DP ENERGY

WINDPOWER

VOLUME 1

BOOLTIAGH WIND FARM EXTENSION
Planning Ref P07/2900

Revised ENVIRONMENTAL STATEMENT

NON TECHNICAL SUMMARY

July 2008

VOLUME 1

Revised Non Technical Summary

Booltiagh Wind Farm North and Eastern Extension

Planning Ref P07/2900

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July 2008

The Non Technical Summary is intended to provide a summary of the main findings of the Environmental Statement (ES), which accompanies the wind farm planning application. The ES provides information on the potential environmental effects of a project. This information is used to help in the decision making about whether projects should go ahead or not.

If you need more detail than described within the Non Technical Summary about any topic you should find it in the same chapter of the main EIS. The full EIS is available to view at the Planning Office in Clare County Council. Further copies of the NTS, and copies of the ES can be obtained from the address below. The NTS is available free of charge, whilst the full ES can be purchased on CD at a price of €10 or in Hard Copy at A4 and A3 at €125.

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If you have any observations or concerns about the project and its effect, you can send them to: -

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1. Introduction

The proposers

DP Energy Ireland Limited is an independent privately owned company registered in Ireland and based in Buttevant, County Cork. It was formed to develop potential wind farm sites in Ireland and the United Kingdom and operates as a development company for the development, construction and operation of wind farms. It has substantial experience in project evaluation and development in Scotland, Northern Ireland and the Republic of Ireland.

Once built the wind farm extension will be operated and owned by Booltiagh Wind Limited, the same owner operator as the main Booltiagh Wind Farm.

The Need

It is widely accepted that human activities utilising fossil fuels, such as power generation and transport, are causing major atmospheric environmental problems. It is estimated that the world wide energy demand will double in the next 25 years releasing ever greater volumes of carbon dioxide (CO2), the most important "greenhouse gas", sulphur oxides (SOX) and nitrous oxides (NOX) into the atmosphere. NOX and SOX are precursors to photochemical smog and acid rain. Global climate change resulting from the release of greenhouse gases is now believed to be the most serious environmental threat facing the planet.

Around the world many Countries, including the UK and Ireland, have Government programmes which aim to develop more sources of renewable energy. This is to help to reduce the use of coal & oil which pollutes the environment. Wind is currently Ireland's main source of renewable energy and the Government have introduced an Alternative Energy Requirement to encourage its development.

The Benefit

It is estimated that overall with the addition of the proposed six turbine extension to increase the Booltiagh Wind Farm to 34.5MW the total energy produced could prevent the production of the following emissions:

- 77,000 tonnes of Carbon dioxide per annum
- 900 tonnes of Sulphur Dioxide per annum
- 271 tonnes of Nitrogen Oxides per annum

and supply enough electricity to meet the electricity usage of around 20,000 houses over the course of year.

The Environmental Impact Assessment

European Law state that an ES must be prepared for wind farm developments of a certain size. Where any wind farm involves more than two turbines or a turbine height greater than 15metres an ES may be required.

An ES must provide a certain range of information including information on the potential impacts on:

Socioeconomic
Landscape and Visual
Ecology
Air Quality and Emissions
Archaeology and Cultural Heritage
Hydrology
Noise
Traffic
Telecommunications
Shadow Flicker

All these topics are covered in detail within the full ES.

New Contents
This 2008 Non Technical Summary (NTS) and ES replaces the 2007 NTS and ES which included the results of a number of new avian assessments included within the 2006 version of the extension application (Winter Waterfowl survey and Hen Harrier Survey 2004/2005), as well as more detailed updates of the surveys of the original March 2000 ES. It also includes the results of assessments completed post submission of the 2006 application particularly in regard of Hen Harrier activity, peat reinstatement and soil stability following further consultation with the National Parks and Wildlife Service.

The 2008 ES corrects a number of errors within the original 2007 ES in relation to turbine numbers (since two of the originally consented 15 turbine planning permission have lapsed), and also the status of the adjacent Lough Naminna NHA. It also includes additional information with respect to the areas ecological landscape with particular reference to Hen Harriers and clarification of a number of points raised by the Further Information Request from the County Council dated 12th February 2008.

2. Proposed Development

Description
The proposed extension consists of an additional six turbine extension to the existing Booltiagh Wind farm, which is located at Booltiagh and Glenmore North Townlands, near Connolly in West Clare. The extension lies within the townlands of Booltiagh and Carncreagh.

The site area forms a relatively flat plain immediately west of Lough Naminna and some 6km north of the R68. It lies almost mid-way between the small towns of Connolly and Kilmihill. Ennis lies approximately 19km to the east and Miltown Malbay lies at a distance of about 14km to the north-west. The geographic location and general layout of the development are shown in Figure 1 and Figure 2 respectively.

The land use of the site and the surrounding area reflects a significant degree of human activity. The predominant land use activity within the proposed development site is forestry and large areas of coniferous forestry exist immediately adjacent to the site. All of the six extension turbines lie within newly planted forestry.

The works will consist of the erection of 6 wind turbines and ancillary equipment for the capture of the wind and generation of electricity. The proposed extension uses the existing wind farm infrastructure, and the only new requirements are for the additional turbines, their dedicated access tracks, crane pads and turbine bases. Cabling will be underground and take the power back to the existing Booltiagh wind farm substation.

Each turbine consists of a wind energy capture device (formed by the rotor blades) and electrical generation equipment mounted on the top of a tubular steel tower. Each tower will have a maximum height of 80metres, and will be tapered with a diameter of approximately 4.5m at the base. On top of the tower is situated a box like enclosure (the nacelle) which incorporates the gearbox, generator and other equipment. Mounted on this nacelle is a steel hub with three equally spaced composite blades, of up to 41.5metres in length. Collectively the tower, nacelle, hub and blades (illustrated in Figure 3) are usually referred to as 'a turbine', and each is fixed to its own individual concrete pad of approximately 15metres square. The overall height of the turbine to its maximum extent will be around 120metres.

The proposed site access is via the existing Booltiagh wind farm entrance and existing site access roads. A short stretch of new access tracks for erection of the turbines and subsequent maintenance leads from the existing site tracks to the base of each additional turbine.

No fences or barriers are required around the turbines or the site.

<u>The 2007 Application</u>

This application replaces that made in 2006 at the same location. The change to the 2006 submission involves only one minor turbine location change (30-40m) in order to mitigate concerns of the National Parks and Wildlife Service with respect to a potentially ecologically sensitive area of Wet Flush. The principal change is both an increase in turbine hub height (to reduce turbulence and shear effects), and turbine rotor area (to increase energy capture).

The rationale for the revised application relates to energy yield. In parallel with the 2006 application, a third party energy production review of the existing Booltiagh wind farm was being undertaken based on the first 18 months ESB export data. The results of this performance review indicated higher than predicted yield losses attributed to a number of factors including tree induced shear and turbulence potentially caused by low tower heights. The review is still ongoing, however, on the basis of both the energy yield assessment and relevant consultations a decision was made to withdraw the 2006 application and replace with a modified application with a higher energy efficiency. The result of this change results in an estimated 50% increase in the yield of the extension turbines.

3. Alternatives Considered

Other Sites in Ireland

A large number of sites have been reviewed both in County Clare and in Ireland as a whole. In reviewing other potential sites in for wind energy development the relevant County Development Plans and Landscape Assessments were used with respect to Visually Sensitive Areas and roads defined as scenic routes.

The main criteria for sites suitable for wind farm development considered were:

- Estimated wind speed of 7.5 - 8 m/s (metres per second).
- Proximity to a connection point with the electricity grid.
- Reasonable road access.
- Terrain suitable for construction.
- In an area where it may be possible to obtain planning permission and where there are no special designations which would be significantly affected.
- Low potential for electromagnetic interference and sufficient distance from housing.

A number of the other sites reviewed met some of the criteria required, but were either sensitively close to scenic areas or too far from the Grid. The site at Booltiagh met all the criteria necessary.

Extensions vs New Developments

Extensions to existing developments have three obvious advantages to new site developments:

- An electrical interconnection and substation is already available therefore no further grid connection lines are required.

- Public road realignments have already been dealt with and a significant proportion of the civil infrastructure (tracks etc) to facilitate access will already be in place.
- The proportional visual impact over and above the main wind farm due to the additional turbines is small compared with similar number of turbines located on a completely new site.

Adjacent Sites vs Extensions

Adjacent sites might be defined as sites with a clear distinction between them usually as a result of distance (1-2km normally), and/or as a result of differences in turbine size an/or design of the layout. Adjacent sites are seen from most viewpoints as discrete separate projects not as a continuous large project. There are in this instance minimal wake interactions between the sites, and although they benefit from common public road upgrade works it is likely, that there will be completely separate civils infrastructure. It is possible they may share grid infrastructure whether that be by sharing a line to the closest ESB substation or as in this case a common ESB access point.

An extension is the continuous expansion of the site where the turbines are within the same array type distancing (i.e. 300-400m), and where the layout matches the existing turbine arrays. Turbines are typically (although not always) of the same size and will be of the same colour. Extension turbines interact with the remainder of the main wind farm as if they were part of the main site – visually they are seen as one entity. Extension turbines typically will share the all the infrastructure of the main site including the on site access tracks and the electrical system.

Alternative to the Booltiagh Extension

A significantly larger extension (or adjacent site) to the south of the existing site was originally considered as part of the expansion plans of the Booltiagh site. This consisted of an additional nine turbines (based on 2-2.5MW machines) in the Boolynaknockaun townland around 2km to the south. Following both a visual impact appraisal and a full bird survey of this proposal it was felt that a simple smaller extension to the current layout would be the best option in terms of increasing installed capacity whilst maintaining design integrity and avoiding unnecessary impact on the Hen Harrier population. The final selection was considered to be the best of options in the balance of the impact of the development with maximising the energy recovery from the site.

4. Socioeconomic

Wind farms, regardless of location, have the potential for significant positive economic impact on the local economy both directly and indirectly. This reviewed within the ES but summarised below.

Economic Activity

The principal economic activity in the immediate area is commercial forestry. This includes both elements of private forestry largely in the newer plantations and large areas of mature forestry which fall under the ownership of the State forest company Coillte Teorranta. The six extension turbines are entirely encompassed within an area affected by commercial forestry (private) and cultivation of this is the primary activity on the site. There are no other land uses or activities on the site and no footpaths over the site.

In between the many forestry blocks farming based on the rearing of sheep and cattle remains the dominant commercial activity and many of the dwellings in the surrounding are farm related.

With 62 turbines consented or built within 10km of the proposed development wind farms are in themselves becoming an increasingly important part of the economic development of the area providing employment during construction and operation. This is likely to continue for the foreseeable future.

Population

The closest village to the proposal is Liscasey at approximately 6km to the south although there are no views from this population centre. Views are obtainable from Kilmalley (at 9km) and Kimihill (at 8km).

There are a number of scattered houses on the approach roads to the site, most of which are involved in farm related activities. The closest house is over 700 metres from the nearest turbine of the proposed extension.

