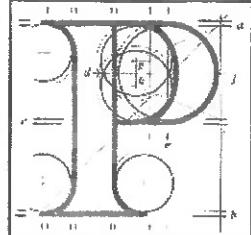


Appendix 1

Aqbənqrib Xixil

An Bord Pleanála



Mr. Martin Collins,
Derrybrien Development Society Limited,
Derrybrien,
Loughrea,
County Galway.

16th October 2008.

Dear Mr. Collins,

The Board has asked me to reply to your letters.

The Board is not in a position to advise you in relation to the implications of the judgement for the case in question. The more appropriate body to which you might address queries is the Department of the Environment, Heritage and Local Government.

I enclose for your information a copy of the circular letters issued by the Department of the Environment, Heritage and Local Government which set out the Department's advice to planning authorities to date, in relation to the implications of the judgement. Hopefully, these will be of assistance to you in terms of understanding the position.

Yours sincerely,

Chris Clarke
Chris Clarke,
Secretary.

64 Sráid Maoilbhride,
Baile Átha Cliath L.

Tel: (01) 858 8100
LoCall: 1890 275 175
Fax: (01) 872 2684
Web:<http://www.leanala.ie>
email:bord@leanala.ie

64 Marlborough Street,
Dublin 1.



Comhshaol, Oidhreacht agus Rialtas Áitiúil
Environment, Heritage and Local Government

Circular PD 6/08

8 October 2008

Subject: Implications of European Court of Justice ruling on retention planning permission for development requiring environmental impact assessment (Case C-215/06).

The purpose of this circular is to extend the advice provided to planning authorities in Circular PD 5/08 of 15 August 2008 (enclosing a copy of the above judgement) and the e-mail communication of 4 September 2008 issued to relevant Directors of Service in the main planning authorities.

The judgment

In its judgment of 3 July 2008, the Court ruled that the retention permission system as it applies in Irish law with regard to projects that require or may require an environmental impact assessment (EIA) under the EIA Directives does not comply with the Directives and needs to be amended. Irish legislation fails to ensure that EIAs will be conducted prior to the construction of a project and permits post development EIAs contrary to the intent of the Directives.

As of 3 July 2008 any permission granted on applications/appeals for retention planning permission in respect of EIA development is in breach of Community law having been granted under a legislative system that the Court has found is inconsistent with the EIA Directives.

Ireland is obliged under the Treaty of the European Community to comply with the judgment or else face the consequence that the Commission will issue Article 228 proceedings and seek the imposition of penalties/fines. Ireland is therefore obliged to respond to the judgment by introducing legislation that will amend the existing

Service is the main business outcome.

planning legislation insofar as it permits retention permissions on projects requiring EIAs.

Proposed legislation

The Minister has received approval of Government to the drafting of the General Scheme of a Planning and Development (Amendment) Bill, which will, among other things –

- remove the possibility of retention for unauthorised development which would otherwise have been subject to environmental impact assessment, other than in exceptional circumstances, and
- revoke the current 7 year time limit within which enforcement action may be taken in respect of unauthorised development (section 157(4) of the Planning and Development Act 2000).

In the interim, more immediate legislative measures with respect to retention planning applications for projects that fall under the EIA Directive are under consideration.

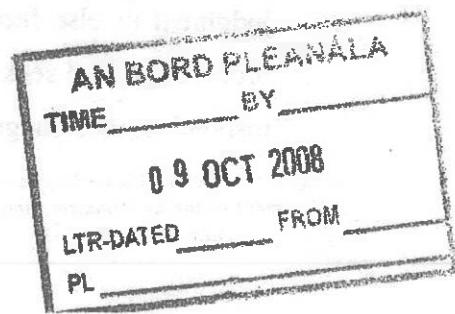
The intention to make such legislation was notified to the European Commission on 3 September 2008, in Ireland's initial formal response to the ECJ judgement.

More immediately however, there is the issue of necessary action in relation to relevant planning applications (i.e. applications for retention permission for development which required an EIA), falling into two categories –

- applications currently awaiting determination by planning authorities; and
- applications which have been determined favourably since 3 July 2008.

Applications awaiting determination

It is understood that some planning authorities may have incorrectly taken the view that they must comply with and operate the relevant planning legislation as it currently stands, and therefore have to continue to make decisions on EIA/retention applications. The case law of the European Court of Justice makes it clear that administrative bodies such as planning authorities and An Bord Pleanála, being emanations of the State, are bound to comply with Community law and if necessary to disapply national law.



banning legislation insofar as it banishes certain businesses or places leading

EIA's

Proposed legislation

The Minister has received advice of Government of the issuing of the General Scheme of a Planning and Development (Amendment) Bill, which will among other things -

- remove the possibility of refusal for unauthorised development which may otherwise have been subject of environmental impact assessment, after there is no objection of the relevant planning authority;
- allow the court to limit any planning permission which may be taken in respect of unauthorised development (section 12(4) of the Planning and Development Act 2000).

In the interim, more immediate legislative measures with respect to regulation planning applications for projects that fall under the EIA Directive are under consideration.

The intention to make such legislation was outlined to the European Commission on 3

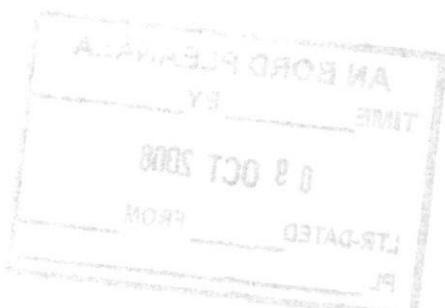
September 2008, in response to initial reports to the EC Indicative

More immediately however, there is the issue of necessary action in respect to relevant planning applications (i.e. applications for relevant permission for development which lead to EIA), falling into two categories -

- applications currently awaiting determination by planning authorities; and
- applications which have been determined from 3 July 2008.

Applications awaiting determination

It is understood that some planning authorities may have unconsciously taken the view that they must comply with and observe the relevant planning legislation as if currently stands, and therefore place of concern to make decisions on EIA legislation applications. The case law of the European Court of Justice makes it clear that planning authorities must act in accordance with Community standards and principles of sound management of resources if they are to ensure effective protection of the environment, the public health and the economy of the State, the pound of quality with Community law and if necessary to discharge international law.



Accordingly, in respect of applications for permission for the retention of unauthorised development where such development should have been subject to prior EIA and where such development comes within Annex I of the Directive, planning authorities should return the application as invalid, on the basis that there is no jurisdiction to grant retention planning permission in those circumstances. That step should be taken upon receipt of the application. Applications that have been received and are currently being processed should be returned in the same way. The relevant body should refer to the judgment of the court in Case C-215/06 when communicating with applicants for retention permission.

In respect of applications for permission for the retention of unauthorised development where such development comes within Annex II of the Directive, planning authorities should proceed to decide whether an EIA is necessary or not ("screening decision"). If an EIA is not considered necessary, then the planning authority should proceed to deal with the application in the normal course. If, conversely, the planning authority decides that an EIA is necessary it should take the steps referred to in the previous paragraph.

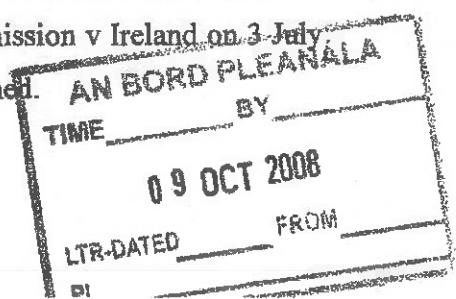
The screening decision as to whether an EIA is necessary or not should be made as it would be made in the normal course of events, *i.e.* on the basis of the criteria set out at Schedule 7 of the Planning and Development Regulations, 2001.

Relevant retention planning permissions granted since 3 July 2008

It would appear that some relevant permissions have been granted since 3 July 2008 and that the planning authorities concerned may not have brought to the attention of the applicants the judgment of the ECJ and its potential implications for the permissions being granted.

Subject to the final paragraph, a recipient of such any retention permission issued since 3 July 2008 in respect of developments requiring an EIA must be informed as follows.

- The ECJ delivered a judgment in Case C-215/06 *Commission v Ireland* on 3 July 2008. The effect of the judgment should be briefly outlined.



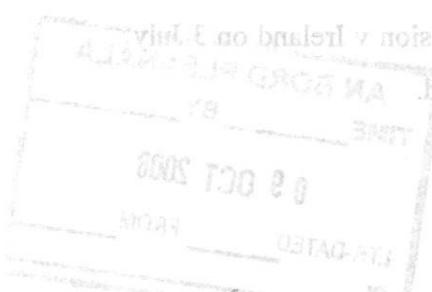
Accordingly, in respect of applications for permission for the transmission of mass-produced development works such development should prove subject to prior authorisation under Article 1 of the Directive, namely applications for which the application is invalid on the basis that there is no justification to grant permission because it poses circumstances. Just as it should be taken upon receipt of the application. Applications that prove necessary may be carried out in the same way. The relevant body should refer to the judgment of the court in Case C-312/06 after communication with applicants for permission for the

In respect of applications for permission for the transmission of mass-produced development works such development comes within Annex II of the Directive if it is necessary to decide whether an EIA is necessary or not for planning purposes should prove necessary to consider accessibility, then the planning ("accessibility decision"). If an EIA is not considered necessary, then the planning authority should proceed to deal with the application in the normal course. It consequently follows that the planning authority need not make an EIA if necessary it should take the counterfactual, the planning authority need not make an EIA if necessary it should take the

The following decision as to whether an EIA is necessary to not should be made as if would be made in the normal course of events, i.e. on the basis of the criteria set out at Schedule 7 of the Planning and Development Regulations, 2001.

Relevant legislation banning permission starting since 3 July 2008. It would appear that some relevant legislation has been running since 3 July 2008 and thus the planning authorities concerned may not have paid attention to the situation of the applications the judgment of the ECJ and the relevant implications for the permission being issued.

Subject to the final ascertainable, a recipient of such an application permission issued since 3 July 2008 in respect of developments requiring an EIA must be informed as follows:



- * The ECI delivered a judgment in Case C-312/06 Commission v Ireland on 3 July

- As a result of the judgment the permission granted is in breach of Community law having been granted under a legislative system that the Court has found is inconsistent with the EIA Directives.
- The applicant is advised not to act upon the permission.

Such notification should be sent by registered post to the applicant for the permission and copied to any person required by the Planning Acts to be notified of a decision on the application.

It is the Department's understanding that a notification need not be made in respect of a permission granted since 3 July for the continued operation of a quarry in respect of which an application for planning permission was made under and in strict accordance with section 261(7) of the 2000 Act, i.e. an application, with an environmental impact statement, made within such period as was specified by or agreed with the planning authority for the purposes of the subsection in respect of a quarry that commenced operation before 1 October 1964. (By extension, any such application currently being processed may proceed to determination).

AN BORD PLEANÁLA	
TIME _____	BY _____
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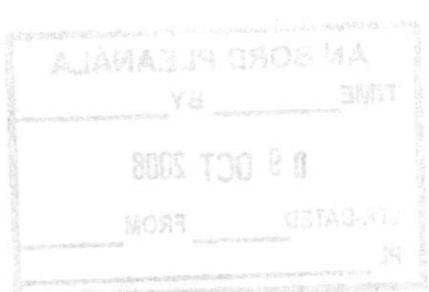
Liam Whelan
Liam Whelan
Principal Officer
Planning System

To all planning authorities.
c.c. An Bord Pleanála

- As a result of the legislation the business is in receipt of Community law
- paralegals must pursue under a legislative scheme that the Court has found is inconsistent with the EIA Directive.
- The applicant is advised not to act upon the business.

Such documentation should be sent by registered post to the applicant for the business
any copies to any person leading the Planning Act to be notified of a decision on
the application

It is the Defendant's understanding that a notification need not be made in respect of
a business change since it is for the competent authority to draw up rules in respect of
which an application for planning permission was made and in strict accordance
with section 261(2) of the 2000 Act, i.e. an application will be determined in respect
of which within six months of receipt of a notice of the planning
statement, made within six months before as was specified by or agreed with the planning
authority for the purpose of the suspension in respect of a directly that connection
objection before it operates fully (by extension, say such application clearly being
processed via a process to determine).



[Handwritten signature]

Liam Maguire
Planning Officer
Planning Services

To all planning authorities
cc: All local authorities

Circular PD 5/08

15 August 2008

European Court of Justice ruling on retention planning permission for development requiring environment impact assessment, and the specific case of a windfarm development at Derrybrien in Galway.

The purpose of this circular is to draw the attention of planning authorities to a recent European Court of Justice (ECJ) judgement (Case-215/06 – see Appendix 1). The judgement in this case, that Ireland had failed to fulfil its obligations under Articles 2, 4, 5 and 10 of Directive 85/337/EEC, as amended by Directives 97/11/EC and 2003/35/EC - the "EIA Directive" - should be carefully considered by planning authorities for the purpose of dealing with planning applications involving projects that fall under the scope of the Directive, as amended.

This circular is advisory, and not a legal interpretation of the judgement, which should be referred to the authority's law agent for detailed consideration.

Overview of the Court Findings

There were two matters addressed in the ECJ judgement – the availability under Irish planning legislation of retention planning permission for development requiring environmental impact assessment, and the specific case of a windfarm development at Derrybrien, County Galway.

1. Retention Planning and Enforcement

In this regard, the ECJ ruling was twofold - firstly that Ireland had failed to adopt all measures necessary to ensure that projects which are within the scope of the EIA Directive are, before they are executed in whole or in part, first, considered with regard to the need for an EIA, and, secondly, where those projects are likely to have a

The bases of assessing why human solutions involving biological tools may be used, as well as the EIA Directive, - should be sufficiently considered by relevant authorities for the implementation of this Directive, as mentioned in Article 10 of Directive 2009/33/EC.

significant impact on the environment by virtue, inter alia, of their nature, size or location, that they are assessed in accordance with Articles 5 to 10 of the EIA Directive.

The ECJ concluded that in Ireland retention planning permission could be granted for unauthorised projects which are covered by the EIA Directive, after those projects were completed. The ECJ found that while Community law cannot preclude the use of retention planning in certain cases, retention planning should not offer developers the opportunity to circumvent the EIA Directive, and that retention should remain the exception.

The ECJ stated that Member States are required to take appropriate action to counteract the unlawful consequences of a breach of Community law and that Irish planning authorities are obliged to take measures to remedy situations where an EIA should have been carried out prior to the granting of planning permission.

2. Derrybrien Wind Farm

The ECJ ruled that Ireland had failed to adopt all measures necessary to ensure that the planning permissions granted, and the execution of, wind farm developments and associated works at Derrybrien were preceded by an assessment with regard to their environmental effects in accordance with Articles 5 to 10 of the EIA Directive as amended. While wind-farms were not listed under Annex's I or II of the Directive at the time of this development, the initial works at Derrybrien included the extraction of peat/minerals of a non metalliferous or energy producing nature, and road construction, both of which were listed in Annex II of the Directive.

The ECJ found that despite the fact that the peat extraction and road construction may have been of secondary importance vis-à-vis the wind farm construction, as a whole, this did not mean, by virtue of that fact alone, that those projects were not likely to have significant effects on the environment. In this specific case, the ECJ found that the peat extraction and road construction should have been regarded as likely to have significant impacts on the environment and should have been subject to an assessment.

significant impact on the environment by virtue, inter alia, of their nature, size or location, part of which are assessed in accordance with Article 6 of the EIA Directive.

The ECI concluded that in issuing permission planning permission could be granted for unsupervised projects which are covered by the EIA Directive, after those projects were completed. The ECI found that while Community law cannot banish the use of television planning in certain cases, regulation banning such use after development of opportunity of circumventing the EIA Directive, and that relevant planning permission is exorbitant.

The ECI stated that Member States are required to take appropriate action of controllers of the unusual consequences of a project of Community law and that they issuing authorities are obliged to take measures to remedy situations where the EIA has been carried out prior to the issuing of planning permission.

5. Development and Law

The ECI held that there are no grounds of belief that such measures necessarily ensure that the issuing of planning permission of wind farm developments and associations with Delphine were based on assessment with regard to their socio-economic effects in accordance with Article 6 of the EIA Directive as provided. While wind farms were not listed under Annex I or II of the Directive at the time of the decision, the initial work of Delphine indicated the exception of Delphine to a number of environmental effects of wind farms under Article II of the Directive.

The ECI found that despite the fact that the best extraction and land contamination may have been of secondary importance in the wind farm connection, as a whole, this did not mean, for example, that those projects were not likely to have significant effects on the environment. In this specific case, the ECI found that the best extraction and land contamination should have been regarded as likely to have significant impacts on the environment and these need special attention.

The ECJ also found that the environmental impact statements that were provided by the developer in this case were deficient. In particular, they did not examine soil stability when excavation was involved. The Court also noted that, contrary to Irish law, deforestation at Derrybrien authorised in May 2003 was not preceded by an assessment. Annex III of the EIA Directive refers to the risks inherent in projects that should be considered when examining the requirement for an assessment. One such risk is the environmental sensitivity of the geographical area, which must be considered having regard, *inter alia*, to the absorption capacity of the natural environment paying particular attention to mountain and forest areas.

The ECJ further ruled that applications for planning permission for the wind farm submitted after the EIA Directive was amended in April 1998 should have been subject to EIA as wind farms were specifically listed in Annex II 3(i) of the amended Directive and Annex II 13 refers to the requirement to screen for EIA any extension or change to a project that is covered by the Directive, but has already been authorised.

Action on foot of the ECJ Judgement

Ireland is obliged, before 3 September, to notify the European Commission of the measures that the relevant authorities here have taken in order to comply with the terms of the ECJ judgement.

The Minister has received approval of Government to the drafting of the General Scheme of a Planning and Development (Amendment) Bill, which will, among other things –

- remove the possibility of retention for unauthorised development which would otherwise have been subject to environmental impact assessment, other than in exceptional circumstances, and
- revoke the current 7 year time limit within which enforcement action may be taken in respect of unauthorised development (section 157(4) of the 2000 Act).

In the interim, more immediate legislative measures with respect to retention planning applications for projects that fall under the EIA Directive are under consideration.

For their part, planning authorities are requested to analyse the findings of the ECJ in this case, and reflect them in their approach to applications for planning permission for projects that require, or may require, EIA. The Development Management Guidelines (June 2007) address EIA in Chapter 4, while Chapter 10 deals with enforcement of planning control.

For their part, planning authorities are required to consider the EIA in this case, and reflect it in their application for planning permission for projects that may reduce EI. The Development Management Guidelines (June 2007) address EI in Chapter 4, while Chapter 10 deals with avoidance of planning control.

Appendix 2

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Microseismic and Infrasound Monitoring of Low Frequency Noise and Vibrations from Windfarms

Recommendations on the Siting of Windfarms in the Vicinity of Eskdalemuir, Scotland

**Professor Peter Styles, Dr Ian Stimpson, Mr S Toon, Mr R England,
Mr M Wright**

**Applied and Environmental Geophysics Research Group
Earth Sciences and Geography
School of Physical and Geographical Sciences
Keele University
Keele
Staffs ST5 5BG**

18 July 2005

Abstract

In order to meet, and in fact exceed, Kyoto targets, the UK government has set a challenging target of reducing the UK's carbon dioxide emissions by 60% by 2050. The development of renewable energy, especially wind power, will be an important contributor to the success of that policy.

Some 40% (in excess of 1 Gigawatt), of this wind generation capacity, was planned for the southern uplands of Scotland. However, the United Kingdom seismic monitoring site which constitutes our component of the Comprehensive Test Ban Treaty compliance for nuclear testing is situated at Eskdalemuir near Langholm in the Scottish Borders. The Ministry of Defence therefore placed a precautionary blanket objection to any wind farm developments within 80 km of Eskdalemuir in case this compromised UK capability to detect distant nuclear test and breached our agreement under the CTBT. This effectively removed at least 40% of the UK renewable wind resource identified by the DTI.

Because of our previous, unique experience in monitoring seismic vibrations from wind turbines in the UK, the Applied and Environmental Geophysics Group of the School of Physical and Geographical Sciences at Keele University, were asked by the MOD, the DTI and the British Wind Energy Association to investigate whether there was a solution to this impasse. By carrying out a detailed programme of seismic and infrasound measurements in the vicinity of several wind farms in Scotland we have been able to identify the characteristic frequencies and mode of propagation of seismic vibrations from wind turbines and develop a model for the integrated seismic vibration at the Eskdalemuir site which will be created by any distribution of wind farms. By carefully considering the present ambient background experienced at the monitoring site it has been possible to set a noise budget which is permissible at Eskdalemuir without compromising its detection capabilities, and we have demonstrated that at least 1.6 GW of planned capacity can be installed and have developed software tools which allow the MOD and planners to assess what further capacity can be developed against criteria established by this study.

Appendix

In order to meet, and in fact exceed, Kyoto pledges, the UK government has set a challenging target of reducing the UK's carbon dioxide emissions by 60% by 2050. The development of renewable energy, especially wind power, will be an important contributor to the success of that policy.

Some 40% (in excess of 1 GigaWatt) of this wind generation capacity was planned for the Southumbrian Islands of Scotland. However, the United Kingdom government has decided to postpone the construction of the combined cycle gas turbine Test Bed at Heysham until after 2010. The Ministry of Defence therefore based a decommissioning plan for such wind farms developments within 80 km of England until in case this combination of capability to detect distant nuclear test and assessment under the C18T. This effectively removes at least 40% of the UK renewable wind resources identified by the DTI.

