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EIS ASSESSMENT CHAPTERS

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1 INTRODUCTION

1.1 Project Introduction and Project Outline

McMahon Finn Wind Acquisitions Ltd wishes to develop a wind farm at Coor and Shanavogh, County Clare. The townlands for the Coor Shanavogh wind farm project are Coor West, Shanavogh East and Shanavogh West, County Clare. This EIS is an assessment for a six turbine wind farm at Coor and Shanavogh, Co. Clare, from here on referred to as the 'Coor Shanavogh Wind Farm Project' and/ or 'the Project').

INIS Environmental Consultants Ltd have prepared an Environmental Impact Statement (EIS) on behalf of McMahon Finn Wind Acquisitions Ltd. The EIS has been prepared in accordance with the European Communities (Environmental Impact Assessment) Regulations.
Cumulative impact effects are also considered in conjunction with the consented wind farms at High Street and Glenmore, Boolynaglereagh, Booltiagh, Cahermurphy and the proposal at Slievecallan.

A previous EIS (Planning Reference 10720) drafted for a larger wind farm project at Coor Shanavogh was submitted during 2010 by McMahon Finn Wind Acquisitions Ltd. The 2010 application (now withdrawn from the planning process) comprised of 12 wind turbines. This application was withdrawn as following consultation its proposed layout and extent were considered unsuitable.

This revised development for Coor Shanavogh is significantly scaled down in both layout and size. This revised layout comprises 6 Enercon E82 electricity generating wind turbines with surrounding hard standing areas for construction and maintenance, an electrical compound, substation operation building and associated equipment, associated excavation of three borrow pits, new internal site access tracks, upgrading of existing site tracks and underground cables.

An outline of the basic physical dimensions of the Enercon E82 is as follows:

- Rated power 2,300 kW;
- Rotor Diameter 82 m;
- Hub height 84.6 m;
- Gearless, variable speed, single blade adjustment.

Additional more specific details of the Turbines can be found in the Project Description Chapter 2. The proposed output capacity of the wind farm is 13.8 MW. A grid connection application has been submitted and validated and is currently being processed.

Specific project construction details are provided in Chapter 2 – Project Description and in the relevant assessment Chapters. A summary outline of the pertinent characteristics of the project is as follows:

- The Proposed Coor Shanavogh Wind farm Project is located within the area designated by Clare County Council as *'Acceptable in Principal'*, Clare Wind Energy Strategy 2011-2017;
- The project landholding is 90.7 Hectares (224.1 Acres);
- The site planning application area/ size is 10.51 Hectares (25.97 Acres);
- The lengths/ areas of internal access roads to be upgraded is 73 meters/ 312 sq m^2;
- The overall additional length/ area of roads is 2066 meters/ 1.2 Hectares (2.9 Acres) 12,000m^2;
- The length/ area of internal access floating roads is 0 meters;
- The hard-standing area (roads, substation, turbines, construction phase compound, parking and all other infrastructure) is 2.1 Hectares (5.3 Acres);
- Total infrastructural excavation volume (peat, soils and stony matter) is 26,500 m^3;

- The volume of rock available from the proposed borrow pit designs is 30,050m^3. All the required infrastructure rock will be sourced onsite.

This Environmental Impact Statement (EIS) is submitted according to the following schedule of documents. Further details are given in section 1.4 below.

Volume I:	Non Technical Summary.
Volume II:	EIS Project Description & Assessment Chapters.
Volume III:	Appendices which include various documents including additional sub contractor reports, figures and various technical information sheets.
Volume VI:	Landscape Character Impact Assessment Photomontages and ZTV maps.
Volume V:	Scaled Project Planning Drawings.

1.1.1 Site Location Description

The site of the Coor Shanavogh wind farm is in the townlands of Coor West, Shanavogh East and Shanavogh West, between Mullagh and Connolly in West Clare. The proposed site is located approximately 9 kilometers from the Atlantic Coast at Quilty County Clare and a little over 20 kilometers from the nearest major town of Ennis, County Clare, see Figure 1.1. Figure 1.1 is represented with higher resolution (image quality) in Appendix 1 of Volume III of this EIS. Irish grid reference coordinates for the approximate central location of the site are 510612, 674756.

Illustrative Plates of the site are given in Sub-Appendix 3 in the EIS Volume III: Appendices. Aerial Illutrative plates of the site and surrounding locality are also given in Sub-Appendix 13 in the EIS Volume III: Appendices. Quick reference maps of the site are given below as Figures. A4 and A3 maps of the site location, site boundaries, site layout, private dwelling locations, forested areas and wind farm infrastructure etc are available in Sub-Appendix 1 of EIS Volume III: Appendices. Scaled presentations of the site layout and all other details are given in Volume V of the EIS: Scaled Planning Drawings.

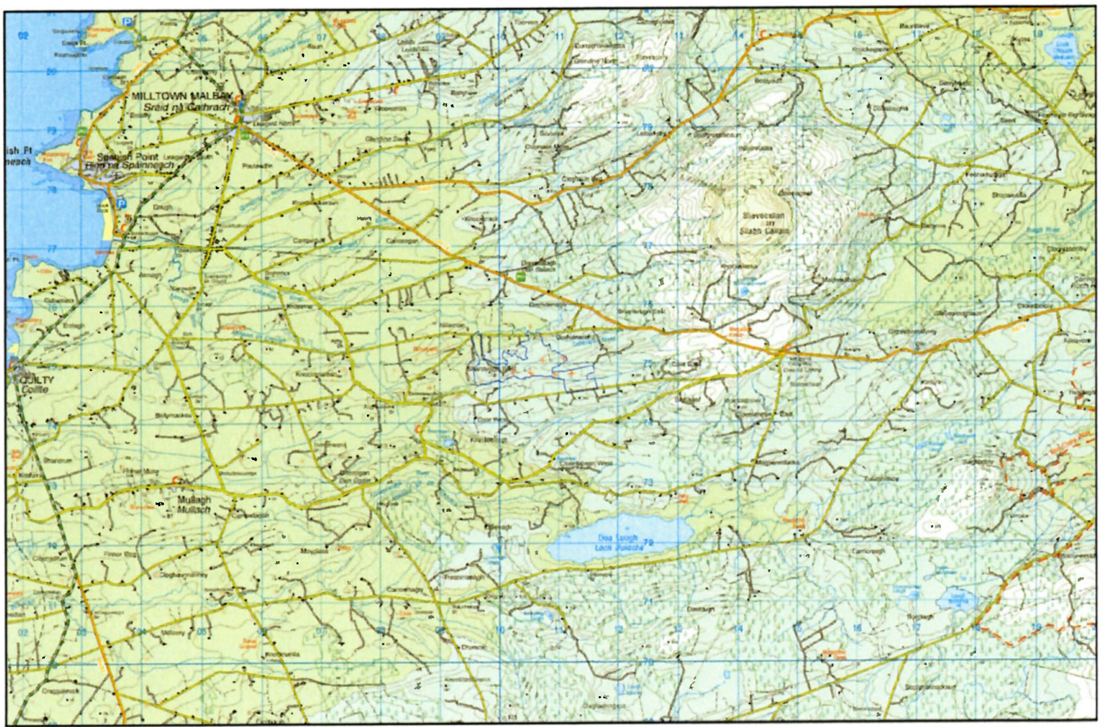

Figure 1.1 Regional context of proposed wind farm at Coor and Shanavogh, County Clare. The wind farm landholding is outlined in blue, the turbine locations are indicated with red crosses (A3 version in Appendix 1, Volume III: Appendices).

The general area is upland and hilly in nature with elevations generally above 110 mOD. Two unnamed streams drain the general location within which the proposed site sits. To the north east of the site is the local mountain top high of Slievecallan at 390 mOD. To the south of the site the dominant natural feature of Doo Lough sits at an elevation of around 83 mOD. Ben Dash at 267mOD is the next highest peak located about 9 kilometer to the south east of the site location.

Land cover on site consists of mostly wet grassland and first rotation coniferous forestry (between 6 and 10 years). Some areas of land are agriculturally managed and can be described as improved agricultural grassland. Two small areas have been identified as wet heath. A small head water streams exists along the southern boundary of the project land holding, this stream eventually flows into an unnamed river which flows into the sea just south of Quilty, the stream and river is identified as the Coor Shanavogh watercourse for the proposes of this EIS. Figure 1.2 gives a more local context of the site. Figure 1.2 is represented with higher resolution (image quality) in Appendix 1 of Volume III of this EIS.

The Site location, Site Layout and all other details relating to turbine and infrastructural design and layout are also illustrated in the scaled Planning drawings submitted as Volume V of this EIS application.

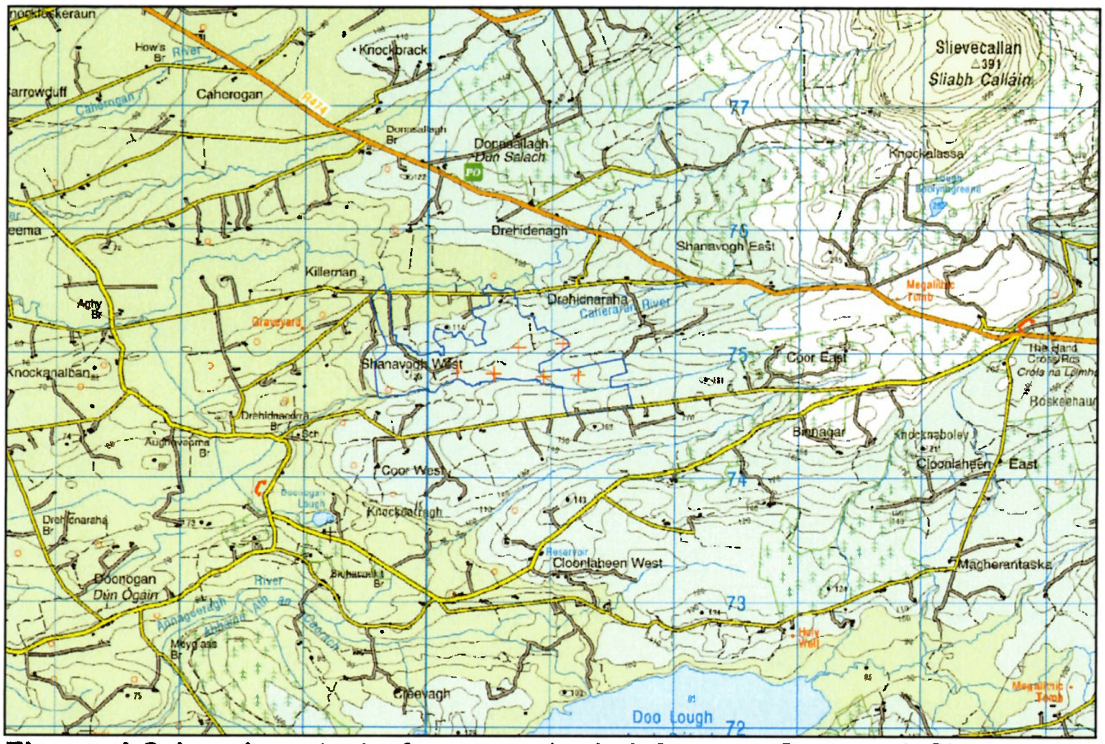

Figure 1.2 Local context of proposed wind farm at Coor and Shanavogh, County Clare. The wind farm landholding is outlined in blue, the turbine locations are indicated with red crosses.

1.1.2 Wind Power and Irelands Future Power Needs

Ireland has a huge potential energy source with wind power. The Atlantic weather systems are consistent and strong. This resource is not currently exploited and our dependence on imported fossil fuels is approximately 91% based on 2006 wind energy only supplies 6%. The Irish economy will derive the following benefits from increasing wind power:

- Security of energy supply;
- Reduced reliance on fuel imports;
- Economic activity and employment associated with construction etc;
- Reduced pollution levels;
- And reduction in greenhouse gas production.

1.2 Planning and Wind farm Legislation

Environmental Impact Statements (EIS's) are carried out in response to the requirements of the European Community Council Directives of 27th June 1985 and 3rd March 1997, on the assessment of the effects of certain public and private projects on the environment (85/337/EC and 97/11/EC). The enabling Statutory Instruments which transpose 85/337/EC into law in Ireland are European Communities (Environmental Impact Assessment) Regulations 1989 to 1999, with the main legislation being Statutory Instruments 349/89 and 93/99. These regulations generally set out the types of projects which must be subject to EIA and the format and contents of EIS's.

Article 24 of the Local Government (Planning and Development) Regulations 1994 provides for the prior carrying out of an EIA for any development of a class specified under Article 24 of S.I. 93/99. The proposed development falls within the class of development types under Article 24, First Schedule, Part II, Section 3 (Energy Industry) (i) – Installations for the harnessing of wind power for energy production (wind farms) with more than 5 turbines or having a total output greater than 5 MW.

The information to be contained in an EIS is set out in the second schedule of Article 25 of S.I. 93/99. The content of this Environmental Impact Statement conforms to the relevant requirements as specified in Article 25 of the above mentioned EIA Regulations. This EIS has furthermore been undertaken having regard to the Environmental Protection Agency's Draft Guidelines on the information to be contained in Environmental Impact Statements (EPA 1995) and Advice notes on Current practice in the preparation of Environmental Impact Statements (EPA 1995).

The objective of the environmental impact assessment is to determine the likely impacts of the proposed development on the environment and where adverse impacts are identified, and to propose measures to avoid reduce or remedy them.

Department of the Environment, Heritage and Local Government has issued the new (2006) Wind Energy Planning Guidelines which are relevant to the project. More specific guidance is provided through the details of the planning frameworks outlined in the west Clare Local Area Plan, the Clare County Council County Development Plan and the Clare County Council Wind Energy Strategy. In addition to the statutory guidance/ planning framework documents there are several other pertinent information sources and peer reviewed guidance documents,

The documents and reports reviewed as part of this EIS assessment include:

1 Best Practice Guidelines for the Irish Wind Energy Industry (IWEA, 2008),
2 Clare County Development Plan 2011 – 2017,
3 West Clare Local Area Plan 2009 – 2015,
4 Volume 5 Draft Wind Energy Strategy, Clare County Development Plan 2011 – 2017,
5 Appropriate Assessment - West Clare Local Area Plan 2009 – 2015,
6 Heritage Councils County Clare Landscape Character Assessment (Environmental Resource Management 2003),
7 Delivering community benefits from wind energy development: A Toolkit (Renewables Advisory Board Centre for Sustainable Energy, 2009),
8 Cumulative Effect of Wind farms - Version 2. Scottish National Heritage, 2005),
9 Wind farm Development - Guidelines for Planning Authorities 1999,
10 Wind farm Development – Guidelines for Planning Authorities 2004,
11 Wind Farms and Tourism. Australia's Peak Body For The Wind Energy Industry (Tourist Attitudes Toward Wind farms, MORI summary report, 2002);
12 Mid Clare Way - Walkers Map Guide,
13 National Parks and Wildlife Service Site Synopsis,

14 EIS and Additional Information for the Slievecallen Wind Farm submitted with Planning Application (Planning Ref No: P10/0009) January 2010,

15 EIS and Additional Information for the Booltiagh North and East Extension submitted with Planning Application (Planning Ref No: P06/1755) August 2006,

16 Clare County Council Decision to Grant Booltiagh North and East Extension (Planning Ref No: P06/1755) April 2007,

17 EIS and Additional Information Reports for the proposed wind farms at High Street and Boolynagleragh by Hibernian Wind power Ltd (Planning Ref: 03/80 and 03/79),

18 EIS and Additional Information for a proposed wind farm Glenmore by Clare Winds Ltd (Planning Ref: 02/2228),

19 EIS for the Booltiagh Wind Farm submitted with Planning Application (Planning Ref No: P00/567) March 2000,

20 An Bord Pleanala inspectors report with respect to the original Booltiagh planning application (ABP Ref. No: PL03.120616),

21 An Bord Pleanala Planning schedule and conditions with respect to the original Booltiagh planning application (ABP Ref. No: PL03.120616) March 2001,

22 EIS and Additional Information for the Booltiagh North and East Extension submitted with Planning Application (Planning Ref No: P06/1755) August 2006.

23 EIS and Additional Information for the Slieve callan Wind Farm submitted with Planning Application (Planning Ref No: P10/0009).

1.3 Consultation

Consultation in the preparation of this report included but was not limited to the following bodies or sources of information:

- Clare County Council;
- Local landowners;
- Community groups;

- Statutory bodies;
- All relative local, regional and national stakeholders.

A consultation letter, containing a preliminary outline project description, was sent to relevant statutory consultees during the scoping process. The consultation letter was drafted and sent by Vaughan Engineering and architectural services acting on behalf of McMahon Finn Wind Acquisitions Ltd. A full list of the bodies consulted, the consultation letter sent and the corresponding responses can be found below in sub-section 1.3. A summary schedule of the consultees and responses received is set out in Table 1.1.

A second consultation letter, containing the revised project description, was sent to relevant statutory consultees during the compilation of this EIS. Details are provided in Table 1.1.

1.3.1 Public Consultation 2010

Comprehensive consultation was undertaken as part of the initial wind farm application (Pl. Ref 10720) in July 2010. Public Consultation started with house to house calls over a number of months explaining to each house holder what MFW Ltd. were proposing to do and to give a preview of the site map and turbine locations in advance of the public meeting.
McMahon Finn Wind Acquisitions Ltd. (MFW) endeavoured to call to all houses adjacent to the proposed wind farm, some houses were unoccupied or the occupier was unavailable so MFW left business cards to all these houses so they could contact MFW regarding a visit at another time. The dates and comments from these visits are listed below.
After the house to house calls MFW had a public meeting on the 20th and the 21st of July in the Spanish Armada hotel. The 20th was a briefing for the TDs and councillors, all were invited to attend, and the following attended Timmy Dooley/ Michael Hillary/ Pat Breen/ Joe Carey.

The meeting on the 21st was a public meeting and it was attended by over 100 people. Duncan Stewart spoke at length to the crowd about the positives and

importance of renewable energy and also his vision of how the community could become involved.
MFW decided after the meeting and taking all comments on board to reduce the size of the project from 15 to 12 turbines, and then went back on the road to meet residents that expressed concerns at the public meeting especially the concerns over turbine location and the school; the three turbines removed from an previous layout alternative for a 15 turbine wind farm were in the vicinity of the school. The turbine numbers were subsequently reduced to 12, now the final proposal is for 6 turbines.
Most houses visited were very appreciative of the call and thanked MFW for giving them the chance to find out more about the project.

At all times the promoters of this project endeavoured to keep the community up to date with the on going situation, and by reducing the size of the project on a number of occasions shows their commitment to taking on board the concerns of the local community.

The public meeting was advertised in the local press and on local radio.

1.3.3 Private NGOs and Statutory Body Consultation

Details of all NGO, statutory body consultation is outlined below in Table 1.1.

Table 1.1 Consultation list for the wind farm proposal.

CONSULTATION LIST 2010	
NAME	**RESPONSE**
Louis Whelan Civils Operations, Chorus NTL, UPC Communications Ireland Ltd., Unit 7 Broomhill Business Park, Tallaght, Dublin 24	No Impact
George Corcoran Transmission Department 02 Ireland 76 Lower Baggot St. Dublin 2 E: george.corcoran@o2.com 086-8148393	No comment issued
Tony Smyth Director of Engineering Services, Office of Public Works 51 St. Stephens Green, Dublin 2	No comment issued
Tom Cooney Irish Aviation Authority Avalon house, Hawkins St, Dublin 2	No negative impact
ESB Networks: Mid West Division, Quinn Rood, Ennis, Co. Clare	No comment issued
Limerick RTE Studios	No comment issued

Cornmarket Sq Denmark St Limerick	
Economic Development & Planning Department, Clare Country Council, Aras Contae and Chlair, New Road Ennis, Co Clare	Clare Co. Council request that the EIS should include sections on: Impact on residential amenity (noise, shadow flicker etc), Clare Co. Council advises that the EIS should take into consideration the cumulative impacts of the proposal and existing wind farm developments in the area, and essentially address the route delivery selection process and presence of the hen harrier bird.
Tom Cooney Irish Aviation Authority Aviation House, Hawkins St Dublin 2	No negative impact
Limerick RTE Regional Studios Cornmarket Sq Denmark St Limerick	No comment issued
Sustainable Energy Ireland Finisklin Business Park Sligo	No comment issued
Mr Paddy Mattews Manager Environmental and Regional Co-ordination Mitre Ireland Baggot St Bridge Dublin 2	No comment issued
Joanne Pender, Development Officer, Irish Wildlife Trust, Sigmund Business Centre,	No comment issued

93A Lagan Rd. Dublin Industrial Estate, Glasnevin, Dublin 11 Ph: 01-8602839 Fax: 01:8308914 E enquiries@iwt.ie	
Dense Healy ESB Telecoms Dublin 2	No impacts predicted
Vodaphone, Radio Planning Dept., Mountain View, Leopardstown, Dublin 18 1800 30 80 20	No comment issued
02 Communications Ltd 28/29 Sir John Rogerson's Quay, Dublin 2 061 203501	No comment issued
Department of Communications, Energy and Natural Resources, 29-31 Adelaide Road, Dublin 2, Ireland 01 678 2000	The remit of this Department is to encourage the further use of renewable such as wind energy as a clean source of energy production. However it does not comment on individual projects.
Failte Ireland	No comment issued
Geographical Survey of Ireland, Beggars Bush, Haddington Rd., Dublin 4. 01 6782000	There are no geological heritage sites that lie within or near the site.
The Heritage Council	No comment issued
Ian Lumley An Taisce Tailors Hall	No comment issued

Back Lane Dublin 8 01 4541786	
Development Applications Unit (DAU) of the Department of Environment, Heritage and Local Government	Written responses dated April 28th and May 6th 2010 observations from the DAU were detailed with regard to archaeological and architectural heritage however no comments were made with regard to the natural heritage. 'Openfield Ecology' addressed this letter as part of the initial ecological assessment work. TVAS Archaeology addressed Cultural Heritage
Dr Julie Fossitt, Divisional Ecologist, Western Division, Department of Environment, Heritage and Local Government	Detailed letter was received dated June 3rd 2010. 'Openfield Ecology' addressed this letter as part of the initial ecological assessment work.
Micheal MacCarthy, Department of Agriculture, Fisheries and Food ' Environment Department Johnstown Castle Co Wexford 053 9163467 Fax 053 9143965	No comment issued
Department of Community Rural & Gaeltacht Affairs, Dun Aimhirgin 43-49 Mespil Road, Dublin 4 01 6473000 Fax: 01 6670826	No comment issued
Birdwatch Ireland, P.O Box 12, Greystones, Co. Wicklow 045 860133	No comment issued

Mr Eamonn Cusack, Chief Executive Officer, Shannon Regional Fisheries Board, Ashbourne Business Park, Dock Road, Limerick	Changes to river morphology should be avoided. The aquatic habitat and physical nature of any watercourse should be fully described in detail. The SRFB are concerned over soil stability. The SRFB recommends that personnel be employed to assess soil strength and suitability. During the construction phase it is important to allow waters being pumped from the site the required retention time in settling pond Silt traps should also be employed and monitored. Normal water flows should be maintained before and during construction. Consideration should be given to the disposal of all waste materials such that they will not give rise to any risk. Details in relation to site offices and services should form part of the EIA. The EIS should indicate proposals to monitor the impact on all water courses within the site.
Anthony Byrne, Department of Environment, Heritage and Local Government, Heritage and Planning, Dim Sceine, Harcourt Lane, Dublin 2 01 8883109	The Department of Environment, Heritage and Local Government request that the applicant take into account the impact of the proposed development on Material Assets including architectural, archaeological and cultural heritage. The Department recommends that the site should be carefully inspected for potential unrecorded archaeological features. A detailed report should be written based on the archaeological assessment and suitable mitigation measures would be recommended where appropriate. Visual impact should also be considered if appropriate.

Proinsias De Battin Development Applications Unit, National Parks and Wildlife Service, 7 Ely Place, Dublin 2. Tel: 01 8883193 Fax: 01 8883272	The DAU request that all guidelines be adhered to. The EIS should give details disposal and rehabilitation disturbed peat. A detailed be required. The EIS must proposed development will surface waters. Likely impacts on birds, habitats and surface considered at the EIS stage. Appropriate Assessment will Bird surveys will be required to paths, importance of the site for birds and impact on bird habitats.
EPA Headquarters PO Box 3000 Johnstown Castle Estate Co. Wexford 053 9160600 Fax:053 9160699	No comment issued
Sinead Clancy Irish Farmers Associations, Regional Office Administrator, 1 Church Street, St. John's Square, Co. Limerick.	No comment issued
Ms Congella Maguire, Clare County Council Heritage Officer	No comment issued
Mr Mike Fitzsimmons, Environment Officer with the Shannon Regional Fisheries Board	No comment issued
Additional consultation 2010/ 11	
Irish Aviation Authority Mr Tom Cooney Corparate Affairs, 4^{th} Floor 11-12 D'Olier Street, Dublin 2.	It is unlikely that the development at Coor would have any adverse consequences for the safety of air navigation provided that it complies with any aeronautical lighting and positional data requirement

01 67186555	specified by the Irish Aviation Authority at the Planning Stage
Emer Sheahan, Frequency Planning and Coverage Department, Radio Telefis Eireann Transmission Network Ltd., Nutley Building, Donnybrook, Dublin 4.	Wind farm frequency planning form issued.
Director of Engineering, An Garda Siochana, Telecommunications Section, Garda HQ, Phoenix Park, Dublin 18.	No comment issued
Engineering & Central Stores, Irish Coast Guard, Unit 1, Rosemount Business Park, Ballycoolin Road, Dublin 11.	No comment issued
The Manager, DDA, Shannon Airport, Co. Clare.	No comment issued

1.3.2 Public Consultation 2011

Following the revision of the previous proposals for 15 and then 12 turbines, the proposal has now been further reduced and the proposed number of turbines is now 6. A public door to door consultation was again carried out by MFW Ltd. between April 20th and April 27th 2011 and was finally completed on May 8th 2011. It was conducted by Mr Pat Taylor, Mr Bobby Finn and Mr Ronan of MFW Ltd. MFW Ltd. visited 30 houses in the locality and also some in Miltown Malbay and Mullagh.

The *modus operandi* was a face to face meeting with householders where MFW Ltd. provided a map showing the revised plan for the project.

MFW Ltd. had lengthy and sometimes robust discussions with the householders and it would appear that generally 90% were in favour and had no immeadiate objection to the project with the remaining people were against the project.

MFW Ltd. emphasized that they had reduced the size of the project and MFW Ltd sought to establish any concerns which the local community may have. Some houses were visited on more than one occasion when no householder was at home or by virtue of the fact that the property was unoccupied. MFW Ltd. intend to continue visiting houses as required in the run up to planning submission date in order that all local people and people of the greater area are aware of the project.

1.3.3 Pre Planning Meetings Clare County Council

A meeting was held on Wednesday 1st December, 12:00 at Clare County Council offices with the west Clare local area planner Mr Gareth Ruane. Clare County Council recommended that the EIS should include sections on alternatives considered, potential impact on residential amenity (noise, shadow flicker etc), Clare County Council also advised that the EIS should take into consideration the cumulative impacts of the proposal and existing wind farm developments in the area, and essentially address the route delivery selection process and importantly the presence of the hen harrier bird.

A second meeting was held on the 17^{th} of February 2011 with both Mr Gareth Ruane (west Clare local area planner) and Mrs Fiona Murran (north Clare local area planner). Clare County Council again pointed out the need for full assessment of potential impacts to residential amenity (noise, shadow flicker etc) and the hen harrier bird. In addition Clare County Council indicated that further consultation with the local community should be carried out. In addition to this the MosArt Viewshed Reference Point (VRP) selection report drafted by MosArt was presented and a selection of VRPs where selected for final production of photomontage work.

1.4 EIS Format

The EIS is prepared in a format which examines each environmental topic or theme (as prescribed by the EIA regulations) as a separate chapter. Each of these separate chapters describes (where relevant):

- The proposed development;
- The receiving environment;
- Likely or potential significant impacts;
- Mitigation measures where appropriate;
- Residual impacts where applicable and
- Potential cumulative impacts.

The EIS addresses each of the topics specified by the EIA Regulations Paragraph 2(c) of the Second Schedule of the 1989 Regulations outlines the following heading as specified information which shall be included in an EIS: 'a description of the likely significant effect, direct and indirect, on the environment of the development, explained by relevance to its possible impact on the topics listed in Table 1.2. The EIS regulation topics are given in Table 1.2 and the Coor EIS chapter under which it is assessed is also given. This report has been prepared in accordance with the recommendations of the Environmental Protection Agency's (EPA) *Guidelines on the Information to be Contained in Environmental Impact Statements* (EPA, 2002) and *Advice Notes on Current Practice (in the preparation of Environmental Impact Statements)* (EPA, 1995) and with reference to the Clare County Development Plan 2011 - 20017. In addition other publicly available information sources and guidance documents have been reviewed and referenced where relevant.

This Environmental Impact Statement (EIS) is submitted according to the following schedule of documents

Volume I: **Non Technical Summary.**

Volume II: **EIS Project Description and Assessment Chapters.**

Chapter 1 Introduction.
Chapter 2 Project Description and Alternatives Considered.
Chapter 3 Human Beings & Material Assets.
Chapter 4 Flora and Fauna.
Chapter 5 Avifauna.
Chapter 6 Landscape & Visual.
Chapter 7 Soils and Geology.
Chapter 8 Water, Hydrology and Hydrogeology.
Chapter 9 Noise.
Chapter 10 Air Quality and Climactic Factors.
Chapter 11 Shadow Flicker & Electromagnetic Interference.
Chapter 12 Traffic, Transportation and Route Selection.
Chapter 13 Archaeology & Cultural Heritage.
Chapter 14 Interaction of the Foregoing.

Volume III: **Appendices.**

Appendices include various documents including additional sub contractor reports, figures and various technical information sheets. Quick reference maps and site layout details are given in Appendix 1. See Table of Contents in Volume III for content details.

Volume VI: **Landscape Character Impact Assessment Photomontages and ZTV maps.**

Volume V: **Scaled Project Planning Drawings.**

See drawings schedule in Volume V for content details.

Additional assessment criteria was included to cover the specific scope of the wind farm project, these additional topics are outlined in Table 1.2.

Table 1.2 EIA Regulations and EIS Format.

EIA REGULATION TOPICS	Coor Shanavogh EIS Chapters which cover EIA regulation headings
Human Beings	Human Beings - Chapter 3, EIS Volume II.
Flora and Fauna	Habitat, Flora & terrestrial Fauna - Chapter 4, EIS Volume II. Avifauna – Chapter 5, EIS Volume II.
Water	Hydrology and hydrogeology – Chapter 8 EIS Volume II.
Soils	Soils and Geology – Chapter 7, EIS Volume II.
Air	Air Quality and Climactic factors - Chapter 10, EIS Volume II.
Climate	Air Quality and Climactic factors - Chapter 10, EIS Volume II.
Landscape	Landscape - Chapter 6, EIS Volume II and EIS Volume IV – Photomontages & Visibility Maps.
Material Assets	Human Beings - Chapter 3, EIS Volume II.
Cultural Heritage	Archaeology and Cultural Heritage - Chapter 13, EIS Volume II.
Interacting of the foregoing	Within each topic as appropriate and under Chapter 14 Interaction of the Foregoing, EIS Volume II.

Table 1.3 Additional assessment criteria pertinent to the Coor Shanavogh Wind Farm identified and addressed as part of this application.

ADDITIONAL WIND FARM EIA TOPICS	DESCRIPTION
Avifauna	Birds and in particular the hen harrier – Chapter 5, EIS Volume II.
Project description	Outline of all specific details of the project – Chapter 2, EIS Volume II.
Construction details	Specifics of construction plan - Chapter 2, EIS Volume II.
Alternatives Considered	Outline of all Alternatives Considered – covered under Project description Chapter 2, EIS Volume II.
Peat Stability	Peat stability Assessment – Chapter 7, EIS Volume II and EIS Volume III, Appendix 7.
Shadow flicker & EMI (Electro magnetic interference)	Shadow flicker from turbines & Electro magnetic interference at all private houses – Chapter 11, EIS Volume II.
Potential Noise Impact	Noise from turbines at all private houses – Chapter 9, EIS Volume II.
Route selection	Provision of adequate delivery route for turbines and substation components to site – Chapter 12, EIS Volume II and EIS Volume III, Appendix 11.
Ground Investigation	Geotechnical ground investigation of site and in particular the site layout – roads and turbine layouts and construction constraints/ details – Chapter 7, EIS Volume II and EIS Volume III, Appendix 7.
Construction plan	All preliminary construction proposals and details – Chapter 2, EIS Volume II.
Planning Application	Mr. Brendan McGrath (Brendan McGrath and associates Planning Consultants.

1.5 Study Team

Table 1.4 The study team consisted of the following:

ROLE	PERSONNEL INVOLVED
Project Manager	Howard Williams, INIS Environmental Consultants Ltd.
Assistant Manager	Keith Neary, INIS Environmental Consultants Ltd.
ASSESSMENT CHAPTERS	
Flora and Fauna	**INIS Environmental Consultants Ltd** - Howard Williams CBiol CEnv MIEEM - Stephanie Murphy MSc, BSc MIEEM - Keith Neary BSc, Dip, AIEEM (October 2010 to March 2011 flora, fauna and avifauna assessments) **Openfield Ecological Consultants** - Padraic Fogarty MSc BSC MIEMA (July 2010 flora and fauna assessments & Article 6 Screening Assessment)
Avifauna	**INIS Environmental Consultants Ltd** - Howard Williams CBiol CEnv MIEEM - Chris Cullen BSc AIEEM - Stephanie Murphy MSc, BSc MIEEM (October 2010 to March 2011 flora, fauna and avifauna assessments)
Human Beings	**DARE Ltd** - Paddy Donovan B. Agr. Sc. (For) MSIF **Biospheric Ltd** - Eugene McKeown B.E., L.L.B., M. Sc., C. Eng., M.I.E.I., M.I.O.A., M.A.S.A.

