits, it is not obvious from the details submitted by the applicant as to where the predicted turbine noise levels, mitigated or otherwise, apply. Are they based on point location of the dwelling, or to the boundary of amenity space and, if so how was same determined? If it is based on the former, bare compliance at the dwellings may actually entail exceedance within amenity space if it is nearer to the proposed turbine. It is therefore not possible to determine whether the proposal meets WEG daytime limits applicable to external amenity space, which, yet again, creates more uncertainty about the potential for significant adverse impacts arising from the proposed development. This may likely have been apparent had the applicant used of noise contour maps. This is not an issue for night time noise limit which, although stated to external location, are applied in order to protect internal amenity space.

2.2.16 The proposed mitigation comprises running specific turbines at noise reduced modes. The turbines are identified in table 6.12, with the relevant noise reduced mode specified relative to the corresponding noise limit to be achieved, relating to turbine nos. T3, T4, T6, T9, T12, T14, T17-T21, T29, T39, T41, T43, T44. It is not stated in the EIS which turbines are to be run at reduced mode to mitigate the impacts on which specific dwellings and it is not feasible to determine this from the drawings and noise impact results. It may be the case that several turbines must run in reduced mode to protect one or a cluster of dwellings.

2.2.17 Other noise concerns (including impact on health) - Infrasound and low frequency noise (LFN) : The issue of infrasound and low frequency noise has been raised as a significant concern by a substantial number of third parties in terms of the potential adverse impact on residential amenities, sleep disturbance, a suite of health issues, concentration and mental health impacts, including its relationship to Wind Turbine Syndrome and the potential to impact on people who have particular sensitivity to sound, such as people with autistic spectrum disorders and those with hearing aids and cochlear implants.

2.2.18 Neither the WEG 2006 nor in the GPG address the issue of infrasound or of LFN. The applicant addresses it under section 6.2.2.2 of the EIS, referring to the *UK Department of Trade and Industry (DTI) Low Frequency Noise Study, W/45/00656/00/00, The Measurement of Low Frequency Noise at Three UK Windfarms*<sup>75</sup> (by Hayes McKenzie). For the sake of clarity, infrasound and LFN are not one and the same. The DTI report explains that infrasound is noise at frequencies below the normal range of human hearing, i.e. <20Hz. Low frequency noise (LFN) is noise between 20Hz and 250Hz. This compares with the normal range of human hearing is between 20Hz to 20,000Hz<sup>76</sup>. Therefore infrasound can be expected to be inaudible, whereas LFN can be typically be expected to be audible. The report does not describe the nature or character of infrasound or LFN in any qualitative way.

2.2.19 The UK DTI study concluded that *'infrasound noise emissions from wind turbines are significantly below the recognised threshold of perception for acoustic energy within this frequency range. Even assuming that the most sensitive members of the population have a hearing threshold which is 12 dB lower than the median hearing threshold, measured infrasound levels are well below this criterion'*. It goes on to state that, based on information from the World Health Organisation, *'there is no reliable evidence that infrasound below the hearing threshold produce physiological or psychological effects'* and that *'it may therefore be concluded that infrasound associated with modern wind turbines is not a source which may be injurious to the health of a wind farm neighbour'* (p.2). The EPA Guidance Note on Noise Assessment of Wind Turbine Operations at EPA Licensed Sites (NG3) states infrasound *'was a prominent feature of passive yaw 'downwind' turbines*<sup>77</sup> *where the blades were positioned downwind of the tower'* but that now *'there is no significant infrasound from wind turbines...with modern active yaw turbines'* (p.11). This is supported by those studies referred to by the applicant in Appendix 15 of the further information submission. I would therefore conclude that the generation of infrasound is not an issue of concern for the proposed development.

2.2.20 The EIS does not refer to the said report's conclusion on Low-frequency noise, which is that *'wind turbine noise may result in an internal noise level that is just above the threshold of audibility ... [and for] a low frequency sensitive person, this may mean that low frequency noise associated with the operation of the three wind farms [subject of the study concerned] could be audible within dwelling'* (p.3). It indicates that whilst its data show that the internal noise levels were insufficient to wake up residents, once awoken, the noise can result in difficulties in returning to sleep. The studies referred to in

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<sup>75</sup> <http://www.hayesmckenzie.co.uk/downloads/Measurement%20of%20Low%20Frequency%20Noise%20at%20Three%20UK%20Wind%20Farms.pdf> (29/03/16)

<sup>76</sup> <http://www.cdc.gov/ncbddd/hearingloss/sound.html> (29/03/16)

<sup>77</sup> And resulted in a characteristic thump sound.

Appendix 15 (Health Studies) of the applicant's further information submission do not refer to LFN. LFN and its potential to impact on sleep would therefore appear to be a legitimate concern.

2.2.21 The EIS explains that noise from modern wind turbines is essentially broadband in nature, with similar amounts of acoustic energy in all frequency bands. As distance from a wind farm increases, noise level decreases due to the spreading out of sound energy and due to air absorption which increases within increasing frequency. This results in an increase in the ratio of *low-frequency* : *high-frequency* noise with increased distance from the site. The applicant submits that at such distances the overall noise level is so low that any bias in the frequency spectrum is insignificant LFN did not form any part of the EIS assessment. This is contradictory to the EPA NG3 which reports that LFN may '*be a significant characteristic for a large wind farm site when heard from a distance, although close to the site it would not be significant*' (p.11)<sup>78</sup>.

2.2.22 Third party observers have submitted various claims about the impacts of wind farm generated infrasound and LFN on humans and animals, including reference to numerous studies carried out in a range of countries. It is evident that it is an emotive issue. An observer claims the use of standard 'A' weighted noise measurement (i.e. dB(A)), rather than a C-weighted rating for lower frequency noise, masks the impact of LFN. Whilst this may or may not be the case, as noted above, neither Irish guidance (WEG, 2006) nor the English GPG, address infrasound or LFN and both require use of the A-weighted rating.

2.2.23 In response to observations the applicant submits that wind turbines do not generate a sufficient level of LFN to be perceivable<sup>79</sup> and quotes from the UK IOA Acoustics Bulletin 2009, that the Hayes McKenzie report found that infrasound and LFN are not a significant factor at the distance at which people lived, that this was peer reviewed and the view concurred with (presumably by the IOA). However, from reviewing more recent IOA Acoustic Bulletin issue, it is evident that the debate over the impact of LFN arising from wind farm development is far from over and it is claimed that '*researchers have identified significant LFN issues in various papers since 2009*'<sup>80</sup>.

2.2.24 Arising from the foregoing, it is apparent that the potential for significant adverse impacts to arise from LFN generated by wind turbines remains an area of uncertainty. The applicant has provided insufficient details and evidence to enable an informed determination to be made on the potential of

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<sup>78</sup> Unhelpfully the document does not define 'distance' or 'close'.

<sup>79</sup> Refers back to section 6 of EIS Vol.2.

<sup>80</sup> *Wind turbine noise – the debate continues*

<http://www.ioa.org.uk/sites/default/files/Acoustics%20Bulletin%20Nov%20Dec%202013.pdf>  
(22/04/16)

adverse impacts to arise on the surrounding population. Given the scale of the development, the proximity to a significant number of dwellings between 500m and 1310m from the proposed turbines and the potential for LFN to interfere with sleep (as noted in the Hayes McKenzie report), I consider the potential risk to be unacceptable and, on the basis of the precautionary principle, would advise that permission be refused.

#### **2.2.25 Wind turbine noise impacts - overall conclusion**

2.2.26 If taken at face value, the application of mitigation measures to comply with the WEG noise limits, as is proposed by the applicant, could be taken as sufficient to ensure that no significant noise impact will occur. However, as I have detailed above, the applicant's noise survey is deficient and non-compliant with good practice methodology in a large number of respects such that I do not consider it can be relied upon.