Because of our location, unique subsections in monitoring seismic activity from wind turbines in the UK, the Abbeville and Boulougneuse Geophysical Group of the School of Physical and Geological Sciences, have undertaken a survey of the British Wind Energy Association to investigate whether there was a solution to this imprecision. By consulting with the MOD, the DTI and the British Wind Energy Association, new models were developed by the DTI and the British Wind Energy Association to predict the distance of seismic and ultrasound measurements in the vicinity of several wind farms in Scotland we have been able to identify the characteristics of individual wind farms in Scotland to predict seismic activity from wind turbines and develop a model for the intended seismic application of the Ecademium site which will be created by the disruption of wind farms. By carefully considering the present seismic experience of wind farms, it has been possible to set a noise budget which is benchmarkable at Ecademium without causing significant disruption to the local environment and we have determined that at least 1.6 Gm of buried cables can be installed and have delivered seismic波es which allow the MOD and Isometrics to assess wind turbine capacity can be established and implemented by this study.

Introduction

The Eskdalemuir Seismic Array (EKA)

Eskdalemuir in the Scottish Borders is the location of a monitoring facility operated by the British Geological Survey where seismological, magnetic and other environmental parameters are monitored because the site is located in a very quiet magnetic and seismic environment. Measurements include horizontal and vertical magnetic field components and declination, total field intensity, and absolute values of the geomagnetic field. Three-component seismological measurements are made at the sites. An environmental monitoring facility operates at Eskdalemuir, monitoring soil and air temperature, wind speed and direction; UV and nuclear radiation; sunshine; concentrations of ozone, SO₂ and NO_x gases; rainfall; humidity and surface wetness.

In addition the UK seismological array (**EKA**) operated by AWE Blacknest is also sited at Eskdalemuir. The facility at Eskdalemuir is part of the auxiliary seismic network of the International Monitoring System (IMS) being set up to help verify compliance with the Comprehensive Test Ban Treaty (CTBT) which bans nuclear-test explosions. So far the CTBT has been signed by 175 states, and ratified by 121. The UK and France were the first nuclear-weapons states to ratify the treaty. The facility at Eskdalemuir is to be upgraded to be an alternate primary IMS seismic station. The treaty requires that States Parties shall not interfere with the verification system, of which Eskdalemuir is an element.

The seismometer array at Eskdalemuir (EKA) (Figure 1) became operational on the 19 May 1962. The recording station comprises a recording laboratory, a seismological vault and an array of seismometers installed in pits spaced over an area 10 km square. The laboratory is situated on the eastern side of the Langholm-Innerleithen road (B709) about 30 km north of Langholm and 3 km north of the Eskdalemuir meteorological observatory. The seismological vault is about 400 m east south east of the laboratory, and the array lies to the east in the form of a cross with its centre, about 2.5 km from the laboratory. The latitude of the point of intersection of the two lines of the array is 55° 20' north and the longitude is 03° 09½' west. The array is situated across the watershed between tributary headstreams of the Teviot and Tweed flowing to the north-east, and headstreams of the Esk which generally flow to the south-west. The ground surface is largely open rolling moorland and forest plantations, which in many places is peat covered. The altitude of the seismic pits varies from c 210 m to c 430 m. The isolated location ensures that microseismic interference is kept to a minimum. While there is very little light vehicular traffic on the Langholm-Innerleithen road logging trucks and heavy forestry machinery do use this road albeit intermittently.

The Array

The array consists of two straight lines of instrument pits intersecting at right angles. Each line has eleven pits (of which only ten on each line are used) approximately 1000 yards apart. Each line intersects the other off centre, forming a cross whose four arms are unequal. The lines run roughly from SSW to NNE and from WNW to ESE. The overall length of each line is approximately 9 km. The seismic pits have been excavated through an overburden of superficial soil (peat in some instances) or thickness from 0 to 1 m into shales of the Llandovery Series (Silurian age). These were folded during late Silurian times, and as a result of the lateral pressures exerted are highly cleaved. Buried recording cables connect each instrument pit to the recording laboratory.

Each pit on the array contains one vertical Willmore MK2 short period seismometer. The signals from the seismometers are transmitted via buried cables back to the recording laboratory where it is then digitised using 3 separate CMG-DM16-R8 digitisers. A central acquisition system then records this data. In addition the seismic vault at Eskdalemuir contains four seismometer plinths. Currently a broadband 120s to 50Hz GURALPCMG-3TD is installed in the vault. The data is transmitted from the vault to the recording station using a leased line modem. Data from this acquisition computer is then transmitted on two separate networks via TCP/IP to a VSAT system link to CTBTO in Vienna and to a local network. From the local network the data is transmitted via VSAT to AWE Blacknest and a second computer records the data locally onto a tape backup system. A study of the background noise at Eskdalemuir was undertaken in 1997/8 as an AWE report (Trodd 1998). The winter and summer RMS averages of the unfiltered summed channels of the array were found to be 8.96 and 1.65 nanometres respectively.

EKA has two arms, each of ten seismometers. The array comprises sensitive seismometers that have recorded signals associated with about 400 nuclear explosions (up to 15,000 km away from EKA). Why is Eskdalemuir so good at this? The main reason is that it occupies a seismically very quiet site (one of only three ever considered in the UK, (Bache et al., 1986)), approaching the low noise model of Petersen (1993), and its history of operation. EKA is the longest operating steerable array in the world has long experience of detecting events over 42 years, is well calibrated, and has detected signals from areas of low seismicity. It has detected signals generated from the detonation of c 100 tonnes of conventional explosive in Kazakhstan. The seismometers are deployed in shallow pits which means that the constructive interference between the up-going and reflected P-waves (compressional-dilatational first arrivals) from the free surface , effectively doubles the amplitude for vertically arriving (teleseismic) phases from distant events in addition to the increase in signal to noise ratio obtained by stacking the 20 seismometer records.

EKA(AS104) was offered by the UK during negotiations with the Comprehensive Test Ban Treaty Organisation (CTBTO) as an auxiliary station and EKA was designated a substitute for a primary seismic station (CTBT/WGB-10/1,1999). EKA data is widely used by the international research community in the pre-Entry into Force (EIF) phase

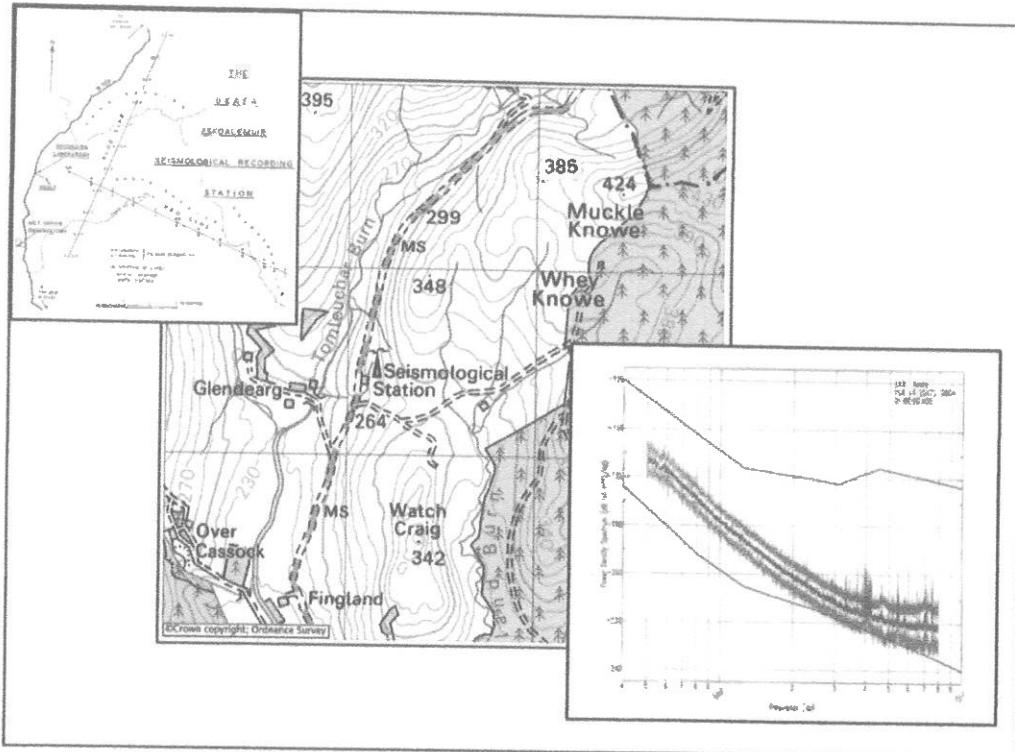
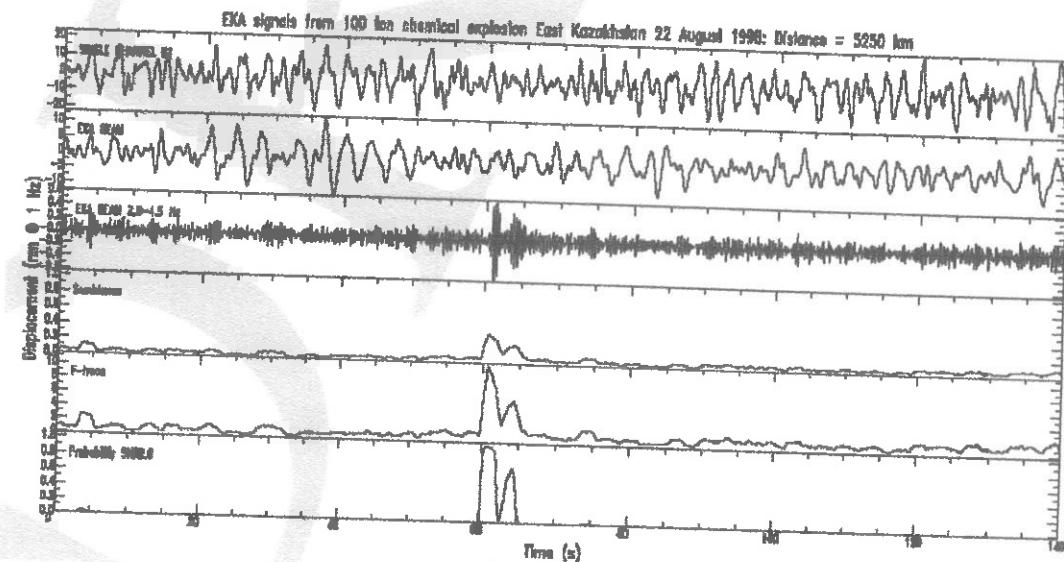


Figure 1 The Location of the EKA seismological array, the detailed layout of the arms of the array and the noise spectrum at the array which closely approaches the Low Noise Model of Petersen (1993).

Figure 2 indicates the detection sensitivity of the Eskdalemuir array as it clearly show the discrimination of the detonation of 100 T of conventional explosive in Kazakhstan a distance of some 5250 km away! The subsequent table which shows the statistics of ambient background is a partial explanation of this exceptional sensitivity as the median noise during a windy period was only 0.25 nm. This, together with years of historical data, makes EKA an unparalleled resource for forensic seismology, i.e. the discrimination of distant nuclear detonations.

EKA signals from a 100 t chemical explosion, Kazakhstan



Passband (Hz)	Quiet rms (nm)			Windy rms (nm)		
	Mean	SD	Median	Mean	SD	Median
1.0-2.0	1.425	0.144	1.454	1.900	0.331	1.857
2.0-3.0	0.245	0.116	0.202	0.497	0.292	0.454
3.0-4.0	0.147	0.097	0.111	0.341	0.220	0.317
4.0-5.0	0.116	0.079	0.088	0.271	0.178	0.253

Quiet times: 2003/12/08 02:00 (1), 2003/12/08 10:00 (1), 2003/12/08 22:00 (2), 2003/12/09 02:00 (1), 2003/12/09 10:00 (1), 2003/12/09 22:00 (1).

Windy times: 2003/12/01 22:00 (16), 2003/12/02 02:00 (19), 2003/12/02 03:00 (20), 2003/12/02 10:00 (11), 2003/12/02 11:00 (9), 2003/12/06 10:00 (7).

Figures in parenthesis are mean wind speed in knots ($1 \text{ knot} = 0.51 \text{ m s}^{-1}$) at Eskdalemuir weather station (source: Met. Office website).

Figure 2 Statistics of ambient microseismic noise at Eskdalemuir during quiet and noisy wind periods and an example of the detection capability of the array in the 2 to 4.5 Hz band (from Bowers (2004), Elliot and Bowers 2004).

Figure 5: Stabilized microwave ionization of ESR spin-trap adducts

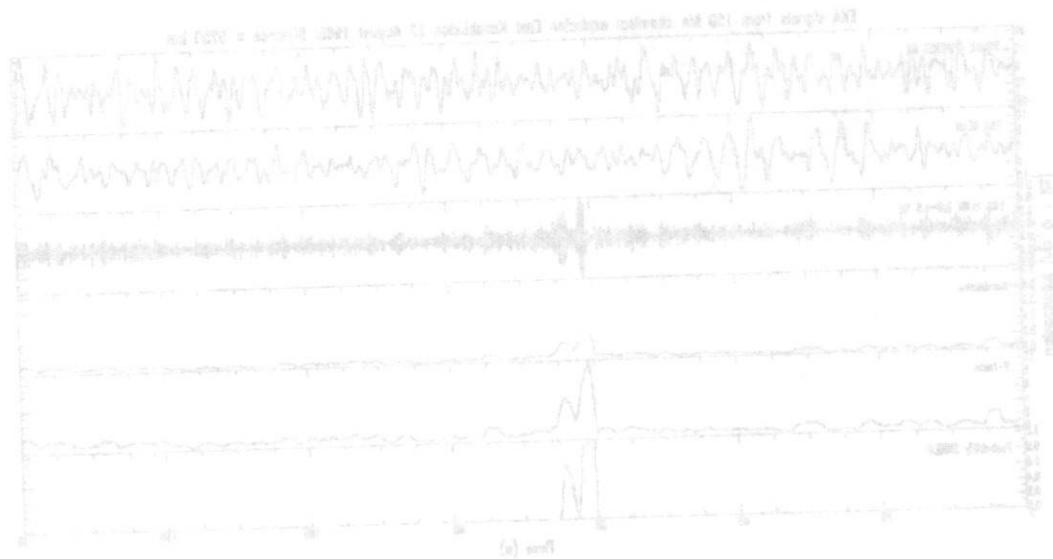


Figure 5: Stabilized microwave ionization of ESR spin-trap adducts. The figure displays four stacked ESR spectra, labeled (a) through (d), illustrating the progression of microwave ionization. Spectrum (a) shows the raw ESR signal with a central peak. Spectrum (b) is a derivative-like signal. Spectrum (c) is a second derivative signal, showing a triplet-like pattern. Spectrum (d) is a third derivative signal, exhibiting a very sharp, narrow peak. The x-axis is labeled '(e) mT'.

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The International Monitoring System (IMS) network will eventually comprise:

- 1 50 primary seismic stations,
- 2 120 auxiliary seismic stations,
- 3 60 infrasound stations,
- 4 11 hydroacoustic stations,
- 5 80 radionuclide stations

The IMS station at Eskdalemuir is part of the verification system. Article IV, Paragraph 6 of the CTBT means that as a state signatory the UK is not allowed to interfere with (degrade) the performance of the verification system.

The International Monitoring System (IMS) is composed of:

50 hydroacoustic stations	1
150 seismic stations	2
60 infrasound stations	3
11 hydroacoustic stations	4
80 radioclock stations	5

The IMS station distribution is best suited to the monitoring of:

Activities in Antarctica & the CTD measure (part of a seismic singularity) the UK is not too far from the boundaries of the continental shelf.

Renewable Energy in the Southern Uplands of Scotland and its implications for Seismic Verification.

The hills of the Lake District and Scottish Borders constitute a major wind resource and some existing wind farms have been operating for many years and many new facilities are planned. As part of the UK renewable energy targets set in order to meet the Kyoto protocol, in excess of 1 GigaW of wind energy capacity are planned for the Southern Uplands of Scotland, a valuable wind resource area. In late December 2003 AWE/MoD recognised that many wind farm developments are planned in the vicinity of the Eskdalemuir International Monitoring Site which constitutes part of the CTBTO monitoring network and that the discrimination capabilities of it might be affected by possible vibration intrusion by wind turbines erected in proximity to the array and that this might have implication for its performance in discriminating nuclear weapons tests.

Wind turbines are large vibrating cylindrical towers, strongly coupled to the ground with massive concrete foundation, through which vibrations are transmitted to the surroundings and with rotating turbine blades generating low-frequency acoustic signals which may couple acoustically into the ground. This may occur in several ways:

1. As a cantilever carrying the nacelle/blade mass, with frequencies typically less than 1Hz, depending on height of tower.
2. As a torsional oscillator at low frequencies.
3. As a complex distributed system at higher frequencies

Additionally, the blade tower interaction is a source of pulses at a low repetition rate, which contain components in the infrasound region. The local and surrounding geology especially layering may play an important part in determining vibration transmission. Energy may propagate via complex paths including directly through the ground or principally through the air and then coupling locally into the ground and it is hope that this study will be able to clarify this.

The site is of national and international significance and requires protection. Because of uncertainty at that time as to the actual levels of seismic vibration generated by large UK wind farms, the Ministry of Defence implemented interim proposals for 30km and 80km cautionary distances. Holding objections were placed on wind farm development within a radius of 30 km from the seismic detection facility near Eskdalemuir and developments up to 80 km radius would be re-examined.

Potential Scottish Wind farm developments which might be affected by this objection are:

Within a 30 km. radius:

Minch Moor, Over Dalgleish (Mast), Craik Forest (Mast)
Corbie Shank, Carlesgill , Ewe Hill/Haggy Hill Allfornought Hill, and Ae Forest

Between 30 km and an 80 km. radius:

Auchencorth Moss , Bowbeat, Broadmeadows, Carcant, Soutra,
Fallagore Ridge, Black Hill. Clints Hill, Lauder Common/Sell Moor, Long Park (mast), Crystal Rig, Monashee , Dalswinton and Kyle Forest.

In addition, many Cumbrian and Northumbrian windfarm sites or planned developments lie within or close to the 80 km re-examination zone.

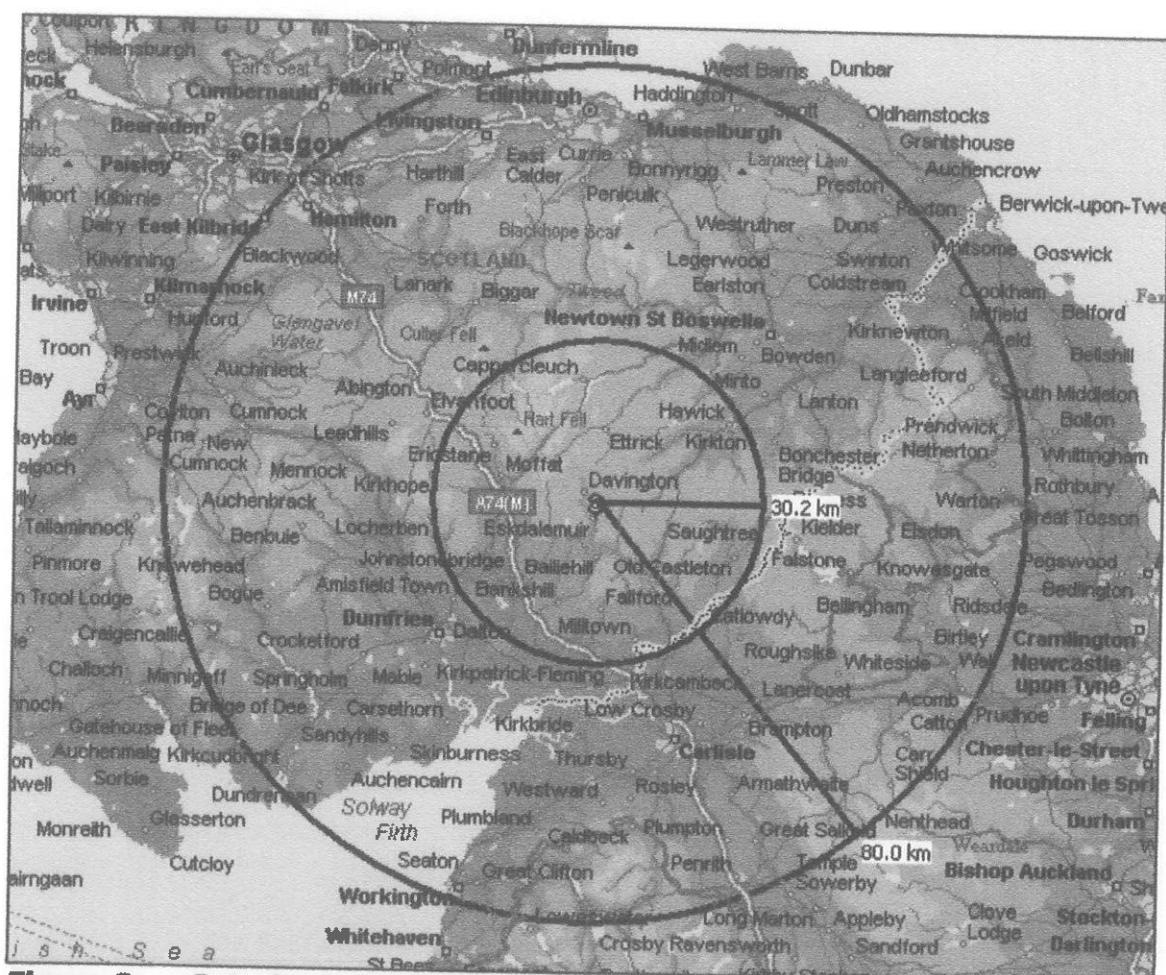


Figure 3 Interim precautionary distances of 30 and 80 km from Eskdalemuir indicating the large areas (2800 km^2 and 20000 km^2) which would be excluded from windfarm development.