	INIS Environmental Consultants Ltd - Keith Neary BSc, Dip, AIEEM **Izzy projects Ltd** - Pim de Ridder – Nijmegen, The Netherlands
Air Quality & Climactic Factors	**INIS Environmental Consultants Ltd** - Keith Neary BSc, Dip, AIEEM
Geology and hydrogeology	**AGEC Ltd - Ground Engineering Consultants** **INIS Environmental Consultants Ltd** - Keith Neary BSc, Dip, AIEEM
Geotechnical ground investigations	**AGEC Ltd - Ground Engineering Consultants** - Dr. Paul Jennings BEng (Hons) PhD Dip Arb - Ian Higgins BSc (Hons) MSc FGS
Hydrological & Hydrogeological Assessments	**Hydro Environmental Services Ltd** - Mr. David Gill - Mr David Broderick
Noise	**Biospheric Ltd** - Eugene McKeown B.E., L.L.B., M. Sc., C. Eng., M.I.E.I., M.I.O.A., M.A.S.A.
Shadow flicker	**Izzy Projects Ltd** Pim de Ridder – Nijmegen, The Netherlands **DARE Ltd** - Paddy Donovan B. Agr. Sc. (For) MSIF
EMI	**Izzy Projects Ltd** Pim de Ridder – Nijmegen,

	The Netherlands
Landscape and visual	**Macroworks Ltd** - Nik Hennessy Photomontages **MosArt Ltd** - Richard Barker Landscape and Visual Impact Assessment
Turbine technical details	**Enercon GmBH** - Jochen StÖttner
Project planning and turbine sitting	**Izzy Projects Ltd** Pim de Ridder – Nijmegen, The Netherlands **Enercon GmBH** - Jochen StÖttner **DARE Ltd** - Paddy Donovan B. Agr.Sc.(For) MSIF **INIS Environmental Consultants Ltd** Jim Williams CEng MIEI
Drawings and design	**Control Surveys** - Cian O'Leahy IIS - Fergal Fitzgearld BEng **INIS Environmental Consultants Ltd** -Jim Williams CEng MIEI
Archaeology	**TVAS Ireland Ltd** - Kate Taylor MA (Cantab) MIAI MIFA - Milica Rajic (Post-Excavation Assistant)
Meterological Mast	**Wind Prospect Group**

Roads, Transportation and Turbine Delivery	**Exceptional Load Services Ltd** - Edwin Sunderland
Interaction of the foregoing	**INIS Environmental Consultants Ltd** - Keith Neary BSc, Dip, AIEEM
Planning	**Brendan McGrath and Associates Planning Consultants** - Mr. Brendan McGrath
Grid connection and electrical designs for site including substation	**Renewable Power Generation Ltd** **Synergy centre** -Dave McNamara Managing Director

1.5.1 The Applicant

McMahon Finn Wind Acquisitions Ltd., as promoters of this project started the journey when the land was zoned under the County Development Plan 2005/ 2010. One of the three promoters' family own the first land block. They were then approached by adjoining land owners to see if they could become involved. Because of the local connection it was very important to MFW to make sure the greater community concerns were taken on board. As a result of the above McMahon Finn Wind Ltd (MFW Ltd) have invested significantly in preparing a project that complied with all current local/ national planning guidelines while assessing and addressing the local concerns.

1.5.2 The landowners

Elizabeth Sexton:

Elizabeth has been involved in agriculture all her life and is assisted by her son Michael, this project will allow the family to further diversify whilst utilising their land holding. Michael has children. Michael and his mother Elizabeth have been of great support to the developers.

John MacMahon:

John is a local farmer living on the site; he has been a great supporter of the project since its inception and is also the father of a young child. John is a construction professional and the construction of the project will allow him to diversify and to further capitalise on his land holding.

PJ Hennessy:

Again a farmer and construction professional who does not live on the immediate site but lives only three miles away in Dunsallagh. PJ has a family and will benefit by capitalising on land that is otherwise marginal.

Michael Glynn:

Michael is living on site and is also a farmer with a family who recognises the difficulties associated with trying to farm on west Clare land and is happy with the prospect of diversification.

Michael and Christina Scanlon:

Michael and Christina Scanlon are non resident landowners and have been of great personal support to MFW Ltd. Michael and Christina are business people in Co. Kerry and the fact that they are non resident is irrelevant as without their good will the project would never have left the concept stage.

Cyril McMahon:

Deceased 2010 but was of great support to the project even though he was battling a terminal illness throughout the inception of the project. He recognised that this type of project would revitalise the area and offer some form of hope to rural west Clare.

1.6 Assessment Quotations

Environmental Impact Statements by their nature contain statements about the proposed development, some of which are positive, and some are negative. Selective quotation or quotations out of context can give a very misleading impression of the findings of the study. Quotations should where reasonably

possible be taken from the conclusions of specialists' sections or from the non-technical summary and not selectively.

1.7 Statements of Difficulties Encountered

It is a requirement of the EIA Regulations to include a statement of the difficulties encountered in preparing the EIS, particularly any involving data deficiency.
No significant difficulties were encountered. It is our opinion that there is no data deficiency within this EIS submission.

1.8 Background to Wind Energy

1.8.1 Global Wind Energy and EU Policy

Global Warming and Fuel Resource
Power generation by the combustion of fossil fuels is, along with transport, causing the world's major man-made environmental problems. It is estimated that world wide energy demand will double in the next 25 years releasing ever greater volumes of carbon dioxide (CO2) and other damaging gaseous compounds such as oxides of nitrogen (NOx), and sulphur oxides (SOx) into the atmosphere.

Global climate change resulting from the release of CO2 and other "greenhouse gases" is now believed to be the most serious environmental threat facing the planet. This message has been recently and emphatically reinforced at the Paris 2007 session of the Intergovernmental Panel on Climate Change (IPCC).

The IPCC report's messages are clear and unequivocal. There has been a 0.74C rise in global temperatures over the past century, much of this occurring in the last few decades. The direct link between human activities and global warming is clear. The report confirms that warming resulting from human activity is around 10 times greater than that from changes in the Sun's activity.

The IPCC concludes that global temperature will rise a further 1.1-6.4C by the end of the century, influenced by how emissions grow. Well below the higher end of this range, the impacts would be devastating.

With world population expanding rapidly the demand for energy is constantly increasing at an even greater pace and, in addition to the threat of climate change, fossil fuels will become exhausted unless energy production from the use of viable sustainable sources is substituted.

Wind Energy

Wind energy has the potential to make a significant contribution to sustainability and reduction of green house gases. The energy pay back period for a wind turbine in terms of the energy that went into manufacturing it is around 3 months, and over the course of its life it will repay the energy that went into its production over 30 times. To the end of June 2010 175,000 Megawatts of wind energy capacity had been installed worldwide (www.wwindea.org). By the end of 2010 installed wind energy capacity in Europe had reached 86,279 Megawatts of which 1,428 Megawatts were installed in Ireland. In 2009 10.1% of Ireland's final electrical consumption was generated by wind energy, putting Ireland in fourth place in the European league (www.ewea.org Wind in power 2010 – European Statistics Feb 2011) Avoided fuel costs for Europe for 2009 amounted to €6,000,000,000 and green house gas emissions of 106 million tonnes. The potential reductions in greenhouse gases resulting from the Irish wind energy installations for 2010 are presented below:

Gas Type	Tonnes
CO_2	3,855,600
SO_2	69,970
NO_x	7,850

1.8.2 Kyoto Protocol – National Commitment

As greenhouse gases such as carbon dioxide (CO2) and nitrogen dioxide NO2 are partly produced by generating electricity from non-renewable energy sources, there is continuing pressure on the international community to find alternative ways of generating power which have less impact on the environment. At the world Convention on Climate Change, which was held in Kyoto in December 1997, a Protocol was adopted setting binding targets on industrialised nations to reduce their emissions of greenhouse gases. The EU agreed a combined target for member states of an 8% reduction on 1990 levels by 2010.

In Ireland more than 95% of man-made CO2 emissions are a result of the combustion of fossil fuels (coal, peat, oil and gas) used for electricity generation and to meet other energy needs. Carbon dioxide is the main greenhouse gas implicated in climate change and Ireland, in line with the EU objective, has adopted a National CO2 Abatement Strategy. This strategy is designed to limit the levels of carbon in the atmosphere as a way of reducing the threat of climate change and meeting Ireland's set targets of limiting CO2 emissions.

Within the EU commitment Ireland was allowed an increase of 13% over 1990 levels by 2010. This limit, however, has already been reached. The Irish Government's Green Paper on Sustainable Energy published in autumn 1999 states that:

"on the basis of present forecasts Ireland will be required to achieve a reduction of 7 million tonnes of CO2 equivalent of Greenhouse gases per annum during the period 2008 –2012. The scale of the challenge involved should not be underestimated. Emissions of greenhouse gases will grow in excess of 25% between 1990 and 2010 compared to the 13% limit allocated to us within the EU. This limit will be reached in 2000 which provides a measure of the task involved."

In December 2003 the Minister of Communications, Marine and Natural Resources, Dermot Ahern, in his introduction to a preliminary review on the current government support programme, the environment in which renewable energy sourced electricity operates and the setting of new targets for the coming decade stated that he:

"....inherited a challenge to complete a target to add 500 megawatts of new renewable energy based electricity generating plant to the electricity network by 2005. I am determined to deliver the target".

Presently the national over all target is 16% of total final energy consumption by 2020. Renewable electricity RES – E 40%, Thermal Market RES – H 12% and Transport RES – T 3%.

1.9 National Strategy and the AER

1.9.1 National Policy - the National Development Plan

The Economic and Social Research Institute's medium-term review 1997-2003 commented that the Irish economy is growing more rapidly than the rest of the EU. It also links the analysis of growth to environmental performance including the issue of carbon dioxide emissions and the associated global warming. It points out that economic growth may however be slowed by problems of environmental pollution. Carbon dioxide levels have already risen by about 15% since 1990 and a possible threat to the economy would be further actions required in response to the need to halt the global warming process. It appears that the country's "Growth permit" (for emissions) will be significantly reduced and it is essential for its carbon-based economy to change.

The review also cautions that external dependency on energy will also increase substantially if indigenous renewable energy sources are not used. Approximately 66% of primary energy requirement is currently obtained from imported fossil fuels. Unless the proportion of indigenous and renewable energy is increased, external dependency could increase to 96% by the year 2010.

The National Development Plan (NDP), 2007 - 2013, identifies, as one of its High Level Objectives, maintaining "a sustainable high quality environment". And as part of that sustainability has defined in the case of electricity, the requirement for an increase of the 2010 target for renewable energy consumption to 15%.

It also goes on to define state support for ongoing renewable and large scale wind development:

"Ireland has significant renewable energy resources available but their large-scale exploitation continues to require support and intervention by policy makers because of the investment costs and risks entailed. This intervention is required across the three principal energy sectors: electricity, heat and transport and in the industrial, public, commercial and domestic sectors. The proposed investments will considerably enhance environmental sustainability. Increased market penetration of renewable energy technologies in the electricity, heat and transport sectors will displace fossil fuels such as coal, oil, gas and peat".

"The NDP Sustainable Energy Sub-Programme has alotted some €276 million to fund the largescale development of wind energy capacity and the development of alternative sources of energy such as bio-mass and bio-fuels, ocean energy and solar and geothermal technologies; this is a further key element to help reduce greenhouse gas emissions".

1.9.2 The Green Paper on Sustainable Energy

Although now superseded by the EU Directive (2009/28/EC), details of the Green paper are given here for information purposes. The Green Paper indicates how Ireland will progress towards meeting its energy requirements in an environmentally and economically sustainable way having regard to forecast economic growth and security of supply objectives. The Brundtland Commission defined "sustainable" as ensuring that the needs of present

generations can be met without compromising the ability of future generations to meet their own needs.

Sustainability and security of supply are the central themes in all Department of the Environment Policy.

'Forecasts of the fuel mix in power generation anticipates that natural gas will account for 56% of the fuel mix in 2010. If, as considered in the ERM report, Money point were to cease to operate as a coal station by the Kyoto commitment period, natural gas could account for 78% of the fuel used in power generation by 2010.'

The Green paper recognises that whilst switching to high efficiency CCGT plants fuelled by natural gas would benefit CO2 abatement it would also raise issues of security of supply and of course sustainability in the longer term. Natural gas is a finite resource.

The production of energy from wind power on the other hand is both sustainable and indigenous (and infinite). Ireland with Scotland has the best wind resource in Europe, which could be utilised to provide clean, totally renewable, cost efficient indigenous energy. Denmark with a similar sized population and very much lower wind speeds meets 7% per cent of its electricity needs from wind power and has a thriving manufacturing and export industry.

The Green Paper on Sustainable Energy states that:

"An ambitious approach will be adopted to increase the role of the renewable sources of energy in power generation. This will include increased targets for the generation of electricity from renewable energy sources to 500MWe in the period 2000 –2005. It is anticipated that the majority of this additional energy will be derived from on-shore wind."

More recent protocol is found in the details pertaining to EU Directive (2009/28/EC)are given in Sub Section 1.9.3. The 'EU Directive 2009/28/EC on the promotion of the use of energy from renewable sources'. This EU directive establishes a common framework for the production and promotion of energy from renewable sources. It describes how EU member states can exchange an amount of energy from renewable sources using a statistical transfer (Article 6). Further, Article 9 emphasizes the possibilities of establishing the cooperation with third countries (non-EU states) if the following conditions are met:

- the electricity must be consumed in the European Community;
- the electricity must be produced by a newly constructed installation (after June 2009);
- the electricity produced and exported must not benefit from any other support.

Each Member State has a target calculated according to the share of energy from renewable sources in its gross final consumption for 2020. This target is in line with the overall '20-20-20' goal for the Community. Moreover, the share of energy from renewable sources in the transport sector must amount to at least 10% of final energy consumption in the sector by 2020. It may be possible that energy form the wind sector could be used a compensation measure for any shortfsall in the transport sector.

1.9.3 Alternative Energy Requirement and REFIT

As part of the Government's efforts to promote alternative energy sources and thereby reduce reliance on fossil fuels and obtain supplies of energy from indigenous sources, the Department of Transport, Energy and Communications announced a series of competitive tender schemes to obtain energy known as the Alternative Energy Requirement (AER).

The AER is designed to:

(1) support the long term development of renewable energy systems;
(2) obtain supplies of energy from indigenous renewable energy sources, a primary objective of Irish energy policy source;
(3) reduce environmental damage caused by energy production;
(4) contribute to the objectives of National Abatement Strategy to limit CO2 emission;
(5) further diversify energy sources;
(6) contribute to the European Union target set in the ALTENER Programme to triple electricity production from renewable sources in the EU as a whole in the period 1991- 2005.

AER 5:

Resulted in the award of around 350 MW of electricity supply contracts. The 350 MW was divided between two project bands – small projects below 3.0 MW (35.8 MW) and large projects above 3.0 MW (318.3 MW).

AER 6:

Resulted in awards of 330 MW including 50 MW offshore. Some AER6 contracts were awarded to AER5 projects and the total awarded for AER5 and AER6 are to be 640 MW and 50 MW offshore.

REFIT 2006:

Since 1994, the government has sponsored various schemes like the AER whereby wind farms could acquire a contract to sell their electricity to the national grid. The most recent scheme is REFIT 2006, which will initially support the construction of an initial target of at least 400 MW of renewable energy powered electricity.

REFIT aims to more than double the contribution of renewable sources in electricity production from 5.2 % in 2004 to 13.2 % by 2010 by increasing the total capacity of renewable energy technologies built to 1,450 MW. Most of the new energy will come from wind projects.

This additional capacity is capable of:

- Supplying the electricity needs of 260,000 homes,
- Reduce Ireland's dependency on imported fossil fuels by more than 2.5 million barrels of oil (4 oil tanker shiploads) every year or 37.5 million barrels of oil (60 oil tanker shiploads) over 15 years (the lifetime of the renewable energy support),
- Improve Ireland's national trade balance by € 75 million annually by redirecting money previously spent on energy imports back into the local Irish economy. This is worth over € 1 billion to the Irish economy over 15 years (the lifetime of the contracts),
- Create 300 new, secure, long-term jobs in renewable energy equipment operation and maintenance and 1,100 full time construction jobs in construction,
- Preventing the emission of over 1 million tonnes of polluting greenhouse gases annually.

On announcing the scheme in May 2006, the 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."

More Recent National Policy:

The Directive 28/2009/EC sets a mandatory target of 20% share of energy from renewable energy sources (RES) in gross final energy consumption for

the European Union as a whole by 2020. In terms of electricity consumption, renewables should provide about 35% of the EU's power by 2020.

The directive legally obliges each EU Member State to ensure that its 2020 target is met and to outline the 'appropriate measures' it will take do so in a National Renewable Energy Action Plan to be submitted by 30 June 2010 to the European Commission.

The key principles of the Directive are the following: 20% overall EU renewables target broken down into differentiated legally binding national targets, priority access to the electricity grid for renewables, the option for Member States of using flexibility mechanisms to help reach national targets and the streamlining of administrative procedures.

Furthermore it was agreed to introduce a normalisation formula to account electrical generation from hydropower, in order to smooth the effects of climatic variation.

National Policy is now stated in EU Directive (2009/28/EC), 20% of total final consumption is to be derived from renewables by 2020, Irelands 28/2009/EC is 16%. The energy market is broken down into three segments; electricity, thermal (heating and cooling) and transport. The targets for each segment are set out below expressed as a percentage of the total final energy consumption for each segment. Also presented are the provisional figures 2009 achieved again expressed as a percentage of total final energy consumption.

Table 1.5 EU Directive (2009/28/EC).

Segment	**Code**	**2020 Target**	**Provisional Figure 2009**
Electricity	RES – E	40%	14.4%
Thermal	RES – H	12%	3.9%
Transport	RES – T	3%	1.5%

Source SEAI – www.seai.ie

1.10 Planning History of the Project

1.10.1 Initial Planning works

EIS assessment work was carried during 2009 and early 2010 by Vaughan Engineering and Architectural services. However significant changes have now been made to that wind farm proposal and that turbine layout. Following this, new assessment work was initiated to focus on the revised proposals and plans. Some of the earlier 2009 (and early 2010) assessment work is still relevant to the overall proposal; any assessment reports which are relevant and/ or useful are quoted/ referenced where relevant and included in the appendices of this EIS. In addition, in the light of the timing of the issue of the new Clare County Development Plan and the status of all adjacent projects it was decided to withdraw the application and to reapply when these matters were finalised. The application (Planning Reference number 10720) was formally withdrawn in 2010.

A planning application was made for an anemometer mast at the site. This planning application was invalidated due to a technical reason. A retention planning application was lodged for the mast, however the mast was later dismantled and removed from the site and the retention planning application was formally withdrawn.

1.10.2 2011 Planning Application

This EIS is submitted as part of a new planning application for a 6 turbine, 13.8 MW electricity generating wind farm with surrounding hard standing areas for construction and maintenance, an electrical compound, substation operation building and associated equipment, associated excavation of borrow pits, new internal site tracks, upgrading of existing site tracks, upgrading of existing drainage, expansion of existing drainage system, and underground cables.

In undertaking the Environmental Impact Assessment work for this current 2011 proposal and assembling the Environmental Impact Statement full

consideration was given to all existing guidance documentation, relevant legislation, relevant studies and existing EIS work which has been carried out separate to this project.

1.10.2.1 Desktop review of relevant guidelines and reference documents

- Clare County Development Plan 2011-2011,
- Clare County Wind Energy Strategy 2011-2017,
- West Clare Local Area Plan 2003,
- Heritage Councils County Clare Landscape Character Assessment (Environmental Resource Management 2003),
- Wind farm Development - Guidelines for Planning Authorities 1999,
- Wind farm Development – Guidelines for Planning Authorities 2004,
- Mid Clare Way - Walkers Map Guide,
- National Parks and Wildlife Service,
- EIS and Additional Information Reports for the proposed wind farms at High Street and Boolynagleragh by Hibernian Wind power Ltd (Planning Ref: 03/80 and 03/79) - ESBI Report No's PO4E213A-R3/R5,
- EIS and Additional Information for a proposed wind farm Glenmore by Clare Winds Ltd (Planning Ref: 02/2228).
- EIS for the Booltiagh Wind Farm submitted with Planning Application (Planning Ref No: P00/567) March 2000,
- An Bord Pleanala inspectors report with respect to the original Booltiagh planning application (ABP Ref. No: PL03.120616),
- An Bord Pleanala Planning schedule and conditions with respect to the original Booltiagh planning application (ABP Ref. No: PL03.120616) March 2001,
- EIS and Additional Information for the Booltiagh North and East Extension submitted with Planning Application (Planning Ref No: P06/1755) August 2006,
- Clare County Council Decision to Grant Booltiagh North and East Extension (Planning Ref No: P06/1755) April 2007.

1.10.2.2 Other Wind Farm and Relevant Sites

A number of other wind projects have been granted planning or are currently going through the planning process in the surrounding locality (Fig 1.3).

- Clare Winds Ltd in Glenmore townland (Planning Ref 02/2228), planning for 11 turbines granted.
- Hibernian Windpower Ltd at High Street/Frure (Planning Ref 03/79), planning for 17 turbines granted.
- Hibernian Windpower Ltd at Boolynagleragh townlands (Planning Ref 03/80), planning for 5 turbines granted.
- Booltiagh Wind Farm, DP Energy Ltd at Booltiagh Planning Ref 07/2900) permission for 13 turbines granted with a further 6 granted as part of an extension application.
- West Clare Renewables Ltd have made an application for the erection of 31 turbines at Slievecallan (Planning ref 010/0009).

According to planning information these projects were based on large Multi Megawatt turbines (of 2.0 –2.5 MW installed capacity each) with a hub height of 70-75 metres and a rotor diameter of around 80 metres giving an overall tip height of 110-115 metres. All projects were granted Planning Permission subject to conditions (including reduction of the number of turbines in some cases) and are waiting for interconnection offers from ESB and a Power Purchase Agreement.

In 2004 a fourth project at Cahermuphy was granted by An Bord Pleanala subject to conditions

- Michael Murphy and Michael Egan at Cahermurphy townland, Kilmihil (Planning Ref 03/2071). This project is based on Megawatt turbines of nominal capacity 1 MW each with a hub height of 55 metres and a rotor diameter of 55 metres.

Table 1.6 Wind Projects in Vicinity of Coor Wind Farm (Granted).

Project	Number of Turbines	Installed Capacity (~MW)	Max Tip Height (m)	Distance to Closest Turbine (km)
Booltiagh	19	31.5	91	5.4
Glenmore	11	22 – 27.5	115	6.707
High Street	5	10 – 12.5	110	9.484
Boolynagleragh	19	38 – 47.5	110	11.512
Cahermuphy	6	6	82.5	5.241

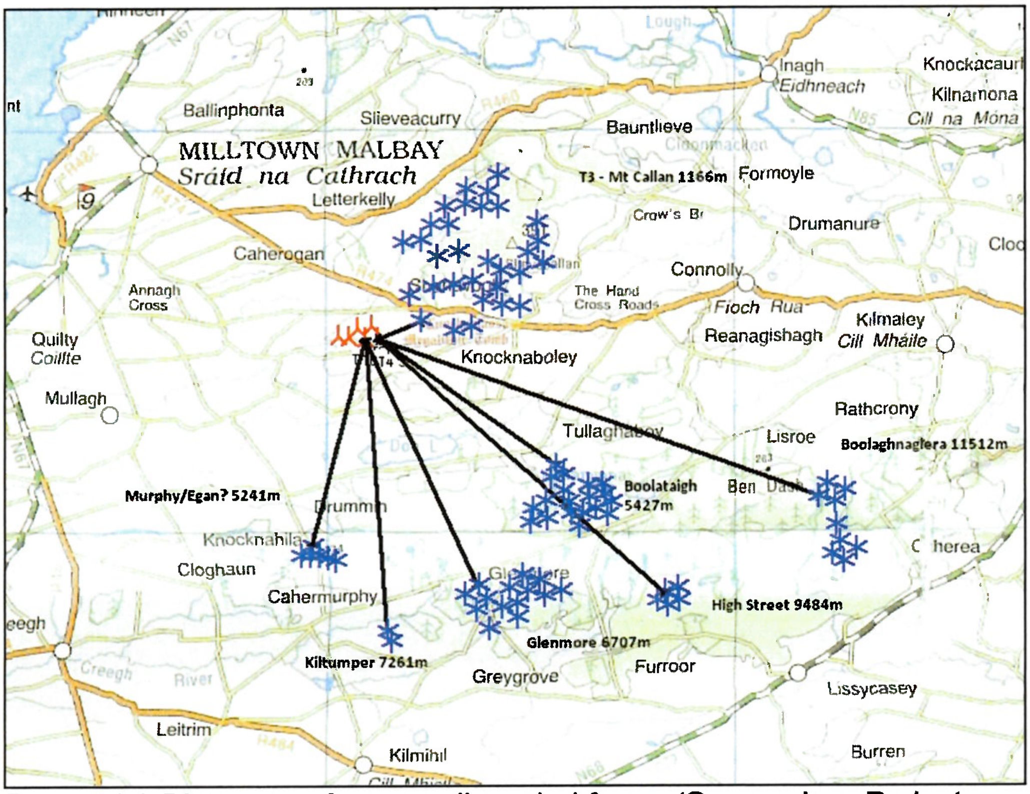

Figure 1.3 Distances of surrounding wind farms (Source: Izzy Projects, WindPRO output).

1.10.5 Other Wind Farm Sites

In addition to the sites granted Planning Permission proximal to the proposed Coor Wind Farm there have been a number of other projects proposed, submitted and either withdrawn or deemed withdrawn:

- West Coast Energy Ltd at Drummin townland, Mullagh (Planning Ref 02/555),
- West Coast Energy Ltd at Doolough/ Drummin townland, Mullagh (Planning Ref 02/556),
- West Coast Energy Ltd at Creevagh & Treenmanagh townland, Mullagh (Planning Ref 02/557).

All of these projects were deemed withdrawn on 24th Nov 2002 after the request for further information date was not met. Given the elapsed time and that these projects appear both dormant and highly speculative they are not considered further.

A single turbine proposal was also made:

- Noel Kelly - Clarewinds Ltd Caheraghacullin townland, Kilmihil, (Planning Ref 02/2306).

This project was deemed withdrawn on 12th August 2003 after the request for further information was not met. Again this project appears dormant and speculative, and as a single turbine would in any case be unlikely to have any significant cumulative effect in relation to the wind farms assessed.

An additional wind farm has been applied for at Slievecallan:

- West Clare Renewable Energy Ltd (WCRE Ltd), Slievecallan, County Clare (planning ref 10/0009).

This project is currently with An Bord Pleanala. At its closest it is 1.166km from the Coor project. The Slieve Callan application is considered in the cumulative impacts of several of the assessment chapters.

1.11 Clare County Council Policy

1.11.1 Clare County Development Plan 2005-2011

The development strategy of the Clare Planning Authority, as outlined in the Clare County Development Plan, is to encourage and facilitate the balanced growth and sustainable development of the county. It is a stated objective of Clare County Council to encourage and facilitate the sustainable economic growth and regeneration of the rural areas of the county. It is also an objective of the Council to encourage the sustainable use of natural resources for, among other purposes, the production of energy.

A Clare County Development Plan 2011-2017 has already been created and it has now replaced the 2005-2011 Plan. Thus the 2011-2017 Plan is considered more relevant to the proposed development, which is the subject of this EIS. The development strategy and relevant policies of the Clare County Development Plan 2011-2017 are outlined in detail in Section 1.11.2 below, along with its Draft Wind Energy Strategy.

The main differences between the Draft Clare County Development Plan 2011-2017 and the current Clare County Development Plan 2005-2011, as relate to wind energy development, are also highlighted in Section 1.11.2 below. The most relevant policies of this document as relate to wind energy are outlined below.

Table 1.7 Relevant policies of Clare County Development Plan 2005-2011.

OBJECTIVE / POLICY	DESCRIPTION
Objective 16	To encourage the sustainable use of natural resources for the provision of potable water supply, the extraction of minerals and aggregates, the planting of forestry and the production of energy.
CDP 25	It is the policy of the Planning Authority to seek the development of wind energy infrastructure sufficient for the production of 50 MW of electricity by the year 2010 through the identification of suitable areas. Proposals for the development of infrastructure for the production and distribution of electricity through the harnessing of wind energy will be determined by reference to the County Wind Energy Strategy. Local Area Plans will include policies for the consideration of proposals for wind energy development in their areas.
CDP 41	The Planning Authority will require proposals for development to demonstrate that it will result in the efficient and sustainable use of natural and cultural resources.
CDP 42	In considering proposals for development the Planning Authority shall have regard to the extent of environmental impact and will require developers to avoid adverse environmental impacts where possible. Where avoidance is not possible developers will be required to show how they will be mitigating against of compensating for such adverse environmental impacts.
CDP 44	A flood impact assessment for development over 0.5 hectares, to ensure that development does not increase flood risk in the relevant catchment, and a certificate from a competent person for other developments, to show that the development will not contribute to flooding, is required to accompany planning applications.
CDP 46	In areas identified as being vulnerable landscapes the Planning Authority will only normally permit proposals for development of the highest quality in terms of siting and design and where the development will not adversely impact upon to a significant extent upon the character, integrity or uniformity of the landscape.

CDP 48	The Planning Authority will normally only permit development outside settlements where it can be clearly demonstrated that regard has been had to the recognised landscape values and character of the area.
CDP 49	The Planning Authority will normally only permit development where it can be clearly demonstrated that the appearance and character of existing local landscape features are where appropriate retained, protected and enhanced in particular, hedgerows, shelter belts and stone walls.
CDP 50	The Planning Authority will normally only permit development where trees and groups of trees of high amenity value are retained and where such retention is not possible to require that suitable replanting takes place within of adjacent to the site.
CDP 51	It will be the polity of the Planning Authority to require that those seeking to carry out development in the environs of a scenic route to demonstrate that there will be; no adverse obstruction of degeneration of the views towards and from vulnerable landscape features; not significant alterations to the appearance or character of these areas.
CDP 52	The Planning Authority will normally only permit development where it can be clearly demonstrated that; • There is on direct or indirect adverse affect on areas designated as sites or candidate of potential sites of national, European or international importance for wildlife and • There will be no direct or indirect impact upon protected species and their habitats; and • There will be no adverse impact upon features of major importance to wild flora and fauna; and • There are no adverse impact upon features of geological or geomorphological importance recognised by the Geological Survey of Ireland; and • There are no significant adverse effects on local habitats or species.
CDP 53	The Planning Authority will normally only permit developments which can clearly demonstrate that there would be no adverse impacts upon the archaeological or historical importance of recorded sites or monuments.

1.11.2 Clare County Development Plan 2011 – 2017

The County Development Plan 2011-2017 (enacted 7th February 2011) is a six-year plan for the County that sets out planning policy and objectives for that period. This Draft Clare County Development Plan 2011-2017 sets out a clear vision for County Clare which provides for an overall strategy for the social, economic, cultural and physical development of the County up to 2017. The vision will be achieved by the delivery of 20 Goals supported by strategic aims and objectives that are set out within the chapters of the Plan.

Goal 8 of the 2011-2017 CDP relates to the Environment, Goal 9 of the 2011-2017 CDP relates to Energy and Communication, while Goal 15 relates to Landscape. The most relevant policies of this document relating to wind/ renewable energy are summarized in 1.8 below. It should be noted that the development of the 6 turbine wind farm at Coor Shanavogh helps achieve these 2011-2017 CDP polices and the proposed Coor Shanavogh Wind Farm therefore helps satisfy many of the objectives set out in the Clare 2011-2017 CDP vision for social, economic, cultural and physical development of the County up to 2017.

Table 1.8: Relevant Policies of the Clare County Development Plan 2011 – 2017.

Policy	**Description**
CDP 6.5 Energy Supply:	It is an objective of Clare County Council to contribute to the economic development and enhanced employment opportunities in the County: • by facilitating the development of a self-sustaining, secure, reliable and efficient renewable energy supply and storage for the County. • by facilitating the County to become a leader in the production of sustainable and renewable energy for National and International consumption through Research, Technology Development and Innovation.
CPD 6.3.9 Natural Resources	It is an objective of Clare County Council to facilitate, encourage and appropriately manage the development of natural resources

	of the County.
CPD 9.13 Climate Change	It is an objective of Clare County Council: a) To have regard to the National Climate Change Strategy 2007-2012 and Limerick Clare Climate Change Strategy 2006. b) To facilitate measures which seek to establish a low carbon economy and society by 2020. c) To facilitate measures which seek to reduce emissions of greenhouse gases. d) To adopt sustainable planning strategies through integrating land use and transportation and by facilitating mixed use developments as a means to reducing greenhouse emissions.
CDP 10.1 Development of Low Carbon Economy	It is an objective of Clare County Council: a) To promote County Clare as a low carbon County by 2017 as a means of attracting inward investment to the County and the Mid-West region. b) To facilitate the development of energy sources which will achieve low carbon outputs.
CDP 10.2 Renewable Energy	It is an objective of Clare County Council to encourage and to favourably consider proposals for renewable energy developments and ancillary facilities.
CDP 10.3 Wind Energy Development	It is an objective of the development plan to promote and facilitate wind energy production in the County. Proposals for the development of infrastructure for the production and distribution of electricity through the harnessing of wind energy will be determined by reference to the County Wind Energy Strategy.
CDP 13.11 Wind Energy Development	It is an objective of the development plan to facilitate the development of Wind Energy developments in rural areas in accordance with the Wind Energy Strategy 2011-2017.
CDP 16.2 Settled Landscapes	It is an objective of the development plan: a) To permit development in areas designated as 'settled landscapes' to sustain and enhance quality of life and residential amenity and promote economic activity subject to:

	a) Conformity with all other relevant provisions of the Draft Plan and the availability and protection of resources b) Selection of appropriate sites in the first instance within this landscape together with consideration of the details of siting and design, are directed towards minimising visual impacts. c) Particular regard should be given to avoiding intrusions on scenic routes and on ridges or shorelines. Developments in these areas will be required to demonstrate: i) That sites have been selected to avoid visually prominent locations. ii) That site layouts avail of existing topography and vegetation to reduce visibility from scenic routes, walking trails, water bodies, public amenities and roads. iii) That design for buildings and structures reduce visual impact through careful choice of forms, finishes and colours, and that any site works seek to reduce visual impact.
CDP 17.8 Non-designated Sites	It is an objective of Clare County Council: • to ensure the protection and conservation of habitats and species of importance outside of designated sites throughout the County; • to complete the Habitat Mapping of the County (in accordance with "*A Guide to Habitats in Ireland*" – The Heritage Council 2007) in order to identify and record the natural habitat of the County at a detailed level and afford appropriate protection to areas of importance, as required.

The above policies and guidelines were taken into consideration when designing the proposed wind energy development at Coor Shanavogh.

1.11.2.1 Wind Energy Development:

Section 13.3.12 of the 2011 – 2017 CDP states that:

> "*There is significant potential for the development of wind energy in the County. County Clare has one of the best wind resources in the world – almost the entire county has either excellent or very good wind energy resource. As the economics of wind energy projects become more*

favorable many more rural areas across the County will be suitable for wind turbines. The development and siting of wind energy projects will need to be balanced with the potential impacts on the landscape and ecology. There are certain planning exemptions for small scale agricultural turbines."

Clare County Council has produced a Wind Energy Strategy for the County (please see Section 1.11.1.2.3.5 below). It sets out areas for wind energy development that are of local, county, regional and national importance and plans for technological advances in wind farms that may occur in the future.