2.2.27 The number of NMLs would appear inadequate to characterise the background noise environment at Windmill, Derrybrennan and Drehid-Hortland (east), and has not been justified by the applicant. The location of NMLs, particularly in respect of Ballynakill would appear to be biased towards sites exposed to high levels of background traffic noise and not to take account of NSRs located away from heavy traffic noise influence. Similarly, the Derrybrennan NML does not appear relevant to the background noise environment of the NSRs most likely to be effected. The actual location of NMLs is not justified by the applicant. In addition, the specific siting of some monitoring equipment appears to have been such as to be contaminated by wind-generated vegetation noise. Any contaminated survey data is likely to have resulted in higher background noise levels being determined that are not characteristic of that experienced by the NSRs at most risk, and which may result in the imposing of higher noise limits than appropriate.

2.2.28 The methodology employed by the applicant to take account of the impact of wind shear, comprising use of 10m masts, and its application of a generic correction factor, are not justified for a development of the scale proposed, results in uncertainty and is contrary to the recommended approach for large scale wind farm development under the GPG. The inconsistent use of wind speed references across the noise assessment (and appendices) is contrary to the GPG advice and further confuses matters, making the actual results difficult to decipher. The applicant's failure to state the wind speed reference used in its turbine noise predictions means that it is not clear that noise levels are based on maximum SPL of the turbines, creating further uncertainty.

2.2.29 The approach to presentation of results, comprising the provision of tabulated data only, with no noise contour maps to illustrating the predicted impacts, is contrary to the recommendations of the GPG regarding provision of key



information and restricts the level of interrogation of results for all parties. It is not evident from the tabulated data, or from chapter 6 of the EIS, as to where the predicted noise levels apply and it is therefore uncertain if proposed mitigated daytime levels apply to the entire external amenity space associated with residential property, or at the nearest face of the dwelling or at the point location of the dwelling concerned.

2.2.30 The actual assessment and discussion of the significance of impacts having regard to the resident population in the vicinity, the baseline noise environments, the likely noise levels and the mitigation measures proposed is, in my professional opinion, seriously inadequate for a development of this scale.

2.2.31 Having regard to the uncertainties and apparent biases of the baseline noise surveys and the uncertainties arising in predicted noise levels at NSRs due to non-compliance with best practice methodology (GPG), I am of the opinion that the noise assessment and, in particular the predicted mitigated noise levels, cannot be relied upon. Having regard to the scale of the development proposed, the close proximity of same to a large number of dwellings, I consider the potential for significant adverse noise impacts on the large number of residential properties in the surrounding areas to be excessive. In the absence of an appropriately revised, accurate and justified noise impact assessment, I would advise that permission be refused in the interest of protecting residential amenities of the resident population.

2.2.32 Furthermore, given that the potential impacts from LFN generated by wind turbines remains uncertain, that the EIS provides insufficient details and evidence to enable an informed determination to be made on the potential for adverse impacts arising from LFN on the surrounding population, the scale of the population that would potentially be affected, and the nature of the potential impact in terms of interference with sleep, I consider the potential risk to be unacceptable and, on the basis of the precautionary principle, would advise that permission be refused.

### 2.2.33 **Substation operational noise**

2.2.34 The EIS indicates that operational noise associated with the introduction of the proposed substation has been assessed with reference to BS 4142:2014, *Methods for rating and assessing industrial and commercial sound*, which provides a method for rating noise based on the difference between the level of existing background noise and the sound immission level of a source at a particular receiver location (known as a specific sound level), with provision made for a penalty to be added where the noise emitted exhibits an identifiable character (e.g. tonal). The difference between the background noise and the rated noise is used to determine the sound impact, with a

difference of 10dB or more being considered significant, 5dB plus being adverse and 0dB low, although where background levels are low, absolute noise levels may be more important, particularly at night.

2.2.35 The proposed substation will emit a 'hum' from the unit and noise generated by cooling fans. The noise level is dependent on the load on the transformer which is dependent on wind speed. The substation has a noise level of 80dB(A) in typical operation mode and 93dB(A) in high operation mode, with 65dB(A) achievable if requested<sup>81</sup>, as measured 2m from the source. The applicant predicts the noise impact at the nearest NSL, a dwelling within c.730m of the source. Allowing for a penalty of 6dB(A) for tonality of the noise at a particular frequency (the character of the noise from transformers is typically described as a buzzing sound) the applicant estimates the noise impact to be 35dB<sub>LAeq,Tr</sub><sup>82</sup> in typical mode, 49dB<sub>LAeq,Tr</sub> in high mode, but that 20dB<sub>LAeq,Tr</sub> is achievable<sup>83</sup>. Under section 6.3.3.3, the EIS submits, having regard to BS 4142:2014, that background levels at dwellings neighbouring the proposed substation will generally exceed 35dB<sub>LA90</sub> during periods when the substation would be expected to emit noise due to the generation of noise from the proposed Maighne turbines. As a result, if the rated noise is less than 35dB<sub>LAeq</sub> this would offer sufficient protection against noise for neighbouring residents. The EIS concludes that if the substation is operating in its achievable or typical mode the operational noise levels at the nearest residential location are not considered significant. No mitigation is proposed in this regard.

2.2.36 Whilst I consider the applicant's conclusion regarding 'achievable' and 'typical' modes to be reasonable, the noise emissions at 'high' mode are quite significant. The applicant does not define at what wind speed the substation would operate in 'high' mode, or what transition from 'typical' to 'high' entails relative to wind speed. The question arises as to whether the substation noise generation increases in tandem with background noise, or more rapidly. It may be that the 'achievable' operation mode (with 65dB<sub>LAeq</sub> noise limit) would be necessary mitigation, but this is not clear from the detail provided. The applicant does not indicate whether or not it is feasible to implement the 'achievable' operation mode.

2.2.37 Given the proximity of the proposed substation to dwellings in the vicinity, in the event that the First Inspector issues a recommendation to grant permission, I would advise that a condition be attached requiring

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<sup>81</sup> <http://www.dantes.info/Publications/Publication-doc/ABB-EPD/ProductDeclarationStarTrafo63.pdf> (21/03/16)

<sup>82</sup> *Specific noise level, LAeq,Tr* - The equivalent continuous 'A'-weighted sound pressure level at the assessment position produced by the specific noise source over a given reference time interval.

<sup>83</sup> The EIS does not state what the given time interval used was.

implementation of the 'achievable' noise emission standard for the proposed substation.

### 2.2.38 Windfarm Operational Vibration

2.2.39 Under section 6.2.2.3 the applicant states '*Vibration from operational wind farms is below the human threshold of perception such that no significant effects are expected. As such, this aspect of the operation of the proposed turbines is not discussed further.*' The WEG 2006 do not address vibration as a potential impact in itself and only refers to the fact that incorporation of anti-vibration techniques in modern turbine design has resulted in significant reductions in mechanical noise, and the use of anti-vibration sensors to detect ice on the blades. I am satisfied that direct vibration impacts are not an issue.

### 2.2.40 Construction noise & vibration

2.2.41 The EIS assesses the significance of potential impacts with reference to '*BS 5228:2009 Code of Practice for Noise and Vibration Control on Construction and Open Sites*', as recommended in the '*IWEA Best Practice Guidelines*' (Fehily Timoney, 2012), as there are no specific Irish guidelines in this regard. The assessment also references the NRA's '*Guidelines for the Treatment of Noise and Vibration in National Road Schemes*' (2004).