Economic impacts from the proposed wind farm would include:

- employment during construction – direct labour and use of local subcontractors;
- employment post construction – direct labour and subcontract maintenance;
- the purchase of local supplies – construction materials, such as reinforcing bar, concrete etc
- use of local facilities during construction; and
- use of local facilities post construction - maintenance and servicing.

Tourism

The area around Ben Dash has not been identified in the County Development Plan as being of particular importance for tourism, however there is a scenic route approximately 5km to the north with views directed toward Ben Dash.

There is a new waymarked walking route (1999), The Mid Clare Way, which passes within 1,000 metres to south and east of the site.

The closest amenity Lough is Lough Naminna immediately to the east which is stocked with trout and fished by the Kilmalley and District Angling Association.

Potential and perceived adverse impacts with respect to the effect on tourism and quality of life (local amenity) are dealt with in the ES but based on the results of survey data are not considered to be significant.

In 2002, MORI interviewed 307 tourists visiting Argyll and Bute in Scotland. Argyll and Bute was chosen as a study area as it currently had the greatest concentration of wind farms in Scotland, with three large commercial wind farms now in operation. Of the 307 tourists interviewed 122 were aware of the presence of wind farms in Argyll and Bute and of those 49% had seen the wind farms. When asked whether the presence of the wind farms had a positive or negative effect, two in five (43%) maintained it had a positive effect, whilst a similar proportion felt it was equally positive and negative. Less than one in ten (8%) felt it had a negative effect.

Impacts

Short term impacts will result from the increased road traffic during construction and longer term impacts from the visual presence of the wind farm. Whether the later is considered entirely negatively, however, will largely depend on the individuals view of wind power in general. Effects from visual impacts are dealt with at length in Chapter 7 Landscape and Visual Impacts which includes a number of photovisualisations and discussion of landscape impacts.

Community Benefits

It has become the practice within the renewables industry not only to pass benefit on to the community through rates, taxes and land lease payments but also to establish community benefit schemes targeted towards those communities directly impacted by renewable development.

A Community Benefit Scheme has being implemented for the main Booltiagh wind farm. This is based on Booltiagh Wind Farm Ltd making an annual payment to the local community via the two parish community council of Kilmihill and Kilmalley.

5. Ecology

Land use

The site is situated within an upland landscape on the Western Atlantic seaboard dominated by a mosaic of coniferous plantation, modified blanket bog, wet heath, and freshwater lakes. The proposed site is bounded to the east by planted forestry, intact blanket bog within the Lough Naminna pNHA and a mosaic of modified blanket bog and wet heath, to the north by an immature Sitka Spruce plantation (3-4m in height) and modified blanket bog, to the south and west by recently planted Sitka spruce and Lodgepole pine forestry (0.5m in height). The land use of the site and surrounding area reflect a large degree of human activity. All of the six extension turbines lie

within newly planted coniferous forestry, which is the predominant land use activity within the site.

Designations

The proposed development site is not within a candidate Special Area of Conservation (cSAC) or Special Protection Area (SPA) although there is a Natural Heritage Area (NHA) directly adjacent to the eastern section of the site which protects an area of Blanket Bog- Lough Naminna Bog (Site ref: 002367). Lough Naminna is known to be a good trout fishery. The Irish Red Data Book species the Otter is known to frequent the waters. The Hen Harrier, also an Irish Red Data Book species, is known to hunt over the site. The proposed turbine layout design will avoid the area (5Ha) of unspoiled and active Blanket bog within the extension boundary which forms part of the Lough Naminna Bog NHA.

There are no other NHAs or proposed NHAs or Special Areas of Conservation (SAC) in close proximity to the site. The site is not under consideration for SPA designation.

Floral Species

No rare or endangered floral species were observed during the site assessment. All habitats identified and assessed within the site area are considered locally abundant and are commonly found throughout County Clare.

Eastern Extension

The eastern extension (Turbines 19,20 and 21 in Figure 2) is dominated by stands of conifer plantations of different age classes and heights ranging from 0.5m to 3.5m at the turbine locations, to 7m+ in the area surrounding them. The vast majority of the plantations composed of recently planted Sitka Spruce and Lodgepole pine trees of a height of approximately 0.5m approximately 5 years of age. A large area of this forestry had been burnt in the recent past and is now largely replanted (2003). Therefore the original floral diversity characteristic of peatland areas has been diminished over the years as a result of the intensive forestry practices. The area immediately around Turbines 20 and 21 has been extensively drained (drainage channels at 10m intervals) and planted with Sitka Spruce and Lodgepole Pine trees approximately 0.5m tall. Around the proposed location of Turbine 19 there are trees of an older age class - immature forestry stands of Sitka Spruce approximately 3.5m high atop modified blanket bog. Narrow strips of broadleaved trees were also evident at the margins of the coniferous plantations these were largely comprised of Alder species. In the eastern extension new road construction has been minimised through turbine layout and design and therefore the impact of construction works will be greatly reduced. Most of the existing tracks that are used for forestry management practices will be upgraded and used to access the proposed new turbines - 19, 20 and 21. New roads will be constructed through cut over bog habitat that has been extensively drained and recently planted with Sitka Spruce,

Lodge pole pine and a limited amount of Alder trees approximately 0.5m-1m high.

The proposed eastern extension area is bounded to the west and north by stands of mature coniferous plantations (6-7m+), to the east by dystrophic lakes, intact blanket bog (within Lough Naminna NHA) and a mosaic of cut over bog and wet heath. The western boundary of the NHA is characterised by a firebreak where vegetation and peat have been removed to a depth of 300mm. This acts as a large drainage channel as was evident from the ponding in areas along the base of the firebreak. Immediately to the west of the firebreak a dense plantation of mature conifers (6-7m + high) on higher ground were noted.

In general the habitat found at the proposed northern extension is composed of recently planted coniferous species atop pre-existing cutover bog. The quality of this habitat has diminished over time as a result of peat extraction and is being continually diminished due to intensive forestry planting in the area. It is a species poor area and much of the vegetation characteristic of peatland habitats does not exist as a result of recent land use practices. Deep drains have been put in place throughout this area, which will further alter the floral diversity over time. The bog is heavily drained and planted stands coniferous species, composed of Sitka Spruce, Lodegpole pine and European Larch, range in height from approximately 0.5m to 4m. The dominant habitat of this proposed extension is young plantation forestry. The underfloor vegetation is primarily composed of dense stands of purple moorgrass, interspersed with rushes and a scattered abundance of heather species. An area of flush which has been modified with the excavation of drainage channels for forestry management purposes is located to the south of the proposed location for Turbine 17. A stream runs in a northerly direction to the east of the proposed extension area; this is the main water course that drains the Booltiagh wind farm site and which eventually runs into Doo Lough. The proposed location for Turbine 16 is approximately 85m northwest of this stream. There is also a distinct drain flowing in a westerly direction just north of Turbine 7 (Figure 4 Habitat Map) which eventually joins with the main stream channel and this will need to be crossed in order to access the extension turbines. (Overall, the habitat associated with the north extension consists of cutover bog, which has recently been planted with coniferous species. The overall quality and ecological diversity of the habitat has diminished over time as a result of the peat extraction and intensive forestry practices. It is a species poor area and much of the vegetation characteristic of peatland habitats does not exist as a result of recent land use practices.

Mammals

The Irish Hare was the only mammal observed at the site during the 2007 site assessment although an earlier mammal survey also recorded the presence of other species including: Feral Goat, Stoat and Fox. The Hare was noted on the access road running adjacent to the proposed eastern extension and hare droppings were noted close to where forestry staff were working to remove

burnt trees from a large section of the site. Having regard to the habitats that exist within the site, in particular the dominant habitats such as the coniferous plantations and peatland habitats, one would also likely find mammals such as the Rabbit, Pygmy shrew, Bank vole, Mink, and the Wood mouse.

The Rabbit is likely to be found within areas of cutover bog and unlikely to be found within the tracts of coniferous plantations on site. However it may use the forest edges as refuge areas. Rabbit droppings were noted along a section of roadway within the area proposed for the eastern extension.

All habitats identified on site are attractive for the Pygmy Shrew. However, it would most likely be found within the younger coniferous plantations where there is a heavy ground cover. The area of blanket bog comprising of long grass and vegetative species is also an ideal habitat for the Pygmy Shrew. The area of unplanted cutover bog, the recently planted areas within the north extension and the earthen banks are also likely habitats for this species. None of the above census techniques confirmed the presence of this species within the site.

The Fox is known to thrive in any of the above named habitats within the site.

The Bank Vole is most likely to be found within the young coniferous plantations where there is good ground cover. They would also use the forestry tracks within the areas of younger plantations to cross from one area to the next. Also the earthen mounds on site are important dispersal corridors for the Bank Vole, especially those with a thick covering of vegetation.

The Mink, similar to the fox is a successful species within a variety of habitats. However, it is most likely to be found at the proposed development site, within thick vegetation adjacent to Cloonmackan Lough and Lough Naminna. Its preferred habitat is slow flowing shallow lakes with thick vegetation along the banks.

The Wood Mouse is also a very adaptable creature. It is found in most habitats, with the exception of water-saturated areas. Within the proposed development site it is most likely to be found within the tracts of coniferous forestry (both young and mature), within the blanket bog adjacent to the mature forestry (furthest east point of the blanket bog) and also within the earthen banks. The identification of discarded shells and damage at the base of vegetation within a tract of the newly planted forestry (northern section of the site) would suggest that this mammal is present.

With the exception of the Irish Hare none of the above mammals are listed as endangered species. The Irish Hare is listed as a protected species under the Wildlife Act (1976) and as an internationally important species in the Irish Red

Data Book. However, although it is listed as an internationally important species it is nonetheless considered to be widespread and common in Ireland.

Other Non Avian Species

The common frog and the common lizard are the amphibians most likely to be present within the site at Booltiagh. The frog most likely occurs in the areas of wet heath and in the recently planted sections of woodland.

Peatland habitats, such as the cutover bog and blanket bog identified at Booltiagh, by nature of their vegetation and waterlogged surfaces, also tend to have a high diversity of invertebrate species associated with them. The vegetation of these habitats is attractive for many invertebrate species. Among those identified at the Booltiagh site were Springtails, Froghoppers, Marsh Fritillary and the Emperor moth. The Marsh Fritillary, is the only Irish butterfly species protected under the EU Habitats Directive.