Within a 30 km. radius:

Minch Moor, Over Darleydale (West), Cawthron Forest (West)
Cobbs Scar, Castle Hill, Eas Hill, Hadda Hill, Allertonby Hill, and Ae
Forest

Beyond 30 km and up to 80 km. radius:

Anclecock Moss, Bowes Moor, Glaisdale, Cawthron Forest,
Fellside Ridge, Black Hill, Cunes Hill, Langdale Common, Seal Moor, Field
Bank (West), Cawthron, Mousehole, Dismalton and Kite Forest.

To addition, many Cumbrian and Northumbrian windbreaks lie
beyond developments to close to the 80 km. radius examination
zone.

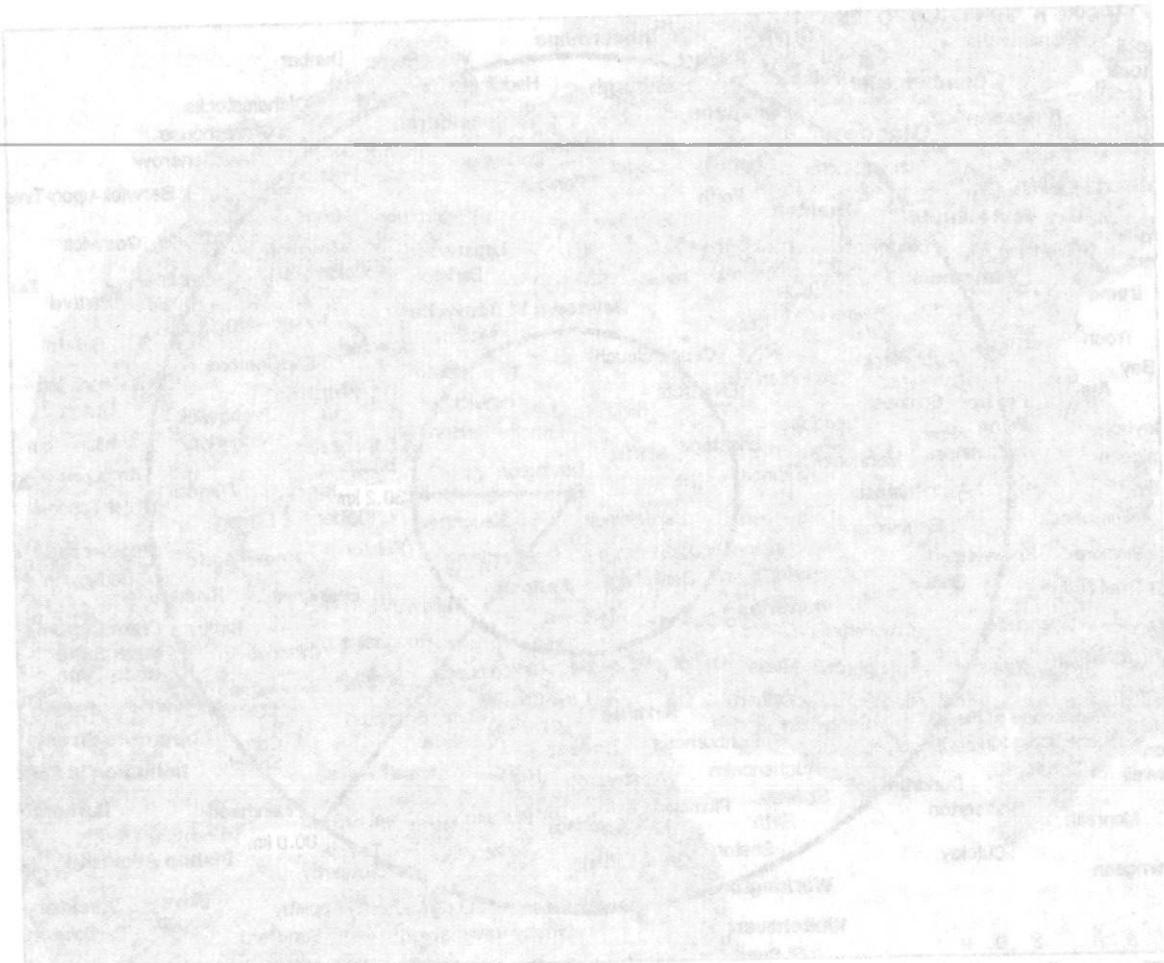


Figure 3. Interim location analysis of 30 and 80 km from
earliest windbreaks in the Lake District (3800 km² and 20000 km²)
which would be excluded from windbreak development.

This preliminary assessment was based on results from literature and web searches presented to BWEA/MoD meeting on 10 February 2004 by Dr David Bowers of AWE Blacknest.

It was recognised that further research was urgently required in order to establish guidelines for future wind-farm development in the vicinity of EKA. The Eskdalemuir Working Group was established to ensure the guidelines had a sound scientific basis and to investigate whether these are the appropriate distances and if necessary develop guidelines for this protection.

Very few studies of the microseismic vibrations from wind farms have been carried out anywhere. The only UK studies prior to this were carried out by the Microseismology Research Group at the University of Liverpool (led by Dr Peter Styles)

The Department of Earth Sciences at the University of Liverpool operated a single three-component seismic station at the Powys Observatory, Knighton, Powys for several years to monitor the seismicity of the Welsh Borders after the large (5.1) Bishop's Castle earthquake of 2 April 1990 and when plans were submitted for a windfarm development a few kilometres away on an adjacent farm it raised concerns that this might produce vibrations which would interfere with the detection of seismic events. Preliminary experiments were carried out near existing Mid-Wales windfarms followed by a significant study at St Breock Down, Cornwall funded by POWERGEN and ETSU (Styles P. (1996), Low-Frequency Wind Turbine Noise and Vibration: ETSU/POWERGEN, Contract Number 503922) and reported by SNOW, (ETSU W/13/00392/REP Low frequency noise and vibration measurements at a modern wind farm, D.J. Snow (1997)) and also reported by Manley and Styles (1995) and Legerton et al. (1996).

In addition a NERC funded studentship was awarded for Microseismic Investigation of Infrasonic Environmental Noise and Vibration (Rushforth, I, PhD Liverpool (2002), While vibrations were found to be well below the BS standards for disturbance to populations they were not interpreted in the light of possible disturbance to ultra-sensitive monitoring facilities.

Details of the various experiments which constitute these studies follow.

Previous Microseismic Monitoring of Wind farms in the UK

1 St. Breock Downs, Cornwall, SW 970 683, 50° 28' 33", 04° 51' 40"

Rated Power: 4.95MW

Wind Turbines: 11 Bonus 450kW

Rotor Diameter: 36 metres

Hub Height: 35m

Connection Voltage: 33 kV

Site Design and Environmental Impact Assessment: EcoGen

Planning Consent: August 1993

Developer: EcoGen SeaWest Tomen Joint Venture

Commissioning: June - July 1994

Owner: PowerGen

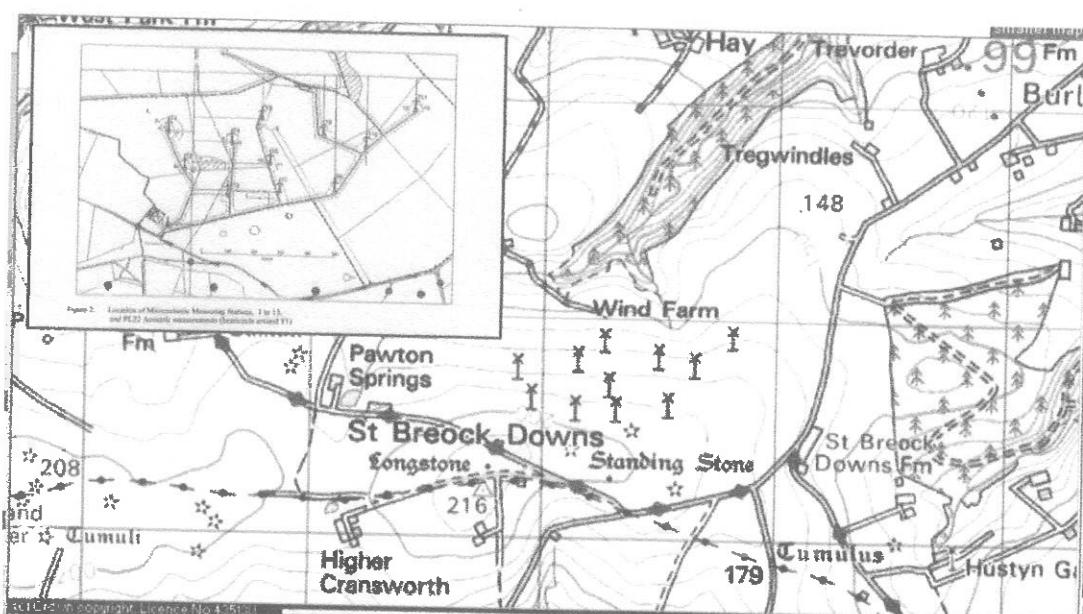


Figure 4 Location of recording stations for the St Breock Downs experiments

A sequence of three experiments were carried out

- 1 Deployment of VIBRO SOUND SP1 24-bit Digital Recorder with LENNARTZ LE-3D/1 Seismometers in buried pits. Two sets of three-component seismometers were used with specifications and calibrations given in Appendix 1. These were deployed from 18 March until 30 March in order to record data from a wide range of wind speed and directions and were the principal instruments on which this investigation was based. Measurements were made at distances of 100 metres, 50 metres and 25 metres for Turbine 1 (positions 1, 2 and 3 on Figure 3).

Plasmas Microsatellite Mission to Mars (Phase II) UK
 SC: Space Dynamics Contract No. 320-083, 20, 28, 33, 44, 51,
 48.

Ridge Power A.25W
 Wind Turbine 11 Bonus 420W
 Rotor Diameter: 36 meters
 Hub Height: 35m
 Controller Voltage: 33 V
 Site Design and Environmental Impact Assessment Ecogen
 Launching Cusset: August 1993
 Development Ecogen 569 West Turner Joint Venture
 Commissioning: June - July 1994
 Owner: Powergen

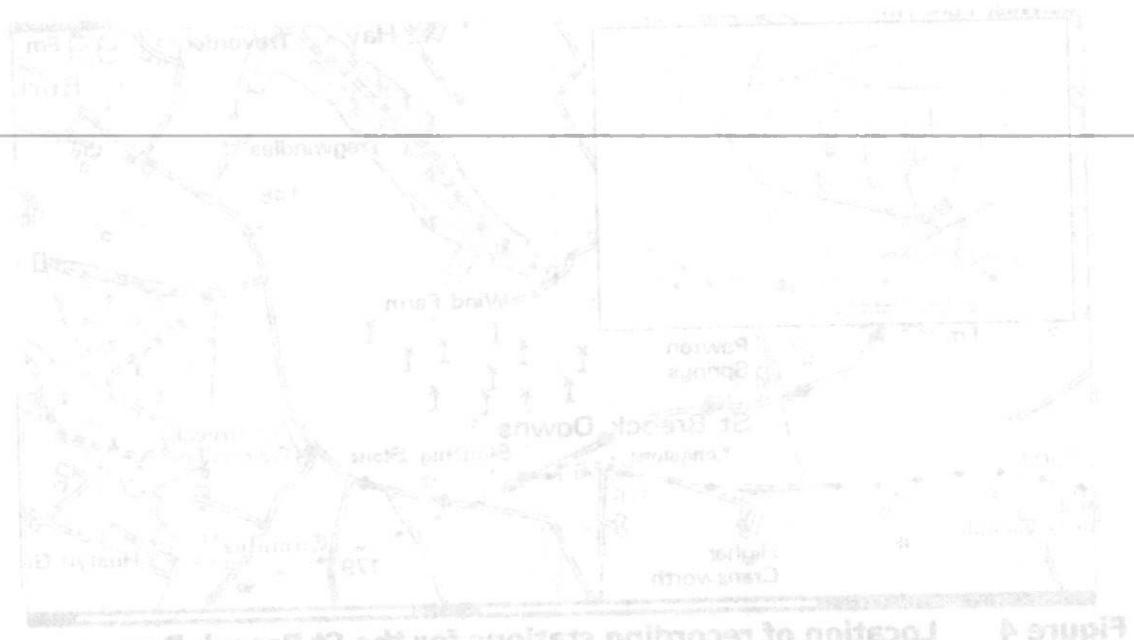


Figure 4 Location of recording stations for the St. George Domes experiments

A summary of three techniques were carried out

1. Deployment of AIRSOUND SPT 34-Pt Digital Recorder with LEVITATORS (E-30) 1 second pause in pulse off. Two sets of three combinations of seismometers were used with specifications and calibrations given in Appendix 1. These were deployed over 18 months until 30 V's were in order to record data from a wide range of wind speeds and directions and were able to record data from a wide range of wind speeds and directions over 100 meters, 20 metres and 25 metres for future studies (Appendix 1, 2 and 3 see Figure 3).

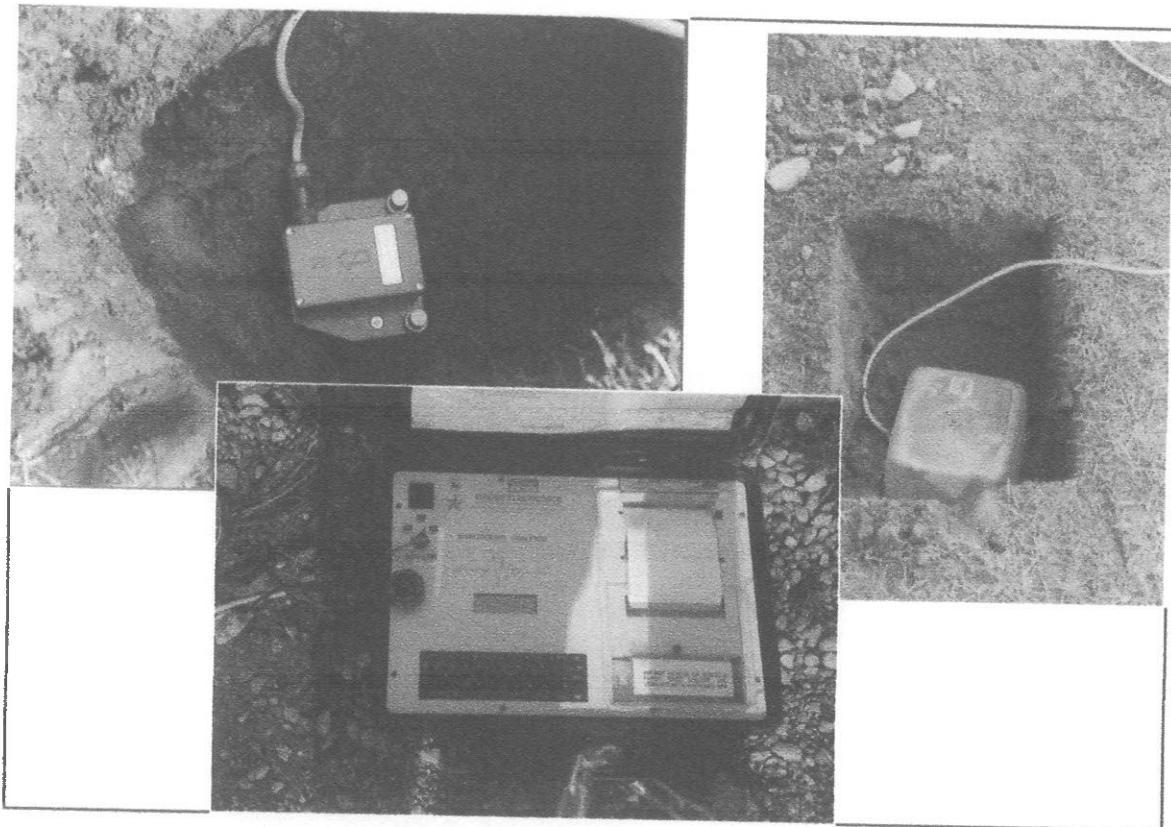


Figure 5 Recording Equipment for experiment 1

- 2 Deployment of GEOSENSE DV1 three component digital seismographs with direct PC interface. This was a portable, compact three-component instrument with a bandwidth from 0.2 Hz to 64 Hz which could be quickly and easily moved from site to site. This was ideal for measuring the variation in the low-frequency signal form different turbines and at a range of distances. This experiment took place during the period 18 to 20 March 1996 and measurements were made at positions 4 through 13 on Figure 4 and also at a distance of c 1 kilometre at Pawton Springs Farm (Figure 4).
- 3 Measurement of Acoustic Noise Level Variation with azimuth around a wind-turbine using Diagnostic Instruments PL22 FFT Frequency Analyzer and a Cirrus Research Ltd ZE901-40F with MK 182LF Microphone Capsule. This was supplied directly from the manufacturers with a dedicated calibrator. This instrument was also used to measure the actual machinery vibration using B&K Type 5318 accelerometers mounted on the base of Turbine 1. (Figure 6).



Figure 5 Recording Equipment for experiment 1

2310 seconds were mounted on the base of Figure 5 (Figure 6).
need to measure the static magnetic induction using 88k Type
Microphone Capsule. This was achieved directly from the
Analog and a Curt Research Ltd ZF80T-40F with MK 185LF
a wind-tube noise level Diagnostic Instrument PI 25 FFT Frequency
Measurement of Acoustic Noise Level Analysis with Attenuation around
50mL/min (Figure 4 and 5) at a distance of c 1 kilometre of Pawton
discharge. The experiment took place during the hours 18 to 20
Tuesday 12/06/2013 measurements were made at positions 4 through
13 on Figure 4 and 50 at a distance of c 1 kilometre of Pawton
Schools Farm (Figure 4).

3 Measurement of Acoustic Noise Level Analysis with Attenuation around
a wind-tube noise level Diagnostic Instrument PI 25 FFT Frequency
Analyzer and a Curt Research Ltd ZF80T-40F with MK 185LF
Microphone Capsule. This was achieved directly from the
manuscript with a digital camera clipper. The measurement was done
using a wind-tube noise level Diagnostic Instrument PI 25 FFT Frequency
Measurement of Acoustic Noise Level Analysis with Attenuation around
50mL/min (Figure 4 and 5) at a distance of c 1 kilometre of Pawton
discharge. The experiment took place during the hours 18 to 20
Tuesday 12/06/2013 measurements were made at positions 4 through
13 on Figure 4 and 50 at a distance of c 1 kilometre of Pawton
Schools Farm (Figure 4).

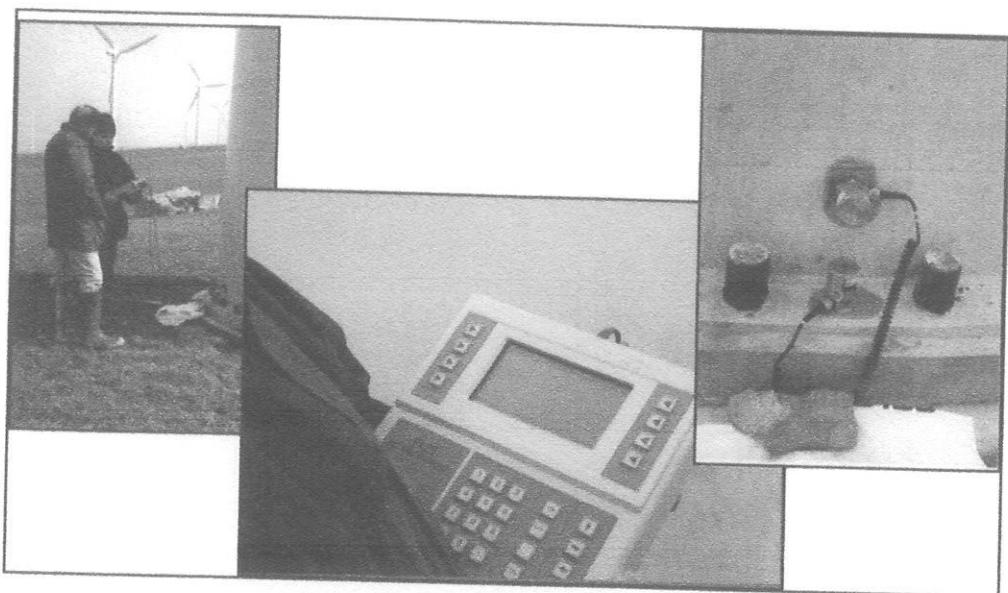


Figure 6 Recording equipment for the on-tower experiment 3

The following objectives were addressed: and the following main conclusions were reached:

- 1 To determine whether low frequency vibrations (down to 0.1 Hz) are transmitted through the ground from a modern wind farm and if so to measure their amplitude and frequency content.