2.2.42 The '*Wind Energy Development Guidelines*' (DoE, 2006) do not address the issue of construction noise, except through general advice on the nature of any condition addressing same, and they do not address the issue of construction vibration at all. The applicant's approach can therefore be considered reasonable. Having regard to *BS 5228:2009*, the applicant has applied the minimum criteria of 65dB<sub>LAeq</sub> over day-time working hours, against which to assess noise impact as the location of the proposed development is considered to be a low noise-environment<sup>84</sup>, where construction would have a duration of longer than one month.

2.2.43 Section 6.5/1 of the EIS indicates that no detailed noise predictions were carried out for construction activities as the specific plant and schedule for construction activity were not known. The applicant considered only track laying and borrow pits have the potential to result in construction noise levels at residential properties, but that as track laying would not likely continue at above the noise limit for duration exceeding 1 month, no significant construction noise effects are predicted. The applicant provides no basis for this assumption, with no estimates for how long it would take to construct the internal tracks for the each of the sites having regard to the obvious different

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<sup>84</sup> EIS Chapter 6, P.4 of 18.

ground conditions. No information on the likely nature of the works, including excavation, deposition and compacting works, or the likely machinery that would be used and the likely generation of noise. And no identification of the particular NSLs that would be at risk over what estimated period. Whilst it may well be that no significant noise impact would result from the construction works (the finite period of construction works will clearly militate against same) the applicant has not provided basic information to enable the Board to carry out EIA of the potential significant impacts.

2.2.44 The EIS includes a cursory assessment of noise impacts arising from the two proposed borrow pits. The details include the average SPL from the machinery (no maximum provided), with octave band centre frequencies (with no explanation of the significance of same is provided). It indicates that construction noise level will not exceed 65dB if the distance of the borrow pit to the received location is greater than 120m, which it states is '*the approximate distance from the nearest neighbouring dwelling to any of the proposed borrow pits*'. This is simply incorrect. The nearest dwelling (#441) to the Ballynakill borrow pit (no.2) is c.50m from the boundary of the pit, with two other (#418 and #419) within 70-100m to the southwest and #440 and #421 at c.120m. At Cloncumber two dwellings, #594 and 595 are within 100m of the proposed pit. The noise impact of these two borrow pits may therefore be significant, with consequential significant adverse impacts on residential amenity. The EIS does not acknowledge these dwellings within its self-determined 120m limit and does not assess the impact having regard to the background noise context of the site and the characteristics of the proposed borrow pit sites and development concerned.

2.2.45 I therefore consider the applicant's construction noise assessment inadequate. It would be inappropriate to issue a favourable recommendation in this context.

### **3 Shadow flicker (impacts on human beings)**

#### **3.0 Introduction**

3.0.0 Assessment of potential impacts of shadow flicker is addressed under chapter 12 of the EIS submitted with the application, with details of the predicted impact at properties contained in appendix R in Vol.3 of the EIS. The assessment has been conducted by Claire Curran, BE CENg MIEI of Fehily Timoney & Company. Shadow flicker was further addressed in the applicant's response to submissions, including in appendix 18 thereto.

#### **3.1 Shadow Flicker Impacts**

- 3.1.0 WEG 2006 states '*shadow flicker occurs where the blades of a wind turbine cast a shadow [from sunlight] over a window in a nearby house and the rotation of the blades causes the shadow to flick on and off*' (p.33). It advises that developers should provide calculations to quantify the effect and, where possible, taken appropriate measures to prevent or ameliorate the potential effect, such as turning off a particular turbine at certain times. It recommends '*that shadow flicker at neighbouring offices and dwellings **within 500m** should not exceed 30 hours per year or 30 minutes per day*' (p.33). WEG considers the risk of shadow flicker to be very low at distances greater than 10 rotor diameters from the turbine, which implies that within 10 rotor diameter distance the risk is significant, yet it applies a restrictive standard only within 500m. An assessment area of 10 rotor diameter has been widely accepted across different European countries and UK guidance on assessment of shadow flicker in the Companion Guide to PPS22 (2004) indicates that there is potential for impact to occur within 130 degrees either side of north from a turbine (UK DoECC)<sup>85</sup>, but only within 10 rotor diameter distance. Scottish guidance requires a 10 rotor diameter separation distance to address shadow flicker risk.
- 3.1.1 Whilst many observers were concerned about the impact of shadow flicker on their external garden areas, etc., under WEG and other comparable guidance from other jurisdictions, generally, shadow flicker is referred to as an issue inside of buildings only<sup>86</sup>. Accordingly my assessment will focus on potential for shadow flicker within buildings.
- 3.1.2 Potential impact of shadow flicker is addressed under chapter 12 of the EIS submitted with the application. At the outset the applicant states that the operation of modern wind turbines can be controlled to ensure that no houses will experience shadow flicker above the requirements of the WEG 2006.
- 3.1.3 The assessment purports to take account of all existing buildings and any, as yet not constructed, buildings that have valid planning permission (994no. buildings) and equine facilities within 1200m diameter. A shadow flicker assessment was carried out using ReSoft Windfarm software, which takes into account the percentage of time shadow flicker would occur based on Met Eireann data for Casement Aerodrome, the nearest Met Eireann meteorological station with historical measurements. Section 12.4 explains, the assessment assumes that the rotor yaw is always perpendicular to the sun, that there is 100% sunshine, that a window directly faces onto the

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<sup>85</sup> '*Update of UK Shadow Flicker Evidence Base*', (2011?)

[https://www.gov.uk/government/uploads/system/uploads/attachment\\_data/file/48052/1416-update-uk-shadow-flicker-evidence-base.pdf](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/48052/1416-update-uk-shadow-flicker-evidence-base.pdf) (06/07/16)

<sup>86</sup> I do note, as raised by third parties, Minnesota Department of Health has raised concern about the potential for impact on public health from shadow flicker outdoors, although they do not recommend any particular standard in this regard. '*Public Health Impacts of Wind Turbines*' (2009) <http://www.health.state.mn.us/divs/eh/hazardous/topics/windturbines.pdf> (07/04/16).

development and that there is no screening vegetation and that the results provide for the worst case scenario, which are set out in Appendix R of the EIS (Vol.3). The findings of the worst case scenario are not included or summarised in the main body of the text, which would have aided assessment of the Board and other parties. I have reviewed the tabulated data and calculated that 506no. building are at risk of shadow flicker in excess of 30 minutes per day within 1200m of a turbine. Of these, 349no. are also at risk of shadow flicker in excess of 30 hours per year. 29no. other buildings are at risk of exceeding the 30 hour limit, whilst not breaching the 30 minute limit, meaning a total of 378no. buildings are at risk of breaching the 30 hour limit.

3.1.4 The EIS also tabulates the data of the potential impact of shadow flicker assuming 31% sunshine, and the summary within chapter 12 indicates that 42no. buildings would receive shadow flicker in excess of 30 hours per year. It neither tabulates nor comments on the number of buildings that would be at risk of breaching the 30 minute standard that also (separately) applies under WEG in the 31% sunshine scenario. It may be that such an assumption would not provide a valid result.

3.1.5 A revised assessment is included, taking account of wind directionality, such that the yaw will not always be oriented in the worst case (perpendicular to sub-turbine vector) position, reducing the area and duration of shadow flicker impact. The wind direction frequency was determined during approximately 1 month survey period (05/11/14 – 03/12/14). The applicant does not explain why the historical average wind direction (i.e. the official wind rose), as measured at Casement Aerodrome was not used as per the sunshine data. Such data is available from Met Eireann and would be far more statistically significant than the data used by the applicant<sup>87</sup>. The '*Irish Wind Energy Best Practice Guidelines*', produced by Fehily Timoney, indicates that it is reasonable to have regard to the wind rose for the location concerned in determining the likely extent of shadow flicker, and such that if winds rarely come from the sectors which would give rise to the greatest shadow flicker effects on a dwelling, this can be taken into account. The said same guidelines advise that at 24 months wind monitoring be undertaken on site to inform any wind energy production assessment<sup>88</sup>, therefore it can reasonably be expected that the applicant for a development of the scale proposed would have undertaken far more extensive, and statistically more reliable, wind monitoring than has been taken into account in the shadow flicker predictions.