The entire turbine infrastructure is sited on land that has been commercially planted with forestry or on modified bog that has been altered through drainage for the purposes of forestry management practices. As the Marsh Fritillary is typically found on damp neutral or acidic grassland the habitat type on which the development is sited is of limited use to this species and will cease to be of use as the forestry matures and the canopy closes over. The key factor for the Marsh Fritillary is the presence of the larval food plant Devils Bit Scabious, however the presence of this larval plant food alone does not point to the occurrence of the butterfly as Succisa is common and widespread throughout Ireland. At the Booltiagh Extension site Devils Bit Scabious was recorded only along and around the margins of the drainage channels in a scattered abundance pattern within a habitat that was otherwise dominated by dense stands of the grasses species. In order to thrive Devils Bit Scabious requires a mosaic of grassland vegetation of sward height 8-25 cm in wet grassland habitats and can often be out-competed by grasses and other species. Given the nature of the proposed development site it is not thought that the existing ground conditions will support large stands of the larval food plant Devils Bit Scabious and will in any event cease to be suitable in the near future as the dominant land use of the site is commercial forestry.

Summary

The dominant habitat of the proposed extension areas, the Booltiagh wind farm site and the surrounding area is intensive coniferous forestry plantations with accompanying extensive network of drainage channels. Large proportions of the young forestry on the site as a whole, which have been destroyed by fire in the recent past, have been replanted within the last five years. The ecological value of this area has therefore diminished over the years.

As stated above, an area of Blanket Bog is confined to the eastern section of the site and constitutes a small area, approximately 5 ha in size. It is located

southwest and west of Lough Naminna and directly south of Cloonmackan Lough. The proposed eastern extension is located adjacent to this blanket bog habitat but all turbines within the eastern extension have been positioned outside this area of undisturbed blanket bog. Following site assessment it can be concluded that this development will not have a negative impact on the blanket bog habitat.

A small area of potentially ecologically sensitive wet flush has been identified in the northern extension in the vicinity of the proposed location for T17. This area has been disturbed in the recent past by the excavation of an extensive network of drainage channels. To mitigate against habitat destruction and disturbance of this wet flush area the proposed location of T17 has been moved to the north of this flush area and the access route to the northern turbines has been re routed to the north along an existing firebreak. This layout design has avoided the wet flush area and therefore will leave this ecologically sensitive area undisturbed.

Following site assessment and desktop research it is not thought that the proposed north and east extensions to the proposed wind farm development will have a significant impact on the Flora and Fauna existing throughout the area.

6. Avian

A number of avian surveys and impact assessments have been carried out over the recent years since the application for the original wind farm in 2000. The most recent bird surveying (2004 to 2007) incorporated:

Over-wintering Migrant Bird Survey – Encompassing Greenland White-Fronted goose, Whooper Swan and other wildfowl on a regional scale

Hen Harrier Surveys – 2004, 2005, 2006, 2007 (including winter roost and hinterland surveys) - Site specific

Wintering birds– to assess winter usage of the site by all birds - Site specific

Breeding bird survey – to assess spring/summer usage of the site by all birds - Site specific

One of the most sensitive ecological and environmental considerations with regard to wind power development is the potentially significant impact that wind turbines may have on birds. In the ecological scoping assessment particular emphasis was therefore placed on the fact that the site is within an area identified by the National Parks and Wildlife Service (NPWS) as of importance to Hen Harriers.

In addition to the works reported in the 2007 ES further assessments were undertaken to complete a cumulative impact assessment to determine the amount and type of available foraging habitat within foraging range (c. 5km) of the site taking account of other wind farms within 5km of the site that may impact on the land use and land availability for Hen Harriers. This is described in detail within the ES.

Wildfowl

A survey of the over wintering migrant wildfowl was carried out in the general vicinity of Doolough and Booltiagh townland in west Clare during December and January 2003 and also at areas on the coast where these birds are known to congregate. Greenland White-Fronted Geese were known historically to be present in the area and that Whooper Swans were present in the general vicinity of Doolough. Both these bird species are strictly protected species and accordingly are Annex I species under the EU Birds Directive.

From the survey it is clear that there are no migratory wildfowl regularly over flying Booltiagh and the immediate vicinity. The closest flight line is approximately 5 kilometres away into the eastern edge of Doolough Lake.

In conclusion the fact that there are no flight paths identified near the wind farm will ensure that there is no disturbance to migrating wildfowl in the area. The cumulative effect of many wind farms in the area will not have an effect either as there is no flight paths identified in the region apart from Doolough, some four kilometres to the west.

Hen harrier

The Hen Harrier is a medium-sized bird of prey that is active by day. It is primarily an upland species, particularly during the breeding season, feeding on a range of small mammal and small bird species. Their foraging flights take place low over the ground, rarely exceeding 10m and mostly less than 2m. Flights do occur at greater heights above the ground but only at a low frequency. These are usually associated with aerial displays (to attract females for breeding), longer-distance flights between foraging areas or flights to chase off intruders from their breeding territory. Such flights can occur up to 1km from a nest but are usually restricted to 500m.

Harriers are ground-nesting birds, traditionally nesting in heather moorland, but also in young pre-thicket stage forests (including second generation plantations). Similar habitats are also used for foraging, as well as rough grassland and wider forest rides. Most foraging usually takes place within 1-2km from the nest. Once a forest plantation has reached the thicket stage (when the canopy has closed) this habitat becomes unsuitable to the harriers for both nesting and foraging.

The Hen Harrier is listed in Annex 1 of EC Directive on the Conservation of Wild Birds (79/409/EEC), the 'Birds Directive'. Article 4(4) of the Directive

requires that Member States should strive to avoid deterioration of habitats that support such species. The population in Ireland is about 100-130 pairs and is currently thought to be stable/slightly increasing.

A comprehensive Hen Harrier survey at Booltiagh townland and the surrounding area was carried out over four years between 2004 and 2007. In 2004 and 2005 (April to July each year) full standard NPWS/SNH (Scottish Natural Heritage) format Hen Harrier surveys were conducted, while surveying in 2006/2007 consisted of monthly assessments during the breeding season (April to July) as well as a 2006-2007 winter roost survey. The collective findings of these surveys constitute a comprehensive and accurate assessment of the present population status of Hen Harriers (breeding and foraging), both site-specific and within 5km of the hinterland in west County Clare.

In 2003, breeding was confirmed at two sites within 5km of Booltiagh and a further site had probable breeding. A female was seen with a fledgling at Boolynaknockaun in 2003. Sky dancing (Hen Harriers' acrobatic courtship ritual) was observed above the mature forestry south of the site at Boolynaknockaun in 2004. Breeding was confirmed at four locations in 2005, three within 5km of the site and one at 10km from the site. There were two incidental sightings of fledglings during 2005 surveying, one of these was with a female adult in the Boolynaknockaun area. One of the nest sites identified in 2005 (located north of the wind farm site) was used again in 2006. This nest was located within 1km of operational turbines (the exact nesting site is known to the local National Parks and Wildlife Service Conservation Ranger but has been omitted here due to the sensitive nature of this species). These birds were regularly seen from the northern vantage point at Booltiagh. This exact nest site was not reused for breeding in 2007. In 2007 however a successful nest was located nearby, within one kilometre of the wind farm boundary, and another two were located within two kilometres of the wind farm, both of which successfully fledged young birds. There were reports also of a probable nest three kilometres west of the site.

No permanent loss of breeding ground would result, as there are no suitable habitat types for breeding Hen Harriers on the proposed area for the wind farm. Temporary loss of breeding habitat may result at the construction phase but Hen Harriers are not nest loyal and different nest sites are used each year.

Winter surveying (during 2006-2007) to ascertain if the wind farm site or immediate hinterland were being used as a roost or whether there are resident harriers present during the winter months concluded that the site does not appear to be utilised as a winter roosting area.

Foraging habitat within 5 kilometres of the wind farm is extensive and includes dedicated foraging areas to the west near Glenmore townland where foraging hen harriers were viewed on almost a daily basis during surveying.

Notably one of the key conclusions of the 2007 survey was that Hen Harrier behaviour at Booltiagh does not appear to have changed discernibly between pre and post construction assessments. Dedicated transit routes noted during 2001/2002 were still being used during 2007 when turbines were operational.

It should also be stated at the outset that there is no scientific evidence that the presence of wind turbines in any particular location interferes with the foraging behaviour of Hen Harriers in that location i.e. there is no evidence that wind turbines permanently displace the birds from their foraging habitats. This fact is substantiated by the results of the 2007 survey which showed that the number of breeding pairs proximal to the existing wind farm has in fact increased, suggesting ample foraging habitat availability in the area despite wind farm construction and operation. The 2006 and 2007 surveys also established that Hen Harrier behaviour at Booltiagh does not appear to have changed discernibly between pre- and post- construction assessments.

Hen Harrier habitat within the development extension where the turbines and internal access roads are located is within young coniferous forestry (age class 5-8 years). While there is no significant foraging activity within this land it does represent a preferred foraging habitat type for hen harriers until canopy closure, after which it can no longer support prey or effectively be hunted. Subject to receipt of planning the earliest commencement date for construction is 2009. There will be an estimated 5+ years of potential suitable habitat removed before canopy closure.

It is inevitable that some foraging habitat will be affected by the different phases of wind farm construction. Hen Harrier activity in this general area is low compared to other areas of Ireland e.g. Ballyhoura, Mullagahreirk and Slieve Aughty mountains. The Booltiagh site exhibited Hen Harrier foraging activity during 2003, prior to wind farm construction. The Glenmore site exhibits Hen Harrier activity regularly on its western area. The remaining areas of the Glenmore site showed no harrier activity during 2003 surveys. High Street wind farm site recorded hen harrier activity in 2003 and on its northern boundary in 2004. Hen Harriers were noted breeding at Lough Acrow near High Street in 2005. This wind farm has been restricted to five turbines as areas to the west and south are important blanket bog habitat and foraging areas for harriers. It is probable that foraging habitat would be temporarily lost, through disturbance, during the construction phase of both Booltiagh and Glenmore wind farms. Post construction, the likelihood is that the birds would become accustomed to the turbines and any habitat lost during construction would be recovered.

There are large areas of foraging habitat proximal to these three wind farms that the harriers can utilise if displaced temporarily through the construction phases. Taking evidence from other wind farm sites in Ireland (e.g. Tursillagh, Co. Kerry, Derrybrien Co Galway), we can deduce that harriers become accustomed to the turbines. In 2004, harriers were observed flying

between the turbines in Tursillagh and they have also bred 700 metres from a turbine. Harriers have also been observed foraging proximal to operational turbines at the Booltiagh wind farm during 2005. In fact it has been noted in studies between the interaction of harriers and turbines that 'if displacement of foraging occurs then it will likely be limited to within 100m of wind turbines if it occurs at all' (Whitfield and Madders 2006)

The addition of three turbines on the eastern edge and three turbines at the northern edge are not felt to pose any greater threat to the local harrier population once they are sited properly i.e. away from identified dedicated breeding and foraging areas. Harriers are present in this general locality and range over large areas to forage. A number of mitigation measures are, however, proposed in order to reduce impacts on this species:

As far as possible construction of the wind farm extensions should take place outside of the breeding season (April – July).

A foraging compensatory area of 18.4ha and of equal habitat value (based on the 100metre radius disturbance area) should be maintained unplanted and as open ground for a period of 5 years after construction of the wind farm.

No fencing should be used to separate the site from adjoining habitat.

