The Moray Council Council Office High Street Elgin IV30 1BX Tel: 01343 563 501 Fax: 01343 563 263 Email: development.control@moray.gov.uk

Applications cannot be validated until all the necessary documentation has been submitted and the required fee has been paid.

Thank you for completing this application form:

ONLINE REFERENCE 100069208-001

The online reference is the unique reference for your online form only. The Planning Authority will allocate an Application Number when your form is validated. Please quote this reference if you need to contact the planning Authority about this application.

Type of Application

What is this application for? Please select one of the following: *

☒ Application for planning permission (including changes of use and surface mineral working).

☐ Application for planning permission in principle.

☐ Further application, (including renewal of planning permission, modification, variation or removal of a planning condition etc)

☐ Application for Approval of Matters specified in conditions.

Description of Proposal

Please describe the proposal including any change of use: * (Max 500 characters)

Installation of an Orenda 49kw wind turbine to generate electricity.

Is this a temporary permission? * ☐ Yes ☒ No

If a change of use is to be included in the proposal has it already taken place? (Answer 'No' if there is no change of use.) * ☐ Yes ☒ No

Has the work already been started and/or completed? *

☒ No ☐ Yes – Started ☐ Yes - Completed

Applicant or Agent Details

Are you an applicant or an agent? * (An agent is an architect, consultant or someone else acting on behalf of the applicant in connection with this application) ☐ Applicant ☒ Agent

Agent Details

Please enter Agent details

Company/Organisation:	AE Associates		
Ref. Number:		You must enter a Building Name or Number, or both: *	
First Name: *	Adele	Building Name:	Cameron House
Last Name: *	Ellis	Building Number:	26
Telephone Number: *	07910741328	Address 1 (Street): *	Cupar Road
Extension Number:		Address 2:	
Mobile Number:		Town/City: *	Auchtermuchty
Fax Number:		Country: *	Fife
		Postcode: *	KY14 7DD
Email Address: *	ae.associates@btinternet.com		

Is the applicant an individual or an organisation/corporate entity? *

☐ Individual ☒ Organisation/Corporate entity

Applicant Details

Please enter Applicant details

Title:		You must enter a Building Name or Number, or both: *	
Other Title:		Building Name:	C/o Cameron House
First Name: *		Building Number:	26
Last Name: *		Address 1 (Street): *	Cupar Road
Company/Organisation	Orenda Energy Solutions	Address 2:	
Telephone Number: *	+447910741328	Town/City: *	Auchtermuchty
Extension Number:		Country: *	Fife
Mobile Number:		Postcode: *	KY14 7DD
Fax Number:			
Email Address: *			

Site Address Details

Planning Authority: Moray Council

Full postal address of the site (including postcode where available):

Address 1:

Address 2:

Address 3:

Address 4:

Address 5:

Town/City/Settlement:

Post Code:

Please identify/describe the location of the site or sites

LAND AT MAINS OF PITLURG

Northing 845608 Easting 343229

Pre-Application Discussion

Have you discussed your proposal with the planning authority? * ☐ Yes ☒ No

Site Area

Please state the site area: 0.10

Please state the measurement type used: ☒ Hectares (ha) ☐ Square Metres (sq.m)

Existing Use

Please describe the current or most recent use: * (Max 500 characters)

Agricultural

Access and Parking

Are you proposing a new altered vehicle access to or from a public road? * ☐ Yes ☒ No

If Yes please describe and show on your drawings the position of any existing. Altered or new access points, highlighting the changes you propose to make. You should also show existing footpaths and note if there will be any impact on these.

Are you proposing any change to public paths, public rights of way or affecting any public right of access? * ☐ Yes ☒ No

If Yes please show on your drawings the position of any affected areas highlighting the changes you propose to make, including arrangements for continuing or alternative public access.

How many vehicle parking spaces (garaging and open parking) currently exist on the application Site? 0

How many vehicle parking spaces (garaging and open parking) do you propose on the site (i.e. the Total of existing and any new spaces or a reduced number of spaces)? * 0

Please show on your drawings the position of existing and proposed parking spaces and identify if these are for the use of particular types of vehicles (e.g. parking for disabled people, coaches, HGV vehicles, cycles spaces).

Water Supply and Drainage Arrangements

Will your proposal require new or altered water supply or drainage arrangements? * ☐ Yes ☒ No

Do your proposals make provision for sustainable drainage of surface water?? * (e.g. SUDS arrangements) * ☐ Yes ☒ No

Note:-

Please include details of SUDS arrangements on your plans

Selecting 'No' to the above question means that you could be in breach of Environmental legislation.

Are you proposing to connect to the public water supply network? *

☐ Yes

☐ No, using a private water supply

☒ No connection required

If No, using a private water supply, please show on plans the supply and all works needed to provide it (on or off site).

Assessment of Flood Risk

Is the site within an area of known risk of flooding? * ☐ Yes ☒ No ☐ Don't Know

If the site is within an area of known risk of flooding you may need to submit a Flood Risk Assessment before your application can be determined. You may wish to contact your Planning Authority or SEPA for advice on what information may be required.

Do you think your proposal may increase the flood risk elsewhere? * ☐ Yes ☒ No ☐ Don't Know

Trees

Are there any trees on or adjacent to the application site? * ☐ Yes ☒ No

If Yes, please mark on your drawings any trees, known protected trees and their canopy spread close to the proposal site and indicate if any are to be cut back or felled.

Waste Storage and Collection

Do the plans incorporate areas to store and aid the collection of waste (including recycling)? * ☐ Yes ☒ No

If Yes or No, please provide further details: * (Max 500 characters)

No requirement

Residential Units Including Conversion

Does your proposal include new or additional houses and/or flats? * ☐ Yes ☒ No

All Types of Non Housing Development – Proposed New Floorspace

Does your proposal alter or create non-residential floorspace? * ☐ Yes ☒ No

Schedule 3 Development

Does the proposal involve a form of development listed in Schedule 3 of the Town and Country Planning (Development Management Procedure (Scotland) Regulations 2013 * ☒ Yes ☐ No ☐ Don't Know

If yes, your proposal will additionally have to be advertised in a newspaper circulating in the area of the development. Your planning authority will do this on your behalf but will charge you a fee. Please check the planning authority's website for advice on the additional fee and add this to your planning fee.

If you are unsure whether your proposal involves a form of development listed in Schedule 3, please check the Help Text and Guidance notes before contacting your planning authority.

Planning Service Employee/Elected Member Interest

Is the applicant, or the applicant's spouse/partner, either a member of staff within the planning service or an elected member of the planning authority? * ☐ Yes ☒ No

Certificates and Notices

CERTIFICATE AND NOTICE UNDER REGULATION 15 – TOWN AND COUNTRY PLANNING (DEVELOPMENT MANAGEMENT PROCEDURE) (SCOTLAND) REGULATION 2013

One Certificate must be completed and submitted along with the application form. This is most usually Certificate A, Form 1, Certificate B, Certificate C or Certificate E.

Are you/the applicant the sole owner of ALL the land? * ☐ Yes ☒ No

Is any of the land part of an agricultural holding? * ☒ Yes ☐ No

Do you have any agricultural tenants? * ☐ Yes ☒ No

Are you able to identify and give appropriate notice to ALL the other owners? * ☒ Yes ☐ No

Certificate Required

The following Land Ownership Certificate is required to complete this section of the proposal:

Certificate B

Land Ownership Certificate

Certificate and Notice under Regulation 15 of the Town and Country Planning (Development Management Procedure) (Scotland) Regulations 2013

I hereby certify that

(1) - No person other than myself/the applicant was an owner [Note 4] of any part of the land to which the application relates at the beginning of the period of 21 days ending with the date of the accompanying application;

or –

(1) - I have/The Applicant has served notice on every person other than myself/the applicant who, at the beginning of the period of 21 days ending with the date of the accompanying application was owner [Note 4] of any part of the land to which the application relates.

Name:	Mr James Mark
Address:	Mains of Pitlurg Farm, Keith, Grange Crossroads, Keith, Moray, AB55 5PJ
Date of Service of Notice: *	04/10/2017

(2) - None of the land to which the application relates constitutes or forms part of an agricultural holding;

or –

(2) - The land or part of the land to which the application relates constitutes or forms part of an agricultural holding and I have/the applicant has served notice on every person other than myself/himself who, at the beginning of the period of 21 days ending with the date of the accompanying application was an agricultural tenant. These persons are:

Name:	
Address:	
Date of Service of Notice: *	

Signed:	Adele Ellis
On behalf of:	Orenda Energy Solutions
Date:	04/10/2017

☒ Please tick here to certify this Certificate. *

Checklist – Application for Planning Permission

Town and Country Planning (Scotland) Act 1997

The Town and Country Planning (Development Management Procedure) (Scotland) Regulations 2013

Please take a few moments to complete the following checklist in order to ensure that you have provided all the necessary information in support of your application. Failure to submit sufficient information with your application may result in your application being deemed invalid. The planning authority will not start processing your application until it is valid.

a) If this is a further application where there is a variation of conditions attached to a previous consent, have you provided a statement to that effect? *

☐ Yes ☐ No ☒ Not applicable to this application

b) If this is an application for planning permission or planning permission in principal where there is a crown interest in the land, have you provided a statement to that effect? *

☐ Yes ☐ No ☒ Not applicable to this application

c) If this is an application for planning permission, planning permission in principle or a further application and the application is for development belonging to the categories of national or major development (other than one under Section 42 of the planning Act), have you provided a Pre-Application Consultation Report? *

☐ Yes ☐ No ☒ Not applicable to this application

Town and Country Planning (Scotland) Act 1997

The Town and Country Planning (Development Management Procedure) (Scotland) Regulations 2013

d) If this is an application for planning permission and the application relates to development belonging to the categories of national or major developments and you do not benefit from exemption under Regulation 13 of The Town and Country Planning (Development Management Procedure) (Scotland) Regulations 2013, have you provided a Design and Access Statement? *

☐ Yes ☐ No ☒ Not applicable to this application

e) If this is an application for planning permission and relates to development belonging to the category of local developments (subject to regulation 13. (2) and (3) of the Development Management Procedure (Scotland) Regulations 2013) have you provided a Design Statement? *

☐ Yes ☐ No ☒ Not applicable to this application

f) If your application relates to installation of an antenna to be employed in an electronic communication network, have you provided an ICNIRP Declaration? *

☐ Yes ☐ No ☒ Not applicable to this application

g) If this is an application for planning permission, planning permission in principle, an application for approval of matters specified in conditions or an application for mineral development, have you provided any other plans or drawings as necessary:

☐ Site Layout Plan or Block plan.
☐ Elevations.
☐ Floor plans.
☐ Cross sections.
☐ Roof plan.
☐ Master Plan/Framework Plan.
☐ Landscape plan.
☐ Photographs and/or photomontages.
☐ Other.

If Other, please specify: * (Max 500 characters)

Provide copies of the following documents if applicable:

A copy of an Environmental Statement. *	☐ Yes	☒ N/A
A Design Statement or Design and Access Statement. *	☐ Yes	☒ N/A
A Flood Risk Assessment. *	☐ Yes	☒ N/A
A Drainage Impact Assessment (including proposals for Sustainable Drainage Systems). *	☐ Yes	☒ N/A
Drainage/SUDS layout. *	☐ Yes	☒ N/A
A Transport Assessment or Travel Plan	☐ Yes	☒ N/A
Contaminated Land Assessment. *	☐ Yes	☒ N/A
Habitat Survey. *	☐ Yes	☒ N/A
A Processing Agreement. *	☐ Yes	☒ N/A

Other Statements (please specify). (Max 500 characters)

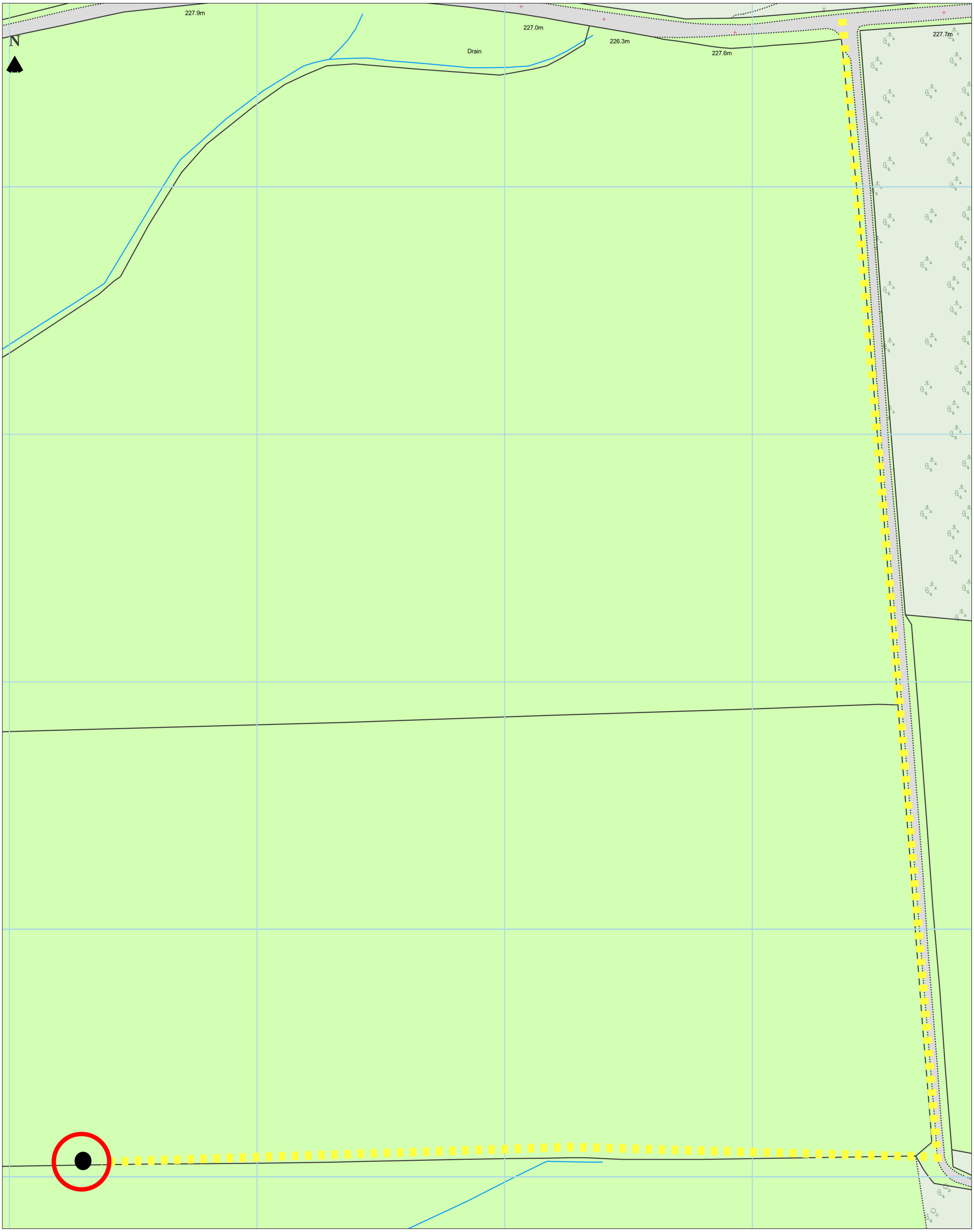
Declare – For Application to Planning Authority

I, the applicant/agent certify that this is an application to the planning authority as described in this form. The accompanying Plans/drawings and additional information are provided as a part of this application.

Declaration Name: Ms Adele Ellis

Declaration Date: 04/10/2017

BLOCK PLAN



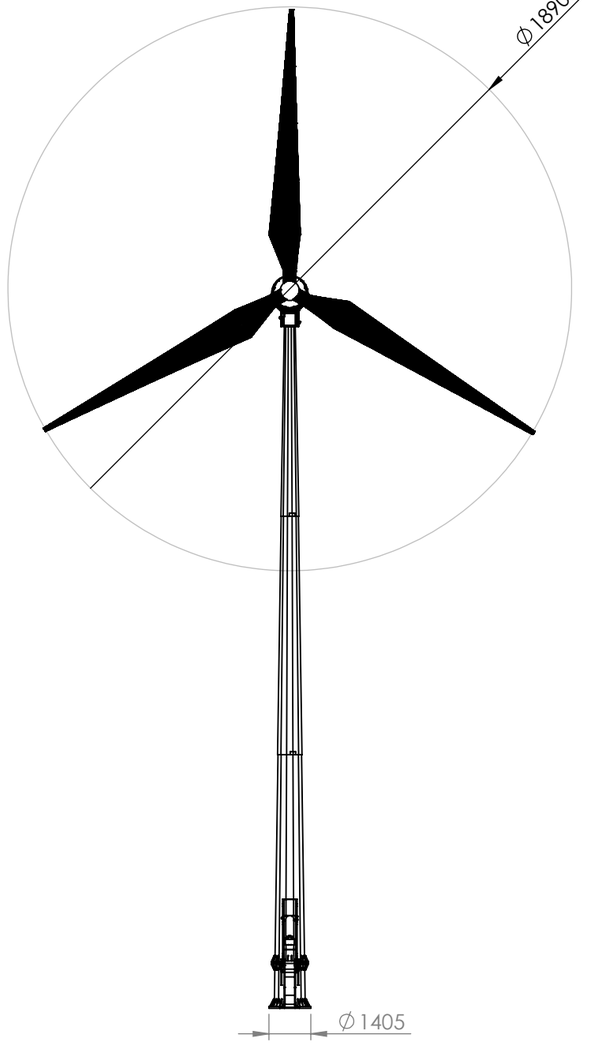
LAND AT MAINS OF PITLURG

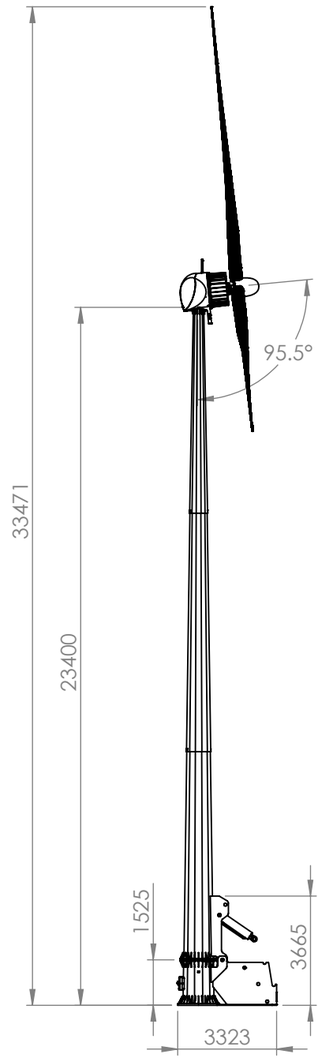
0 — 100m

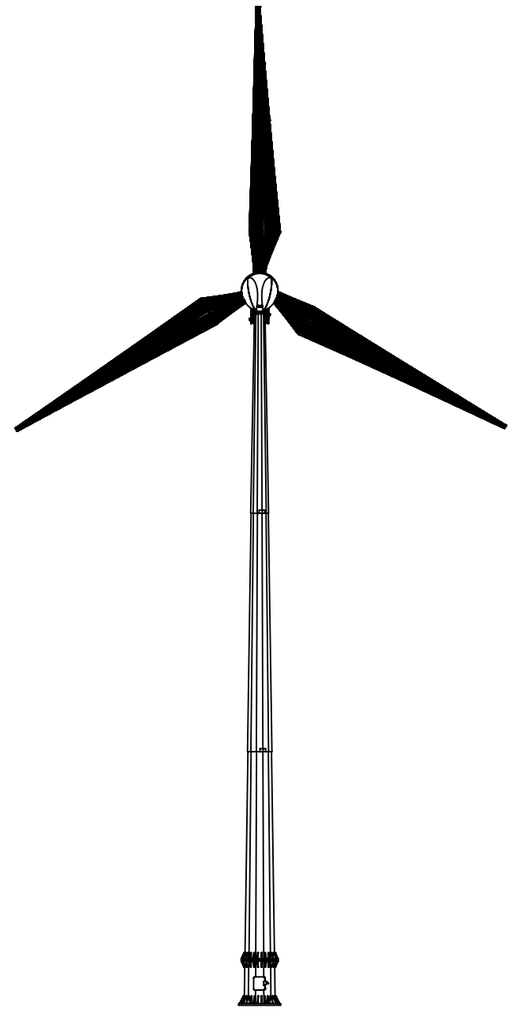
SCALE 1:500 @ A0

TURBINE POSITION:
343229 845608

ACCESS ROUTE







UNLESS OTHERWISE SPECIFIED:		NAME	DATE
DIMENSIONS ARE IN MM TOLERANCES: ANGULAR: MACH ±0.5° ONE PLACE DECIMAL ±0.25 TWO PLACE DECIMAL ±0.1	DRAWN	CW	13/12/12
	CHECKED	PD	13/12/13
	ENG APPR.		
	MFG APPR.		
INTERPRET GEOMETRIC TOLERANCING PER:	Q.A.		
MATERIAL	COMMENTS:		
FINISH			
DO NOT SCALE DRAWING			

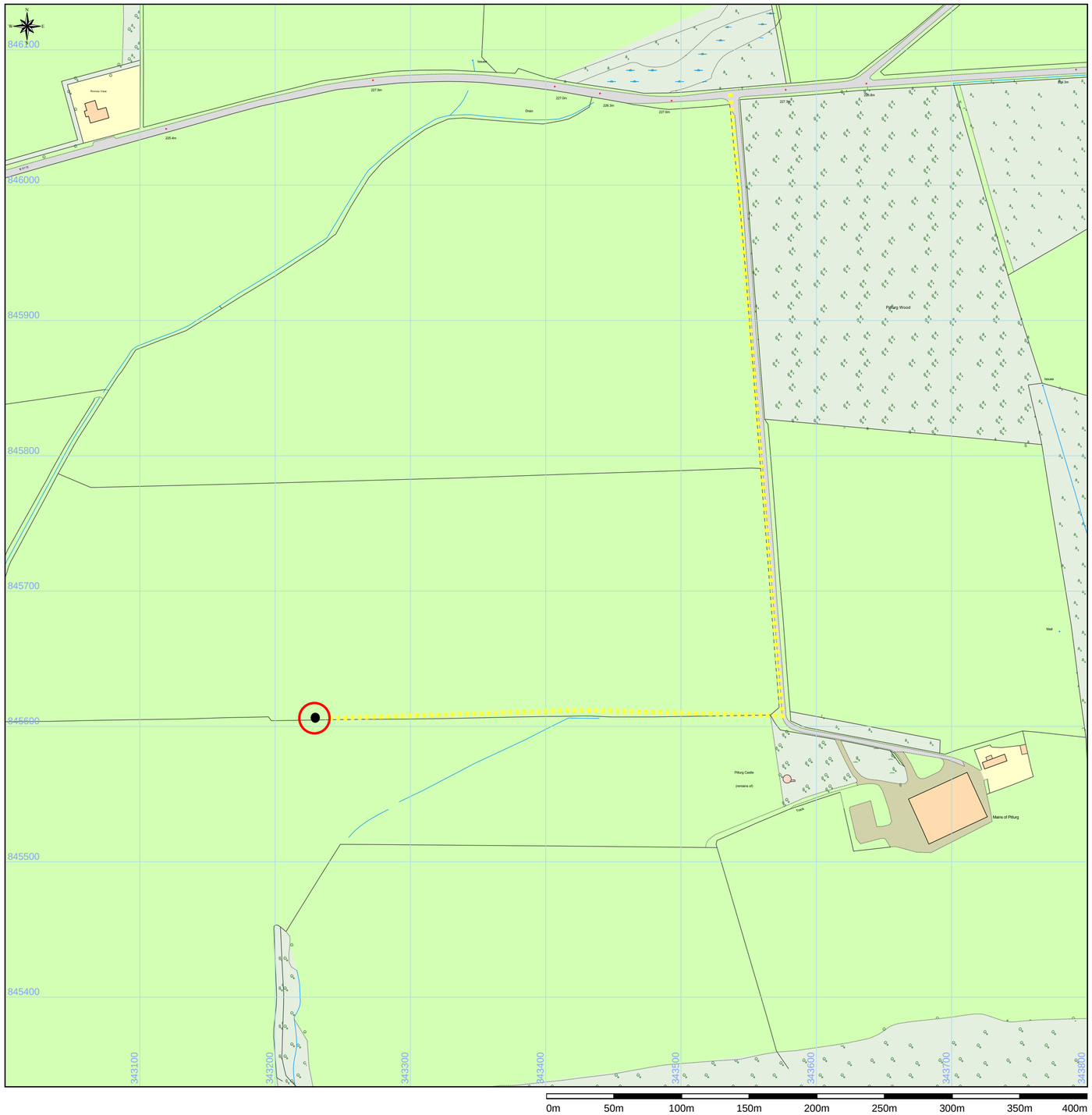
Orenda Energy Solutions

TITLE: SKYE 23.4m TOWER INSTALLATION PLANNING DRAWING

SIZE	DWG. NO.	REV
B	EN-4004-A	A

SCALE: 1:200 | WEIGHT: | SHEET 1 OF 1

LAND AT MAINS OF PITLURG



Turbine location - 343229 845608

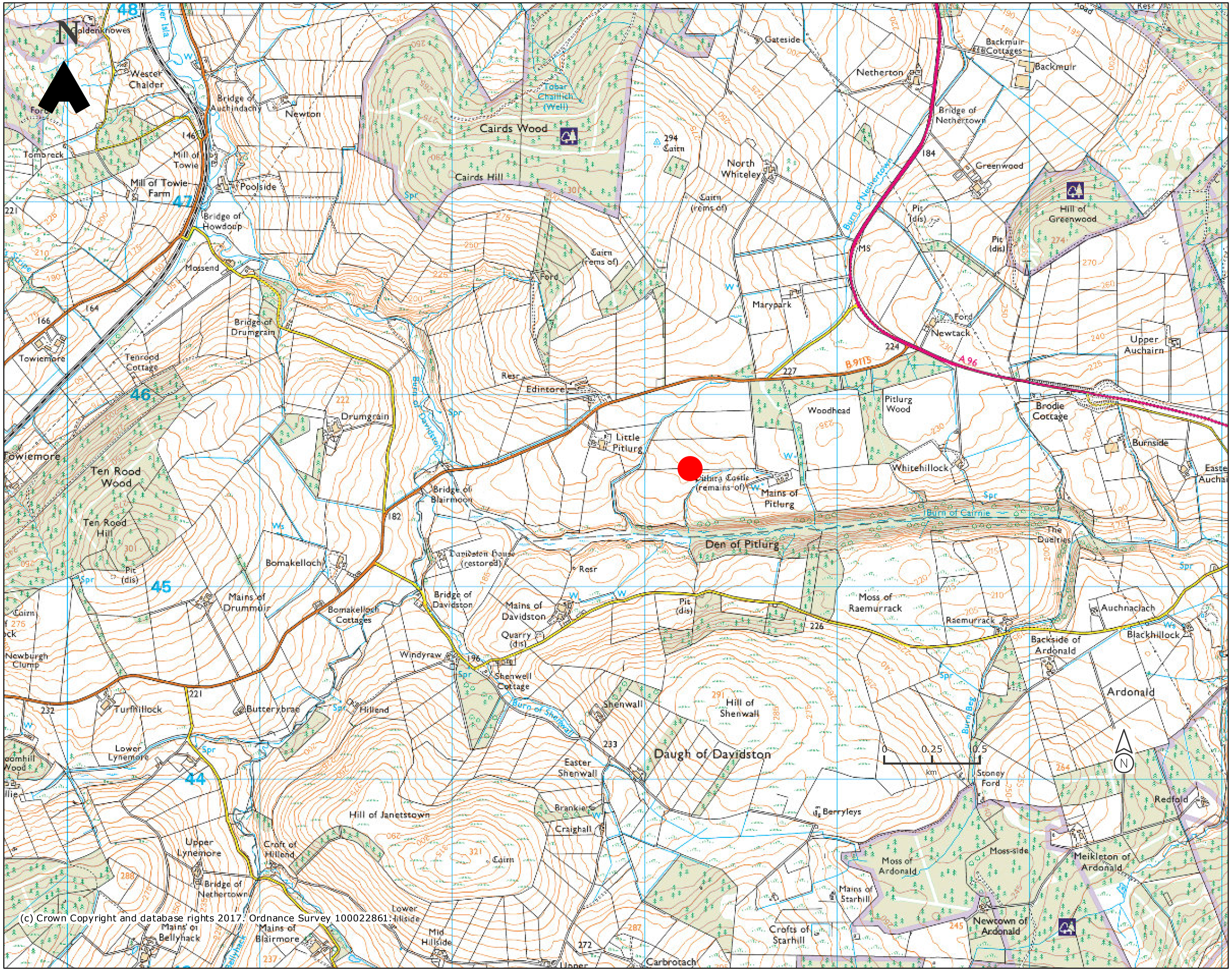
Access route

Scale: 1:2500, paper size: A2

plans ahead by emapsite™

Prepared by: Craig Allan, 04-07-2017

SITE LOCATION



TURBINE POSITION:
343229 845608

0 **1km**

SCALE 1:20,000 @ A3

SUPPORTING STATEMENT

INSTALLATION OF A 49KW WIND TURBINE AT MAINS OF PITLURG FARM WITH HEIGHT TO TIP OF 33.471M, HEIGHT TO HUB OF 23.4M AND A ROTOR DIAMETER OF 18.9M

Turbine Location:
TURBINE 1 – 343229 845608

OCTOBER 2017

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1 INTRODUCTION

This Statement has been prepared to support the planning application lodged with Moray Council for the installation of a 49kw wind turbines on land associated with Mains of Pitlurg Farm. The candidate turbine for this project is the Orenda Skye^{TM}. This turbine comprises the following specifications and measurements:

- 9.2m blades
- 18.9m rotor diameter
- 3 blades
- 23.4 tower
- 49kW generating capacity
- 55 rpm

In line with standard planning conditions, permission is sought for this development for 20 years from the first generation of electricity on site, after which time the turbine will be removed and the site restored.

1.1 Application Site

The site lies within an area of land associated with Mains of Pitlurg Farm. The turbine position lies in the region of 438m south of the B9115 and 1.37km South West of the A96. There is a further unclassified road 635m to the south of the development site. Keith lies 4.6km to the north and Huntly 10.8km south east. Lying 292m south of the proposed development site lies the Den of Pitlurg (SSSI).

The proposed location for the wind turbine sits at a height above sea level of approximately 250m AOD. In support of the application we have provided noise impact information as well as relevant drawings, maps, images and technical details.

1.2 Site Identification

Feasibility work carried out has assessed particular technical, environmental and aesthetic issues relating to the installation of the proposed turbine.

In technical terms, a number of factors were initially considered which included:

- **Topography**: the steepness of the land determines which parts of the site are most suitable for erecting a turbine;
- **Existing infrastructure**: local roads, rights of way, overhead or underground services, etc. which pass in close proximity to or through the proposal site, that require to be protected or safeguarded during construction and in the unlikely event of a structural failure during operation;
- **Access**: the means of accessing the proposal site via the local road network can influence the size of turbine that can be accommodated;
- **Grid connection capacity and location**: the means of carrying the power off-site and the electrical power that can be accommodated by the grid network in the area; and
- **Proximity to housing**: to safeguard the amenity of nearby properties from the potentially intrusive effects of the installation, both visually and noise related.

In environmental terms, the capacity of a proposal site may be further affected by areas of sensitivity, which may limit or even preclude development. Issues considered at the proposal site included:

- **Ecology and ornithology**: valuable habitats and protected species of plants, animals and birds that may be present on site, including the flight path of birds and bats;
- **Cultural heritage**: archaeological features that may be present on site; and
- **Other features**: property boundaries, hedgerows, proximity to buildings.

In landscape and visual terms, the capacity of the proposal site relates to its ability to accommodate wind turbine without creating unacceptable effects on the physical fabric of the site itself, on the character of the surrounding landscape and on views from surrounding areas. A number of landscape and visual design objectives were set out to guide the design process, as follows:

- Turbine positioning within the site should respond to **prevailing wind resource**;
- Turbine positioning within the site should relate to **landform features**, contours and boundaries in order to provide a landscape basis for a wind energy development;
- The development should respond to the **scale of the landform** and be appropriate for the overall landscape scale;
- The development should respond to the **local landscape context**, so that when seen it forms a positive image, with a clear rationale for turbine positioning, particularly from key local receptors;
- The turbine should be sited as far from **local residential properties** as is practicable; and
- The overall **visual intrusiveness** of the development should be minimised.

1.3 The Proposed Development

The intention of the proposal is to generate electricity from the power of the wind. The NOABL wind speed database gives an estimated wind speed of 8m/s at 10m AGL at the proposed turbine locations. The Orenda Skye^{TM} wind turbine can produce 200,000kWh of electricity at an average annual wind speed of 8m/s. Given that the candidate turbine tower measures 23.4m, this figure is an estimate of each turbine's output.

The Orenda Skye^{TM} turbine has a generation capacity typically seen with larger turbine dimensions. The oversized rotor in relation to tower height ensures a relatively large energy output is generated without the need for a larger, more visually intrusive machine.

Concrete foundations will secure the turbine. Underground cabling will transfer the power generated from the wind turbine.

The tower is constructed from high strength columbium-vanadium low alloy steel. The rotor blades are constructed from fibreglass.

1.4 Access

Access to the site by delivery and construction vehicles is likely to be taken from the main unclassified public road which leads directly to the farm and associated field networks. No new access track will be required. The Orenda Skye^{TM} turbine has a hydraulic tower which is raised from ground level without the need for a crane. Therefore, unlike most wind energy installations, there is no requirement for the creation of permanent access tracks in association with the proposal.

No issues associated with site access are predicted.

1.5 Development Phases

Construction

Depending on weather conditions, the turbine could take in the region of six weeks to build and are designed to have an operational life of 20 years. The construction process will consist of the following principal activities:

Week 1

- Site survey, preparation and installation of any temporary storage facilities
    - Duration – c. 1 day.
    - Vehicles – works van to transport construction workers
- Excavate turbine foundations and construct the turbine and transformer bases
    - Duration - 1 week
    - Vehicles required – 1 x digger, 1 x dumper truck, 1 x standard size articulated lorry to transport the digger and dumper truck to and from the site, 2 x concrete wagons, making c. 7 trips to site over a period of c. 3 days, 1 x aggregate wagon, 1 x works van to transport construction workers to site

Weeks 2 – 5

- No activity as concrete base is left to set

Week 6

- Excavate cable trench and lay the power and instrumentation cables
    - Duration: c. 1 day
    - Vehicles required: 1 x digger, 1 x dumper
- Install the grid connection
- Wind turbine component deliveries and turbine erection
    - Duration: 1 day
    - Vehicles required: 4 x standard-size articulated lorries to transport turbine components including tower sections, 1 x works van to transport construction workers to site
- Testing and commissioning the wind turbine
- Site restoration of disturbed areas
    - Duration: 1 day
    - Vehicles required: digger and dumper truck

Operation

Wind turbine operations would be overseen by suitably qualified local contractors who would visit the site to carry out maintenance. The following turbine maintenance would be carried out along with any other maintenance required by the manufacturer's specifications:

- Initial service

- Routine maintenance and servicing
- Blade inspections

Routine servicing would take place once a year with a main service at twelve-monthly intervals. Servicing would include the performance of tasks such as maintaining bolts to the required torque, inspection of blade pitch and braking mechanism, greasing of bearings, inspections of welds and structural integrity of the tower and maintaining all hydraulic and electrical systems.