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<sup>87</sup> In its response to observations from Kildare County Council the applicant justifies its use of the 30 year average sunshine data rather than direct measurement of data over a year on the grounds that the data would not be robust. The lack of robustness can equally be applied to the applicant's use of direct wind measurements over a far shorter period.

<sup>88</sup> '*Temporary met masts, with a total height not exceeding 80m and being erected for a maximum 15 months within a 24 month period are exempt (see SI 235 of 2008)*' under most circumstances (P.12/87).

The EIS does not include the wind direction monitoring results and no comparison of same with the historical average wind direction datasets for Casement is provided. It is therefore not possible to determine whether wind data included is consistent with long term averages or is aberrant.

3.1.6 Taking account of monitored wind direction, the applicant forecasts the maximum probability of the rotor being orientated within 30-degrees of the sun-turbine vector. This results in an estimated 42% reduction of shadow flicker of compared to that of the most onerous wind direction. The revised assessment found only 1no. building (#585), a derelict shed, that would potentially exceed the 30 hour limit, reaching c.48 hours per annum. The table only relates to the 30-hour standard and does not specify whether the 30 minute standard (that also separately applies under WEG) would likely be breached at any of the buildings surveyed. Again, it may be that this would not provide a valid result. In the absence of same the Board should take cognisant of the worst case scenario in terms of minutes per day of shadow flicker, i.e. that 506no. buildings are at risk of shadow flicker in excess of 30 minutes per day within 1200m of a turbine.

3.1.7 The results are provided in tabulated form. Detailed mapped data is readily available with many shadow flicker software models<sup>89</sup>, including contours displaying the different levels (hours per annum / minutes per day) of potential flicker over a geographic area. Such information would more clearly inform the public and aid the Board's assessment of the potential for adverse impacts on specific properties or groups of properties and would have been particularly useful for a wind farm of this scale and extent (Kildare County Council submitted that such mapped data would be helpful). Whilst the chosen format of presentation of results is not optimum, WEG guidance does not provide any advice in this regard, nor does the IWEA Best Practice Guidelines. The ReSoft software package employed by the applicant has the ability to '*analyse a wind farm for possible shadow flicker occurrence at nearby houses, including maps, merged listings and a shutdown list*<sup>90</sup>. The applicant elected only to submit a copy of a Discovery Series OSI map highlighting the affected properties (taking account of 31% sunshine; see appendix 18) by way of further information in response to Kildare County Council's observation. The submitted map does not illustrate the extent of shadow flicker and is of very limited use to the assessment over and above the existing tabulated details.

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<sup>89</sup> E.g. WindPRO, WindFarmer and Windfarm software. Indeed, in response (p.237/264) to third party submission of Donadea Against Turbines, the applicant indicates that it had used one of these 'key computer models' which were subject of a UK review ('*Update of UK Shadow Flicker Evidence Base*' (UK DoECC)

[https://www.gov.uk/government/uploads/system/uploads/attachment\\_data/file/48052/1416-update-uk-shadow-flicker-evidence-base.pdf](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/48052/1416-update-uk-shadow-flicker-evidence-base.pdf) (07/04/16)), therefore one would expect that appropriate mapped data output would have been available for submission to file.

<sup>90</sup> <http://www.resoft.co.uk/English/index.htm> (07/04/16)

- 3.1.8 Observers, including Meath County Council, were concerned that the applicant's assessment related only to the nearest wind turbine. The tabulated results appended to the EIS refer only to the nearest turbine to the dwelling affected, rather than referring to all the turbines impacting on any particular building. The EIS does not make clear that the impact of all relevant turbines was taken into account and included in the tables. In response to the concerns of Meath County Council, the applicant confirmed that the modelling considered the potential cumulative shadow flicker impact on a building due to all turbines within 1200m. The use of appropriate mapped data on potential shadow flicker would have more clearly demonstrated that the impact from all turbines were taken into account.
- 3.1.9 In its further information response, the applicant submitted a table (table 1-1) detailing the predicted dates when mitigation may be required to mitigate shadow flicker at the 42no. buildings that are at risk of exceeding the WEG standards of 30 hours per year (based on 31% sunshine). The final column clarifies that it relates to the dates when mitigation may be require, i.e. when predicted daily shadow flicker exceeds 30 minutes per day. A second table (1-2) specifies which turbines are predicted to give rise to shadow flicker in the case of each of the 42no. buildings. Turbine nos. 1-21, 23, 29, 30-32, 40-44 and 47 (i.e. 32no. in total) are likely to result in shadow flicker in excess of 30 hours at the said 42no. buildings. By deduction, turbine nos.22, 24-28, 34, 34, 36-39, 45 and 46 do not pose a risk of shadow flicker at the buildings concerned.
- 3.1.10 However, this data ignores the possibility that certain buildings may be at risk of breaching the 30 minute daily limit on any given day, whilst being unlikely to breach the 30 hour annual limit due to historical average sunshine limit. This daily limit is at risk of being breached at 506no. dwellings within the 1200m radius of a turbine. The annual average sunshine level is less relevant to risk of exceeding the daily limit as within any one year there will be periods of near 100% sunshine, therefore the risk that the daily limit will be exceeded on any one day would be expected to be higher than the risk of breaching the annual limit. The applicant provides no information on the number of days that those properties will be at risk from breaching the daily limit, or the times of year and times of day that properties may be at risk. This information would provide a clearer picture of the significance of the potential impact.
- 3.1.11 **Mitigation** – Where the conditions arise that generate shadow flicker in excess of the limits, the applicant proposes that the turbine(s) causing the exceedance will be shut down automatically for the duration of the period of time during which those conditions occur, so as to ensure that the guideline limits are not breached at any building. I would caution here that the WEG limits only apply within 500m of a turbine, a standard (and distance) that is clearly referred to by the applicant, and therefore based on the applicant's



proposal there would be no obligation to mitigate any shadow flicker on the majority of the residential properties that might be affected. There is only one dwelling within 500m, but 993no. buildings between 500m-1200m of a turbine, therefore virtually all of the buildings at risk are located outside of the 500m limit. Although it may well be the applicant's intention to ensure that there is no exceedance of the WEG limits within 1200m radius of a turbine, most of the statements of mitigation are somewhat ambiguously worded. I note, however, the following statement on p.235 of the applicant's response to the observations of Donadea Against Turbines:

*'Mitigation measures will be implemented to ensure that these guideline shadow flicker limits of 30 hours per year or 30 minutes per day will not be exceeded for any of the buildings within 1,200 m of a proposed turbine.'* (p.235/264 Response to observations)

3.1.12 It would therefore seem clear that the applicant will mitigate shadow flicker for all dwellings within 1200m radius distance from any turbine. The more distant the turbine, the less risk of shadow flicker will occur on a dwelling, therefore a condition requiring compliance with the WEG standard within 1200m of a turbine may not actually be onerous.

3.1.13 The mitigation comprises the use of turbine control with turbines programmed to stop operating at times where it is anticipated that the relevant guideline limits may be exceeded. It is intended to improve this by connecting the system with light sensors and control software such that the turbine(s) will only stop working if the conditions exist for shadow flicker, thus allowing the turbines to continue to generate electricity on cloudy days. The proposed shadow flicker mitigation measures can be considered best practice and are acceptable. The Board does not have a standard condition to address shadow flicker mitigation. Should the Board decide to grant permission, the wording of any such condition should expressly refer to compliance with the 30 hour annual limit and to compliance with the 30 minute daily limit at any building within 10 rotor diameter distance from any proposed turbine.