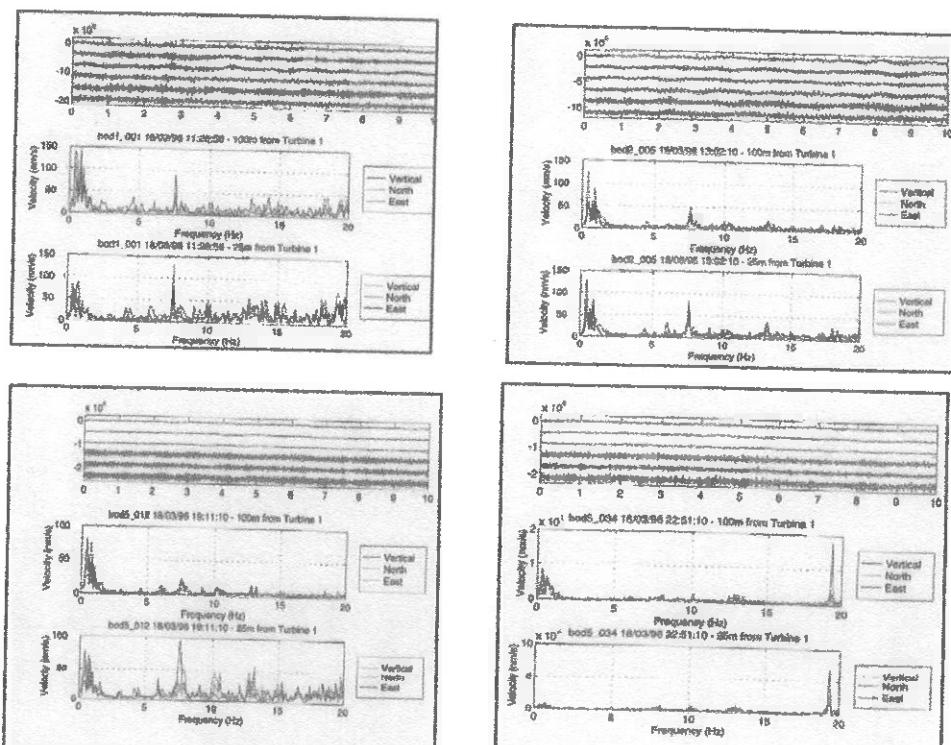


Figure 7 A selection of seismic signals and their spectra measured at St Breock Downs

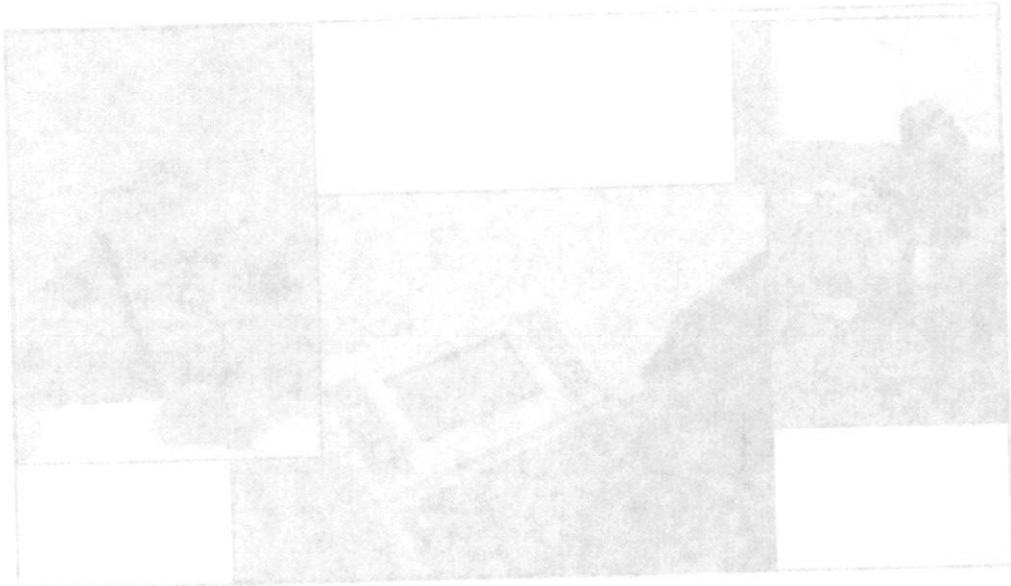


Figure 6 Recording equipment for the no-power examination

The following objectives were addressed; and the following main conclusions were reached:

To determine whether low frequency vibration causes (now) to the following objectives were addressed; and the following main conclusions were reached:

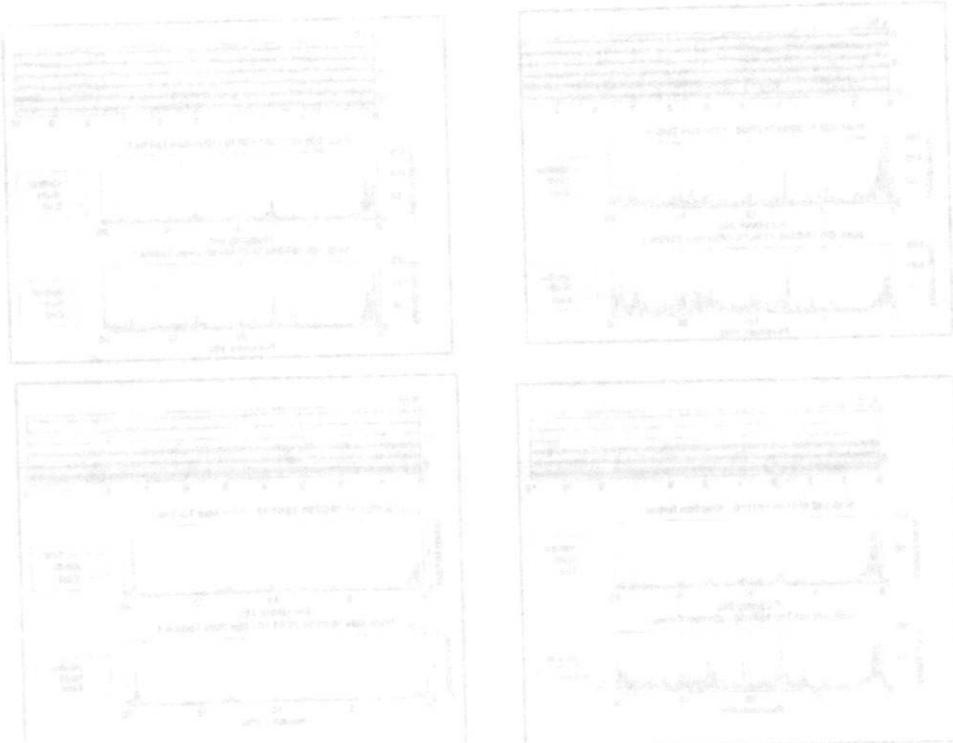


Figure 7 A selection of seismic signal plots from three seismic sensors

Clear harmonic components at multiples of 0.5 Hz were observed on the majority of the spectra with particular peaks at 0.5, 3.0, 4.5, 6.0, 7.5 Hz and higher frequencies at levels of up to 250 nanometres s^{-1} (0.25 microns s^{-1}) and general levels of 50 to 80 nanometres s^{-1} (Figure 6) . The presence of so many harmonics which are multiples of the blade passing frequency and the clear attenuation of signal amplitude with distance especially for the 7.5 Hz component is a *prima facie* argument that the signals are being generated from the wind turbines and although the levels are small they can easily be detected on appropriate sensors. The 1.5 Hz component is not the strongest harmonic as might have been suspected.

2 To make measurements at a range of distances to determine the variation in frequency and amplitude of low-frequency vibrations

Measurements were made at distances of 25, 50 and 100 metres from Turbine 1 and the frequencies above 3.0 Hz were seen to attenuate with distance with higher frequencies decaying faster as expected. During the sequential shutdown frequencies were observed over a distance of some 500 to 700 metres and significant attenuations noted with the exception of the very lowest frequencies which in fact increased in frequency. This may be a due to interference effects which were less with fewer turbines in operation or the harmonic may be sourced from elsewhere. The 0.5 Hz signals were detected at a distance of c 1 kilometre from St Breocks Down at Pawton springs Farm.

3 To make measurements for a range of wind speeds to determine the variation in frequency and amplitude of low-frequency vibrations

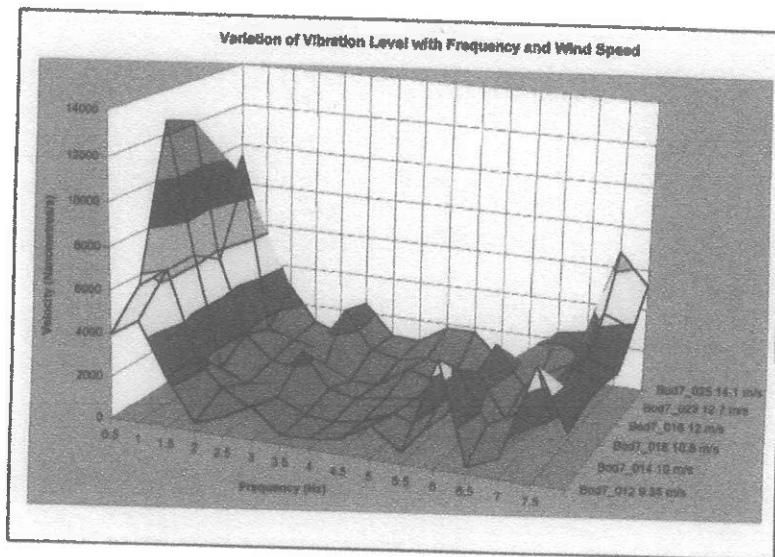
Measurements were made over a range of wind speeds from c 7 ms^{-1} to 14 ms^{-1} at a constant direction (Figure 8). The amplitude of the harmonics generally increase with increasing windspeed. This is particularly evident for the 0.5 Hz harmonic, the 3 Hz harmonic and the 7.5 Hz harmonic. However and rather surprisingly the amplitude of the 6 Hz harmonic shows an inverse relationship: as the wind speed rises the amplitude of this harmonic falls. It seems that the partition of energy between the 6 and 7.5 Hz harmonics in particular is strongly dependent on wind-speed. Notwithstanding the reservations expressed concerning the nature of the ultra-low vibrations, the increase in amplitude of the 0.5 Hz component with wind speed suggests that it does have a source which is related in some way to the wind turbine farm.

4 To make measurements for a range of wind directions to determine the variation in frequency and amplitude of low-frequency vibrations

Measurements were made over a range of wind directions from c 120° to c 310° at a constant wind speed of 10 ms^{-1} . Clear variations in amplitude were

Measurements were made at distances of 25', 50 and 100 metres from T-junction 1 and the frequency slope 3.0 Hz were seen to fluctuate with distance with higher frequencies decreasing faster as speeded. During the steady-state runabout frequencies were observed over a distance of some 200 to 200 metres and significant fluctuations arose with the exception of the area closest to the junction which is fast running. This may be due to interference effects which were less with lower speeds in observation of the 0.2 Hz sinusoidal wave.

observed with levels varying by about a factor two. The variation had the same spatial pattern for most frequencies and this pattern correlated with acoustic measurements made at closer angular increments within the limitations of the data

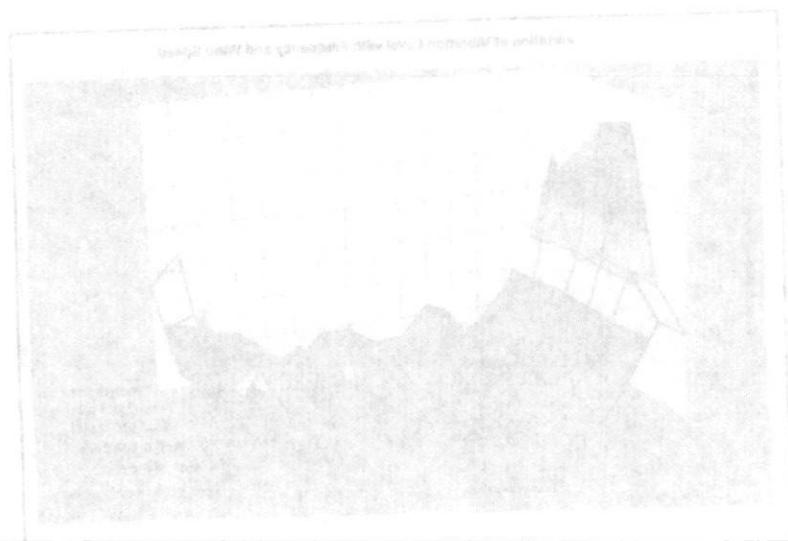


Event Number	Wind Speed	Wind Direction
Bod7_012	9.35	119.5
Bod7_014	10.0	113
Bod7_016	12	123
Bod7_018	10.8	110
Bod7_023	12.7	118.5
Bod7_025	14.1	120

Figure 8 Variation of Amplitude and frequency with windspeed

5 To investigate the variation of amplitude and frequency as a sequence of wind turbines were sequentially switched off

species-rich areas around a major river. This same species-rich area has higher species richness and first settlement dates than the more sparsely populated areas to the east.



Settlement Date	Species Richness	Reduced Logit
1000	20	-0.700
1100	30	-0.500
1200	40	-0.300
1300	50	-0.100
1400	60	0.100
1500	70	0.300
1600	80	0.500

Figure 8. Relationship between first settlement date and species richness. The reduced logit is calculated as $\ln(SR/(100-SR))$, where SR = species richness.

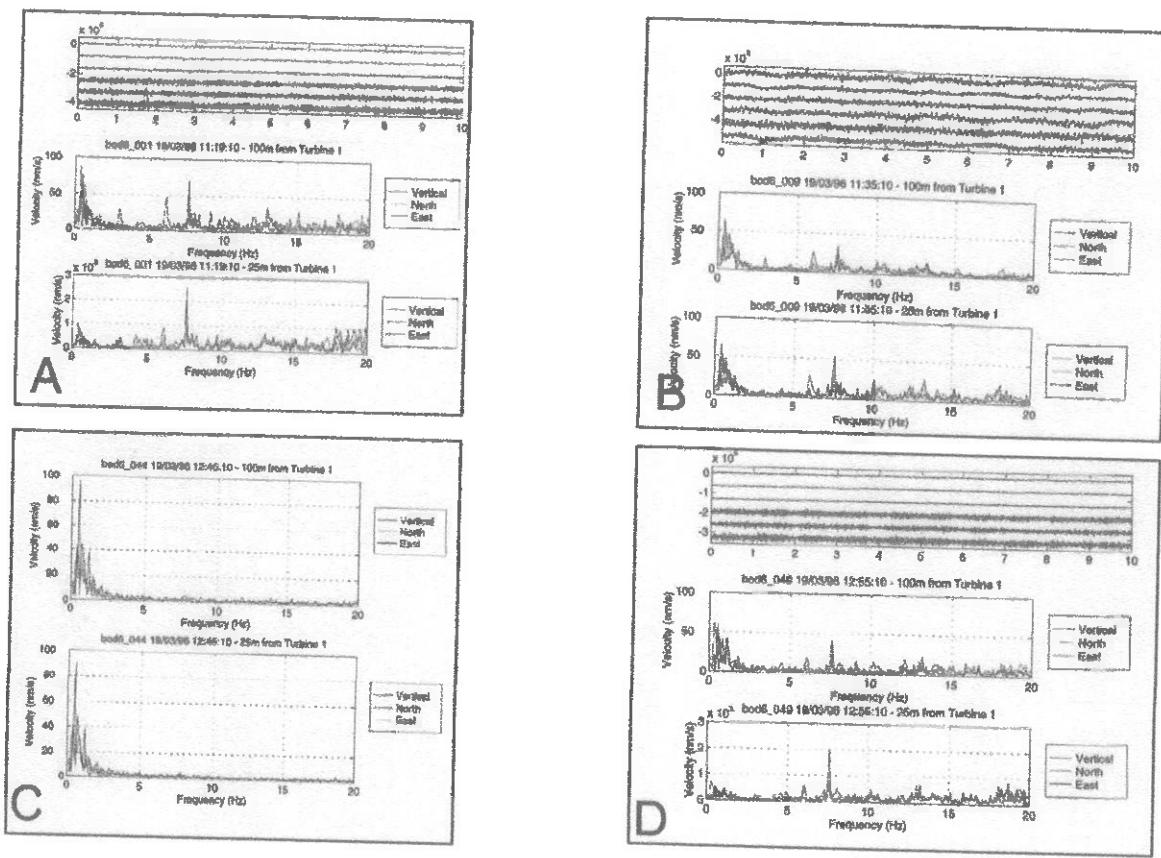


Figure 9 Sequential Shutdown

A) All On, B) T1 Off, C) All Off, D) Only T1 On

Time Interval	Turbines On	Turbines Off	Event Numbers
11:19 to 11:28	All 1 to 11	None	Bod6_001 to Bod6_005
11:29 to 11:48	2 to 11	1	Bod6_007 to Bod6_016
11:49 to 12:08	3 to 11	1,2	Bod6_017 to Bod6_025
12:09 to 12:10	4,5,6,7,8,9,10,11	1,2,3	Bod6_026
12:11 to 12:12	5,6,7,8,9,10,11	1,2,3,4	Bod6_027
12:12 to 12:23	3,5,6,7,8,9,10,11	1,2,4	Bod6_028 to Bod6_03
12:24 to 12:41	5,6,7,8,9,10,11	1,2,3,4	Bod6_034 to Bod6_041
12:42 to 12:49	None	1,2,3,4,5,6,7,8,9,10,11	Bod6_042 to Bod6_046
12:50 to 12:56	1	2,3,4,5,6,7,8,9,10,11	Bod6_047 to Bod6_050
12:57 to 13:13	None	1,2,3,4,5,6,7,8,9,10,11	Bod6_053 to Bod6_058
13:14 to 13:15	3	1,2,4,5,6,7,8,9,10,11	Bod6_059

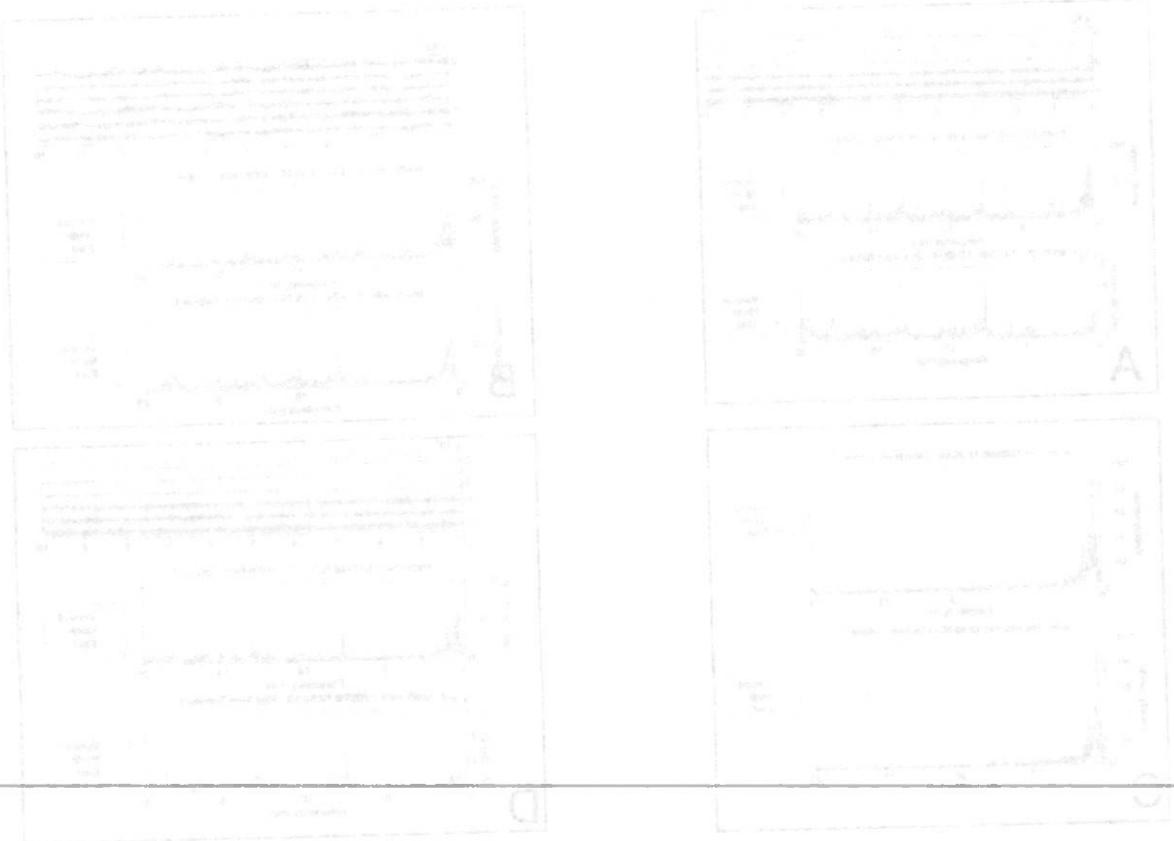


Figure 9. Scatterplot Subplots

(A) Only IT Out
(B) All Out
(C) All Out (D) Only IT Out

Sample Description	Number of T	Number of O	Number of T + O
100_More than 100_000	470	113	583
100_More than 100_000	1	113	114
200_More than 10_000	2,1	113	2,2
200_More than 10_000	2,5	113,0,2,0,2,0	0,1,2,4,5,7,8,9,10
300_More than 10_000	4,5,1	113,0,2,0,2,0,2,0	0,1,2,4,5,7,8,9,10
300_More than 10_000	5,5,1	113,0,2,0,2,0,2,0	0,1,2,4,5,7,8,9,10
100_lowest PCO_000	6,5,3,1	113,0,2,0,2,0,2,0	0,1,2,4,5,7,8,9,10
200_lowest PCO_000	11,0,1,2,3,7,0,2,0,6,1,1	113,0,2,0,2,0,2,0	0,1,1,2,4,5,7,8,9,10
300_lowest PCO_000	11,0,1,2,3,7,0,2,0,6,1,1	113,0,2,0,2,0,2,0	0,1,1,2,4,5,7,8,9,10
370_lowest PCO_000	11,0,1,2,3,7,0,2,0,6,1,1	113,0,2,0,2,0,2,0	0,1,1,2,4,5,7,8,9,10
400_lowest PCO_000	11,0,1,2,3,7,0,2,0,6,1,1	113,0,2,0,2,0,2,0	0,1,1,2,4,5,7,8,9,10