Decommissioning

The development has been designed to have an operational life of 20 years. At the end of this period the development will either be decommissioned or an application submitted to extend its life.

Decommissioning will take account of the environmental legislation in operation and technology available at the time. Notice will be given to the local authority in advance of commencement of the decommissioning works, with all necessary licenses or permits being acquired.

2 PLANNING POLICY FRAMEWORK

The following is a summary of renewable energy law and national and local planning policy relevant to the determination of this application.

International, EU, UK and Scottish law and policy on renewable energy is a material consideration in the determination of this application.

Section 25 of the Town and Country Planning (Scotland) Act 1997 provides that:

"Where, in making any determination under the planning Acts, regard is to be had to the development plan, the determination is, unless material considerations indicate otherwise-

(a) to be made in accordance with that plan..."

The development plan comprises the Moray Local development Plan 2015. National planning policy is set out in Scotland's Third National Planning Framework (NPF3) – (June 2014) and Scottish Planning Policy (June 2014) and other documents that are a material consideration in the determination of the application.

The following outlines the renewable energy law and policy context within which the proposal has been brought forward and relevant national planning policy and applicable development plan polices.

Renewable Energy Law and Policy

Following the Rio Earth Summit in 1992 the development of law and policy in this area has been through various Conventions, Directives and policy statements. These include the United Nations Framework Convention on Climate Change (UNFCCC) 1992, the Kyoto Protocol and the EU Renewable Energy Directive 2009/28/EC. In the UK context they include the UK and Scottish Government's climate change and renewable

energy laws and policies which set out the UK's and Scotland's responses to their international and EU obligations;

Fundamentally, the requirement for cleaner energy generation (both for a secure energy supply and to positively impact on climate change) is the key driver to increasing the proportion of the UK's and Scotland's energy generated from renewables.

The first commitment period applied to emissions between 2008 and 2012; with the total emissions of the developed countries to be reduced by at least 5 % over the period, when compared with 1990 levels.

The second commitment period applies to emissions between 2013 and 2020. In 2010 it was agreed that future global warming should be limited to below 2.0 °C (3.6 °F) relative to the pre-industrial level.

The Protocol identified measures for attaining its objectives including the introduction of national policies to reduce GHG emissions, which is to be achieved in part through the development of renewable energy sources.

EU Law and Policy Renewable Energy Directive 2009/28/EC

Following on from the Kyoto Protocol the European Union implemented a number of measures pursuant to its obligations under the Protocol. Key amongst these has been the enactment of the Renewables Directive, 2009/28/EC. The Directive mandates levels of renewable energy use within the European Union.

Article 3 of the Directive requires that 20% of the energy consumed within the

European Union is renewable by 2020. This target is pooled among the Member States, with different targets being set for each member state. The target sits alongside existing commitments to reduce GHG emissions reductions (by 20%) and improvements in energy efficiency (of 20%), together known as the "20/20/20 targets".

The target for the UK is that 15% of its energy comes from renewable sources by 2020.

Members States are also obliged to prepare a National Renewable Energy Action Plan under Article 4, which sets out the road map of the trajectory to achieve the targets and, under Article 22, report on their implementation of the Directive and their progress towards their targets.

The Directive constitutes an essential part of the package of measures needed to comply with the commitments made by the EU under the Kyoto Protocol on the reduction of GHG emissions.

Updated EU Climate Change and Energy Policy – A Policy Framework for Climate and Energy in the Period from 2020 to 2030 (COM/2014/015 final)

EU policy on climate change and energy has remained under review since the implementation of the Renewable Energy Directive, and in March 2013 the European Commission issued a Green Paper looking beyond 2020 with the purpose of establishing a revised Framework for Climate Change and Energy policies through to 2030. This was followed in January 2014 by a Commission Communication which

proposes to set a greenhouse gas emissions reduction target for domestic EU emissions of 40% in 2030 relative to emissions in 1990. It also proposes a revised target of at least 27% as the share of renewable energy to be consumed in the EU by 2030. It is proposed that the latter should not be delivered through setting individual targets for Member States, as is currently the case, but instead by securing clear commitments to be decided by the Member States themselves, supported by strengthened EU level delivery mechanisms and indicators.

The intention is that European Union should pledge a GHG emissions reduction of 40% compared with 1990 by 2030 as part of the new Paris Agreements concluded in December 2015. In order to achieve this, significantly higher levels of renewable energy will be required.

UK Renewable Energy Law, Policy and Targets

At a UK level, following the UK's commitments through a range of legislation, strategies, plans and other documents to deliver the commitments under the Kyoto Protocol and in response to implementation of the EU Renewables Directive. It is clear that whilst great advances have been made towards meeting targets that there is still substantial additional investment in renewables generating capacity required if the Paris Agreements is to be met up to 2020 and beyond.

The Climate Change Act 2008

In the UK the Government responded to the challenge of the UNFCCC and Kyoto Protocol by the Climate Change Act 2008. The Act commits the UK to reducing emissions of GHGs by at least 80% in 2050 from 1990 levels. The 80% target includes GHG emissions from the devolved administrations, which currently account for around 20% of the UK's total emissions.

The Act requires the Government to set legally binding 'carbon budgets'. A carbon budget is a cap on the amount of greenhouse gases emitted in the UK over a five-year period. The first four carbon budgets have been put into legislation and run up to 2027.

The Renewable Energy Strategy 2009

The UK Renewable Energy Strategy sets out the UK Government's strategy in response to the obligations under the EU Renewable Energy Directive. The Strategy explains how the UK will meet its legally-binding target to ensure 15% of its energy comes from renewable sources by 2020: an almost seven-fold increase in the share of renewables in little more than a decade.

The Strategy seeks to reduce the UK's emissions of carbon dioxide (CO2) by over 750 million tonnes by 2030, promoting the security of the UK's energy supply, reducing overall fossil fuel demand by around 10% and gas imports by 20–30% against what they would otherwise have been in 2020.

UK Low Carbon Transition Plan 2009

The UK low carbon transition plan subsequently set out how the UK Government is to meet its binding carbon budget; an 18% cut in emissions on 2008 levels by 2020 (34% on 1990 levels). It also allocates individual carbon budgets for the major UK government departments, which are expected to produce their own plans. The plan amongst other measures identifies that emission cuts would come from the power sector.

The plan aims to cut emissions from the power sector and heavy industry by 22% on 2008 levels by 2020 - using 40% of electricity from low-carbon sources by that date. This is to be achieved by producing around 30% of the UK's electricity from renewables by substantially increasing the requirement for electricity suppliers to sell renewable electricity.

Carbon Plan 2011 – Delivering Our Low Carbon Future, December 2011

The Carbon Plan 2011 sets out the UK Government's proposals and policies for meeting the first four carbon budgets. It identifies that large-scale deployment of low carbon generation will be needed, estimating that 40–70 GW of new capacity will be required by 2030.

UK Renewable Energy Roadmap (2011) (including 2012 and 2013 Updates)

The UK Renewable Energy Roadmap, which was first published in 2011, sets out how the renewables required will be deployed in order for the UK to achieve its 15% target for meeting the UK's energy demand from renewables in accordance with the EU Renewables Directive. It identifies that in Scotland the Scottish Government has now introduced a target to deliver the equivalent of 100% of demand from renewable electricity by 2020.

The analysis of potential deployment to 2020 considers factors such as technology, cost, build rates, and the policy framework. These variables are modelled to produce illustrative 'central ranges' for deployment. The report identifies that, despite uncertainty about the contribution from individual technologies, the UK can deliver 234 TWh of renewable energy overall in 2020 – equivalent to 15% of its projected energy consumption.

In relation to onshore wind, the Strategy identifies that the UK in 2012 had more than 4 GW of installed onshore wind capacity in operation (generating approximately 7 TWh of electricity annually). The indicators are that onshore wind could contribute up to 13 GW by 2020. Achieving this level of capacity equates to an annual growth rate of 13%.

The UK's total onshore wind capacity increased by 1 GW between the end of 2014 Quarter 2 and end of 2015 Quarter 2, bringing total installed capacity to 5 GW.

The Roadmap updates confirm that, although there has been considerable progress, significant additional investment in new renewable capacity is still required if the UK is to meet its target of 15% of the UK's energy demand being met from renewables by 2020 in accordance with the EU Renewables Directive.

Renewable Energy Review 2011

The review of renewable energy by the Committee on Climate Change (CCC) was commissioned by the UK Government with a view to advising on the scope to increase ambition for energy from renewable sources. It was concluded that the UK Government's 2020 ambition is appropriate, and should not be increased. Instead it stated that the focus should be on ensuring that existing targets are met: this continues to require large-scale investment in renewables over the next 10 years, supported by appropriate incentives.

The CCC's overall conclusion was that there is scope for significant penetration of renewable energy to 2030 (e.g. up to 45%, compared to 3% in 2011). Higher levels subsequently (i.e. to 2050) would be technically feasible. Equally, however, it would be possible to decarbonise electricity generation with very significant nuclear deployment and have limited renewables. Carbon capture and storage may also emerge as a cost-effective technology.

The Review concluded that new policies are required to support technology innovation and to address barriers to uptake in order to suitably develop renewables as an option for future decarbonisation. With specific regard to onshore wind, the Report concludes that cost-estimates suggest that onshore wind is likely to be one of the cheapest low-carbon options. The Report also concluded that over 6 GW (generating 20 TWh a year) of onshore wind capacity could be added in the 2020s.

National Infrastructure Plan 2014

The National Infrastructure Plan (NIP) was first published in 2010, with subsequent updates in 2011, 2012, 2013 and most recently 2014. It sets out the Government's plan for investment in new infrastructure over the next decade and beyond. The latest edition of the Plan identified that the UK Government's strategic energy objectives in response to the Updated EU Climate Change and Energy Policy with its commitment to a greenhouse gas emissions reduction target for domestic EU emissions of 40% in 2030 relative to emissions in 1990.

As far as wind is concerned the NIP identifies that wind will remain in the top 40 priority infrastructure investments and will continue to play a significant part in the UK's energy mix.

Scottish Renewable Energy Law and Policy

The legal and policy framework in Scotland mirrors the development in UK law and policy, although the Scottish Government has committed itself to considerably more ambitious targets than the UK Government, reflecting the current government's proactive stance and the greater renewable energy resource that exists in Scotland.

Key Scottish legislation and policy includes the following:

The Climate Change (Scotland) Act 2009

The Climate Change (Scotland) Act was passed in 2009, committing Scotland to a 42% reduction in GHG emissions by 2020 and an 80% reduction target for 2050. To help

ensure the delivery of these targets, the Act also requires that the Scottish Ministers set annual targets, in secondary legislation, for Scottish emissions from 2010 to 2050.

Low Carbon Economic Strategy for Scotland 2010

Low Carbon Economic Strategy for Scotland 2010 sets out the Scottish Government's commitment to supporting the transition to a low carbon Scottish economy, necessary to meet Climate Change Act targets, to reduce emissions by 42% by 2020 (compared to the equivalent UK target of 34%), and by 80% by 2050. Furthermore, the Scottish Government has, since the publication of the Strategy, upgraded its commitment to delivering the equivalent of at least 100% of gross electricity consumption from renewables by 2020, and it is envisaged that onshore wind will continue to play a central role in achieving the target as the technology that can make the most immediate positive impact on Scotland's low carbon economy. The Strategy therefore expresses continuing encouragement to large, medium and small scale developments that are sited appropriately.

Low Carbon Scotland Meeting the Emissions Reduction Targets 2013-2027 - The Second Report on Proposals and Policies (RPP2) 2013

Low Carbon Scotland Meeting the Emissions Reduction Targets 2013-2027 is the Scottish

Government's Second Report on Proposals and Policies (RPP2) for meeting its climate change targets. It sets out how Scotland can deliver its statutory annual targets for reductions in GHG emissions for the period 2013–2027 set through the Climate Change (Scotland) Act 2009.

Scotland's targets from 2013–2027 are expressed in tonnes of carbon dioxide equivalent (CO_2e). A key part of the Scottish Government's Proposals and Policies is to largely decarbonise the electricity generation sector by 2030, using renewable sources for electricity generation with other electricity generation from fossil-fuelled plants utilising carbon capture and storage. The RPP2 reports that to date, the carbon intensity of electricity generation has fallen from 347 gCO_2/kWh in 2010 to 289 gCO_2/kWh in 2011 and that Scotland is on track for a further 83% reduction in carbon intensity by 2030. The decarbonisation target is a carbon intensity of 50 gCO_2/kWh by 2030.

The RPP2 states that progressing the Scottish Government's thematic energy policy objectives is critical to achieving the Climate Change Report on Proposals and Policies' (RPP)'s decarbonisation target. These include achieving at least 30% overall energy demand from renewables by 2020 and delivering the equivalent of at least 100% of gross electricity consumption from renewables by 2020 with an interim target of the equivalent of 50% of gross electricity consumption from renewables by 2015.

Electricity Generation Policy Statement 2013

The Scottish Government's Electricity Generation Policy Statement (EGPS) was published in 2013 to support the RPP. The EGPS examines the way in which Scotland generates electricity, and considers the changes which will be necessary to meet the targets which the Scottish Government has established, and reflects views from both industry and other stakeholders and also developments in UK and EU electricity policy.

It looks at the sources from which that electricity is produced, the amount of electricity used to meet Scotland's needs and the technological and infrastructural advances and requirements which Scotland will require over the coming decade and beyond.

8.53 The Scottish Government's policy on electricity generation is that Scotland's generation mix should deliver a secure, affordable, largely de-carbonised source of electricity supply by 2030 which also achieves the best possible economic benefit and competitive advantage for Scotland.

2020 Routemap for Renewable Energy in Scotland 2011 and December 2013 Update

The 2020 Routemap for Renewable Energy in Scotland updates the Scottish Government's Renewables Action Plan (2009). It sets out a routemap for achieving the Scottish Governments target to meet an equivalent of 100% demand for electricity from renewable energy by 2020, as well as a target of 11% renewable heat. The Routemap identifies the need for rapid expansion of renewable electricity across Scotland. It includes projections of potential patterns of deployment of renewable electricity capacity, based on historical trends, which indicates deployment of up to 16,000 MWe installed capacity by 2021. The Routemap, including the December 2013 Update, provides status reports on deployment to date (by individual sector) and identifies the main actions required to make progress towards the 2020 target. It identifies that the target requires a sustained annual renewable deployment rate of more than twice that ever previously experienced in Scotland. It states that as part of this deployment the Scottish Government is committed to the continued expansion of a portfolio of onshore wind farms to help meet renewables targets.

Despite the previous success of deploying renewables, the latest published data demonstrate that there is still very considerable additional investment in renewables required over coming years if the Scottish Government's target to meet an equivalent of 100% demand for electricity from renewable energy by 2020 is to be achieved. Considering the rapid decline in smaller scale on shore wind turbine developments it is imperative to encourage well planned and sustainable projects wherever possible in order to have the potential to meet the given targets.

2.1 Scottish Planning Policy

The planning policy context provides the spatial aspect to the Scottish Government's policy on renewables and onshore wind farm development and sets out the key policy criteria against which planning applications under the Town and Country Planning (Scotland) Act 1997 are to be determined including, the environmental impacts.

General Planning Policy Approach to Renewable Energy and Onshore Wind

The general planning policy context in respect of proposals for renewables including onshore wind farms are brought forward in Scotland includes both national and local planning policy.

National Planning Policy concerning renewables on onshore wind farms has evolved with Scottish renewable energy law and policy to ensure that the planning system assists in the delivery of the Scottish Government's target to meet an equivalent of 100% of electricity demand from renewable energy by 2020.

The key planning documents on renewable energy and onshore wind set out both the strategic policy framework, providing overarching guidance for Scottish Ministers and Local Planning Authorities, in terms of providing a generally supportive spatial framework within which proposals for renewable energy projects can be brought forward.

The national policy includes the National Planning Framework (NPF) for Scotland and Scottish Planning Policy (SPP), both of which have recently been reviewed and updated by the Scottish Government. Revised editions of both documents were published by the Scottish Government in June 2014.

2.2 Development Principles

The overarching aim of Scottish Planning Policy (2014) is to achieve sustainable economic growth. The SPP holds a presumption in favour of sustainable development, and seeks to consider the benefits and costs of a development over its entire life cycle.

In supporting business, the SPP states that the planning system should promote business development that increases economic activity while maintaining natural and cultural assets. In line with this, the proposed wind turbine for installation at Mains of Pitlurg Farm will complement and balance the existing business operations by reducing the financial burdens of the farming enterprise by creating a secondary income stream through means other than agricultural farming. The National Planning Framework for Scotland (NPF 2) has the central theme of highlighting the importance of renewable energy as a vital component of the country's energy mix, and identifies small-scale wind energy developments as being effective in contributing to the provision of local renewably generated electricity. The policy views small-scale installations as important in decentralising energy generation, noting that when taken together these projects result in a significant cumulative contribution to renewables targets.

The following include details of overall planning policy approach to renewables and onshore wind.

Scotland's Third National Planning Framework (NPF3), published in June 2014, provides the statutory framework for Scotland's long term spatial development. NPF3 sets out the Scottish Government's spatial development priorities for the next 20 to 30 years and what is expected of the planning system and the outcomes that it must deliver. Whilst it is not prescriptive, NPF3 forms a material consideration when determining applications for new wind energy developments. Strategic and local development plans should take into account the strategy, actions and developments set out in NPF3.

The NPF3 recognises that the Scottish Government has set a target of at least an 80% reduction in GHG emissions by 2050.

Reference to onshore wind is set out in the 'A Low Carbon Place' section. Key points emerging from NPF3 include:

Paragraphs 3.1 to 3.6 which discuss how planning will play a key role in delivering on the commitments set out in Low Carbon Scotland. The priorities are intended to set a clear direction, consistent with the climate change legislation.

Paragraph 3.7 confirms support for onshore wind energy but notes that development should avoid internationally and nationally protected areas. It is also recognised that there is strong public support for wind energy but opinions about onshore wind in particular areas can vary. In some places concern is expressed about the scale, proximity and impacts of proposed wind developments. In other places they are recognised as an opportunity to improve the long-term resilience of rural communities, with more communities benefiting from local ownership of renewables, with at least 285 MW of community and locally-owned schemes installed by 2013.

Paragraph 3.8 sets out targets for renewable energy generation. It is the aim of the Scottish Government to reduce total final energy demand by 12% by 2020. In order to do this it will be necessary to diversify the energy supply. It is also an aim to meet at least 30% of overall energy demand from renewables by 2020 which includes generating at least 100% of gross electricity consumption from renewables, with an interim target of 50% by 2015.

Paragraph 3.9 clarifies that Scotland will continue to capitalise on wind resources as part of the push to diversify Scotland's energy generation capacity. In particular, it is desired that Scotland become a world leader in offshore renewable energy. In time, it is expected that the pace of onshore wind energy development will be overtaken by marine energy opportunities.

Paragraph 3.23 reiterates that onshore wind will continue to make a significant contribution to diversification of energy supplies but that wind development is not desirable in National Parks or National Scenic Areas and points to spatial frameworks which are to be prepared in line with the SPP to guide new wind energy developments to appropriate locations.

Sustainable development is now firmly embedded as the underlying objective of the planning system, although in recent years, policy has tended to place greater emphasis on sustainable economic development. This is clear from the opening paragraph 1.1 of Scotland's Third National Planning Framework (NPF3) – (June 2014), which states that the Scottish Government's central purpose is to create a more successful country, with opportunities for all of Scotland to flourish, through increasing sustainable economic growth. This emphasis is carried thorough into SPP – (June 2014) (paragraph 1). As stated above this identifies that there is a presumption in favour of development that contributes to sustainable development, which we consider the proposed development provides.

Scottish Planning Policy (June 2014)

The new edition SPP was published in June 2014; its purpose is to set out national planning policies that reflect priorities of Scottish Ministers for the operation of the planning system and the development and use of land through sustainable economic growth. SPP aims to promote a planning process that is consistent across Scotland but flexible enough to accommodate local circumstances. It sets out a commitment to sustainable growth through a balance of development in the appropriate places.

According to the SPP, the commitment to increase the amount of electricity generated from renewable sources is a vital part of the response to climate change. Renewable energy generation will contribute to more secure and diverse energy supplies and support sustainable economic growth. The current target is for 50% of Scotland's electricity to be generated from renewable sources by 2020.

Paragraph 184 of SPP makes clear that the planning system should support the transformational change to a low carbon economy, consistent with national renewable energy objectives and targets.

Onshore Wind is referred to specifically in paragraphs 161 to 166 (development planning considerations) and paragraphs 169 to 174 (development management considerations) of the SPP.

Further advice is included the Scottish Government's On-line Renewables Planning Advice – On Shore Wind Turbines (Updated May 2014). This is not a policy document but provides more detailed best practice advice on onshore wind farms and wind turbine developments. This includes advice on development planning and the determination of planning applications for wind turbine development, including 'Typical Planning Considerations in Determining Planning Applications for Onshore Wind'.

As extracted and shown below the Finalised Implementation Guide states:

The land use planning context

The context for renewable development proposals is summarised below.

: Land Use Planning Context

The National Planning Framework 2 (NPF2)

• aims to 'realise the potential of Scotland's renewable energy resources and facilitate the generation of power and heat from clean, low carbon sources, including … producing heat and power from renewable sources …'

• requires 'landscape and visual impacts … to be important considerations in decision making on developments'

• identifies major infrastructure projects needed to deliver the national strategy, including the electricity grid through the Moray region.

3 NATURAL HERITAGE ASSESSMENT

Information concerning statutory and non-statutory natural heritage designated sites was sought within an area extending up to 5km from the proposed site.

3.1 Statutory Designated Sites

The Den of pitlurg (SSSI) is the only designated site located within a 5km radius of the proposal site.

3.2 Non-statutory Designated Sites

There are no non designated sites within 5km.

3.3 Assessment of Impacts

The proposal is for the installation of a wind turbine with a tower height of 23.4m and an 18.9m rotor diameter. No landscape feature, such as trees, hedgerows or ponds will be disturbed by the proposal. There are no statutory designated natural heritage sites within 5km of the proposal. The potential landscape and visual impact is further explored within the submitted LVIA.

4 CULTURAL & ARCHAEOLOGICAL HERITAGE ASSESSMENT

To ensure the development meets planning policy requirements in respect of cultural heritage, its potential effect upon the baseline cultural heritage resource for the site and for buffer zones extending at most to a 5km radius, has been assessed.

4.1 Scheduled Ancient Monuments

There are no Scheduled Ancient Monuments (SAMs) and or Scheduled Monuments & Sites within the vicinity of the proposal.

4.2 ARCHAEOLOGY

A search for sites within a 1km radius of the proposal site was undertaken through Canmore data and noted below:

Canmore ID	Site Name	Classification
279272	Mains Of Davidston	Farmhouse (Period Unassigned), Farmstead (Period Unassigned)
347871	Hill Of Shenwall	Quarry (Period Unassigned)
158935	Mains Of Davidston, Cottage	Cottage (Period Unassigned)
69282	Denhead	Farmstead (Period Unassigned)
156279	Mains Of Pitlurg	Enclosure (Period Unassigned)
131146	Little Pitlurg	Farmhouse (Period Unassigned), Farmstead (Period Unassigned)
131145	Mains Of Pitlurg	Farmhouse (Period Unassigned), Farmstead (Period Unassigned)
131144	Woodhead	Farmstead (Period Unassigned)
130600	Edintore	Farmstead (Period Unassigned)
235372	Edintore House	House (Period Unassigned)
17301	Pitlurg Castle	Dovecot (Period Unassigned), Tower House (Medieval)

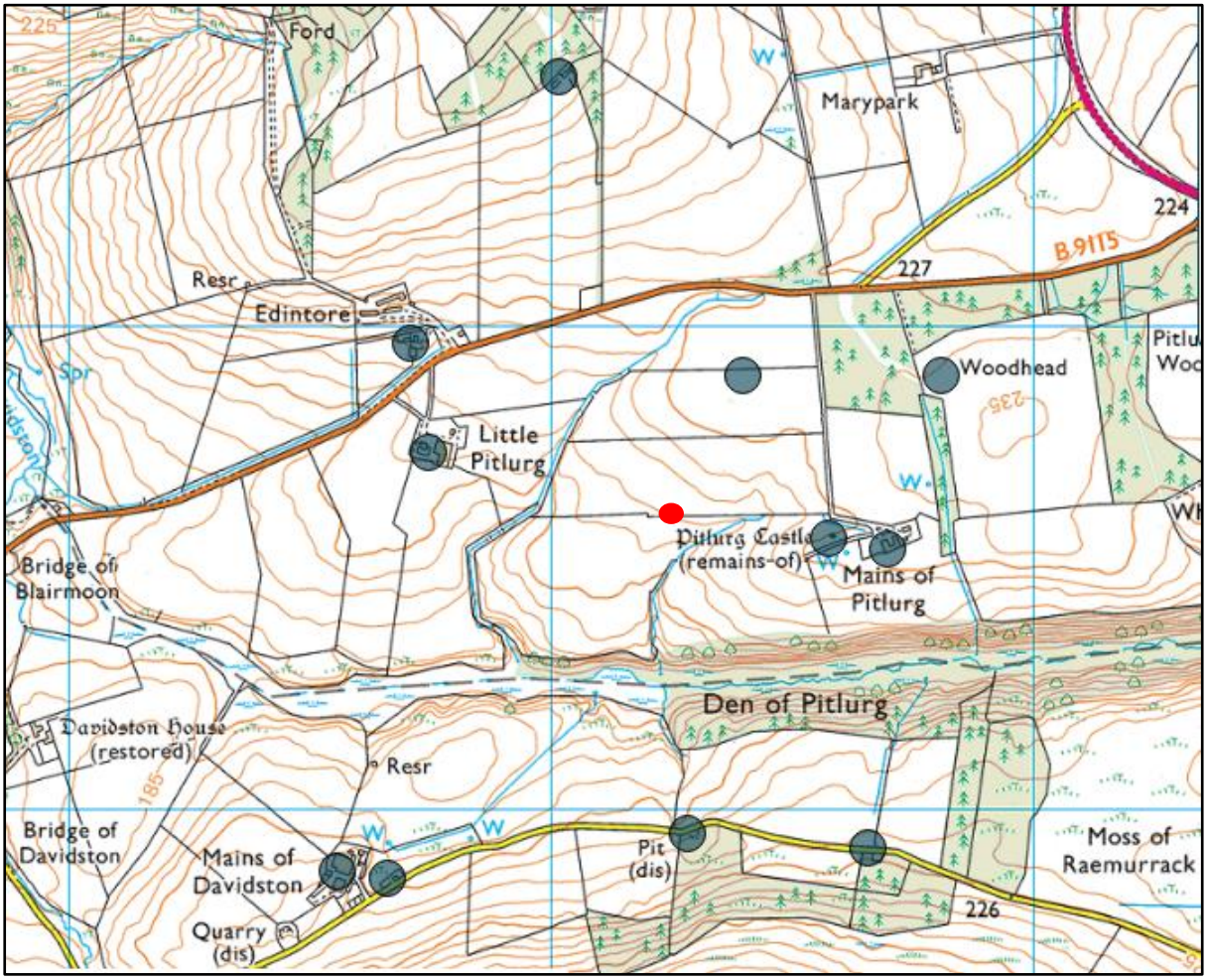
Gardens and Designed Landscapes

There are no entries on the Gardens and Designed Landscapes Inventory located within a 1km radius of the proposal site.

4.3 Assessment of Direct Impacts

This section considers the potential for the development to cause direct effects in the form of damage or destruction during construction upon features of cultural heritage and archaeological interest, whether known sites or unknown buried archaeology. These effects would be most likely to occur during construction and decommissioning, and would be permanent and irreversible.

The proposal site is not located immediately on any historic, cultural or built site, monument or building as shown in the extract from Canmore below:



It is noted that there are no sites within the immediate proximity to the development site nor is there any along the access route. There should be no archaeological impact due to the turbine development. If, in the unlikely event of the uncovering of archaeological remains during the construction stage of the project, work will halt immediately and archaeological expertise sought.

4.4 Assessment of Indirect Impacts

This section considers the potential for indirect, visual impacts to occur upon the settings of features of cultural heritage and/or archaeological interest. The setting of a scheduled monument or listed building can be loosely interpreted as features, spaces and views that are

historically and functionally related, and which can be considered to be vital to their intrinsic interest.

Setting can be tangible, such as a defined boundary, or intangible such as atmosphere or ambience. The main concern for visual effects on a cultural heritage setting is the potential for the development to fragment the historic landscape, separate connectivity between historic sites and impinge on views to and from sites with important landscape settings, although, the visually permeable nature of the development may permit the visible setting to a special interest to still be apparent. Visual dominance, scale, intervisibility, vistas and sight lines as well as noise, movement and light as potential effects upon features of cultural heritage interest that might be derived from wind energy projects. Indirect effects can occur during construction, operation and decommissioning.

The potential for indirect impacts from the proposal is considered to be low for the following reasons:

- No SMs lie within a 5km radius of the proposed turbine location and the scale of the landscape and the existence of turbine developments reduce the potential for visual impact to any noted site. The ZTV gives a worse case scenario and whilst it shows turbine visibility it does not demonstrate how much of the turbine will be visual. In some cases only partial visuals are experienced greatly reducing the perceived level of impact. It is highly unlikely that the turbine will have any damaging effect on their setting.

RESIDENTIAL AMENITY

4.5 Noise

ETSU-R-97 is the industry standard document for setting appropriate noise emission levels for operating turbine and guides planning conditions. ETSU-R-97 includes a simplified noise criterion appropriate for single turbine developments, whereby limiting turbine noise at the nearest properties to no greater than 35 dB, $L_{A90,10min}$ at wind speeds of up to 10 ms^{-1} is considered to afford sufficient protection of amenity (a higher noise limit of 40 dB(A) may be applied to properties where the occupier has a financial involvement). The candidate turbine for the development is the Orenda Skye 49kW machine with an 23.4m tower having a sound power level of 93.5 dB(A) at a wind speed of 10m/s.

A site specific desk top assessment has been carried out to ascertain compliance both as an individual development and cumulatively with turbines within the area.

In order to address any potential cumulative noise levels we took into consideration any turbine development within proximity of the proposed development that in conjunction with the proposed turbine would elevate the noise levels to the residential properties. Please refer to Noise analysis report for full details.

4.6 Shadow Flicker

Shadow flicker is most commonly experienced upon land to the west and east of turbine structures as the sun rises and falls respectively, and is less likely during summer months when the sun is higher in the sky. Planning policy stipulates that a separation distance equivalent to 10 times the rotor diameter is sufficient to avoid unacceptable levels of shadow flicker. In this

instance a 18.9m rotor diameter equates to a 189m separation requirement from the nearest receptor. As the nearest dwelling is far in excess of this from the turbine there should be no residential property either involved with the development or outwith that will be affected by shadow flicker from the proposed turbine.

5 LANDSCAPE & VISUAL IMPACT

A Visual assessment has been undertaken with regard to the proposed development with images being taken from key viewpoints. Reference has been taken with regard to the Carol Anderson Landscape Architects 2017 guidance as per the Finalised Draft Onshore Wind energy Guidance 2017.

As per guidelines care has been taken to ensure that the turbine will not be highly visible against the sea and sky and out of scale with the landform, low buildings and wind pruned trees. It is our opinion that the turbine is capable of being viewed in context with the existing landscape and built environment and that it can function without causing undue visual intrusion.

The landscape in which the turbine is to be sited does have elements of sensitivity but it is our view that this particular site and the closer vicinity in general has the potential to comfortably site turbine without any undue harm being caused to the landscape.

The proposal is of an appropriate scale and context for the area.

The Zone of Theoretical Visibility (ZTV) map accompanying the proposal gives an indication of the visual influence of the proposal within a 15km radius. It is important to note that the ZTV is based solely on ground contour data and so does not account for landscape features such as vegetation and buildings which can limit or block views. As such, the ZTV should be considered as representing a visual impact worst-case scenario.

It is our contention that the scale of turbine corresponds appropriately to the scale of the surrounding landform, ensuring that the turbine 'fits' and will not dwarf or impose upon any landscape feature.

6 FURTHER CONSIDERATIONS

6.1 Cumulative Considerations

Wind energy projects either in the planning process at the time of writing or having been granted approval within a 5km radius of the proposal site, are presented within the noise analysis. Those within 1km would have an effect when considered in cumulative upon noise impact and/or visual impact to residential properties within the area and these have been shown within the visual montage and considered within the cumulative noise assessment as shown previously.

6.2 Aviation

It is acknowledge that because of their height and the rotating blades which can cause 'clutter' on radar, wind farms can have an effect on the aviation domain. As stated rotating wind turbine blades may have an impact on certain aviation operations, particularly those involving radar. The aviation community has procedures in place designed to assess the potential effect

of developments such as wind farms on its activities and where necessary to identify mitigating measures.

We do not considered that there will now be an issue raised with regard to unacceptable levels of impact with regard to turbine operations from this proposal.

6.3 Flood Risk

SEPA's interactive flood risk mapping tool has been consulted, which demonstrates that the proposed site lies outwith any area deemed at risk from flooding.

7 CONCLUSIONS

The proposed wind turbine for installation at Mains of Pitlurg Farm is the small to medium scale Orenda Skye^{TM} 49kW machine with a 23.4m tower and 18.9m rotor diameter. The proposal will generate electricity from a renewable, non-depleting source. The production of such a clean energy, which will be fed into the grid and utilised on a local level will ensure a further contribution to lowering carbon emissions. The financial benefit of the turbine will have a beneficial effect on a small enterprise that strives to ensure continuance in the area. Even small benefits can lead to the enterprise growing and improving over time. This can benefit the local economy and inevitably lead to offering employment in the area. It may only be a small contribution when taken into consideration a National employment of renewable projects but in conjunction with all similar projects throughout the country it will play its part in reaching targets.

It is considered that the turbine will not result in an unacceptable impact to residences, the landscape or the natural and cultural heritage. No access track is involved, therefore the land take requirement is minimal. The benefits of the proposal, can be seen to exceed any perceived harm and as such intrinsically complies with the principle of sustainable development which both the Scottish Government and The Moray Council promote.