3.1.14 Shadow flicker and health – In addition to general health concerns, a particular concern was raised by a number of observers in respect of potential impact on people suffering epilepsy. The WEG make no reference to health issues arising from wind turbines. The only reference to 'health and safety' concerns the siting of ancillary transformers.

3.1.15 The '*Update of UK Shadow Flicker Evidence Base*'<sup>91</sup> was prepared on behalf of the UK Department of Energy and Climate Change in 2011<sup>92</sup>, which

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<sup>91</sup> [https://www.gov.uk/government/uploads/system/uploads/attachment\\_data/file/48052/1416-update-uk-shadow-flicker-evidence-base.pdf](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/48052/1416-update-uk-shadow-flicker-evidence-base.pdf) (07/04/16)

<sup>92</sup> No year stated, but I assume it dates from 2011 based on last referenced year being 2010.

comprised a review of available evidence and standards across a range of countries. Regarding potential impacts on epilepsy, it indicates that between 3.5 and 5% of epileptics are photosensitive and that less than 5% of photosensitive epileptics are sensitive to the lower frequencies of 2.5-3Hz, with the remainder sensitive to higher frequencies up to 30Hz. It notes Canadian guidance (2006) acknowledges that shadow flicker can lead to inducing epilepsy in susceptible people, but that it is not aware of any such recorded incidents. It indicates that most commercial wind turbines (in the UK) rotate much more slowly, at between 0.3 and 1.0Hz and, due to technical constraints, larger turbines tend to rotate slower than smaller turbines (from BERR, 2007). The executive summary (p.5) states:

*'On health effects and nuisance of shadow flicker effect, it is considered that the frequency of flickering caused by the wind turbine rotation is such that it should not cause a significant risk to health.'*

3.1.16 Observers have claimed that the shadow flicker can trigger epileptic fits particularly where multiple turbines are in operation, with the risk of 2.5Hz frequency being reached increasing with scale and extent of wind turbines and have also claimed that two cases were reported to UK authorities in 2007. No evidence has been submitted to support such assertions.

3.1.17 In response to observations concerning potential health impacts and epilepsy, (section 3.14.4 'Noise and Shadow Flicker') the applicant states as follows:

*'Noise and Shadow Flicker will not exceed the DoEHLG guidelines and the potential health risks including the possibility of inducing epileptic seizures are negligible.'*

3.1.18 The applicant provides no information to support this position and makes no reference to possible risk thresholds (such as the 2.5Hz referred to by observers and in the UK DECC report) and to the actual frequency that would be generated by the proposed development.

3.1.19 Health impacts arising shadow flicker generated by turbines is an emotive issue, but not an unreasonable concern considering the scale and extent of the development and its proximity to a significant number of dwelling. However, based on the UK Department of Energy and Climate Change report '*Update of UK Shadow Flicker Evidence Base*', modern large-scale turbines do not appear to pose any significant risk to epileptic sufferers and do not produce shadows at a frequency that would risk inducing epileptic seizures.

3.1.20 Strobing - Concern about strobing has been raised by numerous observers. WEG does not refer to strobing. UK guidance recognises the potential impact of strobing stating:

*‘Another distinct phenomenon that is often confused with ‘shadow flicker effect’ is that of ‘strobe effect’. Strobe effect refers to the flashing of reflected light which can be visible from some distance. This phenomenon has largely been ameliorated by the development of an industry standard (light grey semi-matt) for the colour and surface finish of turbine blades, as proposed by the ETSU (1999) study and the Companion Guide to PPS22 (2004)<sup>93</sup>.*

3.1.21 By and large observers appear to have confused the issue of strobing with shadow flicker. Some raised the issue of strobing arising from artificial lighting of turbines at night, however I do not find that concern to be founded in reality. Although WEG does not acknowledge potential for strobing, it nonetheless, requires that matt non-reflective finishes be used on all turbine components which effectively addresses any potential risk of strobing occurring. The Board’s standard condition on wind turbine colour does not specify a requirement for use of a matt non-reflective finish. Should a decision be taken to grant permission, the said standard condition should be attached and amended to take account of the WEG requirement in this respect.

3.1.22 **Shadow Flicker Conclusion** – In the theoretical worst-case scenario, assuming 100% sunshine and worse-case wind direction, a total of 506no. buildings are at risk of shadow flicker in excess of 30 minutes per day, and a total 378no. buildings are at risk of breaching the 30 hour limit (349no. are at risk breaching both limits) within 1200m of a turbine. As the 30 year historical average sunshine levels for casement are 31%, the actual risk of shadow flicker per annum can be expected to be far lower scenario. However, it would seem that the risk of any of the 506no. buildings receiving 30 minutes shadow flicker on any (at risk) day may remain relatively high.

3.1.23 The applicant proposes to mitigate shadow flicker through the automatic shutdown (through turbine programming) of relevant turbines when conditions arise that generated shadow flicker in excess of the WEG limits at buildings within 1200m of a turbine. I am satisfied that this approach is appropriate and feasible to address the potential adverse impacts on residential amenities from excessive shadow flicker in accordance with the limits under WEG. A mechanism for receiving and dealing systematically with complaints would be essential to ensure that the mitigation measure is implemented appropriately.

#### 4 **Health and safety issues:**

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<sup>93</sup> [https://www.gov.uk/government/uploads/system/uploads/attachment\\_data/file/48052/1416-update-uk-shadow-flicker-evidence-base.pdf](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/48052/1416-update-uk-shadow-flicker-evidence-base.pdf) (07/04/16)

## 4.0 Introduction

4.0.1 I have addressed the issue of health and safety implications arising from infrasound and low frequency noise under the 'Noise' section above, and those arising from shadow flicker and strobing under 'Shadow Flicker, above. Additional health and safety concerns have been raised by parties in respect wind turbine structural integrity and associated potential impacts, and potential impacts from electromagnetic fields associated with the proposed cables.

4.1.0 Safety – The safety issues raised by observers relate mainly to structural issues (blade throw and structural collapse), ice throw, fire and explosion which have direct safety impacts on the local population. In addition, observers have raised concern about the potential for indirect impacts whereby blade throw results at an event at the Irish Industrial Explosives factory within 1km of turbines to the north and west of turbines proposed in Drehid-Hortlands Cluster east.

4.1.1 In response the applicant submits that there are over 1200 turbines operating in Ireland with a very limited number of incidents and, it claims that studies undertaken by IEA, WHO and others indicate that wind energy is one of the lowest form of health and safety risk of power generation. In addition to all turbines and their components carrying the CE mark, which is the manufacturer's declaration that the product meets the requirement of applicable EC Directives, the following mitigation measures are proposed to address safety concerns:

- The turbines have a supervisory control and data acquisition (SCADA) system which monitors and records the operation of the turbines including power generation, faults, alarms and grid interface.
- The SCADA system itself is remotely monitored 24/7, any faults that raise an alarm are checked remotely by the 24/7 monitoring team, a service team can then be dispatched to site to repair the fault.
- If a fault has the potential to cause damage to the turbine, the SCADA system stops the turbine and sends an alarm to the 24/7 monitoring team.
- The default position for the turbine in the case of the fault is to stop.
- The turbine manufacture completes documented 6 monthly inspections of the turbines and documented annual servicing of the turbines.
- Prior to restarting the turbine after a fault, the manufacturer identifies the 'root cause' of the fault, implements a repair/replacement strategy, tests and documents all works and only then restarts the turbine.
- The turbines for this project have smoke detection installed. If smoke is detected in the turbine the turbine immediately stops and the alarm is raised with the 24/7 monitoring team.