The Development Plan for 2011-2017 has adopted four separate Wind Energy Designations, as outlined in Map D, Volume 2 of the document. These include:

- Strategic Areas,
- Acceptable in Principal,
- Open to Consideration, and
- Not Normally Permissible.

The proposed Coor Shanavogh Wind Farm is located in an area designated as '*Acceptable in Principal*'. Please see Section 1.1.1.2.4.4 – Wind Energy Strategy, below for further details.

1.11.2.2 Landscape and Environment

The Landscape Character Assessment of County Clare identifies 26 Landscape Character Types grouped into Upland, Lowland and Coastal Types. The proposed wind farm development site at Coor Shanavogh is predominantly located within Landscape Character Types of Moorland Hills and within the Landscape Character Area of Sliabh Callan Upland (see map 16.1 and 16.2 of the 2011 – 2015 Draft CDP).

Under both the 2005 CDP and Draft Development Plan 2005-2011, the designated nature conservation sites cited by Clare County Council are the

national designations required under European Law. Designation comes under the responsibility of the Department of the Environment, Heritage and Local Government (DoEHLG). The three main types of designation are;

- Special Protection Area (SPA)
- Candidate Special Area of Conservation (cSAC)
- Proposed Natural Heritage Area (pNHA)

It is Clare County Council's policy to maintain and, where possible, enhance the conservation value of all the SPAs, cSACs and pNHAs by ensuring development proposals do not destroy or damage any sites of international or national importance designated for their wildlife/habitat significance. The proposed wind farm is not located within an SPA, cSAC or pNHA (please see Map E, Volume 2 of the CDP 2011-2017).

In addition to designated sites, the CDP 2011-2017 contains a policy to ensure the protection and conservation of habitats and species of importance outside of designated sites in the County (see Policy 17.8 in Table 1.8 above). It recognises that there are many sites throughout the County that host important plant and animal species of their habitats (including Annex I habitats, Annex I birds and Annex II species) but which are not designated as an SPA, SAC or NHA.

The visual impact of the proposed development on these scenic routes ia fully assessed in Chapter 6, Landscape & Visual assessment Chapter.

The proposed wind farm site is not located within areas zoned as Heritage Landscape (see Map G6, Volume 2 of Draft CDP 2011-2017).

As can be seen from Figure1.4 below, there are no recreational walking routes or trees for preservation in the vicinity of the proposed wind farm, nor are there any protected structures within the boundary of the proposed development. The mid Clare Way exists over 9 kilometres to the east of the site (see Figure 1, Appendix I, Volume III). The Mid Clare Way is assessed by MosArt Ltd

(Landscape Character specialists) as part of Chapter 6 Landscape and Visual Impact assessment (LVIA). The MacroWorks Ltd photomontages assess all walkers' views as necessary.

Volume 3 of the Draft CDP 2011-2017 contains a Draft Strategic Flood Risk Assessment. The Planning Guidelines define flood hazard through zonal classification as follows:

i) Zone A – High probability of flooding: >1% probability for river flooding, >5% for coastal flooding,
ii) Zone B – Moderate probability of flooding: 1% to 0.1% probability for river flooding, 0.5% to 0.1% probability for coastal flooding,
iii) Zone C – Low probability of flooding: <0.1% probability.

As seen from Figure 1.4, the proposed development is located within Flood Risk Zone C and thus is at low risk from flooding. The closest high-risk flooding area is located immediately north of the third class road, which runs along the north of the site, the Caheraran River. Please refer to Chapter 8 for further details on the hydrology of the site.

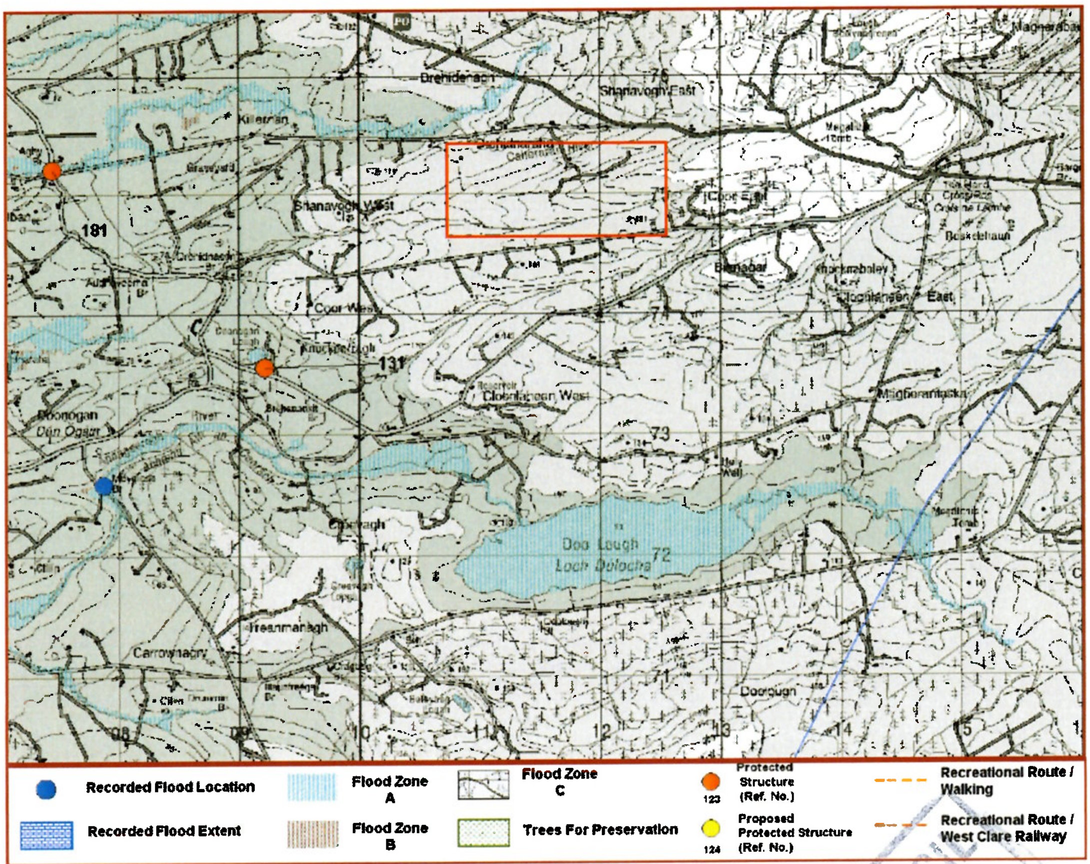

Figure 1.4: Extract from Map H6, Volume 2 of CDP 2011-2017.

11.1.2.3 Relevant Differences between 2005 CDP and the new Draft CDP 2011-2017

11.1.2.3.1 Renewable Energy Targets

Policy CDP 25 of the 2005 CDP states that "It is the policy of the Planning Authority to seek the development of wind energy infrastructure sufficient for the production of 50 MW of electricity by the year 2010".

The Draft 2011-2017 CDP acknowledges The White Paper on Energy, which has set a target of 40% of electricity to be generated from renewable sources by 2020. In the Midwest Regional Climate Change Strategy, County Clare is identified as having a potential 600 MW energy produced from renewables by 2020. In response, the Draft 2011-2017 CDP states that "County Clare will aim to achieve a minimum target of 550 MW from wind energy by 2017".

11.1.2.3.2 Living Landscape

In the assessment of attitudes to the implementation of the 2005 County Development Plan it became apparent that the word 'Landscape' came to be regarded as a restrictive term. As such it came to be perceived as valuing only appearance with little heed to the needs of the communities and landowners that shape it. More positive and proactive policies have been sought that will provide support for the vitality of rural communities and help to make things happen – rather than be perceived as an obstacle to development. In response, the Clare County Development Plan 2011-2017 proposes County Clare as a series of 'Living Landscapes' – where different parts of the County are regarded as having different potential in terms of how communities can pursue their ambitions and aspirations.

This County Development Plan therefore proposes that future planning policies for rural areas in County Clare be integrated by considering the area to comprise three types of areas, as follows:

(i) Settled landscapes – areas where people live and work,

(ii) Working Landscapes – intensively settled and developed areas within Settled landscapes or areas with a unique natural resource,

(iii) Heritage Landscapes – areas where natural and cultural heritage are given priority and where development is not precluded but happens more slowly and carefully.

The area within which the proposed wind farm development is located is characterized as 'Settled Landscape' (see Map B, Vol 2 of the CDP 2011-2017). This comprises a network of farmland villages and towns that make up the majority of the County. They provide opportunities for enterprise, leisure and personal fulfilment. They contain the resources of land, soil, minerals and water that are used to sustain the economy. They accommodate the roads, power-lines, quarries and piped services that service settlements and industry.

Uses envisaged within Settled Landscapes include agriculture, energy, forestry, extraction, transportation, industry & commerce, tourism, recreation and leisure, education, healthcare and social infrastructure.

Many areas within the Settled Landscapes of County Clare contain ground and surface waters that are sensitive to the risk of pollution and coincide with areas identified for nature conservation. The developers acknowledge that the 2011 – 2017 CDP advises that the "highest standards will be applied at all stages of the evaluation of site suitability, site design and the design and management of all installations for the interception, storage and treatment of all effluents". Consideration was given to each of these factors during the design of the proposed development.

1.11.1.2.3.3 Wind Energy Exclusion Zones

According to the 2005 CDP, Clare County Council will not consider proposals in the following areas:

- 500 m from boundaries of settlements
- No Go Areas
- Locations where wind farms are physically or visually obtrusive.

Volume 5 of the Draft 2011-2017 CDP contains the Draft Wind Energy Strategy. This Strategy was prepared in accordance with Strategic Environmental Assessment (SEA) and Habitats Directive Assessment (HDA) processes in line with statuary requirements. The SEA and HDA influenced the inclusion and exclusion of certain areas in the Draft Wind Energy Strategy. Areas defined and 'Not Normally Permissible' was done so with regard to the following criteria:

- large number of natural heritage designations or,
- important recreational / tourism area,
- large number of archaeological sites,

- HDA and SEA recommended against these areas being included.

The areas identified in the Strategy as '*Not Normally Permissible*' for wind energy development generally comprise the Burren, the entire coastal strip and areas close to Lough Derg and the Slieve Aughty uplands. Please refer to Section 1.11.1.2.3.5 below for further details on the Draft Wind Energy Strategy.

1.11.1.2.3.4 Wind Energy Designations

In the 2005 CDP, Clare County was designated into three classes assessed by location and suitability for wind farm developments (please refer to Figure 2.4 – Wind Energy Strategy Map, Clare County Development Plan 2005-2011). The classifications included

- Preferred Areas,
- No Go Areas, and
- Areas Open for Consideration.

The proposed Coor Shanavogh wind farm development is located in an area currently classified as 'Open to Consideration' as outlined by Clare County Development Plan 2005-2011.

The Development Plan for 2011-2017 has adopted four separate Wind Energy Designations, as outlined in Map D, Volume 2 of the document. These include:

- Strategic Areas,
- Acceptable in Principal,
- Open to Consideration, and
- Not Normally Permissible.

The proposed Coor Shanavogh Wind Farm is located in an area designated as '*Acceptable in Principal'*. Please see– Wind Energy Strategy – Wind Energy

designations Map Reference D, Wind Energy Strategy Map, Clare County Development Plan 2011-2017.

1.11.1.2.3.5 Wind Energy Strategy 2011-2017

The Draft Wind Energy Strategy forms Volume 5 of the Draft Clare County Development Plan 2011-2017. It was prepared to reflect the changing economic environment and respond to anticipate commercial demands for wind energy developments. It will facilitate development of wind farms by maximizing the wind resource of the County, having regard to recent technological advances in turbine design, updated information of wind speeds, proximity and availability to grid connections and to changing energy and grid connection regulations, while minimizing any environmental and visual impacts.

The most significant element of this Strategy is the defining of areas for wind farm development. As outlined in Section 2.6.1, these include:

a) Strategic Areas,
b) Acceptable in Principal,
c) Open to Consideration, and
d) Not Normally Permissible.

The proposed Coor Shanavogh Wind Farm is predominantly located in an area designated as '*Acceptable in Principal*'. The following criteria were applied with zoning this designation:

i) viable wind speeds,
ii) proximity to grid,
iii) slopes less than 15 degrees,
iv) exludes cSACs and SPAs and avoids most NHAs,
v) low population density.

Each of these criteria applies to the proposed development site at Coor Shanavogh.

Areas designated as *'Acceptable in Principal'* are considered suitable for wind farm development because of:

- sufficient wind speeds,
- access to grid network, and
- established patterns of inquiries.

Projects within these areas, such as the proposed Coor Shanavogh Wind Farm, must:

- demonstrate conformity with existing and approved wind farms to avoid visual clutter,
- be designed and developed in line with the Planning Guidelines in terms of sitting, layout and environmental studies,
- provide a Habitats Directive Assessment under Article 6 of the Habitat Regulations is situated in proximity of a Special Area of Conservation or Special Protection Area.

The developers have taken cognisance of each of these factors throughout the design phase and the preparation of the Environmental Impact Assessment for Coor Shanavogh Wind Farm.

Section 4.0 of the Strategy provides advice on Landscape Capacity for wind energy developments based on Landscape Character Areas (LCAs). The proposed Coor Shanavogh Wind Farm predominantly lies within the Sliabh Callan Upland LCA. Based on the Strategic Guidance on Landscape Capacity for Wind Energy Developments of the Draft Wind Energy Strategy 2011- - 2015, the overall sensitivity of this landscape to wind farm development is Medium to Low (see Table 1.9 below).

Table 1.9: Strategic Guidance on Landscape Capacity for Wind Energy Developments.

LCA	Overall Sensitivity to Wind Farm Developments	Appropriate size of wind farm (turbine number)	Capacity	LTCs in Co. Clare LCA and Corresponding LCTs in 2006 Planning Guidelines	Cumulative Advice form 2006 Planning Guidelines
Sliabh Callan. This LCA encompasses upland hills and slopes of Sliabh Callan and Ben Dash	Medium to Low	Large	The rolling hills, low settlement, extensive plantations reduce the overall sensitivity of this LCA to wind farm development. The area could accommodate a number of large or medium wind farms subject to careful siting to avoid significant impacts on skylines. Potential Renewable Energy Generation for this area is 250 MW (Limerick Clare Energy Agency).	Upland Hills Moorland Hills Planning Guidelines: Moorland Mountain	Acceptable, depending on topography as well as siting and design of wind energy developments involved.

The Draft Wind Energy Strategy seeks to place County Clare at the forefront of wind energy production, with a County target of 550 MW of renewable electricity by 2017. This target will allow Clare to exceed its pro-rata share of the national target for 40% of the electricity from renewable energy sources and to be an 'exporter' of green electricity. It should be noted that this target of 550 MW or renewable electricity represents a very significant increase from the previous target of 50 MW (Clare County Development Plan 2005-2011). This clearly shows the Council's total commitment to supporting wind energy developments in Clare.

1.11.3 North Clare Local Area Plan 2005-2011

Although the Coor wind farm is located in what would generally be considered as west Clare, the majority of the site is located within the area zoned for the North Clare Local Area Plan 2005-2011.
The current North Clare Local Area plan operates form 2005-2011 and is prepared in accordance with the requirements of the Planning and Development Act 2000 and the Planning and Development (Amendment) Act 2002 to set out an overall strategy for the proper planning and sustainable development of the north Clare area.

Some of the most relevant policies include;

Table 1.10 North Clare Local Area Plan 2005-2011.

North Clare Local Area plan: Policies	
ENV1: Landscape Conservation	Proposals for development within the open countryside will normally be permitted only where it can be clearly demonstrated that: • There are no adverse effects on the character of the landscape; and • A high standard of site layout, design and building materials is incorporated to conserve and enhance this landscape character.
ENV1: Protection of Vulnerable Landscapes	Proposals for development within the areas designated as vulnerable landscapes will normally be permitted only where it can be clearly demonstrated that the development will not impinge in a significant way upon the character, integrity or uniformity of the landscape.
ENV3: Protection of Areas of Nature Conservation.	Proposals for development will only be permitted where it can be clearly demonstrated that: • There is no direct or indirect adverse effect on areas designated as sites or candidate or potential sites of national or international importance for wildlife; and • There will be no direct or indirect impact upon protected species and their habitats; and • There will be no adverse impacts upon features of

North Clare Local Area plan: Policies	
	major importance to wild flora and fauna; and • There will be no unacceptable effects to features of geological or geomorphological importance; and • There are no unacceptable effects on local biodiversity or wildlife corridors.
ENV4: Retention, Protection and Enhancement of Landscape Features	Proposals for development will be permitted where it can be clearly demonstrated that they retain, protect and where necessary, enhance the appearance and character of existing local landscape features, in particular hedgerows, shelter belts and stone walls.
ENV5: Protection of Trees	Proposals for development that would result in the loss destruction or significant damage to any tree or shrub within makes a recognized contribution to the amenity, character or appearance of the area will not normally be permitted.
ENV6: Protection of Water Resources	Development which would have an unacceptable effect on the water environment, including surface water and groundwater quality and quantity, river corridors and associated wetlands will not normally be permitted.
Env9: Protection of Archaeological Sites and Places	Proposals for development which are likely to have an impact upon recorded monuments or areas of potentially archaeological interest will only be permitted where it can be clearly demonstrated that: a) A field evaluation of the archaeological implications has been conducted; and b) Proposals for the conservation and management of archaeological resources have been included; and c) There will be no destruction of recorded monuments.
ENV15: Development of adjacent sites	Development proposals on sites immediately adjacent to an architectural conservation area will only be permitted where it can be clearly demonstrated that the development will not materially affect the character or integrity of the area of views into and out of the area.

North Clare Local Area plan: Policies	
SER15: Overhead Service Lines	Proposals for development of new overhead lines should seek to avoid landscape and environmentally protected areas unless a more suitable alternative route is unavailable. Within environmental and landscape protected areas all cables, pipes, fibres and wires should be placed underground or in concealed locations unless: a) The proposal would have no significant detrimental effect upon the landscape; and b) The associated effects of surface compounds or apparatus associated with such undergrounding of the landscape would outweigh the benefits of undergrounding.
SER16: Renewable Energy	Proposal for new renewable energy projects will be permitted, provided that: a) There would be no significant detrimental impact on the character and amenity of the surrounding areas; an b) There would be no significant detrimental impact on the transport network; and c) There would be no adverse environmental impact.
SER17: Wind farm Developments	Proposals for wind farm developments will be permitted where it can be clearly demonstrated that; a) They do not have an adverse visual impact on the landscape on which they are proposed; and b) They do not have a significant adverse impact on a site of archaeological or historical importance or on sites which have rare or protected flora and/or fauna or a delicate ecological character; and c) Power lines between ESB points of generation and wind farm substations have where possible been laid underground to minimize visual impact; and d) The proposed development has had due regard to the published guidelines on distances to noise sensitive properties and the standards in relation to noise; and e) The proposal has been rigorously examined by an environmental impact assessment.

The North Clare Local Area Plan 2005-2011 recognises that there are substantial environmental benefits in using renewable energy sources to limit emissions of green house gases and other pollutants, conserve fossil fuels and solve some problems of waste disposal.

The Council welcomes the wider environmental benefits of renewable energy development in reducing pollution provided that proposals take full account of other objectives to safeguard areas of environmental importance. In considering proposals for renewable energy developments, the Council will need to be satisfied that there are overall environmental assessments submitted in order to support proposals and to clearly identify the overall environmental benefits that would be achievable.

Another major factor in determining the acceptability of renewable energy developments will be their location. In planning terms, the most suitable locations are within commercial and industrial areas and within existing complexes such as sewage treatment works; but for technical reasons it is often necessary that they should be sited close to the energy source

The Planning Authority recognises the importance of renewable energy in the future development of the County and the country in general and will adopt a positive approach to the development of a renewable resource. It will be the Planning Authority's policy objective to encourage the exploitation and usage of renewable energy resources at optimum locations.

In general terms, wind farm developments should not be located in designated scenic and nature conservation areas or where they would be clearly viewed from such areas, unless there is clear supporting evidence that the amenity involved is not adversely affected. Within these areas, there will be a general presumption against wind farm development in the interests of landscape protection.

The number, siting, grouping and colour of wind turbines should harmonise with the grain, scale and pattern of the landscape in which they are situated.

Although often difficult, wind farm developments should seek to avoid skylines and be situated where they have a backdrop, i.e. a ridge, hill or line of trees so they are less dominant on the landscape.

In relation to part C of Policy SER17, wind farm developments, by their nature, are usually located on sensitive landscapes and should seek to locate in close proximity to the National Grid. This will ensure that the least amount of disruption possible is afforded to the landscape in which they are located.

The North Clare Local Area Plan 2005-2011 also recognises that there are a number of benefits that wind farm developments provide. These include:

a) employment: jobs in manufacture, installation and operation of turbines,
b) rural development: additional income for farmers, co-op's and other investors, along with substantial local employment during installation and long term jobs in maintenance,
c) security of energy supply: dependence on oil and other imported fuels reduced,
d) balance of trade: the manufacture and installation of turbines in Ireland would reduce fuel and other imports related to the conventional power plant,
e) international image: wind energy would enhance Clare's reputation as a relatively.

The proposed wind farm is located mostly within an area designated as Suitable for Wind Energy Development and outside the region of Slieve Callan designated as Vulnerable. There are no protected structures within the site. The R474 to the north of the site is designated as a scenic route (see Proposal Map C, number 8).

1.11.4 Draft North Clare Local Area Plan 2011-2017

The Draft North Clare Local Area Plan 2011-2017 sets out a land use plan for the proper planning and sustainable development for the area, which the Draft Plan governs over a six-year period.

The Draft Clare County Development Plan 2011-2017 is the 'parent' document for this Draft North Clare Local Area Plan, and thus the Draft Local Area Plan is made in accordance with the objectives as set out in the Draft Clare County Development Plan 2011-2017.

The overall strategic aim for the North Clare Local Area Plan is to provide a planning framework which facilitates the social and economic development of the plan area in North Clare in order to stabilise recent population gains whilst protecting and, where appropriate, enhancing the natural and built environment and ensuring that development is both sustainable and of high quality.

For the purposes of the preparation of the Draft North Clare Local Area Plan, the Strategic Environmental Assessment (SEA) process is integrated into the plan-making process by:

a) Carrying out consultations with the public and prescribed environmental authorities;
b) Preparing a Draft Environmental Report in conjunction with the preparation of the Draft Local Area Plan;
c) Integrating environmental considerations into land-use zoning and the formulation of objectives
d) Publishing information on the decision
e) Monitoring the significant environmental effects of the implementation of plans/ programmes.

An Appropriate Assessment was carried out to identify the possible effects of implementing the Draft North Clare Local Area Plan 2011 on the conservation status of designated Natura 2000 sites within the Plan area.

The Draft Plan 2011-2017 focuses on providing settlement plans and zonings for the individual towns and villages in North Clare. As the proposed development is not located in close proximity to a town or village, this plan provides no additional information on the proposed location of Coor West Shanavogh Wind farm or on wind energy in general.

Table 1.11 The Strategic Environmental Objectives of the Draft Local Area Plan 2011-2017 include.

Strategic Environmental Objectives of the Draft Local Area Plan 2011-2017	
B1: Biodiversity:	Protect and conserve the diversity and range of habitats, species and wildlife corridors
B2: Biodiversity:	Protect designated sites including Nature 2000 sites (SACs & SPAs) and Natural Heritage Areas.
B3: Biodiversity:	Protect, conserve and avoid loss of important, non designated sites
B4: Biodiversity:	Protect the inland aquatic environment
B6: Biodiversity:	Promote integrated Coastal Zone Management
B7: Biodiversity:	Meet the requirements of the WFD and the RBMP
S5: Soil and Geology:	Conserve, protect and avoid loss of diversity and integrity of designated habitats, geological features, species or their sustaining resources in designated ecological sites
C2: Air/Climate:	Minimize emissions of greenhouse gases and contribute to a reduction and avoidance of human-induced global climate change
C3: Air/Climate:	Reduce waste of energy, and maximize use of renewable energy sources

Strategic Environmental Objectives of the Draft Local Area Plan 2011-2017	
CH1: Cultural Heritage:	Protect and conserve the cultural heritage including the built environment and settings; archaeological (recorded and recorded monuments), architectural (Protected Structures, Architectural Conservation Areas, vernacular buildings, materials and urban fabric) and manmade landscape features (e.g. field walls, footpaths, gate piers etc.)
L1: Landscape:	Conserve and enhance valued natural landscapes and features within them including those of geological value.
L2: Landscape:	Conserve and protect cultural landscapes including archaeological and architectural.
L4: Landscape:	Minimize visual impacts through appropriate design and siting.

1.12 Grid Connection

Both the County Development Plan and the Local Area plan give consideration to the infrastructure requirements of wind farms and in particular the location of the National Grid. However, in practice whilst proximity is clearly a factor with respect to build costs and environmental planning considerations it is the actual availability of electrical grid capacity within the system which determines whether a project can be constructed at a given point in the network.

1.12.1 Grid Connection History

In 2003 a moratorium on issuing any further grid connection offers was implemented by National Grid on the basis of technical concerns over the potential effects of large scale wind generation being introduced to the network. There were a number of reasons for this, but one of the primary concerns was related to a wind farms ability to stay connected to the grid and supplying power, in the event of a fault elsewhere. From this concern a series of wind energy system requirements were developed and introduced into the Irish Grid Code which required wind farms to meet certain electrical stability conditions before being allowed to connect the grid.

Since 2003 much emphasis has been placed on making wind turbines 'Grid Code compliant', and providing mechanisms at a wind farm level to satisfy the system security requirements of ESB/National Grid. With these systems now in place the moratorium has now been lifted, however, grid connection has remained the most significant issue in terms of project delay for wind farms across the country.

1.12.2 Grid Connection Offers and Status

The Gate 3 Offer Project refers to the third round of connection offers that are currently being issued to generators under the Group Processing Approach (GPA). The GPA allows for strategic processing of generation applications for grid connection and was introduced by the Commission for Energy Regulation (CER) in 2004. It allows applications to be processed by the System Operators (EirGrid and ESB Networks) in groups or batches known as 'Gates'.

The scope is based on the CER's decision papers CER/08/260 CER Direction on Criteria for Gate 3 Renewable Generator Offers and CER/09/191 Direction on Conventional Offer Issuance Criteria and Matters Related to Gate 3. It involves offers for connection to circa 3900 MW of wind generation and 1700 MW of conventional generation. The 3900 MW of wind developments to receive an offer as part of Gate 3 provides for the 40% renewable generation target.

The issuance of offers commenced in December 2009 and the roll out of offers from the system operators will continue until June 2011. Key milestones for the upcoming months are the issuance of offers for Area H2 (Wexford region) by the 29 July and Area H1 (South Midlands region) by 17 September 2010.

McMahon Finn Wind Acquisitions Ltd has received a letter (dated 16/07/2009) from ESB Networks Ltd acknowledging that a connection application has been made. The grid connection application has been deemed valid and is currently being processed. Further information regarding the connection details will be outlined as the roll out of offers continues to June 2011. It is not possible at this stage to say where the project will connect. That will be at the discretion of ESB and Eirgrid at the time of connection offer and will be based on the Least Cost Technically Acceptable principle to the group of projects being

considered at that stage and in that Gate. This may or may not include the Mount Callan project but there are a number of other projects in the area which are outside the Gate 3 process. The application has been made to ESB and the final grid connection route and location will be at the discretion and jurisdiction of ESB, and this will be the subject of a separate planning application.

2 PROJECT DESCRIPTION

The development will comprise of 6 Enercon E82 2.3 MW electricity generating wind turbines with surrounding hard standing areas for construction and maintenance, an electrical compound, substation operation building and associated equipment, associated excavation of borrow pits, new internal site tracks, upgrading of existing site tracks, upgrading of existing drainage, expansion of existing drainage system, and underground cables. The proposed output capacity of the wind farm is 13.8 MW. The project site is located within the townlands of Coor West, Shanavogh East, Shanavogh West in west County Clare. The proposed six turbine wind farm will be connected by underground cables at 20kV to the Coor Shanavogh wind farm substation. No additional substation compound or buildings will be required. The connection route, for the Coor Shanavogh wind farm will commence from this substation. The connection of the wind farm to the grid is being assessed in a separate grid connection study.

2.1 Project Outline

The application is being made by McMahon Finn Wind Acquisitions Ltd and the new development involves six local landowners.
The project consists of 6 turbines in the 2 – 2.5 MW class, the Enercon E82 2.3 MW wind turbine has been chosen for this project. The turbines are sited within the site boundaries taking into account factors like minimum distance between turbines, maximising the yield of the turbines and making use of existing infrastructure, human habitation, noise limitations and shadow flicker limitations have been the primary constraints applied to turbine sitting.
The hub height of the turbines is 84.58m exactly (rounded up to 85m) and the rotor diameter will be 82 meters resulting in a tip height of 125.58 m exactly (rounded up to 126 m). The site is located within an area designated by Clare County Council as *'Acceptable in Principal'*.

The turbines will be located upon wet grassland and immature forestry stands and will use the main Coor Shanavogh wind farm infrastructure – site

entrance(s) and turbine access roads. The present land uses will continue after erection of the wind turbines and beyond the life of the machines. The locations of the six turbine sites have been chosen so that all machines are situated within areas which use the topography to minimise the visual impact of the turbines as much as possible.

The location reference is O.S. Ref. R170705 (Map 57 Discovery Series 1:50,000). The geographical location of the site is shown in (Figure 1.1, 1.2, Chapter 1 and Figures 1 and 2, Appendix 1, Volume III). The Site location, Site Layout and all other details relating to turbine and infrastructural design and layout are also illustrated in the scaled planning drawings submitted as Volume V of this EIS application. The proposed layout is given below as Figure 2.1 for illustration purposes; please refer to Figure 3 Appendix 1 of Volume III, EIS Appendices. Specific details provided by Enercon include the Enercon E82 Coor turbine specifications, E82 weights and dimensions data sheet, E82 foundation outline design data sheet and the E82 delivery, crane platforms and assembly data sheet; all are given in Appendix 2, Volume III EIS Appendices.

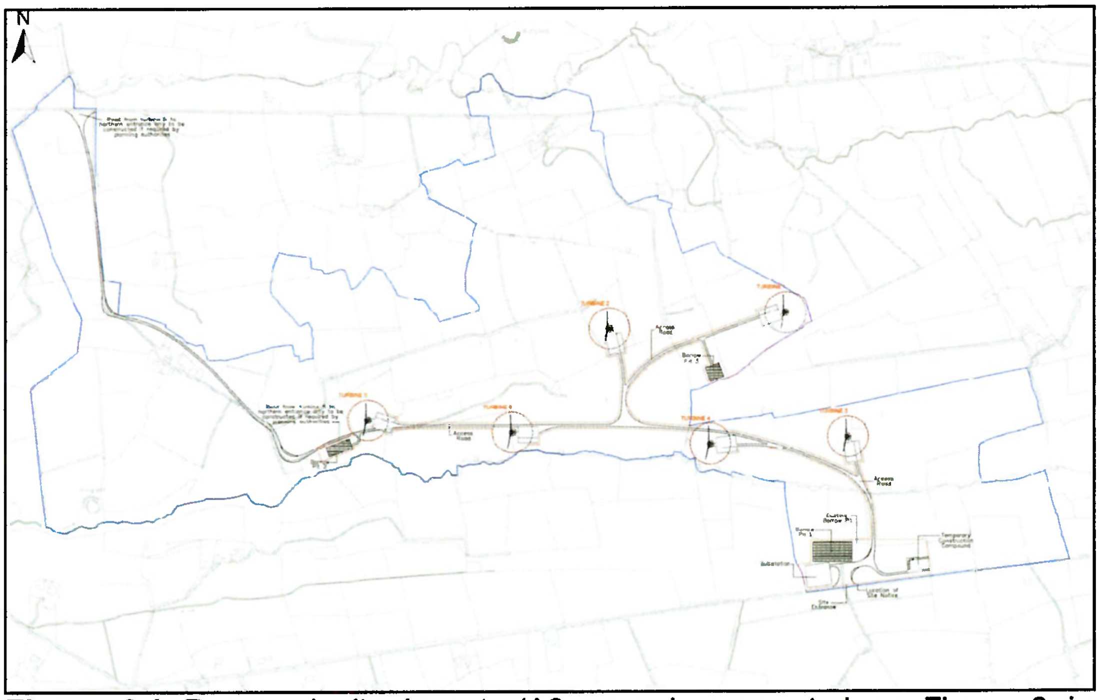

Figure 2.1 Proposed site layout. (A3 copy is presented as Figure 3 in Appendix I, EIS Volume III: Appendices).

2.1.1 Project Construction Details

Specific project construction details are provided in Table 2.1 below, the following Project Description sub headings and relevant assessment Chapters provide further details. A4 and A3 maps of the site location, site boundaries, site layout, private dwelling locations, forested areas, habitats on-site, proposed borrow pits and other wind farm infrastructure etc are available in Sub-Appendix 1 of EIS Volume III: Appendices. More specific details are outlined/ illustrated in other Figures/ Maps which are also provided in Volume III: Appendices. Reference to these Figures/ Maps is given in the relative assessment Chapters.

Table 2.1 Project construction details.

COOR SHANAVOGH WIND FARM CONSTRUCTION DETAILS	
Project Landholding	90.7 hectares (224.1 acres)
Site Planning Application Area	10.51 hectares (25.97 Acres)
Existing lengths/ areas of internal access roads	73 meters/ 312 m^2
Lengths/ areas of internal access roads to be upgraded	73 meters/ 312 m^2
Overall additional length/area of internal access roads	2066 meters/ 1.2 Hectares (2.9 Acres) 12,000 m^2
Length/area of floating internal access roads is	0 meters
Hard-standing area (Roads, substation, turbines, construction phase compound and parking)	2.1 Hectares (5.3 Acres)
Turbine base (approximate excavation area & volume).	225 m^2 and 345 m^3 (approximately 18m^2 of the area will be underground when completed.
Crane Hardstand. There is also a 400 sq meter levelled assembly area (soft	958 m^2

ground) beside each crane hardstand	
Temporary site constuction compound	1350 m^2
Substation area	2250 m^2
Borrow Pit 1	3200 m^2 Extraction volume ~21,600m^3
Borrow Pit 2	1000 m^2 Extraction volume ~3,500m^3
Borrow Pit 3	900 m^2 Extraction volume ~4,950m^3
Total infrastructural excavation volume (peat, soils and stony matter)	~26,500 m^3
The areas of conifer tree clear-fell – access roads & turbulence clearance for turbines (clear-fell license application is submitted following issue of 'notice grant of planning')	Maximum of 11.56 acres (4.67 hectares). The total forested area on site is presently 24.68 hectares.

2.1.1 Government Policy

The Government has outlined a significant requirement for renewable energy development and has indicated that it expects the majority of this to come from on-shore wind development.

The Green Paper on Sustainable Energy defined three key 'deployment constraints' with regard to Renewable Energy Systems and Wind Farms in particular.

