

UWF GRID CONNECTION REFERENCE DOCUMENTS

UPPERCHURCH WINDFARM VOLUME F8: 2013 EIS Ch1 – Ch12

Volume A	Planning Application Documents – Application Form; Site/Newspaper Notice; Letters of Consent; Schedule of Submitted Documents etc.	
Volume B	Planning Drawings	
Volume C	UWF Grid Connection EIA Report (EIAR)	Volume C1: EIAR Non-Technical Summary Volume C2: EIAR Main Report Volume C3: EIAR Figures Volume C4: EIAR Appendices
Volume D	Environmental Management Plan for UWF Grid Connection	
Volume E	Appropriate Assessment Reporting	
VOLUME F	REFERENCE DOCUMENTS FOR OTHER ELEMENTS OF THE WHOLE UWF PROJECT	Volume F1 to F3: UWF Related Works EIA Report Volume F4: Environmental Management Plan For The UWF Related Works Volume F5 TO F7: 2018 UWF Replacement Forestry EIA Report Volume F8 to F10: Upperchurch Windfarm VOLUME F8: 2013 EIS Ch1 – Ch12 DETAILS OVERLEAF

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Volumes F1 to F3: 2018 UWF Related Works EIA Report

Volume F1: EIAR Non-Technical Summary & EIAR Figures

Volume F2: EIAR Main Report (2 Parts)

Volume F3: EIAR Appendices (3 Parts)

Volume F4: Environmental Management Plan for the UWF Related Works

Volumes F5 to F7: 2018 UWF Replacement Forestry EIA Report

Volume F5: EIAR Non-Technical Summary & EIAR Figures

Volume F6: EIAR Main Report (2 Parts)

Volume F7: EIAR Appendices (3 Parts)

Volumes F8 to F10: Upperchurch Windfarm

Volume F8: 2013 EIS Ch1 – Ch12

Volume F9: 2013 EIS Ch13 – Ch16 & 2013 RFI Q1 – Q3

Volume F10: 2013 RFI Q4 – Q11 & 2014 ABP Inspector's Report & 2014 Grant Of Permission & Conditions

UPPERCHURCH WINDFARM

CONSENTED WINDFARM

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Tipperary County Council Planning Application 13/510003 Environmental Impact Statement



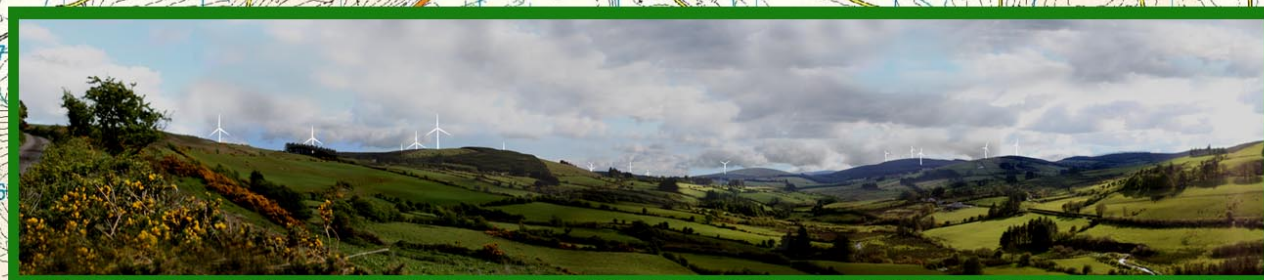
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UPPERCHURCH WINDFARM ENVIRONMENTAL IMPACT STATEMENT



SUBMITTED BY ECOPOWER DEVELOPMENTS LIMITED
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AS PART OF A PLANNING APPLICATION
TO NORTH TIPPERARY COUNTY COUNCIL

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1. Introduction

1.1. WIND ENERGY

Wind energy is harnessed using turbines that consist of an electrical generator driven by 3 aerodynamic blades, which are turned by the force of the wind. The generator is housed in a sound proofed box called a nacelle. This assembly of generator and blades is placed on top of a tower which is 60-126m high. The blades, that drive the generator, are up to 60m long. These large turbines, which are in the MW-class (above 1MW) now represent a share of more than 95 per cent of the turbine market in Europe.

Modern large turbines rotate at slower speeds of between 9-19rpm which compares favourably to earlier models which rotated at 30 rpm. They produce about 1.3 - 5MW of electricity per hour in a strong breeze. The turbines begin to operate at wind speeds of 3 meters/sec (6mph), produce full power at 13m/s (26mph) and shut down in storm conditions of 25m/s (56mph). The turbine then restarts automatically when the storm abates and windspeeds drop below 20m/s for more than a 10-minute period.

The turbines are monitored by remote computer link and can be stopped, by computer, at any time if necessary. Modern wind turbine technology development began in Denmark in the 1970's and 80's and has now reached a very high level of efficiency and reliability. Typically, a modern wind turbine will operate at over 97% availability and is designed to operate for more than 120,000 hours. By comparison, a car engine has a design lifetime of 4,000 to 6,000 hours.

1.2. WIND POWER AND CONVENTIONAL POWER

Transportation and conventional electricity generation cause the emission of greenhouse gasses which contribute substantially to global climate change which is the most serious environmental threat facing the planet.

It is estimated that worldwide energy demand will double in the next 25 years and supplying this demand by conventional generation plant will release ever greater volumes of carbon dioxide (CO₂) and other damaging gaseous compounds such as oxides of nitrogen (NO_x), and sulphur (SO_x) into the atmosphere. In addition to the threat of climate change from global warming, fossil fuels will become exhausted unless energy production from the use of viable sustainable sources is substituted.

One of the principal market drivers for wind energy is the fact that it is a clean, renewable and sustainable means of electricity generation. However, beyond its advantages in terms of combating climate change and addressing the need for increased electricity generating capacity, wind energy can be a major contributor to economic welfare and one of the solutions to the current economic turmoil. Wind power has the potential to satisfy the increasing electricity demand in a sustainable manner; it is also a significant and vital stimulus to new green economic activity. Greater energy independence, lower energy costs,

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hedging against rising fuel prices, improved competitiveness and major employment opportunities are among the attractions that the technology has to offer Ireland.

European wind technology is the leader in renewable energy technologies. It has evolved from an industry making small, simple turbines into a technology, which can compete with the well-established forms of power generation. The cost of wind generated electricity on an elevated site is now comparable with the most efficient fossil fuel generating plant.

Renewable power installations accounted for 71.3% of new electricity generation capacity during 2011 in the EU. EU wind power reached 93,957 MW in total installed capacity in 2011, maintaining the growth of the previous year despite the difficult economic climate.

Wind energy is the number one choice in Europe's efforts to move towards clean, indigenous renewable power. Wind energy companies in the EU currently employ 108,600 people; when indirect jobs are taken into account this figure rises to more than 180,000. In Ireland wind energy jobs are concentrated with wind farm developers, some of which have gained strong international positions. The country also boasts a variety of companies specialising in engineering, operation and maintenance personnel, legal services, insurance and finance serving the wind industry. Based on government targets for 40% of Ireland's electricity to come from renewables (mostly wind) by 2020, the wind energy sector is predicted to deliver more than 10,760 jobs through direct and indirect employment. The construction and development of wind energy projects across the island will involve c. €4.75 billion of investment to 2020; c. €5.1 billion of which will be retained in the local Irish economy. Of the €5.1 billion it is estimated that c. €4.3 billion will be invested in Ireland and c. €0.8 billion will be invested in Northern Ireland.

The wind power capacity installed in the EU by end 2011 produces 205 million MWh of electricity, satisfying 6% of the EU's electricity demand, and avoids the emissions of 156 million tonnes of CO₂ per year, the equivalent of taking more than 70 million cars off Europe's roads.

*Upperchurch Windfarm Environmental Impact Statement***1.3. UPPERCHURCH WINDFARM PROPOSAL**

The proposal is to construct 22 turbines west of Upperchurch village, Co. Tipperary in the townlands of Graniera, Shevry, Knockcurraghbola Commons, Gleninchaveigh, Coumnaageha, Knocknamena Commons, Knockmaroe and Grousehall.

These 22 turbines will produce 150 million kWh of green electricity capable of supplying 23,000 houses which is equivalent the domestic electricity requirements of North Tipperary.* The production of 150million kW/h per annum of green electricity would avoid the emission of 128,118tonnes of greenhouse gases per annum which would result from generating the same amount of electricity by fossil fuel plant.

Emission	Every MW of installed capacity of wind energy in Ireland offsets the following amounts of greenhouse gasses per annum that would otherwise be emitted by conventional fossil fuel electricity generation	Approx. Annual Savings Upperchurch Windfarm
CO₂	2,318tonnes	101,992 tonnes
SO₂	49tonnes	2,156 tonnes
NO_x	5.5tonnes	242 tonnes
Ash	175tonnes	7,700 tonnes
Oil		133,333 barrels**

*the average annual household consumption of electricity in Ireland has increased to approx. 6,500 kWh. The population of North Tipperary was 66,023 in 2006 and the average household size was 2.8. (North Tipperary County Development Plan 2010-2016)

**The energy equivalent of 1 kWh of electricity = 3413 Btu = .034 gallons of oil.

Source: *Wind farms and the Environment, Irish Energy Centre 2004.*

Unlike conventional power sources, the creation of electricity from the wind does not pollute the physical environment; it creates no contribution to climate change or acid rain and emits no radiation or nuclear waste.

Wind energy is an indigenous source of power, which offers security of supply reducing our dependence on imported fuels. According to the annual Energy in Ireland (2012) report published by the Sustainable Energy Authority of Ireland (SEAI) Irish renewable electricity production avoided emissions of 3.6 million tonnes of CO₂ and avoided €300 million in fossil fuel imports in 2011. According to Dr Brian Motherway, Chief Executive of SEAI, 'This is money leaving the country and our economy and brings into sharp focus the continued imperative for an accelerated move away from fossil fuels'.

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1.4. PERSONNEL INVOLVED IN THIS ENVIRONMENTAL IMPACT STATEMENT

This Environmental Impact Statement was prepared by:

EIS co-ordination	Ecopower Developments Ltd. Wind Energy Developer
Ecology Appropriate Assessment Natura Impact Statement Geotechnical Assessment Hydrological Assessment Sediment & Erosion Control Plan Noise Impact Assessment	Malachy Walsh & Partners Consulting Engineers
Visual and Landscape Impact Assessment	Mozart Landscape Architects
Telecommunications Impacts	Ai Bridges Ltd
Construction Impacts Air and Climate Impact Residential Amenity Socio-Economic Impacts	Ecopower Developments Ltd.
Cultural Heritage	Kilkenny Archaeology
Technical information	Wind Turbine Manufacturers

1.5. STRUCTURE OF THIS ENVIRONMENTAL IMPACT STATEMENT

This EIS has been structured having regard to Planning and Development Regulations 2001 (Article 94 and Schedule 6), EPA Guidelines on Information to be contained in EIS (2002), EPA Advice Notes – Section 3 Project Type 33, on preparation of EIS (2003) and EIA Directive 85/337/EEC as amended, on the assessment of the effects of certain public and private projects on the environment. All likely impacts are considered in terms of:

- Existing conditions
- Likely significant effects of the development
- Proposals for mitigation of these impacts

1.6. CONSULTATION

Consultation in the preparation of this report included the following bodies or sources of information:

- North Tipperary County Development Plan 2010 - 2016
- North Tipperary County Council (Planning Department)
- Department of Environment, Heritage and Local Government Wind Energy Guidelines 2006
- Local Landowners
- ESB Networks
- Irish Aviation Authority
- National Parks and Wildlife Service
- National Roads Authority
- Telecoms/Communications Companies

REFERENCE DOCUMENTS

Upperchurch Windfarm Enviromental Impact Statement

2. European and National Policy Context

2.1. EUROPEAN UNION POLICY

In March 2007 EU Heads of State adopted a binding target of 20 per cent of energy to come from renewables by 2020. Electricity represents approx. one-third of our energy requirement. The other two-thirds of energy is required in the form of transportation and heating. In January 2008, the European Commission released a renewables legislation draft, proposing a stable and flexible EU framework, which should ensure a massive expansion of wind energy in Europe to contribute to the electricity requirement.

Within such a positive policy framework wind power achieved an installed capacity of 93,957 MW in the EU-27 by end of 2011. This represents an overall contribution to electricity supply of 6.3%. By 2020, this figure is expected to increase to 12–14%, with wind power providing energy equal to the demand of 107 million European households.

2.2. INDUSTRY AND MARKETS

In 2001, the EU passed its Directive on the promotion of electricity produced from renewable energy sources in the internal electricity market. This is still the most significant piece of legislation in the world for the integration of electricity produced by renewable energies, including wind power. This directive contained an indicative target of 21% of final electricity demand in the EU to be covered by renewable energy sources by 2010. This directive also regulates the electricity markets. It has been tremendously successful in promoting renewables, particularly wind energy, and is the key factor explaining the global success of the European renewable energy industries and the global leadership position of European wind energy companies. The gradual implementation of the 2001 Renewable Electricity Directive in the Member States, as well as the unanimous decision made by the European Council at its Spring Summit in March 2007 for a binding 20% share of renewable energy in the EU by 2020, are all steps in the right direction and indicators of increased political commitment.

A new directive, based on a European Commission proposal from January 2008, was adopted by the European Parliament and Council in December 2008. It will raise the share of renewable energy in the EU from 8.5 per cent in 2005 to 20 per cent in 2020, which means that more of the EU's electricity will have to come from renewables in 2020. It is already clear that wind energy will be the largest contributor to the increase in electricity produced from renewable sources.

Ireland has binding legal obligations under EU Directive 2009/28 EC to ensure that 16% of all energy consumed in Ireland across the electricity, heat and transport sectors is from renewable sources by 2020. The National Renewable Energy Action Plan sets out that the 16% overall will be achieved by around 40% of electricity consumed being from renewable sources, 12% of consumption in the heat sector and 10% consumption in the transport sector.

2.3. THE EU ENERGY MIX

While thermal electricity generation, totalling over 430 GW, has long served as the backbone of Europe's power production - combined with large hydro and nuclear, Europe is steadily transitioning away from conventional power sources towards renewable energy technologies. Between 2000 and 2011, total EU power capacity increased by 364 GW, reaching 939 GW

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by the end of 2011. The most notable changes in the mix were the near doubling of gas capacity and wind energy more than quadrupling.

2.4. WIND ENERGY IN THE EUROPEAN POWER MARKET

The EU is leading the way with policy measures to facilitate the move towards the deployment of renewable energy technologies. With a compound annual growth rate of over 20 per cent in MW installed between 2000 and 2011, wind energy has clearly established itself as a relevant power source in Europe's electricity generation market. In 2011, 21% of EU capacity installed was wind power, and wind power increased more than any other power-generating technology in Europe, including natural gas. Wind power's share has jumped to over 6.3% of total installed capacity and is surpassing 10 per cent in Ireland, Spain and Denmark.

2.5. EU AND THE NATIONAL DEVELOPMENT PLAN (NDP 2007-2013) COMMITMENTS ON RENEWABLE ENERGY

The Sustainable Energy Sub-programme of the National Development Plan (2007-2013) reflects EU renewable energy target in that it pledges

renewable energy measures focusing on achieving Government targets for renewable energy production and meeting policy goals with regard to competitiveness, environment, security of supply, R&D and the development of a sustainable All-Island energy market. The primary focus will be on the large-scale deployment of wind.

In the *State Energy Companies Sub-Programme* the plans for Eirgrid are that

During the period 2007-2013, the main focus of investment by Eirgrid will entail improvement of the transmission network for electricity to accommodate increased usage and enhance security of supply, to allow increased connection of sustainable and renewable energy sources to the network and to support greater interconnection with Northern Ireland and Great Britain. Expenditure of some €770 million is envisaged on the transmission system over the period of the Plan.

2.6. RENEWABLE ENERGY FEED IN TARIFF (REFIT)

The renewable energy feed in tariff (REFIT) scheme was launched in May 2006 by the Department of Communications, Marine (now Energy) and Natural Resources. The REFIT scheme had an announced target of supporting 400MW (with potential to increase this figure depending on demand and uptake of capacity on existing competitions) in order to encourage renewable energy projects through providing a fixed-price support to electricity suppliers purchasing electricity generated from renewable resources, such as biomass, hydropower and on-shore wind energy.

REFIT requires an electricity supplier to enter into a 15 year Power Purchase Agreement (PPA) with the electricity generator. The supplier receives a Reference Price which is a fixed price support from the government. The Reference Price for Large Scale Wind projects is 5.7 eurocents per kWhr. This scheme is in contrast to the previous government schemes to encourage renewable electricity production, which were run on the basis of generators tendering for ESB fixed price PPAs in a price-based "Dutch auction" competition.

In September 2006 the Minister announced REFIT support for 55 new renewable electricity generation projects, 98% of which were wind energy projects, totalling more than 600MW. REFIT has continued to expand. A total generation capacity from wind energy of 1,642MW was connected to the national grid by December 2011.

On announcing the scheme in May 2006, Noel Dempsey the then Minister for Communications, Marine, and Natural Resources said that

“harnessing renewable energy is an essential part of delivering on our Kyoto obligations...the target set is challenging but achievable. It is my intention not to limit our ambition to the achievement of short-term targets but to develop this sector in an ambitious yet realistic manner. We will be considering targets for post 2010 in the context of the green paper on energy which I will be publishing mid year.”

This Green Paper “Towards a Sustainable Energy Future for Ireland” was published in October 2006. In the Green Paper the Government commits to a significant growth in renewable energy. A 2010 target of 15% (increased from 13.2%) of electricity consumption to be met by renewable energy was announced with a further target of 33% of penetration of electricity generated by renewable resources by 2020 being set in the Irish Government’s Energy White Paper 2007.

The White Paper makes clear that renewable energy will be a critical and growing component of Irish energy supply to 2020 and beyond. Renewable energy will be an integral part of our climate change strategy and sustainability objectives. The Paper recognises the additional diversity which renewables bring to Ireland’s energy demand which will also make a direct contribution to the Paper’s goal of ensuring secure and reliable energy supplies.

2.7. CONCLUSION

There is a clear environmental imperative and an increasing economic and security of supply imperative, to the development of renewable energy sources. Over one-fifth of new electricity generation capacity installed in Europe in 2011 was wind energy electricity generation.

A binding target of 20% of all energy coming from renewable sources has been set for the EU to achieve by 2020 by the EU Renewable Energy Directive 2001/77/EC, which would mean approximately 35% of electricity coming from renewables by then. The Renewable Energy Directive creates a legislative framework in all Member States up to 2020 and has had a positive effect on the European wind industry.

In compliance with the EU Directive on the promotion of electricity produced from renewable sources Ireland committed to a national indicative target in the National Development Plan (NDP 2007-2013) of a contribution of 15% of green electricity to total electricity consumption by 2010. This target was increased to 33% of total electricity consumption by 2020 in the Energy White Paper 2007.

Renewable energy measures in the NDP focus on achieving Government targets for renewable energy production through the large-scale deployment of wind. The NDP commits investments by Eirgrid to improve the transmission network to accommodate increased connection of sustainable and renewable energy sources to the network.

The Energy White Paper envisages continuing increased penetration of renewables in electricity production which will reduce our impact on the environment and enhance the diversity of our fuel supply.

REFERENCE DOCUMENTS

Upperchurch Windfarm Enviromental Impact Statement

3. The Proposed Development

3.1. LOCATION OF THE PROPOSED DEVELOPMENT

The proposal is to construct 22 turbines in the townlands of Graniera, Shevry, Knockcurraghbola Commons, Gleninchaveigh, Coumnageeha, Knocknamena Commons, Knockmaroe and Grousehall west of Upperchurch village, Co. Tipperary. For clarity of nomenclature this proposal is described throughout as the Upperchurch Windfarm.

The Upperchurch windfarm is proposed for an area within a series of small hills 2km west of Upperchurch village and 18km to the west of Thurles, County Tipperary. It lies just north of the main road between Limerick and Thurles, which dissects the mountains from west to east and almost borders Milestone on its south-western extent. Milestone is on the regional road from Tipperary Town to Nenagh, which passes from north to south through the Silvermine Mountains.

See **Figure 3.1 Site Location Map** at the end of this chapter.

3.2. DESCRIPTION OF PROPOSED DEVELOPMENT

3.2.1. GENERAL

The Silvermine Mountains comprise many rounded peaks, with intervening valleys of sloping pasture and winding rivers and streams and extend over an area of c.330km². The proposed turbines are arranged in four clusters within an overall area of 12km² on the eastern margins of these mountains.

The proposal is to construct 22 wind turbines together with ancillary service roadways and a 110kV substation compound. It is planned to access the site at Graniera, 1km before Milestone, at Site Entrance No. 1. From this point the construction vehicles will access the full site using newly built windfarm roadways, upgraded farm and forestry tracks and site entrances from the Third Class Road network within the site area. The electricity generated will be cabled underground to the windfarm control building in Knockcurraghbola Commons. See **Figure 3-2: Site Layout Map** at the end of this chapter.

3.2.2. WIND TURBINE CHARACTERISTICS

The turbines will be of the generic, three-bladed, tubular tower model. For the purpose of the planning submission the layout and Zones of Visibility and Photomontages have been based on a turbine with an overall height of 126.6m.

3.2.3. LAND USE AND SITE PLAN

The site plan **Figure 3-2: Site Layout Map** shows the access roads, turbine placements and the windfarm sub-station compound containing the control building, main transformer and end -mast. The turbines are numbered 1 to 22 and are referred to, throughout this report and on the drawings, as T1, T2....T22. The proposal is to locate the turbines on a series of small hills or drumlins ranging in elevation from 280m to 401m OD. The development is set out generally over four areas. The first area, to the north east comprises 8 turbines, the second area to the south east comprises 8 turbines, the third area to the west comprises 5 turbines and the fourth area in the centre comprises 1 turbine. The landcover in the area comprises

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predominantly pasture fields, forestry and frequent areas of bog/reeds. The area is rural with a dispersed population.

The turbine placement on the site is dictated by the topography of the site, visual design criteria, the direction of the prevailing winds and spacing between the individual turbines and between the turbines and the nearest residences and site boundaries.

3.2.4. PLANNING HISTORY OF WIND FARMS IN THE AREA

All existing windfarms in the surrounding area are included in the list below along with all windfarms that have received planning permission or an extension to duration of planning permission within the last 5 years. All projects listed below comprises the windfarms shown in the Visual Impact Assessment Photomontages of this EIS.

Falleennafinoga Windfarm

2-turbine development at Turraheen Upper which is 2km south of the proposed site. South Tipperary Planning Ref. 04/1178. Construction has commenced on this project.

Hollyford Windfarm

3-turbine development at Glenough Upper which is 2km south of the proposed site. South Tipperary Planning Ref. 05/287. Construction has not yet commenced on this project.

Glenough Windfarm

There is an operating windfarm of 13 turbines at Glenough Upper/Lower and Turraheen Upper/Lower which is located 3km to the southeast of the proposed site. Planning Ref. South Tipperary 04/1195&08/701. This windfarm was commissioned during 2011. Planning permission was granted in 2011, for a 1-turbine extension to the windfarm. Construction commenced on this turbine in August 2012.

Glencarbry Windfarm

9-turbine development at Glencarbry/ Piperhill/ Glenpaudeen/ Foilmacduff/ Glenough Lower which is 6km south of the proposed site. South Tipperary Planning Ref 07/255. Construction commenced on this project in September 2012.

Cappawhite Windfarm

8-turbine development (South Tipperary Planning Ref. 07/364) and a further 10 (Ref. 11/6) at Cappagh, Parkroe, Kilmore, Oldcastle and Moher which is 10km to the southwest of the proposed site. Construction has not yet commenced on this project.

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Garracummer Windfarm

13-turbine development at Curraghmarky, Birchgrove, Moanvaun, Garracummer, Cummer More and Cummer Beg which was later combined with permission for 2 turbines at Tooreen. This area is 4km southwest of the proposed site. South Tipperary Planning Ref. 04/1259 & 04/1034 respectively. Construction commenced on this project in 2011.

Knockastanna Windfarm

Operational windfarm of 4 wind turbines at Curraghafoil, Doon, County Limerick. Limerick County Council Reg No. 01/1385

Knockmeale Windfarm

Planning permission was granted for 2 turbines at Lisgarraff, Knockmeale. (North Tipperary Planning Ref. 07/51/0779) in 2009. This area is 7km north west of the proposed site. This windfarm is under construction.

Curraghgraique Windfarm

The Curraghgraique windfarm was extended to 6-turbines under North Tipperary planning permission No. 4/51/1665. This area is 9km north west of the proposed site. This windfarm is operational.

3.2.5. ALTERNATIVES CONSIDERED

The EPA Advice Notes for Project Type 33A - Installations for the harnessing of wind power for energy production do not suggest a specific procedure for describing 'Alternatives Considered' for wind farm projects. However in Section 3.2 – Project Description it states that in general alternatives, where relevant, may be described at three levels - alternative locations, designs and processes and the main reasons for choosing the proposed development should be indicated.

3.2.5.1 ALTERNATIVE WIND FARM LOCATION

Section 1 notes on alternative location state that

Some locations have more inherent environmental problems than others. Such sites can usually be avoided in favour of sites which have few constraints and the maximum capacity to sustainably assimilate the development.

Various sites are identified at the prospecting stage and suitable sites are then chosen if they possess a critical combination of essential characteristics. The proposed location was identified as a suitable windfarm site, where there was maximum capacity to sustainably assimilate the development because of 4 factors;

- Mitigating environmental impact factors - no natural heritage designations on site and adequate separation distance between a turbine and the nearest residence.
- Mitigating visual impact elements – The area is identified as suitable for wind farm developments in the Wind Capacity Strategy and Outline Landscape Strategy for

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North Tipperary. The Strategy is based on landscape assessment and sensitivity together with wind resource mapping and is based on the findings of the baseline Landscape Character Assessment undertaken for the County by Environmental Resources Management (Ireland) Ltd. The study considered the potential effects of wind farm developments on both landscape character and visual amenity

- Sustainability of the proposal – Within the area zoned in the Wind Capacity Strategy the location was refined to an area with an optimal wind resource. The energy in the wind is a cubic factor of its speed. This means that there is eight times more energy in windspeeds of 10 meters per second (m/sec) compared to windspeeds of 5m/sec. In general average windspeeds on elevated terrain are 50% - 60% higher than speeds on low-lying areas. A wind turbine located on an elevated site will produce the same amount of electricity as 2 similar turbines on lower ground. Building wind farms in the more elevated areas means that fewer turbines are required to produce the optimal output for the area zoned in the Strategy which reduces the amount of raw materials required for both the turbine manufacture process and the building process.
- Adequate site access –construction access can be an issue, particularly in the mountainous areas. The location of this site is suitable because the area can be accessed from the south on haul routes previously used for transportation of components and construction materials for the Glenough Windfarm 3km to the southeast and Garracummer Windfarm 4km to the southeast of the proposal. This will mitigate the level of road widening/realignment that would normally be required to access a windfarm development site.
- Other elevated areas with an adequate wind resource were examined at the prospecting stage but were rejected due to natural heritage designations, unsuitable zoning in the Wind Capacity Strategy for North Tipperary or inadequate site access.

3.2.5.2 ALTERNATIVE WIND FARM DESIGN

Section 1 notes on descriptions of alternative design state;

Most problems will be capable of a number of design solutions by varying the site layout, building massing or location of facilities. Where designers are briefed at an early stage about environmental factors, these can usually be incorporated along with other design parameters.

In the early stages of this proposal the designers positioned the turbines in order to most effectively capture the wind resource, while maintaining both the requisite separation distances between the individual turbines and an adequate separation distance from the nearest houses and taking into consideration communication signals from the Knockmaroe telecommunications mast. This preliminary layout was examined and modified in the context of the results of the Environmental Impact Assessment studies on the site geotechs, hydrology, archaeology, ecology and telecommunications and modifications were made to the design to incorporate any recommendations for mitigation of environmental impacts from the consultants' reports. This iteration of the site was then examined and modified in the context of including as many of the local landowners in the scheme in order to mitigate impacts on the proposed windfarm site's neighbours. Alternative locations within the site boundaries for the windfarm sub-station were examined with a preference to siting the compound at a lower elevation to mitigate visual impact and as near as possible to the grid

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connection route to reduce overhead line/cable lengths and thus mitigate visual and ecological impact.

Thus an optimum design was reached which was the best fit having consideration for wind resource, residential amenity, landholdings and environmental impacts. The final design accommodates 22 turbines, which are the subject of this planning application.

Various turbine sizes were considered and the 2/3MW size turbine was selected for this project as the dimensions are similar to neighbouring permitted projects. Similarly to the preference for locating wind turbines in elevated areas, building larger and more efficient turbines mean fewer turbines overall. A 10-15% increase in turbine height can increase the energy yield by up to 50%. These more efficient turbines increase our ability to meet greenhouse gases reduction targets, reduce the amount of turbines needed and reduce the amount of raw materials required.

3.2.5.3 ALTERNATIVE PROCESS

A Section 1 notes on descriptions of alternative process state;

Within each design solution there can be a number of different options as to how the processes or activities of the development can be carried out. These can include management of emissions, residues, traffic and the use of natural resources. Consideration of environmental factors can influence the selection of processes which avoid adverse impacts.

Although the process of conversion of the power in the wind to electricity is standard, alternative haul routes and construction activities were examined as part of the alternative process exercise. The haul route already used by previous developments was finalised as the preferred route. Construction activities will only be conducted during daylight hours, 6 days a week and delivery times will be actively managed. This will mitigate disruption to the local community.

3.2.6. CONSTRUCTION

The site will be accessed from the Regional Road R503 to the south of the site and through the local road network running through the center and north of the site. The first stage in the construction of the turbines is the construction of the site roads. Then follows the excavation of foundations, fixing the steel reinforcements and pouring the concrete for the foundations and erection of the turbines. The electrical connections are cabled underground to the substation compound and roadway verges are revegetated.

3.2.6.1 SCOPE OF WORKS

- 11.9km of windfarm tracks comprising 8km newly built roads and 3.6 upgraded farm and forestry roads.
- 22 No. concrete turbine bases along with hardstands to facilitate crane operation.
- Electrical cabling to the sub-station compound. The substation compound comprises of a sub-station control building, main transformer and end mast.
- 2 meteorological mast
- 22 wind turbines

*Upperchurch Windfarm Environmental Impact Statement***3.2.6.2 ON-SITE ROADS**

The proposed roads will be a combination of upgraded agricultural and forestry tracks and newly constructed roads. Construction access will be gained from the R503 which is the Regional Road from Thurles to Limerick, at Graniera. There will be access points/road crossings from the local roads at Knockmaroe, Knockcurraghbola Commons, Gleninchaveigh and Shevry, generally in the centre of the site and at Grousehall generally to the north of the site. These local road access points will be retained for day to day operations. On commissioning of the windfarm, the main construction access from the R503 can be closed for day to day operational access save for occasional deliveries involving major components.

The electricity generated will be cabled underground to the windfarm substation compound in Knockcurraghbola Commons. See **Figure 3.2 Site Layout Map** for the layout of the roads, crane pad areas and turbine placements on the site.

Construction of on-site roads involves removal of topsoil and subsoil. This is stored adjacent to the road for later reinstatement of the verges. Crushed rock will be laid on the excavated hard ground and compacted in layers of 200mm. The edges of the roads will be graded and revegetated. Adjacent to each turbine an area of level hardstanding will be laid to accommodate cranes during assembly of the turbine, occasional major component replacements and for decommissioning.

3.2.6.3 TURBINE BASES

The bases will consist of approximately 345m³ of concrete and 14 tonnes of reinforcement steel. There will be no surface expression of the turbine foundations and they will be covered with stone and topsoil. These areas will be reseeded.

3.3. CONSTRUCTION TIMETABLE

- Civil engineering works - 6 months.
- Electrical works - 4 months, which will be carried out in conjunction with the civil works.
- Turbine erection and commissioning – 16 weeks. Turbines are normally installed when the majority of the civil works are completed.

3.4. GRID CONNECTION

Upperchurch Windfarm has secured access to the grid under the Gate 3 Grid Connection process. The power from the proposed windfarm will be connected to the National Grid at a point on the newly built Killonan to Nenagh 110kV line. The windfarm substation compound is proposed for lower lands at Knockcurraghbola Commons in the south west of the site. The low elevation will help to mitigate the visual impact of the compound.

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3.5. MAINTENANCE AND MONITORING PROGRAMME

Technical operation and monitoring activities will be carried out remotely using computers connected to the turbines. Four maintenance personnel will be employed at the Upperchurch site to service, maintain and monitor the turbines for operational safety and performance.

3.6. DECOMMISSIONING

3.6.1. *ENVISAGED LIFE OF PROPOSED WORKS*

The turbines have a design life of 25 years. All the electrical equipment - main transformer and individual turbine transformers, switch gear and control gear have a design life of 40 years. The options after 25 years would be to:

- Refit the turbines with new gearboxes, generators and blades and generate as before
- Repower with the most up to date technology and continue production
- Decommission the wind farm and reinstate the site.

3.6.2. *DECOMMISSIONING*

Decommissioning involves dismantling the turbines and restoration of the site.

3.6.2.1 *DISMANTLING THE TURBINES*

Turbine dismantling involves removal of the blade sets, the removal of the nacelle, which contains the gearbox and generator, followed by the removal of the tower sections.

3.6.2.2 *RESTORATION OF THE SITE*

Turbine foundations: The turbine foundations can be left in situ as the foundations are below ground level and have a steel cylindrical ring protruding from the foundations up to ground level onto which the turbine tower is bolted. This ring can be cut away and the steel recycled. The foundations can then be covered with topsoil.

Roads: Any roads or hardstands that are not required by the local landowners for agricultural activity can be covered over with topsoil and reseeded.

3.6.2.3 *DISPOSAL OF TURBINES AND FOUNDATIONS*

Turbines: The turbine tower consists primarily of steel, which can be completely recycled.

Blades: The blades are mainly made up of composite materials, which can be incinerated for electricity generation/direct heat or disposed of in landfill. Production methods for the blades in modern turbines principally involves the use of epoxy composites. This method helps to reduce emissions from organic solvents, thus appreciably reducing impact on the environment at the production and disposal stage.

Turbine transformers: Transformers can be reused and have a second-hand value of at least their removal costs.

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Turbine electrical equipment: The generator comprises copper windings which can be reclaimed and have a high recyclable value.

Waste oil and lubricants: All oil-based waste can be collected from site and recycled.

The ease with which wind turbines can be decommissioned, in comparison with nuclear or fossil fuel fired generating stations is another significant environmental benefit of wind energy.

3.7. CONCLUSION

The proposal is to construct 22 turbines, to be called Upperchurch Windfarm, in the townlands of Graniera, Shevry, Knockcurraghbola Commons, Gleninchaveigh, Coumnaageha, Knocknamena Commons, Knockmaroe and Grousehall west of Upperchurch village, Co. Tipperary. The windfarm will be accessed from the public road at seven points – Graniera, Knockmaroe, Knockcurraghbola Commons, Shevry, Grousehall and Gleninchaveigh. The Upperchurch windfarm is proposed for an area 2km west of Upperchurch village and just north of the main road between Limerick and Thurles, at Milestone.

The first stage in the construction of a wind farm is building the on-site roads. This is followed by excavation of foundations, pouring of concrete and the erection of the turbines. The electricity generated by the turbines will be cabled underground to the windfarm control building located in the substation compound at the southwest of the site. The windfarm will be connected to the National Grid at the Killonan Nenagh 110kV line c.20km to the west of the substation compound.

Technical operation and monitoring activities will be carried out remotely using computers and there will also be four full time maintenance personnel employed to monitor and maintain turbine operational safety and performance.

The turbines have a design life of 25 years. All the electrical equipment - main transformer and individual turbine transformers, switch gear and control gear have a design life of 40 years. The options after 25 years would be to retrofit the turbines and continue generating or to decommission the wind farm and reinstate the site.

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FIGURE 3-1: SITE LOCATION MAP

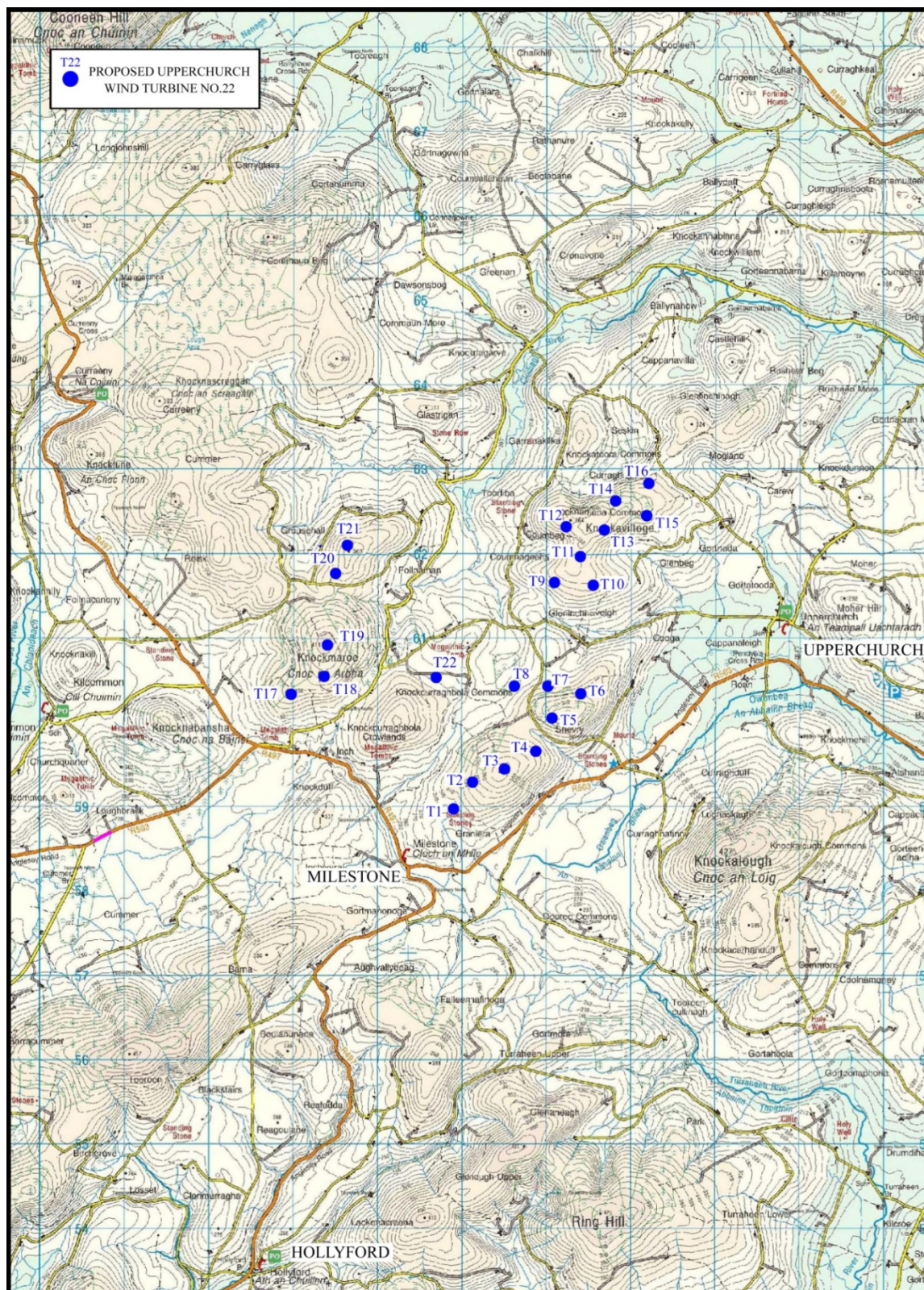
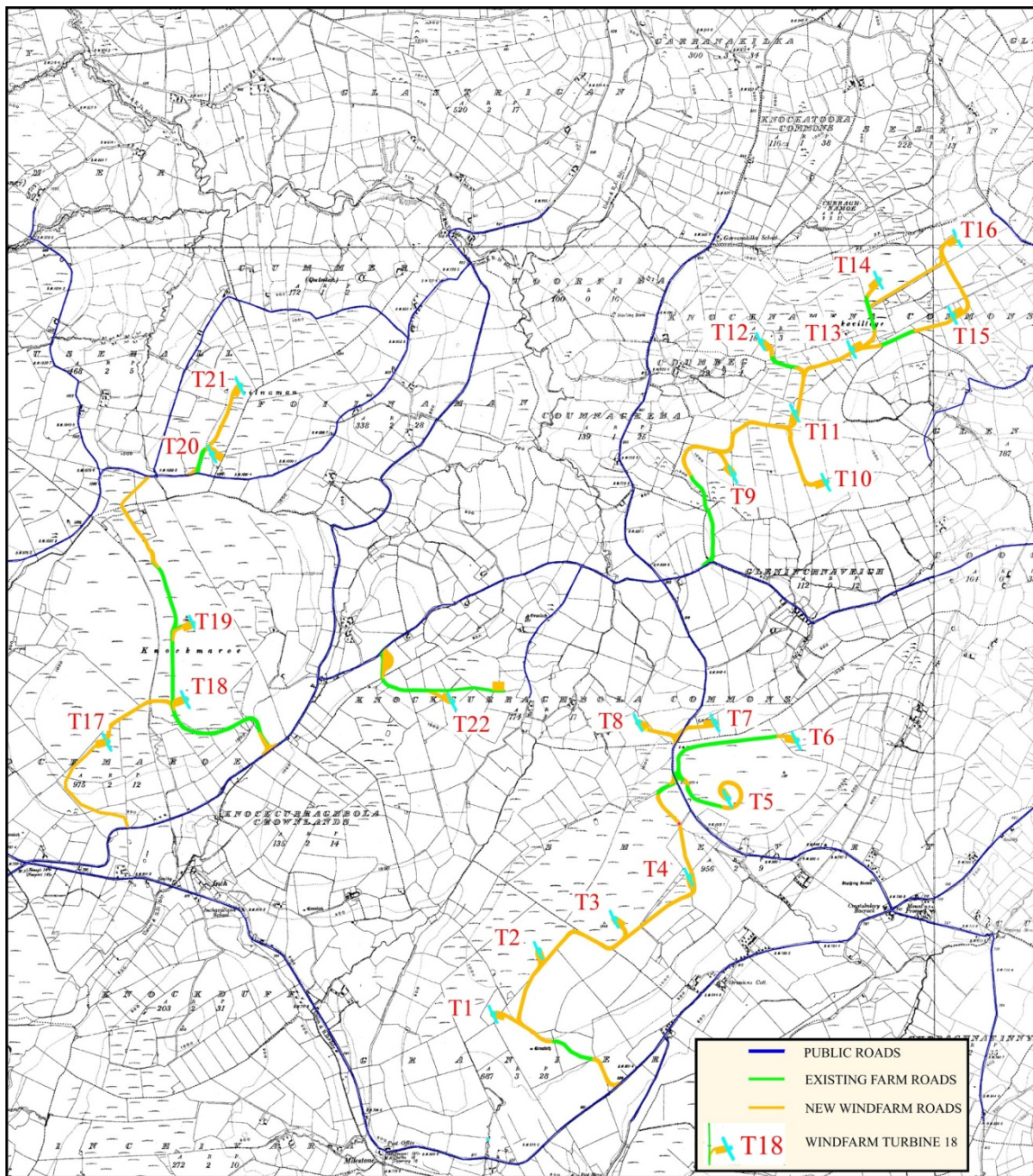


FIGURE 3-2: SITE LAYOUT MAP



REFERENCE DOCUMENTS

Upper Merich Wind Farm Environmental Impact Statement

The Proposed Development

4. Site Selection Process

4.1. SUITABLE CHARACTERISTICS OF UPPERCHURCH WINDFARM SITE

The following characteristics combine to make the Upperchurch turbine sites suitable;

4.1.1. *The Wind Resource.*

The turbine sites are elevated between 290m and 401m and can thus avail of a favourable wind regime.

The first comprehensive Wind Atlas for Ireland was published in October 2003. This atlas was commissioned by Sustainable Energy Ireland and funded by the National Development Plan and European Union Structural Funds. It was produced by ESB International and Truwind Solutions. In the atlas the wind resource is evaluated county by county. These evaluations had regard to elevation, exposure to the prevailing winds and roughness of the surrounding terrain and are represented by maps showing the estimated mean wind speeds and mean power density at 50m, 75m and 100m hub height.

The wind resource is seldom a steady, consistent flow. It varies with the time of day, season, height above ground, and type of terrain. An area's surface roughness and obstacles are also important determinants in wind resource. High surface roughness and larger obstacles in the path of the wind result in slowing the wind and creating turbulence. Wind speed generally increases with height above ground. The power density or energy in the wind is calculated by the frequency at which the wind blows at each speed distribution. Power Density is a useful way to evaluate the wind resource available at a potential site. The wind power density, measured in watts per square meter of swept area, indicates how much energy is available at that site for conversion by a wind turbine.

The Wind Atlas for Ireland contains maps for the Annual Mean Power Density for each county at 50m, 75m and 100m hub-height. The 75m above ground level mean power density map was chosen as reference for the development potential in North Tipperary. Hub heights of c.75m and above are the industry standard for high capacity turbines on inland sites. The wind resource development potential in North Tipperary is concentrated in the elevated areas of the county. Upperchurch and surrounds are in an area with an Annual Mean Power Density in excess of 750 Watts/sq.m which would be considered commercially viable under current economic conditions.

Ecopower Developments Ltd has commissioned wind analysis studies from Garrad Hassan for the general area using data gathered from various meteorological masts installed in the area, the results of which confirm that a viable wind resource exists there. Garrad Hassan are renewable energy consultants and have been providing independent technical services to promoters and financiers of the wind energy industry for over two decades.

4.1.2. *Ease of Access:*

There is adequate access for construction and operational traffic to the site. Construction traffic can access the site from the Thurles to Limerick road at Graniera, south of the site. Access for construction and operational traffic is available from the Local Road at Knockmaroe, Knockcurraghbola Commons, and Gleninchaveigh and road crossings on the Local Road at Shevry and Knockcurraghbola Commons, all generally in the centre of the site, and also on the Local Road at Grousehall generally to the north of the site.

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4.1.3. County Development Plan Zoning:

The site is in an area zoned for wind farm development in the Wind Capacity Strategy which was adopted by the Council in 2009. The wind farm is proposed for the area Upperchurch – Kilcommon Hills as detailed in the Strategy. The Strategy states that this area has extensive capacity to absorb wind farm development and that windfarms of a bigger scale are acceptable.

4.1.4. Site Ecology:

The site is not part of a designated or proposed designated Natural Heritage Area (NHA), candidate Special Area of Conservation (c.SAC) or Special Protection Area (SPA).

4.1.5. Visual Impact:

The surrounding undulating topography provides screening for the development and high banks and hedgerows allow only intermittent views within a 5km radius. The landscape context is one of a working landscape with many anthropogenic elements, including wind turbines, communications mast, electricity and telephone lines, once off rural housing and farmsteads, farms buildings and roads. This setting provides a relatively high visual absorption capacity.

4.1.6. Telecommunications' Signals:

The turbine layout takes into account the signals which are transmitted from the telecommunications mast at Knockmaroe. A communications impact study was carried out and adjustments to the turbine locations were possible at the design stage. The final layout is predicted to have no effect on the communication signals in the area.

4.1.7. Access to the Grid Network and to Grid Connection Agreement:

There are grid connection options for the project at Upperchurch. The electricity can be transported to the National Grid by a combination of cable and overhead line to a connection point on the Killoan to Nenagh 110kV line. The project has secured access to the National Grid in the Gate 3 Grid Connection process operated by ESB Networks.

4.2. SITE SUITABILITY CONCLUSION

The area is identified as having a commercially viable wind regime in the Irish Wind Atlas and by independent analysis consultants, Garrad Hassan. There is access available from the nearby public road network. The site itself is not within an NHA, c.SAC or p.SPA. The area is zoned as suitable in the Wind Capacity Strategy for the County. The anthropogenic nature of the surrounding topography mitigates the visual impact of the development. The Upperchurch Windfarm has secured a Connection Agreement in the Gate 3 grid connection process.

The wind resource of North Tipperary can be developed providing benefit for:

- Local landowners through long term annual land lease payments
- Local Authority area through commercial rates
- Local community through an annual community contribution payment.
- North Tipperary by increasing the county's contribution to installed capacity of renewable energy in support of National and EU policy.
- Electrical and mechanical service providers in the South-East, South-West and Mid-West Regions during the operation and maintenance period following construction
- The Regions during the construction phase through an additional €20 million being spent on civil, electrical, engineering, project management, legal and accounting services. Construction workers will increase business for the local hospitality sector.
- National interest by improvement in the balance of payments through the generation of electricity using an indigenous fuel and by helping to meet our Kyoto commitments on greenhouse gases emission reductions.
- Global interest in helping to reduce the environmental impact of electricity generation.

REFERENCE DOCUMENTS

Upperchurch Windfarm Enviromental Impact Statement

5. North Tipperary County Development Plan 2010-2016

5.1. NTCDP (2010-2016) GENERAL POLICY WIND ENERGY DEVELOPMENT

County Development Plan Policy: General policy on wind energy developments is stated in Chapter 7 Infrastructure and Services in **Section 7.13.5(ii) Renewable Energy Sources, Item A - Wind Energy.**

In Section 7 it is acknowledged that at present wind energy is the principal renewable inland resource which is accessible to technology. It is stated that the Council will have regard to The Department of the Environment, Heritage and Local Government Wind Energy Guidelines (2006) whilst it endeavours to achieve a reasonable balance between responding to overall positive Government policy on renewable energy and enabling the wind energy resources of the Planning Authority's area to be harnessed in a manner that is consistent with proper planning and sustainable development.

Site suitability is identified as an important factor in determining the suitability of wind farms, having regard to possible adverse impacts associated with for example, residential amenities, views or prospects, public rights of way, wildlife, habitats, special areas of conservation, protected structures, bird migration paths, aircraft flight paths or disturbance by reason of noise, electromagnetic interference or visual impact. In this regard the Council produced a Wind Energy Strategy for the county which was adopted by the Council in 2009. This Strategy identifies areas suitable and unsuitable for wind energy under the following categories:

1. Areas of the County that have adequate wind resources for wind farm development

Areas deemed eminently suitable for wind farm development subject to normal planning considerations.

2. Areas of the County with adequate wind resources but deemed unsuitable for wind farm development

Areas identified as particularly unsuitable for wind farm development. This category is used for areas which due to their scenic, ecological, historic or tourism values are unable to accommodate wind development.

Upperchurch Windfarm proposal: The Upperchurch windfarm proposal is examined in the context of meeting the requirements of the Wind Energy Guidelines (2006) in the following chapter - Chapter 6.

In the preparation of this Environmental Impact Statement an Environmental Impact Assessment, Appropriate Assessment and Natura Impact Statement were prepared by Malachy Walsh & Partners (MWP) Engineering and Environmental Consultants. During this process possible adverse impacts as listed above were examined.

The Upperchurch area of the windfarm site is identified in the Wind Capacity Strategy as having extensive capacity to absorb wind farm development and that windfarms of a larger scale are acceptable.

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5.2. NTCDP (2010 – 2016) CHAPTER 10: DEVELOPMENT MANAGEMENT GUIDELINES AND STANDARDS

County Development Plan Policy: Chapter 10 of the County Development Plan sets out the development management and design standards which will be applied by the Council in assessing development proposals. The Guidelines for wind farms is contained in **Section 10.13 Wind Farms**.

5.2.1. *NTCDP Section 10.13 – Windfarms*

Section 10.13 states that the Council will assess windfarm development applications having regard to the DoEHLG Guidelines for Planning Authorities on Wind Energy Development 2006, the Landscape Character Assessment and Wind Capacity Strategy and Landscape Strategy for North Tipperary, 2009.

Upperchurch Windfarm Proposal: The proposal is examined in the context of the Wind Energy Guidelines in the following chapter – Chapter 6. Examination of the recommendations of the Landscape Character Assessment and Wind Capacity Strategy and Landscape Strategy for North Tipperary 2009 follows in this Chapter at Section 5.3.

Further it is stated in Section 10.13 of the CDP that the following criteria need to be addressed by planning applications for wind farm developments:

5.2.1.1 *Environmental Impact / Impact on Natural Heritage (10.13.1)*

An Environment Impact Assessment (EIA) is required to be submitted with wind farm planning applications. In addition any wind farm development that is likely to have an impact on a SAC or SPA should be accompanied by an Appropriate Assessment. Where proposal falls within a conservation designation, the developer is advised to consult with the DoEHLG prior to making an application.

Upperchurch Windfarm Proposal: An EIA was conducted and the assessment is described in this Environmental Impact Statement (EIS). An Appropriate Assessment was conducted to assess any impact on designated sites in the area. This Appropriate Assessment and accompanying Natura Impact Statement is contained as **Appendix 13-II** in Chapter 13. The proposal does not fall within a conservation designation.

5.2.1.2 *Exclusion Zones (10.13.2)*

Exclusion zones are set out in table 10.9 (below) in order to protect the visual and residential amenities of the area. New developments are required to comply with these exclusion and separation zones.

Table 10.9 Exclusion & Separation Zones

Exclusion Area	Exclusion Distance (m)
Towns, villages	1,000
National Primary	300

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National Secondary	200
High voltage cables	200
Lakes > 6 Ha	2,000
Primary amenity areas Secondary amenity areas	See County Designations map
Boundary set back to turbines	1.5 x turbine height
Separation between turbines	3 x turbine height

** CDP note under Table 10.9 Boundary set back and separation distances between turbines may vary depending on total height of turbines and rotor diameter.*

Upperchurch Windfarm Proposal: The proposal can comply with all the exclusions detailed in Table 10.9 quoted above in the following manner.

Exclusion Area	Exclusion Distance (m)	Upperchurch Windfarm Proposal
Towns, villages	1,000	No towns or villages within 1000m. (Upperchurch 2,000m distant)
National Primary	300	No National Primary Routes within 300m
National Secondary	200	No National Secondary Routes within 200m
High voltage cables	200	No HV cable within 200m
Lakes > 6 Ha	2,000	None within 2,000m. (Lough Derg > 20km distant)
Primary amenity areas Secondary amenity areas	See County Designations map	Not in an amenity area. Nearest area > 20km to the west.
Boundary set back to turbines	1.5 X turbine height	Set back distance of 189m has been achieved at all but one turbine site. T17 is 60m from a neighbouring boundary.
Separation between turbines	3 x turbine height	Separation distance = 379m A minimum separation distance of 379m has been achieved.

Note: Turbine height to tip height (126.6m) is the turbine height used in the compliance table above.

5.2.1.3 Visual Impact (10.13.3)

This section states that because of the scale of development, wind farms can have a significant visual impact and should be sited by taking account of the character and sensitivity of the landscape as outlined in the North Tipperary County Council Landscape

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Character Assessment. A Visual Impact Statement and Photomontages from key focal points, such as nearby settlements, tourism sites and protected structures are required to be submitted.

Upperchurch Windfarm Proposal: The character and sensitivity of the landscape in the Upperchurch area is described in the North Tipperary County Council Landscape Character Assessment as Landscape Character Type 6: Farmed Foothills and Landscape Character Area LCA 7: Upperchurch - Kilcommon Hills where wind energy developments are listed as a probable force for change.

The character and sensitivity of the landscape is described as a working landscape and highly scenic owing to the varied and interesting topography of rolling hills and valleys. However it states that the nature of the varying topography is such that there is a capacity to accommodate development without undue deterioration in the scenic quality.

The windfarm will be visible, although intermittently because of the rolling topography, from Views and Prospects as designated in Appendix 5: List of Protected Views of the CDP. The significance of the visibility of the proposal from these points is assessed by Mozart Landscape Architects in the Visual Assessment Chapter 11 and illustrated in Photomontages in that Chapter.

It is recommended in the Landscape Character Assessment of NTCDP, that criteria for the wind energy development and layout should be provided in order to manage this landscape. These criteria are set out in the Wind Capacity Strategy and Landscape Strategy for North Tipperary 2009 where the proposed wind farm development is in an area where the Strategy states that there is extensive capacity to absorb windfarms. The Strategy further states that an increase in scale would result in a more successful layout, responding to the landscape pattern which is bigger in scale than that found elsewhere in the county.

5.2.1.4 Roads (10.13.4)

It is recommended that access roads within the site be unsurfaced and follow the natural contours of the site and it is noted that roads providing access to the site may require widening and resurfacing to facilitate construction. Provision is made for the application of a Special Contribution in accordance with Section 48 of the Planning and Development Act for the purpose of up-grading/improvement of works along the route corridor for the construction of the wind farm and to facilitate the development.

Upperchurch Windfarm Proposal: The access roads within the site will be unsurfaced and will follow the natural contours of the site as far as is possible. The application of a Special Contribution can be subject of a Planning Condition.

5.2.1.5 Connection to the Grid (10.13.5)

It is a requirement that proposals for wind farms are accompanied by indicative option(s) for grid interconnection lines and associated facilities. Evidence that an application has been made to the relevant statutory provider should accompany the planning application.

Upperchurch Windfarm Proposal: Ecopower Developments Ltd applied for a grid connection for a windfarm in the area in 2004 (DG96). A Grid Connection Offer for the area, in the Gate 3 Grid Connection Process, was issued to Ecopower Developments by ESB Networks in 2010.

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Under grid connection rules, which are determined by the Commission of Energy Regulation (CER), a particular Grid Connection must connect to a defined node on the National Grid but the specific location of the generation plant/windfarm is more flexible.

Under the Grid Connection Offer (Agreement Number: 6002910592 Gate 3 Ref. DG96) it is proposed to connect this windfarm to the National Grid at a point along the Killonan to Nenagh 110kV Transmission line. The point of connection and method of construction of the connection line will be determined by E.S.B. Networks and will be either fully cabled underground or will be a combination of underground cable and overhead line.

5.2.1.6 Shadow Flicker / Noise (10.13.6)

This section states that proposals for wind turbines within 500m of a dwelling house must demonstrate that the orientation of the house, its private amenity space and disposition of windows is such that the dwelling will be largely unaffected by shadow flicker and not be seriously injurious to the amenity of the dwelling. Proposals must also demonstrate that the residential amenity will not be impacted by virtue of noise and all applications should be accompanied by a Noise Impact Statement of noise sensitive locations such as occupied dwellings.

Upperchurch Windfarm Proposal: It is stated in the DoEHLG Wind Energy Guidelines that at distances greater than 10 rotor diameters from a turbine, the potential for shadow flicker is very low. All houses within 900 meters of a turbine have been modelled for the amount, if any, of shadow flicker effect. The results of this modelling is detailed in Chapter 10 Residential Amenity.

A Noise Impact Study was commissioned from Malachy Walsh, Consultant Engineers to assess the impact on all noise sensitive locations in the area. This study is detailed in Chapter 10 Residential Amenity and **Appendix 10-I** of this EIS.

5.2.1.7 Landscape Character Assessment of North Tipperary

In December 2004, Environmental Resources Management Ireland (ERM) in association with ERA-Maptec Ltd was commissioned by North Tipperary County Council to prepare a Landscape Character Assessment of North Tipperary. The study was prepared in accordance with the Landscape Guidelines from the Department of Environment and Local Government. The objective of the study was to complete a thorough assessment of the character, value and sensitivity of North Tipperary's landscape in order to provide the basis for assessment and classification of the landscape in order to inform policy formulation and decision-making regarding landscape management in the County.

The Landscape Character Assessment is divided into five sections:

1. Chapter One – Introduction
2. Chapter Two - The Evolution of the North Tipperary Landscape where the principal forces that have shaped the North Tipperary landscape are described along with important and distinctive geological, cultural and habitat features and their distribution.
3. Chapter Three - The Present Day Landscape of North Tipperary. This chapter provides the definition and identification of Landscape Character Types (LCTs) found

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within the County. A description of each LCT is presented, accompanied by an initial identification of forces for change for each LCT.

4. Chapter Four - A presentation of each geographical Landscape Character Area (LCAs). These presentations are accompanied by written descriptions on formative influences, elements and features defining each LCA, including human influences, principal forces for change, current condition of the landscape and sensitivity to change. Characteristics that are particularly distinctive, rare or vulnerable are identified.
5. Chapter Five - Forces for Change. This chapter discusses the forces for change operating currently on the landscape and discusses them in terms of landscape implications, policy directions and recommendations for landscape management.

The proposal is examined below in the context of Chapter Three, Four and Five of the Landscape Character Assessment.

5.2.2. Chapter Three - The Present Day Landscape of North Tipperary

5.2.2.1 Landscape Character Types (LCTs)

Landscape Character Types (LCTs) are discussed in detail here. LCT are distinct types of landscape that are relatively homogenous in character. Where they occur they share similar combinations of geology, topography, land cover and historical landuse.

The proposed windfarm site is located in the Upperchurch/Kilcommon area which is a large area of LCT 6: Farmed Foothills as illustrated in Figure 7 of the Landscape Character Assessment. The location of the application site is shown in the context of Figure 7 (of the Landscape Character Assessment) in **Figure 5-1: Landscape Character Type of Proposed Windfarm Site** at the end of this Chapter.

The distinct LCT are described under 4 headings. LCT 6: Farmed Foothills is described as

Landscape Character Type	Key Drivers	Description	Forces for Change
6. Farmed Foothills	<p>Topography is steep sided at the highest elevations</p> <p>Elevation ranges from 200m to 450m</p> <p>Geology generally comprises Silurian Greywackes and slates with some Devonian old red sandstone at lower elevations.</p> <p>Land cover is largely</p>	<p>An incised landscape comprising rolling prominent hills with localised valleys between.</p> <p>Tracts of commercial forestry are a frequent feature in this hilly terrain, the larger plantations generally being located on hilltops.</p> <p>In general, the dominant landuse on the hills is pasture. The pastoral landscape is in good condition comprising fields at a medium to large</p>	<p>Commercial coniferous forestry</p> <p>Potential for development of windfarms and Government Renewable Energy policy.</p> <p>Development of visibly obtrusive single dwellings in the</p>

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	blanket bog and commercial afforestation	<p>scale bounded by deciduous hedgerows containing some mature trees.</p> <p>Rivers and watercourses are a feature of this landscape albeit not usually visually prominent. These are typically fringed by deciduous vegetation. Pockets of woodland with scrub under storey can be found. These are generally at lower elevations and associated with the Rivers Bilboa and Owenboy.</p> <p>Dwellings are relatively sparse and comprise a mixture of traditional farmhouses and more modern dwelling houses.</p>	countryside.
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The subject site follows the descriptions for Farmed Foothills. The site is within a series of small hills or drumlins. The hills are at elevations of between 350m and 400m and the peaks are generally at heights of 100m above the intervening lower terrain. The highest peak is that of Knockmaroe at an elevation of 411m. The principal land use within the surrounding area is pasture (dairy farming and dry cattle). Some blocks of conifer plantation occur within the site.

The development potential for windfarm projects is recognised as a force for change in this landscape.

5.2.3. *Chapter Four - Landscape Character Area (LCAs)*

The County is divided into geographical Landscape Character Areas (LCAs) based on the Landscape Character Types described in Chapter Three of the Landscape Character Assessment. LCAs are delineated and are accompanied by written descriptions on formative influences, elements and features defining each LCA, including human influences, principal forces for change, current condition of the landscape and sensitivity to change. Characteristics that are particularly distinctive, rare or vulnerable are also identified.

The subject site is in LCA 7: Upperchurch/Kilcommon Hills as illustrated on Figure 8 of the Landscape Character Assessment. The location of the application site is shown in the context of Figure 8 (in the Landscape Character Assessment) in **Figure 5-2: Landscape Character Area of Proposed Windfarm Site** at the end of this Chapter.

The key characteristics of LCA 7 are that it is a highly scenic pastoral landscape with rolling hills and valleys. It is sparsely populated particularly in the central area with remote character. The elevated points afford extensive views. There is a cluster of prehistoric graves around Rearcross-Kilcommon creating a distinct archaeological landscape of significant value. The principle settlements are on the perimeter of the LCA at Templeberry and Borrisoleigh.

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The geology of the area is described as principally underlain by Silurian Greywacke and Shale, with Old Red Sandstone on the perimeter. It may be considered part of the wider Silvermines Uplands but the landform is more gentle and composed of rolling hills and valleys. The Bilboa river drains southwards in the LCA, whilst the other principal rivers (the Clodiagh, the Owenbeg and the Turraheen) all drain south easterly before joining the River Suir in South Tipperary.

The landcover is described as pastoral, composed predominantly of improved or rushy pasture with some arable lands. Given its lower elevation than the neighbouring LCA, there is no blanket bog although rushy pasture and wetland pockets are located in the lower areas and adjacent to the numerous streams and rivers draining this area. There are plantations of coniferous forestry on the more marginal lands. A gradation is apparent between improved pasture on lower slopes, with pockets of wetland and riparian vegetation, and as elevation increases, there is more rough grazing, and an increase in coniferous planting on the summits of these hills.

In terms of nature designations, this area supports two SACs, with a NHA designation at the Nenagh River Gorge east of Cooneen Hill. There are Four SACs within 10km; Bolingbrook Hill, Anglesey Road, Lower River Shannon and Lower River Suir.

The human influences on the area are described as the settlements of Borrisoleigh, Templederry and Upperchurch. Single storey dwellings are the dominant style and the number of derelict single storey dwellings is noticeable. There is a presence of stone walls within this area which are frequently earth topped and support a variety of vegetation. In the more elevated areas, high earth banks are present. Fields are usually quite large and geometric. There are several good examples of small cut stone bridges, a distinctive feature in this LCA.

There are a number of stone circles, associated with the Early Bronze Age located around Kilcommon, at Reisk, Rardnogy More and Bauraglana with a possible passage grave underneath a stone cairn on Ballincurra Hill near Templederry. A later Iron Age hillfort exists at Ballincurra Hill.

This LCA lies largely within the Barony of Kilmanagh Upper.

The landscape condition and sensitivity is described as a working landscape featuring pasture as the dominant landuse. It is in very good condition and highly scenic owing to the varied and interesting topography of rolling hills and valleys with vantage points that afford views. Although the scenic quality renders this a significantly sensitive landscape it is stated in the Assessment that the nature of the varying topography is such that there is a capacity to accommodate development without undue deterioration in the scenic quality.

The principal contrary factor in this landscape is identified as coniferous forestry and single dwellings of inappropriate design and which are poorly sited and which reduce the scenic quality of this landscape in localised areas. Scenic views, which are protected, are gained from the R497 road route in the south-western part of this LCA.

Further development of wind energy is listed as one of the forces for change in this area. The recommendation for the management of this landscape in respect of wind energy is that

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criteria for wind energy development and layout should be provided. These criteria are provided in the Wind Capacity Strategy and Landscape Strategy for North Tipperary which was adopted into the County Development Plan in 2009.

5.2.3.1 Chapter Five - Forces for Change.

This chapter discusses the forces for change operating currently on the landscape and discusses them in terms of landscape implications, policy directions and recommendations for landscape management. It contains a brief review of the principal policies and strategies that provide the context within which the forces for change are likely to emerge, an outline of these forces and a suggested management response. It is stated in the Landscape Character Assessment that separate guidance has been produced in relation to wind energy development that will be subject to a separate consultation process by North Tipperary County Council at a later stage.

The Wind Capacity Strategy and Landscape Strategy for North Tipperary (2009) provides the guidance for wind energy development and layout in the County and is based on the Landscape Character Assessment document. The Strategy was produced in 2006 and adopted into the County Development Plan in 2009. It is incorporated in the current CDP (2010 – 2016).

To summarise the application site Landscape Character Type (LCT6) and geographical Landscape Character Area (LCA7 – Upperchurch/Kilcommon Hills) is identified in the Landscape Character Assessment as having potential for wind energy developments. Further the Upperchurch/Kilcommon Hills LCA7 is identified as having the capacity to accommodate development without undue deterioration in the scenic quality due to the nature of the varying topography of the area.

5.3. WIND CAPACITY STRATEGY AND OUTLINE LANDSCAPE STRATEGY FOR NORTH TIPPERARY

Section One of this document comprises the Wind Capacity Strategy for North Tipperary and Section Two comprises the Outline Landscape Capacity.

5.4. WIND CAPACITY STRATEGY (WCS) FOR NORTH TIPPERARY (2009)

The study follows methodologies outlined in government policy on renewable energy, specifically the DoEHLG Wind Energy Guidelines for planning authorities (2006) together with good practice guidance published by the Landscape Institute of the United Kingdom and methodologies used in similar case studies conducted in Scotland. The Strategy is founded on the findings of the baseline Landscape Character Assessment undertaken for the County by Environmental Resources Management (Ireland) Ltd.

The Strategy considered the potential effects of windfarm developments on both landscape character and visual amenity and is focused on two objectives as follows:

- Assessment of the relative suitability of North Tipperary landscapes to wind farm development.
- Provision of design guidance in terms of wind farm layout in respect of the particular landscape character types encountered in the study.

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The assessment process was conducted in three steps and included a desk study, fieldwork and reporting as detailed below.

5.4.1.1 Desk Study

The desk studies included

- Data review - a review of both wind farm capacity studies undertaken in Ireland and Scotland and best practice guidance on the subject, specifically the Wind Energy Guidelines (2006) issued by the Department of the Environment, Heritage and Local Government
- GIS Mapping - A wind resource map was prepared for the County GIS and Ordnance Survey mapping for the County at a scale of 1:50,000 and wind speed data sourced from the Wind Atlas 2003 for Ireland prepared by Sustainable Energy Ireland.
- Landscape Character Assessment of North Tipperary -this was prepared in 2004 to form the basis for assessment and classification of the landscape in order to inform policy formulation and decision-making regarding landscape management in the County. The Landscape Character Assessment which identifies and subdivides the County into landscape character areas, with further subdivisions as landscape character types, is the basis for the wind farm strategy.

In the Wind Capacity Strategy (WCS) the Landscape Character Assessment is augmented by further subdividing landscape character types to reflect variations in landscape characteristics that were considered relevant to the WCS. Wind speeds, where these exceed 7m/s in locations within each landscape character area are also recorded. The area relevant to the Upperchurch windfarm application is identified as Landscape Character Area Upperchurch – Kilcommon Hills comprising Landscape Character Type 6. Farmed Foothills and 16. Enclosed Valley where windspeeds of between 7m/sec and 10m/sec exist.

The WCS states that in general, the southern end of the County has greater wind speed and therefore greater capacity to facilitate wind farm proposals.

- Wind farm capacity assessment –
 - (a) *Suitability of landscapes to wind farm developments* - From the methodologies studied, a series of 10 No. landscape and 3 No. visual criteria were selected to represent the landscape characteristics most likely to be affected by wind farm developments. These criteria were used to evaluate the relative suitability of the receiving landscapes. The landscape characteristics identify the better locations for wind farms and in this regard, landscapes with a higher potential to accommodate windfarms (less sensitive) in respect to any one of the 10 criteria are scored as 1 whilst areas with a lower potential (more sensitive) to accommodate windfarms under a given criterion are scored as 0. Similarly criteria that relate to visual characteristics that would help to identify the landscapes that would be more visually sensitive to wind farms. A score of 1 applies to a landscape that has a higher capacity to accommodate windfarms based on a given visual criterion and a score of 0 applies in respect of a landscape which has a lower potential to accommodate windfarms.
- Wind farm capacity assessment –

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- (b) *Design Guidance*–The Wind Capacity Strategy (WCS) takes account of the Wind Energy Planning Guidelines issued by the Department of the Environment, Heritage and Local Government. The WCS states that the design criteria listed in the Guidelines for 6 No. landscape types are applied to the landscapes of North Tipperary and, in general, the county is judged to have ‘areas with higher potential’ for wind farm development.

5.4.1.2 Fieldwork

A field study was undertaken for the purpose of applying the landscape and visual criteria identified above to the landscape character types identified in each of the Landscape Character Areas (LCA’s) of North Tipperary. Within each LCA, the landscape character types that featured appropriate wind resource were studied and scored accordingly.

5.4.1.3 Reporting

The findings of the wind farm capacity strategy are presented for each Landscape Character Area and the Landscape Character Types contained therein for which, viable wind speeds are recorded. The viable areas are evaluated each in turn.

Upperchurch Windfarm is proposed for the Farmed Foothills of the Upperchurch/Kilcommon Hills area. The windfarm is identified on **Figure 5-3: Wind Capacity Strategy Map (from Figure A1 from the WCS)** at the end of this Chapter. The area is among the highest scoring (a score of 11) landscapes for the accommodation of wind energy developments in the Wind Capacity Strategy (WCS) for North Tipperary.

Upperchurch Kilcommon Hill LCA (Table 1.5 WCS) with LCT 6. Farmed Foothills attracts a score of 8 out of a possible 10 in the 10 No. landscape criteria for suitability for wind farms and 3 out of a possible 3 within 3 No. visual criteria for suitability for wind farms.

The landscape area and landscape type score 1 (indicating suitability) for the following –
Landscape criteria:

- Large in scale and open, regular undulating landform within an anthropogenic landscape containing masts, pylons, buildings, infrastructure, settlements and a regional road. The area is windswept and dynamic with activity and human induced noise

Visual criteria:

- Absence of prominent distinctive peaks and ridges. Absence of topographic features that define the setting, backdrop, main outlook or horizon of areas with extensive population. The area does not constitute an important skyline from a main transport corridor.

The following is the Strategy assessment for the Upperchurch Kilcommon Hills area:

The farmed foothills in this landscape are very similar to those encountered in the Silvermines Character Area, In this regard, the capacity to absorb windfarm development is extensive and as previously discussed, some care is required in terms of achieving the right scale of development to match the scale of the receiving

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landscape. The design layout would broadly follow that prescribed for hilly and flat farmland according to the DoEHLG draft guidelines 2004. Some modification will be required to this design solution and that relates to the size of the development. An increase in scale will result in a more successful layout that will respond to this landscape pattern which is bigger in scale than that found in the farmed ridges.

The Upperchurch windfarm proposal is in accordance with the above recommendations. The proposal follows the design guidance of the DoEHLG Guidelines as detailed in the following Chapter of this EIS.

5.4.2. *Outline Landscape Strategy for North Tipperary*

Outline guidance in respect of particular development types is presented in the context of the twelve Landscape Character Areas defined for the County in Section Two (Outline Landscape Capacity). The development types which are the subject of this assessment include the following:

- Commercial Forestry
- Housing in rural areas
- Telecommunications masts

and so do not relate to the proposed development of a windfarm in North Tipperary.

5.5. CONCLUSION

This Chapter examines the proposal for a windfarm at Upperchurch in the context of the North Tipperary County Development Plan 2010-2016, the Landscape Character Assessment and the Wind Capacity Strategy and Landscape Strategy for North Tipperary 2009.

An EIA was conducted and the assessment is described in this Environmental Impact Statement (EIS). An Appropriate Assessment and accompanying Natura Impact Statement was conducted to assess any impact on designated sites in the vicinity of the proposal.

The subject site is in LCA 7: Upperchurch/Kilcommon Hills as illustrated on Figure 8 of the Landscape Character Assessment and the area is identified as having the capacity to accommodate development without undue deterioration in the scenic quality due to the nature of the varying topography of the area.

The proposal is compatible with the North Tipperary County Development Plan 2010-2016 in the context of policy on renewable energy development, design guidelines for windfarms and landscape management policy.

FIGURE 5-1: LANDSCAPE CHARACTER TYPE OF PROPOSED WINDFARM SITE

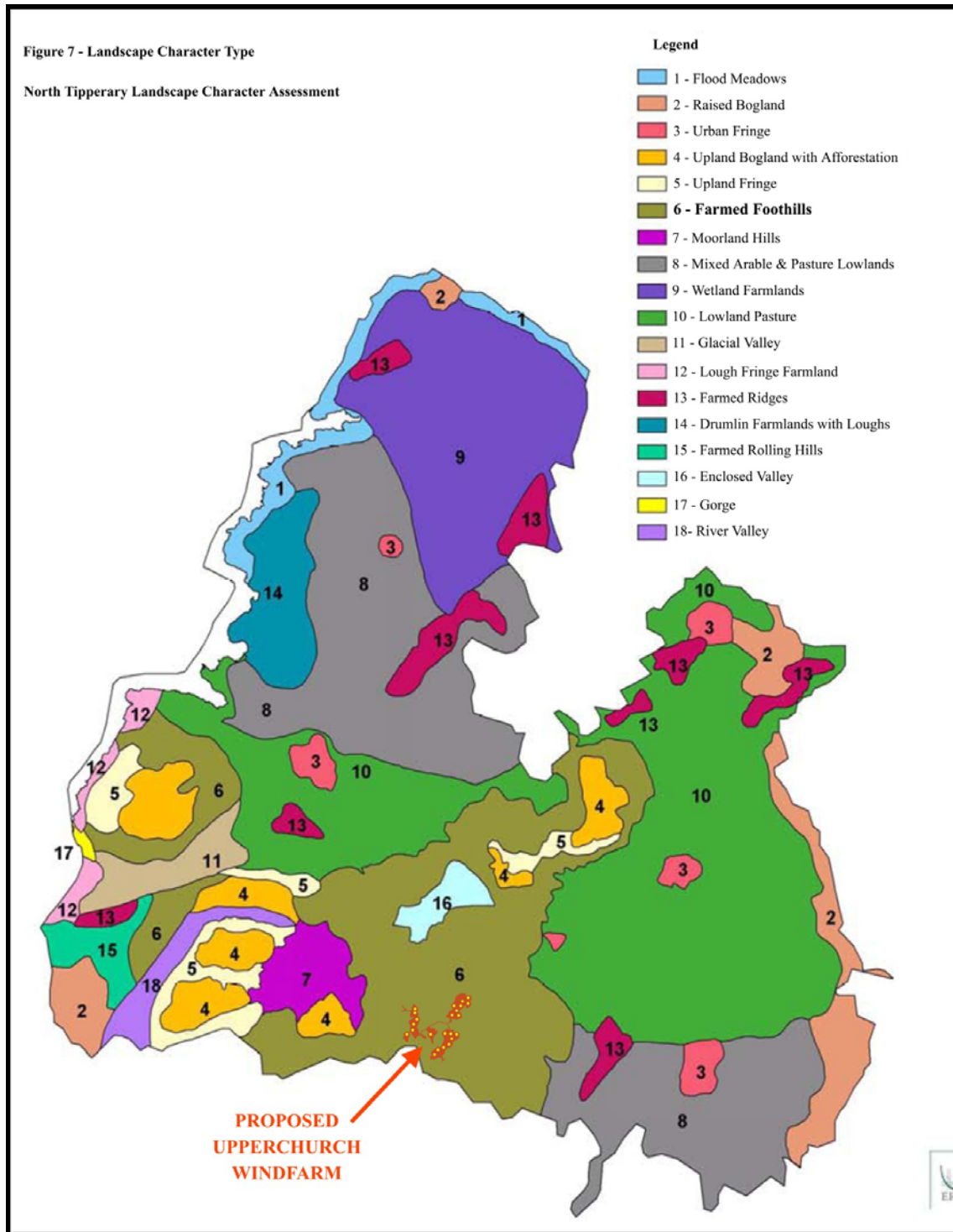


FIGURE 5-2: LANDSCAPE CHARACTER AREA OF PROPOSED WINDFARM SITE

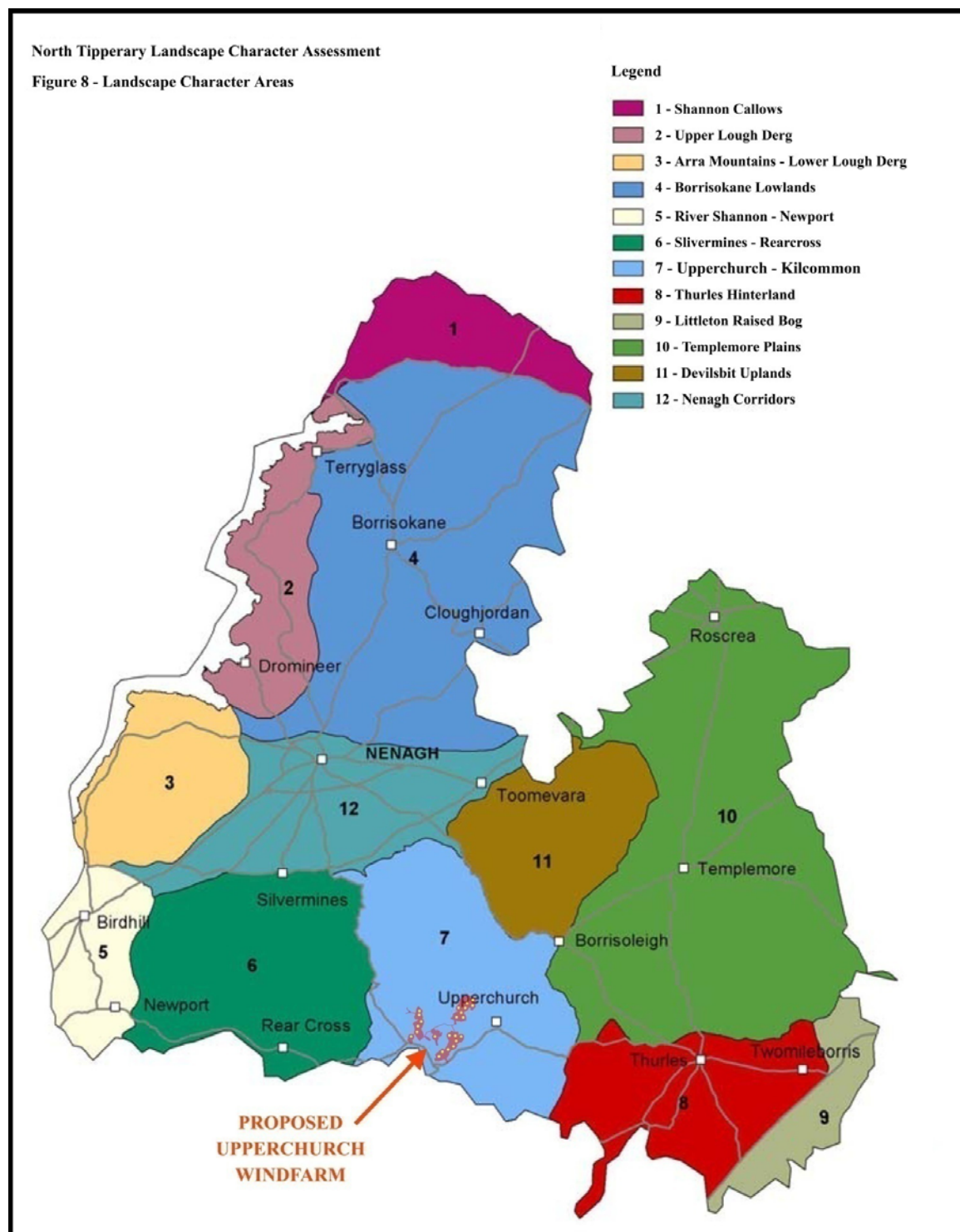
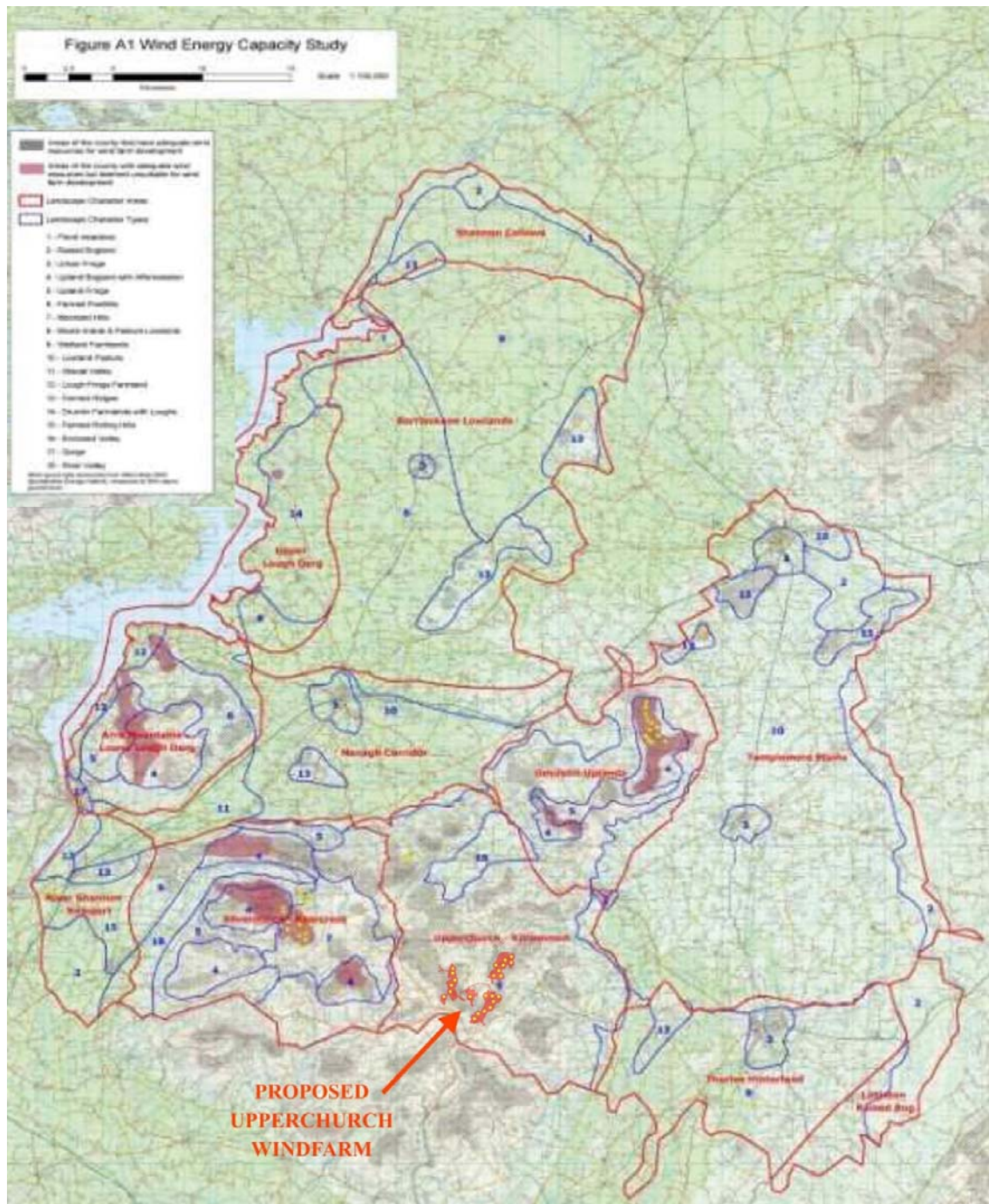


FIGURE 5-3: WIND CAPACITY STRATEGY MAP (FIGURE A1 FROM THE WCS)



REFERENCE DOCUMENTS

Upperchurch Windfarm Enviromental Impact Statement

6. Wind Farm Planning Guidelines

The Department of the Environment, Heritage and Local Government (DoEHLG) issued their 1st set of Guidelines to the planning authorities, on wind energy development, in September 1996. Revised Guidelines issued in draft in August 2004 updated and revised, where necessary, the advice given in the 1996 Guidelines. These Guidelines were formally adopted, with modifications, in June 2006.

6.1. CHAPTER 1: INTRODUCTION AND POLICY CONTEXT

The Guidelines state that the development and increasing penetration of renewable energy sources is a priority, nationally and at European level, for both environmental and energy policy grounds. The Policy context for the 2006 Guidelines is:-

- The National Development Plan (2000-2006)
- Sustainable Development: A Strategy for Ireland (1997)
- EU White paper on Renewable Energy (November 1997)
- Green Paper on Sustainable Energy (September 1999) – as reviewed in 2006
- The Electricity Regulation Act 1999
- National Climate Change Strategy (2000)
- Habitat & Birds Directive
- Convention on Biological Diversity and National Biodiversity Plan (2002)
- Making Ireland's Development Sustainable (2002)

A review of options for future renewable energy policy targets and programmes is detailed in the recently published Green Paper on Energy published by the Department of Communications, Marine and Natural Resources in October 2006. The Green Paper commits to a policy of 15% of electricity from renewable sources (mainly wind) by 2010; this target has been achieved and further commitments to implement policies to facilitate the target of 40% of electricity from renewables by 2020 have been made by successive Ministers.

6.2. CHAPTER 2: TECHNOLOGY AND WIND ENERGY DEVELOPMENT

Wind Energy Guidelines Recommendation

Chapter 2 discusses the typical turbines, both size and type, that are in commercial use at present. Details of the typical wind farm are also included. It is stated that technical factors may influence the size of a development, including the physical nature of the site, the wind resource and the capacity of the local electricity transmission or distribution grid as well as landscape and heritage considerations and Development Plan policies.

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Upperchurch Windfarm Proposal The design of the proposed Upperchurch windfarm has been influenced by the wind resource present on site, by local residential, natural and built heritage, by the visual amenity/impact and by available grid capacity.

6.3. CHAPTER 3: WIND ENERGY AND THE DEVELOPMENT PLAN

Recommendations are made for turbine developments which might be proposed in designated amenity areas and these are listed under the following headings;-

6.3.1. *Natural and built heritage, amenities and wind energy development*

The designation of an area for protection of natural or built heritage or as an amenity area does not preclude wind farm development.

Upperchurch Windfarm Proposal- The subject site at Upperchurch has no specific natural or built heritage designations. The site is within 2 areas which are identified in the County Designations Map of the County Development Plan 2010 -2016 (CDP) – 1. Upperchurch and 2. Kilcommon Upper. Neither of these areas are zoned Amenity in the Designations Map.

Both the Upperchurch area and Kilcommon Upper area are zoned A1 – Special Landscape Zone and D – Structurally weak. These are zones for which there are specific Housing policies. Policy HSG9 applies to Special Landscape Zones and HSG10 applies to Structurally Weak zones. This zoning is not relevant to the subject application.

6.3.2. *Amenity Designations*

The windfarm will be visible intermittently from Views and Prospects as designated in Appendix 5: List of Protected Views of the County Development Plan. Policy for Views and Prospects is stated in Chapter 4: Environment - Section 4.2.2 Preserving Important Views;

Policy ENV 4: Views and Prospects

It is the policy of the Council to protect views and prospects of special amenity value or special interest, as set out in Appendices and the Designations map.

Upperchurch Windfarm Proposal; the significance of the visibility of the proposal from Views and Prospects as designated is assessed by Mozart Landscape Architects in the Visual Assessment Chapter 11 and sample prospects that offer a view of the proposal are illustrated in the Photomontages in the Visual Impact Assessment chapter also.

Tourism and Recreation

Wind energy developments are not incompatible with tourism and leisure interest, but care needs to be taken to ensure that insensitively sited wind energy developments do not impact negatively on tourism potential. The results of survey work indicates that both tourism and wind energy can co-exist happily.*

**Attitudes towards the Development of Wind Farms in Ireland- (Lansdowne Market Research) Sustainable Energy Ireland, 2003.*

Upperchurch Windfarm Proposal – A further survey on tourist's attitudes to wind farms has been conducted since the SEI survey in 2003. In Aug/Sept 2007 Lansdowne Market Research conducted face to face interviews with tourists in tourism information offices both

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North and South as the basis of a presentation for Fáilte Ireland and the Northern Ireland Tourist Board entitled ‘Impact of Windfarms on Island of Ireland Tourism’. The scope of the research was to assess tourists’ opinions as to whether or not development of wind farms would spoil their enjoyment of the Irish scenery. The responses reflect every opinion on wind energy developments held in the resident/ non-visitor population and can be summarised that although most visitors are broadly positive towards the idea of building more wind farms on the island of Ireland, there exists a minority who are negative towards wind farms in any context (one in seven). However, the great majority felt that wind farms either positively impact on sightseeing or have no impact. The numbers claiming a positive impact on the landscape due to the wind farms are greater than those claiming a negative impact. More than two thirds claim that potentially greater numbers of wind farms would either have no impact on their likelihood to visit or have a strong or fairly strong positive impact on future visits to the Island of Ireland. Those who are negatively disposed are more likely to cite that wind farms look ugly, are noisy and can frighten or damage wildlife. A small number also claim they have preference for other forms of renewable energy. Of those who feel that potentially greater number of wind farms would positively impact on their likelihood to visit, the key driver is their support for renewable energy and potential decreased carbon foot print emissions.

The proposal will not be at variance with the Specific Objectives in the CDP and specifically those stated in Chapter 6: Tourism, Section 6.11.4– E2 to E19.

6.4. CHAPTER 4: RECOMMENDATIONS FOR THE PLANNING APPLICATION

6.4.1. *Pre-application consultation*

Wind Energy Guidelines Recommendation

Pre planning discussions between the developer and the planning authority are recommended.

Upperchurch Windfarm Proposal - Pat Brett of Ecopower Developments met Fergus Wright, North Tipperary County Council on 5th March, 2012 (PPC/4495) to discuss a proposed windfarm development at Knocknamena, Shevry, Knockmaroe and Foilnamon. Recommendations from the meeting were that;

1. Reference should be made to CPD Policies and standards in respect to windfarm developments, the County Landscape Character Assessment as well as the Wind Capacity Strategy.

The proposal is assessed in the context of the above North Tipperary policy documents in the preceding chapter of this EIS – Chapter 5. Specifically CDP policies and standards are dealt with at Section 5.1 to 5.2. The County Landscape Character Assessment is examined in Section 5.3. The Wind Capacity Strategy is assessed in Section 5.4.

2. An EIS is required. This document comprises the written statement of the Environmental Impact Assessment for the Upperchurch Windfarm proposal
3. It is recommended that a Natura Impact Statement should be submitted given the proximity of the site to the adjoining SPA to the west.

An Screening for Appropriate Assessment has been undertaken to determine the potential for significant impacts of the proposal on nearby Natura 2000 Sites. This

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screening and subsequent Appropriate Assessment has been undertaken by Malachy Walsh and Partners ecologists. Stage 2 of the Appropriate Assessment process comprises the Natura Impact Statement and is found in Chapter 13 **Appendix 13-II** of this EIS.

4. It is recommended that the visual impact assessment takes into account the cumulative impact of other windfarms in the area (existing and permitted, including those in Co. Limerick) on the landscape. The visual impact assessment comprising Chapter 11 and undertaken by Mozart Landscape Architects contains written assessment and photomontage illustrations of the cumulative effects of existing and permitted windfarms in South Tipperary immediately to the south, in County Limerick to the south west and North Tipperary to the north west. There are no windfarms either existing or permitted to the east.
5. Haul routes for construction traffic are detailed, as requested, in Chapter 7 of this EIS.

A copy of the consultation document PPC/4495 is found as **Appendix 6-I** at the end of this Chapter.

6.4.2. Access to the Electricity Grid

Wind Energy Guidelines Recommendation

It is recommended in the Guidelines that

Details of indicative and feasible options for grid interconnection lines and facilities should in general be adequate for a planning authority to consider the wind farm application as the precise capacity required for connection will not be known until planning permission is obtained. Suggested content for these indicative options might include (a) general direction of connection, (b) connecting line capacity (e.g. 38 kV, 110kV) and (c) line supporting structure (e.g. single pole, twin pole, lattice towers).

Upperchurch Windfarm Proposal –Ecopower Developments Ltd applied for a grid connection for a windfarm in the area in 2004. A Grid Connection Offer for the area, in the Gate 3 Grid Connection Process, was issued to Ecopower Developments by ESB Networks in 2011.

Under grid connection rules, which are determined by the Commission of Energy Regulation (CER), a particular Grid Connection must connect to a defined node on the National Grid but the specific location of the generation plant/windfarm is more flexible.