- 4.1.2 In addition, the applicant indicates that any turbine component that has a requirement for oil, will have a self-contained bund to hold 110% of the oil capacity (e.g. a gear box with 300L will have a 330L bund). The turbines will have an ice detection facility so that if ice is detected on the blades, the turbines will pause until the ice falls to the ground from the blades.
- 4.1.3 In respect of potential impact on the Irish Industrial Explosives facility, which constitutes an ‘*establishment*’ under the Major Accidents Directive (2012/18/EU) and which is designated as a COMAH<sup>94</sup> site, the applicant submits that the wind farm is designed to last for at least 30 years and the turbines equipped with a number of safety devices to ensure safe operation during their lifetime. There are rigorous statutory and engineering safety checks for turbines during design, constructions, commissioning and operation that ensure the risks posed to humans are negligible. Risk is also mitigated through the standard provision of remote monitoring and fault notification (see above) included in turbine operation and maintenance contracts, with scheduled maintenance in addition to maintenance call out on fault notification. I note the report of the HSA (received 11/04/16) which expressly does not advise against granting of planning permission in the context of Major Accident Hazard<sup>95</sup>, but advises that the applicant should be made aware of HSE Research Report RR968 ‘*Study and development of a methodology of the estimation of risk and harm to persons from Wind Turbines*’ in designing and developing the proposed windfarm and notes that future expansion around COMAH establishments has the potential to impact on the expansion of those establishments.
- 4.1.4 Whilst evidence has been submitted by many observers that blade throw, ice-throw, fire and structural collapse can and have occurred on windfarms, the applicant maintains that the health and safety record of the wind energy industry worldwide is exceptionally good. Almost no development or facility is without some safety risk. Accidents will happen. However, based on the information submitted by the applicant regarding the standard measures applied to mitigate safety risk, in addition to the report of the HSA, I am satisfied that the proposed windfarm development does not present an unacceptable safety risk to local residents or to the general public.
- 4.2.0 Health impacts (impact of electromagnetic fields) – I have address possible health impacts arising from noise and from shadow flicker above. In addition, observers have raised concern about Electromagnetic Fields and EMF. Appendix J2 of the EIS (Vol.3) comprises an ‘*EMF study for cables associated with the Maighne Wind Farm*’ which concludes that:

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<sup>94</sup> Formerly known as a SEVESO site.

<sup>95</sup> It advises the Board to consult document ‘*Policy & Approach of the Health and Safety Authority to COMAH Risk-based Land-use Planning*’ in order to fully understand HSA advice.

*The current scientific consensus, as expressed most recently by the WHO, is that the research does not suggest that ELF-EMF causes any health effects at the levels typically encountered in our environments. Authoritative scientific organisations have not recommended exposure limits at these levels or steps to reduce our exposures. The electric and magnetic fields expected to be associated with the operation of the proposed cables fully comply with the ICNIRP and EU guidelines on exposure of the general public to ELF-EMF. (para.1.13)*

4.2.1 In response to the appeal the applicant reiterates that the electric and magnetic fields associated with the operation of the proposed cables will fully comply with the ICNIRP and EU guidelines on exposure of the general public to ELF-EMF and as a result EMF will be insignificant in health terms. Accordingly, I do not consider ELF-EMF impacts to be of concern.

## **5 Property value and sterilisation**

5.1.0 The potential for adverse impacts on property value was raised by large number of observers. Under chapter 11 of the EIS, the applicant submits that the following measures are proposed to negate or mitigate such impacts:

- Provision of 500m separation distance between the centre of the turbine and any dwelling.
- Siting of turbines in low lying areas to lessen the visual impact.
- Noise emissions to meet the levels recommended in the guidelines.

5.1.1 The applicant refers to 5 studies (2007 report of Royal Institute of Chartered Surveyors; 2006 research by Edinburgh Solicitors' Property Centre; 2014 study carried out by Centre for Economics and Business Research on behalf of Renewable UK; 2009 study on behalf of USA government; and 2012 study by Chartered Institute for Environmental Health, University of Ulster) which found or suggested no adverse impact on house prices in proximity to windfarms.

5.1.2 Observers claim that a material reduction in value of homes will result for properties located proximate to turbines (from noise, shadow flicker, visual impact, impact on scenic views etc., and cumulative impact, in addition to impacts from excavation and construction works) and make it difficult to find a buyer. It is claimed that this is backed up by Real Estate agents and Research in UK which indicate reduction in value by up to 30%. It has also been asserted that the British Government has reduced property related taxes on some homes (Davis 2008) because of reduced valuations caused by wind farm proximity and that a UK Court has ruled that value of house within 930m

of turbine was reduced in value by presence of the turbine (e.g. Fullabrook Turbines North Devon). Observers suggest that research findings to the contrary are funded by or linked to the Wind Industry. Some observers has submitted letters from estate agents to confirm that house sales have fallen through in the locality due to the proposed wind farm, and that there would be an impact on property values in the area.

5.1.3 Many observers reference report by London School of Economics Spatial Economics Research Centre - *'Gone with the Wind: Valuing the Visual Impacts of Wind Turbines through House Prices'*<sup>96</sup>, which reported that house prices were reduced in postcodes where turbines are visible relative to postcodes where turbines not visible, estimating that windfarms (of 10+ turbines) can reduce house prices by 12%. The report attributes the impact to visibility of wind farms rather than to any other impacts. According to observers, the study by Sim and Dent (2007)<sup>97</sup> on behalf of RICS Education Trust reported reduction in house values of up to 54% within 1.6km. Whilst others refer to a review of 11 US studies by McCann (2013) which reported a loss of property value of between 25-40% within 2km. In addition, it has been submitted that the adverse impact on property value has been recognised in other jurisdictions, including Denmark (through implementation of compensation model) and the State of Victoria, Australia.

5.1.4 The applicant addresses the issue further in its further information submission, although it does not address any of the studies referred to in the individual observations. The applicant commissioned Mr Tom Kirby, who is experienced in valuation and all aspects of the estate agency profession<sup>98</sup>, to carry out a comprehensive literary review of relevant published information on property devaluation resulting from wind farm development. Only studies and property valuation which have been published and peer-reviewed has been considered, with all other documentation discounted as not validated. From a review of three studies<sup>99</sup>, Mr Kirby concludes that the reports prepared to date suggest that the presence of wind farms does not devalue residential property. Whilst the prospect of a proposed wind farm can become a factor in sales, once constructed, the new infrastructure becomes part of the general

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<sup>96</sup> [Journal of Environmental Economics and Management, Vol.72](#), July 2015, Pages 177–196 (09/06/16)

<sup>97</sup> Journal of Property Investment & Finance

<sup>98</sup> Mr Kirby is a Director in GVA Donal O'Buachalla, with over 15 years' experience in all aspects of valuation an estate agency profession. He has a comprehensive knowledge of property acquisition for and on behalf of Local Authorities for road schemes under CPO and through direct negotiations with landowners and has acted on behalf of landowners and advised many local authorities in respect of compulsory acquisitions. (P.227/264, Response to Submissions).

<sup>99</sup> 'The effect of wind farms on house prices' (Renewable UK, 2014).

'A spatial hedonic analysis of the effects on wind energy facilities on surrounding property values in the United States' (Berkeley National Laboratory, 2013).

'The impact of wind power projects on residential property values in the United States: a multi-site hedonic analysis' (Berkeley National Laboratory, 2009).

environment and does not become an ongoing negative factor in pricing properties which are situated more than 500m from same.