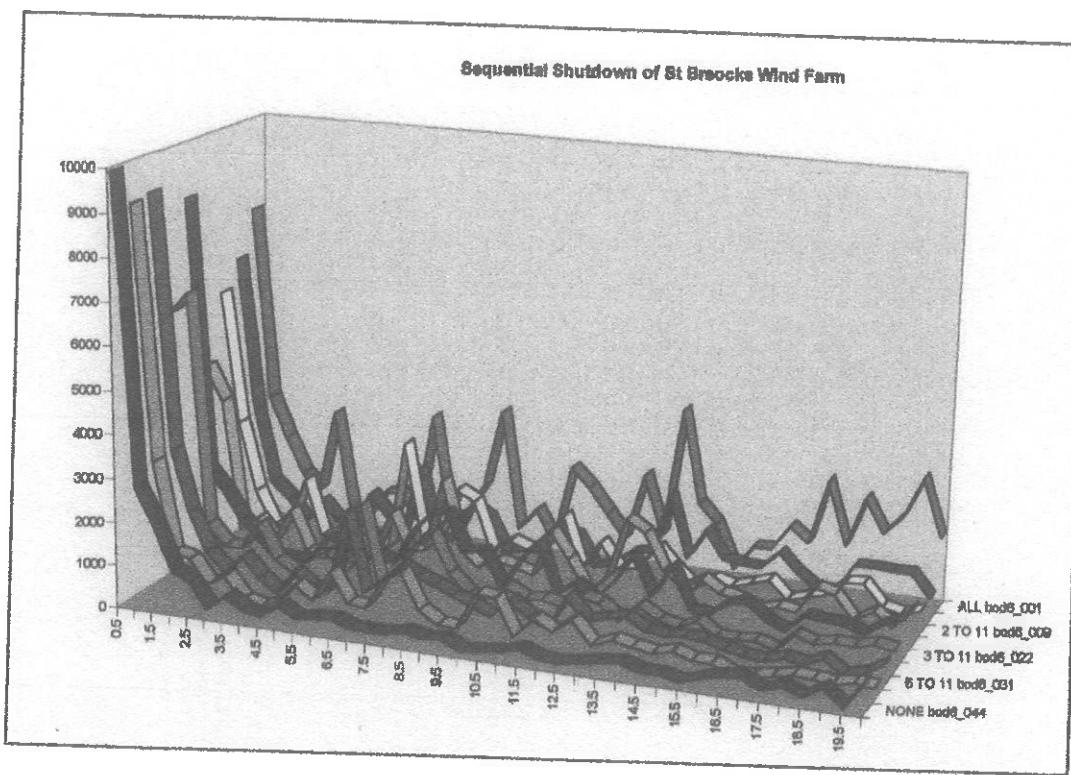


Figure 10 Shutdown Summary

The levels of vibration fell in a manner which was consistent with their origin being from the wind turbine farm. The lowest frequencies persisted even when the whole turbine field was shut-down which indicates that their source may be external to the site or that some complex interference is happening between the multiple vibration sources such as the resonance of the tower structure itself under wind loading.

6 To investigate the variation of amplitude and frequency between individual wind turbines

The presence of large wind components on the shallowly buried instrument masked some of the subtler variation but the levels of vibration (c 50 to 100 nms^{-1}) were consistent between machines although individual frequencies showed considerable variation over the whole St Brecks site.

7 To investigate the frequencies present in the vibrational spectrum of the turbine tower itself for comparison with the microseismic measurements

Figure 11, recorded using accelerometers mounted on the base of Turbine 1, clearly show tonal components which correspond with the frequencies observed out as far as 1 km away from the windfarm. The 4.5 and 7.5 Hz components seen on the microseismic records are particularly pronounced within the infrasonic band (sub 20 Hz) as are other harmonics of 1.5 Hz.

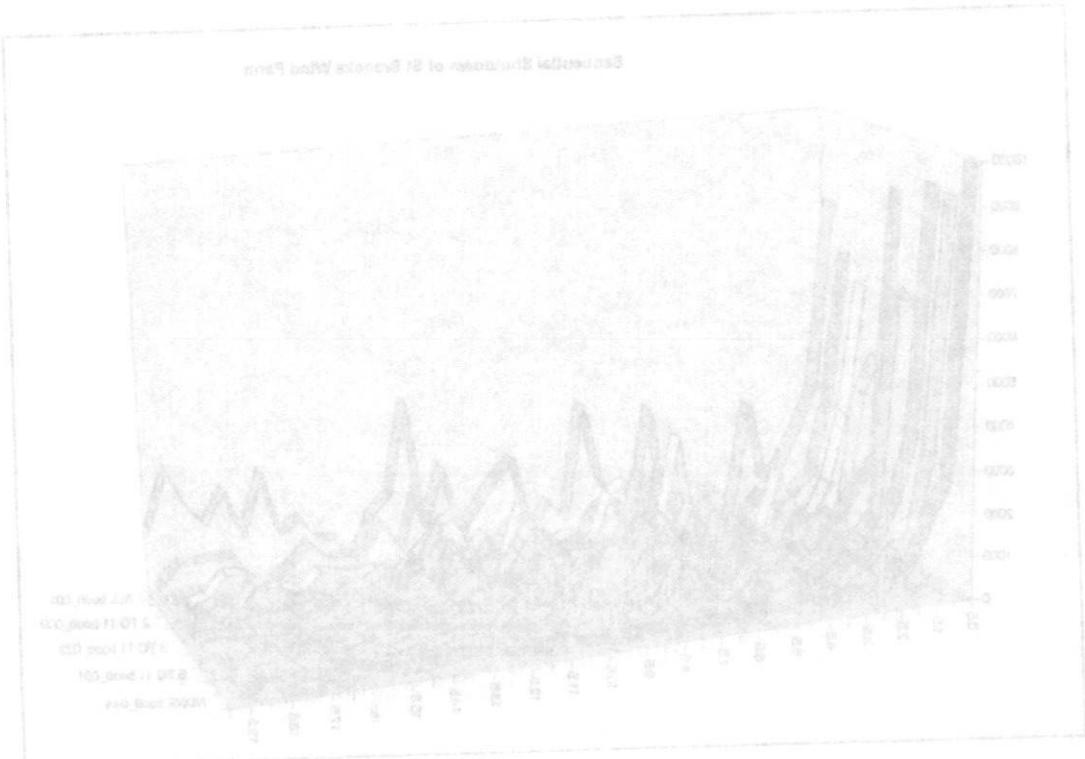


Figure 10. Spectrogram of ambient wind turbulence.

The presence of such a scatterer will in a manner which was consistent with their origin lead to more wind turbulence levels. The lowest turbulence levels were between 0.01 and 0.02 sec. Wind turbulence levels may be expected to rise or fall due to some complex interactions between the various sources between the multiplex dispersion sources such as the resonance of the former structures itself under wind loading.

6.2 Investigations of amplitude and frequency dependence individual wind turbulence components

The presence of single wind components on the scatterer produced instabilities which were due to the smaller separation of the levels of dispersion (≈ 20 to 100 nm). The consequent pattern was quite similar to individual turbulence sources considered over the range of 12 decades size.

7.2 Investigations of the turbulence spectrum in the dispersion measurements

Figure 11 recorded using scattering methods on the pass to Tunisie, clearly shows point components which correspond with the frequencies observed out as far as to away from the windscreen. The 2.5 and 5 Hz components seen on the micrometeorological records are definitely bounded within the resonance band (up to 5 Hz) as the other resonance of 1.2 Hz.

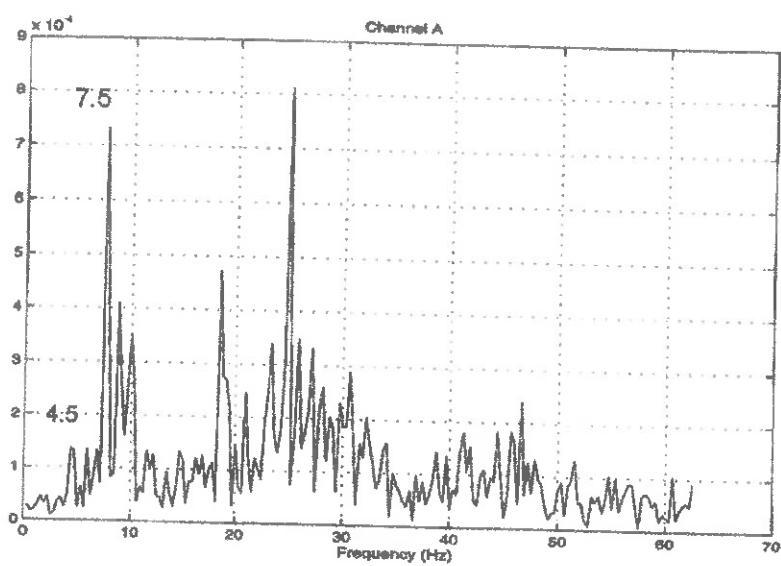


Figure 11 On-tower accelerometer spectrum at Turbine 1 recorded while all other turbines were switched off.

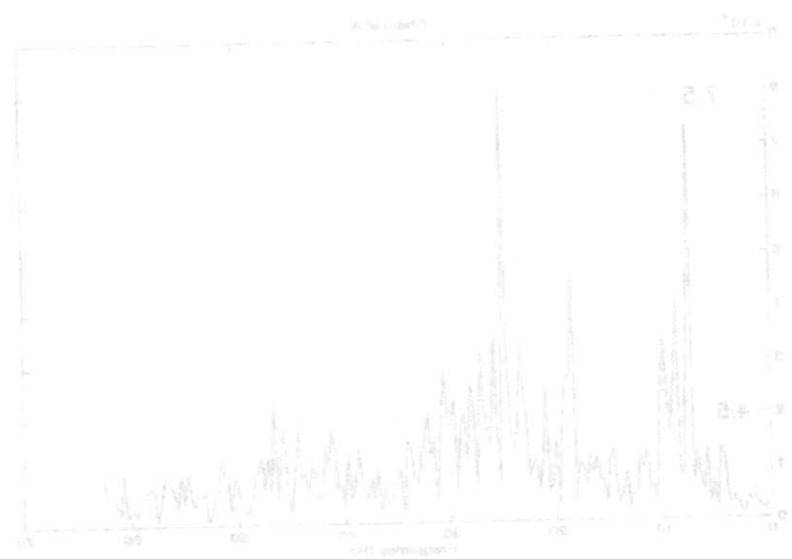


Figure 11. On-power accelerometer spectrum of Turnipine I recorded while all other puppines were swiped off.

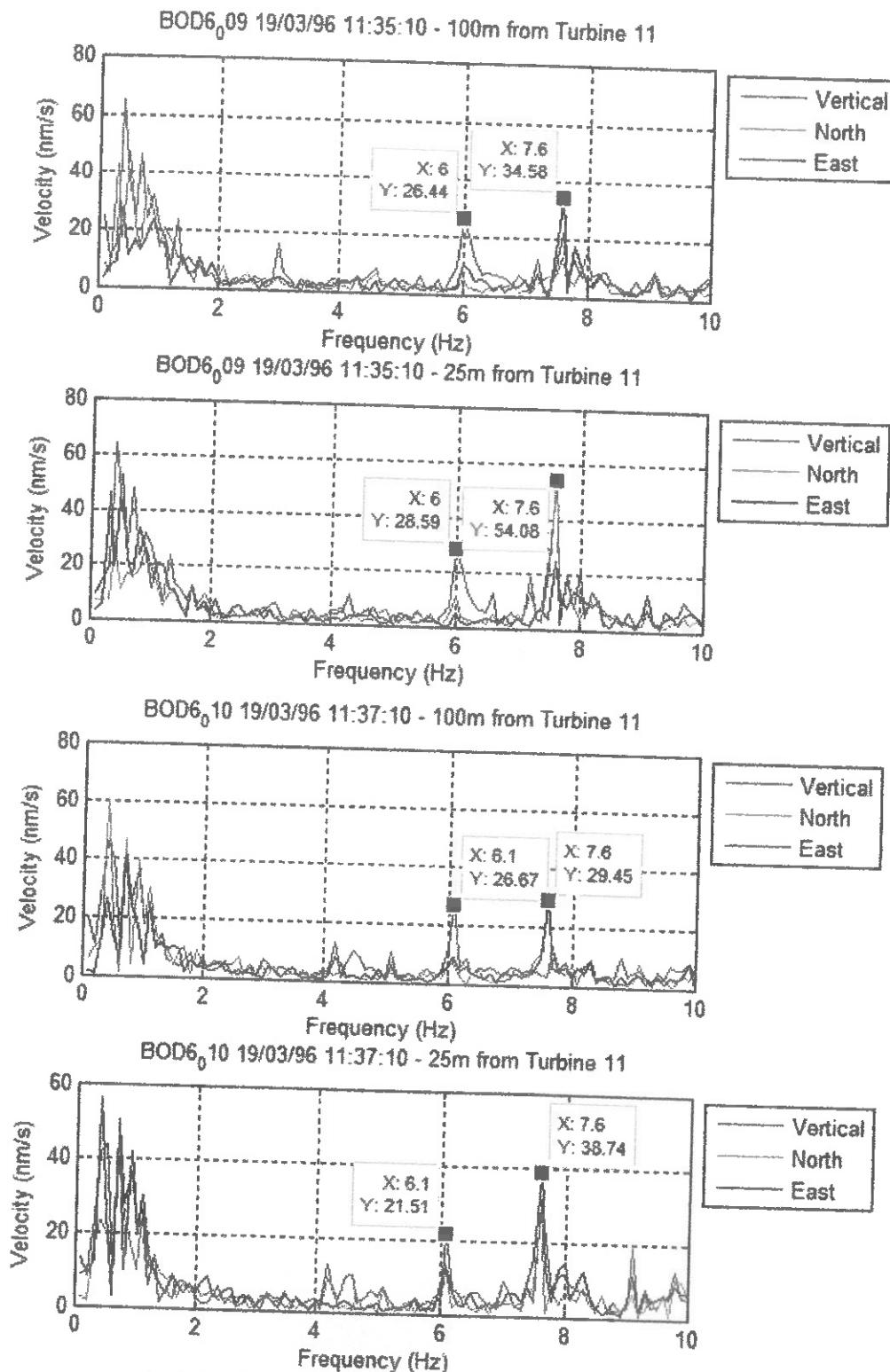


Figure 12 Selected spectra during the sequential shut-down at St Breock Downs

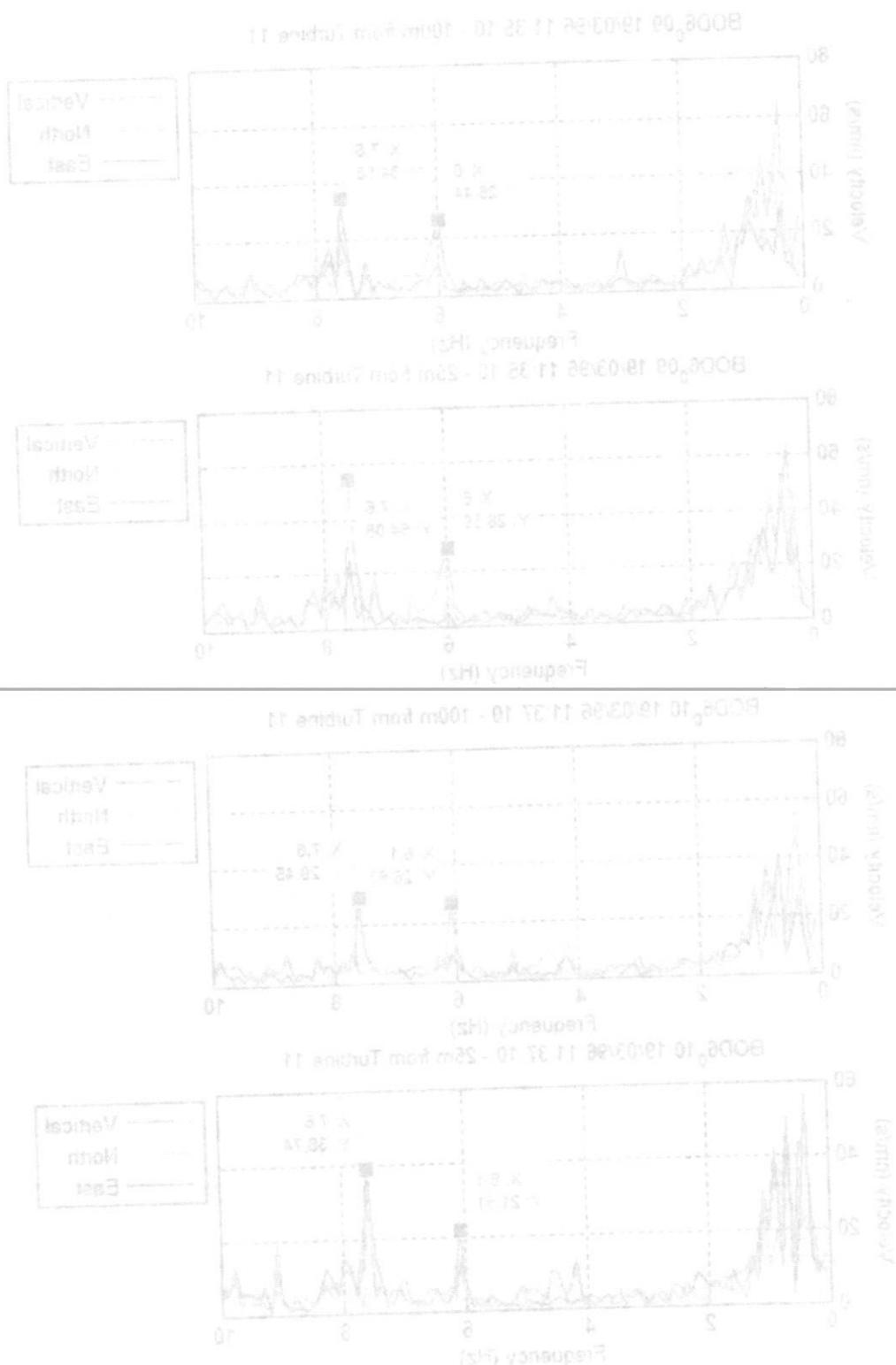


Figure 15 Selected seconds during the second half of the 100m race Turnie II

8 To investigate the mode of propagation of the seismic vibrations

The spectra above and the following figure show the variation in amplitude of the best detected 6 and 7.5 Hz harmonics, against distance from the turbine during the switch-off experiment. These and their averages have then been compared with different models for the attenuation of the amplitude with distance. There is considerable variation but the data fit a $r^{-(1/2)}$ model much better than a r^{-1} model.

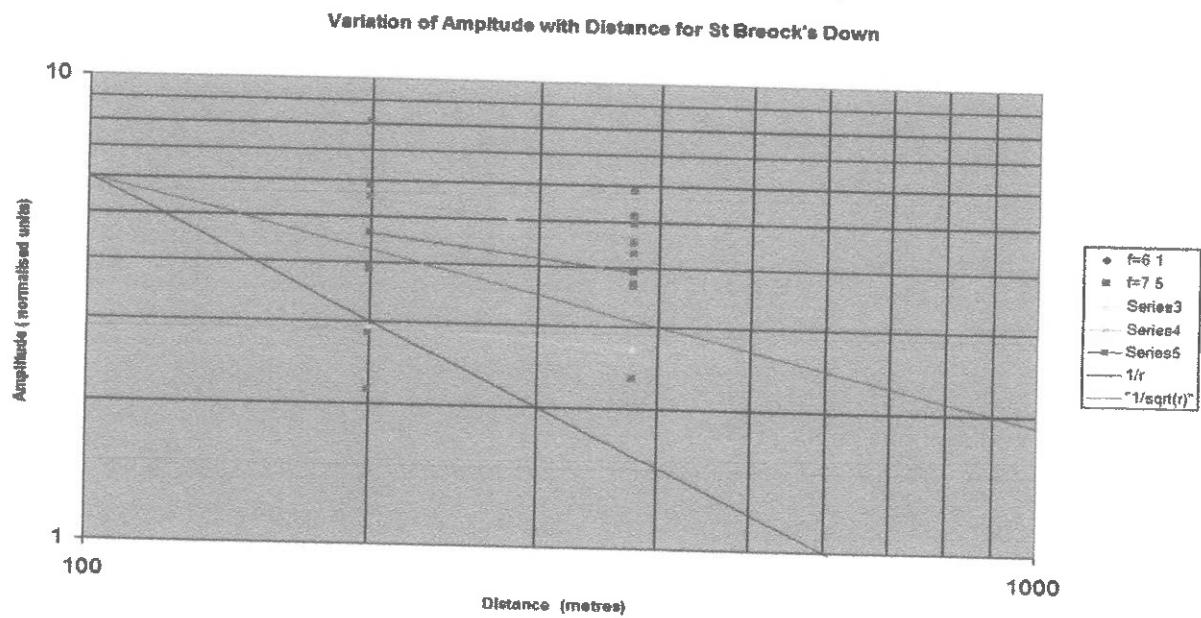


Figure 13 Variation of amplitude of well-detected frequencies with distance and a comparison with various attenuation models.