Under the Grid Connection Offer (Agreement Number: 6002910592 Gate 3 Ref. DG96) it is proposed to connect this windfarm to the National Grid at a point along the Killonan to Nenagh 110kV Transmission line. The point of connection and method of construction of the connection line will be determined by E.S.B. Networks and will be either fully cabled underground or will be a combination of underground cable and overhead line.

6.4.3. Public consultation with the local community

Wind Energy Guidelines Recommendation

The guidelines recommend *the developer engage in public consultation with the local community.*

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Upperchurch Windfarm Proposal - The developer has agreement with the 37 landowners, 35 of whom live locally and in the main, adjacent to the wind farm. An Information Day was held in the Upperchurch Community hall on 12 December 2012 where proposed site layouts, sound maps, shadow flicker maps and photomontages were presented for examination and discussion. Ecopower Developments staff was available to answer any questions on the project. The walks that have been developed in the area were also discussed and ideas were shared on how the windfarm infrastructure can be used to enhance the walks. An annual community payment was also discussed, the details of which will be agreed with the local community development committee.

6.4.4. ***Requirements of the Environmental Impact Assessment***

Wind Energy Guidelines Recommendation

An Environmental Impact Assessment is mandatory for wind energy developments that exceed the following thresholds:

- have more than five turbines, or
- will have a total output greater than 5 megawatts.

Upperchurch Proposal – An EIA was carried out and the written statement of this assessment comprises this EIS.

6.5. CHAPTER 5: ENVIRONMENTAL IMPLICATIONS (CHAPTER 5)

6.5.1. ***Natural, built and geological heritage***

Wind Energy Guidelines Recommendation

It is recommended that the County Development Plan be consulted in relation to the natural, built and geological heritage, particularly those areas statutorily designated or protected because of the potential of wind energy developments, like all developments, to impact on the natural and built environment.

Upperchurch Windfarm Proposal

The subject site is not part of a p.NHA, c.SAC or SPA. It is subject of no national or international habitat designations. A flora, fauna and birds survey was conducted of the proposed site and Chapter 13 comprises a report on this survey wherein likely impacts, of the proposal, on the natural heritage of the area are considered and mitigation measures, where appropriate, are suggested. An Appropriate Assessment was also carried out and the resultant Natura Impact Statement is contained in Appendix 13-II of **Chapter 13 Ecological Impact Assessment**.

6.5.2. ***Built Heritage – Archaeology***

Wind Energy Guidelines Recommendation

It is recommended that the potential impact of the proposal on the archaeological heritage of the site should be accessed through desk study or field inspection where necessary and that

Upperchurch Windfarm Environmental Impact Statement

the potential impact of the proposed wind energy development on the architectural heritage of the locality and its landscape context and in particular any nearby structures included on the Register of Protected Structures (RPS) be assessed.

Upperchurch Windfarm Proposal

An archaeological assessment was conducted, including a desk study and field visit, in order to identify the nature and extent of any archaeological remains, the potential direct impact on archaeological features and structures and the potential indirect impact on the archaeological landscape, and on the integrity and visual amenity of existing archaeological monuments in their settings. The architectural heritage of the locality and its landscape context and in particular any nearby structures included on the Register of Protected Structures (RPS) was also studied. The full text of this study is contained in Cultural Heritage Chapter 12.

In summary the proposed turbines will not impact on any identified above ground archaeology. Mitigation proposals are presented which will allow any sub-surface archaeological remains discovered during the civil construction phase to be dealt with appropriately. Archaeological monitoring during excavations for the proposed development will be undertaken by a suitably qualified archaeologist.

6.5.3. Geology

Wind Energy Guidelines Recommendation

It is recommended that a geological assessment of the locality and the bedrock and overburden be conducted. This should include a slope stability assessment and an assessment of any potential impacts of the development on groundwater, any nearby geological NHAs or any on-site mineral or aggregate potential.

It is recommended that provision be made for site-specific geo-technical investigations in order to identify the optimum location for each turbine and that a degree of flexibility for the as-built position of the turbines, of up to 20m, be built into the planning permission and EIS. All surveys should be conducted by a suitably qualified geotechnical engineer and where appropriate hydro-geologist.

Upperchurch Windfarm Proposal

Geotechnical surveys of the site was carried by Malachy Walsh, consultant engineers. These surveys identified geological and soil features, peat extent and depth, geomorphological features, relict failures, rock exposures, wet ground, general soil and rock types and drainage patterns. Trial pits were excavated at 20 of the proposed turbine sites and peat depth and classification was measured at the remaining three sites which are in forested areas. Ground surface slope was measured at all turbine sites. These surveys did not reveal any stress indicators in the form of erosion and the information from the trial pits indicates that the ground is inherently stable and there is no particular risk of failure. All site excavations and construction will be supervised by a suitably qualified engineer. The contractor's method statement will be reviewed and approved by a suitably qualified geotechnical engineer prior to site operations.

Any potential impacts on ground water were also assessed, by Malachy Walsh, during the hydrological and hydrogeological assessment; the results of this assessment are contained in Chapter 15 Hydrological Impact Assessment. The GSI and EPA databases were consulted. The existing hydrological characteristics at the proposed wind farm site are described,

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including the surface water features and characteristics, as well as the site drainage and groundwater. An impact assessment was carried out to determine whether the proposal poses a significant impact to the hydrology and hydrogeological aspects of the environment and to propose mitigation measures to reduce any potential negative impact of the proposal. The consultants conclude that the proposed windfarm will not have a significant impact on Hydrology and Hydrogeology provided mitigation measures, as detailed, are implemented.

6.5.4. NoiseWind Energy Guidelines Recommendation

The nature of the noise which emanates from a working turbine is discussed in this section. It is recognised that advances in turbine technology and design have resulted in reduced noise emissions and that sound output from modern turbines can be regulated. It is recognised that turbine noise increases as wind speeds increase, but at a slower rate than wind generated background noise increases. The impact of wind energy development noise is therefore likely to be greater at low wind speeds when the difference between noise of the wind energy development and the background noise is likely to be greater. At higher wind speeds noise from wind has the effect of largely masking wind turbine noise.

It is recommended that noise impact should be assessed by reference to the nature and character of noise sensitive locations and should include any occupied dwelling house. In general, a lower fixed limit of 45 dB(A) or a maximum increase of 5dB(A) above background noise at nearby noise sensitive locations is considered appropriate to provide protection to wind energy development neighbours. However, in very quiet areas, the use of a margin of 5dB(A) above background noise at nearby noise sensitive properties is not necessary to offer a reasonable degree of protection and may unduly restrict wind energy developments which should be recognised as having wider national and global benefits. Instead, in low noise environments where background noise is less than 30 dB(A), it is recommended that the daytime level of noise be limited to an absolute level within the range of 35-40 dB(A). Separate noise limits should apply for day-time and for night time. During the night the protection of external amenity becomes less important and the emphasis should be on preventing sleep disturbance. A fixed limit of 43dB(A) will protect sleep inside properties during the night.

Upperchurch Windfarm Proposal

Malachy Walsh, engineering and environmental consultants, assessed the predicted noise impact from the proposed windfarm using extended measurements of the existing background noise levels (across a range of wind speeds) at nearby representative dwellings and comparisons against the predicted noise output from the proposal, which will also vary with wind speed.

The predicted noise levels present at the nearest dwellings in the worst case scenario i.e. when the turbines are operating in wind speeds of 7-8m/s (approx. 16mph) and when the wind is blowing from the turbines towards the houses are used for this calculation. The Noise Impact Assessment comprises **Appendix 10-I** of Chapter 10.

The assessment has been carried out in accordance with methodology described in ETSU-R-97, Assessment and Rating of Noise from Wind Farms. The results show that the predicted wind farm noise levels adhere to the assessment criteria and in particular the DoEHLG Wind Farm Planning Guidelines.

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6.5.5. Safety Aspects

Wind Energy Guidelines Recommendation

The guidelines recognise that there are no specific safety considerations in relation to the operation of wind turbines.

Upperchurch Windfarm Proposal

The Health and Safety aspects of the proposed windfarm are assessed in Chapter 7 Section 7.6 Health & Safety.

6.5.6. Proximity to Roads and Railways

Wind Energy Guidelines Recommendation

It is considered that over time the turbines become part of the landscape and in general do not cause any significant distraction to motorists.

6.5.7. Proximity to power lines

Wind Energy Guidelines Recommendation

Adequate clearance between structures and overhead power lines as specified by the electricity undertaker should be provided.

Upperchurch Windfarm Proposal

No structures proposed for this site are located beneath existing power lines. See exclusion table in NTCDP Chapter 5.

6.5.8. Interference with Communication Systems

Wind Energy Guidelines Recommendation

Wind turbines, like all electrical equipment, produce electro -magnetic radiation and this can interfere with broadcast communications. The interference with broadcast communication can be overcome by the installation of deflectors or repeaters. Planning authorities should advise the developer to contact the individual broadcasters, national and local and advise them of the proposals..... Mobile phone operators should also be advised to the proposed development.

Upperchurch Windfarm Proposal

Ai Bridges, who are a leading supplier of innovative broadband & telecommunication solutions and services for the telecom's industry, were commissioned to assess the interference if any with communication signals in the area. Their report - Upperchurch

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Communications Impact Study finds that no licensed or unlicensed microwave radio links will be impacted by the proposed turbines. Vodafone has a GSM service operating from Knockmaroe mast, however turbines do not impact GSM services. Tetra Ireland has confirmed that there will be no impact to the Tetra network. With regard to TV reception, it is recommended that prior to the construction phase a TV modelling report should be conducted and mitigation measures to offset any interference caused by the proposed wind turbines should also be provided.

The Communications Impact Study is attached in **Appendix 6-II** at the end of this chapter.

6.5.9. Aircraft Safety

Wind Energy Guidelines Recommendation

The siting of wind turbines may have implications for the operations of the Communications, Navigation and Surveillance systems used for Air Traffic Control. Wind turbine siting may also have implications for the flight paths of aircraft..... Accordingly, wind energy developers should be advised to contact the Irish Aviation Authority at the pre-planning stage of consultation, with details of locations and proposed heights of turbines, to ensure that the proposed development will not cause difficulties with air navigation safety.

See **Appendix 6-III** Email response from IAA at the back of this Chapter.

Upperchurch Windfarm Proposal

The developer contacted the IAA regarding possible interference with their communications signals. They replied that their requirements are

an agreed lighting scheme, notification 30 days prior to construction and as built coordinates of the completed development for charting purposes.

6.5.10. Shadow Flicker

Wind Energy Guidelines Recommendation

The phenomenon of Shadow Flicker is explained in this section. It is stated that the effects of flicker only last for short periods and under a particular set of circumstances combined. It is recommended that shadow flicker at neighbouring dwellings within 500m should not exceed 30 hours per year or 30 minutes per day. It is recognised that at distances greater than 10 rotor diameters from a turbine, the potential for shadow flicker is very low. Where shadow flicker could be a problem, developers should provide calculations to quantify the effect and where appropriate take measures to prevent or ameliorate the potential effect, such as by turning off a particular turbine at certain times.

Upperchurch Windfarm Proposal

The predicted shadow flicker effect on the nearest occupied dwellings was modelled and the full results are detailed in Residential Amenity Chapter 10. In summary the Wind Energy Guidelines recommend that shadow flicker at neighbouring dwellings within 500m should not exceed 30 hours per year. The Guidelines state that at distances greater than 10 rotor diameters from a turbine, the potential for shadow flicker is very low. Therefore computer modelling to assess the predicted period of shadow flicker effect inside houses within 900m

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of a proposed turbine was carried out. The module which was used allows for the creation of a ‘shadow flicker effect at specified sensitive receptors’ occurrence map. The scope of the model was to access the cumulative effect of the proposed turbines on any receptor (i.e. dwelling) within 900m of the nearest turbine. There are 93 houses within 900m of a proposed turbine. The model, which predicts a ‘worst case’ scenario, shows that 4 houses within 500m and 2 other houses outside of 500m, exceed the Guidelines recommendation by between 7 to 22 hours per annum. However, predicted durations will apply only if there is a coincidence of the sun shining at a very low angle, the property has a window facing the turbine and there are no intervening trees and the turbine blades are moving. In other words shadow flicker can only occur if the sun is shining and when the sun is low in the sky and if the wind is blowing and the turbine blades can be seen from the house.

Met Eireann data shows that the sun shines for 29% - 40% of the time in Ireland and therefore in reality all the houses will only experience shadow flicker for less than half of the time that the model has predicted.

Ecopower Developments intend, for the first two years of operation, to log in real time the actual shadow flicker duration at the six dwellings mentioned above to ensure that the effect will not exceed 30 hours per annum. In the unlikely event that it is found that the 30 hours per annum limit will be exceeded, the offending turbine will be shut down during the time that it would cause the effect at the particular dwelling in question for the remaining part of that year.

6.5.11. Decommissioning and ReinstatementWind Energy Guidelines Recommendation

It is recommended that the decommissioning of a wind energy development once electricity ceases to be generated must be assessed. Issues to be addressed include restorative measures, the removal of above ground structures and equipment, landscaping and/or covering with topsoil and reseedling.

Upperchurch Windfarm Proposal

The decommissioning and reinstatement of the proposed wind farm is assessed in Chapter 3 (Section 3.6 Decommissioning).

6.5.12. WindtakeWind Energy Guidelines Recommendation

It is recommended that *“The question of windtake should be dealt with at scoping stage and/or during pre-application discussions, to ensure that any proposed layout of wind turbines takes into account the development potential of an adjoining site for a similar development”*

And...*“Bearing in mind the requirements for optimal performance, a distance of not less than two rotor blades from adjoining property boundaries will generally be acceptable, unless by written agreement of adjoining landowners to a lesser distance.”*

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Upperchurch Windfarm Proposal

The proposed turbines will have a rotor blade of up to 55m and therefore a distance of 110m from adjoining property boundaries is generally acceptable. The County Development Plan recommendation is for 1.5 X turbine height in which case an indicative boundary set back distance is 189m (the application is for turbines of up to 126.6 tip height).

The Guidelines state that a lesser distance is acceptable by written agreement of adjoining landowners.

The proposed turbines are a minimum of 189m from the site boundaries except in the case of T17 which is 60m for a neighbouring boundary.

6.6. CHAPTER 6 OF THE GUIDELINES: AESTHETIC CONSIDERATIONS IN SITING AND DESIGN

The primary purpose of Chapter 6 of the Guidelines is to provide guidance to planning authorities in decision-making in relation to the siting and design of wind energy developments in the landscape when assessing applications for planning permission.

The first section of this chapter deals with the general principle of landscape siting and design of wind farms under the following headings:-

- Siting
- Spatial extent and scale
- Cumulative effect
- Spacing of turbines (regular, irregular, graduated)
- Layout of turbines (single line, staggered line, clustered, grid)
- Height of turbines (tall, medium, short)

The second part (from Section 6.9 Landscape Character Types as a Basis for Guidelines) considers how these principles can be best applied within different types of landscapes.

Six No. landscape character types are identified to provide a basis for the application of the siting and design guidelines, as described in the first part of Chapter 6 (Sections 6.3 - 6.8 of the Guidelines). The six landscape character types, which have been identified, are:-

- Mountain moorland
- Hilly and flat farmland
- Flat peatland
- Transitional marginal land
- Urban / industrial
- Coast

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Upperchurch Windfarm Proposal

The proposed site area is within Upperchurch Kilcommon Hills Landscape Character Area (LCA) in the Wind Capacity Strategy and Outline Landscape Strategy for North Tipperary. The site area is in Landscape Character Type (LCT) 6: Farmed Foothills within this LCA. The Strategy states that the design layout for this LCA would broadly follow that prescribed for hilly and flat farmland according to the Wind Energy Guidelines.

The key characteristics of hilly and flat farmland are described in the Guidelines as

- Intensively managed farmland, whether flat, undulating and hilly
- A patchwork of fields delineated by hedgerows varying in size
- Farmsteads and houses are scattered throughout as well as occasional villages and towns
- Roads, telegraph and electrical power lines are significant components
- A working and inhabited landscape type

6.6.1. *Siting and design guidance for hilly and flat farmland (Section 6.9.2 of the Guidelines)*

6.6.1.1 *Location:*

Wind Energy Guidelines Recommendation

Location on ridges and plateaux is preferred, not only to maximise exposure, but also to ensure a reasonable distance from dwellings. Sufficient distance should be maintained from farmsteads, houses and centres of population in order to ensure that wind energy developments do not visually dominate them. Elevated locations are also more likely to achieve optimum aesthetic effect. Turbines perceived as being in close proximity to, or overlapping other landscape elements, such as buildings, roads and power or telegraph poles and lines may result in visual clutter and confusion. While in practice this can be tolerated, in highly sensitive landscapes every attempt should be made to avoid it.

Upperchurch Windfarm Proposal

The turbines are proposed for the more elevated lands on the site to maximise exposure to the available wind regime and to achieve a separation distance from the nearest residences. The turbines are proposed for the elevated areas at Knockmaroe to the west, Grousehall to the north-west, Knocknamena to the north-east and Shevry to the east. Roads, power-lines and houses are generally in the more low lying lands throughout this area. The proposed siting of turbines on the elevated lands will result in the total project being viewed as separate from other landscape elements.

6.6.1.2 *Spatial extent:*

Wind Energy Guidelines Recommendation

Spatial extent: This can be expected to be quite limited in response to the scale of fields and such topographic features as hills and knolls. Sufficient distance from buildings, most likely

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to be critical at lower elevations, must be established in order to avoid dominance by the windfarm.

Upperchurch Windfarm Proposal

The design of the proposed wind farm is in general accordance with all of the design criteria outlined in the Guidelines except that relating to spatial extent. However, in this instance there is clear direction from the North Tipperary County Development Plan that a broader extent of development will be sought in this landscape character area than is provided for in the guidelines for 'Hilly and Flat Farmland'. Furthermore, the fact that the development is relatively dispersed across four elevated areas reduces its intensity, particularly at local receptors where views of discreet clusters of turbines are more commonplace than of the full scheme.

6.6.1.3 Spacing:

Wind Energy Guidelines Recommendation

The optimum spacing pattern is likely to be regular, responding to the underlying field pattern. The fields comprising the site might provide the structure for spacing of turbines. However, this may not always be the case and a balance will have to be struck between adequate spacing to achieve operability and a correspondence to field pattern.

Upperchurch Windfarm Proposal

The turbines are spaced in response to the underlying field patterns which are irregular and undulating and provide the structure for spacing of turbines which must be positioned a minimum separation distance from other turbines, site boundaries and neighbouring residences.

6.6.1.4 Layout:

Wind Energy Guidelines Recommendation

The optimum layout is linear and staggered linear on ridges (which are elongated) and hilltops (which are peaked) but a clustered layout would also be appropriate on a hilltop. Where a wind farm is functionally possible on a flat landscape a grid layout would be aesthetically acceptable.

Upperchurch Windfarm Proposal

It is proposed to position the turbines in clusters on the elevated areas to the west, north-west, north-east and east of the site.

6.6.1.5 Height:

Wind Energy Guidelines Recommendation

Turbines should relate in terms of scale to landscape elements and will therefore tend not to be tall. However, an exception to this would be where they are on a high ridge or hilltop of

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relatively large scale. The more undulating the topography the greater the acceptability of an uneven profile, provided it does not result in significant visual confusion and conflict.

Upperchurch Windfarm Proposal

The proposal is for tall turbines, similar in size to turbines already constructed and permitted in the area, on a series of hills and ridges of relatively large scale comprising complex undulating topography which has a high visual absorption capacity.

6.6.1.6 Cumulative Effect:Wind Energy Guidelines Recommendation

It is important that wind farm development is never perceived to visually dominate. However, given that these landscapes comprise hedgerows and often hills and that views across the landscape will likely be intermittent and partially obscured, visibility of two or more wind farms is usually acceptable.

Upperchurch Windfarm Proposal

The wind farm will be intervisible, to a greater or lesser extent depending on vegetation and undulating topography when travelling through the area, with other planned and permitted wind farms in particular to the south around Hollyford in South Tipperary and to the west at Knockastanna in Co. Limerick.

The cumulative visual impact of the proposed turbines in addition to the permitted and existing wind farms in South Tipperary and East Limerick is illustrated in all of the photomontages in the Landscape and Visual Assessment Chapter 11.

6.6.2. Summary of Siting and design guidelines**Table 1: Matrix Summarising Landscape Character Based Recommendations**

	Location	Spatial Extent	Cumulative Effect	Spacing	Layout	Height
Hills and Flat Farmland	Anywhere	Generally limited to small wind farms	Acceptable depending on appropriate siting and design	Regular	Linear and staggered linear on ridges and clustered on hilltops	Medium typically preferred but tall acceptable

Wind Energy Guidelines Recommendation

It is stated in North Tipperary Wind Capacity Strategy that the proposed site corresponds to the landscape description for Hilly and Flat Farmland in the Guidelines. The siting and design guidelines for this landscape type (summarised in Table 1 above from the Guidelines) are for the location of a wind farm, limited in spatial extent, on ridges and plateaux, above houses and other infrastructural developments. The turbines should be regularly spaced and positioned in a staggered linear layout on ridges and clustered on hilltops. Tall turbines are

Upperchurch Windfarm Environmental Impact Statement

accepted on high ridges and hilltops of large scale and where the topography is complex and undulating. Given that these landscapes comprise hedgerows and often hills and that views across the landscape will likely be intermittent and partially obscured, visibility of two or more wind farms is usually acceptable.

Upperchurch Windfarm Proposal

It is proposed to construct a large wind farm in clusters on elevated sites above houses and infrastructure in the Upperchurch area and the siting and design of the proposal is compatible with the Wind Energy Guidelines. A wind farm of large scale is recommended for this area in the North Tipperary Wind Capacity Strategy. Tall turbines are proposed which will reflect the scale of the receiving landscape and the size of existing turbines. The windfarm will be intervisible when travelling through the area with existing and permitted windfarms to the south. This intervisibility will be intermittent due to roadside vegetation and undulating topography.

6.6.3. *Landscape impact of wind farm construction*

Wind Energy Guidelines Recommendation

(Section 6.10 of the Guidelines)

The process of construction can result in adverse landscape and visual impact due to, for example, temporary structures and materials on site, alterations to drainage, dust, ground compaction, excavation, road construction, soil erosion and mineral leaching, as well as traffic movement.

Upperchurch Windfarm Proposal

The recommendations for the construction phase, as outlined in Section 6.10 of the Guidelines, will be implemented during the construction of the proposed windfarm. Details of construction mitigation measures are contained in Chapter 37 Construction Impacts, of this EIS.

6.6.4. *Landscape impact of associated development*

6.6.4.1 *Section 6.11 of the Guidelines*

Wind Energy Guidelines Recommendation

Guidance is also given in relation to associated development, including substation compounds, access tracks and fencing.

The elements associated with wind farms other than turbines include the roads and tracks, power poles and lines, the control building, the wind measuring mast and compound. Individually and collectively these elements should be considered, located and designed to respect the character of surrounding landscape.

Upperchurch Windfarm Proposal

The character of the surrounding landscape has been considered when deciding the layout of associated development on the windfarm. The sub-station compound is proposed for a low lying area in the centre of the site. All electrical lines between the turbines and the wind farm

Upperchurch Windfarm Environmental Impact Statement

sub-station will be cabled underground. In total c.12km of site roads are required for the development, however one third these roads will be upgraded from existing farm and forestry tracks.

6.6.4.2 Fencing

Wind Energy Guidelines Recommendation

It is recommended that fencing on site should be limited to the sub-station compound.

Upperchurch Windfarm Proposal

The sub-station compound will be fenced according to ESB regulation. There is no requirement for fencing of turbine areas as access can only be gained to the towers through a steel door which is locked at all times. There will be some agricultural fencing erected on site where required by the landowners and any existing fencing along farm boundaries will be restored.

6.6.4.3 Connection to electricity providers

Wind Energy Guidelines Recommendation

It is recommended that power line connections between turbines and from turbines to the control building should be undergrounded and these lines should be interred alongside wind farm access roads in order to minimise habitat and hydrological disturbance. Above ground connections, carried preferably on wooden poles, from the sub-station compound to the national grid are acceptable in all but the most sensitive landscapes. Where practicable, power lines should not cross the horizon at ridge level unless a line already exists. Where passing through a forest, power line connections should follow existing firebreaks or roads. In landscape types where human presence and rectilinear landscape patterns are typical, power line layout can be more flexible.

Upperchurch Windfarm Proposal

The cabling between the proposed turbines and the windfarm sub-station will be undergrounded and interred alongside access road routes whenever possible. The nature and location of the power line or cable from the sub-station to the National Grid will be subject of a separate planning application.

6.6.4.4 Roads/Tracks

Wind Energy Guidelines Recommendation

It is recommended that the extent of new tracks should be kept to a minimum and existing roads should be utilised where possible. Sensitive areas such as archaeological sites should be avoided as far as possible while important features such as streams should be properly bridged or culverted. Crushed stone, sourced locally, is preferred for the road material. Disturbed soil should be levelled and balanced and reseeded or re-sodded whichever is appropriate.

*Upperchurch Windfarm Environmental Impact Statement*Upperchurch Windfarm Proposal

In total there will be 11.6km of windfarm roads, 3.6km of these roads will be along existing farm roads and some forestry roads. These roads will be upgraded to facilitate wind farm construction. There will be 8km of new tracks constructed on site. Prior to the layout of the site roads being finalised, an archaeological assessment was carried out on site and areas of archaeological interest were avoided (see Chapter 12 Cultural Heritage **Figure 12-5 to Figure 12-12**). There is one stream crossings required for the windfarm development, in the east of the site. It will be clear spanned or culverted. (see Chapter 15 Hydrological Impact Assessment). There are six borrow pits identified on site which will be used to quarry stone for the construction. If more stone is required it will be sourced locally. (See Chapter 14 – Geotechnical Assessment Section 14.4.1.3).

6.6.4.5 Turbine ColourWind Energy Guidelines Recommendation

It is recommended that white, off-white or light grey are the most appropriate turbine colour under Irish visibility conditions. Matt, non-reflective finishes should be used on all turbine components.

Upperchurch Windfarm Proposal

The turbines will be painted off white/ light grey. This colour has been found to be the most satisfactory tone for blending with the predominately cloudy/misty conditions of Irish upland sites. Matt non-reflective paints will be used.

6.6.4.6 Turbine MaintenanceWind Energy Guidelines Recommendation

It is recommended that rotors should be kept rotating and counter rotation of blade-sets should be avoided. Any malfunctioning turbines should be repaired or removed together with ancillary structures. Nacelles and towers should be kept clean of leakage from internal fluids.

Upperchurch Windfarm Proposal

Counter rotation of blades will be avoided. The nacelle and tower will be cleaned of any leakage of oil or fluids. The turbines will be maintained by fully trained turbine maintenance technicians and will be kept in good working order.

6.6.4.7 Turbine transformersWind Energy Guidelines Recommendation

It is noted that turbine transformers are relatively small and their visual impact is localised and therefore turbine transformers can be located either within the tower, partially underground or adjacent to the tower and that decisions regarding the location of transformers should be informed by health and safety criteria.

Upperchurch Windfarm Environmental Impact Statement

Upperchurch Windfarm Proposal

The transformers for the turbines planned for the entire windfarm are located within the turbine tower. However if another/newer model is used the location of the transformers will be informed by health and safety criteria.

6.6.5. *Landscape Impact of Wind Farm Operation and Decommissioning*

Wind Energy Guidelines Recommendation

It is recommended that the operability of turbines should be carefully monitored electronically so as to minimise the duration of a static non-functioning blade set, as otherwise visual disharmony could result.

Decommissioning should involve the removal of all of the aboveground elements of the wind energy development and making good of the site, with the possible exception of roads and tracks where some further use can be found for them and this is approved by the planning authority. Foundation pads can be covered with local soil and left for natural re-vegetation.

Upperchurch Windfarm Proposal

The turbines will be monitored remotely on a 24-hour basis and monitored locally by maintenance personnel to ensure that the turbines work as efficiently as possible. A modern wind turbine typically delivers 97% availability i.e. the turbines will be available for production at least 97% of the time. Modern turbines begin to produce electricity at low wind speeds of 3 – 4 m/sec.

In the event of the decommissioning of the wind farm, all the above-ground elements can be removed and the access tracks and foundation pad covered in soil and re-seeded if required. The decommissioning proposals for turbines are contained in Chapter 3 Section 3.6.

6.7. CHAPTER 7 OF THE GUIDELINES: PLANNING CONDITIONS

Chapter 7 presents guidance to the planning authority on matters that may be appropriately dealt with by the inclusion of conditions on a planning permission for wind energy development.

The subject application is examined in the previous Chapter of this EIS in the context of North Tipperary County Development Plan policy on wind energy developments.

6.8. CONCLUSION

The siting, design (both technical and aesthetic) and layout of the proposed Upperchurch windfarm was developed having regard to the Department of Environment, Heritage and Local Government Wind Energy Guidelines (2006).

REFERENCE DOCUMENTS

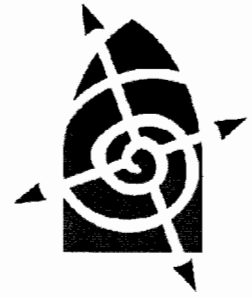
Upperchurch Windfarm Enviromental Impact Statement

REFERENCE DOCUMENTS

Upperchurch Windfarm Enviromental Impact Statement

APPENDIX 6-I: COPY OF PRE-PLANNING MEETING (PPC-4495)

Comhairle Contae Thiobraid Árann Thuaidh
North Tipperary County Council



Telephone (067) 44652
 Fax (067) 44654
 E-mail planning@northtippcoco.ie

Planning Section
 Civic Offices,
 Limerick Road, Nenagh,
 Co. Tipperary.

Our Reference
PPC/4495

Your Reference

Date
7th March, 2012

Re: Pre-Planning Consultation

Proposed development at Knocknamena, Shevry, Knockmaroe & Foilnamon

Dear Sir/Madam,

The Planning Authority is required to keep a written record of consultations in relation to proposed development in accordance with Section 247 of the Planning & Development Act 2000 – 2002.

Attached are details kept in relation to your pre-planning consultation **received on 06/02/2012. Please refer to response on Page 2.**

Your pre-planning Ref No. is **PPC/4495**. If you make a planning application you will require this information to answer Question 18 on the Application Form.

If you have any queries in relation to same, please do not hesitate to contact this office on 067 44655 **(between the hours of 9.30 a.m. and 4.00 p.m.)**

Yours faithfully,

Ann-Marie O'Flaherty

for Director of Services.

**Pat Brett,
 Ecopower Developments,
 Sion Road,
 KILKENNY.**

*Upperchurch Windfarm Environmental Impact Statement***North Tipperary County Council
Planning Section****CONSULTATION IN RELATION TO PROPOSED DEVELOPMENT**

1. Name: Pat Brett	1a. Name of Land Owner: Ecopower Developments
2. Postal Address: Ecopower Developments Sion Road, Kilkenny	2a. Land Owner's address: Sion Road, Kilkenny
3. Phone: 056-7750140	Mobile: 086-8241542
4. Nature and Extent of Proposed Development: Windfarm Development	
5. Location of proposed development (include Townsland): Knocknamena, Shevry, Knockmaroe & Foilnamon	
6. Details of nature of query: Pre-planning meeting	
7. Current or previous Planning Ref. (if any): none	

N.B: Please attach appropriate site location map to a scale of 1:10560 (6":1mile) or relevant extract from 1:50,000 Ordnance Survey and photographs showing the context of the site i.e. adjacent land/buildings and general topography (if rural), and landholding of land owner.

Note: Please complete and return this form to: Planning Section, North Tipperary County Council, Civic Offices, Nenagh, Co. Tipperary. 067 - 44652 planning@northtippcoco.ie

As soon as we receive this completed form, it will be assessed by the relevant Planner to determine the appropriate method of dealing with the consultation query, i.e. by telephone or by written report or by pre-arranged appointment. You will be contacted in the appropriate format as soon as possible. **It is essential that as much information as possible is submitted to enable the consultation to be of benefit to you.**

North Tipperary County Council, pursuant to Section 247 of the Planning and Development Act, 2000, holds consultations with interested parties who may wish to make a planning application for a development in the Council's functional area. North Tipperary County Council as Planning Authority will keep a record of any such consultations, which will be a matter of public record. The carrying out of such consultations shall not prejudice the performance by the Planning Authority of any other of its functions under the above Act, or any Regulations made under the above Act, and cannot be relied upon in the formal planning process or in legal proceedings

8. For Office Use Only:		(d) Dealt with by report on _____
(a) Will Part V apply	Yes <input type="checkbox"/> No <input type="checkbox"/>	(e) Date of appointment: 5.3.12
(b) Allocated Planner:	FW	(f) Time of appointment: 3.00pm
(c) Dealt with by phone on:	_____	(g) PPC Ref. No. 4495

Refer to relevant County Development Plan policies and standards in respect of wind farm development as well as the County Landscape Character Assessment as well as the Wind capacity Strategy

- Prior to the submission of a planning application you may wish to submit more details of the project including some photomontages etc as well as summarizing the main issues etc to be covered in the intended EIS and extent of the NIS.

HH Wright EP.

06/03/12

APPENDIX 6-II TELECOMMUNICATIONS IMPACT STUDY

Appendix 6-II A
**Communications Impact Study with preliminary
layout**

Report

Appendix 6-II

Upperchurch Wind Farm


Telecommunications Impact Study

Company: Ai Bridges - Telecommunication Consultants

Author: D. McGrath.

Approved for Release: Rev 3.0 David McGrath **Date:** 04/09/12

Document Filename: *Upperchurch Wind Farm Communications Impact Study*

	Procedure: 001	Rev: 3.0
Title: Upperchurch Communications Impact Study	Approved: DM	Date: 04/09/2012

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REFERENCE DOCUMENTS

Upperchurch Windfarm Enviromental Impact Statement

Appendix 6-II Telecommunications Impact Study

Communications Impact Study

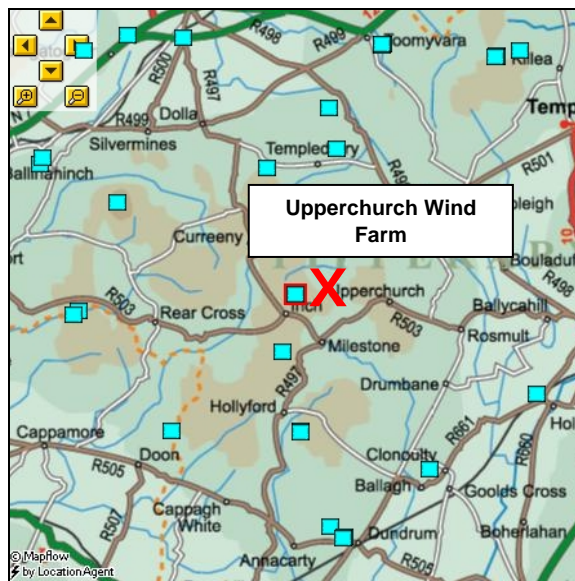
with preliminary layout

1. INTRODUCTION

In this report we evaluate the possible effects that the proposed wind farm development at Upperchurch could have on existing communications networks. The requirement was to identify any communications infrastructure that may be impacted by the development through telecom operator consultations and field & desktop studies.

Methodology:

A selection of communications site coordinates obtained during desktop & site surveys, as well as inputs from various operators \ service providers were converted from Irish National grid (Easting and Northing in meters) to degrees minutes seconds format and then imported into a radio planning tool. This provides a means of graphically showing the sites in the vicinity relative to the proposed wind farm. The possible impact to communications infrastructure near the development can then be assessed. Figure 1 below shows that there are 18 communication sites in the vicinity of the Upperchurch development. Following consultations with telecom operators, it was found that only one communications site (Knockmaroe) would be impacted by the wind farm. Communications equipment on the other sites are not impacted by the proposed development.



2. WIND FARM DEVELOPMENT DETAILS

The proposed wind farm development at Upperchurch is located west of the village of Upperchurch in County Tipperary. The report is based on a wind farm proposal consisting of 23 turbines with a maximum hub height of 85 meters and a maximum rotor diameter of 90 meters.

Number of Turbines	Max Hub Height	Max Rotor Radius	Max Tip Height
23	85m	45m	126.6m

Table 1. Upperchurch Wind Farm Turbine Details

The location of Upperchurch wind farm is shown below in Figure 2. The co-ordinates of the proposed turbines are listed in Appendix A.

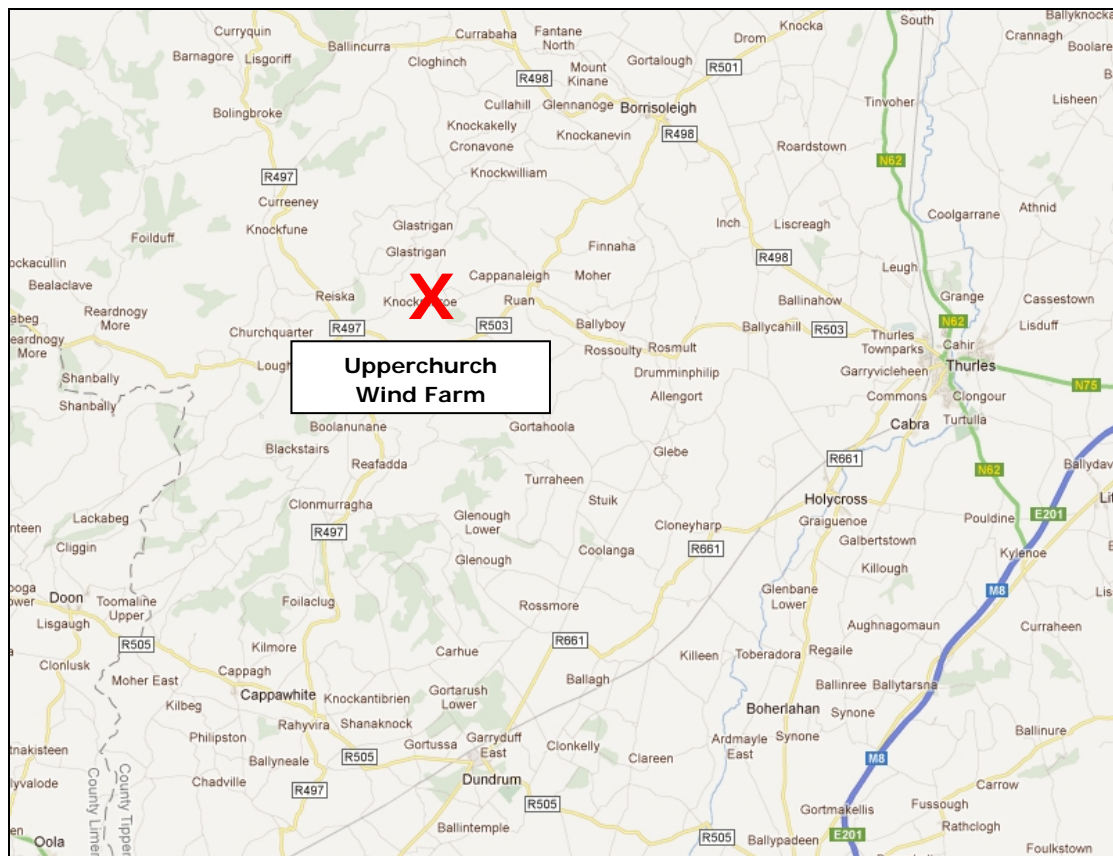


Figure 2. Location of Upperchurch Wind Farm.

3. TELECOM OPERATOR CONSULTATIONS

To establish if communication infrastructure could be impacted by the proposed wind farm development, consultations with telecom operators in the area were undertaken. Table 2 lists the operators and the relevant departments contacted. The responses received from each of this operator are presented in Section 3.1

Operator	Division / Department
Three Ireland	BT Global (Ireland), Transmission Planning
Eircom	Radio Division
Meteor	Mobile Communications
O2	Telefonica O2 (Ireland), Network Delivery
Tetra Ireland	Tetra Ireland
RTE NL (RTÉ Transmission Network Limited)	RTE Radio Planning
Vodafone	Vodafone Ireland, Team South, Access Engineering
Munster Broadband	Munster Broadband Network Operations

Table 2. Telecom Operators Consulted.

3.1 Telecom Operator Responses

Sections 3.1.1 to 3.1.8 that follow, present the telecom operator responses to consultations regarding their communications infrastructure in the vicinity of the wind farm development at Upperchurch.

3.1.1 Three Ireland Response to Consultations

Three Ireland provided the following email response to consultations:

*“The turbine that is causing concern for 3 Ireland is UCT9. This is approximately 150m away from the site *TP Foilnahan Tower . Whilst the impact of the proposed location of UCT9 is not ideal, it is not detrimental to the 3 Ireland **RF network.*

However if the location of UCT9 changes in any way we would like to be consulted on this.”

** Three Ireland refer to the site at Knockmaroe as “TP Foilnahan Tower”*

*** RF network: Radio Frequency network*

3.1.2 Eircom Response to Consultations

Eircom provided the following email response to consultations:

"I have checked the proposed turbine layout below and I can confirm that there is no conflict with the eircom microwave network."

Turbine ID	Easting	Northing
UCT1	194900	158957
UCT2	195136	159283
UCT3	195513	159435
UCT4	195885	159645
UCT5	196409	160330
UCT6	196015	160391
UCT7	196080	160032
UCT8	193386	160635
UCT9	193455	161035
UCT10	193558	162082
UCT11	195614	160417
UCT12	196559	161625
UCT13	196105	161649
UCT14	196409	161953
UCT15	196251	162315
UCT16	196692	162277
UCT17	197203	162448
UCT18	197224	162824
UCT19	196830	162616
UCT20	193023	160374
UCT21	193537	161812
UCT22	194615	160329
UCT23	193671	161365

3.1.3 Meteor Response to Consultations

Meteor provided the following email response to consultations:

*"I've looked at this proposal (co-ords below) and it will cause no issues for the Meteor
TXN network."

Turbine ID	Easting	Northing
UCT1	194900	158957
UCT2	195136	159283
UCT3	195513	159435
UCT4	195885	159645
UCT5	196409	160330
UCT6	196015	160391
UCT7	196080	160032
UCT8	193386	160635
UCT9	193455	161035
UCT10	193558	162082
UCT11	195614	160417
UCT12	196559	161625
UCT13	196105	161649
UCT14	196409	161953
UCT15	196251	162315
UCT16	196692	162277
UCT17	197203	162448
UCT18	197224	162824
UCT19	196830	162616
UCT20	193023	160374
UCT21	193537	161812
UCT22	194615	160329
UCT23	193671	161365

* TXN : Transmission Network

3.1.4 Telefonica O2 Response to Consultations

O2 provided the following email response to consultations:

"I'm happy to report that this proposed development will not affect any of our microwave links in the area. Please see attachment with the nearest transmission path marked in green."



Figure 3. O2 Communication links in the vicinity of the proposed development.

3.1.5 RTE NL Response to Consultations

RTE NL provided the following email response to consultations:

“Do you know who will be considering the potential impact on TV reception in the area? If so could you forward me their contact details so I can consult with them.

There should be no impact to any RTÉ NL links in the area.”

Note: RTE NL have been informed that Ai Bridges will be considering the potential impact on TV reception in the Upperchurch area.

3.1.6 Tetra Ireland Response to Consultations

Tetra Ireland provided the following email response to consultations:

“Based on the information provided this development does not cause us any network/coverage problems”

Upperchurch Windfarm, County Tipperary

Turbine ID	Easting	Northing
UCT1	194900	158957
UCT2	195136	159283
UCT3	195513	159435
UCT4	195885	159645
UCT5	196409	160330
UCT6	196015	160391
UCT7	196080	160032
UCT8	193386	160635
UCT9	193455	161035
UCT10	193558	162082
UCT11	195614	160417
UCT12	196559	161625
UCT13	196105	161649
UCT14	196409	161953
UCT15	196251	162315
UCT16	196692	162277
UCT17	197203	162448
UCT18	197224	162824
UCT19	196830	162616
UCT20	193023	160374
UCT21	193537	161812
UCT22	194615	160329
UCT23	193671	161365

3.1.7 Vodafone Response to Consultations

Vodafone provided the following email response to consultations:

*“T9 and T23 pose a threat to services on the Vodafone Network and if possible should be considered for relocation to ensure an acceptable *perpendicular threshold distance of at least 75m.”*

The graphic below was also provided by Vodafone Ireland and shows that they have one microwave radio link that traverses the wind farm. Vodafone refer to this link as link “TY013TY024”.

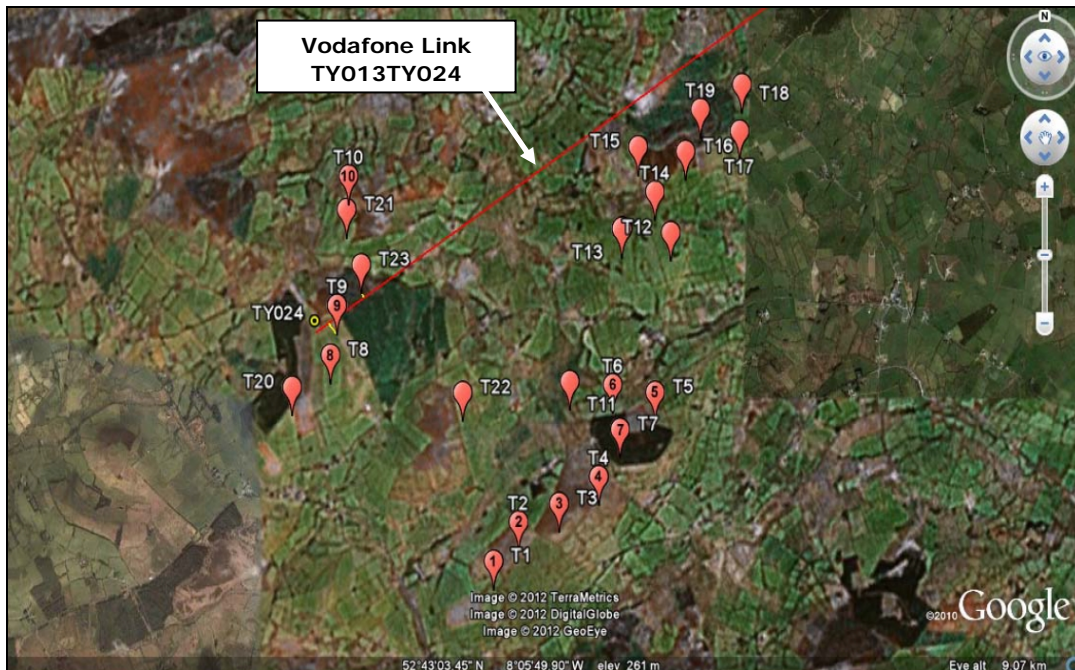


Figure 4. Vodafone Link TY013TY024 relative to the turbines at Upperchurch

**The “perpendicular threshold distance” referred to by Vodafone is the buffer or clearance distance between the turbine blade tip and the microwave radio link Fresnel Zone. See Figure 18 Section 6.1.1.1*

3.1.8 Munster Broadband Response to Consultations

To date, a final response from Munster Broadband regarding the Upperchurch wind farm development has not been received.

4. FIELD SURVEYS

Results from telecom operator consultations found that one communications site would be impacted by the proposed development. This communications site is located on Knockmaroe Hill and is shown below relative to the proposed turbines in Figure 5.

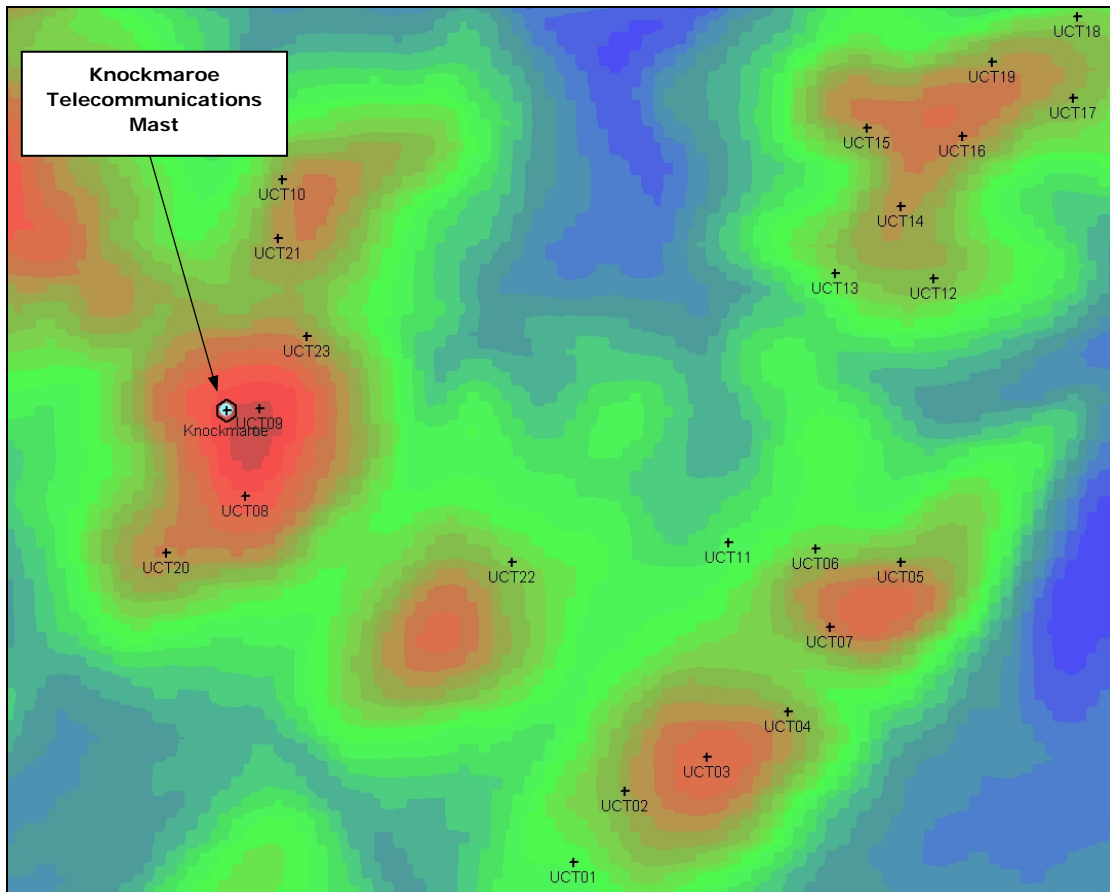


Figure 5. Knockmaroe Communications Mast near to the proposed Upperchurch wind farm development.

Field surveys of this site were carried out to identify the communications equipment that could be impacted by the proposed turbines. During the field survey, approximations of radio antenna size, bearing and height were made for the communications equipment installed on the mast. With this information, it was possible to assess if any of the turbines at Upperchurch would impact the communications infrastructure at Knockmaroe.

Section 4.1 that follows details the findings from the field surveys of the Knockmarore Telecoms Mast.

4.1 Telecommunications Mast at Knockmaroe

The field survey of the telecommunications mast at Knockmaroe found four types of communications equipment installed on the mast. A description of the equipment types are listed in Table 2 below.

Equipment Type	Description
Licensed Microwave Radios	This type of radio requires a frequency license (obtained from ComReg) to operate. Licensed Microwave Frequencies typically range from 7GHz to 38GHz.
Unlicensed Microwave Radios	This type of radio is permitted (by ComReg) to operate in the ISM 5.8 GHz radio band. Radio operators do not need a license from ComReg to used radio equipment in this frequency band.
GSM Panels	GSM panels are used to distribute GSM communications from the site to the mobile phone users.
3G Panels	3G panels are used to distribute 3G communications from the site to the mobile phone users.

Table 2. Equipment types installed at Knockmaroe mast

A large radio antenna is also installed at this communications site; however this radio is no longer in use and will not be impacted by the proposed turbines (Figure 6).

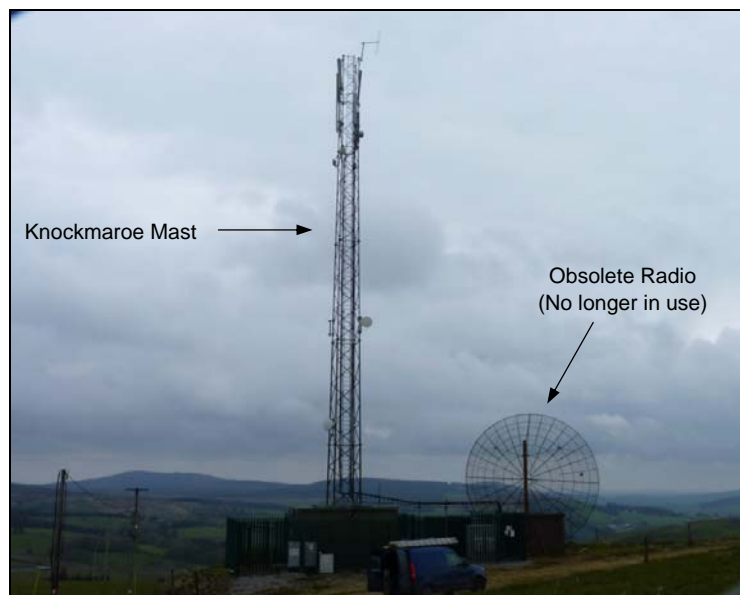


Figure 6. Telecommunications Mast at Knockmaroe

As the turbines at Upperchurch are positioned in a bearing range between 0° and 225° relative to the mast at Knockmaroe, the field survey focused on communications equipment which are aligned in this bearing range. Sections 4.1.1 and 4.1.2 that follow, present the communication equipment observed with alignments in this range.

4.1.1 Licensed & Unlicensed Microwave Radios at Knockmarore

Figure 7 below shows the Licensed & Unlicensed microwave radio equipment with bearing alignments that traverse the proposed wind farm (i.e. between 0° and 225°).

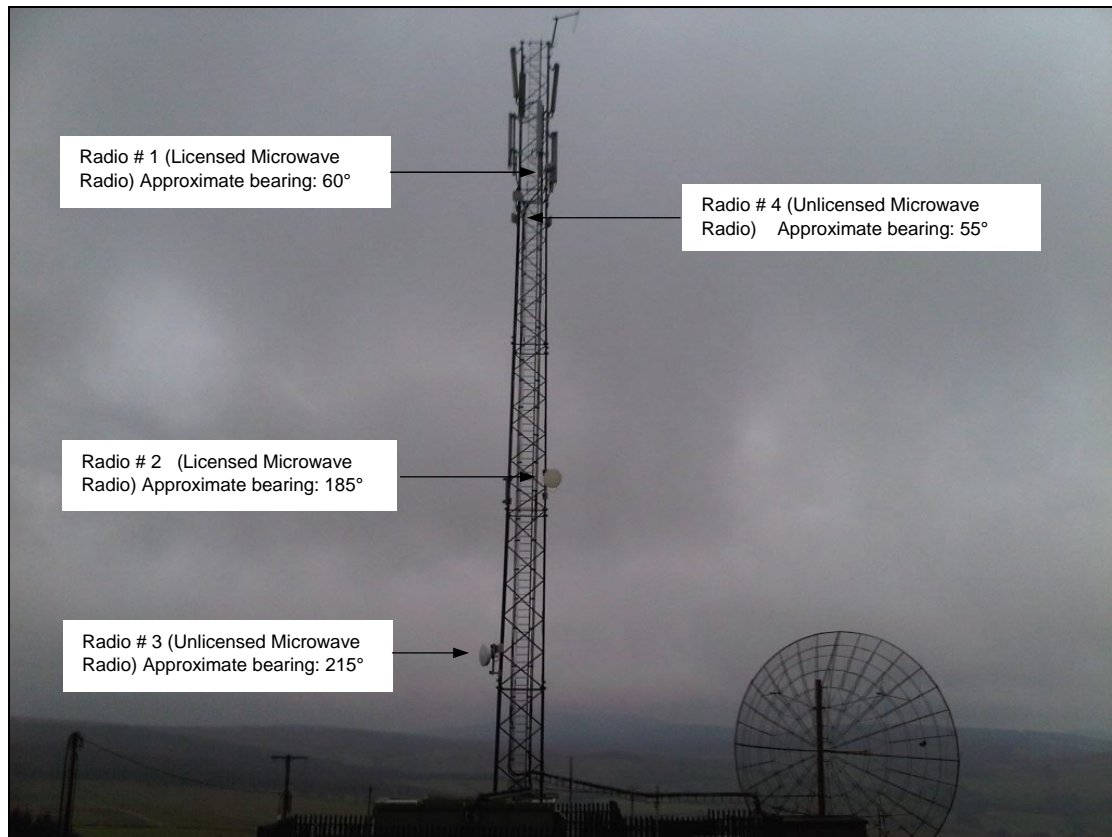


Figure 7. License & Unlicensed Microwave Radio Links at Knockmaroe mast.

Table 3 below, tabulates the microwave radio equipment at Knockmaroe and lists the bearing for each of the microwave radios. The telecom operators of each of these radios have been identified and are also shown in the table.

Microwave Radio ID	Licensed or Unlicensed	Telecoms Operator	Radio Bearing *
Radio # 1	Licensed	Vodafone	60°
Radio # 2	Licensed	Three Ireland	187°
Radio # 3	Unlicensed	Munster Broadband	215°
Radio # 4	Unlicensed	Munster Broadband	55°

Table 3. Licensed & Unlicensed radio equipment at Knockmaroe mast (0°- 225°).

* Approximate bearings recorded during field survey.

4.1.2 GSM & 3G Panels at Knockmaroe Mast

During the field survey, two sets of radio panels (3 panels per set) were observed at Knockmaroe. The first set belongs to Vodafone and are GSM panels which are used to provide GSM network coverage for Vodafone's end customers. The second set belongs to Three Ireland and are 3G panels which are used to provide 3G network coverage for Three Ireland's end customers.

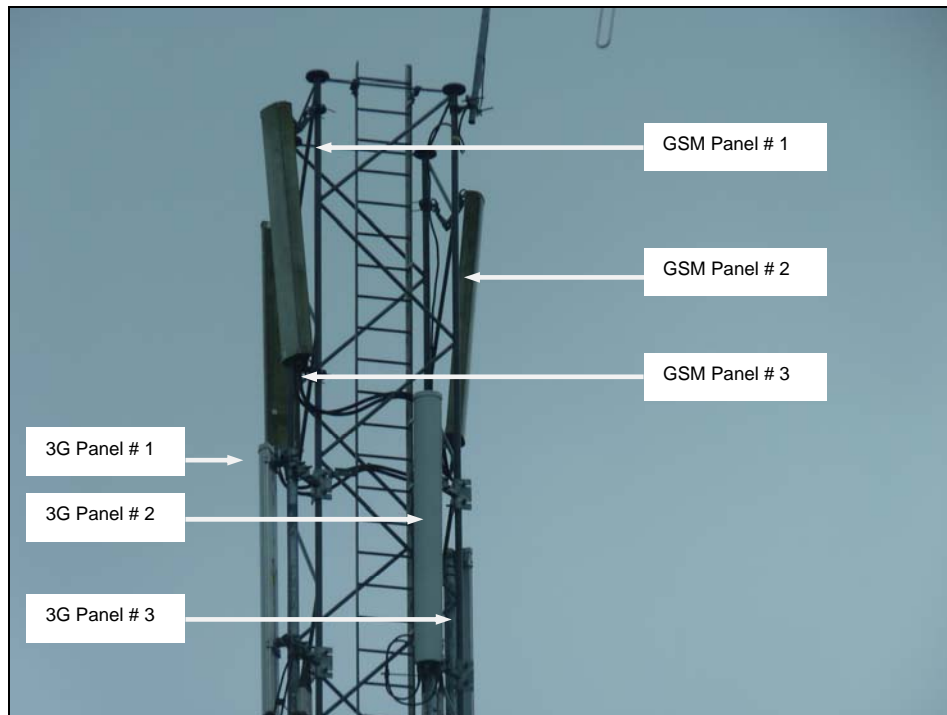


Figure 8. GSM & 3G Panels at Knockmaroe Mast

Wind turbines do not affect the operation of GSM technologies and the proposed wind farm development will have no impact on the operation of Vodafone's GSM panels. In some instances wind turbines can impact 3G network equipment operation; however Three Ireland's response to consultations stated that the proposed turbines are not detrimental to their network, thus no further analysis of GSM or 3G is carried out.

5. DESKTOP SURVEY AND ANALYSIS

To determine the microwave radios (licensed & unlicensed) that could be impacted by the Upperchurch development, each radio listed in Table 3 was plotted in radio planning software. From the results, it is possible to assess if the radios will or will not be impacted by the turbines. As the GSM and 3G services at Knockmaroe will not be impacted, a desktop analysis for these technologies is not required.

5.1 Licensed & Unlicensed Microwave Radios

Sections 5.1.1 to 5.1.4 below presents the finding of the desktop survey for each of radios listed in Table 3.

5.1.1 Radio # 1 Desktop Analysis

During the consultation process this radio was identified as one end of the Vodafone licensed microwave radio link between Knockmaroe and Knocknahaney, Borrisoleigh. The Vodafone reference ID for this link is “TY013TY024” (See section 3.1.7). This microwave radio link has been plotted in radio planning software and is shown below in Figure 9.

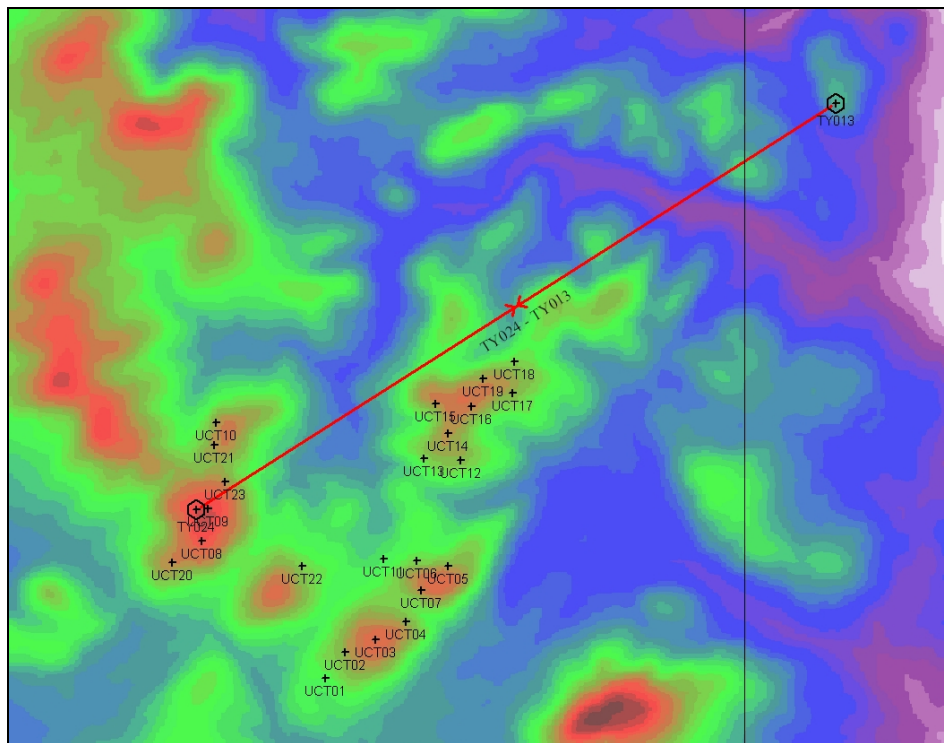


Figure 9. Vodafone's Licensed Microwave Radio Link “TY013TY024” – Radio # 1

Figure 10 below show turbines UCT09 and UCT23 relative to Vodafone's microwave link “TY013TY024”. Around the centerline of the microwave radio link the *2nd Fresnel

Zone has also been plotted. The Fresnel Zone is an area which encapsulates the centerline of a microwave radio. Obstructions in this area can impact the operation of a microwave radio link. The Fresnel Zone of every microwave radio link is different and is dependent on the microwave radio link frequency and link distance.

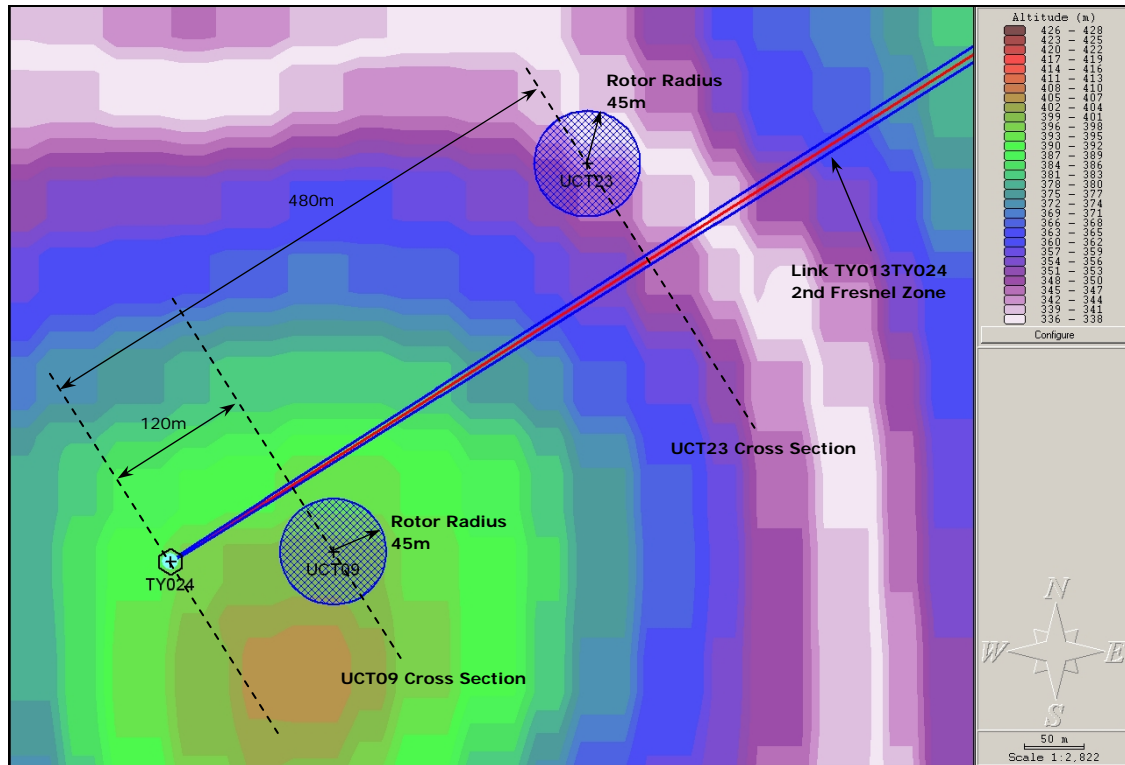


Figure 10. Turbines UCT09 & UCT23 Microwave Radio Link “TY013TY024” – Radio 1

In Sections 5.1.1.1 and 5.1.1.2 the clearance distances of turbines UCT09 and UCT23 to the microwave radio link “TY013TY024” are examined. To calculate the worse-case-scenario clearance distances, the 2nd Fresnel Zone of the microwave link has been used.

* Every microwave radio link has multiple Fresnel Zones (1st Fresnel Zone, 2nd Fresnel Zone, 3rd Fresnel Zone, etc). In radio frequency analysis, it is normal to use the 1st Fresnel Zone in radio interference calculations; however the 2nd Fresnel Zone is sometimes used to provide worse-case-scenario results as it encompasses a larger area around the centerline of the microwave link.

5.1.1.1 Turbine UCT09

Figure 11 below shows a close-up view of Turbine UCT09 relative to the microwave radio link's 2nd Fresnel Zone.

To calculate the actual clearance distance between the turbine rotor tip and the 2nd Fresnel Zone, the vertical height of the turbine rotor and the microwave radio link centerline should be considered. It is also important that the heights used in the clearance calculations are obtained from the appropriate cross-section along the microwave radio link (Cross-section UCT09 in this case – See figure 12).

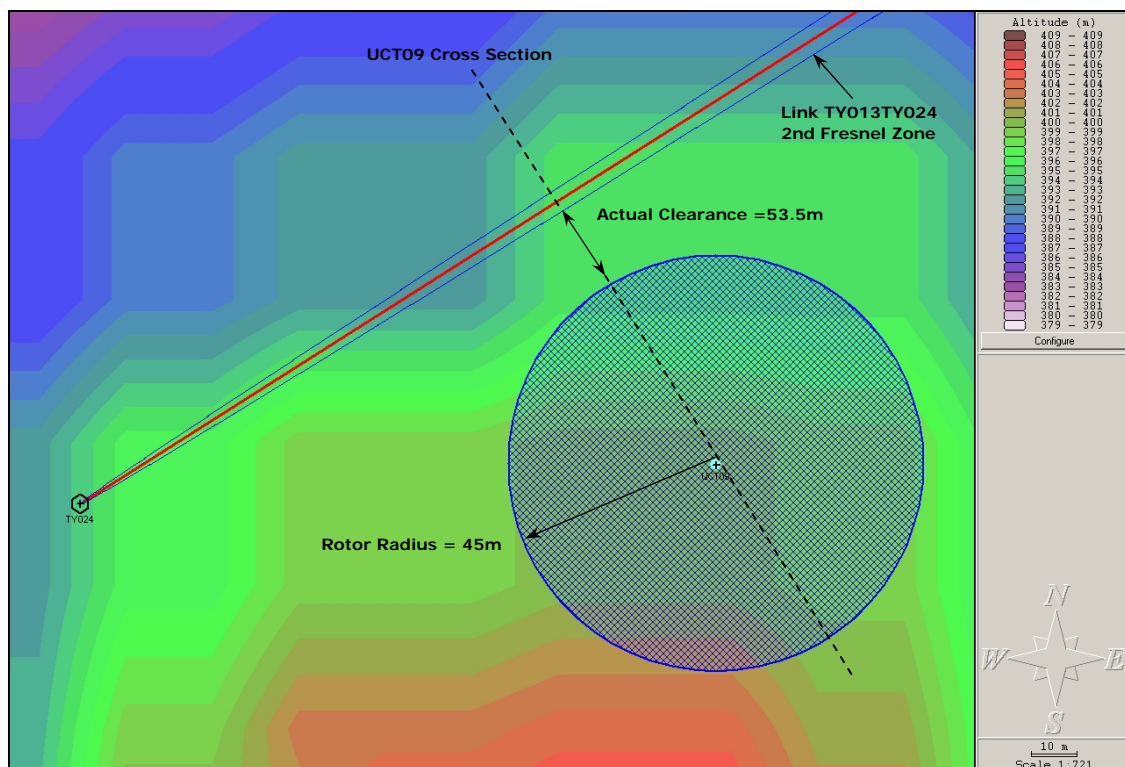


Figure 11. Close-up view of Turbine UCT09 relative to Microwave Radio Link “TY013TY024” – Radio 1

Figure 12 below shows the parameters that have been used to calculate the actual clearance between turbine UCT09 and the 2nd Fresnel Zone of the microwave radio link. The radio engineers who conducted these calculations (Ai Bridges Ltd.) consider that the **Actual Clearance** distance is **50m**. This distance is sufficiently far that the operation of this microwave radio link will not be impacted.

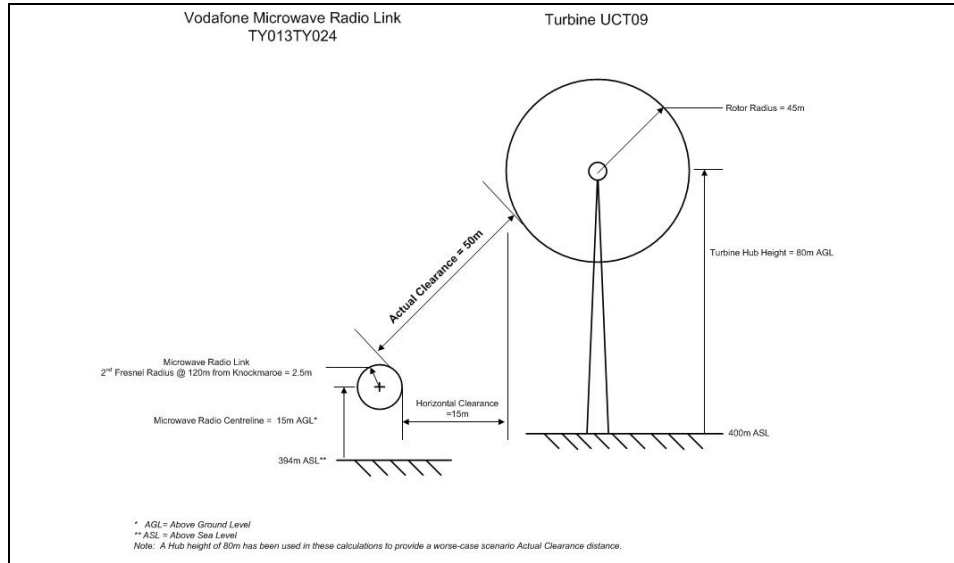


Figure 12. UCT09 Cross section view showing Actual Clearance distance.

5.1.1.2 Turbine UCT23

Figure 13 below shows a close-up view of Turbine UCT23 relative to the microwave radio link's 2nd Fresnel Zone.

To calculate the actual clearance distance between the turbine rotor tip and the 2nd Fresnel Zone, the vertical height of the turbine rotor and the microwave radio link centerline should be considered. It is also important that the heights used in the clearance calculations are obtained from the appropriate cross-section along the microwave radio link (Cross-section UCT23 in this case – See figure 14).

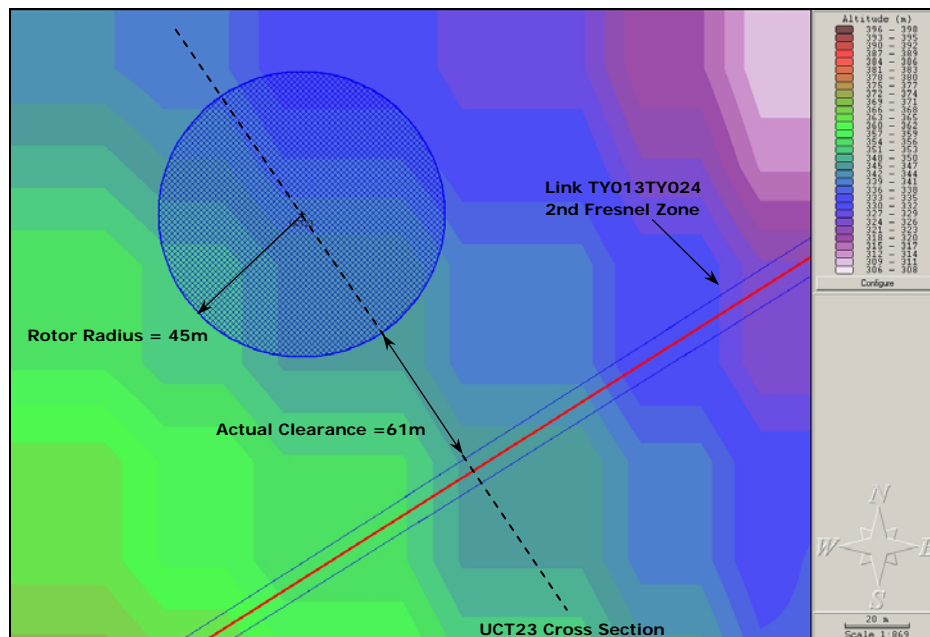


Figure 13. Close-up view of Turbine UCT23 relative to Microwave Radio Link "TY013TY024" – Radio 1

Figure 14 below shows the parameters that have been used to calculate the actual clearance between turbine UCT23 and the 2nd Fresnel Zone of the microwave radio link. The radio engineers who conducted these calculations (Ai Bridges Ltd.) consider that the **Actual Clearance** distance is **55m**. This distance is sufficiently far that the operation of this microwave radio link will not be impacted.

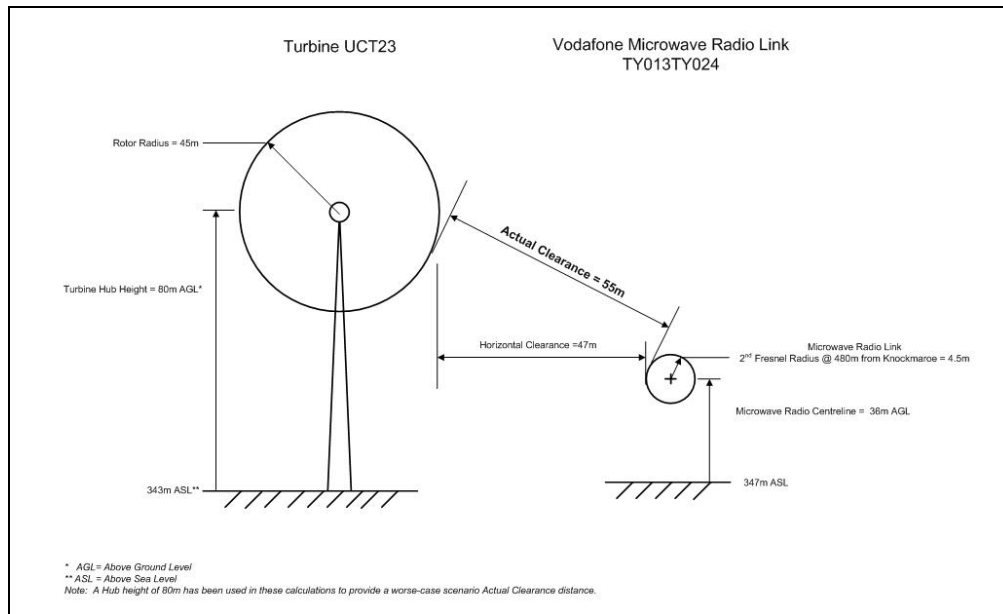


Figure 14. UCT23 Cross section view showing Actual Clearance distance.

5.1.2 Radio # 2 Desktop Analysis

During the consultation and field survey processes this radio was identified as one end of a licensed microwave radio link belonging to Three Ireland.

The nearest turbine to the centerline of this microwave radio link is turbine UCT08 and is a distance of more than 130m (This distance has been calculated using the same radio modeling software as described in Section 5.1.1). This distance is sufficiently far that that this licensed microwave radio link will not be impacted, thus further analysis of this link is not required.

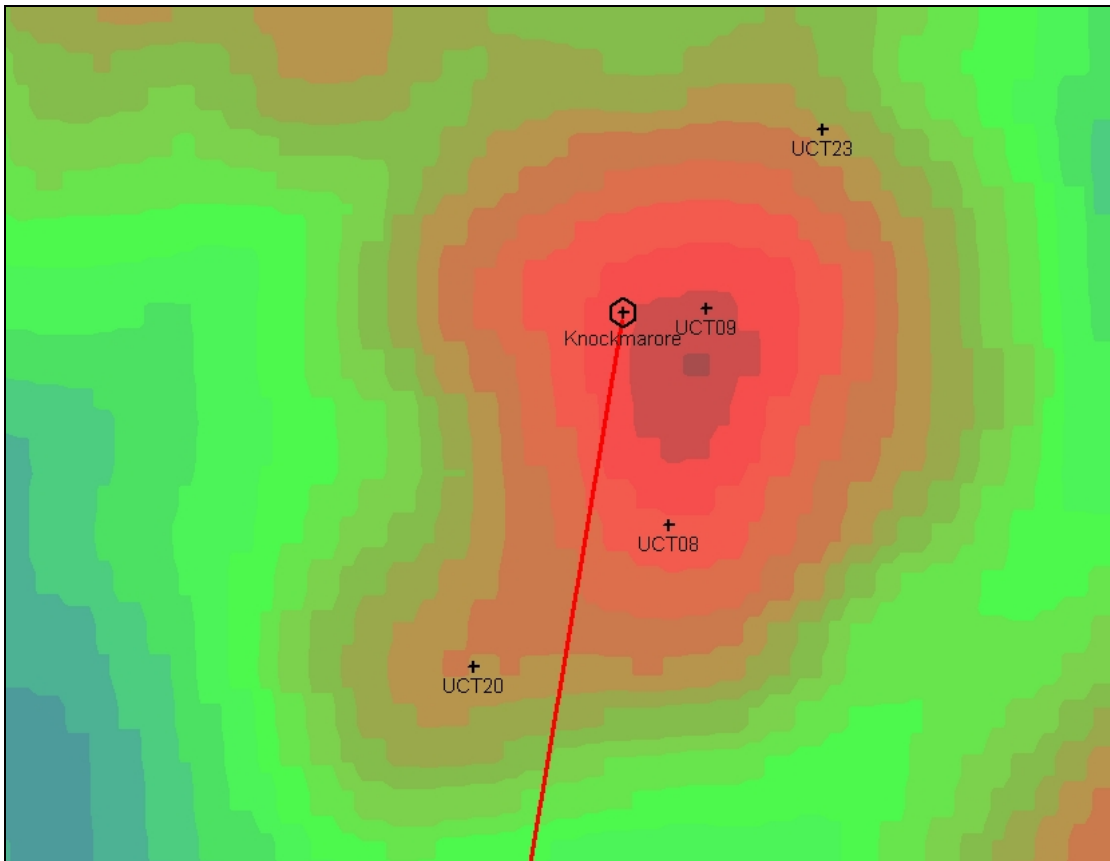


Figure 15. Three Ireland's Licensed Microwave Radio Link – Radio # 2

5.1.3 Radio # 3 Desktop Analysis

During the consultation process the owner of this unlicensed microwave radio was identified as Munster Broadband. This operator has not yet provided the details of the receiving end of this microwave radio link; however, the bearing of this radio was recorded as 215° during the field survey of Knockmaroe. For assessment purposes, a radio link on this bearing has been plotted in radio planning software and is shown below in Figure 16. Turbine UCT20 is more than 150m from the centerline of this microwave radio link (This distance has been calculated using the same radio modeling software as described in Section 5.1.1). This distance is sufficiently far that that this unlicensed microwave radio link will not be impacted, thus further analysis of this link is not required.

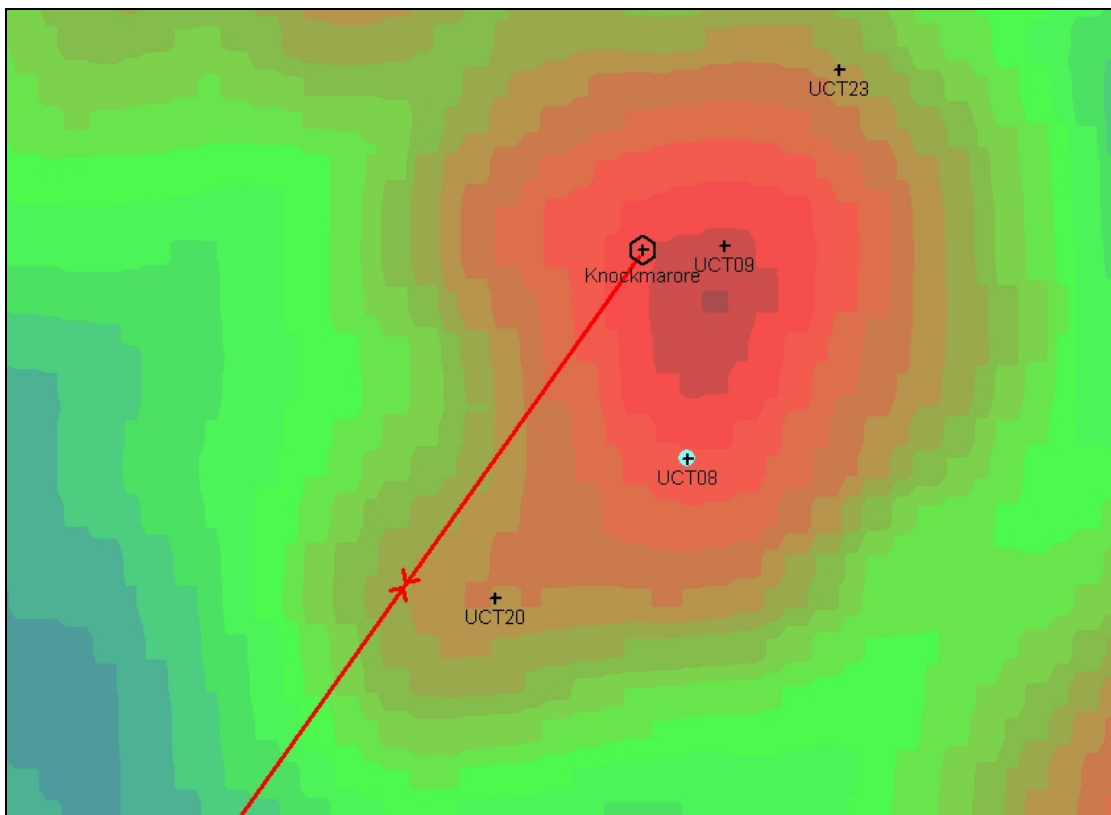


Figure 16. Munster Broadband's Unlicensed Microwave Radio # 3

5.1.4 Radio # 4 Desktop Analysis

During the consultation process the owner of this unlicensed microwave radio was identified as Munster Broadband. This operator has not yet provided the details of the remote end of this microwave radio link; however during the field survey the bearing of this radio was recorded as 55°. For assessment purposes, a radio link on this bearing has been plotted in radio planning software and is shown below in Figure 17. Turbine UCT23 is 74m from the centerline of this radio link (This distance has been calculated using the same radio modeling software as described in Section 5.1.1). From our analysis, this turbine is sufficiently far away that the operation of this unlicensed microwave radio link will not be impacted, thus further analysis of this link is not required.

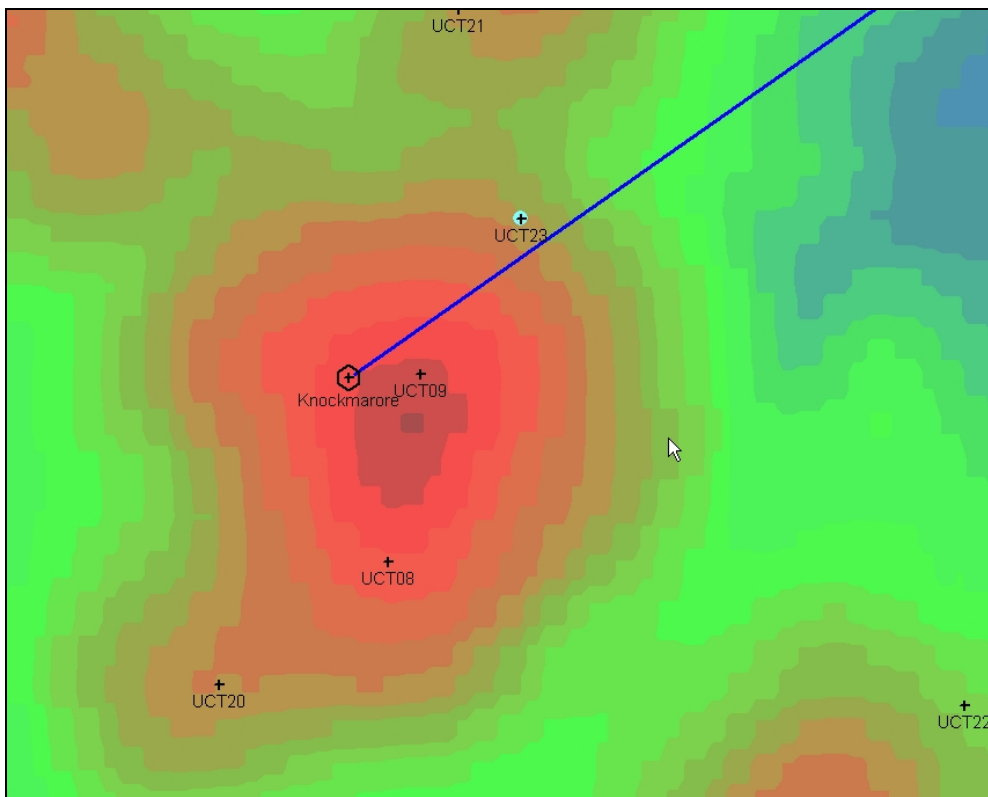


Figure 17. Munster Broadband's Unlicensed Microwave Radio # 4

6 TELECOMS MITIGATION MEASURES

As mentioned earlier in this report, the telecommunications site at Knockmaroe Hill is owned by one of the farmers involved in the Upperchurch wind farm development. The site owner informed the mast operator that they could put up a mast if it did not affect his involvement in the wind farm project. This information should be noted when considering if mitigation measures are necessary.

Section 6.1 below describes the mitigation measures available to the wind farm developer to offset the impact of the turbines on telecoms services in the Upperchurch area.

6.1 Telecoms Mitigation Measure Solutions

This report has found that no microwave radio links will be impacted by the proposed turbines at Upperchurch. Although Vodafone have raised concerns about the position of two turbines, desktop analysis shows that all turbines are sufficiently far away from Vodafone licensed microwave radio link. However for completeness, Section 6.1.1 below shows a mitigation solution which could be implemented in the event that the microwave radio link is impacted.

6.1.1 Provision of Relay Site

An option of offset the impact of turbines on any affected licensed microwave radio link would be to provision a relay site so that an alternative radio path could be used for communications to/from the Knockmaroe mast.

Turbines can be used as relay sites and Figure 20 below shows that turbine UCT21 would be an ideal site to relay the Vodafone microwave radio link to/from the Knockmaroe mast. Using turbine UCT21 as a relay site would eliminate any impact on Vodafone's link TY013TY024 due to turbines UCT09 or UCT23.

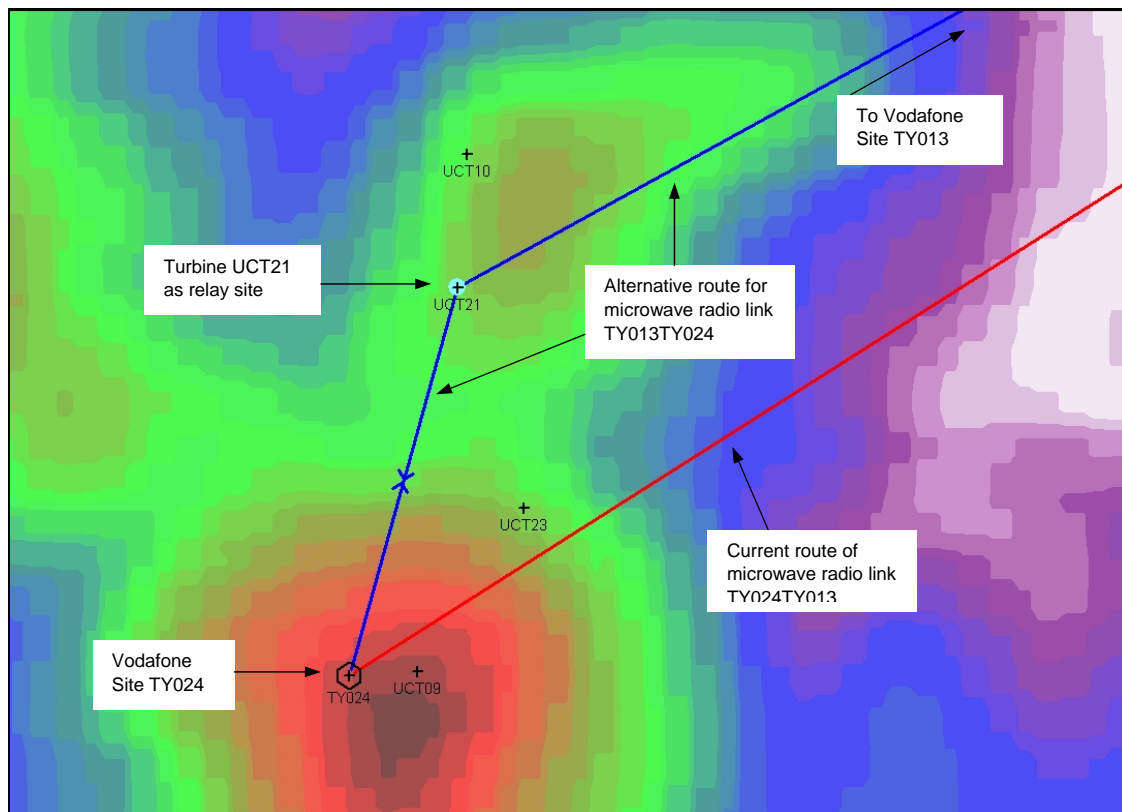


Figure 18. Turbine UCT21 as relay site for Vodafone link TY013TY024

7 CONCLUSIONS

Following the field / desktop surveys and the consultation responses from telecom operators the following conclusions have been made:

- i) With the exception of Munster Broadband, consultation responses have been received from each of the telecom operators contacted. From the findings of this study the Munster Broadband communications equipment will not be impacted by the turbines and further consultations with this telecoms operator are not necessary.
- ii) From the findings in this report no licensed or unlicensed microwave radio links will be impacted by the Upperchurch turbines. Although Vodafone have highlighted concerns about two turbines (UCT09 & UCT23) in relation to one of their licensed microwave radio links (TY013TY024), desktop analysis has shown that in the opinion of the Radio Engineers (Ai Bridges Ltd), the actual clearance distance between these turbines and the microwave radio link is sufficiently far that the operation of the link will not be impacted. Table 4 below shows the Actual Clearance distance between the two turbines and the 2nd Fresnel Zone of Vodafone's licensed microwave radio.

Turbine	Actual Clearance from Vodafone licensed microwave link TY013TY024
UCT09	50m
UCT23	55m

Table 4. Actual Clearance Distances

- iii) Vodafone has a GSM service operating from Knockmaroe mast, however turbines do not impact GSM services and the development at Upperchurch should have no impact on the Vodafone GSM network. Three Ireland has a 3G service operating from the mast at Knockmaroe. In some instances wind turbines can impact 3G services; however Three Ireland's response to consultations stated that the proposed turbines are not detrimental to their network.
- iv) Wind turbines can impact TV transmission networks and in their response to consultation RTE NL asked who will be considering the potential impact on TV reception in the area. RTE NL has been informed that Ai Bridges will be considering the potential impact on TV reception. RTE NL has also stated that the wind farm development will not impact any of their microwave radio links.
- v) Tetra Ireland have confirmed that there will be no impact to the Tetra network due to the turbines at Knockmaroe.

8 RECOMMENDATIONS

Following the results from, telecom operator consultations, field surveys and network analysis, the following recommendations have been made:

- i) The findings in this report show that none of the Upperchurch turbines will impact Vodafone's licensed microwave radio link TY013TY024; however if there is an impact, the recommendation of the provision of a relay site on UCT21 will be implemented.
- ii) Prior to the construction phase of the Upperchurch wind farm development it is recommended that a TV modeling report should be conducted. This TV modeling report should assess the potential interference that the development could cause to terrestrial TV services in the vicinity of the wind farm. It is also recommended that mitigation measures to offset any TV interference caused by the proposed wind turbines should also be provided in this report.

APPENDIX A - Turbine Co-ordinates

The turbine co-ordinates for the Upperchurch wind farm studied in this report are listed below in Figure A-1.