- Grid connection;
- Economic costs;
- Planning process.

In order to achieve a competitive p/kWh price it has been necessary to have both the highest achievable wind energy resource and the lowest capital costs.

High wind sites are typically found in remote upland areas and/or coastal regions where there are few people. On the positive side, the presence of few people eliminates noise issues; however, this also means access to the National Grid may be problematic.

High wind areas typically mean coastal areas or areas of high elevation which because of their nature tend to attract scenic designations and also tend to have a positive public perception with regard to landscape quality. Hence the potential conflicts between wind farms and planning policies.

2.1.2 Coor Shanavogh Wind Farm Scale

The Coor Shanavogh project was intended to be a utility scale wind farm designed to maximise the energy capture by having a large density of installed capacity in a focused area to make a significant contribution to the Governments overall Renewable Energy MegaWatt (MW) targets.

To give an outline of the size of the Shanavogh project relative to other wind projects a number of other significantly larger projects which have now been granted approval and are at various stages of construction are given below:

- Meentycat Co Donegal 72.4 MW with 38 turbines of both 2.3 and 1.3 MW.
- Booltiagh (19.5MW, 13 turbines 1500kW each) and Booltiagh extension (12 MW, 6 turbines, 2000kW each) 19 turbines in total with a combined 31.5kW output.
- Derrybrien Co. Galway 60.35 MW with 71 x 850kW turbines.
- Keelderry Co. Galway 48 MW based on 48 x 1 MW turbines.
- Kilgarvan Co. Kerry 45 MW based on 15 x 3 MW turbines.

Locally the proposed Hibernian Windpower project at Boolynagleragh near Lissycassey consists of 19 turbines of between 2 and 2.5 MW in electrical capacity giving an installed capacity of 38-47.5 MW. There is also a

significantly sized wind farm proposed for the Slieve callan mountain to the north east of the site.

The scale of the Coor Shanavogh wind farm can be considered as a small scale commercial wind farm.

2.1.3 Wind Resource

The site has been selected due to the fact that it has good wind resource and is located in an area idenified by the Clare County Development Plan 2011-2017 as *'Acceptable in Principal'*. The prevailing south-westerly winds sweep off the Atlantic Coast some 11km to the west of the site and across the Coastal Plain before reaching an area of high ground at Coor west. Positioned as it is the range provides the first piece of high ground (and wind acceleration) for the approaching winds.

At its highest, this ground reaches an altitude of 390m at Slieve callan 4km to the north east of the site, and 267m at Ben Dash around 9km to the south east. The proposed site lies relatively at the centre of this area on an area of flat lands at approximately between 110mOD to 165mOD The site is significantly lower than the highest points on this 'range' of mountains. It is also notable that several wind farms with planning permission currently sit at elevations higher than that proposed at Coor Shanavogh. Tone of the objective of the wind farm positioning was for it to be visibly removed from the scenic coastal area and effectively trade the loss of wind due to terrain roughness and shelter (by coming inland) and by gaining height.

The estimated long term mean wind speed on the site is 7.9m/s and the annual energy production for the six turbine project is anticipated to be approximately 41.7 GWh/annum.

2.1.4 Hydrology, Hydrogeology and Soil Stability

Investigations have been carried out by Vaughan Engineering and architectural services during February 2010. Additional ground Investigations have taken place since 2011 with Applied Geotechnical Engineering

Consultants (AGEC) and Hydro Environmental Services (HES) having completed significant onsite investigations in 2011 in support of this present application. Geotechnical investigations indicate that the site has very little constraints or problems with ground or peat stability and construction on site will be relatively straightforward. HES concluded that due to the distance of the Annagh River to the proposed development areas, negligible to no impact is anticipated for this water course after mitigation measures are put in place. Direct, negative, slight to imperceptible, short term, low probability impacts on Stream S1 are anticipated during the construction phase. This relates primarily to tree felling and excavation work. Neutral, imperceptible, long term, low probability impacts on stream S1 are anticipated during the operational phase. Inaddition HES concluded that direct, negative, imperceptible, short term, low probability impacts on groundwater quality are anticipated during the construction phase. No impacts on groundwater quality are anticipated during the operational phase and that proposed excavations at the site *(i.e.* borrow pits) do not intersect any flow paths which are contributing groundwater to local water supply wells (*i.e.* there are no wells down-gradient of the development areas). Borrow pits and other excavations cannot therefore impact on yields from any local water supply wells.

2.1.5 Terrain and Peat Depths and Soil Stability

Site investigations were carried out by Vaughan Engineering and architectural services during February 2010. Additional ground Investigations have since taken place in 2011 with Applied Geotechnical Engineering Consultants (AGEC) and Hydro Environmental Services (HES). The terrain in the Coor Shanavogh area is generally a raised plain with a number of small hills/ mountains the highest being Ben Dash (267 metres). At 390 m Slieve Callan is the highest 'hill' in Clare. The project area is between 120 to just over 160 mOD. The project area is mostly wet grassland with an area of coniferous forestry and some small patches of wet health. There is also agricultural farmland and sparse hedgerows with sod (earthen) banks occurring on the project areas. The terrain is accessible at all locations and there is no topographical inclines that could present any notable access and or

construction phase difficulties. Applied Geotechnical Engineering Consultants (AGEC) has carried out significant geotechnical investigations for the area. A peat stability assessment was also carried out.

Recorded peaty topsoil and peat depths vary from 0m to 1.6m (bgl). All of the turbine base locations, road and other infrastructure are located in areas where peat depths are <1.

Overall the analysis of peaty soil depths along the proposed developed areas indicated shallow depths. In–situ peat strength was recorded by shear vane testing at selected locations across the study area to provide a representative coverage of indicative peat strengths. The results indicate undrained shear strengths in the range 28 to 100kPa, with an average of about 60kPa. These strengths would be considered typical of shallow, more fibrous peat deposits. When compared with the shear strengths back-calculated for the well characterised and reported Derrybrien wind farm site (AGEC, 2004), the shear strengths for the study area are well in excess of those at Derrybrien (estimated at 2.5kPa), indicating that there is less likelihood of failure at this site.

The stability of a peat slope is dependent on several factors in combination. The main factors that influence peat stability are slope angle, shear strength of peat, depth of peat, pore water pressure and loading conditions.

The purpose of the analysis is to determine the Factor of Safety (FoS) of peat slopes. The analysis was carried out at the turbine locations and at various shear vane test locations across the study area.

The minimum required FoS is 1.3 based on BS6031:1981: Code of Practise for Earthworks (BSI, 1981). Results of the drained and undrained analysis found that the *'Probability of Instability'* ranges from *'Negligible/ None'* to *'Unlikely'*.

Detailed analysis of these factors is summarised in Chapter 7 Soils and Geology, the geotechnical specifics of peat and ground stability on site is outlined in detail in Appendix 7 of EIS Volume III, this Appendix gives the full Peat Stability Report carried out by AGEC Ltd, the report includes all trial pit

logs, ground sample analysis, geotechnical risk register and calculated FoS for turbines and internal access roads.

2.1.6 Special Area Designations

None of the turbine locations fall within a designated or proposed NHA National Heritage Area, pNHA (proposed National Heritage Area) or SAC (Special Area of Conservation or SPA (Special Protection area for birds).

There is only one special environmental designation area close enough to be relevant to the site environmental impact assessment. This is the Lough Naminna Bog Natural Heritage Area (NHA) (site Code 2367). Lough Naminna is > 2km away from the proposed wind farm site at Coor and Shanavogh. The Lough appears to be outside the water catchment of the Coor Shanavogh site and there does not appear to be any potential for direct or indirect impacts on any part of the NHA. Further details are outlined in Chapters 4 Flora and Fauna, Chapter 5 Avifauna and Chapter 8 Water.

2.1.7 Grid Connection

The turbines will be connected via underground cables to the wind farm substation and to the main grid system. The 20/110 kV transformer installed for the wind farm is been electrically sized to accept this 13.8 MW capacity.
A cable, maintained at 110KV, will bridge the on-site substation (tail station). it is not possible to say where the project will connect. That will be at the discretion of ESB and Eirgrid at the time of connection offer and will be based on the Least Cost Technically Acceptable principle to the group of projects being considered at that stage and in that Gate. An application has been made to ESB and the final grid connection route will be the subject of a separate planning application.

2.1.8 Road Access

The potential for two access locations exist; however no new public road access is currently proposed as part of the application. The present access at

the south east end of the site will be utilised as the site entrance (see Site Layout Figure 3, Appendix I, Volume III & Scaled Planning Drawings Volume V). Excellent visibility splays exist for both cars and HCVs at the site entrance. An option also exists to open an entrance onto the site from the north western end of the site. This option is illustrated in the scaled planning drawings (EIS Volume V) showing the potential access road to T5 and the rest of the site, this northern entrance is presented purley as an option which can be developed and utilised if necessary, it is not currently proposed to open any new access to the site.

The proposed route for turbine delivery, and import route for construction material i.e. concrete will be identical to the route agreed (and utilised) for the main wind farm construction traffic with the County Roads Engineering Department. This route has been surveyed by Exceptional Load Services Ltd (ELS) to ensure that delivery of the turbines is possible. ELS Ltd found that there were minimum restrictions along the proposed delivery route; in summary the proposed route option #1 (M18/N18 to Ennis – Ring Rd – R474 – Coor East - to site) is very straightforward with no apparent private land take. Apart from road widening the only modifications required are at Hand Cross where a $10m^2$ area is required to allow for oversail, see Chapter 12 for specific delivery route details.
A visual recording of surface quality and a structural survey by load deflection tests will be carried out at a later stage in the planning process. Full details of proposed delivery routes for turbines and other materials, traffic management of such deliveries and other issues relating to roads/ traffic are set out in Chapter 12.

2.1.9 Hen Harrier

This site lies within a very important area for hen harriers in County Clare and nationally. While there are no pairs of birds resident on the wind farm site a full standard hen harrier survey is taking place to quantify any usage of the site, to identify important areas for harriers in the locality and assess impacts if any on their population. Please refer to the Chapter 5 Avifauna.

2.1.10 Population and Dwellings

There are no major population centres close by with the nearest major population centre being Ennis which is located some 20km to the east.

In the surrounding area and plains there are numerous scattered dwellings. These are either solitary dwellings or farms, or minor collections of 3-4 dwellings distributed around minor roads and crossroads. Like much of the surrounding towns and villages the predominant occupation of the local population would be farming or agriculture related activities. More specific details are outlined in Chapter 3 Human beings.

2.1.11 Project Site Layout - Turbine and Access Track Layout

The six turbine layout is illustrated in Figure 1.3, Chapter 1, and Figure 3, Appendix I, Volume III and the scaled planning drawings Volume V. The Figure shows the site layout and track layout for the wind farm, the specific details for road design are outlined in the scaled planning drawings Volume V. The turbine layout and access tracks have been located to use existing tracks where possible and to avoid areas of peat and or deep soils. The main access to the turbines is via the main wind farm entrance on the road to the south with an additional option for access is provided at the north end of the site, see Figure 1.3, Chapter 1, and Figure 3, Appendix I, EIS Appendices, Volume III. This proposed optional access entrance can be constructed if necessary. This proposed optional northern access entrance and road to T5 will only be constructed if deemed necessary by Clare County Council.

In addition to the various environmental assessment criteria, the turbines are sited based on the analyses of the various on-site measurement data. Further to the wind data and other EIS determined criteria, various recommendations from the manufacturers are taken into account.

In addition to this the spacing selection and siting of the turbines are the combined result of:

(1) Minimisation of noise to surrounding areas and noise at private houses;
(2) Avoidance of shadow flicker at private dwellings;
(3) Avoidance of ecologically sensitive areas including areas of deep peat;
(4) The landowner boundaries;
(5) Minimising the visual impact of the machines on the Scenic Route to the North;
(6) Minimising the requirement for additional roads;
(7) Minimising the impact of the new roads that would be required.

The most significant environmental issue that influenced the siting of these machines was the avoidance of noise and shadow flicker at private dwellings and the avoidance of any impacts on any local population of the hen harrier. The final proposed wind turbine locations at Coor and Shanavogh are outlined in Table 2.2 below.

Table 2.2 Finalised Coor wind turbine Positions (Irish Grid Coordinates).

Turbine	Eastings	Northings
T1	111091	175077
T2	110736	175045
T3	111217	174826
T4	110939	174812
T5	110247	174861
T6	110538	174836

2.2 Existing Environment

An area of high ground effectively divides the Atlantic coastal plain to the West and the Inagh and Inch River plain to the east. It runs from the N67 just northeast of Milltown Malbay, down to the N68 in the south. At its highest mountains areas reach an altitude of 391 metres at Slievecallan some 3km to the north of the site, and 267 metres at Ben Dash around 45 km to the east. The Atlantic coast is approximately 15 km to the west of the site and positioned as it is the range provides the first piece of high ground (and wind acceleration) for the prevailing southwesterly winds.

The proposed site lies at the centre of this area on a relatively flat plateau of approximately 160 metres altitude, some way below the highest points on this 'range'. The objective of the turbine positioning was to satisfy noise and shadow flicker constraints for all surrounding private dwellings and structures which could potentially provide dwelling and to minimise the views of the turbines in the short to middle distance where visual impact would be most significant.

The land use consists solely of wet agricultural grasslands, improved agricultural grasslands and areas of young to semi mature commercial forestry. It is surrounded in all directions by a mosaic of young and mature forestry, wet grassland and improved grasslands. Some small patches of wet heath have been identified and a small head water stream flows along the southern boundary.

2.2.2 Project Technical Components

Potential candidate turbines for the Coor Shanavogh project are given below in Table 2.3. Specialist consultant Mr Pim de Ridder has run several models through Wind PRO and other software for noise, shadow, viability and grid suitability. With all factors taken into account the Enercon E82- 2.3 MW turbine has been chosen as the preferred turbine for this site.

Table 2.3 Candidate turbines.

Candidate Turbine	Rotor Diameter (m)	Hub Height (m)	Swept Area per MW installed (m^2)
Gamesa G87	87	78	2972
Enercon E82 (2.3 MW)	82	84,6	2296
Nordex N80	80	80	2010
Siemens 2.3	82.4	80	2318
Vestas V80	80	78	2513

2.2.2.1 The Wind Turbines

The Enercon E82 comes as a 2.0 MW and 2.3 MW turbine. The 2.3 MW turbine has been used as the basis of this application A typical Enercon E82 turbine is included as Figure 5 Appendix 1 Volume III, scaled drawing are also presented in Volume V.

Table 2.4 Enercon E 82 Turbine details for Coor Shanavogh wind farm.

Model	Enercon E82 – 2.3MW
Rotor Diameter	82m
Hub Height	85m
Height to tip	126m
Rated Power	2,300kw
Sweep Area	5,281m²
Type	Upwind rotor with active pitch control
Gears	Gearless
No of Blades	3
Direction of Rotation	Clockwise
Rotational Speed	Variable 6 – 18rpm
Pitch Control	Single blade pitch system, one per rotor blade.
Cut out wind speed	28 – 34 m/s
Brake System	3 Independent pitch controls Rotor Brake Rotor Loc

The turbine base is 6.9 m in diameter (inner diameter); it will need a finished surrounding hardstanding area of 958 m^2 adjacent to it. The underground (outer diameter) of the turbine foundation will be approximately 16.90 m diameter, this wil be subject to changes following final engineering designs provided by the manufacturer Enercon. A hard standing area will also be required for the cane to erect each turbine, this area will be left as hardstanding and it will be 958 $m^{2.}$ A typical construction hardstanding area for a wind turbine is given in Appendix I, EIS Volume III. The scaled planning drawings provide more detail in EIS Volume V. Specific details provided by Enercon include the Enercon E82 Coor turbine specifications, E82 weights and dimensions data sheet, E82 foundation outline design data sheet and the E82 delivery, crane platforms and assembly data sheet; all are given in Appendix 2, Volume III EIS Appendices.

2.2.2.2 Technology Type

The Enercon E82 is a wind energy converter with a three bladed rotor, active pitch controls, variable operating speed and a rated power of 2300 kW. Its 82 m rotor diameter and 85 m hub heights enable the turbine to make use of the prevailing wind conditions at the respective sites to produce electrical energy.

Enercon wind energy converters are characterized by the following features. The inner ring of the Enercon annular generator and the rotor of the E82 form one unit. These two components are flanged directly to the hub so that they both rotate at the same low speed. Since there are no gears or other fast-rotating parts, energy loss between generator and rotor, noise emissions, the use of gear oil and mechanical wear are reduced.

The output produced by the E82 generator is fed via the grid connection system into the power supply company's grid. The grid connection system comprises a rectifier/inverter unit (converter). This system ensures that high-quality electricity is fed into the power supply company's network. Using the converter, this grid connection concept permits the E-82's rotor to operate at variable speeds. The rotor rotates slowly at low wind speeds and quickly at

high wind speeds. This optimises wind flow on the rotor blades. Moreover, variable speed also reduces loads caused by gusts. Each of the three rotor blades is equipped with an electrical pitch system. The pitch system limits the rotor speed and the use of the wind's power thus allowing the output of the E-82 to be reduced to rated power, even within a short period. By pitching the rotor blades into the feathered position, the rotor stops without mechanical brakes exerting load on the drive train.

2.2.2.3 Rotor

The E-82 rotor blades made of glass reinforced plastic (GRP) (epoxy resin) have a major influence on turbine output and its noise emission. Their shape and profile were developed according to the following criteria:

- high power coefficient;
- long service life;
- low noise emissions;
- low loads and
- less material.

One special feature to be pointed out is the new rotor blade profile which extends down to the nacelle. This design eliminates the loss of the inner air flow experienced with conventional rotor blades. Together with the streamlined nacelle, the use of prevailing winds is considerably optimised.

The rotor blades of the E-82 were designed to operate with variable pitch control and variable speed. Due to this special profile, the blades are not sensitive to turbulence and dirt on the leading edge. On the outside, a top coat protects the rotor blades against environmental factors. The polyurethane-based material employed is highly resistant to abrasion, durable, and highly resistant to chemical factors and solar radiation.
Each of the three rotor blades is adjusted by independent microprocessor-controlled pitch systems. Angle encoders constantly monitor the set angle on

each blade and ensure that the three blades are synchronised. This permits quick and accurate adjustment according to the prevailing wind conditions.

Table 2.5 Enercon E 82 Rotor details for Coor Shanavogh wind farm.

Model	**Enercon E82 – 2.3MW**
Type	Upwind rotor with active pitch control
Rotational Direction	Clockwise
No. of blades	3
Swept area	5281 m^2
Blade material	Fibreglass (epoxy resin)
lightning protection	epoxy resin integrated lightning protection
Speed	Variable, 6 – 19,5 rpm
Tip speed	25 - 80 m/s
Pitch control	Enercon blade pitch system, one Independent pitching system per rotor blade with allocated emergency supply

2.2.2.4 Colour

The Coor Shanavogh E82 turbines are proposed to be coloured the same as Slieve Callans turbines (if the Slieve Callan proposal goes ahead). This will negate the visual impact. Please refer to Chapter 6 Landscape and Visual Impact assessment (LVIA) for more details. In addition Enercon offer ground level mitigation via graded green colouring of the base section of the turbine mast, studies have indicated that this grading scheme is favoured by viewers, please refer to Enercon drawings Appendix 1 Volume III.

2.2.2.5 Towers and Heights

A typical Enercon E82 turbine tower is included as Figure 4, Appendix I, Volume III. The scaled planning drawings provide more detail in Volume V.

2.2.2.6 Transformer Location

The turbine transformers will be located in the bottom of the nacelle. The transformer will be part of the integrated grid feed unit.

2.2.2.7 Nacelle Logo

No nacelle logo is proposed for the wind farm. A typical Enercon E82 turbine nacelle is included as Figure 4, Appendix I, Volume III. The scaled planning drawings provide more detail in Volume V.

2.2.2.8 Meteorological Mast

The meteorological mast has been taken down as it is no longer required. Wind data information gathered by the now dismantled mast is not included as part of this EIS application.

2.3 Site Infrastructure

In total it is proposed to build approximately 2066 meters of new internal access roads to access the site, please refer to Figure 2.1 and/ or the scaled planning drawings EIS Volume V.

Ground bearing roads have been selected in areas of shallower peat and where there is outcropping of bedrock and ground bearing strata as per the geotechnical directions of AGEC Ltd. A series of detailed scaled drawings of entrance, craneage locations and road design is included within the scaled planning drawings in Volume V of this EIS, quick reference Figures are supplied in Appendix 1, Volume III.
The site will also need an area of not more than 50 m x 45 m for the site substation. Mr David McNamara (managing director) Renewable Power Generation Ltd. has been commissioned to design the electrical infrastructure for the site. Renewable Power Generation Ltd specifications relating to the electrical design and substation are provided in Appendix 14, EIS Volume III.

2.3.1 Road and Craneage Design – Routing

The turbine layout and access tracks have been located to use existing tracks wherever possible and to avoid potential problem areas. Avoidance clearly has potential ecological benefit and it reduces construction costs. For example, it minimises the need for piling of turbine bases, and for the construction of floating roads, which require significantly more material to build than standard roads.

The most significant strategy is to avoid an area of wet and potentially sensitive peat. The AGEC assessment work focused on this issue to address all potential problems. As previously mentioned there is a '*negligible/ none to low*' peat stability risk on site (AGEC, 2010), please refer to Peat Stability Report provided in EIS Volume III, Appendix 7.

2.3.2 Road and Craneage Design – Loads

The on-site roads will have a nominal width of 5 m and be designed to carry a load based on a minimum of 12-14 tonne/ axle limit.

2.3.3 Road and Craneage Design – Design Selection Criteria

There are two basic construction methods employed during wind farm road construction. These are:

(1) Excavated roads where peat/ soil depths are shallow or
(2) Floating roads where the depths are greater.

Although soil/ peat depth is one of the criteria which define the requirement for a floating road there are a number of other factors which influence this decision. This includes the size of the peat pocket (if present), the track cross slope, and the peat water content etc.

AGEC have carried out a full geotechnical investigation for the proposed site layout. There are no ground stability risks. Roads will be constructed for the most part constructed on load bearing ground which will only require the stripping of shallow soils or peaty soils. In peat areas the excavation for floating roads will be possible if necessary, although the geotechnical investigation has identified that peats are shallow across the site and that floating roads will most probably not be needed. Peats along all roads, hardstandings and turbine areas are in all cases less than 1 meter in depth, the peat on-site appears to be for the most part a shallow peaty soil deposit.

2.3.4 Road and Craneage Design Methodology

2.3.4.1 Excavated roads

Construction of the site roads tracks on shallow soil or peaty soils is relatively straightforward. The method involves removal of vegetation and peat or topsoil to rock level. This is stored adjacent to the track for later reinstatement of the verges. Where the excavations to rock are shallow, crushed rock will be laid on the excavated hard ground and compacted in layers of 200mm to achieve level passage ways. Road depth can vary between say 500mm and 1,000mm although with a good substrate formation 300-500mm should be sufficient to provide a good road surface.
Soil, peaty solid and or peat is battered back on the sides to a slope of approximately 1:2 and a drainage channel will be formed at the sides of the access road if deemed necessary.

If localised deeper pockets of peat are found which do not warrant adopting floating road construction and the excavations to rock are necessarily deeper (up to 2m) the peat will be excavated to rock level and a layer of quarry run used to raise the road level and to aid drainage. These will be up to 1 metre in depth. A layer of compacted 4" clean stone up to 300mm, and then layers of crushed rock is laid and compacted in 200mm layers. A drainage channel is formed at the sides of the road and the peat battered back to a slope of 1:2 (minimum - depending on the stability of the peat).

2.3.4.2 Floating Roads

The Coor Shanavogh site has no deep peat, however, in consistently deep peat a floating track construction may be used. The general description of floating road design is given here for completeness. The detailed construction methodology varies depending on slope, stability and peat water content and track routing (i.e. traversing or climbing). Generally a 7m wide water porous membrane is laid directly onto the peat surface to prevent material fine migration, followed by a geotextile layer, and approximately 450mm of crushed stone. On weak peat an additional geotextile layer may be used before the road is finished with 250mm compacted material. The AGEC geotechnical investigation has found that peats are shallow across the site and that there is no need for utilisation of the floating roads design, however the details for the floating road option are provided as a matter of course.

Typical road construction cross sections and indicative craneage pad designs are illustrated in the scaled planning drawings Volume V.

Material for the roads will be obtained from the proposed site borrow pits.

2.3.4.3 Road and Craneage Design – Water Runoff

A detailed discussion of potential road construction hydrological effects and mitigation measures is included within Chapter 8 Water, Hydrology and Hydrogeology.

2.3.4.4 Road and Craneage Design – Visuals

Unlike mountain/ hill sites where high visibility scars can result from lack of care in designing roads, carnage areas and reinstatement plans, this site is essentially flat and the level of visual impact will be minimal. In addition since all the selected turbine locations are located within areas of new forestry the existing and future plantation growth will also reduce visual impact.
The roads will be well drained and culverted at any appropriate locations.

2.3.5 Temporary Site Construction Compound

During construction phase it will be necessary to provide appropriate facilities for all construction staff. The layout will be temporary and position on a hardstanding area adjacent to the substation area. It will be removed and the ground areas which will be reinstated

Construction phase facilities will include:

- Site offices and canteen;
- Site compound area;
- Secure bunded area for hydrocarbons;
- Bund oil storage area;
- Toilet facilities (sealed, waste will be removed by a licensed operator for correct disposal).

2.3.6 Site mast

A retention planning application for a site anemometry mast was made separate to this planning application and EIS submission for the wind farm at Coor and Shanavogh Co. Clare site. To avoid ambiguity the retention planning application for the mast and the proposed wind farm were separate applications. In addition the anemometry mast retention planning application has now been withdrawn and the mast has been dismantled and taken off site. The mast is no longer a feature of this site. Wind data information gathered by the now dismantled mast is not included as part of this EIS application.

2.4 Construction and Post Construction works

Turbine bases and internal access roads have been assessed with respect to vegetation, ground conditions, peat depths and existing surface gradients at the location of and along the route of the proposed access roads.

The drawings included within the Consultant Engineers (AGEC Ltd) Peat and Soils Stability Report (Appendix 7, EIS Volume III) indicates Factor of Stability/ safety for all infrastructural proposals across the site with respect to ground stability. Should planning be achieved then the structural design process will be commissioned. Following completion of structural design process which will be carried out in cooperation with Enercon, an additional full geotechnical survey prior to construction will be carried out as necessary.

2.4.1 Reinstatement

Following the end of the working life of the wind farm the site will be reinstated as according to the conditions of the local authority. The working life of the wind farm is greater than or equal to 25 years.

2.4.2 Turbine Bases and base design

The Enercon reference data gives typical base dimensions which are outlined in the scaled planning drawings, Volume V and in Appendix 2, Voulme III. However the final design is usually very much dependant on the soil and geology of the turbine base location and the final design is undertaken by the design civil engineering consultant with loads and turning moments supplied by the manufacturer Enercon. The initial geotechnical investigations indicate that bedrock is located <1 m below ground level at all turbine locations. This indicates that construction of the turbine bases will be a relatively straightforward and no engineering or design difficulties are envisaged. In addition the Enercon foundation base design is a curcular one, this has several advantages which includes a the spead of all forces equally in all wind directions, the curcular design is proven to reduce the size of the formwork area and the amount of reinforecement and concrete required, backfilling the foundation with soil is included in the structural analysis as load. Overal Enercon foundations require less ecxcvation, formwork and reinforcement for foundation stability.

A typical Enercon E82 turbine base is included in the scaled drawings of Volume V of this application.

2.4.2.1 Base Design – Loads

The base designs will be suitable for the local wind conditions (IEC Class IIA) however the exact design for each turbine base will depend on the ground conditions at each particular location. The Peat/ Soils Stability Report (Appendix 7, EIS Volume III) has answered all questions on ground conditions at turbine locations and gives the necessary information for design requirements for foundations. The final design details will be outlined should the project progress.

2.4.2.2 Base Design – Ground Conditions

The peaty topsoil depth is generally less than 1 mbgl onsite and as with all sites peaty soil depth and bedrock/ weathered bedrock interface across the site varies, the base design will be modified to suit. Each turbine base will be excavated to reach load bearing material and the height will then be brought up with a concrete mix designed in conjuction with the turbine manufactures Enercon. This will be backfilled after the concrete has cured. The ground conditions across the site and in particular at all turbine locations are detailed in the Soils/ Peat Stability Report, Appendix 7, EIS Volume III. The final construction design details will be made in consultation with Enercon.

2.4.2.3 Base Design – Engineering Design

The six turbine bases for the proposed wind farm project are Enercon E82, 2.3 MW. The Enercon reference data gives typical outer base dimensions of approximately 16.90m diameter (and 2.8m deep foundation height). The inner base diameter is given as 6.90m. The final design is usually undertaken by the design civil engineering consultant with loads and turning moments supplied by the manufacturer. Approximately 34 tonnes of reinforecement steel may be required along with 345 m^3 of concrete for each turbine foundation. These figures are subject to final site specific design criteria which will be decided by Enercon should the project progress.

2.5 Site Electrical Design

2.5.1 Transformers Design

Each turbine generates at a voltage and incorporates a step-up transformer which will be situated inside the turbine generating voltage up to the distribution voltage of 20kV. Renewable Power Generation Ltd have designed the electrical infrastructure for the site, all specific details are available in Appendix 14, EIS Volume III.

2.5.2 Underground Cables

The site distribution voltage will be 20kV. The on-site electrical cables will be trenched and locations marked to appropriate electrical standards. Typical cable trench cross sections are in the scaled drawings of Volume V of this application and in Appendix 15 of Volume III.

2.5.3 Cable routing

The proposed cable routing generally runs parallel to the turbine access tracks. Areas of wet ground are avoided as the proposed internal roads already avoid wet areas. Where cabling passes under internal access tracks it will be ducted according to best practice. Cabling will also be ducted at the substation. Cabling onsite will not be ducted to avoid creating any unnecessary flow paths for groundwaters this is in line with good pratice for minimisation of impact on peaty soils, vegetation and groundwater movements in these soils, it ais also in line with acceptable electrical cable laying protcols. Detail relating to cabling are outlined in the Renewable Power Generation Ltd have designs given in Appendix 14 and in the scaled planning drawings Volume V.

2.5.4 Substation-Control Building

The proposed six turbine wind farm will be connected by underground cables at 20kV to the Coor Shanavogh wind farm substation. 2250 m^2 has been

allocated to accomadate the substation electrical designs and control houses etc. No additional substation compound or buildings will be required. The connection route for the Coor Shanavogh wind farm will commence from this substation. The connection of the wind farm to the grid will be assessed in a separate grid connection study and EIS. Approximate concrete volumes for substation control building, equipment plinths, roadways, etc is $192m^3$.
Renewable Power Generation Ltd have designed the electrical infrastructure for the site, all specific details are available in Appendix 14, EIS Volume III.

- The substation in entireity will require a footprint size of 50 m x 45 m;
- It will be secured with palisade fencing;
- All details relating to substation design are outlined in Appendix 14, EIS Volume III.

There is the potential that additional electrical equipment such as separate metering and protection breakers may be necessary in order to comply with the AER rules. These will not significantly add to the application in any notable way.
The use of toilet facilities is expected to be minimal. A sealed holding tank is proposed with a minimum of 10 m^3. This tank would be emptied annually.

2.5.5 Backfilling Cables

It is proposed to backfill the trenches with the excavated peat and/ or sand bedding. Further details of both routing and cable trench back filling are discussed in Chapters 7 and 8. The methodology is in line with good pratice for minimisation of impact on peaty soils and vegetation and in line with acceptable cable laying protcols. Peats excavated at cable lines will be replaeced with the vegetation side facing up allowing the seed bank to regain growth as soon as possible.

2.5.5.1 Construction Materials

The on-site access roads to each turbine will be constructed from material quarried at the proposed site borrow pits. The total volume of granular fill required for the wind farm is estimated at approximately 30,000 m^3 for turbine and craneage areas and turbine access roads (all infrastructural areas).

Based on the Soils and Geology Assessment work for the site layout, AGEC Geotechnical Engineering Consultants has indicated that 3 suitable areas exist on-site for proposed borrow pits. They are deemed adequate to cater for the projected volume of granular material that will be required for the construction of the wind farm.

A typical Enercon E82 base would have a concrete content of around 345 m^3. The requirement for reinforcement steel will be decided by Enercon at a later stage should the project progress; it should not exceed 34.95 tonnes per turbine base. All of this will be imported to the site from the minor road running south of the site.

2.5.5.2 Excavations

The size of the excavation will be approximately 2 m deep with an area of approximately 225 m^2 for each of the Enercon turbine base areas, however this final excavation dimensions for the underground concrete base will be decided by Enercon in consultation with the project construction engineer (should the project progress). Each turbine base will be excavated to reach load bearing material and the height will then be brought up with a concrete mix designed by Enercon. This will be backfilled with granular material after the concrete has cured. The final design decisions will be decided by Enercon at a later stage should the project progress. Additional excavation of 958 m^2 is required for the crane hardstanding area, the general excavation depth at the crange areas will be less than 1 m.

Specific base by base excavation and fill methods have been defined following a full geotechnical appraisal involving trial pits and/ or core drilling. All additional design work in association with Enercon will be carried out prior to construction.

2.5.5.3 Emissions and discharges

During the course of the project construction no material will be transported off-site except for that highlighted above (i.e. waste from the sealed toilet facilities). A chemical toilet and self-contained water tank washing facilities will be provided for personnel during servicing. There should be no noise other than machinery noise. Dust may arise during construction under prolonged dry spells. This is easily mitigated via treatment of the construction tracks etc with a mobile water bowser.

2.6 Temporary Constuction Phase Works

Temporary construction phase works will include the erection of temporary site offices, chemical toilets and welfare facilities (for bad weather shelter and canteen use) for the period of the construction. This will be located as indicated on the site layout, alternatively the temporary site compound can be located on one of the existing tracks or crane pad areas and no new area will be required. The toilets will be sealed and waste will be moved off site by a licensed operater. All other waste (both cobnstruction and canteen/ office) will be moved off site by a licensed operater. Water supply for the canteen and wash facilities can be provided by an onsite bored well. Water for other construction activities can also be sourced from an additional bored well.

2.6.1 Description of Operations

- Earthworks for the foundations, hard-standings and access tracks;
- Construction of access tracks;
- Fixing of formwork and reinforcement for the foundations;
- Placing and compacting of ready mixed concrete for the foundations;
- Back-filling around the foundations;
- Construction of the substation, security fence and control building;
- Completion of hard-standing areas and landscaping;
- Electric cable burying between each turbine and the on-site substation;
- Erection of each wind turbine;
- Reinstatement of area around turbine bases and track edges.

2.6.2 Construction Works Programme

It is anticipated that the construction process will take 4 to 5 months from starting on site to commissioning of the electrical system.