ECOLOGICAL APPRAISAL

PROPOSAL TO INSTALL A 49kW ORENDA WIND TURBINE

LAND AT MAINS OF PITLURG

Turbine Location:
TURBINE 1 – 343229 845608

OCTOBER 2017

INTRODUCTION

The following report pertains to the potential ecological constraints and assessment of potential impacts on Protected Species and Habitats within the vicinity of the proposed 49kw Orenda Wind turbine on land at Mains of Pitlurg Farm.

The purpose of the assessment is to assess

- The potential constraints to a development of this nature taking place on site.
- Assess the ecological value of the site
- Ascertain the level of ecological impact
- Highlight and recommend any further specialist assessment requirements.

It has been established that in line with The Town & Country Planning (Environmental Impact Assessment) (Scotland) Regulations 2011 that the proposed development does not require an Environmental Impact Assessment to be submitted in support of the application and therefore a full, in-depth ecological and ornithological study is not required.
It has however been requested that further information regarding of the potential ecological impact and protected species in the area of the proposed development be submitted in order to provide more information to the relevant interested parties.

LEGISLATIVE CONTEXT

In line with current legislation it is acknowledged that the following legislation and guidance requires to be taken into consideration:

- Council Directive 92/43/EEC on the Conservation of Natural Habitats and of Wild Flora and Fauna (the Habitats Directive 1992)
- The Wildlife and Countryside Act 1981 (as Amended)

Birds
Schedule 5 Animals

- The Natural Conservation (Scotland) Act 2004; Protection of Badgers Act 1992
- Conservation (Natural Habitat &c.) Regulations 1994 (as Amended)
- Natura 2000 Sites (European Sites)
- Bird Species of Conservation Concern
- Amphibians & Reptiles
- Scottish Biodiversity List
- UK and Local Biodiversity Action Plan (BAP)
- Statutory Designated Sites

Protected Species include:

- Badgers
- Bats
- Water Vole
- Otters
- Red Squirrels
- Great Crested Newts
- Amphibians & Reptiles
- Birds

Protected Sites and Habitats include:

- Sites of Special Scientific Interest (SSSI)
- Special protection Area (SPA)
- Special Area of Conservation (SAC)

AREA OF ECOLOGICAL CONSIDERATION

The area of sensitivity for ecological features vary dependent on the nature, behaviour and/or habitat of the species and how sensitive it/they are to the proposed development.
In order to assess the impact to species, individual habitats and sensitive areas [redacted] has been considered [redacted].

METHODOLOGY
In order to compile an informed report we have consulted SNH directly concerning potential for impact, especially concerning bird activity, Magic Maps, NBN Gateway and NBN Atlas Scotland. The landowners were also asked to provide any information they could about the current interaction of wildlife within the area.

SITE DESCRIPTION
The site lies within an area of land associated with Mains of Pitlurg Farm. The turbine position lies in the region of 438m south of the B9115 and 1.37km South West of the A96. There is a further unclassified road 635m to the south of the development site. Keith lies 4.6km to the north and Huntly 10.8km south east. Lying 292m south of the proposed development site lies the Den of Pitlurg (SSSI).
The proposed location for the wind turbine sits at a height above sea level of approximately 250m AOD.

We have undertaken desk top analysis of available information in order to ascertain whether there is likely to be impact and if so whether further site specific specialist surveys require to be undertaken.

Based on the information available it has been identified that there is very little bird activity [redacted] and that SNH do not have any further comment to make other than that stated previously, we do not anticipate that site specific specialist reporting is required in this instance.

SPECIES REVIEW
Utilising the data provided by Nesbrec and NBN Atlas Scotland for the area we can identify the recorded sightings of species [redacted] is as noted below:

Roe Deer	13
Red Deer	3
Hedgehog	5
Wild Cat	7

Brown Hare
Mountain Hare
Otter
Pine Marten
Badger
Field Vole
Stoat
American Mink
Rabbit
45 Khz Pipistrelle
Pipistrelle
55 Khz Pipistrelle
Brown Long-Eared Bat
Red Squirrel
Common Shrew
Mole
Fox

BATS

Given that there is recorded bat activity in the area it is considered prudent to adhere to given guidelines regarding the sighting of turbines in relation to potential impact to bats.
It is noted that the turbine position is [redacted] from any building noted for bat activity, that the turbines are not sited along any hedgerow and that they are a[redacted] separation between the turbine blade tips and any linear feature that bats may follow.

RED SQUIRREL

There are recorded sightings of Red squirrel [redacted] however the land on which the turbine is to be sited does not offer suitable habitat for Red squirrels. More suitable and available habitats are available in the wider locale. No tree will be removed or affected by the proposed development.

PINE MARTIN

There are recorded sighting of Pine Martin [redacted]. The area in and around the turbine development does not offer suitable habitats or play suitable host to pine martin activity.

WATER VOLE

There are no recorded sighting of water Vole [redacted]. The area in and around the turbine development does not offer suitable habitats or play suitable host to water vole activity.

OTTER

Evidence of Otter has been shown [redacted]. Due to their tendency to utilise burns and dense gorse for their habitats it is thought that otter activity it will be centralised in those areas. The area around the turbines does not offer prime habitat which is readily available in other areas. In order to ensure that no impact to any undiscovered habitats that the turbines or an part of the infrastructure including cable runs would not be within 30m of a Burn in order to ensure that any habitat, feeding or commuting route is not disturbed.

BADGERS

There is identified sites of badgers [redacted]. However not within the vicinity of the turbine development. It is noted however that badgers have been noted to wander widely and therefore it is prudent to mitigate against any potential impact or inadvertent destruction of habitat by the following methods:

- All contractors will be made aware of badgers and their legal protection.
- All contractors will be made aware that there is the potential for badgers to be near the site and that they are at risk from vehicles, exposed trenching and pipes. In order to reduce the risk of badgers being hit by vehicles a speed restriction will be implemented for all vehicles during construction, maintenance and visitations to the site. All trenchwork, pipes and any other potential for open entrapment will be covered safely at the end of each working day to ensure that no badgers or any other wildlife becomes trapped.
- Ramps will be located within trenches or pits that cannot be covered at the end of each day in order to provide an exit for any animal that may inadvertently wander into a pit or trench.

SUMMARY

It can be concluded from the information provided and that readily available online information that [redacted] around the proposed turbine development shows little terrestrial mammals and/or ornithological activity that would be of concern. The land does not offer suitable habitat in respect of ornithological concerns. There has been no evidence of any protected species or habitat on site and with preferred habitats within the areas away from the turbines it is considered that there is minimal risk of impact to species or habitats by the installation of the 49kw Orenda wind turbine. It is noted that there have been sightings of protected species [redacted] and so in order to protect any potential disruption or impact all contractors will be instructed on how to maintain a safe environment and reduce the risk of harm to habitats and species [redacted].

It is considered that no further survey work will be required in order for the turbine development to proceed.

VISUAL MONTAGE

LAND AT MAINS OF PITLURG

TURBINE POSITION:343229 845608

INSTALLATION OF AN ORENDA 49kw WIND TURBINE

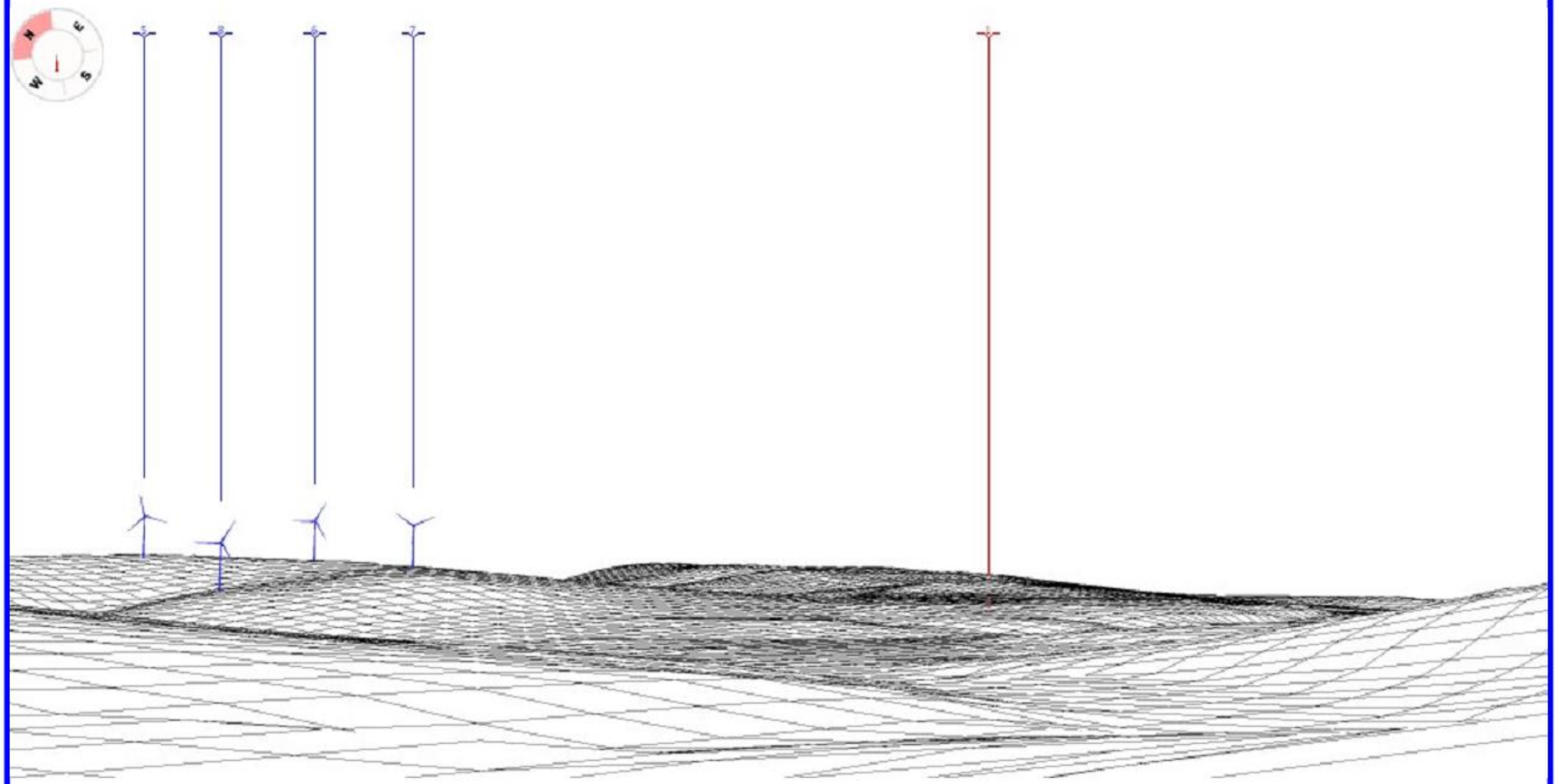
EXISTING VIEW

Project:
Mains of Pitlurg

	Valid	Manufact.	Type-generator	Power, rated [kW]	Rotor diameter [m]	Hub height [m]	Distance [m]
1 New	Yes	Orenda	-51	51	19.1	24.5	3,421
5 Exist	Yes	ENERCON	E-82 E2-2,300	2,300	82.0	78.3	3,828
6 Exist	Yes	ENERCON	E-82 E2-2,300	2,300	82.0	78.3	3,909
7 Exist	Yes	ENERCON	E-82 E2-2,300	2,300	82.0	78.3	3,660
8 Exist	Yes	ENERCON	E-82 E2-2,300	2,300	82.0	78.3	3,278

Recommended observation distance: 30 cm
Photo exposed: 17/09/2017 14:27:52
Lens: 50 mm Film: 36x24 mm Pixels: 2448x1633
Eye point: British TM-OSGB36/Airy (GB/IE) East: 340,273 North: 843,886
Wind direction: 0° Direction of photo: 53°
Camera: A
Photo: C:\...\Adele\Dropbox\Adams photos\Mains of Pitlurg\340273 843886.jpg

Created by:
Adele Ellis / whichturbine@btinternet.com



Project:
Mains of Pitlurg

	Valid	Manufact.	Type-generator	Power, rated [kW]	Rotor diameter [m]	Hub height [m]	Distance [m]
1 New	Yes	Orenda	-51	51	19.1	24.5	3,421
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8 Exist	Yes	ENERCON	E-82 E2-2,300	2,300	82.0	78.3	3,278

Recommended observation distance: 35 cm
Photo exposed: 17/09/2017 14:27:52
Lens: 50 mm Film: 39x19 mm Pixels: 1000x500
Eye point: British TM-OSGB36/Airy (GB/IE) East: 340,273 North: 843,886
Wind direction: 0° Direction of photo: 53°
Camera: A
Photo: C:\...\Adele\Dropbox\Adams photos\Mains of Pitlurg\340273 843886.jpg

Created by:
Adele Ellis / whichturbine@btinternet.com

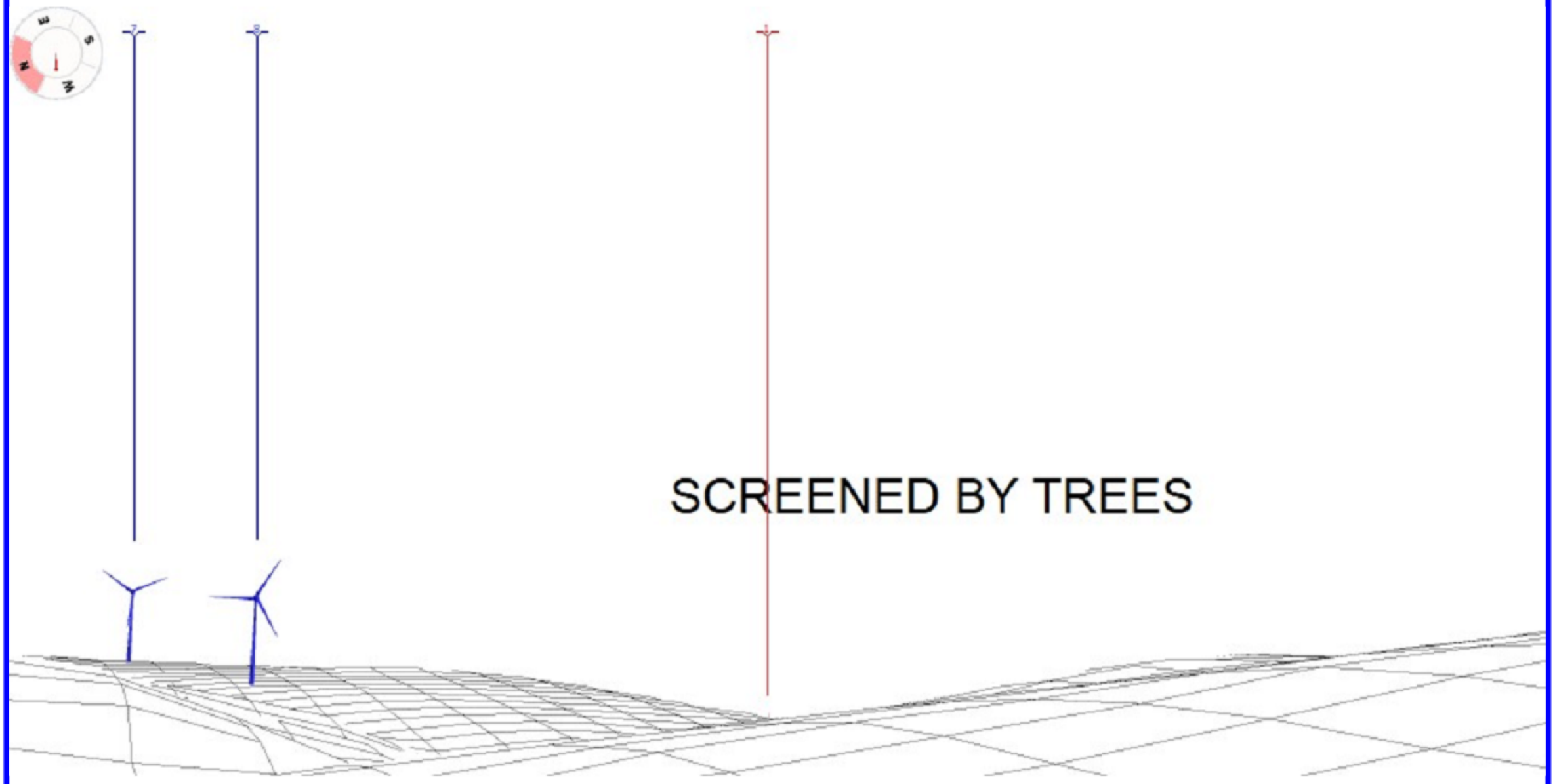
EXISTING VIEW

Project:
Mains of Pitlurg

	Valid	Manufact.	Type-generator	Power, rated [kW]	Rotor diameter [m]	Hub height [m]	Distance [m]
1 New	Yes	Orenda	-51	51	19.1	24.5	3,004
7 Exist	Yes	ENERCON	E-82 E2-2,300	2,300	82.0	78.3	2,369
8 Exist	Yes	ENERCON	E-82 E2-2,300	2,300	82.0	78.3	1,887

Recommended observation distance: 30 cm
Photo exposed: 17/09/2017 14:52:55
Lens: 50 mm Film: 36x24 mm Pixels: 2448x1633
Eye point: British TM-OSGB36/Airy (GB/IE) East: 340,420 North: 846,673
Wind direction: 0° Direction of photo: 110°
Camera: B
Photo: C:\...\Adele\Dropbox\Adams photos\Mains of Pitlurg\340420 846673.jpg

Created by:
Adele Ellis / whichturbine@btinternet.com



Project:
Mains of Pitlurg

	Valid	Manufact.	Type-generator	Power, rated [kW]	Rotor diameter [m]	Hub height [m]	Distance [m]
1 New	Yes	Orenda	-51	51	19.1	24.5	3,004
7 Exist	Yes	ENERCON	E-82 E2-2,300	2,300	82.0	78.3	2,369
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Wind direction: 0° Direction of photo: 110°
Camera: B
Photo: C:\...\Adele\Dropbox\Adams photos\Mains of Pitlurg\340420 846673.jpg

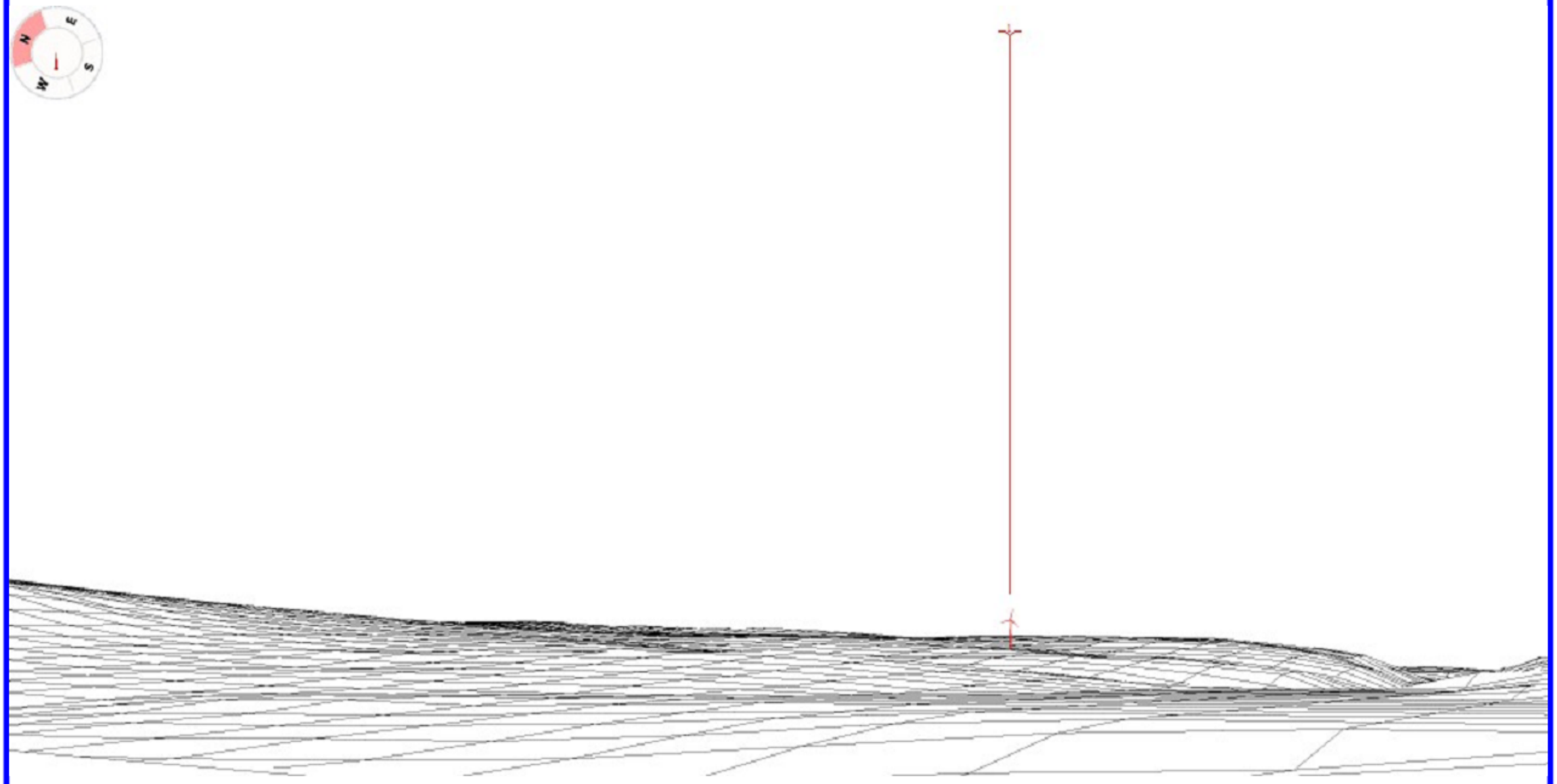
Created by:
Adele Ellis / whichturbine@btinternet.com

Project:
Mains of Pitlurg

	Valid	Manufact.	Type-generator	Power, rated [kW]	Rotor diameter [m]	Hub height [m]	Distance [m]
1 New	Yes	Orenda	-51	51	19.1	24.5	1,749

Recommended observation distance: 30 cm
Photo exposed: 17/09/2017 14:36:32
Lens: 50 mm Film: 36x24 mm Pixels: 2448x1633
Eye point: British TM-OSGB36/Airy (GB/IE) East: 341,559 North: 845,089
Wind direction: 0° Direction of photo: 65°
Camera: C
Photo: C:\...\Adele\Dropbox\Adams photos\Mains of Pitlurg\341559 845089.jpg

Created by:
Adele Ellis / whichturbine@btinternet.com



Project:		Valid	Manufact.	Type-generator	Power, rated [kW]	Rotor diameter [m]	Hub height [m]	Distance [m]
Mains of Pitlurg								
	1 New	Yes	Orenda	-51	51	19.1	24.5	1,749

Recommended observation distance: 35 cm

Photo exposed: 17/09/2017 14:36:32
Lens: 50 mm Film: 39x19 mm Pixels: 1000x500
Eye point: British TM-OSGB36/Airy (GB/IE) East: 341,559 North: 845,089
Wind direction: 0° Direction of photo: 65°
Camera: C
Photo: C:\...\Adele\Dropbox\Adams photos\Mains of Pitlurg\341559 845089.jpg

Created by:

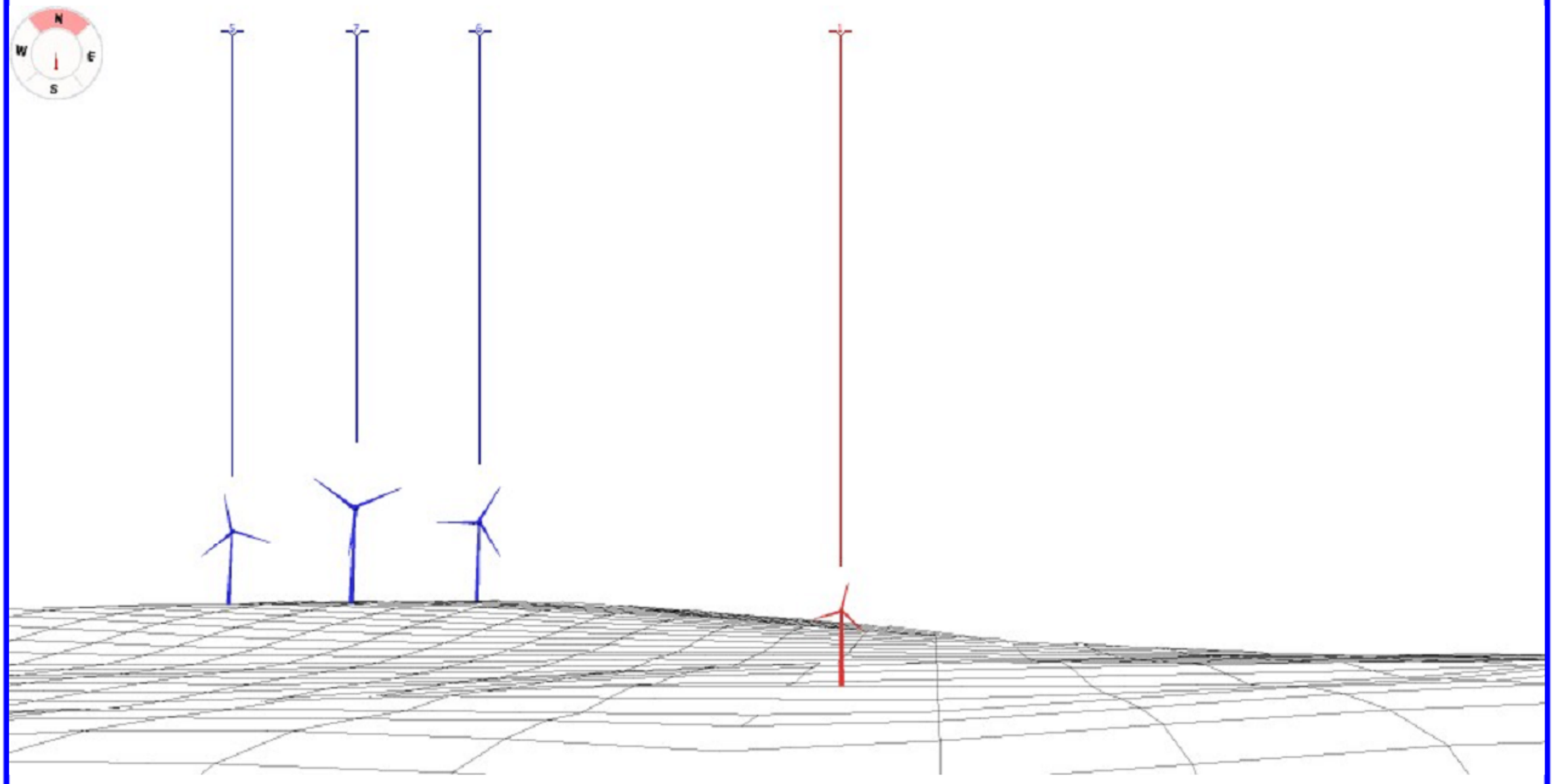
Adele Ellis / whichturbine@btinternet.com

Project:
Mains of Pitlurg

	Valid	Manufact.	Type-generator	Power, rated [kW]	Rotor diameter [m]	Hub height [m]	Distance [m]
1 New	Yes	Orenda	-51	51	19.1	24.5	657
5 Exist	Yes	ENERCON	E-82 E2-2,300	2,300	82.0	78.3	2,156
6 Exist	Yes	ENERCON	E-82 E2-2,300	2,300	82.0	78.3	1,951
7 Exist	Yes	ENERCON	E-82 E2-2,300	2,300	82.0	78.3	1,664

Recommended observation distance: 30 cm
Photo exposed: 17/09/2017 14:40:28
Lens: 50 mm Film: 36x24 mm Pixels: 2448x1633
Eye point: British TM-OSGB36/Airy (GB/IE) East: 343,259 North: 844,952
Wind direction: 0° Direction of photo: 355°
Camera: D
Photo: C:\...\Adele\Dropbox\Adams photos\Mains of Pitlurg\343259 844952.jpg

Created by:
Adele Ellis / whichturbine@btinternet.com



Project:
Mains of Pitlurg

		Valid	Manufact.	Type-generator	Power, rated [kW]	Rotor diameter [m]	Hub height [m]	Distance [m]
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5	Exist	Yes	ENERCON	E-82 E2-2,300	2,300	82.0	78.3	2,156
6	Exist	Yes	ENERCON	E-82 E2-2,300	2,300	82.0	78.3	1,951
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Wind direction: 0° Direction of photo: 355°
Camera: D
Photo: C:\...\Adele\Dropbox\Adams photos\Mains of Pitlurg\343259 844952.jpg

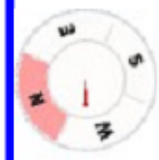
Created by:
Adele Ellis / whichturbine@btinternet.com

Project:
Mains of Pitlurg

	Valid	Manufact.	Type-generator	Power, rated [kW]	Rotor diameter [m]	Hub height [m]	Distance [m]
1 New	Yes	Orenda	-51	51	19.1	24.5	544

Recommended observation distance: 30 cm
Photo exposed: 24/09/2017 14:02:55
Lens: 50 mm Film: 36x24 mm Pixels: 2448x1633
Eye point: British TM-OSGB36/Airy (GB/IE) East: 342,791 North: 845,931
Wind direction: 0° Direction of photo: 110°
Camera: E
Photo: C:\...\Adele\Dropbox\Adams photos\Mains of Pitlurg\342791 845931.jpg

Created by:
Adele Ellis / whichturbine@btinternet.com



Project: Mains of Pitlurg

	Valid	Manufact.	Type-generator	Power, rated [kW]	Rotor diameter [m]	Hub height [m]	Distance [m]
1 New	Yes	Orenda	-51	51	19.1	24.5	544

Recommended observation distance: 35 cm

Photo exposed: 24/09/2017 14:02:55
Lens: 50 mm Film: 39x19 mm Pixels: 1000x500
Eye point: British TM-OSGB36/Airy (GB/IE) East: 342,791 North: 845,931
Wind direction: 0° Direction of photo: 110°
Camera: E
Photo: C:\...\Adele\Dropbox\Adams photos\Mains of Pitlurg\342791 845931.jpg

Created by:

Adele Ellis / whichturbine@btinternet.com

Project:
Mains of Pitlurg

Description:
Installation of an Orenda wind turbine

Printed/Page
03/10/2017 12:13 / 1

Licensed user:

Adele Ellis / whichturbine@btinternet.com

Calculated:
03/10/2017 11:36/2.9.285

VISUAL - Map

Calculation: photomontage

0 500 1000 1500 2000 m

Map: Bitmap map: NJ.tif , Print scale 1:40,000, Map center British TM-OSGB36/Airy (GB/IE) East: 341,766 North: 844,579

New WTG Existing WTG Camera

Project:
Mains of Pitlurg

Description:
Installation of an Orenda wind turbine

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25/08/2017 11:30 / 1

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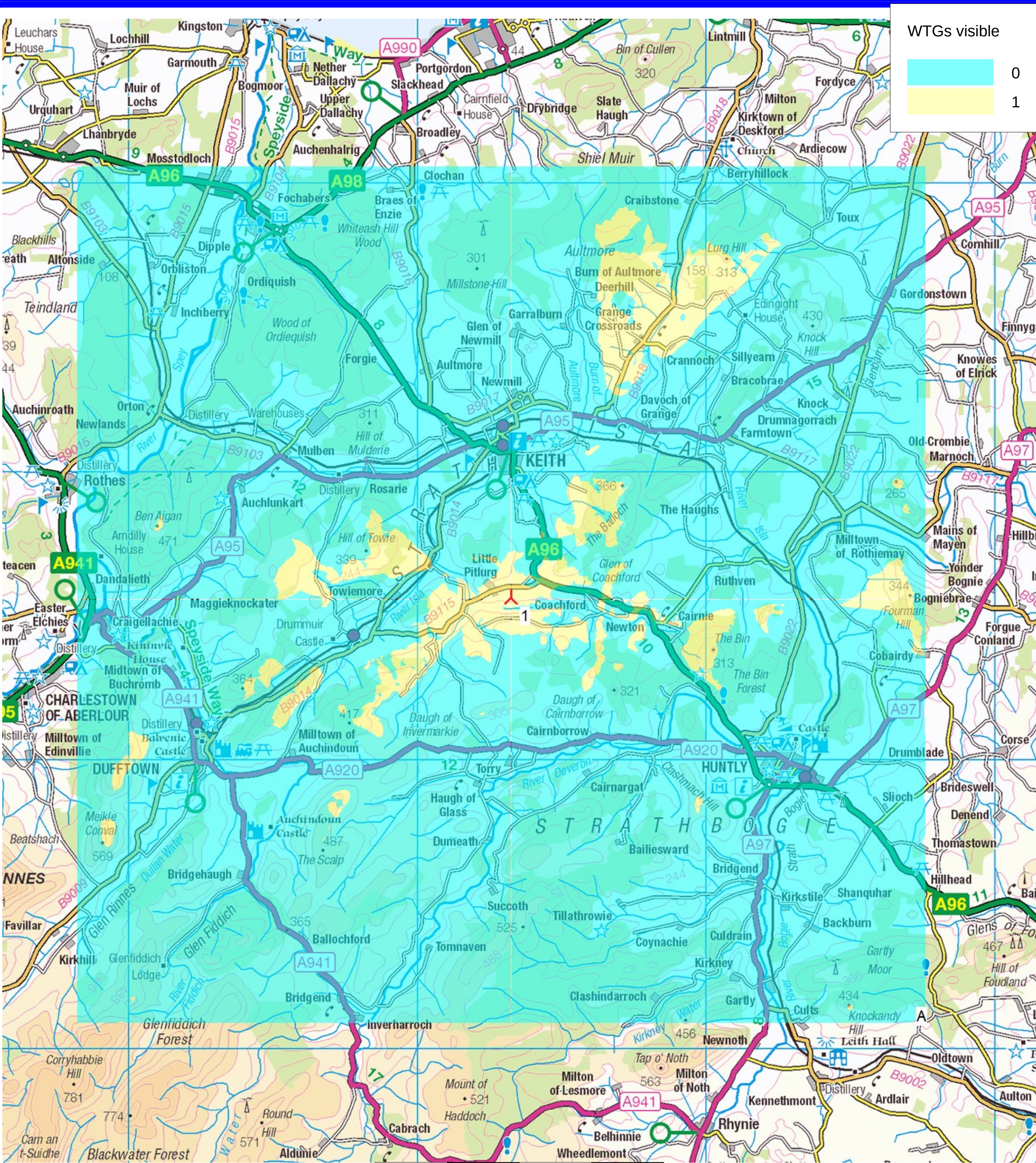
Adele Ellis / whichturbine@btinternet.com

Calculated:
25/08/2017 11:28/2.9.285

ZVI - Map

Calculation: ZTV to tip

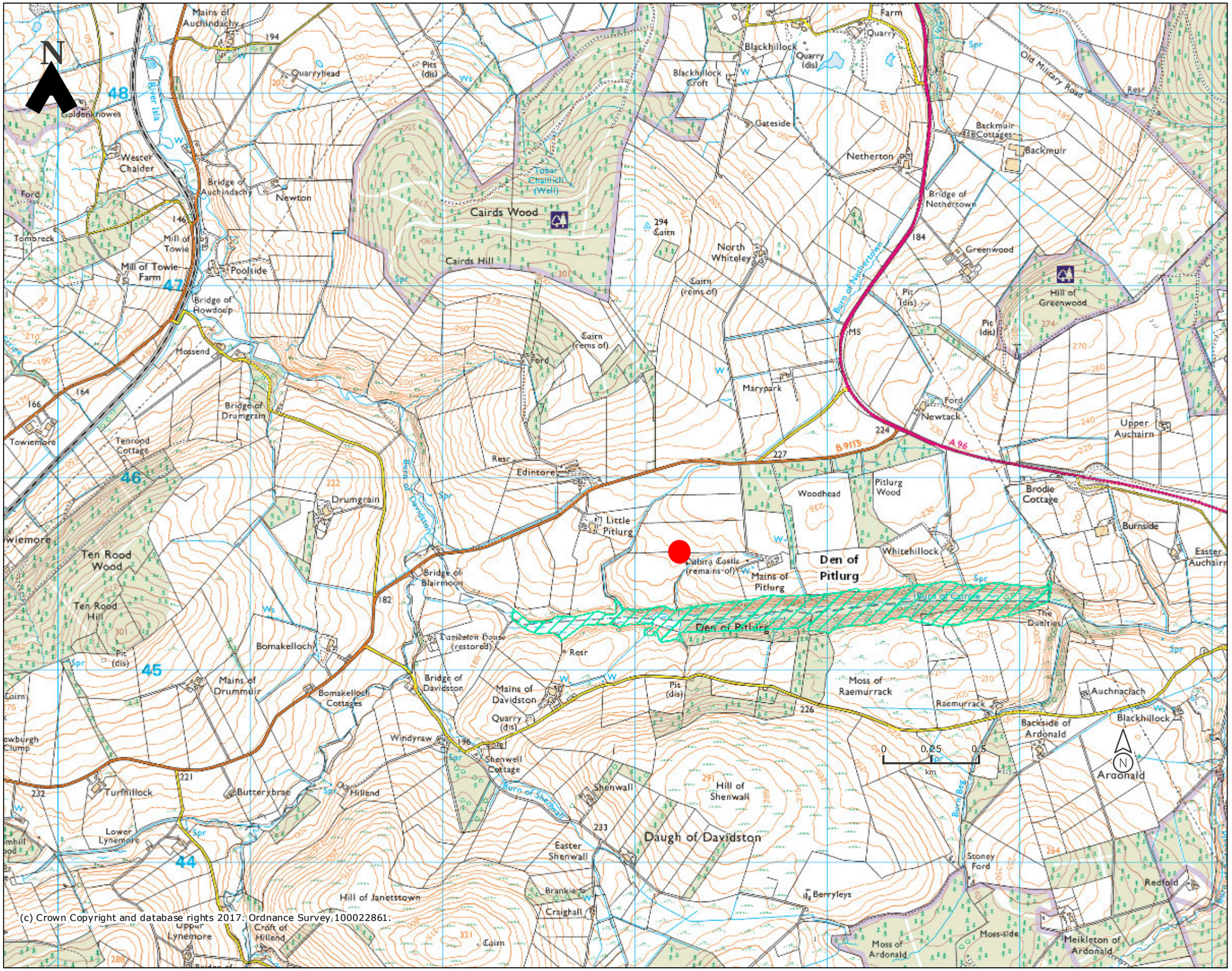


0 2.5 5 7.5 10km

Map: Bitmap map: NJ.tif , Print scale 1:200,000, Map center British TM-OSGB36/Airy (GB/IE) East: 343,229 North: 845,608

New WTG   Obstacle

DESIGNATIONS



Legend

- National Nature Reserves (Scotland)
- Ramsar Sites (Scotland)
- Sites of Special Scientific Interest (Scotland)
- Special Areas of Conservation (Scotland)
- Special Protection Areas (Scotland)
- Biosphere Reserves (Scotland)

TURBINE POSITION:
343229 845608

0 — 1km

scale 1:20,000 @ A3

Impact on acoustic assessment of change to Orenda 49kW Wind Turbine

ORENDA
ENERGY SOLUTIONS

Iroquois, Ontario

Canada

24th October 2016

Recently, Orenda Energy Solutions re-engineered their 51kW Wind Turbine, to limit it's export to 49kW.