Turbine ID	Easting	Northing
UCT1	194900	158957
UCT2	195136	159283
UCT3	195513	159435
UCT4	195885	159645
UCT5	196409	160330
UCT6	196015	160391
UCT7	196080	160032
UCT8	193386	160635
UCT9	193455	161035
UCT10	193558	162082
UCT11	195614	160417
UCT12	196559	161625
UCT13	196105	161649
UCT14	196409	161953
UCT15	196251	162315
UCT16	196692	162277
UCT17	197203	162448
UCT18	197224	162824
UCT19	196830	162616
UCT20	193023	160374
UCT21	193537	161812
UCT22	194615	160329
UCT23	193671	161365

Figure A-1 Upperchurch Turbine Co-ordinates

REFERENCE DOCUMENTS

Upperchurch Windfarm Enviromental Impact Statement

Appendix 6-II Telecommunications Impact Study

REFERENCE DOCUMENTS

Upperchurch Windfarm Enviromental Impact Statement

Appendix 6-II Telecommunications Impact Study

APPENDIX 6-II TELECOMMUNICATIONS IMPACT STUDY

Appendix 6-1I B

Communications Impact Study with revised and final layout

Upperchurch Wind Farm Telecommunications Impact Study – December 2012 Turbine Layout


Ai Bridges - Telecommunication Consultants

Company:

Author: D. McGrath.

Approved for Release: Rev 1.1 David McGrath **Date:** 11/12/12

Document Filename: *Upperchurch Wind Farm Communications Impact
Study - December 2012 Turbine Layout*

	Procedure: 001	Rev: 1.1
Title: Upperchurch Wind Farm Communication Impact Study – Dec 2012 Turbine Layout	Approved: DM	Date: 11/12/2012

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REFERENCE DOCUMENTS

Upperchurch Windfarm Enviromental Impact Statement

Appendix 6-II Telecommunications Impact Study

Communications Impact Study with revised and final layout

1. Introduction

This report was commissioned to review the impact to existing communication networks due to the revised changes to the Upperchurch turbine layout network. It should be read in conjunction with the previously submitted EMI report "Upperchurch Wind Farm Communications Impact Study, 4th Sept 2012".

Figure 1 below shows the co-ordinates of the Original Turbine Layout along with the co-ordinates of the New Turbine Layout. In Section 2 of this report, we analyse the impact of the new turbine layout. Conclusions and Recommendations are provided in Sections 3 & 4 respectively.

Original Turbine Layout			New Turbine Layout		
Turbine ID	Easting	Northing	Turbine ID	Easting	Northing
UCT01	194900	158957	UCT01	194908	158961
UCT02	195136	159283	UCT02	195134	159279
UCT03	195513	159435	UCT03	195513	159435
UCT04	195885	159645	UCT04	195885	159645
UCT05	196409	160330	UCT05	196015	160411
UCT06	196015	160391	UCT06	196420	160324
UCT07	196080	160032	UCT07	196078	160033
UCT08	193386	160635	UCT08	193375	160528
UCT09	193455	161035	UCT09	193415	160903
UCT10	193558	162082	UCT10	193647	162090
UCT11	195614	160417	UCT11	195631	160413
UCT12	196559	161625	UCT12	196567	161609
UCT13	196105	161649	UCT13	196105	161649
UCT14	196409	161953	UCT14	196411	161955
UCT15	196251	162315	UCT15	196243	162310
UCT16	196692	162277	UCT16	196696	162271
UCT17	197203	162448	UCT17	196830	162616
UCT18	197224	162824	UCT18	197224	162824
UCT19	196830	162616	UCT19	197199	162441
UCT20	192992	160336	UCT20	192984	160316
UCT21	193537	161812	UCT21	193507	161751
UCT22	194615	160329	UCT22	194703	160517
UCT23	193671	161365	Removed	n/a	n/a

Figure 19. Old and New Turbine Layout Co-ordinates List

2. New Turbine Layout Analysis

The new turbine layout has been plotted relative to the original layout and is shown below in Figure 2.

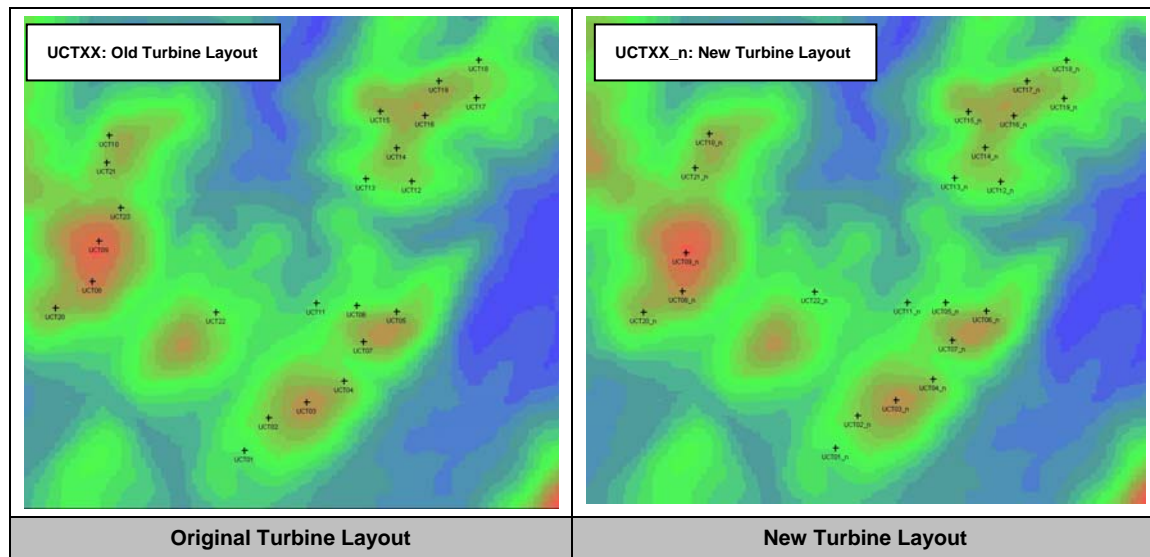


Figure 20. Original and New Turbine Layouts.

From the plot shown in Figure 2 we can see that there are only relatively small changes to the co-ordinates for most of the turbines in the new layout, with the exceptions listed in Table 1 below.

Turbine	Change in New Turbine Layout
UCT23	Turbine removed from the new layout.
UCT09	Turbine moved to a new location 137m to the southwest of its original position.
UCT20	Turbine moved to a new location 64m to the southwest of its original position.
UCT22	Turbine moved to a new location 208m to the northeast of its original position.
UCT21	Turbine moved to a new location 67m to the southwest of its original position.
UCT08	Turbine moved to a new location 109m to the south of its original position.
UCT10	Turbine moved to a new location 95m to the east of its original position.

Table 5. Notable changes in New Turbine Layout.

There are no significant impacts due to the changes to turbines UCT20, UCT22, UCT21, UCT08, UCT10 expected. However, as concerns were raised by two telecom operators: Vodafone and Three Ireland to the original locations of turbines UCT23, and UCT09 (See Section 3.1 Upperchurch Wind Farm Communications Impact Study, 4th Sept 2012) we examine the new layout in respect to both operators below.

*Upperchurch Windfarm Environmental Impact Statement**Appendix 6-II Telecommunications Impact Study***Vodafone Ireland**

In the original EMI report “Upperchurch Wind Farm Communications Impact Study, 4th Sept 2012 Section 3.1.7”, it had been noted that Vodafone Ireland had raised concerns about Turbine UCT23 and UCT09 in relation to one of their licensed microwave radio links (Link Reference ID: TY013TY024).

3.1.7 Vodafone Response to Consultations

Vodafone provided the following email response to consultations:

*“T9 and T23 pose a threat to services on the Vodafone Network and if possible should be considered for relocation to ensure an acceptable *perpendicular threshold distance of at least 75m.”*

From our analysis, none of the turbines in the new turbine layout will impact this Vodafone link, as UCT23 has been removed from the development plans and UCT09 has been moved further away from the radio link. The new location of turbine UCT09 is 137m to the southwest from its original position. In its new location it is 157m from the Vodafone Licensed Radio Link “TY013TY024” and poses no threat to the operation of this radio link.

Figure 3 below shows a close-up view showing the Old and New Turbine Layouts relative to Vodafone’s microwave radio link “TY013TY024”.

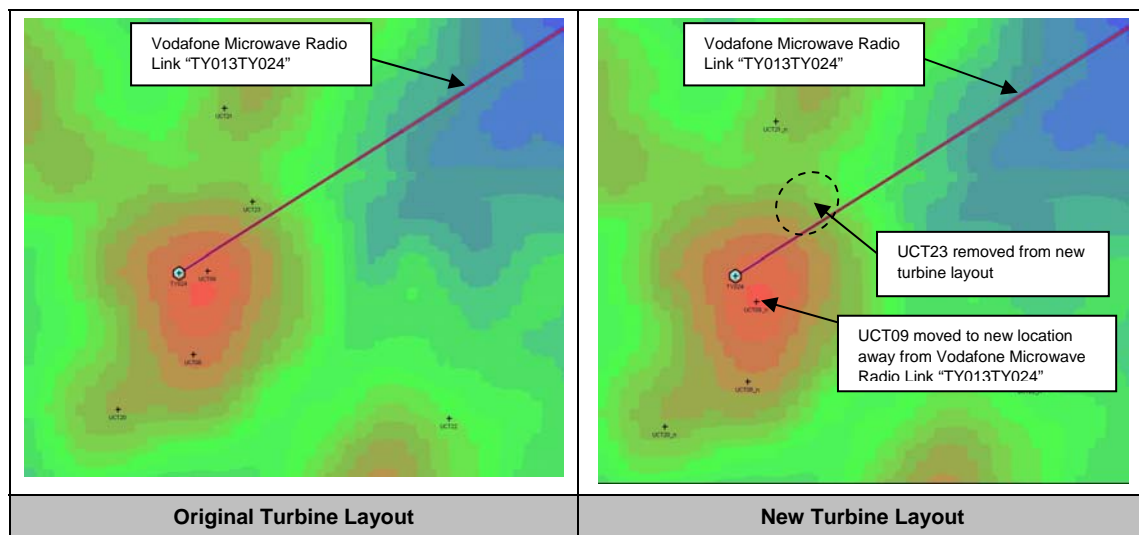


Figure 21. Close-up view of Original and New Turbine Layouts relative to Vodafone Microwave Radio Link “TY013TY024”

Upperchurch Windfarm Environmental Impact Statement

Appendix 6-II Telecommunications Impact Study

Three Ireland

In the original EMI report Three Ireland requested that they be notified of any changes to the position of Turbine UCT09. (See below for relevant excerpt from *Upperchurch Wind Farm Communications Impact Study*, 4th Sept 2012 Section 3.1.1”,

3.1.1 Three Ireland Response to Consultations

Three Ireland provided the following email response to consultations:

*“The turbine that is causing concern for 3 Ireland is UCT9. This is approximately 150m away from the site *TP Foilnahan Tower . Whilst the impact of the proposed location of UCT9 is not ideal, it is not detrimental to the 3 Ireland **RF network. However if the location of UCT9 changes in any way we would like to be consulted on this.”*

Note: As per Three Ireland’s request, they have been notified of the change in position of this turbine. To date, no response has been received from Three Ireland regarding the new position of Turbine UCT09.

From: David McGrath
Sent: 06 December 2012 10:27
Cc: Kevin Hayes; logistics; Support
Subject: RE: Request for Information - Upperchurch Wind Farm

Hello Malachy,

Further to your request below regarding the location of turbine UCT09
We wish to inform you that the proposed location of this turbine has been modified.
The old and new turbine co-ordinates are shown below.

OLD co-ordinate for turbine UCT09

193455 E
161035 N

NEW co-ordinate for turbine UCT09

193415 E
160903 N

Please let us know if you have any issues with the new proposed position of turbine UCT09.

Best Regards,
David McGrath.

3. Conclusions

Following the findings in this report the following conclusions have been made:

- i) Turbine UCT23 has been removed from the original turbine layout and no longer poses a threat to Vodafone's licensed microwave radio link "TY013TY024"
- ii) Turbine UCT09 has been moved 137m from its original location to a position which is 157m from Vodafone's licensed microwave radio link "TY013TY024". In its new location, this turbine should have no impact on the operation Vodafone's radio link.
- iii) In previous consultations with Three Ireland they requested to be notified of any changes to the position of Turbine UCT09. The new position of this turbine is 137m from its original proposed location and Three Ireland have been notified of this change. To date no response has been received from Three Ireland regarding the new position of this turbine.

APPENDIX 6-III: EMAIL RESPONSE FROM IRISH AVIATION AUTHORITY (IAA)

Upperchurch Windfarm Enviromental Impact Statement

EMAIL FROM JACK BRETT (ECOPOWER DEVELOPMENTS) TO DEIRDRE FORREST (IAA)

From: Jack Brett [mailto:jackb@ecopower.ie]
Sent: 08 October 2012 18:31
To: FORREST Deirdre
Subject: Re: Upperchurch Windfarm Location

Hi Deirdre,

The Wind Turbine hub height is up to 80m and the overall blade tip height is up to 126.6m

As request, please find attached map showing the location of the proposed Upperchurch Windfarm.

Regards
Jack Brett

Ecopower Developments Ltd
Sion Road
Kilkenny

Office: 0567750140
Mobile: 0863575310

REPLY EMAIL FROM DEIRDRE FORREST (IAA) TO JACK BRETT (ECOPOWER DEVELOPMENTS)

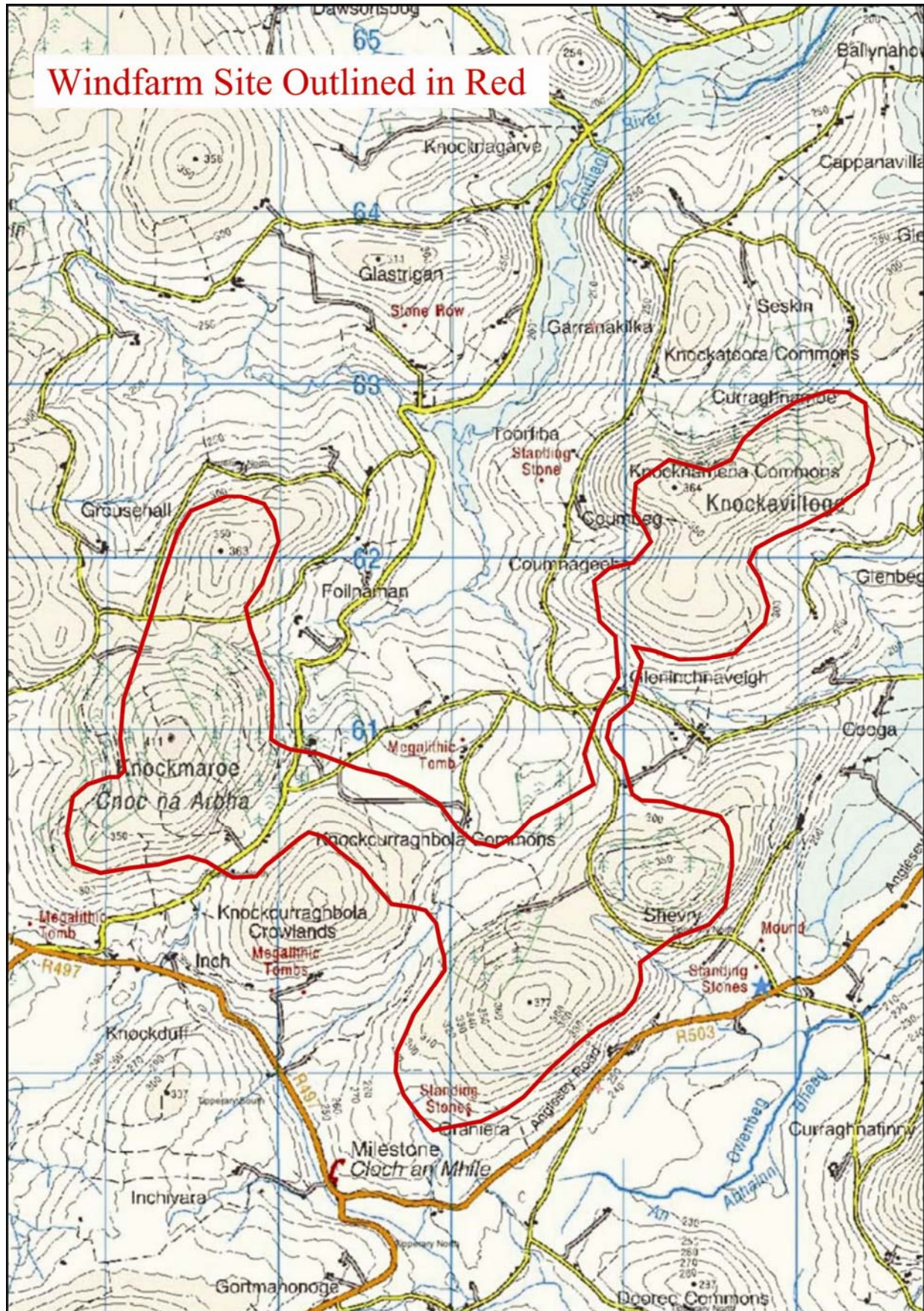
From: FORREST Deirdre [mailto:Deirdre.FORREST@IAA.ie]
Sent: 10 October 2012 14:45
To: Jack Brett
Subject: RE: Upperchurch Windfarm Location

Hi Jack

After looking at the proposal the IAA will require an agreed lighting scheme, notification 30 days prior to construction and as built coordinates of the completed development for charting purposes.

Many thanks
Deirdre Forrest

The Irish Aviation Authority (IAA)
The Times Building,
11-12 D'Olier Street,
Dublin 2



REFERENCE DOCUMENTS

Upperchurch Windfarm Environmental Impact Statement

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Appendix 6-III Email response from IAA

REFERENCE DOCUMENTS

Upperchurch Windfarm Enviromental Impact Statement

7. Construction Impacts and Employment

7.1 INTRODUCTION

This section addresses the impacts on the road network and traffic resulting from the construction and operation of the proposed Upperchurch turbines. Effects on employment in the region are also discussed.

7.1.1 Access routes during the Construction Phase

7.1.1.1 Access Road from Port

The turbine components will be delivered either from Dublin port or Foynes port. If the components are delivered from Dublin Port they will be transported west along the M7 to the Nenagh by-pass and turn onto the R498 at Knockalton Upper. If the turbine components are delivered from Foynes Port they will be transported east on the M7 to the Nenagh by-pass and turn right on the R498 at Knockalton Upper. The traffic will then travel the R498 into Thurles and turnaround at the Tipperary Institute roundabout and travel back up the R498 for 2.5km in order to effect the turn left onto the R503 after the Racecourse at Killianan Junction.

The vehicles will travel west along the R503 for 16km as far as Graniera, 1km before Milestone, turning right into Site Entrance No. 1. From this point the construction vehicles will access the full site using newly built windfarm roadways, upgraded farm and forestry tracks and site entrances from the Third Class Road network within the site area. See **Figure 7-1: Turbine Components Haul Route** and **Figure 7-2: Site Entrance Locations** at the end of this chapter.

The haul route as far as Graniera has already been used for large turbine component deliveries to Glenough Windfarm and Garracummer Windfarm, which are both in South Tipperary just south of the Upperchurch windfarm site. The haul route from M7 comprises 54.4km of Regional Road; the R503 and the R498, both of which have been used previously to delivery turbine components.

A review of the approach roads will be carried out with the County Roads Engineer prior to commencing construction.

7.1.1.2 Traffic Management

During construction, access for heavy plant such as cranes and excavators would be required. Turbine components will be transported to site on articulated trucks. In general traffic would heaviest during the construction of roadways and foundations. The construction entrance at Graniera is an existing field gate on Regional Road the R503. It is proposed that this entrance will only be used for construction traffic and after the construction phase this entrance will be closed. During the operational phase the turbines at will be accessed from the local road construction entrances in Knockmaroe, Knockcurraghbola Commons, Shevry, Grousehall and Knocknamena Commons.

All construction entrances have been designed having regard to the North Tipperary County Development Plan and the National Roads Authority Geometric Design of Major/Minor Priority Junctions and Vehicular Access to National Roads.

Upperchurch Windfarm Environmental Impact Statement

In order to mitigate for this increased road use, principles of good traffic management will be applied. Deliveries of heavy equipment can be scheduled to cause minimal disturbance to the local residents.

7.2 ACCESS REQUIREMENTS

The access requirements can be divided into five phases

- Civil engineering works
- Electrical works
- Wind turbine delivery and erection
- Routine inspection and maintenance
- Major maintenance and final decommissioning

7.2.1 Civil Engineering Works

7.2.1.1 On site roads and hardstands

The Upperchurch on-site roads (8km) and hardstands will be laid to a depth of 400mm with crushed stone. The roadway including both new and upgraded existing forestry and farm roads along with hardstanding areas will require approximately 4,010 loads of crushed stone. The developer will endeavour to win as much of this stone as possible from borrow pits onsite to reduce the volume of construction traffic.

7.2.1.2 Turbine Foundations

Foundations for the 22 turbines will require approximately 345m³ per base. This amounts to approximately 950 truckloads of readymix concrete required for the 22 bases.

Other building materials, including pre-cast concrete pipes for drainage will be procured locally. Crushed stone not won on site, sand and concrete products will be sourced from local suppliers.

7.2.1.3 Steel Reinforcing

14 tonnes per turbine will be needed. This amounts to approximately 15 deliveries by flatbed articulated lorry in total.

7.2.1.4 Haul Route Surveys

Prior to construction, Pavement Condition Surveys to include FWD analysis, width and forward stopping sight distance analysis and culvert/bridge strength analysis, will be carried out on the local roads that transverse the Upperchurch windfarm site to determine suitability for use and whether they will require to be strengthened and/or restored after the construction phase. Any strengthening or reinstatement required will be carried out by the developer in agreement with the Roads Department. The haul route proposed as far as the site entrance at Graniera has just

Upperchurch Windfarm Environmental Impact Statement

been used for the construction traffic for Garracummer windfarm and previously for Glenough Windfarm.

7.2.2 Traffic for Electrical Works

The following deliveries will be required

- articulated lorries carrying cable rolls – 1 load
- delivery lorries carrying equipment for the turbines - 1 load

7.2.3 Wind Turbine Delivery and Erection

The components will be delivered to the site by articulated trucks. The maximum load per axle, for delivery of the turbine components and construction materials will be confined to within legal limits.

A proposed route for carriage of turbine components from the M7 was discussed with the North Tipperary Area Roads Engineers. The entire haul route is within the Newport Area and Thurles Area. Any strengthening or reinstatement required will be carried out by the developer in agreement with the roads engineers. **Figure 7-1: Turbine Components Haul Route** at the back of this chapter.

The erection of wind turbines involves the assembly and lifting into position of the main components of the turbine (the tower, nacelle and rotor assembly).

The following loads are required per turbine:-

Table 1: Turbine Delivery Details

Component	Transportation Requirement
Nacelle (2 loads)	2 truck load-carried on a 8 axle rear- steering trailer and 3 axle tractor unit
Tower section (top)	1 truck load (carried on 5 axle rear steering trailer and 3 axle tractor unit)
Tower section (middle)	1 truck load (carried on 5 axle rear steering trailer and 3 axle tractor unit)
Tower section (bottom)	1 truck load (carried on 5 axle rear steering trailer and 3 axle tractor unit)
3 Blades	1 truck load per blade (carried on 2 axle rear steering trailer and 2 axle tractor unit)

This amounts to approximately 8 truckloads per turbine with a total number of 176 deliveries over the delivery period for all 22 turbines. Axle weights per axle will not exceed legal limits.

*Upperchurch Windfarm Environmental Impact Statement***7.2.3.1 Craning Requirements**

A crane, with a lifting capacity of circa.500 tonnes, will be used to remove the heavier components from the lorries and for the erection of the turbines. This crane will likely be an 8 axle, crane weighing approx. 97 tons. It will be equipped with large low ground pressure tyres carrying approx. 12 tons per axle. A smaller crane will be used to remove the blades from the trailer and for assisting assembly (tailing of the turbines).

7.2.4 Routine Inspection and Maintenance

The operational phase will involve daily remote monitoring by the owner's operator and visits by maintenance crews to carry out scheduled and un-scheduled maintenance and repairs. A light four-wheel drive vehicle will be required for access for maintenance personnel. On the few occasions of major component failure a crane would be needed to be brought on site.

7.2.5 Mitigation Measures

A detailed condition survey of the public roads throughout the site would be necessary in liaison with the County Council Roads Engineer, prior to commencement of construction works. The objective being to identify those sections of road which may require strengthening or re-alignment and as a basis for agreeing remedial works to be carried out by the developer on completion of the project.

The haul route on Regional Roads as far as site entrance No. 1 at Graniera has been used before for the delivery of similar size turbines to Glenough Windfarm and Garracummer Windfarm, both in South Tipperary. Site Entrance No. 1 will be designed so that the component delivery trucks will be able to completely clear the R503 before they reach the gates of the construction site (**Figure 7.3** at the end of this Chapter). It is proposed that this entrance will be closed on completion of the construction phase and will only be used during the operational phase in the case of a necessary replacement of a major component or for decommissioning the windfarm. The other entrances from the Third Class roads throughout the site will be used for operation and maintenance traffic, which will mainly be four wheel drive vehicles and vans.

Traffic control will be provided for, while transporting oversized loads to the site. Movement of oversized loads will be co-ordinated with the local authorities and Gardai.

Temporary facilities will be provided on the proposed site for construction traffic parking, temporary site offices and storage areas.

The promoter will at all times ensure that inconvenience to local people is minimised and would schedule traffic flow to achieve this.

7.3 CONSTRUCTION METHODS FOR ROADS AND FOUNDATIONS

7.3.1 *Road Construction*

Prior to the designing of the roadways the geotechnical and hydrological conditions that exists on site were assessed and trial pits were excavated at 20 of the proposed turbine sites and peat depth and classification was measured at the remaining two sites (T05 & T14) which are in forested areas. Ground surface slope was measured at all turbine sites. These investigations were carried out in order to classify the depths and nature of the soil and underlying sub-soil.

The locations of these trial pits and descriptions of conditions found are in Chapter 14 **Appendix 14-I**.

In 18 out of the 20 trial pits that were excavated, bedrock was encountered at an average depth of 1.90m below the surface, the minimum and maximum depths being 1.20m and 2.90m respectively. Bedrock consisted of siltstone or hard shale. The two remaining trial pits were excavated in stiff clay to depths of 1.50m and 2.70m. Some bedrock will be excavated for the turbine bases where it is shallow although the volumes will be minimal.

A number of suitable locations have been identified for borrow pits for the extraction of material for road construction within the site. The position of the borrow pits are shown in Chapter 14 Table 14.3

Peat was found at 3 of the 22 turbine base locations but because of the shallow depths of the peat which was encountered there and the inherent stability of the sub-soils on site there is no particular risk to ground stability on any part of the wind farm site.

A full report on the geotechnical assessment carried out on the proposed site is contained in Chapter 14 Geotechnical impact Assessment.

The final layout of the roads and turbines was planned following a thorough walkover of the site and trial pit investigations and also considering the contours of the land and the gradients of the slopes on site.

7.3.2 *Mitigation measures*

The first priority of the construction phase will be to construct the on-site road network and upgrade the existing on-site roads, so that they are capped with limestone or similar quality stone to reduce wear and tear during the construction phase. Vehicular movements will be restricted to the footprint of the proposed development. This implies that machinery will be kept on the site roads and hardstanding areas and aside, from advancing excavations, avoid moving onto areas not delineated on the site drawings.

The geotechnical investigations at the proposed Upperchurch windfarm site indicate that the site has a very low risk of slope failures or landslides due to the virtual absence of peat there. Slopes are moderate over most of the development footprint. It is noted that geotechnical investigations indicate stable conditions throughout the extent of the areas investigated and therefore constraint mapping was not required for this site. As a pre-cautionary principle, however, the following procedures are recommended as best-practise mitigation measures to avoid slope instability, even of a very local nature, at wind farm sites. These are:

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- Drains will be established to effectively drain grounds prior to excavation or earthworks of each section of road. Such drains will be positioned at an oblique angle to slope contours to ensure ground stability;
- All site excavations and construction will be supervised by a suitably qualified engineer. The contractor's method statement will be reviewed and approved by a suitably qualified geotechnical engineer prior to site operations.

All excavated earth materials must be either re-used in an environmentally appropriate and safe manner, e.g. used for landscaping, or removed from the development site at the end of the construction phase.

A construction phase Environmental Management Plan will be incorporated to include regular checking of equipment, materials storage and transfer areas, drainage structures and their attenuation ability during the construction phase of the project. The purpose of this management control is to ensure that the measures that are put in place continue to operate effectively, to prevent accidental leakages, and to identify potential breaches in the protective retention and attenuation network during earthworks operations.

Also a fuel management plan will be implemented. This plan will incorporate the following elements:

- Mobile bowsers, tanks and drums will be stored in secure, impermeable storage areas away from drains and open water;
- Fuel containers will be stored within a secondary containment system, e.g. bunds for static tanks or a drip tray for mobile stores;
- Ancillary equipment such as hoses and pipes will be contained within the bund;
- Taps, nozzles or valves will be fitted with a lock system;
- Fuel and oil stores including tanks and drums will be regularly inspected for leaks and signs of damage;
- Only designated trained operators will be authorised to refuel plant on site;
- Procedures and contingency plans will be set up to deal with emergency accidents or spills; and
- An emergency spill kit with oil boom, absorbers etc. is to be kept on site for use in the event of an accidental spill.

7.4 WATER RUN-OFF

The upgrading of 3.6km of existing farm tracks, the excavation of 8km of new roadways, along with additional drainage for the construction of the turbines and control building will result in the disturbance of localised areas of soil and subsoil.

The proposed site drains into streams that form the upper reaches of the Turraheen, Owenbeg, Clodiagh and Aughvana Rivers. The first three of these rivers form part of the South Eastern River Basin District and ultimately join the River Suir to the southeast. The Aughvana River,

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which forms part of the Shannon River Basin District, joins the Mulkear River and ultimately flows into the River Shannon to the east of Limerick City.

Erosion control where runoff is prevented from flowing across exposed ground and sediment control where runoff is slowed to allow suspended sediment to settle are important elements in runoff and sediment control. A Sediment and Erosion Control Plan has been prepared (See Chapter 15 **Appendix15-I**) and will be implemented to prevent sediment and pollutant runoff into the local watercourses during the construction phase. The plan includes the following elements:

- The plan effectively consist of restoring and maintaining the existing drainage network along the existing access track and roads where it exists and integrating it with newly constructed drainage required for upgraded and new roads.
- No work will take place within 50m buffer zones of watercourses, except at crossings.
- All construction method statements will be prepared in consultation with Inland Fisheries Ireland – South Eastern River Basin District and Shannon River Basin District.
- The area of exposed ground will be kept to a minimum by maintaining, where possible, existing vegetation.
- Temporary deposition areas will be designated and designed to hold temporary stockpiles and will be located away from drains and watercourses.
- Stockpiles that are at risk of erosion will be protected by silt trapping apparatus such as a geo-textile silt fence to prevent contaminated runoff.
- Silt fences or other appropriate silt retention measures will be installed where there is a risk of erosion runoff to watercourses from construction related activity, particularly during prolonged wet weather periods or following an intense rainfall event.
- The silt retention measures where they are installed will be inspected and maintained on a regular basis throughout the construction and operation phases of the wind farm.
- All associated tree felling will be undertaken using good working practices as outlined by the Forest Service in their ‘Forestry Harvesting and Environment Guidelines’ (Forest Service, 2000a) and the ‘Forestry and Water Quality Guidelines’ (Forest Service, 2000b). The latter guidelines deal with sensitive areas, erosion, buffer zone guidelines for aquatic zones, ground preparation and drainage, chemicals, fuel and machine oils.
- Drainage ditches or other suitable measures will be adopted alongside access roads, turbines and other disturbed areas to prevent silt or contamination from construction water runoff entering watercourses.
- Check dams will be placed at regular intervals based on slope gradient along all drains to slow down runoff so as to encourage settlement and to reduce scour and ditch erosion.
- Drains carrying construction site runoff will be diverted into silt traps.
- Wheel washes will be provided for exiting heavy vehicles to ensure roads outside of the site boundary are clean.

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- Pumped or tremmied concrete will be monitored carefully to ensure no accidental discharge into local watercourses.
- A programme of inspection and maintenance of drainage and sediment control measures during construction will be designed and dedicated construction personnel assigned to manage this programme.
- Water quality monitoring will be carried out in years 1 and 2 of operation to determine whether water quality has been impacted. Monitoring of water quality parameters will be conducted monthly in Year 1. If thresholds are not exceeded in Year 1, then the effort may be reduced in Year 2.

7.4.1 Turbine Foundations and crane pad areas

It is proposed that the turbine foundations will extend to a depth 2.0m. At locations where competent bedrock is encountered the foundations for the turbines will be keyed into the bedrock. In locations where the subsoil (or subsoil and broken rock) thickness is greater than 2.0m the foundations may need to be deeper or some pile foundations may need to be installed.

There will be 22 turbine foundation bases and crane pads. The bases will be approximately 17m in diameter and 2m deep. They will consist of 1m of concrete reinforced with steel into which is embedded a 2.3m high steel cylinder or bolt ring. The concrete is then covered with 1m of crushed stone leaving the top of the cylinder or bolt protruding 30cm above ground level. The bottom section of the turbine tower is then bolted onto a flange at the top of the cylinder. The 22 crane pad areas will comprise of level hardcore hard-standing areas of 40m X 26m each.

7.4.2 Mitigation measures

During the construction phase, any excavations will be backfilled as soon as is possible to prevent any infiltration of potentially polluting compounds to the subsurface and the aquifer. Any wastewater from the construction facilities on the site will be stored for removal off site for subsequent treatment and disposal. A geotechnical analysis will be carried out for each turbine base into the method of excavation. It is considered, by the geotechnical engineer who assessed the site, that the site is geologically and geotechnically and hydrologically stable and that the construction of the turbines and the construction and retention of the access roads will not affect the drainage of the site. As such it is considered unlikely that land slippages will occur as the site is characterised by shallow soils underlain by bedrock consisting of siltstone or hard shale. More mitigation measures are detailed in Chapter 14: Geotechnical Impact Assessment.

During the construction phase, excavation of the soils in the localised area around the turbine locations and new access roads will be kept to a minimum, to ensure minimal disturbance of the natural soil conditions.

7.4.3 Cabling areas

Cables will be laid underground in trenches approximately 1.2m deep, between the turbines and from the turbines to the proposed substation compound.

7.5 HEALTH AND SAFELY

The wind farm will be designed, constructed, operated and decommissioned in accordance with the Safety, Health & Welfare at Work (Construction) Regulations 2006. Different stages of the development will present health and safety issues.

7.5.1 Construction Health and Safety

- Machinery on site
- Traffic safety during the transport of oversized loads to the site
- Lifting of heavy loads overhead using cranes
- Working with electricity during commissioning
- Working at heights
- General construction site safety

These issues will be covered comprehensively in a safety statement, which will cover all aspects of the construction process.

7.5.2 Operational Health and Safety

During operation, under normal circumstances, there is no danger to people or animals on a wind farm site. There will be no fences around the turbines and the farm boundary fences and gateways will be maintained. Access to the turbines is gained through a door at the base of the tower. This will be locked at all times when unattended. The substation compound will also be securely locked and fenced.

The components of a wind turbine are designed to last 25 years and are equipped with a number of safety devices to ensure safe operation during their lifetime.

Modern turbines have two independent fail-safe mechanisms to stop the turbine. The aerodynamic breaking system is the main braking system, with mechanical brakes as a backup system. This is additional to the yawing and blade pitch mechanisms, which protect the blades from very strong winds by turning and allowing the wind to flow over the blades with least resistance. At the design stage the blades are tested statically by applying weight to bend the blades and dynamically by testing the blades ability to withstand fatigue from repeated bending (more than 5 million times).

The rigorous safety checks imposed on the turbines during design, construction and commissioning should ensure that the risks to humans will be negligible. The health and safety record of the wind industry internationally is exceptionally good. The operation of a wind farm has practically no potential for severe accidents to the general public.

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Regular safety audits of control measures in place on the site will be conducted during the operational phase to ensure that these control measures are effective at reducing risk to persons and property.

7.6 EMPLOYMENT

7.6.1 Employment in the Industry

The renewable energy sector generates more jobs per MW of power installed, per unit of energy produced and per euro of investment, than the fossil fuel energy sector. Industrial and craft jobs are created right through from manufacture and production to installation and maintenance. Approx. 60% of these jobs are in the turbine and component manufacturing sector and 40% are in promotion, construction engineering, project management, legal, accounting and financial services. Wind energy companies in the EU currently employ 108,600 people; when indirect jobs are taken into account this figure rises to more than 180,000.

7.6.2 National Employment and Benefits

Over 1,500 people are employed directly in wind energy companies in Ireland. The development at Upperchurch will boost direct and indirect employment in Ireland. European Wind Energy Association analysis concludes that 15.1 temporary jobs are created in the EU for each new MW installed. Approx. 40% of these jobs are created in the country where the turbines are installed. This equates to 277 jobs in Ireland, during the development, planning, construction and commissioning of the 22 proposed turbines. In addition, 0.4 jobs are created per MW of total installed capacity in a country in operation and maintenance, legal, sales, asset management and other activities related to existing installations. This equates to 8 jobs related to the operation of the turbines at Upperchurch Windfarm.

In summary the jobs and opportunities that will be created both during the construction and the operation phase of 22 turbines at Upperchurch windfarm are:-

- 8 permanent jobs operation and maintenance, legal, electricity sales, asset management
- 277 temporary jobs in civil and electrical construction companies, legal and accountancy firms, financial services sector, insurance sector, quarry and stone suppliers and project management.
- €20 million will be spent in Ireland on the civil and electrical contracts
- General activity on the site will increase business in the local service industry i.e. accommodation and restaurants for a period of 8 months.
- There will be increased orders at local concrete plants and quarries.
- Commercial Rates will be paid annually to the Local Authority.
- Annual rental payments to 37 landowners
- Annual community benefit payment

7.7 CONCLUSION

There will be short term and long term consequences, in the Upperchurch area, due to the construction and operation of the proposed turbines.

The construction phase will boost jobs locally in contracting, services and labouring. There will, however, be more disruption on local roads due to construction traffic. The construction of the turbines presents no concerns with regard to human safety or environmental protection issues.

The operational phase will provide work and experience for companies in the region who wish to get involved in the growing wind industry and a long-term rental income for 37 landowners, 35 of whom live locally and an income for the Local Authority area in the form of commercial rates.

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FIGURE 7-1: TURBINE COMPONENTS HAUL ROUTE

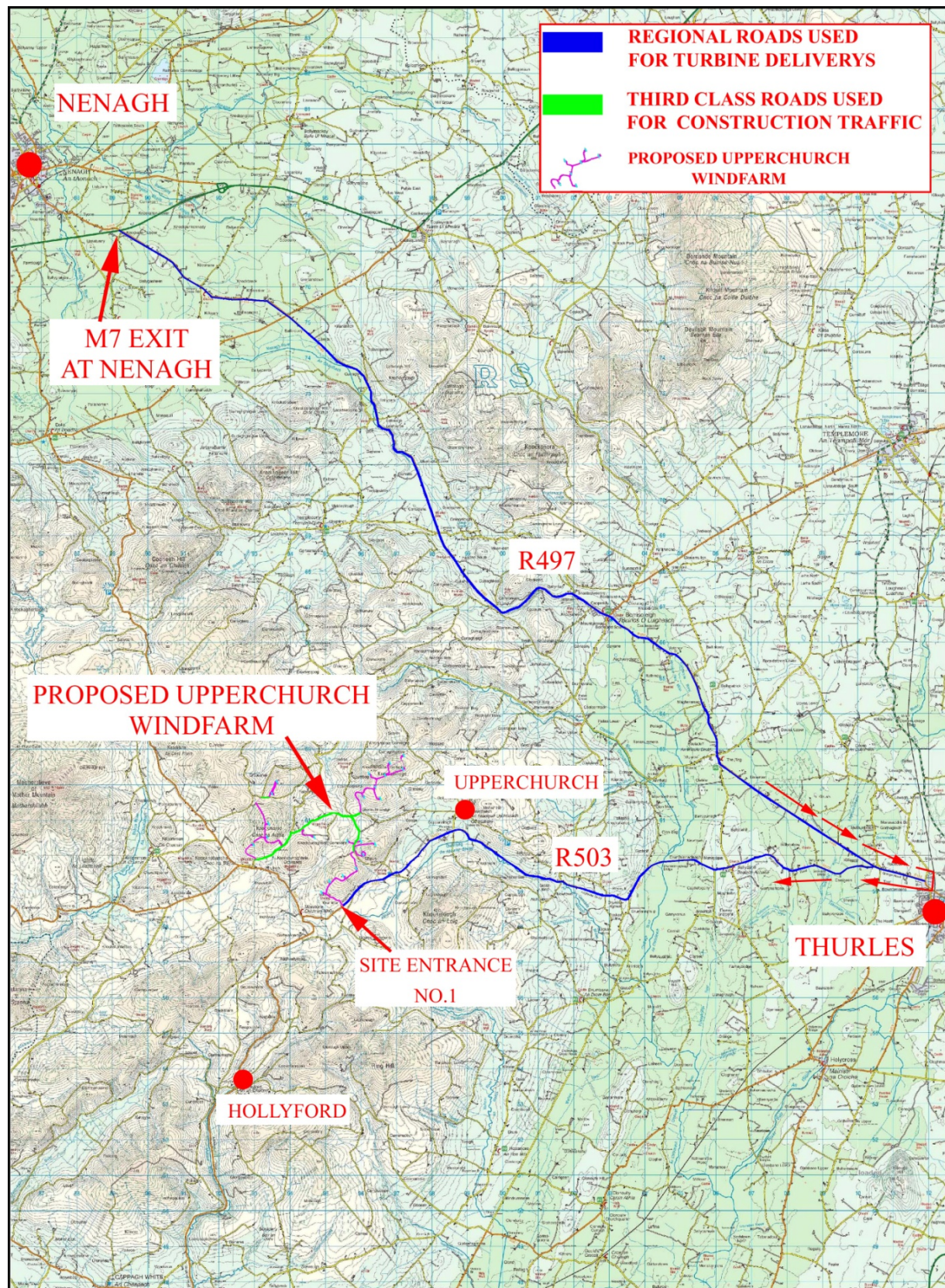


FIGURE 7-2: LOCATIONS OF SITE ENTRANCES

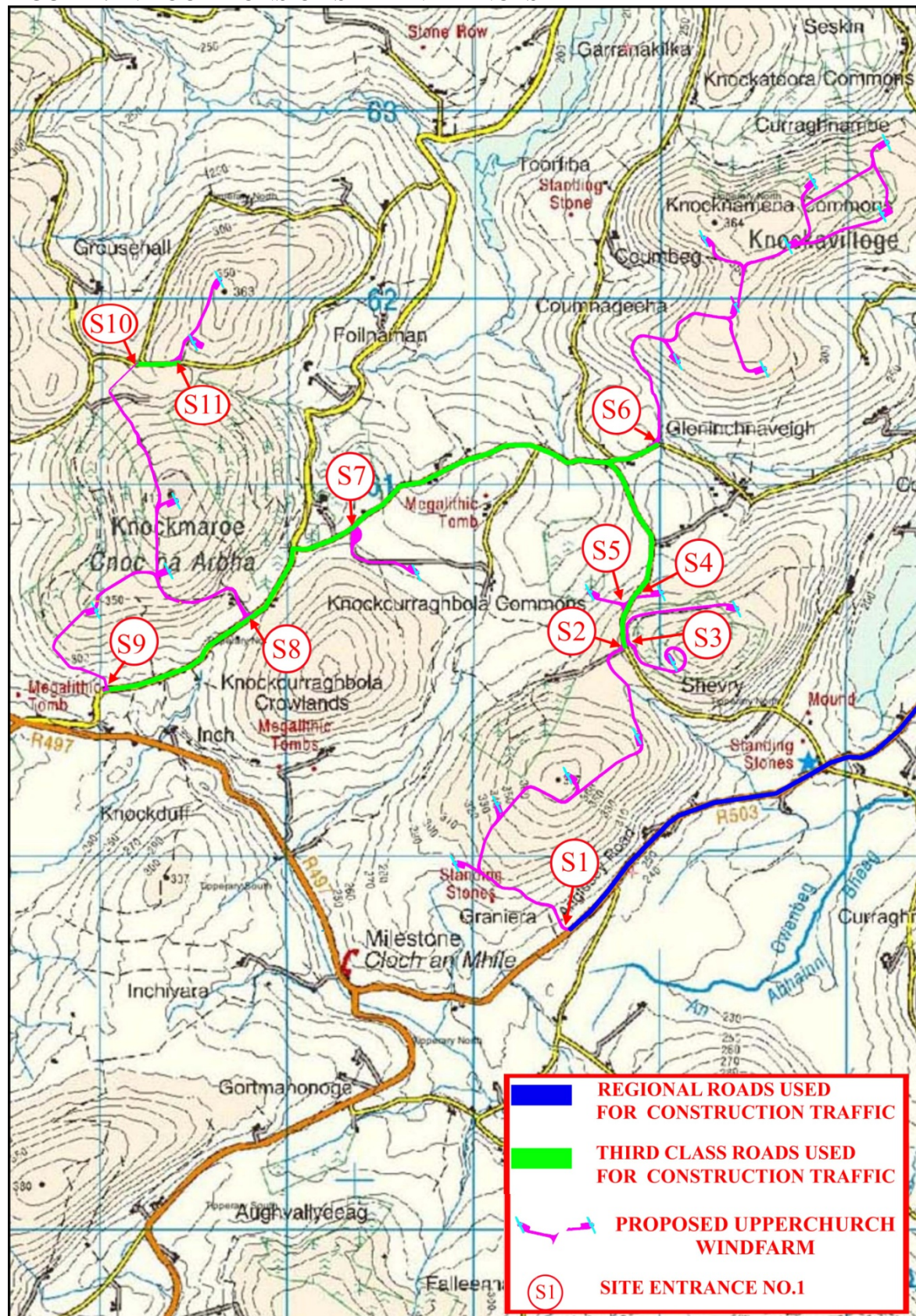
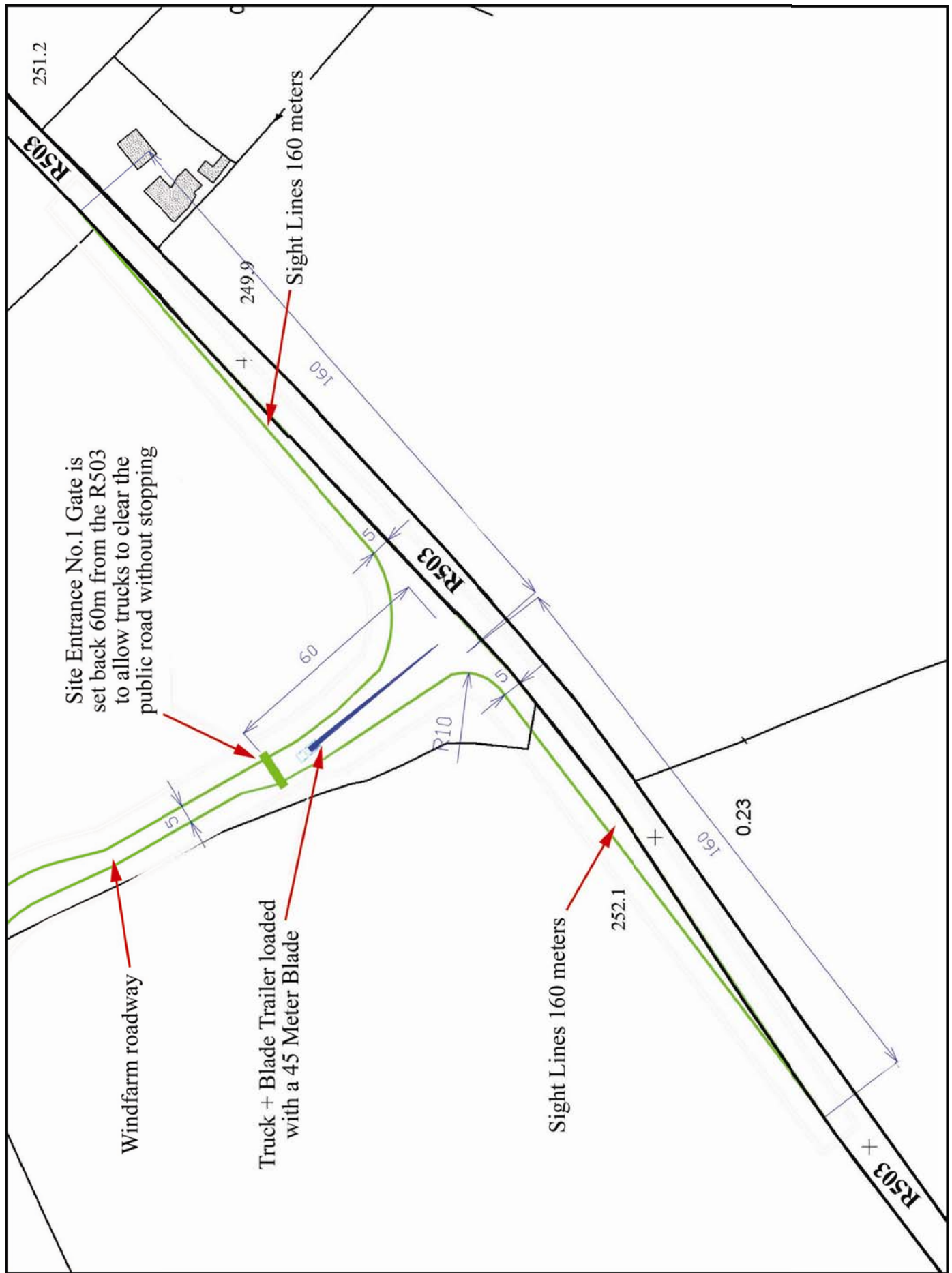


FIGURE 7-3: SITE ENTRANCE NO.1



REFERENCE DOCUMENTS

Upper Merich Wildlife Environmental Impact Statement
Construction Impacts and Employment

REFERENCE DOCUMENTS

Upperchurch Windfarm Enviromental Impact Statement

8 Air & Climate Impact Assessment

8.1 THE EXISTING ENVIRONMENT

Given the site's rural setting, existing air quality in the locality is typically regarded as good. With the exception of local traffic, agricultural activities and domestic fuel combustion, no fugitive or point sources of emission have been identified that significantly compromise the existing air quality.

8.2 SIGNIFICANT IMPACTS OF THE PROPOSAL

No air-polluting emissions arise during the operational phase of a wind farm. Any potential adverse impact on air quality as a result of the development will principally be confined to the construction phase of the development. The potential air pollutants as a result of the proposed wind farm development constitutes (i) site machinery and vehicle exhaust emissions (NO_x, SO_x, CO₂ etc) resulting from transportation and installation of turbines and (ii) dust emissions as a result of foundation excavation, internal road construction and turbine transportation.

Of the aforementioned, the most notable emission likely to arise from the development during this phase would be an increase in dust concentrations. It is considered that only minute quantities of air pollutants would be emitted from development related vehicle traffic and machinery.

8.2.1 Effects on Air Quality during Construction

During the construction phase of the development, site preparation works namely the removal of topsoil, the construction of internal on-site roads and excavation works for turbine foundations are likely to contribute to minor point and fugitive emissions of dust particles in the area. Turbine haulage trucks are also likely to contribute minor fugitive emissions of dust due to movement of trucks on unpaved surfaced internal haul roads and/or are likely to re-suspend dust when travelling the local road networks.

Generally the greatest proportion of dust generated is likely to have a particle size in excess of 30 microns, which will generally deposit within 100m of the dust sources. Intermediate sized particles (10 – 30 microns) may circulate 200m-500m, while small particles (<10 microns) will travel greater distances. Meteorological data indicates that the prevailing wind originates from the southwest direction. This indicates that the main direction of dust dispersion will be to the north, northeast and east of the sites.

Generally speaking the dust created by the above works is principally considered non-hazardous nuisance dust. As regards effects on agricultural lands and vegetation, no significant impact on livestock, soil structure, or flora would be expected due to the duration of the works involved. In consideration of neighbouring residences, particularly those residence to the north, northeast and east, the distances involved from site works will mitigate any significant impact relating to dust nuisance.

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Given the limited time period for construction there is unlikely to be any quantifiable or lasting negative effects on air quality from dust emissions. Thus the effect on air quality is considered to be of minor temporary significance.

8.2.2 *Effects on Air Quality during Operation*

Wind energy is among the cleanest energy source available. It is safe, renewable and completely non-polluting in the operational phase. Wind is in abundant supply and there are no emissions from the energy production phase of a wind farm. During the operational phase there is a positive net environmental impact associated with wind farm developments. There is a reduction in the need for the production of electricity from non-renewable sources, such as the burning of fossil fuels and nuclear energy, as a result of the production of electricity from wind power. Non-renewable sources of electricity production all have major significant negative environmental impacts.

The proposed turbines are predicted to produce approximately 150 million kilowatt hours (kWh) of clean electricity per annum.

8.3 MITIGATION MEASURES**8.3.1 *Construction Phase***

Dust arising during the construction phase of the wind farm development due to a prolonged dry spell would be regarded as an unavoidable nuisance. In this eventuality it is desirable that the amount of dust arising be kept to a minimum so as to minimise effects on air quality in the locality. Mitigation measures to minimise the concentration of dust generated during construction of the development includes the selection of construction materials for the onsite road network so as to ensure that particles are not blown around the site, this includes the use of aggregate of not less than 5mm grade and to also ensure that surface dressing be compressed quickly. In addition to reduce impacts on air quality concrete brought to the site will be poured directly, haulage trucks will not be over filled and also that site machinery and vehicles onsite will not be left running unnecessarily. More than one third of the turbine access roads already exist as forestry/farm tracks and although these will require up-grading the limited new access roads that will be required mitigates construction traffic considerably.

8.3.2 *Operational phase*

During the operational phase of the wind farm the implementation of mitigation measures is not necessary, as only positive impacts on air and climate are associated with this stage of the development.

REFERENCE DOCUMENTS

Uppercut Wind Farm Environmental Impact Statement

Air & Climate Impact Assessment

REFERENCE DOCUMENTS

Upperchurch Windfarm Enviromental Impact Statement

9 Socio-Economic Impact Assessment

9.1 INTRODUCTION

A demographic, social and economic profile of the area was conducted to assess the impact of constructing a windfarm in the area.

9.2 THE EXISTING ENVIRONMENT

9.2.1 *The Site*

The windfarm is proposed for an area within a series of small hills, 2km west of Upperchurch village and 18km to the west of Thurles, County Tipperary. It lies just north of the main road between Limerick and Thurles, which dissects the mountains from west to east. The village of Milestone is immediately to the south-west. The site is located in the townlands of Graniera, Shevry, Knockcurraghbola Commons, Gleninchaveigh, Coumnageeha, Knocknamena Commons, Knockmaroe and Grousehall. The turbines are set out generally over four areas, to the north east, the south east, the west and an area in the centre of the site. The landcover in the area comprises predominantly pasture fields, forestry and frequent areas of bog/reeds. The area is rural with a dispersed and low population.

9.2.2 *Settlement & Population*

Overall the area is very sparsely populated with settlement patterns in the study region typically comprising very small community settlements to relatively isolated farmlands. Settlements are essentially single individual dwellings dotted along the third class routes that service the locality or are located along cul-de-sacs.

The nearest Local Service Centre is the village of Upperchurch located 2km to the east of the site boundary. Upperchurch is served by a network of local roads, the R503 linking Newport to Thurles lies just to the south of the village. Upperchurch is serviced by a public water supply, waste water treatment plant, a post office, Church, public houses, community centre and creche, community welfare centre, school and graveyard. It also a technology centre, Uplands IT which is located in the primary school grounds.

The village of Kilcommon lies 3km to the west of the site boundary, mid-way between Thurles and Newport. Kilcommon forms two distinct parts, namely Kilcommon Upper which is located c. 1.25km north of the regional road R503 and Kilcommon Lower which is located at the junction with the regional road R-503. The settlement is serviced by a public water supply and is well connected to Thurles via the R503 and to Nenagh via the R497. The upper village provides a range of services including two pubs, school, church, graveyard and community hall. The lower village is defined by a cluster of development consisting of a pub/shop, private housing and playing pitch. The village also enjoys the benefit of a prayer garden and a picnic area near the Bilboa river.

The nearest District Service Centre is Newport which is 22km to the west. The nearest Secondary Service centre is Borrisoleigh which is 8km to the north east. The nearest Primary

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Service Centre is Thurles which is 18km to the east. There is good access to the site area from Newport to the west and Thurles to the east on Regional Road; R503.

The site of the proposed windfarm is in the townlands of Graniera, Shevry, Knockcurraghbola Commons, Gleninchaveigh, Coumnageeha, Knocknamena Commons, Knockmaroe and Grousehall which are in Electoral Divisions Foilnaman and Upperchurch. Population statistics for these EDs are given below in Table 1

Table 1: Area Statistics

E.D	DED Population 2011	No. of Households
Foilnaman	332	122
Upperchurch	329	114

Source: CSO Census 2011- Small Area Population Statistics

In Upperchurch and Foilnamon ED areas 42% of the total population are in employment; in agriculture and forestry activity being the biggest occupation followed by professional services.

In Upperchurch and Foilnamon, 172 males are employed in the following sectors; agriculture and forestry at 34%, manufacturing industry at 16%, commerce and trade at 13%, public administration and professional at 8% each and building and construction at 6%.

In Upperchurch and Foilnamon, 110 females are employed mainly in the following sectors: professional services 45%, commerce and trade 15%, public administration 11%, manufacturing industry 9% and agriculture and forestry 7%.

9.2.3 Agriculture and Forestry in North Tipperary

Agriculture is the predominant land-use in North Tipperary with 149,411 ha of land under agriculture. Of this, 12,322 ha are under tillage for crops, fruit and horticulture. A further 130,371 ha are used for hay, silage and pasture. The most important activity is dairying and cattle rearing with over 80% of the agricultural gross output being generated by these sectors. Sheep account for c.136,000 animals in the County. There are approximately 26,000 ha of land taken up by forestry. Coillte own over 75% of the forestry land in the County while the remaining 25% is in private ownership.

The pre-dominant agricultural activity in the area is cattle rearing, dairying and forestry with some sheep rearing also.

9.2.4 Industry

While the County has a varied and diverse economic structure, economic activity is largely centred in urban centres although there is an increasing amount of economic activity locating in villages and the open countryside. Industrial activities in the study area are not intensive and essentially comprise of small local indigenous and micro enterprises.

*Upperchurch Windfarm Environmental Impact Statement***9.2.5 Education**

The Tipperary Institute in Thurles, now LIT Tipperary having joined forces with Limerick Institute of Technology, provides third level education in the County via a multimodal model. The Institute also has strong community links and targeted links with industry. The multi-nodal locations include both Thurles and Clonmel and links with secondary schools and the University of Limerick. There is also a Regional Training Centre in Roscrea.

LIT Tipperary located is 18km to the west of the study area and has promoted education through full time and part-time 3rd level courses in renewable energy since its inception in 1999. LIT Tipperary hosted a successful energy week as recently as October 2012 in recognition that many countries, including Ireland, are looking to green growth as the way out of the current economic crisis. LIT Tipperary offers a range of renewable energy courses in the context, to quote their website, of *government reports suggesting that there is the potential to create over 80,000 jobs in the 'Green Economy' (Developing the Green Economy in Ireland, 2009) and that there are currently at least 6,500 people employed directly in the environment sector in Ireland and the potential to create over 50,000 direct jobs by 2020 (Forfás, 2009).* LIT Tipperary offers full time undergraduate courses relevant to the Green Economy including Certificate in Renewable Energy Development, BSc in Environmental & Natural Resource Management and BSc in Computing, Smart Energy Systems.

The development of a large windfarm using the most up to date technology and computer systems in windfarm management, close to LIT Tipperary will be a realisation of one of the aims of the Institute to facilitate the promotion of the Green Economy.

9.2.6 Tourism

Although tourist visits to North Tipperary have increased in the past 15 years, the number of tourists represents only 5.4% of total visitors to Ireland.

North Tipperary has the longest shoreline of Lough Derg and provides some of the most striking views of the area from the Arra Mountains east of the lake. Ballina, Portroe, Garrykennedy, Dromineer and Terryglass are the centres for tourism around Lough Derg. The area is the most important tourism offering in the county, focusing on water and marine based activities as well as shore side activities including jetties and marinas.

The rural environment of North Tipperary provides an increasingly important location for water based, forestry based, agri-tourism and heritage based recreation to an increasing number of urban dwellers both from Tipperary and outside of the county.

Recreational offerings in the immediate environs of the proposal include a prayer garden and picnic area based in Kilcommon village and a walking festival weekend based in Upperchurch village.

The Walking Festival, held in November and in its 3rd year, promotes walks of various levels of difficulty in a programme of events from Friday to Sunday in the hills around Upperchurch village including three National Loop Walks - Knockalough Red Hugh Walk, Birchill Loop Walk and Slí Éamoin an Chnoic Walk. The Kilcommon Pilgrim Trail is also a national loop walk and features in the Upperchurch Walking Festival also. There are also 3 cycling events leaving from Upperchurch, offered in the programme of activities.

9.3 LIKELY SIGNIFICANT IMPACTS

Nationally the impacts of wind farm developments are largely beneficial. The generation of electricity from this renewable source will avoid the cost of importation of fossil fuels that would otherwise be required to generate the equivalent amount of electricity and will contribute to security of supply. However impacts at local level are typically more complex. Implications associated with the proposed wind farm development which may affect the local human environment are discussed hereunder. Please note that issues concerning noise and health and safety are principally addressed within other sections of the E.I.S. document (Chapters 7 & 10).

9.3.1 Construction Impacts

As with any development initial construction activities will pose temporary minor disturbances locally. The most notable of these disturbances relates to the generation of additional traffic on the local road networks. Given the nature of the vehicles required for turbine transportation in relation to the local road infrastructure it is likely that local residents and users of these roadways will experience minor disturbance from turbine related traffic. Here noise and safety implications are also an issue. However all disturbances associated with the additional volumes of traffic will be confined to the construction phase. Thus impacts are considered of temporary significance.

9.3.2 Operational Impacts

There are no major adverse operational impacts associated with the proposed wind farm development which would significantly impact negatively on local society. The project will produce electricity in an environment-friendly manner thereby avoiding the risk of air pollution and thus risk to human health. Noise emissions will not adversely impact on the quality of life of local residents.

The visual element of the development is perhaps the most pertinent aspect. Given the size of the turbine structures a visual consequence is unavoidable. The extent of visual impact will vary in degree and significance according to viewing distance, the numbers and parts of turbines visible, the local topography and public perception. Please refer to Chapter 11 of the EIS for the Visual Impact assessment.

The windfarm will be visible to a greater or lesser extent from the Loop walks and cycling events that comprise the Upperchurch Walking Festival. These events have been discussed with local community representatives and ideas were shared on how the windfarm infrastructure can be used to enhance the programme of activities.

The community in the area will gain from the significant rental payments which will be paid annually to 35 local landowners. The wider community will gain through a direct payment to the local community development groups.

9.3.3 Land-use

In an area dominated by agricultural land: the pattern of land use on the site will not change significantly as a result of the proposed wind farm. Only approx 2% of the total land area of a site is used for the turbines and roads associated with the wind farm development. The remaining land is available for use as before. Wind turbine foundations are normally completely buried, permitting existing agricultural activities to extend right up to the tower base. The proposed development will therefore be compatible with the current agricultural practices on the site. Thus the ability for the site to sustain current agricultural practices in conjunction with the proposed wind turbines greatly enhances the economic land-use viability of the 37 individual farms involved in the project.

9.3.4 Property value

Land and property value may be economic or amenity in nature.

The land on which the turbines are positioned will increase in value because of the lease income from the development.

The potential for the proposed development to devalue neighbouring lands is mitigated by the EDP policy requirement to maintain a distance of 1.5X the turbine height from the boundaries of neighbouring lands. In all cases where this distance is not achieved it is with the permission of the neighbouring landowner.

Impact on existing residential property in its vicinity is essentially dependent upon public perception of the development and perceived associated impacts. Personal disposition regarding visual impact is the only likely significant implication with regard to residential values.

The windfarm development will not cause any material damage to neighbouring lands or residences and does not pose any polluting or hazardous threat that would result in the devaluation of neighbouring properties.

9.4 MITIGATION & RECOMMENDATION

In the interest of road safety during the construction stage, measures regarding traffic control will be implemented. In order to mitigate for increased road usage, deliveries of heavy equipment will be timed to cause minimal disturbances to the residents and users of the local roads. Road authorities will also be informed of the planned road use.

10. RESIDENTIAL AMENITY

10.1. INTRODUCTION

The construction of wind turbines has the potential to impact on nearby residential amenity with regard to shadow flicker effect and noise.

Irish Wind Energy Association Best Practice Guidelines recommend that the predicted noise and shadow flicker effects are assessed for houses up to 10 rotor diameters from the nearest turbine. For the purposes of this EIS all houses within 900m of a proposed turbine are assessed.

There are 93 houses within 900m of a proposed turbine. The nearest house is 385m from a proposed turbine and is owned by one of the site owners but is unoccupied. The nearest house which is occupied by a person that is not involved in the project is 446m from a proposed turbine.

These houses are numbered 1-93 on **Figure 10.1** Shadow Flicker Effect Map and Chapter 10, Appendix 1 **Figure 2** Predicted Noise Levels at the end of this Chapter.

Shadow flicker is assessed below at 10.2. Noise Impacts are assessed separately by Malachy Walsh and Partners, Environmental Engineers in Appendix I of this Chapter.

10.2. SHADOW FLICKER

Wind turbines can cast long shadows when the sun is low in the sky. Where the blades of a wind turbine cast a shadow over a window in a nearby house and the rotation of the blades causes the shadow to flick on and off this occurrence is known as shadow flicker. This effect lasts only for a short period and happens only when the 7 specific circumstances listed below **combine**:

1. the sun is shining *and*
2. The sun is at a low angle (after dawn and before sunset), *and*
3. the turbine is directly between the sun and the affected property, *and*
4. there is enough wind to ensure that the turbine blades are moving *and*
5. the turbines are directly facing onto or away from the window, *and*
6. there is a window on the wind-turbine side of the house, *and*
7. there is no screening from vegetation

Note: The turbine blades are electronically directed to track the wind. The 3 blades then turn automatically to face the wind. For the turbines to face directly onto or away from a given property the wind would need to be blowing directly towards or away from the same property.

The DoEHLG Wind Energy Guidelines recommended that

shadow flicker at neighbouring dwellings within 500m should not exceed 30 hours per year or 30 minutes per day. It is recognised that at distances greater than 10 rotor diameters from a turbine, the potential for shadow flicker is very low. Where shadow flicker could be a problem, developers should provide calculations to quantify the effect.

When computer modelling to assess the predicted period of shadow flicker effect of the proposed turbines on Houses 1-93 was carried out the module created a 'shadow flicker effect at specified sensitive receptors' occurrence map in which the location and profile of the proposed turbines is recorded along with the nearest sensitive receptors i.e. all houses within 900m of a proposed turbine. It should be noted that this map (Figure 10.1) and data summary (below) presents the 'worst case' scenario as the neither probability of the sun not shining or the turbine not facing the house is taken into account when calculating the Shadow Flicker Occurrence. For example for every hour calculated by the model as having a shadow flicker effect, the actual periods of shadow flicker experienced at a particular receptor may be much less, given the cloudy weather conditions prevalent in Ireland and the variety of wind directions experienced in Ireland.

There are 93 houses (Houses 1-93 on **Figure 10.1**) within 900m of the proposed turbines. The result for the cumulative impact, in hours per year of shadow flicker effect of all 22 proposed turbines on Houses No. 1-93 and are listed below in Table 1.

10.2.1. Shadow Flicker Data

The following table summarises the shadow flicker effect at each of the 93 No. houses within 900m of a proposed turbine. The house number corresponding to the numbering on **Figure 10.1** is shown in column one and the cumulative hours from all 22 turbines is shown in column two.

Table 1: Shadow Flicker Data for Figure 10.1

House No.	Total Hours of predicted shadow flicker effect	Distance to nearest turbine (m)
1	38	471
2	27	385
3	40	460
4	35	494
5	0	502
6	0	457
7	25	503
8	6	442
9	37	516
10	37	474
11	4	513
12	16	600
13	19	528
14	0	519
15	12	533
16	24	524
17	0	514
18	19	396
19	23	541

REFERENCE DOCUMENTS

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House No.	Total Hours of predicted shadow flicker effect	Distance to nearest turbine (m)
20	27	549
21	0	535
22	0	551
23	9	559
24	26	528
25	10	446
26	5	608
27	0	544
28	11	582
29	0	533
30	0	591
31	0	594
32	24	609
33	52	598
34	0	610
35	1	602
36	0	617
37	0	558
38	0	585
39	0	620
40	13	613
41	10	633
42	0	824
43	8	629
44	4	633
45	15	630
46	7	643
47	7	651
48	9	668
49	21	652
50	0	602
51	0	680
52	16	595
53	7	648
54	1	553
55	9	625
56	0	693

REFERENCE DOCUMENTS

Upperchurch Windfarm Enviromental Impact Statement

House No.	Total Hours of predicted shadow flicker effect	Distance to nearest turbine (m)
57	0	694
58	0	646
59	0	689
60	0	635
61	0	641
62	16	508
63	0	706
64	5	707
65	1	643
66	0	647
67	0	651
68	0	723
69	0	729
70	0	744
71	0	759
72	0	717
73	4	566
74	0	770
75	1	779
76	5	580
77	4	749
78	0	762
79	0	800
80	0	821
81	0	761
82	0	833
83	0	769
84	0	838
85	0	815
86	0	842
87	0	781
88	0	860
89	0	864
90	0	782
91	0	666
92	0	885
93	0	861

*Upperchurch Windfarm Environmental Impact Statement***10.2.2. Shadow Flicker Assessment Results**

The DOEHLG Wind Energy Guidelines state that shadow flicker at neighbouring dwellings within 500m should not exceed 30 hours per year. At distances greater than 500m the effect is dissipated and at distances greater than 10 rotor diameters the potential for shadow flicker is very low.

Table 1 lists the results of the Shadow Flicker Occurrence model. Shadow flicker is predicted to exceed 30 hours per annum at 6 of the 93 houses surveyed, 4 of which are within 500m of a turbine. The House number as per Table 1 above and Figure 10.1 (Column 1), hours of shadow flicker occurrence from specific turbines (Column 2) and hours of cumulative shadow flicker occurrence per annum. values (Column 3) are listed. Mitigating factors for each house are also listed (Column 4).

Table 2: Shadow Flicker > 30 hours per annum

1	2		3	4
House No.	Turbine No.	Hours	Total hours per annum assuming sunshine 100% of the time	Mitigating factors
1	T21	38	38	471m from T21 Landowner involved in the project Fully screened by trees in the direction of the turbine
3	T21	40	40	460m from T21 Fully screened by trees in the direction of the turbine
4	T11	1	35	494m from T12 Fully screened by trees in the direction of the turbine
	T12	34		
9	T6	28	37	516m from T6 Landowner involved in the project House is partially screened by trees Over 500m from nearest turbine
	T7	9		
10	T21	37	37	474m from T21 Fully screened by trees in the direction of the turbine
33	T9	3	52	600m from T12 House is partially screened by tall trees in the direction of the turbines Over 500m from nearest turbine
	T11	2		
	T12	47		

Upperchurch Windfarm Environmental Impact Statement

Note: The wind would need to blow 100% of the time from critical wind directions and the sun would need to shine for 100% of this time for the predicted shadow flicker effect hours to be achieved. In reality, when these constraints are taken into account, the actual shadow flicker hours will be much less than predicted.

10.2.3. Mitigation Measures

Predicted durations will apply only if there is a coincidence of the sun shining at a very low angle, the turbine blade set is turned towards the property, the property has a window facing the turbine, there is no intervening vegetation or building and the turbine blades are moving. In other words shadow flicker can only occur if the sun is shining, the sun is low in the sky, the wind is blowing towards or away from the house and there is nothing obstructing the view of the turbine.

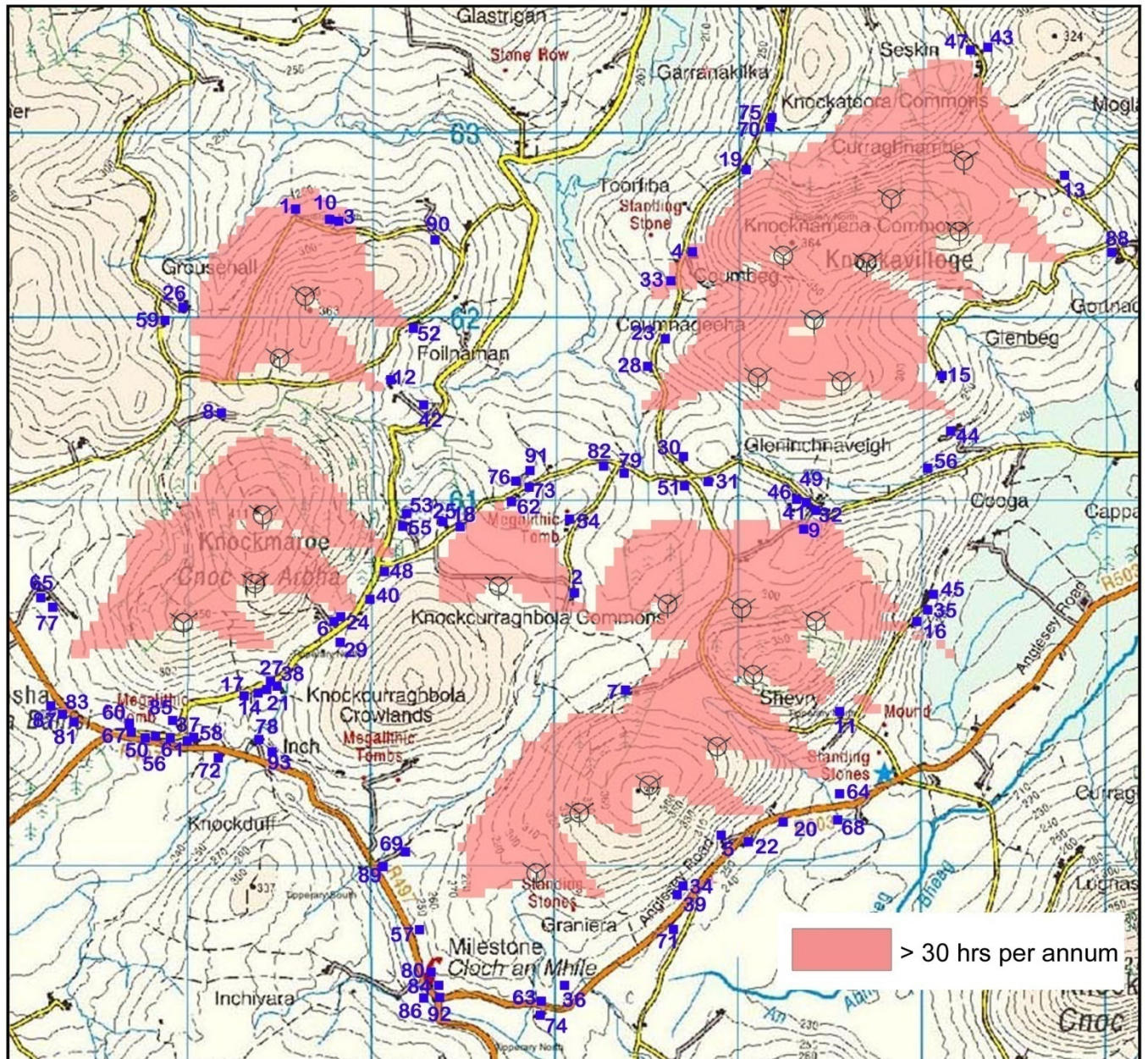
According to Met Eireann data the sun shines for an average of between 28% and 40% of the time in Ireland and even using the conservative 40% value, shadow flicker occurrence will not exceed 30 hours per annum. at any house surveyed.

In addition, shadow flicker effect is ameliorated by distance. For the turbines proposed for Upperchurch, which are standard turbines consisting of a tower topped by a set of three tapered blades mounted on the horizontal axis it is conservatively assumed that there will be negligible effect for distances greater than 1,000 meters and only a partial effect between 400 meters and 1,000 metres.

The angular diameter of the sun is about 0.54° based on a diameter of 1.4×10^6 km at a distance of 1.49×10^8 km. This will affect the extent of time that the shadow effect occurs at any location and the nature of the effect. At close distance, a blade may have a noticeable shadowing effect, but the extent of the effect will decrease with distance. For example, a 3.5m wide blade would need to be at a distance of only 375m to have the same angular width as the sun. Even at 375m the effect of atmospheric scattering of light is likely to mean that the shadow effect is not clearly defined. Beyond 375m the turbine blade is less than the angular width of the sun. In this situation, the shadow flicker effect may be considerably reduced in intensity.

Ecopower Developments intend, for the first two years of operation, to log in real time the actual shadow flicker duration at the six dwellings listed at Table 2 above to ensure that the effect will not exceed 30 hours per annum. In the unlikely event that it is found that the 30 hours per annum limit will be exceeded, the offending turbine will be shut down during the time that it would cause the effect at the particular dwelling in question for the remaining part of that year.

FIGURE 10-1: SHADOW FLICKER EFFECT MAP



APPENDIX 10-I NOISE IMPACT ASSESSMENT


Malachy Walsh and Partners

Engineering and Environmental Consultants

Appendix 10-I

Upperchurch Wind Farm

Noise Impact Assessment

14802

October 2012

EcoPower Developments

Job number	Revision	Prepared by	Checked by	Status	Date
14802-6001	A	Peter Barry		Client Review	07/09/2012
14802-6001	B	Peter Barry		Client Review	12/10/2012
14802-6001	C	Peter Barry		Client Review	06/12/2012

Peter Barry, BSc, MSc, PGDip (Air Quality, Noise and Vibration, Waste Management) is an Environmental Consultant with six years experience across a wide range of environmental projects, including EIA, contaminated land site investigations, waste management, environmental monitoring and air quality and noise and vibration assessment. Peter has completed many air quality and noise assessments for inclusion in Environmental Reports and Environmental Impact Statements.



1 INTRODUCTION

This chapter describes the potential noise and vibration associated with the construction and operation of the proposed Upperchurch wind farm.

The main sources of noise from a wind turbine include aerodynamic noise (rotating blades in the air) and mechanical noise (gearbox (if not a direct drive system) and generator).

Noise only occurs above the 'cut-in' wind speed and below the 'cut-out' wind speed. The typical 'cut-in' wind speed of a modern turbine is 3 meters per second (m/s) and the 'cut-out' wind speed is approximately 25 to 30 m/s. At this stage of the proposal the preferred turbine candidates has not yet been finalised. For the purpose of this assessment the sound power levels and octave banding associated with the Vestas V90 turbine were used. Ultimately the most appropriate turbine model and operating will be selected in order to achieve the noise limits set down in any planning condition.

Construction noise will occur during excavation and earth moving, laying of roads and hard standings, transportation of materials and erection of the wind turbines. The construction phase will be phased and temporary.

Aerodynamic Modulation, Infrasound, Wind Farm Noise on Health and Vibration associated with wind turbines have also been addressed in this report.

2 METHODOLOGY AND ASSESSMENT CRITERIA

In general the methodology used to assess the noise impact from wind farms includes extended measurements of the existing background noise levels (across a range of wind speeds) at nearby representative dwellings and comparisons against the predicted noise output from the wind farm, which also varies with wind speed. The methodology and planning guidance framework are described in the following sections.

2.1 WIND FARM NOISE PLANNING GUIDANCE

a) ETSU-R-97 – The Assessment and Rating of Wind Farm Noise (1997)

The assessment methodology was adopted from *ETSU-R-97 – The Assessment and Rating of Wind Farm Noise (1997)*¹. This document is currently used as the industry standard in the UK and Ireland and the noise levels contained within the Irish Wind Energy Planning Guidelines are adapted from this document.

b) IoA Acoustics Bulletin Article, Prediction and Assessment of Wind Turbine Noise, March/ April 2009

The Institute of Acoustics Bulletin Vol. 34 no 2 contains an agreement, jointly authored by a number of consultants working in the wind turbine sector for developers, local authorities and third parties, on an agreed methodology for addressing issues not covered by ETSU-R-97. This includes a methodology for dealing with wind shear and an agreed method for noise predictions.

c) Department of the Environment, Heritage, and Local Government (DoEHLG) – Wind Energy Planning Guidelines (Department of the Environment, Heritage and Local Government 2006)

This document provides the framework for wind farm noise assessment in Ireland. It is evident that the assessment criteria in this document are adapted from *ETSU-R-97 – The Assessment and Rating of Wind Farm Noise (1997)*.

¹ A recent research report published by Hayes McKenzie reviewed the way noise assessments are being carried out as part of the application process for planning consent for wind turbines in England. It was reported that from the sample set reviewed the ETSU-R-97 methodology has been universally adopted for the assessment of noise from proposed wind farm developments with 100% of cases stating it to be the appropriate guidance.

*Upperchurch Windfarm Environmental Impact Statement***2.1.1 Prevailing Background Noise Levels**

For the purpose of this assessment noise monitoring was carried out for period of two weeks at each of the measurement locations between July and August 2012. Given the number of dwellings in the area noise monitoring was undertaken at 10 locations (NM1 to NM10). The monitoring equipment used included:

- a) **A Bruel and Kjaer (B&K) 2250 sound level meter** was used to measure background noise levels at the selected receptors. The microphone was mounted on a tripod at least 3m away from any reflective surfaces and at height of 1.2 meters (m). A wind shield was mounted on the microphone. An outdoor environmental noise enclosure protected the equipment from the elements.
- b) **A Vantage Pro2 weather station** developed by Davis Instruments was used to monitor wind speeds, wind direction, temperature, humidity and rainfall rate throughout the measurement period. This data was logged in 10 minute intervals which were synchronised with the sound level meters.

Wind speed measurements were recorded at a height of 4m. However, wind speed varies with height above the ground level, increasing with increased height. In accordance with ETSU the values of wind speed were corrected to a height of 10m. Using equation (1) wind speeds measured at one height, can be corrected to the value that would have been measured at another height.

$$\frac{v_1}{v_2} = \frac{\ln\left(\frac{h_1}{z_0}\right)}{\ln\left(\frac{h_2}{z_0}\right)} \quad (1)$$

where v_1 is the wind speed (m/s) at a height of h_1 meters above ground level, v_2 is the wind speed (m/s) at a height of h_2 meters above ground level, z_0 is the ground roughness length (m). Some typical values for z_0 are presented in Table 11.2. For the Upperchurch case a roughness length of 0.05 was selected.

Table 1 Roughness length for various types of terrain (ETSU).

Type of Terrain	Roughness length z_0
Water area, snow or sand surfaces	0.001m
Open, flat land, mown grass, bare soil	0.01m
Farmland with some vegetation	0.05m
Suburbs, towns, forests, many trees and bushes	0.30m

*Upperchurch Windfarm Environmental Impact Statement***2.2 POTENTIAL IMPACT**

The noise modelling software (Predictor, Version 7.1) is based on ISO 9613-2:1996 Acoustics – *Attenuation of sound during propagation outdoors* – Part 2: General method of calculation. This software was used to predict wind farm noise at all dwellings within 900m of the proposed wind farm. The data input into the model was defined by *IoA Acoustics Bulletin March/April 2009 – Prediction and Assessment of Wind Turbine Noise* and is presented in table 2.

The data used in the model is conservative in particular as it assumes all dwellings are downwind of all turbines simultaneously, which in practice cannot happen. For wind directions other than downwind, noise levels will be lower.

The predicted turbine noise L_{Aeq} has been adjusted by subtracting 2dB(A) to give the equivalent L_{A90} as suggested by ETSU-R-97.

Table 2 Model Input Data

Item	Description
Turbine	Vestas V90
Turbine Locations	GPS Co-ordinates
House Locations	Site Survey/ Geo-Directory Data
Acoustic Emission	Acoustic Specification Document
Hub Height	80m
Topography	Discovery 10m Contours
Ground Factor	Mixed (0.5) ^{Note 1}
Receptor Height	4m
Wind Direction	Downwind
Relative Humidity	70%
Temperature	10°C

Note 1: The ground factor may be between 0 and 1, where 0 represents hard ground and 1 represents soft ground. Hard ground reflects sound and soft ground absorbs it.

The sound power levels for the Vestas V90, with typical octave band data was obtained from the Vestas Specification Document² are outlined in Table 3.

² 1/1 Octaves According to General Specification V90-0005-5233 V01

*Upperchurch Windfarm Environmental Impact Statement***Table 3 Vestas V90 – Octave Banding and Sound Power Levels (SPL)**

Wind Speed	Octave Band (Hz)								
	63	125	250	500	1000	2000	4000	8000	SPL dB
10 m/s	91.3	93.0	95.5	98.2	100.4	99.2	94.9	85.0	105.6
9 m/s	92.3	94.2	96.9	99.5	101.7	100.4	96.4	86.6	106.9
8 m/s	91.8	94.0	97.3	99.6	101.8	100.5	96.7	86.7	107.0
7 m/s	89.7	93.3	96.1	98.3	100.8	100.1	96.2	85.7	106.1
6 m/s	85.7	90.9	94.0	96.5	99.1	98.2	94.3	83.7	104.2
5 m/s	82.1	86.9	91.5	93.5	95.9	94.6	90.5	79.1	100.9

2.2.1 Noise limits and Assessment Criteria

The noise limits applied to the nearest dwellings were adopted from the Department of the Environment Heritage and Local Government (DoEHLG) – Wind Farm Energy Planning Guidelines.

The impact of the construction works on the local dwellings has also been predicted. The construction works will be of short duration. Higher noise limits apply to the construction works as there must be a compromise between the practicality of construction and the temporary nature of the works.

2.2.1.1 Operational Phase Noise Limits

The limits set out in the Department of the Environment Heritage and Local Government (DoEHLG) – Wind Farm Planning Guidelines were adopted for the purpose of this assessment. The noise limits have been defined as shown in table 4.

Table 4 Day and Night Time Noise Limits

Daytime	Night time
Where the prevailing background noise level is less than 30dB, the greater of 35 - 40dB or plus 5dB above background Or Where the prevailing background noise level is greater than 30dB the noise limits are the greater of 45dB or plus 5dB above background.	the greater of 43dB or plus 5dB above background

For the purpose of this assessment where the prevailing background noise level is less than 30dB, the greater of 40dB L_{A90} or plus 5dB above background has been adopted.

*Upperchurch Windfarm Environmental Impact Statement***2.2.1.2 Construction Phase Noise Limits**

There are no mandatory noise limits for construction noise in Ireland. The most recent revision of BS 5228-1:2009 Code of practice for noise and vibration control on construction and open sites outlines noise thresholds for significant impacts. These are outlined in Table 5.

Table 5 Threshold of significant effect at dwellings

Assessment category and threshold Value Period (L_{Aeq})	Threshold value in decibels (dB)
	Category A
Night time (23.00 – 07.00)	45
Evening and Weekends	55
Daytime (07.00 – 19.00) and Saturdays (07.00-13.00)	65

Table 4 can be used as follows: for the appropriate period (night, evening/weekends or day), the ambient noise level is determined and rounded to the nearest 5 dB. This is then compared with the total noise level, including construction. If the total noise level exceeds the appropriate category value, then a significant effect is deemed to occur.

3 EXISTING ENVIRONMENT

The wind farm is to be developed in a rural area 2 km west of Upperchurch Village, County Tipperary. The main sources of noise in the area and the existing noise environment include traffic on the local and regional road network, agricultural activity and other noise typically associated with a rural location.

The locations (GPS Coordinates) of all dwellings within 900m of the proposed wind farm have been provided by the client, Ecopower Developments. There are approximately 93 dwellings within 900m of the proposed development. In total noise monitoring was undertaken at 10 locations, referred to as N1 to N10. The location of the dwellings, noise monitoring locations and proposed turbines are illustrated on Figure 1.

3.1 DERIVATION OF PREVAILING BACKGROUND NOISE

The variation in background noise level with wind speed was determined by correlating $L_{A90,10min}$ noise measurements taken over a period of time (2 weeks) with the average wind speeds measured over the same 10-minute periods and then fitting a curve to these data. The derived regression line (line of best fit) is the average background noise which occurs under different wind speed conditions. This process was repeated for the day and night time periods. The graphs in Appendix A illustrate the prevailing background noise levels across a range of wind speeds as derived from the two week noise monitoring period at each of the monitoring locations.

*Upperchurch Windfarm Environmental Impact Statement***3.1.1 Critical Wind Speed**

The rate at which wind turbine noise increases with wind speed is lower than the rate at which background noise levels increase with wind speed. The impact of wind turbine noise is therefore likely to be greater at low wind speeds, when the difference between the noise of the wind turbine and the background noise is likely to be greater. In accordance with the Irish Wind Farm Planning Guidelines, where the prevailing background noise level is greater than 30dB the noise limits are the greater of 45dB or plus 5dB above background and at **night time** - the greater of 43dB or plus 5dB above background. However the wind farm cannot discriminate between day and night and consequently the lower night time limit of 43dB(A) must apply at all times. Predictions have been undertaken at 8m/s which represents the likely critical wind speed. However noise predictions have been undertaken for all wind speeds for the purpose of comparison against the derived the prevailing background noise levels (see Appendix B).

4 LIKELY SIGNIFICANT IMPACT**4.1 OPERATIONAL PHASE PREDICTED RESULTS**

Noise from the wind farm was predicted at all dwellings within 900m with the wind speed at the greatest sound power level to represent worst case scenario conditions. 8m/s wind speed was used because at wind speeds below 8m/s wind turbine noise emission and above 8/s the noise from the wind is likely to mask wind turbine noise.

Table 6 Predicted Worst Case Noise Results (Downwind) @ Maximum Noise Emission (8m/s)

Name	Description	Predicted Noise Level	Predicted Noise Level (with certain turbines in noise reduced mode)	Guideline Limit
H7 (NM10)	Unoccupied	45	43	43
H2	Landowner	45	43	43
H5	Landowner	44	42	43
H9	Landowner	44	43	43
H15 (NM5)	Landowner	44	43	49*
H41 (NM4)	Landowner	43	42	43
H49	Landowner	43	42	43
H32	Unoccupied	43	42	43
H18		43	42	43
H31	Unoccupied	43	42	43
H46	Landowner	44	42	43
H8 (NM6)		43	43	49*
H51		43	42	43
H11 (NM2)		43	40	43
H54	Landowner	43	41	43

REFERENCE DOCUMENTS

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H30		43	42	43
H25		43	41	43
H6 (NM3)	Landowner	42	42	43
H23		42	42	43
H4 (NM8)		42	42	43
H13 (NM9)		42	42	43
H62		42	40	43
H14		42	42	43
H48	Unoccupied	42	41	43
H33		42	42	43
H24	Unoccupied	42	41	43
H12 (NM7)	Landowner	41	41	43
H73		41	40	43
H20		42	39	43
H28	Unoccupied	42	41	43
H40	Unoccupied	42	41	43
H34		41	38	43
H39	Landowner	41	38	43
H55		41	39	43
H21		42	41	43
H29		41	41	43
H79		41	40	43
H17		41	41	43
H27		41	41	43
H22	Landowner	41	38	43
H76		41	40	43
H53	Unoccupied	41	40	43
H82		41	40	43
H44		41	40	43
H56	Unoccupied	41	40	43
H52		40	40	43
H38		40	40	43
H70	Community Hall	40	40	43
H3		41	40	43
H75		40	40	43
H26	Landowner	40	40	43
H71		40	38	43
H1 (NM1)	Landowner	40	40	43
H10		40	40	43
H19		40	40	43
H42		40	40	43

REFERENCE DOCUMENTS

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H64	Landowner	40	37	43
H91		40	39	43
H43		40	40	43
H68	Landowner	40	37	43
H37		40	40	43
H36	Landowner	39	39	43
H47		39	39	43
H59		39	39	43
H16		39	34	43
H50		39	39	43
H69		39	38	43
H58	Landowner	39	39	43
H88		38	38	43
H61		39	38	43
H60		38	38	43
H65		38	38	43
H66	Unoccupied	38	38	43
H63		38	37	43
H35		38	37	43
H78	Landowner	38	38	43
H57		38	38	43
H67		38	38	43
H72	Unoccupied	38	38	43
H45		38	38	43
H74		37	37	43
H93		38	37	43
H77		37	37	43
H90		37	37	43
H85		37	36	43
H81		37	36	43
H80	Unoccupied	36	36	43
H83		36	36	43
H84		36	36	43
H87		36	36	43
H86	Unoccupied	36	35	43
H92	Unoccupied	36	35	43

*5dB(A) above background noise at this wind speed

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The results show that the guideline limit may be exceeded at H2 (landowner), H5 (landowner), H7 (empty) and H9 (landowner) with the turbines running in normal operating mode. These results are likely an overestimate as no consideration of wind direction has been factored into the results. The model assumes that all dwellings are downwind of all turbines simultaneously which is practice cannot happen. In reality the contribution of wind turbines to noise levels at local dwellings will be much less under downwind conditions. In addition at all other wind speeds noise levels will be lower. The results in table 6 are illustrated in Figure 2. It must also be noted that these results are based on the turbine running in normal operating mode. Some can turbine types can be run in different operating modes which results in different sound level outputs. The individual turbines will operate in a mode that ensures compliance with the noise limit i.e. 43dB(A).

To demonstrate this, turbines have been modelled in the appropriate mode and the mitigated noise levels are presented in table 6. The turbines operating in noise reduced mode are presented in table 7 below.

Table 7 Mitigated Turbine and Operating Mode

Turbine	Operating Mode
T1	normal operating mode
T2	noise reduced mode 1
T3	noise reduced mode 3
T4	noise reduced mode 2
T5	noise reduced mode 1
T6	noise reduced mode 1
T7	noise reduced mode 1
T8	noise reduced mode 3
T9	normal operating mode
T10	noise reduced mode 1
T11	normal operating mode
T12	normal operating mode
T13	normal operating mode
T14	normal operating mode
T15	normal operating mode
T16	normal operating mode
T17	normal operating mode
T18	normal operating mode
T19	normal operating mode
T20	normal operating mode
T21	normal operating mode
T22	noise reduced mode 2

*Upperchurch Windfarm Environmental Impact Statement***4.2 WIND FARM NOISE VS. NOISE LIMIT CRITERIA**

A scatter graph using the baseline noise data (see also Appendix A) and the derived 10 meter high wind speeds was generated and a trend line was added. It was then possible to derive the noise limit curve for each location using the trend line and noise limit criteria set out in table 4. This process was repeated for the day time and night time periods. Using the predicted L_{A90} across different wind speeds the turbine noise was plotted against the noise limit curves for N1 to N10. These curves are illustrated in Appendix B and the results presented in table 7 above.

4.3 CONSTRUCTION PHASE

The construction works will require heavy earth moving machinery involved in overburden removal, and construction of the wind farm infrastructure including roads, hard standings and substation. Table 8 below is a typical list of plant and machinery involved in a wind farm construction of this size. Traffic generated by materials delivery to site and employee traffic will also contribute to the noise level. The noise levels from the equipment identified above have been sourced from BS5228 Noise Database for Noise and Vibration Control on Construction and Open Sites-1:2009.