2.6.3 Imported Materials

Ready-mix concrete will be sourced from local suppliers. A total of 2,262 m^3 of concrete are likely to be required for the construction of turbine foundations and substation infrastructure, this figure may change following the final constuctiuon designs for the turbine foundations.

Steel reinforcement (if necessary) is likely to be procured from suppliers in Limerick and will involve approximately 6 - 8 deliveries to the site.Other building materials including cables, ducting, and precast concrete pipes for drainage etc., will be procured from local material suppliers.

The infrastuctural stone requirements will be met by on-site borrow pits. The borrow pits will be reinstated with excavated peat and soils. Additional soils may be imported for reinstatement purposes; however this is unlikely to be necessary.

2.7 Borrow Pits

2.7.1 Potential Locations

Stone will be recovered from the excavation of turbine bases and levelling and excavation of access tracks. However additional stone will be required. Three site suitable locations of borrow pits were confirmed during the trial pit and bore hole drilling accompanying the geotechnical ground investigations carried out by AGEC Ltd. The potential locations have been illustrated in the scaled drawings in Volume V of this EIS. The on-site borrow pits will easily provide the majority of construction aggregates for road and hardstanding areas.

Reasons for suitability include:

- Visual inspection, site geology;
- All three site have already been quarried for agricultural purposes;
- Environmental suitability;
- No archaeological features;
- No protected habitats or flora;
- Ease of access;
- Visual suitability;
- Proximity to turbines etc;
- Excellent reinstatement characteristics;
- Outcropping rock.

The locations of the proposed borrow pits do not pose any significant constraints. The proposed borrow pit locations are visually sheltered, not within any rare or protected habitat and do not have any protected or rare species at these locations. The proposed borrow pit locations are assessed were relevant in Chapters 3, 4, 5, 7, 8, 10, 12, 13 and 14, Human being, Flora and Fauna, Avifauna, Water, Air and Climactic Factors, Roads and Transport, Archaeology and interaction of the foregoing. The location and extent of the

borrow pits is shown on the Site Layout drawings and cross sections are also provided in the scaled planning drawings EIS Volume V.

2.7.2 Potential Rock Volumes – Granular Fill Requirements

The construction of the access tracks and craneage pads will require approximately 9,000 and 11,496 m^3 of granular fill material respectively, all of which is will be recovered from the site borrow pits. The temporary site compound will require 1350 m^3 of granular fill sourced from the site borrow pits. Sufficent and suitable rock for this and all other infrastructural details can be sourced fro the proposed borrow pit designs.

2.7.3 Borrow Pit Geotechnical Details

According to AGEC Ltd observations made from the trial pits, the mudstone encountered in the proposed borrow pit locations has a fracture spacing of typically very close to close that is 20 to 200mm and strength of moderately weak to moderately strong. Using excavatability charts (Pettifer & Fookes, 1994), the mudstone would be capable of being excavated by “hard digging” or “easy ripping”. Locally hydraulic breaking may be required. Previous experience of similar mudstones would indicate that blasting is not required.

To determine the suitability of the type of excavation plant required (eg size of excavator), ideally an excavation trial should be carried out. This is a constructability issue and is outside of any EIS/ planning issues.

Borrow pits 1 and 2 are to be dug into the side of a hill. Borrow pit 3 is located on top of a hill and will be essentially an excavation 5.5m deep. To be able to excavate rock at this depth the excavator would need to enter the pit. The side walls of the pit would be sub-vertical with an access ramp in the side of the pit. The ramp would allow dumper trucks and excavator access to a lower level in the pit; this lower level may not be the floor depth but an intermediate level e.g. 3m depth. The actual process of excavation will depend on the contractor. Material stored in borrow pits 1 and 2 will require a suitable bund to be constructed at the borrow pit entrance to ensure that the material is safely

contained and to prevent any run-off occurring. This bund is likely to be constructed with suitable excavated material and excavated rock. No bunding would be required for borrow pit 3.

2.7.4 Excavation and Reinstatement

A detailed excavation and reinstatement plan for the project will be prepared as part of the Construction Method Statement should the project progress. The vegetation, soil/ peat and subsoil will be removed and separately stockpiled in lightly compacted bunds beside the borrow pits, taking care that living vegetation is preserved by careful placement. There will be no soils placed vegetation side down) or mixed. Any exposed soils will be seeded to prevent soil erosion. Extraction of rock will be carried out either by easy ripping or hard digging (see 2.7.3 above). Hydraulic breakers may be required in some instances, no blasting of rock is required. In addition it is proposed to carry out crushing and screenings on-site at each borrow pit area as the excavations progress the ccrushing and screening operation will be mobile. Crushed and screened/ processed rock will be stockpiles according to best practice and at sheltered locations within the borrow pits, spraying of stockpiles to control dust levels will be carried out if necessary. Following extraction of the material required for track/ road and hardstanding construction the borrow pits would be backfilled with surplus material excavated from the turbine foundations, and the subsoil, peat/ soil and vegetation reinstated. The geotechnical consultant AGEC have carried out an excavation and reinstatement balance for the volumes of rock necessary and the volumes of peat and peaty soils arising. Natural vegetation regeneration would be assessed after 1-2 growing seasons to determine if any additional measures (such as additional reseeding are required). The proposed designs illustrated in the scaled planning drwings Volume V of this EIS indcated that Boorw pit 1 offers 12,800 m^3 of space for deposition and stabilisation of peat with consiquebnt reinstatement. Borrow pit 2 as designed offers 1500 m^3 and borrow pit 3 offers 4050 m^3 this gives a combined total of 18350 m^3 Realistically the pits will accept a larger volume of excvvated peaty soils following stabiliation in the pits. The total excavation estimate is 26,500 m3 for all ifrastuctural excvastion works. Some of this will

be stony matter which can be reporcesd throught the site crushed and used as fill onsite. The difference between the excavated material and that deposited to the borrow pits will not exceed 8150 m^3, this will be deposited along the hardstanding, road verges and over the cable trenches at a height that will not exceed 0.5 m.

The assessment of the borrow pits is also carried out in Chapter 7, 8, 3, 4 and 5, Geology, Water, Human Beings/ Material Assets, Habitats, Flora and Fauna, and Avifauna respectively.

2.8 Water Crossings, Site Drainage and Silt Traps

2.8.1 Drainage Design

The site drainage plan is included Volume V, Scaled Planning Drawings. Details relating to drainage and water quality/ water protection are fully assessed in Chapter 8 Water (Hydro Environmental Services Ltd).

Only one watercourse is crossed by the proposed internal access tracks. This is a small stream which runs east to west immediately south of Turbines 3, 4, 6 and 5 (Figure 2.1, and Figure 3 Appendix EIS Volume III). Only Turbines 6 and 5 are proximal and within the streams catchment area. This stream which flows east to west before heading west towards Quilty. The crossing design is illustrated in the scaled planning drawings, Volume V.

2.8.2 Potential Water Contamination Risks

In anticipation of detailed information requests from the DAU and Clare County Council a detailed assessment of the site peat depths and water courses, hydrology and geotechnical attributes was commissioned by INIS Environmental Consultants Ltd and undertaken by AGEC Ltd and HES Ltd. Project elements related to hydrology are discussed in more detail within Chapter 8, and mitigation measures and site hydrology design are also discussed within Chapter 8. In addition the assessment of drainage is also

carried out as part of the Flora and Fauna Assessment Chapter 4. The aquatic habitats are evaluated and any species therein or further downstream are also assessed. Mitigation if necessary was proposed and cross referenced with the HES mitigation plans.

It has been identified that there is little or no potential '*for peat slides, siltation and contamination from the proposed development on the adjacent lakes or watercourses'* (AGEC, 2011), the potential is low due to the existing ground conditions and the site layout, including borrow pit design and location and turbine locations. Furthermore the site infrastructure is hydrologically separated from the catchment of the pNHA and Lough Namina. There is, therefore, no potential for the turbines to affect (adversely or otherwise) the existing public water supply of Lough Naminna". The EIS contains appropriate mitigation for potential for siltation or contamination of any watercourses and water bodies on site or proximal to the site.
Construction method statements for the site will be prepared and submitted to the planning authority prior to commencement of construction. This statement will outline the site management plan for drainage detailing specific management and engineering mechanisms to be used, including sediment traps, check dams and silt fences where appropriate (the HES Ltd assessment work provided in Chapter 8 gives specific details). All activities will be carried out in consultation and agreement with the local authority and (if necessary) the Regional Fisheries Board. Watercourses receiving drainage waters from the site during the construction phase will be monitored for suspended solids downstream of the percolation zone. All silt traps shall be located, constructed, operated and maintained in such a manner to retain sediment and prevent silting of aquatic zones. They will be constructed at locations that will intercept run-off to streams from construction areas. Details shall be submitted and agreed prior to commencement.

2.9 Power Purchase Agreements

A Power Purchase Agreement (PPA) for the sale of the electricity generated by the wind farm will be actioned once planning permission and a grid

application are successful. It will be obtained under future AER arrangements pursuant to the Government requirements set out in the Green Paper, or negotiated in the electricity trading market under arrangements for Third Party Access to the electricity grid. This is now open to all generators of energy from renewable sources. The AER agreement is a base price and not a PPA. So the PPA is the agreement between the purchaser and the producer. The AER price is used to top up the difference between purchase price and the Refit price.

2.10 Life of Project and Operation of Wind farm

The expected technical life of a wind turbine is approximately 25 years and potentially longer. The operational life time of a wind energy project tends to be shorter and generally tied into the terms of the Power Purchase Agreement.

2.10.1 Maintenance and Monitoring Programme

The wind farm will be constructed as per outlined in the drawings and the wind farm project and will be maintained and operated by the same operating company. All necessary electrical maintenance works will be carried out as specified by the turbine manufacturer Enercon. Day to day operational maintenance of the wind farm will be carried out on-site and technical monitoring will also be carried out remotely with the aid of computers connected through the telephone system. Additional on-site maintenance will take place periodically as required, on site monitoring/ maintenance will probably not exceed one visit per week for normal operations and two visits per annum for maintenance personnel. The type of monitoring will cover such areas as turbine operational safety and performance, security of substations, bird impacts, etc.

2.10.2 Decommissioning

As per any decided grant of planning permission conditions and in accordance with outlined reinstatement plans. This will usually encompass removal of power cables and all other infrastructure from the site. Internal roads may also be reinstated however these details need to discussed with the landowners and County Council.

2.11 Current Planning Guidance - timing

The Department of the Environment, Heritage and Local Government has issued the new (2008) Wind Energy Planning Guidelines. These reflect the current knowledge with respect to wind energy and acknowledge the increased importance and status of wind energy within the state's energy mix. These state that:

"Conditions that limit the life of a wind energy development to a particular time period have been included in the past in order to enable the planning authority to reassess the operation or reequipping of the wind energy development in the light of circumstances prevailing at the time. This can instead be achieved by way of a condition requiring that future re-equipping be agreed in writing with the planning authority or be the subject of a separate planning application. The inclusion of a condition which limits the life span of a wind energy development should be avoided, except in exceptional circumstances".
DoEHLG Planning Guidelines 2006 – Section 7.20

It should also be noted that receipt of grid connections and wind farm infrastructure (turbines, substation parts etc) procurement impose long lead in times on projects outside of the developers control. Therefore extended planning permissions are required to accommodate the lead in time: by example a grid connection could take up to five years or more. The current lead in time for the turbines is approximately one year.

2.11.1 Proposed Decommissioning

After the turbines have reached their useful life the possible options are to either refurbish or replace the turbines, or to decommission the wind farm.

The DOE 2006 guidelines recommend not including a time limited planning period but instead suggest including a condition for re-equipment to be agreed in writing or for the re-equipment to be subject to a further planning application.

The DOE 2008 guidelines recommend that at the end of the turbine life span, the machines can be removed; alternatively, the turbines can be repowered.
If decommissioning notice should be given to the Council in advance, and decommissioning should be carried out according to any conditions of planning, e.g. reinstatement works. It is commonly considered that the scrap value of the turbines should cover the cost of decommissioning. However funds should be set aside for this phase of the project.

The location of the Coor Shanavogh site is located centrally in the designated area as 'acceptable in principal' for wind development in the county. The current life of the forestry crop surrounding and including the wind farm is likely to be 40-50 years and this will increasingly dominate the landscape as it becomes more mature. The assessment work associated with this EIS indicates that there is no specific reason or reasons which would warrant inclusion of a 20 year life limited planning permission Condition.

As part of any decommissioning works the turbines and the towers themselves will be removed. The vast majority of the turbine equipment is likely to be recycled but anything which cannot be recycled will be disposed off at appropriately licensed disposal facilities.
The foundations, which are of course also located within forestry, will be left in situ and covered with local soil and allowed to regenerate naturally.

The underground power cables will be deactivated and the above ground connections to the individual turbines cut and buried. The remaining cables will be left in situ.

2.11.2 Decommissioning Bond

For the wind farm a requirement for agreement with the Planning authority of a cash deposit, bond or other security deposit to ensure the satisfactory reinstatement of the site after decommissioning will most probably be agreed.

The 2006 Planning Guidelines state that "the use of a long term bond is not recommended" (Section 7.19), a bond can be agreed with the Council.

2.12 Alternatives Considered

This section assesses and discusses the main criteria for site selection which applied to the project, the project location, preliminary layouts and the final project layout in comparison with alternatives sites and alternative site layouts.

2.12.1 The Selection Process for Wind Farm Sites

The most important criteria applied to the selection of the site were identification of the locality as being favourable for wind farm development in the Clare County Council Development Plans, average wind speeds, accessibility and visual attributes. A large number of sites have been reviewed both in County Clare and in the Country as a whole on the basis of these criteria. A selection of these have been described below and a number are still being actively pursued.

In order to define a site as suitable for development, a number of siting criteria are applied. These criteria are generic in nature but are intended to be flexible in relation to location of the proposed project, i.e. the acceptability of scale and type of development is dependent on location and land use characteristics of the area.

Various site criteria and site constraint criteria were applied as part of the process. Some of the main criterion and constraint criteria applied as part of the overall site selection process included:

- Adherence to the Department of the Environment, Clare County Council and Irish Wind Association best practice guidelines, feasibility reports and planning regulations;
- Density and location of private dwellings;
- Density and location of various structures associated with human beings;
- Avoidance of noise levels from the project at any private structures/ dwellings;
- Avoidance of shadow flicker at any private dwelling/ structures;
- Economical capture of wind resource, estimated wind speed of 7.5 - 8 m/s (metres per second) are required;
- Proximity to a connection point with the electricity grid,
- Avoidance of excessive and/ or unacceptable visual presence in the landscape;
- Avoidance of excessive impact on hen harrier flight activity
- Avoidance of ecological impacts;
- No special designations which would be significantly affected.
- Avoidance of Archaeological impacts;
- Reasonable road access;
- Topographical landscape suitable for construction;
- Adherence to DOE, CCC and IWA best practice guidelines, feasibility reports and planning regulations;
- In an area where it may be possible to obtain planning permission
- An area where there are Low potential for electromagnetic interference and sufficient distance from housing.

2.12.2 Coor Shanavogh Site Specific Wind Farm Criteria

The initial project objective in selecting a site was not to identify the highest wind speed area in the region but to identify a location where a medium sized wind farm could be built with:

- A significant distance from residences which would comfortably satisfy all shadow flicker, noise etc potential impacts;
- good wind resource;
- minimal visual impact;
- minimal impact on the environment; and
- grid connection options.

The finalised Coor Shanavogh project layout provides a compromise between proximity to and exposure to prevailing wind direction, with some elevation and surrounding private dwellings and other environmental constraints. Turbine siting on surrounding hills/ mountains would have provided higher energy but would also increase visibility. One of the objectives of positioning at the centre of this area was to minimise the views of the turbines in the short to middle distance where visual impact would be most significant. Further details as to the extent of visual impact are given in the Landscape Assessment provided by MosArt Consultants and MacroWorks Consultants Ltd, see Landscape Visuals Impact Assessment Chapter 6, EIS Volume III and Photomontages/ ZTV presentations EIS Volume IV.

The site is located centrally in a commercial forest and wet grassland area and the majority of the site is already planted with young to semi mature trees (6 to 10 year old range). Although low-level turbulence does result from tree growth, the combined land use of forestry and wind turbines does minimise the visual impact of these two forms of development.

An ESB 110 kV station is located proximal at the Booltiagh wind farm site. There will be necessary external works to connect to this substation; these works will be the subject of a separate EIS. In addition given the proximity of

the proposed Mount Callan wind farm site and the size of sub station required, it might be possible to connect under ground at 20kV.

The proposed Coor Shanavogh wind farm site layout as illustrated in the scaled drawings (Volume V) met all the above criteria as follows:

- The site is an elevated location open to the prevailing winds from the south-west; the site is also open to other wind directions. Wind measurements indicate average wind speeds of at or around 8 m/s;
- The site has a direct road access from a minor public road skirting the southern side of the site; it is located just two kilometres west of a junction onto the R474;
- The site has been degraded visually by heavy commercial forestry and its associated roads;
- The site lies in an area, defined as a Preferred Area for wind farm developments in the 2005 - 2010 County Development Plan and in the new 2011 - 2017 County Development Plan;
- There are no special nature designations affecting by the site;
- The area is sparsely populated;
- Public road realignments have already been dealt with (from delivery of turbines to other proximal sites) and a significant proportion of the civil infrastructure (tracks etc) to facilitate access are already be in place.

The electricity grid 110kV transmission line is located to the south east of the site. A straight line measurement indicates that the closest location for connection is in the townland of Booltiagh, therefore presently the most convenient connection point would be at Booltiagh substation, however other factors will determine this at a later stage.

2.12.3 Alternative Sites

The initial alternative sites included the present landholding and lands to the west. In addition an additional larger landholding was initially established as a proposed site to the south of the final site location. This large landholding was

submitted as part of the orginal application which was subsequently withdrawn and scrapped because initial studies found that these lands were not as suitable for wind farm development with the proposed layout. Three initial landholding sites were eventually disregarded and the final landholding outlined within this application was identified as the most suitable location for wind farm development. Following this several site layouts have been applied to the land holding and assessment in terms of their suitability. We have had in total 7 proposed site layouts. Following extensive studies for prediction of potential environmental impacts for the various assessment criteria e.g. noise, shadow flicker, landscape and geo-technical considerations. In this application we have finalised a layout which sacrifices energy efficiency and power output to accommodate a significantly reduced impact on the environment. The original layout and the previous application included for 12 turbines, this application has now reduced that number to 6 turbines. The final layout satisfies all environmental safety and protection thresholds. Figures outlining previous proposed site layouts are not provided as they are not considered necessary or relevant and may lead to unwarranted confusion.

The site layout has implemented absolute worst case scenarios for all assessment criteria:

- The site layout ensures that there will be no noise impact at any private dwelling and/ or structures;
- There will be no significant shadow flicker at any private houses;
- There will be no EMI at any private houses, any potential EMI will be dealt with according to RTNL protocol;
- There will be a significantly reduced visual impact from the turbine on the surrounding locality;
- No protected habitats or habitats of national or international value will be affected;
- No environmental designations will be affected;
- No watercourse's will require any re-routing, nor will any watercourses under any significant impact;

- Local traffic will not be significantly affected as on-site borrow pits will provide the majority of construction materials;
- Water quality will not be affect;
- Ground water supplies or ground water quality will not be affected,
- There will be no impact on migrating birds.

2.13 Scale of Wind Energy Projects

History in Ireland:

The first wind farm built in Ireland was commissioned in 1992 at Bellacorrick in County Mayo. This project consisted of 22 Nordtank turbines of 300kW size and an overall installed capacity of 6.45 MW. Until the advent of the Alternative Energy Requirement (AER) no further projects were built until 1997.

In 1997 Barnesmore, Co. Donegal was constructed with 25 Vestas V42 600kW Turbines and an installed capacity of 15 MW. Cark wind farm (1997), also in Co. Donegal, with 25 NEG Micon 600kW turbines and an installed capacity of 15 MW. The Turrsillagh 15.18 MW (2000) was constructed in Co. Kerry in the Tralee area. This wind farmconsists of 23 Vestas 660kW wind turbines. An extension to the Tursillagh wind farm was also commissioned.

Since 1997 there has been a dramatic change in both project and turbine size. The projects included:

- Meentycat Co Donegal 72.4 MW with 38 turbines of both 2.3 and 1.3 MW;
- Derrybrien Co. Galway 60.35 MW with 71 x 850kW turbines;
- Keelderry Co. Galway 48 MW based on 48 x 1MW turbines;
- Boolynagleragh near Lissycassey 38-47.5MW based on 19 x 2-2.5MW turbines.

Scale of Projects:

There are a number of small scale projects of turbines and less, and smaller projects of 1, 2 and 3 turbines being proposed (and granted planning permission). These form a generally different type of project from the 'utility scale' developments such as Booltiagh. In utility type projects historically the trend in both turbine scale and project size has been generally upwards and this is the same in Ireland as it is across the rest of the world. It is likely that the trend for larger utility projects will continue. The Coor Shanavogh project can be considered a small scale utility project.

Given that there is a defined minimum requirement for Ireland of 13.2% with respect to green electricity the numbers of turbines installed must increase, and this will result in increasing pressure on suitable land available for turbine installation. The options to achieve this target range from numerous clusters of small projects dotted about the landscape or strategic large projects in more concentrated groups. Reality is likely to fall between these two extremes.

Small projects are seen as more local in nature, and have a less dramatic effect on the immediate landscape, however, given the level of interconnection costs and power purchase contracts available in the Irish market at this time they are not easy to fund. It is also relevant that one of the often quoted arguments by anti-wind groups is the 'insignificant amount of energy' derived from a wind farm and the high 'visual cost' associated with their 'minimal output'. Typically the annual output in GWh from a wind farm is highlighted as the number of hours of operation of a major coal plant – the most popular being the 4,000 MW Drax plant in Northern England (the largest power station in Europe). These comparisons are neither very meaningful nor logical but do bear witness to the importance of function and purpose (and scale) in terms of defining a wind farm's role. Clearly, this is much exacerbated when dealing with a small project compared with a utility scale project.

Although anti-wind farm campaigns and vocal vociferous anti-wind lobbyists are still part of the climate of the Planning process (and of course always will be) all the public opinion surveys illustrate that wind farms enjoy general public

support (even if this is generally silent). Naturally the level of support on a project by project basis is dependent on the proposal itself and clearly not all proposals are necessarily good or sound in either their location or philosophy but the fact remains wind is generally perceived as good. Wind is seen to be both a domestic 'product' and an Irish resource.

Public Awareness and Acceptance:

Over the past two to three years there has been a significant increase in the press coverage associated with wind energy and climate change. Public awareness of both Global climate issues and the potential consequences of Global Warming and the heavy dependence of Ireland on imported foreign oil and coal has never been more profound.

Recent statements by the Department of Environment and the Minster Mr Dermot Ahern in the National press have highlighted the direct effect for failing to meet agreed CO2 obligation and have indicated that penalties of €1.2 billion per annum will be incurred.

Whilst it is true that the distribution of wind farms is still somewhat sparse across the Country modern wind turbines and wind farms are no longer completely new features in the Irish landscape.

The result of the press coverage and the physical presence of more wind farms around the Country is an increased general public understanding of wind energy and familiarity with wind turbines. There is an increasing acceptance of wind energy and that has an effect on acceptability of both the scale of the turbines and scale of projects. There is no reason for a fixed notional project size to be applied to a project as a fundamental maximum.

Coor Shanavogh Scale:

Turbines must be sited sensitively (and appropriately) and whilst some project sites with well defined visual enclosure boundaries may have a landscape capacity of perhaps 5-10 turbines or less, others could comfortably accommodate 20, and others 50+ i.e. it is site specific. The Coor Shanavogh

project can be considered a small scale utility project and the details of its landscape Visual attributes are clearly outlined by MosArt Ltd in Chapter 6 LVIA.

Adjacent Sites with Planning Consent:

A number of other proximal wind projects have materialised in the immediate area Figure 1.3.

- DP Energy Ltd, Booltiagh and Booltiagh extension,
- Clare Winds Ltd in Glenmore townland (Planning Ref 02/2228),
- Hibernian Windpower Ltd at High Street/ Frure (Planning Ref 03/79),
- Hibernian Windpower Ltd at Boolynagleragh townlands (Planning Ref 03/80),
- Michael Murphy and Michael Egan at Cahermurphy townland, Kilmihil (Planning Ref 03/2071).
- Potential wind farm at Slieve Callan.

The first four projects are based on large Multi Megawatt turbines (of 2.0 –2.5 MW installed capacity each) with a hub height of 70-75 metres and a rotor diameter of around 80 metres giving an overall tip height of 110-115 metres. The fourth project, at Cahermuphy, was granted by An Bord Pleanala subject to conditions and is based on Megawatt turbines of nominal capacity 1 MW each with a hub height of 55 metres and a maximum rotor diameter of 55 metres.

Since the drafting of the above text it is now apparent that none of the above projects (with the exception of Booltiagh) have received offers in the recent round of ESB connection offers (Gate 2). It is therefore highly unlikely that any of these projects will proceed until the next round of connection offers is announced. Given the probable timing of these offers it is therefore also fairly certain that these projects will run out of planning time and will be forced to resubmit planning applications.

Other Adjacent Sites:

In addition to the sites granted Planning Permission proximal to the proposed Coor Shanavogh Wind Farm there have been a number of other projects proposed submitted and either withdrawn or deemed withdrawn:

- West Coast Energy Ltd at Drummin townland, Mullagh (Planning Ref 02/555),
- West Coast Energy Ltd at Doolough/ Drummin townland, Mullagh (Planning Ref 02/556),
- West Coast Energy Ltd at Creevagh & Treenmanagh townland, Mullagh (Planning Ref 02/557).

All of these projects were deemed withdrawn by december 2002 after the request for further information dates was not met. Given the elapsed time and that these projects appear both dormant and highly speculative they are not considered further.

A single turbine proposal was also made:

Noel Kelly c/o Clare winds Ltd Caheraghacullin townland, Kilmihil, (Planning Ref 02/2306).

This project was deemed withdrawn on 12th August 2003 after the request for further information was not met. Again this project appears dormant and speculative, and as a single turbine is unlikely to have any significant cumulative effect in relation to the wind farms assessed.

What is not clear from any of these sites is where the proposed connection to the ESB network would be.

Alternative Turbines:

It is possible to discuss the aesthetic qualities of wind turbines, and their positive symbolism in relation to their green energy function. However, the primary objective of a wind turbine or wind farm is obviously to produce the maximum energy from the available wind resource. The primary choice on

turbine selection then (subject to relevant environmental constraints) is to maximise energy recovery from the given site wind resource i.e. effectively the energy efficiency of the site.

Performance Assessment:
The increased energy yield of up to 58% results from the combined effect of both increased generator rating, rotor swept area and the increased hub height. The larger rotor means more air volume that passing through it, and the higher hub results in an increased hub wind speed and reduced tree turbulence effects.

Table 2.5 Candidate Turbine Energy Yield Benefits.

Baseline Turbine	**Rotor Diameter (m)**	**Project size [MW]**	**Hub Height (m)**	**Turbine Yield (GWh)**	**Capacity factor**	**% of Baseline**
Enercon E82	82	13,8	84,6	41,7	34,4%	100%
Candidate Turbine	**Rotor Diameter (m)**	**Project size [MW]**	**Hub Height (m)**	**Turbine Yield (GWh)**	**Capacity factor**	**% of Baseline**
Gamesa G87	83	12	78	38,7	36,8%	92,8
Nordex N80	80	15	80	37,1	28,2%	89,0
Siemens 2.3	82.4	13,8	80*	37,1	30,7%	144
Vestas V80	80	12	78	34,8	33,1%	83,5

2.14 The Need for the Proposed Development

The need for the development is outlined clearly in the EU 28/2009 documentation. National Energy Policy is now stated in EU Directive (2009/28/EC). The new European Directive on the promotion of Electricity from Renewable Energy Sources was endorsed on April 23, 2009.

The Directive 28/2009/EC sets a mandatory target of 20% share of energy

from renewable energy sources (RES) in gross final energy consumption for the European Union as a whole by 2020. In terms of electricity consumption, renewables should provide about 35% of the EU's power by 2020.

The directive legally obliges each EU Member State to ensure that its 2020 target is met and to outline the 'appropriate measures' it will take do so in a National Renewable Energy Action Plan to be submitted by 30 June 2010 to the European Commission.

The key principles of the Directive are the following: 20% overall EU renewables target broken down into differentiated legally binding national targets, priority access to the electricity grid for renewables, the option for Member States of using flexibility mechanisms to help reach national targets and the streamlining of administrative procedures.

Targets for wind derived electricity generation may or may not be met here in Ireland, however it is clear that other renewable sectors such as solar photovoltaic will not meet their set requirements for the renewable energy supply mix. It may be the case that wind will have to compensate for the sectors which cannot reach their predetermined targets as outlined in the ability for Member States to use 'flexibility mechanisms' to reach national targects. The 34% of EU electricity demand met by renewables in 2020 is made up of 14% from wind energy (10% onshore, 4% offshore), 10.5% from hydro, 6.6% from biomass, 2.4% from solar photovoltaic, 0.5% from CSP, 0.3% from geothermal and 0.1% from ocean.

3 HUMAN BEINGS

3.1 Introduction

The Human Beings section examines the relevant socio-economic context of the proposed development. It examines the impact on human beings, focusing on issues such as existing economic activity, land use, road traffic, tourism, amenity, health and safety, in so far as they relate to or are likely to have effects on the environment. In addition the Human Being Chapter includes an Assessment of Material Assets fort the locality and all potential impacts on Material Assets are identified.

Furthermore the assessment of human being within the existing environment and the potential impact on human beings with respect to the proposed development, the project has also been assessed in terms of the Strategic planning polices presently outlined and implemented by the local Authority Clare County Council. These policies are outlined within the Clare County Council Development Plans and the Local Area Development Plans for the areas of North and West Clare. The Clare County Development Plan 2011 - 17, the North Clare Local Area Plan 2005 – 2011 and draft North Clare Local Area Plan 2011 – 2017 and the West Clare Local Area Plan have all been reviewed and consulted and assessed in terms of implication on Human Beings in the Specific Details of relevant Council polices can be found in the Introduction Chapter sub sections.

3.2 The Proposed Development

The proposed development will be assessed in the context of the project description as outlined and introduced in Chapters 1 and 2. The main areas of concern with respect to the potential effects of the development on humans are visual character of the locality, shadow flicker, Electro Magnetic Interference (EMI) and noise impacts. Each of these topics are accessed and addressed separately and in more detail in their individual assessment chapters, indeed all aspects of potential impacts and/ or mitigation for human

beings is provided in those chapters. The following is a description of the existing human environment and the other likely impacts on this human environment arising from the proposed wind farm development. These include:

- Socio-economic,
- Recreation and amenity,
- Land use,
- Health and safety.

3.3 The Existing Environment and Existing Land Uses

Overall the land is a mixture of wet grassland used for rough grazing, and lower lying peaty areas used for commercial forestry. The six turbines are located within stands of semi mature commercial forestry and wet grassland. This land use is likely to continue for the next 20 years and beyond with felling likely to take place 10-20 years from now. There are scattered houses within 1km of the site and most of these are associated with farming activities.

The whole wind farm landholding covers an area of about 224 acres (~90 hectares). The actual proposed development area for turbine erection and the construct of the service tracks will encompass only about 2% of this.

The wind farm site and its infrastructure is unlikely to have any significant effect on the existing land use of the site and existing farm and agricultural activities can continue unaffected.

3.4 Existing Activities

The six turbines are located within stands of semi mature commercial forestry and wet grassland. This land use is likely to continue for the next 15 years and beyond with felling likely to take place 15-20 years from now.

The Coor Shanavogh site as a whole is used by the local landowners for commercial forestry, and for grazing for sheep and cattle. There is no other land use within the landholding area.

3.5 Existing Access

No new road access is required from the Public road. The existing entrances on the southern boundary of the site will be utilised for all turbine and heavy construction deliveries. The design details of the existing entrances may have to be changed in order to accommodate turbine delivery. An additional potential entrance to the site may be utilised if necessary. This potential entrance is on the northern boundary and it is marked as a potential entrance on the application drawings. It may be utilised and constructed upon request of the County Council.

The proposed route for turbine delivery, and import route for construction material – concrete and stone will be identical to the route agreed for the main wind farm construction traffic. This can be further managed with the County Roads Engineering Department if deemed necessary. Specific management of the delivery route to avoid excessive road congestion will be worked out as part of the ongoing planning process.

Details of proposed delivery routes for turbines and other materials, traffic management of such deliveries and other issues relating to roads/ traffic are set out in Chapter 12 –Traffic and Transport.

3.6 Commercial Land Use in the Surrounding Area

Slieve callan and Ben Dash are the highest points in the vicinity of the site and they rise to 390 metres 267 metres respectively. The area where Ben Dash is situated could not be classified as a mountain range but rather as an upland area. Slieve callan can be considered a mountain.

There are no villages in the immediate vicinity of the site. The nearest town/ village is Connolly. It is situated approximately 6km north-east of the site. There are a number of scattered houses in the area, most of which is farm related; however the closest private dwelling is approximately 400 metres from the nearest turbine of the proposed wind farm layout.

The principal economic activity in the immediate area is commercial forestry and to a lesser degree farming. Farming employs small numbers of people but due to the poor quality of land most farms are small family holdings. There is no cutting of peat noted within the immediate locality as suitable peat lands do not occur within the landholding site or proximal.

Wind farms are in themselves (as described in the previous chapters) an increasingly important part of the economic development of this area. This is likely to continue for the foreseeable future.

3.7 Recreational Land Use in the Surrounding Area

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

There is a waymarked walking route, The Mid Clare Way, which passes within 8 km to the east of the site (Figure 1.1 and Figure 1 Appendix I, EIS Volume III). This walk is listed as a long distance walking route and runs in a circle from the edge of the Burren to the Galway border to the Shannon Estuary, it is 139km in length.

The closest amenity Lough is Lough Namina located just over 2 km to the south which is stocked with trout and fished by the Kilmalley and District Angling Association.

The MosArt Ltd., Landscape Impact Assessment indicated that the overall significance of impact for the proposed Coor Wind Farm is also considered to be **Moderate**. This is the median of five levels of impact significance available to the assessors and is defined earlier as '*An impact that changes the character of the environment in a manner that is consistent with existing and emerging trends'.* If the majority of the currently permitted wind farms in the vicinity are constructed the significance of impact of the proposed Coor Wind Farm is likely to be diminished.

3.8 Socio-economic Impacts - Economic and Employment

Wind farms, regardless of location, have the potential for significant positive economic impact on the local economy both directly and indirectly. There are, however, frequent concerns with respect to the perceived adverse effect on tourism and quality of life (local amenity). These public fears are cited as commonly major issues during public consultation exercises.