Extremely Low wind speed, no production:

Date: 01.10.2004
Time: 04:00 to 05:00
Average wind speed: 3.46ms⁻¹
Average wind direction: 206.67°
Average production: -4.5 kW

It is clear that when wind speeds are close to zero and there is no production then no infrasound signals can be seen on any of the detectors as would be predicted.

Low wind speed, low production:

Date: 01.10.2004
Time: 06:00 to 07:00
Average wind speed: 4.58ms⁻¹
Average wind direction: 221.33°
Average production: 1826.8 kW

When the windfarm starts to generate at low wind speeds, considerable infrasound signals can be detected at all stations out to c 10 km. Clear harmonic components which are the second multiple and up of 1.4 Hz (the blade-passing frequency) can be seen although interestingly and somewhat enigmatically the blade-passing frequency itself is not so strongly detected

Moderate wind speed, moderate production:

Date: 02.10.2004
Time: 00:00 to 01:00
Average wind speed: 7.29ms⁻¹
Average wind direction: 245.67°
Average production: 9100.9 kW

When the windspeed and production rise clear signals can be seen on Kelphope 1 at c 2 km but the signals are not so well detected at the more distant array.

High wind speed, full production:

Date: 02.10.2004
Time: 11:00 to 12:00
Average wind speed: 11.189ms⁻¹
Average wind direction: 254.67°
Average production: 16920.8 kW

Experiments for Wind speed, no loadings

Average Wind speed:	3.46m/s	Date:	01.10.2004
Time:	04:00 to 09:00		
Average Wind direction:	208.62°		
Average loadincition:	-4.2 KM		

If a clear first year wind speeds are close to zero and there is no loadincition then no interesting signs can be seen on any of the detectors as many be predicted.

Low wind speed, no loadings

Average Wind speed:	4.28m/s	Date:	01.10.2004
Time:	06:00 to 09:00		
Average Wind direction:	251.33°		
Average loadincition:	1856.8 KM		

When the windfarm starts to generate at low wind speeds, one detector situated close to the turbines out of a 10 km. Clear permanent countonuts appear in the second minute due to the 1st HS (the pitch-based loadincition) can be seen significantly intensifying as the pitch-based loadincition frequency repeat is not so strongly detectable

Moderate wind speed, moderate loadings

Average Wind speed:	7.52m/s	Date:	05.10.2004
Time:	00:00 to 01:00		
Average Wind direction:	245.62°		
Average loadincition:	3100.8 KM		

When the windspeed and loadincition rise clear signs can be seen on Kefiboe's up to 5 km up the signs are not so well detected as the more distant sites.

High wind speed, full loadings

Average Wind speed:	11.186m/s	Date:	05.10.2004
Time:	11:00 to 15:00		
Average Wind direction:	254.82°		
Average loadincition:	16850.8 KM		

When the windspeed and production rise then while it is possible to see the harmonics at Kelphope they are not detectable at all on the more distant array at 10 km.

This is a very significant observation and indicates that infrasound signals from windfarms only appear to propagate efficiently to the more distant parts of the array during relatively calm conditions when turbulence associated with high wind velocities is not present.

This is in marked contrast to the microseismic signals observed during exactly the same period which grow in amplitude and power as the wind speed and energy production increase. While it is apparent that infrasound signals can clearly be detected at considerable distances away from a windfarm in the right conditions and may have an importance in this regards, they CANNOT be the primary source for the ground vibrations we measure on buried seismometers as there is an inverse relationship with windspeed and weather conditions for the two phenomena and they cannot therefore be causally related.

This confirms what was suggested earlier, that the vibrations experienced on seismometers situated at considerable distances from farms propagate through the ground as high frequency Rayleigh waves and not through the air, and as such must obey the propagation modes and attenuation and absorption laws for geological materials and not air.

This confirms what was suggested earlier, that this division excludes no elements of considerable interest from some publications although the Bluna as high modernity Relying on bases and not through this, such as such must obey the proportionality norms and differentiation and specialization and the other

ON-Tower monitoring of a variable speed wind farm

A variable speed site was made available at Ardrossan, a 12 turbine 24 MW windfarm operated by Airtricity in order for us to carry out on-tower monitoring there and we are grateful for their very helpful cooperation.

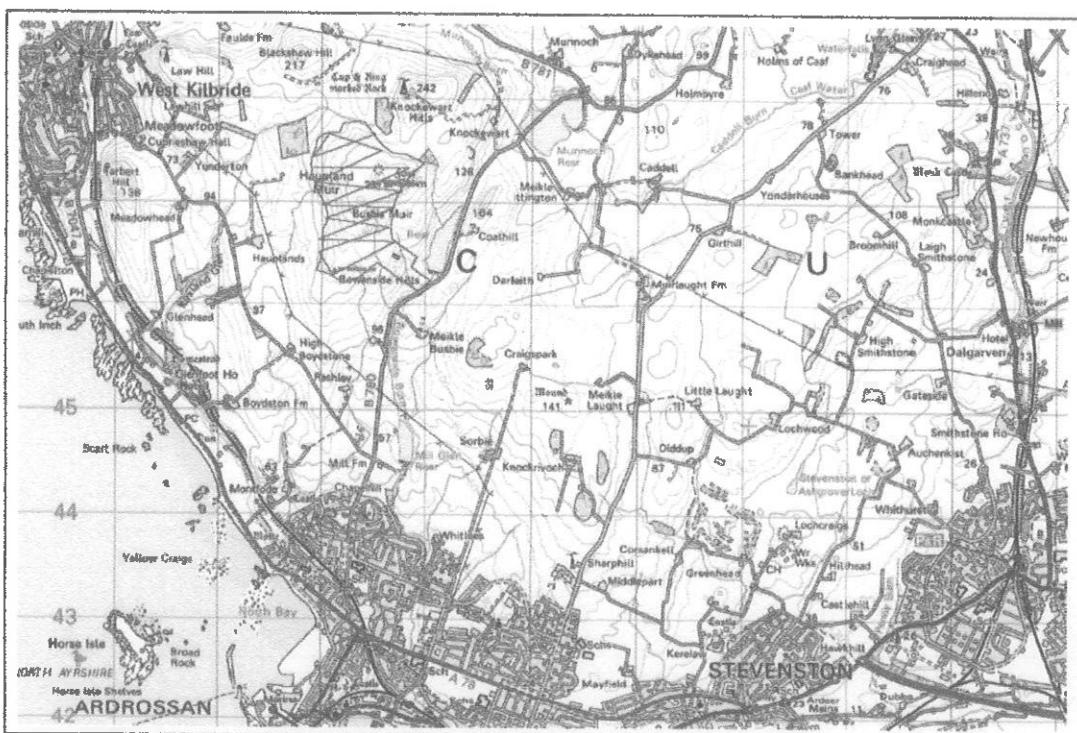
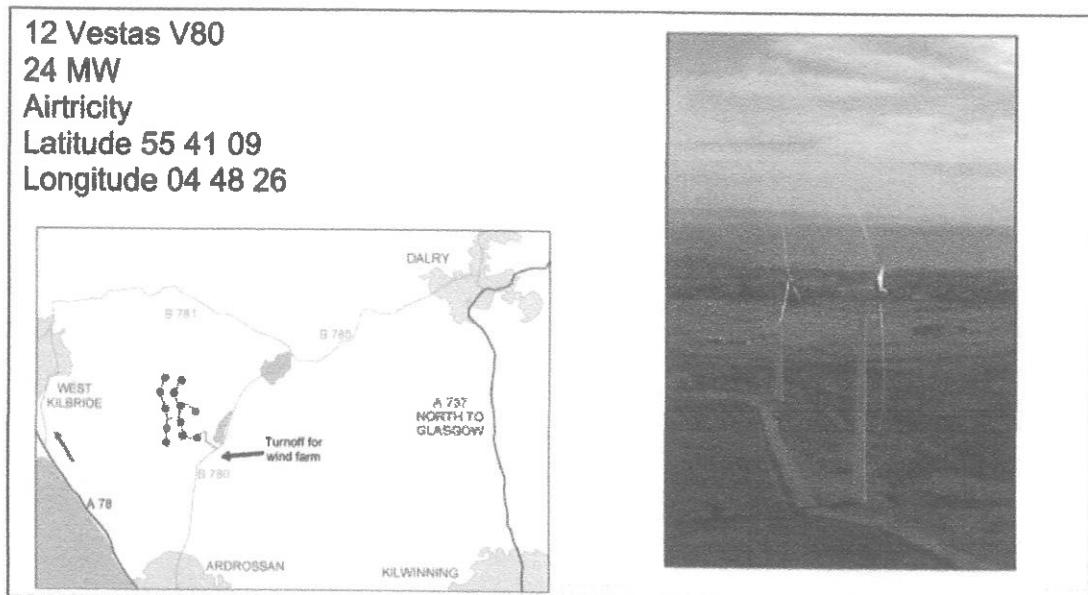


Figure 56 Location of Ardrossan variable speed windfarm

ON-Tower monitoring of a shipshape wind farm

A shipshape based site was made available at Alderssau, a 15 turbine 54 MW windfarm operated by Altholz in order for us to carry out on-tower monitoring and site specific flow field measurements.

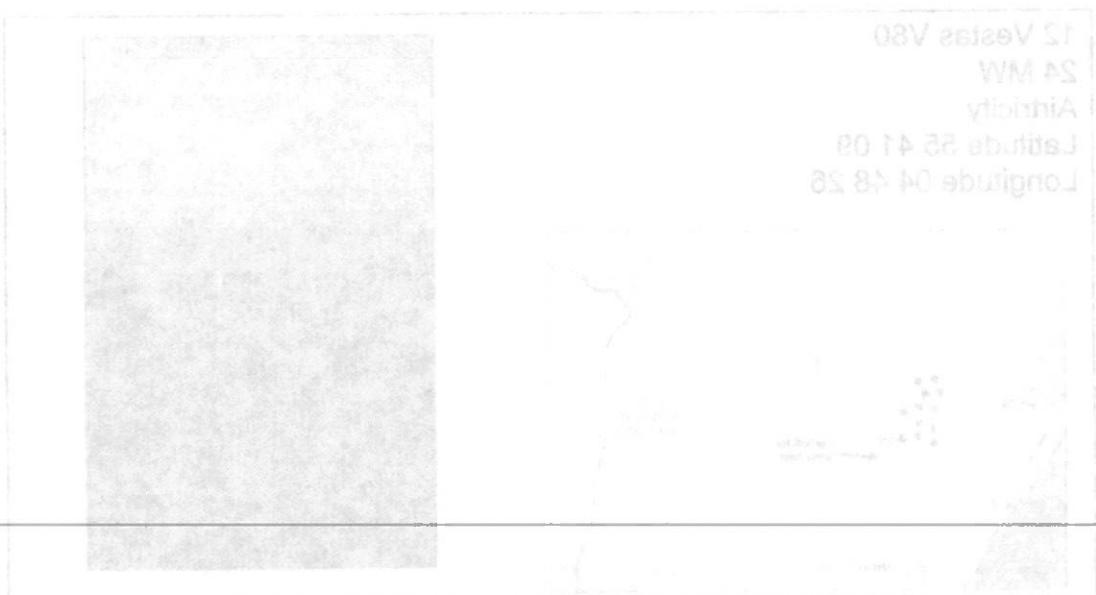


Figure 66 Location of Alderssau shipshape windfarm

The Guralp CMG-DM24S12AMS acquisition and monitoring system with 6 CMG-5U accelerometers was deployed on wind turbine 1 on 2/11/2004 and on Turbine 7 on 9/12/2004 , in each case a 1 CMG-5TD digital output strong motion accelerometer buried at a distance between from each turbine. Locations of the site and the turbines are shown in figures 56 and 57. Details of the deployment and sequence of shutdown of these experiments are given in Appendix C.

Accelerometers were attached to the tower along North South East and West azimuths and also mounted vertically as described in Appendix 3. A rapid shut down and sequential switch on was carried out and the spectrograms for both phases are shown in Figures 58 and 59.

As these are variable speed turbines we should not expect to obtain quite such distinct harmonics as we might measure at a fixed speed windfarm as has already been shown from Crystal Rig. However, it is very clear that we do have remarkably persistent spectral peaks which do not appear to change much during the 90 minutes of this experiment. They form bands which are very pronounced between 3 to 5 Hz and between 6 to 9 Hz but there are distinct spectral peaks even within these bands. They disappear as soon as the farm is switched off, reappear for the short time that turbine 7 and then 6 are on individually and then reappear gradually as the sequential switch-on occurs as described in the tables beneath the spectrograms.

Measurements close to the turbines allow us to clearly see the fall and subsequent rise in power but because there is a considerable disparity in distance to the individual turbines does not allow us to assess quantitatively how the signal sums as extra turbines are included.

In order to address this we have selected the 4.5 Hz band on the Kelphope1 station (2.4 km) during the Dun Law switch-off experiment and have calculated the power change during the switch off and on. The signals from this station were filtered to remove all other components and the rms power was calculated through the duration of the switch off. These are shown in Figure 60 (lower figure).

It is clear that as the number of turbines increases the power increases but it does not scale linearly with power (i.e. the final signal is not 26 times as large as the 1 with a single turbine).

Schofield (2001) suggested that the power should scale as $/N$ and this seems to be the case as in fact it is approximately 4 to 5 times as much, which is close to what we would anticipate for 26 turbine ($/26=5.1$).

The CMG-DM5431SAMS accelerometer and gyroscope assembly will be CMG-
5U accelerometers was developed on wind turbine 1 on S115004 and on Turbine 2
on S115004. In each case it is CMG-5TD digitized output standard motion
accelerometer having a vibration pattern from each turbine. Location of the
site and the turbine site shown in figure 28 and 29. Details of this development and
background of vibration of these experiments are given in Appendix C

Accelerometers were attached to the tower south South East and West
summits and sky mounted vertically as described in Appendix 3. A rigid shaft
down and secondary switch on was carried out and the specifications for both
bases are shown in Figure 28 and 29.

At these sites shapes speed turbines are shown for each of option drive and
driving harmonics as we might measure at a fixed speed windturbine as has already
been shown for Cayley Ridge. However, it is very clear that we do have
yawshape based on the Cayley Ridge. They form bands which are also pronounced
between 3 to 2 Hz and between 6 to 8 Hz but there is distinct spectral break
even within these bands. They disappear as soon as the flow is switched off, i.e.
better for the short time first turbine 1 and then 6 are no individuality and thus
lessable directly as the secondary switch-on occurs as described in the paper
except the second drive

Measurements done of the turbines show us to classify see the left and suspended
base in power put because there is a considerable disability in dynamics of the
individual turbines does not allow us to assess dynamics how the individual sum
as extra turbines the tendency

In order to address this we have selected the 2.5 Hz band on the Kielometer
spill (2.4 km) during the day and night and excursion and have calculated
the power dissipation during the active part and on. The results from this option were
utilized to remove all other components and the rms power was calculated through
the duration of the campaign. These are shown in Figure 60 (power figure).

If is clear that as the number of turbines increases the power increases but it does
not scale linearly with power (i.e. the total signal is not 25 times as large as the 1
with a single turbine).

Schlieren (200) addressed that the power scaling rule is in and this seems to be
the case as in fact it is approximately 4 to 5 times as much, which is close to what
we would anticipate for 2.5 turbine (2.5=2.1).

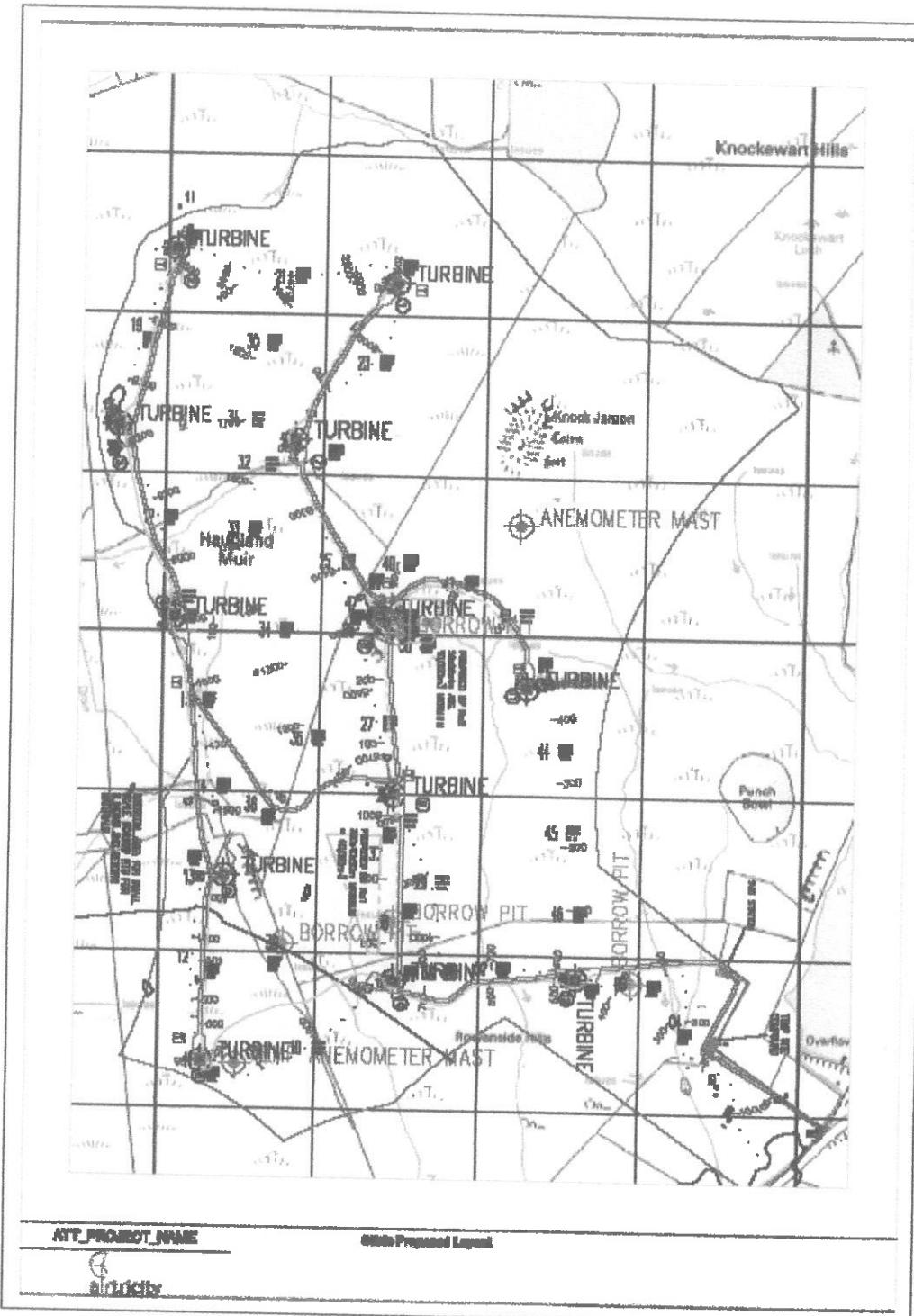
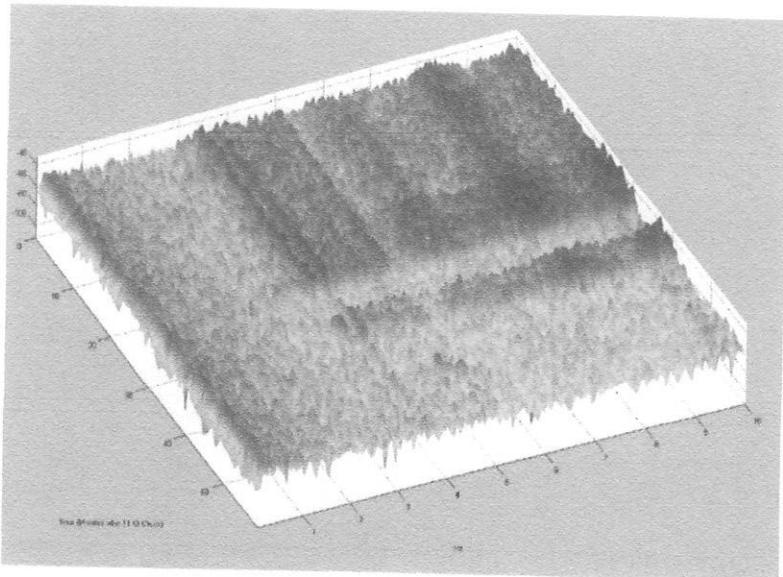