Table 8 Sound Power Frequency Data for Typical Construction Plant Machinery

Plant and Machinery	Octave Banding (Hz)								Sound Power Level dB(A)	Sound Pressure Level @10m dB(A)
	63	125	250	500	1k	2k	4k	8k		
Telescopic Handler	86.8	86.9	85.4	92.8	98	96.2	88	78.9	102	71
Mobile Crane	84.8	90.9	93.4	90.8	95.0	95.2	88.0	79.9	101	70
30-50T Excavator (x2)	89.8	92.9	99.4	104.8	104	103.2	100	92.9	110	79
15-30T Excavator (x4)	99.8	98.9	104.1	100.8	101	100.2	96	86.9	109	78
12T Roller (x2)	94.8	98.9	99.4	108.8	104	100.2	97	90.9	111	80
Dump truck (x5)	89.8	94.9	99.4	98.8	105	102.2	97	87.9	109	78
Tractor & Trailer (x4)	97.8	100.9	98.4	103.8	104	104.2	96	88.9	110	79
15-20T Rubber Tired Excavator	78.8	80.9	86.4	91.8	94	92.2	91	79.9	99	68
Erection and Assist Crane (x2)	70.8	85.9	90.4	89.8	97	98.2	87	75.9	102	71
3-10T mini digger	85.8	86.9	90.4	90	95.0	90	92	84.9	100	69
Rock Breaker	83.8	96.9	103.4	109.8	117	118.2	118	114.9	123	92
Diesel Generator	84.8	88.9	79.4	81.8	84	80.2	77	66.9	92	61

The estimated programme of works for construction indicates a 6 to 8 month period. The construction works will be phased and all the noise sources presented in table 8 will not be in operation continuously or simultaneously for the duration of the construction phase. However for the purpose of this assessment a worst case scenario has been assumed and all the items of machinery have been modelled as if they were in operation continuously and simultaneously over the course of a twelve hour working day.

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The results of the construction noise predictive modelling indicate that the appropriate threshold of significance **(65dB (A))** as outlined in BS5228-1:2009 will not be exceeded beyond 200m. There are no dwellings within this range. The results are illustrated in table 9 below. In reality all items of plant will not be operating at the same location and at the same time, therefore it is reasonable to conclude that the noise levels experienced by the receiving environment will be much lower.

Table 9 Theoretical Worst Case Scenario Construction Noise

Distance to receiver (m)	Theoretical Worst Case Scenario dB(A)
100	72
200	64
300	60
400	57
500	54

4.4 VIBRATION, LOW FREQUENCY NOISE AND HEALTH

4.4.1 Vibration

Although there is no Irish guidance on vibration, low frequency noise and health, it is an issues that crops up regularly. A study of low frequency noise and vibration around a modern wind farm was carried out for ETSU and reported in ETSU W/13/00392/REP, Low Frequency Noise and Vibrations Measurement at a Modern Wind Farm. The study found that vibration levels 100m from the nearest turbine were a factor of 10 less than those recommended for human exposure in sensitive buildings, such as hospitals or laboratories housing precision measurement instruments.

These findings were confirmed in July 2005 by the Applied and Environmental Geophysics Group of the School of Physical and Geographical Sciences at Keele University. Keele University undertook an assessment of the likely impact of ground borne vibrations from wind turbines on the seismic array at Eskdalemuir, Scotland. Eskdalemuir, in the Scottish Borders, is in the location of a monitoring facility operated by the British Geological Survey where seismological, magnetic and other environmental parameters are monitored because the site is located in a very quiet and seismic environment. Testing showed that vibration can be detected several kilometres from the wind turbines. However, Keele University clarified the context of their results.

“The level of vibration from wind turbines is so small that only the most sophisticated instrumentation and data processing can reveal their presence, and they are almost impossible to detect. The Dun Law study was designed to measure effects of extremely low level vibration on one of the quietest sites in the world (Eskdalemuir) and

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one which houses one of the most sensitive seismic installations in the world. Vibrations at this level and in this frequency range will be available from all kinds of sources such as traffic and background."

In a recent letter to the press two of the authors of this report stated that *'to put the level of vibration into context, they are ground vibrations with amplitudes of about one millionth of a millimetre. There is no possibility of humans sensing the vibration and absolutely no risk to human health'.*

4.4.2 Infrasound and Low Frequency Noise

Infrasound is the term generally used to describe sound below that at which is normally audible, at frequencies below 20Hz. At separation distances from wind turbines which are typical of residential locations, the levels of infrasound from wind turbines are well below the human perception level. Infrasound from wind turbines is often at levels below that of the noise generated by wind around buildings and other obstacles. Sounds at frequencies from about 20Hz to 200Hz are conventionally referred to as low frequency sounds. A report for the Department of Trade and Industry (DTI) in 2006 by Hayes McKenzie concluded that neither infrasound nor low frequency noise was a significant factor at the separation distances at which people lived.

4.4.3 Wind Farms Noise and Health

To date there is no published evidence to suggest a direct link between wind farms and health. The main publications supporting these views include.

a) Australian National Health and Medical Research Council (NHMRC) July 2010

"There is currently no published scientific evidence to positively link wind turbines with adverse health effects".

b) Wind Turbine Sound and Health Effects - An Expert Panel Review - American Wind Energy Association and Canadian Wind Energy Association December 2009

"There is no evidence that the audible or sub-audible sounds emitted by wind turbines have any direct adverse physiological effects.

The ground-borne vibrations from wind turbines are too weak to be detected by, or to affect, humans.

The sounds emitted by wind turbines are not unique. There is no reason to believe, based on the levels and frequencies of the sounds and the panel's experience with sound exposures in occupational settings, that the sounds from wind turbines could plausibly have direct adverse health consequences."

c) Renewable UK - Wind Turbine Syndrome - An independent review of the state of knowledge about the alleged health condition July 2010

"There is no reason to believe that the sounds from wind turbines could plausibly have direct adverse health consequence"

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4.5 MITIGATION MEASURES

4.5.1 Operational Phase

This assessment has been based on a typical turbine suitable for the site, operating in normal mode. Four locations have been identified where the noise limit could be exceeded by 1 or 2 dB(A). However these locations are either empty or have a financial involvement. The owners may consent to the increase over the limit or the selected turbine will be programmed to the most appropriate noise reduced mode to ensure compliance with the noise limit (see also table 6 and table 7).

4.5.2 Construction Phase

Best practice in the form of *BS5228 –1&2:2009, Code of Practice for the Control of Noise and Vibration on Construction and Open Sites* should be adopted during the construction phase in order to minimise the noise generated by construction activities and nuisance to neighbours.

4.6 RESIDUAL IMPACTS

While noise from wind turbines may be audible at certain locations under certain meteorological conditions, noise levels will predicted to exceed the DoEHLG Wind Energy Planning Assessment Criteria designed for the protection of residential amenity at the majority of locations, once mitigation measures are employed.

4.7 CONCLUSION

An assessment of the likely noise impact of the proposed Upperchurch Wind Farm has been carried out.

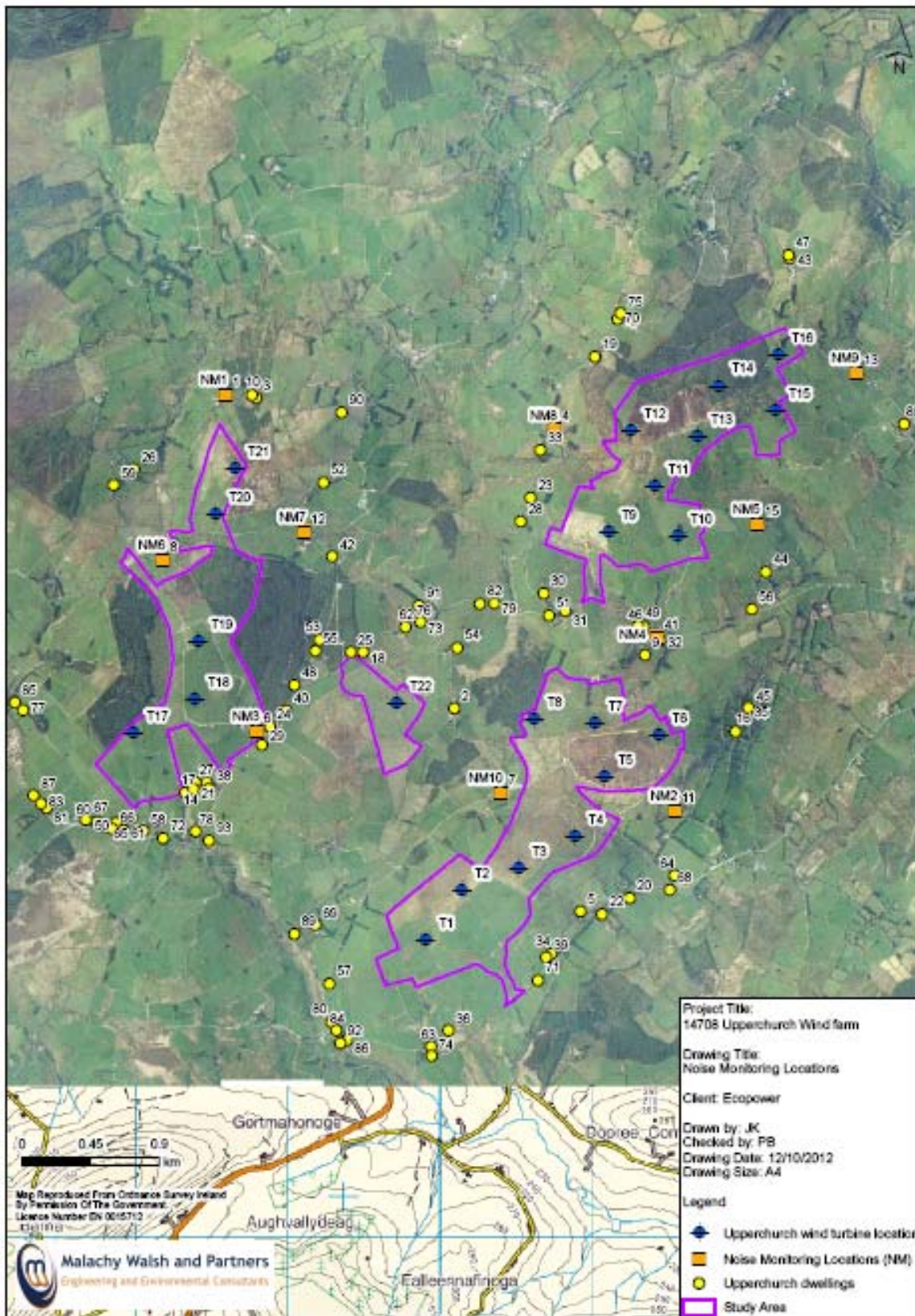
Typical downwind turbine noise levels at the closest residential locations to the site have been predicted based on provided sound power level data for a Vestas V90 wind turbine.

The assessment has been carried out in accordance with methodology described in ETSU-R-97, Assessment and Rating of Noise from Wind Farms.

The results show that the predicted wind farm noise levels adhere to the assessment criteria and in particular the DoEHLG Wind Farm Planning Guidelines.

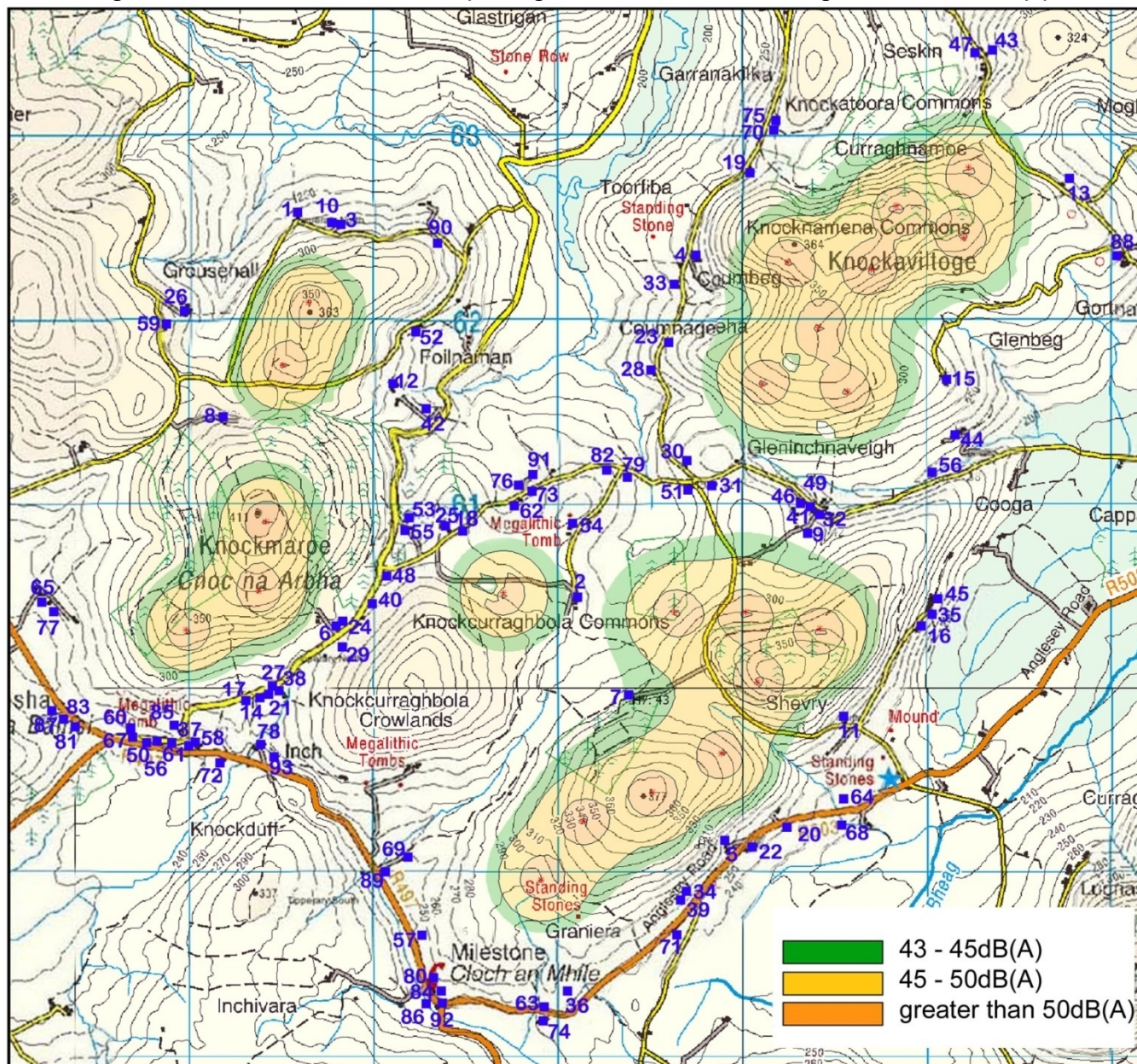
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Figure 1 Wind Farm and all dwellings within 900m



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Figure 2 Predicted Noise Level at 8m/s (unmitigated, all areas outside shading are below L90 43dB(A))



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4.8 REFERENCES

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Renewable UK - *Wind Turbine Syndrome - An Independent review of the State of Knowledge about the Alleged Health Condition* July 2010

Wind Turbine Sound and Health Effects - An Expert Panel Review - American Wind Energy Association and Canadian Wind Energy Association December 2009

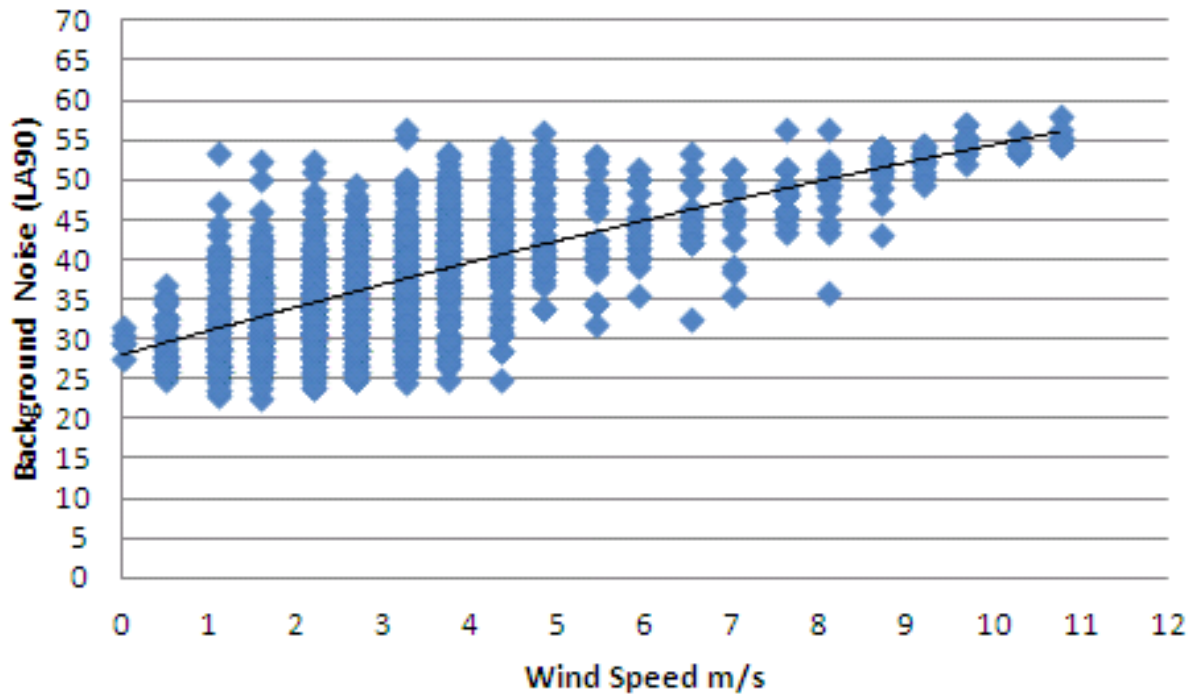
W/45/00656/00/00 .*The Measurement of Low Frequency Noise at Three UK Windfarms*. Department of Trade and Industry, 2006.

Appendix A

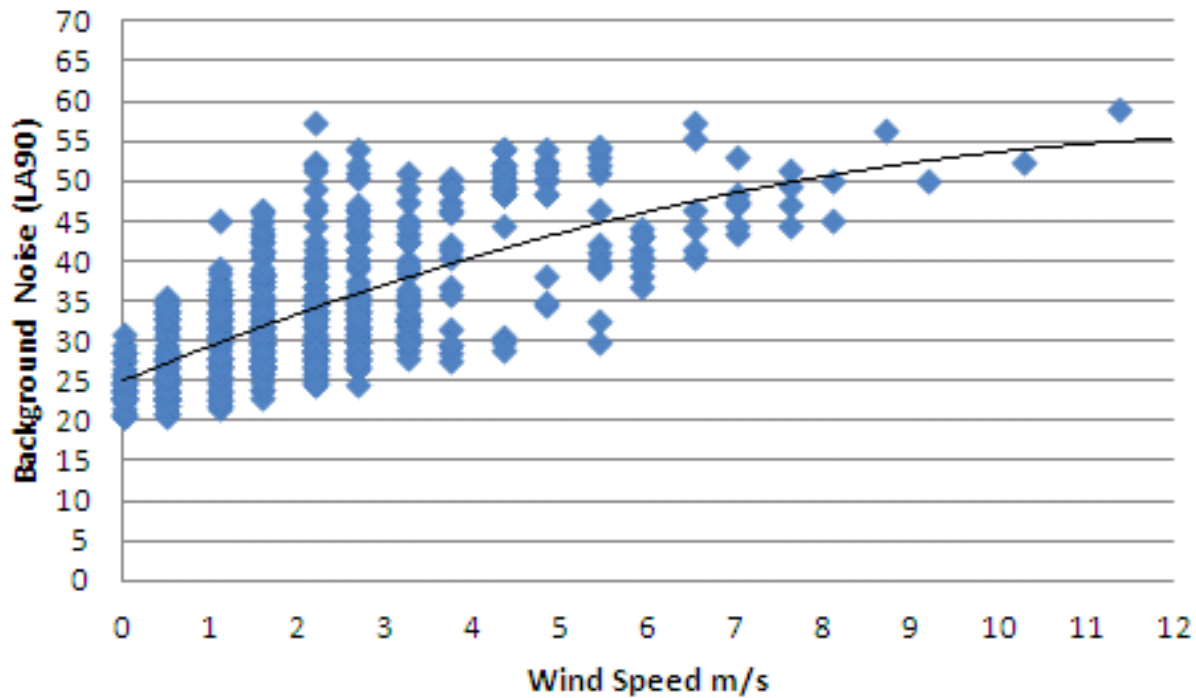
Prevailing Background Noise Levels at NM1 to NM10

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Location N1 Daytime Prevailing Background Noise Level

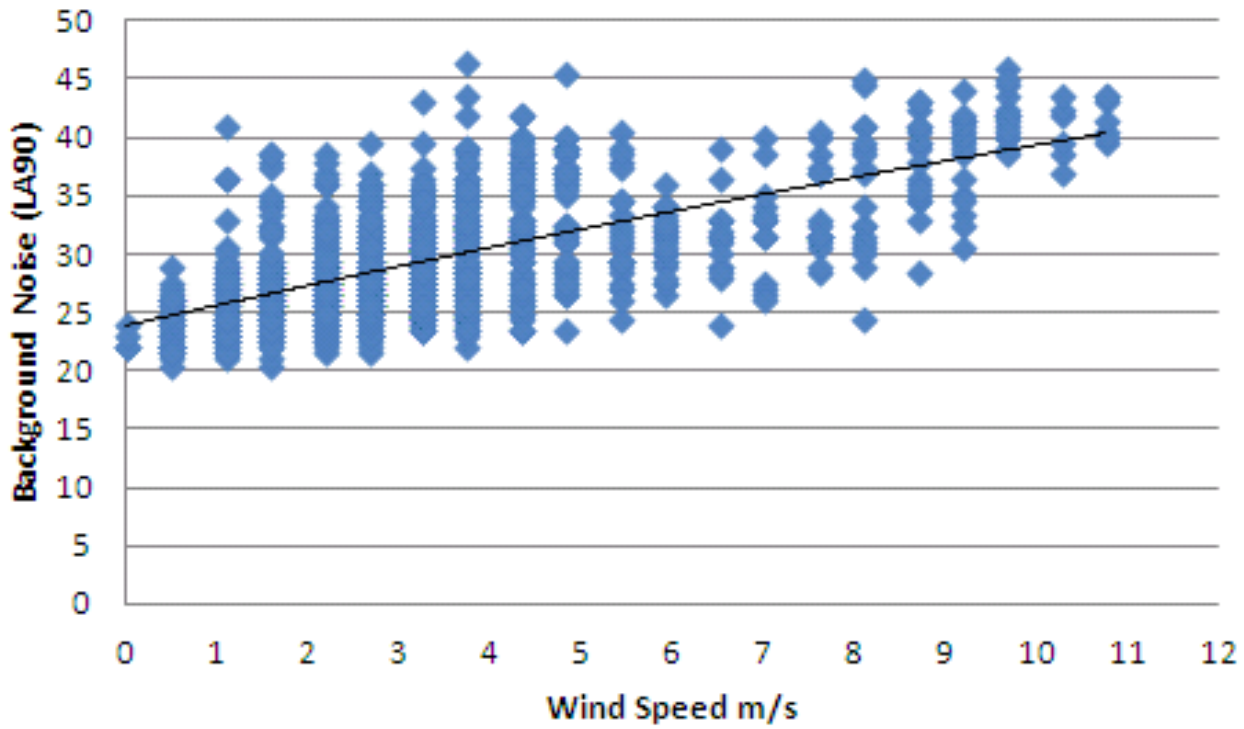


Location N1 Night time Prevailing Background Noise Level

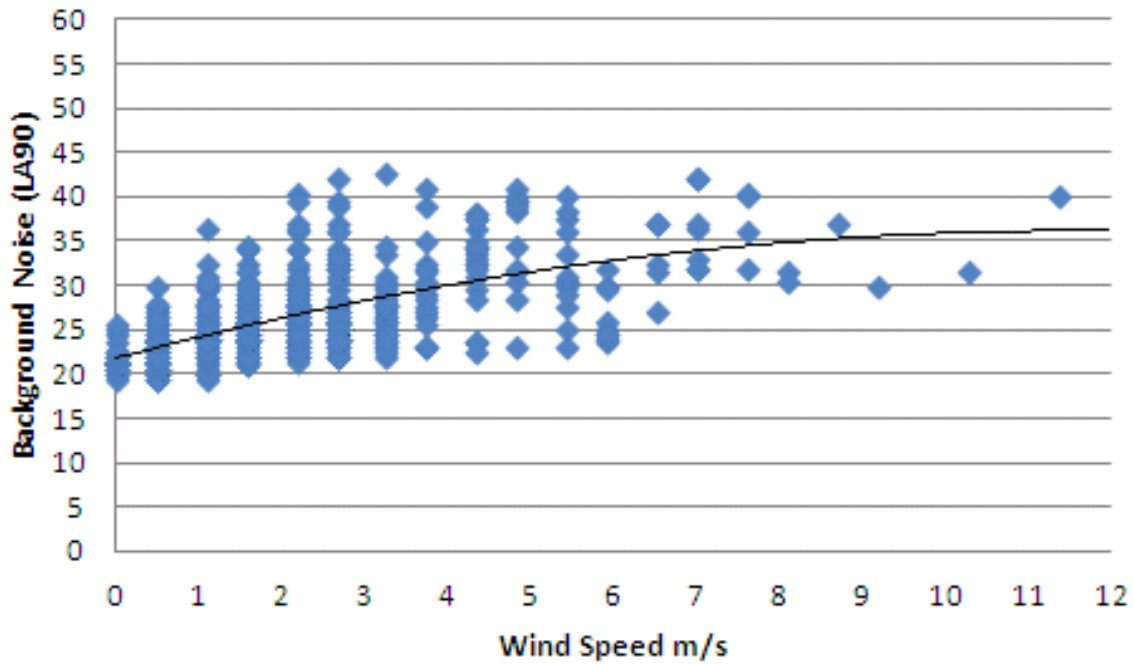


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Location N2 Day time Prevailing Background Noise Level

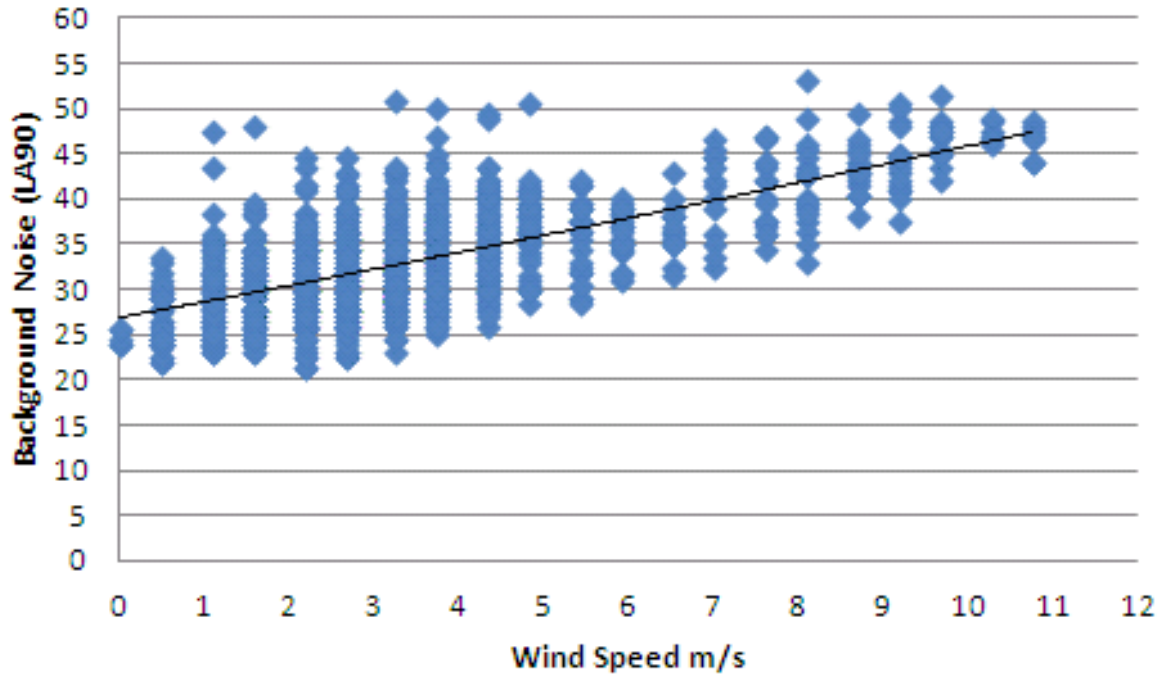


Location N2 Night time Prevailing Background Noise Level

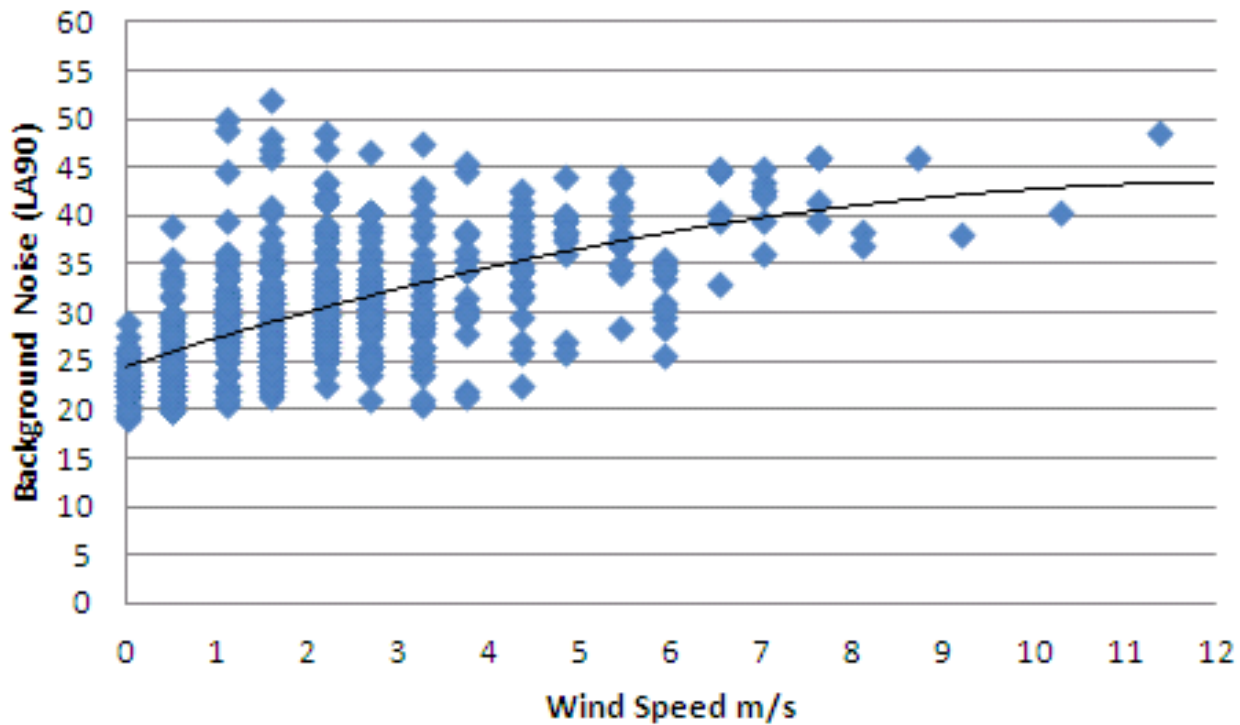


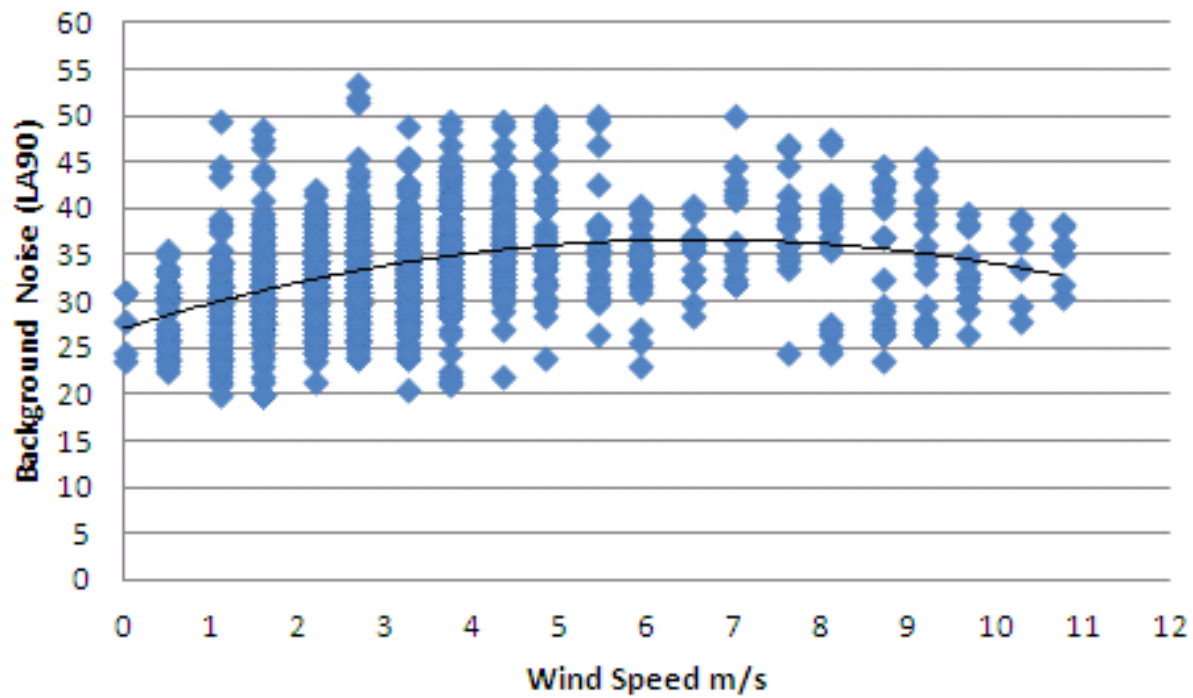
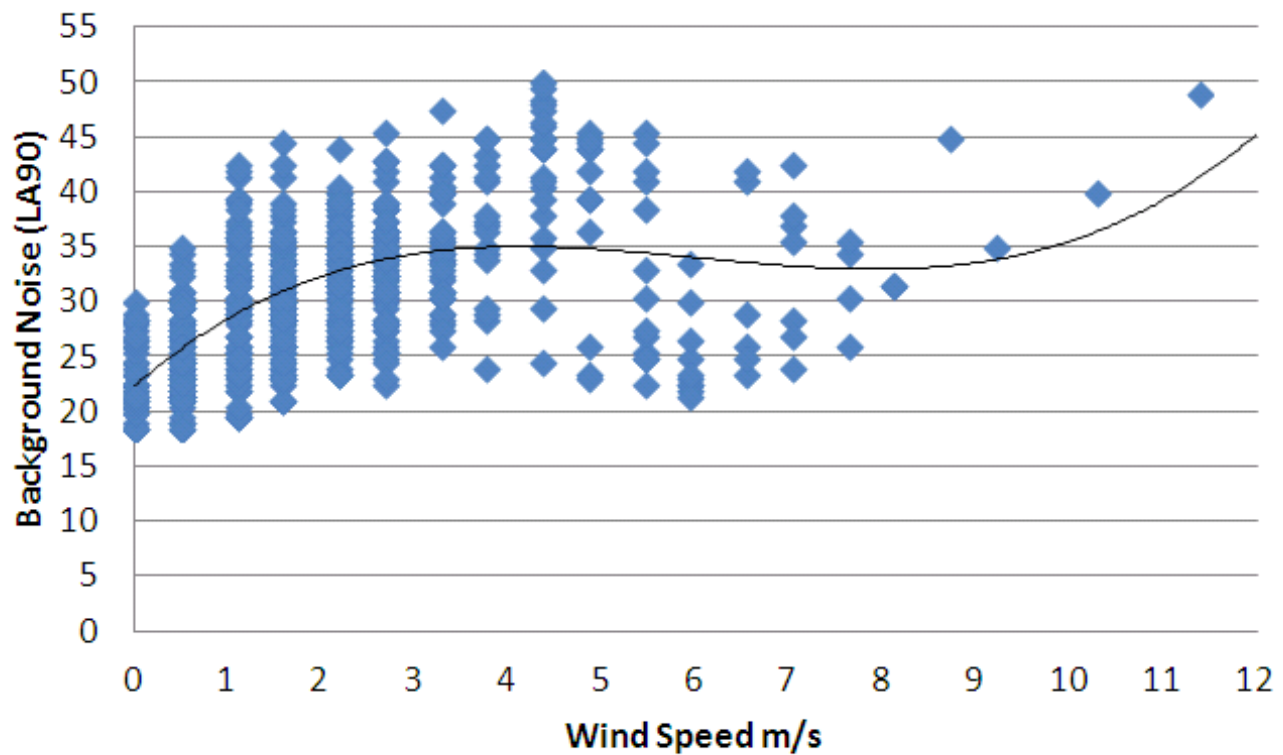
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Location N3 Day time Prevailing Background Noise Level

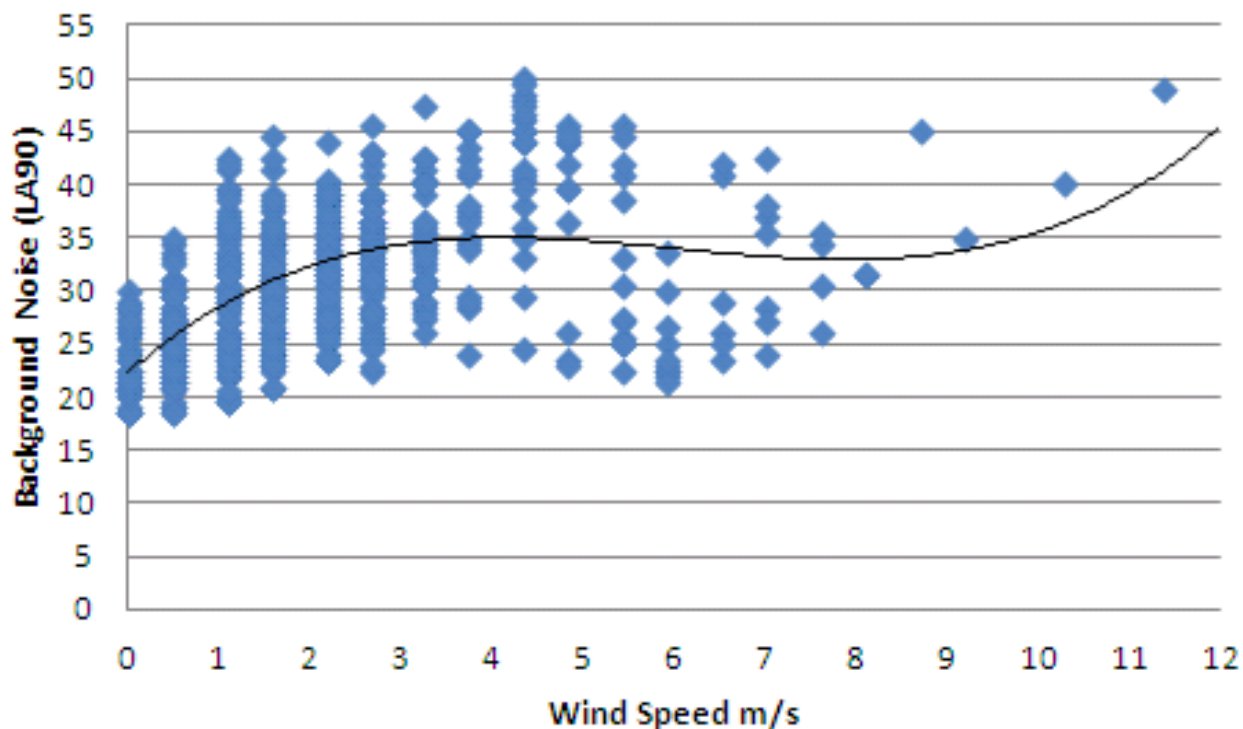


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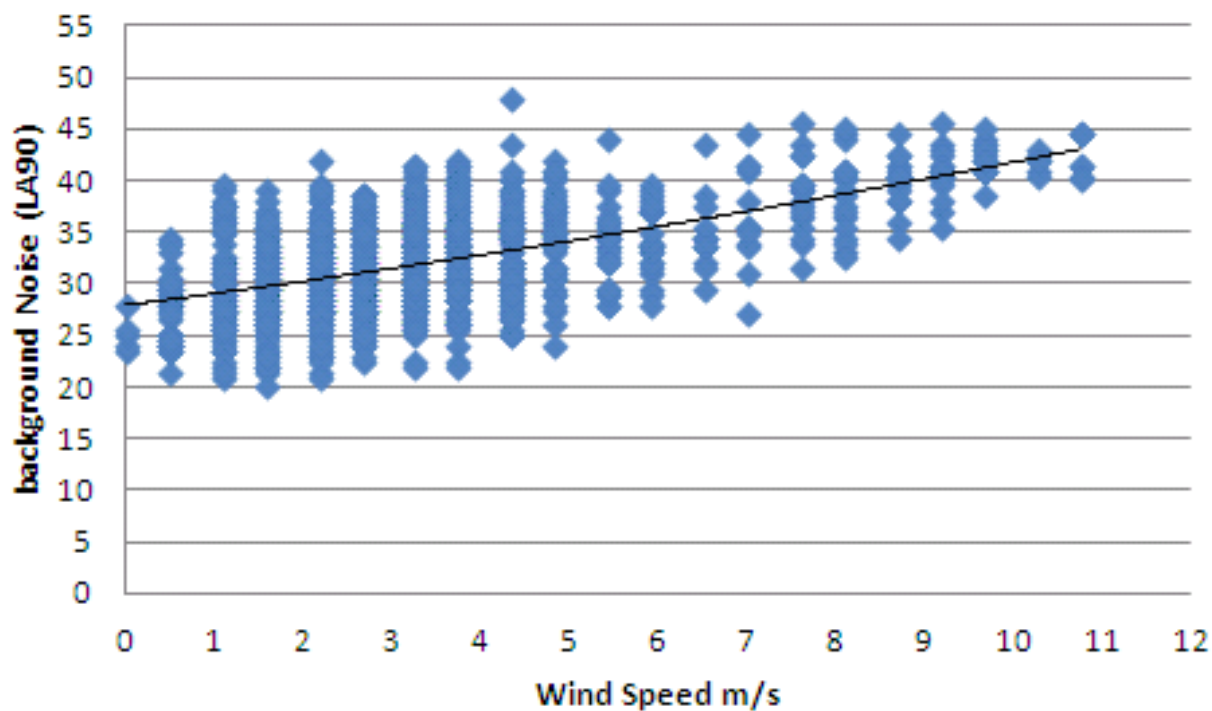


Location N4 Day time Prevailing Background Noise Level**Location N4 Night time Prevailing Background Noise Level**

Location N5 Day time Prevailing Background Noise Level

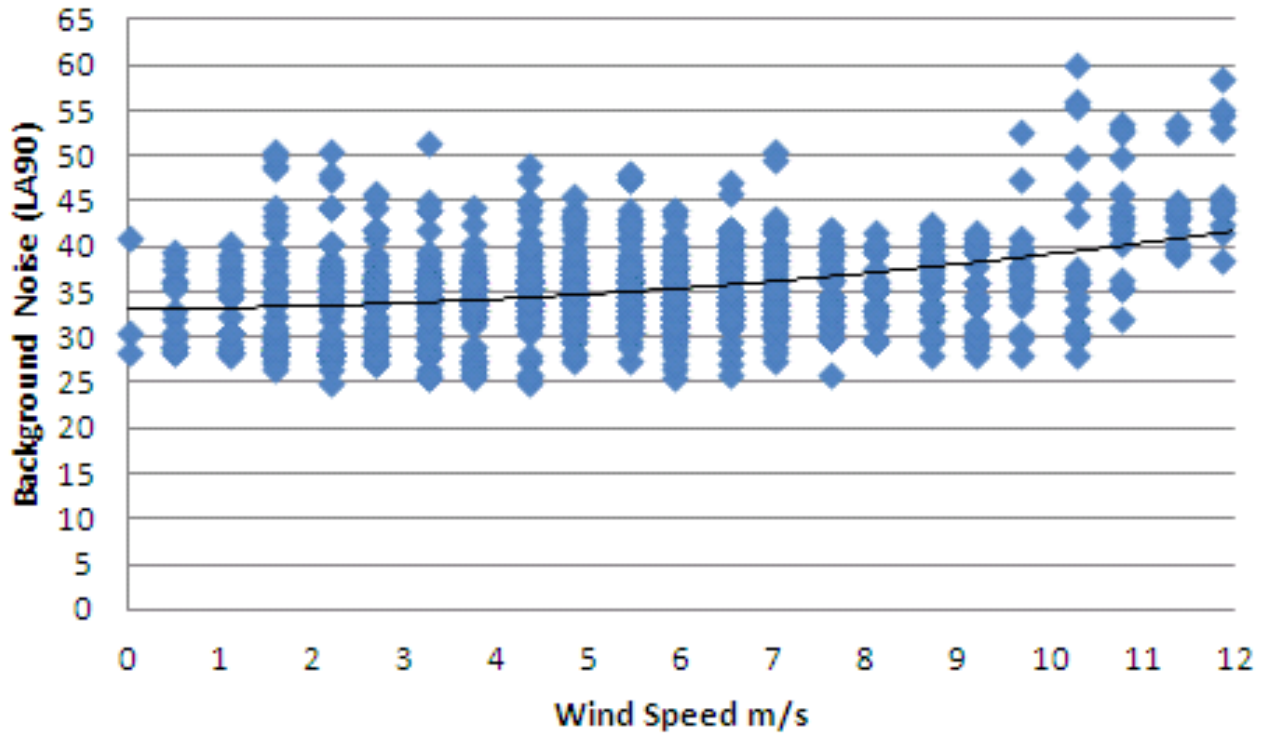


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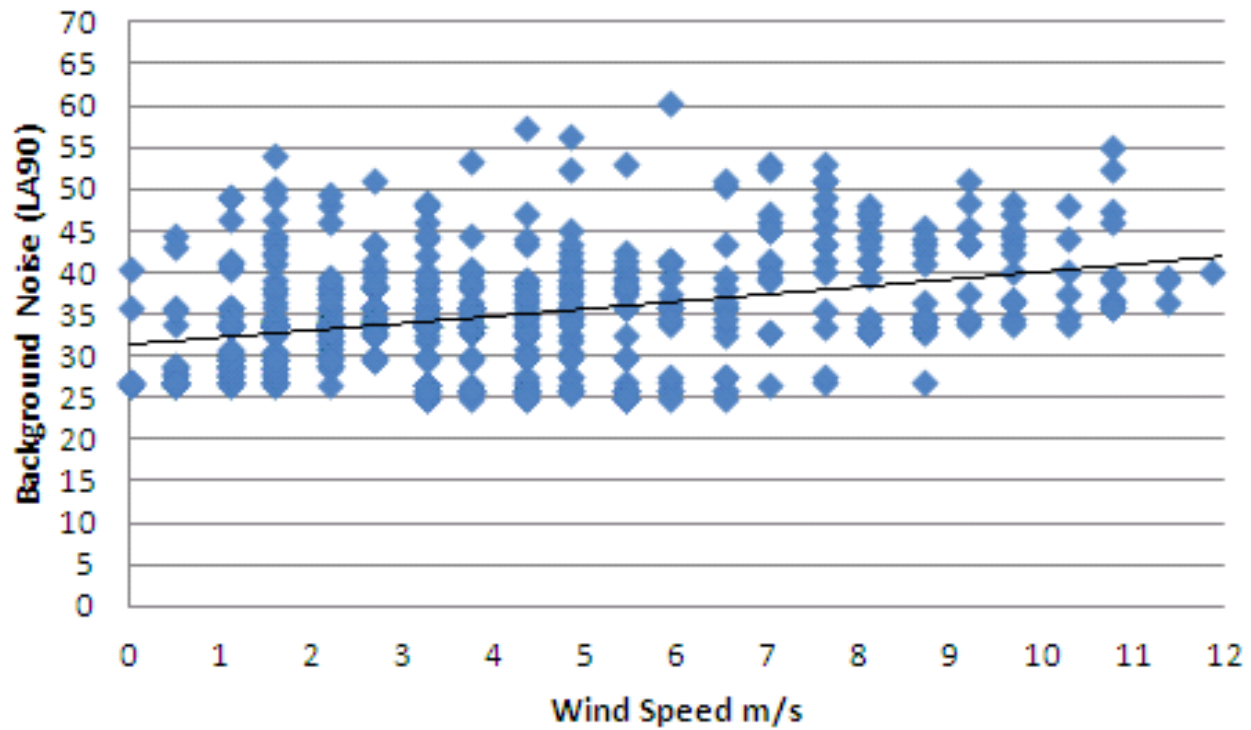


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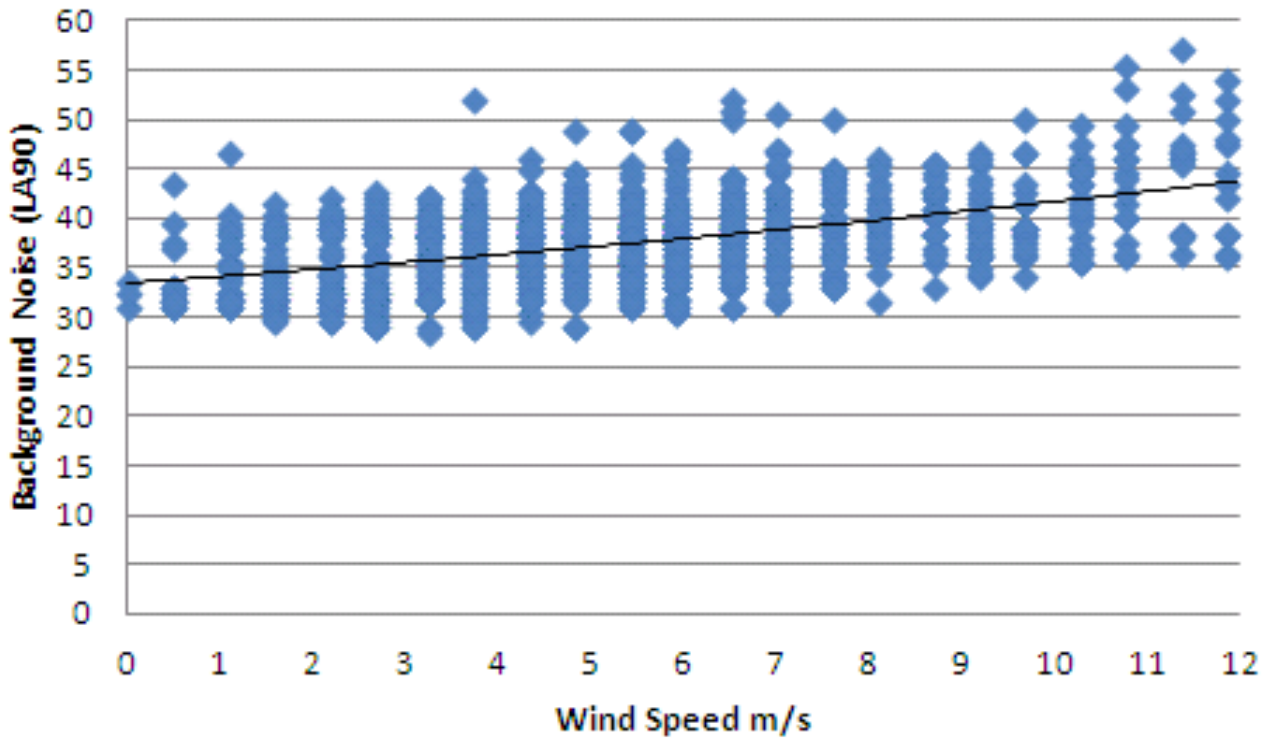
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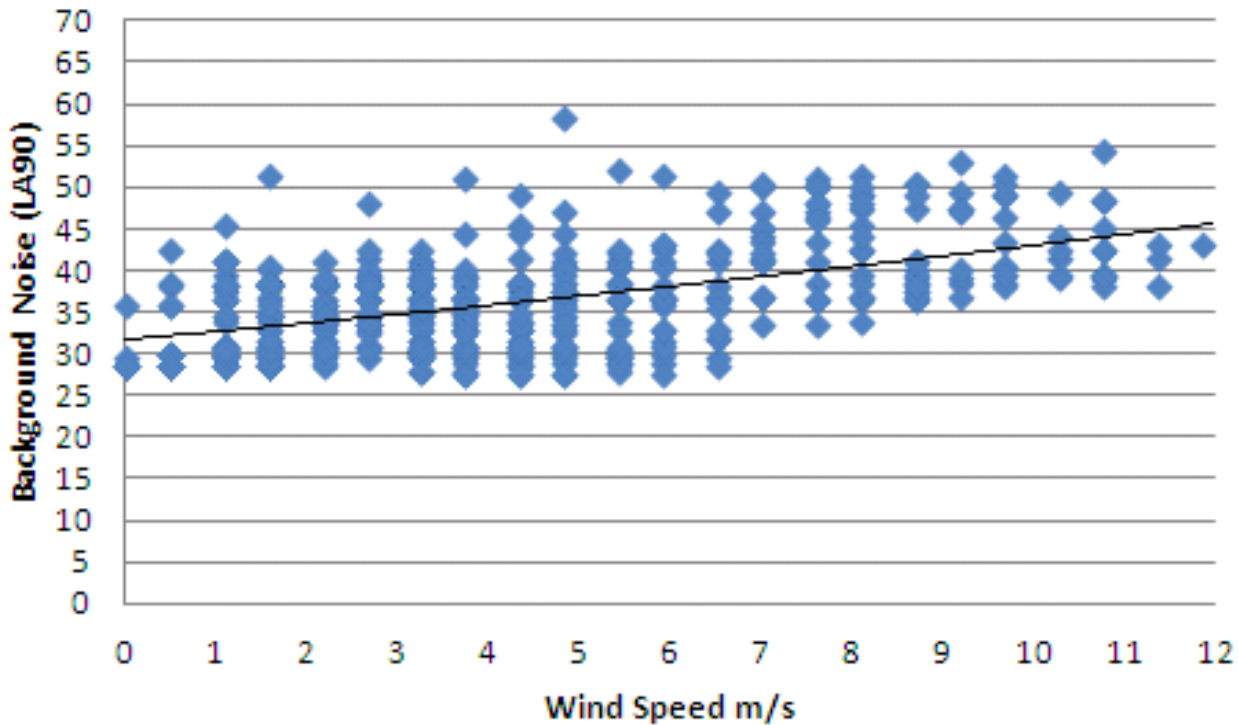
Location N6 Night time Prevailing Background Noise Level



Location N7 Day time Prevailing Background Noise Level

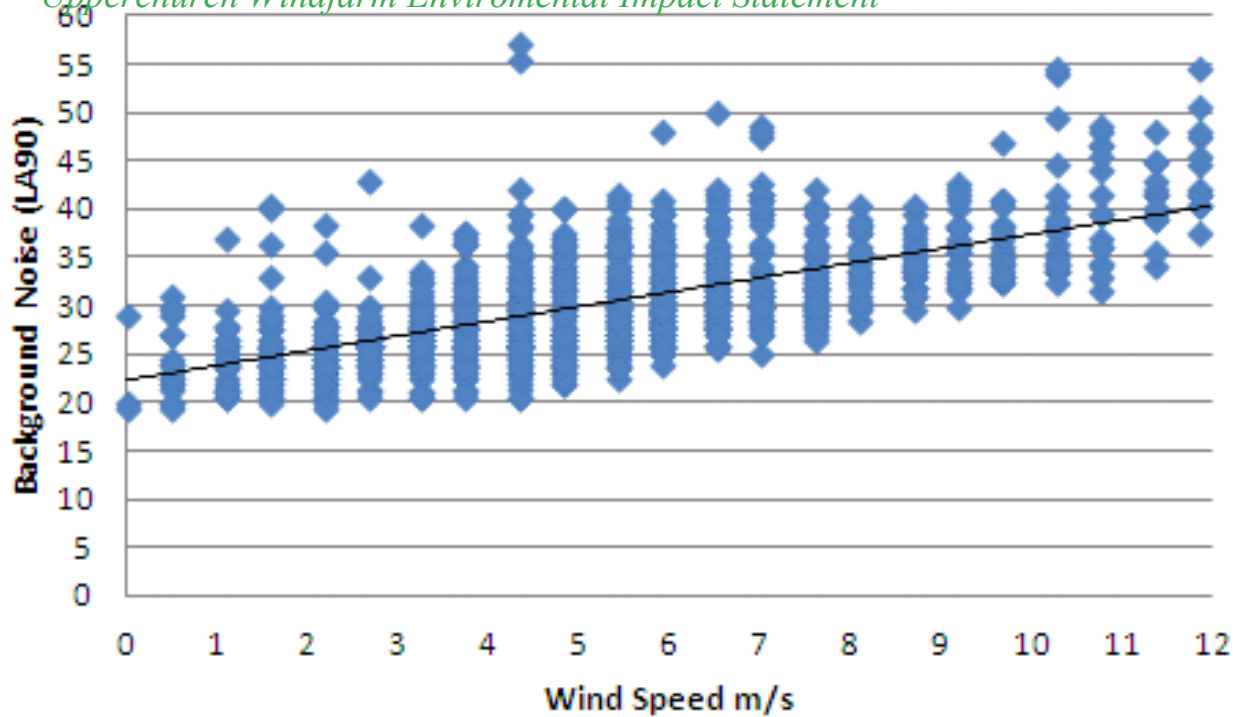


Location N7 Night time Prevailing Background Noise Level

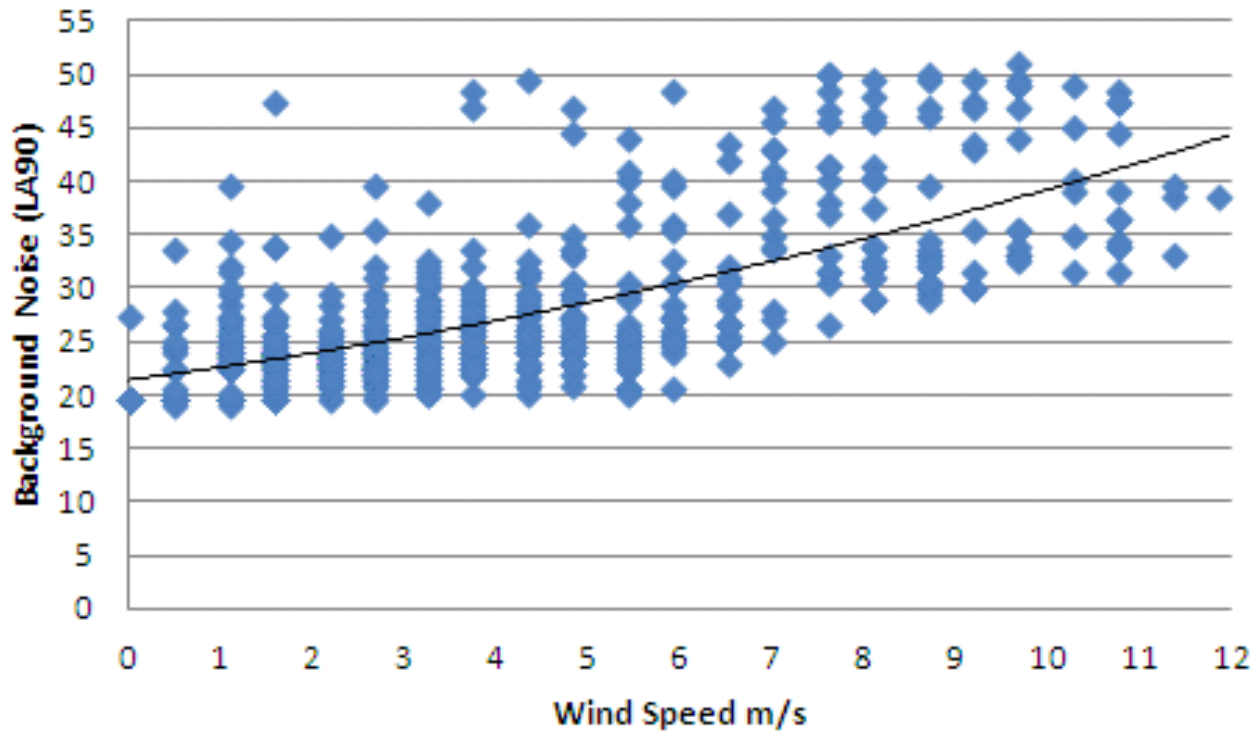


Location N8 Day time Prevailing Background Noise Level

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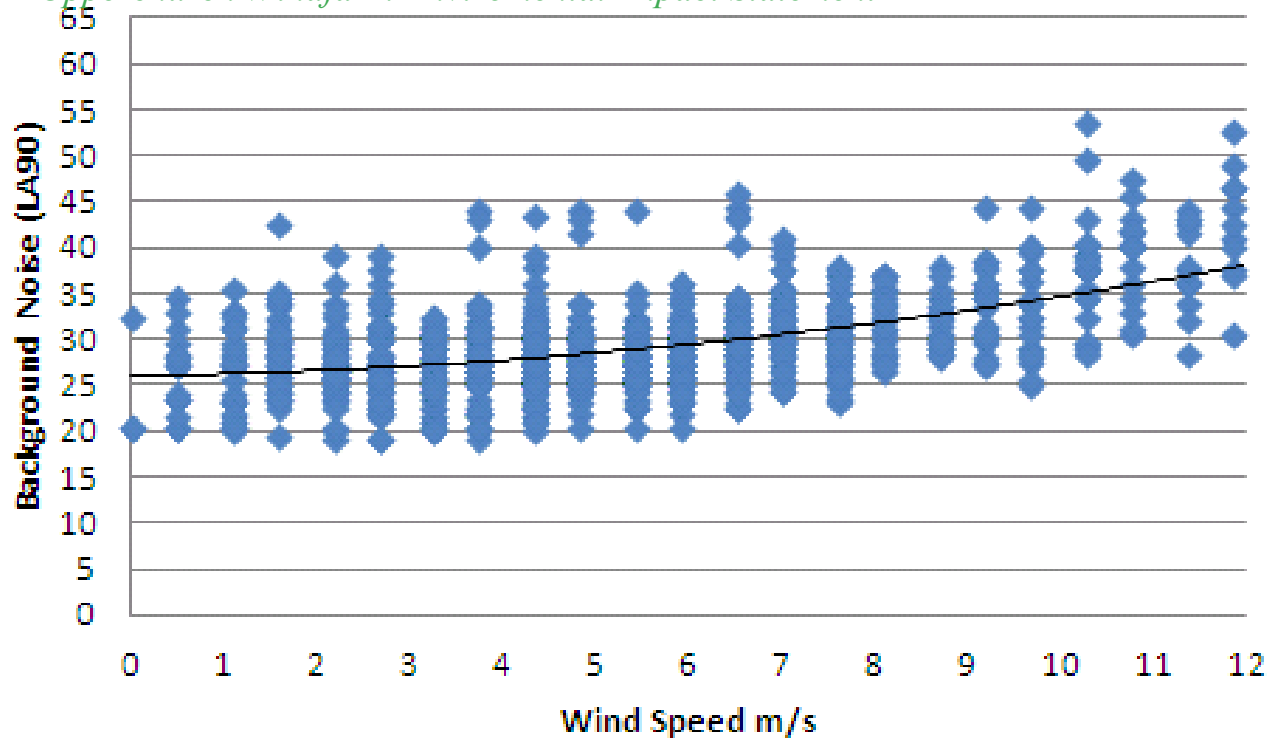


Location N8 Night time Prevailing Background Noise Level

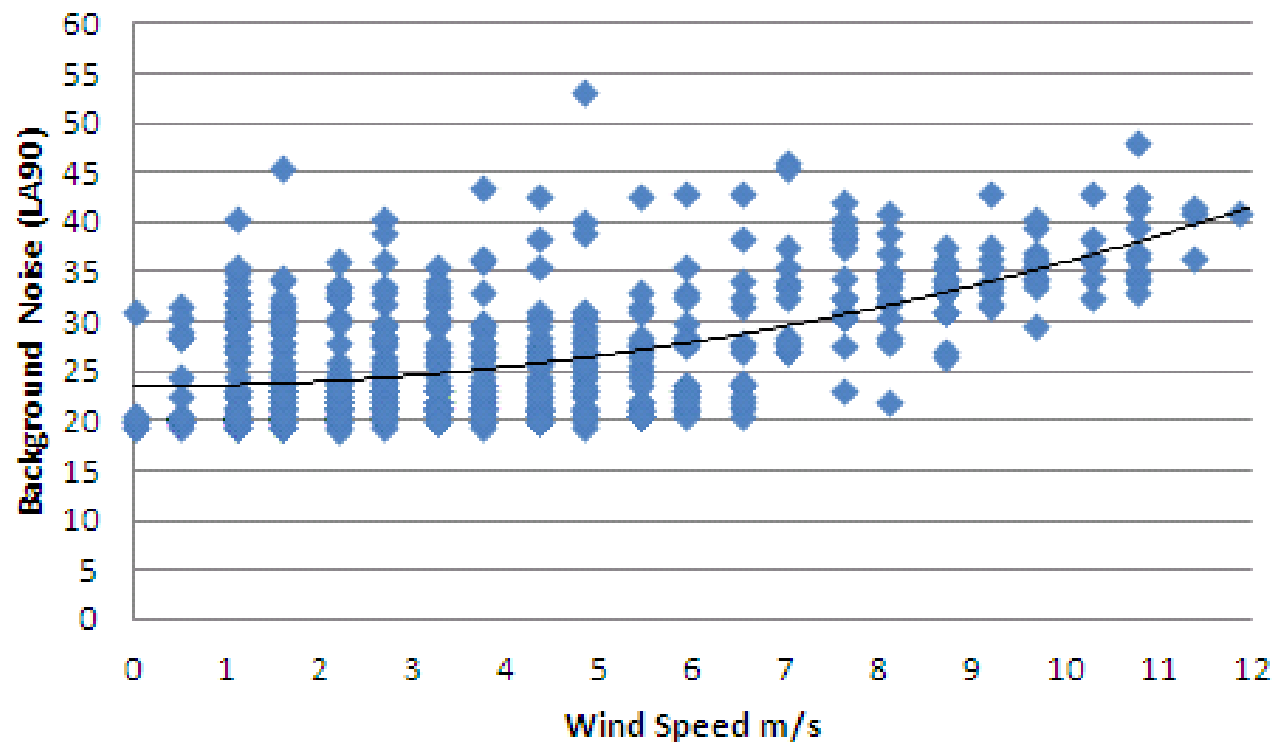


Location N9 Day time Prevailing Background Noise Level

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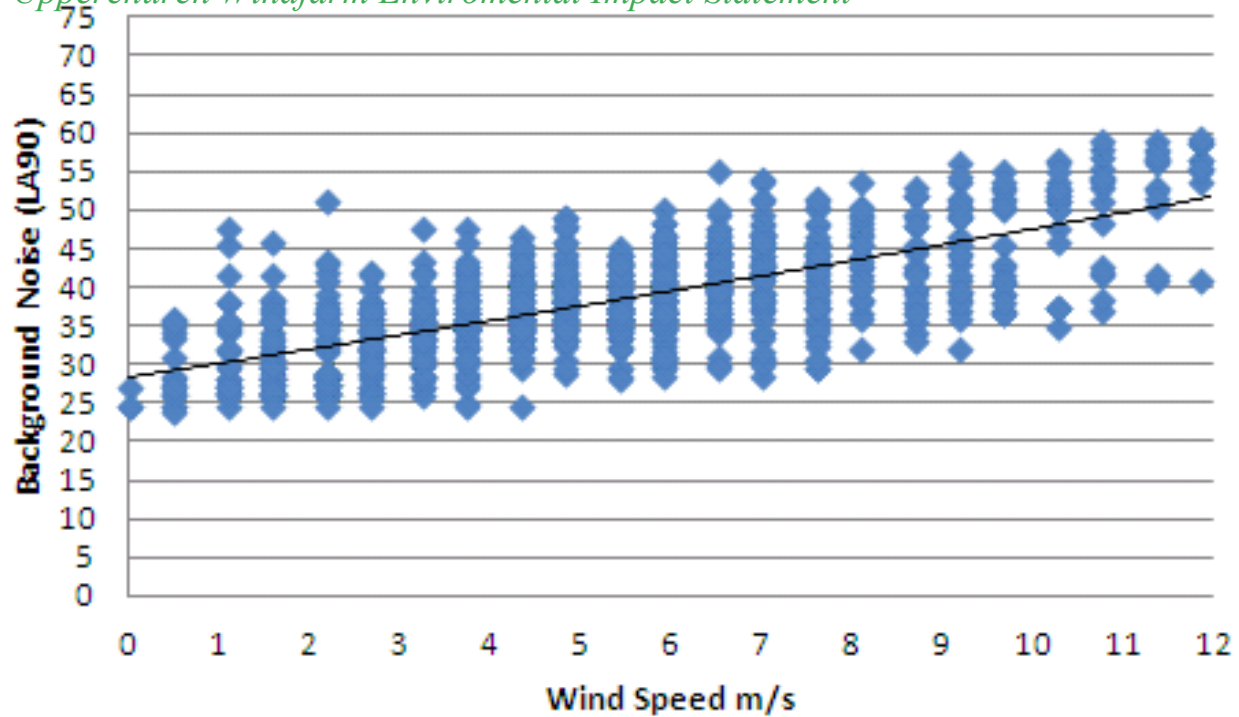


Location N9 Night time Prevailing Background Noise Level

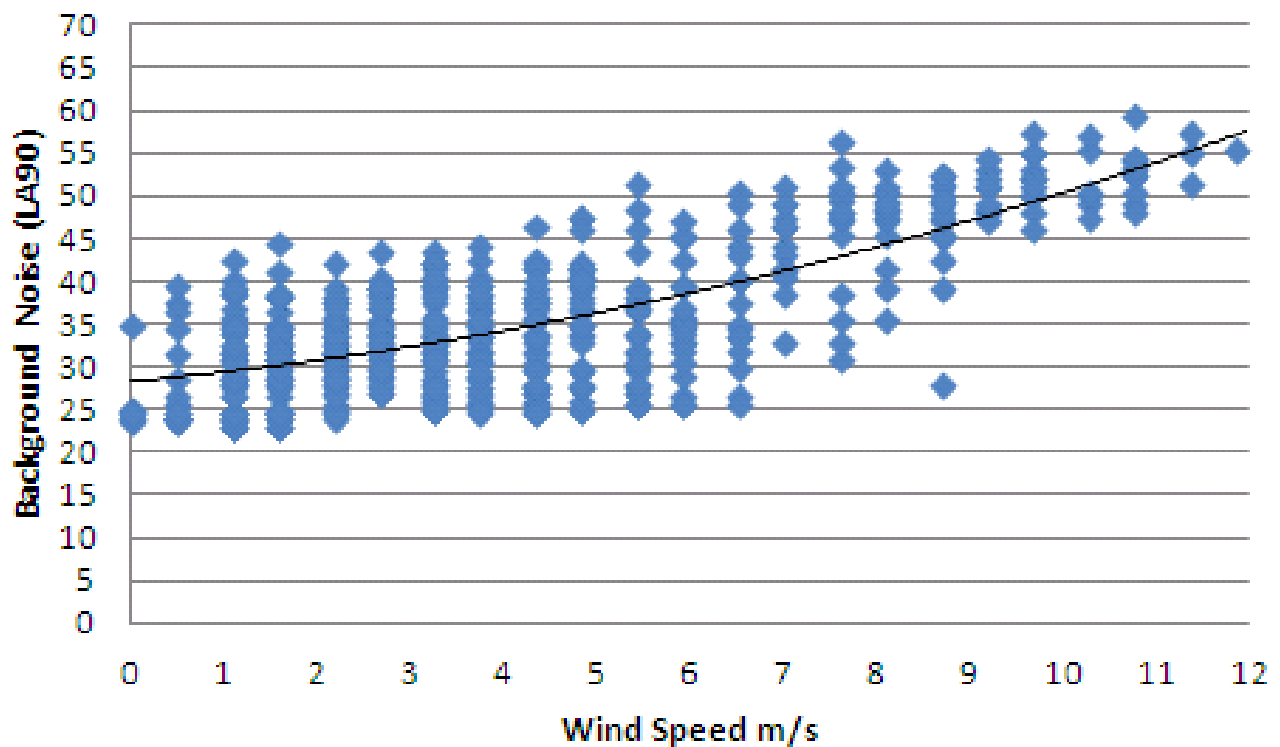


Location N10 Day time Prevailing Background Noise Level

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Location N10 Night time Prevailing Background Noise Level

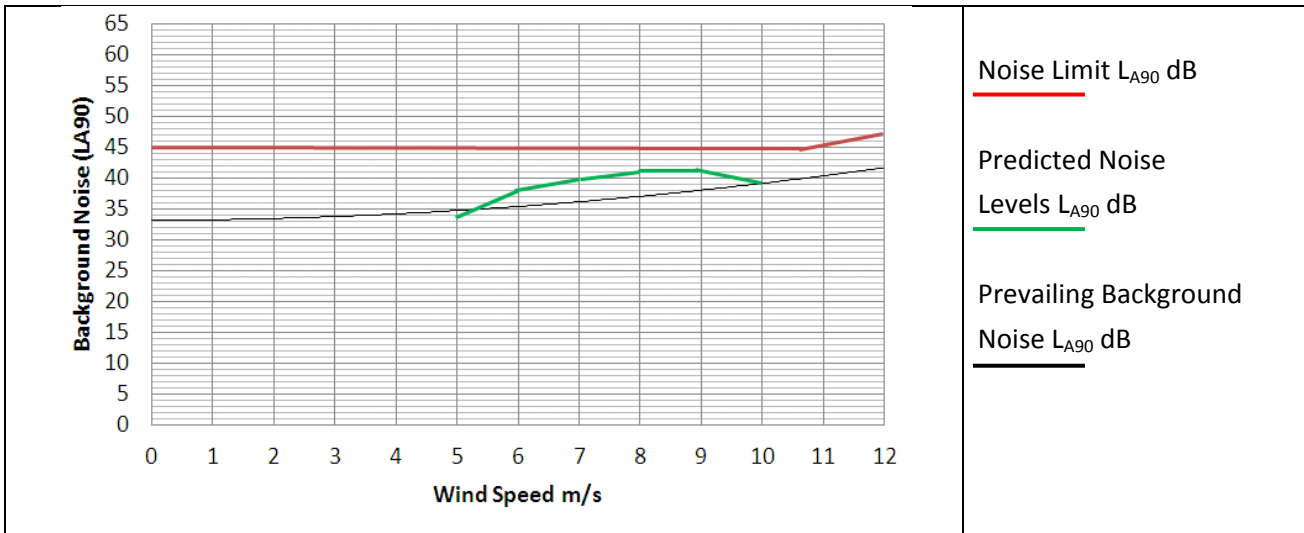


Appendix B

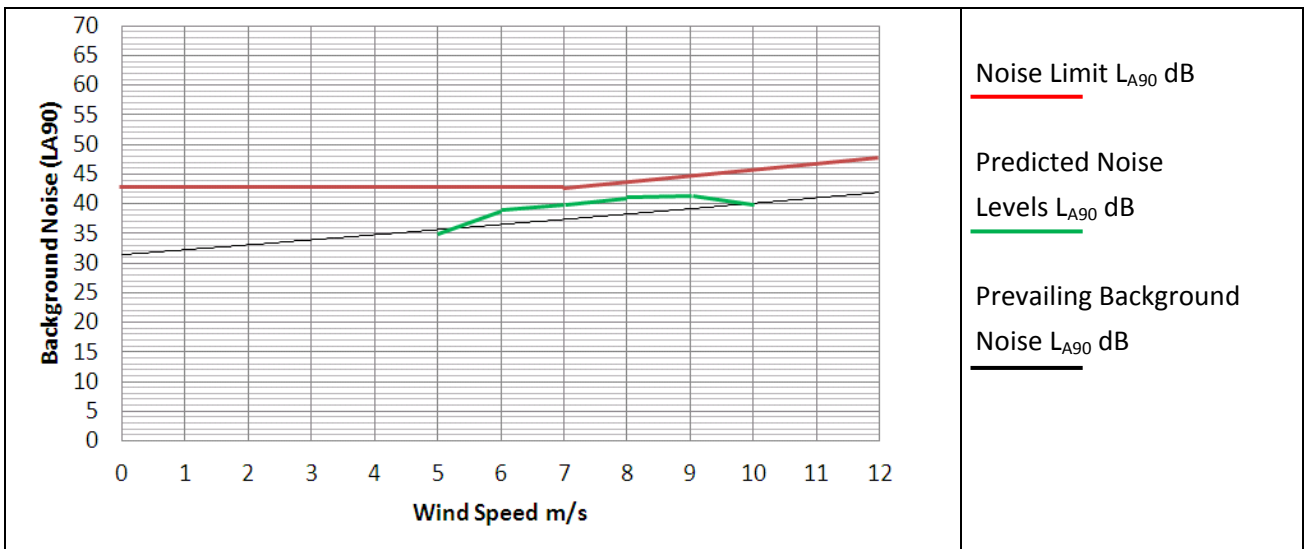
Noise Limit Curves

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Location N1 Daytime Noise Limit Curve

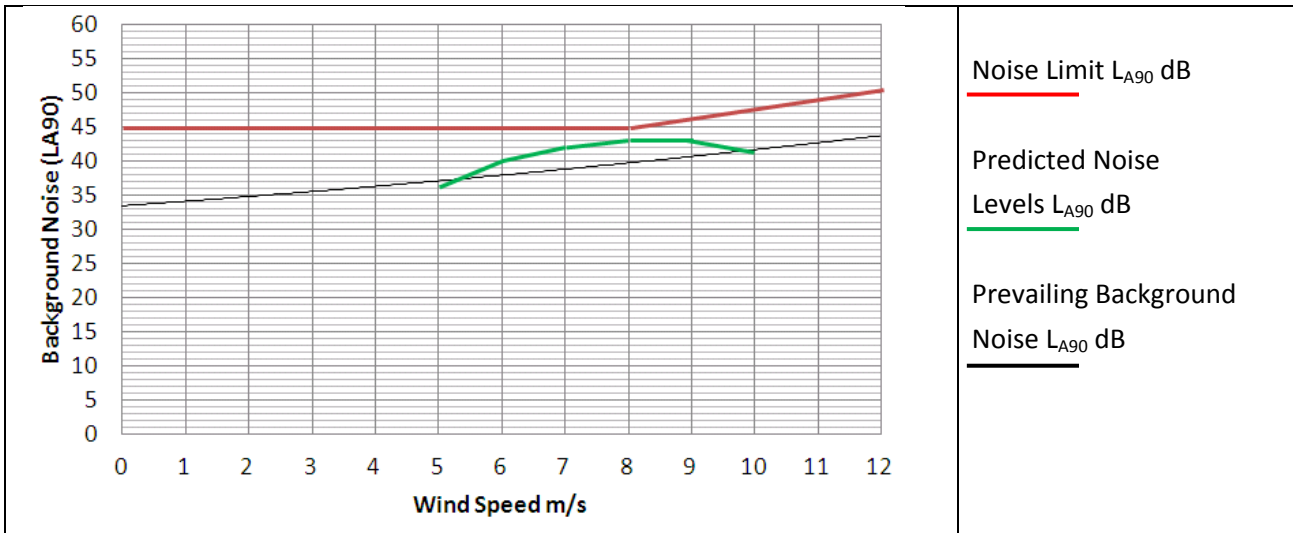


Location N1 Night time Noise Limit Curve

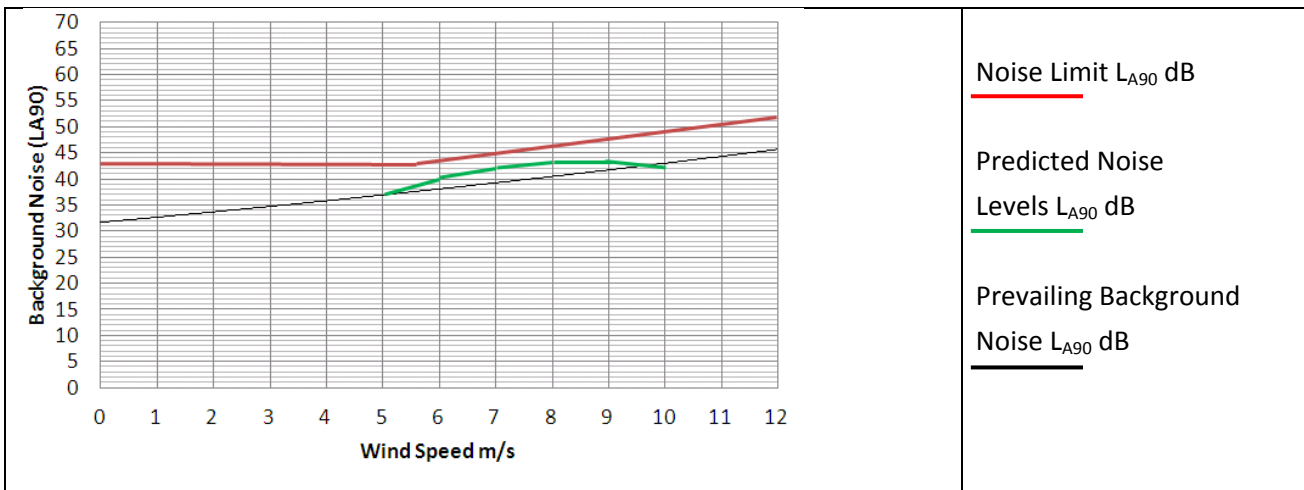


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Location N2 Day time Noise Limit Curve

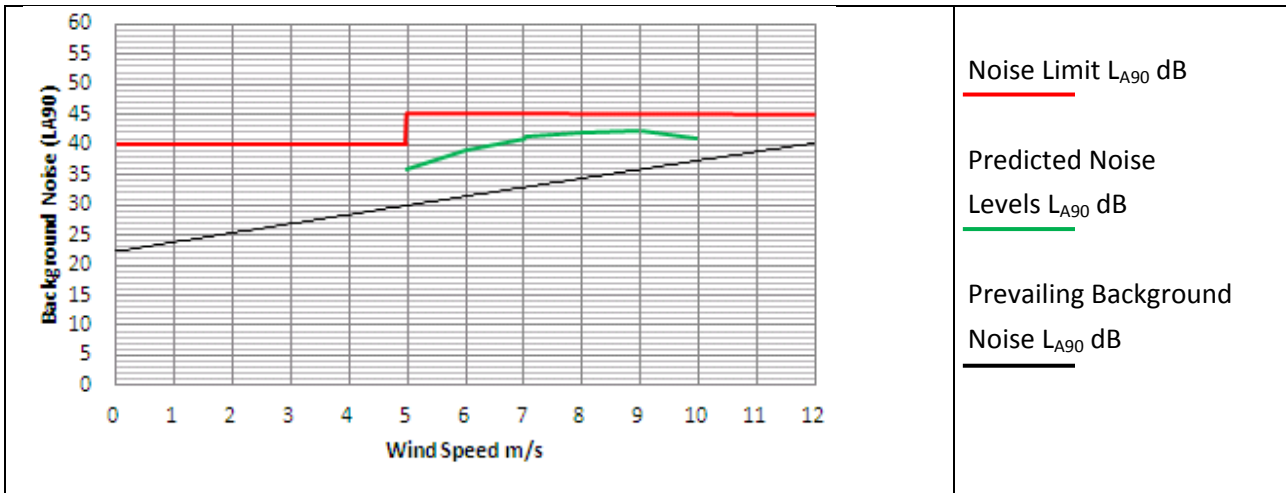


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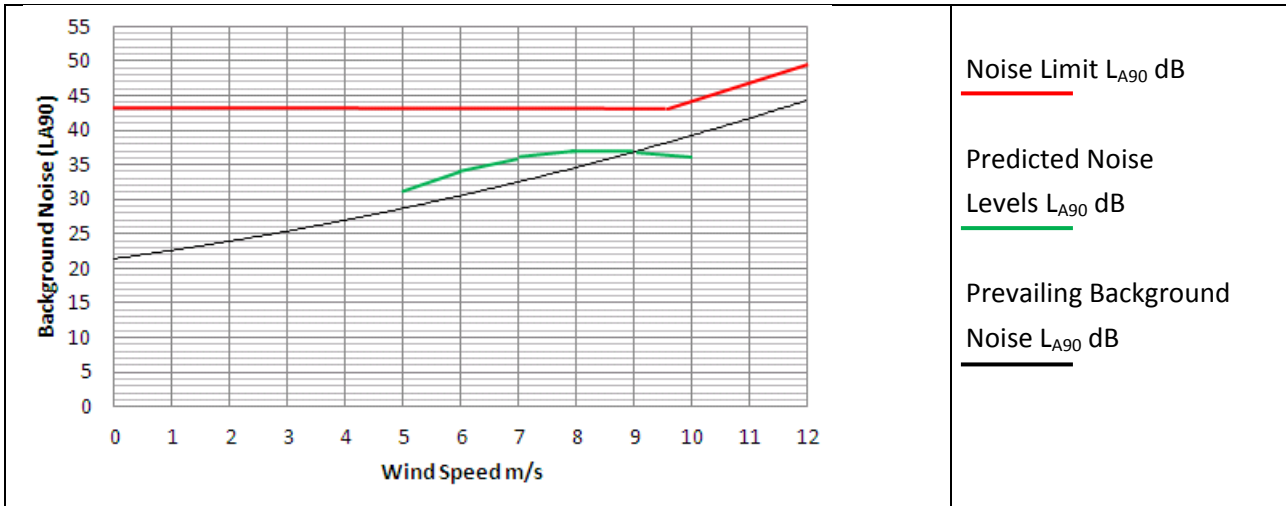


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Location N3 Day time Noise Limit Curve

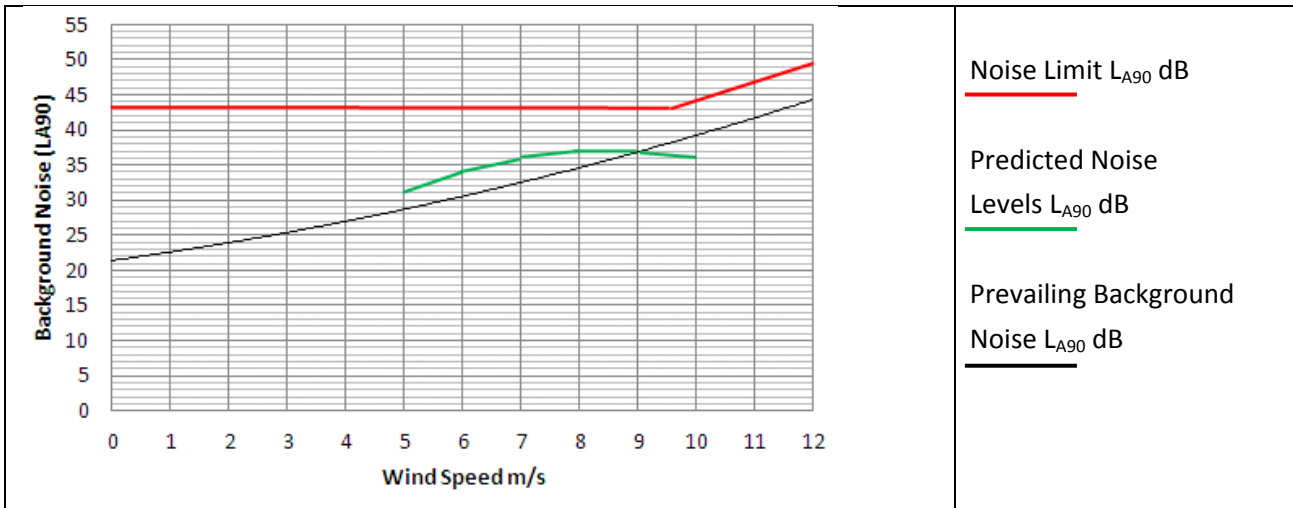


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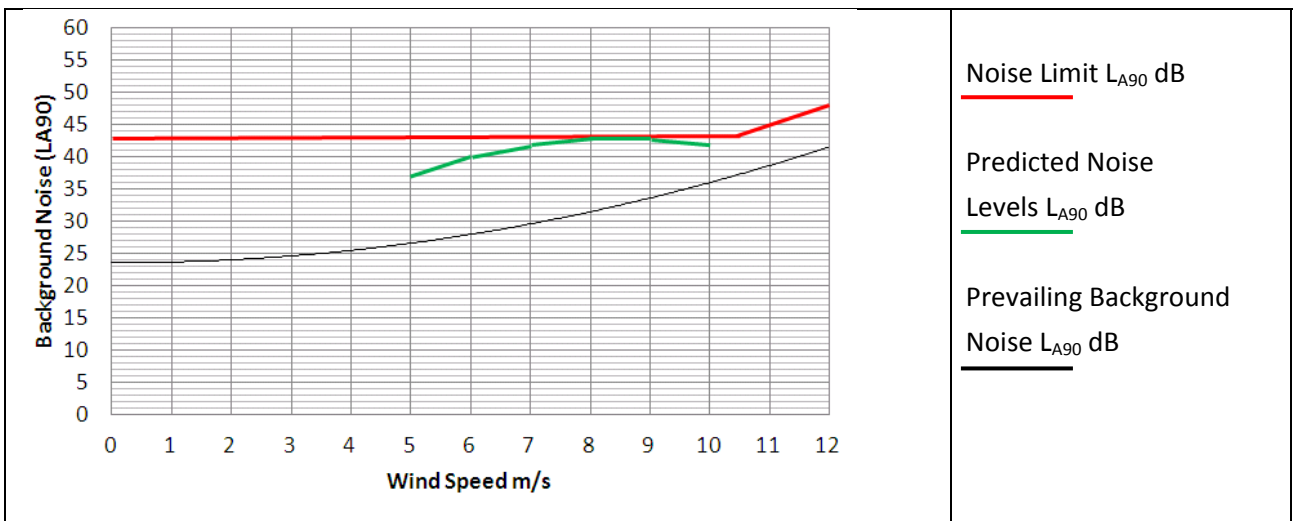


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Location N4 Day time Noise Limit Curve

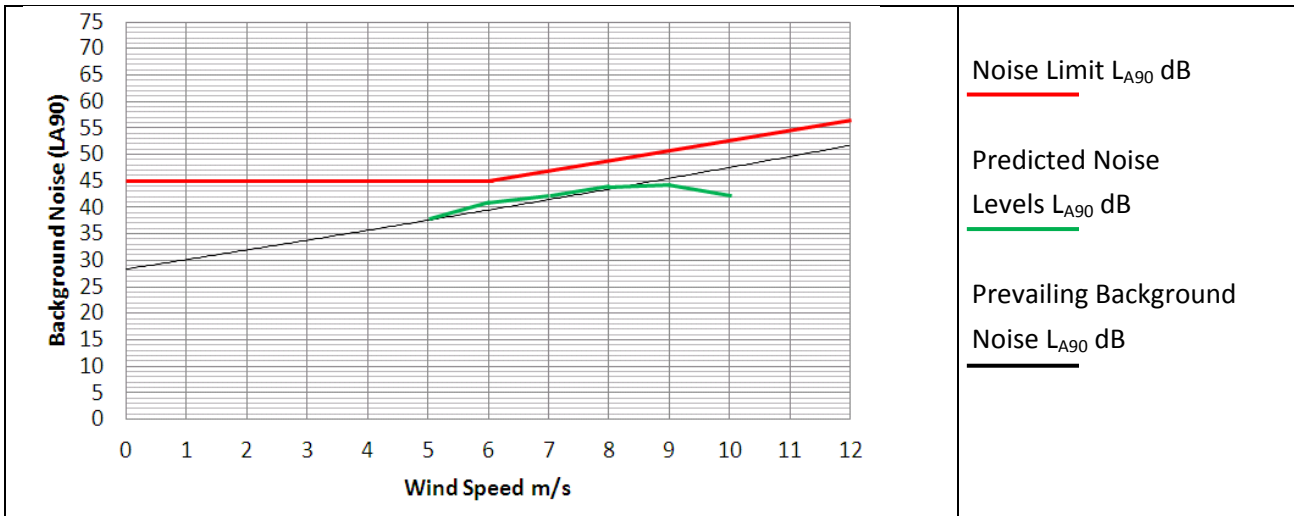


Location N4 Night time Noise Limit Curve

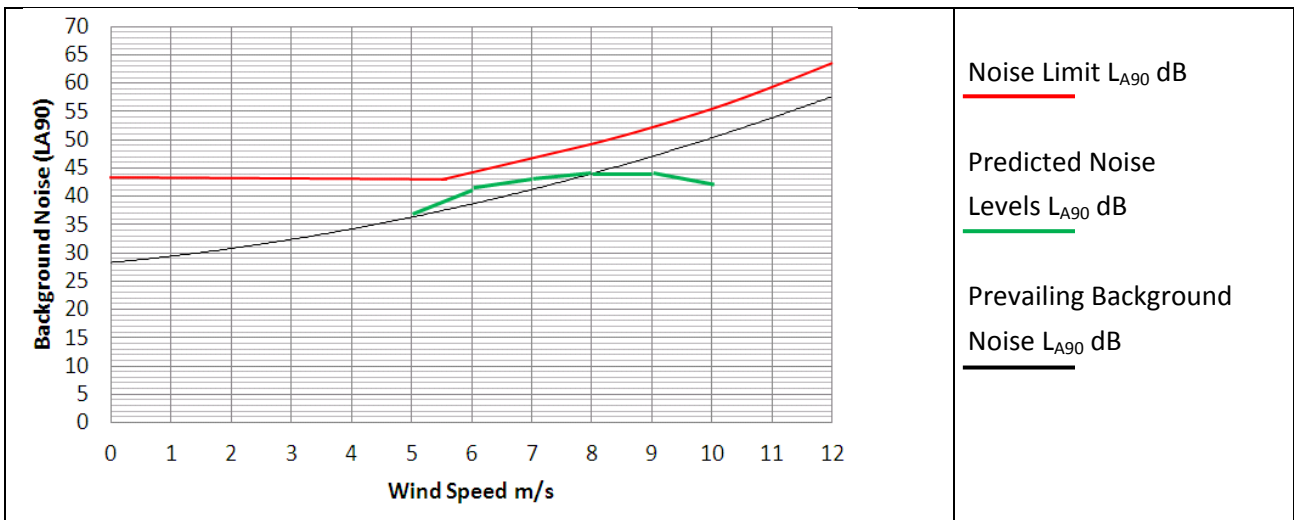


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Location N5 Day time Noise Limit Curve