3.8.1 Benefits West & North Clare Local Area Plan 2003

Detailed emphasis of the policies from the Clare County Council Development Plan 2011 - 2017, the North Clare Local area plans 2005 - 2011, draft North Clare Local area plan 2011 – 2017 and the West Clare local Area Plans have been carried out in subsection 1.11 to 1.11.4 of the Introduction Chapter 1. There are a number of benefits that wind farm developments provide. These include:

- Employment: jobs in manufacture, installation and operation of turbines;
- Rural development: additional income for farmers, co-op's and other investors, along with substantial local employment during installation and long term jobs in maintenance;
- Security of energy supply : dependence on oil and other imported fuels reduced;

- Balance of trade: the manufacture and installation of turbines in Ireland would reduce fuel and other imports related to the conventional power plant;
- International image: wind energy would enhance Clare's reputation as a relatively clean, unpolluted county with benefits for tourism and agricultural exports.

3.8.2 Coor Shanavogh Wind Farm

The experience on the surrounding localities such as at Booltiagh, and other west Clare wind farms supports the West Clare Local Area Development Plans which are in practice. The main civil works contractor for the Coor wind farm will be an Ennis based construction company which will employ local labour.

Although specialist equipment including the turbines was sourced from non local sources, building materials for construction of the wind farm substation and access roads will be almost exclusively obtained locally. Concrete for example for the substation and turbine foundations will also be supplied by a local supplier.

3.8.3 Direct Economic Impacts

Direct economic impacts would include:

- Employment during construction – direct labour, and use of local subcontractors: up to 10 construction jobs may be created over the construction period, and plant equipment and associated operatives will be sourced locally wherever practicable;
- Employment post construction – direct labour, and subcontract maintenance.

3.8.4 Indirect Economic Impacts

Indirect economic impacts are:

- Use of local service facilities during construction; and
- Use of local service facilities post construction - maintenance and servicing.

It is acknowledged that the wind farm project will also involve purchase of material and equipment from the local area including:

- Crushed stone – where not available from the site;
- Geogrid material - for construction of floating roads;
- Concrete;
- reinforcing bar - for turbine foundations;
- Electrical cabling.

3.8.5 Community Benefit Schemes

It has become the practice within the renewable industry not only to pass benefit on to the community through rates, taxes and land lease payments but also to establish community benefit schemes targeted towards those communities directly impacted by renewable development. To try an include additional benefits to the local community the developer has consulter other more experienced wind farm companies for advise and McMahon Finn Have also consulted and applied advice outlined in 'Delivering Community Benefits from Wind Energy Development: A Toolkit A report for the Renewables Advisory Board, July 2009 edition. In addition considerable community consultation has been carried out as previously mentioned in Chapter 1.

3.8.6 Land owner benefits

The land owners involved in the development of the wind farm will receive a direct monetary payment for the use of their lands. This is a direct financial input into the local region.

3.9 Socio-economic Impacts Tourism and Amenity

Any form of development that has the potential to adversely affect tourism is a major concern where these visitors are a major contributor to the economic well being of an area. It must be noted that the general public perception is often that wind farms because of their visual nature, will deter visitors, and this is often a major topic of debate during community open days and voiced during public meetings. Numerous opinion poll studies have shown that is not the case e.g. the MORI poll in Scotland as described below. The most telling facts are, however, not opinion polls but actual experience measured by the tourist boards. Cornwall in the south-west region of England has a number of wind farm developments, including the first UK wind farm at Delabole which was built in 1991. Pertinent information is outlined below.

3.9.1 Cornish Tourism

To put the assessment into perspective with respect to Tourism, data for the entire south-west English region, and Cornwall in particular, has been used to illustrate trends over the past few years. This data is derived from data published by 'South West Tourism: Facts of Tourism 1999' and from the 'United Kingdom Tourism Survey': International Passenger Survey.

The south-west region includes:

3 two national parks, Dartmoor and Exmoor, which cover 1,631 square kilometres (8.3% of the region's land area),

4 large areas of Outstanding Natural Beauty which cover approximately one fifth of the region (4,641 square kilometres); and,

5 400 kilometers (39%) of the regions (1,022 km) coastline has been designated as Heritage Coast.

The West Country region accounts for 15% of England's domestic tourist trips, 21% of nights spent on holiday, and 22% of spending. In terms of visitors from overseas, the region accommodates 7% of trips to England, 6% of the night's spent and 5% of spending.

3.9.2 Cornish Wind Farms

Over the past 10 years 7 wind farms (totalling 103 turbines) have been built in Cornwall. The first of these, Delabole wind farm, was commissioned in November 1991, some 4 km from Tintagel Castle ("King Arthur's" castle) one of the most famous tourist spots in the UK, (source, Renewable Energy Office for Cornwall).

Table 3.1 Wind Farms in Cornwall.

Commissioned	Wind Farm	Turbine Rating (kW)	Number of Turbines	Capacity (MW)
Sep-01	Bears Down	600	16	9.6
Mar-95	Four Burrows	300	15	4.5
Jul-94	St Breock	450	11	4.95
Apr-93	Cold Northcott	300	22	6.6
Apr-93	Goonhilly Downs	400	14	5.6
Aug-92	Carland Cross	400	15	6
Nov-91	Delabole	400	10	4

Delabole, relatively small by modern standards with only ten turbines, stirred controversy well out of proportion to its size. As well as fears over noise the potential negative impact on tourism was cited as a major concern because of the importance of visitors to the Cornish economy.

3.9.3 Visitor Trends

The table below illustrates the annual trends in number of trips made and the amount spent by tourists over the period 1990 to 1997 during which time 6 of thumbee 7 wind farms were built.

Table 3.2 Number of Trips Made to Cornwall and Amount Spent by Tourists.

Year	No Trips (Millions)	£ Spend (Millions)
1990	3.42	671
1991	3.42	613
1992	3.36	623
1993	3.35	782
1994	3.97	831
1995	4.11	762
1996	4.02	824
1997	4.44	937

Over the period 1990 to 1997, the number of tourist trips increased by a factor of 29%, with an increase in spend over the same period of 39%.

There is no evidence to suggest tourist numbers are affected by the presence of wind farms, and the Cornish experience clearly shows no trends that would support this despite the nature of the south-west and Cornwall as a tourist intensive region.

3.9.4 The Mori Poll - Tourist Attitudes to Wind Farms

There have been a number of polls conducted over recent years by various bodies including the Countryside Commission for Wales, the DTI, BBC Wales, and the Scottish Executive, as well as commissioned surveys by Robertson Bell Associates, Research and Auditing Services Ltd etc. These surveys were primarily directed at residents living close to wind farms both before and after construction. This is discussed further under Amenity Impacts below.

More recently an opinion poll was commissioned by the Scottish Renewables Forum, in conjunction with the British Wind Energy Association, specifically to address the potential tourist impacts of wind farms.

MORI interviewed 307 tourists visiting Argyll and Bute face-to face in five locations Tarbert, Inverary, Oban, Campeltown and Lochgilipead during September 2002. Argyll and Bute was chosen as a study area as it currently has the greatest concentration of wind farms in Scotland, with three large commercial wind farms now in operation.

Of the 307 tourists interviewed 122 were aware of the presence of wind farms in Argyll and Bute and of those 49% had seen the wind farms. When asked whether the presence of the wind farms had a positive or negative effect, two in five (43%) maintained it had a positive effect, whilst a similar proportion felt it was equally positive and negative. Less than one in ten (8%) felt it had a negative effect.

Q What effect if any would you say the presence of that/these wind farm(s) has had on your impression of Argyll as a place to visit?

Completely Positive Effect	15%
Generally Positive Effect	28%
Equally Positive and Negative Effect	43%
Generally Negative Effect	7%
Completely Negative Effect	1%
Don't Know	6%

Base: All who are aware that there are a number of wind farms in Argyll (122).

Asked whether a presence of wind farms in Argyll, made any difference to the likelihood of them visiting the area, the majority 91% maintained that it made no difference.

Q Has the presence of wind farms in Argyll made you any more or less likely to visit the area in future, made it less likely or has it made no difference?

More Likely	4%
No difference	91%
Less Likely	2%
Don't Know	3%

Base: All respondents (307)

These results can be expected as people do not normally go on holiday and seek out wind farms to look at. The same is true of most developments of this type such as conventional power stations, or other man made structures. Wind farms are incidental features in the area which will attract visitors if they are already intending to visit but will not, by and large, make them chose a location as a holiday destination.

3.9.5 Public Attitudes to Wind Farms

Independent local opinion studies have shown strong support for wind energy developments both before construction and even more after the wind farms are operating.

The Dept of Trade and Industry in the UK commissioned a study at Delabole in Cornwall. Before construction local residents expressed some concern about the potential noise and visual impacts. After it was constructed and running, local attitudes became much more positive and 84% of those asked approved of wind energy development. Only 4% disapproved.

Similarly the Countryside Council for Wales reported on attitudes in four different areas, three of which already had wind farms. 70% of people questioned said that they would favour further wind energy development. Other studies confirm that support for wind energy is even stronger after construction.

A survey of public attitudes to proposals to site a wind generator at Corkey, Co. Antrim was carried out during March 1992. (The Department of Environmental Studies at the University of Ulster and the Energy Research Centre E.I. Report of Proposed Wind Farm at Slievenahanagan Co. Antrim. unpublished 1993.)

'A random sample of 123 of the approximately 1,500 households within a 10 km radius of the development on the western side of the mountain (the eastern side being largely uninhabited) was used. Most people in the area expressed some degree of concern for the environment and a very significant proportion were in favour of attempts to find alternatives to coal and oil as a means of generating electricity. Since the installation of the experimental turbine at Corkey people in the area are much better informed about wind energy. Four out of five of those surveyed considered that wind power could be a viable alternative to conventional generation methods and almost two thirds of them had been to visit the experimental site. The majority of people

believed that wind turbines were quiet and safe and that a wind farm was an appropriate use of the land, even though it was perceived as bringing no obvious financial benefits to the area'.

In 1995 the Corkey site was developed as a full wind farm with 10 generators in addition to the existing experimental one, and responses to on-site questionnaire after 'Open Days' from interested parties have been largely favourable.

In summary:
Scottish Government commissioned report in 2008 showed that wind farm developments have a minimal impact on tourism. Of the visitors surveyed in the study 93-99% said wind farms would have no impact on their decision to return to Scotland. 68% said they felt positive that a 'well sited wind farm does not ruin the landscape' with a further 12% neutral about this statement. Wind farms are also attracting visitors in their own right: the UK's first commercial wind farm at Delabole, Cornwall received 350,000 visitors in its first ten years of operation, while 10,000 visitors a year take the turbine tour at the EcoTech Centre in Swaffham, Norfolk. In a visitor survey undertaken on behalf of the Wales Tourist Board, 68% of respondents said that if the number of wind farms increased in Wales it would have no difference to the likelihood they would take holidays in the Welsh countryside. A further 9% said any impact would be negligible and only 2% said they would be 'less likely to come back' (Renewable UK, 2010).

3.9.6 Tourism Policy West Clare Local Area Plan 2003

The West Clare Local Area Plan defines Regional Tourism Priorities:

The relevant priorities at a regional level are to:

- Expand and upgrade an accommodation base in non-established tourism areas;

- Develop flagship projects or regional attractions with a view to drawing demand from main tourism hubs;

- Upgrade and increase utilisation of existing visitor attractions to ensure a high quality visitor experience;
- Develop tourism potential of water-based resources and provide facilities for water based activities; Improve sign posting in key tourism areas and centres.

It goes on to state that one of the tourism benefits that wind farm developments provide:

- International image: wind energy would enhance Clare's reputation as a relatively clean, unpolluted county with benefits for tourism and agricultural exports.

3.9.7 Local Tourism and Amenity

Although tourism is an important sector within the economy of County Clare the proposed wind farm is located in an area of the county not considered to be of significant tourist attraction.

The proposed six turbines of the wind farm is considered as a Moderate Impact (MosArt Ltd, Landscape Impact assessment Chapter 6) within the area and is, therefore, unlikely to have any significant effects on the amenity value of the locality.

The wind turbines may be seen by limited numbers of hillwalkers using the Mid-Clare Way to the east (Figure 1.1) but the visual impacts of the Coor Shanavogh wind farm itself are considered to be Moderate. Additional qualitative results regarding the visual impact of the proposed wind farm are outlined in detail in the landscape and Visual Impact Assessment (LVIA) Chapter 6. For example the visual impacts of the wind farm from localities (within the wind farm viewshed) which are considered to be of significant

touristic importance (e.g. Quilty/ Spanish point) are detailed in the LVIA Chapter and its associated photomontages.

Overall no significant or negative impacts on tourism are expected.

3.10 Road Traffic Impacts

The proposed project presents various traffic issues which must be planned for. Issues include onsite management of construction traffic, construction products delivery, and turbine parts delivery. Coor Shanavogh wind farm is located in a remote area. The local road network will experience some additional traffic during the construction phase of the project. This is, however, a relatively lightly loaded road in terms of the volumes of vehicular movement, which use this public road and the additional traffic is unlikely to cause significant difficulties. It is relevant to note that these existing roads are already planned as acceptable for removal of forestry during felling operations and consequently heavy vehicle movement would not therefore be an unexpected feature of the existing road network. The proposed on site borrow pit will ensure that the road traffic impact associated with sourcing rock material is avoided.

When operational, there will be no significant impacts on residential amenity from traffic. Road traffic impacts are again outlined in the Traffic, Transport and Delivery Route Selection Assessment Chapter 12.

3.10.1 Transport of Oversized Loads

The turbines will be delivered to site in separate parts. This comprises (for each turbine) four loads of tower sections, one load for the nacelle, three loads for the rotor blades, and a further load each for the rotor hub. At approximately 82 tonnes, the nacelle will be the heaviest single component, and when considered with its low loader it would weigh approximately 97 tonnes gross. The use of trucks which spread the local over many axles will maintain permissible standard axle loads on the roads.

Exceptional Load Services Ltd., a specialist company which provides route planning for delivery of oversized products such are wind turbine parts where commissioned to provide a survey of potential delivery routes. A number of traffic/ delivery routes were assessed to determine an optimum route from the port of delivery to the site. The existing entrance on the southern boundary of the site has been indicated as the preferred delivery option. No significant issues or problems were identified along the delivery route. All pertinent details are provided in Chapter 12. The full Exception Wide Load Delivery Route Selection Survey is included in its entirety in Appendix 11, EIS Volume III.

It is estimated that 54 HGVs will be required to transport the 6 towers, 6 hubs, 18 blades, 6 nacelles and 6 turbine bases to the site, assuming each tower arrives in four sections. While the number of HGVs in itself is not significant, the loads are oversized, and will require co-ordination with Clare County Council and the Gardaí.

3.10.2 Traffic Access Routes to and within the Site

Access to the proposed site is available from all directions via regional and county roads.

Although it is not yet confirmed, it is likely that the wind turbine components will arrive from Foynes Port in County Limerick. Vehicles transporting the various turbine components will travel along the N69 to Limerick. From here, the turbine components will travel along the N18 for 66km to Ennis. From Ennis, traffic will continue along the N85 ring road taking the R474 to The hand Cross road and then south to Coor East, entering the site at the existing southern access entrance.

Any works necessary along the public roads will be agreed, in advance, with Clare County Council. It is proposed that traffic relating to civil works (concrete delivers, excavation machinery, etc) will approach the site from Ennis or from the north or west if that is the origin of the traffic.

3.10.3 Construction Traffic

There will be an increase in local traffic during the construction phase of the project. Staff, including plant operators, electricians, engineers and trades-people will be commuting to and from the site. Intermittent deliveries of building material will also take place.

HGV movements on public roads have been minimised by the proposed use of rock fill from borrow pits within the site.

3.10 4 Potential impacts on electricity generation

There will be a positive impact on electricity generation.

3.10.5 Mineral and rock resources

The site has three small areas were rock has historically been quarried for landowner purposes. These pits are small and have not been quarried for several years. These locations also provide the perfect location for borrow pits for the construction of onsite roads and hard standings for this wind farm dev elopement. Geotechnical consultants AGEC Ltd have carried out on site investigations to design borrow pits for these already quarried locations. Furthermore proposals for disposal of peat into these borrow pits is proposed to allow borrow pit reinstatement. Balances for excavated soils/ peats and excavated rock are provided. Three small Borrow Pits exist on the site with a proposed combined extraction toatal of 30,050 m^3. The material in these pits consists of a weathered shale and siltstone. This material is suitable for all new internal access roads (AGEC, 2010):

- Borrow pit 1, 21,600 m^3
- Borrow pit 2, 3,500 m^3
- Borrow pit 3, 4,950 m^3

Some excavation of the till sub-soil will be required due to the shallow depth of peat at some turbine bases, and across the area of associated infrastructure. Excavations will be less than 1 mbgl. Some quantities of rock may be recovered from the initial excavation process, this rock may be crushed/ processed and used as part of internal hard standings.

3.11 Health and Safety Impacts

3.11.1 Health

Wind turbines have been known to produce a "flicker effect" on sensitive residents living within close proximity to the wind turbines. Noise, Shadow Flicker and EMI assessments have been made to determine any potential effects on the surrounding properties. All Irish statutory and EU Directive Guidelines including guidelines outlined by the IWEA have been met as part of the final site layout and operation of the site in its proposed layout will not breach any thresholds for Noise and Shadow flicker. The properties are not expected to notice or under go any discernible effect. In addition mitigation measures for controlling certain turbines in certain background wind conditions. Details are provided in Chapters 11 and 9.

Cumulative effects of Shadow flicker and noise are assessed and discussed in further detail in Chapter 11 and 9.

3.11.2 Safety

Wind turbines are fundamentally safe pieces of equipment and provided they are maintained and serviced properly and the standard operation procedures (SOP) for continued inspection are appropriate there is no safety requirement for turbines to have restricted public access.

With over 40,000 wind turbines operating throughout the world, there has been no report of any accidents involving the general public. No issues with respect to safety are envisaged.

3.11.3 Blade Loss

The loss of a piece of the blade or, in exceptional circumstances, of the whole blade is a possible but rare potential danger to human or animal life. Most blades are composite structures with no bolts or other separate components and even for blades with separate control surfaces such as tip brakes separation is extremely unlikely. The loss of parts of blades is very rare and when it has occurred is usually the result of a catastrophic event such as a direct major lightning strike. The same risks apply to all tall buildings including church spires.

3.11.4 Ice Shedding

Blade icing, and the potential icing shed from blades is not a significant problem in most turbine sites and the build-up of ice on turbine blades is unlikely to present problems on the majority of sites in Ireland. Very few sites have icing problems. The Searsburg project in Vermont, USA is situated on a high ridgeline at an elevation of over 760 m; it is both at a high elevation and experiences both high snowfall and perfect freeze thaw icing conditions. Even on this project it is the build up of ice sheets formed on the nacelle roof which is more of a problem than the icing of rotor blades themselves. These sheets tend to build over time and unless physically removed will eventually slide off the roof of the nacelle and land within a few meters of the tower.

Where icing of blades does occur, fragments of ice may be released from blades on machine start up, however, most turbines are fitted with vibration sensors which would detect any rotor imbalance caused by icing of the blades. This would enable the operation of machines with iced blades to be inhibited. The climate of Clare is relatively mild and of a relatively low elevation site, and is very unlikely to experience significant or prolonged icing build up.

3.11.5 Lightning Strike

Similar to the copper strips which run down a church steeple, wind turbine blades contain metal lightning strips, which in the event of a strike conduct the energy generated down the length of the blade and to the hub where they are then conducted to earth.

The majority of lightning strikes are dealt with completely successfully in this way, and it is often possible, on close inspection of blades which have been in service for some time, to see blades with multiple strike marks typically close to the tip of the blade.

Where major lightning strikes occur on buildings, or trees the results are inevitably significant. On buildings this can result in exploding masonry and collapse of parts of the structure and, on trees, the splitting of the trunk and again falling of all, or part of, the trunk. Major strikes on wind turbines are less catastrophic and are invariably confined to the rotor blades themselves. The result of a major strike, which cannot be dissipated by the lightning protection system, is usually the axial rupture of the blade as the superheated air inside the blade expands rapidly and splits the blade from the inside. This would result in an immediate emergency turbine trip (shutdown) and the turbine would be brought to a halt. Normally in these instances the blade remains intact although very occasionally there is some material loss.

3.11.6 Technology Standards

The turbines will be designed, constructed, operated and de-commissioned in accordance with Safety, Health and Welfare at Work (Construction) Regulations 1995, and the Irish Wind Energy Association's (IWEA) Best Practice Guidelines (2008 and 2008).

Companies supplying products and services to the wind energy industry operate to a series of International, and European Standards. A set of product

standards for wind energy equipment has been developed by the International Electro-technical Commission - IEC 16400.

3.11.7 Driver Safety

There is no evidence to suggest that driver distraction due to wind turbines is a factor has been a factor in road traffic accidents.

The proposed turbines are set back from the boundaries and public roads as per guidance and they are unlikely to have any significant effect on drivers observing the site either from roads in the immediate vicinity or in the distance.

3.12 Potential Impacts on Material Assets

This chapter evaluates the impacts, if any, which the development will have on material assets during both the construction and operation phases. Material assets are defined in the EPA Advice notes on Current practice in the preparation of EIS, 2003 as 'resources that are valued and that are intrinsic to specific places, they may be either human or natural origin and the value may arise for either economic or cultural reasons'. The assessment of cultural heritage is discussed in Chapter 13; therefore, this chapter will concentrate on the economic assets only. Economic assets discussed will include the following areas:

1. Land Use and Ownership;
2. Local Settlement;
3. Infrastructure and Utilities;
4. Natural Resources;
5. Waste Management;
6. Contribution to National Economy;
7. Opportunities for Future Development.

Cross reference has been carried out for all relevant assessment chapters and assessment criteria that relates to the human environment. Where relevant pertinent assessment data from these separate sections is reproduced here to

highlight all and any interactions. Further assessment and mitigations measures are carried and proposed where necessary.

3.12.1 Use of Finite Resources

In addition to reducing harmful atmospheric emissions, wind energy is an indigenous, secure and sustainable resource. Current rates of use of fossil fuels (coal, oil and gas) are greater than the rate at which these fuels are naturally created. While new sources of such fuels are continually discovered, these resources are finite. As these energy sources are depleted, they are accordingly becoming more expensive. The development of wind energy slows this depletion and offers an alternative power source. The proposed wind farm at Coor Shanavogh will increase the electricity resource, without compromising other material resources in the area. The overall impact of the wind energy development on the material assets of the area is considered, in general, to be positive.

The White Paper "Energy Policy Framework 2007 - 2020", published by the Department of Communications, Marine and Natural Resources in 2007 sets a 020 target of 33% of electricity consumption to be met by renewable energy. This target has subsequently been revised upwards to 40% of generated electricity by 2020. The proposed wind farm will have a beneficial effect in meeting this requirement. The site output is 13.8 MWs.The estimated long term mean wind speed on the site is 7,9 m/s and the annual energy production for the six turbine project is anticipated to be approximately 41,7 GWh/annum.

3.12.2 Mineral and Rock Resources

Quarry and mine activities are often associated with potential environmental impact and are energy intensive. The wind farm will have no direct impact on mineral or rock extraction in the surrounding area, with the exception of the on-site borrow pits. If additional rock for road and turbine foundations will be required, it may be convenient to purchase some quantities of it from nearby quarries, however AGEC ltd have established that rock resources are readily

available onsite from bedrock which exists at or just below ground level onsite. There of the borrow pit locations identified as suitable for rock extraction have already been opened for agricultural purposes in the past. Concrete and other construction products will be imported.
The site has three small areas were rock has historically been quarried for landowner purposes. These pits are small and have not been quarried for several years. These locations also provide the perfect location for borrow pits for the construction of onsite roads and hard standings for this wind farm developement. Geotechnical consultants AGEC Ltd have carried out on site investigations to design borrow pits for these already quarried locations. Furthermore proposals for disposal of peat into these borrow pits is proposed to allow borrow pit reinstatement. Balances for excavated soils/ peats and excavated rock are provided. The potential impact of the operation of the borrow pits is primarily assessed under the Flora, Fauna, Avifauna and Water Quality Chapters.

No significant impacts are expected as no environmental constraints are directly impacted on, the habitats at the site of the proposed borrow pits are of low ecological importance and sensitivity, the turbines are located over 10 meters back from the one existing watercourse, it is of low ecological importance, mitigation can be easily designed and implemented. Most importantly no groundwater resource will be impacted, there is no source protection zone nearby or proximal, nor is there any private abstraction wells proximal. The theoretical zones of drawdown for any private wells in the locality is far outside the impact zone of any borrow pits and or other wind farm infrastructure.

3.13 Potential Impacts of Shadow Flicker

In times of direct sunshine, wind turbine blades could cast moving shadows on windows of houses in close proximity to the turbines. At certain times of the year, moving shadows from the turbine blades could periodically block light to a room, causing the light to appear to flicker. This will not generally have an effect on health or safety, but could on limited occasions present a brief, minor

nuisance effect at some dwellings. An analysis of shadow flicker throughout the year from the proposed Coor Shanavogh Wind Farm layout was carried out using WindPRO. Pim De Ridder carried out the final shadow flicker modelling for the finalised Coor Shanavogh turbine layout.

The shadow flicker assessment takes into account the behaviour of the sun, the local topography and the turbine layout and dimensions. The model calculates times throughout the year when a turbine, viewed from the window of a house, is in line with the sun, and therefore the potential exists for shadow casting.

Mr. De Ridders shadow flicker model makes a number of assumptions and is carried out as a worst case scenario model, please note that the worst case scenario assumptions applied will probably never occur with any consistency:

- there are no obscuring features around the residences, which would minimise views of the development and hence reduce or eliminate the potential for shadow flicker;

- every house has a window facing directly onto the wind farm;

- daylight hours consist of 100% sunshine;

- at distances greater than ten rotor diameters from a turbine, the potential for shadow flicker is very low;

- the wind direction is always parallel with the line between the sun, the turbine and the window in question (which means the turbine will be always facing the house).

When the wind is from another direction the turbine blades move to face the wind. This will reduce the extent of shadows falling in the direction of the window. This makes the shadow flicker model very conservative, because:

- some residences are screened by vegetation;
- some residences are screened by out-houses, sheds and other man made structures etc;
- not all residences have windows facing onto the wind farm;
- Irish daylight hours would typically experience 40% sunshine rather than 100%;
- the hours when the wind is blowing in a line between the turbine and the house will be considerably less than 100% and will in many cases not coincide with sunny hours.

The potential impact of shadow flicker is reduced with increased distance from a turbine. However, as the distance from the wind turbines increases, the shadow flicker effect diminishes as the low-angle light bends around objects and becomes diffuse. n the calculations, the shadow flicker is calculated up to a distance of 10 times the rotor diameter from each turbine, as this distance is indicated in chapter 5.12 of the Irish planning guidelines. The area of inspection is presented in Chapter 11 – Shadow Flicker.
A distance of 820m (ten times rotor diameter), within which six shadow receptors have been positioned. These six receptors have been positioned so that the most sensitive points are represented and at which the 30 hours per annum threshold might be exceed. These are the ones closest to the turbines and it is assumed that there will be a direct line of sight between the turbines and the windows of the buildings.

As none of the receptors exceeds the threshold of 30 hours per annum set out in the Irish planning guidance directions, no mitigation is required.

The total annual duration of shadow flicker calculated for all dwellings within 2km of the proposed development is zero and is therefore in compliance with the DOEHLG, 2006/ 2008 annual and daily guidelines limits.
Additional assessment detail regarding shadow flicker assessment work is provided in Chapter 11.

3.14 Telecommunications

Consultation has been carried out with all communication and telecommunication service providers The proposed wind farm at Coor Shanavogh is not expected to significantly affect any communication or telecommunication service providers. Any levels of TV interference can be easily mitigated.

There will be no impact on telecommunications on the locality. Phones radios and televisions will operate as normal following construction of the wind farm site. The RTNL protocol has already been entered into. This effectively requires the developer to accept responsibility for remedial measures which could be required as a result of potential negative impacts of wind farms on the RTE network.

3.15 Potential Impacts of turbine Operational Noise

There will be no impact on background noise levels in the locality following construction of the wind farm site. A detailed noise survey has been carried out for the development. In most cases noise surveys for development are carried out by creating was is often referred to as a dartboard assessment. These models only take into account a few variables such as predominant wind direction expected maximum and minimum output noises. The noise survey associated with this assessment has applied the most advanced modelling software available. Input variables and constants included:

- Topography;

- Average maximum and minimum wind speeds;
- All possible wind directions;
- Noise carry associated with wind speeds;
- Background wind noise;
- Other background noises;
- Worst case scenario's.

The noise assessment applied a worst case scenario for each private house proximal to the wind farm. Models were run for each individual turbine locations and private house locations.

In addition, a 2007 Salford University survey showed that the occurrence of complaints about wind turbine noise is very low (Renewable UK, 2010).
In 2007, as part of research into wind farm noise commissioned by the government, the University of Salford surveyed all local authorities in the UK where wind farms were in operation. Out of all UK wind farms (133 at the time of the report, some operating for up to 16 years), only one wind farm
has ever been found guilty of causing a nuisance to the nearest residents – and the issue has since been resolved through management of the turbine control system. In comparison, the report highlights that in one year alone (and for only 69% of local authorities in England and Wales, not the entirety of the UK), there were 39,508 cases of noise nuisance not related to wind farm noise" (Renewable UK, 2010).

3.16 Potential Impacts of Construction Phase

Overall the construction phase will provide a positive impact on the local human environment, providing jobs and secondary activity in the locality. The construction phase will not extend more than 10 months depending on weather conditions. There will be minor potential for localised dust, noise and traffic inconveniences, however all of these potential impacts have been assessed in detail individually and in combination with each other, limits of acceptable thresholds for all activities have been identified and d thresholds

will be adhered to during construction works. Monitoring programmes will ensure that there are no unacceptable discharges or emissions to the local environment during the construction phase. In addition traffic management plans will be designed and agreed with the Gardai and Clare County council. Furthermore, specific attention has been applied to the turbine delivery route and the quality of the roads associated with the turbine deliveries. Mitigation, repair work etc will be applied as required.

3.17 Potential Impacts on Electricity Generation

There will be a positive impact on electricity generation for the country.

3.18 Potential Impacts on Land-use/ Ownership

The land used for this project will remain in its current ownership. Lease agreements have been finalised along with wind farm operational benefits. Land-use will effectively remain the same (i.e. forestry and farming) following development of the wind farm. There is no impact on land-use and ownership as a result of the project. No mitigation is required.

3.19 Potential Impacts on Local Settlement

The nearest settlement to the proposed facility is the village of Connolly. The general area does not have any significant settlements or clusters of population. Other settlements or clusters in the greater area (15 -20 km) include Mullagh, Creeagh, Kilmihal, Quilty, Miltown Malbay, Inagh and Ennis, The proposed facility will provide significant employment opportunities, both directly on the site, and indirectly for spin-off and service providers.

3.19.1 Potential Impacts on Property Values

Recent UK studies show no clear relationship between the proximity of wind farms and property prices. A 2007 survey by the Royal Institute of Chartered

Surveyors on the potential impact of wind farms on house prices concluded that "proximity to a wind farm simply was not an issue." Estate agents in the case study areas analysed reported that there were generally other factors that had a more significant effect on property prices than a wind farm.

A Scottish Executive study found that those living nearest to operating wind farms are their strongest advocates, stating: "The overwhelming majority of people living within 20 km of a wind farm support an increase in the proportion of electricity generated in Scotland through the use of wind power over the coming 15 years (82%), while just 2% feel that there should be a reduction."

In the worlds most comprehensive study on the subject to date, the USA's Renewable Energy Policy Project compiled a survey of house values in the vicinity of wind turbines compared with those with no turbines in the vicinity. They examined 24,300 property transactions from 10 locations within the US over a period of six years; and concluded that there was no evidence to suggest that wind turbines sited within a five mile radius of property had a negative impact on value. In fact, property values appeared to rise above the regional average within the case study locations, suggesting that wind turbines actually had a positive effect on value (Renewable UK, 2010).

Given the well documented trends in Irish property and its relationship with national economic decline it could be argued that the most crucial indirect driver which will determine the future valuations of Irish property is the control of security of energy supply, energy supply diversification and energy cost. Unless a diversification of Irish energy reliance is achieved and energy costs are controlled or lowered then the economic climate will continue to suffer, consequently so too will property evaluations. On this basis it is clear that the provision of renewable energy to the Irish supply mix is indirectly crucial to the value of all Irish property.

3.20 Potential Impacts on Infrastructure and Utilities

All impacts on infrastructure and utilities will be positive. Roads will be upgraded and repaired along the delivery route where necessary and the wind farm will form part of the grid network upgrading works.

3.21 Potential Impacts on Waste Management

There will be no impacts on waste management as insignificant waste volumes will arise as part of the project.

3.22 Potential Impacts on National Economy

All impacts on the national economy will be positive. Business and jobs will be created during the construction phase. The wind farm will increase the energy created within the renewable sector and increase security of energy supply. The wind farm has the potential to decrease energy costs within Ireland. The wind farm and its additional MW output to the national grid increases the value of exporting inter-connecter between Ireland and the UK.

3.23 Potential Impacts on Opportunities for Future development

The wind farm contributes positively to local business and their development. The wind farm and its additional MW output to the national grid increases the value of exporting inter-connecter between Ireland and the UK.

3.24 Mitigation Measures for the Human Environment

Cross reference and in-combination (cumulative) assessment work has been carried out for all relevant assessment chapters and assessment criteria that relates to the human environment. Wherever relevant, assessment data from separate sections of this EIS is reproduced here to highlight all and any

interactions. Further assessment and mitigations measures are carried and proposed where necessary.

3.24.1 Mitigation Measures for Socio Economics

The proposed development will provide employment opportunities to the local community during the construction phase, and ongoing sustainable income for the developers and landowners involved. As these effects are positive, no mitigation measures are necessary.

3.24.2 Mitigation Measures for Energy Consumption

The development of energy production from a renewable source will aid in securing and stabilising energy supply for the long term future. This will be of benefit in meeting the demands of energy consumption. Again, as the impact is a positive one, no mitigation measures are necessary.

3.24.3 Mitigation Measures for Recreation and Amenity

It is not considered that mitigation measures are necessary with respect to recreation and amenity in the vicinity. Mitigation measures in terms of siting and turbine location have been assessed as part of the Landscape and Visual Impact assessment. The proposed development will not result in a critically adverse visual impact on the landscape, as discussed in Chapter 6 of this document.

With regard to the potential for peat slides, Chapter 7 addresses the risks associated with the proposed development and outlines the mitigation measures and peat management system to be fully implemented and monitored during the development (the full Peat Stability Report is incl;uded in an Appendix).