- 5.1.5 Referring to the UK Valuation Office Agency decision to move a house down a tax value band due to proximity to wind turbines, it is submitted that all other VOA decisions have affirmed the valuation due to lack of evidence to support any loss of value. The applicant therefore accepts that it is possible that, in certain circumstances residential properties are devalued by the presence of turbines, this is only when they are situated in close proximity to a turbine or turbines. It is the applicant's position that post construction the value of properties 500m plus distant from the proposed turbines will remain / return to values on par with process in similar areas unaffected by wind farms.
- 5.1.6 The applicant's review of the literature, comprising only three reports, can hardly be described as comprehensive or of broad scope (two of the reports are from the one body and author). Whilst limiting the review to peer review published studies is a valid approach, the applicant does not provide any indication of the quantity of relevant valid research that exists and how the three reports were selected. In my opinion this undermines the applicant's response. I note that the also applicant did not elect to respond directly to the contrary results of peer reviewed published research, most notably that by Gibbons (2015) of the London School of Economics (see above), or other studies referred to by observers.
- 5.1.7 As submitted by observers, lands within 500m of a proposed turbine may effectively become sterilised from residential development. This is likely to impact on the 'hope' value that attaches to lands in anticipation of development potential whether or not such anticipation is legitimate or not. Also, as noted, above in respect of proposed cabling works, the prevention of access to existing in-road services / utilities through the development of the proposed underground cable network would inhibit future development potential of lands affected and consequently would be expected to impact adversely on land value. I cannot determine whether the installation of the cable network would prevent access. The sterilisation of lands would be a particular concern where the proposed development impacted on zoned development land or on lands identified as within a settlement. This would not appear to be the case as regards the proposed turbines, but it is uncertain whether it may result from the proposed cable networks.
- 5.1.8 It would seem plausible that the proximity of a dwelling to wind turbines would be a determining factor in property value, and that the larger, more prominent and more numerous wind turbines are within a development, the more likely there is to be significant factor. Property value is also likely to be impacted by the perception of noise associated with the wind farm, again this will be related primarily with separation distance. However, there is clearly



contradictory findings in different research studies in this hotly contested and sensitive area and it is not possible for me to reach a determination on the whether a permanent material impact will arise on residential property value in the vicinity based on the information at available to me. Given that the WEG 2006 do not refer to impact on property value but set standards in relation to minimum setback distance from and maximum noise impacts at residential properties, it may be reasonable of the Board to take the view that subject to compliance with the standards that the issue of permanent material impact on property value does not arise.

## **6 Conclusion and recommendations:**

### **6.1.0 Traffic and Transport**

6.1.1 I consider the assessment of traffic and transport impacts in the EIS to be deficient on for the following reasons:

- The assessment does not take account of the full extent and width of cable trenching works proposed, referring at various points to cabling works of lesser lengths and to providing unsupported assumptions regarding the ratio of trenches of different width. There is no indication that the assessment has regard to the number of joint bays and communication chambers required (I estimate 60no. based on ESBI guidance), to the dimensions of these not-insubstantial sub-surface structures, or to where they would be located.
- The applicant's assessment is not informed by appropriate survey work of road structure condition, the location of in-road services / utilities along the proposed cable route and the topography of the route as necessary to inform the actual location of cable trenches, joint bays and communication chambers having regard to all existing constraints. As the location of the proposed structures within (or possibly adjacent) the carriageway has not determined having regard to existing constraints, it is not possible to assess the potential impact of same on the road network, on any particular route, or indeed on existing in-road services including the future accessibility of same from settlements or zoned lands.
- Regarding the assessment of potential impacts on the physical structure of the road network from cable trenching work, in addition to the above points I have concern that the sample investigative assessments did not include the R414 (and L7004). The reinstatement plans for the route are therefore uncertain, but as the R414 traverses cutover bog, Type 4 road reinstatement design for legacy / bog roads can be assumed. The Type 4 reinstatement design is not to DTTS standard (Type 1, 2 and 3 are stated

as compliant) and, in my opinion, would appear likely to result in differential settling of the carriageway. This may result in a long term negative impact on the roads concerned, with cost implications for the Roads Authority for ongoing maintenance. The potential cumulative impact of cabling works and haulage on the structural condition of the road network and, in particular, on legacy roads, has not been adequately addressed.

- The applicant's assessment of the potential impacts of cable works on traffic is insufficient to enable a determination of the realistic extent, nature and significance of impacts on road users. There is no assessment of the existing traffic capacity of routes concerned or of the impact of cabling works on that capacity; there is no estimated schedule of duration of works on any particular route; there is no estimation of duration of works per km length; the assumptions underlying the overall estimated duration of cable works are not stated. The impact assessment does not justify the assumption that regional roads will be subject of lane closures having regard to absence of a topographical survey of the routes concerns and the failure to take account of the full extent of works. The assessment provides no estimate of the likely duration route diversions required, or the availability and suitability of alternative routes. The potential impacts are not quantified in terms of duration, the road users affected or the significance of routes affected. There is no assessment of impacts at AM/PM peak traffic times. The EIS fails to provide an adequate assessment of the likely significant impacts arising from cabling works but provides only general conclusion on impacts that are appropriate to the scoping assessment stage.
- In terms impacts of construction traffic on the network, the assessment makes no reference to the capacity of haulage routes, including in particular where those route are constrained traversing population settlements (or at other critical junctions), or to the reduced capacity during cable trenching works which will exacerbate any adverse impacts of construction traffic. There is no assessment of traffic impact on AM/PM peak traffic time, which is of critical importance in the assessment of traffic impacts. There is no explicit consideration of the significance of the routes affected (e.g. commuter routes, access routes for schools, hospitals, employers, etc.) and the road users that would be affected. There is no assessment of the impact of traffic on human beings (impacts on amenities, disturbance) in terms of the populations affected, particularly where proposed haulage routes traverse population settlements, having regard to the duration of construction works and haulage traffic and the nature of the traffic generated. I consider the traffic

and transport assessment to be deficient and contrary to the 'Traffic and Transport Assessment Guidelines' issued by NRA, 2014.

- 6.1.2 Given the scale and extent of the proposed development, the dispersed pattern of settlement along much of the county road network and settlements along the regional network, the potential construction traffic generated has the potential to significantly impact on amenities for a significant period of time (e.g., over a period of at least 1½ years for residents of Johnstownbridge). The EIS included no adequate assessment of the impact on human beings arising from physical works to the network and from generated traffic, or on economic activity in terms of restriction on access to businesses. Similarly, that the additional traffic and diversions on the network may be likely to increase risk of road accident on the network for all road users, including pedestrians, but this has not been addressed adequately in the EIS.
- 6.1.3 Having regard to the foregoing I would advise that the traffic and transport assessment carried out by the applicant is deficient and is inadequate to inform a full assessment of the proposed development or to inform a proportionate environmental impact assessment of the likely significant impacts arising from same. Accordingly, it would be inappropriate to issue a favourable recommendation on the development proposal.
- 6.1.4 Turbine delivery route - The application is not accompanied by the written consent of the relevant landowners to make the application in order to carry out the development concerned, including the accommodation works adjacent the public road network identified in the EIS Report (Appendix K of the EIS) to the standard as set out in the judgement of Herbert J in *McCallig v An Bord Pleanála* (24/01/13). In addition, the full extent of the works required to accommodate the proposed turbine delivery have not been identified through the carrying out of a detailed topographical survey, noted as necessary in the EIS report, and much of the identified accommodating works are not contained within the redline (or blue line) application boundary. The ability of the applicant to implement the proposed development, in its entirety, in accordance with drawings and documentation (including the EIS and NIS) submitted on file is therefore at question.
- 6.1.5 Vehicular entrances - Based on the information submitted with the application and the further information submitted subsequently, it is evident that some of the proposed entrances will not comply with the required standards (NRA/TII TD.41/42) and that insufficient information in terms of survey drawings, detailed proposal drawings and relevant documentation (including written agreements) has been submitted to demonstrate that the proposed entrances can comply with same. I would draw attention to the failure of the applicant to include any assessment of the proposed entrance junction to the R414 to the

south of Derrybrennan Cluster concerning compliance with the said standards. In the absence of demonstrable compliance with the relevant national road standards, it must be concluded that the proposed development endanger public safety by reason of a traffic hazard. Accordingly, it would be inappropriate to issue a favourable recommendation on the development proposal.