After installation, ongoing studies are proposed to assess the long-term impact of turbines on the hen harrier breeding population around Booltiagh in order to discern the nature of such impacts, if any.

Overwintering Birds

This site recorded nine species of birds, eight of which were recorded on the site and one flying over the site.

The eight species recorded on the site were Reed Bunting, Snipe, Meadow Pipit, Wren, Blackbird, Mistle Thrush, Redpoll and Robin. With the exception of the Snipe and numerous meadow pipits, all the other species were recorded along the hedgerows or on the forestry fringe to the north of the site. There was a large flock of Reed Buntings, numbering close to 400, observed along the hedgerows at the western access route to the site in February. This is an unusual occurrence for this species.

The proposed site did not record any Skylarks, Red Grouse or any other of the declining Irish bird species that would be expected on this site.

The species of bird seen over-flying the site was the Hooded Crow. Golden plover, Hen Harrier or Greenland White-fronted geese were not recorded on these site visits.

General Breeding Birds

This site recorded eighteen species of birds in during the breeding season.

Meadow Pipit was the most numerous species on the site being seen regularly on the heath/bog and grassland areas which cover almost all of the site. Nesting along the hedgerows and in the young conifer plantations were Reed Bunting, Stonechat, Chaffinch, Bullfinch, Goldcrest, Robin and Blackbird, along with the summer migrants that appeared in late April to early May notably Sedge Warbler, Grasshopper Warbler and the Cuckoo. Sand Martins were seen arriving in groups but were probably passing through on migration. A Woodcock was seen flying high overhead and circling a territory of conifers while carrying out the distinctive “roding” display flight for which they are famous. Hooded Crows were regular visitors to the site but did not seem to be breeding onsite. Curlews also flew over the site and at least two pairs were breeding south of the existing wind farm site, to the west of Boolynaknockaun townland. In the adjacent lake, Cloonmackan Lough, Teal were regularly seen but no breeding activity was recorded.

This survey did not record any Skylarks, Red Grouse or, apart from the Hen Harrier which is dealt with in-depth elsewhere, any other of the Annex I protected Irish breeding bird species that might be expected on this site.

Of the eighteen bird species recorded during the survey, the majority are common and widespread. Most species recorded are resident in the area with some exceptions for migratory species that use the area to breed before moving on to winter grounds in Africa.

The study area shows a different set of birds using the habitats onsite from winter to summer. The only bird consistently seen over the whole year was Meadow Pipit, which is a normal occurrence for this general habitat. The area in question shows little bird biodiversity throughout the year and exhibits low bird biomass during the breeding season.

No significant impacts are expected on the local bird population

7. Landscape and Visual Impacts

Landscape and visual impact is one of the key environmental issues in determining wind farm applications.

Landscape change may be brought about by many forms of development, including changes in agricultural usage and forestry as well as by construction of manmade structures including wind farms. Like forestry and agricultural effects it should also be noted that wind turbines are not permanent structures and once removed the landscape can largely return to its previous condition.

Landscape impacts are the changes which impact on the landscape fabric, character and quality of the site and area. Visual effects relate to the appearance of these changes and their effect on people.

Wind developments have a number of characteristics which cause landscape and visual impacts. These include the turbines, and the turbine access tracks, the substation building, the grid connection.

Careful site selection taking into account proximity of population centres and local housing, visibility from defined scenic points and landscape character is the first and most critical element in avoiding or minimising potential impacts. The receiving environment of the study area is illustrated in Figure 5.

An overall visibility map (Zone of Visual Influence Map ZVI) is included within the ES which illustrates where the potential areas of visibility are (Figure 6). A comparative ZVI was also produced which demonstrated that the change to larger turbines would have no significant effect on the overall visibility of the site.

The ES includes fourteen photovisualisations or photomontages from locations around the wind farm in all directions from the general area and from specific population centres including from Kilmalley and from West of Kilmihil (Figures 7 and 8). Again a comparative assessment on views was undertaken comparing the proposed larger turbines with the existing turbines and this is illustrated in Figure 7 the view from Kilmalley. Views are also included within the assessment from the closest scenic routes and amenity areas (for example Lough Naminna is included here as Figure 9).

The assessment predicts a beneficial impact of medium significance on the landscape. This reflects the unusually high geographic advantages of the Booltiagh Site, including a high wind speed owing to its elevation, its location within a depression or saddle which restricts its visibility from the receiving environment, and the existence of coniferous plantations on the surrounding ridges to further screen the development. The ‘preferred’ designation of the majority of the Site in the County Clare Wind Energy Strategy supports this

assessment. Taking account of the DoEHLG's Wind Energy Guidelines, Booltiagh can be considered an ideal location for wind energy development, one in which framing of the development, and thus accentuation of the topographic profile of the landscape, can be achieved. In conclusion, the proposed extension would result in the optimal occupation and utilisation of this Site making a significant additional contribution to the County's sustainability objectives, and can thus be considered an appropriate intervention in the landscape.

As a result of the local topography, the zone of visual influence of the Booltiagh site (ZVI - the area from which the proposed development would be visible) is very limited.

The proposed extension would increase the Booltiagh wind farm's ZVI by only a fraction of the total area of environment. The Ben Dash uplands are noted for their very low density of population, which further limits the number of potential visual receptors.

The visual impact assessment concludes that of the fourteen viewpoints selected, eleven would experience a neutral impact, ranging in significance from none to medium. The addition of six turbines to these views, already characterised by the presence of wind turbines, would in no way cause detriment to the locations' visual amenity. One view, from a house overlooking Doo Lough would be enhanced by the development, by bringing improved balance to the existing turbine cluster which is a co-dominant element of the view.

The assessment predicts that two of the viewpoints would experience an adverse impact, although of low significance resulting from only negligible changes to the views. The negative impact would arise from the contribution of the proposed Booltiagh extension to views already characterised by wind farms dissimilar in spatial extent, spacing and layout. This potential cumulative impact assumes that four planning-approved wind farms elsewhere in the Ben Dash uplands will be built.

The proposed extension to the Booltiagh wind farm comprises three turbines to the east and three to the north of the existing cluster. Three of the planning-approved (but as yet un-built) wind farms in the vicinity (Cahermurphy, Glenmore and High Street) lie to west and south of Booltiagh. One (Boolynagleragh) lies some 5km to the east. From the majority of views in the receiving environment therefore, the proposed change would not bring the various wind farms any closer together and they would remain as distinct elements of a landscape characterised by wind energy production. As such there would be no significant accumulation of visual impact arising from the proposed development.

In conclusion, based on detailed, objective landscape and visual impact assessment, the proposed extension of the Booltiagh wind farm is considered an appropriate development.

8. Geology and Hydrology

Geology

The key objectives of the geology and hydrology assessment were: -

- To identify the soils and key geological features of the site.
- To identify the key hydrological and hydrogeological features of the site.
- To identify the potential impact of the proposed wind farm development on local geology and soils and the hydrological and hydrogeological regime.
- To recommend appropriate mitigation measures to minimise the impacts of the development.

The underlying geology is from the Carboniferous Period. The Central Clare Group, the Gull Island Formation and the Clare Shale Formation lie in the Namurian and the Slievenaglasha Formation lies in the Visean.

The Central Clare Group underlies the site. It consists of sandstone, siltstone and mudstone. Laminated shales overlie the mudstones, followed by laminated to massive siltstones, and laminated sandstone.

The Gull Island Formation underlies the Central Clare Group. It consists of grey siltstone sandstone and mudstone. The formation is dominated by grey siltstones with up to 20% sandstones at the base of the succession, decreasing towards the top.

The Clare Shale Formation consists of dark-grey shales, with bands of siliceous mudstone towards the base. Goniatite bands are also found within the formation.

An unconformity occurs in the succession after the Clear Shale Formation. Following this is the Slievenaglasha Formation of the Visean. This formation consists of thin cyclic crinoidal limestones and non-cyclic cherty, well bedded, dark-grey to black bioturbated packstones and wackestones

Hydrology

Where peat is present over the site it will hold water within its mass and since the underlying clays (glacial till), where present, are of low permeability they will act as a barrier to downward flow. Even where glacial till is absent the bedrock itself is of low permeability and a known poor aquifer; therefore across the site significant downward flow of groundwater below the base of

peat is highly unlikely. Limited flow will take place laterally within the peat mass itself.

The general drainage pattern associated with the proposed extension turbine locations was confirmed as being overall to the northwest although there may be a very minor component of flow from the area around turbine 19 towards the southwest although this would be very limited.

It should be noted that the Ordnance Survey map is in error in the vicinity of Cloonmackan Lough. This shows the line of a stream from the Lough that curves westwards around turbine 20 before heading towards the location of turbine 19. This is incorrect. The small stream/area of standing water to the west of Cloonmackan Lough becomes indistinct and essentially stops. The blue line from beside turbine 19 is a fairly indistinct feature with limited flow, which flows in a northwesterly direction before turning west away from the waterbody coming from Lough Cloonmackan.

The general site area has a modified hydrological regime as a result of previous historic ditching, the excavating of firebreaks and ditches for forestry purposes and to a limited extent the existing tracks of Booltiagh main wind farm development. There is only one distinct surface water drainage system. Surface water flow across the rest of the site is fairly indistinct via, small flushes, drainage ditches, small ponds (where present), and for the most part by surface water/groundwater seeps.

In developing the site layout a design process was undertaken informing the layout development. This in itself is considered mitigation through design. The site area was surveyed and on the basis of proposed turbine locations the most appropriate access track routes were selected. These adopted the following principles:

- Avoidance of crossings of streams where at all possible;
- Avoidance of contouring across slope of the access tracks where possible to avoid intercepting groundwater;
- Locating access tracks where possible on relatively higher ground locally to minimise surface water interception impact;
- Use of existing tracks where possible (eastern area access tracks);
- Avoidance of encroachment on streams and headwaters by turbine positions; and
- Avoidance of encroachment on ponds by turbine and track positions.

Forestry guidance details appropriate standoff distances for works relating to watercourses and these have been incorporated into the site design. The layout has adopted a minimum buffer zone of 20m to main streams within the site where practicable, to provide a suitable level of protection.

No losses of best or most versatile agricultural land will take place and excavations are limited in terms of the entire site area.

In line with good practice existing peat will be used in immediate post-construction restoration works for tracks and turbines or on poorer areas of the site. Material will also be stored for decommissioning restoration in such a manner that it does not degrade. This will not be stored on areas of existing peat bog.
The following points would summarise the impact assessment:

- The site is not known to be within an area designated for geological reasons.
- Soils of Best or Most Versatile status will not be lost as a result of the proposed development.
- No geological features of significance will be lost as a result of the proposed development.
- Potential impacts range associated with the development range from Major Adverse to Negligible and are mainly associated with potential contamination or dewatering.

Through adoption of appropriate mitigation measures the residual impacts on the hydrology and geology are expected to range from slightly adverse to negligible.