This change was done by software changes to the control system only, and there was no physical or operational changes.

The Wind Turbine uses a patent pending hydrostatic braking system for speed control, which allows Orenda to finely balance the amount of power sent to the grid as electrical energy vs the amount of power removed from the system in the form of heat from hydraulic braking.

This system allowed the Orenda engineering team to re-set the export limit to 49kW without changing either the physical design of the system or the operational RPM.

As a consequence of this, it is anticipated that there is no change to the acoustic profile of the turbine.

[redacted]

Graeme Allan B.Eng (Hons), MSc, C.Eng, MIET

VP, Engineering & Operations

Tel: 1.613.686.1677 www.orendaenergy.com
24A Bath Road, Iroquois, Ontario, K0E 1X0 Canada

NOISE ASSESSMENT REPORT

INSTALLATION OF A 49KW WIND TURBINE AT MAINS OF PITLURG FARM
WITH HEIGHT TO TIP OF 33.471M, HEIGHT TO HUB OF 23.4M AND A ROTOR DIAMETER OF 18.9M

Turbine Location:
TURBINE 1 – 343229 845608

OCTOBER 2017

Disclaimer

In receiving this report, the Client accepts that Adele Ellis trading as AE Associates can in no way be held responsible for the application or use of the results and findings reported herein either now or in the future. The Client is, and remains, responsible for the use of such information and any consequences thereof.

The results presented in this report, whilst following standard industry practice, cannot be claimed to be “bankable” as no bank engineers’ approval has been sought.

Noise Assessment Report –Mains of Pitlurg

1. Introduction

AE Associates is assisting in the development of a site in the Moray Council area which requires an assessment for potential operational noise and has compiled the following report in support of the application.

1.2. Details of the site

The site lies within an area of land associated with Mains of Pitlurg Farm. The turbine position lies in the region of 438m south of the B9115 and 1.37km South West of the A96. There is a further unclassified road 635m to the south of the development site. Keith lies 4.6km to the north and Huntly 10.8km south east. Lying 292m south of the proposed development site lies the Den of Pitlurg (SSSI).

The proposed location for the wind turbine sits at a height above sea level of approximately 250m AOD. The landowner occupies the premises known as Mains of Pitlurg Farm and will receive financial benefit from the development therefore an allowance for owner/occupier has been allocated. There are a number of residential properties within the locale and we have undertaken a review of the noise level impacts towards these properties.

We have identified the properties which may be affected by noise impact and have included these noise sensitive areas within the calculations. The properties are known as Little Pitlurg, Rinnes View, Taber-Chalic, Edintore, Edintore Cottage and Whitehillock. None of these properties are believed to be within the landowners control and none will receive a financial benefit from the development. As there is no benefit to any of these properties they have been assessed on a 35.0 dB(A) level to ensure compliance.

2. Data supplied

2.1. Project Description

One turbine location is proposed. The turbine has the following physical characteristics:

Turbine location: 343229 845608
Tower - 23.4m
Rotor diameter - 18.9m
Tip height - 33.5m
Type: Orenda Skye

It should be noted that noise will also be created as a result of both the construction and decommissioning phases of this development, but this noise will be short-lived and similar to other construction industry noise sources. Such noise emissions are not dealt with in this report.

It should further be noted that the use in the assessment of a particular turbine type does not imply acceptance by the turbine supplier that either the site or layout are suitable for such a turbine nor does it imply that every turbine type will meet all environmental constraints on the site. Confirmation should be sought from suppliers that warranties will be provided for their machines if used on this site.

3. Noise assessment at Mains of Pitlurg

3.1. Noise

Wind turbines are noise sources. The principle sources are the machinery in the nacelle at the top of the tower (gearbox, generator, cooling fans, pitch gear, yaw gear and yaw brakes), and the aerodynamic sound of the blades passing through the air1.

The proposed turbine location was selected to be as far as reasonably practicable from domestic dwellings yet close to a grid connection, clear of power lines and microwave links and have an adequate wind resource.

The noise characteristics of the proposed turbine are as follows:

Standardised windspeed at 10m above ground (m/s)	L_{WA} (dB)	Tonal penalty (dB)
4	88.9	1.5
5	91.3	0.1
6	92.6	0
7	92.7	0
8	92.9	0
9	93.8	0
10	94.2	0
11	96.7	0
12	99.7	0

ACOUSTIC NOISE LEVELS

Turbine Make:	Orenda	Model:	Skye (49 kW)

IEC 61400-11:2012 NOISE EMISSION LEVELS

Wind Speed (m/s) at 10 m Height	2	3	4	5	6	7	8	9	10	11	12	13
Apparent Sound Power Level, L_{WA}, dB(A) re 10^{-12}W	-	84.8	87.5	90.2	91.5	91.6	91.8	92.7	93.1	95.6	98.4	-
Combined Uncertainty, U_c, dB	-	1.01	0.72	0.64	0.63	0.62	0.62	0.63	0.63	0.65	0.75	-
Declared Sound Power Level, L_{Wd}, dB(A) re 10^{-12}W	-	86.6	88.9	91.3	92.6	92.7	92.9	93.8	94.2	96.7	99.7	-

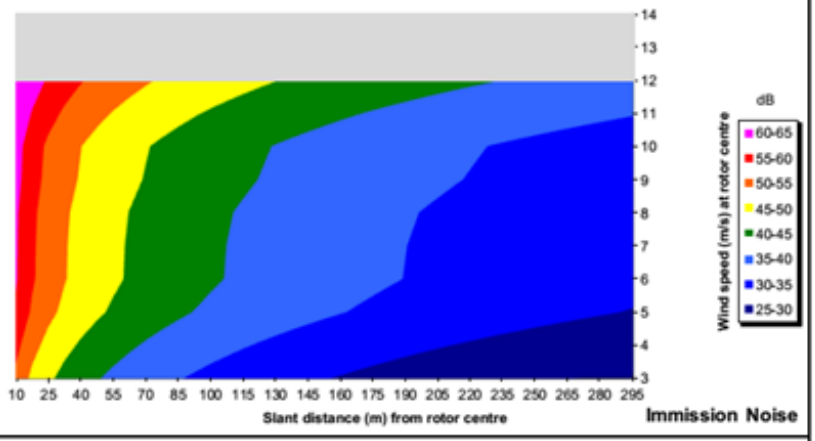
IEC 61400-11:2012 TONALITY

General Comment	0-20 kHz narrow-band analysis using Δf = 1.5625 Hz

Wind Speed (m/s) at 10 m Height	2	3	4	5	6	7	8	9	10	11	12	13
Critical Band Centre Frequency (Hz)	-	591	591	591	-	-	-	-	-	-	-	-
Tonal Audibility, ΔL_a	-	+2.0	+1.5	+0.1	-	-	-	-	-	-	-	-

ESTIMATED NOISE IMMISSION LEVELS (dB(A) at a distant observer location)

Note: based on 'Apparent' Sound Power Level at Hub-height and 'Spherical' propagation.



Immission Noise

www.tuvnel.com

ORE005 - 2016/328

Tested and Issued by:
TUV SUD Ltd.
Feb 2017

IEC 61400-11:2012 TONALITY

General Comment	0-20 kHz narrow-band analysis using Δf = 1.5625 Hz

Wind Speed (m/s) at 10 m Height	2	3	4	5	6	7	8	9	10	11	12	13
Critical Band Centre Frequency (Hz)	-	6250	-	-	-	-	-	-	-	-	-	-
Tonal Audibility, ΔL_a	-	+1.6	-	-	-	-	-	-	-	-	-	-

IEC 61400-11:2012 TONALITY

General Comment	0-20 kHz narrow-band analysis using Δf = 1.5625 Hz

Wind Speed (m/s) at 10 m Height	2	3	4	5	6	7	8	9	10	11	12	13
Critical Band Centre Frequency (Hz)	-	99	-	-	-	-	-	-	-	-	-	-
Tonal Audibility, ΔL_a	-	-2.7	-	-	-	-	-	-	-	-	-	-

A roughness length of 0.1 was used, derived from Eqn. (D2) with historical site data.

This data is derived from documents published by the manufacturer of the turbine, extracts of which are shown. This data is an updated, Version 2 noise report directly from the manufacturers and having been approved by NEL. The data are test data, with measurement uncertainty is quoted. Following the advice of the Institute of Acoustics Best Practice Guidelines2 ("IoA BPG"), an uncertainty of 1.645 times the stated measurement uncertainty is included in the figures shown above.

1 Rogers, A.L., Manwell, J.F, Wright, S.W. "Wind Turbine Acoustic Noise", RERL, University of Massachusetts, 2006. (http://www.minutemanwind.com/pdf/Understanding Wind Turbine Acoustic Noise.pdf) [Accessed 05/12/2016]

The data shown includes octave band data and these are used in the analysis reported here.

ETSU-R-973 states that a "tonal penalty" may be added to the sound power level in cases where the turbine emits specific tones in its noise characteristics. From the test results shown in Appendix A, the proposed turbine has been deemed to exhibit such tones at windspeeds of 4.0-5.0m/s (10m standardised windspeeds) and hence the appropriate tonal penalty is applicable. A tonal Penalty of 1.5dB at 4 m/s and 0.1dB at 5m/s.

3.2. Policy Considerations Scottish Planning Policy (2010) 4 does not explicitly state methods or levels of acceptability, it simply directs developers to take account of noise in the design and assessment of projects.

For the Mains of Pitlurg project, the ETSU-R-97 and IoA BPG methods will be followed. The ISO 9613-2 propagation model will be used.

Additional comments on cumulative noise will follow at the end of this report.

2 http://www.ioa.org.uk/sites/default/files/IOA Good Practice Guide on Wind Turbine Noise - May 2013.pdf [Accessed 05/12/2016]. 3 ETSU-R-97: The Assessment and Rating of Noise from Wind Farms, http://webarchive.nationalarchives.gov.uk/+/http:/www.berr.gov.uk/files/file20433.pdf [Accessed 05/12/2016] 4 The Scottish Government. [Online] Available from: http://www.scotland.gov.uk/Publications/2010/02/03132605/8 [Accessed 05/12/2016]

3.3. Assessment of Noise

3.3.1. Methodology

The assessment has been desk-based. The magnitude of predicted noise and its variation with windspeed have been calculated using the DECIBEL module of EMD's WindPRO software5. The software, which is typical of those in use in the wind energy industry, creates a mathematical model of the proposed project, its location, the surrounding terrain and the locations of noise-sensitive properties. The following factors are taken into account in the calculation:

- Turbine location
- Turbine source noise (data supplied by turbine suppliers).
- Topography, including valley and screening effects.
- Locations of houses/buildings (data from property curtilage)

3.3.1.1. limits

As no background noise has been measured, the simple 35.0dB LA90, 10 min will be used for properties with no financial interest whilst properties within the landowners control who is receiving benefit will be allocated a 40dB level. The property known as Mains of Pitlurg Farm is owner occupied and will receive financial benefit and therefore will be assessed at the 40dB level.

3.3.1.2. IoA GPG recommendations

The IoA GPG provides recommendations for the calculation of noise from wind turbine projects in the UK. The paper recommended:

* the use of the ISO 9613-2 propagation model with receiver height of 4.0m, 10°C and 70% relative humidity (§4.3.8);
* documentary support for the wind turbine source noise data used in the calculation (manufacturer-supplied data);
* ground porosity factor, G, of 0 where wind turbine data was of test or measured quality, and 0.5 where the data were warranted by the manufacturer or where test data is supplemented by measurement uncertainty (§4.3.6). **In this case, all turbine data includes the appropriate levels of measurement uncertainty (as per IoA guidance), hence a value of 0.5 is considered appropriate;**
* Valley effect (§4.3.9) - 3dB penalty applied where applicable;
* Screening effect due to terrain (§4.3.11) - 2dB benefit applied where applicable;

The DECIBEL module in windPRO has been used with these settings in the calculation of the results presented in this report. The ISO 9613-2 model has been found to be a robust method for the assessment of turbine-generated noise.

3.3.1.3. Quantification of the effects

The noise levels have been quantified as follows:

- Variation in turbine-produced noise with 12m agl windspeed at each noise-sensitive property;
- A contour plot of noise at a specific windspeed (12m/s equivalent at 10m above ground)

3.3.2. Assessment of results

The assessment concludes that the development will not exceed the simplified ETSU limits, namely 35.0dB to 10m/s assuming no financial involvement (40db for involved properties) of any property in the vicinity of the project.

No Valley or screening effect has been applied to the calculations.

The properties assessed are listed below:

	Grid reference	Financial Involvement	IoA Valley Penalty	IoA Screening Benefit
A Little Pitlurg	**342737 845741**	No	No	No
B Mains of Pitlurg	**343721 845574**	Yes	No	No

C Rinnes View	**343068 846058**	No	No	No
D Taber-Chalich	**342802 845975**	No	No	No
E Edintore	**342619 846023**	No	No	No
F Edintore Cottage	**341984 845618**	No	No	No
G Whitehillock	**344631 845616**	No	No	No

The Cumulative Consideration of turbines are listed below:
There are no other turbines within 1km of the proposal and therefore there is no cumulative considerations.

3.3.3 Detailed Results

LITTLE PITLURG

Wind Speed	Demand	WTG Noise Level	Demand Fulfilled	Exceedance
4.0 m/s	35.0dB	22.8dB	Yes	-12.2dB
5.0 m/s	35.0dB	23.8dB	Yes	-11.2dB
6. 0 m/s	35.0dB	25.0dB	Yes	-10.0dB
7.0 m/s	35.0dB	25.1dB	Yes	-09.9dB
8.0 m/s	35.0dB	25.3dB	Yes	-09.7dB
9.0 m/s	35.0dB	26.2dB	Yes	-08.8dB
10 m/s	35.0dB	26.6dB	Yes	-08.4dB

MAINS OF PITLURG

Wind Speed	Demand	WTG Noise Level	Demand Fulfilled	Exceedance
4.0 m/s	40.0dB	23.1dB	Yes	-16.9dB
5.0 m/s	40.0dB	24.1 dB	Yes	-15.9dB
6. 0 m/s	40.0dB	25.3dB	Yes	-14.7dB
7.0 m/s	40.0dB	25.4dB	Yes	-14.6dB
8.0 m/s	40.0dB	25.6dB	Yes	-14.4 dB
9.0 m/s	40.0dB	26.5dB	Yes	-13.5dB
10 m/s	40.0dB	26.9dB	Yes	-13.1dB

RINNES VIEW

Wind Speed	Demand	WTG Noise Level	Demand Fulfilled	Exceedance
4.0 m/s	35.0dB	23.4dB	Yes	-11.6dB
5.0 m/s	35.0dB	24.4dB	Yes	-10.6dB
6. 0 m/s	35.0dB	25.6dB	Yes	-09.4dB
7.0 m/s	35.0dB	25.7dB	Yes	-09.3dB
8.0 m/s	35.0dB	25.9dB	Yes	-09.1dB
9.0 m/s	35.0dB	26.8dB	Yes	-08.2dB
10 m/s	35.0dB	27.2dB	Yes	-07.8dB

TABER-CHALICH

Wind Speed	Demand	WTG Noise Level	Demand Fulfilled	Exceedance
4.0 m/s	35.0dB	21.8dB	Yes	-13.2dB
5.0 m/s	35.0dB	22.8dB	Yes	-12.2dB

6. 0 m/s	35.0dB	24.0dB	Yes	-11.0dB
7.0 m/s	35.0dB	24.1dB	Yes	-10.9dB
8.0 m/s	35.0dB	24.3dB	Yes	-10.7dB
9.0 m/s	35.0dB	25.2dB	No	-09.8dB
10 m/s	35.0dB	25.6dB	No	-09.4dB

EDINTORE

Wind Speed	Demand	WTG Noise Level	Demand Fulfilled	Exceedance
4.0 m/s	35.0dB	19.0dB	Yes	-16.0dB
5.0 m/s	35.0dB	20.0dB	Yes	-15.0dB
6. 0 m/s	35.0dB	21.2dB	Yes	-13.8dB
7.0 m/s	35.0dB	21.3dB	Yes	-13.7dB
8.0 m/s	35.0dB	21.5dB	Yes	-13.5dB
9.0 m/s	35.0dB	22.4dB	No	-12.6dB
10 m/s	35.0dB	22.8dB	No	-12.2dB

EDINTORE COTTAGE

Wind Speed	Demand	WTG Noise Level	Demand Fulfilled	Exceedance
4.0 m/s	35.0dB	13.8dB	Yes	-21.2dB
5.0 m/s	35.0dB	14.8dB	Yes	-20.2dB
6. 0 m/s	35.0dB	16.0dB	Yes	-19.0dB
7.0 m/s	35.0dB	16.1dB	Yes	-18.9dB
8.0 m/s	35.0dB	16.3dB	Yes	-18.7dB
9.0 m/s	35.0dB	17.2dB	No	-17.8dB
10 m/s	35.0dB	17.6dB	No	-17.4dB

WHITEHILLOCK

Wind Speed	Demand	WTG Noise Level	Demand Fulfilled	Exceedance
4.0 m/s	35.0dB	12.6dB	Yes	-22.4dB
5.0 m/s	35.0dB	13.6dB	Yes	-21.4dB
6. 0 m/s	35.0dB	14.8dB	Yes	-20.8dB
7.0 m/s	35.0dB	14.9dB	Yes	-20.1dB
8.0 m/s	35.0dB	15.1dB	Yes	-19.9dB
9.0 m/s	35.0dB	16.0dB	No	-19.0dB
10 m/s	35.0dB	16.4dB	No	-18.6dB

Exceedances of existing noise limits (in dB) (negative values mean limits are not exceeded).

The detailed results show all properties lie outside the regions where noise is predicted to be above 35.0dB (or 40dB) or 5dB above background, thus also meeting the limits and the simplified conditions of ETSU-R-97.

3.3.4. Summary

The predicted noise levels are such that background noise measurements will not be required as compliance has been achieved within existing limits.

3.4. Mitigation
The results of the assessment indicate mitigation will not be required.

3.5. Residual effects
The modelled effects show that the maximum potential for turbine-produced noise is within the limits stated in ETSU-R-97 for properties around the proposed turbine location with or without financial involvement in the project and there is no need for the measurement of background noise.

4. Conclusions
The potential for operational turbine-produced noise occurring around the proposed wind turbine site named Mains of Pitlurg has been assessed on behalf of the developer.

The results have been based on a desk-top study using industry-standard tools.

Results have been assessed using:
* the ISO 9613-2 propagation model
* manufacturer-supplied source noise data including:
* Tonal penalties calculated according to ETSU-R-97.
* Uncertainty of 1.645 times the stated measurement uncertainty according to IoA recommendations.
* atmospheric conditions of 10°C and 70% RH
* ground porosity of 0.5 (semi-porous ground - applicable as source noise data include measurement uncertainty)
* no barrier effects
* valley effect - 3dB penalty applied where applicable

The proposed development at Mains of Pitlurg meets the limits as set out in local and national guidance. The analysis has been carried out taking into consideration that there are no other turbines within 1km of the proposed turbine location and therefore there should be no unacceptable level of impact for the turbine in its own right or cumulatively.

Project:
Oxwell farm

Description:
Installation of 2 Orenda wind turbines

Licensed user:
Orenda Energy Solutions Ltd
c/o MacRoberts, Excel House 30 Semple Street
GB-EDINBURGH EH3 8BL

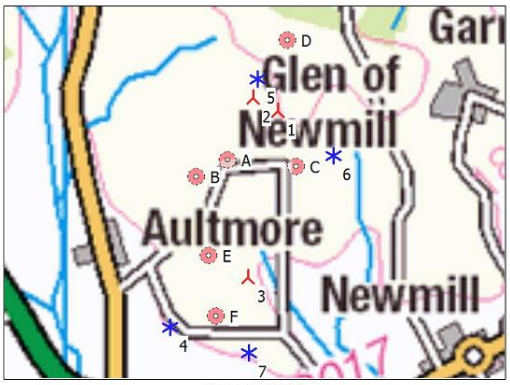
Adele / ae.associates@btinternet.com
Calculated:
10/07/2017 15:59/3.1.617

DECIBEL - Main Result

Calculation: Fieldhead Noise Analysis

Noise propagation model:
ISO 9613-2 United Kingdom
Wind speed:
4.0 m/s - 12.0 m/s, step 1.0 m/s
Ground attenuation:
General, fixed, Ground factor: 0.5
Type of demand in calculation:
WTG noise is compared to ambient noise plus 5dB margin with the option of a floor setting (e.g. 35dB)
Noise values in calculation:
All noise values are 90% exeedence values (L90) designed to show compliance with ETSU-R-97 limits
Pure tones:
Fixed penalty added to source noise of WTGs with pure tones: 0.0 dB(A)
Calculation height above ground level:
4.0 m
Octave band data required

All coordinates are in
British TM-OSGB36/Airy (GB/IE)



Scale 1:50,000
New WTG Existing WTG Noise sensitive area

WTGs

	Easting	Northing	Z	Row data/Description	WTG type Valid	Manufact.	Type-generator	Power, rated	Rotor diameter	Hub height	Noise data Creator	Name	First wind speed	LwaRef	Last wind speed	LwaRef	Pure tones
			[m]					[kW]	[m]	[m]			[m/s]	[dB(A)]	[m/s]	[dB(A)]	
1	341,878	854,696	240.0	T1	Yes	Orenda	-51	51	19.1	24.5	USER	Runtime input	4.0	88.9	12.0	99.7	2 dB h
2	341,661	854,811	234.4	T2	Yes	Orenda	-51	51	19.1	24.5	USER	Runtime input	4.0	88.9	12.0	99.7	2 dB h
3	341,618	853,248	189.9	Fieldhead T1	Yes	Evance	R9000-5	5	5.5	15.0	USER	Runtime input	4.0	80.7	12.0	92.1	No h
4	340,938	852,815	184.7	Killismart	Yes	C & F	CF20-20	20	13.1	20.5	USER	Runtime input	4.0	75.0	12.0	93.0	No h
5	341,700	854,979	238.2	Followsters	No	EWT	DW52-500	500	52.0	35.0	EMD	Level 0 - Guaranteed - DW52/DW54*500 - 03-2012	4.0	95.5	12.0	100.9	3 dB g
6	342,362	854,312	221.8	Evance R9000 5 5.5 !O! hub: 15...	Yes	Evance	R9000-5	5	5.5	15.0	USER	Runtime input	4.0	80.7	12.0	92.1	No h
7	341,625	852,595	186.8	Loanhead	Yes	C & F	CF20-20	20	13.1	20.5	USER	Runtime input	4.0	75.0	12.0	93.0	No h

h) Generic octave distribution used
g) Data calculated from data for other wind speed (uncertain)

Calculation Results

Sound level

Noise sensitive area No.	Name	Easting	Northing	Z	Imission height	Most critical demand Wind speed	Demand	Predicted sound level WTG noise	Max exceedence	Distance to noise demand	Demands fulfilled ? Noise
				[m]	[m]	[m/s]	[dB(A)]	[dB(A)]	[dB(A)]	[m]	
A	Cherrybrae	341,442	854,271	217.2	4.0	7.0	35.0	29.8	-5.2	277	Yes
B	Ardioch	341,169	854,126	209.4	4.0	7.0	35.0	26.5	-8.5	546	Yes
C	Followsters	342,039	854,217	223.5	4.0	7.0	35.0	30.1	-4.9	236	Yes
D	Whitestones	341,958	855,315	257.1	4.0	5.0	35.0	33.8	-1.2	49	Yes
E	Aichairn	341,275	853,439	200.0	4.0	6.0	35.0	25.9	-9.1	304	Yes
F	Fieldhead	341,337	852,912	199.1	4.0	10.0	40.5	31.7	-8.8	304	Yes

Distances (m)

WTG	A	B	C	D	E	F
1	609	910	505	624	1394	1865
2	583	843	704	585	1425	1927
3	1038	986	1056	2095	393	438
4	1541	1331	1783	2700	709	410
5	753	1005	834	424	1597	2099
6	921	1207	337	1081	1394	1735
7	1686	1597	1674	2740	914	428

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Calculated:
10/07/2017 15:59/3.1.617

DECIBEL - Assumptions for noise calculation

Calculation: Fieldhead Noise Analysis

Noise calculation model:
ISO 9613-2 United Kingdom
Wind speed:
4.0 m/s - 12.0 m/s, step 1.0 m/s
Ground attenuation:
General, fixed, Ground factor: 0.5
Meteorological coefficient, C0:
0.0 dB
Type of demand in calculation:
3: WTG noise is compared to ambient noise plus margin (UK, AT etc.)
Noise values in calculation:
All noise values are 90% exeedance values (L90)
Pure tones:
Fixed penalty added to source noise of WTGs with pure tones: 0.0 dB(A)
Height above ground level, when no value in NSA object:
4.0 m Don't allow override of model height with height from NSA object
Deviation from "official" noise demands. Negative is more restrictive, positive is less restrictive.:
0.0 dB(A)
Octave data required
Air absorption

63 [db/km]	125 [db/km]	250 [db/km]	500 [db/km]	1,000 [db/km]	2,000 [db/km]	4,000 [db/km]	8,000 [db/km]
0.1	0.4	1.0	1.9	3.7	9.7	32.8	117.0

WTG: Orenda 51 19.1 !O!
Noise: Runtime input

Status	Hub height [m]	Wind speed [m/s]	LwA,ref [dB(A)]	Pure tones	Penalty [dB]	Octave data	63 [dB]	125 [dB]	250 [dB]	500 [dB]	1000 [dB]	2000 [dB]	4000 [dB]	8000 [dB]
User value	24.5	4.0	88.9	Yes	1.5	Generic data	70.5	77.5	80.9	83.5	83.3	80.4	75.6	66.1
User value	24.5	5.0	91.3	Yes	0.1	Generic data	72.9	79.9	83.3	85.9	85.7	82.8	78.0	68.5
User value	24.5	6.0	92.6	No		Generic data	74.2	81.2	84.6	87.2	87.0	84.1	79.3	69.8
User value	24.5	7.0	92.7	No		Generic data	74.3	81.3	84.7	87.3	87.1	84.2	79.4	69.9
User value	24.5	8.0	92.9	No		Generic data	74.5	81.5	84.9	87.5	87.3	84.4	79.6	70.1
User value	24.5	9.0	93.8	No		Generic data	75.4	82.4	85.8	88.4	88.2	85.3	80.5	71.0
User value	24.5	10.0	94.2	No		Generic data	75.8	82.8	86.2	88.8	88.6	85.7	80.9	71.4
User value	24.5	11.0	96.7	No		Generic data	78.3	85.3	88.7	91.3	91.1	88.2	83.4	73.9
User value	24.5	12.0	99.7	No		Generic data	81.3	88.3	91.7	94.3	94.1	91.2	86.4	76.9

WTG: Evance R9000 5 5.5 !O!
Noise: Runtime input

Status	Hub height [m]	Wind speed [m/s]	LwA,ref [dB(A)]	Pure tones	Octave data	63 [dB]	125 [dB]	250 [dB]	500 [dB]	1000 [dB]	2000 [dB]	4000 [dB]	8000 [dB]
User value	15.0	4.0	80.7	No	Generic data	62.3	69.3	72.7	75.3	75.1	72.2	67.4	57.9
User value	15.0	5.0	82.4	No	Generic data	64.0	71.0	74.4	77.0	76.8	73.9	69.1	59.6
User value	15.0	6.0	84.0	No	Generic data	65.6	72.6	76.0	78.6	78.4	75.5	70.7	61.2
User value	15.0	7.0	85.6	No	Generic data	67.2	74.2	77.6	80.2	80.0	77.1	72.3	62.8
User value	15.0	8.0	87.2	No	Generic data	68.8	75.8	79.2	81.8	81.6	78.7	73.9	64.4
User value	15.0	9.0	88.9	No	Generic data	70.5	77.5	80.9	83.5	83.3	80.4	75.6	66.1
User value	15.0	10.0	90.5	No	Generic data	72.1	79.1	82.5	85.1	84.9	82.0	77.2	67.7
User value	15.0	11.0	92.1	No	Generic data	73.7	80.7	84.1	86.7	86.5	83.6	78.8	69.3
User value	15.0	12.0	92.1	No	Generic data	73.7	80.7	84.1	86.7	86.5	83.6	78.8	69.3

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DECIBEL - Assumptions for noise calculation

Calculation: Fieldhead Noise Analysis
WTG: C & F CF20 20 13.1 !O!
Noise: Runtime input

Status	Hub height [m]	Wind speed [m/s]	LwA,ref [dB(A)]	Pure tones		Octave data 63 [dB]	125 [dB]	250 [dB]	500 [dB]	1000 [dB]	2000 [dB]	4000 [dB]	8000 [dB]
User value	20.5	4.0	75.0	No	Generic data	56.6	63.6	67.0	69.6	69.4	66.5	61.7	52.2
User value	20.5	5.0	77.5	No	Generic data	59.1	66.1	69.5	72.1	71.9	69.0	64.2	54.7
User value	20.5	6.0	91.8	No	Generic data	73.4	80.4	83.8	86.4	86.2	83.3	78.5	69.0
User value	20.5	7.0	84.3	No	Generic data	65.9	72.9	76.3	78.9	78.7	75.8	71.0	61.5
User value	20.5	8.0	87.4	No	Generic data	69.0	76.0	79.4	82.0	81.8	78.9	74.1	64.6
User value	20.5	9.0	90.2	No	Generic data	71.8	78.8	82.2	84.8	84.6	81.7	76.9	67.4
User value	20.5	10.0	93.0	No	Generic data	74.6	81.6	85.0	87.6	87.4	84.5	79.7	70.2
User value	20.5	11.0	93.0	No	Generic data	74.6	81.6	85.0	87.6	87.4	84.5	79.7	70.2
User value	20.5	12.0	93.0	No	Generic data	74.6	81.6	85.0	87.6	87.4	84.5	79.7	70.2

WTG: EWT DW52 500 52.0 !O!
Noise: Level 0 - Guaranteed - DW52/DW54*500 - 03-2012

Source	Source/Date	Creator	Edited
Manufacturer	14/03/2012	EMD	16/08/2012 09:27

Based on EWT Specification S-1005020-R02.
The warranted sound power levels are based on actual measurements executed by an independent noise measurement institute according to the preferred methods set out in IEC-61400-11.
Uncertainty levels are included in the warranted sound power levels.
At 5m/s a maximum tonal noise penalty of 2,5dB shall be considered according to ETSU-R-97 guidelines.
The values given in the table are valid for normal operational mode (rotation speed 0-24 RPM)
The calculation of the standardized wind speed at 10m height according to IEC 61400-11 is based on a terrain roughness length Z0=0,05m.