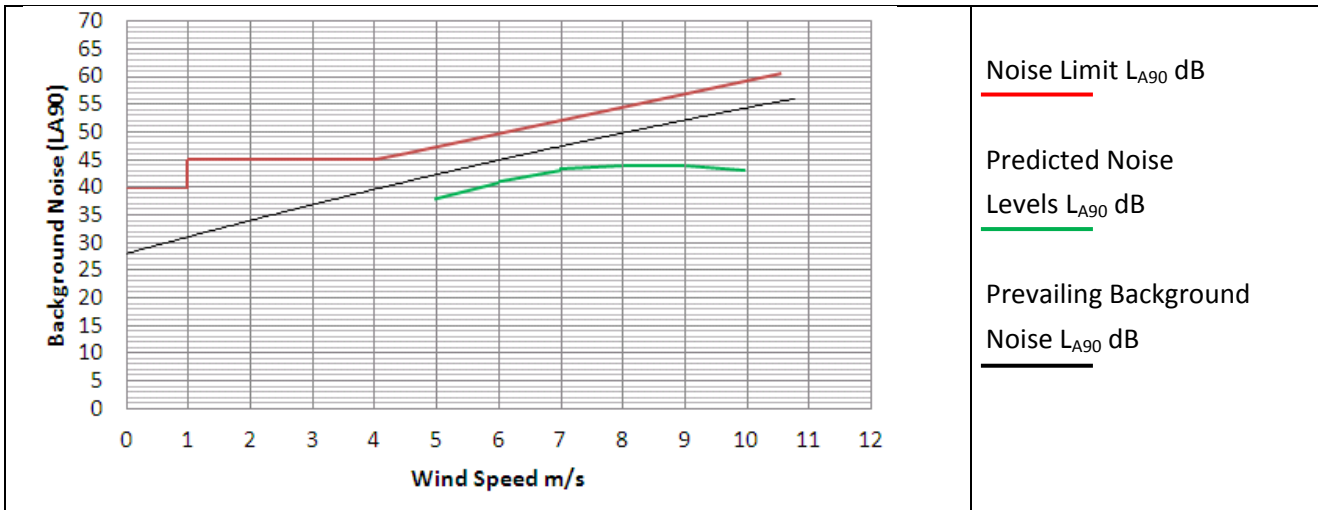


Location N5 Night time Noise Limit Curve

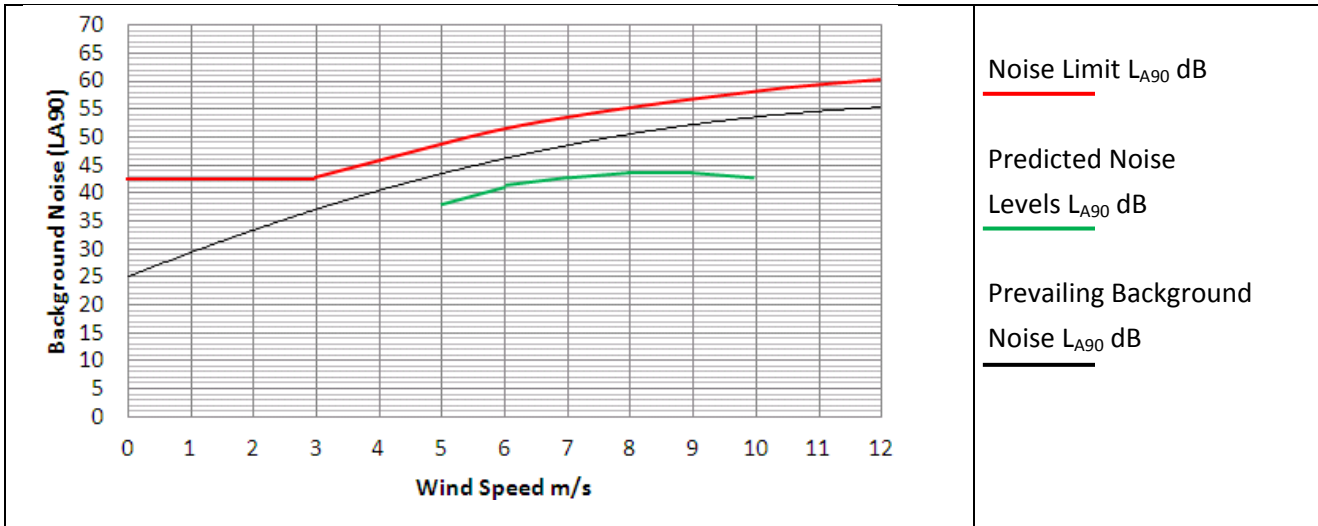


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Location N6 Day time Noise Limit Curve

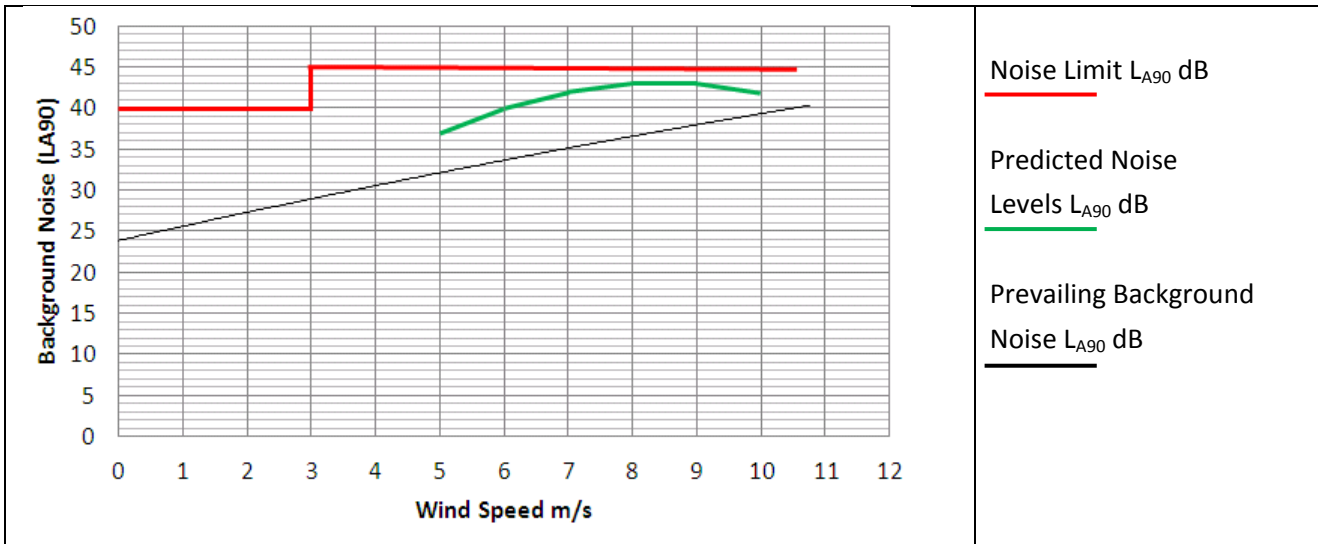


Location N6 Night time Noise Limit Curve

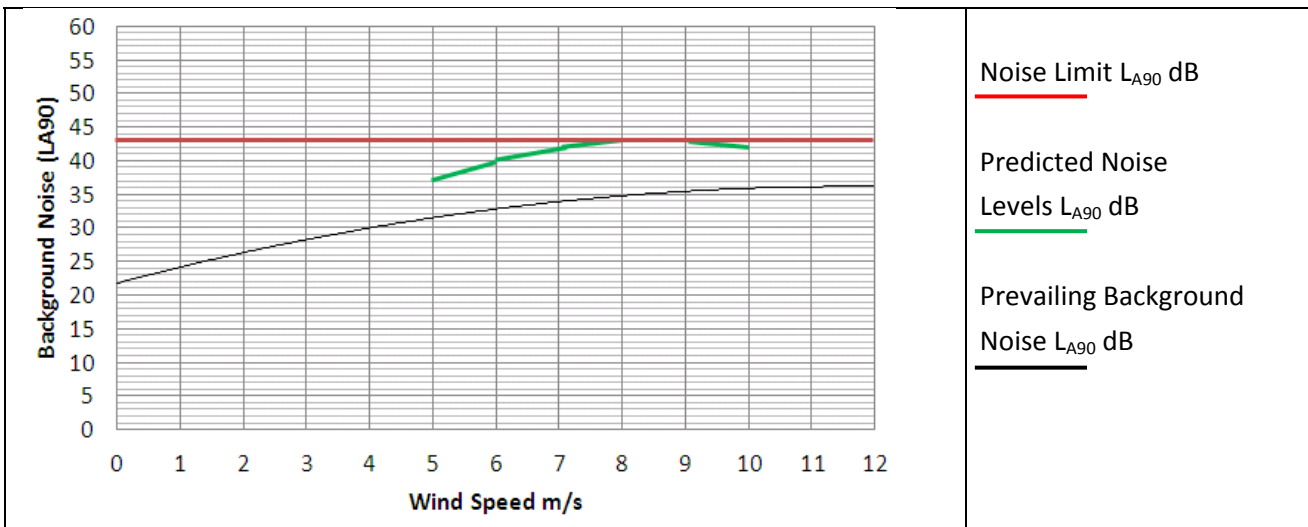


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Location N7 Day time Noise Limit Curve

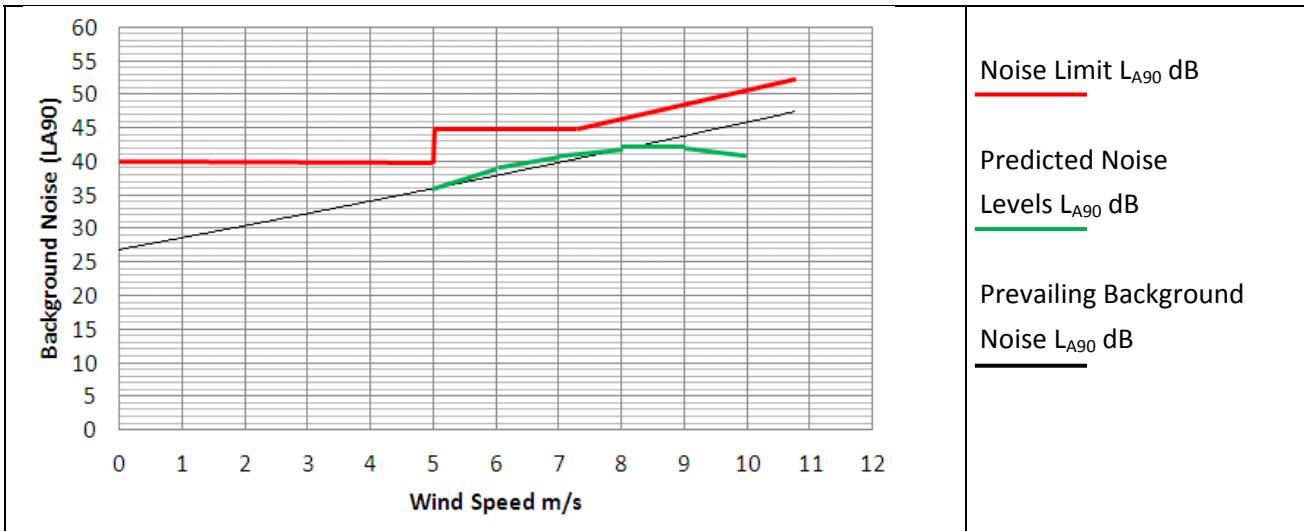


Location N7 Night time Noise Limit Curve

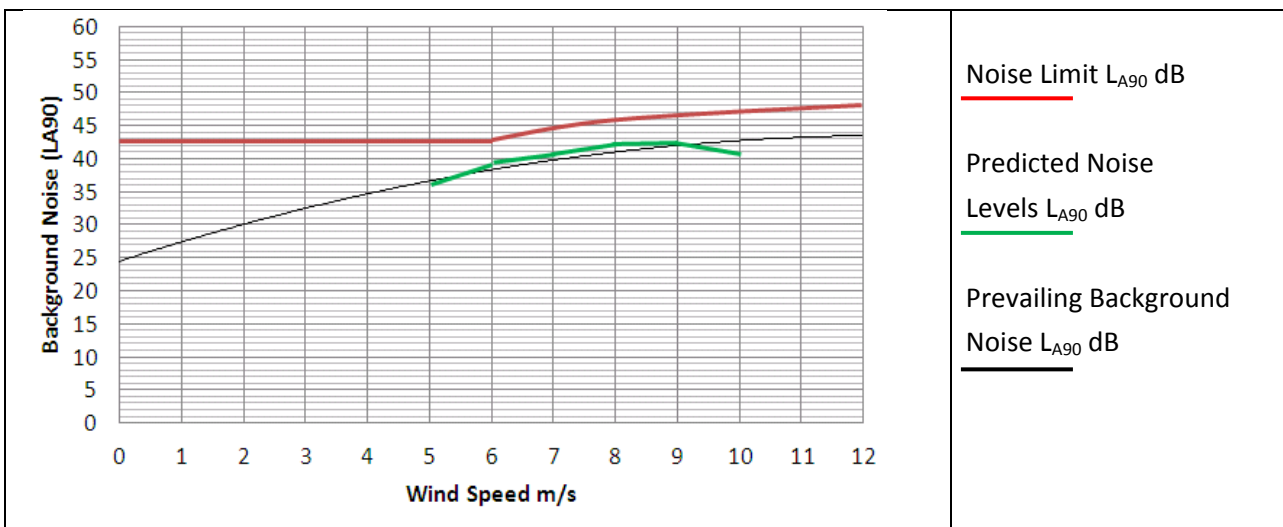


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Location N8 Day time Noise Limit Curve

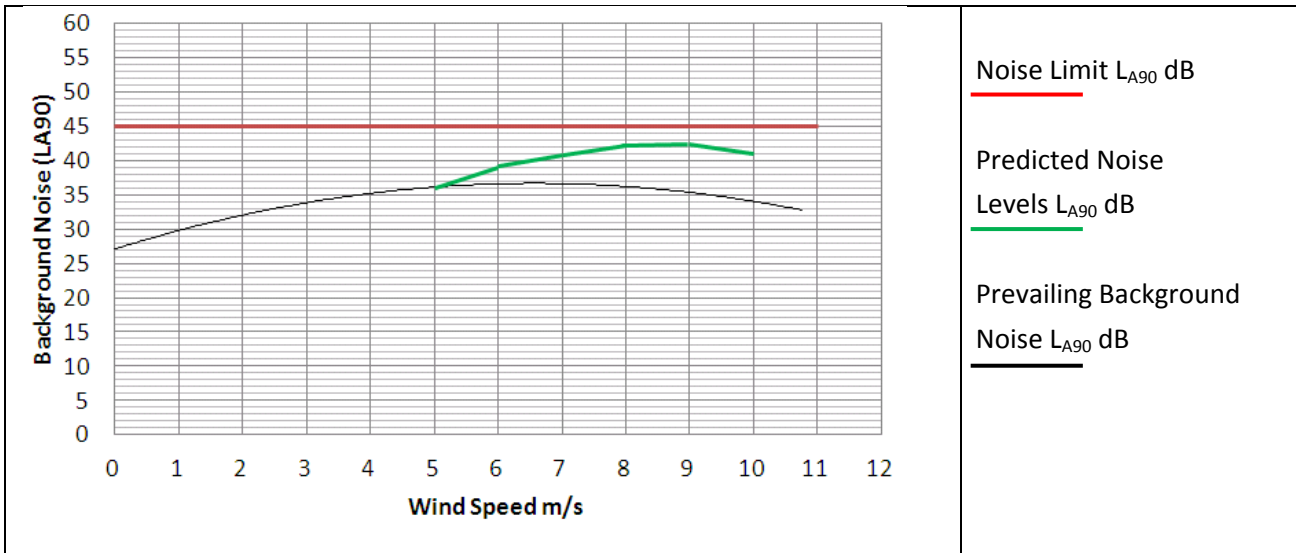


Location N8 Night time Noise Limit Curve

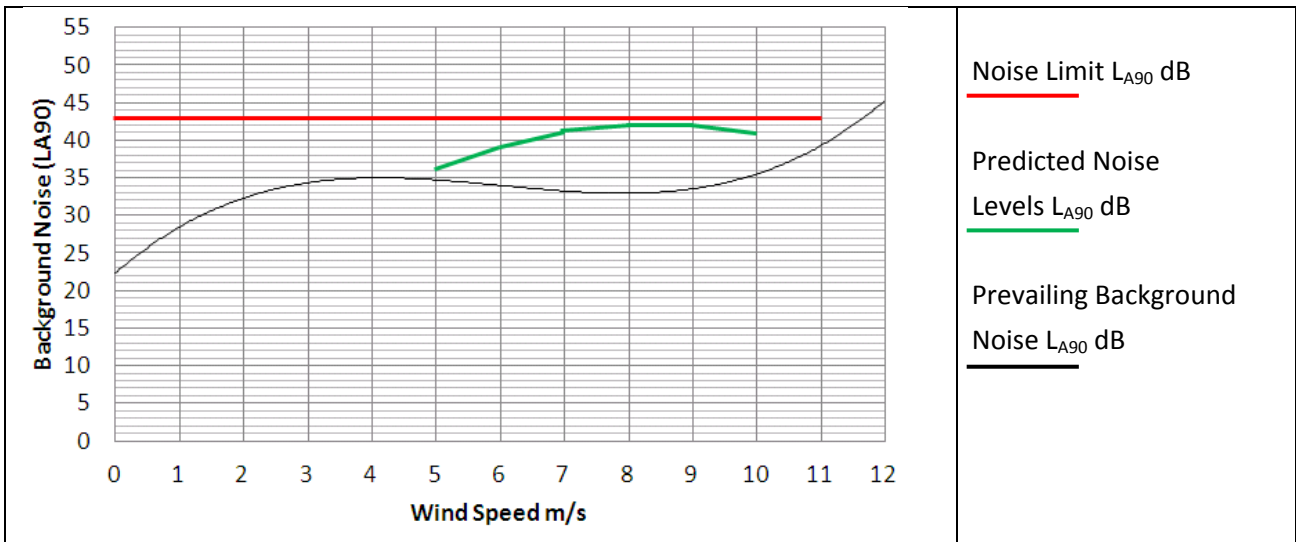


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Location N9 Day time Noise Limit Curve

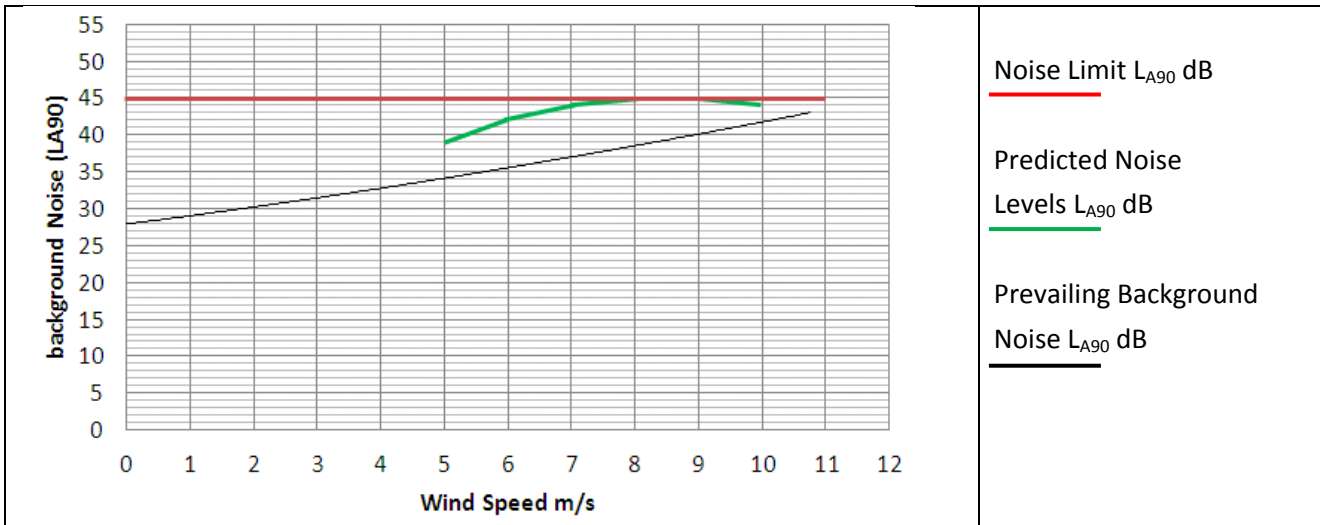


Location N9 Night time Noise Limit Curve

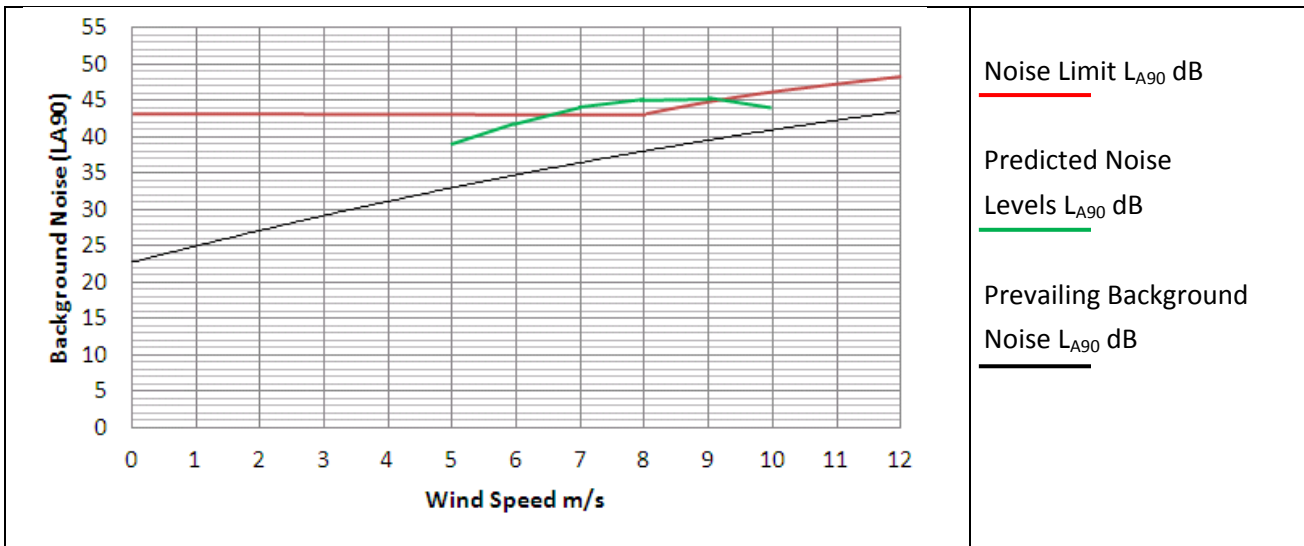


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Location N10 Day time Noise Limit Curve



Location N10 Night time Noise Limit Curve



CHAPTER II

LANDSCAPE AND VISUAL ASSESSMENT

UPPERCHURCH WINDFARM



MosArt Ltd., Architecture Landscape Urban Design
Block 6, Broomhall Business Park, Wicklow, Co. Wicklow, Ireland



11 LANDSCAPE AND VISUAL ASSESSMENT

11.1 INTRODUCTION

This chapter describes the landscape context of the proposed Upperchurch Wind Farm and assesses the likely landscape and visual impacts of the scheme on the receiving environment. Although closely linked, landscape and visual impacts are assessed separately as the effects to the physical landscape and landscape character resulting from the development form the baseline of the assessment of visual impacts from key visual receptors.

Landscape Impact Assessment (LIA) relates to changes in the physical landscape, brought about by the proposed development, which may alter its character and how this is experienced. This requires a detailed analysis of the individual elements and characteristics of a landscape that go together make up the overall landscape character of that area. By understanding the aspects that contribute to landscape character it is possible to make judgements in relation to its quality (integrity) and to identify key sensitivities. This, in turn, provides a measure of the ability of the landscape in question to accommodate the type and scale of change associated with the proposed development, without causing unacceptable adverse changes to its character.

Visual Impact Assessment (VIA) relates to changes in the composition of views as a result of changes to the landscape, how these are perceived and the effects on visual amenity. Such impacts are population based rather than resource based as in the case of landscape impacts. Visual impacts are measured on the basis of:

- *Visual Obstruction* (blocking of a view, be it full, partial or intermittent) or;
- *Visual Intrusion* (interruption of a view without blocking).

This landscape and visual impact assessment is based on:

- Environmental Protection Agency (EPA) publication 'Guidelines on the Information to be contained in Environmental Impact Statements (2002) and the accompanying Advice Notes on Current Practice in the Preparation of Environmental Impact Statements (2003)
- Landscape Institute and the Institute of Environmental Management and Assessment publication entitled Guidelines for Landscape and Visual Impact Assessment (2002).



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- Scottish Natural Heritage (SNH) Environmental Assessment Handbook –Guidance on the Environmental Impact Assessment Process Appendix 1: Landscape and Visual Impact Assessment (2011)
- Scottish Natural Heritage (SNH) Guidance Note: Cumulative Effect of Wind Farms (2005)
- Department of Environment, Heritage and Local Government (DoEHLG) ‘Wind Energy Development Guidelines’ (2006)

11.1.1 Statement of Authority

This assessment report was prepared by Richard Barker, Senior Landscape Architect, MosArt Landscape Architects, Wicklow. MosArt have extensive experience at both project level and strategic planning for wind farms in Ireland. A summary of relevant experience is included below:

- Assisted the Department of Environment, Heritage and Local Government (DoEHLG) in drafting the Landscape Section of the revised Wind Energy Development Guidelines (2006);
- Responsible for the landscape section of the national attitude survey to wind farms commissioned by Sustainable Energy Ireland (2003);
- Drafted the DoEHLG Landscape and Landscape Assessment Guidelines (2000);
- Completed a wind farm strategy for Waterford County Council (2004);
- Landscape character and sensitivity classification of County Cork for wind farm planning for Cork County Council (2003);
- Involved in landscape impact assessment of over 100 on-shore wind farm projects;
- Prepared the landscape impact assessment reports for the Arklow Bank, Codling Bank and Oriel offshore wind farm projects; and
- Presented papers at numerous national conferences concerning landscape assessment for strategic planning and also for the planning and design of wind farms.

11.1.2 Description of the Proposed Development

The developer proposes to locate the wind farm in an upland area west of Upperchurch. It is proposed that this development comprises of the following main elements:

- Twenty two turbines – at a maximum hub height of 90m; a maximum rotor diameter of 90m; a maximum blade tip height of 126.6m as well as associated areas of crane hardstands and foundations;
- One permanent wind measurement mast
- One Substation and compound and associated areas of hard standing;
- Access tracks – 5m wide; and
- Underground electric cabling.



11.1.3 Assessment Methodology

Production of this Landscape and Visual Impact Assessment involved desktop studies and fieldwork comprising professional evaluation by qualified and experienced Landscape Architects. This entailed the following:

11.1.3.1 Desktop Study

- Establishing an appropriate Study Area from which to study the landscape and visual impacts of the proposed wind farm;
- Review of a Zone of Theoretical Visibility (ZTV) map, which indicates areas from which the development is potentially visible in relation to terrain within the Study Area;
- Review of relevant County Development Plans, particularly with regard to sensitive landscape and scenic view/route designations;
- Selection of potential Viewshed Reference Points (VRPs) from key visual receptors to be investigated during fieldwork for actual visibility and sensitivity;
- Preparation of an initial VRP selection map from which the visualisation consultant can prepare 'wireframe images' at each potential VRP location for use during fieldwork. Wireframe images depict the proposed wind farm within the context of a basic three dimensional view of the terrain as seen from each selected VRP location.

11.1.3.2 Fieldwork

- Recording of a description of the landscape elements and characteristics within the Study Area generally and within view from each VRP.
- Selection of a refined set of VRP's for assessment. This includes the capture of panoramic photography and grid reference coordinates for each VRP location for the visualisation specialist to prepare photomontages;

11.1.3.3 Assessment

- Description of the geographic location and landscape context of the proposed wind farm site;
- General landscape description concerning essential landscape character and salient features of the Study Area, discussed with respect to; landform and drainage; vegetation and land use; centres of population and houses; transport routes and; public amenities and facilities;
- Consideration of design guidance, the planning context and relevant landscape designations.
- Assessment of predicted landscape impacts.
- Assessment of predicted visual impacts using standard ZTV maps and cumulative ZTV maps as well photomontages prepared from selected VRP locations.
- Discussion of mitigation measures.
- Assessment of residual impacts following mitigation

11.1.4 Definition of Study Area

The Wind Energy Development Guidelines published by the Department of the Environment, Heritage and Local Government specify different radii for examining the zone of theoretical visibility of proposed wind farm projects (ZTV). The extent of this search area is influenced by turbine height, on the basis that taller turbines would be visible at greater distances, as follows:

- 15km radius for blade tips up to 100m; and
- 20km radius for blade tips greater than 100m.

In the case of this project, the blade tips are 126.6m high and, thus, the ZTV radius required is 20km from the outermost turbines of the scheme. This 20km radius, therefore, defines the extent of the Study Area for this project.

11.2 EXISTING ENVIRONMENT**11.2.1 Landscape Baseline**

The landscape baseline represents the existing landscape context and is the scenario against which any changes to the landscape brought about by the proposal will be assessed. This also includes reference to any relevant landscape character appraisals and the current landscape policy context (both are generally contained within County Development Plans).

A description of the landscape context of the proposed wind farm site and wider study area is provided below under the headings of landform and drainage, vegetation and land use, centres of population and houses, transport routes and public amenities and facilities and the site context. Although this description forms part of the landscape baseline many of the landscape elements identified also relate to visual receptors i.e. places and transport routes from which viewers can potentially see the proposed development. The visual resource will be described in greater detail in section 9.2.2.

11.2.1.1 Landform and Drainage

The landform of the study area is that of rolling hills at the south eastern periphery of a contiguous upland area that consists of the Slieve Felim Mountains, the Silvermines Mountains and the Devils Bit Mountains. Relatively distinctive dome shaped hills occur to the west of the site in the heart of the ranges and the highest of these are; Keeper Hill (694m a.s.l.), Mother Mountain (543m a.s.l.) and Cooneen Hill (467m a.s.l.). The upland area is the source of a number of small watercourses that tend to run directly from the ranges then trend southwards towards the larger River Shannon system. These include; the Mulkear River, the Clare River, the Owenbeg River, the Clodiagh River, and the Nenagh River.



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Image 9.1 – Rolling hills and distinctive dome shaped peaks of the central portion of the study area



Image 9.2 – flat to gently undulating landscape typical of the lowlands in the north and south of the study area

11.2.1.2 Vegetation and Land Use

The landscape of the study area is a productive rural one and this is reflected in the land cover. Within the lowland landscape in the northern and southern extents of the study area the predominant land uses are pastoral farming and tillage. Pasture remains a dominant land cover within the upland areas comprising of large geometric fields defined by broadleaf hedgerows. On higher slopes and ridges commercial conifer plantations take over as the dominant land cover. Only on the upper slopes of the tallest peaks such as Keeper Hill (generally above 500m a.s.l.) is there a natural land cover of heathland. There are some small patches of broadleaf woodland within the study area as well as narrow riparian woodlands lining the banks of the numerous watercourses.



Image 9.2 – Mixed land cover of predominantly pasture and commercial conifer plantations.

11.2.1.3 Centres of Population and Houses

The largest settlements within the study area are Nenagh at the north-western periphery and Thurles at the eastern periphery. There are a number of other modest sized settlements within the



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plains to the east and these include; Templemore, Borrisoleigh, Ballycahill, Holycross, Clonoulty and Dundrum. The closest of these to the site is Borrisoleigh, which is approximately 7km to the northeast. Settlements within the upland area tend to be small and relatively dispersed. The nearest of these to the proposal site is Upperchurch approximately 2km to the southeast, whilst Kilcommon is 3km to the southwest and Hollyford is 6km to the south. There is a relatively high density of rural dwellings throughout the study area reflecting the productive nature of the landscape within both the lowland and upland portions.

11.2.1.4 Transport Routes

There are two principal transport routes that both pass through the outer fringes of the study area and these are the M7 motorway to the northwest and M8 motorway to the southeast. The N62 national secondary road links north-south between the settlements of Thurles and Templemore and is approximately 15km to the east of the proposal site at its nearest point. There are a number of regional roads that crisscross the study area and the closest of these to the proposal site is the R503 which traces a path around the southern half of the site and is within 2km of it for approximately 7km of its east – west journey through the uplands. The R497 links with the R503 from the south and is less than one kilometre to the south of the site at this intersection.

11.2.1.5 Public Amenities and Facilities

There is one waymarked walking route within the upland portion of the study area and this is the Slieve Felim Way. This winds through the heart of the Slieve Felim Mountains and is 10km to the west of the site at its nearest point. There are also four signposted loop walks in close proximity to the proposal site, which are part of the national loop walks initiative. These include the Knockalough, the Slí Éamoin an Cnoic, the Birch Hill and the Kilcommon Pilgrim Loop Walks.

Note: Approximately 2km beyond the south-eastern perimeter of the study area is the Rock of Cashel, which is one of Ireland's premier heritage features and tourist attractions. Given the considerable separation distance (22km) and the presence of other wind energy development in closer proximity to this heritage feature, it is not deemed necessary to consider the Rock of Cashel in terms of landscape and visual impacts herein.

11.2.1.6 Site Context

This is a relatively extensive site and thus it encompasses a rolling landscape similar to that described above at a more macro level for the upland parts of the study area. The land cover of the site is that of pastoral farmland with several blocks of commercial conifer plantation. The hills encompassed within the site that will be populated by turbines are generally in the order of 350m a.s.l. The tallest is Knockmaroe at the western edge of the site, which is 411m a.s.l. In terms of terrain this is a transitional zone as the peaks immediately to the west are generally taller than those contained within the site whilst those to the east are generally lower. The site also



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encompasses the headwaters catchment of the Clodiagh River which runs out of the site to the north before veering to the east.

11.2.1.7 Landscape Policy Context and Designations

11.2.1.7.1 North Tipperary County Development Plan 2010 - 2016

A landscape character assessment was undertaken for North Tipperary County Council in 2004, which formed the basis for the North Tipperary County Council Wind Capacity Strategy and Outline Landscape Strategy adopted in 2009. The role of the County Landscape Character Assessment is described in the current County Development Plan under policy ENV2: Landscape Protection:

‘It is the policy of the Council in assessing applications for development that would impact on landscape to balance the need to protect landscape character against the requirement for socio-economic development in accordance with value assessment and sensitivity as identified in the County Landscape Character Assessment 2009.’

The Landscape Character Assessment sets out 12 Landscape Character Areas (LCA's) and 18 generic Landscape Character Types (LCT). The proposal site is located in LCA7 'Upperchurch – Kilcommon Hills', which contains landscape character types 6 (Farmed foothills) and 16 (Enclosed valleys). In relation to landscape condition and sensitivity for LCA7 it is stated;

“This is a working landscape featuring pasture as the dominant landuse. It is in very good condition and indeed is highly scenic owing to the varied and interesting topography of rolling hills and valleys with vantage points that afford views. This high scenic quality renders this a significantly sensitive landscape. However, the nature of the varying topography is such that there is a capacity to accommodate development without undue deterioration in the scenic quality. The principal contrary factor in this landscape is the coniferous forestry. Its location on hilltops causes the maximum negative visual impact. In addition, single dwellings of inappropriate design which are poorly sited, reduce the scenic quality of this landscape in localised areas.”

In the subsequent Wind Capacity Strategy and Outline Landscape Strategy the following excerpt applies to wind energy development in LCA7 'Upperchurch – Kilcommon Hills';

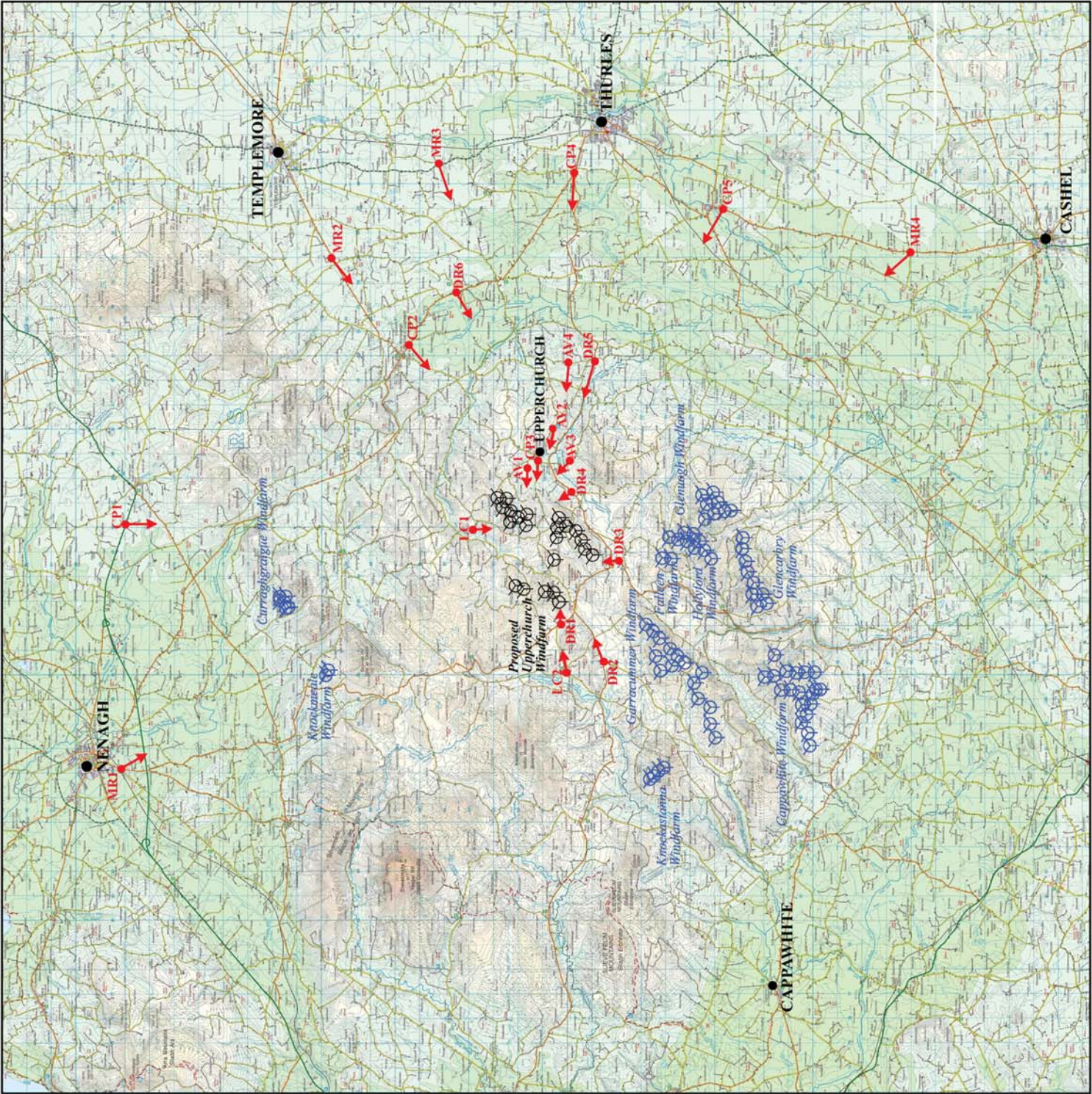
“The farmed foothills in this landscape are very similar to those encountered in the Silvermines Character Area. In this regard, the capacity to absorb wind farm development is extensive and as previously discussed, some care is required in terms of achieving the right scale of development to match the scale of the receiving landscape. The design layout would broadly follow that prescribed for hilly and flat farmland according to the DoEHLG draft guidelines 2004. Some modification will be required to



Figure 10.4

Map showing the location of the Viewpoint Reference Points (VRP's)

- Proposed Upperchurch turbines
- Existing or permitted turbines as identified on the map
- CP1 Viewpoint code showing direction of the view towards the proposed Upperchurch Windfarm



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this design solution and that relates to the size of the development. An increase in scale will result in a more successful layout that will respond to this landscape pattern which is bigger in scale than that found in the farmed ridges."

11.2.1.8 South Tipperary County Development Plan (2009 – 2015)

Given the close proximity of the boundary to South Tipperary immediately to the south of the site, the wind energy policy of South Tipperary County Council is an important cross-boundary consideration. In this regard, the current Development Plan identifies the area adjacent to the site and within this upland area generally as being a '*preferred area for wind energy development*'.

11.2.2 Visual Baseline

Given the generally prominent nature of commercial wind energy developments, visual impacts tend to be a key issue for such projects. This relates both to the extent of visibility as well as the nature and degree of intrusion into views, particularly those of recognised scenic value. Only those parts of the study area that potentially afford views of the proposed wind farm are of concern to this part of the assessment. Therefore, the first part of the visual baseline is establishing a 'Zone of Theoretical Visibility' and subsequently, identifying important visual receptors from which to base the visual impact assessment.

11.2.2.1 Zone of Theoretical Visibility (ZTV) Figure 10.1 (over)

Ecopower Developments Ltd. carried out a computer automated study of the zone of theoretical visibility (ZTV). The purpose of this exercise is to identify the 'theoretical' extent and degree of visibility of turbines. This is a theoretical exercise because it is based on topography only at 10m contour intervals and does not allow for intermittent screening provided by, for example, hedgerows, forests or buildings and does not involve the actual height of crests (but using the nearest 10m contour below). Thus the ZTV map, assuming no screening, represents a 'worst-case-scenario' with respect to viewing exposure. For the purposes of this project a radius of 20km was used for the ZTV as discussed earlier.

The following key points should be noted from the ZTV study:

- The ZTV map indicates that from within 5km of the proposal site theoretical visibility of the proposed turbines is fairly comprehensive. However, only from higher slopes within the site itself and from the opposing sides of surrounding valleys can all 22 of the proposed turbines be seen at once within this inner zone. The key receptors encompassed by the central ZTV pattern are the settlements of Upperchurch and Kilcommon, the R503 and R497 regional roads and the four signposted loop walks identified at 9.1.2.5 above. The entire length of the R503 and R497 regional roads contained within the first 5km from the site are designated as scenic routes and have theoretical visibility of some but not all of the proposed turbines.
- Between 5km and 10km away from the proposal site, theoretical visibility of the proposed wind farm falls away quickly due to terrain screening. Views from higher slopes and ridges remain, whilst from lower slopes and valleys there is either no view of turbines or views of a



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very limited number of them. The key receptors contained within the ZTV pattern in this concentric zone are the settlements of Borrisoleigh and Ballycahill, which lie at the interface of the upland and lowland zones to the east. The R498 regional road to the south of Borrisoleigh, which is also designated as a scenic route, falls within ZTV coverage in this zone.

- Between 10-15km away from the site extensive theoretical visibility has emerged in the lowland plains to the east of the site encompassing most of the settlements identified at 9.2.1.3 above as well as the N62 national secondary road. Theoretical visibility within the uplands to the north, south and west of the site is limited to the highest peaks and ridges. The only key receptor this coincides with is the Slieve Felim Way which is largely contained within commercial conifer forests at these elevations.
- At the outer periphery of the study area, between 15-20km from the proposal extensive theoretical visibility remains throughout the lowland landscape in the eastern quarters. This encompasses the settlements of Templemore and Thurles. Two further patches of visibility arise in the north western segment of the study area and one of these takes in the outskirts of Nenagh. Another occurs at the south-western periphery of the study area and encompasses the small settlement of Donohill.

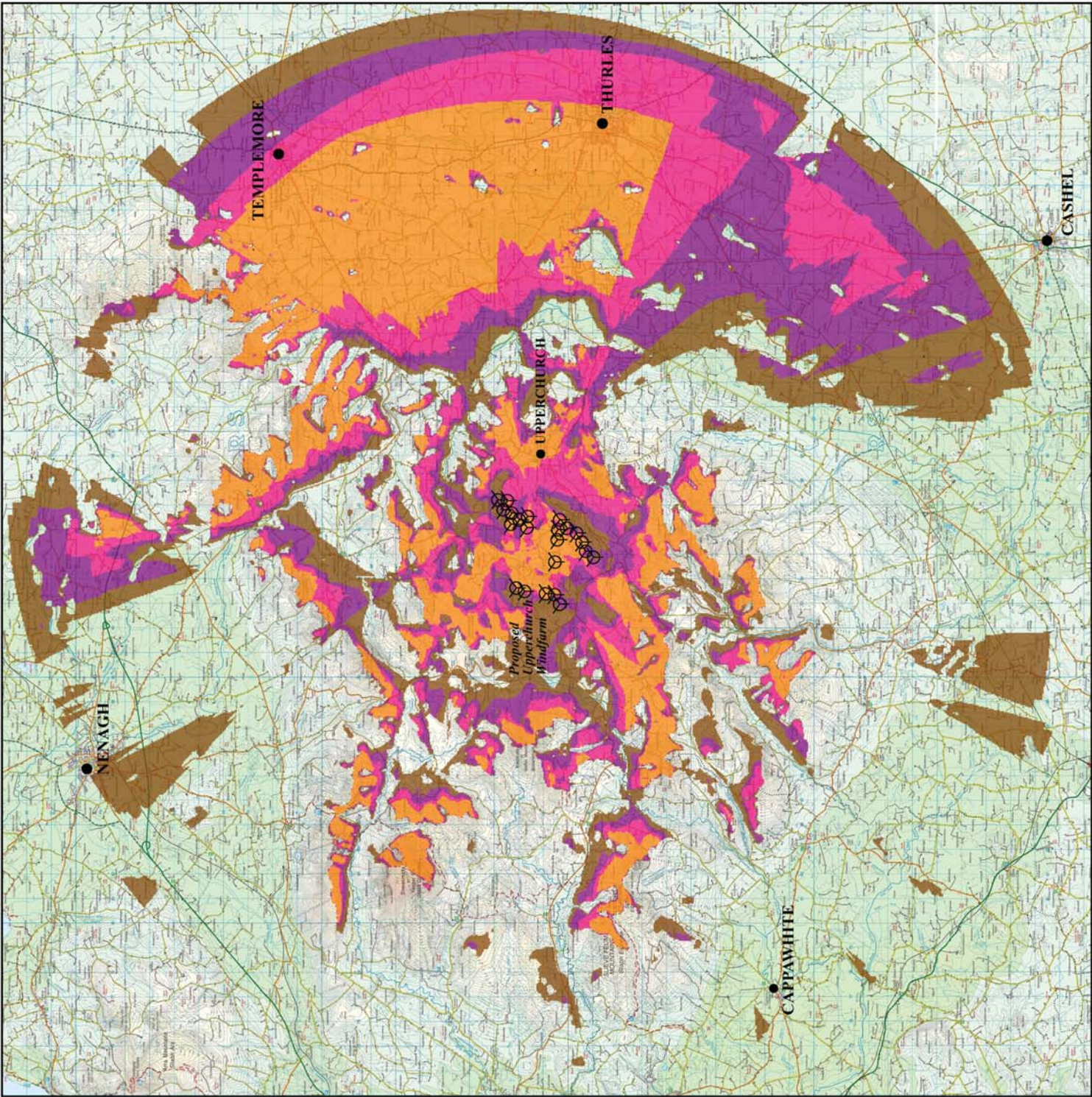


Figure 10.1

Zone of Theoretical Visibility (ZTV) of the proposed Upperchurch turbines.

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11.2.2.2 Views of Recognised Scenic Value

Views of recognised scenic value are primarily indicated within County Development plans in the context of scenic views/routes designations, but they might also be indicated on touring maps, guide books, road side rest stops or on post cards that represent the area.

11.2.2.3 North Tipperary County Development Plan (2010 – 2016)

The North Tipperary County Development Plan identifies 15 protected views, which are all from sections of road. Those relevant to this proposal are identified below;

V11 Views north and south of the R498 from Bouladuff through Borrisoleigh to Latteragh

V12 Views north and south on sections of the R503 from Newport to Ballycahill

V13 Views east and west of the R497 from the R503 through the mountains to Dolla – including Mother Mountain to the West, Knockacreggan to the East, Cooneen Hill to the East and the Silvermines to the west

V15 Views west on the N62 north of Templemore

11.2.2.4 South Tipperary County Development Plan (2009 – 2015)

Designated scenic views from within South Tipperary are also relevant to this proposal given the close proximity of the jurisdictional boundary immediately to the south of the site. The only relevant scenic route identified within the South Tipperary County Development Plan is identified below;

V036 Views in all directions from Ironmills to Milestone Road (R497)

11.2.2.5 Limerick County Development Plan (2010 – 2016)

There are no relevant designated scenic views from the small section of County Limerick that is contained within the south-western quarter of this study area.

*11.2.2.6 Identification of Viewshed Reference Points as a Basis for Assessment **Figure 10.4 (over)***

The results of the ZTV analysis provide the basis for selection of Viewshed Reference Points (VRP's), which are the locations used to study the landscape and visual impact of the proposed wind farm in detail. It is not warranted to include each and every location that provides a view of this development as this would result in an unwieldy report and make it extremely difficult to draw out the key impacts arising from the project. Instead, the assessors endeavoured to select a variety of location types that



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would provide views of the proposed wind farm from different distances, different angles and different contexts.

The visual impact of a proposed development is assessed using up to 6 categories of receptor type as listed below;

- **Key Views** (from features of national or international importance);
- **Designated Scenic Routes and Views;**
- **Local Community views;**
- **Centres of Population;**
- **Major Routes; and**
- **Amenity and heritage features;**

Where a VRP might have been initially selected for more than one reason it will be assessed according to the primary criteria for which it was chosen. The characteristics of each receptor type vary as does the way in which the view is experienced. These are described below.

11.2.2.6.1 Key Views

These VRP's are at features or locations that are significant at the national or even international level, typically in terms of heritage, recreation or tourism. They are locations that attract a significant number of viewers who are likely to be in a reflective or recreational frame of mind possibly increasing their appreciation of the landscape around them. The location of this receptor type is usually quite specific.

11.2.2.6.2 Designated Scenic Routes and Views

Due to their identification in the County Development Plan this type of VRP location represents a general policy consensus on locations of high scenic value within the Study Area. These are commonly elevated, long distance, panoramic views and may or may not be mapped from precise locations. They are more likely to be experienced by static viewers who seek out or stop to take in such vistas.

11.2.2.6.3 Local Community Views

This type of VRP represents those people that live and/or work in the locality of the wind farm, usually within a 5km radius of the site. Although the VRP's are generally located on local level roads they also represent similar views that may be available from adjacent houses. The precise location of this VRP type is not critical, however, clear elevated views are preferred, particularly when closely associated with a cluster of houses and representing their primary views. Coverage of a range of viewing angles using several VRP's is necessary in order to sample the spectrum of views that would be available from surrounding dwellings.



11.2.2.6.4 Centres of Population

VRP's are selected at centres of population primarily due to the number of viewers that are likely to experience that view. The relevance of the settlement is based on the significance of its size in terms of the Study Area or its proximity to the site. The VRP may be selected from any location within the public domain that provides a clear view either within the settlement or in close proximity to it.

11.2.2.6.5 Major Routes

These include national and regional level roads and rail lines and are relevant VRP locations due to the number of viewers potentially impacted by the proposed development. The precise location of this category of VRP is not critical and might be chosen anywhere along the route that provides clear views towards the proposal site, but with a preference towards close and/or elevated views. Major routes typically provide views experienced whilst in motion and these may be fleeting and intermittent depending on screening by intervening vegetation or buildings.

11.2.2.6.6 Amenity and Heritage Features

These views are often one and the same given that heritage locations are often important tourist and visitor destinations and amenity areas or walking routes are commonly designed to incorporate heritage features. Such locations or routes tend to be sensitive to development within the landscape as viewers are likely to be in a receptive frame of mind with respect to the landscape around them. The sensitivity of this type of visual receptor is strongly related to the number of visitors they might attract and, in the case of heritage features, whether these are discerning experts or lay tourists. Sensitivity is also heavily influenced by the experience of the viewer at a heritage site as distinct from simply the view of it. This is a complex phenomenon that is likely to be different for every site. Experiential considerations might relate to the sequential approach to a castle from the car park or the view from a hilltop monument reached after a demanding climb. It might also relate to the influence of contemporary features within a key view and whether these detract from a sense of past times. It must also be noted that the sensitivity rating attributed to a heritage feature for the purposes of a landscape and visual assessment is not synonymous with its importance to the Archaeological or Architectural Heritage record.

Table 9-1 Outline Description of Selected Viewshed Reference Points (VRPs)

VRP No.	Location	Direction of view
CP1	Toomyvara	SE
CP2	Borrisoleigh	SW
CP3	Upperchurch	W
CP4	Thurles	W
CP5	Holycross	NW
LC1	Local road at Garranakilka	S
LC2	Kilcommon Village	E
MR1	Nenagh	SE
MR2	R501 Borrisoleigh - Templemore Road	SW
MR3	N62 Thurles -Templemore Road	SW
MR4	R660 at Boherlahan	NW
DR1	Curreeny Road	NE
DR2	Anglesey Road at Loughbrack	NE
DR3	Anglesey Road at Milestone	N
DR4	R503 at Ruan	NW
DR5	Anglesey Road at Rossoulty	NW
DR6	R498 at The Ragg/Inch	W
AV1	Slí Éamoin an Cnoic	W
AV2	Ballyboy lookout point	W
AV3	Knockalough looped walk	NW
AV4	Birch Hill looped walk	W

11.3 LIKELY SIGNIFICANT IMPACTS

11.3.1 Landscape Impact

11.3.1.1 Assessment Criteria

When assessing the potential impacts on the landscape resulting from a wind farm development, the following criteria are considered:

- landscape character, value and sensitivity
- Magnitude of likely impacts; and
- Significance of landscape effects

The sensitivity of the landscape to change is the degree to which a particular landscape receptor (Landscape Character Area (LCA) or feature) can accommodate changes or new features without unacceptable detrimental effects to its essential characteristics. Landscape Value and Sensitivity is classified using the following criteria;

Table 9-2 Landscape Value and Sensitivity



Sensitivity	Description
Very High	Areas where the landscape character exhibits a very low capacity for change in the form of development. Examples of which are high value landscapes, protected at an international or national level (World Heritage Site/National Park), where the principal management objectives are likely to be protection of the existing character.
High	Areas where the landscape character exhibits a low capacity for change in the form of development. Examples of which are high value landscapes, protected at a national or regional level (Area of Outstanding Natural Beauty), where the principal management objectives are likely to be considered conservation of the existing character.
Medium	Areas where the landscape character exhibits some capacity and scope for development. Examples of which are landscapes which have a designation of protection at a county level or at non-designated local level where there is evidence of local value and use
Low	Areas where the landscape character exhibits a higher capacity for change from development. Typically this would include lower value, non-designated landscapes that may also have some elements or features of recognisable quality, where landscape management objectives include, enhancement, repair and restoration.
Negligible	Areas of landscape character that include derelict, mining, industrial land or are part of the urban fringe where there would be a reasonable capacity to embrace change or the capacity to include the development proposals. Management objectives in such areas could be focused on change, creation of landscape improvements and/or restoration to realise a higher landscape value.

The magnitude of a predicted landscape impact is a product of the scale, extent or degree of change that is likely to be experienced as a result of the proposed development. The magnitude takes into account whether there is a direct physical impact resulting from the loss of landscape components and/or a change that extends beyond the proposal site boundary that may have an effect on the landscape character of the area.

Table 9-3 Magnitude of Landscape Impacts

Magnitude of Impact	Description
Very High	Change that would be large in extent and scale with the loss of critically important landscape elements and features, that may also involve the introduction of new uncharacteristic elements or features that contribute to an overall change of the landscape in terms of character, value and quality.
High	Change that would be more limited in extent and scale with the loss of important landscape elements and features, that may also involve the introduction of new uncharacteristic elements or features that contribute to an overall change of the landscape in terms of character, value and quality.
Medium	Changes that are modest in extent and scale involving the loss of landscape characteristics or elements that may also involve the introduction of new uncharacteristic elements or features that would lead to changes in landscape character, and quality.
Low	Changes affecting small areas of landscape character and quality, together with the loss of some less characteristic landscape elements or the addition of new features or elements.
Negligible	Changes affecting small or very restricted areas of landscape character. This may include the limited loss of some elements or the addition of some new features or elements that are characteristic of the existing landscape or are hardly perceivable.

The significance of a landscape impact is based on a balance between the sensitivity of the landscape receptor and the magnitude of the impact. The significance of landscape impacts is arrived at using the following matrix;

*Upperchurch Windfarm Environmental Impact Statement***Table 9-4 Landscape Impact Significance Matrix**

Scale/Magnitude	Sensitivity of Receptor				
	<i>Very High</i>	<i>High</i>	<i>Medium</i>	<i>Low</i>	<i>Negligible</i>
<i>Very High</i>	Profound	Profound-major	Major	Moderate	Minor
<i>High</i>	Profound-major	Major	Major-moderate	Moderate-minor	Minor-negligible
<i>Medium</i>	Major	Major-moderate	Moderate	Minor	Negligible
<i>Low</i>	Moderate	Moderate-minor	Minor	Minor-negligible	Negligible
<i>Negligible</i>	Minor	Minor-negligible	Negligible	Negligible	Negligible

Note that potential beneficial landscape impacts are not accounted for in the tables and matrix above. In the rare instances that this might occur, perhaps by facilitating the rehabilitation of a degraded landscape, the benefits will be discussed in the assessment and the significance of impact would default to the lowest end of the range (negligible).

11.3.1.2 Landscape Character, Value and Sensitivity

Effects on landscape character will be considered at both the localised scale of the site and its immediately surrounding landscape as well as the broader scale of the study area.

In the near vicinity of the proposal site (within approximately 5km) the landscape comprises of steeply rolling hills and valleys with a mixed land cover of pastoral grazing and commercial forests. The existing Glenough wind farm also occurs just to the southwest. This landscape is also influenced by the R503 and R497 regional roads, a network of local roads and small settlements such as Upperchurch, Milestone and Kilcommon, which give it an anthropogenic character. Nonetheless, this character is that of remote rural uplands.

The landscape character of the wider study area (beyond approximately 5km) is very similar to that described above, particularly within the upland areas to the north, south and west. Forest plantations begin to dominate grazing land as the predominant land use within the heart of the ranges to the west and several wind farms also occur in this area.

The landscape character changes markedly as the hills give way to the flat lowland plains fairly abruptly to the northwest and southeast. The plains are characterised by a higher intensity of rural and built development as well as a higher settlement density. This is centred on evenly dispersed, modest scale settlements, which act as rural service centres. The major transport corridors of the M7 and M8 motorways influence the landscape character at the north-western and south-eastern fringes of the study area respectively. The mountains ranges that occupy the heart of the study area act as a distinctive undulating backdrop to the plains giving these otherwise unremarkable rural



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lowlands something of a sense of place. Wind turbines that can be seen above the ridgeline also contribute to the character of this backdrop. Overall it is considered that the landscape character of the lowland plains is a strongly anthropogenic one of intensive agriculture.

Due to the reasons outlined above, and particularly the presence of existing wind farms, the landscape sensitivity of the site and its immediate surrounds as well as the wider study area is deemed to be **low**.

11.3.1.3 Magnitude of Landscape Effects

The physical landscape as well as the character of the site and its immediate surrounds is affected by the proposed turbines as well as ancillary development such as access and circulation roads, areas of hard standing for the turbines, the permanent meteorological mast and the substation. By contrast, for the wider landscape of the study area, landscape impacts relate almost exclusively to the influence of the proposed turbines on landscape character.

It is considered that the proposed wind farm development will have only a minor physical impact on landscape components within the site as none of the proposed development features (turbines, substation, anemometer mast) have a significant 'footprint'. The topography of the site will remain unaltered with excavation being limited to establishment of some additional tracks and areas of hard standing for the turbines. Such excavation will tie into the existing contours and will be the minimum required for safe working. Any temporary stockpiles of material will be re-graded to marry into existing site levels. Similarly, the land cover of the site will only be interrupted as necessary to create tracks and areas of hard standing for the turbines. It is estimated that 4.35ha of existing conifer plantation will need to be clear-felled in order to construct the wind farm. The current pastoral farming regime will continue below the wind turbines without significant disruption following the construction phase.

The principal landscape impact will be the change in character of the immediate area due to the introduction of large scale structures with moving components. These will be a prominent landscape feature within the local landscape as would be the case for a commercial scale wind farm placed into almost any landscape context. However, the turbines will not represent a new and unfamiliar feature even in this localised area as the 14 turbine Glenough Wind Farm occurs only 3.2km away to the south of the proposal site. There are also two wind farms currently under construction in the near vicinity of the proposal including the 15 turbine Garracummer scheme (3.5km to the southwest) and the 2 turbine Falleen development (2.8km to the south). Therefore, the proposal represents a further intensification of wind energy development, which has considerably less effect on the landscape character than an initial introduction of turbines would have. Indeed, wind energy development is emerging as one of the defining land uses in the central study area irrespective of the proposed development.



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The height of the proposed turbines and the overall scale of the wind farm, although relatively substantial, is not considered excessive in this landscape context due to the scale of the terrain and the relatively broad land use patterns in the vicinity. This is reflected in the North Tipperary 'Wind Capacity and Outline Landscape Strategy', which seeks a broad scale of wind energy development in this Landscape Character Area to reflect the nature of the landscape (see 9.2.1.7.1 above).

Although the wind farm represents a slightly increased sense of human intervention and level of built development than currently exists on the site or in the immediate area, it will not detract significantly from the relatively remote, rural character. This is on the basis that wind farms are regularly located in such areas and have become somewhat synonymous with remote rural locations. This perception is also aided by the fact that a generally low level of site activity occurs during the operational phase of a wind farm development.

Site activity will be at its greatest during the construction phase due to the operation of machinery on site and movement of heavy vehicles to and from site. This phase will have a more significant impact on the character of the site, but it is a temporary impact that will cease upon completion of the scheme (6-8 months).

It is important to note that in terms of duration, this wind farm proposal represents a long term, but not permanent impact on the landscape. The lifespan of the project is 25 years, after which time it will be dismantled and the landscape reinstated to prevailing conditions. Nonetheless, this is a significant period of time and it might be argued that if the development remains viable an application could be made to extend its lifecycle or an alternative development proposed on the basis of an established use on this site. Subsequent use of the site is difficult for anyone to predict and is not part of this assessment. Instead, the key point is that a wind farm development has a fairly 'light footprint' on the landscape in comparison to a quarry or road development, for example. Within a couple of years of decommissioning there would be little evidence that a wind farm ever existed on the site.

Within the wider landscape context there are two other existing wind farms including Curraghraigue 9.5km to the north and Knockstanna (4 turbines) just over 8km to the south. These contribute the character of the upland landscape in which they sit and as a background feature they also influence the character of the surrounding lowland plains. Again, the proposed development represents the intensification of an established land use and it will contribute to wind energy development becoming one of the defining elements of the landscape character of the wider study area.

For the reasons outlined above, the magnitude of the landscape impact is deemed to be **low**.

In accordance with the significance matrix, a 'low' sensitivity judgement coupled with an impact magnitude of 'low' results in a **Minor-negligible** significance of landscape impact.



11.3.2 Visual Impact

As with the landscape impact, the visual impact of the proposed wind farm will be assessed as a function of sensitivity versus magnitude. In this instance the sensitivity of the visual receptor, weighed against the magnitude of the visual effect.

11.3.2.1 Sensitivity of Visual Receptors

Unlike landscape sensitivity, the sensitivity of visual receptors has an anthropocentric basis. It considers factors such as the perceived quality and values associated with the view, the landscape context of the viewer, the likely activity they are engaged in and whether this heightens their awareness of the surrounding landscape. A list of the factors considered by MosArt in estimating the level of sensitivity for a particular visual receptor is outlined below and used in table 9-6 to establish visual receptor sensitivity at each VRP:

1. **Recognised scenic value of the view** (County Development Plan designations, guidebooks, touring maps, postcards etc). These represent a consensus in terms of which scenic views and routes within an area are strongly valued by the population because in the case of County Developments Plans, at least, a public consultation process is required;
2. **Views from within highly sensitive landscape areas.** Again, highly sensitive landscape designations are usually part of a county's Landscape Character Assessment, which is then incorporated with the County Development Plan and is therefore subject to the public consultation process. Viewers within such areas are likely to be highly attuned to the landscape around them;
3. **Primary views from dwellings.** A proposed development might be seen from anywhere within a particular residential property with varying degrees of sensitivity. Therefore, this category is reserved for those instances in which the design of dwellings or housing estates, has been influenced by the desire to take in a particular view. This might involve the use of a slope or the specific orientation of a house and/or its internal social rooms and exterior spaces;
4. **Intensity of use, popularity.** This relates to the number of viewers likely to experience a view on a regular basis and whether this is significant at county or regional scale;
5. **Connection with the landscape.** This considers whether or not receptors are likely to be highly attuned to views of the landscape i.e. commuters hurriedly driving on busy national



route versus hill walkers directly engaged with the landscape enjoying changing sequential views over it;

6. **Provision of elevated panoramic views.** This relates to the extent of the view on offer and the tendency for receptors to become more attuned to the surrounding landscape at locations that afford broad vistas.
7. **Sense of remoteness and/or tranquillity.** Receptors taking in a remote and tranquil scene, which is likely to be fairly static, are likely to be more receptive to changes in the view than those taking in the view of a busy street scene, for example;
8. **Degree of perceived naturalness.** Where a view is valued for the sense of naturalness of the surrounding landscape it is likely to be highly sensitive to visual intrusion by distinctly manmade features;
9. **Presence of striking or noteworthy features.** A view might be strongly valued because it contains a distinctive and memorable landscape feature such as a promontory headland, lough or castle;
10. **Historical, cultural and / or spiritual significance.** Such attributes may be evident or sensed by receptors at certain viewing locations, which may attract visitors for the purposes of contemplation or reflection heightening the sense of their surroundings;
11. **Rarity or uniqueness of the view.** This might include the noteworthy representativeness of a certain landscape type and considers whether the receptor could take in similar views anywhere in the broader region or the country;
12. **Integrity of the landscape character.** This looks at the condition and intactness of the landscape in view and whether the landscape pattern is a regular one of few strongly related components or an irregular one containing a variety of disparate components;
13. **Sense of place.** This considers whether there is special sense of wholeness and harmony at the viewing location; and

14. **Sense of awe.** This considers whether the view inspires an overwhelming sense of scale or the power of nature.

Those locations which are deemed to satisfy many of the above criteria are likely to be in the higher order of magnitude in terms of sensitivity and vice versa. No relative importance is inferred by the order of listing in the table 9-5 below. Overall sensitivity may be a result of a number of these factors or, alternatively, a strong association with one or two in particular.

Upperchurch Windfarm Enviromental Impact Statement

Table 9-5 Analysis of Visual Receptor Sensitivity at Viewshed Reference Points

Assessment Criteria	CP1	CP2	CP3	CP4	CP5	LC1	LC2	MR1	MR2	MR3	MR4	DR1	DR2	DR3	DR4	DR5	DR6	AV1	AV2	AV3	AV4
Recognised scenic value of the view	N	N	N	N	N	N	N	N	N	N	N	Y	Y	Y	Y	Y	Y	N	Y	N	N
Views from within highly sensitive landscape areas	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
Primary views from residences	Y	Y	Y	Y	Y	Y	Y	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Intensity of use, popularity (number of viewers)	Y	Y	Y	Y	Y	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Viewer connection with the landscape	N	N	N	N	N	Y	Y	N	N	N	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Provision of vast, elevated panoramic views	N	N	N	Y	N	Y	N	Y	Y	N	Y	N	Y	Y	N	N	Y	N	Y	N	Y
Sense of remoteness and/or tranquillity at the viewing location	N	N	N	N	N	Y	N	N	N	N	N	N	N	N	N	N	N	Y	Y	Y	Y
Degree of perceived naturalness	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N

REFERENCE DOCUMENTS

Upperchurch Windfarm Environmental Impact Statement *Upperchurch Windfarm Environmental Impact Statement Landscape and Visual Assessment*

Presence of striking or noteworthy features	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
Sense of Historical, cultural and / or spiritual significance	N	N	N	N	N	N	Y	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
Rarity or uniqueness of the view	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
Integrity of the landscape character within the view	Y	Y	Y	N	Y	Y	Y	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Sense of place at the viewing location	N	Y	Y	Y	Y	Y	Y	N	N	N	N	N	N	N	N	N	N	Y	Y	N	N	N
Sense of awe	N	N	N	N	N	N	N	N	N	N	N	N	N	Y	N	N	N	N	Y	N	N	N
Overall sensitivity assessment	L	L	L	L	L	M	M	L	L	L	L	M	M	M	M	M	M	M	H	M	M	M

Notes: **N** implies 'no', the VRP is generally not sensitive with respect to the assessment criterion, whereas **Y** implies 'yes' it is sensitive

N = Negligible; **L** = low sensitivity; **M** = medium sensitivity; **H** = high sensitivity; **VH** = very high sensitivity



11.3.2.2 Visual Impact Magnitude

The magnitude of visual effects is determined on the basis of two factors; the visual presence of the proposal and its effect on visual amenity.

Visual presence is something of a quantitative measure relating to how noticeable or visually dominant the proposal is within a particular view. This is based on a number of aspects beyond simply scale in relation to distance. Some of these include the extent of the view as well as its complexity and the degree of movement experienced i.e. within a busy street scene. The backdrop against which the development is presented and its relationship with other focal points or prominent features within the view is also considered. Visual presence is essentially a measure of the relative visual dominance of the proposal within the available vista and is often expressed as such i.e. sub-dominant, co-dominant, dominant, highly dominant.

For wind energy developments a strong visual presence is not necessarily synonymous with adverse impact as might be the case for a factory, a road or electricity pylons, for which the general consensus is likely to be almost wholly negative. Instead, the 2003 SEI funded survey of 'Attitudes Towards The Development of Wind Farms in Ireland' found that "*wind farms are seen in a positive light compared to other utility-type structures that could be built on the landscape*". Furthermore, a clear and comprehensive view of a wind farm might be preferable in many instances to a partial and confusing view of turbine components that are not so noticeable within a view. On the basis of these reasons, the visual amenity aspect of assessing impact magnitude is qualitative and considers such factors as the spatial arrangement of turbines both within the scheme and in relation to surrounding terrain and land cover. It also examines whether the development contributes positively to the existing qualities of the vista or results in distracting visual effects and disharmony.

It should be noted that as a result of this two-sided analysis, a high order visual presence can be moderated by a low level of effect on visual amenity and vice versa. Given that wind turbines do not represent significant bulk, visual impacts result almost entirely from visual 'intrusion' rather than visual 'obstruction' (the blocking of a view). The magnitude of visual impacts is classified in the following table;

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Table 9-6 Magnitude of Visual Impact

Criteria	Description
Very High	The proposal intrudes into a large proportion or critical part of the available vista and is without question the most noticeable element. A high degree of visual clutter or disharmony is also generated, strongly reducing the visual amenity of the scene
High	The proposal intrudes into a significant proportion or important part of the available vista and is one of the most noticeable elements. A considerable degree of visual clutter or disharmony is also likely to be generated, appreciably reducing the visual amenity of the scene
Medium	The proposal represents a moderate intrusion into the available vista, is a readily noticeable element and/or it may generate a degree of visual clutter or disharmony, thereby reducing the visual amenity of the scene. Alternatively, it may represent a balance of higher and lower order estimates in relation to visual presence and visual amenity
Low	The proposal intrudes to a minor extent into the available vista and may not be noticed by a casual observer and/or the proposal would not have a marked effect on the visual amenity of the scene
Negligible	The proposal would be barely discernible within the available vista and/or it would not detract from, and may even enhance, the visual amenity of the scene

11.3.2.3 Visual Impact Significance

As stated above, the significance of visual impacts is a function of visual receptor sensitivity and visual impact magnitude. This relationship is expressed in the following significance matrix;

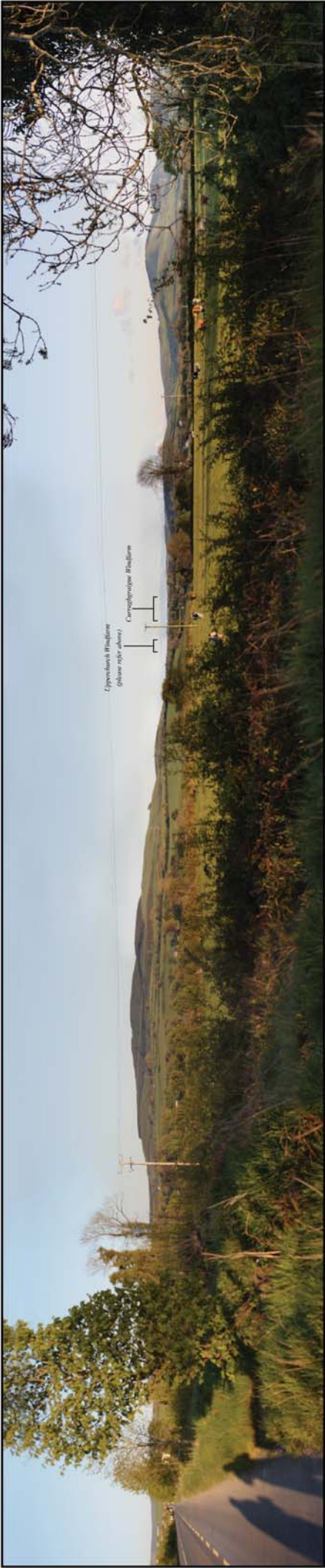
Table 9-7 Visual Impact Significance Matrix

	Sensitivity of Receptor				
Scale/Magnitude	<i>Very High</i>	<i>High</i>	<i>Medium</i>	<i>Low</i>	<i>Negligible</i>
<i>Very High</i>	Profound	Profound-major	Major	Moderate	Minor
<i>High</i>	Profound-major	Major	Major-moderate	Moderate-minor	Minor-negligible
<i>Medium</i>	Major	Major-moderate	Moderate	Minor	Negligible
<i>Low</i>	Moderate	Moderate-minor	Minor	Minor-negligible	Negligible
<i>Negligible</i>	Minor	Minor-negligible	Negligible	Negligible	Negligible

CP1: View from Toomevara



Photomontage and wireframe depiction of the proposed Upperchurch wind farm



Panned view showing the cumulative visual influence of the proposed Upperchurch turbines with the existing and permitted wind farms in the area in a landscape context

CP1

CP1: Toomevara

CP1 Grid Reference: E196146 N177960

Viewpoint elevation 132m

Nearest proposed Upperchurch turbine 15.2km

No. proposed Upperchurch turbine hubs visible 12

No. proposed Upperchurch turbine blade sets visible 12

Direction of view S



REFERENCE DOCUMENTS

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11.3.2.4 Estimation of Visual Impacts at VRPs

Viewshed Reference Point		Direction of View	Distance to nearest turbine:	Number of turbine hubs visible:
CP1	Toomevara	S	15.2	12

Representative of:

- An area identified on the ZTV map as having a theoretical view of 19-22 of the proposed turbines
- A settlement
- A regional road

Receptor Sensitivity

Low

Existing View

This is a slightly elevated and fairly broad panorama that is interrupted somewhat by roadside vegetation. Across a flat pastoral landscape of large geometric fields and broadleaf hedgerows can be seen two distinctive sets of hills. The one to the left is the Devils Bit range and to the right is the northern extent of the Silvermines range. A broad saddle lies between the higher undulating ridgelines of these two linked sets of hills. Several turbines from the Curraghraigue wind farm can be faintly seen in the base of this saddle.

Visual Impact of Upperchurch Wind Farm

Some of the proposed turbines will be just visible in the base of the low saddle between the sets of hills described above. Only the western end of the scheme can be seen above a band of intervening vegetation and these also rise above the skyline so that they are faintly seen in silhouette against the sky. At this distance the turbines are seen at a very small scale. They are also oblique to the road and within a relatively complex vista, which makes them a barely noticeable feature.

The visible turbines are seen in an unambiguous manner with a staggered linear layout and an undulating profile that complements the terrain and land cover patterns within the view. The turbines represent an extension and intensification of wind energy development in this portion of the view and are not, therefore, an unfamiliar element. Overall the magnitude of visual impact is deemed to be negligible.

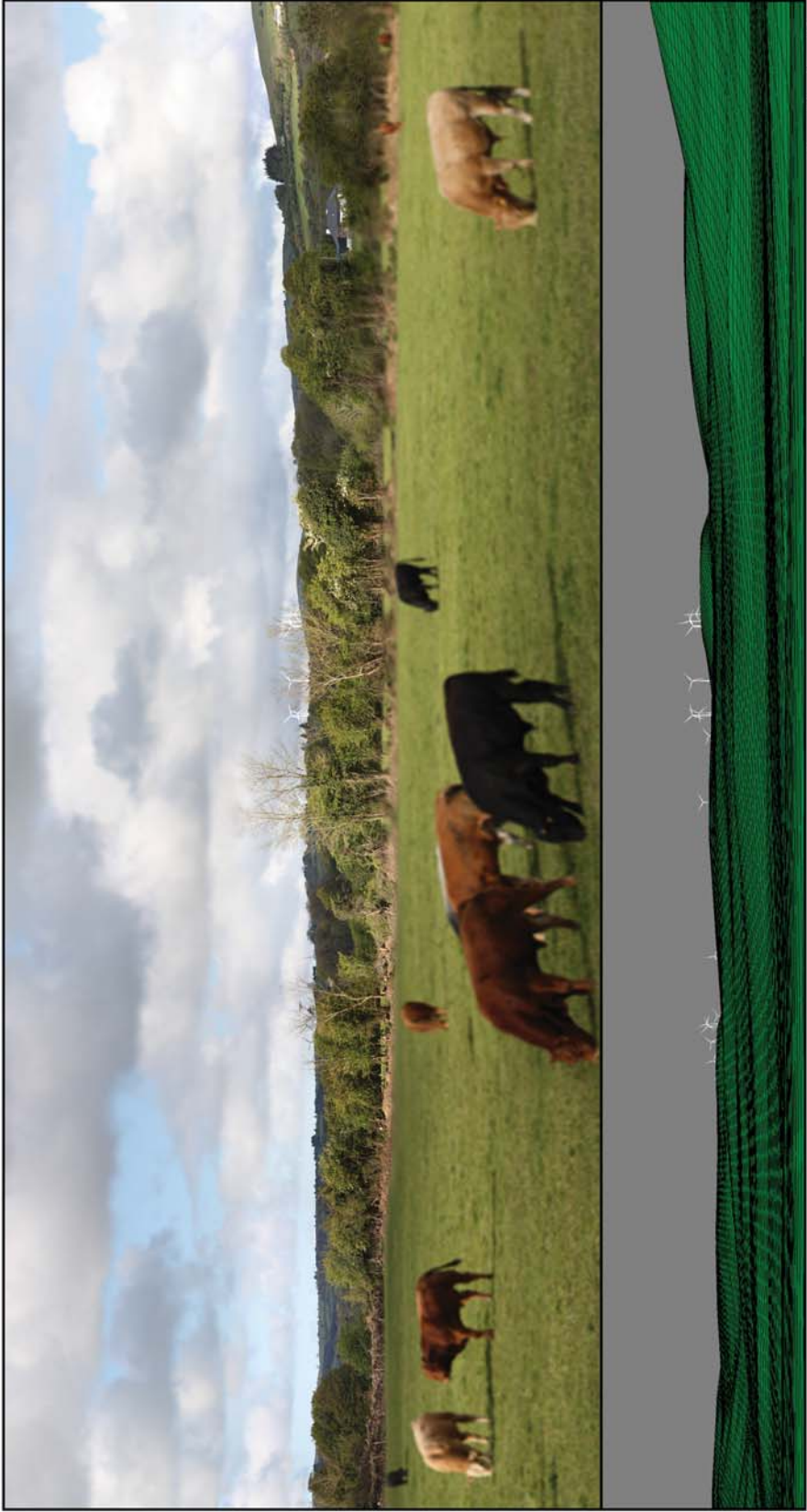
Summary

Based on the assessment criteria and matrices outlined at section 9.3.2 the significance of visual impact is summarised below.

Visual Receptor Sensitivity	Visual Impact Magnitude	Significance of Visual Impact
Low	Negligible	Negligible



CP2: View from Borrisoleigh



Photomontage and wireframe depiction of the proposed Upperchurch wind farm

Focal length: 50mm
Recommended viewing distance: 39cm

CP2

CP2: Borrisoleigh

CP2 Grid Reference: E203435 N166415

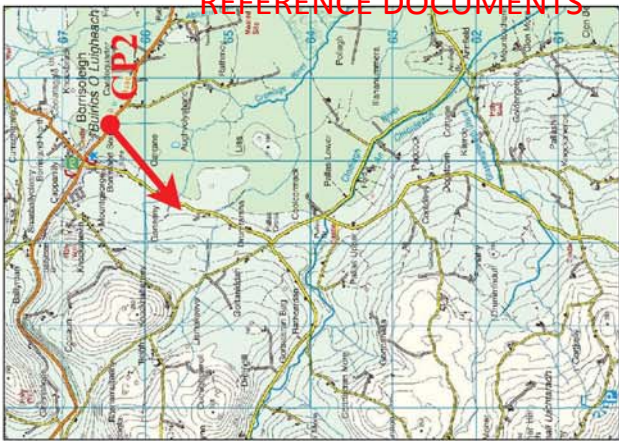
Viewpoint elevation 100m

Nearest proposed Upperchurch turbine 7.2km

No. proposed Upperchurch turbine hubs visible 13

No. proposed Upperchurch turbine blade sets visible 14

Direction of view SW



REFERENCE DOCUMENTS



Panned view showing the cumulative visual influence of the proposed Upperchurch turbines with the existing and permitted wind farms in the area in a landscape context

Upperchurch Windfarm Environmental Impact Statement

Viewshed Reference Point		Direction of View	Distance to nearest turbine:	Number of turbine hubs visible:
CP2	Borrisoleigh	SW	7.2km	13

Representative of:

- An area identified on the ZTV map as having a theoretical view of between 13 and 18 of the proposed turbines
- A centre of population
- A regional road

Receptor Sensitivity

Low

Existing View

This is a view towards the Slieve Felim mountains from the outskirts of Borrisoleigh. The foreground of the view is transitional in character with fields and hedgerows to the left and the built environment of the village to the right. An open field defined by mature broadleaf trees lies directly in front of the viewer. These trees limit the view of the surrounding hills so that only sections of the undulating ridgeline are apparent.

Visual Impact of Upperchurch Wind Farm

The proposed turbines are seen in two dense clusters within the tops of the intervening trees and above the more distant skyline ridge. Whilst the overlapping of several of the turbines might draw attention as the blades cross over each other, the scheme is relatively camouflaged by the foreground trees. The blade sets of the turbines are seen at a modest scale from this distance and within a broad vista. The visual presence of the scheme is considered to be sub-dominant from here.

The view of the tightly clustered and overlapping turbines within the vegetated skyline is somewhat ambiguous and also generates a degree of visual clutter. These undesirable effects are moderated slightly by the low order of visual presence. On the basis of these factors the magnitude of the visual impact at CP2 is deemed to be medium.

Summary

Based on the assessment criteria and matrices outlined at section 9.3.2 the significance of visual impact is summarised below.

Visual Receptor Sensitivity	Visual Impact Magnitude	Significance of Visual Impact
Low	medium	Minor



CP3: View from Upperchurch

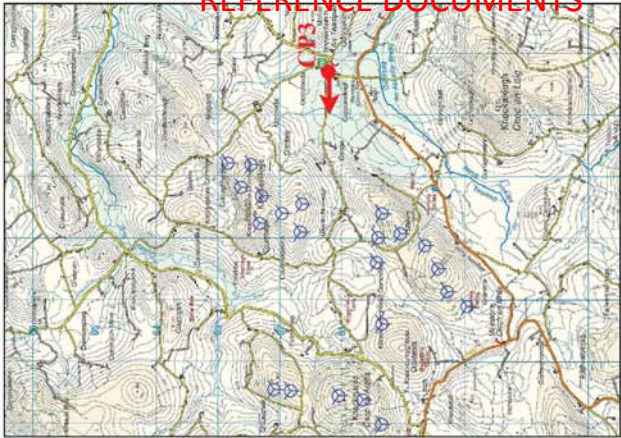


Photomontage and wireframe depiction of the proposed Upperchurch wind farm

Focal Length: 20mm
Recommended viewing distance: 10cm

CP3

- CP3: Upperchurch
- CP3 Grid Reference: E198670 N161178
- Viewpoint elevation 190m
- Nearest proposed Upperchurch turbine 1.9km
- No. proposed Upperchurch turbine hubs visible 16
- No. proposed Upperchurch turbine blade sets visible 19
- Direction of view W



REFERENCE DOCUMENTS



Panned view showing the cumulative visual influence of the proposed Upperchurch turbines with the existing and permitted wind farms in the area in a landscape context

Upperchurch Windfarm Environmental Impact Statement

Viewshed Reference Point		Direction of View	Distance to nearest turbine:	Number of turbine hubs visible:
CP3	Upperchurch	W	1.9km	16

- Representative of:**
- An area identified on the ZTV map as having a theoretical view of between 19 and 22 of the proposed turbines
 - The closest settlement to the proposed wind farm

Receptor Sensitivity **Low**

Existing View This is a view across a playing field from the core of Upperchurch Village. Some conifer screening at the edge of the field veils the view of the rolling hills that form a backdrop to this scene at a relatively short distance. These hills have a mixed land cover of both agriculture and silviculture. Dwellings and commercial premises can be seen to the left and right in this typical rural village street scene.

Visual Impact of Upperchurch Wind Farm The proposed wind farm will line the ridge that contains this westerly view. The turbines are almost all fully revealed in silhouette above the skyline and the uphill view of them tends to accentuate their height. The lateral extent of the scheme is considerable when viewed from here as it occupies much of the westerly view. Even though the turbines will be a background feature of this dynamic street scene they are considered to have a dominant visual presence.

There is a relaxed linear rhythm to the spacing of the turbines and for the most part the clear view of them above the skyline makes for an unambiguous view of the scheme. However, there will be partial screening of some of the turbines by the conifers in the foreground and the blade sets will cut against the branches in perspective. This is a typical view from Upperchurch in that all of the turbines are seldom visible at once, but some will almost always be visible as part of the western backdrop of the settlement. Overall the magnitude of the visual impact is deemed to be high from Upperchurch.

Summary Based on the assessment criteria and matrices outlined at section 9.3.2 the significance of visual impact is summarised below.

Visual Receptor Sensitivity	Visual Impact Magnitude	Significance of Visual Impact
Low	High	Moderate-minor



CP4: View from Thurles



Photomontage and wireframe depiction of the proposed Upperchurch wind farm

Focal length: 50mm
Recommended viewing distance: 39cm

CP4

CP4: Thurles

CP4 Grid Reference: E210471 N159701

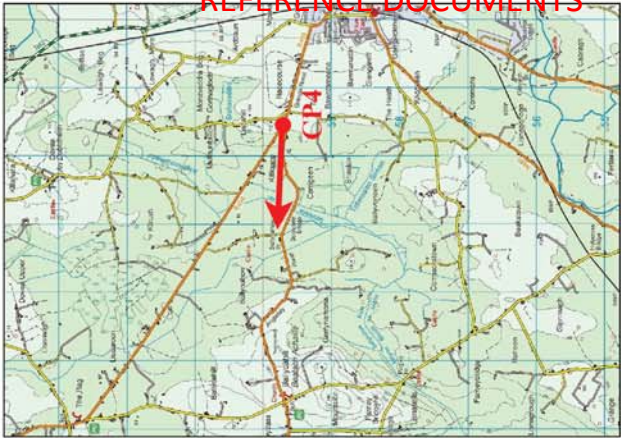
Viewpoint elevation 107m

Nearest proposed Upperchurch turbine 13.5km

No. proposed Upperchurch turbine hubs visible 21

No. proposed Upperchurch turbine blade sets visible 22

Direction of view W



Panned view showing the cumulative visual influence of the proposed Upperchurch turbines with the existing and permitted wind farms in the area in a landscape context

Upperchurch Windfarm Environmental Impact Statement

Viewshed Reference Point		Direction of View	Distance to nearest turbine:	Number of turbine hubs visible:
CP4	Thurles	W	13.5km	21

Representative of:

- An area identified on the ZTV map as having a theoretical view of between 19 and 22 of the proposed turbines
- A significant settlement
- A regional road

Receptor Sensitivity

Low

Existing View

This is a broad and elevated view from the western outskirts of Thurles at the top of a rise. For motorists travelling west this expansive view opens abruptly from a relatively confined urban context and the viewer becomes immediately aware the landscape ahead of them. This consists of peri-urban housing in the foreground followed by gently rolling, lowland fields in the middle ground and finally the undulating backdrop of the Slieve Felim mountains. Turbines from the Glenough wind farm can be seen above the skyline ridge.

Visual Impact of Upperchurch Wind Farm

The proposed turbines will be visible at a relatively small scale, but covering a substantial section of the visible ridgeline in the centre of the panorama afforded from here. A viewer's eye is drawn through this vista towards the distinctive skyline and as such the proposed wind farm will be a noticeable feature. The turbines rise above the skyline and will be camouflaged slightly against a backdrop of sky, especially when viewed from this distance.

The turbines have an appropriate staggered linear layout and undulating profile that reflects the underlying ridge. There are only a few minor instances of turbine overlap. Whilst the proposed wind farm represents an additional, but characteristic feature in this section of the view there is a sense that wind energy development is beginning to dominate this part of the skyline. On balance of these reasons the magnitude of the visual impact at CP3 is considered to be medium.

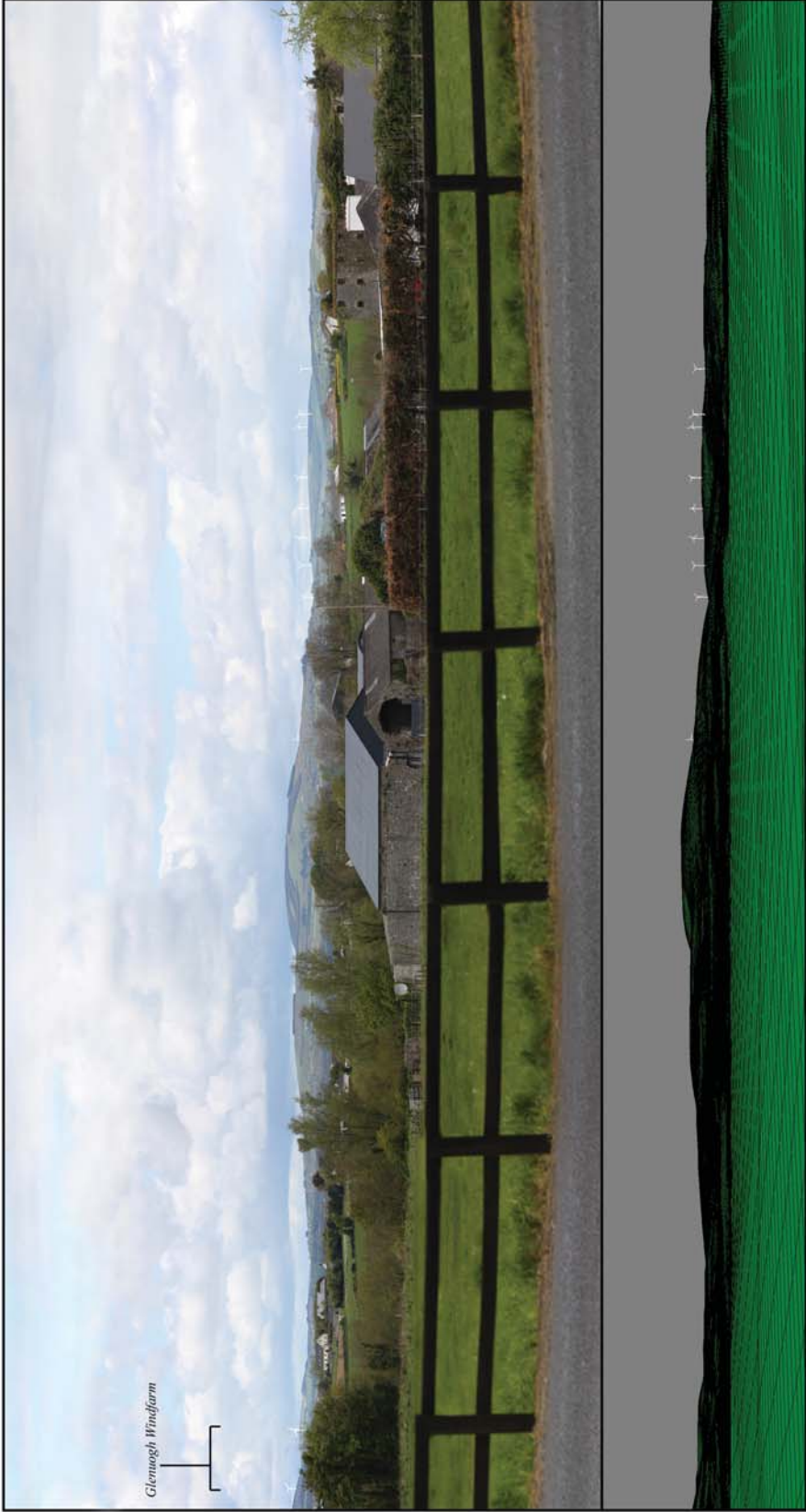
Summary

Based on the assessment criteria and matrices outlined at section 9.3.2 the significance of visual impact is summarised below.

Visual Receptor Sensitivity	Visual Impact Magnitude	Significance of Visual Impact
Low	Medium	Minor



CP5: View from Holycross



Photomontage and wireframe depiction of the proposed Upperchurch wind farm

CP5

CP5: Holycross

CP5 Grid Reference: E208937 N153643

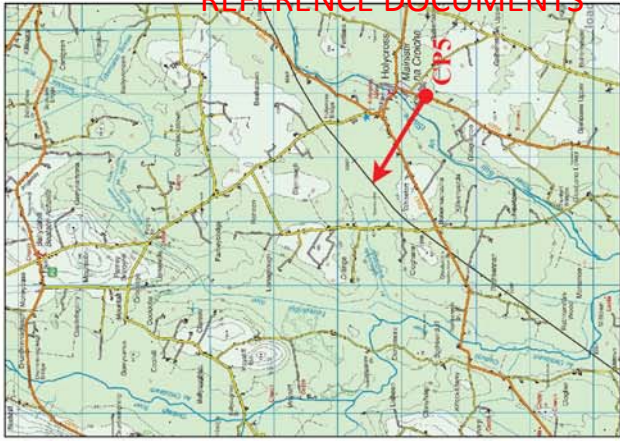
Viewpoint elevation 94m

Nearest proposed Upperchurch turbine 14.1km

No. proposed Upperchurch turbine nacelles visible 9

No. proposed Upperchurch turbine blade sets visible 9

Direction of view NW



REFERENCE DOCUMENTS



Panned view showing the cumulative visual influence of the proposed Upperchurch turbines with the existing and permitted wind farms in the area in a landscape context

Upperchurch Windfarm Environmental Impact Statement

Viewshed Reference Point		Direction of View	Distance to nearest turbine:	Number of turbine hubs visible:
CP5	Holycross	NW	14.1km	9

Representative of:

- An area identified on the ZTV map as having a theoretical view of between 7 and 12 of the proposed turbines
- A settlement
- A regional road

Receptor Sensitivity

Low

Existing View

This view takes in the rolling rural hinterland of Holycross, which comprises of fields and hedgerows as well as some riparian vegetation in the lower foreground associated with the River Suir. This vista is contained in the distance by the undulating profile of the Slieve Felim range. A number of turbines from the Glenough wind farm can be seen above the ridgeline.

Visual Impact of Upperchurch Wind Farm

Nine of the proposed turbines will be seen in silhouette above the skyline ridge, which tends to deemphasise them in comparison to a darker terrain backdrop. They are a fairly small scale but prominently located feature within this view. The visual presence of the development is considered to be sub-dominant from this location.

The visible turbines are relatively evenly spaced in what is an unambiguous view of the scheme. The profile of the development also matches that of the ridge below. One minor detraction, in an aesthetic sense, is the view of a single turbine from the substantially screened southerly cluster penetrating just above the skyline so that its blades will cut against the ridge in perspective. There is also a significant portion of the visible skyline now subject to wind farm development. This is ameliorated somewhat by the screening of half of the proposed scheme behind a hilltop. Overall the visual impact magnitude is deemed to be low.