Peat Stability
Because of general concerns about peat stability following the Derrybrien landslide incident in County Galway a soils stability assessment was commissioned. This included an overall inspection of the area, and probing of the peat local to the position of each of the proposed wind turbines, and along the proposed access routes.

The report concluded that the risk of a significant landslide arising from the construction of the wind farm was very low, provided that the works are executed in accordance with the proper procedures and supervised by competent engineering personnel with the appropriate expertise and experience.

9. Material Assets including Archaeology & Cultural Heritage

The revision to the Archaeology assessment incorporates both the findings of the original surveys undertaken in 1999 and 2003 as part of the 2007 Environmental Statement but in addition also addresses the question of potential impacts on Architectural and Cultural Heritage in both a local and a wider setting.

Recorded Sites
The Record of Monuments and Places (RMP) is a list of archaeological sites known to the National Monuments Service with accompanying RMP maps,

based on OS 6" Sheets, which indicate the location of each recorded site. The record comprises Ordnance Survey 6" sheets which indicate the location of each monument or place of archaeological interest and files of further documentary and photographic data or information relating to an archaeological event such as a site visit, survey or excavation. The list is based on the Sites and Monuments Record (SMR) files which are kept in the National Monuments Service, DoEHLG and are updated on a regular basis. The Sites and Monuments Records (SMR) are lists with accompanying maps and files of all known archaeological sites and monuments mainly dating to before 1700AD. These lists were initially compiled from cartographic, documentary and aerial photographic sources.

The Sites and Monuments Record for Co. Clare indicates that there are no known archaeological sites or monuments within the existing wind farm or within the area of the proposed six-turbine extension. The nearest monuments of significance are located in Glenmore townland to the west of the operational wind farm and to the north of the windfarm close to Doo Lough. The monument in Glenmore is classified as an 'unclassified megalith' (CL039-035) and that in Carncreagh is also a megalithic structure (CL039-024).

A number of other recorded sites are also present in the wider environs of the wind farm including prehistoric megalithic sites, ecclesiastical sites, holy wells, enclosures and castles. The proposed wind farm extension straddles two 6-inch OS maps (39 and 40) with Turbines 19-21 located in Booltiagh townland on Map 40 and Turbines 16-18, also in Booltiagh townland on Map 39. The density of recorded archaeological monuments in both maps is quite low with just 19 sites being recorded for Map 40 of which 15 are classified as enclosures. The nearest archaeological monument to the wind farm on Map 40 is an enclosure located a considerable distance away to the northeast.

A wedge tomb is located in Carncreagh townland to the north of proposed turbines T16-18 and an unclassified megalithic structure, also possibly a wedge tomb, lies to the immediate west of the existing turbines in Glenmore townland.

<u>Surveys</u>

In addition to the earlier surveys completed in 1999 and 2003, a further detailed field inspection of the proposed area of development and its surroundings was carried out in July 2008 by Margaret McCarthy, MA, MIAI, Archaeological Consultant. The primary objectives of the survey were to:

- Assess the potential for direct impacts by walking those areas of the proposed extension to the wind farm where maximum ground disturbance would occur and visually inspect the land where the turbines would be constructed for hitherto unknown sites

- Assess the potential for indirect impacts on setting for any features of architectural or cultural heritage value both on the site and in the immediate environs.

As part of the survey and assessment, consideration was also given to any other ancillary works associated with the development including any additional electrical works and off-site public road works.

Results

No new sites of archaeological or architectural significance were identified during the field inspection though it has to be considered that the ground conditions were not advantageous to the recognition of low-lying ephemeral features. This has been considered within the proposed mitigation measures including a recommendation for archaeological supervision during ground breaking.

A number of the local sites were visited during the 2008 field survey to consider this aspect of the setting of the wind farm on the archaeological and cultural heritage of the locality. It was noted that the proposed extension cannot be regarded as a discordant feature in the rural landscape as the site location was chosen primarily due to its location within an existing operational wind farm in an upland region where there are few buildings of architectural or cultural heritage merit. Neither are there concentrations of archaeological monuments in the prevailing landscape.

The only archaeological monuments within the vicinity of the wind farm are two prehistoric megalithic structures, located to the west and north of the operational turbines. An unclassified megalith in Glenmore townland to the west of the operational wind farm is located on a raised hillock to the north of two vernacular houses, one of which is now unoccupied. The tomb is not visible on the prevailing landscape, as it comprises four large limestone slabs set on edge and less than 1m in height. The stones have mostly collapsed sideways and one of the capstones is lying on the surface to the immediate north of the tomb. Viewing opportunities northwards and eastwards from the tomb site itself are intruded by the presence of the 13 existing turbines. It can be argued that these monuments show their greatest expression as ritual sites for the immediate locality as distinct from at a distance on the ground. The corollary of this is that the views from the monument towards Booltiagh townland should not be regarded as critical to the appreciation of the tomb site.

The proposed extension to the wind farm will not affect the setting of the wedge tomb located in Carncreagh townland on the northern side of the road leading from Doo Lough to Kilmaley. The turbines will not be visible elements from the monument owing to intervening features including forestry, other vegetation and natural topographical features. The setting of the monument has already been seriously compromised by recent afforestation, and access

to the tomb site itself could not be gained due to the presence of extensive undergrowth.

During the field survey, careful consideration was also given to the landscape setting of sites of cultural heritage merit including the field systems and the stone hut identified to the south of the existing wind farm and an abandoned vernacular house on the east side of a trackway providing access to the proposed three northern turbines (T16-18). These vernacular dwellings with their associated field systems were never intended to be dominant features on the landscape and it is considered that they have not been adversely impacted upon either directly or indirectly by the construction of the existing wind farm.

Mitigation

In order to mitigate the potential damage to any sub-surface archaeological finds or features that may be uncovered during development at the site, the following measures are proposed.

All ground disturbance associated with the construction of the turbines, crane pads, new access roads and clearing for site facilities will be monitored by a suitably qualified archaeologist to ensure that no features are damaged or removed without proper recording.

All test pits for engineering purposes should be archaeologically monitored to prevent accidental damage to buried archaeological features and to record any accidental discovery of features and/or finds.

The shallow coverage of soil and peat over the proposed development site suggests there may be suitable locations for borrow pits for stone. The excavation of these pits should be carried out under archaeological supervision.

10. Air and Emissions Quality

The primary issue with respect to construction and air pollutants is related to the potential generation of dust from the preparation of material for and laying of access tracks. The degree of nuisance that this may create is a function of the terrain and is related to weather conditions, dry conditions with high wind being worst, and proximity of dwellings.

Dust can be a significant problem in dry desert sites such as those in California, but is not a significant issue on Irish sites such as the Booltiagh site due to the types of soil removed during road construction (more loam than sand), and the higher rain fall and vegetation cover.

The most significant benefit of wind energy and the reason behind it of course is the generation of electricity from the wind with no production of emissions. The British Wind Energy Association recommends calculations of

avoided emissions based on typical emissions from coal-fired plant of 860g CO2/kWh, 10g SO2/kWh and 3g NOX/kWh

For the 12.0MW Bootliagh extension this equates to emissions savings of:

Pollutant	Emissions Saved Per Annum (Tonnes)
CO2	44,375
SO2	516
NOX	154

11. Noise

All moving aerodynamic surfaces and mechanical equipment produce noise. The same is as true for trees as it is for wind turbines.

Mechanical noise is largely derived from the gearbox and the high speed output shaft driving the generator. This is exacerbated by the variable nature of wind which causes variable loads and vibration on the gearbox and it is for this reasons most of the components are fitted with mounting dampers. Aerodynamic noise is generated by the flow of air over the moving blades and comes.

The existing noise conditions across the Booltiagh Wind Farm area are typical of a rural, low noise environment. Prominent noise sources noted in the general area include:

- agricultural activities; and
- local rural traffic movements.

Higher noise levels would be experienced during periods of felling and timber extraction but whilst locally significant these would be temporary and limited in extent.

The Planning Guidelines states “that noise is unlikely to be a significant problem where the distance…. is more than 7 rotor diameters”. In this instance, 581metres (7 x 83metres). In fact there are no residential houses within 700metres of any of the proposed Booltiagh North and East extension turbines and therefore no properties which would be deemed sensitive based on the nominal separation distance described in the guidance notes. The Mid Clare Way waymarked walk, at its closest, passes the nearest proposed Booltiagh extension turbine at a distance of approximately 1,000metres. The extreme western edge of Lough Naminna, (which is on private land owned by one of the wind farm landowners), is at its closest 430 metres from the nearest proposed Booltiagh Extension turbine. Anglers bank fishing from the eastern bank where there is road access and parking would be some 900 - 1,000metres from the nearest turbine.

A cumulative noise assessment has been made based on the effect of the Bootliagh Extension turbines with the remainder of the Booltiagh wind farm, and also in conjunction with the adjacent sites. A number of locations have been used for these assessments to represent any possible increase in noise as a result of the extension turbines.

The cumulative effect of the Bootliagh extension turbines is predicted to be insignificant in comparison with the noise levels already predicted for the adjacent wind farms and no noise issues are anticipated.

12. Shadow Flicker and Telecommunications

Shadow Flicker

Wind turbines like all tall structures will cast a shadow in their immediate vicinity when the sun is strong enough. Where wind turbines differ from most other structures, however, is in their potential ability to create a flickering effect on a stationary observer due to the rotation of the rotor blades.

Shadow flicker is rare and is predominantly an indoor phenomena which may be experienced by a viewer sitting in an enclosed room with the flicker effect of the shadow passing the window. It is rarely a problem outside when the light reaches the viewer from a much less focussed source and therefore assessments are typically based on closest residences or indoor workplaces.

Knowing the latitude and geometry of the turbine the potential for shadow flicker can be calculated for any given residence and has been estimated for the closest houses to the wind farm. It is generally only relevant within approximately 10 rotor diameters (around 830m) of a turbine since beyond this distance the shadows tend to be diffuse and no flicker effect can be discerned. Only one properties assessed is located within 10 rotor diameters of any of the extension turbines and has any potential for shadow flicker and this lies at the upper limit of the distance at which shadow flicker can be detected.

The maximum shadow prediction value of 78.5 is higher than that predicted for the standard GE turbines (at 33.5hours) as a result of the larger rotor diameter. However, this is the maximum theoretically possible. This number would be reduced by the moderating factors of rotor plane angle, cloud cover and operational hours to a value of less than 16 hours. Given the low number of hours and the fact that the property lies at the upper end of the detectable range (at 9 diameters distant) no significant impacts are expected.

The impact of the proposed extension is predicted to be negligible and overall no significant impacts are anticipated and no mitigation measures are proposed. However, with modern sophisticated turbine control systems individual turbine operation can easily be restricted to prevent any effect during the brief periods where shadow flicker might be possible.

Radio and TV

Wind farms, or individual wind turbines, like all large structures have the potential to interfere with television or radio signals. The towers are large steel obstacles and can provide a physical blockage to microwave links, and the alternating current electrical generating and transformer equipment, like all electrical equipment, generates its own electromagnetic fields. However, the most significant effect, at a domestic level, is straightforward involving a possible flicker effect caused by the moving rotor, particularly on television signals.