Status	Hub height [m]	Wind speed [m/s]	LwA,ref [dB(A)]	Pure tones	Penalty [dB]		Octave data 63 [dB]	125 [dB]	250 [dB]	500 [dB]	1000 [dB]	2000 [dB]	4000 [dB]	8000 [dB]
ExtraPolated	35.0	4.0	95.5	Yes	2.5	Generic data	77.1	84.1	87.5	90.1	89.9	87.0	82.2	72.7
From Windcat		5.0	96.5	Yes	2.5	Generic data	78.1	85.1	88.5	91.1	90.9	88.0	83.2	73.7
From Windcat		6.0	97.5	No		Generic data	79.1	86.1	89.5	92.1	91.9	89.0	84.2	74.7
From Windcat		7.0	98.5	No		Generic data	80.1	87.1	90.5	93.1	92.9	90.0	85.2	75.7
From Windcat		8.0	99.5	No		Generic data	81.1	88.1	91.5	94.1	93.9	91.0	86.2	76.7
From Windcat		9.0	100.3	No		Generic data	81.9	88.9	92.3	94.9	94.7	91.8	87.0	77.5
From Windcat		10.0	100.5	No		Generic data	82.1	89.1	92.5	95.1	94.9	92.0	87.2	77.7
ExtraPolated		11.0	100.7	No		Generic data	82.3	89.3	92.7	95.3	95.1	92.2	87.4	77.9
ExtraPolated		12.0	100.9	No		Generic data	82.5	89.5	92.9	95.5	95.3	92.4	87.6	78.1

NSA: Cherrybrae-A
Predefined calculation standard: British
Imission height(a.g.l.): Use standard value from calculation model

Ambient noise:

4.0 [m/s]	5.0 [m/s]	6.0 [m/s]	7.0 [m/s]	8.0 [m/s]	9.0 [m/s]	10.0 [m/s]	11.0 [m/s]	12.0 [m/s]
25.9 dB(A)	26.7 dB(A)	27.8 dB(A)	29.3 dB(A)	31.0 dB(A)	33.1 dB(A)	35.5 dB(A)	38.2 dB(A)	41.3 dB(A)

Margin or Allowed additional exposure: 5.0 dB(A)
Sound level always accepted: 35.0 dB(A)
No distance demand

NSA: Ardioch-B
Predefined calculation standard: British
Imission height(a.g.l.): Use standard value from calculation model

Ambient noise:

4.0 [m/s]	5.0 [m/s]	6.0 [m/s]	7.0 [m/s]	8.0 [m/s]	9.0 [m/s]	10.0 [m/s]	11.0 [m/s]	12.0 [m/s]
25.9 dB(A)	26.7 dB(A)	27.8 dB(A)	29.3 dB(A)	31.0 dB(A)	33.1 dB(A)	35.5 dB(A)	38.2 dB(A)	41.3 dB(A)

Margin or Allowed additional exposure: 5.0 dB(A)
Sound level always accepted: 35.0 dB(A)
No distance demand

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Calculated:
10/07/2017 15:59/3.1.617

DECIBEL - Assumptions for noise calculation

Calculation: Fieldhead Noise Analysis

NSA: Followsters-C
Predefined calculation standard: British
Imission height(a.g.l.): Use standard value from calculation model

Ambient noise:

4.0 [m/s]	5.0 [m/s]	6.0 [m/s]	7.0 [m/s]	8.0 [m/s]	9.0 [m/s]	10.0 [m/s]	11.0 [m/s]	12.0 [m/s]
25.9 dB(A)	26.7 dB(A)	27.8 dB(A)	29.3 dB(A)	31.0 dB(A)	33.1 dB(A)	35.5 dB(A)	38.2 dB(A)	41.3 dB(A)

Margin or Allowed additional exposure: 5.0 dB(A)
Sound level always accepted: 35.0 dB(A)
No distance demand

NSA: Whitestones-D
Predefined calculation standard: British
Imission height(a.g.l.): Use standard value from calculation model

Ambient noise:

4.0 [m/s]	5.0 [m/s]	6.0 [m/s]	7.0 [m/s]	8.0 [m/s]	9.0 [m/s]	10.0 [m/s]	11.0 [m/s]	12.0 [m/s]
25.9 dB(A)	26.7 dB(A)	27.8 dB(A)	29.3 dB(A)	31.0 dB(A)	33.1 dB(A)	35.5 dB(A)	38.2 dB(A)	41.3 dB(A)

Margin or Allowed additional exposure: 5.0 dB(A)
Sound level always accepted: 35.0 dB(A)
No distance demand

NSA: Aichairn-E
Predefined calculation standard: British
Imission height(a.g.l.): Use standard value from calculation model

Ambient noise:

4.0 [m/s]	5.0 [m/s]	6.0 [m/s]	7.0 [m/s]	8.0 [m/s]	9.0 [m/s]	10.0 [m/s]	11.0 [m/s]	12.0 [m/s]
25.9 dB(A)	26.7 dB(A)	27.8 dB(A)	29.3 dB(A)	31.0 dB(A)	33.1 dB(A)	35.5 dB(A)	38.2 dB(A)	41.3 dB(A)

Margin or Allowed additional exposure: 5.0 dB(A)
Sound level always accepted: 35.0 dB(A)
No distance demand

NSA: Fieldhead-F
Predefined calculation standard: British
Imission height(a.g.l.): Use standard value from calculation model

Ambient noise:

4.0 [m/s]	5.0 [m/s]	6.0 [m/s]	7.0 [m/s]	8.0 [m/s]	9.0 [m/s]	10.0 [m/s]	11.0 [m/s]	12.0 [m/s]
25.9 dB(A)	26.7 dB(A)	27.8 dB(A)	29.3 dB(A)	31.0 dB(A)	33.1 dB(A)	35.5 dB(A)	38.2 dB(A)	41.3 dB(A)

Margin or Allowed additional exposure: 5.0 dB(A)
Sound level always accepted: 40.0 dB(A)
No distance demand

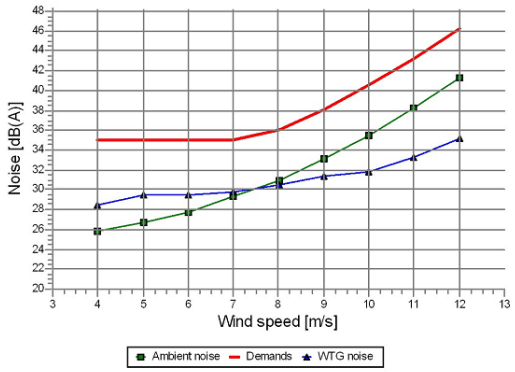
Licensed user:
Orenda Energy Solutions Ltd
c/o MacRoberts, Excel House 30 Semple Street
GB-EDINBURGH EH3 8BL

Adele / ae.associates@btinternet.com
Calculated:
10/07/2017 15:59/3.1.617

DECIBEL - Detailed results, graphic

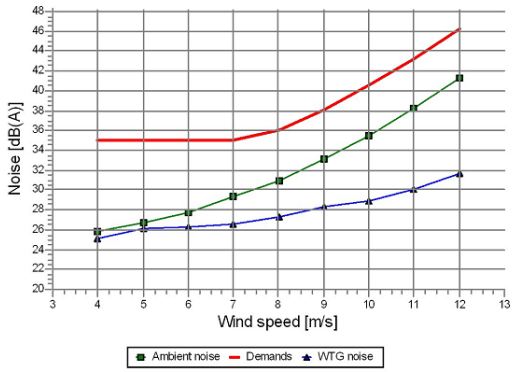
Calculation: Fieldhead Noise Analysis**Noise calculation model:** ISO 9613-2 United Kingdom

Cherrybrae (A)



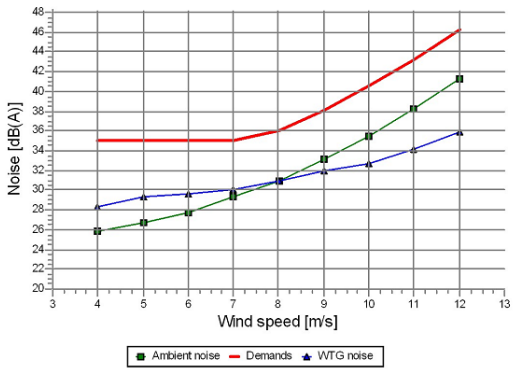
		Demands		Sound level	
Wind speed	Ambient noise	Margin	Demands	WTG noise	Demands fulfilled ?
[m/s]	[dB(A)]	[dB(A)]	[dB(A)]	[dB(A)]	
4.0	25.9	5.0	35.0	28.5	Yes
5.0	26.7	5.0	35.0	29.5	Yes
6.0	27.8	5.0	35.0	29.4	Yes
7.0	29.3	5.0	35.0	29.8	Yes
8.0	31.0	5.0	36.0	30.5	Yes
9.0	33.1	5.0	38.1	31.4	Yes
10.0	35.5	5.0	40.5	31.9	Yes
11.0	38.2	5.0	43.2	33.2	Yes
12.0	41.3	5.0	46.3	35.1	Yes

Ardioch (B)



		Demands		Sound level	
Wind speed	Ambient noise	Margin	Demands	WTG noise	Demands fulfilled ?
[m/s]	[dB(A)]	[dB(A)]	[dB(A)]	[dB(A)]	
4.0	25.9	5.0	35.0	25.1	Yes
5.0	26.7	5.0	35.0	26.1	Yes
6.0	27.8	5.0	35.0	26.3	Yes
7.0	29.3	5.0	35.0	26.5	Yes
8.0	31.0	5.0	36.0	27.3	Yes
9.0	33.1	5.0	38.1	28.3	Yes
10.0	35.5	5.0	40.5	28.8	Yes
11.0	38.2	5.0	43.2	30.0	Yes
12.0	41.3	5.0	46.3	31.7	Yes

Followsters (C)



		Demands		Sound level	
Wind speed	Ambient noise	Margin	Demands	WTG noise	Demands fulfilled ?
[m/s]	[dB(A)]	[dB(A)]	[dB(A)]	[dB(A)]	
4.0	25.9	5.0	35.0	28.3	Yes
5.0	26.7	5.0	35.0	29.3	Yes
6.0	27.8	5.0	35.0	29.6	Yes
7.0	29.3	5.0	35.0	30.1	Yes
8.0	31.0	5.0	36.0	30.9	Yes
9.0	33.1	5.0	38.1	32.0	Yes
10.0	35.5	5.0	40.5	32.7	Yes
11.0	38.2	5.0	43.2	34.2	Yes
12.0	41.3	5.0	46.3	35.9	Yes

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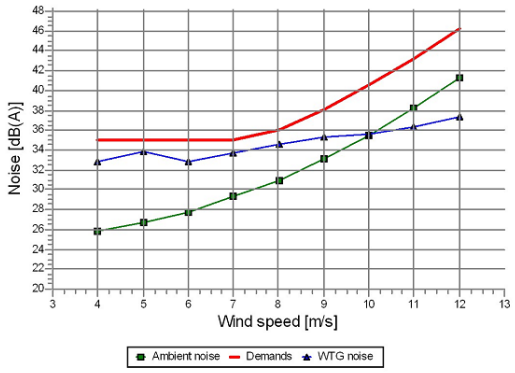
Adele / ae.associates@btinternet.com
Calculated:
10/07/2017 15:59/3.1.617

DECIBEL - Detailed results, graphic

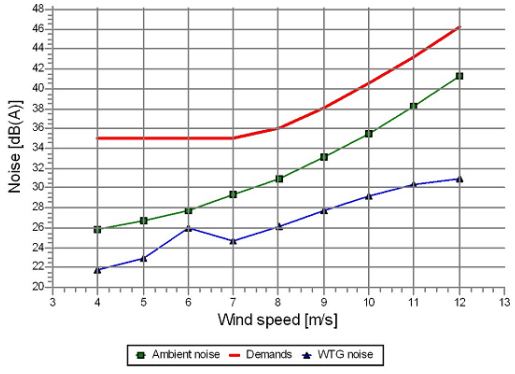
Calculation: Fieldhead Noise Analysis**Noise calculation model:** ISO 9613-2 United Kingdom

Whitestones (D)



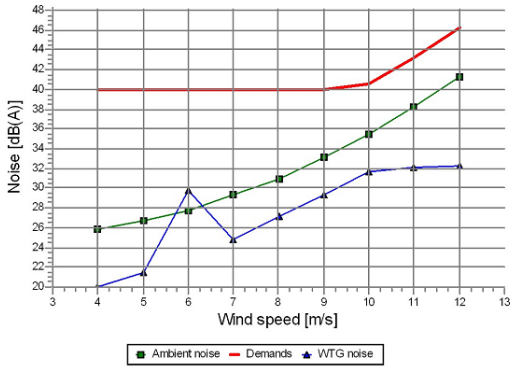
Wind speed	Ambient noise	Demands Margin	Demands	Sound level WTG noise	Demands fulfilled ?
[m/s]	[dB(A)]	[dB(A)]	[dB(A)]	[dB(A)]	
4.0	25.9	5.0	35.0	32.8	Yes
5.0	26.7	5.0	35.0	33.8	Yes
6.0	27.8	5.0	35.0	32.8	Yes
7.0	29.3	5.0	35.0	33.7	Yes
8.0	31.0	5.0	36.0	34.5	Yes
9.0	33.1	5.0	38.1	35.3	Yes
10.0	35.5	5.0	40.5	35.6	Yes
11.0	38.2	5.0	43.2	36.3	Yes
12.0	41.3	5.0	46.3	37.4	Yes

Aichairn (E)



Wind speed	Ambient noise	Demands Margin	Demands	Sound level WTG noise	Demands fulfilled ?
[m/s]	[dB(A)]	[dB(A)]	[dB(A)]	[dB(A)]	
4.0	25.9	5.0	35.0	21.7	Yes
5.0	26.7	5.0	35.0	23.0	Yes
6.0	27.8	5.0	35.0	25.9	Yes
7.0	29.3	5.0	35.0	24.7	Yes
8.0	31.0	5.0	36.0	26.1	Yes
9.0	33.1	5.0	38.1	27.7	Yes
10.0	35.5	5.0	40.5	29.2	Yes
11.0	38.2	5.0	43.2	30.3	Yes
12.0	41.3	5.0	46.3	30.9	Yes

Fieldhead (F)



Wind speed	Ambient noise	Demands Margin	Demands	Sound level WTG noise	Demands fulfilled ?
[m/s]	[dB(A)]	[dB(A)]	[dB(A)]	[dB(A)]	
4.0	25.9	5.0	40.0	20.0	Yes
5.0	26.7	5.0	40.0	21.5	Yes
6.0	27.8	5.0	40.0	29.7	Yes
7.0	29.3	5.0	40.0	24.9	Yes
8.0	31.0	5.0	40.0	27.1	Yes
9.0	33.1	5.0	40.0	29.4	Yes
10.0	35.5	5.0	40.5	31.7	Yes
11.0	38.2	5.0	43.2	32.1	Yes
12.0	41.3	5.0	46.3	32.3	Yes

Project:
Oxwell farm

Description:
Installation of 2 Orenda wind turbines

Licensed user:
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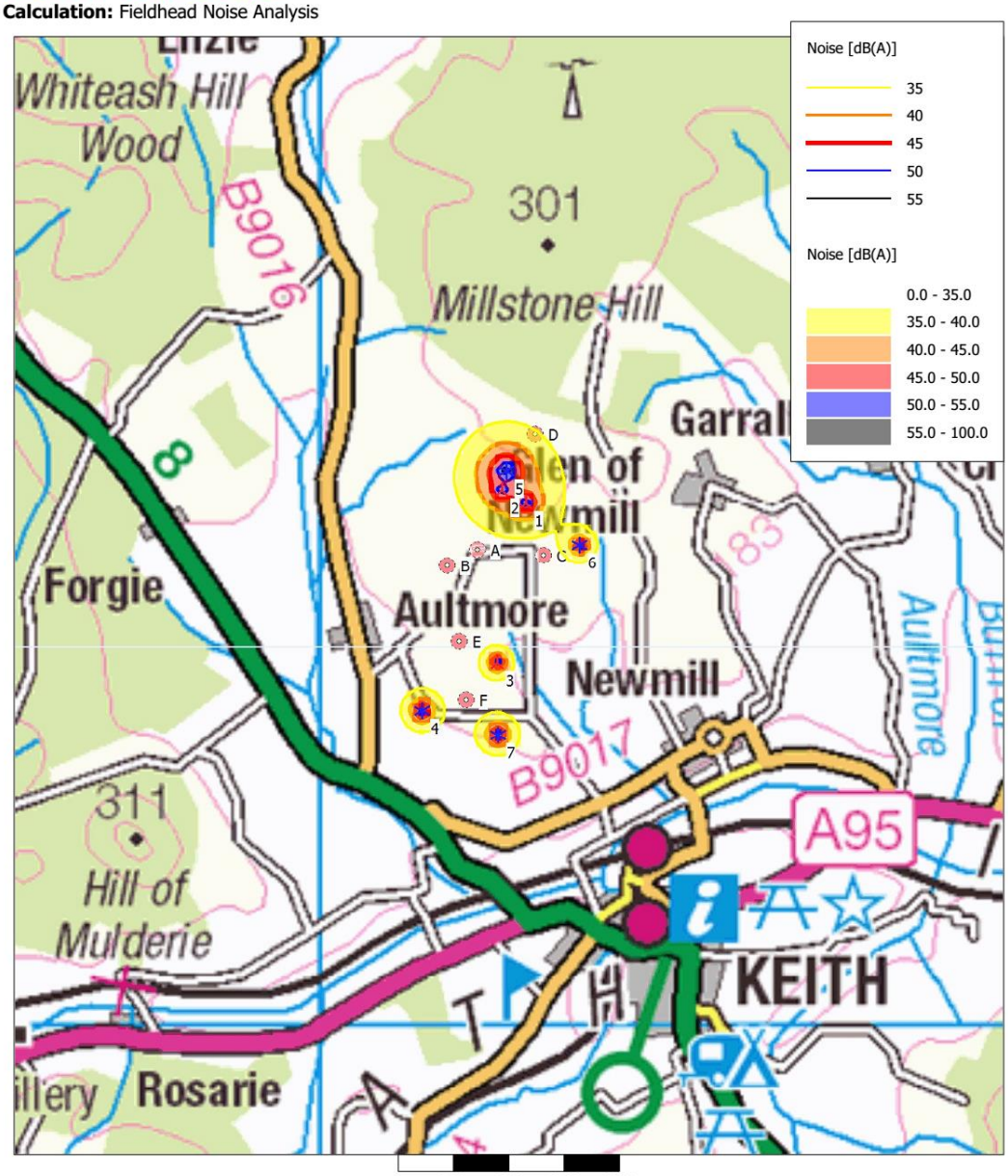
Calculated:
10/07/2017 15:59/3.1.617

DECIBEL - Map 10.0 m/s

Calculation: Fieldhead Noise Analysis



0 500 1000 1500 2000 m

Map: Bitmap map: NJ.tif , Print scale 1:50,000, Map center British TM-OSGB36/Airy (GB/IE) East: 341,650 North: 853,787

New WTG Existing WTG Noise sensitive area

Noise calculation model: ISO 9613-2 United Kingdom. Wind speed: 10.0 m/s
Height above sea level from active line object

CONFIDENTIAL

Acoustic Performance Test of a 49 kW rated Orenda 'Skye' Wind Turbine unit

A Report from NEL for

Orenda Energy Corporation

Reference No: ORE005

Report No: 2016/328
Issue 2

Date: February 2017

0432

www.tuvnel.com

This report is issued as part of the contract under which the work has been carried out for the client by TUV SUD Ltd trading as NEL ('NEL').

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UKAS TESTING
0432

IEC 61400-11:2012 Acoustic Performance Test of a 49 kW rated Orenda 'Skye' Wind Turbine unit

A report from NEL for

24A Bath Rd
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ONTARIO
K0E 1K0
Canada

Issue No.	Revision	Date
1	Original (running to 52 pages excluding front cover sheets & 3 appendices)	Feb. 2017
2	• Appendix added showing an Immission Noise Map based on wind speed (WS) at 10 m, using 0.1 roughness length to scale down Hub-Ht. WS's. • For informative purposes text changed in Figures 5 - 12 so it includes corresponding wind speeds at 10 m a.g.l. and elsewhere for continuity.	Feb. 2017

Prepared by:	Approved by:
[redacted]	[redacted]
Patrick Jones	**Lynn Hunter**

For
Brian Millington
Director
Date: February 2017

CONTENTS

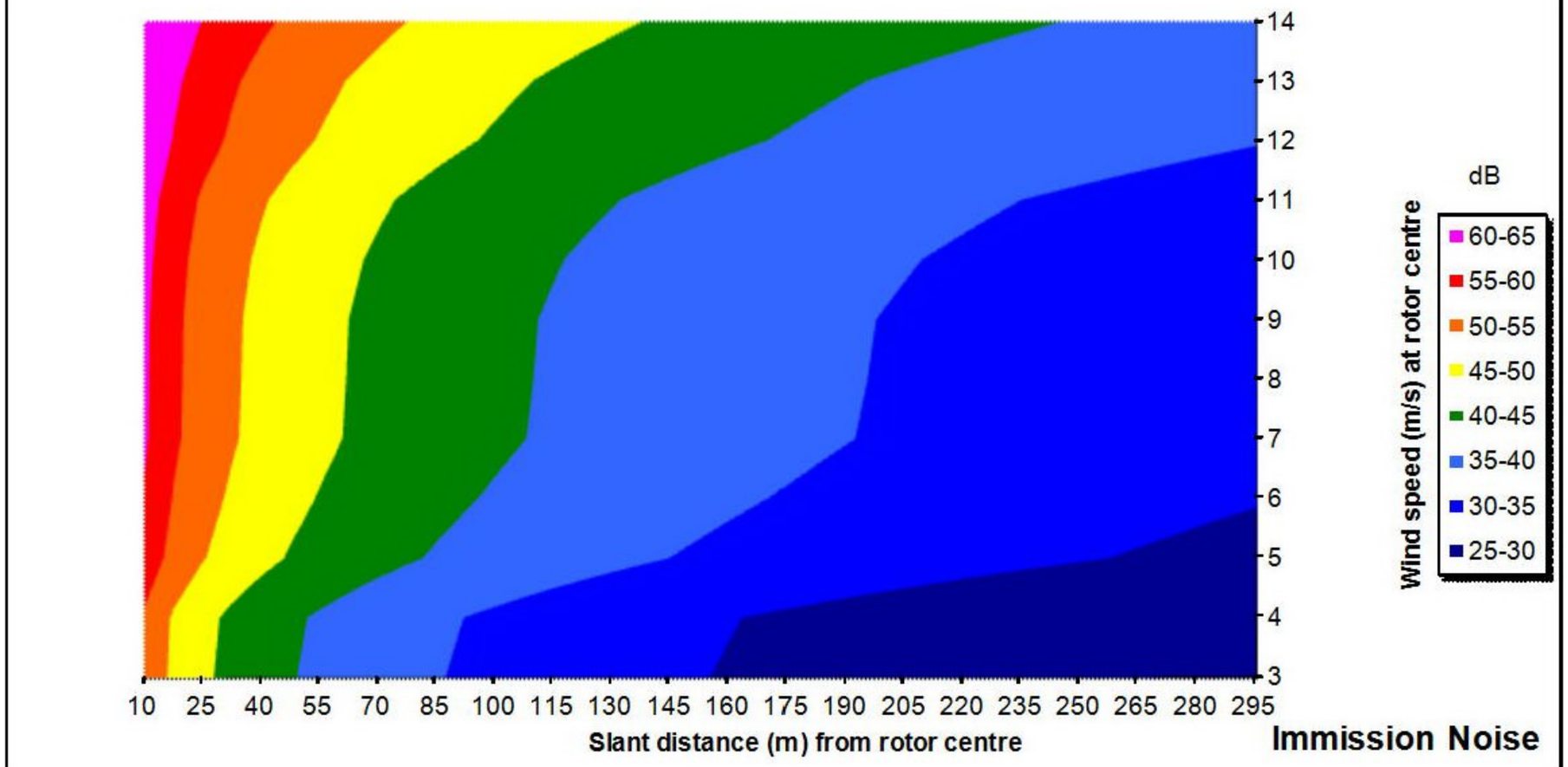
SUMMARY

NEL (TUV SUD Ltd) have carried out a series of acoustic noise measurements on a 49 kWe rated Orenda 'Skye' Wind Turbine unit on 1st and 21st December 2016.
A summary of test results are shown in the immission noise map below.

ACOUSTIC NOISE LEVELS													
Turbine Make:	**Orenda**	**Model:**	**Skye**										
IEC 61400-11:2012 NOISE EMISSION LEVELS													
Wind Speed (m/s) at Rotor Centre Height	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**
Apparent Sound Power Level, L_{WA}, dB(A) re 10^{-12}W	84.8	85.2	89.2	90.6	91.7	91.8	91.9	92.4	93.4	95.6	96.8	98.8
Combined Uncertainty, U_c, dB	1.06	0.84	0.64	0.64	0.62	0.63	0.62	0.62	0.63	0.66	0.68	0.77
Declared Sound Power Level, L_{Wd}, dB(A) re 10^{-12}W	86.5	86.6	90.3	91.7	92.7	92.9	93.0	93.5	94.5	96.7	98.0	100.1
IEC 61400-11:2012 TONALITY												
General Comment	**0-20 kHz narrow-band analysis using Δf = 1.5625 Hz**											
Wind Speed (m/s) at Rotor Centre Height	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**
Critical Band Centre Frequency (Hz)	591	591	591	-	-	-	-	-	-	-	-	-
Tonal Audibility, ΔL_a	+1.6	+2.7	+0.5	-	-	-	-	-	-	-	-	-

ESTIMATED NOISE IMMISSION LEVELS (dB(A) at a distant observer location)

Note: based on 'Apparent' Sound Power Level at Hub-height and 'Spherical' propagation.



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ORE005 - 2016/328

Tested and Issued by:
TUV SUD Ltd.
Feb. 2017

IEC 61400-11:2012 TONALITY												
General Comment	**0-20 kHz narrow-band analysis using Δf = 1.5625 Hz**											
Wind Speed (m/s) at Rotor Centre Height	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**
Critical Band Centre Frequency (Hz)	6250	6250	-	-	-	-	-	-	-	-	-	-
Tonal Audibility, ΔL_a	+1.3	+2.3	-	-	-	-	-	-	-	-	-	-

1 INTRODUCTION

The wind turbine manufacturer Orenda Energy Corporation commissioned NEL to undertake a series of acoustic noise measurements on its 49 kW rated 'Skye' wind turbine model. Details of the test campaign and the results of the data analysis are presented in this report.

2 STANDARDS AND REFERENCE DOCUMENTS

The execution of the acoustics performance measurements and analysis of relevant data were undertaken in compliance with the following standards:

- IEC 61400-11: 2012 Wind turbine generator systems – Part 11: Acoustic noise measurement techniques (identical to BS EN 61400-11: 2013).
- IEC/TS 61400-14:2005 Wind Turbines – Part 14: Declaration of Apparent Sound Power Level and Tonality Values.
- ISO 17025:2005 General requirements for the competence of testing and calibration laboratories.

3 TEST WIND TURBINE CONFIGURATION

The Orenda Skye wind turbine is a three-bladed upwind design and is rated at 49 kWe. The test turbine was installed at NEL's Myres Hill wind turbine test site. Table 1 provides a summary of the test configuration and it should be noted that the test results are only applicable to the wind turbine configuration tested.

4 DESCRIPTION OF TEST SITE

The Myres Hill wind turbine site is located in high moorland in the central belt of Scotland, within the Whitelee Forest area above Eaglesham, south of Glasgow and is centred at Ordnance Survey grid reference NS 568 467, approximately 330 m above sea level. Photographs of the surrounding area are shown in Figure 1.

There are a few small steel container or portacabin style out-houses within the confines of the test site, the closest of these lying approximately 10 m north of the turbine under test. The terrain slopes away steeply from the test site fence some 80 west of the turbine while sloping down more gradually southwards from the turbine. There are areas with long grass, heather or otherwise low lying shrubbery spread in all directions across the grounds of the test site.

There are a number of wind turbines at the test site too. During the acoustic testing reported here, it was ensured that all these other turbines remained in a parked condition. There are some large wind turbines and also forested areas within the Whitelee Wind Farm lying on neighbouring lands. These are well to the south and west outside the test site, with the closest being wind turbines that lie some 700 m away. The potential effect of any such far-away features on the background readings and thereby the reported results, is however deemed negligible following tests carried out many years ago when the whole of the Whitelee Wind Farm was off.

5 DESCRIPTION OF MEASUREMENT EQUIPMENT

Table 2 lists the measurement instrumentation used. The corresponding calibration certificates are provided in Appendix 1.

6 ACOUSTIC PERFORMANCE MEASUREMENTS

Audible noise measurements were undertaken at Myres Hill on 1st and 21st December 2016 and covered a 10-second averaged wind speed range of 3 m/s to 14 m/s for a height above ground level of 19.5 m. The measurements were taken in accordance with Annex F of the IEC 61400-11: 2012 test standard.

During each measurement session, A-weighted 1/3-octave spectra were measured concurrently with the overall continuous A-weighted sound pressure levels. An audio recording of each session was also made on a Brüel & Kjær (B&K) 2250 noise analyser. The audio signal was played back later via the B&K BZ-5503 Measurement Partner Suite software and input to a Quattro DP240 dynamic signal analyser which generated the fine frequency spectra to be used in the tonal assessment.

6.1 Measurement Procedure

A trailer based meteorological mast was used to cover westerly winds on the two days. This mast had an anemometer mounted at 19.5 m above ground level, corresponding to the hub height of the wind turbine, and was sited 38 m, i.e. 2D from the turbine on a bearing of 250°.

The total testing period covering the measurements used in the analysis lasted from 15:17 until 16:21 on 01/12/2016 and 12:22 until 12:56 on 21/12/2016. During the total testing period the measured hub height wind speed ranged from 2.3 to 14.3 m/s.

The direction of the wind, air temperature and pressure were also monitored over this total testing period. The air temperature was in the range 2.9 to 3.1°C and the atmospheric pressure was 969 mBar to the nearest mBar on the 1st test day and on the 2nd test day the air temperature was in the range 6.5 to 7.5 °C while the atmospheric pressure was in the range 988 to 990 mBar.

Noise measurements were made using a ½" diameter microphone located at the centre of a 1 m diameter ground-mounted (acoustically hard) board located 38 m downwind from the wind turbine. Noise, wind speed and direction data were captured in 10-second periods. The location of the ground mounted board and microphone was chosen to minimise influence of any out-houses, parked turbines, MET masts and ground vegetation in the immediate vicinity of the wind turbine upon reported test results. The conditions complied with free field behaviour for reflecting planes. Photographs showing the test arrangements are shown in Figure 2.

Simultaneous noise and wind speed measurements were made with the turbine running and then, as part of the same measurement session, with it parked and the control panel isolated.

Wind speeds were normalised to standard meteorological conditions as per Equation (F1) of IEC 61400-11:2012 where required.

Data were filtered to remove data points where either the noise board position was outside the valid sector (± 45° relative to the wind direction) or the anemometer mast position was not in the valid sector (± 90° upwind of the turbine). Filtering was also performed to discard data where there had been interference due to extraneous noise events, e.g. passing aircraft or any noisy birds during the background tests.

6.2 Apparent Sound Power Levels

There were 442 valid data sets, post-filtering, of which 289 samples had the wind turbine running and 153 samples had it switched off. Figure 3 shows data captured during the various measurement sessions, with the turbine running and with it parked.

A summary of the apparent sound power levels and associated uncertainty at wind speed bin centres at hub height are given in Table 3.

6.3 Noise Immission Levels

Estimated noise immission levels for different wind speeds and for selected slant distances from the rotor centre are presented in Figure 4. The sound pressure levels, dB(A), shown in the noise immission map are based on the Apparent Sound Power Levels referenced to the wind turbine hub height and are calculated assuming spherical propagation.

From the graph it can be seen that for a hub height wind speed of 10 m/s the sound pressure immission level at a slant distance of 215 m from the rotor centre is 35 dB(A). This distance reduces to 140 m for a wind speed of 5 m/s.

6.4 One-Third Octave Band Spectra

The A-weighted one-third octave band sound power spectra are shown in Figures 5 - 12 for each of the rotor wind speed bins. Note that the wind speed is referenced to the rotor centre height. Numbers shown in square brackets represent points where the background level is within 3 dB of the total noise level, i.e. with the turbine running. The wind speed bin centre A-weighted one-third octave band sound pressure levels are presented in Table 4 with the corresponding uncertainty values. Wind speed is referenced to rotor centre height. The values marked with an asterisk represent the points in the spectrum where the difference between total noise and background noise is between 3 dB and 6 dB. Results shown in brackets indicate the difference is less than 3 dB and these values were not used in the calculation of the average.

6.5 Tonal Audibility

For each of the bins, 30 fine frequency spectra were available for the analysis with the exceptions of the 3 m/s bin where there were only eleven valid measurements available and then bins 12 – 14m/s where only fifteen valid measurements available, spread over the higher integer wind speed bins, roughly averaging five in each bin.

The search for tones was conducted in the frequency range 20 - 11,200 Hz. Narrowband spectra, with a resolution of 1.5625 Hz were generated from the Quattro DP240 dynamic signal analyser in 10-second periods using a Hanning window with an overlap of 50%.

Figures 13a to 24b show one representative fine frequency spectrum from each of the wind speed bins. Two graphs, a, and b, are presented for each spectrum. The first, a, shows the whole spectrum with the frequency of highest tonality marked with a blue dotted vertical line. The two vertical blue lines show the limits of the associated critical band. Similarly red verticals lines highlight the critical band with the next second highest tonality value and green lines mark the critical band containing the spectrum's peak. In some cases the spectrum peak and highest tonality coincide.