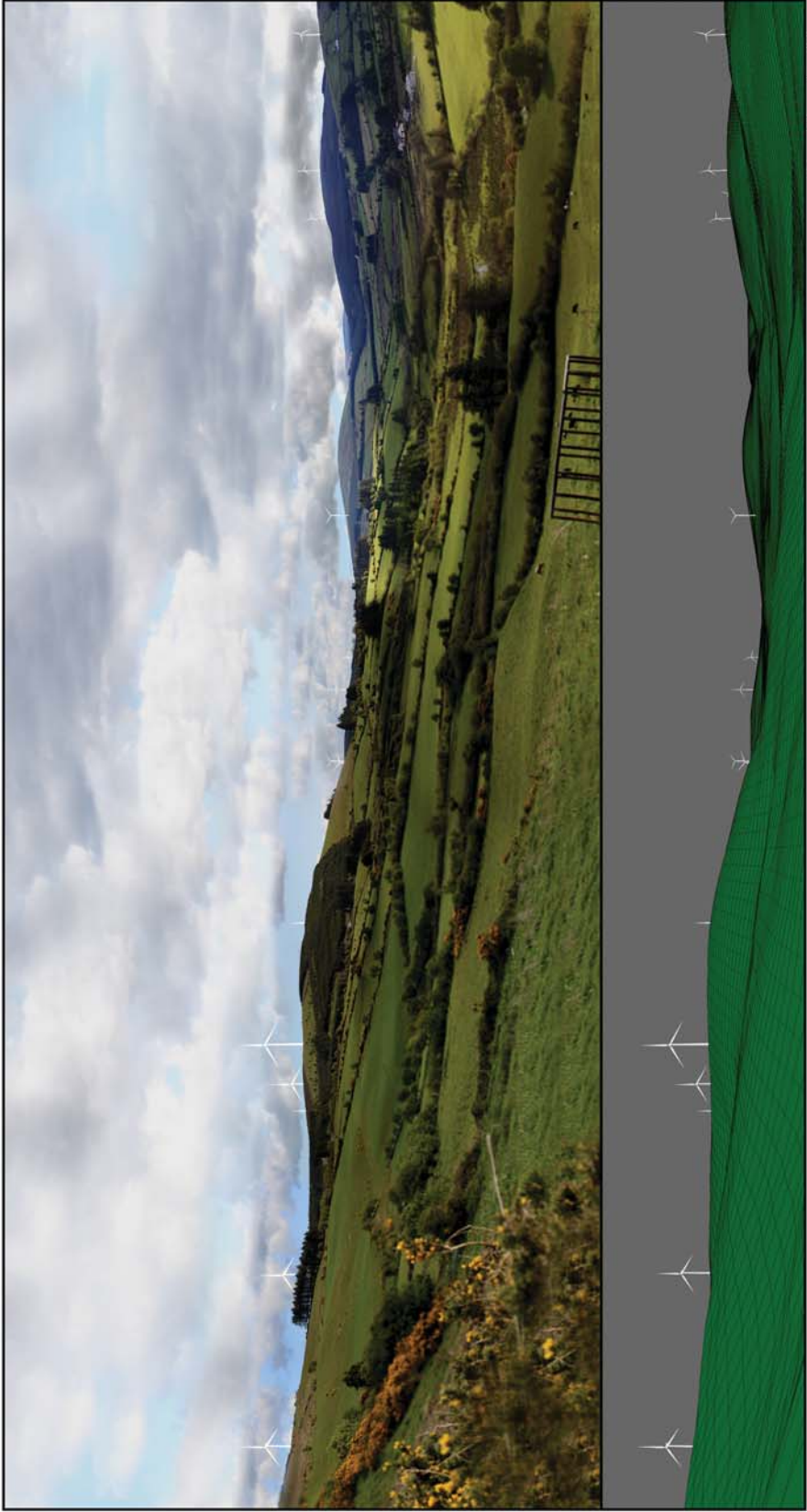
Summary

Based on the assessment criteria and matrices outlined at section 9.3.2 the significance of visual impact is summarised below.

Visual Receptor Sensitivity	Visual Impact Magnitude	Significance of Visual Impact
Low	Low	Minor-negligible

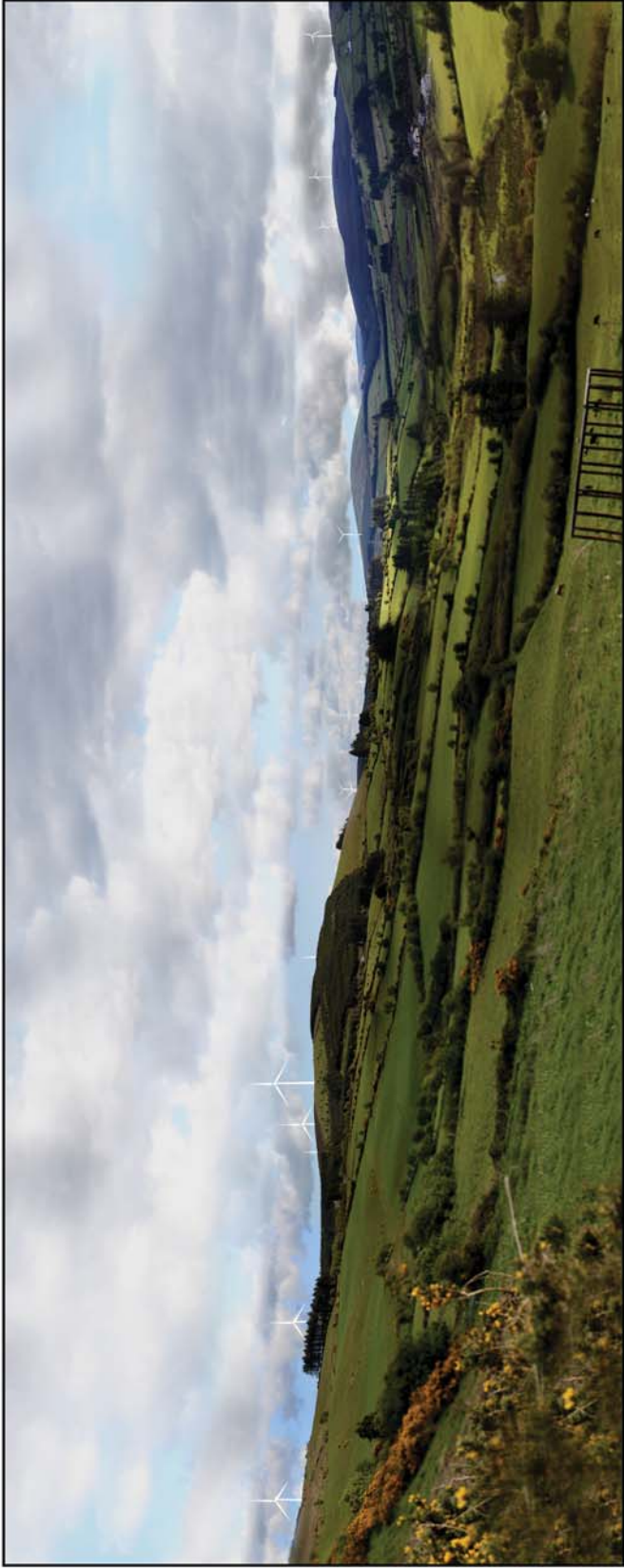


LC1: View from Garraakilka



Photomontage and wireframe depiction of the proposed Upperchurch wind farm

*Focal Length: 20mm
Recommended viewing distance: 10cm*



LC1

LC1: Garraakilka

LC1 Grid Reference: E195943 N163825

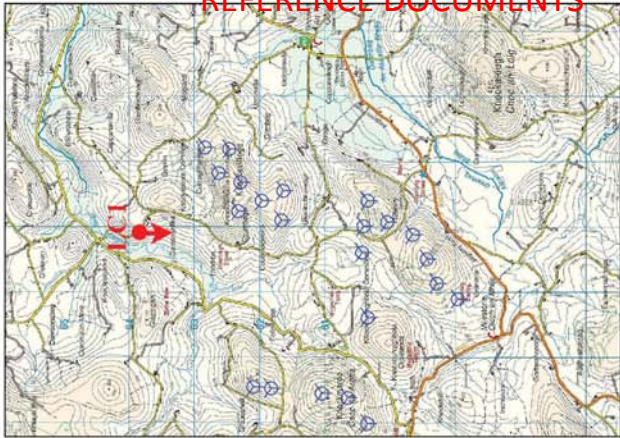
Viewpoint elevation 247m

Nearest proposed Upperchurch turbine 1.5km

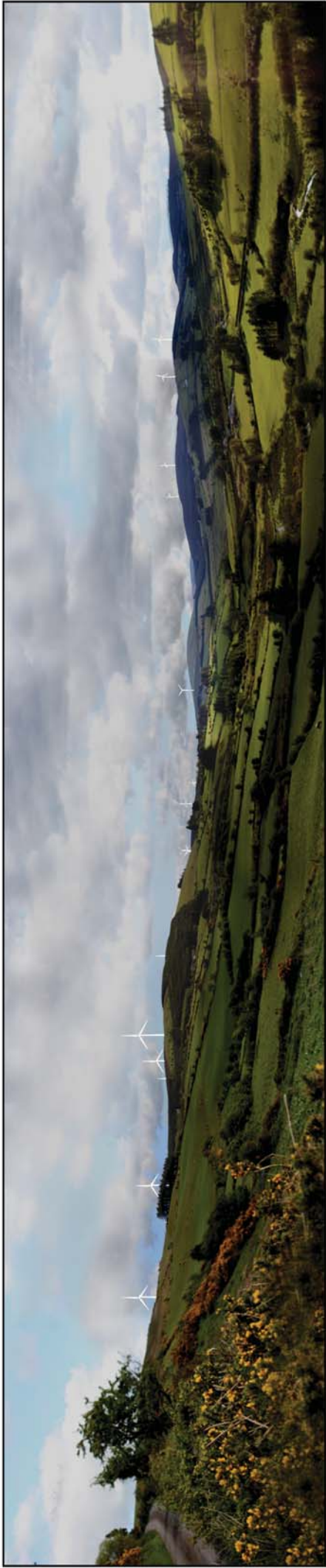
No. proposed Upperchurch turbine hubs visible 12

No. proposed Upperchurch turbine blade sets visible 15

Direction of view S



REFERENCE DOCUMENTS



Panned view showing the cumulative visual influence of the proposed Upperchurch turbines with the existing and permitted wind farms in the area in a landscape context

Upperchurch Windfarm Environmental Impact Statement

Viewshed Reference Point		Direction of View	Distance to nearest turbine:	Number of turbine hubs visible:
LC1	Local road at Garranakilka	S	1.5km	12

Representative of:

- An area identified on the ZTV map as having a theoretical view of between 13 and 18 of the proposed turbines
- Views from local roads and residences to the north of the site

Receptor

Medium

Sensitivity

Existing View

This is an elevated but enclosed view of the upper Clodiagh Valley. The base of the valley has a strong pastoral aesthetic comprising a pattern of fields hedgerows and occasional farmsteads. On the upper slopes and ridges that contain the view there are a number of substantial sized forest plantations. The vista has a tranquil, upland, rural character.

Visual Impact of Upperchurch Wind Farm

The proposed turbines are seen at a variety of scales due to the range in relative distances from the viewer. The nearest ones, at the left hand side of the view, are seen at a substantial scale, whilst those in the centre of the view are seen at a more modest scale. The wind farm wraps around the head of this valley and turbines will occupy the skyline ridges throughout the southerly aspect. The uphill nature of the view also tends to emphasise the height of the turbines. The visual presence of the scheme is considered to be dominant at this location.

The layout of the wind farm appears extensive, but relatively dispersed from this location. Whilst there is not a strong intensity of development in any one section of the view there is a sense of being surrounded by turbines to the south. Turbines will be a new feature of this particular vista though they could not be considered an unfamiliar feature to viewers at this locality given the surrounding developments. The sense of tranquillity and remoteness in this valley will be slightly reduced by the presence of large man-made structures, but again, wind turbines are relatively synonymous with this type of upland landscape. Overall the magnitude of the visual impact at this location is deemed to be medium.

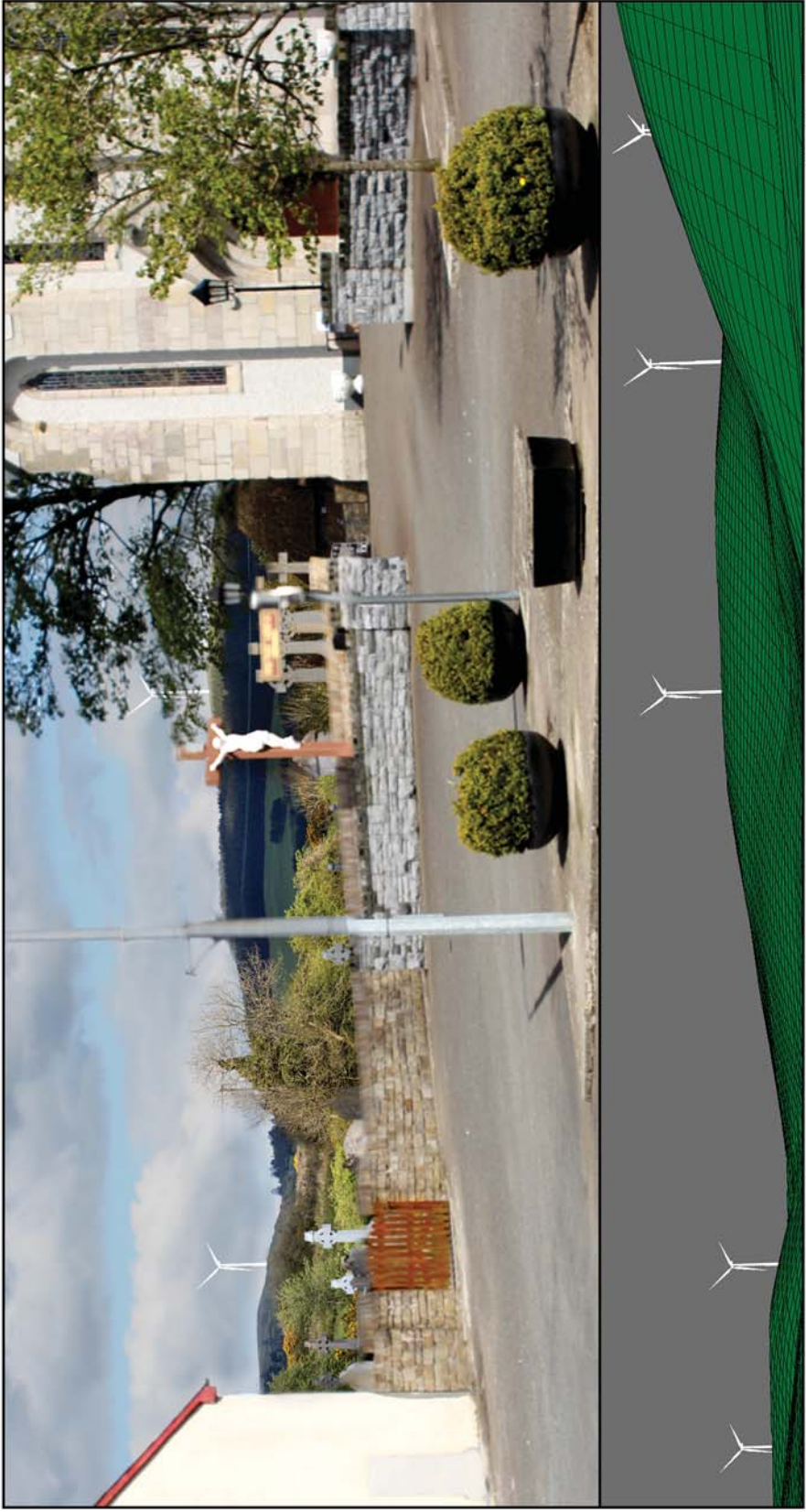
Summary

Based on the assessment criteria and matrices outlined at section 9.3.2 the significance of visual impact is summarised below.

Visual Receptor Sensitivity	Visual Impact Magnitude	Significance of Visual Impact
Medium	Medium	Moderate



LC2: View from Kilcommon Village



Photomontage and wireframe depiction of the proposed Upperchurch wind farm

Focal Length: 50mm
Recommended viewing distance: 39cm



Panned view showing the cumulative visual influence of the proposed Upperchurch turbines with the existing and permitted wind farms in the area in a landscape context

LC2

LC2: Kilcommon Village

LC2 Grid Reference: E190094 N160019

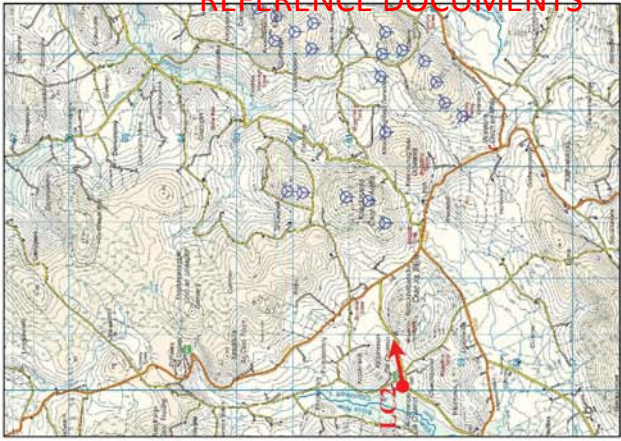
Viewpoint elevation 202m

Nearest proposed Upperchurch turbine 2.9km

No. proposed Upperchurch turbine hubs visible 4

No. proposed Upperchurch turbine blade sets visible 4

Direction of view E



REFERENCE DOCUMENTS

Upperchurch Windfarm Environmental Impact Statement

Viewshed Reference Point		Direction of View	Distance to nearest turbine:	Number of turbine hubs visible:
LC2	Kilcommon Village	E	2.9km	4

Representative of:

- An area identified on the ZTV map as having a theoretical view of between 1 and 6 of the proposed turbines
- A settlement
- General views from local roads and residences a short distance to the west of the site

Receptor Sensitivity

Medium

Existing View

This is a confined view from the centre of Kilcommon Village over the rural landscape to the west. The foreground of this vista is dominated by the settlement's church and graveyard. Beyond the edge of the settlement are steeply rolling hills cloaked in a mixture of pastoral fields and conifer plantations.

Visual Impact of Upperchurch Wind Farm

Three of the proposed turbines can be seen at a noticeable scale rising above the skyline ridges that contain this view to the east. Two of the turbines are partially obscured by buildings and by trees and headstones from the foreground graveyard and another is only visible from just below the hub behind a forested section of ridge. Because the view of the scheme is limited and it is a background element of this complex vista the visual presence is deemed to be sub-dominant.

The rural context of the turbines is clearly apparent but there are some issues of turbines overlapping within intervening landscape elements that might cause a degree of visual clutter and confusion. The approach to the church affords views over the rural countryside beyond and the turbines are not an unexpected element in this scene. Overall, the visual impact magnitude is considered to be Low at LC2.

Summary

Based on the assessment criteria and matrices outlined at section 9.3.2 the significance of visual impact is summarised below.

Visual Receptor Sensitivity	Visual Impact Magnitude	Significance of Visual Impact
Medium	Low	Minor



MR1: View from Nenagh



Photomontage and wireframe depiction of the proposed Upperchurch wind farm

Focal length: 50mm
Recommended viewing distance: 39cm

MR1

MR1: Nenagh	
MR1 Grid Reference:	E186164 N178158
Viewpoint elevation	60m
Nearest proposed Upperchurch turbine	17.7km
No. proposed Upperchurch turbine hubs visible	1
No. proposed Upperchurch turbine blade sets visible	2
Direction of view	SE



REFERENCE DOCUMENTS



Panned view showing the cumulative visual influence of the proposed Upperchurch turbines with the existing and permitted wind farms in the area in a landscape context

Upperchurch Windfarm Environmental Impact Statement

Viewshed Reference Point		Direction of View	Distance to nearest turbine:	Number of turbine hubs visible:
MR1	Nenagh	SE	17.7km	1

Representative of:

- An area identified on the ZTV map as having a theoretical view of between 1 and 6 of the proposed turbines
- A significant settlement
- A regional road
- A worst case scenario view from this section of the national rail network
- Similar views from the Nenagh bypass section of the M8 motorway, which is approximately 1km closer to the site

Receptor Sensitivity

Low

Existing View

This is a slightly elevated view to the south over the hinterland of Nenagh. The land cover in view comprises of urban fringe development intersecting with pastoral farmland. Hedgerow vegetation in the middle ground limits the view of much of the lowlands beyond, but the steeply undulating form of the Silvermines range rises to form a backdrop to the vista

Visual Impact of Upperchurch Wind Farm

Only the blades of two turbines from the proposed development can potentially be seen in the saddle between two of the distant hills. At this considerable distance they will be barely discernible even without taking into consideration the complex, fleeting and oblique view from this location. The visual presence is therefore deemed to be minimal.

The partial view of turbine blades cutting against the skyline is generally undesirable as it can lead to visual clutter and confusion. However given the low order of visual presence the magnitude of the visual impact is judged to be negligible from here.

Summary

Based on the assessment criteria and matrices outlined at section 9.3.2 the significance of visual impact is summarised below.

Visual Receptor Sensitivity	Visual Impact Magnitude	Significance of Visual Impact
Low	Negligible	Negligible



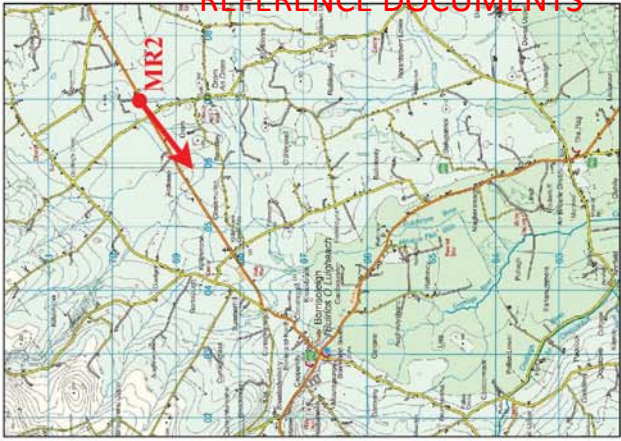
MR2: View from Borrisoleigh - Templemore Road (R501)



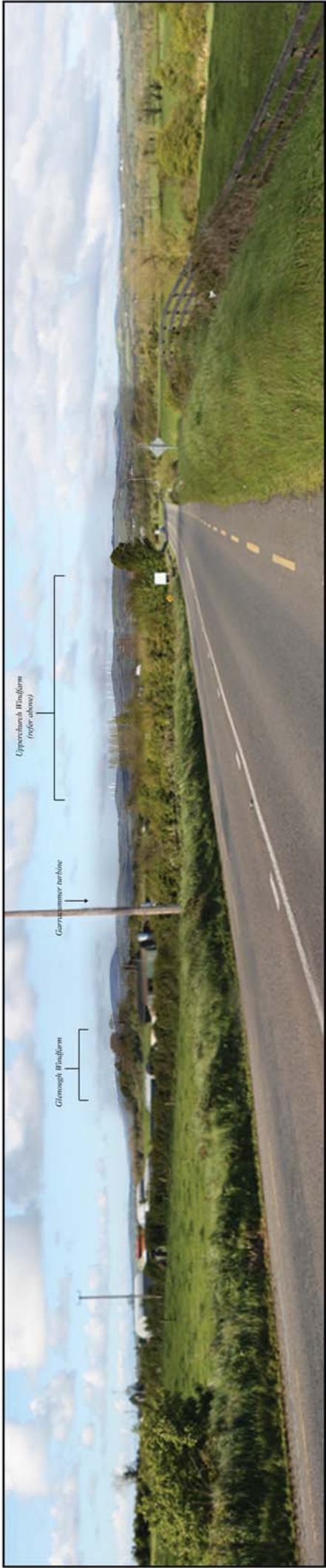
Photomontage and wireframe depiction of the proposed Upperchurch wind farm

Focal length: 50mm
Recommended viewing distance: 39cm

- MR2**
- MR2: Borrisoleigh - Templemore Road (R501)
 - MR2 Grid Reference: E206990 N169553
 - Viewpoint elevation: 120m
 - Nearest proposed Upperchurch turbine: 11.9km
 - No. proposed Upperchurch turbine hubs visible: 21
 - No. proposed Upperchurch turbine blade sets visible: 22
 - Direction of view: SW



REFERENCE DOCUMENTS



Panned view showing the cumulative visual influence of the proposed Upperchurch turbines with the existing and permitted wind farms in the area in a landscape context

Upperchurch Windfarm Environmental Impact Statement

Viewshed Reference Point		Direction of View	Distance to nearest turbine:	Number of turbine hubs visible:
MR2	R501 Borrisoleigh - Templemore Road	SW	11.9km	21

Representative of:

- An area identified on the ZTV map as having a theoretical view of between 19 and 22 of the proposed turbines
- A regional road
- General views from the outer northeast of the study area

Receptor

Low

Sensitivity

Existing View

This is a broad panoramic vista from a slightly elevated location within the lowland context of the eastern study area. The view encompasses a mildly undulating rural landscape of fields and hedgerows that gives way to the steeper upland landscape of the Slieve Felim range in the distance. This comprises of a series of ridges and peaks that are stacked in perspective to form an undulating skyline.

Visual Impact of Upperchurch Wind Farm

The proposed wind farm is almost entirely visible in silhouette above the skyline ridge except for the partial screening of several turbines at the northern end of the scheme. The turbines are seen at a noticeable scale from this distance in a prominent part of the vista especially due to the almost direct alignment with the road. Although the lateral extent of the development is considerable it occupies only a small proportion of the skyline that is visible from this location. The visual presence of the wind farm is considered to be sub-dominant in this vista. The profile of the development appropriately mimics that of the underlying ridge and despite the density of turbines in this staggered linear layout there are only a couple of minor instances of turbine overlap. Several of the blade sets will undesirably rotate against the skyline in perspective, but this will be only a minor detraction from the view of the development, which is otherwise unambiguous from here. The development represents an extension and intensification of wind energy development within this view and not a new and unfamiliar feature. Nonetheless, it increases the proportion of developed to undeveloped skyline ridge within the vista. On the basis of these reasons the visual impact magnitude is deemed to be medium at MR2.

Summary

Based on the assessment criteria and matrices outlined at section 9.3.2 the significance of visual impact is summarised below.

Visual Receptor Sensitivity	Visual Impact Magnitude	Significance of Visual Impact
Low	Medium	Minor



MR3: View from Thurles - Templemore Road (N62)

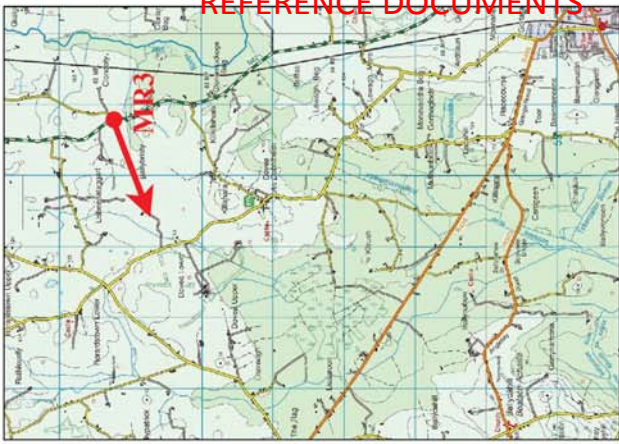


Photomontage and wireframe depiction of the proposed Upperchurch wind farm

Focal length: 50mm
Recommended viewing distance: 39cm

MR3

- MR3: Thurles - Templemore Road (N62)
- MR3 Grid Reference: E210804 N165225
- Viewpoint elevation 103m
- Nearest proposed Upperchurch turbine 13.8km
- No. proposed Upperchurch turbine hubs visible 17
- No. proposed Upperchurch turbine blade sets visible 17
- Direction of view W



REFERENCE DOCUMENTS



Panned view showing the cumulative visual influence of the proposed Upperchurch turbines with the existing and permitted wind farms in the area in a landscape context

Upperchurch Windfarm Environmental Impact Statement

Viewshed Reference Point		Direction of View	Distance to nearest turbine:	Number of turbine hubs visible:
MR3	N62 Thurles -Templemore Road	SW	13.6km	17

Representative of:

- An area identified on the ZTV map as having a theoretical view of between 19 and 22 of the proposed turbines
- A national secondary road
- General views from the outer eastern section of the study area

Receptor Sensitivity **Low**

Existing View

This is a broad horizontal vista from within the lowland context of the eastern study area. A view of some sections of the Slieve Felim ridgeline can be seen just above foreground hedgerows that define a large grassed field. This is a fairly typical rural view over a gently undulating, productive landscape.

Visual Impact of Upperchurch Wind Farm

The proposed wind farm can be seen at a fairly small scale at this distance rising above the distant skyline. Approximately one third of the turbines at the northern end and one third at the southern end of the scheme are visible, whilst those at the centre are screened from view by intervening vegetation. The turbines are oblique to the road and may not be noticed by the casual observer passing along this route. The visual presence of the development is in the order of minimal to sub-dominant.

The proposed turbines are seen in a staggered linear arrangement that rises and falls in accordance with the ridgeline. There will be a minor visual distraction caused by several blade sets rotating within the middle ground tree line but this is likely to be barely noticeable giving the distances involved and the fleeting nature of the view. Overall the visual impact magnitude is deemed to be low from here.

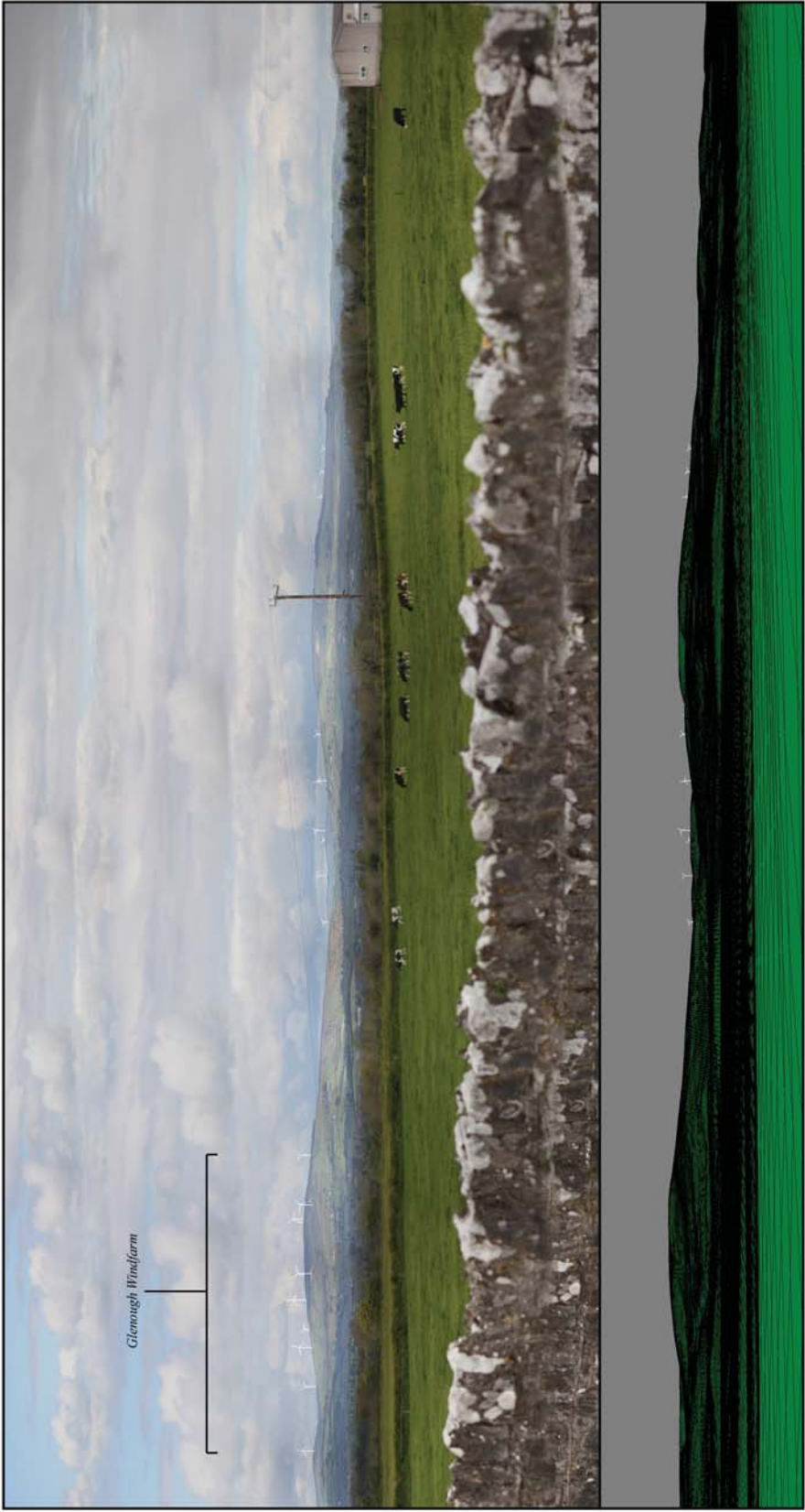
Summary

Based on the assessment criteria and matrices outlined at section 9.3.2 the significance of visual impact is summarised below.

Visual Receptor Sensitivity	Visual Impact Magnitude	Significance of Visual Impact
Low	Low	Minor-negligible



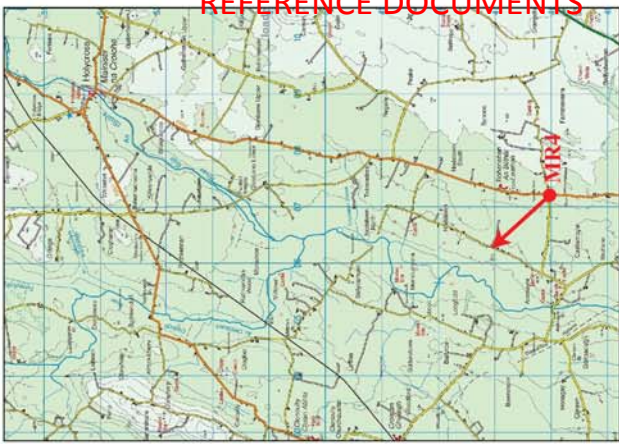
MR4: View from Boherlahan (R660)



MR4

MR4: Boherlahan (R660)

- MR4 Grid Reference: E207191 N146050
- Viewpoint elevation 94m
- Nearest proposed Upperchurch turbine 17.7km
- No. proposed Upperchurch turbine hubs visible 9
- No. proposed Upperchurch turbine blade sets visible 9
- Direction of view NW



REFERENCE DOCUMENTS



Panned view showing the cumulative visual influence of the proposed Upperchurch turbines with the existing and permitted wind farms in the area in a landscape context

Upperchurch Windfarm Environmental Impact Statement

Viewshed Reference Point		Direction of View	Distance to nearest turbine:	Number of turbine hubs visible:
MR4	R660 at Boherlahan	NW	17.7km	9

Representative of:

- An area identified on the ZTV map as having a theoretical view of between 7 and 12 of the proposed turbines
- A regional road
- A small settlement

Receptor Sensitivity

Low

Existing View

This is a westerly view towards the Slieve Felim Mountains from the small settlement of Boherlahan that lines the R660. The intervening landscape is predominantly rural comprising of gently rolling fields and hedgerows, but with some buildings associated with the settlement visible to the right-hand side in the foreground. The turbines of the Glenough Wind Farm can be seen above the undulating skyline ridge.

Visual Impact of Upperchurch Wind Farm

The proposed wind farm is partly screened from view by a peak in the skyline ridge so that 6 turbines are almost fully revealed to the left hand side of it with only 3 blade sets seen to the right. The turbines are seen at a noticeable scale from this distance although they are less prominent than the adjacent Glenough turbines. Whilst the proposed turbines are likely to have a sub-dominant visual presence in their own right, when viewed in conjunction with the Glenough turbines the collective developments are considered to be co-dominant.

The 6 turbines at the southern end of the scheme have a fairly even spacing with only one instance of a turbine cutting against the skyline ridge, whereas all three of the visible turbines at the northern end of the scheme will generate this effect. Due to the screening of the central turbines by the intervening hilltop, the two clusters may be perceived as separate developments. Any visual confusion caused by this relationship is balanced by the fact that the prominent section of the ridgeline remains undeveloped. This is an important consideration in this instance as the proportion of developed to undeveloped skyline in this section of the view will be fairly even as a result of the proposal. On the basis of these reasons the magnitude of the visual impact is considered to be medium.

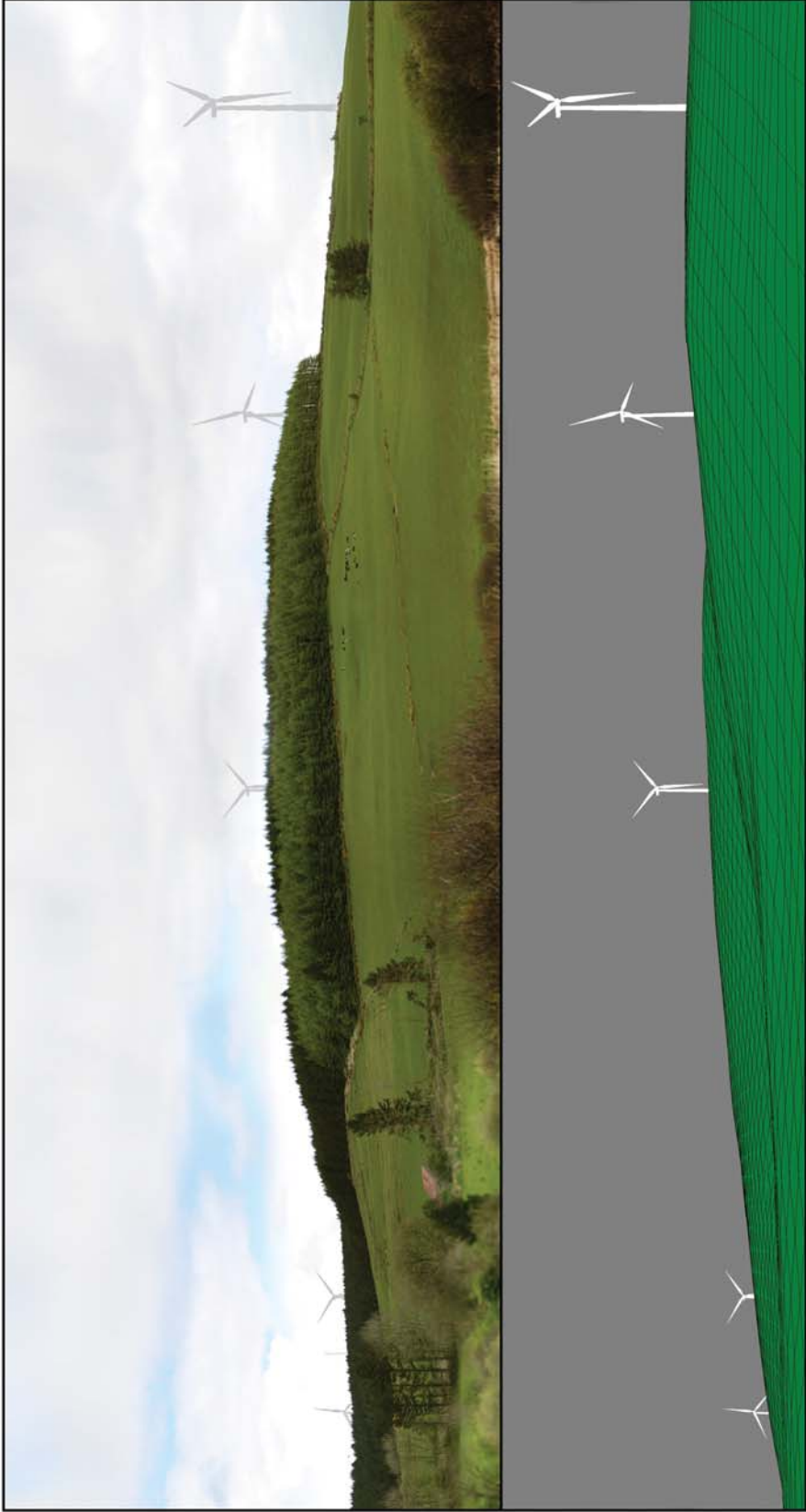
Summary

Based on the assessment criteria and matrices outlined at section 9.3.2 the significance of visual impact is summarised below.

Visual Receptor Sensitivity	Visual Impact Magnitude	Significance of Visual Impact
Low	Medium	Minor



DR1: View from the Dolla Road (R497)



Photomontage and wireframe depiction of the proposed Upperchurch wind farm

Focal length: 40mm
Recommended viewing distance: 21cm

DR1

DR1: Dolla Road (R497)

DR1 Grid Reference: E192092 N160232

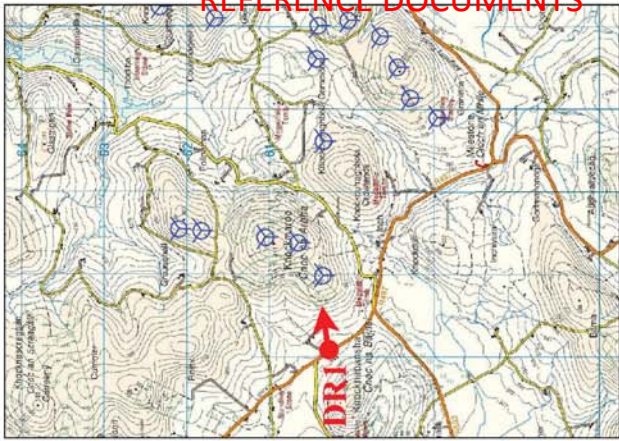
Viewpoint elevation 240m

Nearest proposed Upperchurch turbine 0.9km

No. proposed Upperchurch turbine hubs visible 5

No. proposed Upperchurch turbine blade sets visible 5

Direction of view E



REFERENCE DOCUMENTS



Panned view showing the cumulative visual influence of the proposed Upperchurch turbines with the existing and permitted wind farms in the area in a landscape context

Viewshed Reference Point		Direction of View	Distance to nearest turbine:	Number of turbine hubs visible:
DR1	Dolla Road (R497) near Anglesey Road Junction	E	0.9	5

Representative of:

- An area identified on the ZTV map as having a theoretical view of between 1 and 6 of the proposed turbines
- A designated scenic route
- A regional road

Receptor Sensitivity

Medium

Existing View

This is a short distance uphill view over a relatively steep slope comprising of marshland at the base, pastoral farmland on the mid-slope and a forested crest. There is a thick band of marshy scrub adjacent to the road, which limits extended views from much of this section of the route.

Visual Impact of Upperchurch Wind Farm

Several of the proposed turbines rise just above the near, forested ridgeline, but due to the close proximity and the uphill nature of the view they are seen at a substantial scale. The most that can be seen of any of the turbines is a full blade set and this occurs in only one instance. For the remaining visible turbines only the hubs and blades can be seen. Given the close proximity, the proposal is considered to have a co-dominant visual presence from here.

Aesthetically speaking this is not an ideal viewing scenario, with partial views of turbines cutting against a near skyline ridge. This can cause a degree of visual clutter and confusion as well as generating eye catching motion. These effects are moderated somewhat by the limited view of only a small proportion of the proposed turbines. This is also an anthropogenic vista in an area where turbines are a familiar feature. On balance the magnitude of the visual impact is deemed to be medium.

Summary

Based on the assessment criteria and matrices outlined at section 9.3.2 the significance of visual impact is summarised below.

Visual Receptor Sensitivity	Visual Impact Magnitude	Significance of Visual Impact
Medium	Medium	Moderate



DR2: View from Anglesey Road at Loughbrack



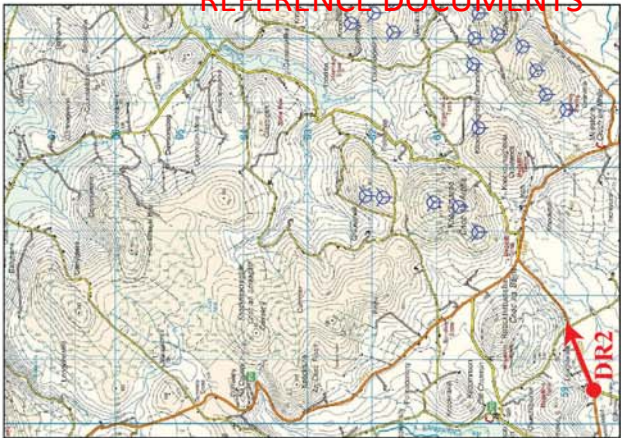
Photomontage and wireframe depiction of the proposed Upperchurch wind farm



Panned view showing the cumulative visual influence of the proposed Upperchurch turbines with the existing and permitted wind farms in the area in a landscape context

DR2

- DR2: Anglesey Road at Loughbrack
- DR2 Grid Reference: E190521 N158532
- Viewpoint elevation 220m
- Nearest proposed Upperchurch turbine 3.0km
- No. proposed Upperchurch turbine hubs visible 11
- No. proposed Upperchurch turbine blade sets visible 12
- Direction of view NE



Upperchurch Windfarm Environmental Impact Statement

Viewshed Reference Point		Direction of View	Distance to nearest turbine:	Number of turbine hubs visible:
DR2	Anglesey Road at Loughbrack	NE	3km	11

Representative of:

- An area identified on the ZTV map as having a theoretical view of between 13 and 18 of the proposed turbines
- A designated scenic route
- Views from local roads and residences

Receptor Sensitivity

Medium

Existing View

This is a northerly view from within the upland context of the study area. The terrain in the foreground is flat and boggy and has a land cover of rough pasture and scrub as well as extensive conifer plantations. Better quality pasture occurs on the series of rolling hills that contain the vista at a relatively short distance.

Visual Impact of Upperchurch Wind Farm

Approximately half of the proposed turbines will rise above three different hills that make up the skyline to the northeast. The nearest and largest scale turbines can be seen in a cluster of three to the left of the road alignment. The remaining turbines are seen at a slightly more modest scale. The scheme occupies a wide portion of the northerly vista and it is considered to have a dominant visual presence.

Aside from one instance of turbine overlap and a couple of blades cutting against the skyline, the scheme is unambiguously displayed from here. The extensive nature of the scheme within the view is balanced by its dispersal and, therefore, a low degree of intensity. Nonetheless there is some sense of being surrounded by turbines, at least in this northern aspect. On the basis of these reasons the magnitude of the visual impact is deemed to be medium.

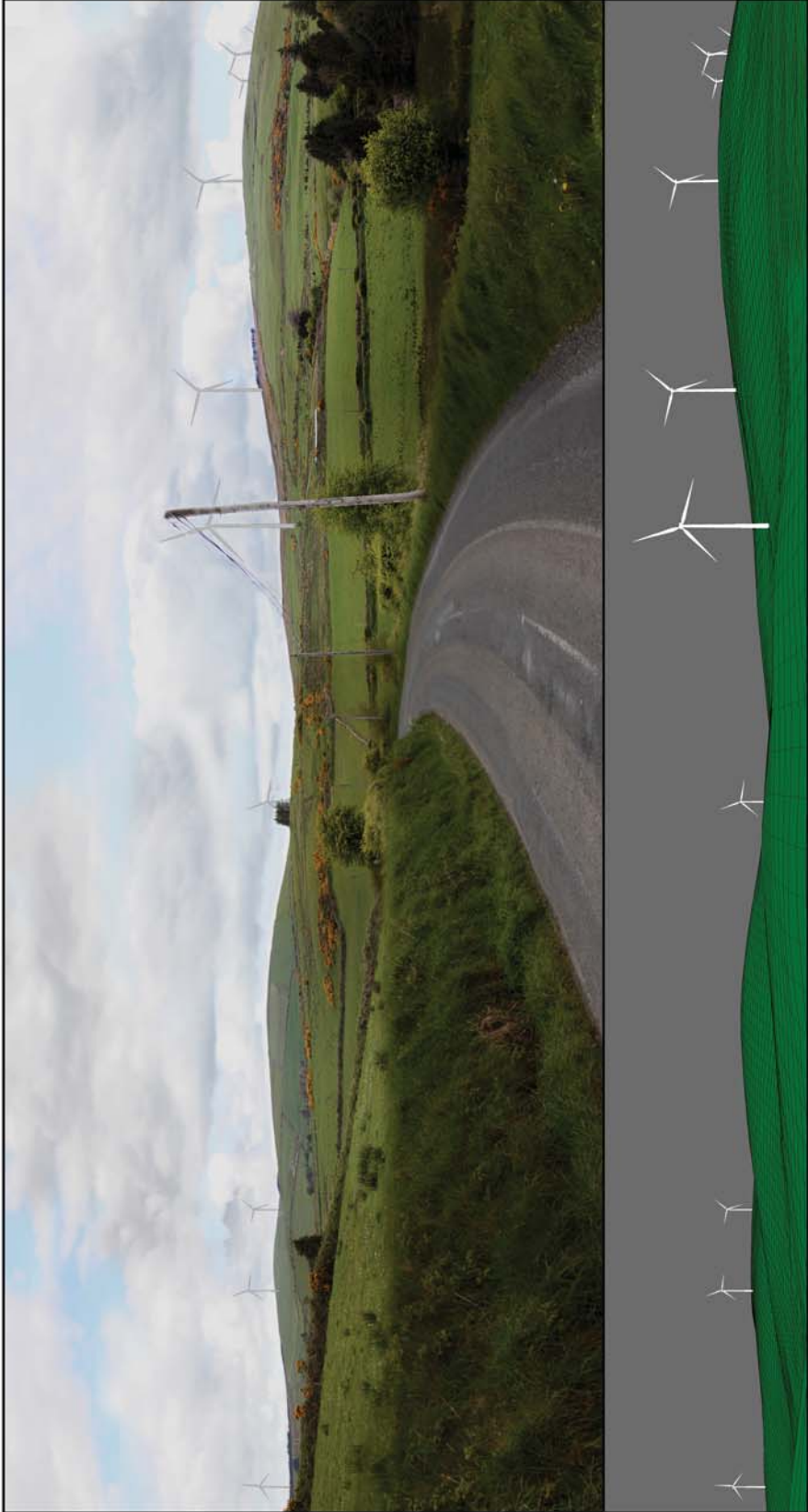
Summary

Based on the assessment criteria and matrices outlined at section 9.3.2 the significance of visual impact is summarised below.

Visual Receptor Sensitivity	Visual Impact Magnitude	Significance of Visual Impact
Medium	Medium	Moderate



DR3: View from Anglesey Road near Milestone



Photomontage and wireframe depiction of the proposed Upperchurch wind farm

DR3

DR3: Anglesey Road near Milestone

DR3 Grid Reference: E194669 N157872

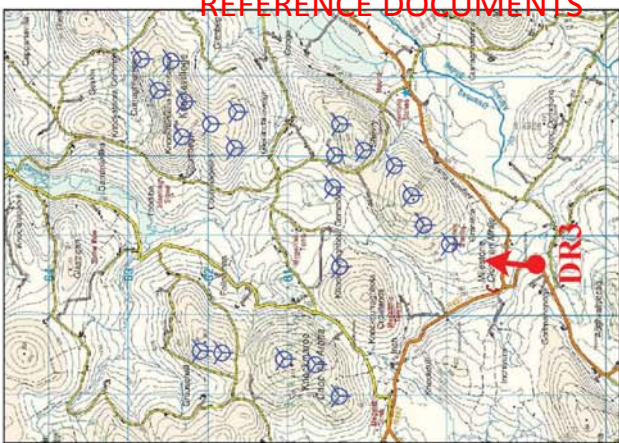
Viewpoint elevation 250m

Nearest proposed Upperchurch turbine 1.1km

No. proposed Upperchurch turbine hubs visible 9

No. proposed Upperchurch turbine blade sets visible 10

Direction of view N



REFERENCE DOCUMENTS



Panned view showing the cumulative visual influence of the proposed Upperchurch turbines with the existing and permitted wind farms in the area in a landscape context

Upperchurch Windfarm Environmental Impact Statement

Viewshed Reference Point		Direction of View	Distance to nearest turbine:	Number of turbine hubs visible:
DR3	Anglesey Road at Milestone	N	1.1km	9

Representative of:

- An area identified on the ZTV map as having a theoretical view of between 7 and 12 of the proposed turbines
- A designated scenic route
- A regional road
- Views from local residences

Receptor

Medium

Sensitivity

Existing View

This is a relatively contained vista over the rolling landscape at the centre of the study area. In the lower foreground, the flat base of the valley is in rough pasture reflecting the boggy nature of the soil. On the more free draining slopes above are large pastoral fields divided by scrubby hedgerows.

Visual Impact of Upperchurch Wind Farm

Only five of the proposed turbines can be seen clearly from here rising above the undulating ridgeline, whilst several others are substantially screened by the ridge or intervening vegetation. The nearest turbines, which are almost fully revealed, are seen at a significant scale, but there is a considerable scale differential to those that are seen further in the distance. The turbines will be the most noticeable singular element in this vista and as such they are considered to have a dominant visual presence.

The scale differential between the nearest and furthest of the turbines creates a striking sense of perspective that contributes to the picturesque qualities of this vista. It also reveals the extensive nature of this scheme, but as with other close views, this is countered by the limited number of visible turbines and the apparent low intensity of the development. There are a couple of instances of turbines blades cutting against the ridgeline and foreground vegetation. However, these are fairly minor issues in the context of what is otherwise an uncomplicated view of the scheme. Overall the magnitude of the visual impact is considered to be medium.

Summary

Based on the assessment criteria and matrices outlined at section 9.3.2 the significance of visual impact is summarised below.

Visual Receptor Sensitivity	Visual Impact Magnitude	Significance of Visual Impact
Medium	Medium	Moderate



DR4: View from the Anglesey Road at Ruan



Photomontage and wireframe depiction of the proposed Upperchurch wind farm

DR4

DR4: Anglesey Road at Ruan

DR4 Grid Reference: E197436 N159843

Viewpoint elevation 206m

Nearest proposed Upperchurch turbine 1.1km

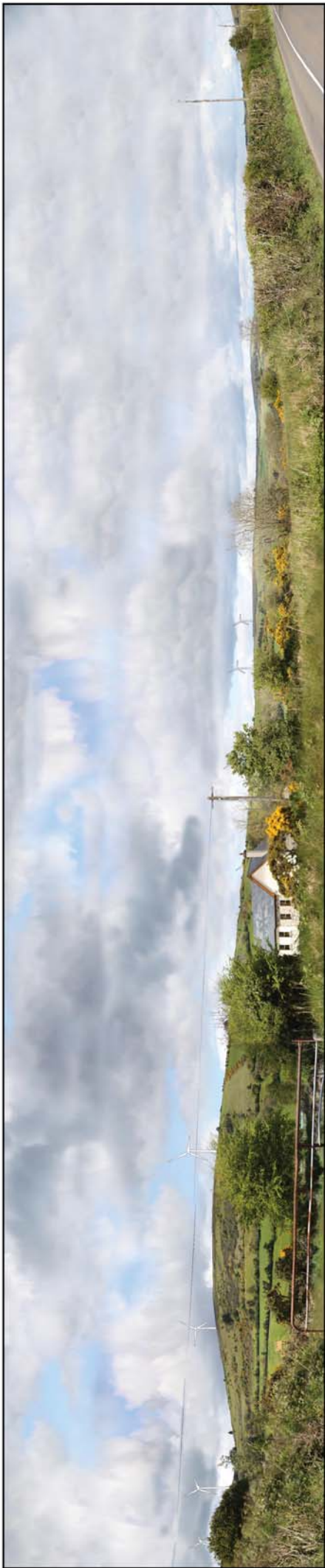
No. proposed Upperchurch turbine hubs visible 12

No. proposed Upperchurch turbine blade sets visible 13

Direction of view W - NW



REFERENCE DOCUMENTS



Panned view showing the cumulative visual influence of the proposed Upperchurch turbines with the existing and permitted wind farms in the area in a landscape context

Viewshed Reference Point		Direction of View	Distance to nearest turbine:	Number of turbine hubs visible:
DR4	Anglesey Road at Ruan	NW	1.1km	12

- Representative of:**
- An area identified on the ZTV map as having a theoretical view of between 13 and 18 of the proposed turbines
 - A designated scenic route
 - A regional road
 - Views from local residences

Receptor Sensitivity **Medium**

Existing View This is a somewhat confined view from within the rolling upland context of the central study area. The foreground roadside context of a dwelling and nearby hedgerow limits the view over the landscape beyond until a steep ridge emerges to contain the vista at a modest distance. The slopes below the ridge are clad in pastoral fields and sporadic hedgerows as well as small stands of conifers and patches of scrubby vegetation.

Visual Impact of Upperchurch Wind Farm Five of the proposed turbines from the southern cluster of the scheme can be seen rising at a prominent scale above the near ridgeline at the left hand side of the view. A similar number from the northern cluster can be seen at a slightly greater distance to the right hand side of the view. The scheme would be immediately noticeable from this section of the road and it is likely to have a dominant visual presence in the context of this relatively confined vista.

The scheme is perceived to have a fairly modest extent from here due to the view of only a limited number of turbines. These are seen in a simple arrangement above the crown of the hill, but with some turbines overlapping or blades sets cutting against the skyline in perspective. The character of this vista is strongly anthropogenic and turbines are a familiar element in the local area. For these reasons the magnitude of the visual impact is judged to be medium.

Summary Based on the assessment criteria and matrices outlined at section 9.3.2 the significance of visual impact is summarised below.

Visual Receptor Sensitivity	Visual Impact Magnitude	Significance of Visual Impact
Medium	Medium	Moderate



DR5: View from the Anglesey Road at Rossoulty



Photomontage and wireframe depiction of the proposed Upperchurch wind farm

DR5

DR5: Anglesey Road at Rossoulty

DR5 Grid Reference: E202740 N158906

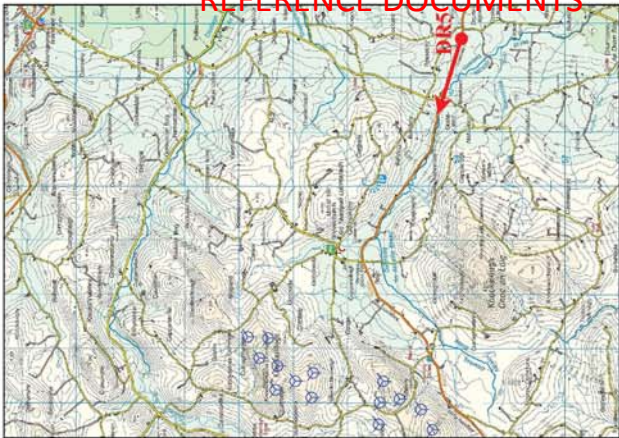
Viewpoint elevation 141m

Nearest proposed Upperchurch turbine 6.5km

No. proposed Upperchurch turbine hubs visible 13

No. proposed Upperchurch turbine blade sets visible 17

Direction of view W



REFERENCE DOCUMENTS



Panned view showing the cumulative visual influence of the proposed Upperchurch turbines with the existing and permitted wind farms in the area in a landscape context

Upperchurch Windfarm Environmental Impact Statement

Viewshed Reference Point		Direction of View	Distance to nearest turbine:	Number of turbine hubs visible:
DR5	Anglesey Road at Rossoulty	W	6.5km	13

Representative of:

- An area identified on the ZTV map as having a theoretical view of between 13 and 18 of the proposed turbines
- A designated scenic route
- A regional road

Receptor Sensitivity

Medium

Existing View

This is a relatively broad vista, particularly to the south, from the R503 as it enters the foothills of the Slieve Felim range. The slopes of these hills are cloaked in a combination of fields and hedgerows, patches of broadleaf woodland and blocks of commercial conifer forest at higher levels. The Glenough Wind farm can be clearly seen further along the ridge to the south.

Visual Impact of Upperchurch Wind Farm

Only three of the proposed turbines are clearly visible from this point rising above the skyline ridge in a tight cluster just to the left hand side of the road alignment. A number of other turbines can also be seen with closer scrutiny to the left and right of the road, but these are substantially screened by the ridge and/or foreground vegetation. The visual presence of the scheme is considered to be in the order of sub-dominant to co-dominant.

This is not an optimal view of the scheme in anaesthetic sense as there is a reasonable level of visual ambiguity generated. This relates to the partial view of the scheme with turbines cutting against intervening landscape elements or overlapping each other. In the context of the anthropogenic landscape character and the presence of other turbines within the view, there is little change to the nature of the vista. For these reasons the magnitude of the visual impact is deemed to be medium at DR5.

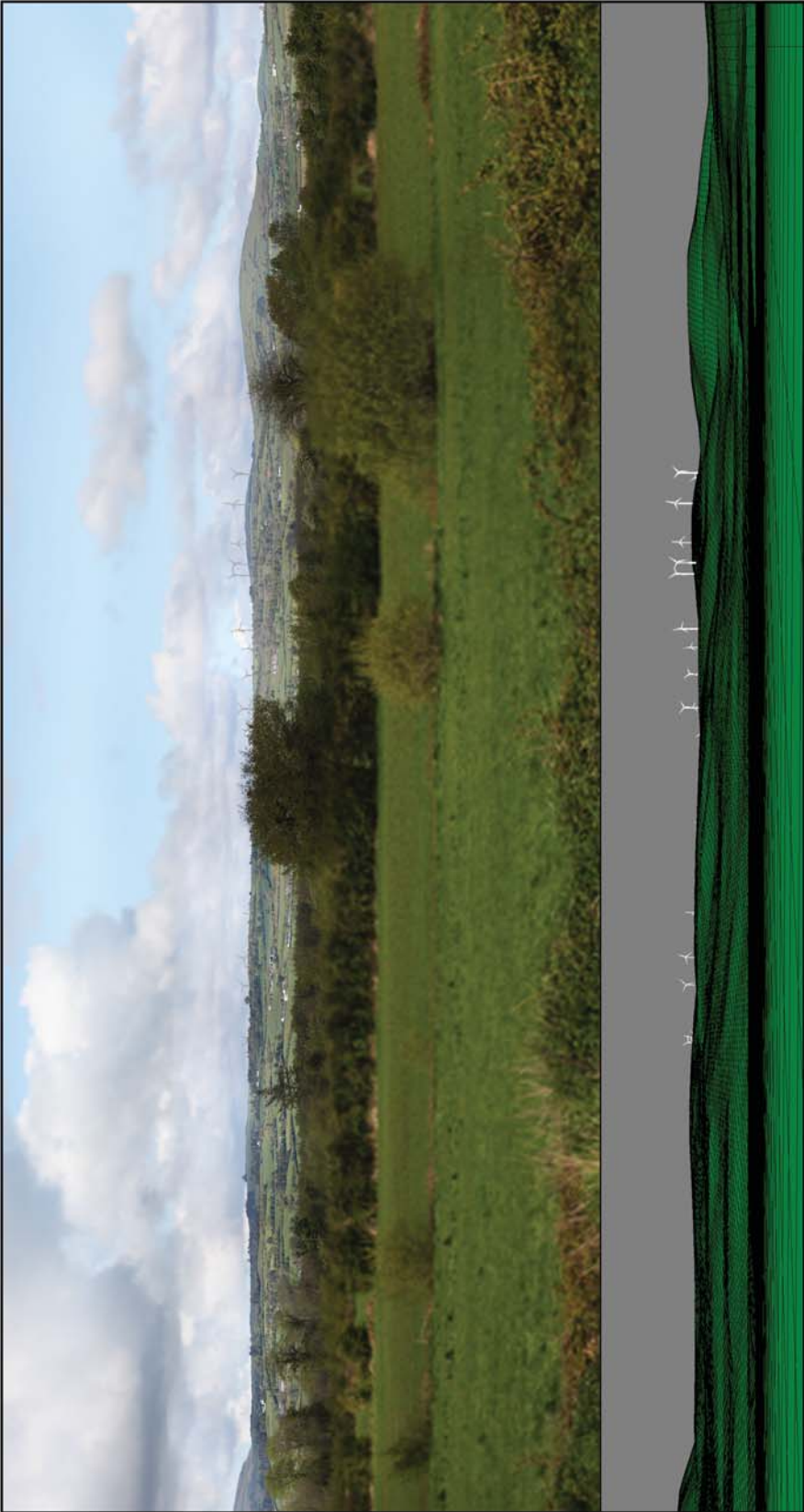
Summary

Based on the assessment criteria and matrices outlined at section 9.3.2 the significance of visual impact is summarised below.

Visual Receptor Sensitivity	Visual Impact Magnitude	Significance of Visual Impact
Medium	Medium	Moderate



DR6: View from the The Ragg/Inch on the R498 Borrisoleigh Road



Photomontage and wireframe depiction of the proposed Upperchurch wind farm

DR6

DR6: The Ragg/Inch (R498)

DR6 Grid Reference: E205586 N164444

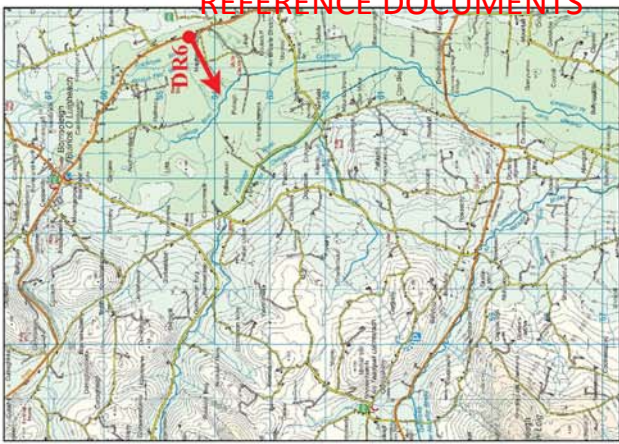
Viewpoint elevation 90m

Nearest proposed Upperchurch turbine 8.5km

No. proposed Upperchurch turbine hubs visible 13

No. proposed Upperchurch turbine blade sets visible 15

Direction of view SW



REFERENCE DOCUMENTS



Panned view showing the cumulative visual influence of the proposed Upperchurch turbines with the existing and permitted wind farms in the area in a landscape context

Upperchurch Windfarm Environmental Impact Statement

Viewshed Reference Point		Direction of View	Distance to nearest turbine:	Number of turbine hubs visible:
DR6	R492 at The Ragg/Inch	SW	8.5	13

Representative of:

- An area identified on the ZTV map as having a theoretical view of between 13 and 18 of the proposed turbines
- A designated scenic route
- A regional road

Receptor

Medium

Sensitivity

Existing View

This is a westerly vista towards the Slieve Felim range from within the rural lowland context in the eastern portion of the study area. The landscape in view comprises of flat to gently rolling farmland in the foreground surrounding several dwellings. Above the tops of the foreground vegetation rises the Slieve Felim foothills and these have a clearly defined, pastoral field pattern with conifer forests at upper levels. Several turbines from the Glenough Wind Farm can be seen above the ridge to the south.

Visual Impact of Upperchurch Wind Farm

The proposed turbines are seen at a noticeable scale from this distance although only those at the northern end of the scheme rise fully above the skyline ridge. Only blade sets and blade tips of several of the turbines that comprise the southern cluster penetrate above the ridge. The visual presence of the scheme is deemed to be sub-dominant within the context of this vista.

The turbines from the northern cluster of the scheme are well revealed with a staggered linear layout that avoids instances of overlapping and with a collective profile that compliments the underlying terrain. The partial view of the southern cluster of turbines is less satisfactory in an aesthetic sense with blade sets cutting against the skyline ridge in perspective. However, this cluster is far less noticeable than the northern cluster. The proposed turbines are a familiar element within this anthropogenic vista and for these reasons the magnitude of the visual impact is judged to be low.

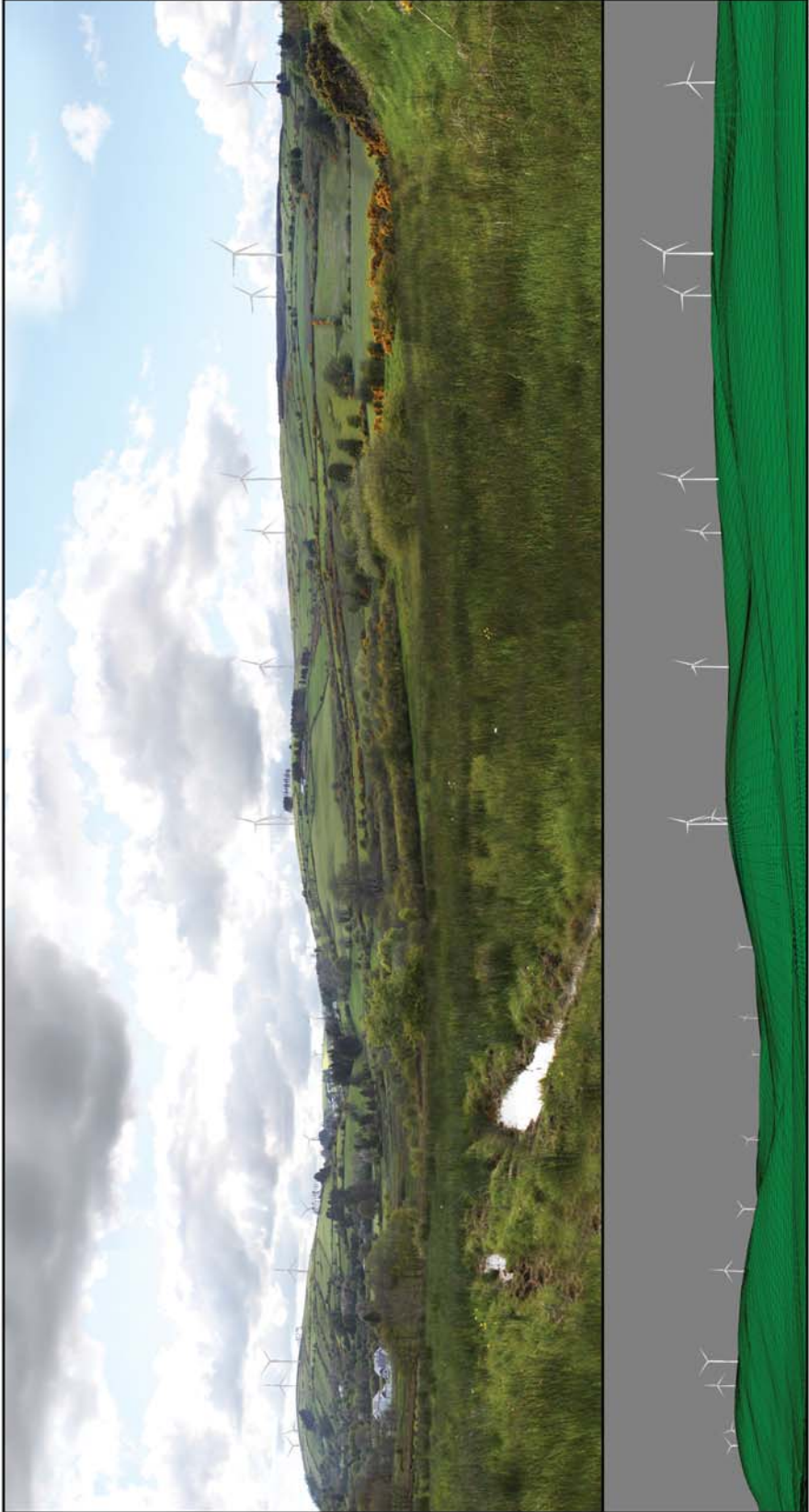
Summary

Based on the assessment criteria and matrices outlined at section 9.3.2 the significance of visual impact is summarised below.

Visual Receptor Sensitivity	Visual Impact Magnitude	Significance of Visual Impact
Medium	low	Minor



AV1: View from Slí Éamoin an Chnoic



Focal length: 20mm
Recommended viewing distance: 10cm

Photomontage and wireframe depiction of the proposed Upperchurch wind farm

AV1

AV1: Slí Éamoin an Chnoic

- AV1 Grid Reference: E198380 N161584
- Viewpoint elevation: 200m
- Nearest proposed Upperchurch turbine: 1.5km
- No. proposed Upperchurch turbine hubs visible: 18
- No. proposed Upperchurch turbine blade sets visible: 18
- Direction of view: W



REFERENCE DOCUMENTS



Panned view showing the cumulative visual influence of the proposed Upperchurch turbines with the existing and permitted wind farms in the area in a landscape context

Upperchurch Windfarm Environmental Impact Statement

Viewshed Reference Point		Direction of View	Distance to nearest turbine:	Number of turbine hubs visible:
AV1	Slí Éamoin an Cnoic	W	1.5km	18

Representative of:

- An area identified on the ZTV map as having a theoretical view of between 13 and 18 of the proposed turbines
- A signposted local loop walk – part of the national looped walk network
- Views from local residences

Receptor Sensitivity

Medium

Existing View

This is an enclosed vista to the west from a point on the Slí Éamoin an Cnoic. The rolling upland landscape in view has a rich and varied land cover ranging from a flat marshy field in the foreground to pastoral fields and hedgerows on sloping ground and conifer plantations on some hilltops. The vista has a remote rural character.

Visual Impact of Upperchurch Wind Farm

The proposed turbines are seen at a significant scale from this short viewing distance and the uphill nature of the view accentuates their height. The lateral extent of the scheme is also considerable within this relatively contained vista. For these reasons the scheme is considered to have a dominant visual presence at this location.

The turbines have a clear and simple arrangement when viewed from here. The majority are fully revealed above the skyline ridge in a legible linear rhythm and the profile of the scheme compliments that of the ridgeline. There is also a picturesque sense of perspective generated in the varying scale between the nearest and furthest turbines. The extent of the scheme is somewhat dominant in relation to the contained vista and the finer grain of the land use patterns below. On balance of these reasons the magnitude of the visual impact is deemed to be high.

Summary

Based on the assessment criteria and matrices outlined at section 9.3.2 the significance of visual impact is summarised below.

Visual Receptor Sensitivity	Visual Impact Magnitude	Significance of Visual Impact
Medium	High	Major-moderate



AV2: View from Ballyboy Lookout



Photomontage and wireframe depiction of the proposed Upperchurch wind farm



Panned view showing the cumulative visual influence of the proposed Upperchurch turbines with the existing and permitted wind farms in the area in a landscape context

AV2

AV2: Ballyboy Lookout

AV2 Grid Reference: E200070 N160488

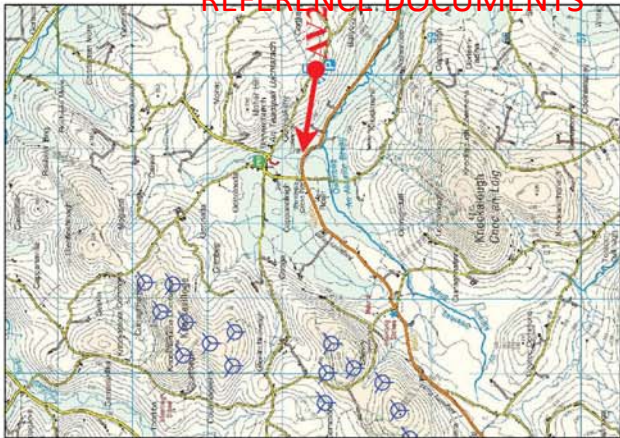
Viewpoint elevation 261m

Nearest proposed Upperchurch turbine 3.5km

No. proposed Upperchurch turbine hubs visible 22

No. proposed Upperchurch turbine blade sets visible 22

Direction of view W



REFERENCE DOCUMENTS

Upperchurch Windfarm Environmental Impact Statement

Viewshed Reference Point		Direction of View	Distance to nearest turbine:	Number of turbine hubs visible:
AV2	Ballyboy lookout point	W	3.5km	22

Representative

of:

- An area identified on the ZTV map as having a theoretical view of between 19 and 22 of the proposed turbines
- A locally recognised and signposted lookout point

Receptor

High

Sensitivity

Existing View

This is a broadly panoramic and highly elevated lookout point that affords views over the upland context of the Slieve Felim range to the west and the lowland plains to the east. Almost the entire landscape in view is in productive use as either agriculture or silviculture. Even so, there is a reasonable level of complexity within the view and this lookout provides an idyllic and tranquil location to take it in.

Visual Impact of Upperchurch Wind Farm

A view of all of the proposed turbines is afforded from this elevated viewpoint and the scheme occupies a significant section of the view to the west. However, in the context of the full panorama this is a fairly small proportion of the vista. The turbines are seen at a reasonable scale from this distance, but it is the extent of the scheme that draws attention. In the context of this vista the proposed wind farm is deemed to be co-dominant in terms of visual presence.

Aesthetically speaking the turbines are well displayed from here in an uncomplicated manner. Nearly all of the turbines are fully visible in silhouette above the skyline with a staggered linear layout that accords with both the terrain and land cover patterns in the vicinity. There is, however, a noticeable contrast in scale between the overall extent of the scheme and the more intricate nature of the surrounding land cover pattern. This gives a minor sense of visual ambivalence. Turbines are a characteristic feature of this general area and the only effect on the character of the view is an increased intensity of built development. On the basis of these reasons the proposed wind farm is considered to generate a medium visual impact magnitude.

Summary

Based on the assessment criteria and matrices outlined at section 9.3.2 the significance of visual impact is summarised below.

Visual Receptor Sensitivity	Visual Impact Magnitude	Significance of Visual Impact
High	Medium	Major-moderate



AV3: View from Knockalough Looped Walk



Photomontage and wireframe depiction of the proposed Upperchurch wind farm

Focal length: 25mm
Recommended viewing distance: 13cm

AV3

AV3: Knockalough Looped Walk

AV3 Grid Reference: E198689 N159873

Viewpoint elevation 214m

Nearest proposed Upperchurch turbine 2.3km

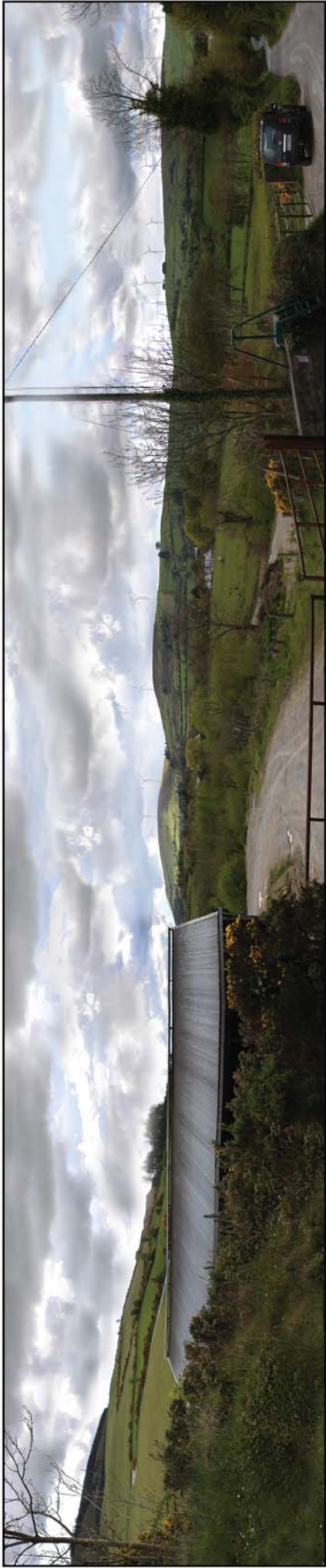
No. proposed Upperchurch turbine hubs visible 14

No. proposed Upperchurch turbine blade sets visible 15

Direction of view NW



REFERENCE DOCUMENTS



Panned view showing the cumulative visual influence of the proposed Upperchurch turbines with the existing and permitted wind farms in the area in a landscape context

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Viewshed Reference Point		Direction of View	Distance to nearest turbine:	Number of turbine hubs visible:
AV3	Knockalough looped walk	NW	2.3km	14

Representative of:

- An area identified on the ZTV map as having a theoretical view of between 13 and 18 of the proposed turbines
- A signposted local loop walk – part of the national looped walk network
- Views from local roads and residences

Receptor Sensitivity

Medium

Existing View

This is a panoramic vista to the northwest from an elevated local road. The view afforded crosses an upland valley and is contained at a modest distance by the opposing ridgeline. The land cover in the valley consists of a combination of grazing land and conifer plantations with some small patches of broadleaf woodland.

Visual Impact of Upperchurch Wind Farm

The proposed wind farm will occupy the majority of the ridgeline on the opposite side of the valley and at this short distance the visible turbines are seen at a considerable scale. The turbines will be the most prominent singular feature in the view and thus, their visual presence is deemed to be dominant.

The line of turbines that tops the ridge is evenly and generously spaced and the profile of the scheme undulates in accordance with the terrain. This is diluted slightly by a more ambiguous and distracting view of the more distant turbines cutting against the skyline ridge in perspective. The considerable extent of the scheme is also considered to be somewhat dominant in the context of this vista. The character of this anthropogenic rural vista is not unduly influenced by the presence of wind turbines, which are relatively synonymous with this type of upland landscape, particularly in the vicinity. Overall, the magnitude of the visual impact is judged to be medium.

Summary

Based on the assessment criteria and matrices outlined at section 9.3.2 the significance of visual impact is summarised below.

Visual Receptor Sensitivity	Visual Impact Magnitude	Significance of Visual Impact
Medium	Medium	Moderate



AV4: View from Birch Hill Looped Walk



Photomontage and wireframe depiction of the proposed Upperchurch wind farm

AV4

AV4: Birch Hill Looped Walk

AV4 Grid Reference: E202710 N159897

Viewpoint elevation 200m

Nearest proposed Upperchurch turbine 6.1km

No. proposed Upperchurch turbine hubs visible 13

No. proposed Upperchurch turbine blade sets visible 16

Direction of view W



REFERENCE DOCUMENTS



Panned view showing the cumulative visual influence of the proposed Upperchurch turbines with the existing and permitted wind farms in the area in a landscape context

Upperchurch Windfarm Environmental Impact Statement

Viewshed Reference Point		Direction of View	Distance to nearest turbine:	Number of turbine hubs visible:
AV4	Birch Hill looped walk	W	6.1km	13

Representative of:

- An area identified on the ZTV map as having a theoretical view of between 19 and 22 of the proposed turbines
- A signposted local loop walk – part of the national looped walk network
- Views from local roads and residences

Receptor Sensitivity

Medium

Existing View

This is a broad and elevated vista to the west from a high point of the Birch Hill Looped Walk. The rolling upland landscape in view has a land cover that comprises a rich texture of pastoral fields and hedgerows as well as patches of woodland and geometric blocks of conifer plantation. The vista has a remote rural character.

Visual Impact of Upperchurch Wind Farm

Just over half of the proposed turbines will rise above undulating sections of the skyline ridge in two clusters divided by an intervening hilltop. The turbines are seen at a reasonable scale from here and despite the discontinuity, the lateral extent of the scheme is also considerable. In the context of this broad and rich vista the wind farm is deemed to have a co-dominant visual presence.

The proposed turbines are relatively well displayed from here with most of them rising fully in silhouette above the skyline ridge and the profile of the scheme rising and falling in sympathy with the underlying terrain. There are a couple of instance of turbine overlap or blade sets rotating against the skyline in perspective. Overall, the magnitude of the visual impact is deemed to be medium.

Summary

Based on the assessment criteria and matrices outlined at section 9.3.2 the significance of visual impact is summarised below.

Visual Receptor Sensitivity	Visual Impact Magnitude	Significance of Visual Impact
Medium	Medium	Moderate



11.3.3 Cumulative Impacts

The Scottish Natural Heritage (SNH) Guidelines relating to the Cumulative Effects of Wind Farms (2005) identify that cumulative impacts on visual amenity consist of combined visibility and sequential effects.

‘Combined visibility occurs where the observer is able to see two or more developments from one viewpoint. Combined visibility may either be in combination (where several wind farms are within the observer’s arc of vision at the same time) or in succession (where the observer has to turn to see the various wind farms).

Sequential effects occur when the observer has to move to another viewpoint to see different developments. The occurrence of sequential effects may range from frequently sequential (the features appear regularly and with short time lapses between, depending on speed of travel and distance between the viewpoints) to occasionally sequential (long time lapses between appearances, because the observer is moving very slowly and / or the there are large distances between the viewpoints.)’

Cumulative impacts of wind farms tend to be adverse rather than positive as they relate to the addition of moving manmade structures into a landscape and viewing context that already contains such development. Based on guidance contained within the SNH Guidelines relating to the Cumulative Effects of Wind Farms (2005) and the DoEHLG Wind Energy Guidelines (2006) cumulative impacts can be experienced in a variety of ways. In terms of landscape character, additional wind energy developments might contribute to an increasing sense of proliferation. A new wind farm might also contribute to a sense of being surrounded by turbines with little relief from the view of them. The term ‘skylining’ is used in the SNH Guidelines to describe the effect where *“an existing windfarm is already prominent on a skyline the introduction of additional structures along the horizon may result in development that is proportionally dominant. The proportion of developed to non-developed skyline is therefore an important landscape consideration”*.

In terms of visual amenity, there is a range of ways in which an additional wind farm might generate visual conflict and disharmony in relation to other wind energy developments. Some of the most common include visual tension caused by disparate extent, scale or layout of neighbouring developments. A sense of visual ambivalence might also be caused by adjacent developments traversing different landscape types. Turbines from a proposed wind farm that are seen stacked in perspective against the turbines of nearer or further developments tend to cause visual clutter and confusion. Such effects are exacerbated when, for example, the more distant turbines are larger than the nearer ones and the sense of distance is also distorted. Table 9.8 below provides criteria for assessing the magnitude of cumulative impacts.



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Table 9-8 Magnitude of cumulative impact

Magnitude of Impact	Description
Very High	<ul style="list-style-type: none"> • The proposed wind farm will strongly contribute to wind energy development being the defining element of the surrounding landscape. • It will strongly contribute to a sense of wind farm proliferation and being surrounded by wind energy development. • Strongly adverse visual effects will be generated by the proposed turbines in relation to other turbines.
High	<ul style="list-style-type: none"> • The proposed wind farm will contribute significantly to wind energy development being a defining element of the surrounding landscape. • It will contribute to a significant sense of wind farm proliferation and being surrounded by wind energy development. • Significant adverse visual effects will be generated by the proposed turbines in relation to other turbines.
Medium	<ul style="list-style-type: none"> • The proposed wind farm will contribute to wind energy development being a characteristic element of the surrounding landscape. • It will contribute to a sense of wind farm accumulation and dissemination. • Adverse visual effects might be generated by the proposed turbines in relation to other turbines.
Low	<ul style="list-style-type: none"> • The proposed wind farm will be one of only a few wind farms in the surrounding area and will viewed in isolation from most receptors. • It might contribute wind farm development becoming a familiar feature within the study area. • The design characteristics of the proposed wind farm accord with other schemes within the surrounding landscape and adverse visual effects are not likely to occur in relation to these.
Negligible	<ul style="list-style-type: none"> • The proposed wind farm will most often be viewed in isolation or occasionally in conjunction with other distant wind energy developments. • Wind energy development will remain an uncommon landscape feature. • No adverse visual effects will be generated by the proposed turbines in relation to other turbines.

11.3.3.1 Cumulative Baseline

There are 4 operational wind farms and 3 wind farms currently under construction within the study area. There are also 3 other permitted wind farm developments and these are all outlined in table 9-9 below.



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Table 9-9 Existing and permitted wind farms within the study area

Wind farm Name	Turbine No.	Distance and direction from proposal site	Status
Knockastanna, Co Limerick	4	8.1km S	Operating
Mienvee	1	9km SW	Operating
Garracummer	15	3.5km SW	In Construction
Falleennafinoga	2	5.5km S	In Construction
Hollyford	3	5.5km S	Permitted
Glencarbry	9	6.3 S	In Construction
Glenough	14	3.2 S	Operating
Cappagh White	18	8.5km S	Permitted
Curraghgraique	6	9.5km N	Operating
Knockmeale	2	8.2km NW	Permitted

11.3.3.2 Department of Environment, Heritage and Local Government (DoEHLG) 'Wind Energy Development Guidelines' (2006)

The above guidelines provide direction on wind farm siting and design criteria for a number of different landscape types. This proposal site is considered to be contained within the 'Hilly and Flat Farmland' landscape type and the guidance with respect to cumulative impact in such areas is;

"It is important that wind energy development is never perceived to visually dominate. However, given that these landscapes comprise hedgerows and often hills, and that views across the landscape will likely be intermittent and partially obscured, visibility of two or more wind energy developments is usually acceptable".

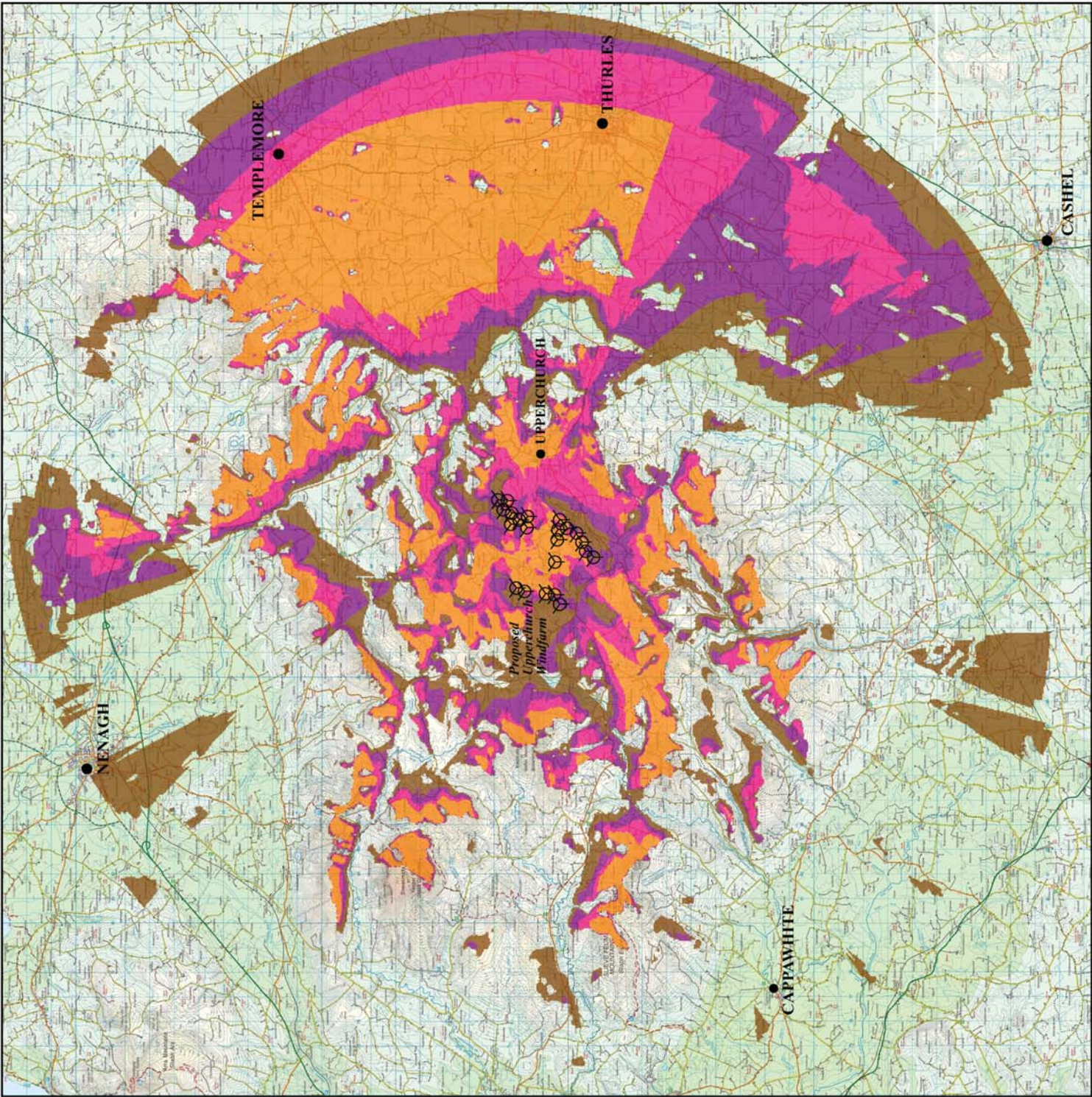


Figure 10.1

Zone of Theoretical Visibility (ZTV) of the proposed Upperchurch turbines.

Proposed Upperchurch turbines

Colour Code:

- Brown Shading: Areas where 1 - 6 Upperchurch turbines are visible (to uppermost blade tip height)
- Purple Shading: Areas where 7 - 12 Upperchurch turbines are visible (to uppermost blade tip height)
- Pink Shading: Areas where 13 - 18 Upperchurch turbines are visible (to uppermost blade tip height)
- Orange Shading: Areas where 19 - 22 Upperchurch turbines are visible (to uppermost blade tip height)



11.3.3.3 Cumulative Zone of Theoretical Visibility (ZTV)

Figure 10.1 ZTW of the Proposed Upperchurch Turbines (over)

Figure 10.2 ZTV of the existing and permitted turbines in the area(over)

Figure 10.3 ZTV of the proposed Upperchurch turbines along with the existing and permitted turbines in the area (over)

The cumulative ZTV maps indicate that;

- Despite the high density of turbines from the various existing and permitted wind farms in this part of the Slieve Felim uplands, intervisibility between them and the proposed Upperchurch Wind Farm is surprisingly limited within the rolling upland context. This is particularly true beyond 5km of the proposal site.
- Extensive visibility of the proposed Upperchurch Wind Farm in conjunction with multiple other wind farms emerges within the lowlands to the east and south beyond where the foothills of the range no longer screen the primary ridgelines from view (approximately 5km east of the R661 alignment).
- There is a relatively small proportion of the landscape that will afford views of only the proposed Upperchurch Wind Farm and no other schemes. These areas all occur either within the confines of the development or to the northeast within approximately 8km. Notwithstanding, this is still a notable proportion of the study area given the density of development in this general upland area. Again, this reflects the absorption capacity of the rolling upland context.

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The following table identifies the characteristics of the cumulative view of wind farms from each of the VRP's used earlier in the assessment of the visual impacts of the proposed scheme in its own right.

Table 9-10 Cumulative view of existing and consented wind farms from VRP's

VRP Ref.	No. of other wind farms potentially in view	Nearer or further than proposal	Combined view (within a single viewing arc)	Succession view (within a series of viewing arcs from the same location)	Sequential view (view of different developments moving along a linear receptor)
CP1	1	nearer	yes	no	no
CP2	0	-	-	-	-
CP3	1	further	no	yes	no
CP4	3	1 at a similar distance and 2 further	yes	no	no
CP5	4	1 at a similar distance and 3 further	yes	yes	no
LC1	1	further	no	yes	yes
LC2	0				
MR1	2	nearer	yes	no	no
MR2	3	All further	yes	yes	no
MR3	2	1 at a similar distance and 1 further	yes	no	yes
MR4	5	3 at a similar distance and 2 further	yes	yes	yes
DR1	0				
DR2	2	nearer	no	yes	no
DR3	1	nearer	no	yes	no
DR4					
DR5	2	1 at a similar distance and 1 further	no	yes	yes
DR6	3	1 at a similar distance and 2 further	yes	yes	no
AV1	2	Both further	yes	no	no
AV2	2	Both further	yes	no	no
AV3	0	-	-	-	-
AV4	3	1 at a similar distance and 2 further	no	yes	no

*Upperchurch Windfarm Environmental Impact Statement**11.3.3.4 Cumulative Impact Assessment*

As can be seen from table 9-10 above, cumulative effects relating to the proposed Upperchurch Wind Farm follow several patterns, which are analysed below.