6.1.6 Leinster Orbital Route - The proposed development encroaches on the route option identified in the NRA's LOR Feasibility Study, would prejudice the future development of the LOR, is premature pending the determination by the planning authority, or the road authority, of a road layout for the LOR and would be contrary to the proper planning and sustainable development of the area. This issue can be resolved by condition through the omission of proposed turbines T11 and T13 and the relocation of the proposed substation should the First Inspector be mindful to make a favourable recommendation.

6.1.7 Possible future development – At Drehid-Hortland Cluster the proposed turbine access tracks extend beyond the obvious needs of the proposed development (concerning T20, T21, T22, T35, T36 and T45) and extend to the site boundary in the case of T21 and T22, raising concern that the subject development proposal may directly facilitate future development within and beyond the site. This may have implications in terms considering possible specific cumulative impacts and in-combination effects under EIA and AA, respectively, which have not been addressed in the EIS and NIS submitted by the applicant. Should the First Inspector be inclined to recommend a grant of permission, I would advise that a condition be attached requiring the omission of the said extended sections of track.

## 6.2.0 **Noise**

6.2.1 The applicant's baseline noise survey is deficient and non-compliant with good practice methodology in respect of the number and location of noise monitoring locations to inform the baseline noise levels, which have not been justified by the applicant, that includes noise monitoring locations exposed to high levels of traffic noise and the siting of monitoring equipment such that the results are contaminated by wind-generated vegetation noise. Contaminated survey data will have resulted in higher background noise levels not characteristic of the background noise environment of the NSRs at most risk, and which may result in the imposing of higher noise limits than appropriate.

6.2.2 The methodology employed by the applicant to take account of the impact of wind shear, comprising use of 10m masts, and its application of a generic correction factor, are not justified for a development of the scale proposed,

results in uncertainty and is contrary to the recommended approach for large scale wind farm development under the GPG. The inconsistent use of different wind speed references across the noise assessment (including appendices) contrary to the GPG advice, and the failure to state the wind speed reference used in its turbine noise predictions confuses the results and creates further uncertainty.

- 6.2.3 The approach to presentation of results, comprising the provision of tabulated data only, with no noise contour maps to illustrating the predicted impacts, is contrary to the recommendations of the GPG regarding provision of key information and restricts the level of interrogation of results for all parties. It is not clear from the presentation whether the predicted noise levels and proposed mitigated daytime levels apply to the entire external amenity space associated with residential property (as required under WEG 2006 and advised under GPG), or at the nearest face of the dwelling or at the point location of the dwelling concerned.
- 6.2.4 There is no adequate assessment of the significance of noise impacts having regard to the resident population in the vicinity, the baseline noise environments, the likely noise levels and the mitigation measures proposed.
- 6.2.5 Having regard to the foregoing, I am of the opinion that the noise assessment and, in particular the predicted mitigated noise levels, cannot be relied upon. Given the scale of the development proposed and the close proximity of same to a large number of dwellings, I consider the potential for significant adverse noise impacts on the large number of residential properties in the surrounding areas to be excessive. In the absence of an appropriately revised, accurate and justified noise impact assessment, I would advise the First Inspector that permission be refused in the interest of protecting impact on residential amenities of the area from risk of significant noise impacts.
- 6.2.6 Furthermore, given that the potential impacts from LFN generated by wind turbines remains uncertain, that the EIS provides insufficient details and evidence to enable an informed determination to be made on the potential for adverse impacts arising from LFN on the surrounding population, the scale of the population that would potentially be affected, and the nature of the potential impact in terms of interference with sleep, I consider the potential risk to be unacceptable and, on the basis of the precautionary principle, would advise the First Inspector that permission should be refused.
- 6.2.7 It should be possible to resolve any noise impact concerns arising from the proposed substation at Drehid Hortland (west) Cluster by condition. No significant vibration impacts result at operational stage of the development.
- 6.2.8 The potential for significant noise impacts from the construction stage has not been adequately assessed. There is a lack of basic information on the nature

and duration of construction works considered and the assumptions upon which the applicant's noise assessment of the proposed borrow pits are based, in relation to the separation distance from noise sensitive receptors, are incorrect. I therefore consider the assessment to be inadequate and would advise the First Inspector that it would not be appropriate to recommend a grant of permission without an appropriately revised assessment being carried out to inform suitable mitigation measures.

### 6.3.0 **Shadow Flicker**

6.3.1 The applicant proposes to mitigate shadow flicker through the automatic shutdown (through turbine programming) of relevant turbines when conditions arise that generated shadow flicker in excess of the WEG limits at buildings within 1200m of a turbine. I am satisfied that this approach is appropriate and feasible to address the potential adverse impacts on residential amenities from excessive shadow flicker in accordance with the limits under WEG. A mechanism for receiving and dealing systematically with complaints would be essential to ensure that the mitigation measure is implemented appropriately.

6.3.2 Based on UK Department of Energy and Climate Change report '*Update of UK Shadow Flicker Evidence Base*', I am satisfied the subject development does not present any significant risk to epileptic sufferers and will not produce shadows at a frequency that would risk inducing epileptic seizures. Should permission be granted, the potential for impacts from strobing can be adequately addressed by a condition requiring the use of a matt non-reflective finish to the turbines.

### 6.4.0 **Health and safety**

6.4.1 Based on the information submitted by the applicant regarding the standard measures applied to mitigate safety risk for wind farm developments, in addition to the report of the HSA, I am satisfied that the proposed windfarm development does not present an unacceptable safety risk to local residents or to the general public.

6.4.2 The applicant submits that the electric and magnetic fields associated with the operation of the proposed cables will fully comply with the ICNIRP and EU guidelines on exposure of the general public to ELF-EMF and as a result EMF will be insignificant in health terms. Accordingly, I do not consider ELF-EMF impacts to be of concern.

### 6.5.0 Property Value

- 6.5.1 It would seem plausible that the proximity of a dwelling to wind turbines would be a determining factor in property value, and that the larger, more prominent and more numerous wind turbines are within a development, the more likely that such development will be a significant determining factor. Property value would also seem likely to be impacted by the perception of noise associated with the wind farm. Again this may relate primarily to separation distance.
- 6.5.2 However, there is clearly contradictory findings in different research studies in this hotly contested and sensitive area and it is not possible for me to reach a determination on the whether a permanent material impact will arise on residential property value in the vicinity. Given that the WEG 2006 do not refer to impact on property value but set standards in relation to minimum setback distance from and maximum noise impacts at residential properties, it may be reasonable of the Board to take the view that subject to compliance with the standards that the issue of permanent material impact on property value is not a matter for consideration.
- 6.5.3 As submitted by observers, lands within 500m of a proposed turbine may effectively become sterilised from residential development. Concern has also been raised regarding the prevention of access to existing in-road services / utilities through the development of the proposed underground cable network. The inhibiting of future development potential of lands affected and consequently would be expected to impact adversely on land value. This impact has not been adequately addressed by the applicant. Potential sterilisation of lands would be a particular concern where the proposed development impacted on zoned development land or on lands identified as within a settlement.

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John Desmond  
Senior Planning Inspector  
27/06/16