Figure 57 Map of the Turbine Locations at Ardrossan



11.25	All
11.30	All Off
11.35	7
11.40	All Off
11.45	6
11.50	6,10
11.55	6,10,12

12.00	6,10,12,5
12.05	6,10,12,5,9
12.10	6,10,12,5,9,11
12.15	6,10,12,5,9,11,8
12.20	6,10,12,5,9,11,8,4
12.25	6,10,12,5,9,11,8,4,3
12.30	6,10,12,5,9,11,8,4,3,2
12.35	6,10,12,5,9,11,8,4,3,2,7

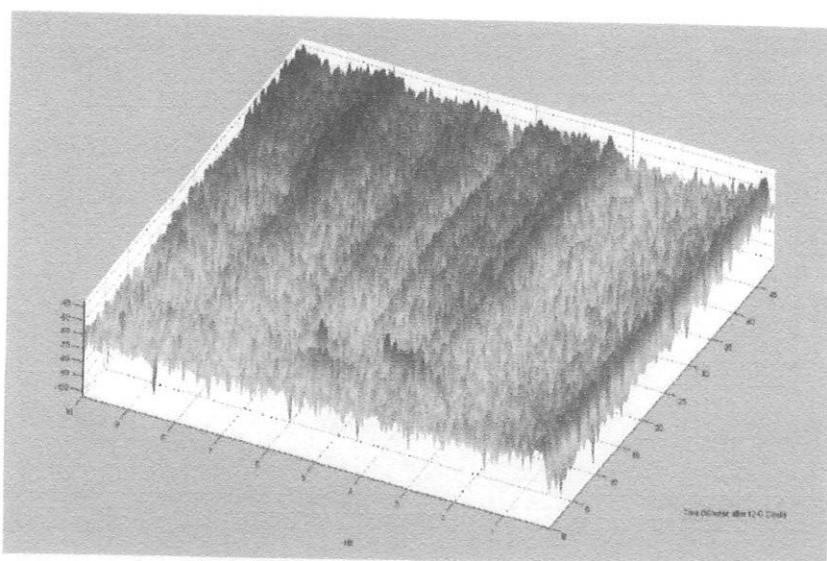
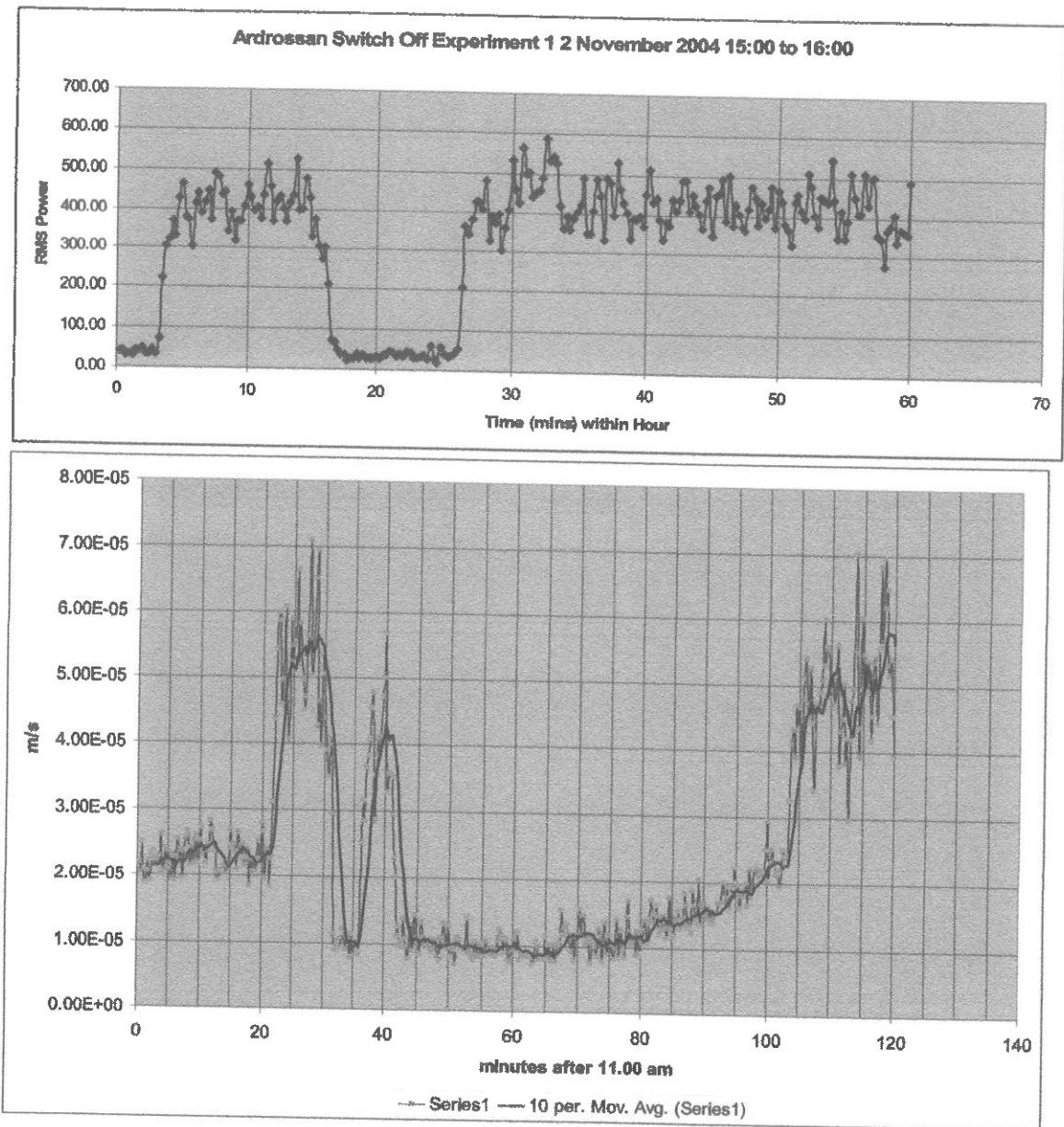


Figure 58 Spectrograms of the switch off and switch on at Ardrossan on 9/12/2004

15.30	e_10,15,2
15.29	e_10,15,2,3
15.28	e_10,15,2,3,11
15.27	e_10,15,2,3,11,8
15.26	e_10,15,2,3,11,8,4
15.25	e_10,15,2,3,11,8,4,3
15.24	e_10,15,2,3,11,8,4,3,5
15.23	e_10,15,2,3,11,8,4,3,5

IIA	25.11
III A OUT	30.11
3	32.11
III A OUT	40.11
6	42.11
10	50.11
15.22	52.11

Figure 28 Specimens of the surface of the Anilox on 3\15\2004



**Figure 59 Ardrossan Switch Off and On,
2 /11/2004 15:00 to 16:00 (top) and
9/12/2004, 11:00 to 13:00 (bottom)**

00:01 to 00:01 100% Monitor & Internal Outgoing

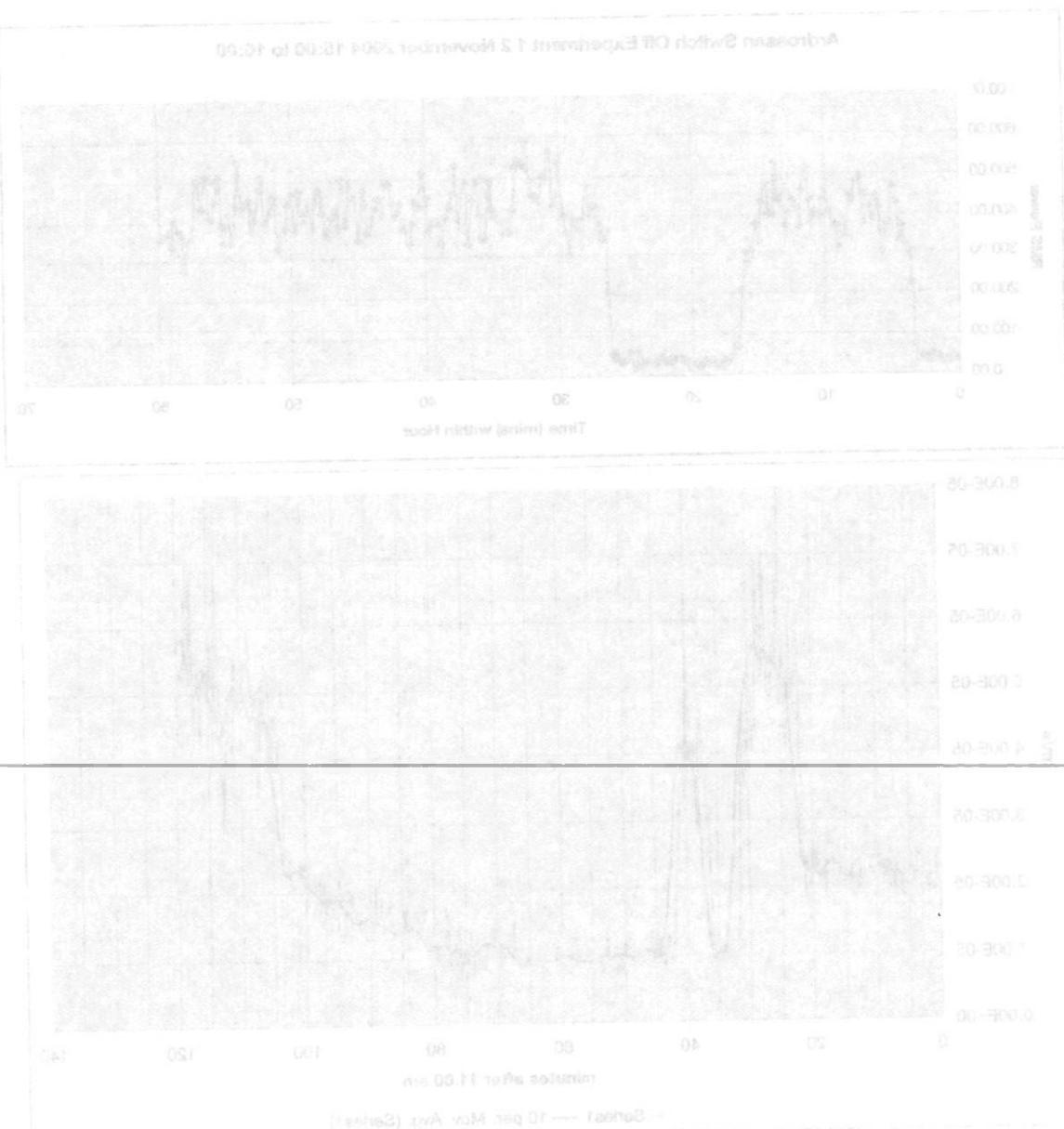
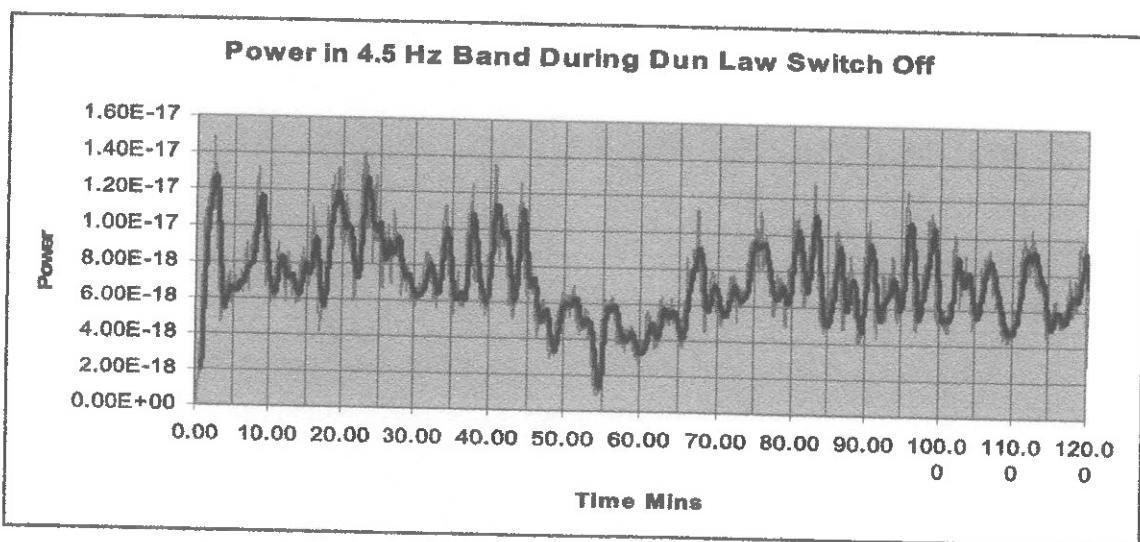
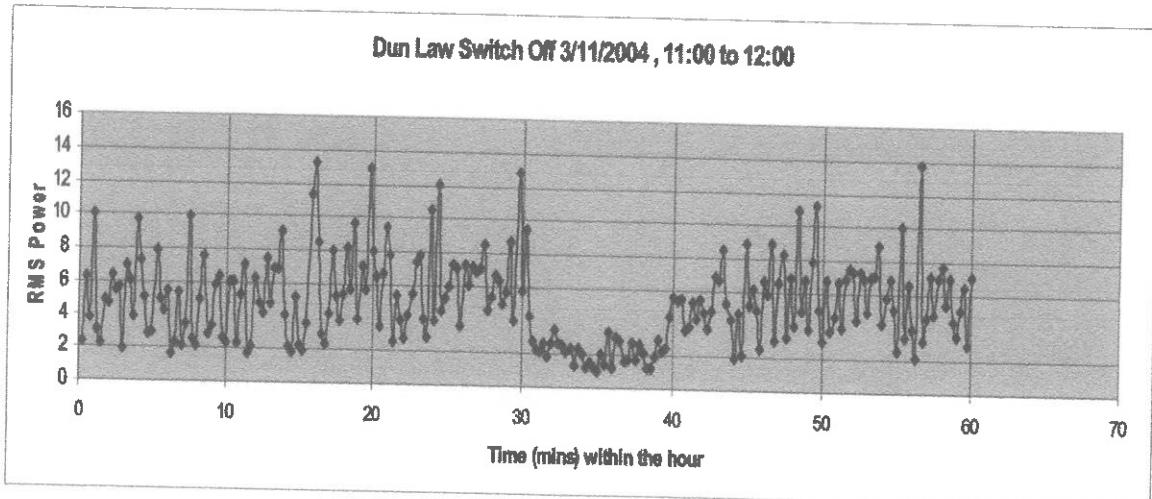
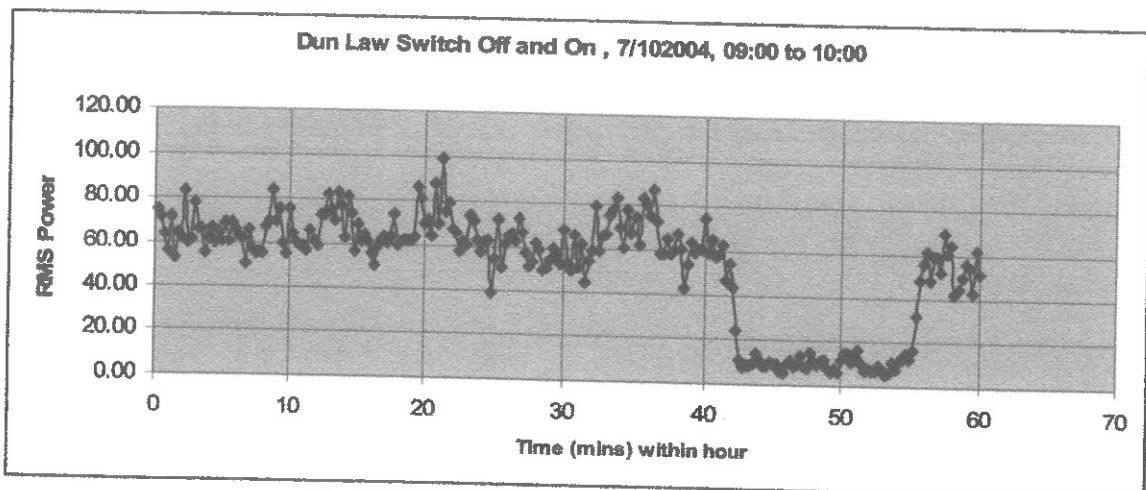
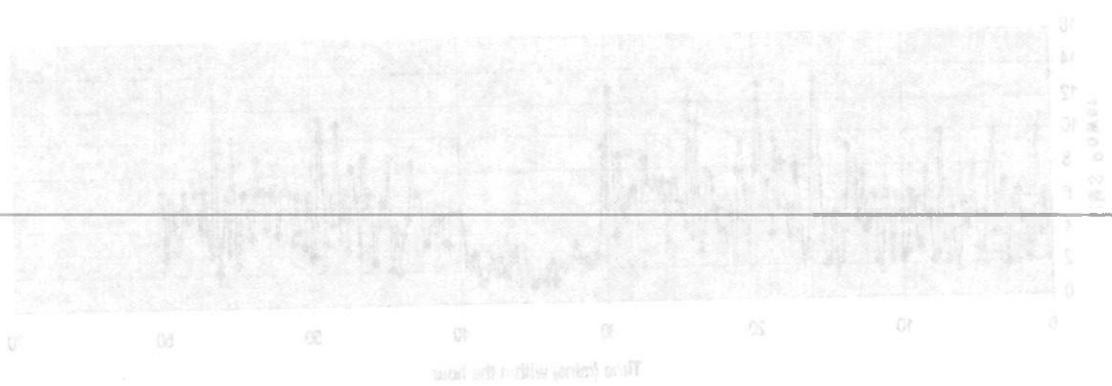


Figure 20. Addressed Switch Off and On
3 \17\2004 12:00 to 00:00 (top)
3\13\2004 11:00 to 13:00 (bottom)



**Fig 60 Switch Off at Dun Law on 7/8/2003 Top and Bottom and
3/11/2004 (middle)**



We now have sufficient information from the monitoring and analysis of microseismic, infrasound and on-tower monitoring to develop a solution to the problem of what level of vibration is permissible at Eskdalemuir, how does wind farm vibration propagate and attenuate and what is the permissible number and distribution of wind farms and turbines in the Southern Uplands. We first propose a mathematical model for the system following Bowers (2004) and then address the points of interest as a series of important questions with the answers derived from this study.

We now have sufficient information to monitor and analyse the microseismic, infrasound and air-power monitoring to develop a solution to the problem of what level of vibration is permissible at Bekkarselvum, how does wind from airships and aeroplanes and satellites and what is the permissible number and distribution of wind turbines in the Southern Uplands. We first propose a mathematical model for the shear following Powers (2004) and then address the points of interest as a series of individual discussions with the answers derived from this study.

Mathematical Model of Wind Farm Noise Propagation

In order to evaluate the nature and properties of noise propagation from windfarms we postulate the following mathematical model

The seismic displacement amplitude spectrum, $U(\omega, r)$ at angular frequency ω , of a single wind turbine operating at distance r , from the recording station is given by the following convolutional mathematical model:

$$U(\omega, r) = S(\omega)G(r)B(\omega, r)P(r)$$

where,

$S(\omega)$ represents the source spectrum,
 $P(r)$ is a frequency-dependent receiver-site effect,
 $G(r)$ represents geometrical spreading, $G(r) = r^\eta$
 $B(\omega, r)$ is the attenuation
 v =seismic velocity

$$B(\omega, r) = \left(\exp\left(\frac{-\omega r}{2Q(\omega)v} \right) \right)$$

For Cylindrical Spreading (seismic surface waves)

$$\eta = -0.5$$

Therefore the amplitude of the signal from a single turbine at a distant location, A_{far} , is related to the amplitude at a location closer to the turbine, A_{near} , by the following equation (the $1/\sqrt{r}$ with linear attenuation model), where:

$$A_{far} = A_{near} \sqrt{\frac{R_{near}}{R_{far}}} e^{-\frac{\pi f(R_{near}-R_{far})}{Qv}}$$

R_{near} and R_{far} are the distances from the source to the near and far locations, respectively,

Q is a factor giving the non-geometrical attenuation of the wave with distance travelled i.e. absorption of energy within the rock as the seismic wave does work to vibrate the particles of the material.

f is the frequency of the signal ($\omega=2\pi f$)

This formula is applicable to surface waves radiating out from the source uniformly. Localised inhomogeneities may cause some focussing of the energy but this is not predictable in a generalised model and is unlikely to significantly affect the conclusions.

Mathematical Model of Wind Farm Noise Propagation

In order to evaluate the noise and propagation of noise propagation from wind turbines we postulate the following mathematical model:

The seismic displacement amplitude spectrum, $U(\omega)$, at singular frequency ω of a single wind turbine depending on distances r from the location is given by the following convolutional mathematical model:

$$U(\omega) = P(\omega)G(\omega)r^{-\alpha}$$

where

$G(\omega)$ represents the source spectrum,
 $P(\omega)$ is a source-dependent receiver-site effect,
 $G(1)$ represents geometric spreading, $G(1) = 1$
 r is the distance
 ω is specific velocity

$$\left(\left(\frac{\omega}{\omega_0} \right)^{-\alpha} \exp \left(-\frac{\omega}{\omega_0} \right) \right) = (1, \omega)$$

For Cylindrical Spreading (seismic surface waves)

$$r = 0 \rightarrow \infty$$

Therefore the amplitude of the signal from a source at a distant location A_ω is inversely proportional to the amplitude of a source at the position A_{ω_0} . This is the inverse-distance law of cylindrical spreading (the Fidelity Attenuation model). Where:

$$\frac{A_\omega^2}{A_{\omega_0}^2} = \frac{1}{R_{\omega_0}^2} \cdot \sqrt{R_{\omega_0}^2 + R_{\omega}^2}$$

R_{ω_0} and R_ω are the distances from the source to the near and far locations respectively.