From locations within the central upland spine of the study area, where the landscape is steeply undulating, there is less opportunity to see other wind energy developments except from elevated locations. Importantly, most sensitive receptors in this area, such as roads and settlements, are contained within the base of valleys. Receptors at higher elevations that are afforded potential views of multiple developments tend to be local walking routes, elevated farmsteads and lookout points. Overall it is considered that the central upland zone of the study area has a high capacity to absorb multiple and expansive wind energy developments. Currently the number of existing and permitted schemes in this area combine to make wind energy development a familiar element in this productive rural landscape, but without a significant sense of proliferation or being surrounded by turbines.

From the lowland context, particularly to the southeast, a different scenario occurs regarding cumulative effects. Whilst the foothills of the Slieve Felim upland spine tend to screen close views of multiple wind energy developments, from distances beyond approximately 5km of the base of these hills a more comprehensive view of the primary ridgeline is afforded. This in turn allows for clear, but distant views of the turbines that rise above the skyline ridge. There are a number of settlements and major routes contained within this zone that are afforded such views. Perhaps the best example of this effect is the view from MR4 at Boherlahan, where combined and succession views of the proposal in conjunction with up to 5 other schemes are afforded. This route is also subject to sequential views of different wind farms as the viewer travels along it. The key issue here is not so much the manner in which multiple schemes are viewed but the effect of 'skylining' where the proportion of developed skyline can begin to dominate the proportion of undeveloped skyline. The proposed development will noticeably contribute to this effect at MR4. It should be noted that MR4 represents a worst case scenario in this regard as the adjacent section of ridgeline is subject to the highest level of turbine accumulation within the upland spine. Clear views of significant sections of the Slieve Felim range are also often screened by foreground vegetation from within the wider lowland context.

From the lowland plains to the northwest of the Slieve Felim uplands there is less opportunity to see multiple wind farm developments. This is due to most of the existing and permitted wind farms being located closer to the south-eastern edge of the upland spine. The steeply undulating Silvermines Mountains that run along the northwestern edge of the upland zone also tend to screen views of the landscape and, therefore, the wind farms beyond.

Should the proposed development proceed to construction along with all of the other permitted wind farms currently shown in the cumulative photomontages there would be an overall sense that the Slieve Felim uplands has become something of a strategic area for wind energy development.



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This would not be a unique situation within the country and given the robust and productive landscape character along with the generally low level of sensitivity of surrounding receptors it is not inappropriate either.

On the basis of the factors outlined above, the additional cumulative impact represented by the proposed development is deemed to be **medium**.

11.4 MITIGATION MEASURES

Given the highly visible nature of commercial wind energy developments it is not generally feasible to screen them from view using on-site measures as would be the primary form of mitigation for many other types of development. Instead, landscape and visual mitigation for wind farms must be incorporated into the early stage site selection and design phases. A principle consideration in this regard was the Department of Environment Heritage and Local Government's Wind Energy Development Guidelines (2006).

11.4.1 Department of Environment, Heritage and Local Government Wind Energy Development Guidelines (2006)

The Wind Energy Development Guidelines (2006) provide guidance on wind farm siting and design criteria for a number of different landscapes, including 'Hilly and Flat Farmland' similar to the context for the proposed Upperchurch Wind Farm. Recommendations in the guidelines for this landscape type include the following:

Location –	<p>"Although hilly and flat farmland type is usually not sensitive in terms of scenery, due regard must be given to houses, farmsteads and centres of population."</p> <p>"Location on ridges and plateaux is preferred..."</p> <p>"Elevated locations are also more likely to achieve optimum aesthetic effect."</p>
Spatial extent -	"This can be expected to be quite limited in response to the scale of fields and such topographic features as hills and knolls"
Spacing -	"The optimum spacing pattern is likely to be regular, responding to field pattern...However ... a balance will have to be struck between adequate spacing to achieve operability and a correspondence to field pattern."
Layout -	"The optimum layout is linear, and staggered linear on ridges and hilltops but a clustered layout would also be appropriate on a hilltop"
Height -	"Turbines will tend not to be tall ... the more undulating the topography the greater the acceptability of an uneven profile."

The design of the proposed wind farm is in general accordance with all of the design criteria outlined above except that relating to spatial extent. However, in this instance there is clear direction from the North Tipperary County Development Plan that a broader extent of development will be sought in this landscape character area than is provided for in the guidelines for 'Hilly and Flat Farmland'. Furthermore, the fact that the development is relatively dispersed across four elevated areas reduces



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its intensity, particularly at local receptors where views of discreet clusters of turbines are more commonplace than of the full scheme.

A number of general mitigation measures are also included below:

- Matt non-reflective finishes will be used on all turbine components;
- Transmission lines between individual turbines and the substation will be placed underground;
- Counter rotation of blade sets will be avoided;
- The number and extent of new access tracks will be kept to a minimum and properly landscaped immediately following completion of works. Such landscaping will include reinstating original vegetation along verges and repairing any wheel ruts;
- Special care will be taken to preserve any features, which contribute to the landscape character of the study area. Any damage to existing hedgerows from transporting the turbines will be rectified; and
- Turbines will be the same size as existing turbines in the area

A high standard of design will be applied to all structures associated with the substation considering not only its function but also the aesthetic quality, in order to minimise any sense of intrusion. The proposed development will provide colour harmony and adequate screening of the substation using berms covered with scrub and ground vegetation in order to mitigate its impact.

11.5 RESIDUAL IMPACTS

Landscape and visual mitigation measures have been incorporated into the design of the scheme from its early stages. Therefore, the proposed wind farm presented as the subject of this application already incorporates any substantial landscape and visual mitigation measures. Unlike for many of the other EIA topics, the residual impacts of the proposed wind farm are essentially the same as assessed in the predicted landscape and visual impacts section (9.3) above.

11.6 CONCLUSION

A summary table is provided below, which collates the assessments of landscape and visual impacts. A discussion of the results is provided thereafter.

Table 9-11: Summary Impact Assessment

Landscape Impact			
Landscape Sensitivity		Landscape Impact	Landscape impact Significance
Low		Low	Minor-negligible
Visual Impact			
VRP	Visual Receptor Sensitivity	Magnitude of visual impact	Visual Impact Significance
CP1	Low	Negligible	Negligible
CP2	Low	medium	Minor
CP3	Low	High	Moderate-minor
CP4	Low	Medium	Minor
CP5	Low	Low	Minor-negligible
LC1	Medium	Medium	Moderate
LC2	Medium	Low	Minor
MR1	Low	Negligible	Negligible
MR2	Low	Medium	Minor
MR3	Low	Low	Minor-negligible
MR4	Low	Medium	Minor
DR1	Medium	Medium	Moderate
DR2	Medium	Medium	Moderate
DR3	Medium	Medium	Moderate
DR4	Medium	Medium	Moderate
DR5	Medium	Medium	Moderate
DR6	Medium	low	Minor
AV1	Medium	High	Major-moderate
AV2	High	Medium	Major-moderate
AV3	Medium	Medium	Moderate
AV4	Medium	Medium	Moderate
Cumulative Impact			Medium

11.6.1 Landscape Impacts

The assessment of landscape impacts is based on a comparison of landscape sensitivity against the magnitude of effects on the physical landscape and on landscape character. In this instance the judgement of sensitivity is 'low'. This is mainly due to the robust and productive rural character of the receiving landscape and the influence of existing wind energy developments on that character.



The magnitude of the landscape impact is also considered to be 'low' on the basis that the proposed wind farm represents a familiar form, scale and intensity of development in an area where the scale of the terrain and land use patterns is such that even this relatively extensive proposal will not be overly dominant. The wind farm is not considered to have a physical impact on the site in excess of that experienced for surrounding forestry operations and the prevailing site land uses will be maintained below the turbines. On the basis of the judgements relating to landscape sensitivity and the magnitude of the landscape impact expected from this proposal, the overall significance of impact on the landscape is deemed to be 'Minor-negligible'.

11.6.2 Visual Impacts

Visual impacts were assessed on the basis of visual receptor sensitivity versus the magnitude of the visual impact. The magnitude itself is the function of the visual presence of the proposal and its effect on visual amenity. Visual impacts were assessed at 22 visual receptors throughout the study area.

As can be seen from the summary table above, visual receptor sensitivity generally varied between medium and low with these judgements being relatively evenly shared. Only one of the VRP's was attributed High sensitivity. The High sensitivity rating occurred at AV2 which is a local signposted lookout point that affords vast panoramic views over both the Slieve Felim uplands to the west and the lowland plains to the east.

Notably, none of the designated scenic routes is attributed a sensitivity judgement of higher than medium. This is on the basis that the sensitivity of a receptor is not wholly synonymous with the scenic quality of the view on offer, but also many other factors such as the likely mind set of the viewer and the popularity of the location. Many of the designated scenic routes relate to the provision of elevated or broadly panoramic vistas over the landscape. The value of such vistas relates directly to the vast nature of the view as opposed to the naturalistic or unique qualities of the scene, elements of the picturesque or a strong sense of place. Therefore, such views are most sensitive to visual obstruction (Blocking of the view) and not necessarily visual intrusion (an additional element within the view).

In terms of the magnitude of visual impacts, the relative visual dominance of the scheme from each VRP is strongly related to viewing distance in this instance. It also tends to relate to whether the view of the scheme is uphill or downhill and how vast the overall vista is. Where other wind farms are in view the proposed scheme is also generally considered to be less of a distinctive feature in the landscape. Notably, there are very few locations that afford views of all 22 of the proposed turbines at once due to the steeply rolling nature of the terrain surrounding the site. The view of only a limited number of turbines tended to moderate the visual presence of the scheme, especially in close proximity (<5km). Aesthetically speaking, the proposed development is well designed for this site with a sprawling layout and undulating profile that reflects the scale and form of the underlying terrain as well as the loosely structured land use patterns in the vicinity. For these reasons the



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magnitude of the visual impact is only considered to be higher than medium in two instances (AV2 and CP3), which are both less than 2km from the nearest turbines. This level of visual impact is almost unavoidable in such close proximity to commercial scale wind energy developments.

11.6.3 Cumulative Impacts

There is a reasonable accumulation of wind farms within the upland spine that runs through the centre of the study area. Views of multiple wind energy developments tend to be limited from within the steeply rolling terrain of this upland zone. Contrastingly, views of multiple developments are afforded from some locations within the plains to the southeast, where the turbines are seen to rise above the primary skyline ridge. In some instances the extent of wind farm development along the ridge is beginning to dominate the extent of undeveloped ridgeline creating an effect referred to as 'skylining' in the Scottish Natural Heritage Guidelines relating to the Cumulative Effects of Wind Farms (2005). The proposed development is considered to contribute noticeably to this effect at one of the VRP's (MR4), but this is a worst case scenario within the lowland area where unimpeded views of long sections of the skyline ridge are otherwise uncommon between hedgerows. The intervening peak of Knockalough also breaks up the line of turbines when viewed from much of the lowland area to the southeast. On balance of these factors the additional cumulative effect generated by the proposed Upperchurch Wind Farm is deemed to be of a medium level.

11.6.4 Overall Significance of Impact

In terms of the significance of impact, the majority of judgements across all assessment categories are in the mid to lower order of magnitude (Moderate to negligible). Only at two of the visual receptors that are both in very close proximity to the proposal is the significance of the visual impact judged to be major-moderate. This is on the basis of a medium sensitivity rating coupled with a high visual impact magnitude and vice versa. Whilst this represents the highest level of impact in this assessment it is only in the mid to high order of magnitude in terms of the visual impact significance matrix (table 9-7). On the basis of these reasons it is considered that the proposed Upperchurch Wind Farm represents an acceptable level of landscape and visual impact across the study area. It also complies with all of the relevant policies and guidelines for the receiving landscape in relation to wind energy developments.

REFERENCE DOCUMENTS

Upperchurch Windfarm Environmental Impact Statement

Upperchurch Windfarm Environmental Impact Statement

Landscape and Visual Assessment





UPPERCHURCH WINDFARM

CHAPTER 12

CULTURAL HERITAGE

KILKENNY ARCHAEOLOGY



12 Parliament street
Kilkenny City

12 Cultural Heritage

12.1 INTRODUCTION AND METHODOLOGY

This chapter of the EIS assesses the receiving environment in terms of its cultural heritage. It details the methodology which was employed in the assessment and documents the recorded cultural heritage of the study area. The potential impact of the proposed scheme on the cultural heritage is outlined, as are mitigation measures to ameliorate any adverse affects.

The material contained within the document is based on the *Guidelines on the Information to be Contained in Environmental Impact Statements* (E.P.A. 2002, 2003), and conforms to the methodologies recommended in 'Framework and Principles for the Protection of the Archaeological Heritage' issued by the Dept. of Arts, Heritage, Gaeltacht and the Islands (1999). Section 3.6.6 of 'Framework and Principles for the Protection of the Archaeological Heritage' notes '*Environmental impact assessment should unless there are substantial grounds to show that it is not necessary, involve the carrying out of archaeological assessment including, where appropriate, test excavation*' (Dept. of Arts, Heritage Gaeltacht and the Islands 1999). All recommendations conform to the legislative frameworks of the *National Monuments Acts 1930-1994*, *Heritage Act 2000* and the *European Convention on the Protection of the Archaeological Heritage (ratified by Ireland 1997)*.

This assessment comprises a desk-based study and a field survey of the subject area.

12.1.1 Desk based study methodology

A geographic information system (GIS) was used to manage the datasets relevant to the archaeological study and for the creation of all the maps in this section of the EIS. This involved the overlaying wind turbines locations and site extent upon georeferenced aerial photographs, contour maps, digital surface models, present day maps and historical maps. The integration of all this spatial information allowed for the accurate measurement of distances of sites from cultural heritage sites. It also aided in the field survey with accurate maps being produced for use on site. Visual analyses were undertaken in GIS for two purposes: 1) to determine which cultural heritage sites the proposed windfarm would be visible from and 2) to help interpret archaeological site distribution patterns. Visual analysis of the turbines took into account their height of 126.6m.

Primary sources

The Record of Monuments and Places for Co. Tipperary was consulted for the relevant parts of North Tipperary Ordnance Survey 6" Sheets 33, 34, 39 & 40 and South Tipperary 6" Sheets 39 and 45 . The relevant files for these sites, which contain details from aerial photographs, early maps, OS memoirs, OPW

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Archaeological Survey notes and other relevant publications, were inspected in the Sites and Monuments Records Office.

The following documentary sources were also examined;

- Topographical Files and Finds lists of the National Museum of Ireland
- 1st edition OS 6 inch mapping (1843) on www.OSI.ie
- 2nd edition OS 25 inch mapping (1905) supplied by client
- Griffiths Evaluation map, 1847-1864
- Discovery Series 1:50,000 mapping supplied by client
- Aerial photographs from 1995, 2000 and 2005 (on www.osi.ie), 2012 (Google Earth) and aerial photograph supplied by client
- Excavations bulletin at www.excavations.ie
- National Inventory of Architectural Heritage (NIAH) for Fingal
- North Tipperary County Development Plan 2010-2016
- Secondary sources (see bibliography)

12.1.2 Field survey methodology

Field inspection is undertaken with the aim of identifying any potential impacts that the proposed development may have upon identified/previously unidentified archaeological sites/areas of archaeological potential that lie within or without the proposed development area. Each field was inspected and photographed. Recorded archaeological sites within close proximity of the proposed development area were visited. *Pro forma* record sheets were employed to record information on local topography, landuse, areas of archaeological and/or architectural significance/potential and any folklore connected with the locale.

12.2 RECEIVING ENVIRONMENT (BASELINE)

This assessment focused on the cultural heritage within the area of the proposed development and also that of the surrounding landscape to a distance of c.4km from the centre of the development. In certain instances, archaeological sites of interest beyond this area were also consulted. The following townlands were studied as the proposed development falls within them: Coumnageeha, Foilnaman, Gleninchnaveigh, Graniera, Grousehall, Knockcurraghbola Commons, Knockmaroe, Knocknamena Commons and Shevry.

12.2.1 Results of desk based study

12.2.1.1 Location and Topography

The development area lies 2km west of the village of Upperchurch in the Silvermine mountains (Figure 12.1). The mountains comprise many rounded peaks of c.300-400m elevation, with intervening valleys of sloping pasture and winding rivers and

streams (Plate 12.1). The mountains extend over an area of c.22km WE by c.15km NS. The Hollyford Formation is the main geological unit of the area. It is formed of greywacke, siltstone and grit. Upperchurch village is on the eastern margins of the mountains. It lies just north of the main road between Limerick and Thurles, which dissects the mountains from west to east. The proposed development almost borders the village of Milestone on its southwestern extent. Milestone is on the road from Tipperary to Nenagh, which passes from north to south through the Silvmine mountains.



PLATE 12-1: PROPOSED DEVELOPMENT AREA. GENERAL VIEW S TOWARDS AN EXISTING WINDFARM FROM AREA C.

The proposed development is set out over four areas. For the purposes of the archaeological field survey these areas have been designated A, B, C and D. The wind turbines of areas A-C are located on three separate peaks of similar elevation while Area D is in a lowland setting. The four areas span eight townlands in Kilnamanagh Upper Barony, Upperchurch Civil Parish: Coumnageeha, Gleninchaveigh, Graniera, Grousehall, Knockcurraghbola Commons, Knockmaroe, Knocknamena Commons and Shevry. The townlands comprise predominantly pasture fields, forestry and frequent areas of bog/reeds. The area is rural with a dispersed and low population.

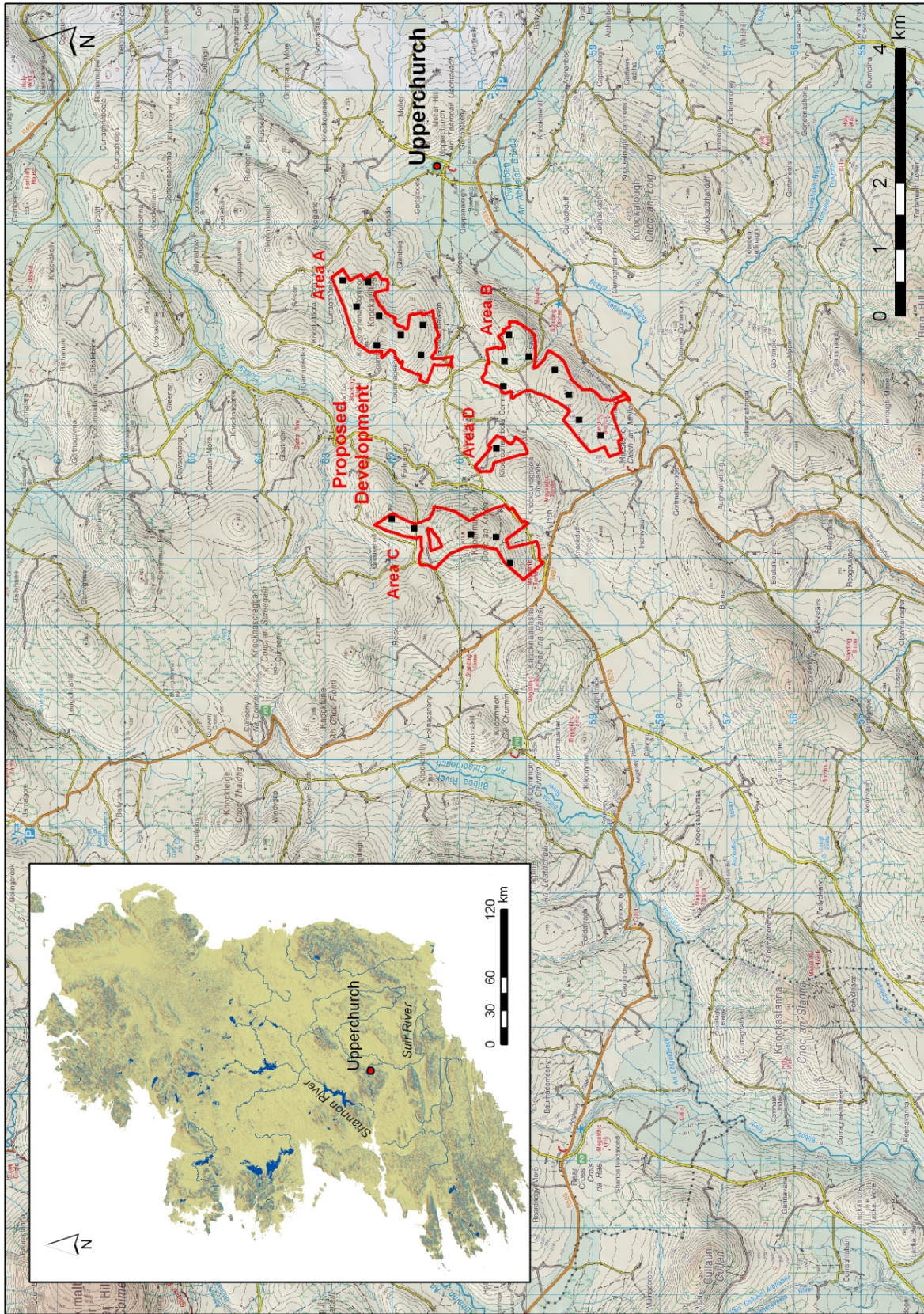


FIGURE 12-1: SITE LOCATION MAP. THE PROPOSED DEVELOPMENT AREA BEGINS C.2KM WEST OF UPPERCHURCH

12.2.1.2 General Archaeological and Historical Background

The proposed windfarm of Upperchurch is located in a region where there is a relatively high concentration of archaeology: there are 101 Recorded Monuments within a 4km radius of the development – herein known as *the study area*. Of these monuments, 71 are situated within 2km of the development. Further to the west there are more upland archaeological sites although these become less concentrated. In 1959, Michael O’Kelly from the Department of Archaeology, University College Cork, excavated one of the most visually impressive monuments in the region, the prehistoric Wedge tomb of Baurnadomeeny (RMP TN038-009), which is located 8km west of Turbine-20 (O’Kelly 1959; 1961). The monuments of Tipperary were surveyed in the early 1980s by the Archaeological Survey of Ireland (see Appendix 12-I for a list of every within 4km of the proposed development). A review of prehistoric archaeology in Tipperary undertaken by Richard Raleigh (1985) highlighted the prehistoric richness of this North Tipperary region, while between 1992 and 1995 the North Munster Project of the Discovery Programme sought to understand settlement patterns over a vast 7000km² area that centred on the lower Shannon catchment (Grogan 1996). None of the North Munster Project case studies centred on Upperchurch but their results offer insights into the wider nature of prehistoric settlement in the area. An Archaeological Inventory for County Tipperary was published in 2002 (see Farrelly and O’Brien 2002)

The Neolithic period sees the first evidence of human settlement in the study area. There is no evidence of earlier Mesolithic hunter-gatherer occupation. While people in the Neolithic were predominantly farmers and lived in rectangular or oval shaped wooden houses, it is their megalithic tombs and cairns which leave a lasting visual impression in the landscape. A court tomb at Shanballydesmond (RMP TN038-013), 8km west of the proposed development area, is the oldest known Neolithic monument in Tipperary (Raleigh 1985). Excavations by Kelly in 1958 inside the tomb yielded six unburnt or cremated human remains and tools of flint and chert. The tomb itself sits at high point in the landscape overlooking the Bilboa River. Another probable Neolithic monument class is a cairn, and four such monuments lie between 2.5 and 5km of the proposed development. The nearest one, Gortnaskehy, (RMP TN040-039002) to the east is within the study area. It is high on a summit and contains a cist burial (Figure 12.2).

The Early Bronze Age period is represented in the study area by three main site types: Wedge tombs (n = 6), barrows (n = 25) and fulachta fiadh (n = 11). The most prominent and complete of the wedge tombs is Knockcurraghbola Commons (TN039-009), which is 740m NW of Turbine 8 and sits on a the southern slopes of a small knoll. The tomb is 7m long and decreases in height and width from SW-NE (Plate 12.2). A complex of four tombs – two of which are Wedge tombs – are located 1.5m SW of the Knockcurraghbola Commons tomb (RMP numbers TN039-016/017/037/045) are also in this townland. The first one is the most preserved of this group. These are on lower mountain slopes and overlooked by many of the wind turbines, which start c.700m away (see Table 12.1 and Plates 12.3 to 12.7). These tombs were visited as part of the field survey as was TN039-050, another megalithic tomb in the townland.

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Elksewhere, excavations at the aforementioned Bournadomeeny Wedge tomb by O'Kelly yielded 21 burials and a range of flint tools (Raleigh 1985). A distribution analysis of the tombs of the study area and those as far away as Bournadomeeny revealed that these types of burial monuments were not on the summits of hills like in the Neolithic but were more generally on lower lying, sloping land. The Wedge tombs are associated with a series of rivers and streams that ultimately flow into the River Shannon, with the exception of the Knockcurraghbola Commons group, which are at the juncture where streams flow to both the Bilboa River (and on to the Shannon) and the Turraheen River, which connects with the Suir River.



PLATE 12-2: TN039-009, WEDGE TOMB, FROM E. THIS IS LOCATED N OF AREA D

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PLATE 12-3: TN039-0016, MEGALITHIC TOMB, FROM NE



PLATE 12-4: TN039-017, MEGALITHIC TOMB, FROM NE

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PLATE 12-5: TN039-037, MEGALITHIC TOMB, FROM SE



PLATE 12-6: TN039-045, MEGALITHIC TOMB, FROM W



PLATE 12-7: TN039-050, MEGALITHIC TOMB, FROM NW

A strikingly different pattern is evident with the distribution of barrow monuments (Bronze Age/Iron Age burial mounds) in the study area (Figure 12.2, Plate 12.8). A viewshed analysis carried out as part of this desk-study shows that 23 of 25 barrows overlook rivers and streams that drain into the River Suir. While it cannot be certain that the barrows all relate to the Early Bronze Age, the fact that they juxtapose the Wedge tomb locality suggests that this form of burial monument was contemporaneous. Figure 12.3 shows that not a single Wedge tomb overlooks a barrow within the 4km study area, and only one beyond it. The TN039-009 Wedge tomb of Knockcurraghbola Commons is not only the most intact tomb of the study area but it also the most significantly positioned, being at the frontier with the barrow monument tradition: the next nearest Wedge tomb to the east is 30km away. Interestingly, the viewshed analysis shows that the monument is hidden from view the numerous barrows to its north and east. One barrow, no longer extant, is located inside the proposed development area (see discussion of TN039-046 in the next section).



PLATE 12-8: TN039-0388001, RING BARROW, FROM SW

To make sense of such site distribution patterns, Raleigh (1985) had proposed that the Wedge tomb builders were pastoral and the barrow builders more agrarian, exploiting fertile alluvial soils. He observed that mineral resources may have been an attraction for settlement in the upland region. No mines are recorded in the study area; there is a prehistoric copper mine 14km west of Turbine-17 in Lackamore (TN038-020). Figure 12.2 shows that the fulachta fiadh distribution is notably linked to the River Suir tributaries and as such they may be associated with the Early Bronze Age barrow builders. Some examples are intact, such as TN040-048 (Plate 12.9).

The Middle Bronze Age period is represented in the study area by standing stones ($n = 12$, examples: Plate 12.10 – 12.13), stone rows ($n = 2$) and a single stone circle. The stone circle (RMP TN039004-001) was marked on the second edition mapping (1905) at Reisk but it no longer survives. Three impressive stone circles are still upstanding 7-12km west/northwest of the development area at Bauraglanna, Reardnogy More and Cooneen. The latter is a variant known as a Kerb Circle (RMP TN033-047), of which only 30 are known across Ireland. Distribution and viewshed analyses of the standing stones within and adjacent to the study area show a striking pattern: they are overwhelmingly placed at positions which overlook the numerous rivers and streams. Furthermore, all of the rivers with the exception of the Owenbeg has one stone per valley and these stones are not intervisible. The reason the Owenbeg River is different is because it is overlooked by six standing stones. Four of these, running NE-SW, are all theoretically intervisible, while two running NW to SE are also intervisible. The stones themselves typically ranged in height from 0.8m to 1.96m. The nearest standing stone to the proposed development is at Toorfiba (RMP TN039-001001), which is 751m WSW of Turbine-12.



PLATE 12-9: TN040-048, FULACHT FIA, FROM N



PLATE 12-10: TN039-044, STANDING STONE, FROM N

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PLATE 12-11: TN039-052, STANDING STONES, FROM SE



PLATE 12-12: TN039-043, STANDING STONE, FROM NW.



PLATE 12-13: TN039-011003, STANDING STONES, FROM E

The next phase where archaeological monuments are apparent is the Early Medieval period. Seven ringforts, two possible ringforts, four enclosures and nine possible enclosures within the study area probably date from this era (Figure 12.3, Plate 12.15). The six definite ringforts range in size from 31m to 53m in diameter. Three are bivallate. The closest pair of ringforts to the proposed development area are TN040-001 and TN040-002, which are 752m and 596m east of Turbine-15 respectively. These are depicted on the second edition OS Map and still survive today, albeit slightly worn. The nearest enclosure to the proposed development is TN039-047, which is 218m ENE of Turbine-11. Overall, the distribution of ringforts and enclosures within and beyond the study area suggest a focus on the rivers that drain into the Suir. There are numerous ringforts in these areas and considerably less in the more mountainous areas to the west of the study area.

Four castles within the study area provide evidence for the Anglo-Norman encroachment into the locality. Three are probable ringworks that dates to the 12th or 13th centuries and one is a tower house, which would date to the 14th – 15th centuries. They are situated at the foothills of the mountains overlooking the Clodiagh and Owenbeg rivers but not in the upland regions, which would have remained out of Norman influence. These frontier castles appear to defend a key routeway into the mountainous regions of North Tipperary.

Moving into more recent times, no buildings are depicted in the proposed development on the first edition OS map. The Griffiths evaluation documents occupants of Coumnaageha, Foilnahan, Gleninchaveigh, Graniera, Grousehall, Knockcurraghbola Commons, Knockmaroe, Knocknamena Commons and Shevry townlands but there is no evidence of buildings from this era within the development.

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By the revision of the first edition map in 1905 a stone agricultural building is shown on Field A-1. It still stands today. Also shown on the map are low banks where 19th century structures or enclosures such as booleys once existed for housing cattle (see BH-1 to BH-5). The landuse today of the proposed development area contains a mix of pastoral and forestry. Other areas are wet and boggy.



PLATE 12-14: TN039-047, ENCLOSURE, FROM S

12.2.1.3 Cultural Heritage within the Proposed Development Area

One Recorded Monument is located within the proposed development area. This is TN039-046 in Knockanema Commons. It is a Ring Barrow and is in Area A, Field number A-28 (see Figures 12.5, 12.6, 12.13 and Plate 12.15). The recorded description is as follows: “Situated on top of high ground in upland region with good panoramic views in all directions. Much degraded monument consisting of a barely visible circular mound (diam. 8m N-S) enclosed by an inner fosse (Wth 2m; ext. D 0.2m) and slight traces of an outer bank (Wth 1m). A field boundary bisected the monument on a N-S axis. This field boundary has since been levelled. Monument is barely visible in the winter months and is probably not visible during the summer months”. The monument was not visible in the field survey.

Field inspection and aerial photography failed to identify any further previously unrecorded sites within the proposed development area.

Five National Inventory of Archaeological Heritage (NIAH) within 2.5km of the proposed development area but will not be impacted upon (see Appendix 12-II). These are a mile post in the village of Milestone, and a Church, a Shrine, a School and a house in the village of Upperchurch, located 2km east of the proposed development.

Built Heritage has been recorded within the development area. (see Table 12.2 and Plates 12.16 to 12.20). These include two probable booleys (BH-1 and BH-2, two small c-shaped enclosures marked on the second edition 1905 OS Map (BH-3 and BH-5), and a rectangular enclosure (BH-4). None will be impacted by the development.

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PLATE 12-15: TN039-046---, RING BARROW (NOT VISIBLE DURING SUMMER), FROM S



12-16: BH-2, POSSIBLE BOOLEYS IN FIELD B-21, FROM NE

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12-17: BH-3, C-SHAPED ENCLOSURE IN FIELD A-15, FROM SE



12-18: BH-4, RECTANGULAR ENCLOSURE IN FIELD A-16, FROM N



12-19: BH-5, C-SHAPED ENCLOSURE IN FIELD B-11, FROM E

12.2.1.4 Archaeological Artefacts from the Study Area

A search of the National Museum of Ireland's *Topographical Files* revealed no archaeological artefacts from the study area.

12.2.1.5 Aerial Photography

Examination of the 2005 Ordnance Survey aerial orthophotography and air photos provided by Ecopower did not indicate any additional archaeological sites (Figures 12.6, 12.8, 12.10 and 12.12)

12.2.1.6 Cartographic Sources

The first edition 1840 and second edition 1900 1:10560 Ordnance Survey maps were examined (Figures 12.5, 12.7, 12.9, 12.11) as was the Griffith's Valuation maps. These did not indicate any additional archaeological sites within the study area, only the built heritage sites.

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No sites additional to RMPs were recorded in the RPS list of the County Development Plan within the study area.

Visual assessment

The results of the visual assessment are incorporated into Table 12.1 and 12.3. Eight out of 101 sites within the 4km study area will have intervisibility with all 22 wind turbines.

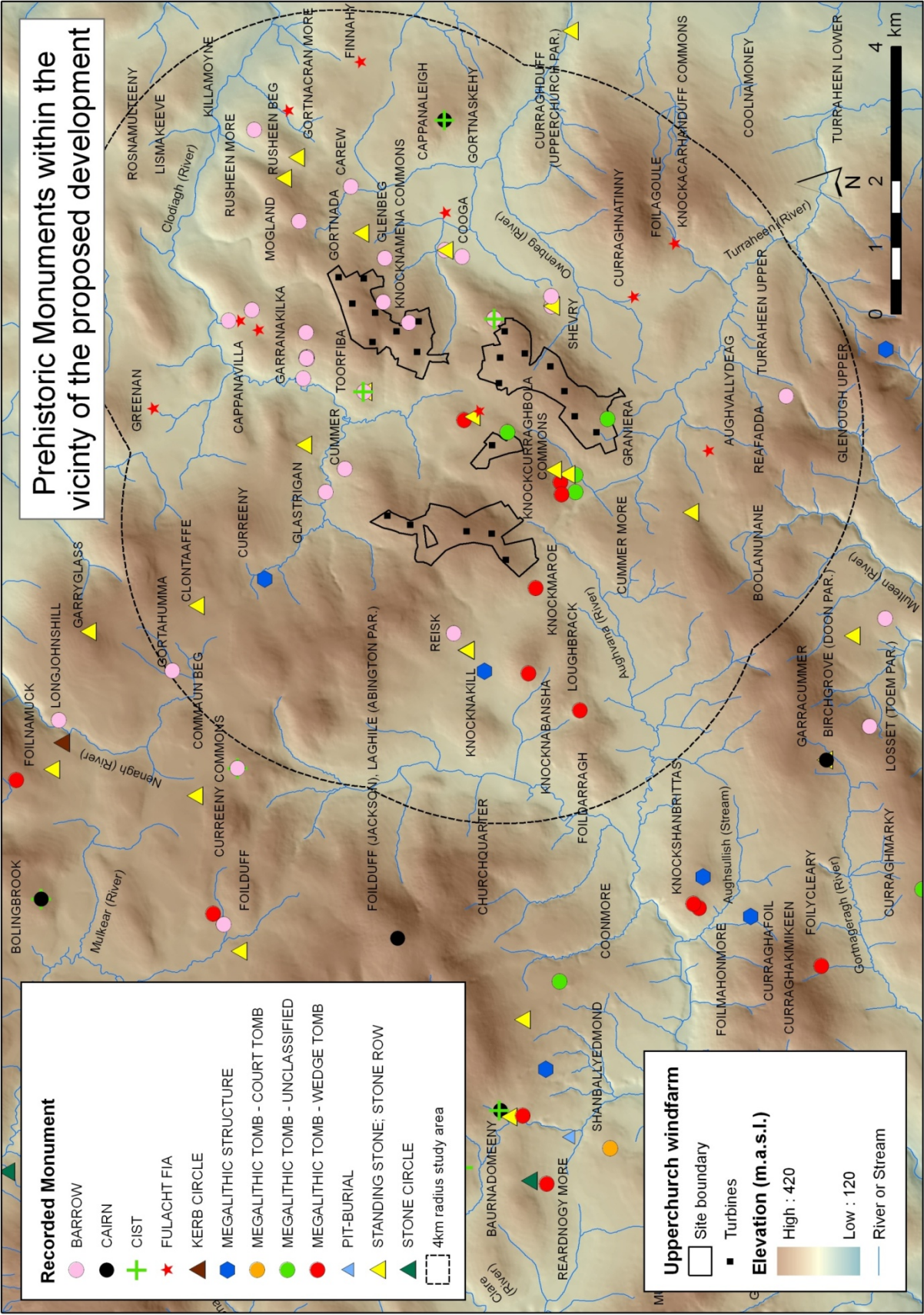


FIGURE 12-2: PREHISTORIC MONUMENTS WITHIN THE VICINITY OF THE PROPOSED DEVELOPMENT

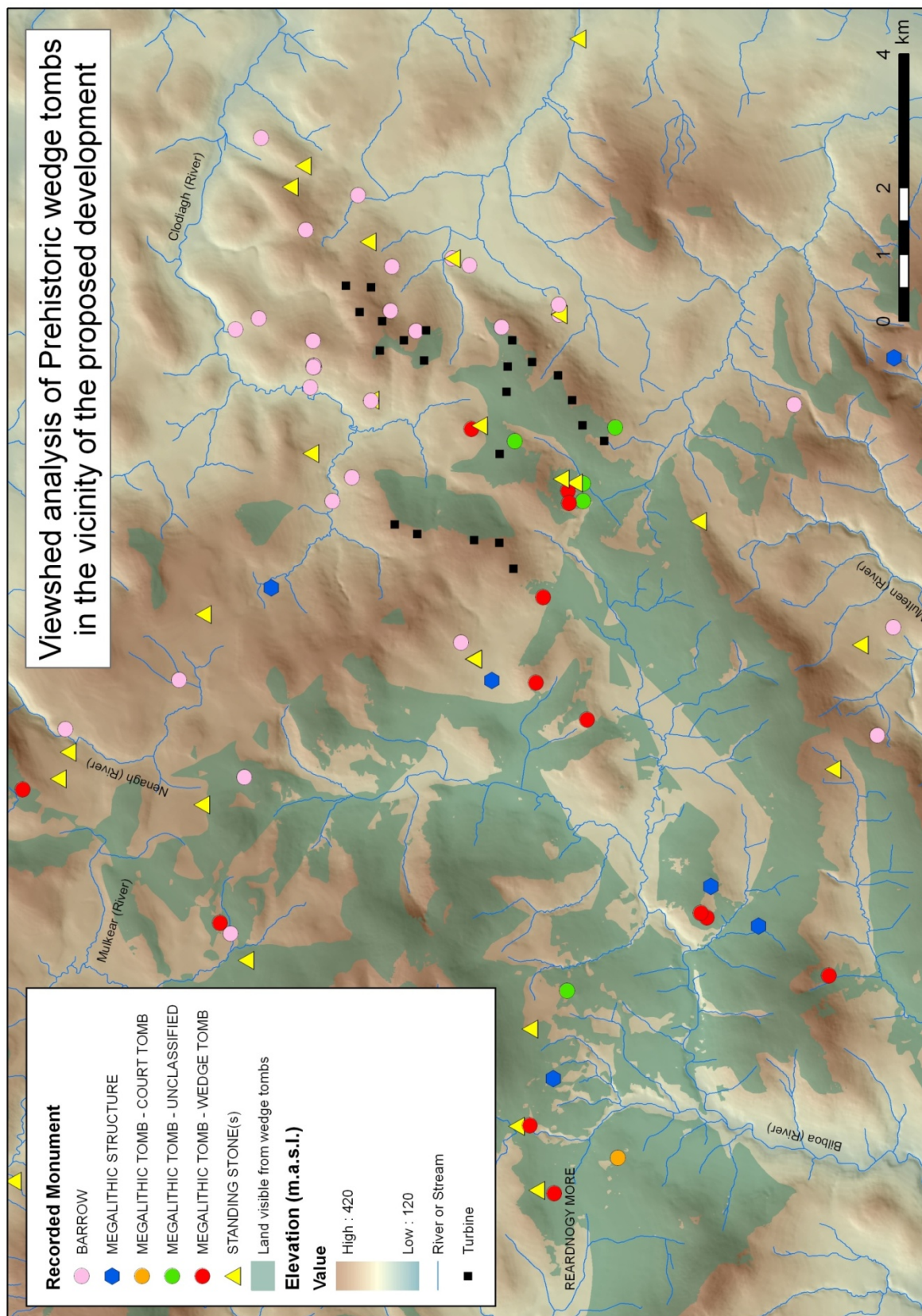


FIGURE 12-3: VIEWSHEDED ANALYSIS OF PREHISTORIC WEDGE TOMBS. THE AREAS SHADED GREEN REPRESENT THE CUMULATIVE TOTAL OF LAND VISIBLE FROM THE WEDGE TOMBS VISIBLE IN THE MAP.

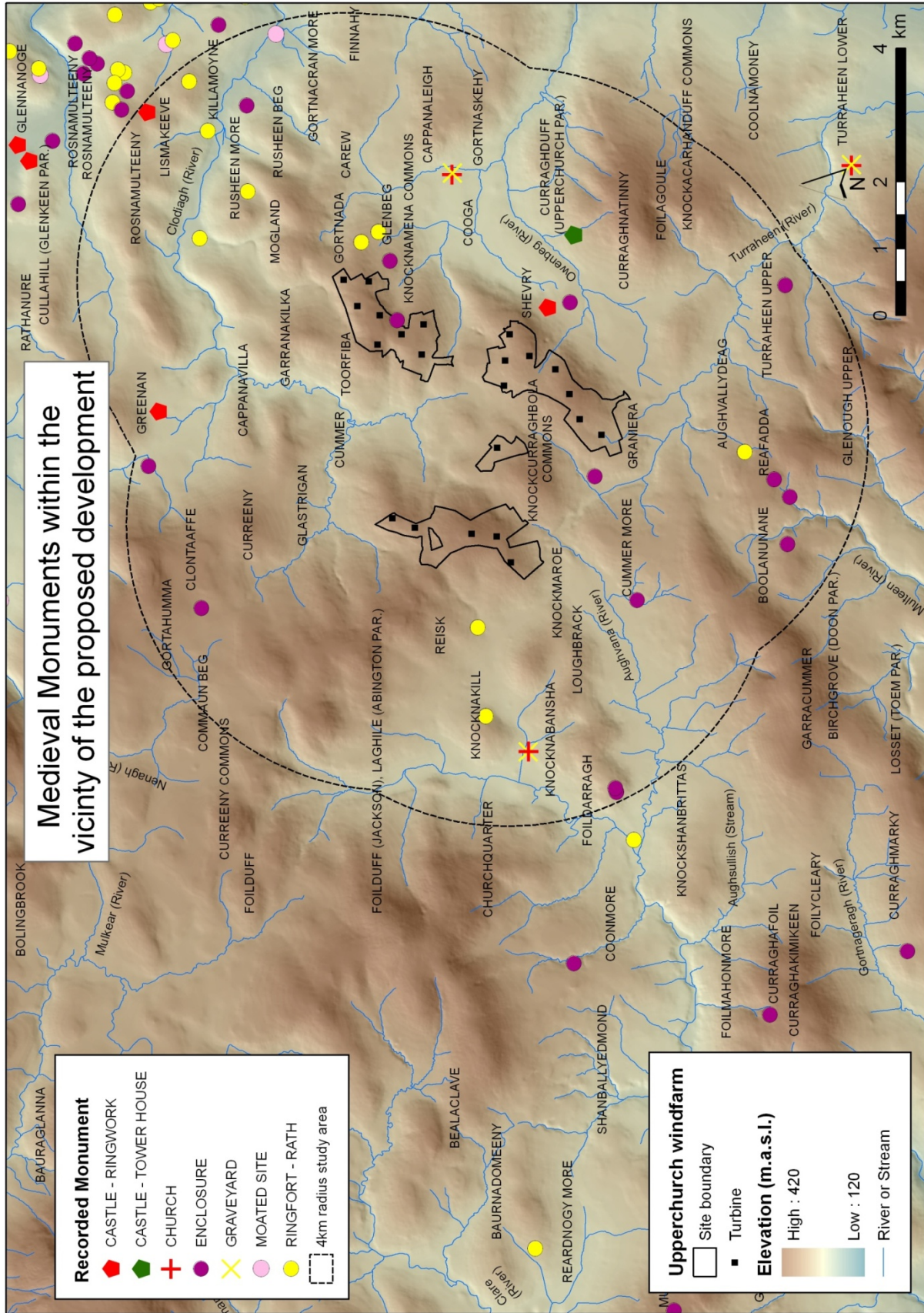


FIGURE 12-4: MEDIEVAL MONUMENTS WITHIN THE VICINITY OF THE PROPOSED DEVELOPMENT

TABLE 12-1 RECORDED ARCHAEOLOGICAL SITES WITHIN 4KM OF THE PROPOSED DEVELOPMENT (SORTED BY DISTANCE TO PROPOSED DEVELOPMENT. THE TABLE ALSO SHOWS POTENTIAL IMPACT AND RECOMMENDATIONS. A FULL DESCRIPTION OF EACH MONUMENT IS PRESENTED IN APPENDIX 1

SMR Entry	E	N	Townland	Description	Distance from nearest turbine	Number of turbine nacelles visible	Impact	Recommendation
TN039-046----	196543	161770	Knocknamena Commons	Barrow - Ring-Barrow	29.5m E of access road in Field A-28 and 143m N of T-10	15	None	Avoidance
TN039-018----	195100	158790	Graniera	Megalithic Tomb - Unclassified possible	69m SW of access road in Field B24 and 265m SW of T-1	6	None	Avoidance
TN039-048----	196849	162153	Glenbeg	Barrow - Ring-Barrow	198m SE of T-13	13	None	Avoidance
TN039-047----	196619	162022	Knocknamena Commons	Enclosure possible	218m ENE of T-11	13	None	Avoidance
TN039-038002-	196600	160490	Shevry	Cist possible	238m NE of T-6	21	None	Avoidance
TN039-038001-	196600	160490	Shevry	Barrow - Ring-Barrow	248m NE of T-6	21	None	Avoidance
TN039-050----	194897	160291	Knockcurraghbola Commons	Megalithic Tomb - Unclassified possible	286m E of T-22	22	None	Avoidance
TN039-035----	191880	161100	Reisk	Barrow - Ring-Barrow	349m NW of T-17	3	None	Avoidance
TN040-046002-	197510	162130	Knocknamena Commons	Barrow - Ditch Barrow possible	443m SE of T-15	14	None	Avoidance
TN040-046001-	197510	162130	Knocknamena Commons	Enclosure	443m SE of T-15	14	None	Avoidance
TN039-051----	195214	160729	Knockcurraghbola Commons	Fulacht Fia	501m NW of T-8	22	None	Avoidance
TN040-001----	197793	162562	Knocknamena Commons	Ringfort - Rath	596m E of T-15	15	None	Avoidance
TN039-027----	194280	159060	Graniera	Enclosure possible	630m W of T-1	17	None	Avoidance
TN039-052----	195131	160825	Knockcurraghbola	Stone Row possible	641m NW of T-8	20	None	Avoidance

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Cultural Heritage	TN040-042----	197883	162490	Commons	Standing Stone	680m E of T-15	19	None	Avoidance
	TN039-008----	192560	159870	Knockmaroe	Megalithic Tomb	700m SW of T-17	7	None	Avoidance
	TN039-037----	194260	159270	Knockcurraghbola Commons	Megalithic Tomb Unclassified possible	713m NW of T-1	7	None	Avoidance
	TN039-009----	195079	160943	Knockcurraghbola Commons	Megalithic Tomb Wedge Tomb	741m NW of T-8	22	None	Avoidance
	TN039-001001-	195509	162446	Toorfiba	Standing Stone	751m WNW of T-12	20	None	Avoidance
	TN040-002----	197944	162305	Gortnada	Ringfort - Rath	752m E of T-15	19	None	Avoidance
	TN039-001003-	195508	162455	Toorfiba	Cist	754m WNW of T-12	20	None	Avoidance
	TN039-001002-	195501	162443	Toorfiba	Barrow - Ring-Barrow	759m WNW of T-12	20	None	Avoidance
	TN039-044----	194270	159400	Knockcurraghbola Commons	Standing Stone	768m WNW of T-1	10	None	Avoidance
	TN039-010----	196809	159771	Shevry	Castle - Ringwork possible	774m SE of T-5	7	None	Avoidance
	TN039-011003-	196790	159630	Shevry	Standing Stone	813m ESE of T-5	7	None	Avoidance
	TN039-011001-	196790	159630	Shevry	Barrow - Pond Barrow possible	813m ESE of T-5	7	None	Avoidance
	TN039-011002-	196797	159635	Shevry	Standing Stone	823m ESE of T-5	7	None	Avoidance
	TN033-064----	196397	163314	Knockatoora Commons	Barrow - Ring-Barrow possible	824m NW of T-14	18	None	Avoidance
	TN039-043----	194330	159600	Knockcurraghbola Crownlands	Standing Stone possible	858m NW of T-1	7	None	Avoidance
	TN039-017----	194150	159500	Knockcurraghbola Commons	Megalithic Tomb Wedge Tomb	921m NW of T-1	8	None	Avoidance
Cultural Heritage	TN039-049----	196939	159636	Shevry	Barrow - Ditch Barrow possible	954m ESE of T-5	11	None	Avoidance
	TN039-045----	194000	159270	Knockcurraghbola Commons	Megalithic Tomb Unclassified possible	957m NW of T-1	12	None	Avoidance

TN034-119----	198061	163420	Mogland	Barrow - Ring-Barrow	1009m NE of T-16	22	None	Avoidance
TN033-065----	196020	163297	Garranakilka	Barrow - Ring-Barrow possible	1010m NW of T-12	7	None	Avoidance
TN033-065001-	196023	163305	Garranakilka	Barrow - Ring-Barrow possible	1016m NW of T-12	7	None	Avoidance
TN033-065003-	196000	163299	Garranakilka	Barrow - Ring-Barrow possible	1017m NW of T-12	7	None	Avoidance
TN039-019----	196890	159430	Shevry	Enclosure possible	1020m E of T-4	13	None	Avoidance
TN039-036----	194350	162730	Cummer	Barrow - Pond Barrow	1022m NE of T-21	11	None	Avoidance
TN033-065002-	196004	163310	Garranakilka	Barrow - Ring-Barrow possible	1027m NW of T-12	7	None	Avoidance
TN033-046----	194000	163020	Glastrigan	Barrow - Mound Barrow possible	1038m NNE of T-21	10	None	Avoidance
TN039-016----	193966	159479	Knockcurraghbola Commons	Megalithic Tomb - Wedge Tomb	1068m NW of T-1	8	None	Avoidance
TN039-005----	192011	160813	Reisk	Ringfort - Rath	1093m NW of T-17	5	None	Avoidance
TN040-040002-	197630	161230	Cooga	Standing Stone	1138m SE of T10	13	None	Avoidance
TN040-040001-	197630	161230	Cooga	Barrow - Ring-Barrow	1138m SE of T10	13	None	Avoidance
TN040-047----	197530	160970	Cooga	Barrow - Ring-Barrow	1164m SE of T-10	13	None	Avoidance
TN033-063----	195701	163352	Garranakilka	Barrow - Ring-Barrow	1176m NW of T-12	12	None	Avoidance
TN033-061----	196733	164125	Cappanavilla	Barrow - Ring-Barrow possible	1382m NNW of T-16	9	None	Avoidance
TN040-003----	198580	162640	Carew	Barrow - Bowl-Barrow	1386m E of T-15	15	None	Avoidance
TN033-062----	196427	164035	Garranakilka	Fulacht Fia	1448m NW of T-16	2	None	Avoidance
TN039-054----	194926	157511		Hut Site	1472m S of T-1	14	None	Avoidance
TN039-004002-	191630	160910	Reisk	Standing Stone	1492m NW of T-17	5	None	Avoidance
TN039-004001-	191630	160920	Reisk	Stone Circle	1492m NW of T-17	5	None	Avoidance
TN039-056----	196928	158409	Curraghnatinny	Fulacht Fia	1610m SE of T-4	15	None	Avoidance
TN033-059----	196568	164312	Cappanavilla	Fulacht Fia	1620m NNW of T-16	5	None	Avoidance
TN040-048----	198190	161230	Cappanaleigh	Fulacht Fia	1669m ESE of T-10	17	None	Avoidance

TN034-118----	198707	163654	Rusheen Beg	Standing Stone possible	1689m NE of T-16	0	None	Avoidance
TN039-055----	194615	157281		Fulacht Fia	1719m S of T-1	15	None	Avoidance
TN033-027----	194710	163350	Glastrigan	Stone Row	1720m NNE of T-21	22	None	Avoidance
TN039-003----	191315	160640	Reisk	Megalithic Structure possible	1725m W of T-17	9	None	Avoidance
TN033-060----	196570	164473	Cappanavilla	Barrow - Ring-Barrow	1764m N of T-16	0	None	Avoidance
TN039-007----	191280	159980	Knocknabansha	Megalithic Tomb - Wedge Tomb	1789m WSW of T-17	0	None	Avoidance
TN039-053----	193696	157544		Standing Stone(s)	1847m SW of T-1	8	None	Avoidance
TN034-114----	199020	163460	Rusheen More	Standing Stone	1888m ENE of T-16	19	None	Avoidance
TN040-016----	197901	159386	Curraghduff (Upperchurch Par.)	Castle - Tower House	1936m ESE of T-5	18	None	Avoidance
TN034-081----	198553	164262	Castlehill, Rusheen Beg	Ringfort - Rath	1942m NE of T-14	4	None	Avoidance
TN033-042----	192700	163940	Curreeny	Megalithic Structure possible	2045m WNW of T-21	20	None	Avoidance
TS039-015----	192418	158421	Cummer More	Enclosure possible	2055m SSW of T-17	9	None	Avoidance
TS039-029----	194643	156810	Aughvalleydeag	Ringfort - Rath possible	2181m S of T-1	22	None	Avoidance
TS045-004----	194230	156366	Reafadda	Enclosure possible	2231m S of T-1	0	None	Avoidance
TN034-055----	197850	164980	Ballynahow (Glenkeen Par.)	Ringfort - Rath possible	2232 NNE of T-16	8	None	Avoidance
TN040-004----	198810	161199	Cappanaleigh	Church	2286m ESE of T-10	22	None	Avoidance
TN040-004001-	198832	161192	Cappanaleigh	Graveyard	2310m ESE of T-10	22	None	Avoidance
TN039-002----	190680	160690	Knocknakill	Ringfort - Rath	2364m W of T-17	13	None	Avoidance
TN034-117----	199434	164093	Rusheen More	Barrow - Ring-Barrow possible	2525m NE of T-16	2	None	Avoidance
TN034-115----	199720	163590	Gortnacran More	Fulacht Fia possible	2587m NE of T-16	8	None	Avoidance
TN039-014----	190725	159210	Loughbrack	Megalithic Tomb - Wedge Tomb	2615m SW of T-17	8	None	Avoidance
TN040-051----	197726	157788	Foilagoule	Fulacht Fia	2618m SE of T-4	0	None	Avoidance
TN040-039002-	199580	161240	Gortnaskehy (Upperchurch	Cairn	2669m ESE of T-15	22	None	Avoidance

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Cultural Heritage	TN040-039001-	199580	161240	Gortnaskehy (Upperchurch Par.)	Cist	2669m ESE of T-15	22	None	Avoidance
	TS045-005----	193971	156135	Reafadda	Enclosure possible	2714m S of T-1	0	None	Avoidance
	TN039-006002-	190150	160060	Churchquarter	Graveyard	2912m W of T-17	5	None	Avoidance
	TN039-006001-	190155	160053	Churchquarter	Church possible	2912m W of T-17	5	None	Avoidance
	TS045-026----	195440	156110	Turraheen Upper	Barrow - Ring-Barrow	2938km S of T-1	22	None	Avoidance
	TN034-082----	199841	164281	Rusheen More	Enclosure	2991m ENE of T-16	0	None	Avoidance
	TN034-056002-	199470	164900	Killamoyne	Redundant Record	3015m NE of T-16	4	None	Avoidance
	TN034-056001-	199460	164860	Killamoyne	Ringfort - Rath	3056m NE of T-16	3	None	Avoidance
	TN033-041002-	192300	164960	Commaun Beg	Enclosure	3135m NW of T-21	6	None	Avoidance
	TN033-041001-	192300	164960	Clontaaffe	Standing Stone - Pair	3135m NW of T-21	6	None	Avoidance
	TN040-052----	198055	157380	Knockacarhanduff Commons	Earthwork	3161m SE of T-4	15	None	Avoidance
	TN040-041----	200452	162504	Finnahy	Fulacht Fia	3227m E of T-15	22	None	Avoidance
	TS045-003----	193263	156167	Boolanunane	Enclosure possible	3240m S of T-1	22	None	Avoidance
	TN033-029003-	195250	165610	Greenan	Fulacht Fia	3415m NNW of T-16	20	None	Avoidance
	TN033-029002-	195250	165610	Greenan	Fulacht Fia	3415m NNW of T-16	20	None	Avoidance
	TN033-029001-	195250	165610	Greenan	Castle - Ringwork possible	3415m NNW of T-16	20	None	Avoidance
	TS046-001----	197145	156203	Turraheen Upper	Enclosure	3577m SE of T1	0	None	Avoidance
	TN034-083----	200910	163840	Gortnahalla	Moated Site possible	3824m ENE of T-16	5	None	Avoidance
	TN034-057----	199740	165780	Killamoyne, Rosnamulteeny		3869m ENE of T-16	0	None	Avoidance
	TN033-026----	194430	165750	Dawsonsbog	Enclosure possible	3881m NNE of T-12	16	None	Avoidance

TN033-051----	191320	165320	Gortahumma	Barrow - Ring-Barrow possible	3923m NE of T-21	14	None	Avoidance
TN034-065----	200200	165140	Curraghcarroll, Drumgill	Ringfort - Rath	3999m NE of T-17	16	None	Avoidance

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TABLE 12-2: TABLE OF BUILT HERITAGE SITES WITHIN THE PROPOSED DEVELOPMENT. THESE HAVE NO PROTECTION STATUS. THE NEAREST NIAH ARCHITECTURAL SITES WERE OUTSIDE OF THE DEVELOPMENT AREA (SEE APPENDIX 12-II).

Code	E	N	Townland	Description	Distance from nearest turbine / access road	Impact	Recommendation
B1	194897	159170	Graniera	Enclosure - possible booley - in Field B-21 marked on second edition 1905 map	129m NE of T-1	None	Avoidance
B2	194982	159051	Graniera	Enclosure - possible booley - in Field B-21 marked on second edition 1905 map	215m N of T-1	None	Avoidance
B3	197157	162477	Knockcurraghbola Commons	C-Shaped enclosure on second edition 1905 map	10m to Access road and 53m NW of T-15 in field A-15	None	Avoidance
B4	197207	162475	Knockcurraghbola Commons	Rectangular possible building foundations identified in field survey – not on historic mapping	32m NE of T-15 in Field A-16	None	Avoidance
B5	195780	160313	Knockcurraghbola Commons	Foundations of possible enclosure marked on second edition 1905 map	39m S of Access Rd and 197m ENE of T-8	None	Avoidance

Table 12-3: Recorded monuments within 4km study area most overlooked by wind turbines

SMR Entry	Townland	Class	Number of turbine nacelles visible
TN039-050----	Knockcurraghbola Commons	Megalithic Tomb - Unclassified possible	22
TN039-051----	Knockcurraghbola Commons	Fulacht Fia	22
TN034-119----	Mogland	Barrow - Ring-Barrow	22
TN033-027----	Glastrigan	Stone Row	22
TN040-039002-	Gortnaskehy (Upperchurch Par.)	Cairn	22
TN040-039001-	Gortnaskehy (Upperchurch Par.)	Cist	22
TN040-041----	Finnahy	Fulacht Fia	22
TS045-003----	Boolanunane	Enclosure possible	22
TN039-009----	Knockcurraghbola Commons	Megalithic Tomb - Wedge Tomb	22
TS039-029----	Aughvallydeag	Ringfort - Rath possible	22
TN040-004----	Cappanaleigh	Church	22
TN040-004001-	Cappanaleigh	Graveyard	22
TS045-026----	Turraheen Upper	Barrow - Ring-Barrow	22
TN039-038002-	Shevry	Cist possible	21
TN039-038001-	Shevry	Barrow - Ring-Barrow	21

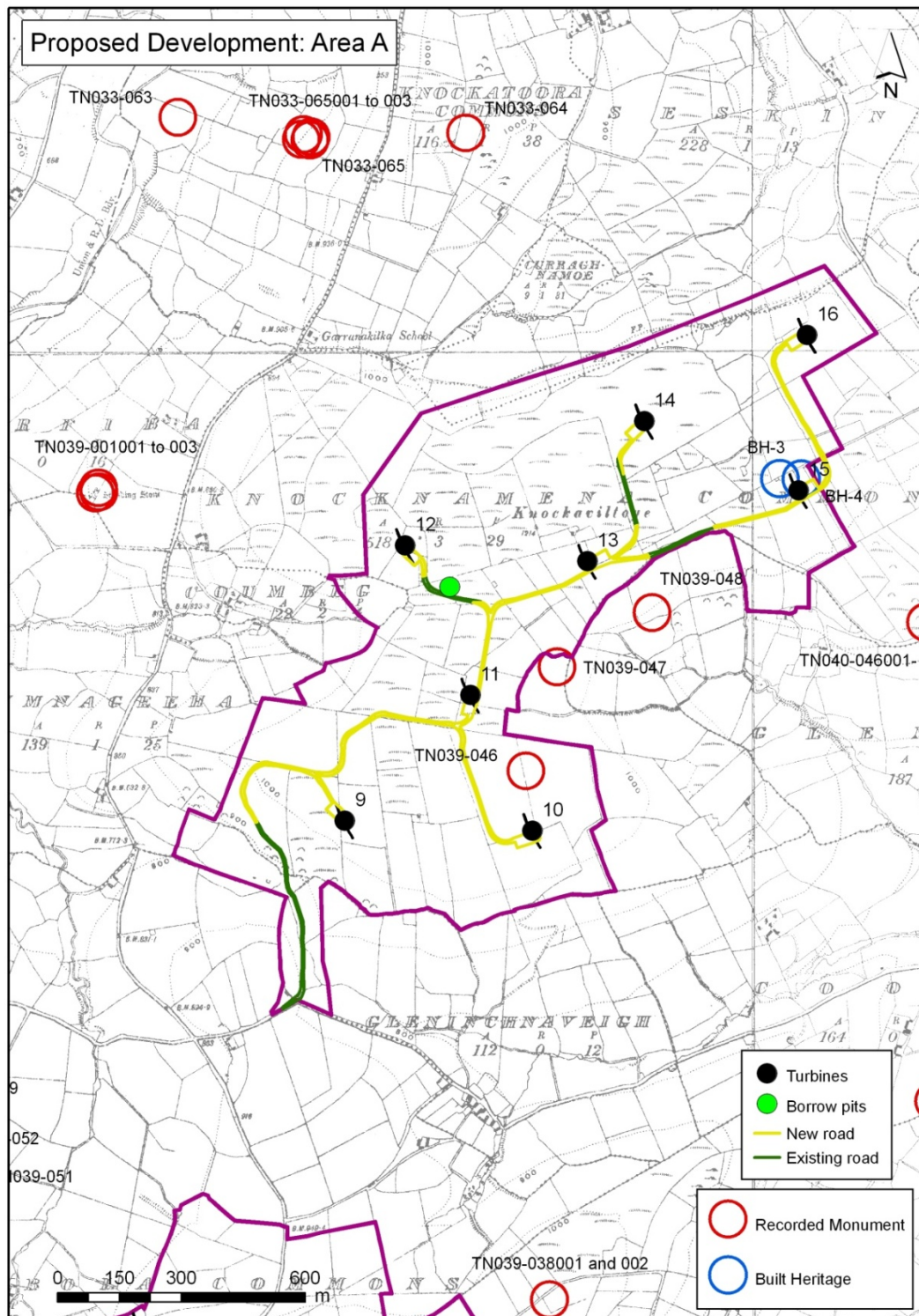
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FIGURE 12-5: PROPOSED DEVELOPMENT (AREA A) AND SURROUNDING ENVIRONMENT ON 1905 2ND EDITION OS MAP

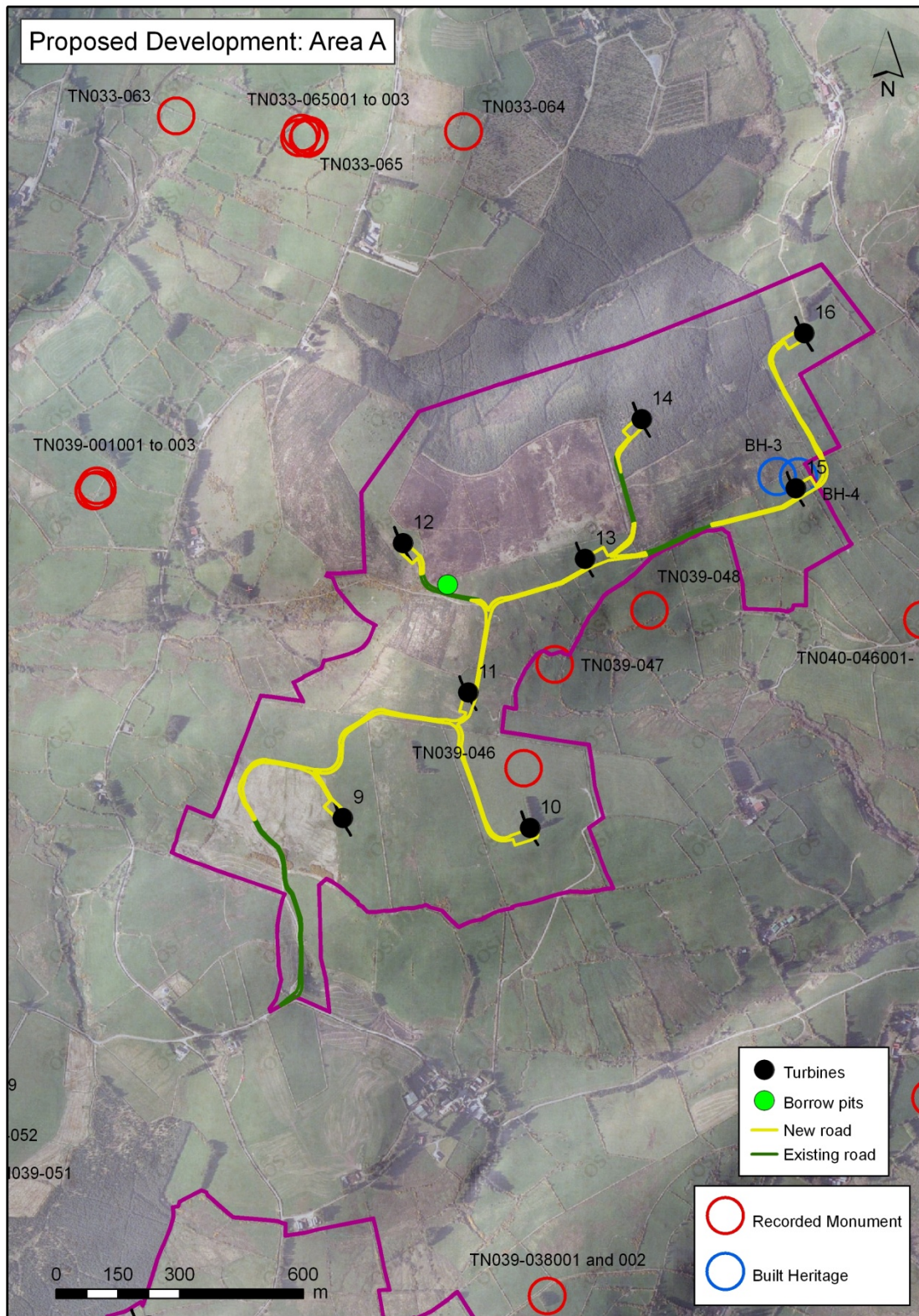


FIGURE 12-6: PROPOSED DEVELOPMENT (AREA A) AND SURROUNDING ENVIRONMENT ON OSI ORTHOPHOTOGRAPH (2005)

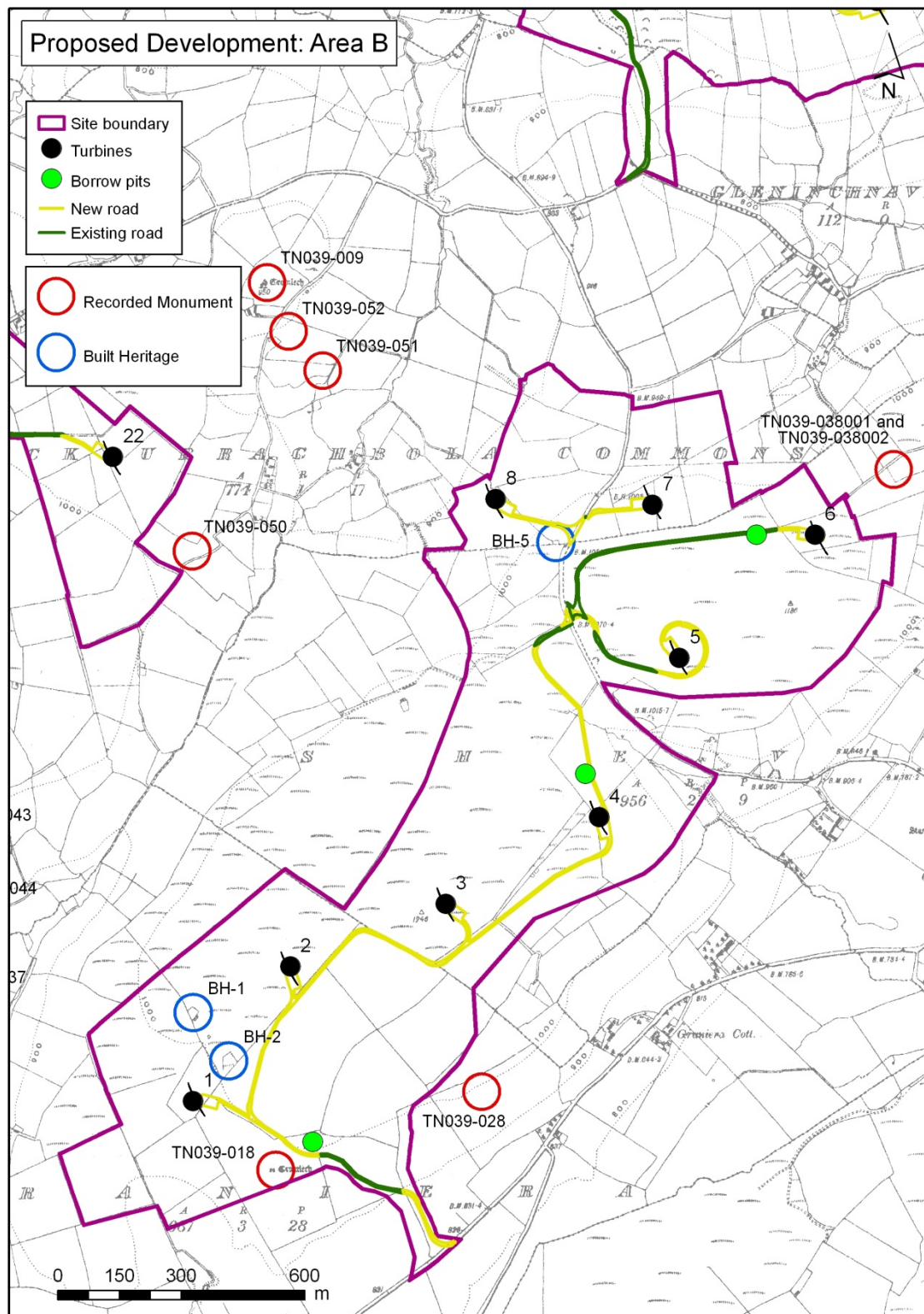


FIGURE 12-7: PROPOSED DEVELOPMENT (AREA B) AND SURROUNDING ENVIRONMENT ON 1905 2ND EDITION OS MAP

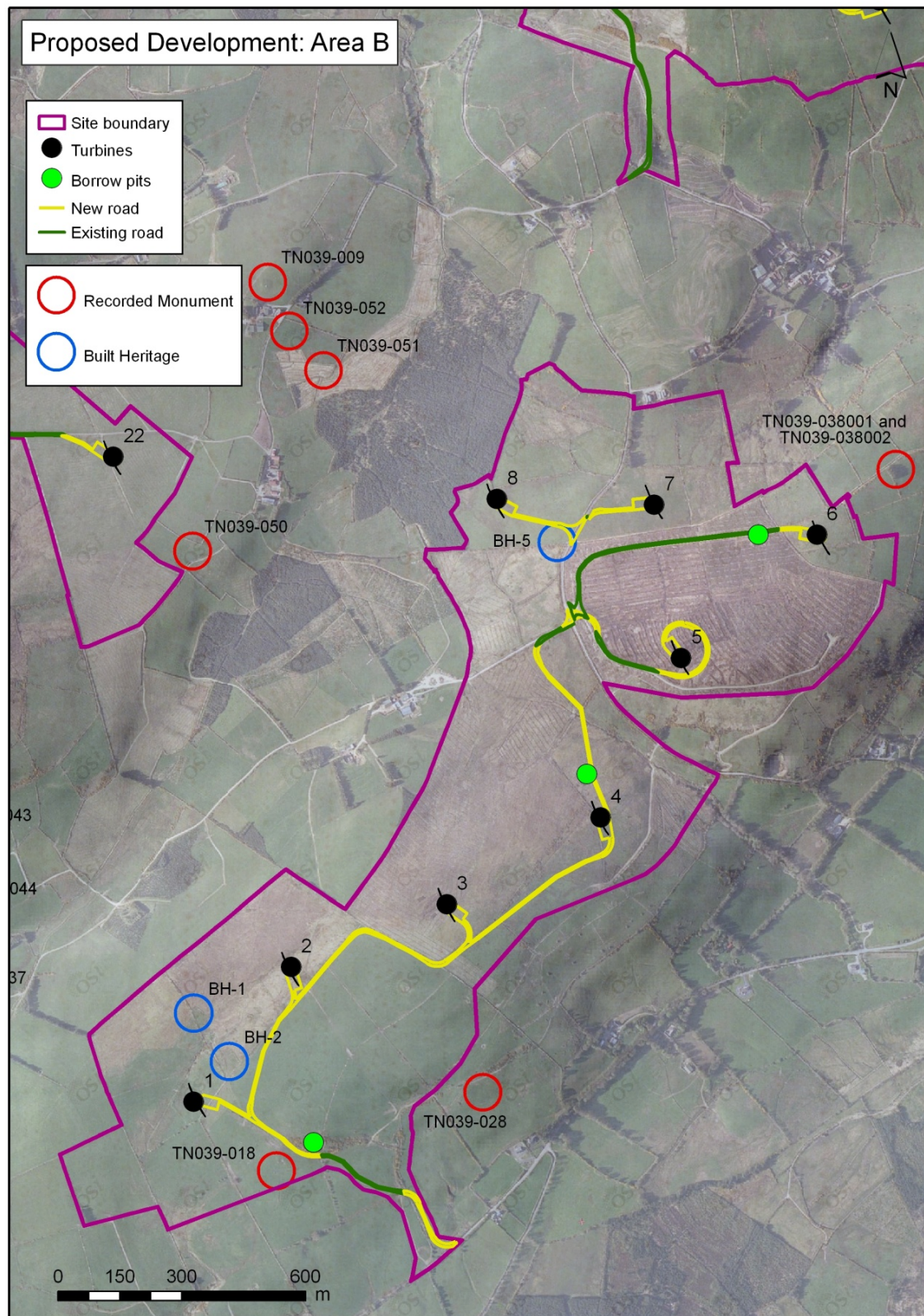


FIGURE 2-5 PROPOSED DEVELOPMENT (AREA B) AND SURROUNDING ENVIRONMENT ON OSI ORTHOPHOTOGRAPH (2005)



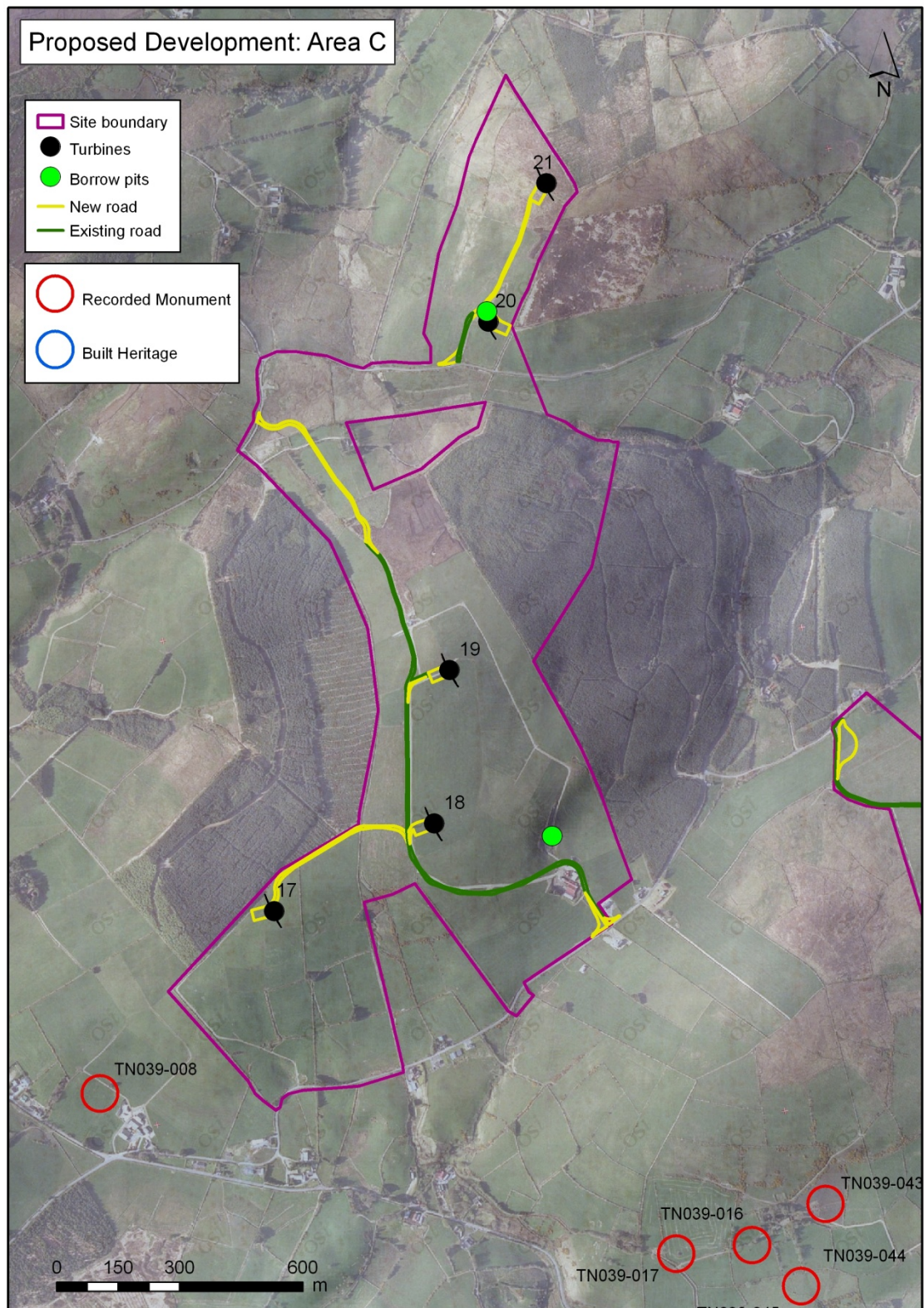
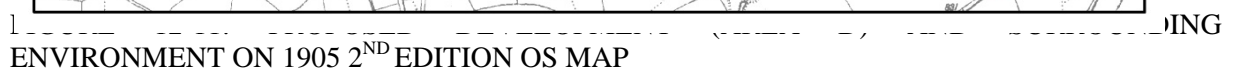


FIGURE 12-10: PROPOSED DEVELOPMENT (AREA C) AND SURROUNDING ENVIRONMENT ON OSI ORTHOPHOTOGRAPH (2005)



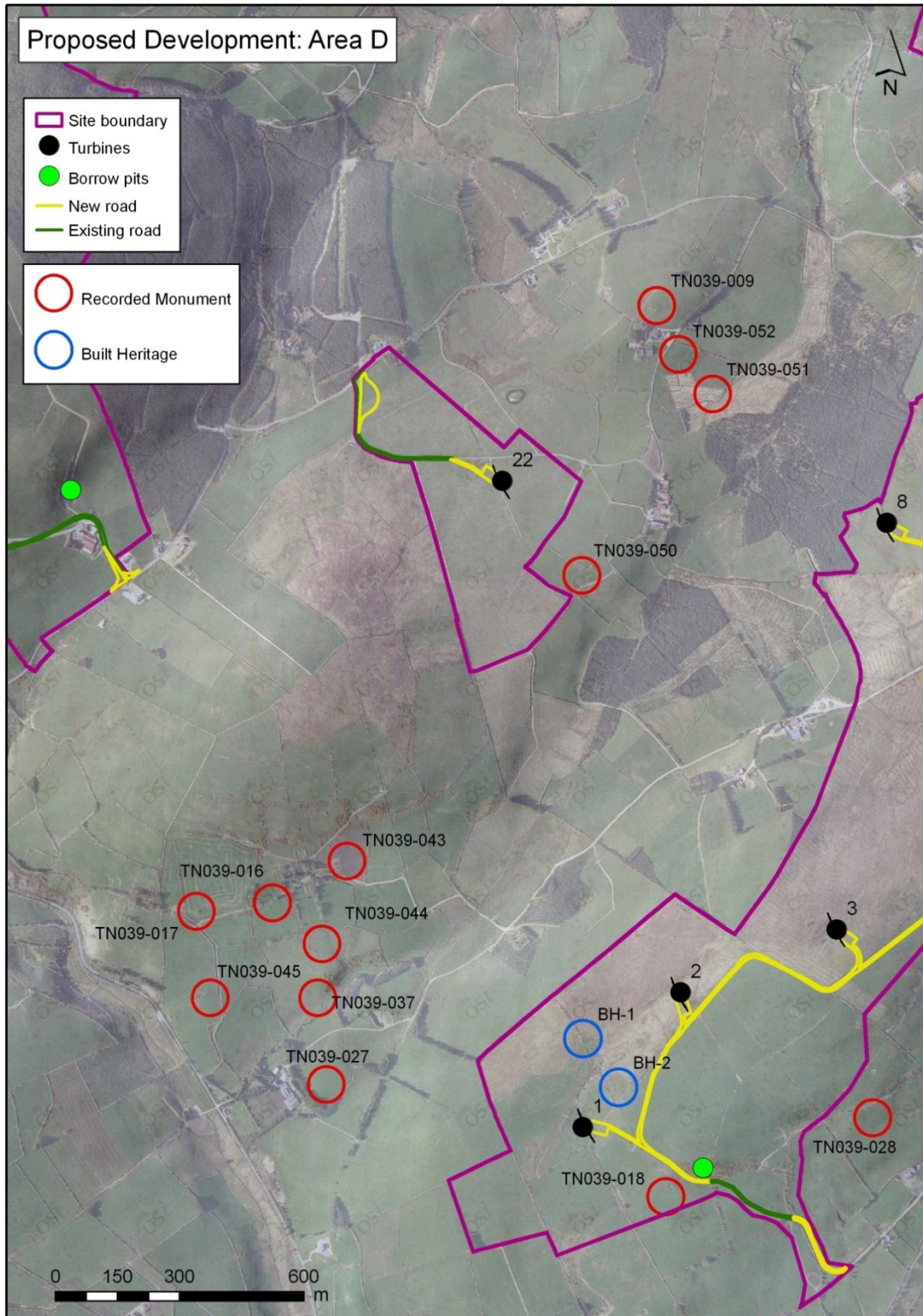


FIGURE 12-12: PROPOSED DEVELOPMENT (AREA D) AND SURROUNDING ENVIRONMENT ON OSI ORTHOPHOTOGRAPH (2005)

12.2.2 Results of field survey

The field inspection of the proposed development area and its immediate environs was undertaken over three days (18th May, 21st May and 22nd May 2012). The weather was inclement on the first day and overcast with occasional sunny spells on the second and third days. A description of the fields visited in each of Areas A-D follows. A photograph of each field is presented in Appendix 12-III and of each turbine location in Appendix 12-IV. A summary table appears at the end of this section (Table 12.4)

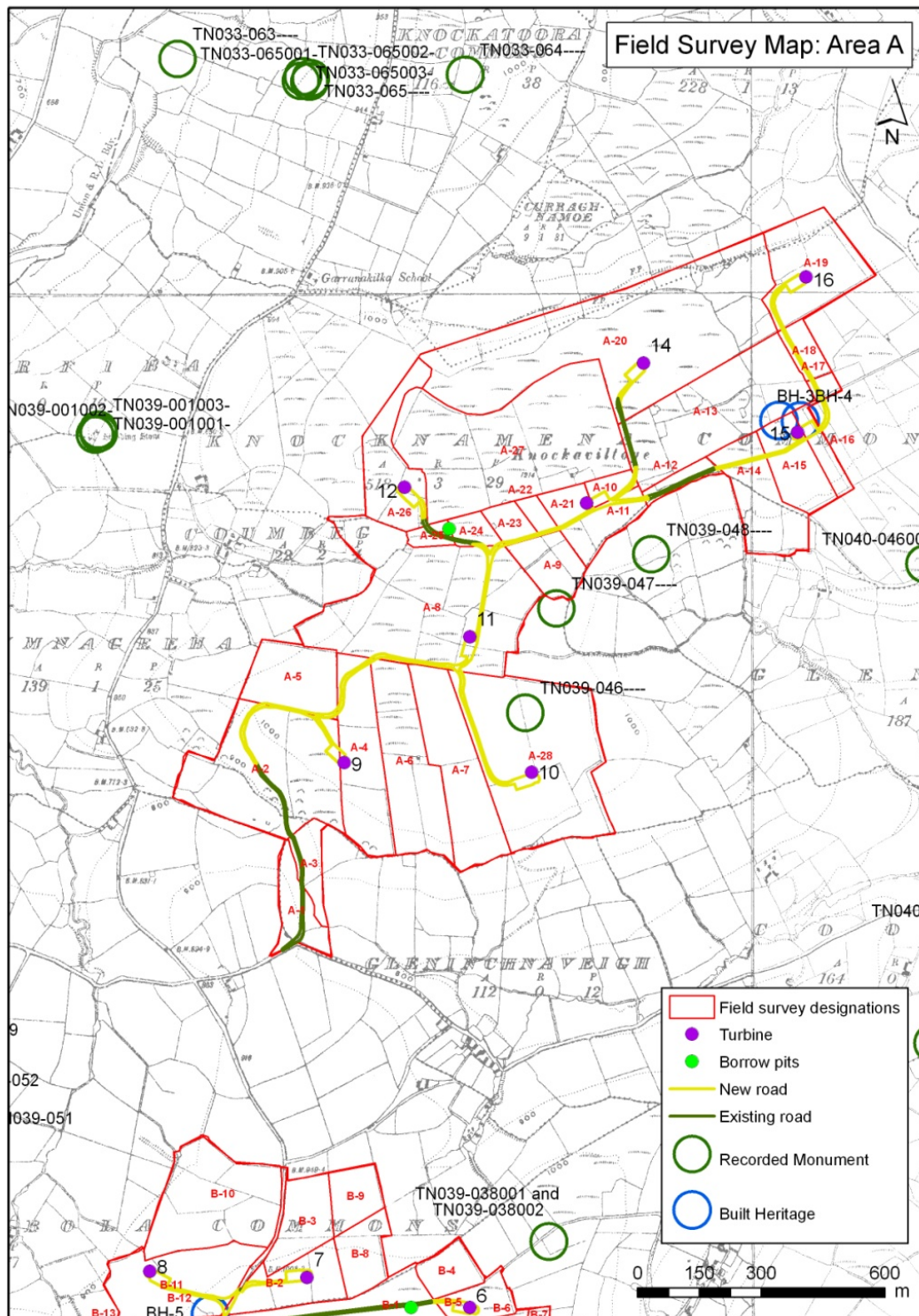
*Upperchurch Windfarm Enviromental Impact Statement***AREA A**

FIGURE 12-13: FIELD NUMBERS AND BOUNDARIES FOR AREA A OF THE PROPOSED DEVELOPMENT

*Upperchurch Windfarm Environmental Impact Statement***Field A-1***Access Rd*

Gate entrance from road to Area A. Gate at S of field. Small stone agricultural building near gate. This building is not visible on the 1st edition OS map. Track runs S-N. Rest of field under young forestry, divided by post and wire fencing. Slopes W-E. No archaeological features visible at the time of the inspection.

Field A-2*Access Rd*

Large field covered by a mixture of young forestry and gorse. Moderate slope from NE-SW. Track continues in a SE-NW direction before turning to the right at the top of the field and running along the N boundry. Surrounded by wire and post fencing. This is the proposed route for the haul road. No archaeological features visible at the time of the inspection.

Field A-3*Access Rd*

Large Pasture field. Surrounded by wire and post fencing. Moderate N-S facing slope with gentle undulations. No archaeological features visible the time of the inspection.

Field A-4*Access Rd**Turbine 9*

Large undulating pasture field. Slopes N-S with a gentle E-W slope at the N end of the field. This is the proposed site of Turbine 9. Patches of boggy ground with reed growth scattered about field. Haul road runs along north boundry of the field. No features of archaeological potential noted.

Field A-5*Access Rd*

Undulating pasture field. Gentle SE-NW slope. Surrounded by wire and post fencing. No features of archaeological potential noted.

Field A-6*Access Rd**Possible mound*

Mixture of pasture and marshy land. Scattered reeds at north end of field. Slopes N-S with gentle undulations. Possible mound at north end of field. Sits on high ground with good panoramic views in all directions. Roughly oval in shape, sixed 17m from E-W and 25m N-S. Rises to approximately 1.5m high. Not visible on the 1st edition OS maps. Proposed haul road runs along the N boundry of this field and passes close to this mound.

*Upperchurch Windfarm Environmental Impact Statement***Field A-7***Possible mound*

Large field of pasture. Good visibility. Declines NW-SE. Bounded by post and wire fencing. Haul road runs along N boundry. L shaped tree formation and NW boundry. At N there is a pile of stones about 6m E-W and 5m N-S. Roughly 1M in height. Possible field clearance. No record on 1st edition OS map.

Field A-8*Turbine 11**Access Rd*

Marshy ground covered in reeds with panoramic views in all directions. Slopes steeply E-W. Field subdivided at lower western side. Proposed site of Turbine 11. Ringfort T039-047 lies just to the E of the field, outside the proposed development area. Bounded by a low earthen bank on all E, W and S sides. Young forestry along the N boundry. Proposed haul road bisects the field N-S.

Field A-9

Field covered in young forestry. Very gentle south facing slope. Forestry meant visibility was very poor.

Field A-10*Turbine 13**Access Rd*

Site of Turbine 13. Slopes gently to S. Small pasture fields. Bounded by earth and stone banks roughly 1m high by 1m wide. Proposed haul road will run over these boundries. No features of archaeological potential noted.

Field A-11*Access Rd*

Gentle S sloping, undulating field posibly used as pasture. Scatterings of stone and surrounded by earth and stone boundry. Some evidence of old boundry walls. Proposed haul road will cross over the north boundry and run along the north of the field. No features of archaeological potential noted.

Field A-12*Access Rd*

Narrow strip of pasture with forestry along the northern boundry. E and W boundries are a 1m high earthen bank. Haul road runs W-E and will bass through these boundries. No features of archaeological potential noted.

Field A-13*Access Rd*

Field is covered in medium aged forestry. Visibility is poor and forestry made the field impossible to visit. Slopes gently W-E. Proposed haul road runs N along with the E boundry. No features of archaeological potential noted.

*Upperchurch Windfarm Environmental Impact Statement***Field A-14***Access Rd*

This field contains mixture of pasture land to the north and reedy marsh land to the south. Rounded by earth and stone boundries about 1m high by 1m wide. Small quarry is visible in the N of the field facing S. Field slopes N-S with gentle undulations. Haul road runs E-W along north end of the field and will cross over the above mentioned field boundries. No features of archaeological potential noted.

Field A-15*Turbine 15**Access Rd*

Undulating pasture field with general NW-SE facing slope. Occasional rocky outcrops throughout field. Bounded by a 1m high by 1m wide bank. Haul road runs along N boundry of the field and will cross these boundries. Contains the proposed site for Turbine 15. Turbine site is in the NE end of the field. Field also contains evidence of a C-shaped enclosure on the N boundry of the field. This consists of stone and earth walls 1.5m wide by .75m high. This is situated approx. 30 M from the E boundry of the field and is quite close to the proposed site of the turbine and the haulroad servicing it. The enclosure is visible on the 1st edition OS map.

Field A-16

Narrow strip of pasture field. Boundries are earthen banks, .75m high by 1.5m wide and are mostly covered in gorse. Field slopes NW-SE. Contains an enclosure which abuts the W boundry of the field and is rectangular in shape. Its dimensions are 18m by 10m. The walls dimensions are similar to the field boundries. There is a slightly raised section(approx .50m) in the middle of the enslosure. It is not visible on the 1st edition OS map.

Field A-17*Access road*

Small pasture field. Poor grazing land sloping gently to the E. Boundries are covered in gorse. Haul road cuts across NW corner of field and will pass through the boundries. No features of archaeological potential noted.

Field A-18*Access road*

Moderate to poor pasture land in use for grazing. Gently undulating with a gentle slope SW-NE. Boundries are earthen and roughly 1m high by 1m wide. North of field is very boggy. Pond on N boundry. Haul road runs along W boundry of the field and passes though the boggy land as it crosses the north boundry. No features of archaeological potential noted.

Field A-19*Turbine 16**Access road*

Proposed site of turbine 16. Undulating pasture with a mixture of grazing land and marshy wetland. Scattered reeds. Slopes from W-E and bisected from N-S by a low boundary. There is a large natural hollow on the north end of the field. Proposed haul road runs along the SW boundary until turning to the E to the turbine site. No features of archaeological potential noted.

Field A-20*Turbine 14**Access road*

Field covered in old forestry. Unable to visit. Contains proposed site for Turbine 14. Field is on a steep S-N slope. No features of archaeological potential noted.

Field A-21*Access road*

Slopes gently NW-SE with heavy undulations. Pastureland with scattered rocky outcrops and marshy wet land patches. Contains a modern concrete structure which cannot be defined but appears to be unused. Field is bounded by a 1m high and 1.5m wide earth and stone bank. Haul road runs roughly E-W, crosses the S bank and runs along the S boundary. No features of archaeological potential noted.

Field A-22*Access road*

Poor pasture with marshy patches as well as occasional rocky outcrops. Undulates heavily with a gentle S facing slope. There is a vertical exposure of bedrock in the NE corner that may be a quarry. Field is bounded by a 1m high and 1.5m wide earth and stone bank. Haul road runs E-W crossing these boundaries. No features of archaeological potential noted.