The second figure, b, shows the critical band in more detail. The spectral lines (points in the frequency domain) identified as possible tones are highlighted as red markers and the masking noise shown in green. Calculating the energy sum of all the points identified as tones gives the sound pressure level of the tone, Lpt, which is shown as a red dotted horizontal line on the graph. The black dotted horizontal line labelled, Lpn,avg, represents the energy average of all the masking points and the dot-dash line represents the defined masking level, Lpn.

The tonality, ΔLtn, for each spectrum is determined by subtracting the masking level, Lpn, from the sound pressure level of the tone, Lpt. The final step is to calculate the

tonal audibility, ΔLa, by subtracting the frequency dependent audibility criterion, La, specified in IEC61400-11:12 from the tonality.

The results of the analysis shows a reportable tonal audibility at 591 Hz for the wind turbine in the range 3 - 5 m/s. Table 5 shows a summary of this reportable audibility.

There are no reportable audible tones for wind speeds above 5 m/s. In the range 3 to 5 m/s there are two tones with audibility greater than 0 dB. These are at 591 Hz with its highest audibility being +2.6 dB for 4 m/s wind speed and 6.25 kHz with its highest audibility being +2.3 dB but is always lower in audibility than for 591 Hz, over 3 -14 m/s.

A tonal audibility calculation summary sheet for each of the wind speed bins is presented in Appendix 3. This includes the subordinate tone at 6.25 kHz for 3 - 4 m/s.

LIST OF TABLES

LIST OF FIGURES

APPENDICES

TABLE 1 SUMMARY OF TEST WIND TURBINE CONFIGURATION

Turbine Characterisation (Section 10.2 IEC 61400-11:2012)	
WIND TURBINE DETAILS	
Manufacturer	Orenda Energy Solutions
Model number	Skye
Serial number	00018
OPERATING DETAILS	
Vertical or horizontal axis wind turbine	Horizontal axis
Upwind or downwind rotor	Upwind rotor
Hub height	19.5m
Horizontal distance from rotor centre to tower axis	1.4m
Diameter of rotor – manufacturer's data*	18.9m
Tower type (lattice or tube)	2 - nesting tubular sections
Passive stall, active stall, or pitched controlled turbine	Passive stall
Constant or variable speed	53 r.p.m. +/- 10%
Power curve (if required for wind speed determination)	N/A
Rotational speed at each integer standardised wind speed bin from 6 - 10 m/s and at rated power.[Speeds at 12 - 24m/s]	46, 53, 54, 54, 54 & 54 [54 - 58 Max.]
Pitch angle at each integer standardised wind speed from 6 - 10 m/s	Fixed for all speeds
Rated power output	49 kWe @ 11m/s
Control software version	V.1.00.05
ROTOR DETAILS	
Rotor control devices	None
Presence of vortex generators, stall strips, serrated trailing edges	N/A
Blade type	Aerosa 191
Number of blades	3
GEARBOX DETAILS	
Manufacturer	N/A
Model number	N/A
Fixed-parallel-shaft or planetary gearbox	N/A
GENERATOR DETAILS	
Manufacturer	EM
Model number	49 kW
Rotational speed	54 rpm
Rated power	49 kW
Nominal current	80 A
Nominal voltage	400 V

* The rotor diameter (swept) was noted from the Wind Turbine Installation Datasheet pro-forma (WI/WE/4348/F1) completed by Orenda and emailed to NEL on 16/05/16.

TABLE 2 INSTRUMENTATION USED IN ACOUSTIC TESTS

PARAMETER	INSTRUMENT	MANUFACTURER	TYPE	SERIAL NUMBER	CALIBRATION CERTIFICATE. REF.	CALIBRATION LABORATORY
Sound Level	Microphone	Brüel & Kjær	4189	2643613	Cert. No. 02399_2	Salford Uni. (UKAS 0801)
Sound Level	Handheld Analyser	Brüel & Kjær	2250	2653893	Cert. No. 02399_3	Salford Uni. (UKAS 0801)
Sound Level	Calibrator	Brüel & Kjær	4231	2651818	Cert. No. 02399_1	Salford Uni. (UKAS 0801)
Sound Level	DP240A	D48-023	A66-02	21717	Cert. No. 28450	Data Physics Corp.
Wind Speed	Anemometer	Vector Instruments	A100R/K	11778/E88F	1612813 06/2016	Deutsche WindGuard (DAkkS D-K-15140-01-00)
Wind Direction	Vane - potentiometer	Vector Instruments	W200P/F20	55392/V92	N/A	N/A
Pressure	Barometric pressure transducer	Setra/ Campbell Scientific	CS100-278	4288972	U80137-16	Antech Calibration Services (UKAS 0489)
Temperature	Temperature sensor	Vaisala/ Campbell Scientific	HMP45AC	E3350007	U80150-16	Antech Calibration Services (UKAS 0489)
-	Datalogger	Campbell Scientific	CR1000	6242 (E4107)	N/A	N/A

TABLE 3 SUMMARY OF L_{WA} LEVELS AND ASSOCIATED UNCERTAINTY uL_{WA}, AT BIN CENTRES

Parameter	Wind Bin Centre, k (m/s) at Rotor Centre Height											
	3	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**
Run points (289 total)	11	32	31	35	33	35	32	34	31	7	5	3
Run V^{Bar}	3.21	3.97	4.99	6.01	6.97	8.05	9.09	9.98	10.99	11.92	12.90	13.96
Bkgd points (153 total)	9	19	23	24	14	13	12	9	10	8	7	5
Bgd V^{Bar}	3.04	3.97	4.94	5.92	7.10	7.99	9.14	10.02	11.16	12.01	12.82	14.01
L_{WA} @ H	**84.8**	**85.2**	**89.2**	**90.6**	**91.7**	**91.8**	**91.9**	**92.4**	**93.4**	**95.6**	**96.8**	**98.8**
L_{WA} Status	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK
uL_{WA} dB	**1.08**	**0.84**	**0.64**	**0.64**	**0.62**	**0.63**	**0.62**	**0.62**	**0.63**	**0.65**	**0.68**	**0.77**
$L_{WA,d}$ @ H	**86.5**	**86.6**	**90.3**	**91.7**	**92.7**	**92.9**	**93.0**	**93.5**	**94.5**	**96.7**	**98.0**	**100.1**

Note: Status = "OK" if Background noise is at least 6dB less than Turbine running

TABLE 4 BIN CENTRE A-WEIGHTED 1/3rd OCTAVE BAND SOUND PRESSURE LEVELS AND UNCERTAINTY VALUES FOR ROTOR CENTRE HEIGHT WIND SPEEDS

Wind Bin centre, k (m/s)	Parameter	1/3rd Octave Band Centre Frequency																											dBA Total
		20Hz	25Hz	31.5Hz	40Hz	50Hz	63Hz	80Hz	100Hz	125Hz	160Hz	200Hz	250Hz	315Hz	400Hz	500Hz	630Hz	800Hz	1kHz	1.25kHz	1.6kHz	2kHz	2.5kHz	3.15kHz	4kHz	5kHz	6.3kHz	8kHz	10kHz	
4	Total $L_{V,T}$	2.5	5.2	9.0	14.4	17.0	19.8	25.0	30.3	27.2	27.3	32.4	31.5	32.5	31.5	32.7	38.7	35.1	36.6	39.2	39.4	38.1	33.4	27.1	23.4	20.6	22.2	13.9	9.7	47.2
	Bgnd $L_{V,B}$	0.1	4.0	8.8	12.8	16.7	18.8	20.2	19.9	20.0	20.0	19.0	19.1	19.6	19.2	19.5	19.9	19.9	18.0	14.0	10.0	7.4	7.2	7.5	7.7	7.9	7.8	7.2	6.2	31.2
	Corrected $L_{V,c}$	[0.9]	[2.4]	[6.1]	[11.5]	[14.1]	[17.0]	24.8	30.2	27.1	27.2	32.3	31.3	32.4	31.3	32.5	38.5	34.9	36.5	39.0	39.2	38.0	33.3	26.9	23.3	20.5	22.1	13.7	9.5	47.1
	u_c	[1.2]	[1.2]	[1.0]	[1.1]	[1.2]	[1.1]	0.90	0.91	0.73	0.73	0.70	0.66	0.67	0.66	0.65	0.64	0.64	0.64	0.63	0.63	0.63	0.63	0.63	0.62	0.62	0.61	0.63	0.67	
5	Total $L_{V,T}$	1.5	5.1	10.5	14.2	17.2	21.0	30.9	36.2	32.9	35.2	36.7	37.6	38.5	38.6	38.4	41.2	39.5	41.4	43.3	41.0	45.8	43.6	42.9	34.7	27.2	24.7	18.2	14.6	52.9
	Bgnd $L_{V,B}$	1.1	3.9	9.3	13.3	16.6	19.6	19.7	21.9	21.6	22.0	20.9	20.4	21.1	20.6	20.8	20.2	20.3	17.6	12.3	9.6	7.3	6.9	7.4	7.8	7.9	7.8	7.1	6.2	32.2
	Corrected $L_{V,c}$	[0.0]	[2.3]	[7.6]	[11.4]	[14.4]	[18.1]	30.7	36.1	32.8	35.0	36.5	37.5	38.3	38.4	38.2	41.1	39.3	41.2	43.1	40.8	45.6	43.4	42.8	34.6	27.0	24.6	18.0	14.5	52.8
	u_c	[1.1]	[1.0]	[0.9]	[1.1]	[1.0]	[1.1]	0.89	0.55	0.56	0.58	0.56	0.57	0.57	0.55	0.56	0.57	0.54	0.61	0.58	0.56	0.63	0.71	0.68	0.72	0.70	0.73	0.71	1.10	
6	Total $L_{V,T}$	7.3	11.8	15.3	18.6	21.8	24.7	28.4	34.7	34.8	34.1	39.0	38.9	39.3	40.3	41.7	44.7	43.9	45.7	44.8	43.4	44.8	45.2	44.8	42.7	34.7	28.6	22.5	17.1	55.0
	Bgnd $L_{V,B}$	6.1	10.4	14.1	17.2	20.4	22.6	24.1	25.2	25.9	25.9	26.2	26.7	27.3	26.9	27.1	26.3	25.8	24.6	21.3	18.9	16.6	15.3	13.9	11.9	9.8	8.3	7.3	5.9	37.5
	Corrected $L_{V,c}$	[4.7]	[9.1]	[12.6]	[15.8]	[18.9]	[21.7]	26.1*	34.0	34.0	33.1	38.5	38.3	38.7	39.8	41.2	44.2	43.4	45.2	44.3	43.0	44.4	44.8	44.4	42.3	34.4	28.6	22.5	17.0	54.7
	u_c	[1.3]	[1.3]	[1.4]	[1.4]	[1.4]	[1.4]	1.12	0.70	0.72	0.75	0.66	0.66	0.67	0.66	0.65	0.64	0.64	0.64	0.63	0.63	0.63	0.63	0.63	0.62	0.61	0.60	0.66	0.67	
7	Total $L_{V,T}$	12.2	17.7	20.8	24.0	26.0	29.8	33.0	35.2	36.4	39.0	41.9	44.0	45.1	45.4	46.1	46.6	46.3	45.1	43.5	43.7	43.1	43.7	43.1	40.2	36.7	33.3	28.2	22.4	56.2
	Bgnd $L_{V,B}$	9.2	15.5	18.3	22.1	23.9	26.9	27.6	28.1	29.5	30.3	30.6	32.1	34.1	32.2	33.2	32.0	30.8	30.1	28.4	26.4	24.5	21.5	17.5	14.2	11.4	9.5	8.0	6.4	42.7
	Corrected $L_{V,c}$	[10.2]	[14.0]	[17.2]	[20.2]	[23.3]	[26.2]	30.2*	35.0	36.0	36.7	40.3	41.2	41.6	42.7	43.9	45.9	46.2	47.2	45.2	43.5	44.2	45.0	44.0	43.1	38.4	30.9	24.9	18.7	56.0
	u_c	[1.3]	[1.3]	[1.4]	[1.4]	[1.4]	[1.4]	0.84	0.74	0.73	0.68	0.65	0.66	0.69	0.68	0.66	0.64	0.63	0.63	0.63	0.62	0.61	0.61	0.60	0.59	0.59	0.58	0.63	0.63	
8	Total $L_{V,T}$	13.8	17.7	21.1	24.4	28.0	31.8	33.7	35.8	36.9	39.5	42.5	44.6	45.8	46.4	46.5	46.9	46.7	45.6	44.1	44.4	44.0	44.4	43.6	40.7	37.3	33.9	28.8	23.0	56.8
	Bgnd $L_{V,B}$	12.6	17.2	20.3	22.3	24.7	27.4	28.9	28.5	29.6	29.9	31.0	32.5	33.0	33.4	34.1	34.5	32.6	32.0	30.9	29.9	28.8	26.7	23.7	20.7	18.0	16.5	14.9	12.9	43.9
	Corrected $L_{V,c}$	[11.1]	[15.1]	[18.6]	[21.5]	25.3*	28.5*	32.6*	36.2	37.2	38.6	41.8	43.7	44.5	45.8	46.5	47.6	46.9	46.1	43.0	42.5	43.1	44.4	44.0	41.6	37.8	32.5	26.7	20.4	56.6
	u_c	[1.3]	[1.3]	[1.4]	[1.4]	1.65	0.98	0.74	0.68	0.69	0.65	0.63	0.64	0.65	0.64	0.64	0.63	0.62	0.62	0.62	0.62	0.61	0.60	0.60	0.59	0.58	0.58	0.63	0.63	
9	Total $L_{V,T}$	14.8	18.5	21.4	24.6	27.0	30.5	34.2	35.8	36.9	39.6	42.4	44.5	45.7	46.2	46.3	46.8	46.6	45.7	44.4	44.5	44.2	44.7	43.8	40.7	37.5	34.3	29.2	23.3	56.8
	Bgnd $L_{V,B}$	14.0	17.5	20.5	22.4	24.6	27.7	29.3	28.4	29.5	30.1	30.9	32.4	32.8	33.1	33.7	33.2	32.2	31.5	30.4	29.4	28.3	27.1	24.5	21.2	18.3	16.5	14.8	12.5	43.6
	Corrected $L_{V,c}$	[11.9]	[15.2]	[18.3]	[20.8]	[23.7]	[27.1]	30.1*	35.3	36.6	37.6	41.3	43.9	44.8	45.5	46.2	47.3	46.7	46.1	43.2	43.0	44.1	45.0	44.0	42.3	38.9	33.3	28.1	22.3	56.6
	u_c	[1.2]	[1.3]	[1.3]	[1.3]	[1.4]	[1.4]	1.15	0.72	0.71	0.70	0.64	0.63	0.63	0.62	0.63	0.61	0.61	0.61	0.62	0.61	0.60	0.59	0.59	0.58	0.58	0.57	0.63	0.65	
10	Total $L_{V,T}$	15.9	20.6	22.3	25.0	27.6	30.8	33.7	35.7	36.7	39.5	42.4	44.6	45.9	46.2	46.4	47.1	47.0	46.3	45.0	44.7	44.3	44.8	44.0	40.9	37.5	34.5	29.3	23.4	57.0
	Bgnd $L_{V,B}$	16.1	18.5	21.4	23.1	25.4	28.0	29.3	29.8	30.3	31.1	32.1	33.5	35.0	34.3	34.3	33.8	32.1	31.4	30.2	28.7	27.1	24.9	21.7	18.5	15.6	13.5	11.8	9.8	44.2
	Corrected $L_{V,c}$	[12.1]	[16.4]	[19.3]	[21.5]	[23.9]	[27.3]	30.8*	35.5	36.9	39.3	42.7	44.9	45.3	46.5	47.0	47.4	47.1	46.3	43.1	42.9	42.8	44.1	44.2	41.6	37.6	33.6	28.3	22.5	56.8
	u_c	[1.3]	[1.3]	[1.3]	[1.4]	[1.4]	[1.4]	0.66	0.64	0.65	0.63	0.62	0.62	0.62	0.63	0.63	0.62	0.62	0.62	0.62	0.62	0.61	0.61	0.61	0.60	0.60	0.59	0.64	0.63	
11	Total $L_{V,T}$	19.2	23.0	24.1	26.5	29.1	31.4	34.8	36.9	37.9	40.5	43.5	45.5	46.4	46.5	47.3	48.2	48.2	47.7	46.4	45.8	45.3	45.8	45.1	42.2	38.7	35.5	30.5	24.6	58.0
	Bgnd $L_{V,B}$	16.6	20.1	22.6	24.3	26.7	28.6	30.8	30.1	31.7	32.0	33.1	34.0	35.4	36.0	36.0	34.3	33.9	34.1	33.4	32.7	31.7	30.3	28.2	24.9	21.5	18.3	14.9	12.3	45.9
	Corrected $L_{V,c}$	[13.9]	[18.1]	[20.6]	[22.6]	[25.4]	[28.9]	32.6*	36.6	37.6	40.3	43.6	45.9	46.9	47.3	47.7	48.2	47.6	46.4	44.5	44.3	44.2	45.4	44.7	41.9	38.2	34.7	29.5	23.6	57.7
	u_c	[1.3]	[1.4]	[1.4]	[1.4]	[1.4]	[1.4]	0.68	0.65	0.66	0.65	0.63	0.63	0.63	0.64	0.64	0.63	0.62	0.63	0.63	0.63	0.62	0.62	0.61	0.61	0.60	0.59	0.65	0.64	

TABLE 5 TONAL AUDIBILITY RESULT FOR EACH WIND SPEED BIN

Wind Speed Bin at Rotor Centre (m/s)	Frequency (Hz)	Critical Bandwidth (Hz)	Tonality ΔL_k	Tonal Audibility $\Delta L_{a,k}$
3	590.6	124	-0.8	+1.6
4	592.2	124	0.3	+2.7
5	592.2	124	-1.9	+0.5
6	590.6	124	-2.5	- 0.1
7	No Relevant Tones			
8				
9				
10				
11				
12				
13				
14				

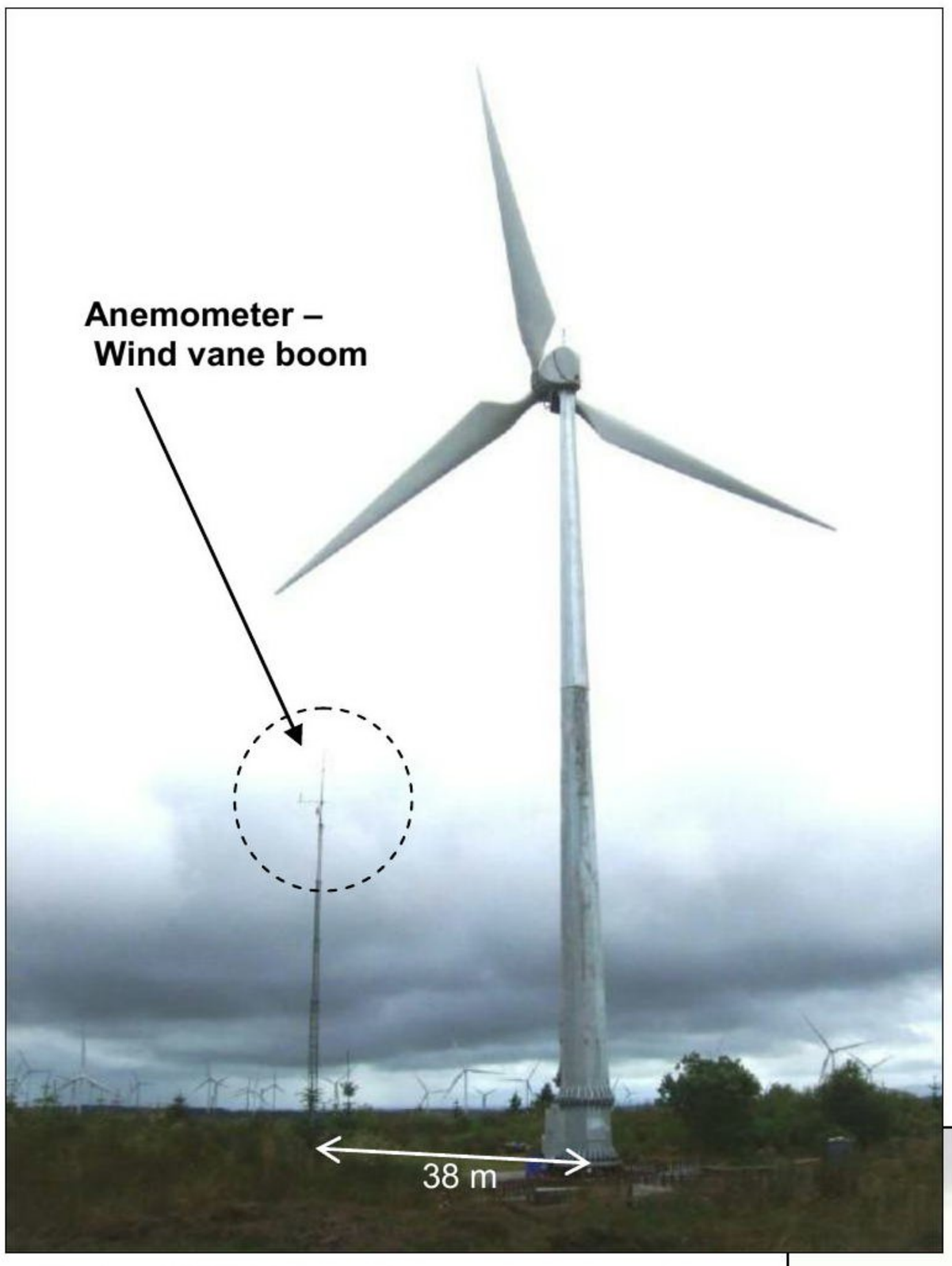
Wind Speed Bin at Rotor Centre (m/s)	Frequency (Hz)	Critical Bandwidth (Hz)	Tonality ΔL_k	Tonal Audibility $\Delta L_{a,k}$
3	6250	1227	-3.4	+1.3
4	6250	1227	-2.4	+2.3
5	No Relevant Tones			
6				
7				
8				
9				
10				
11				
12				
13				
14				

Wind Speed Bin at Rotor Centre (m/s)	Frequency (Hz)	Critical Bandwidth (Hz)	Tonality ΔL_k	Tonal Audibility $\Delta L_{a,k}$
3	98.4	124	-4.6	-2.6
4	100.0	124	-5.1	-3.0
5	No Relevant Tones			
6				
7				
8				
9				
10				
11				
12				
13				
14				

Viewing WSW from the Wind Turbine under test to NEL's Trailer MET Mast.

Viewing WNW from the Wind Turbine under test on Test Pad No. A6.

FIGURE 1 PHOTOGRAPHS FROM THE TEST BASE ON MYRES HILL



Trailer MET Mast with cup anemometer (above)

Board mounted microphone (below)

FIGURE 2 PHOTOGRAPHS SHOWING ACOUSTIC TEST ARRANGEMENT

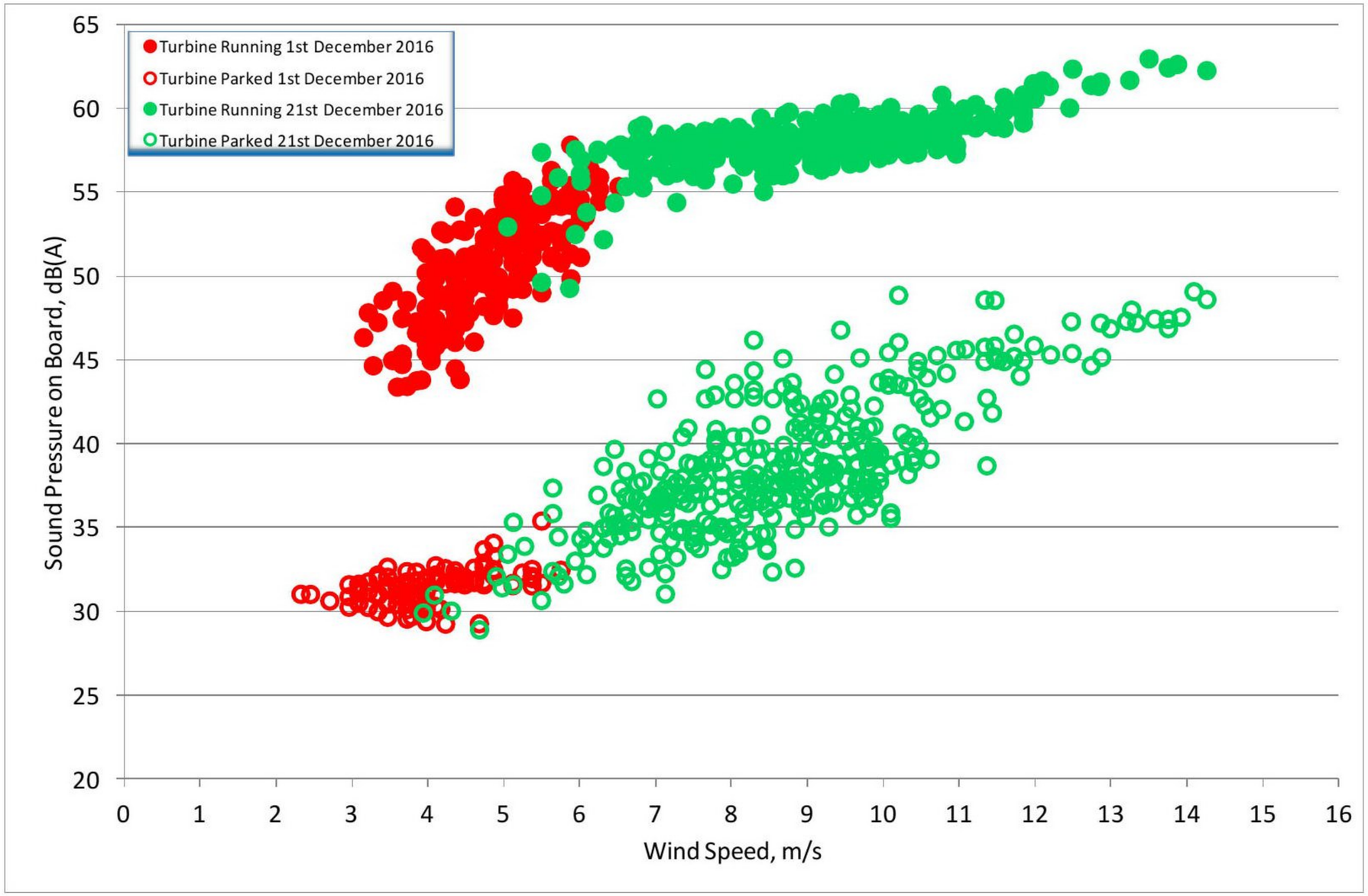


FIGURE 3 AUDIBLE NOISE (AS MEASURED AT THE GROUND BOARD) AS A FUNCTION OF WIND SPEED AT 19.5 M ABOVE GROUND LEVEL (Rotor Centre Height/ Hub Height a.g.l.)

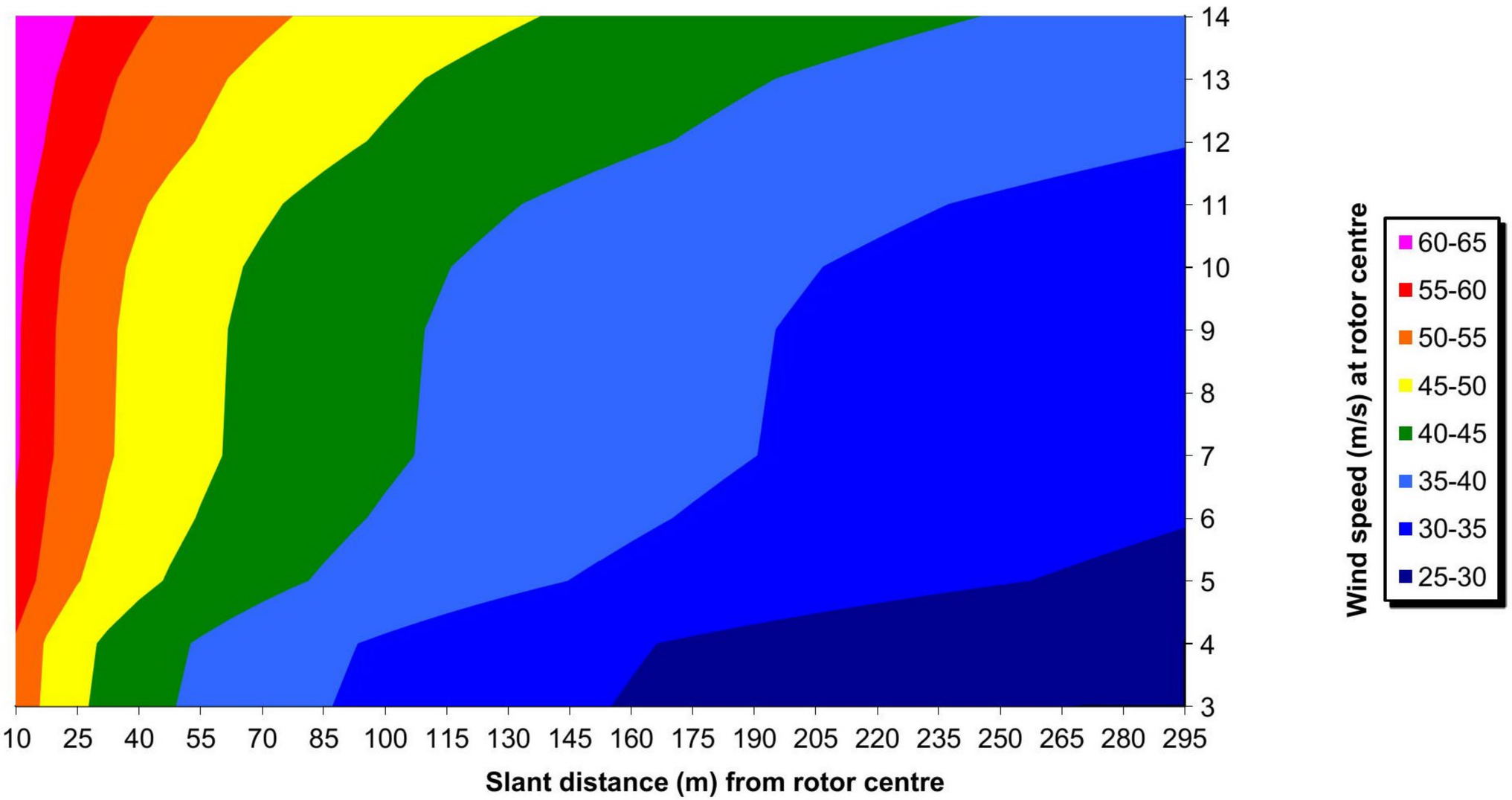


FIGURE 4 IMMISSION NOISE MAP

1/3rd Octave Band Centre Frequency																										dBA Total
20Hz	25Hz	31.5Hz	40Hz	50Hz	63Hz	80Hz	100Hz	125Hz	160Hz	200Hz	250Hz	315Hz	400Hz	500Hz	630Hz	800Hz	1kHz	1.25kHz	1.6kHz	2kHz	2.5kHz	3.15kHz	4kHz	5kHz	6.3kHz	8kHz	10kHz	
[37]	[39]	[42]	[48]	[50]	[53]	61.1	66.5	63.4	63.5	68.6	67.6	68.7	67.6	68.8	74.8	71.2	72.8	75.3	75.5	74.3	69.6	63.2	59.6	56.8	58.4	50.0	45.8	84.6

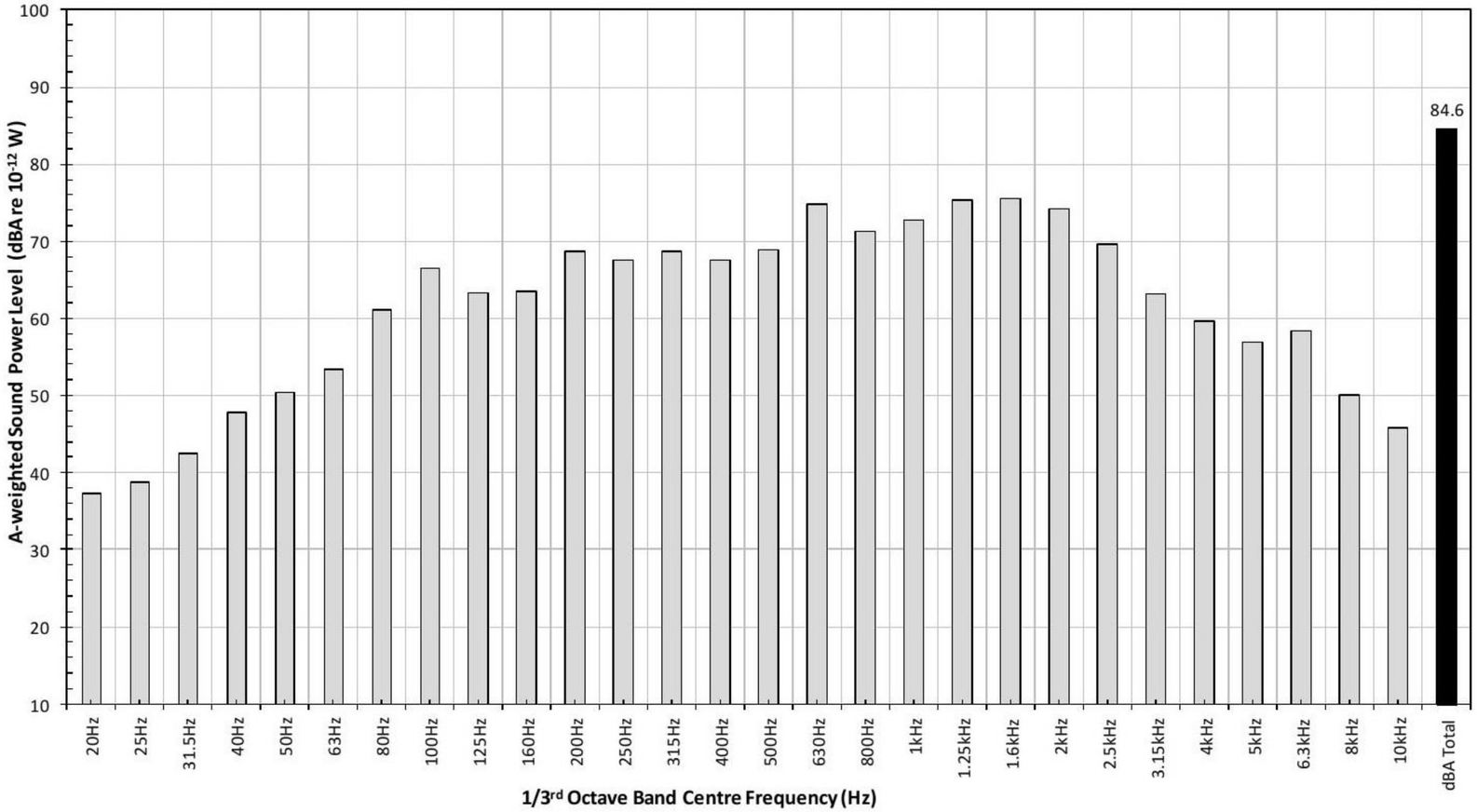


FIGURE 5 A-WEIGHTED 1/3rd OCTAVE BAND SOUND POWER LEVELS FOR 4 m/s WIND SPEED BIN AT ROTOR CENTRE HEIGHT
(3.5 m/s @ 10 m ABOVE GROUND LEVEL, WITH A ROUGHNESS LENGTH OF 0.1)