Depending on the topography surrounding a residence, a domestic receiver may receive broadcast signals from more than one location although the strength of those signals will vary with distance from the transmitter. It is normal for the receiver's antenna to be directed towards the most local, and usually strongest, broadcasting station. This is not, however, always the case particularly if the terrain is such that there is no direct line of sight between the receiver and that transmitter.

No significant radio or television signal impacts have been experienced for the main wind farm since commissioning in September 2005 and none are anticipated for the extension.

13. Road and Air Traffic

Roads

Heavy construction vehicles will create some impact during the construction phase but this will be short lived likely to be less than the impact already experienced by the other heavy traffic using the area.

The delivery route will be the same as that used for the delivery of the main Booltiagh wind farm turbine and equipment (Figure 10). Significant road improvement works have already been undertaken on this route for the main development, however, further consultation with the Clare County Council Roads Engineers discussed potential for additional works required to facilitate delivery of the six turbine extension equipment. The following was agreed:

- Prior to construction an inspection will be carried out of the access route to determine the extent of roadway which might need additional strengthening to facilitate construction of the extension.

- Structural assessment of the bridges along the access route would also be undertaken prior to construction to determine if any strengthening works required.

No significant road traffic impacts are anticipated.

Aviation

The Irish Aviation Authority (IAA) were contacted as part of the consultation process for the main wind farm and expressed no concerns regarding the wind farm. No requirements for aeronautical lighting were defined, solely that as built turbine co-ordinates be supplied following construction.

No impacts are anticipated on Civil Aircraft.

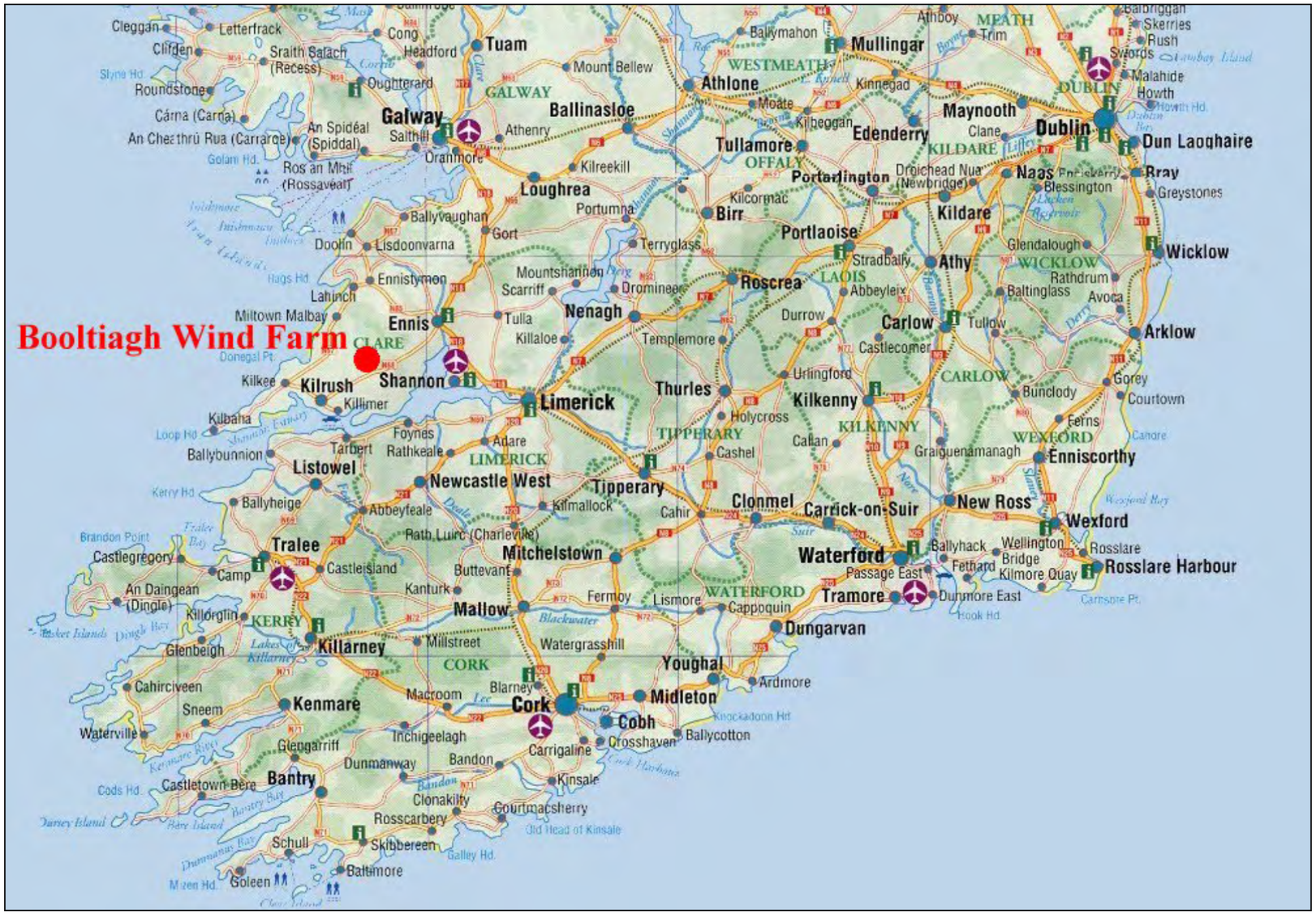

Figure 1 Site Location

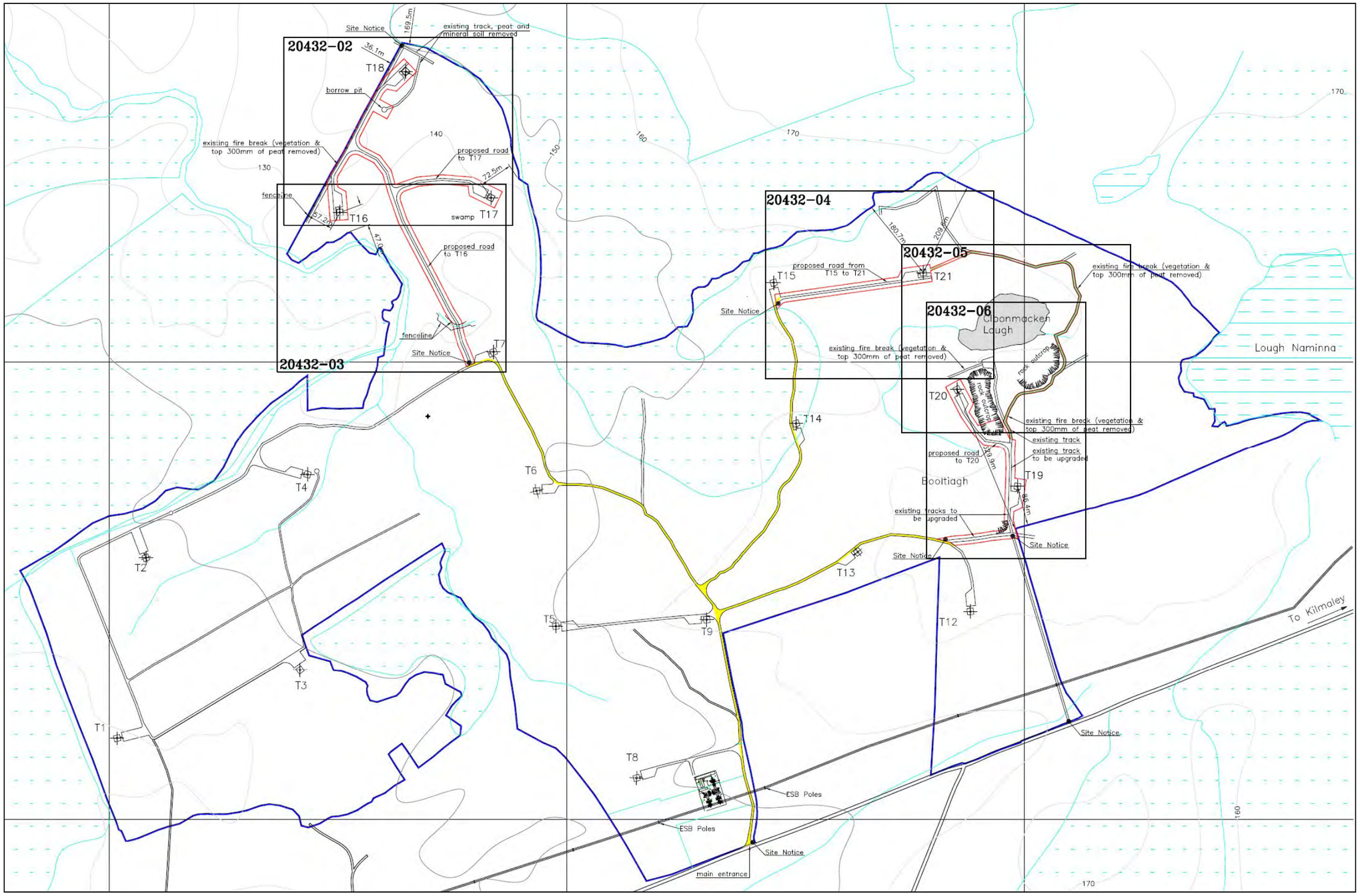

Figure 2 Site Layout Plan (Extract from Dwg No 20432-1)