Field A-23*Access road*

Marshy land with heavy reed covering. Undulates heavily with a gentle S facing slope. N, E and S boundaries consist of earth and stone banks approximately 1m high and 1.5m wide. W boundary defined by forest from field A-9. Proposed haul road runs E-W SW quadrant as a small mound of stones. Not obvious if this is of archaeological interest as it may be part of a field clearance or an old field boundary. Mound is 11m N-S, 8m E-W and 1.5m high. Not visible on the 1st edition OS maps.

Field A-24*Access road*

Rocky exposed ground. Trackway runs along E-W and will be part of the proposed haul road. Steep slope runs N-S. Forestry along S boundary. No features of archaeological potential noted.

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Field A-25

Access road

Rocky exposed ground with patches of gorse. Trackway runs along E-W before turning N and will be part of the proposed haul road. Steep slope runs N-S. Forestry along S boundry. No features of archaeological potential noted.

Field A-26

Turbine 12

Access road

Poor pasture land with a moderate NE-SW slope. Proposed site of Turbine 12. Commanding views of surrounding contryside. Old forestry on the W boundry of the field. No features of archaeological potential noted.

Field A-27

Access road

Large field consisting entirely of gorse and reeds. Steep S-N slope. Proposed alternative haul road runs E-W though this field. Visibility poor. No features of archaeological potential noted.

Field A-28

Turbine 12

Access road

TN039-046

Large field level at N with a gentle N-S slope developing to the S. Contains monument TN039-046, however this monument is much degraded and was not visible on the day the field was visited. Field surrounded and subdivided by wire and post fencing. Haul road runs south along the W boundary before turning E to the proposed site of Turbine 20

AREA B

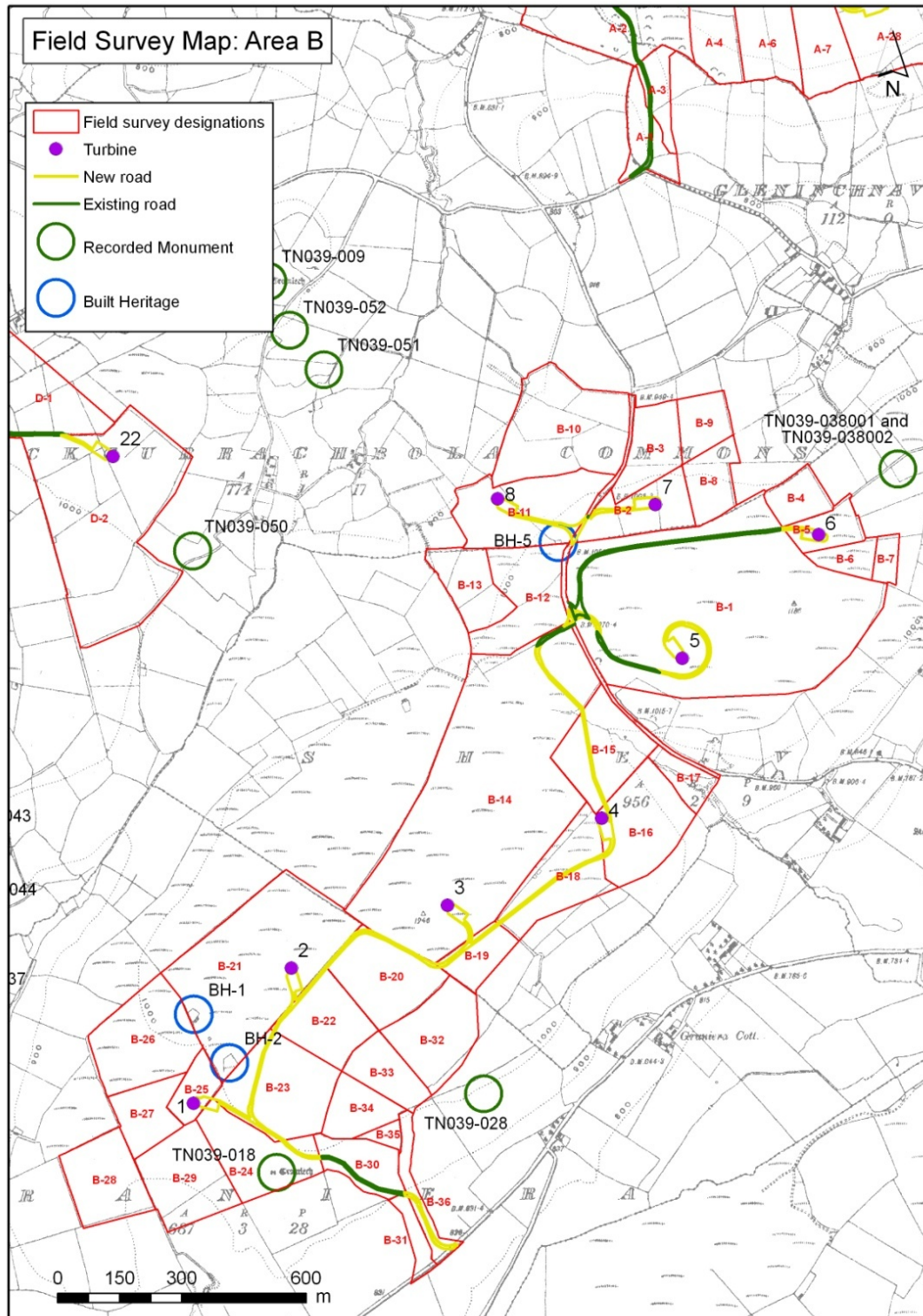


FIGURE 12-14: FIELD NUMBERS AND BOUNDARIES FOR AREA B OF THE PROPOSED DEVELOPMENT

Field B-1*Turbine 5**Access road*

Large field covered in young forest. Contains the peak of a hill and slopes down on each side. Difficult to see ground as it is covered in trees, branches and tree stumps. Existing wind turbines visible to SW. Commanding views of surrounding landscape. Proposed site of Turbine 5. Road runs along the W boundry of the field. Existing track enters field from this road way and runs along the N end of the field and exiting on the E boundry. This is the route of the propped haul road. This route branches to the south in the middle of the field to reach the site of turbine 5. Nothing of archaeological potential noted.

Field B-2*Turbine 7**Access road*

Pasture with forestry on the S boundry. S-N slope, leveling out at the N end of the field. Wide ditch on the E boundry. Proposed turbine 7 site centrally situated with the haul road entering the field from the W. No features of archaeological potential noted.

Field B-3

N-S slope reaching the base of a valley at the S end. Surrounded by earth and stone boundry measuring 1m high by 1.5m wide. Farm building to the N outside proposed development area. No features of archaeological potential noted.

Field B-4

Poor pasture with rushes scatted throughout the field, interspersed with occasional small trees. Earthen bank on 4 sides roughly 1m high and wide. Slopes S-N steeply. No features of archaeological potential noted.

Field B-5*Turbine 6**Access Rd*

Marshy land with a large covering of rushes. Earthen bank on 4 sides roughly 1m high and wide. Moderate to sharp slope S-N. Site of turbine 6. Haul road will cross the W boundry bank to access the proposed turbine location. No features of archaeological potential noted.

Field B-6

Pasture with scattered clumps of reeds. Slopes gently S-N. Earthen bank on 4 sides roughly 1m high and wide. No features of archaeological potential noted.

*Upperchurch Windfarm Environmental Impact Statement***Field B-7**

Large pasture. Development area does not cover the entirety of the field. East facing slope. Gravel pit on S end of the field. Earthen bank on 4 sides roughly 1m high and wide. No features of archaeological potential noted.

Field B-8

Gently S-N sloping pasture field. Scattered stones to the N. Forestry on the S boundry. All sides have a modern deep boundry, roughly 2.5m. No features of archaeological potential noted.

Field B-9

N-S slope reaching the base of a valley at the S end. Surrounded by earth and stone boundry measuring 1m high by 1.5m wide. Cluster of trees at the south boundry of the field. No features of archaeological potential noted.

Field B-10

Cluster of lowlying fields. Mainly wetland with patches of pasture scattered around. Occasional evidence of old boundry walls however few are intact. Difficult to reach so not systematically walked. Entirety of field was visible and no features of archaeological potential noted.

Field B-11

Turbine 8

Access road

SE-NW facing slope. A sharp ridge runs from the S to the NE boundry and north of this the gradient steepens. Several artificial undulations are visible through out the field which be old field boundries. N of field on a vally floor and is extremely wet and boggy. This is the proposed site for turbine 8. The proposed haul road runs from the SE corner of the field down hill to the site of the turbine. A drainage ditch runs along the N boundry and forestry runs along the W boundry. No features of archaeological potential noted.

Field B-12

Pasture with occasional clumps of reeds and wetland. Slopes steeply S-N and surrounded by a 1.5m deep ditch. Road runs along the W boundry. No features of archaeological potential noted.

Field B-13

Field covered in young forestry. Visibility poor. Gentle SE-NW slope. No features of archaeological potential noted.

Field B-14

Turbine 3

Access road

Large field sloping steeply SW-NE. Very poor marsh land. Old forestry to S and W. Haul road cuts acrss the NE edge of the field reenters the field in the SE, accessing the propsed

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site for turbine 3. This site is on the peak of the hill and commanded excellent views of the the surrounding landscape. No features of archaeological potential noted.

Field B-15

Steep S-N slope. Poor, rushy wetland. Deep ditch runs E-W along N edge of the field. 1m high by 1.5m wide earthen banks along the SW and NW boundries. Proposed haul road runs from the NW to SE of the field and crosses these boundries. No features of archaeological potential noted.

Field B-16*Turbine 4**Access road*

Steep SW-NE slope. Reedy covered marchy land. Proposed site of turbine 4 is in the W corner of the field. Surrounded by 1m high and 1.5m wide earthen boundries. Haul road enters in next to the turbine site and exits to the SW. This will go through these exisiting boundries. No features of archaeological potential noted.

Field B-17

Boggy gorse covered field with S-N slope. A stream runs E-W. 1m high and wide boundries on 4 sides with a road runing along the N boundry. No features of archaeological potential noted.

Field B-18*Access road*

Gorse covered wetland sloping SW-NE. Surrounded by bank 1m high and 1m wide. Haul road enters the field in the NE and runs straight through to exit on the SW. This cuts through boundries at both the entry and exit points. No features of archaeological potential noted.

Field B-19*Access road*

Mixture of pasture and marshy wetland. 1m high and wide bank along the N, W and E sides of the field. Thin strip of young foresty along the SW boundry. Hall road runs NE to SW and will cut through one earthen boundry and the forestry No features of archaeological potential noted.

Field B-20*Access road*

Large field of good pasture land. Undulates strangelyat the SW end where it looks terraced but is natural. Earthen bank to the S, N and E up to 1.2m high. W boundry defined by a wire and post fence. Proposed haul road to run along E and N boundries. No features of archaeological potential noted.

*Upperchurch Windfarm Environmental Impact Statement***Field B-21***Turbine 2**Access road**BH-1 and BH-2 : Possible booleys*

Large wetland field sloping steeply E-W. Covered thickly in reeds. Proposed site of turbine 2. Test pit however has been dug in the adjoining field. Haul road enters from the S beside wither the proposed turnbine site is located. Surrounded by an earthen bank roughly 1m high and 1m wide. Possible booley in SW corner of field (35m x 22m) and second one 150m to N (30m x 21m) W. Walls of this booley are 1m high and .5m wide. This is visible on the 1st edition OS map. No other features of archaeological potential noted.

Field B-22*Access road*

Good pasture land with only occasional wet patches. NE to SW slope. Compacted undulations in the NE of field. N and E boundry consists of a 1m high earthen bank. S and W boundries consist of wire and post fencing. Proposes hall road runs long the N boundry. Turbines from a neighbouring windfarm run visible to the SW. No features of archaeological potential were noted.

Field B-23*Access Rd*

Gently undulating NE-SW slope. Good pasture land with 1m high earthen boundries at the N, S and W ends of the field. Wire and post fencing defines the E side. A shallow drainage ditch runs along the N boundry of the field. Proposed haul roads run along the W and N boundries. No features of archaeological potential noted.

Field B-24*Access Rd**TN039-018*

Good pasture land with a gentle NE-SW facing slope. Mild undulations across the field. Haul road runs across the NE corner of the field and will cross over the 1m high earthen boundries with run along all the edges of the field. There is a potential megalithic tomb in the centre of the field with NMS of TN039-018----. Description of this is in the monument table attached.

Field B-25*Access road**Turbine 1*

Small pasture field with a E-W facing slope. Surrounded on all sides by a .8m high earthen bank. Soil is quite peaty and a stream runs along the N boundry. Site of turbine 1 is in the centre of the field and is accessed by a haul road entering the field from the E. No features of archaeological potential noted.

*Upperchurch Windfarm Environmental Impact Statement***Field B-26**

Field is split between marshy, reed covered land to the N and good pasture to the S. Surrounded by a 1m high eathern bank on all sides. Slopes generally N-S. No features of archaeological potential noted.

Field B-27

Good pasture land with a N-S facing slope and gentle undulations. Surrounded by a 1m high eathern bank on all sides. No features of archaeological potential noted.

Field B-28

Good pasture land with a gentle W-E slope. There is a clump of trees in the SW and the grass is long beneath the same. A curve of reeds is visible in the SE and a drainage ditch runs E-W along the S part of the field. No features of archaeological potential noted.

Field B-29

Good pasture land with NE-SW facing slope. Stream runs along SW boundry. Surrounded by a 1m high eathern bank on all sides. No features of archaeological potential noted.

Field B-30*Access road*

Good undulating pasture land with a general NE-SW slope. Banked by trees to the N. A large quarry can be seen in the NW corner of the field. The rest of the field is defined by wire and post fencing. Proposed haul road runs from NW to SE corners of the field. No features of archaeological potential noted.

Field B-31*Access road*

Undulating pasture leading to the main road way to the south. Haul road runs N-S to the main road. No features of archaeological potential noted.

Field B-32

Moderate NE-SW sloping pasture field with some reeds visible. Low ditch and bank on W and N sides adjacent to new line of pine hedging. No features of archaeological potential noted.

Field B-33

Large field of good short pasture. Field slopes moderately N-S in northern half becoming steep in the southern half. Bordered by post and wire fencing. No features of archaeological potential noted.

Field B-34

As per field B-33 (adjacent field). No features of archaeological potential noted.

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Field B-35

Triangular shaped N-S sloping pasture field. Bordered to the east by a 1m high bank. No features of archaeological potential noted.

Field B-36

Steep N-S facing pasture field. Slope moderates as it approaches road. Rich pasture with a boundry 1.2m high. Field half within site area. No features of archaeological potential noted.

AREA C

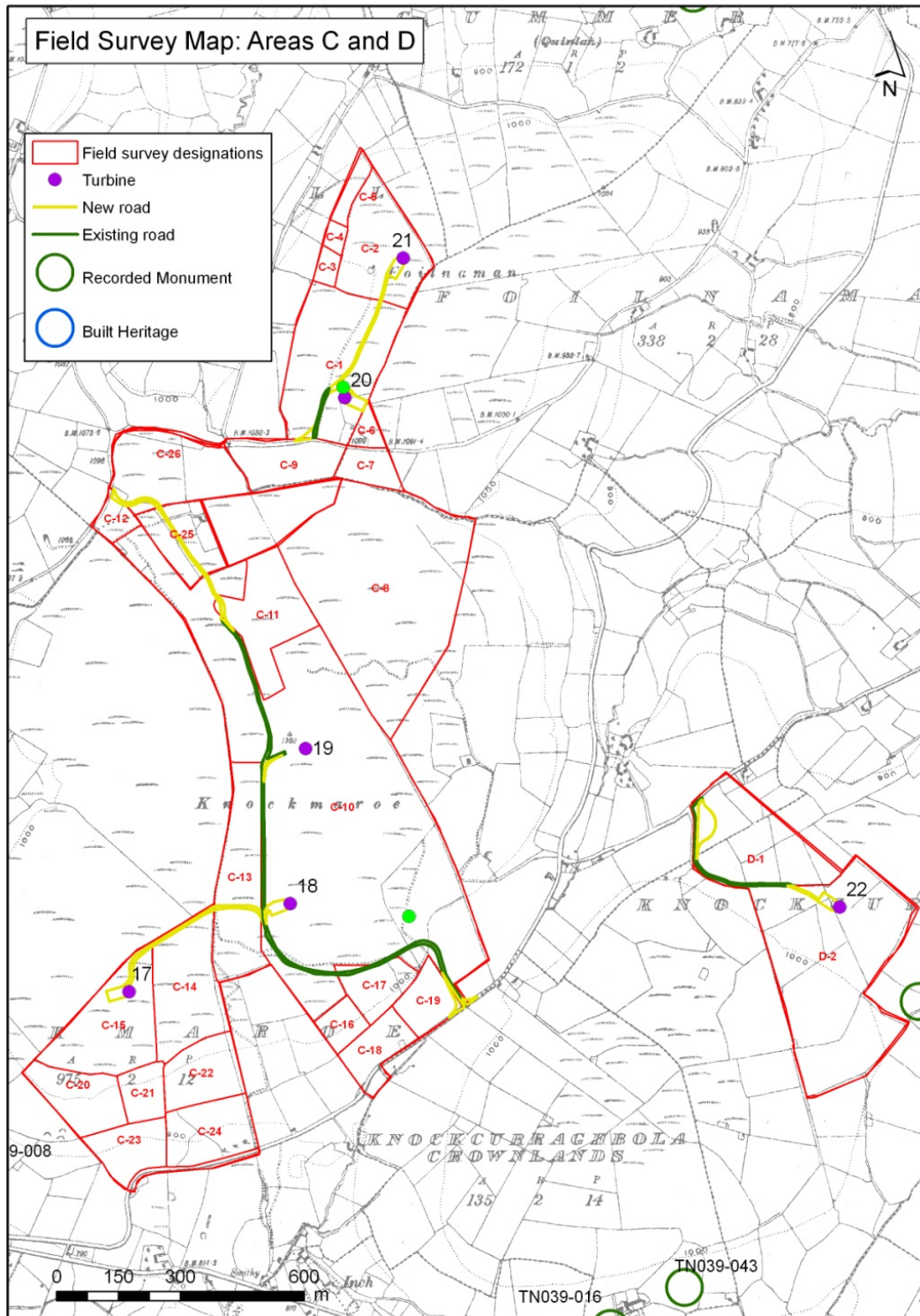


FIGURE 12-15: FIELD NUMBERS AND BOUNDARIES FOR AREAS C AND D OF THE PROPOSED DEVELOPMENT

*Upperchurch Windfarm Environmental Impact Statement***Field C-1***Turbine 20**Access road*

Pasture land with undulations and a gentle N-S and W-E facing slopes. Some reads along W boundry. Bisected N-S by an existing road which will form the basis of the proposed haul road. Turbine 20 is centrally located within the field and is situated on a spot with commanding views of the surrounding landscape. There is a quarry in the SE quadrant of the field. There is a road along the south boundry with a concrete gateway into the field. It is bound on 4 sides by a 1.5m high earth and grass bank. The haul road will cross over the N boundry. Field also contains an indeterminate artificial mound which is currently under long grass. This is probably an agricultural feature. No other features of archaeological potential noted.

Field C-2*Turbine 21**Access Road*

Gorse and reed cover land with a SE-NW facing slope. The SE area of the field is quite boggy. Ground improves to good pasture land as you go down hill. Bound on all sides by stone and earth bank 1m high and 1.5m wide. Impressive all around view. Proposed haul road crosses the S boundry and approaches the site of turbine 21 which is located on a very steep slope. Possible mound at the left side of the hill 1m high and about 2m square. Stones are stood on their sides. No evidence of it being an archaeological feature on the 1st edition OS maps or the NMS. No other features of archaeological potential noted.

Field C-3

Pasture land with a moderate SE-NW slope. Surrounded by a 1m high and 1m wide earth and stone bank. No features of archaeological potential noted.

Field C-4

Pasture land with a moderate SE-NW slope. Surrounded by a 1m high and 1m wide earth and stone bank. Evidence of a stone wall on the along the N boundry approximately 1m high and 1.5m wide. No features of archaeological potential noted.

Field C-5

Very rocky pasture land with a SE-NW slope. Surrounded on 4 sides by a stone wall boundry approximately 1m high by 1.5m wide. No features of archaeological potential noted.

Field C-6

Small tringular shaped field of pasture land with a gentle NE-SW slope. Surrounded by a 1.75m high ditch and a round runs along its S boundry. No features of archaeological potential noted.

Field C-7

Good pasture field covered in long grass on little or no slope. It is bisected by a wire and post fence running E-W. A 1m deep gully runs along the W boundry. A 2m high bank

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runs along the N boundry. Forestry from field C-8 defines the S boundry. No features of archaeological potential noted.

Field C-8

This large field is completely covered in old forestry. It lies on a moderate SW-NE slope. Visibility is poor. No features of archaeological potential noted.

Field C-9

Field of pastureland with gentle undulations. It is bisected E-W by wire and post fencing. Patches of marshy ground are scattered across the field. A deep ditch runs along the N boundry. No features of archaeological potential noted.

Field C-10

Turbine 18

Turbine 19

Access Rd

Large lush pasture land rising to the peak of the hill it is situated on. Slopes mainly from N-S however slopes in all other directions from the peak. The field is subdivided by wire and post fencing. Forestry runs along its E and W boundries. A quarry is visible in the SE of the field next to a collection of modern farm buildings. The haul road enters the field in the SE and runs along the south boundry before turning N for the length of the field, branching off at the location of the two turbines. There is an existing farm track that the haul road is proposed to follow. There is a communications tower also at the highest point of the field. As this is the highest point in the development area it affords excellent views of the surrounding landscape, including areas A, B and D. There is a mound of stones at the N end of the field. Stones are large, up to 2m by 1m and the pile of stones itself covers an area of 5m by 5m. A similar pile of stones in the corner of the field is most likely a field clearance. No other features of archaeological potential noted.

Field C-11

Marshy bogland covered in reeds. Bog is raised to the height of 1m. S-N facing slope. There is a ditch running E-W across the field which turns into a ridge and the incline steepens. No features of archaeological potential noted.

Field C-12

Small field of good pastureland with a S-N slope. A ditch and post and wire fence runs along the SE boundry. Forestry defines the SW boundry. To the NW there is a road with a gate way into the fiel. No features of archaeological potential noted.

Field C-13

Access road

Marshy wetland covered in reeds with a N-S facing slope. Bordered to the W by forestry and on the other three sides by wire and post fencing. A shallow ditch runs from E-W.

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The boundry in the SW corner is a 1m high by 1m wide bank with wire and post fencing. The proposed haul road crosses the field E-W and will pass over this boundry. No features of archaeological potential noted.

Field C-14*Access road*

Pasture field with a gentle N-S slope. There is a ridge running E-W across the field and S of this the slopes sharpens considerably. The field is bound on all sides by a 1m high and wide earthen bank with post and wire fencing. To the N is dense forestry. The proposed haul road enters the field in the NE and exits in the NW runing along the Norther boundry and crossing the existing banked boundries. No features of archaeological potential noted.

Field C-15*Turbine 17**Access road*

Pasture with a gentle NE-SW facing slope. Bound to the N by thick forestry and on all other sides by a 1m high by 1m wide ditch. Proposed site of turbine 17 is in the NE corner of the field. No features of archaeological potential noted.

Field C-16

Rectangular pasture field with a N-S slope. Bordered to the south by a 1m high and wide ditch and on all other sides by wire and post fencing. No features of archaeological potential noted.

Field C-17

Pasture field with a N-S slope. Bordered to the south by a 1m high and wide ditch and on all other sides by wire and post fencing. No features of archaeological potential noted.

Field C-18 and C-19

Ploughed field with a gentle N-S slope. Bordered by a 2m high by 1.5m high bank. No feaures of archaeological potential visible.

Field C-20

N-S facing pasture surrounded by a 1m high and 1m wide bank. Clump of trees in the SE corner. Existing farm track runs from S to N. No features of archaeological potential noted.

Field C-21 and C-22

N-S facing pasture surrounded by a 1m high and 1m wide bank. No features of archaeological potential noted.

Field C-23

Pasture with a gentle N-S slope. Banked on all sides by a 1m high by 1m wide boundry. A gravel pit is evident in the SE quadrant of the field. An exisiting farm trackway runs

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from the N boundry to the S and through a gate onto the main road with runsalong the S boundry. No features of archaeological potential noted.

Field C-24

N-S facing pasture surrounded by a 1m high and 1m wide bank. Some trees in the SE corner. No features of archaeological potential noted.

Field C-25

Access road

Pasture with a moderate SE-NW slope. Ditched on the N boundry and fenced on the S. Access road runs N-S through this field. No features of archaeological potential noted.

Field C-26

Access road

Reed covered boggy ground. Access road runs N-S through this field where it exits to the N onto the existing road. No features of archaeological potential noted.

AREA D

Field D-1

Access road

Area is completely covered in young forestry. Track runs N-S through middle of forest. Visibility very poor. Land is level. Haul road runs along S boundry. No feaures of archaeological potential noted.

Field D-2

Turbine 22

Access road

Area is completely covered in young forestry. Track runs N-S through middle of forest and is the proposed site of the haul road access to the turbine site. Visibility very poor. Land is level. Haul road runs along N boundry. No feaures of archaeological potential noted.

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TABLE 12-4 SUMMARY OF TURBINE LOCATIONS VISITED IN FIELD SURVEY

Turbine Number	Field Number	Description
1	B-21	Small pasture field with a E-W facing slope.
2	B-21	Large wetland field sloping steeply E-W.
3	B-14	Steeply sloping marshy ground
4	B-16	Steeply sloping marshy ground
6	B-5	Sloped marshy land with a large covering of rushes.
7	B-2	Sloped pasture field
5	B-1	Large field covered in young forest.
18	C-10	Large lush pasture land rising to the peak of the hill it is situated on
19	C-10	Large lush pasture land rising to the peak of the hill it is situated on
21	C-2	Gorse and reed cover land with a SE-NW facing slope.
8	B-11	Steeply sloped marshy wetland.
10	A-28	Large level pastureland
9	A-4	Gently sloping pasture field
11	A-8	Steeply sloping marshy ground
12	A-26	Poor pasture land with a moderate NE-SW slope
13	A-10	Small gently sloping pasture field
15	A-15	Sloped pasture field
16	A-19	Undulating pasture with a mixture of grazing land and marshy wetland.
14	A-20	Field covered in old forestry
17	C-15	Pasture with a gentle NE-SW facing slope.
20	C-21	Pasture land with undulations and a gentle N-S and W-E facing slopes.
22	D-2	Level field completely covered in young forestry.

12.3 POTENTIAL IMPACT OF THE PROPOSAL

This section describes the potential impacts of the proposed scheme; these are summarised in Table 12.1.

12.3.1 Construction Phase

12.3.1.1 Direct Impacts

There will be no direct impacts on any cultural heritage sites, features or items. The possibility exists however that previously unknown archaeological material could be impacted upon by the proposed development given the high number of Recorded Monuments in close proximity to development.

12.3.1.2 Indirect Impacts

There will be no indirect impact on any of the recorded monuments in the study area.

There is the low potential for adverse indirect impacts on cultural heritage sites within the study area. The possibility also exists that previously unknown archaeological/cultural heritage material could be impacted upon by the proposed development.

12.3.1.3 Interaction with Other Impacts

None were identified during the assessment.

12.3.2 Operational Phase

12.3.2.1 Direct Impacts

There will be no direct impacts on any cultural heritage sites, features or items during the operational phase.

12.3.2.2 Indirect Impacts

Eight out of 101 sites within the 4km study area will have intervisibility with all 22 wind turbines. During the operational phase the development will lead to a visual impact upon the archaeological landscape.

12.4 REMEDIAL OR REDUCTIVE MEASURES

12.4.1 Construction Phase

12.4.1.1 Direct Impacts

Due to the possibility of the survival of sub-surface archaeological deposits or finds within the development area, it is recommended that all groundworks associated with the proposed development be archaeologically monitored under licence to the National Monuments Service.

12.4.1.2 Indirect Impacts

It is recommended that a buffer-zone where development is precluded, be instituted around the Recorded Monument in the proposed development area. This should measure a minimum of 30m around the site. In addition no site offices, depots or storage facilities should be placed within these buffer zone.

12.4.2 Operational Phase

12.4.2.1 Direct Impacts

As there will be no direct impacts on any cultural heritage sites, features or items during the operational phase no remedial or reductive measures are required.

12.4.2.2 Indirect Impacts

During the operational phase the development will lead to a visual impact upon the archaeological landscape. See visual and landscape assessment chapter for remedial/reductive measure.

12.5 MONITORING

Monitoring is discussed in section 12.4.1 above.

12.6 REINSTATEMENT

Any site requiring re-instatement will be established in conjunction with the statutory authorities.

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12.7 BIBLIOGRAPHY

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Maps

First edition 1837 Ordnance Survey map sheet 69

Second edition 1920 Ordnance Survey map sheet 69

Griffiths's Valuation maps and valuation report

Records of Monuments and Places (RMP) constraints maps sheet 69

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Aerial photographs

1995 Ordnance Survey orthophotography

2000 Ordnance Survey orthophotography

2005 Ordnance Survey orthophotography

2012 Google Earth

Tile supplied by Ecopower Developments Ltd

APPENDIX 12-1

DESCRIPTION OF RMP SITES WITHIN STUDY AREA.

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Table 1: Descriptions of Recorded Monuments within a 4km radius of proposed development. Table extracted from Archaeological Survey of Ireland database

SMRS	NAT_GRID_E	NAT_GRID_N	TLAND_NAME	CLASSDESC	Description
TN033-026----	194430	165750	DAWSONSBOG	Enclosure possible	Situated on level ground at the base of a SE-facing hillslope with a stream, which forms the townland boundary, running NE-SW c. 15m S of the site. Depicted on the 1st ed. (1840) OS 6-inch map as a roughly pear-shaped enclosure, which is semicircular from NE to S to SW and then straightens and tapers towards the townland boundary. It is only partially depicted on the 1902 ed. The site has been levelled but is still visible as a large irregular enclosure (dims. 44m N-S; 57m NW-SE) defined by a very low bank (Wth 2.7m; int. H 0.18m; ext. H 0.14m).
TN033-027----	194710	163350	GLASTRIGAN	Stone Row	Situated at the base of the N slope of a small hillock which in turn is on the SE-facing slope of a ridge in an upland area. Site indicated on 1st ed. (1840) OS 6-inch map as 'Three Stones'. Not depicted on subsequent 2nd (1902) ed. A row of four stones, aligned NE-SW, with a possible fifth stone (H 1.3m; Wth 0.45m; T 0.2m) lying prostate near a gap in the row; overall length 7.63m. These limestone orthostats are set in a slight hollow with little evidence of packing-stones, though there are tufts of grass around the bases. The largest standing stone (H 1.78m; 1.56m x 0.4m), at SW end, has a hole in the SE face into which hands were dipped as a cure for warts. From NE to SW the remaining three stones measure: (1) H 1.05m; 0.76m x c.0.3m (2) H 1.56m; 1.47m x 0.28m (3) H 0.95m; W 0.8m x 0.53m.

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TN033-029001-	195250	165610	GREENAN	Castle - Ringwork possible	Situated at the base of a S-facing slope in an undulating valley with a stream c. 10m W of the site running N-S. A small hillock has been artificially scarped to create a large, trapezoidal, grass-covered platform (66m max. N-S; 29.5m min. N-S; 63m E-W) enclosed by a low, earth and gravel bank (Wth 1.3m; int. H 0.35m; ext. H 1.57m) which falls steeply to the exterior and is relatively insignificant internally. The bank is levelled at NE and the S end of the E side has been denuded by modern agriculture. There is no fosse visible around the base of the platform though there is a slight dip (Wth c. 1m) which is quite wet. A fulacht fia (TN033-029002) is incorporated into the NE angle of the site and another (TN033-029003) lies immediately N of the site.
TN033-029002-	195250	165610	GREENAN	Fulacht Fia	Situated at the base of a S-facing hill in an undulating valley with nearby fulacht fia (TN033-029003) to W. A mound of burnt material (dims. 5.3m NE-SW; 7.5m NW-SE; H 0.33m) incorporated into the NE angle of a possible ringwork (TN033-029001).
TN033-029003-	195250	165610	GREENAN	Fulacht Fia	Situated at the base of a S-facing hill in an undulating valley with nearby fulacht fia (TN033-029002) to E. Located immediately N of a possible ringwork (TN033-029001). A large horseshoe-shaped mound of burnt material (dims. 14.8m E-W; H above ext. 0.66m) with possible trough area at S (dims. 3.8m N-S; 2.8m E-W; H above possible trough 0.9m).
TN033-041001-	192300	164960	CLONTAARFE	Standing Stone - Pair	Situated on a natural hillock in a valley, enclosed by high ground except to S. The immediate area is wet and rushy and has been planted with coniferous forest, as has the monument itself. The stone pair, composed of shaly limestone, is aligned on an NE-SW axis, with the larger stone (H 0.9m; L 1.6m; T 0.76m) to the SW and the smaller (H 0.82m; L 0.98m; T 0.13-0.25m) located 0.7m to the NE. The stones are roughly centrally placed within a kerbed enclosure (TN033-041002) which consists of a bank with internal and

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					external stone revetment. Only the SE and SW portion of the bank survives.
TN033-041002-	192300	164960	COMMAUN BEG	Enclosure	Situated on a natural hillock in a valley, enclosed by high ground except to S. The immediate area is wet and rushy and has been planted with coniferous forest, as has the monument itself. The stone pair (TN033-041001), composed of shaly limestone, is aligned on an NE-SW axis, with the larger stone to the SW and the smaller located 0.7m to the NE. The stones are roughly centrally placed within a kerbed enclosure (diam. 10.7m E-W), which consists of a bank (Wth 1.4m; int. H 0.32m; ext. H 0.4m) with internal and external stone revetment. Only the SE and SW portion of the bank survives.
TN033-042----	192700	163940	CURREENY	Megalithic Structure possible	Situated on a gentle SE-facing slope in wet, upland terrain. A line of three closely set, upright stones orientated NE-SW. The largest, to the NE, measures 0.52m H (L 0.8m), the middle stone is 0.49m H (L 0.53m) and the SW stone is 0.62m H (L 0.45m). Approx. 5m to the SW there are four embedded stones arranged in pairs - possible double walling. This possible walling, running NW-SE, is 1.5m long and c. 0.7m wide. The largest stone is 0.37m high. The distance from the three uprights to the end of the walling is 6.3m. The landowner has dumped a number of boulders on and near the walling, these are loose. The possible remains of a much denuded tomb.

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TN033-046----	194000	163020	GLASTRIGAN	Barrow - Mound Barrow possible	In flat poorly drained pasture on N side of the Clodiagh River in an upland region. The site consists of an irregular-shaped flat-topped earthen mound (H 2m; base dims. 20m NE-SW x 16m SE-NW) the top of which is defined by a scarp. The flat summit (diam. 12m NE-SW x 6m SE-NW) has a central depression (dims. D 0.3m; 1.7m x 1.3m) which may be an indication of a collapsed cist. Known locally as Quigley's fort.
TN033-051----	191320	165320	GORTAHUMMA	Barrow - Ring- Barrow possible	Situated on a S-facing slope of poorly drained ground in an upland region surrounded by modern coniferous plantation. A low poorly preserved irregular-shaped mound (Dims. 5m N-S; H 0.5m) enclosed by an inner fosse (Wth 2.2m; D 0.3m) and outer bank (Wth 1.5m; H 0.1m) visible at N only. The bank is intersected at N by a townland boundary extending NE-SW.
TN033-059----	196568	164312	CAPPANAVILLA	Fulacht Fia	Situated on wet poorly drained NW facing slope of rising ground in upland mountain valley overlooking valley to W. Higher ground to S and E. Roughly horseshoe shaped mound (H 0.5-0.8m; dims. 13.5m N-S; 9m E-W) of burnt material with slight depression (D 0.2m; 2m x 2m) in W face, facing onto old drain running N-S to W of fulacht.
TN033-060----	196570	164473	CAPPANAVILLA	Barrow - Ring- Barrow	Impressive well preserved ring-barrow situated on wet poorly drained grassland on N facing slope in upland area overlooking river valley below to W, higher ground to E. Well preserved monument consisting of a circular area (diam. 4.1m N-S; 4.1m E-W; H above fosse 0.6m) enclosed by an inner fosse (base Wth 1m; top Wth 1m; ext. D 0.5m) and outer bank (Top Wth. 1.8m; base Wth 1.8m; ext. H 0.5m). Gap in bank at NNW probably the result of livestock poaching, livestock gap. No other features visible. Site has good views looking down into mountain valley which runs E-W. Overall diameter of monument 8.9m N-S x 9.8m E-W.

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TN033-061----	196733	164125	CAPPANAVILLA	Barrow - Ring- Barrow possible	Situated in pasture on fairly level ground, in mountainous region with good panoramic views in all directions. Much degraded monument that is barely visible as a low circular rise of ground (diam. 11m SE-NW; 10m NE-SW) defined by a fosse (Wth 2m; ext. D 0.2m) with the slightest traces of an outer bank. Site is severely degraded and is only visible during the winter months.
TN033-062----	196427	164035	GARRANAKILKA	Fulacht Fia	Situated on poorly drained land with a stream immediately to the SE. Roughly crescent-shaped mound (max. H 1m; dims. 13m NW-SE; 10m NE-SW) of burnt material with slight shallow depression in S face of mound. This depression may indicate possible location of trough area.
TN033-063----	195701	163352	GARRANAKILKA	Barrow - Ring- Barrow	Situated on poorly drained W facing slope overlooking Clodiagh River in mountain valley. River runs through base of mountain valley from N to S. Higher ground overlooks barrow to E. Well preserved site consisting of a low oval-shaped sunken area (diam. 7.5m N-S) enclosed by a slight bank (Wth 3m; int. H 0.1m) and outer fosse (base Wth 2m; ext. D 0.2m). Overall diameter of site measures 21m N-S; 16m E-W. Not clear whether the sunken area in the centre is enclosed by a bank or is this just a bank created by the sunken interior.
TN033-064----	196397	163314	KNOCKATOORA COMMONS	Barrow - Ring- Barrow possible	Situated atop high ground with good panoramic views in all directions. Barely visible and much degraded site consisting of a low circular mound (diam. 1.5m; H 0.1m) enclosed by an inner fosse (Wth 3m; ext. D 0.1m) and outer bank (Wth 3m ; ext. H 0.1m). The overall diameter of the site measures 11m N-S. The small size of the mound casts some doubts on its antiquity. May have been formed by the presence of a ring-feeder though not sure, its excellent panoramic views may suggest that this is a burial monument.

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TN033-065----	196020	163297	GARRANAKILKA	Barrow - Ring- Barrow possible	<p>One of a group of four possible ring-barrows although their arrangement and state of preservation may suggest ring-feeders. Their size and siting on a steep slope and situated to a nearby ring-barrow suggests that they may be authentic ring-barrows. It would have been an unlikely location on a steep slope for a ring-feeder, local land-owner has no memory of ever using a ring-feeder in this field. Situated on the NW-facing slope of rising ground in upland area overlooking Clodiagh river valley to W, higher ground to E. Monument consists of a low circular mound (diam. 1.6m; H 0.2m) enclosed by an inner fosse (Wth 2m; ext. D 0.2m) and outer bank (Wth 3m; ext. H 0.2m) which is visible only on the downward slope side from SW through W to NW only, not visible and doubt if ever there was an outer bank on the upslope side of the barrow. Overall the monument measures 10m in diameter N-S. This barrow has a second barrow (TN033-065001) conjoined to its NE side and both of these barrows are located 20m to the E of the other two barrows (TN033-065002; TN033-065003)</p>
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TN033-065001-	196023	163305	GARRANAKILKA	Barrow - Ring- Barrow possible	<p>One of a group of four possible ring-barrows although their arrangement and state of preservation may suggest ring-feeders. Their size and siting on a steep slope and situated to a nearby ring-barrow suggests that they may be authentic ring-barrows. It would have been an unlikely location on a steep slope for a ring-feeder, local land-owner has no memory of ever using a ring-feeder in this field. Situated on the NW-facing slope of rising ground in upland area overlooking Clodiagh river valley to W, higher ground to E. Monument consists of a low circular mound (diam. 1.8m; H 0.2m) enclosed by an inner fosse (Wth 2.5m; ext. D 0.2m) and outer bank (Wth 2.6m; ext. H 0.2m) which is visible only on the downward slope side from SW through W to NW only, not visible and doubt if ever there was an outer bank on the upslope side of the barrow. Overall the monument measures 10.5m in diameter N-S. This barrow has a second barrow (TN033-065002) located 12m to the NE and both of these barrows are located 20m to the W of the other two barrows (TN033-065; TN033-065001)</p>
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TN033-065002-	196004	163310	GARRANAKILKA	Barrow - Ring- Barrow possible	<p>One of a group of four possible ring-barrows although their arrangement and state of preservation may suggest ring-feeders. Their size and siting on a steep slope and situated to a nearby ring-barrow suggests that they may be authentic ring-barrows. It would have been an unlikely location on a steep slope for a ring-feeder, local land-owner has no memory of ever using a ring-feeder in this field. Situated on the NW-facing slope of rising ground in upland area overlooking Clodiagh river valley to W, higher ground to E. Monument consists of a low circular mound (diam. 1.8m; H 0.2m) enclosed by an inner fosse (Wth 2.5m; ext. D 0.2m) and outer bank (Wth 2.6m; ext. H 0.2m) which is visible only on the downward slope side from SW through W to NW only, not visible and doubt if ever there was an outer bank on the upslope side of the barrow. Overall the monument measures 10.5m in diameter N-S. This barrow has a second barrow (TN033-065002) located 12m to the NE and both of these barrows are located 20m to the W of the other two barrows (TN033-065; TN033-065001)</p>
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TN033-065003-	196000	163299	GARRANAKILKA	Barrow - Ring-Barrow possible	One of a group of four possible ring-barrows although their arrangement and state of preservation may suggest ring-feeders. Their size and siting on a steep slope and situated to a nearby ring-barrow suggests that they may be authentic ring-barrows. It would have been an unlikely location on a steep slope for a ring-feeder, local land-owner has no memory of ever using a ring-feeder in this field. Situated on the NW-facing slope of rising ground in upland area overlooking Clodiagh river valley to W, higher ground to E. Monument consists of a low circular mound (diam. 1.8m; H 0.2m) enclosed by an inner fosse (Wth 2.5m; ext. D 0.2m) and outer bank (Wth 2.6m; ext. H 0.2m) which is visible only on the downward slope side from SW through W to NW only, not visible and doubt if ever there was an outer bank on the upslope side of the barrow. Overall the monument measures 10.5m in diameter N-S. This barrow has a second barrow (TN033-065002) located 12m to the NE and both of these barrows are located 20m to the W of the other two barrows (TN033-065; TN033-065001)
TN034-055----	197850	164980	BALLYNAHOW (GLENKEEN PAR.)	Ringfort - Rath possible	Situated on top of a natural rise of ground in a river valley in a mountainous region. A raised circular area (diam. 15m E-W) enclosed by an earth and stone bank (Wth 1.5m; int. H 0.3m; ext. H 1m) with slight traces of a shallow fosse. Possible entrance gap (Wth 2.5m) at NE.
TN034-056001-	199460	164860	KILLAMOYNE	Ringfort - Rath	Situated on a low natural rise of ground in a poorly drained river valley in a mountainous region. A raised circular area (diam. 31m E-W) enclosed by an earth and stone bank (Wth 1.5m; int. H 0.65m; ext. H 1m) and waterlogged external fosse (Wth 3m; D 0.2m). No entrance feature visible.
TN034-056002-	199470	164900	KILLAMOYNE	Redundant Record	Drainage features and vegetation growth show up on aerial photographs. These are non-archaeological features.

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TN034-057----	199740	165780	KILLAMOYNE, ROSNAMULTEENY		Situated on the summit of a hill in a mountainous region with extensive views. An impressive bivallate earthwork consisting of a raised circular area (diam. 28m NE-SW) enclosed by two earth and stone banks with a narrow deep intervening fosse (Wth 1m; D 1m) and a causewayed entrance (Wth 3.8m) at ESE. The inner bank (Wth 3.5m; int. H 1.7m; ext. H 3-4m) is the best preserved while the outer bank (Wth 1.5m; ext. H 0.2m) is mainly reduced to a scarp and is destroyed by a modern road at N.
TN034-065----	200200	165140	CURRAGHCARROLL, DRUMGILL	Ringfort - Rath	Situated on a NW-SE ridge on a NE slope of rising ground in a mountainous region. A circular area (diam. 45m NW-SE; 38m E-W) enclosed by two earth and stone banks with an intervening fosse (Wth 1.5m; D 0.8m). The inner bank (Wth 1.2m; ext. H 1.5m; int. H 0.8m) is the best preserved while the outer bank (Wth 1.5m; ext. H 0.8m), visible from N through E to S, is elsewhere destroyed. A townland boundary bisects the site on a NE-SW axis. Quarry holes are scattered around the interior of the ringfort.
TN034-081----	198553	164262	CASTLEHILL, RUSHEEN BEG	Ringfort - Rath	Situated on a S-facing slope of rising ground in a river valley in a mountainous region. A raised circular area (diam. 34m N-S) enclosed by an earth and stone bank (Wth 2m; int. H 0.5m; ext. H 1.7m) with traces of a shallow external fosse (Wth 1m; D 0.2m). The bank is reused as a townland boundary from N to E and is reduced to a scarp in places. No clear entrance feature visible.
TN034-082----	199841	164281	RUSHEEN MORE	Enclosure	Situated on an E-W ridge on a N-facing slope of rising ground in a mountainous region. The barely discernible outline of a much degraded enclosure (approx. diam. 30m) with adjoining modern bungalow located on the site of the original conjoined enclosure to the S. No other features visible.

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TN034-083----	200910	163840	GORTNAHALLA	Moated Site possible	Situated on a NW-SE ridge overlooking a river ravine below to the N. Depicted as a rectangular enclosure on the 1st ed. (1840) OS 6-inch map. Only the SE bank (Wth 2m; int. H 0.4m; ext. H 1m) of a rectangular enclosure survives (dims. 22m NE-SW; 35m NW-SE) with traces of an external fosse.
TN034-114----	199020	163460	RUSHEEN MORE	Standing Stone	Situated on top of a broad, flat ridge in upland pasture. Extensive views in all directions except to W. The stone (H 1.46m; dims. 0.93 x 0.32), composed of shaley limestone, is aligned N-S; the weathered top rises to a point. There is a hollow around the base of the stone caused by cattle.
TN034-115----	199720	163590	GORTNACRAN MORE	Fulacht Fia possible	Situated on a valley floor, in wet, marshy terrain, at the base of a steep hill which rises immediately to the SE. A much denuded mound (dims. 9m x 4.5m; H 0.15m-0.35m) with very dark soil, friable stone and small lumps of charcoal. The site has been badly poached by cattle.
TN034-117----	199434	164093	RUSHEEN MORE	Barrow - Ring-Barrow possible	Situated on a N-facing slope in pasture-land amongst some rock outcrop in an upland region. Good views of mountain valley to the N, higher ground to the S. Site consists of a roughly rectangular shaped flat-topped platform (int. diam. 6m N-S; 3.1m E-W) or mound defined by a scarp (H 0.2m) and inner fosse (Wth 1m; ext. D 0.25m) with outer bank (top Wth. 0.7m; base Wth 1m; ext. H 0.2m). The shape of the central platform is unusual for a ring-barrow, which may cast doubts about its classification. The shape of the platform is more like a hut site but there is no entrance feature and there is an internal fosse. According to local folklore from the Schools Manuscript there was a legend that there was a grave of three kings in this townland. This folklore may have been associated with this monument.

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TN034-118----	198707	163654	RUSHEEN BEG	Standing Stone possible	Situated on SE-facing slope overlooking mountain valley in upland region with good view of standing stone (TN034-114) directly opposite to SE. The collapsed stone (L 1m; dims. 0.65 x 0.20m), composed of limestone, is lying in a slight hollow caused by cattle poaching and was originally aligned N-S; the top of the stone rises to a point in a fashion similar to other standing stones in the region. The size of the stone and its lack of height may suggest that it is not a standing stone, however the tapering top of the stone and its relationship to the visible standing stone (TN034-114) suggest some relationship between the two monuments.
TN034-119----	198061	163420	MOGLAND	Barrow - Ring-Barrow	Situated in poorly drained land atop low hillock in upland area with panoramic views in all directions. Good views of the Devils Bit mountain to the NE, Slievenamon to the SW and Cooneen Hill. Field boundary intersects monument on an E-W axis. Monument consists of a low circular mound (diam. 6.2m E-W; 7m N-S) enclosed by an inner fosse (Wth 2m; ext. D 0.2m) and outer bank (top Wth 1m; base Wth 1.8m; ext. H 0.2m) which is intersected at N on an E-W axis. Overall diameter of monument measures 15.5m E-W; 12m N-S.
TN039-001001-	195509	162446	TOORFIBA	Standing Stone	Located on a gradual, subtle break on a NW-facing slope, in hilly pasture with a ring-barrow (TN039-001002/003) 3.6m to the SW. A standing stone of limestone composition, roughly triangular in plan, (H 1.44m; dims. 0.87m x 0.5m) aligned on a NE-SW axis. The stone tapers towards the top where part of a layer has broken away. It is quite spalled at the top. There is a grassy hummock at the base of the NW side but no evidence of stone packing.

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TN039-001002-	195501	162443	TOORFIBA	Barrow - Ring- Barrow	Situated on a gradual, subtle break in a NW-facing slope in hilly terrain, under pasture. The site is in the SE corner of a field with the field ditch skirting the monument at SE and SW. A standing stone (TN039-001001) is situated 3.6m to the NE. A roughly circular site (diam. 12.1m N-S; 12.9m E-W) consisting of a central mound (Wth 3.8-5.1m; H 0.53m), a deep, U-shaped fosse (Wth 2m; D 0.5m) and an outer bank (Wth 1.5m-2.1m; ext. H 0.65m). There is evidence of a stone cist (TN039-001003) in the centre of the mound with two long slabs exposed at right angles (L 1m x Wth 0.3m and L 0.67m x 0.16m). No visible entrance feature.
TN039-001003-	195508	162455	TOORFIBA	Cist	Situated on a gradual, subtle break in a NW-facing slope in hilly terrain, under pasture. The site is in the SE corner of a field with the field ditch skirting the monument at SE and SW. A standing stone (TN039-001001) is situated 3.6m to the NE. A roughly circular ring-barrow (TN039-001002) consisting of a central mound, a deep, U-shaped fosse and an outer bank. There is evidence of a stone cist in the centre of the mound with two long slabs exposed at right angles (L 1m x Wth 0.3m and L 0.67m x 0.16m).
TN039-002----	190680	160690	KNOCKNAKILL	Ringfort - Rath	Sited on the steep SE-facing slope of a hill in rushy pasture. A roughly oval, denuded enclosure consisting of a raised area (diam. 53m N-S; 48m E-W) defined by a very low bank in the NW quadrant, otherwise discernible as a very slight scarp, a fosse (Wth 3.6m) and an earth and stone outer bank (Wth 6m; H 1.06m). The interior slopes steadily with the hillslope. There is a slight dip in the interior towards the centre.
TN039-003----	191315	160640	REISK	Megalithic Structure possible	This feature, removed sometime prior to 1884 (OS Name Book, 1904) stood on wetish ground close to the foot of Knocknabansha Hill. There are no known accounts of it. The name 'Cromlech' applied to it on the original OS 6-inch map would suggest that it may have been a megalithic tomb. (De Valera and Ó Nualláin 1982, 98, No.8)

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TN039-004001-	191630	160920	REISK	Stone Circle	Situated in rough terrain on a small hillock, on a SW-facing slope, overlooking a valley. A stone circle not marked on the 1sted. (1840) OS 6-inch map but depicted on the 2nd ed. (1905). There are no visible remains of the stone circle or of the standing stone (TN039-004002) also indicated at this location on the current 6-inch map.
TN039-004002-	191630	160910	REISK	Standing Stone	Situated in rough terrain on a small hillock on a SW-facing slope, overlooking a valley. A low standing stone (H 0.8m; dims. 0.85m x 0.2m) aligned NE-SW, sloping slightly to SW. The ground level has been built up with spoil and field clearance. A stone circle (TN039-004001), no longer evident, is also named on the map at this location.
TN039-005----	192011	160813	REISK	Ringfort - Rath	Situated on a slight break in a S-facing slope in pasture. A denuded bivallate ringfort consisting of a circular area (diam. 34.5m N-S; 33m E-W) enclosed by a low bank (Wth 4m; int. H 0.13m; ext. H 1m), a U-shaped fosse (Wth 4m; D 0.43m) and outer bank (Wth 3.2m; ext. H 0.38m). Possible entrance in NE quadrant (Wth c. 2.5m) which appears to have been widened. The outer bank is not apparent along the NE quadrant - probably disturbed by adjacent NW-SE field boundary.

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TN039-006001-	190155	160053	CHURCHQUARTER	Church possible	<p>Situated on raised ground in a graveyard immediately N of Kilcommon RC church. The boundary wall of the graveyard (TN039-006002) along the N, E and W sides have been rebuilt. The ground level drops immediately NE of the N boundary wall and continues to fall gently to an adjacent river. The supposed site of the church depicted on the seventeenth-century Down Survey map is completely occupied by twentieth-century graveslabs. According to Gwynn and Hadcock the OS mistakenly identified Kilcommon, Kilnamanagh Upper Barony as the site of a Benedictine Priory, and points out that the founder's lands were in south Tipperary and that Orpen considered that Kilcommon, parish of Caher, is the site. This is taken as the correct identification. Brooks gives the date of foundation as c. 1200, with evidence that the priory continued until the reign of Edward III. It was probably abandoned soon after Glastonbury lost much of its property in Ireland in 1332 (Gwynn and Hadcock 1970, 107). During a recent graveyard clean-up scheme, however, portion of an ogee-headed window was found (pers. comm. Richard O' Brien) which may indicate the presence of a medieval church.</p>
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TN039-006002-	190150	160060	CHURCHQUARTER	Graveyard	<p>Situated on raised ground in a graveyard immediately N of Kilcommon RC church. The boundary wall of the graveyard along the N, E and W sides have been rebuilt. The ground level drops immediately NE of the N boundary wall and continues to fall gently to an adjacent river. The supposed site of the church (TN039-006001) depicted on the seventeenth-century Down Survey map is completely occupied by twentieth-century graveslabs. According to Gwynn and Hadcock the OS mistakenly identified Kilcommon, Kilnamanagh Upper Barony as the site of a Benedictine Priory, and points out that the founder's lands were in south Tipperary and that Orpen considered that Kilcommon, parish of Caher, is the site. This is taken as the correct identification. Brooks gives the date of foundation as c. 1200, with evidence that the priory continued until the reign of Edward III. It was probably abandoned soon after Glastonbury lost much of its property in Ireland in 1332 (Gwynn and Hadcock 1970, 107). During a recent graveyard clean-up scheme, however, portion of an ogee-headed window was found (pers. comm. Richard O' Brien) which may indicate the presence of a medieval church.</p>
TN039-007----	191280	159980	KNOCKNABANSHA	Megalithic Tomb - Wedge Tomb	<p>Situated in a small clearing in a plantation on the western slope of Knocknabansha Hill. It consists of the remains of a gallery aligned SW-NE, now 2.1m long and some 0.7m wide, formed by two opposed sidestones and a septal-stone outside the SW end of the more southerly sidestone may represent a doubling of the gallery wall. A slight depression in the ground extending about 1.5m beyond the E end of the structure may indicate that the gallery was originally longer. There are a number of displaced stones at the site. (De Valera and Ó Nualláin 1982, 89, No.8)</p>

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TN039-008----	192560	159870	KNOCKMAROE	Megalithic Tomb - Wedge Tomb	<p>Situated close to the foot of the S-facing slope of Knockmaroe Hill. The remains consist of a mound about 9m in diameter and 1m high with a hollow towards its western perimeter where there are three stones. One of these is an orthostat aligned WSW-ENE. This stone, which declines in height from W to E, may have formed part of a chamber side. Resting against the last is a large slab, possibly a displaced roofstone. A thin slab beneath this may have been detached from its underside. Some stons exposed at the edge of the hollow and at the perimeter of the mouond are of uncertain origin. The scant remains seem to be those of a wedge tomb. (De Valera and Ó Nualláin 1982, 89, No.9)</p>
TN039-009----	195079	160943	KNOCKCURRAGHBOLA COMMONS	Megalithic Tomb - Wedge Tomb	<p>Situated on a hillock at the NE end of a low ridge. It consists of a long, narrow, partly roofed gallery closed at the SW by a septal-stone. Both sides of the gallery are flanked by outer-walling with the more westerly stone at either side set in advance of the septal-stone. These two stones would have served as the sides of a portico or, alternatively, represent a doubling of the portico sides since removed. The structure is 7m in overall length. The main chamber, open at its more easterly end, is 5.3m long and 1.2m wide at the septal-stone whence it narrows slightly towards the E. Two roofstones cover its forward end. There are five sidestones on the N side and three on the S side. There are six outer-wall stones to the N and four to the S. These are set close to the gallery walls and two of those to the N double as buttress-stones. Beyond the easternmost at the S there is a small stone which may be the butt of a taller one, probably another outer-wall stone. There are traces of a mound around the structure. A large rectangular slab lies prostrate at the SW end of the gallery. (De Valera and Ó Nualláin 1982, 90, No.10)</p>

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TN039-010----	196809	159771	SHEVRY	Castle - Ringwork possible	Situated on a break in the SE-facing lower slope of a hill in undulating pasture. A roughly rectangular earthen mound (H 2.15m; base dims. 21m x 15.5m; top dims. 15.5m x 10.3m) which tapers towards the NE side with a deep central depression (D 1.23m). The mound is fairly steep-sided, particularly along the SW side and at the NW corner. It is badly disturbed by quarrying in the centre. No outer fosse or defences visible.
TN039-011001-	196790	159630	SHEVRY	Barrow - Pond Barrow possible	Situated on the summit of a natural rise, close to the W edge of a gradual fall, overlooking a valley at the base of the slope. The site consists of a flat central area (14.3m N-S; 15m E-W) enclosed by a compact earthen bank (Wth 2.3m; int. H 0.35-0.55m; ext. H 0.18-0.35m), less visible at S. An entrance gap (Wth 3m) is visible at ESE. There is a small standing stone (TN039-011002) in the interior in the SW sector with a second stone (TN039-011003) standing at the entrance at ESE, in line with the outer edge of the bank.
TN039-011002-	196797	159635	SHEVRY	Standing Stone	Situated on the summit of a natural rise, close to the W edge of a gradual fall, overlooking a valley below. A small standing stone (H 1m; max. dims. 0.83m x 0.5m) of limestone composition located in the SW quadrant of the interior of a possible pond barrow (TN039-011001). The standing stone is aligned on a N-S axis and is roughly trapezoidal in plan. There is a slight hollow around the base with no evidence of packing-stones. There is a second standing stone (TN039-011003) nearby at the entrance to the barrow in the ESE quadrant.

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TN039-011003-	196790	159630	SHEVRY	Standing Stone	<p>Situated at the entrance to a possible pond barrow (TN039-011001) on the summit of a natural rise, close to the W edge of a gradual fall, overlooking a valley below. A rectangular standing stone (H 1.3m; dims. 0.63m x 0.34m) of limestone composition aligned on an E-W axis. There is a slight hollow around the base with no evidence of any packing-stones. The top of the stone tapers to a point from W to E. A second standing stone (TN039-011002) is situated in the interior of the same barrow.</p>
TN039-014----	190725	159210	LOUGHBRACK	Megalithic Tomb - Wedge Tomb	<p>Situated on a level tract of wetland ground between Loughbrack and Knocknabansha Hills. Many gallery orthostats are missing but outer-walling, doubled at both sides, is well preserved and indicates a diminution in height and width towards the E. A large septal-stone at the W and adjoining it a long sidestone to the N and two alongside to the S remain of the gallery. The short surviving length of gallery is 1.3m wide. Immediately forward of the N end of the septal-stone there is a small transversely set stone. Almost 7m E of the septal-stone a transverse stone links the inner lines of the outer-walls. This stone may be part of the outer-walling though it could be the backstone of the gallery. The inner line of outer-walling at the S is represented by six stones. Outside and flanking the eastern half of this and extending further to the E there is an outer line of seven thin stones. Six stones of an inner line of outer-walling remain on the N side of the monument and there are four stones of an outer line. Just W of mid-length a further stone sits in the gap between these two lines. Opposed single stones extend the inner lines of outer-walling beyond the eastern transverse slab. A displaced slab lies between the surviving gallery sidestones and another rests against the eastern transverse stone. Low traces of a mound surround the structure.</p>

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TN039-016----	193966	159479	KNOCKCURRAGHBOLA COMMONS	Megalithic Tomb - Wedge Tomb	Sited on a S-facing slope in farmland. A narrow, SW-facing, wedge-shaped gallery flanked at either side by outer-walling survives. There are slight traces of a mound along the S side of the structure. The gallery, at least 4.2m long, is open at both ends. It narrows from 1m wide at the SW to 0.65m at the NE and a diminution in the height of the gallery orthostats in the same direction is also indicated. Four orthostats survive along both sides of the gallery. Two of those on the S side have split into two or more separate uprights. Four outer-wall stones flank the S side of the gallery. The easternmost is set inside the line of the other three and adjoins the gallery wall. Six outer-wall stones flank the N side of the gallery, a number of them also split into separate uprights. Two transversely set stones seem to mark the end of this line of outer-walling. A number of partly concealed slabs lie to the W of the structure. (De Valera and Ó Nualláin 1982, 92, No.13)
TN039-017----	194150	159500	KNOCKCURRAGHBOLA COMMONS	Megalithic Tomb - Wedge Tomb	Sited 200m E of the a wedge tomb (TN039-016) and on the same S-facing slope. The scant remains consist of a septal-stone at the WSW, two sidestones of the more southerly side of the chamber and one of the opposite side. Another stone a little to the E of the last is somewhat loosely set and of uncertain origin. A small, low mound adjoins the S side of the chamber. The origin of a number of displaced stones at the site is uncertain. (De Valera and Ó Nualláin 1982, 91-2, No.12)
TN039-018----	195100	158790	GRANIERA	Megalithic Tomb - Unclassified possible	Situated on an E-facing slope. An orthostat 1.2m high and aligned NE-SW, stands here. Another stone, probably but not certainly in situ, leans against its more southerly face. There are traces of a mound around the stones. The two stones might be the remnants of a megalithic tomb. (De Valera and Ó Nualláin 1982, 99, No.11)

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TN039-019----	196890	159430	SHEVRY	Enclosure possible	Situated on a natural platform with ground falling fairly steeply in all directions except to W, in an area of rough pasture. Depicted as an irregular-shaped enclosure on the 1st ed. (1840) OS 6-inch map but not indicated on the 1905 ed. The area where the enclosure was located is quite disturbed and uneven with a suggestion of lazy bed cultivation and the remains of a bank along portion of the W side - this appears to be part of an old field bank. Not visible at ground level.
TN039-027----	194280	159060	GRANIERA	Enclosure possible	Situated on the SE slope of a flat-topped hill which falls steeply to a valley below. Identified as a roughly circular enclosure on an aerial photograph taken in 1974 (GSIAP, R 360/359). Not visible at ground level. The landowner does not recollect any site in this field.
TN039-035----	191880	161100	REISK	Barrow - Ring- Barrow	Situated on the gentle SW-facing slope of a hill, in pasture. A circular site (12.8m N-S; 12.8m E-W) consisting of a central mound (diam. 4.8m; H 0.26m), a narrow, U-shaped fosse (W 1.7m; D 0.86m) and an outer bank (W 2m; ext. H 0.14m). The bank is steep-sided and the fosse is well defined with some rushes growing in it.
TN039-036----	194350	162730	CUMMER	Barrow - Pond Barrow	Located on a break in a N-facing slope in wet, upland terrain. A circular depression (diam. 24m N-S; 21m E-W) enclosed by a broad, flat bank (Wth 3.6m; int. H 0.35m; ext. H 0.18m). An old, low, earthen field bank extends N-S through the S half of the site. The interior is very wet and has been badly eroded by cattle. There is a small circular enclosure (diam. 13m) adjoining the NW quadrant. It is enclosed by a very low earthen bank except where it shares the pond barrow's bank.

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TN039-037----	194260	159270	KNOCKCURRAGHBOLA COMMONS	Megalithic Tomb - Unclassified possible	<p>Sited just 200m S of wedge tomb (TN039-017) in a prominent position on a hillock in upland pasture. The remains are scant perhaps because of deliberate disturbance that may account for a subcircular depression measuring some 7m x 6m and at least 0.3m deep on top of the hillock. At the northern edge of the depression there is a low orthostat aligned WNW-ESE. It is 1.45m long, 0.15m thick and slopes from 0.65m high at its more westerly end to 0.15m at the opposite end. Some 0.5m S of this there is a prostrate slab 1.6m in maximum dimension while 5-7m to the SW there are three irregularly spaced stones, possibly representing a kerb. The diminution in height of the orthostat from W to E would suggest it could be the surviving remnant of the gallery side or outer-wall of a wedge tomb.</p>
TN039-038001-	196600	160490	SHEVRY	Barrow - Ring- Barrow	<p>Situated on a break in an E-facing slope in upland terrain, under pasture. Extensive views in all directions except upslope to SW. A circular area (diam. 11.5m N-S; 11.4m E-W) consisting of a central mound (diam. 4.6m N-S; 4.7m E-W; H 0.23m) enclosed by a water-logged fosse (Wth 1.6m; D 0.26m) and well-preserved outer bank (Wth 1.9m; H 0.3m), partially denuded in the SE quadrant. There are three stones embedded in the N half of the central mound which appear to be set on edge, possibly indicating the presence of a cist (TN039-038002).</p>
TN039-038002-	196600	160490	SHEVRY	Cist possible	<p>Situated on a break in an E-facing slope in upland terrain, under pasture. Extensive views in all directions except upslope to SW. A circular Aring-barrow (TN039-038001) consisting of a central mound enclosed by a water-logged fosse and well-preserved outer bank, partially denuded in the SE quadrant. There are three stones embedded in the N half of the central mound which appear to be set on edge, possibly indicating the presence of a cist.</p>

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TN039-043----	194330	159600	KNOCKCURRAGHBOLA CROWNLANDS	Standing Stone possible	Situated on a poorly drained S-facing slope of rising ground in an upland region. A narrow standing stone (H 1.25m; 0.25m x 0.2m) which is rectangular in plan with its long axis orientated N-S. The stone is unusually narrow and may have been erected as a scratching post.
TN039-044----	194270	159400	KNOCKCURRAGHBOLA COMMONS	Standing Stone	Situated on flat elevated pasture with good views in all directions. A triangular shaped standing stone (H 1.26m; 1m x 0.2m) which is rectangular in plan with its long axis orientated E-W.
TN039-045----	194000	159270	KNOCKCURRAGHBOLA COMMONS	Megalithic Tomb - Unclassified possible	Situated on a low rise of ground overlooking a river valley in an upland region. A chamber, 1.35m long (SSE-NNW) is 0.85m wide at the open SSE end and narrows slightly towards the opposite end. It is formed by four low stones, one at the more westerly side, one at the NNW end, and there are two, a longer outer and shorter inner example, at the more easterly side. The shorter of the latter two stones is skewed so as to narrow the rear of the chamber. There is a largely concealed stone at the inner face of the last. The structural stones are relatively thin slabs and none rises more than 0.25m above ground level. This seems to be a large cist.
TN039-046----	196543	161770	KNOCKNAMENA COMMONS	Barrow - Ring- Barrow	Situated on top of high ground in upland region with good panoramic views in all directions. Much degraded monument consisting of a barely visible circular mound (diam. 8m N-S) enclosed by an inner fosse (Wth 2m; ext. D 0.2m) and slight traces of an outer bank (Wth 1m). A field boundary bisected the monument on a N-S axis. This field boundary has since been levelled. Monument is barely visible in the winter months and is probably not visible during the summer months.

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TN039-047----	196619	162022	KNOCKNAMENA COMMONS	Enclosure possible	Situated in pasture on E facing slope overlooking mountain valley in upland region, higher ground to W of enclosure. A roughly rectangular-shaped area (int. dims. 19m E-W; 20m N-S) enclosed by an earthen bank (Top Wth 1m; base Wth 2m; int. H 0.1m; ext. H 0.3m) with slight traces of an outer fosse, no entrance feature visible. Quarry in NE quadrant of enclosure. Possible linear field boundaries intersect enclosure along its S side. Possible summer grazing enclosure or booley site for upland grazing during the summer months.
TN039-048----	196849	162153	GLENBEG	Barrow - Ring- Barrow	Situated in pasture, on a SE-facing slope of rising ground in a mountainous region. Well preserved monument consisting of a raised circular area (diam. 4m N-S; 3.7m E-W; H 0.3m) with sunken depression (diam. 3m) on top of mound, defined by an inner fosse (Wth 1m; ext. D 0.2m) with the slightest traces of an outer bank, only visible in places. Overall diameter 8m N-S. Central depression may be due to collapsed cist in centre of mound.
TN039-049----	196939	159636	SHEVRY	Barrow - Ditch Barrow possible	Situated in wet marshy pasture, atop low hillock with good views of Devils Bit to NE in mountain valley running NE-Sw in upland region. Well preserved possible ditch-barrow consisting of a circular mound (top diam. 9m NW-SE; base diam. 13m NW-SE; H 0.3m) and fosse (base Wth 5m; top Wth 9m; ext. D 0.45m) with no traces of an outer bank. Overall diameter measures 31m NW-SE.

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TN039-050----	194897	160291	KNOCKCURRAGHBOLA COMMONS	Megalithic Tomb - Unclassified possible	Situated in upland region, in pasture with good panoramic views in all directions, view of Galtee More to the SW on a clear day. Good views of Wedge tomb (TN039-009) located 670m to N. A roughly rectangular chamber, 1m long by 0.85m wide and 0.3m high at the open SW end formed by four low upright stones with a large capstone (H 0.55m; L 2m; Wth 2m) sitting on top of the side stones. A second capstone may be a displaced roofstone from the SW end of the chamber. Not clear whether this is a megalithic tomb or not however the arrangement of the capstone sitting on side stones forming a chamber suggests that it is a possible megalithic structure. It also has an impressive siting in the landscape with fine panoramic views of hilltops within this mountain region.
TN039-051----	195214	160729	KNOCKCURRAGHBOLA COMMONS	Fulacht Fia	Situated in wet marshy field in upland area with stream immediately to the S, field has recently been planted with conifer trees. Possible two stone row (TN039-052) and wedge tomb (TN039-009) to NW. During the planting of trees in this field a drainage ditch (Wth 0.70m; D 0.40m) was cut through the middle of the mound on an E-W axis revealing the burnt material of the monument. The monument consists of a large circular mound (diam. 16m N-S ; 20m E-W; H 1m) of burnt material with stream immediately to S of mound. No visible sign of any trough.
TN039-052----	195131	160825	KNOCKCURRAGHBOLA COMMONS	Stone Row possible	Situated in pasture on SE facing slope of rising ground in upland area with good views of mountain valley to S and E, higher ground to N. Nearby wedge tomb (TN039-009) to NNW and fulacht fiadh (TN 039-051) to SE. Monument consists of two low limestone orthostats, aligned E-W, and 2.48m apart. Both stones are roughly triangular in shape with rectangular sections and the tops of the stones are tapering towards a point. The W stone measures 0.9m H; 0.58m x 0.21m. The E stone measures 0.8m H; 0.60m x

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						0.30m. Local landowner has no recollection that they were ever erected as scratching posts for livestock.
TN039-053----	193696	157544		Standing Stone(s)	Redundant Record	
TN039-054----	194926	157511		Hut Site	Redundant record	
TN039-055----	194615	157281		Fulacht Fia	Redundant record	
TN039-056----	196928	158409	CURRAGHNATINNY	Fulacht Fia	Situated in wet marshy valley in upland area with nearby stream to the W and well to the NW. Large horseshoe-shaped mound of burnt material which was impossible to examine due to dense cover of vegetation at time of visit.	
TN040-001----	197793	162562	KNOCKNAMENA COMMONS	Ringfort - Rath	Situated on the E-facing slope of a hill in pasture. An oval bivallate enclosure (diam. 40.7m N-S; 34.5m E-W) enclosed by a bank (Wth 2.3m; int. H 0.2m; ext. H 0.75m), a U-shaped fosse (Wth 3.2m; D 0.74m) and an outer bank (Wth 2.9m; ext. H 0.6m). A causewayed entrance at E (Wth 4.3m) may have been widened for tractor access. The outer bank is incorporated into a field boundary at W, N and NE.	
TN040-002----	197944	162305	GORTNADA	Ringfort - Rath	Situated on a break in a gentle S-facing slope, near the summit of a hillock, in pasture. A roughly circular bivallate site (diam. 24m N-S; 22.4m E-W) enclosed by a bank (Wth 2.4m; int. H 0.28m; ext. H 0.92m), a U-shaped fosse (Wth 3.11m; D 0.8m) and a denuded outer bank (Wth 2.8-3.5m; ext. H 0.32m) with a causewayed entrance (Wth 3m) in the SE quadrant. There are old field boundaries adjacent to the site at W and NW and a farm roadway built at NE has damaged the inner bank. There is a roughly circular hollow (Wth c. 9m) in the interior in the SE quadrant.	

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TN040-003----	198580	162640	CAREW	Barrow - Bowl- Barrow	Situated on the crest of a low hill, in pasture. A roughly circular mound (base diam. 12.5m N-S; top diam. 7m; H 1.55m) enclosed by a U-shaped fosse (Wth 2.6m; D 0.5m). Whitethorns are growing on the summit and around the edge of the site. There may have been quarrying into the summit at some stage (though not in memory of present landowner) with upcast around the edge of the summit to the SE and SW. A large boulder lies prostrate at the outer edge of the fosse at N.
TN040-004----	198810	161199	CAPPANALEIGH	Church	Situated on high ground on top of a hillock which slopes SE down to the main graveyard. The church was formerly located in the NW corner of the graveyard (TN040-004001) but the area is now occupied by burials and headstones, the earliest dated 1700. It was marked as Templeougher (site of) on the 1903 ed. OS 6-inch map. There are no architectural fragments visible in graveyard which has been extended southward. There are at least two eighteenth-century headstones (dated 1734 and 1761) in the NE quadrant, otherwise the headstones date to the nineteenth and twentieth centuries.
TN040-004001-	198832	161192	CAPPANALEIGH	Graveyard	Situated on high ground on top of a hillock which slopes SE down to the main graveyard. The church (TN040-004) was formerly located in the NW corner of the graveyard but the area is now occupied by burials and headstones, the earliest dated 1700. It was marked as Templeougher (site of) on the 1903 ed. OS 6-inch map. There are no architectural fragments visible in graveyard which has been extended southward. There are at least two eighteenth-century headstones (dated 1734 and 1761) in the NE quadrant, otherwise the headstones date to the nineteenth and twentieth centuries.

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TN040-016----	197901	159386	CURRAGHDUFF (UPPERCHURCH PAR.)	Castle - Tower House	Situated on the N spur of a break in a N-facing slope, in pasture. A stream runs N-S at the base of the slope immediately to the E. The site has been levelled, however, faint indications of foundations (dims. c. 15.4m N-S; Wth c. 2m) are still visible though less so on the E side. According to the OS Letters nothing remained of the castle called 'Caislean Cruinn', though its location was known locally (O'Flanagan 1930, vol. 1, 187).
TN040-028----	197660	157070	KNOCKACARHANDUFF COMMONS	Redundant Record	Possible enclosure identified on aerial photograph (GSI 16.4.1974, R 358/9). Site non-archaeological. Natural, fairly circular low hill on break of slope.
TN040-039001-	199580	161240	GORTNASKEHY (UPPERCHURCH PAR.)	Cist	Situated on the flat summit of Moher Hill overlooking a broad valley to the SW and panoramic views from E through S to W. A denuded circular cairn (dims. 10.1m N-S; 10.5m E-W) defined by occasional small stones and a slight scarp. The cairn covers a recently exposed cist (L 0.82m x Wth 0.6-0.76m; D 0.8m), aligned NE-SW, trapezoidal in plan, with the wider end to SW. There is a large rectangular capstone (2.15m x 0.96m; T 0.21m) of sandstone with quartz pebble inclusions. Four flat sandstone slabs (av. H 0.5m) set on edge line the cist (sidestone at SW end is 0.17m T). A depth of 0.2m of soil has recently been removed from the base and a flag floor which paved the bottom has been broken through. According to local information the soil covering the flag floor had been very dry. A small quantity of charcoal was found in the disturbed soil.
TN040-039002-	199580	161240	GORTNASKEHY (UPPERCHURCH PAR.)	Cairn	Situated on flat summit of Moher Hill overlooking broad valley to SW and panoramic view from W-S-E. Denuded circular cairn (10.1m N-S; 10.5m E-W) defined by occasional small stones and slight scarp. Cairn covers a recently exposed trapezoidal cist with large rectangular capstone (see TN040-039001 for description).

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TN040-040001-	197630	161230	COOGA	Barrow - Ring-Barrow	<p>Situated in flat terrain on a valley floor in poorly drained land, under pasture. A roughly circular ring-barrow (diam 19.1m N-S; 17.8m E-W) consisting of a circular mound (diam 10.7m; 0.42m H) enclosed by a fosse (Wth 2-2.5m; D 0.37m) and outer bank (Wth 1.5m at crest, 3.7m at base; ext. H 0.31m). The mound has a central depression probably due to cattle erosion. A standing stone (TN040-040002) lies prostrate in the fosse at W and the outer bank is not visible at this point. Some stone protrudes from the central mound. According to local tradition this is the burial site of the 'Great Dane' and was part of the 'Jewel of Dane' estate. The fosse and central depression become waterlogged in the winter.</p>
TN040-040002-	197630	161230	COOGA	Standing Stone	<p>Situated in flat terrain on a valley floor in poorly drained pastureland. A collapsed standing stone (L 1.96m; dims. 0.56m x 0.45m) which lies partially embedded in the fosse of a ring-barrow (TN040-040001) in the W quadrant. There are deep linear scores on both exposed corners. The third corner, which is partially embedded, doesn't appear to have any markings. The lines do not conform to ogham script, however, in the nineteenth century there were incidences of standing stones being scored with false 'ogham script' to confound antiquarians (pers. comm. F. Moore). The stone was standing in recent memory according to local information.</p>
TN040-041----	200452	162504	FINNAHY	Fulacht Fia	<p>Situated in a small, boggy valley with hills rising to E and W; a small stream ran down the centre of this valley. The site is in rough, wet pasture immediately N of a cut-away bog. An impressive horseshoe-shaped mound of burnt material (dims. 12m N-S; 12.8m E-W; H 0.8m) with a depression (dims. 5m N-S; 2.8m E-W), presumably for a trough, facing N.</p>

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TN040-042----	197883	162490	GORTNADA	Standing Stone	Situated just below the crest of a hill on ground sloping very gradually to the S, in meadow. Limestone standing stone orientated on a NE-SW axis, roughly rectangular in plan (H 0.83m at apex; max. dims. 1m x 0.44m) with top sloping up to SW. The stone is spalling to some degree, particularly on the SE face. There is a grassy hummock around the base of the standing stone but no obvious packing-stones.
TN040-046001-	197510	162130	KNOCKNAMENA COMMONS	Enclosure	A large semicircular enclosure situated on a SE-facing slope of rising ground in an upland area overlooking a mountain valley with higher ground above the site to the N. Originally a circular enclosure, the present remains consist of a semicircular area (dims. 52m SE-NW; 60m E-W) enclosed by a bank (Wth 5m; int. H 0.25m; ext. H 0.7m) and external fosse (Wth 5m; D 0.3m) which survives from NW through N to SSE. The site is intersected by a road from SSE to S running along an E-W axis and from S to W by a field boundary aligned on a N-S axis. No entrance feature visible.
TN040-046002-	197510	162130	KNOCKNAMENA COMMONS	Barrow - Ditch Barrow possible	Situated on a poorly drained SE-facing slope of rising ground in an upland area with a nearby enclosure (TN040-046001) 70m to the S. A low flat-topped mound (diam. 4.2m NE-SW; 4.4m E-W; H 0.45m) enclosed by a shallow water-logged fosse (Wth 2.4m; D 0.1m) with no evidence for an external bank.
TN040-047----	197530	160970	COOGA	Barrow - Ring- Barrow	Situated in a prominent position on top of a hillock in upland pasture, with extensive views in all directions except upslope to NW. This site has been ploughed over but is still visible. It consists of a circular mound (diam 3.3m; H 0.08m) enclosed by a water-logged and silted fosse (Wth 3m; D 0.3m) and outer bank (Wth 2.8; ext. H 0.2m) (overall diam. 16.1m N-S: 16m E-W). The outer bank is most denuded in the NW quadrant.

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TN040-048----	198190	161230	CAPPANALEIGH	Fulacht Fia	Situated in wet, marshy upland terrain with a channelised stream c. 10m to the NE. A classic horseshoe-shaped mound of burnt material (dims. 7m NNE-SSW; 7.5m ESE-WNW; H 0.25m); opening (dims. 3.5m NNE-SSW; 3.5m ESE-WNW) faces SSW. A small area of possible burnt material lies c. 200m to the SE
TN040-051----	197726	157788	FOILAGOULE	Fulacht Fia	Situated on wet S facing slope of rising ground in upland area with steep cliff-edge forming S boundary of site. Semi-circular shaped mound (H 0.7m; base diam. 4m N-S; base diam. 10m E-W; top diam. 3m) of burnt material with the cliff edge forming the S boundary of the mound.
TN040-052----	198055	157380	KNOCKACARHANDUFF COMMONS	Earthwork	Situated in upland area on W facing slope of rising ground with good extensive views to W and higher ground to E. Field boundary intersects earthwork at S running along an E-W axis. Present remains consist of a semi-circular sunken wet area (dims. 4.5m N-S; D 0.2m) enclosed by a low earthen bank (top Wth 1m; base Wth 2m; ext. H 0.4m) with faint traces of an outer fosse, no entrance feature visible. The enclosing bank and outer fosse are destroyed along the S side of the site by the field boundary which runs along an E-W axis. May be the remains of a much degraded possible ring-barrow or could be the remains of a possible square-shaped hut site (ext. dims. 6m E-W) that has been truncated by a field boundary.
TS039-015----	192418	158421	CUMMER MORE	Enclosure possible	On a poorly drained marshy W facing slope of rising ground in upland area. This possible enclosure is not visible at ground level. Though this is an unlikely location for an archaeological monument, a roughly circular enclosure (diam. c. 15m) is depicted on the 1st ed. (1840) OS 6-inch map.

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TS039-029----	194643	156810	AUGHVALLYDEAG	Ringfort - Rath possible	On a poorly drained E-facing slope of rising ground in an upland area with good views from the N-E-S. This monument, identified from an aerial photograph (GSI, R. 360/59; 16/04/74), was heavily overgrown with reeds at the time of inspection. The monument consists of a low sunken circular area (diam. 11.5m; ext. D 0.1m) with traces of a second bank (Wth 2m; ext. H 0.3m) only visible at the SE.
TS045-003----	193263	156167	BOOLANUNANE	Enclosure possible	On NNE facing slope of rising ground in upland area overlooking river valley. Good extensive views from NW through E to S. No surface remains visible. Monument identified from aerial photographs (GSI 360/59, 16/04/74) as a circular enclosure.
TS045-004----	194230	156366	REAFADDA	Enclosure possible	Just below summit of hill on W facing slope of rising ground in upland area overlooking river valley. Nearby enclosure (TS045-005----) to SW. No surface remains visible. Monument identified on aerial photograph (GSI, 360/59; 16/04/74) as a circular enclosure.
TS045-005----	193971	156135	REAFADDA	Enclosure possible	On poorly drained W facing slope of rising ground in upland area with ravine immediately N and enclosure (TS045-004----) to NE. No surface remains visible. Monument identified from aerial photograph (GSI, 360/59; 16/04/74) as a circular enclosure.
TS045-026----	195440	156110	TURRAHEEN UPPER	Barrow - Ring-Barrow	On flat partially reclaimed grassland in upland area with good views to the E. The ring-barrow consists of a well preserved low circular flat-topped platform (diam. 4m N-S; 4m E-W; H 0.2m) enclosed by an inner fosse (base Wth 1.5m; top Wth 3m; ext. D 0.2m) and outer bank (base Wth 4m; top Wth 2.5m; ext. H 0.4m). Overall diameter 12.9m NW-SE; 11.1m SW-NE.

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TS046-001----	197145	156203	TURRAHEEN UPPER	Enclosure	On a SE-facing slope of Gortmore Hill overlooking Turaheen river valley in an upland region. Enclosure was inaccessible due to its location in a Coillte conifer plantation. The monument is visible as an enclosure on aerial photographs (GSI R 359/8, 16/04/74). An inspection in 1994 described this monument as an enclosure (diam. C.50m) defined by a low bank (Wth c. 3-4m; H 0.5m) and shallow external fosse (Wth 3-4m) which is tangential with roadside level along the S quadrant and remains of the external bank are visible along the SE sector. The enclosure had been recently shallow ploughed and planted with conifers and a new forest access road constructed to the SE of monument.
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APPENDIX 12-II

NIAH RECORDS WITHIN VICINITY OF THE PROPOSED DEVELOPMENT.

Note these are located in the villages of Upperchurch and Milestone and will not be impacted upon by the proposed development.

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Tipperary North - Thu May 17 16:31:56 IST 2012

Main Record - Tipperary North**Milestone, Tipperary North**

22403906



Reg. No.	22403906
Date	1760 - 1800
Previous Name	N/A
Townland	GRANIERA
County	Tipperary North
Coordinates	194385, 158239
Categories of Special Interest	ARCHITECTURAL SOCIAL TECHNICAL
Rating	Regional
Original Use	milestone/milepost
In Use As	milestone/milepost

Description

Triangular-profile limestone milestone, c. 1780. Inscribed 'Newport 15 Miles, Thurles 13, Tipper[ary] 16' on front faces. Recent rubble limestone setting at junction of two roads.

Appraisal

This milestone is a physical reminder of the era when the post office operated a coach-based system of postal distribution. The naming of the village after the milestone is evidence of the historical significance of the feature. The simple form and well-executed Roman letting of the carving exhibit fine craftsmanship. It is attractively set with a rubble stone wall constructed to protect it from damage.

[Back To Results](#)**Main Record - Tipperary North****Saint Patrick's National School, Upperchurch, Tipperary North**

22404005



Reg. No.	22404005
Date	1950 - 1960
Previous Name	N/A
Townland	GORTATOODA
County	Tipperary North
Coordinates	198741, 161486
Categories of Special Interest	ARCHITECTURAL SOCIAL
Rating	Regional
Original Use	school

Description

Detached six-bay double-height national school, built c. 1955, now disused. Four-bay single-storey flat-roofed block to rear and whole flanked by flat-roofed porches to gable ends with concrete canopies over doors to sides. Sprocketed slate roof with roughcast rendered chimneystack, and cast-iron rainwater goods. Roughcast rendered walls with rendered plinth and slate date plaque. Square-headed openings with six-over-six pane timber sash windows and concrete sills. Timber battened doors. Flat-roofed rendered concrete block playground shelter with open front with round columns. Bounded by roughcast rendered walls with concrete stile and steel gates.

Appraisal

A variation of the standard design for national schools built throughout the twentieth century, the building is a successful attempt to design in sympathy with the vernacular architectural tradition of rural Ireland, by using simple forms and a limited palette of materials. This former school retains many of its original features and materials such as the timber sash windows, timber door and bootscape, date plaque, pedestrian stile, steel gates and playground shelter.

Main Record - Tipperary North**Saint Mary's Roman Catholic Church, Upperchurch, Tipperary North**

22404006



Reg. No.	22404006
Date	1925 - 1930
Previous Name	N/A
Townland	CAPPANALEIGH
County	Tipperary North
Coordinates	198753, 161297
Categories of Special Interest	ARCHITECTURAL ARTISTIC HISTORICAL SOCIAL
Rating	Regional
Original Use	church/chapel
In Use As	church/chapel

Description

Detached five-bay two-storey over half basement house with dormer attic, built 1784, with lower two-storey return and with lean-to extensions to rear and north gable. Pitched slate roof to slightly-raised overhanging eaves, having slated roofs and sides to dormers, and rendered chimneystacks to gable ends. Corrugated-iron roofs to extensions. Rendered rubble limestone walls, with rendered brick to return and to one extension. Replacement aluminium windows to slightly-widened openings to front wall and replacement uPVC to basement. Few and recent windows and one blocked window to rear wall. Limestone block-and-start door surround having date to keystone "1784", spoked fanlight, and with flight of limestone steps leading to timber panelled door.

Appraisal

Saint Mary's Church is a well-designed church, using a modern interpretation of traditional forms and details to create a building of significant architectural quality. It contains elements of artistic value, including the stained glass to the east window of 1928, possibly from the Harry Clarke studio.

Main Record - Tipperary North**Upperchurch, Tipperary North**

22404008



Reg. No.	22404008
Date	1965 - 1970
Previous Name	N/A
Townland	CAPPANALEIGH
County	Tipperary North
Coordinates	198793, 161237
Categories of Special Interest	ARTISTIC SOCIAL TECHNICAL
Rating	Regional
Original Use	shrine/oratory/grotto
In Use As	shrine/oratory/grotto

Description

Freestanding grotto, built 1967. Composed of random rubble limestone, with three segmental-arched recesses of various sizes, one containing a statue of the Blessed Virgin Mary, another an altar. Stone paving to front. Bounded by a pebbledashed wall with rendered piers and concrete capstones and steel railings.

Appraisal

This grotto, located in a very prominent position in the village, on an elevated site opposite the cemetery, and near Saint Mary's Church, is a dominant feature of the streetscape. The stonework forming the grotto is well executed, and adds artistic interest to the site.

Main Record - Tipperary North

Upperchurch, Tipperary North

22404009



Reg. No.	22404009
Date	1860 - 1880
Previous Name	N/A
Townland	ROAN (UPPERCHURCH PR)
County	Tipperary North
Coordinates	198350, 160506
Categories of Special Interest	ARCHITECTURAL SOCIAL
Rating	Regional
Original Use	house
In Use As	house

Description

Detached four-bay two-storey house, built c. 1870, with single-storey extension to rear and flat-topped windbreak to entrance. Lobby-entry plan. Hipped slate roof with rendered chimneystacks. Pebbledashed walls to first floor and rear and smooth rendered to ground and gables, with render quoins and plinth to front. Square-headed openings with two-over-two pane timber sash windows with stone sills to front elevation and replacement uPVC windows to rear. Former five-bay single-storey with loft vernacular house, built c. 1800, to south-west, now used as farm building and having lean-to extension to south. Pitched slate roof with carved timber bargeboards, windbreak with lean-to slate roof, rubble sandstone walls, two-over-two pane timber sash windows with stone sills and retaining interior features including wide hearth with iron crane and wheel bellows. Single-storey rubble outbuildings with pitched slate roofs to site.

Appraisal

This layout of this complex of buildings, comprising the original house and outbuildings ranged to form a courtyard, and the later two-storey house constructed adjacent, shows the typical historical development of rural farmyards in the local vernacular idiom. The older house and outbuildings contain intact original features, including the fireplace with bellows and crane and the later house provides interest to the local roadscape.

APPENDIX 12-III: PHOTOGRAPHS OF FIELDS WITHIN PROPOSED DEVELOPMENT AREA



Field A-1, from W



Field A-2, from E



Field A-3, from W



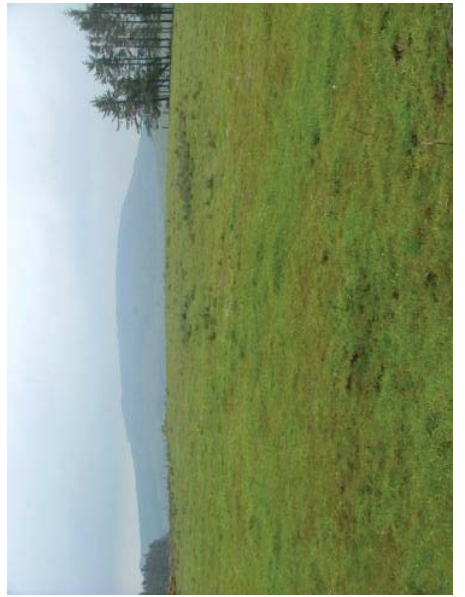
Field A-4, from S



Field A-5, from N



Field A-6, from W



Field A-7, from W



Field A-8, from S



Field A-9, from S



Field A-10, from N



Field A-11, from N



Fields A-12 and A-13, from W



Field A-14, from N



Field A-15, from N



Field A-16, from N



Field A-17 From S



Field A-18, from S



Field A-19, from N



Field A-20 (forestry), from NE



Field A-21, from E



Field A-22 and A-23, from E



Field A-24, from S



Field A-25, from E



Field A-26, from S



Field A-27, from SW



Field A-28, from N



Field B-1 (forestry), from S



Field B-2, from S



Field B-3, from S



Field B-4 from S



Field B-5, from NW



Field B-6, from W



Field B-7, from S



Field B-8, from S



Field B-9, from S



Field B-10, from SE



Field B-11, from E



Field B-12, from W



Field B-13, from E



Field B-14, from N



Field B-15, from S



Field B-16, from SW



Field B-17, from SW



Field B-18, from N



Field B-19, from W



Field B-20, from SW



Field B-21, from SW



Field B-22, from NE



Field B-23, from W



Field B-24 from SW



Field B-25, from W



Field B-26, from W



Field B-27, from N



Field B-30, from N



Field B-29, from E



Field B-28, from NE



Field B-33, from W



Field B-32, from W



Field B-31, from N



Field B-36, from N



Field B-35, from N



Field B-34, from E



Field C-1, from N



Field C-2, from S



Field C-3 (background), from NW



Field C-4 and C-5, from S



Field C-6, from SW



Field C-7, from NW



Field C-8 (forestry), from N



Field C-9, from NW



Field C-10, from SE



Field C-11, from SW



Field C-12, from W



Field C-13, from N



Field C-14, from NE



Field C-15, from NW



Field C-16 and C-17, from N



Field C-18 and C-19 from, SE



Field C-20, from SE



Field C-21, from SE



Field C-22 from S



Field C-23 from S



Field C-24, from S



Field C-25 from NW



Field C-26 from SW



Field D-1 from N



Field D-2 (forestry), from W

APPENDIX 12-IV: PHOTOGRAPHS OF WIND TURBINE FOOTPRINTS WITHIN PROPOSED DEVELOPMENT AREA



Turbine 1, from E



Turbine 2, from E



Turbine 3, from N



Turbine 4, from E



Turbine 5, from NW



Turbine 6, from E



Turbine 7, from S



Turbine 8, from N



Turbine 9, from E



Turbine 10, from NW



Turbine 11, from W



Turbine 12, from N



Turbine 13, from N



Turbine 14, from E



Turbine 15, from S



Turbine 16, from N



Turbine 17, from SW



Turbine 18, from SW



Turbine 21, from N



Turbine 20 from NW



Turbine 19 (in forestry), from NE



Turbine 22, from W

REFERENCE DOCUMENTS

Upperchurch Windfarm Environmental Impact Statement

Ecological Impact Assessment



Malachy Walsh and Partners
Engineering and Environmental Consultants