1/3rd Octave Band Centre Frequency																										dBA Total
20Hz	25Hz	31.5Hz	40Hz	50Hz	63Hz	80Hz	100Hz	125Hz	160Hz	200Hz	250Hz	315Hz	400Hz	500Hz	630Hz	800Hz	1kHz	1.25kHz	1.6kHz	2kHz	2.5kHz	3.15kHz	4kHz	5kHz	6.3kHz	8kHz	10kHz	
[36]	[39]	[44]	[48]	[51]	[54]	67.0	72.4	69.1	71.3	72.8	73.8	74.6	74.7	74.5	77.4	75.6	77.5	79.4	77.1	81.9	79.7	79.1	70.9	63.3	60.9	54.3	50.8	89.1

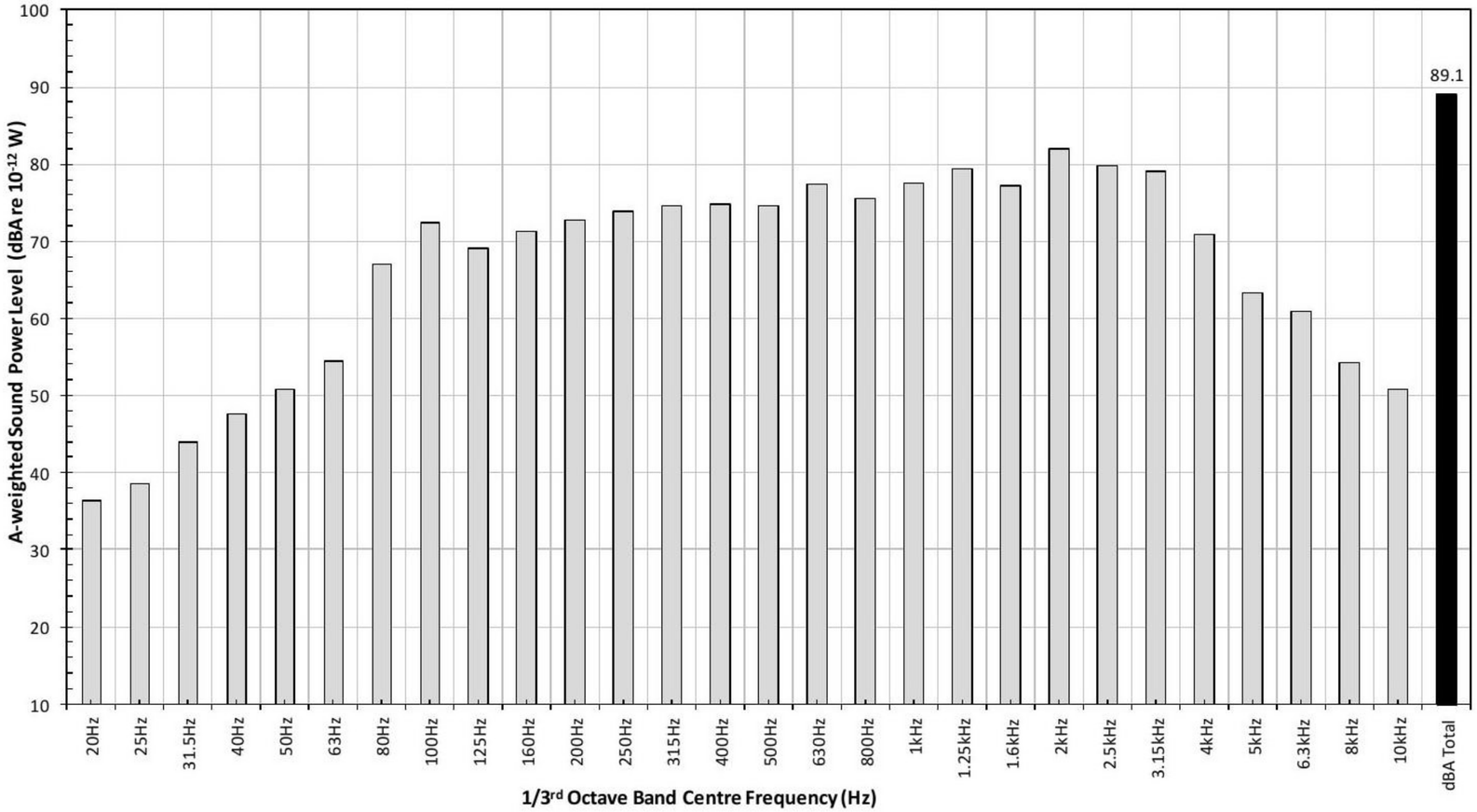


FIGURE 6 A-WEIGHTED 1/3rd OCTAVE BAND SOUND POWER LEVELS FOR 5 m/s WIND SPEED BIN AT ROTOR CENTRE HEIGHT
(4.4 m/s @ 10 m ABOVE GROUND LEVEL, WITH A ROUGHNESS LENGTH OF 0.1)

1/3rd Octave Band Centre Frequency																											dBA Total
20Hz	25Hz	31.5Hz	40Hz	50Hz	63Hz	80Hz	100Hz	125Hz	160Hz	200Hz	250Hz	315Hz	400Hz	500Hz	630Hz	800Hz	1kHz	1.25kHz	1.6kHz	2kHz	2.5kHz	3.15kHz	4kHz	5kHz	6.3kHz	8kHz	10kHz	
[41]	[45]	[49]	[52]	[55]	[58]	62.4*	70.3	70.3	69.4	74.8	74.6	75.0	76.1	77.5	80.5	79.7	81.5	80.6	79.3	80.7	81.1	80.7	78.6	70.7	64.9	58.8	53.3	90.6

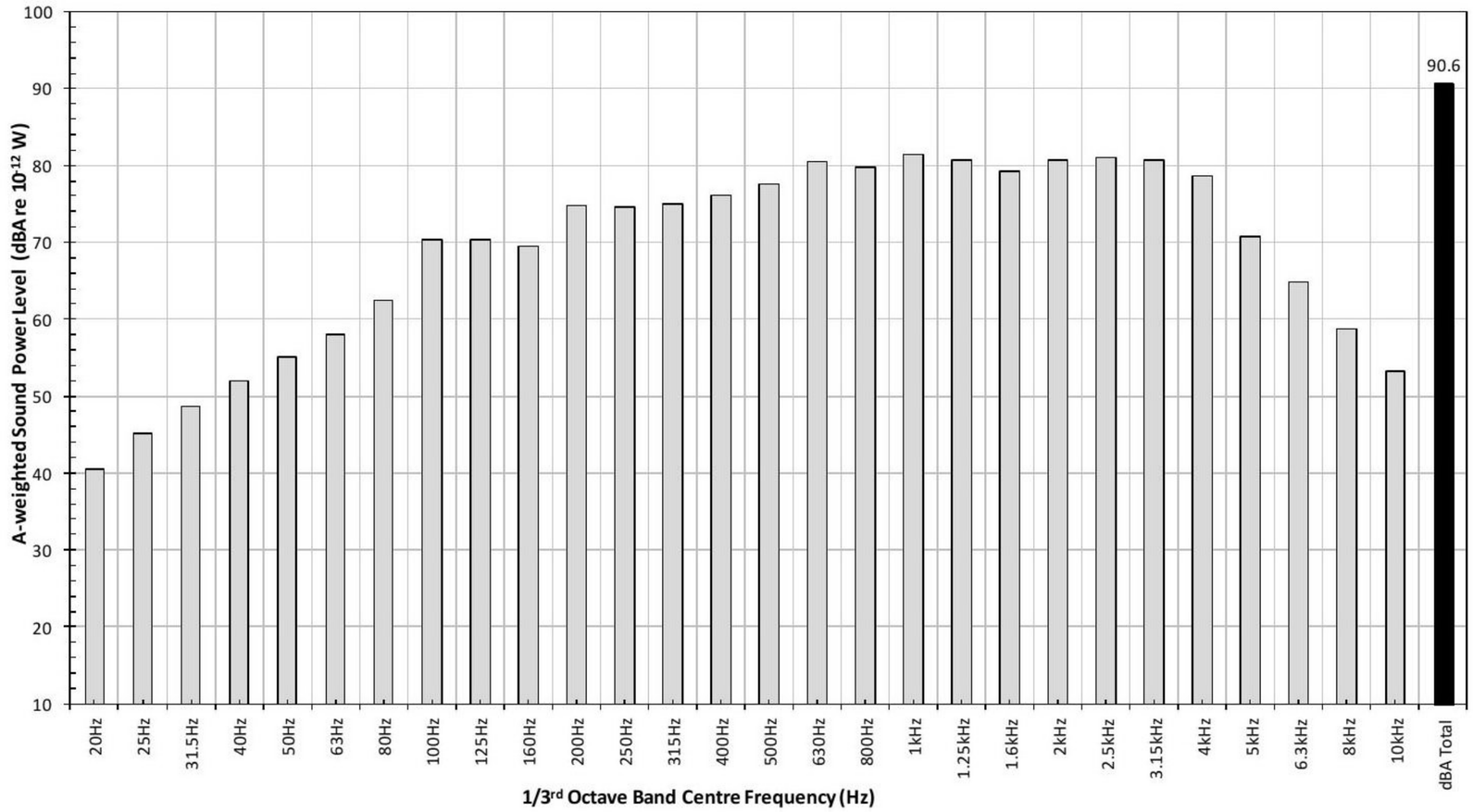


FIGURE 7 A-WEIGHTED 1/3rd OCTAVE BAND SOUND POWER LEVELS FOR 6 m/s WIND SPEED BIN AT ROTOR CENTRE HEIGHT
(5.2 m/s @ 10 m ABOVE GROUND LEVEL, WITH A ROUGHNESS LENGTH OF 0.1)

1/3rd Octave Band Centre Frequency																											dBA Total
20Hz	25Hz	31.5Hz	40Hz	50Hz	63Hz	80Hz	100Hz	125Hz	160Hz	200Hz	250Hz	315Hz	400Hz	500Hz	630Hz	800Hz	1kHz	1.25kHz	1.6kHz	2kHz	2.5kHz	3.15kHz	4kHz	5kHz	6.3kHz	8kHz	10kHz	
[46]	[51]	[54]	[57]	[59]	[63]	66.3*	71.3	72.3	73.0	76.6	77.5	77.9	79.0	80.2	82.2	82.5	83.5	81.5	79.8	80.5	81.3	80.3	79.4	74.7	67.2	61.2	55.0	91.7

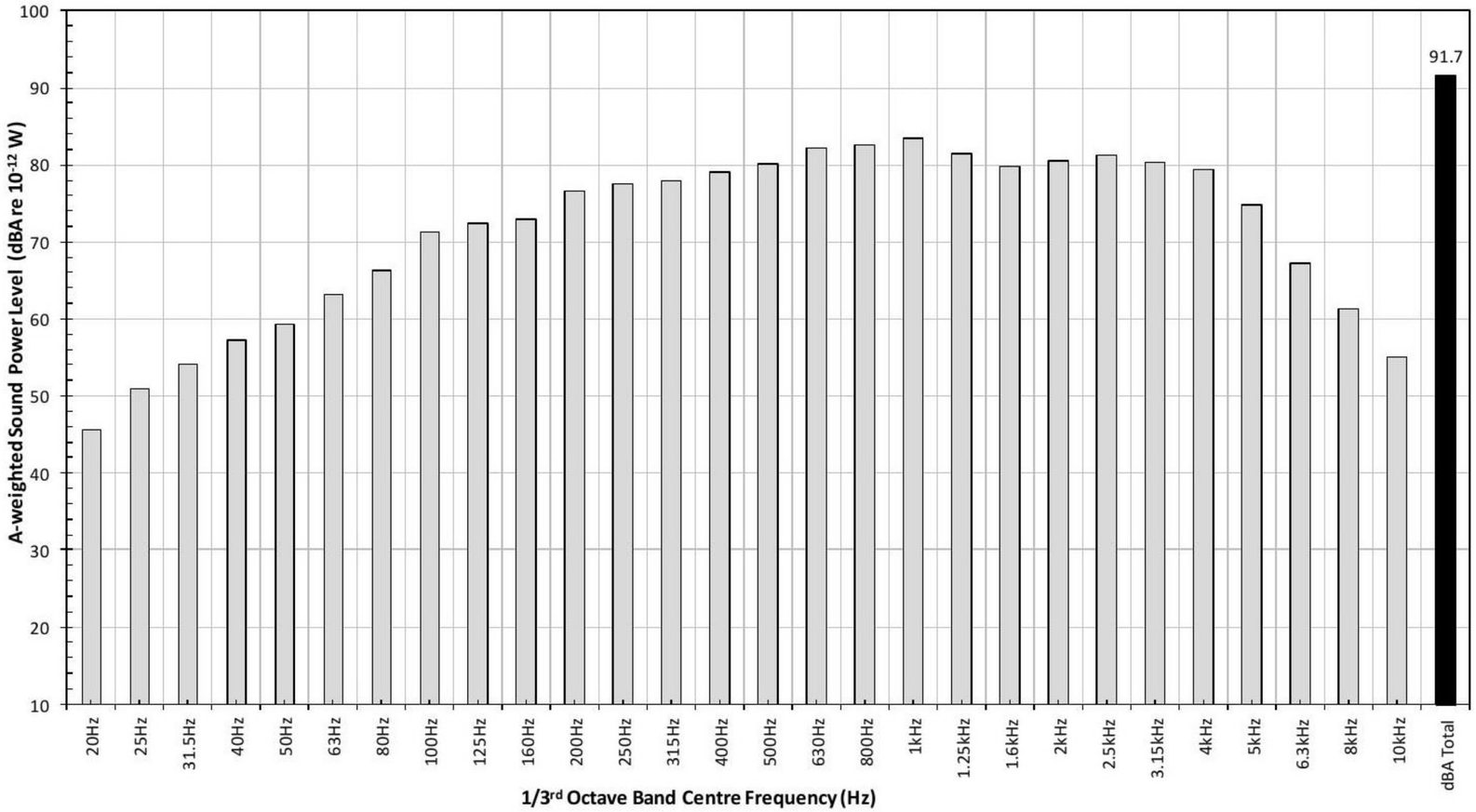


FIGURE 8 A-WEIGHTED 1/3rd OCTAVE BAND SOUND POWER LEVELS FOR 7 m/s WIND SPEED BIN AT ROTOR CENTRE HEIGHT
(6.1 m/s @ 10 m ABOVE GROUND LEVEL, WITH A ROUGHNESS LENGTH OF 0.1)

1/3rd Octave Band Centre Frequency																										dBA Total
20Hz	25Hz	31.5Hz	40Hz	50Hz	63Hz	80Hz	100Hz	125Hz	160Hz	200Hz	250Hz	315Hz	400Hz	500Hz	630Hz	800Hz	1kHz	1.25kHz	1.6kHz	2kHz	2.5kHz	3.15kHz	4kHz	5kHz	6.3kHz	8kHz	10kHz	
[47]	[51]	[55]	[58]	61.3*	65.1*	69*	72.5	73.5	74.9	78.1	80.0	80.8	82.1	82.8	83.9	83.2	82.4	79.3	78.8	79.4	80.7	80.3	77.9	74.1	68.8	63.0	56.7	92.2

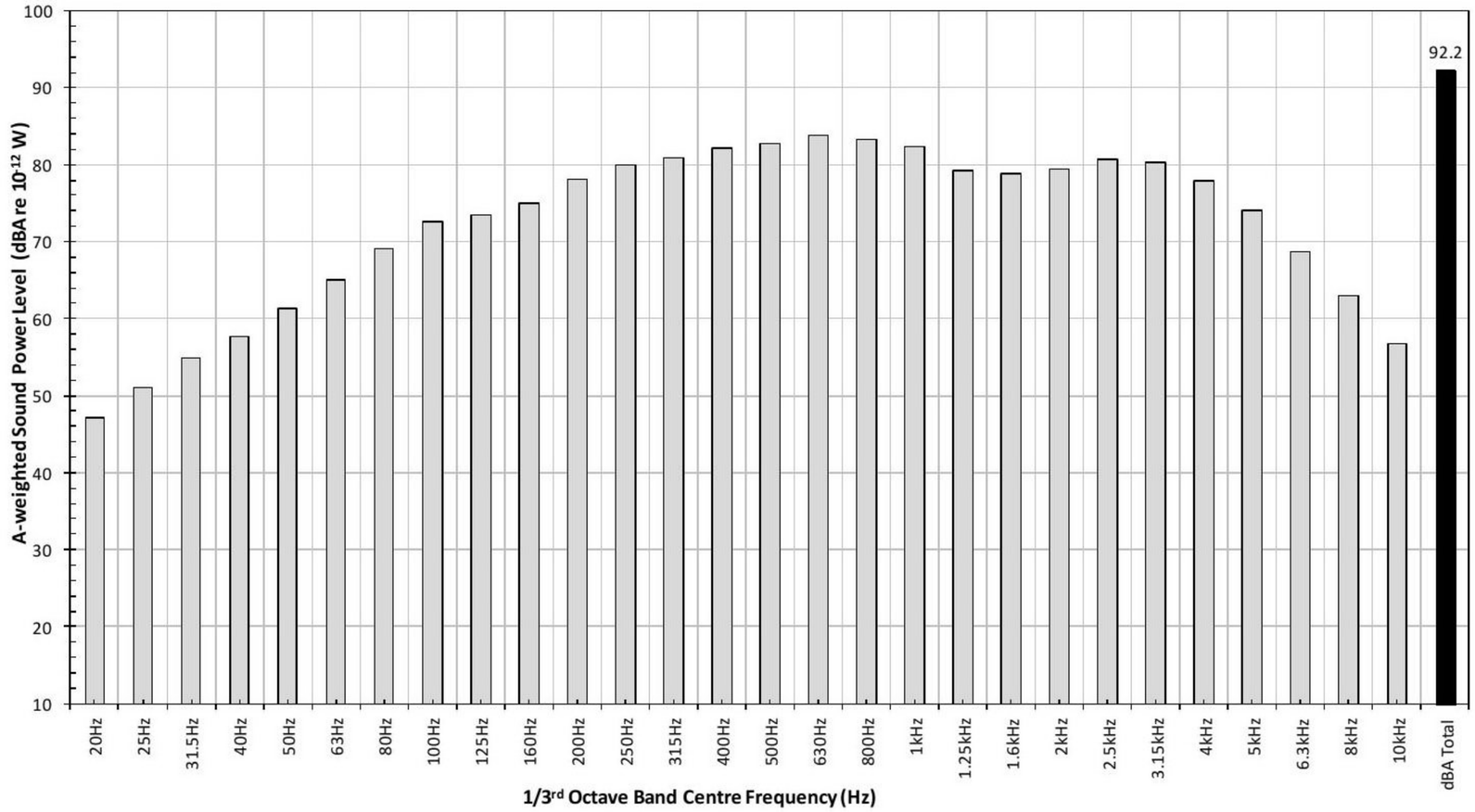


FIGURE 9 A-WEIGHTED 1/3rd OCTAVE BAND SOUND POWER LEVELS FOR 8 m/s WIND SPEED BIN AT ROTOR CENTRE HEIGHT
(7.0 m/s @ 10 m ABOVE GROUND LEVEL, WITH A ROUGHNESS LENGTH OF 0.1)

1/3rd Octave Band Centre Frequency																											dBA Total
20Hz	25Hz	31.5Hz	40Hz	50Hz	63Hz	80Hz	100Hz	125Hz	160Hz	200Hz	250Hz	315Hz	400Hz	500Hz	630Hz	800Hz	1kHz	1.25kHz	1.6kHz	2kHz	2.5kHz	3.15kHz	4kHz	5kHz	6.3kHz	8kHz	10kHz	
[48]	[52]	[55]	[57]	[60]	[64]	66.5*	71.6	72.9	73.9	77.6	80.2	81.1	81.8	82.5	83.6	83.0	82.4	79.5	79.3	80.4	81.3	80.3	78.6	75.2	69.6	64.4	58.6	92.2

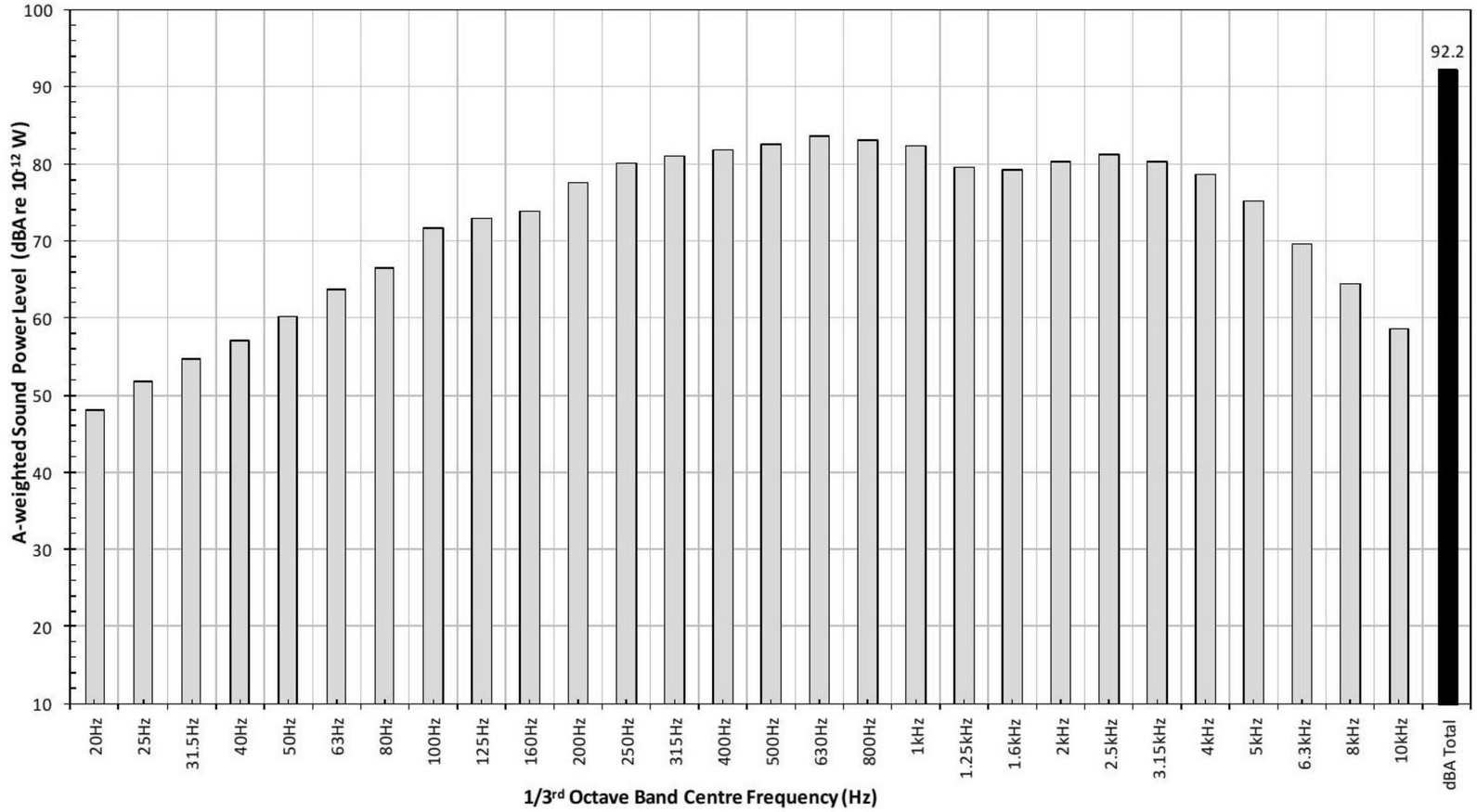


FIGURE 10 A-WEIGHTED 1/3rd OCTAVE BAND SOUND POWER LEVELS FOR 9 m/s WIND SPEED BIN AT ROTOR CENTRE HEIGHT
(7.9 m/s @ 10 m ABOVE GROUND LEVEL, WITH A ROUGHNESS LENGTH OF 0.1)

1/3rd Octave Band Centre Frequency																										dBA Total
20Hz	25Hz	31.5Hz	40Hz	50Hz	63Hz	80Hz	100Hz	125Hz	160Hz	200Hz	250Hz	315Hz	400Hz	500Hz	630Hz	800Hz	1kHz	1.25kHz	1.6kHz	2kHz	2.5kHz	3.15kHz	4kHz	5kHz	6.3kHz	8kHz	10kHz	
[49]	[53]	[56]	[58]	[60]	[64]	67*	71.8	73.2	75.6	79.0	81.2	81.6	82.8	83.3	83.7	83.4	82.6	79.4	79.2	79.1	80.4	80.5	77.9	73.9	69.9	64.6	58.8	92.5

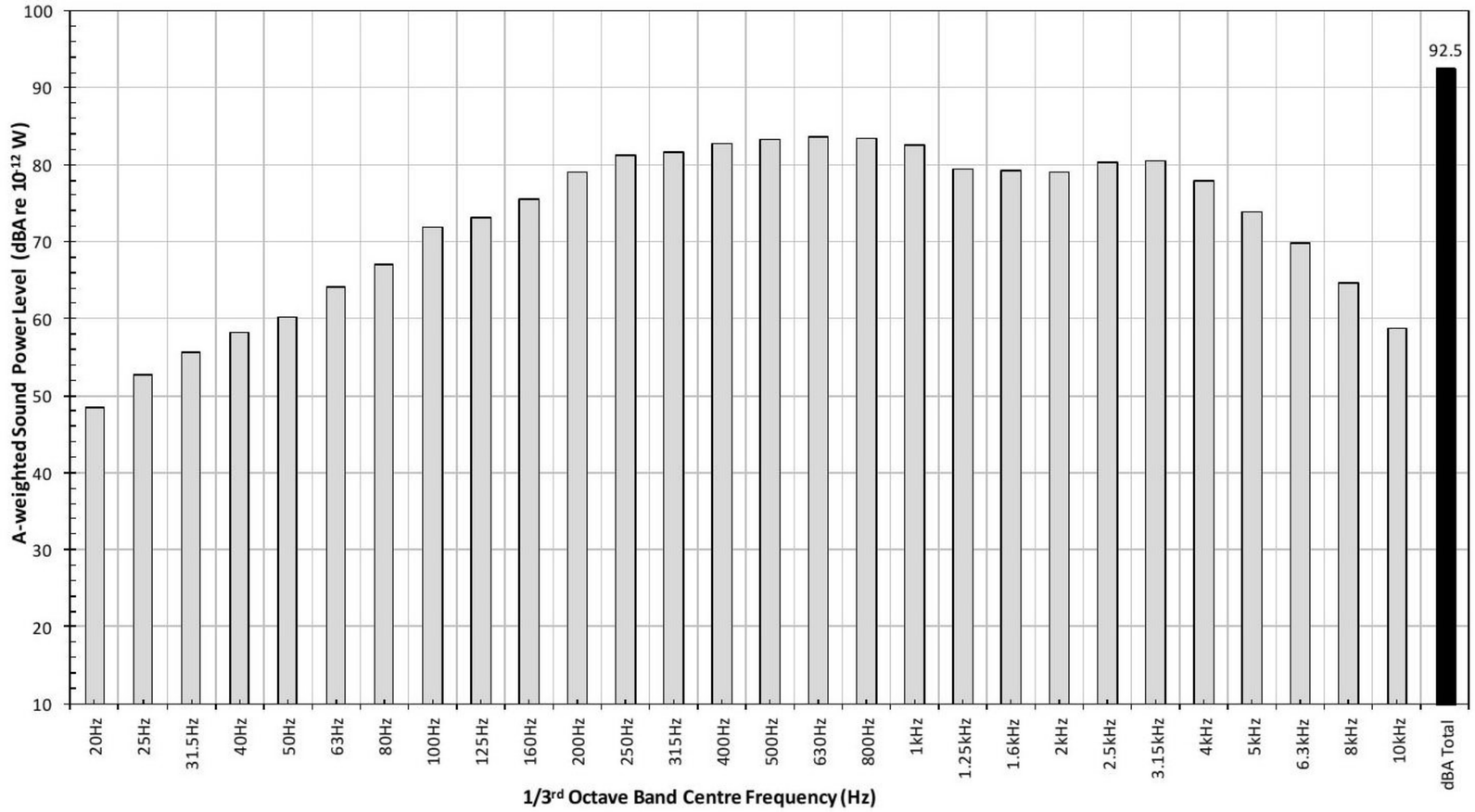


FIGURE 11 A-WEIGHTED 1/3rd OCTAVE BAND SOUND POWER LEVELS FOR 10 m/s WIND SPEED BIN AT ROTOR CENTRE HEIGHT
(8.7 m/s @ 10 m ABOVE GROUND LEVEL, WITH A ROUGHNESS LENGTH OF 0.1)

1/3rd Octave Band Centre Frequency																										dBA Total
20Hz	25Hz	31.5Hz	40Hz	50Hz	63Hz	80Hz	100Hz	125Hz	160Hz	200Hz	250Hz	315Hz	400Hz	500Hz	630Hz	800Hz	1kHz	1.25kHz	1.6kHz	2kHz	2.5kHz	3.15kHz	4kHz	5kHz	6.3kHz	8kHz	10kHz	
[50]	[55]	[57]	[59]	[62]	[65]	68*	72.9	73.9	76.6	79.9	82.2	83.2	83.6	84.0	84.5	83.9	82.7	80.8	80.6	80.5	81.7	81.0	78.2	74.5	71.0	65.8	59.9	93.4

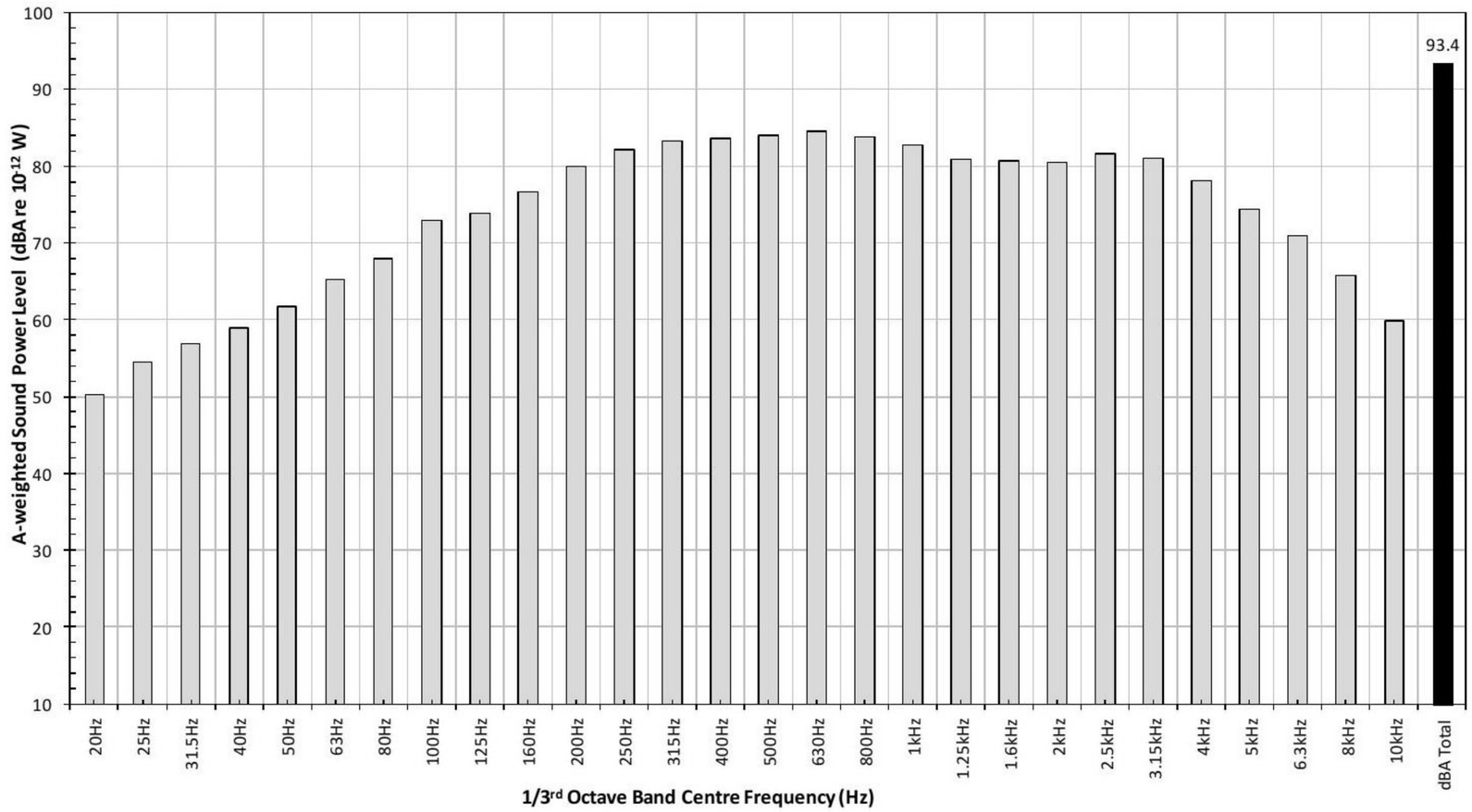
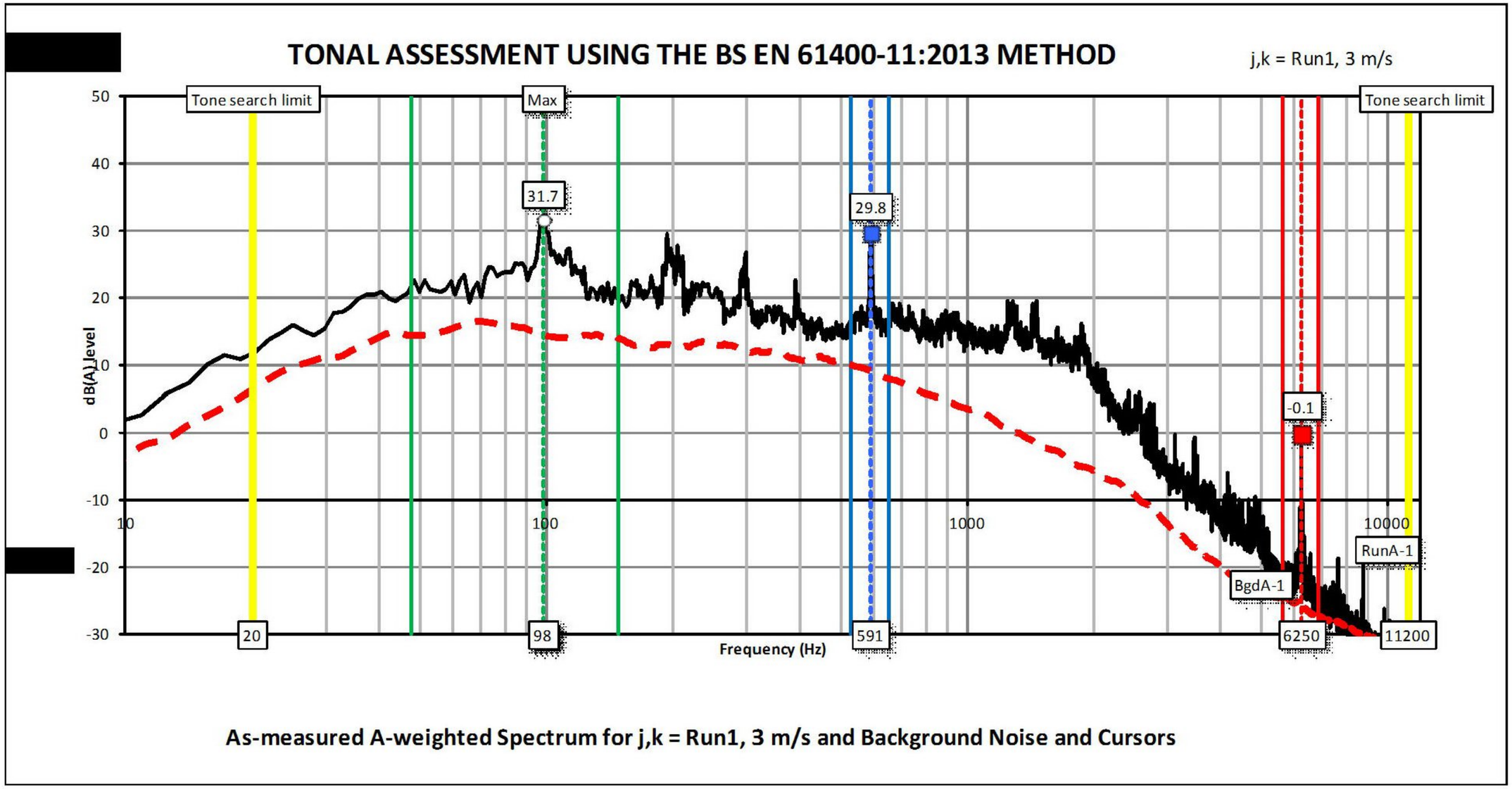