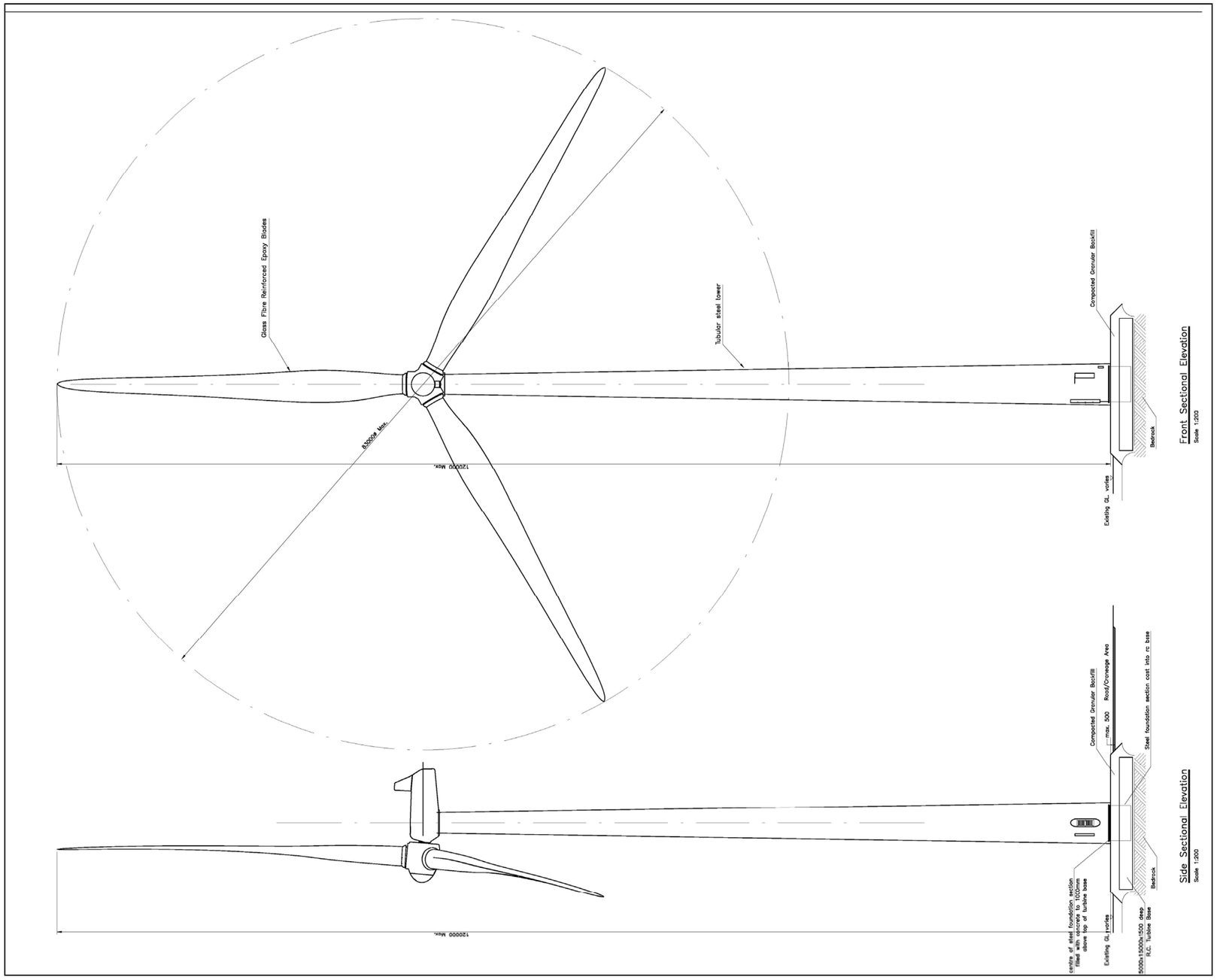

Figure 3 Turbine Elevation (Extract from Dwg No 20432-14)