3.24.4 Mitigation Measures for Land Use

The areas cleared for the wind farm internal site tracks, the hard standings and turbine footprint, and the substation are not significant, at approximately 1% of the site landholding as a whole. More detailed assessment of land use is provided as part of the habitat assessment provided in Chapter 4. On decommissioning of the wind farm, turbine foundations will be covered over and allowed to re-vegetate naturally if required.

3.24.5 Mitigation Measures for Traffic and Transport

To mitigate against the impacts of traffic associated with the project, the following measures will be implemented:

The timing of turbine deliver along the N18 and R474 route will be agreed with Clare County Council and the Gardaí to ensure that the effect on the public and emergency services and public transport is minimised;

- temporary public traffic control may be required at junctions during the short duration while the turbine loads pass;

- a transport co-ordinator will be appointed to regulate all HGV movements to ensure easy access and egress at the site, as well as minimising the impact on local users;

- recommendations made by Exceptional Load Services will be carried out in advance of the turbines being delivered to site;

- a condition survey of country roads will be undertaken pre-construction and the condition of the road agreed with the local Roads Engineer to provide a benchmark against which the condition of the road can be reviewed;

- an experienced road repairs contractor will be appointed to carry out any necessary repairs to county roads upon completion of construction works, or earlier if deemed necessary by Clare County Council Roads Department, so as to ensure that access to the site is deemed passable at all times to minimise impact on local community;

- parking facilities will be provided on site for construction traffic;

- a wheel wash, located inside the entrance to the proposed site, will mitigate the effects of mud or dust on the local road network;

- the mitigation of construction noise is examined in Chapter 9 of this document;

- water spraying will be used for dust suppression as required;

- on completion of construction, the condition of the non-public tracks network will be monitored on an on-going basis, and if considered necessary, repairs will be carried out to ensure that the condition does not deteriorate below a standard that could affect the use of the site;

- all road works will be carried out in accordance with the relevant environmental legislation;

- any realignment of junctions will be agreed with the relevant landowners prior to works commencing;

On a long term basis, once the site is in operation, it is anticipated that the development will not generate any adverse impacts on traffic in the vicinity of the site.

3.24.6 Mitigation Measures for Material Assets

Finite Resources:

Wind energy is a sustainable resource. Mitigation measures are not necessary.

Electrical Resource and Infrastructure:

The proposed Coor Shanavogh wind farm will enhance energy independence and security, while contributing to the decentralisation of the energy system, reducing energy transmission losses. Mitigation measures are not necessary.

Mineral and Rock Resources:

Mitigation measures are not required in respect of mineral and rock resources outside of the site. However, the mitigation measures required for the on-site borrow pits are addressed in Chapter 7, 8 and 5.

3.24.7 Mitigation Measures for Health and Safety

Construction Health and Safety Mitigation Measures

Coor Shanavogh Wind Farm (McMahon Finn Wind Acquisitions Ltd) aims to ensure construction hazards are managed by everyone, and that plans are adequately prepared to ensure that there is an accident and incident free environment. In particular, the contractors will:

- Ensure that hazards are identified and that the risk to those involved in the project and to third parties (e.g. the public) are minimised;
- Consider mitigation against hazards and reduce risk during the design stage. Risk assessments, methods of construction and information regarding the maintenance shall be completed and submitted to the safety file;
- Ensure the life cycle of the project (including development, construction and operation of the wind farm) is assessed so that hazards are eliminated or reduced to lower the risk level for workers.

A site specific Safety and Health Plan will be prepared for the project in accordance with the Safety, Health and Welfare at Work (Construction) Regulations 2006. This document will be prepared on a preliminary basis prior to the appointment of a contractor and will be finalised by the contractor prior to commencing work on site. This document will address all safety, health and welfare issues associated with the construction phase of this project including, but not limited to, the following:

- Site access and induction training;
- General site safety;
- Excavations and earthworks;
- Compressed air;
- Transport, earthmoving and material handling machinery;
- Working at heights;
- Working with heavy, pre-fabricated loads;
- Lifting appliances;
- Protection from overhead power lines;
- Chains, ropes and lifting gear;
- Special provisions for hoists;
- Carriage of persons and securing loads;
- Protective clothing and footwear required;
- Lock-out/ tag-out procedure for safe electrical work;
- Peat management and monitoring plan;
- Measures to ensure ground stability;
- Measures to deal with emergencies.

All hazards will be identified and risks assessed. Where elimination of the risk is not feasible, appropriate mitigation and/or control measures will be established. The contractor will be obliged under the construction contract and current health and safety legislation to provide adequately for all hazards and risk associated with the construction phase of the project.

With regard to managing peat excavation and disposal and the potential for peat slides, Chapters 7 and 8 address the risks associated with the proposed development and outlines the mitigation measures and peat management system to be fully implemented and monitored during the development.

Suitable access to and egress from the proposed site will be maintained for the emergency services during the construction phase.

FÁS Safepass registration cards are required for all construction, delivery, and security staff. Construction operatives will hold a valid Construction Skills Certificate Scheme (CSCS) card where required.

The developer is required by law to ensure a competent contractor is appointed to carry out the construction works. The contractor will be responsible for the implementation of procedures outline din the Safety & Health Plan. Public safety will be addressed by restricting site access during construction. Appropriate warning signs will be posted, directing all visitors to the site manager. All settlement ponds and borrow pits will be fenced off and signposted.

Operational Health and Safety Mitigation Measures:
For security purposes, the main gate to the site will be kept locked except while maintenance and caretaking duties are carried out. Doors to the towers will also be kept locked. A harness will be provided for employees when accessing the nacelle and will connect to a central safety line running behind the ladder. This will prevent personnel from freefalling more than a few centimetres, hence reducing the potential for injury.

The control compound will be locked, except when operations and maintenance staff are in attendance.

Adequate clearance of structures from overhead lines will be provided. In this case, all on-site electrical connections are carried by underground cable.

Health Effects of Avoiding Fossil Fuel Power Production:

As the health affects of avoiding fossil fuel power production are directly neutral and indirectly positive, no mitigation effects are necessary.

3.24.8 Mitigation Measures for Shadow Flicker

The results of the shadow flicker modelling indicate that there is no potential for shadow casting from Coor Shanavogh Wind Farm, and so mitigation measures are not required.

3.24.9 Mitigation Measures for Reflected Light

The use of matt or semi-matt paint significantly reduces potential for light reflecting from the turbines. Additional mitigation measures are not required.

3.24.10 Mitigation Measures for Socio-Economics

Mitigation measures as outlined for the different facets of the project will be adequate for all social aspects of the human environment, e.g. traffic management, noise limits, dust limits an/ or turbine delivery etc. In terms of socio –economics there will be a benefit to the local and national economies, especially during the construction phase.

3.24.11 Mitigation measures for Energy Consumption

Mitigation for energy consumption during the construction phase will be applied as necessary. Cost efficient project delivery will ensure that fuels etc are not wasted during project construction.

3.24.12 Mitigation measures for Recreation and Amenity

There will be no significant impact on recreation or amenity for the local area or the regional area of County Clare.

3.24.13 Mitigation Measures for land use

There will be no significant impact on land-use for the local area or the regional area of County Clare. Land-use will remain as agricultural and/ or forestry orientated. The footprint of the wind farm will only permanently remove a small area from these land-uses.

3.25 Conclusions on Human Environment

In terms of socio-economics, the development is expected to have a positive impact, especially during the construction phase.

The proposed development will enhance energy independence and security to a degree. It will exploit a sustainable resource while not diminishing material assets in the area.

The wind farm is not expected to have any significant or adverse effect on tourism in the area or result in a critically adverse landscape impact. The proposed development does not lie within or adjacent to any tourist routes or significant sites of interest.

There are no negative impacts on surrounding land use. The conversion of site land use to turbines and infrastructure is limited to approximately 2% of the total landholding.

There will be a temporary increase in local traffic during the construction phase of the project. The construction phase traffic will be managed and planned for in accordance will all regulations and requests of the Council. After construction is complete, the increase in traffic will be negligible.

The movement of oversized loads will require carful co-ordination with the Gardaí and the County Council. There will be no long term effects on the level of service experienced by road-users or the capacity of the road network in the area.

The health and safety implications of the proposed development from the design phase through to construction and operation of the wind farm have been taken into account. The construction phase is deemed the most hazardous stage of the proposed development. This will be addressed by the developer who will identify a site manager with responsibility for co-ordinating good environmental and health and safety practices during construction.

A 2007 survey by the Royal Institute of Chartered Surveyors on the potential impact of wind farms on house prices concluded that "proximity to a wind farm simply was not an issue." the worlds most comprehensive study on the subject to date, the USA's Renewable Energy Policy Project compiled a survey of house values in the vicinity of wind turbines compared with those with no turbines in the vicinity. They examined 24,300 property transactions from 10 locations within the US over a period of six years; and concluded that there was no evidence to suggest that wind turbines sited within a five mile radius of property had a negative impact on value. In fact, property values appeared to rise above the regional average within the case study locations, suggesting that wind turbines actually had a positive effect on value. Given the well documented trends in Irish property and its relationship with national economic decline it could be argued that the most crucial indirect driver which will determine the future valuations of Irish property is the control of security of energy supply, energy supply diversification and energy cost. Unless a diversification of Irish energy reliance is achieved and energy costs are controlled or lowered then the economic climate will continue to suffer, consequently so too will property evaluations. On this basis it is clear that the provision of renewable energy to the Irish supply mix is indirectly crucial to the value of all Irish property.

3.26 Cumulative and In-Combination Impacts

The cumulative/ in-combination impacts on the human environment are positive.

3.27 Residual Impact

The residual impact on the human environment is positive.

3.28 Summary

Due to impacts not being significant, no significant mitigation measures are required; planning will be implemented where necessary to avoid traffic or other problems. Operational measures will ensure that access to electrical plant is restricted to authorised persons who will operate under site specific safety rules established by the owner and operator. This will ensure that there is no danger to people from the development.

References

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4 HABITAT, FLORA AND FAUNA

4.1 Introduction

An ecological assessment of the proposed wind farm site (including the substation and borrow pit) at Coor, Shanavogh and Killernan, Mullagh, Co. Clare was carried out by Openfield Ecological Services during June and July 2010. An Article 6 Screening Assessment was also carried out by Openfield during June and July 2010. The study evaluated the existing environment in terms of habitats and flora and the wind farm layout as proposed in 2010.

The proposed wind farm layout has since been significantly scaled back and a new layout has been proposed, nevertheless works carried out by Openfield are still relevant and useful as part of the now revised Flora and Fauna Assessment.

This chapter reviews the findings of the previous ecological assessments and investigates any significant effects of the proposed development on existing flora and fauna. The new turbine layout is assessed within this Flora and Fauna Chapter. Avifauna is dealt with in a separately in Chapter 5.

4.1.1 Statement of Authority

Mr. Williams completed his B.Sc. in Biological Sciences, National University of Ireland Cork, specialising in ecology. Following his degree he worked as a biologist for three years (1997-2000). Mr. Williams is a full member of the Institute of Ecology and Environmental Management (IEEM). He is also a Chartered Environmentalist and a Chartered Biologist.

Since 2000 he has worked as a professional ecologist and has completed numerous ecological impact assessments/surveys on projects throughout Ireland. Mr. William's survey work has taken place, hand in hand, with the recording of habitat data at proposed development locations. Mr. Williams is

principal ecologist with INIS Environmental Services and currently project manager for all projects in the Republic of Ireland and Northern Ireland.

Mr. Williams has worked assessing bats at proposed development sites at numerous locations throughout Ireland and has previously held a license from the National Parks and Wildlife Service to monitor lesser horseshoe bats at bat houses on the Ennis Bypass project. He has completed all relevant Bat Conservation Trust training programmes relating to the surveying of buildings and more importantly the planning and preparation of bat surveys.

Mr. Keith Neary, B.Sc. Env. Sc. (Hons), Dip, FETAC, AIEEM, completed his B.Sc. in Environmental Sciences, National University of Ireland Cork; he was awarded a first class honors degree specialising in applied ecological sciences. Mr. Neary has worked assessing bats and mammals at proposed development sites at numerous locations throughout Ireland and has attended several Bat Conservation Ireland survey training courses. He was also involved in operations to monitor lesser horseshoe bats at bat houses on the Ennis Bypass project. Mr. Neary is also capable of operating the advanced bat identification device i.e. the Anabat bat identification module. Mr. Neary is a member of Bat Conservation Ireland (BCI) and is currently involved in several lesser horseshoe and Daubenton's bat surveys on behalf of the BCI. He has also worked with Roscommon County Council Environment Section dealing with issues such as ecological assessment of proposed development sites, waste water discharge licenses, waste management permits, groundwater protection and groundwater source contamination identification and remediation. Keith Neary has spent the last three years working on various environmental projects including numerous bat and mammal surveys with INIS Environmental Services both in the Republic and in Northern Ireland.

Stephanie Murphy B.Sc., M.Sc., MIEEM is a qualified Ecologist with a degree in Biological Sciences, National University of Ireland, Cork, received in 2002 and a Masters in Biodiversity and Conservation received from Leeds University in 2004. Stephanie has been involved in ecological surveys in Ireland since 2007, particularly in relation to the wind energy industry. She has

had work published in *Irish Birds* and *Irish Naturalists' Journal*. Stephanie is senior ecologist with INIS Environmental Consultants Ltd.

Christopher Cullen AIEEM is a qualified ecologist (Dip. In Field Ecology) and a graduate of UCC. In recent years he has worked on numerous bird surveys, both voluntary and non-voluntary. He has also been employed by BirdWatch Ireland as an avian surveyor, and completed the national red grouse survey. He has worked for UCC as an avian researcher on hen harriers, and as an avian surveyor for the Environmental Research Institute. He has had work published in peer-reviewed journals such as Irish Birds and the Irish Naturalists Journal. He has also co-authored work in Irish Birds and Ringing and Migration. Mr. Cullen is the Project Manager for Bird Survey Ireland, a wholly owned subsidiary of INIS Environmental Consultants Ltd.

4.1.2 Assessment History

An initial Environmental Impact Assessment was carried out for Coor Shanavogh Wind Farm in July 2010 for 12 proposed turbines (Pl. Ref 10720). This application was deemed incomplete. This application was withdrawn and a new project layout was designed. Six turbines have since been dropped from the proposed development and the final proposal is for a 6 turbine application. This Flora and Fauna chapter reviews the previous ecological work by Openfield and assesses the new and presently proposed 6 turbine application and site layout.

In July 2010 Openfield Ecological Services carried out an ecological assessment of the Coor Shanavogh wind farm site, which included an assessment of habitats, flora and fauna in the existing environment. At the same time Openfield also prepared an Appropriate Assessment Screening Report for the initially proposed 12 turbine wind farm. This assessment found that no significant effects on either the Carrowmore Point to Spanish Point and Islands SAC or the Mid-Clare coast SPA were likely to arise as a result of the proposed development.

This Habitat, Flora and Fauna assessment chapter was prepared by INIS Environmental Consultants Ltd in response to the new wind farm layout comprising 6 turbines. Cognisance has been taken of the previous ecological assessments carried out by Openfield Ecological Services.

4.1.3 General Goals of the Assessment

The purpose of the study was:

- to undertake a desktop study of available ecological data for the site and area, including a review of designated sites within 10km of the site;
- to review the findings of the Openfield ecological field surveys of the site and surrounding land;
- to evaluate the ecological significance of the site in relation the existing flora and fauna present on the site and surrounding lands;
- to assess the potential impact(s) of the proposed wind farm development on the ecology of the site and surrounding areas;
- to recommend mitigation measures to reduce the potential negative impact(s) of the proposed wind farm development on the ecology of the site and surrounding land;
- to reassess the Article 6 Screening Assessment for the new turbine locations and site infrastructural layout.

The following chapter presents the methodology and results of the surveys carried out by Openfield Ecological Services, an assessment of the potential impact(s) of the proposed development and any mitigating measures required to reduce potential negative impacts.

4.1.4 Consultation

Comprehensive consultation was undertaken as part of the initial wind farm application (Pl. Ref 10720) in July 2010. The primary stakeholder on this site in relation to ecology was judged to be the National Parks and Wildlife Service (NPWS). A letter was sent to the Development Applications Unit (DAU) of the

Department of Environment, Heritage and Local Government dated April 7th 2010 and an acknowledgement was received. In written responses dated April 28th and May 6th 2010 observations from the DAU were detailed with regard to archaeological and architectural heritage however no comments were made with regard to the natural heritage.

An email was sent to Dr Julie Fossitt, Divisional Ecologist, Western Division, on June 2nd 2010 to confirm whether NPWS had further comments to make regarding this development. In response a detailed letter was received dated June 3rd 2010. In summary the main points are:

- An EU Habitats Directive appropriate assessment will be required for this proposal as well as an assessment of any potential impacts to the nearby Slievecallan Mountain Natural Heritage Area (NHA, site code: 2397) and Cragnashinguan Bogs NHA (site code: 1021).
- A detailed habitat map with the footprint of all parts of the development overlain should be presented.
- Impacts to fauna, including, but not limited to, birds and mammals should be included.
- Bird surveys will be required to determine bird usage of the wind farm and in particular the potential impact to Hen Harrier, an Annex I species known to be resident in the area, must be fully quantified. This assessment must take into account not only impacts from this development but also the cumulative impacts of existing wind farms upon the west Clare uplands population of this bird. This should be based on a '25 year landscape model' of forest stages and habitat availability for Hen Harrier within 5km of the wind farm site over the lifetime of the wind farm.

The information provided in this Chapter and in Chapter 5, Avifauna, has taken cognisance of all of the points raised above.

Details of the project were also sent to:

- Ms Congella Maguire, Clare County Council Heritage Officer;
- Mr Mike Fitzsimmons, Environment Officer with the Shannon Regional Fisheries Board;
- Ms Kathleen Connelly, local resident.

Responses were not received from this latter group.

4.1.5 Existing Legislation

4.1.5.1 National and European Conservation Policy

4.1.5.1.1 The Birds Directive

Under Article 4 of the Birds Directive (1979) it is required that in Special Protection Areas (SPAs) developers provide empirical evidence to show that any aspect of the proposed development will not adversely affect the qualifying feature of the SPA. The Mountain Waters development lays approximately 2.5km outside the Slieve Beagh SPA but could still potentially affect hen harriers within the SPA.

With regard to habitats outside SPAs, the State is required to strive to 'avoid pollution or deterioration of habitats' of all wild birds, including species listed in Annex I of the Birds Directive (Annex I refers to a list of species that require strict protection due to their populations declining seriously throughout their respective ranges).

4.1.5.1.2 The Habitats Directive

The Habitats Directive 92/43/EEC was transposed into national law through the European Communities (Natural Habitats) Regulations 1997 (S.I. 94/97). These regulations require local governments to ensure that an appropriate assessment of the impacts on Special Areas of Conservation (SACs) of any proposed development is undertaken, with regard to the SACs conservation

objectives. This applies to all development proposals, irrespective of their location, or likely impact on these sites.

4.1.5.1.3 The Wildlife Act, 1976

The Third Schedule to the Wildlife Act 1976, was amended on the 6th December 1985, when the minister, in compliance with the European Communities Council Directive of 2nd April, 1979 (No. 79/409/EEC), made regulations entitled 'The European Communities (Wildlife Act, 1976) (Amendment) Regulations, 1985 (No. 397 of 1985)', removing the remaining twelve unprotected species from that schedule. The Wildlife Act 1976 is the principal national legislation providing for the protection of wildlife and the control of activities, which may adversely affect wildlife. The Act came into operation on 1st June 1977. The aims of the Act are to provide for the protection and conservation of wild fauna and flora, to conserve a representative sample of important ecosystems, to provide for the development and protection of game resources and to regulate their exploitation, and to provide the services necessary to accomplish such aims. As a consequence of the Wildlife Act all wild birds are now protected throughout the state and careful assessment of their habitats must take place before any development is allowed.

4.1.5.1.4 The Wildlife (Amendment) Act, 2000

This Act broadened the scope of the Wildlife Act to include most species, including the majority of fish and aquatic invertebrate species, which were excluded from the 1976 Act. It also strengthened the provisions relating to the cutting of hedgerows during the critical bird-nesting period. It strengthened the protective regime for Special Areas of Conservation (SACs) by removing any doubt that protection will in all cases apply from the time of notification of proposed sites. The act also gave specific statutory recognition to the Minister's responsibilities in regard to promoting the conservation of biological diversity, in light of Ireland's commitment to the UN Convention on Biological Diversity.

Natural Heritage Areas can be designated for species, habitats or geological features. Many have no statutory protection under law (hence the prefix 'proposed' in many of their titles). Nevertheless there is a presumption in favour of their full protection and they are considered to be of national importance (NRA, 2006).

The Ramsar convention for the protection of wetlands identifies sites of importance. In most cases Ramsar sites are coincident with SPAs. There are no Ramsar sites within 15km of the proposed development.

4.1.5.2 Bird Watch Ireland Policy Statement on Wind Farms

BirdWatch Ireland is the largest conservation non-governmental organisation in Ireland (NGO). Its policy document 02-05 (BirdWatch Ireland 2002) has 10 points, the following being relevant to this development;

- There should be a presumption against sitting wind farms in or adjacent to sensitive ecological sites, including IBAs, SPAs, SACs and NHAs.
- Baseline data and post-construction monitoring needs to be established in order to determine future impacts and inform EIA procedures.
- Incentives should be provided for wind farm developments in areas other than the coast and uplands where environmental impacts are likely to be less. Such areas include intensive farmland and disused industrial areas.
- A full Strategic Environmental Assessment (SEA) should be undertaken by the government for the wind energy programme in Ireland identifying areas important for nature conservation where development should be avoided.
- A SEA should include indicative mapping of bird populations, their habitats, flyways and mitigation routes in order to provide a structure for decision making.

This policy broadly mirrors a more recent document from BirdLife International *Position Statement of Wind Farms* that was commissioned by the Council of Europe (BirdLife International 2005).

4.1.5.3 Department of Environment, Heritage and Local Government Planning Guidelines for Wind Development (DoEHLG)

These guidelines state that "the designation of an area for protection of natural or built heritage or as an amenity area does not automatically preclude wind energy development. However, consideration of any wind energy development in or near these areas must be subject to Ireland's obligations under the Habitats Directive (92/43/EEC), the EU (Birds) Directive (97/409/EEC) and the Environmental Impact Assessment Directive. Planning authorities must ensure that a proposal which is likely to have a significant effect on an SAC or other designated area, is authorised only to the extent that the planning authority is satisfied will not adversely affect the integrity of the area. If necessary, they can seek changes to the development proposed or attach appropriate planning conditions."

4.1.6 Survey Methodology

4.1.6.1 Desk-based Study

In addition to the existing Openfield Flora, Fauna and Habitat assessment and the Openfield Article 6 Appropriate Assessment/ Natura Impact Assessment reports of the site, information regarding the site also exists in a number of forms, for example the NPWS database and published reports/ literature. Data on water quality is available from the EPA. The following sources were accessed as part of the desk-based study;

- NPWS database
- EPA
- Birdwatch Ireland Monitoring sites

4.1.6.2 Field Survey

Openfield carried out several filed visits during the compilation of the Openfield Flora, Fauna and Habitat Assessment and Appropriate Assessment (see Appendix 4.4 at the end of this chapter). INIS Environmental Consultants Ltd also carried out additional field surveys during October, November 2010 and February 2011. Materials used by INIS to complete the field study work included:

- Garmin GPS 440 Oregon with OSI discovery series maps;
- Garmin GPS 301;
- Garmin GPS NuVi (actively map's all traversed routes and plots to map);
- Petterson D100 heterodyne detector;
- Batbox IIID;
- Batbox Duet;
- Anabat CF detector and Belkin data-logger;
- Analook software for the Anabat CF;
- Batbox MP3 recorder and playback device;
- Moonlight Night Vision NV-100 night scope;
- Timex expedition temperature gauge and compass;
- Olympus SP-500UZ, x10 zoom Digital Camera & Adobe Photo deluxe 7.0.1.

The field survey set out to determine what habitats and species of importance were present on the site and this data is presented in Figure 4.1 (Appendix 3, Volume III) as a Habitat Map. Incidental sightings of animals, as well as tracks, burrows and droppings were recorded.

Site visits were carried out by Openfield on May 20th and 21st 2010 in good weather conditions and again on July 15th, 16th and 28th 2010 in less than favourable conditions. The site was surveyed in accordance with the Heritage Council's draft Habitat Survey Guidelines (Heritage Council, 2002) and the 'Guidelines for Baseline Ecological Assessment' from the Institute of

Environmental Assessment (IEA, 1995). Habitats were identified in accordance with Fossit's 'Guide to Habitats in Ireland' (Fossit, 2000). A species list for each habitat was compiled and target notes were made. Where relevant, target notes and location information were taken with a *Garmin GPS 60*. Data were then uploaded to the *ArcView 9.2* GIS Software suite.

A full floral species list was compiled for each habitat and this is provided in Appendix 4.1 at the end of this Chapter. The nomenclature for this list, and throughout this report, is referenced to the *Census Catalogue of Flora of Ireland* (Scannel & Synnott, 1987) for English names and *An Irish Flora* (Web et al., 1996) for Latin names. Bryophytes (the so-called 'lower plants' consisting of mosses and liverworts) are referenced to *A Checklist and Census Catalogue of British and Irish Bryophytes* (Hill et al., 2008) and *Mosses and Liverworts of Britain and Ireland* (Atherton et al., eds., 2010) (English names).

To assist in assessing the quality and composition of each habitat the DAFOR scale will be used (D = Dominant; A = Abundnat; F = Frequent; O = Occasional; and R = Rare). While this is subjective it is nevertheless useful as a broad descriptor.

Target notes were taken with the aid of a Garmin GPS60 and digital photographs were taken using a Nikon D3000 SLR camera.

The monitoring of breeding and wintering birds is described in detail in Chapter 5, Avifauna.

4.1.6.3 Bat Survey

A dedicated bat survey was carried out by INIS Environmental Consultants Ltd in November 2010. Methodology employed included the application of field survey techniques as outlined in the below listed literature:

- **Bat Survey Guidelines: Traditional Farm Buildings Scheme** (2008) Tina Aughney, Conor Kelleher & Donna Mullen. The Heritage Council, Áras na hOidhreachta, Church Lane, Kilkenny.
- **NRA Guidelines for treatment of Bats During Construction of National Road Schemes** (2005) NPWS, Natura, Tina Aughney.
- **A Conservation Plan for Irish Vesper Bats** (2006) Irish Wildlife Manuals, no. 20 McAney, K. NPWS, DoEHLG, Dublin.
- **Irish Bat Monitoring Programme** (2006) Tina Aughney, Steve Langton, Niamh Roche, Jon Russ and Phillip Briggs.
- **Identification of Bats in Flight** (1990) by Ingemar Ahlén. Swedish Society for Conservation of Nature, Stockholm, Sweden.
- **The World of Bats** (1996) by Michel Barataud. Sitelle, Alpha Copie, 38000 Grenoble, France.
- **Bat Detector Manual** (1994) by Colin Catto. The Bat Conservation Trust, 15 Cloisters House, 8 Battersea Park Road, London SW8 4BG, England.
- **Conservation status assessment for Species: S1303 - *Rhinolophus hipposideros* – Lesser horseshoe bat.** (2006) Second Report by the United Kingdom under Article 17 on the implementation of the Directive from January 2001 to December 2006.
- **Animal tracks and signs.** (2007) Preben Bang and Preben Dahlstrom. Oxford Press.
- **How to find and identify mammals** (1997) by Gillie Sargent and Pat Morris. ISBN 0-906-282-34-9. The Mammal Society, 15 Cloisters House, 8 Battersea Park Road, London SW8 4BG, England.
- **Mammals of Britain and Europe** (1993) by David Macdonald & Priscilla Barrett. Collins Field Guide ISBN 0-00-219779-0. HarperCollins Publishers, 77-85 Fulham Palace Road, Hammersmith, London W6 8JB, England.
- **Observing British and European Mammals** (1989) by Christian Bouchardy and François Moutou. ISBN 0-565-01095-6. British Museum (Natural History), Cromwell Road, London SW7 5 BD.

The most modern technology available was used to assess bats at the site and immediate surrounding areas. The Anabat CF has been launched by an Australian company and heralds a system that is extremely sensitive and accurate for identifying any different species present. However, it is currently extremely difficult to separate out the *Myotis* group of bats using any of the bat detector types (time expansion and heterodyne) currently available. Field notes and observer experience used in conjunction with the Anabat graphs will help identify specific *Myotis* species.

The Anabat CF incorporates the Anabat II detector used in conjunction with the CF Storage ZCAIM and makes a powerful remote recording system for bats. Timer facilities are incorporated into the ZCAIM so it can be programmed to switch on and off at selected times. The ZCAIM controls the power to the detector. Because of this and the systems use of compact flash memory cards the system can be left remotely in the field for a week or more without changing batteries or CF cards.

The Analook software for programming the ZCAIM, reading the memory card and extracting AnaBat files will now work on computers using any version of Windows. The software is supplied with the system. A CF memory card and CF reader/writer are required.

Various websites were used as information sources. Websites used included:

- **University of Bristol:**
  http://www.bio.bris.ac.uk/research/bats/britishbats/
- **Bat Conservation Ireland:**
  http://www.batconservationireland.org/index.php

Evidence of bats was searched for and all information on all potential roosts was recorded according to roost identification guidelines 'Bat Survey Guidelines: Traditional Farm Buildings Scheme', Aughney, T., Kelleher, C. & Mullen, D. (2008).

Two days and two nights were applied to field surveys. These survey bouts were carried out in November 2010, and as such survey conditions were not optimal. However, it should be noted that survey by an experienced ecologist outside the optimal survey season still allows for the assessment of the suitability of the locality for specific bat species via the presence/ absence of suitable feeding and roosting habitat. The initial reconnaissance field survey visit was completed over one full day for site investigations, site familiarization, and potential roost investigations/ transect inspections. All OS maps, site layout maps and aerial photographs were used to guide and aid this preliminary investigation and further field survey investigations. During survey investigations one ecologist worked using the most modern bat detection and recording equipment available. An Anabat was left stationary for remote recording on each night at different locations that showed potential for bat activity. The surveys where carried out according to all relevant bat survey guidelines identified in the above guideline literature. The aim of the field survey was to:

- Carry out day investigations to ensure any transects proposed to be walked and roost/ potential roosts are still accessible prior to night walks;
- Carry out day investigations to check for evidence of bats at roosts/ potential roosts;
- Identify further suitable bat habitat during daylight hours. Transects used cover all habitat types on site and within the zone of interaction. It was also decided that most transects should start at a potential roost and end at or pass by a turbine location;
- Inspect and record potential roosts during night time hours;
- Carry out dawn bat surveys at identified bat roosts;
- Carry out emergence bat surveys at identified bat roosts;
- Carry out Daubenton's bat pass surveys at streams/ rivers on site;
- Identify the range of bat species present on site and proximal to the site;

- Develop a cursory approximate of bat populations and bat species diversity on site.

4.1.7 Constraints

It is important to note that a baseline survey does not attempt to catalogue all the species that are either present on the site or that may use the site for essential resources (foraging, roosting etc.). Whole groups of species such as invertebrates may therefore go unrecorded. However, this need not be an obstacle to a full ecological assessment. A baseline survey uses a group of indicator species, vascular plants, to determine the extent and conservation status of individual land parcels. It is therefore not necessary to identify species of every taxonomic group. Target notes are taken where important features are noted during the survey and where the presence of a protected species is revealed, further studies may then be required.

The months of May and July lie within the optimal season for general habitat survey. While May is optimal for breeding bird survey July is outside this period (NRA, 2006). Therefore the timing and weather conditions were suboptimal for breeding birds during the second phase of field work that covered lands to the south. It is therefore considered that breeding birds are under-recorded for this area.

Large areas of coniferous forestry are impenetrable and so were identified from accessible points around the periphery. In terms of floral composition this does not present a problem since plantation forests are very low in biodiversity. However it may be that drainage ditches are running though these forests and so it has not been possible to map these areas.

4.2 The Existing Environment

4.2.1 Designated Sites

The site is not immediately adjacent to or within, either wholly or partially, any areas designated for nature conservation including SAC, SPA, NHA, pNHA,

National Nature Reserve, National Park, UNESCO Biosphere Reserve or RAMSAR Site.

There are two NHAs within a 5km radius of the proposed Coor Shanavogh Wind Farm:

- Slievecallan Mountain Bog NHA (site code 2397) is an area of upland blanket bog with important plant assemblages and breeding pairs of golden plover *Pluvialis apricaria* and hen harrier *Circus cyaneus.* Both of these birds are listed on Annex I of the EU Birds Directive and are listed as Red and Amber conservation concern respectively (Lynas et al., 2007).

- Cragnashingaun Bog NHA (site code 2400) is of conservation value as it is a good example of both upland and lowland blanket bog in which both hen harrier and red grouse *Lagopus lagopus hibernicus* are recorded (see Appendix 4.2 at the end of this Chapter for site synopsis).

The Mid-Clare Coast is the nearest SPA (site code 4182). It encompasses a coastal area from Spanish Point south to Doonbeg and at its nearest point is 6km from the wind farm site (see Figure 4.1). It is important for a range of wetland and wading birds that over-winter here. The largely coincindent Carrowmore Point to Spanish Point and Islands SAC (site code 1021) is designated for a number of coastal habitats that are listed under Annex I of the Habitats Directive (see Appendix 4.2 at the end of this Chapter I for a site synopsis of each designated area).