α is a factor dividing the non-geometric attenuation of the wave with distance parallel i.e. spreading of energy within the rock as the seismic wave does work to displace the particles of the medium.

α is the frequency of the signal ($\omega = 2\pi f$)

This formula is applicable to surface waves radiating out from the source nonlinearly. Nonlinearity may cause some focusing or the source but this is not always the case in a nonviscous medium and is unlikely to eliminate the focusing of the wave.

Question 1: **Do Fixed and Variable speed wind turbines generate detectable vibrations**

Answer: **Yes**

- We have clearly shown that both fixed speed and variable speed wind turbines generate low frequency vibrations which are multiples of blade passing frequencies and which can be detected on seismometers buried in the ground at significant distances away from wind farms even in the presence of significant levels of background seismic noise (many kilometres).
- Some of these are non-stationary at very low wind speeds where we clearly see variation in frequency over long and short timescales and we postulate that these are generated by the interaction between the blades and the towers. There are other frequencies which are stationary and we postulate that these are caused by normal modes of vibration of the towers
- We have clearly shown that wind turbines generate low frequency sound (infrasound) and acoustic signals which can be detected at considerable distances (many kilometres) from wind farms on infrasound detectors and on low-frequency microphones (Hayes pers. comm.)

Question 2: **How does energy propagate from the Wind Turbine to a receiving SEISMIC Station?**

- as Infrasound travelling through the air for the near zone where

$$G=r^{-1} ?$$

or

- as Seismic Surface Waves travelling through the ground (cylindrical spreading), where

$$G=r^{-1/2} ?$$

Note: At greater distances where the atmosphere acts as a waveguide infrasound may also have a cylindrical dependency on r

Answer

- It travels to the seismometer as seismic surface waves, because, we can examine co-located seismic records and infrasound records at the same times and show that it is clear that infrasound energy propagation is optimal in quiet wind conditions where stable atmospheric conditions prevail and that the amplitude DECREASES as the wind speed (and turbulence) increase.

Question 1:	Do High Wind Velocities affect Wind Turbine Performance?	Answer
	We have clearly shown that both high shear and wind speeds affect wind turbines' performance for turbines which are situated on sites with high turbulence and which can be affected by strong winds even in the presence of significant levels of background seismic noise (several kilometers).	✓
	Some of these site non-stationary effects vary with wind speeds where we clearly see variation in turbulence over long and short timescales and we observe that these site differences by the interaction between the blades and the tower. There are other influences which are stochastic and we hypothesize that these site changes by themselves of the tower.	✓
	We have clearly shown that wind turbines generate low frequency sound (ultrasound) and acoustic sources which can be detected at considerable distances (several kilometers) from wind farms or turbines depending on the source characteristics (towers, towers, etc.).	✓

Question 2:	How does nearby blasting from the Wind Tunnel to a location SEISMIC stations?	Answer
	as illustrated parallel diagrams for the near zone where	•
	$G = L \cdot S$	
	10	
	as Seismic Surface Waves travelling around the ground (dynamic) equivalent), where	•
	$G = L \cdot W \cdot S$	
Note:	At larger distances where the amplitudes are as a waveguide influence may also have a dynamic dependence on the	

Answer
If it's clear to the seismometer as seismic surface waves, because we can examine co-located seismic records and influence records to the same waves and show that if is clear that influence should probably be present in due Wind Turbines which sample atmospheric conditions prevail such that this subsurface DECRAVE as the Wind speed (and fluctuations) increases.

- Conversely, Seismic Amplitude INCREASES with wind speed as the energy of the turbines increases
- Clearly there CANNOT be a causal relationship between the seismic amplitude and the infrasound if they have different behaviours with wind speed.
- N.B. However, it is also clear that low-frequency sound waves can be detected at considerable distances away from a wind farm under the right atmospheric conditions.

Question 3: **If we have a wind farm of N turbines, how does the seismic amplitude increase as compared to 1 turbine?**

Answer

- We have shown it varies as the square root of N and this is to be expected because the turbines are not all in phase and neither are they operating at exactly the same frequency because of the slight possible variations in rotation speed and also wind conditions across the farm. There is also a possible 10% variation in speed (Optislip) which will cause broadening of the spectral peaks. They are quasi-random sources and therefore add as \sqrt{N}
- Therefore 100 turbines are 10 times as noisy as 1, not 100 times

Question 4: If we have N wind farms, how does the seismic amplitude increase as compared to 1 windfarm?

Answer:

- For similar reasoning as given previously for individual wind turbines, individual wind farms will not be in phase with each other and so they will add in QUADRATURE
- $v_{tot} = \sqrt{(v_1^2 + v_2^2 + v_3^2 + \dots + v_n^2)}$

Question 5: **How will wind speed and direction affect the vibrations?**

Answer: The following graph (Figure 2) shows the variation of seismic power with windspeed and direction. Although there is some variation with wind direction there is a clear increase with windspeed within the operational region (up to c 15m/s)

Quesiton 2: How will wind speed and direction affect the outcome of the turbines increase?

Geahy there CANNOT be a causal relationship between the seismic amplitude and the influence of different positions with wind speed.

N.B. However, it is also clear that low-frequency sound waves can be detected at considerable distances away from a wind farm under the right atmospheric conditions.

Question 3: If we have a wind farm of N turbines, how does the seismic amplitude increase as a consequence of the turbines

Answer

We have shown it achieves as the distance from the farm first is to be expected because the turbines are not all in phase and neither are they dependent on each other. The individual phases of the signal possible arise in relation speed and size wind conditions such as this. There is also a possible 10° variation in speed (Oblique) which will cause resonance of the spectral peaks. They are quasi-random sources and therefore add as an

Their total 100 turbines are 10 times as noisy as 1, not 100 times

Question 4: If we have N wind farms, how does the seismic amplitude increase as consequence of the wind farms

Answer

For similar reasons as given previously for individual wind turbines, individual wind farms will not be in phase with each other and so they will add in QUADRATURE

$$\text{Adv} = A_1(A_1^2 + A_2^2 + A_3^2 \dots + A_n^2)$$

Question 5: How will wind speed and direction affect the vibration?

Answer: The following graph (Figure 3) shows the variation of seismic power with wind speed and direction. Although there is some variation with wind direction there is a clear increase with wind speed. Within the operational region (up to a TSWS)

Appendix 3

A qeqəneñbir xibnε ε

Who will monitor the hundreds of thousands of tonnes of excavated peat and rock, which will be disturbed during construction?

Is there a suitably qualified archaeologist at all times on the site?

Has the roads and bridges in this area been assessed and upgraded where necessary in light of the fact that construction has started?

All of the above questions are in the interest of proper planning and development of the community in which I live.

The integrity of both the planning and democratic processes are at stake here so therefore it is of critical importance that openness, transparency and accountability principals are rigidly adhered to.

I may be contacted at the above address or by phone at 091 632291 or E-mail:
mjcollins@eircom.net

Yours sincerely,

Martin Collins
Martin Collins

REGISTERED POST	
ITEM NO.	RR 3784 5381 SIE
TO	Mr Noel Banks
ADDRESS	Planning Sub- Committee Galway Co Council - Parnell Hall GALWAY
LIFT	8000
VALUE OF CONTENTS (In words & figures)	
ACCEPTING OFFICER'S INITIALS	
REG. FEE	
CUSTOMER RECEIPT - AUMHÁIL	
STAMPA DÁTA	

RECEIVED
10/10/2001

...for has been made to control the development of the primary forms of
the disease and to reduce the incidence of secondary forms.

There are no cases in England and Wales at present which
can be regarded as being due to the disease.

The meningitis has generally been reported as a rare disease with
fewer than 100 cases in the United States.

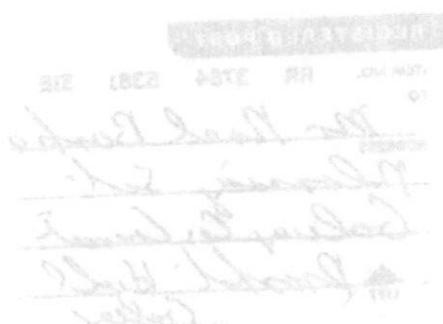
The meningitis is a rare disease with few cases in the United States.
The disease is usually fatal.

The meningitis is a rare disease with few cases in the United States.
The disease is usually fatal.

For a summary



NAME OF COMPANY
ARMED FORCES



Derrybrien
Loughrea
Co Galway

29/7/2003

Mr Noel Burke
Enforcement Officer
Planning Section
Galway Co Council
Prospect Hill
Galway

Dear Mr Burke

I have made a number of unsuccessful attempts to contact you since our conversation by phone on 24/7/2003.

As you are aware from my initial contact with you on 16/7/2003 I am requesting information from the planning section of Galway Co Council as to whether or not development work adjacent to windfarm sites at Derrybrien North, Toormacnevin and Bohaboy are authorised or unauthorised.

The planning reference numbers for the developments referred to are 97/3470, 97/3652 and 00/4581.

It is my understanding that Galway County Council and An Board Pleanala decided to "grant permission for the said development in accordance with the said plans and particulars, subject to the conditions specified in the second schedule".

I would be grateful to you if you could clarify and make the following information available to me as soon as possible.

Is the entry exit roadway currently under construction approximately 2 km north of the original access roadway authorised or unauthorised?

Is the quarry, which is in operation authorised or unauthorised?

Is the site compound authorised or unauthorised?

What is the status of the 5-year grant of permission given on 12/10/1998 as the construction is likely to take approximately 18 months to complete?

What steps have been taken to monitor water quality before and since construction started?

Has the developers requested changes to roadways, control house or turbine locations since the grant of permission?

Has the survey of the Hen Harrier population been properly undertaken?

Appendix 4

A qeqənəbiləx xibnə

Mr John Morgan,
Director of Services,
Roads and Transport Unit,
PO Box 27,
Aras an Chontae,
Prospect Hill,
Galway.

Your Ref: JM/MH RT1072

Re: Landslide at Derrybrien, County Galway,

Dear Mr Morgan,

I refer to your letter dated the 27th January 2004 in connection with the above matter.

The Department welcomes the assurances given by Galway County Council in relation to habitat protection generally and the Derrybrien situation in particular. We further welcome the commitment at Point 1 of your letter to make all relevant reports available to this Department for comment.

We note also that the County Council is satisfied that the development thus far complies with the planning permission granted. The question of whether any future works would require planning permission is, of course, a matter for the local authority. The reference in paragraph 8 of our previous letter to submission of new planning applications, as appropriate, was not intended to suggest otherwise. We also accept, as stated at points 5 and 6 of your letter, that the issues referred to at those points are matters for the developer.

We note your position at point 4 of your letter regarding the EIS. Overall, our letter of the 22nd December was concerned with impacts of the landslide and assessments of future works. The reference to the EIS was mainly in the context of advising on sensitive peatland areas to be avoided in any future works.

The Department does not dispute that Galway County Council is operating to appropriate professional standards in relation to its planning and other key services and notes your affirmation to this effect.

Yours sincerely,

Amanda Maguire
Site Protection Section
NPWS

6th February 2004

The Department of Defense has selected the Qsiway Group to lead its mission to develop a new generation of secure communication systems for the military.

3. With regard to any new works proposed to be carried out on the site, all such works, unless exempted development, will constitute development for which Planning Permission will be required.
4. Whilst noting your view of the E.I.S. lodged with the Planning Authority, you should note that the contents of the E.I.S. was considered by both the County Council as Planning Authority and by An Bord Pleanala, both of whom granted Planning Permission.
5. The provision of an Ecological Assessment and the carrying out of works as described by you as well as the consideration of the regeneration and future management of the area damaged by the landslide are all matters for the developers.
6. The assessment of indirect impact on any designated sites is also a matter for the developer as, indeed, you have pointed out in your letter.

The dissemination of information within the County Council whether by formal circulation of minutes or by other direct means is a matter for the Council itself. Indeed the inference that Galway County Council is failing in some way to conduct its affairs to a sufficiently high standard is resented and I would wish to place on record the fact that grave exception is taken by the County Council to that inference.

Misc, le meas,



John Morgan
Director of Services
Roads and Transportation Unit

C.C. Mr. Tom O'Mahony,
Assistant Secretary,
Department of the Environment, Heritage & Local Government,
Custom House,
Dublin 1.

Wiff larger to fit new wings proposed to be cut out on the side, all except
wings, unless extended development will continue to develop
prior to finalization will be delayed.

A. Whichever longer your wish to the P.T.S. together with the Planning Authority, you
should note that the constraints of the P.T.S. may considerably delay parts of the County
Council as Planning Authority and by A.B.C. and Police, Body of your
Planning Function permission.

2. If the proposal of the Local Authority has the advantage of making out of works as
described by you as well as the consideration of the location and future
management of the area described will begin in the matter for the
developer.

3. To assess the cost of planning impact on site a cost for
the developer as listed, you pay being out in your favor.

The differentiation of infrastructure within the County Council master plan
depends on whether or not there is a market for the Council itself.
Indeed the intention of Gisela County Council is finding in some way to connect its
affiliations to a sufficiently rigid business model so as to receive
funding from the public sector.

With regards

John Marlow
Director of Services
Local Government Unit
County and Planning Authority

C.C. Mr. Tom O'Halloran,
Vice-Chairman
Chairperson of the Environment, Health & Local Government
Committee
Deputy I.
County House,

Post Office Box No. 27,
Áras an Chontae,
Prospect Hill,
Galway.

Mo Thag:

JM/MH RT1072



Do Thag.

Bosca Poist Uimhí 27,
Áras an Chontae,
Croc na Radharc,
Gaillimh.

Telephone: (091) 509000
Fax: (091) 509010
E-Mail: @galwaycoco.ie
Web: www.galwaycoco.ie
www.galway.ie

COMHAIRLE CHONTAE NA GAILLIMHE GALWAY COUNTY COUNCIL

Housing Loans/Grants
(091) 509 301

Housing Applications
(091) 509 300

Environment
(091) 509 302

Personnel
(091) 509 303

Motor Taxation
(091) 509 099

Driving Licences
(091) 509 305

Water Services
(091) 509 306

Community & Env.
(091) 509 066

Planning
(091) 509 308

Engineering
(091) 509 309

Register of Electors
(091) 509 310

Higher Ed. Grants
(091) 509 310

27th January, 2004.

The Secretary General,
Department of the Environment, Heritage & Local Gov
Custom House,
Dublin 1.

Re -

This was copied to me,
I presume the main reply
to this will go back to
DTS state

John

RE: Landslide at Derrybrien, County Galway

A Chara,

I wish to refer to your letter dated the 22nd December last dealing with the purpose and content of a number of meetings attended by representatives from your Department, the Shannon Regional Fisheries Board, E.S.B. Fisheries, E.S.B. International and the Environment Section of the County Council.

In general terms, the County Council would agree with your view of the purpose of these meetings, namely, to review environmental issues, exchange information and highlight various concerns. From this perspective the meetings have been extremely productive.

The Council is keenly aware of its obligations and duties under Environmental Legislation and accords a high priority to the protection of all habitats. In that context, it has always facilitated full disclosure of all information to interested parties including your Department. Please be assured that the County Council will continue to provide full co-operation to your Department and its officials are available to discuss any environmental aspect of the Derrybrien situation of concern to you.

With regard to the specific points raised in your letter, I reply as follows:-

1. The County Council will make available all relevant reports to your Department and will consider your comments thereon.
2. The County Council has inspected the site and assessed it for compliance with the Planning Permissions granted. The Planning Authority is satisfied that the development, thus far, is in compliance with the Planning Permissions granted

It is our opinion that all Sections of the Galway County Council dealing with the proposed development and the resulting landslide should be informed of the above concerns and requirements regarding same. Accordingly this letter should be forwarded to all relevant personnel.

Yours faithfully,

Amanda Maguire
Site Protection Section
NPWS

It is our desire that if questions of the Galloway County Council qualify with the
above-mentioned requirements, they be returned to the appropriate office of the Board
as soon as possible. Accordingly this letter should be forwarded
to the Secretary of State.

Very truly yours,

James W. Morris
State Licensee Section
NPS

2. There should be ecological assessment of any areas outside the limits of the windfarm footprint and works area that will be impacted in the course of emergency and stabilisation works. This assessment should include any areas that may be used for the removal and disposal of peat from the landslide area, the dams or the river.
3. There should be detailed consideration of the regeneration and future management of the damaged areas within the limits of the landslide. The revegetation of these areas will be a key element in their stabilisation and in the control of ongoing erosion and siltation.
4. In the course of site works and any new site drainage, areas of intact wet bog, (some with extensive pool systems) and the infilling lake, should be avoided. One such sensitive peatland area occurs near the summit, in the area bounded by turbines 60, 61, 62, 11, 66 and 67. There should be no negative impacts on these areas in the course of stabilisation works or any other works associated with the completion of this development.
5. It is our opinion that the original EIS for this development, including the extensions, was deficient in that it failed to identify many sensitive ecological areas and hydrological issues within the site. This was pointed out at the meetings and accepted by ESBI.
6. There should be a detailed report on how the current development deviates from the original EIS and planning conditions, including in terms of:
 - site layout (locations of site access roads and turbines);
 - construction methodology;
 - on-site quarrying and blasting;
 - siltation and pollution control measures (silt traps, settlement ponds, cement wash out facilities);
 - site drainage.
7. There should be a detailed report on the environmental impacts associated with the landslide and the emergency and stabilisation works. It should be noted that, under Article 6 of the Habitats Directive, the onus is on the developer to assess the indirect impacts on any designated sites (candidate Special Areas of Conservation - SACs or Special Protection Areas - SPAs) as a result of a plan or project. This is therefore required in relation to the impacts on sites downstream of the Owendalulleagh River: Lough Cutra cSAC (No. 299), Lough Cutra SPA (No. 4096), Coole-Garryland Complex cSAC (No. 252) and Coole-Garryland SPA (No. 4107).
8. There should be a detailed report and ecological assessment of any proposed new works at the site, including any changes to the site layout, site drainage or construction methodology. New planning applications should be submitted to Galway County Council for these changes; as appropriate.

to the extent that it is able to do so. It is important to note that the new legislation will be implemented in the course of the next few months and will affect all areas of the economy. The new legislation will also affect the way in which companies do business in the country.

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Copy

Our Ref: SP278/AM

County Secretary
Galway County Council
County Hall,
Prospect Hill
Galway

Issued.

22nd December 2003

Re: Planning Application Reg. Ref. No. 02/3560 by Saorgus Energy Limited for permission for alterations to previously approved wind farm development at Toormacnevin, Bohaboy & Derrybrien North, Co. Galway.
- Co-ordinating meetings of ad hoc group re landslide at Derrybrien in October 2003.

Dear Sir/Madam,

We refer to the above proposed development and the meetings between representatives of Galway County Council (Environment Section), the windfarm developer (ESBI), ESB Fisheries, the Shannon Regional Fisheries Board, and the National Parks & Wildlife Service (NPWS) of this Department which were arranged following the landslide in October 2003.

It is our understanding that the meetings of this ad hoc group were intended as a means of distributing and reviewing information on the landslide, particularly in relation to the impacts on surface waters, and as a means of keeping all parties informed of progress on the emergency works being carried out. It has now emerged that this ad hoc group does not report back formally to other sections of Galway County Council. As a result, many of the issues and concerns that were raised by NPWS and recorded in minutes of the meetings, may not have been passed on to other relevant sections of the Council, such as the Planning and Development Section.

It should be noted that, in addition to the landslide, the emergency works being carried out, and the likely impacts on designated conservation areas downstream, there are other serious concerns about the project, including possible future ecological impacts. In addition to proposals for monitoring from NPWS (see copy attached), other issues that were raised by NPWS in these meetings are outlined below.

1. NPWS should be provided with copies of all reports, including technical assessments, pertaining to the landslide and the development in general, and should be given an opportunity to comment.

Om Rul SED 18/07

25. December 2007

Gatwala
Bulburi Hill
County Hall
Giswazi Council
Giswazi Society

- Re: - Bawali Application Ref. No. 015290 by Giswazi generally
- intended for permission for utilisation of land/area already
taken possession at Tsoemewa, Gopasapu & Derrapur
Co. Gopasapu
- Co-ordination message to be issued to respective in Derrapur
in October 2007.

Dan Suryadevan

We refer to the above letter and the meeting between
of Giswazi Council (Chairman Section), the mining developer (ESB) ESB
Liberator, the Giswazi Regional Project Board, and the Mining Project
Services (MPS) of the Department which was arranged following the inspection in
October 2007.

If at our suggestion that the mining may be a threat
to development and environment as it involves
removal of soil and water, and the mining
processes no mining may be carried out if the
mining project has been stopped until such time
the environmental works have been carried out. It is
not about peace formally or other sections of Giswazi Council. As a result, many
of the issues and concerns first raised by MPS and forwarded to members of the
Council, may not be addressed as per relevant sections of the Council, now to
the Planning and Development Board

being raised by MPS in their meeting with
the chairman of the developer, the developer
will have to take necessary steps to ensure
that the mining does not affect the environment
and the community. In addition, the
developer must take necessary steps to ensure
that mining does not affect the environment
and the community.

I. MPS should be provided with copies of all
responses, including those of the developer and
the chairman of the developer, to commence
as soon as possible.