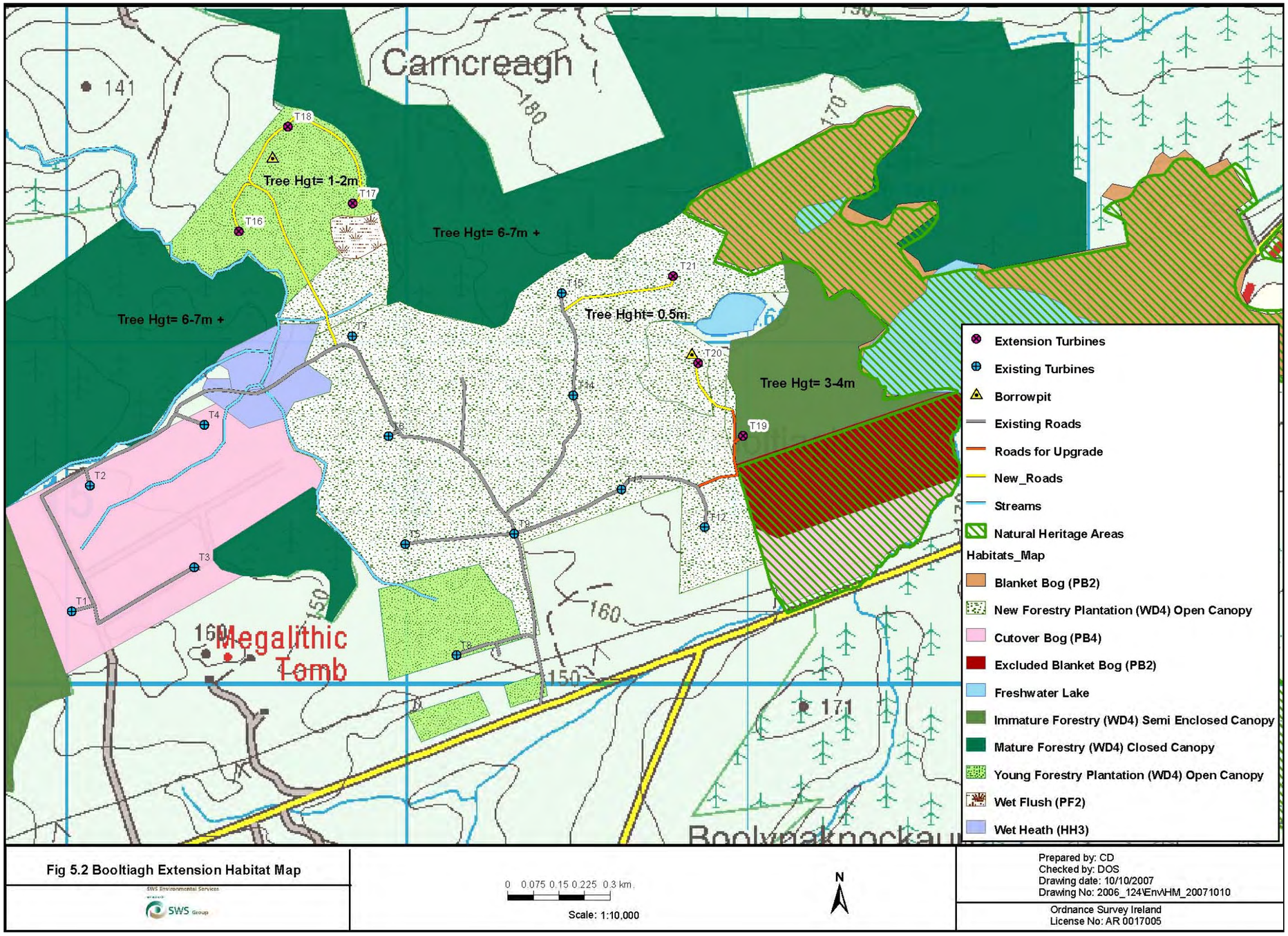

Fig 5.2 Booltiagh Extension Habitat Map

Figure 4 Habitat Plan of the Site

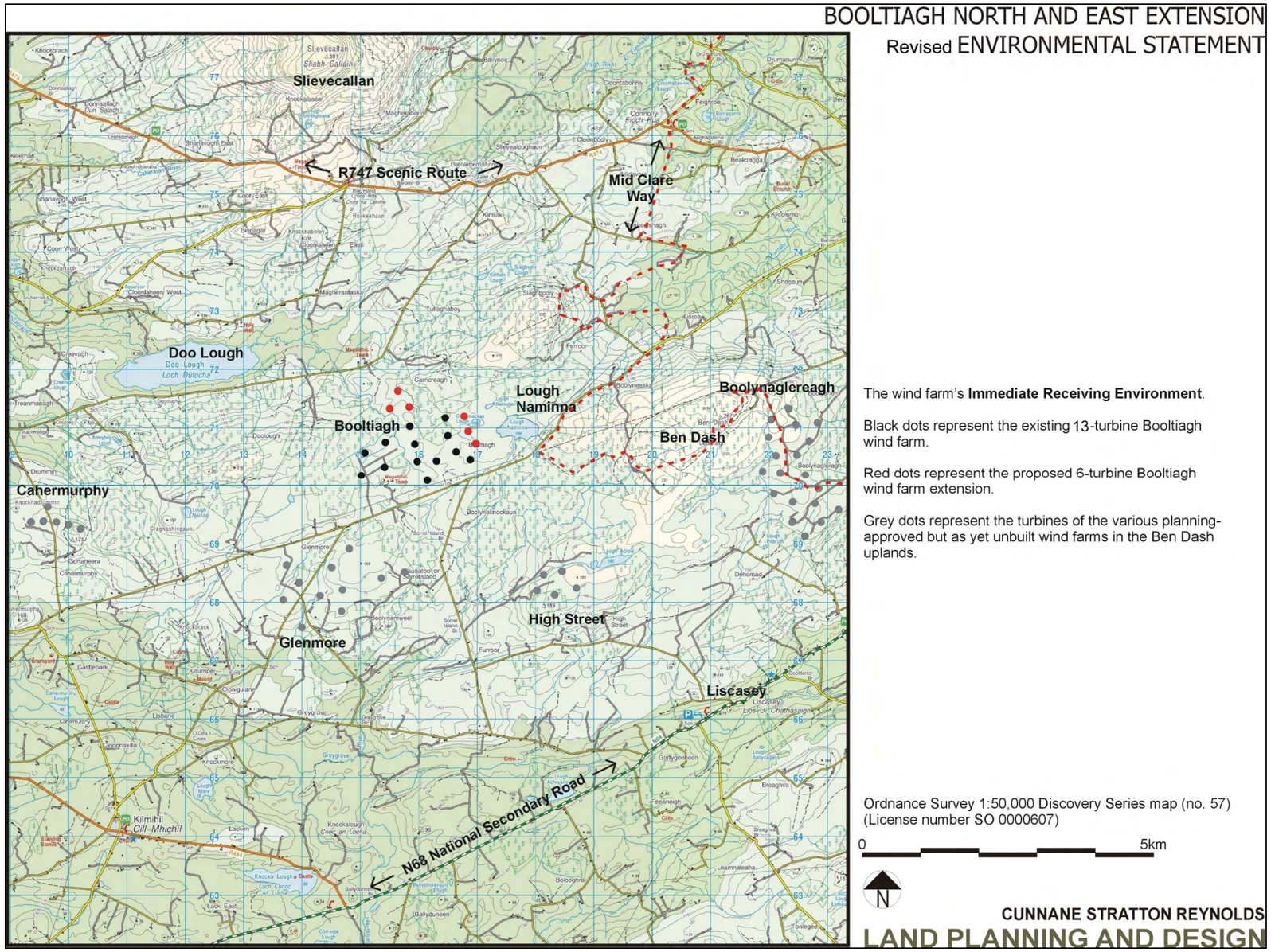

Figure 5 Receiving Environment and other nearby Wind Farms

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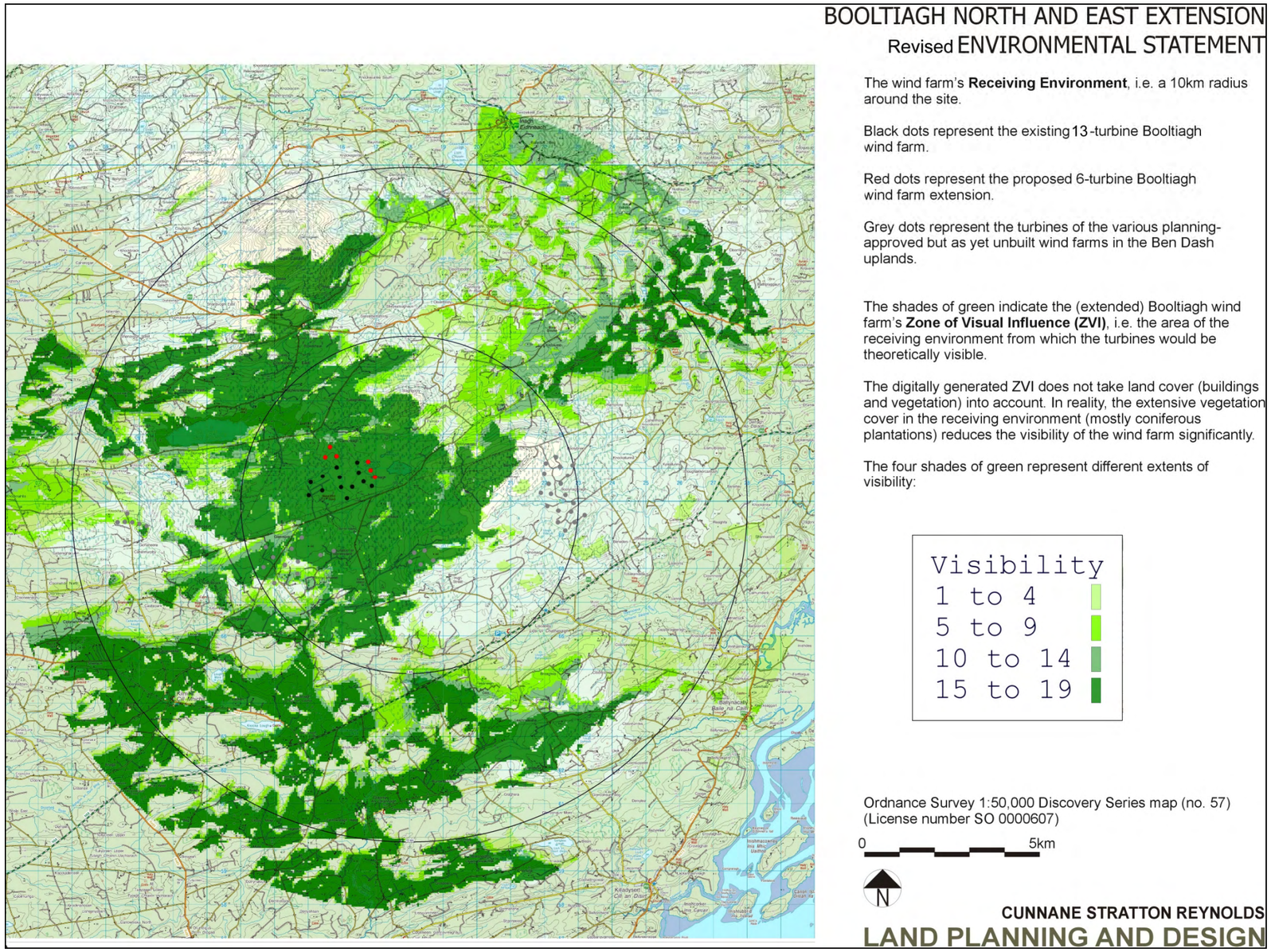

Figure 6 Zone of Visual Influence

Viewpoint 8: House Near Kilmaley - Comparative Photomontages

The proposed change, i.e. All planning-approved turbines in the Ben Dash uplands, plus the proposed 6-turbine Booltiagh extension.

For comparison, the existing 13 turbines (height 90m) with an extension of six of the same turbines (height 90m).

Viewpoint Information
Coordinates (Irish Syst.) - Easting: 124962
- Northing: 175436
Nominal Direction of View: 245.3 degrees
View Angle: 120 degrees
Elevation: 80m
Distance to Nearest
Booltiagh Turbine: 9,216m
Camera Information: Olympus 35mm SLR, 50mm fixed lens. Camera Height: 1.7m

BOOLTIAGH NORTH AND EAST EXTENSION
ENVIRONMENTAL STATEMENT

CUNNANE STRATTON REYNOLDS
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Figure 7 Photomontage and Wireframe from Kilmaley

Viewpoint 1: Lough Naminna Amenity Area

Response to FI Requested for P07/2900

Plate A. The potential long term view, i.e. all planning-approved turbines in the Ben Dash uplands installed, excluding the proposed Booltiagh extension.

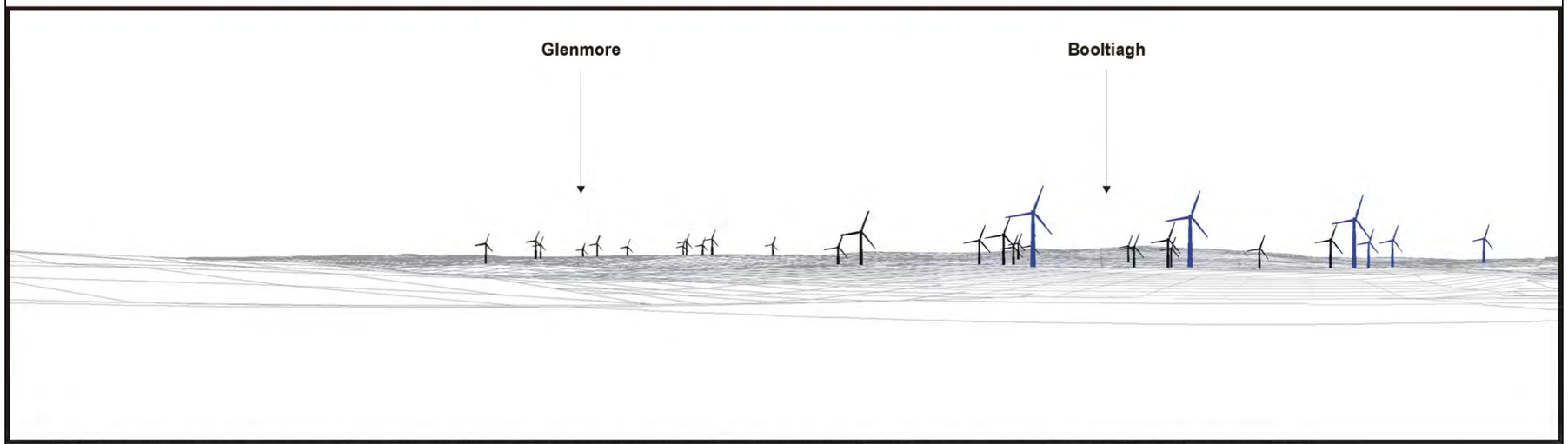

Plate B. A wireframe showing the proposed change, i.e. all planning-approved turbines in the Ben Dash uplands (black), and the proposed 6-turbine Booltiagh extension (blue).

Turbine Information
13 no. Existing:
Hub Height: 54.7m
Blade Length: 35.25m
Total Height: 90m
6 no. Proposed:
Hub Height: 78m
Blade Length: 41.5m
Total Height: 119.5m

Viewpoint Information:
Coordinates (Irish Syst.) - Easting: 118389
- Northing: 171082
Nominal Direction of View: 249.5 degrees
View Angle: 90 degrees
Elevation: 196m
Distance to Nearest Turbine: 1,448m

Camera Information: Olympus 35mm SLR, 50mm fixed lens. Camera Height: 1.7m

Summary of Visual Impact Assessment (Refers to Plate C):
Number of Proposed Turbines Visible: 6
Viewpoint Sensitivity: High
Degree of Change: Medium
Impact Significance: High Neutral

BOOLTIAGH NORTH AND EAST EXTENSION
ENVIRONMENTAL STATEMENT

CUNNANE STRATTON REYNOLDS
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Figure 8 Photomontage and Wireframe from West of Kilmihill

Viewpoint 13: R484 Regional Road West Of Kilmihil

Response to FI Requested for P07/2900

Plate A. The potential long term view, i.e. all planning-approved turbines in the Ben Dash uplands installed, excluding the proposed Booltiagh extension.

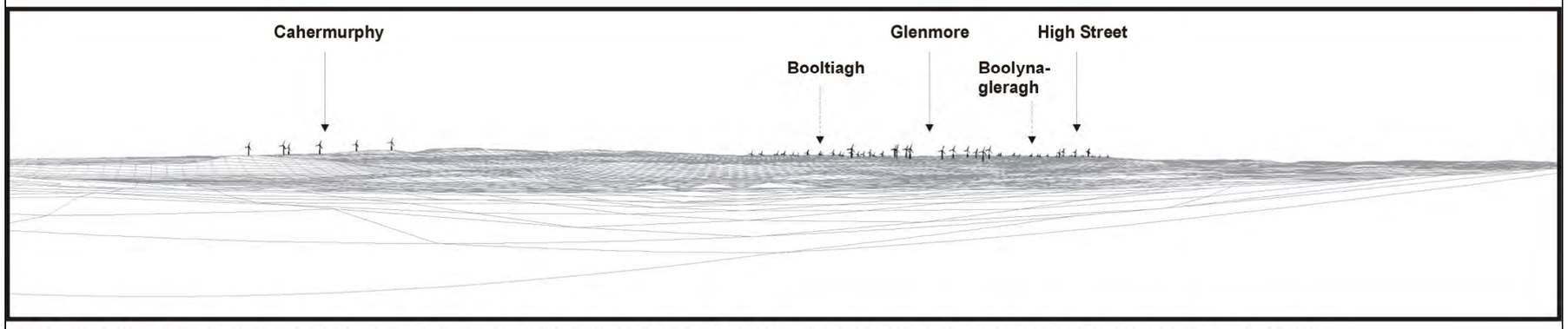

Plate B. A wireframe showing the proposed change, i.e. all planning-approved turbines in the Ben Dash uplands (black), and the proposed 6-turbine Booltiagh extension (blue).

Turbine Information
13 no. Existing:
Hub Height: 54.7m
Blade Length: 35.25m
Total Height: 90m
6 no. Proposed:
Hub Height: 78m
Blade Length: 41.5m
Total Height: 119.5m

Viewpoint Information
Coordinates (Irish Syst.) - Easting: 108819
- Northing: 165022
Nominal Direction of View: 42.9 degrees
View Angle: 120 degrees
Elevation: 90m
Distance to Nearest
Booltiagh Turbine: 8,061m
Camera Information: Olympus 35mm SLR, 50mm fixed lens. Camera Height: 1.7m

Summary of Visual Impact Assessment
(Refers to Plate C)
Number of Proposed Turbines Visible: 6
Viewpoint Sensitivity: Medium
Degree of Change: Negligible
Impact Significance: Low Neutral

BOOLTIAGH NORTH AND EAST EXTENSION
ENVIRONMENTAL STATEMENT

CUNNANE STRATTON REYNOLDS
LAND PLANNING AND DESIGN

Figure 9 Photomontage and Wireframe from West of Kilmihill

Figure 10 Access Route over Public Roads