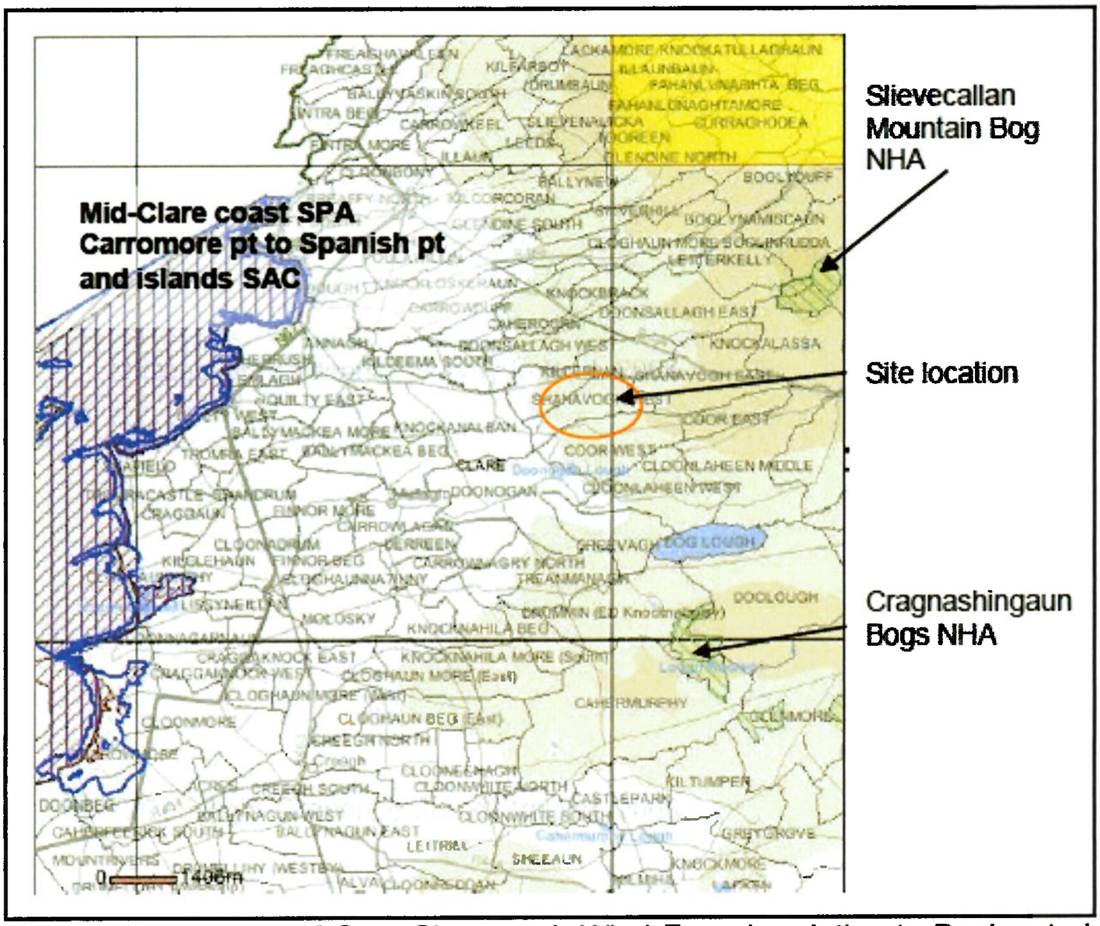

Figure 4.1 Location of Coor Shanavogh Wind Farm in relation to Designated Conservation Areas (Source www.npws.ie).

4.2.2 The Proposed Development

The proposed development at Coor Shanavogh consists of six turbines and associated hardstands, a substation, three proposed borrow pits, a temporary site compound, underground cabling and access roads. The project landholding comprises a total area of 90.7Ha. Of this, the proposed temporary and permanent wind farm infrastructure will comprise just 7.3Ha, or 8% of the total landholding. The wind farm site layout is presented in Figure 3, Appendix 1 of Volume III of this EIS.

4.2.2.1 Turbines

Four of the turbines (T3-T6) are to be located within commercial forestry of mixed age classes. Turbine 1 is located in an area of Improved Agricultural Grassland and Turbine 2 is in Wet Grassland. Each of these three habitats

have been modified, are widespread in Ireland and are considered of low ecological value. Please see Section 4.2.3 for further details on existing habitats.

4.2.2.2 Roads

A total of 12,000m^2 of new roads will be required to access the six turbines, with approximately 73m^2 of existing roads to be upgraded. The majority of new roads will be located within conifer plantation (63%), with the remainder in wet grassland (22%) and improved agricultural grassland (15%). The access road will require the removal of two small sections of earth banks and will cross the Coor Shanavogh Stream at one location to the southeast of the site. This first order stream is less than 1.5m in width and will be culverted in line with best practice recommendations and in conslutation with Inland Fisheries Ireland. The stream is described further in Section 4.2.3, specific assessment of mitigation measures to protect the stream are also provided by Hydro Environmental Services in Chapter 8 Water.

There is an option for an additional section of access road, from T5 to the northern entrance and Shanavogh. This will not be constructed unless required by the planning authorities. If constructed, this road will mostly require upgrading of an existing farm track and a section of new road within improved agricultural grassland.

4.2.2.3 Borrow Pits

It is proposed to excavate rock for the construction purposes at three locations within the site boundary. Borrow Pit 1 will comprise an area of 3,200m^2 and is partially located within an existing borrow pit on site and in wet grassland habitat. Borrow Pit 2 comprises 1000m^2 and is located in an area of soil or bare ground (previously opened for agricultural purposes) near Turbine 5. Borrow Pit 3 is just 900m^2 located in improved agricultural grassland near T1. Assessment of the borrow pit areas has also be considered under the avifauna section. These borrow pits will be reinstated post construction. According to

proposed drawings the reinstatement designs the borrow pits will tie in with existing topography.

4.2.3 Flora in the Existing Environment

The project landholding covers an area of 90.7ha (224.1 acres) and is broadly composed of improved agricultural grassland, wet grassland and conifer plantation. The elevation of the land ranges from approximately 90m – 160m OD (Malin Head) and the bulk of the site is south and west facing. A small 1st order stream traverses the site along a part of its southern landholding boundary and does not have a name on OSI maps. It remains relatively small and enters the sea near Quilty. This stream is called the Coor Shanavogh stream for the purposes of this assessment report (the same stream is referred to as S1 in the Water Assessment Chapter 7. The Caheraran River runs along the north of the site and is located a least 300m from any proposed new development works.

No rare or protected species of plant was recorded (Flora Protection Order; Curtis & McGough, 1988). A full flora species list for each habitat surveyed is provided in Appendix 4.1 of this chapter. All habitats identified and assessed within the site area are considered locally abundant and are commonly found throughout County Clare. Following site assessments the following habitats, which are classified in accordance with "*A Guide to Habitat Types in Ireland*" (Fossit, 2000), were found to exist within the proposed wind farm land holding areas:

- Improved Agricultural Grassland (GA1)
- Wet Grassland (GS4)
- Coniferous Plantation (WD4)
- Wet Heath (HH3)
- Eroding /Upland River (FW1)
- Drainage Ditch (FW4)
- Spoil and Bare Ground (ED2)
- Hedgerow (WL1)

- Earth Banks (BL2) and Stone Walls (BL2)

The Habitat Map, included in Appendix 3 of Volume III of this EIS, it outlines habitats present within the footprint of the proposed development site. The habitat types within each turbine location, substation, site compound and borrow pit site are described below.

4.2.3.1 Improved Agricultural Grassland – GA1

This type of grassland is an intensively managed habitat and is grazed by cattle. Due to land management practices they are species poor and are dominated by a few resilient grass species; e.g. marsh foxtail *Alopecurus geniculatus*, Timothy *Phleum pratense* and perennial rye-grass *Lolium perenne*. Some areas are quite wet and these are characterised by the nutrient tolerant soft rush *Juncus effusus* and one small patch of yellow iris *Iris pseudacorus*. While a small number of broad-leaved herbs are present and widespread, including cuckoo flower *Cardamine pratensis*, meadow buttercup *Ranunculus acris* and red clover *Trifolium pratense*.

In small areas of fields where it is relatively steep and nutrients have been leached there are some additional species such as a pyramidal orchid *Anacamptis pyramidalis*, ragged robin *Lychnis flos-cuculi* and field wood-rush *Luzula campestris,* but these occur infrequently.

Turbine 1 is located within Improved Agricultural Grassland, along with approximately 1,797m^2 of proposed new access road and one small borrow pit (Borrow Pit 3) comprising 900m^2. A total of approximately 4,421m^2, or 1.1 acre, of Improved Agricultural Grassland will be lost during the construction of the development. Of this, 0.8 acres will be premenant, for the lifetime of the windfarm. This habitat is the most widespread habitat type in Ireland, highly modified and is of low biodiversity and conservation value.

4.2.3.2 Wet Grassland – GS4

In the study area there are a number of fields, and parts of fields, that are characterised as wet grassland. These are wet areas in which there have been efforts at reclamation but nevertheless remain wet. They are generally dominated by rushes and are species poor. Lack of grazing has seen colonisation by bramble *Rubus fruticosus*. To the north there is some change is species composition as it grades into wet heath habitat. This is evident by the presence of brown and glaucous sedge *Carex disticha* and *C. flacca* respectively as well as lousewort *Pedicularis sylvatica*, common mildwort *Polygala vulgaris* and tormentil *Potentila erecta*. This area is much altered by human disturbance and hence the mix of habitats. Bog mosses *Sphagnum sp.,* marsh violet *Viola palustris* and hare's-tail cottongrass *Eriophorum vaginatum* are occasional and increase in frequency as the depth of peat increases. This community is also present on a sloping area just south of the Coor Shanavogh stream (location of proposed substation, site compound and entrance track). Despite this rushes continue to dominate this area.

Turbine 2, the substation, Borrow Pit 1 comprising 3200m^2, the temporary site compound and approximately 2708m^2 of access road are located within this Wet Grassland habitat. A total of approximately 11007 m^2 or 2.7 acres of wet grassland will be lost as a result of the proposed development. Of this, over 1 acre will be temporary loss only as the borrow pit and site compound will be reinstated post construction. Due to the species-poor nature of this habitat and its highly altered state it is considered of low biodiversity value.

4.2.3.4 Conifer Plantation – WD4

This woodland type consists of exotic species of pine *Picea sp.* that are planted in close ranks for timber production. Broad-leaved species are planted at the margins of the plantation (rowan *Sorbus aucuparia* and alder *Alnus glutinosa*) to reduce the visual impact; however species diversity in the forest is very low. For this reason it is a habitat of low biodiversity value. The majority of the proposed development is located within Conifer Plantation, including Turbines 3, 4, 5 and 6 and approximately 7806m^2 of access road. Turbine 6 is

located at the edge of the conifer plantation to the south of the site where the habitat grades between wet grassland and wet heath just north of the Coor Shanavogh stream. Approximately 11.56 acres (infrastructural features and turbulence felling) of conifer plantation may be lost to the footprint of the development. This will require clearfelling under licence following grant of planning.

4.2.3.5 Wet Heath – HH3

Wet heath is a habitat characterised by shallow peat depths (30-80cm) (NPWS 2008). It is widespread in Ireland but is associated with the Annex I habitat North Atlantic Wet Heaths with *Erica tetralix* (code: 4010). The NPWS have assessed the status of this habitat as 'bad' and have blamed overstocking, reclamation afforestation and burning as contributory factors.

Within the study area it can be seen that much of the land that is now conifer plantation was peatlands and likely to have been wet heath or blanket bog. The remaining areas here are small amounting to only 1ha in extent. They have been drained and turf has been extracted from them, leaving them in a highly degraded state. There is evidence of tree stumps and these may be of ancient origin (likely to be Scots Pine *Pinus sylvestris*).

Purple moor-grass *Molinea caerulea* dominates while Hare's-tail cottongrass, tormentil, bog mosses, lichens *Cladonia sp.* and Coommon haircap *Polytrichum commune* are occasional. There is frequenty coverage of heather, mostly Ling *Calluna vulgaris* but also Bell heather *Erica cinerea.*

Despite its poor condition wet heath habitat is of high local biodiversity value because of its listing on Annex I of the Habitats Directive. Turbine 6 is located at the edge of the conifer plantation to the south of the site where the habitat grades between wet grassland and wet heath just north of the Coor Shanavogh stream. This is a very small patch of wet heath, less than 0.5 acre. Approximately 25% of the turbine hard standing is likely to encroach on this

area, no more than 400m^2. The total habitat loss as a result will be extremely minimal, less than 0.1 acres.

4.2.3.6 Eroding River – FW1

The Coor Shanavogh stream runs east to west along the south of the proposed site. It is no more than 1.5 meters wide at most and narrower towards the east. In places it is totally overgrown by bramble and willow *Salix cinerea*. The green algae *Cladophora sp.* occurs frequently, which is an indication of nutrient enrichment and organic pollution. Along its length it is enclosed in either hedgerow or hazel scrub. In shaded areas leafy liverworts are prominent such as overleaf pellia *Pelia epiphylia*. All turbines and access roads are located between approximately 22-350m from this stream. Turbine 6 is the closest proposed turbine to this stream. The proposed access road will cross the Coor Shanavogh stream at one location to the southeast of the site between Turbine 3 and the substation.

A second waterbody, the Caheraran River, runs east to west to the north of the site and forms the site boundary for approximately 200m. This river eventually joins the Annagh River and flows into the Atlantic south of Spanish Point. All proposed new development works will be located at least 300m from this river. The hydrology of the site is discussed further in Water & Geology Chapters 8 and 7 respectively in Volume II of this EIS.

4.2.3.7 Drainage Ditches – FW4

Like most of Irelands fields that have been dedicated to agricultural production, drainage ditches are common in this area and all are man made. These have varying volumes of flowing or standing water and varying degrees of vegetation. For this reason the DAFOR scale was not used. Some distinctively wetland species include frogbit *Dydrocharis morsus-ranae*, pondweed *Potamogeton sp.* and water-starworts *Callitriche sp.* Collectively they are important for water quality in the rivers into which they flow as they can facilitate the ingress of pollutants such as sediment, nitrated and

phosphates. No drainage ditches will be traversed or modified by the proposed development works.

4.2.3.8 Spoil and Bare Ground – ED3

There is a small areas of bare ground located Borrow Pit 1, Borrow pit 2 and at Borrow pit 3. This is a habitat classification where vegetation cover is less than 50% and there area a range of ruderal species such as foxglove *Digitalis purpurea*, bramble, ribwort plantain *Plantago lanceolata* and gorse.

4.2.3.9 Hedgerow – WL1

Hedgerows are generally managed i.e. periodically cut back, to maintain a stock-proof barrier and are under 5m in height. Hedgerows border the river as well as fields. The hedgerows within the locality are generally of poor quality with many having spare and stunted vegetation. No hedgerows will be lost as a result of the proposed development.

4.2.3.10 Earth Banks – BL2 and Stone Walls – BL1

An earth bank is little more than a heap of soil but may have been in place for considerable time. Stone walls are characteristic of the west of Ireland landscape and can harbour a number of distinct species.

Species diversity can be high along earth banks or hedgerows and while the quality from an ecological point of view is variable they should be seen as a network, laced across the landscape and providing refuges for large numbers of plants and animals. No stone walls will be impacted by the proposed development. The proposed access road will disect earth banks in two locations only, along the spur road to Turbine 1. This will involve the removal of no more than approximatley 10m of earthbank.

4.2.3.11 Invasive Species

There are no records of alien invasive species in the area and none were recorded during site visits.

4.2.4 Fauna in the Existing Environment

The presence of various species is deduced from the existence of suitable habitat. Incidental sightings on the day were also recorded, as were proxy signs such as tracks, trails, droppings and burrows.

The results of the breeding and wintering bird surveys are presented in Chapter 5, Avifuana.

4.2.4.1 Mammals - Results

A number of protected mammal species are known from this region of county Clare and for which suitable habitat exists on the Coor Shanavogh Wind Farm site. These are detailed in Table 4.1 below.

Table 4.1 Protected mammals in Ireland. Cells that are greyed out indicate either that suitable habitat is not available or that the site is outside the known range of that species (Harris & Yalden 2008).

Level of Protection	Species	Habitat
Annex II & IV Habitats Directive; Wildlife (Amendment) Act, 2000	Otter *Lutra lutra*	Rivers and wetlands. Not recorded from west Clare (Bailey et al., 2006)
	Lesser horseshoe bat *Rhinolophus hipposideros*	Disused, undisturbed old buildings, caves and mines, west of Ireland only.
Annex IV Habitats Directive; Wildife (Amendment) Act, 2000	Whiskered bat *Myotis mystacinus*	Gardens, parks and riparian habitats
	Natterer's bat *Myotis natteri*	Woodland
	Leisler's bat *Nyctalus leisleri*	Open areas roosting in attics
	Brown long-eared bat *Plecotus auritus*	Woodland

Level of Protection	Species	Habitat
	Brandt's bat *Myotis brandtii*	Woodlands and water
	Common pipistrelle *Pipistrellus pipistrelus*	Farmland, woodland and urban areas
	Soprano pipistrelle *Pipistrellus pygmaeus*	Rivers, lakes and riparian woodland
	Daubenton's bat *Myotis daubentonii*	Woodlands and bridges associated with open water
	Nathusius' pipistrelle *Pipistrellus nathusii*	Parkland, mixed and pine forests, riparian habitats
Annex V Habitats Directive; Wildlife (Amendment) Act, 2000	Irish hare *Lepus timidus hibernicus*	Wide range of habitats
	Pine marten *Martes martes*	Broad-leaved and coniferous forest. Recorded from this square (O'Mahony, 2005)
Wildlife Amendment Act 2000	Hedgehog *Erinaceus europaeus*	Woodlands and hedgerows
	Pygmy shrew *Sorex minutus*	Woodlands, heathland and wetland
	Irish stoat *Mustela erminea hibernica*	Wide range of habitats
	Badger *Meles meles*	Farmland, woodland and urban areas
	Red squirrel *Sciurus vulgaris*	Woodlands, recorded south of Doo Lough (maps.biodiversityireland.ie)
	Red deer *Cervus elaphus*	Woodland and open moorland
	Fallow deer *Dama dama*	Mixed woodland but feeding in open habitat
	Sika deer *Cervus nippon*	Coniferous woodland and adjacent heaths

4.2.4.2 Bats - Results

Bat Conservation Ireland (www.batconservationireland.org) maintains a database of bat activity in Ireland. This shows records in county Clare for common pipistrelle, soprano pipistrelle, Leisler's bat, Natterer's bat, Daubenton's bat, whiskered bat, lesser horse-shoe bat and brown long-eared

bat. All of the aforementioned species are listed as of 'international importance' in the Red Data Book (Whilde, 1993) and are protected by law.

It should be noted that transects were chosen to incorporate one or all of the following variables:

- suitable bat commuting and/ or foraging habitat;
- turbine base location or area proximal to turbine base location;
- proposed location of burrow pit(s);
- suitable potential roost locations.

Considering the habitat of the Coor Shanavogh Site and its zone of potential and roost potential, bat numbers on site were expected to be relatively low, the habitat in terms of suitability for bat feeding is noted to be very poor over large areas. Furthermore the bat foraging habitat is moderately productive at best in small patches. There are many outsized farmland buildings that may provide roosting opportunities however the supporting foraging habitat is not present and no large roost populations are expected. Large areas of exposed wet and agricultural grassland and poor stunted hedgerows dominate the site area, indeed field margins are mostly sod embankments at best with sparse vegetation; there is poor commuting habitat for bats. All transects walked returned no bat activity, all potential roost sites checked indicated no bat presence. It is expected that an additional survey during optimal summer conditions may identify small numbers of common and soprano pipistrelles, brown long eared bats, and Leisler's bats. Site specific assessment indicates that suitable foraging habitat for the lesser horseshoe bat does not exist at the site or in the general locality and this particular bat species is not expected to occur in the immediate locality. No large potential roosts are expected on site, any bats present are expected to roost and/ or hibernate at individual locations where environmental conditions are suitable.

With regards to the winter survey field results for hibernating bats:

Temperatures favourable to bat feeding activity drop during winter and insect numbers naturally decline, males and females move into hibernation roosts (hibernacula). Hibernation takes place from October/ November onwards (Bat Mitigation Guidelines for Ireland, 2006) during which time hibernating bats use very little energy and their body temperature drops to 8-9°C. It is known that individual bats may wake up occasionally during periods when the weather becomes mild i.e. if the ambient temperatures rise above 10 degrees Celsius. Pipistrelles are known to leave the winter hibernating roost during all winter months when temperatures rise above 10 degrees Celsius, (Avery, 1985). The Pipistrelles are known to use these opportunities to feed and to drink water. By spring all bat species gradually wake up to begin their yearly cycle again.

Locations suitable for winter hibernation inspections were identified during November 2010. Following day time habitat inspections of the proposed site and it's zone of interaction, it was concluded that any small numbers of bats which may be present will hibernate in small numbers or individually at random locations that provide the suitable ambient environment of high humidity low temps and shelter from winds and air currents. It is our conclusion that although there may be hibernation roosts onsite we have not yet identified one. Therefore it is our general opinion that any bats hibernating around the locality of the peoposed site do so in small numbers at buildings or structures where suitable conditions exist.

4.2.4.3 Badger

A well-used badger sett was recorded during the Openfield ecological survey approximately 1km south of the proposed Coor Shanavogh Wind Farm. No badger activity or badger setts were noted within the proposed wind farm site. Badgers may utilise the site occasionally however.

4.2.4.4 Irish Hare

Numerous sightings of Irish hare were made throughout the Openfield survey but confined to areas of grassland. They are likely to be using the conifer

plantation. The Irish have is listed as of 'international importance' in the Red Data Book (Whilde, 1993).

4.2.4.5 Pine Martin

In Ireland pine martins are associated with areas of forest as well as open, rocky landscapes. While there have been suggestions that the expansion of conifer plantations in recent years have been in their favour, studies in the UK suggest that this is very much dependent on the nature of these forests and the availability of prey (NPWS, 2008; Birks, 2002). Pine martens are recorded from this region and it is possible that they are present in the conifer plantation habitat. They too are listed as of 'international importance' in the Red Data Book (Whilde, 1993).

4.2.4.6 Red Squirrel

The red squirrel is protected under the Wildlife (Amendment) Act 2000 in the Republic of Ireland. It is also on Schedule III of the Berne Convention. The red squirrel is exclusively a woodland species that occupies a wide range of woodland types across much of Ireland. There are an estimated 40,000 red squirrels in Ireland, across a fragmented range (NPWS/ Environment and Heritage Service, 2008). This species is scarce along western and northern coasts. Although not previously recorded in the immediate area of the site (Carey et al., 2007), they have, however, been recorded approximately 6km southeast of Doo Lough near Greygrove and within north Clare (National Biodiversity Data Centre http://maps.biodiversityireland.ie). Given the presence of suitable habitat on site, it is possible that this species may be present in low numbers.

4.2.4.7 Amphibians and Reptiles

Both common frog *Rana temporaria* and the smooth newt *Triturus vulgaris* are protected under the Wildlife (Amendment) Act 2000, while the frog is also protected under Annex V of the Habitats Directive. During the May survey, tadpoles were observed in drainage ditches in a number of locations. Ponds

are the preferred habitat of the Smooth newt (Marnell, 1998) while the common frog can be found in a wide variety of habitats (NPWS, 2008). No ponds exist across the site due to the gradients which favour fast surface water runoff. Other potential habitat includes drainage ditches. No drainage ditches are expected to be altered as part of the proposed wind farm works.

The common lizard *Lacerta vivipara* is Ireland's only native reptile species and is protected under the Wildlife (Amendment) Act 2000. It is known from a wide range of habitats in Ireland, including woodland and hedgerows, and they are thought to be widespread (Curran & Fagan, unknown year). The common lizard is not expected at the Coor site.

4.2.4.8 Fish and Water Quality

The small stream flowing through the site is not known to be of salmonid quality but it can be considered to be of salmonid potential i.e. suitable for Atlantic salmon *Salmo salar* or brown trout *S. trutta*. While macroinvertebrate sampling was not undertaken, in-stream conditions suggest that this stream is slightly polluted due to large growths of the algae *Cladophora sp.* and extensive 'tunnelling' i.e. the near total overshadowing of the water by vegetation (Toner et al., 2005). There is EPA water quality available for the upstream parts of the Coor Shanavogh water course close to Mullagh and the Drehidnacarriga bridge. The water quality rating here is Q4 – Good status. An additional sample site exists closer to Quilty where the stream flows into the sea. The Q-Value here is also Q4.

4.2.4.9 Invertebrates

A large number of insect species, both terrestrial and aquatic, are likely to be present on the site. Areas with a diversity of habitats are known to be rich in insect life. Due to the limited number of protected invertebrates in Ireland and a similarly poor level of data, it is unlikely that protected insect species are present on the site. The marsh fritillary butterfly *Euphydryas aurinia* is the only protected insect in Ireland, listed in Annex II of the Habitats Directive. It is not

recorded from this part of west Clare (Fox et al., 2006). In addition, the food plant of its caterpillar life stage, the Devil's-bit scabious *Succisa pratensis*, was not recorded during field surveys.

A number of non-insect invertebrates are of conservation importance and are protected under European legislation. The white-clawed crayfish *Austrophtamobios pallipes* is not recorded from streams in west Clare (Souty-Grosset et al., 2006). The freshwater pearl mussel *Margaritifera margaritifera* in Clare is only present in the Fergus catchment (Moorkens, 1999). County Clare is outside the range of the Kerry slug *Geomalacus maculosus* (NPWS, 2008). Of the three protected whorl snails, only the nattow-mouthed whorl snail *Vertigo angustior* is to be found in Clare. This population is confined to the coastal grasslands around Doonbeg (Kerney, 1999).

4.2.5 Summary of Flora and Fauna in the Existing Environment

Subsequent to the site survey, consultation and a literature review, the Coor Shanavogh Wind Farm site is confirmed to be, or has potential to be, a habitat for the following rare or protected species;

- Bats
- Badgers
- Fox
- Irish Hare
- Stoat
- Hedgehog
- Pine Marten
- Red Squirrel
- Pygmy shrew
- Common frog

No plants listed under the Flora Protection Order 1999 are present on the site.

A small, degraded area of Annex I habitat North Atlantic Wet Heath is present to the north of the site and will be unaffected by the proposed development (see Figure 4.2). Another smaller patch of wet heath also exists alongside the north bank of the Coor Shanavogh stream to the east of the disused quarry. Part of the hard standing for Turbine 6 is likely to encoach in part on this area but will result in the loss of approximately 0.1 acres of this already degraded habitat.

Four turbines (T3-T6) and approximately 7805m^2 of access road are located within coniferous forestry. This will require approximately 2.3 acres of coniferous forestry to be removed for the construction of the proposed wind farm and an additional minimum of 50m clearfelled around each of the four turbines. Approximately 1.7 acres of the development footprint will be located on wet grassland with the remainder of improved agricultural grassland 0.8 acres). The latter three habitat types are strongly altered by human activity and are considered of low conservation value. No hedgerows will be removed as a result of the proposed development (see Figure 4.1 of Volume 3).

4.2.6 Ecological Evaluation of the Existing Environment

The impact significance is a combined function of the value of the affected feature (its ecological importance), the type of impact and the magnitude of the impact. It is necessary to identify the value of ecological features within the study area in order to evaluate the significance and magnitude of possible impacts. Appendix 3 of the National Roads Authority Guidelines for the Ecological Assessment of Road Schemes (NRA, 2006) outlines a 'site evaluation scheme' that is designed to assign value to ecological features. This is included in Appendix 4.3 at the end of this Chapter, EIS Volume III.

The results of the ecological survey were evaluated to determine the significance of habitats located in the study area on an importance scale ranging from international to local. The local scale is approximately equivalent to one 10km square but can be operationally defined to reflect the character of

the area of interest. Table 4.2 lists the habitats that were recorded and their associated value.

Table 4.2 Evaluation of habitat with reference to the NRA Guidelines (2006).

Habitat	Rating	Criteria
Het Heath (degraded) – HH3	C – High value, locally important	Sites containing semi-natural habitat types with high biodiversity in a local context.
Hedgerow – WL1	D – Moderate value, locally important	Sites containing some semi-natural habitat or locally important for wildlife.
Earth banks – BL2		
Eroding river – FW1		
Spoil and bare ground – ED3	E – Low value	Artificially or highly modified habitats with low species diversity.
Improved agricultural grassland – GA1		
Drainage ditch – FW4		
Conifer plantation – WD4		
Wet grassland – GS4		

The Coor, Shanavogh and Killernan townlands provide resources for species listed under Annex V of the Habitats Directive (pine marten), Annex IV of the Habitats Directive (bats, Irish hare and common frog), the Wildlife (Amendment) Act 2000 (stoat, hedgehog, smooth newt, pygmy shrew, red squirrel and common lizard) and Appendix III of the Bern Convention (red squirrel).

As the level of protection and local abundance varies across faunal species, it is suggested that the potential impact of faunal species be split into two catergories. Species which are considered to be widespread in the Irish countryside such as common frog, smooth newt, stoat, hedgehog, pygmy shrew, common lizard, fox and badger are valued as Rating E – **low value, locally important.**

Those species of international importance or which are particularly rare/ vulnerable, which includes the Irish hare, pine matren and red squirrel, are valued as Rating C – **high value, locally important**.

As the site is located in County Clare, there is the potential for the presence of Lesser horseshoe bat. The lesser horseshoe is an Annex II species under the Habitats Directive and its range is limited to six counties in the west of Ireland. If confirmed, this would be of **national importance.** Site specific assessment indicates that suitable foraging habitat for the lesser horseshoe bat does not exist at the site or in the general locality. Foraging habitat for all other bat species is considered to be poor at the site and in the general locality.

4.3 Potential Impact of the Proposed Development

The potential impact of the proposed development is considered below under four headings:

- Potential Impacts during Construction.
- Potential Impacts during Operation.
- Potential Impact on Designated Sites.
- Potential Cumulative Impacts.

4.3.1 Potential Impacts during Construction

The primary potential impacts identified during construction works are though direct habitat loss, which may result in species loss and/or disturbance, direct species disturbance/displacement during construction works and clearfelling and pollution of water courses.

4.3.1.1 Habitat Loss

The following habitats will be directly affected during the construction of the proposed wind farm:

- Improved agricultural grassland; (approximately 0.8 acres)
- Conifer plantation (approximately 3.2 acres plus a minimim of 50m radius around four turbines)
- Wet grassland (approximately 1.7 acres)

- Wet heath (0.2 acres)

These first three are highly modified habitats of low ecological value and therefore classified as 'E Sites' (see Table 4.2). This is therefore assessed to be a **minor negative** impact (see Table A4.2 of Appendix 4.3 at the end of this Chapter).

The Wet Heath habitat is classified as a 'C Sites' of high local importance as it is listed on Annex I of the Habitats Directive. The small patch which will be affected by the proposed development (approximately 0.2 acres) however has already been degraded through turf cutting and drainage. The impact on this habitat is assessed as **moderate negative** (see Table A4.2 at the end of this Chapter).

The access roads of the proposed development will result in the permanent loss of approximately 10m of earth banks. This habitat is catorgorised as D – moderate value. However, as the loss is small in relation to the overall site, is therefore assessed to be a **minor negative** impact (see Table A4.2 at the end of this Chapter).

Three borrow pits are proposed within the windfarm site (see Figure 3 Appendix 1, Volume III). It is proposed to extract stone and gravel from these areas for use in the construction of access roads, thereby reducing the amount of transport to and from the site (see Chapter 2). Upon completion of works, each pit will be back-filled with spoil that was removed elsewhere on the site. The proposed borrow pits are located on wet grassland (3200m^2), improved agricultural grassland (900m^2), and spoil or bare ground (1000m^2), none of which are considered of high ecological value.

No hedgerows will be disturbed during construction works.

4.3.1.2 Species mortality/ disturbance

Construction works on the site have the potential to impact directly through mortality and/or displacement. Disturbance/ displacement as a result of works will be temporary and construction works outside of clearfelling operations are unlikely to result in direct mortality of mobile species such as hares. The number of individuals potentially affected by disturbance cannot be determined but includes species listed in Table 4.1. The majority of these species are valued at D – moderate value, locally important and temporary impacts on these would result in a **neutral or no** impact (see Table A4.2 at the end of this Chapter).

Three species of high value may be present on site - Irish hare, pine marten and red squirrel. The Irish hare is considered widespread in Ireland and is highly mobile. Any temporary displacement of this species from the site is likely to be **minor negative.** Both pine marten and red squirrel, if present on site, will be confined to the conifer plantation habitat. The permenant impact of clearfelling on a small part (clearfelling is likely to be a minimum of 50m corridor around the centre point of Turbines 3-6) of the site results in a **minor negative** impact (see Table A4.2 at the end of this Chapter. However, as mentioned in Section 4.3.1.3 below, it is important to note that this commercial plantation will, in time, be felled in the future, with or without the proposed Coor Shanavogh Wind Farm, thus this impact will still occur, even in the absence of the proposed works.

No badger sett or badger activity was recorded on site and this species will not be directly affected by the construction of the proposed development.

There will be no significant impact to bat species or population. Bat activity during optimal feeding (weather) conditions is expected to be low due to the lack of high quality feeding habitat on site and around the site locality. In addition bats are not expected to commute at the rotor heights, the site is elevated and exposed to consistent winds any bats which may be using the

area are expected to conserve their energy and fly close to the vegetation and within sheltered areas.

Impacts on birds are addressed in detail is Chapter 5 Avifauna.

4.3.1.3 Clearfelling Operations

Tree felling will be required for the construction of approximately 7805m^2 of new internal roads and for Turbines 3, 4. 5 and 6. It is proposed that a minimum of 50m from the centre point of each turbine will be removed. Construction works will follow the guidelines stipulated in the Forest Service Forestry Harvesting and the Environment Guidelines (2000).

Foresty clearance have the potential to disturb and/or destroy small mammals and birds with occur in this habitat. Mammals, if present on site, which may be directly impacted by clearfelling works include pine martin, stoat, Irish hare, hedgehog and red squirrel (the impact on bird species is addressed in Chapter 5). Stoat and hedgebog are valued at D – moderate value, locally important. The permenant impact on a small part (clearfelling is likely to be a minimum of 50m corridor around the centre point of Turbines 3-6) will result in a **minor negative** impact (see Table A4.2 of at the end of this Chapter). Irish hare, pine marten and red squirrel are valued as 'C' high value, locally important. The permenant impact on a small part of the site will result in a **moderate negative** impact on these species, if present.

However, it is important to note that this commercial plantation will, in time, be felled in the future, with or without the proposed Coor Shanavogh Wind Farm, thus this impact will still occur, even in the absence of the proposed works. It should also be noted that in the Republic of Ireland, it is not an offence to interfere with a red squirrel breeding place while engaged in forestry work (NPWS/ Enrivonment and Heritage Service, 2008).

The potential impact of forestry clearance on water quality is addressed below.

4.3.1.4 Pollution of watercourses

Pollution to surface water bodies such as drainage ditches and eroding rivers can occur through site clearance activities. Sediment or toxic substance runoff can result in temporary deterioration of water quality and, under extreme circumstances, fish kills (ERFB, unknown year).

Clearfelling of trees has the potential to adversely impact on water quality, through increased erosion rates, sedimentation and nutrient losses, which in turn can contribute to eutrophication effects (Giller et al., 2002). Such impacts are difficult to quantify as it is dependent to a large degree on site management practices as well as weather conditions during the construction phase. Sustainable management such as ditch blocking and implementation of best management practices in felling operations will minimise any potential impacts associated with clearfelling and construction operations in general.

Turbines and access roads have been located away from the main water courses as much as possible. The nearest water course is approximately 22m from Turbine 6. In this case a buffer of at least 15m will be put in place. The felling of trees will be limited in all cases and a buffer zone of at least 15m will remain.

At one point the eroding river will be culverted so that an access track can pass over it. The potential for pollution effects is greatest at this point. Significant management details have been outlined in Chapter 8 for the water crossing.

The eroding stream on site is classified as D – moderate value, locally important (see Table 4.2). As the potential impact on water quality is largely limited to the construction phase of the development, it is considered temporary in nature (up to 1 year duration). Thus, according to NRA guidance (2006) the impact on the aquatic environment is considered **not significant** (see Table A4.3 at the end of this Chapter).