FIGURE 12 A-WEIGHTED 1/3rd OCTAVE BAND SOUND POWER LEVELS FOR 11 m/s WIND SPEED BIN AT ROTOR CENTRE HEIGHT
(9.6 m/s @ 10 m ABOVE GROUND LEVEL, WITH A ROUGHNESS LENGTH OF 0.1)



As-measured A-weighted Spectrum for j,k = Run1, 3 m/s and Background Noise and Cursors

FIGURE 13a TONAL ASSESSMENT USING THE IEC 61400-11:2012 METHOD FOR THE 3 m/s HUB-HEIGHT WIND SPEED BIN

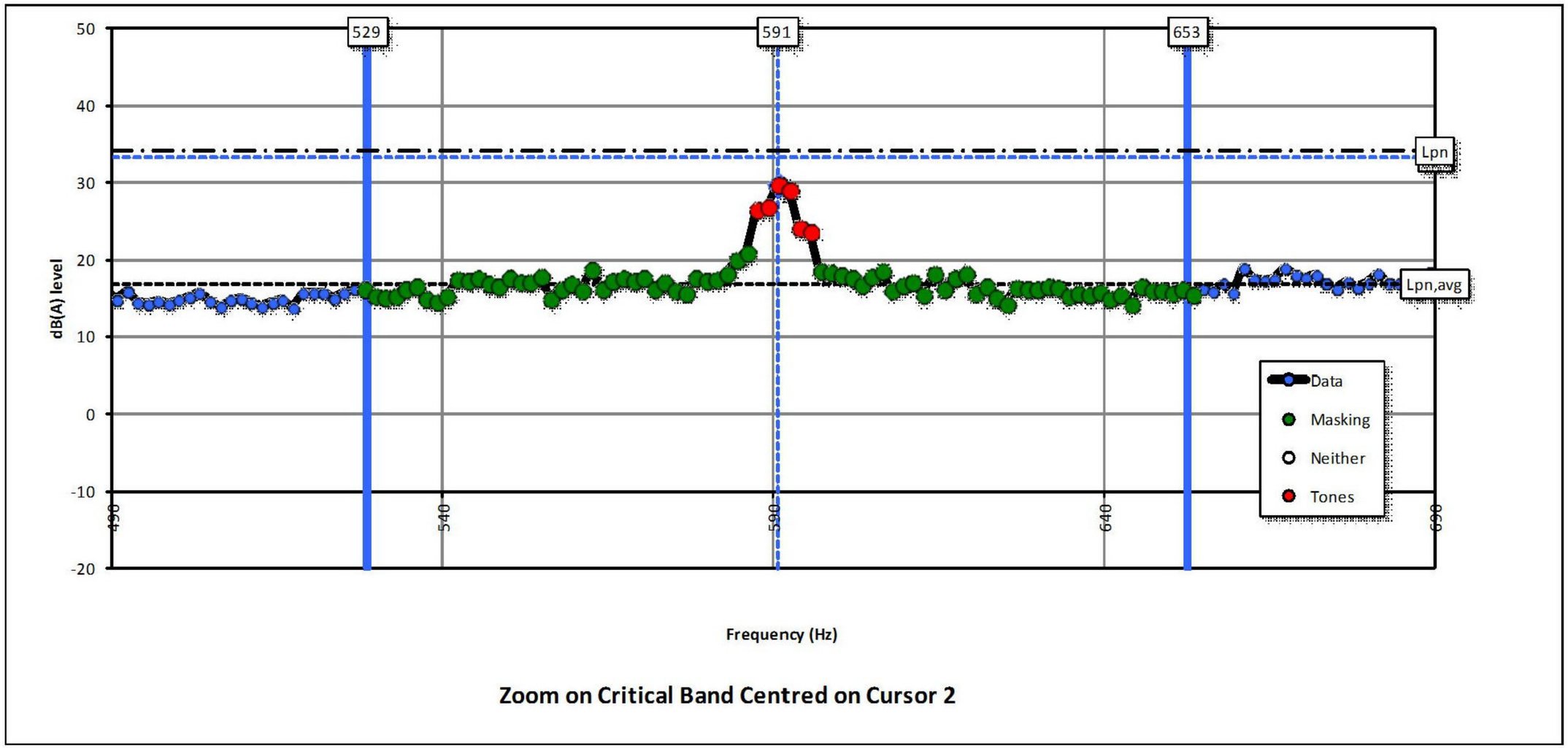


FIGURE 13b CRITICAL BAND WITH HIGHEST TONALITY SHOWING TONES AND MASKING NOISE FOR 3 m/s WIND SPEED BIN. (Tonality +1.6 dB)

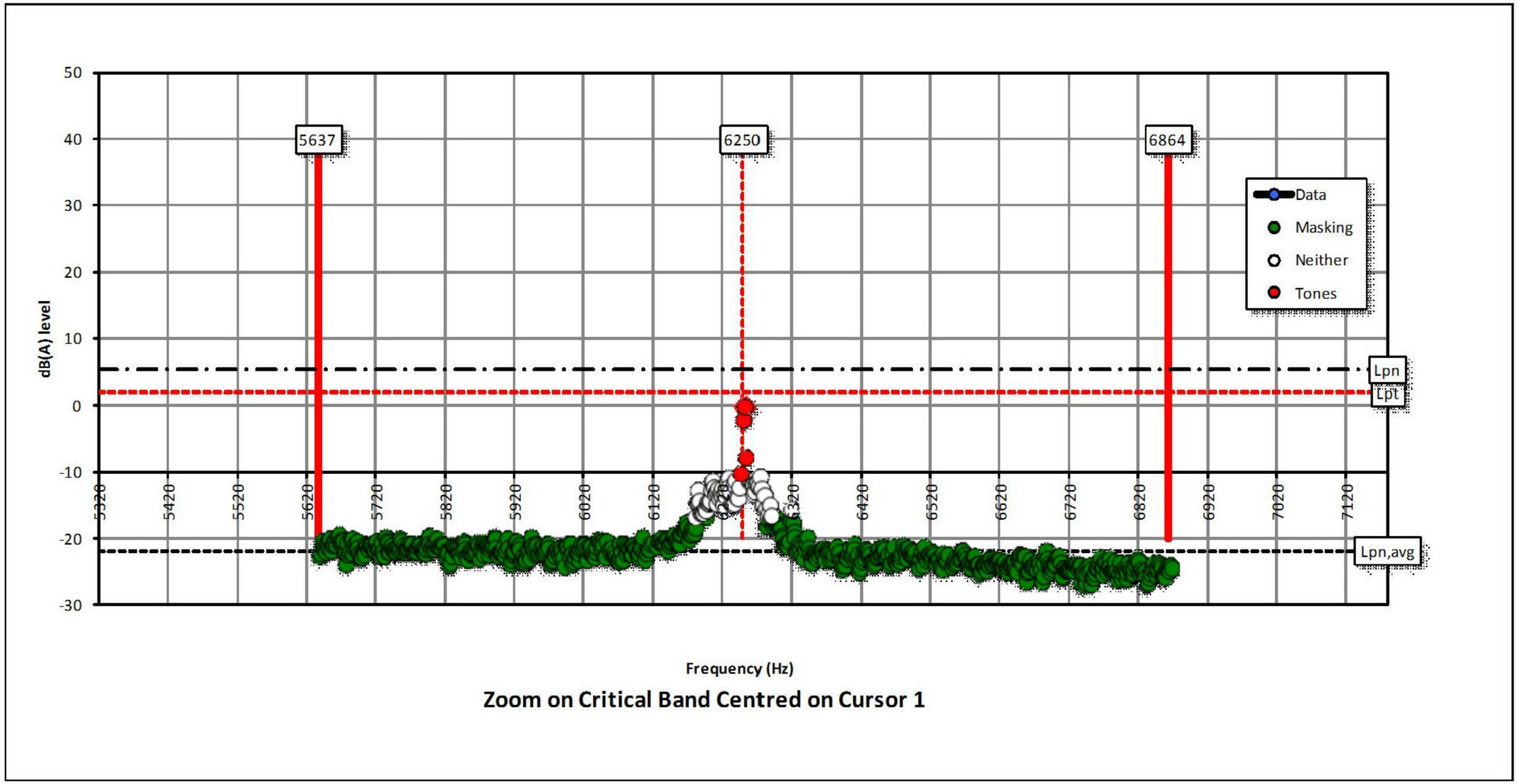
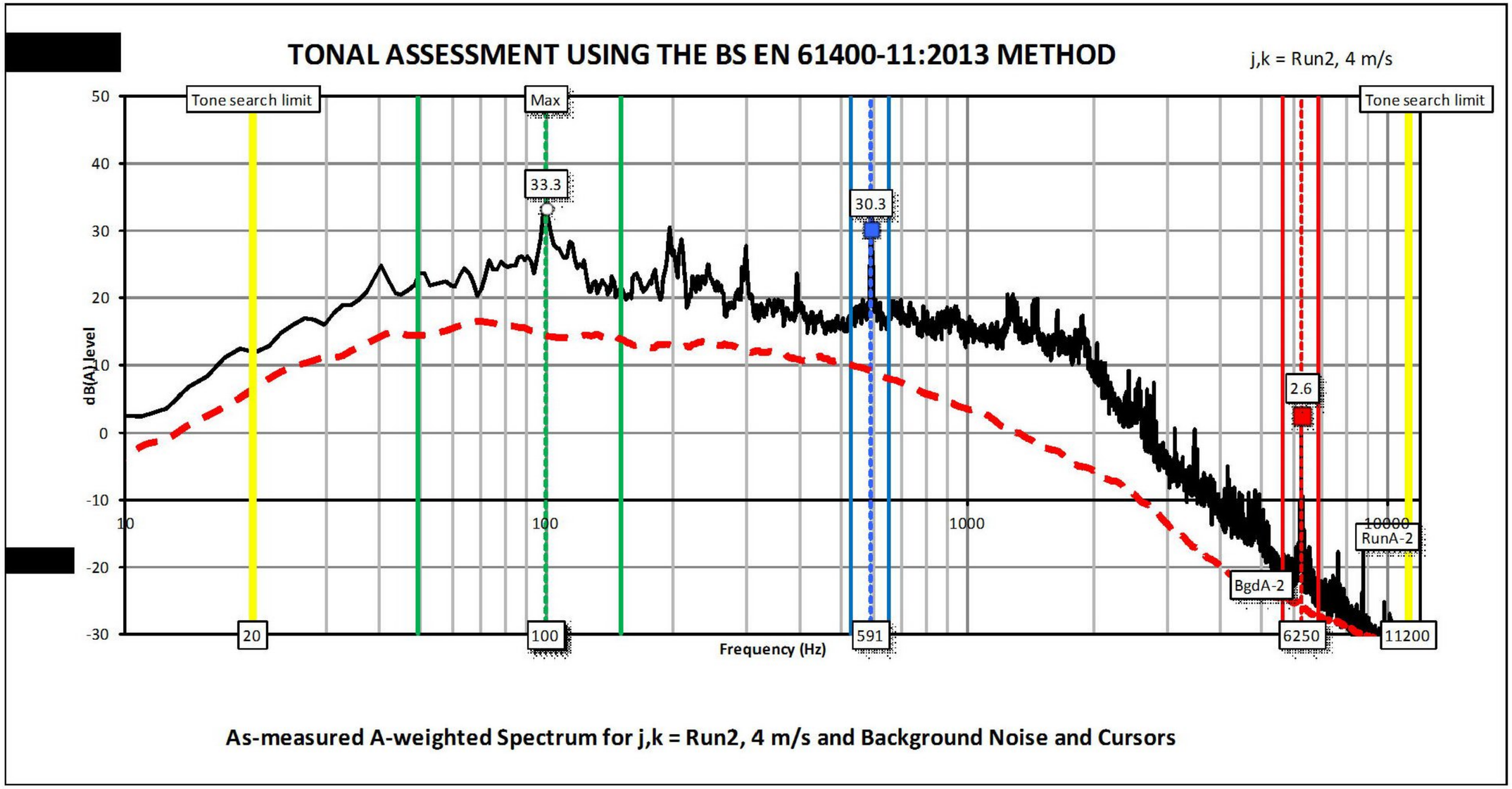


FIGURE 13c CRITICAL BAND WITH 2nd HIGHEST TONALITY SHOWING TONES AND MASKING NOISE FOR 3 m/s WIND SPEED BIN. (Tonality +1.3 dB)



As-measured A-weighted Spectrum for j,k = Run2, 4 m/s and Background Noise and Cursors

FIGURE 14a TONAL ASSESSMENT USING THE IEC 61400-11:2012 METHOD FOR THE 4 m/s HUB-HEIGHT WIND SPEED BIN

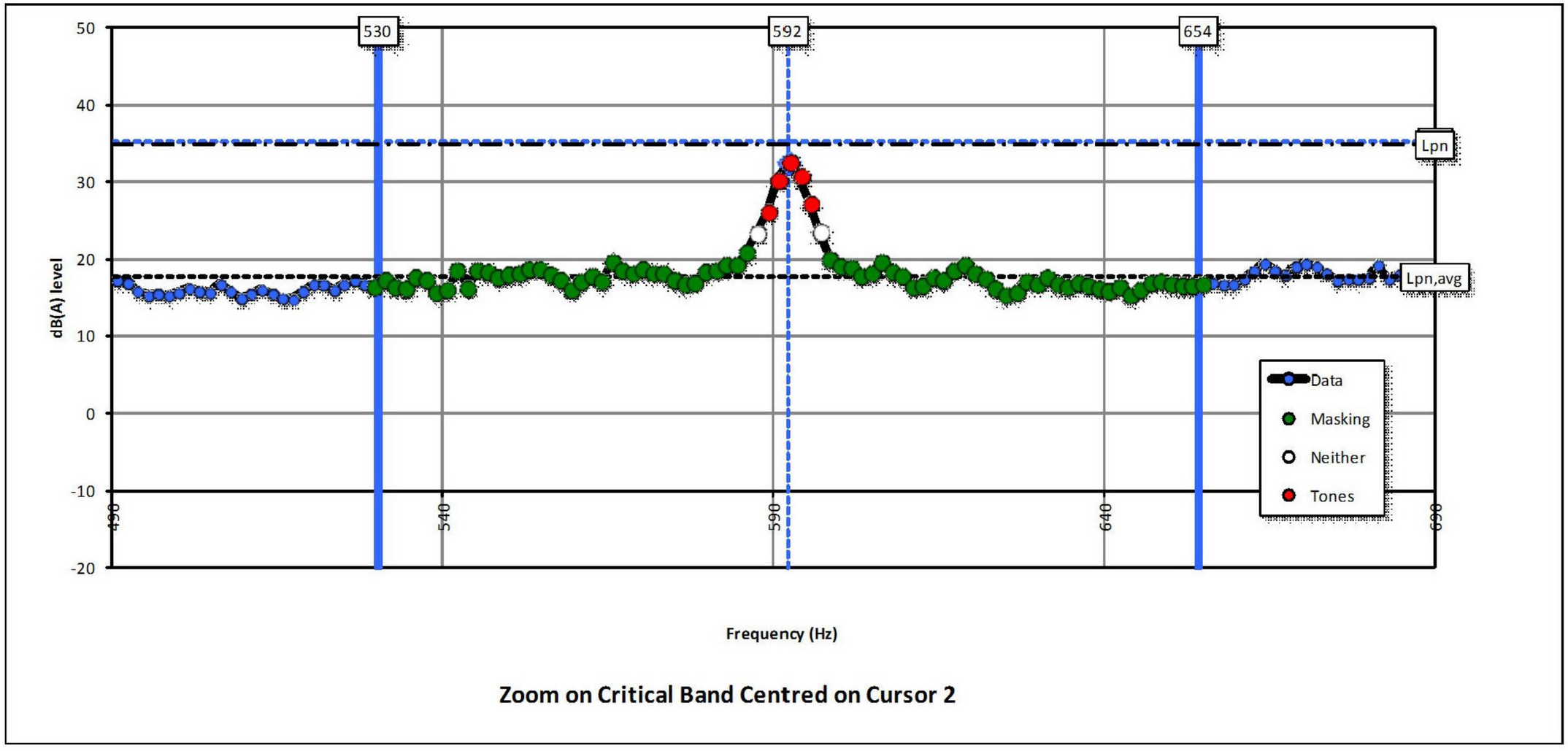


FIGURE 14b CRITICAL BAND WITH HIGHEST TONALITY SHOWING TONES AND MASKING NOISE FOR 4 m/s WIND SPEED BIN. (Tonality +2.7 dB)

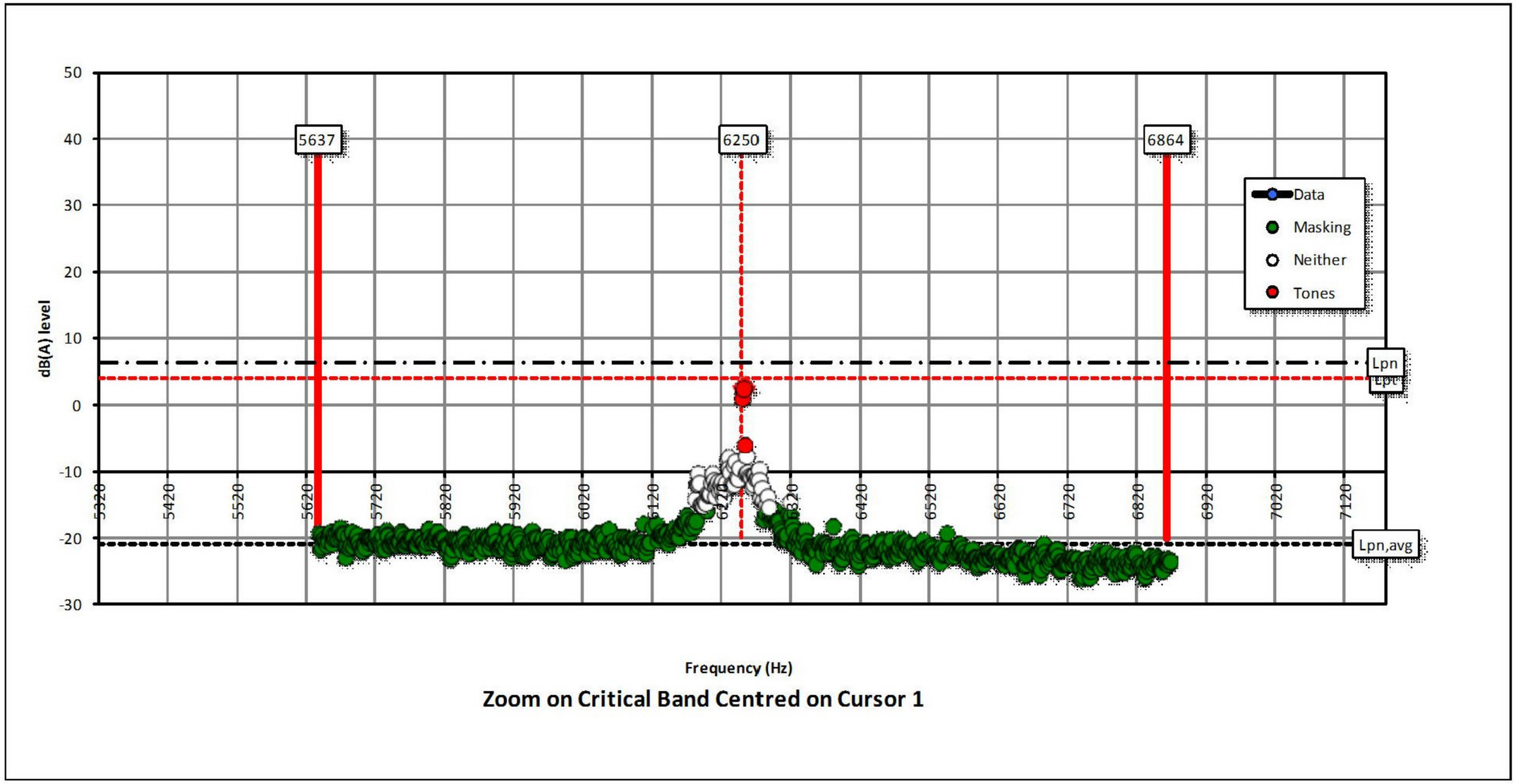


FIGURE 14c CRITICAL BAND WITH 2nd HIGHEST TONALITY SHOWING TONES AND MASKING NOISE FOR 4 m/s WIND SPEED BIN. (Tonality +2.3 dB)

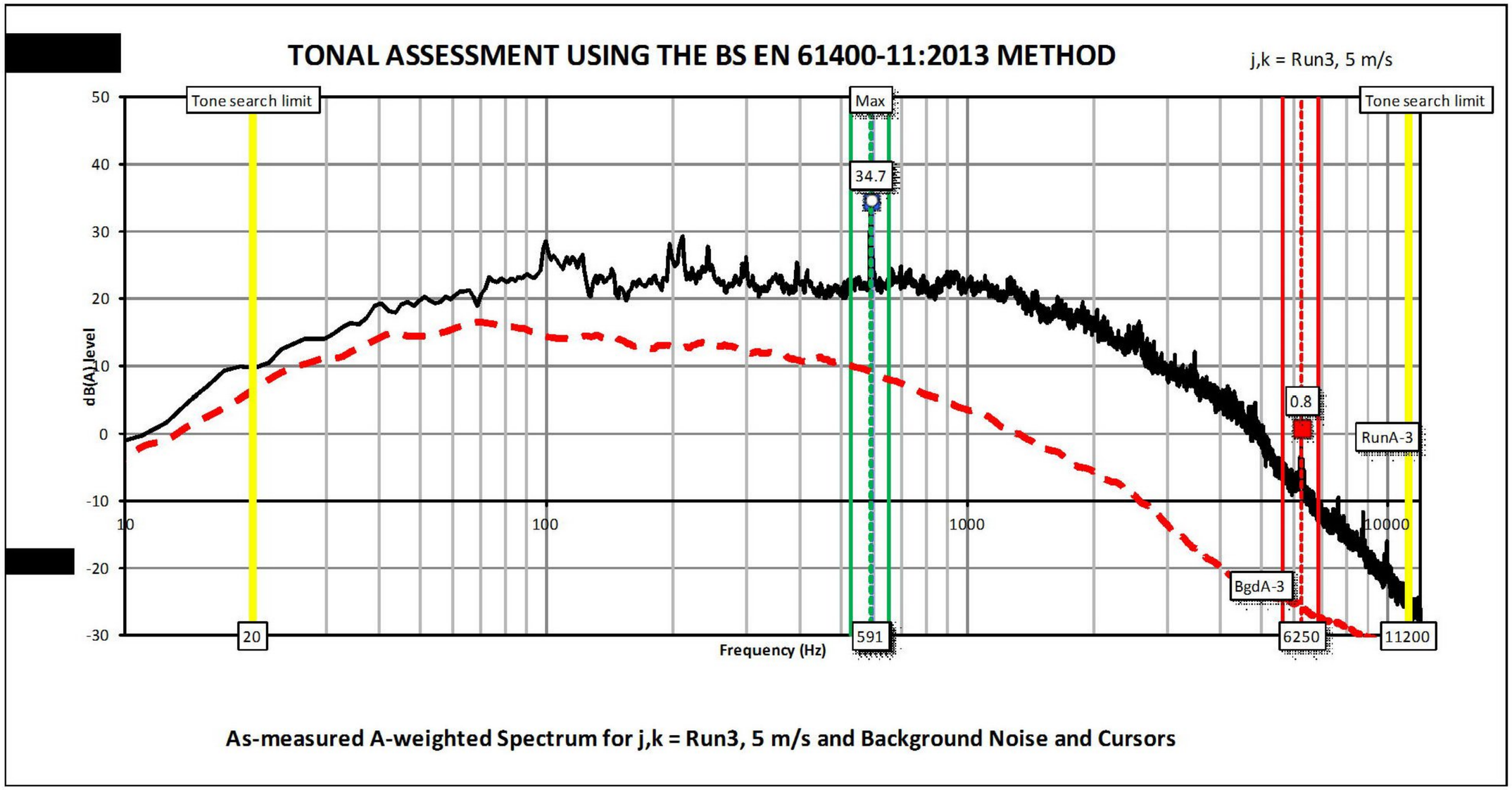


FIGURE 15a TONAL ASSESSMENT USING THE IEC 61400-11:2012 METHOD FOR THE 5 m/s HUB-HEIGHT WIND SPEED BIN

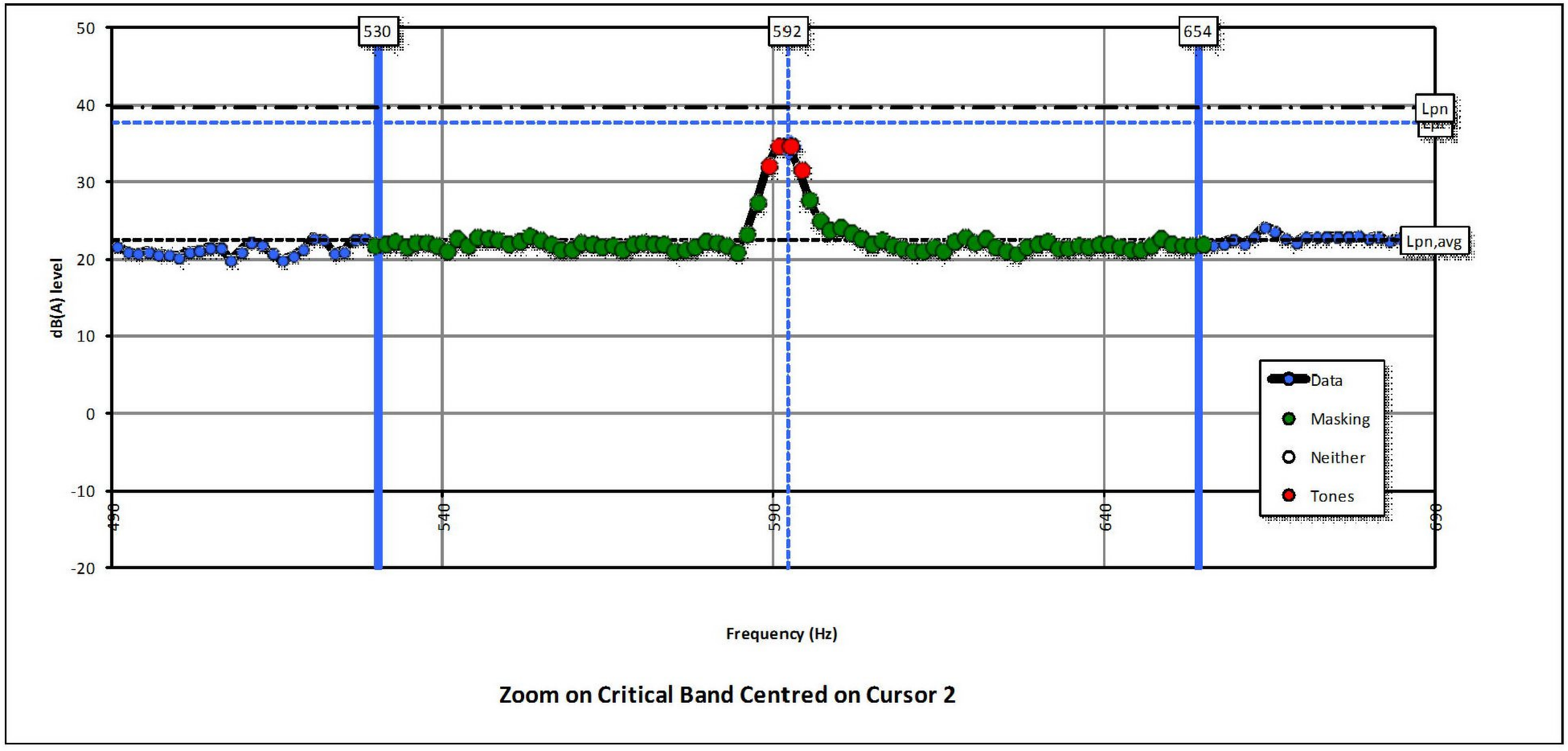


FIGURE 15b CRITICAL BAND WITH HIGHEST TONALITY SHOWING TONES AND MASKING NOISE FOR 5 m/s WIND SPEED BIN.
The Spectrum Maximum and Highest Tonality are equivalent in this case (Tonality +0.5 dB)

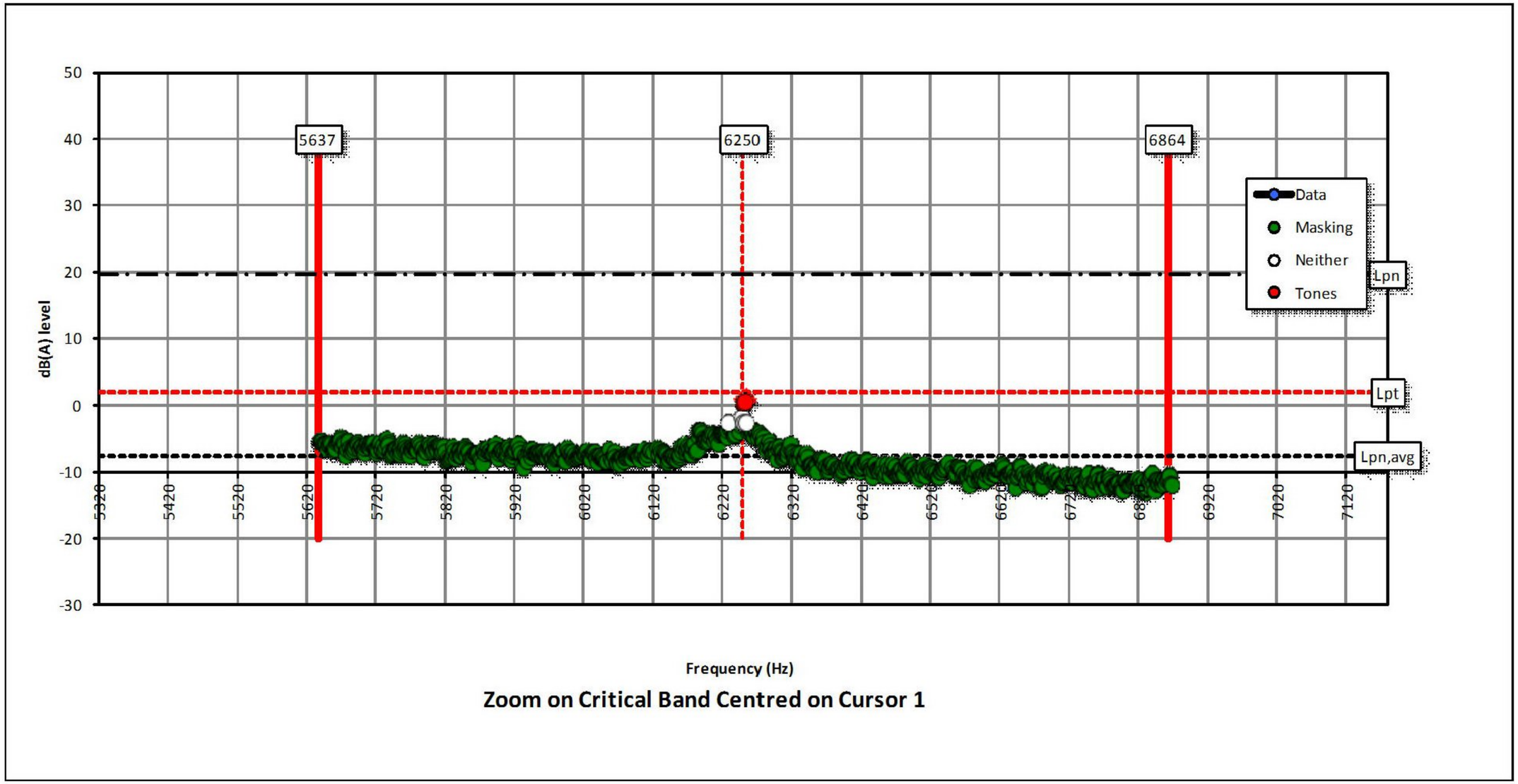
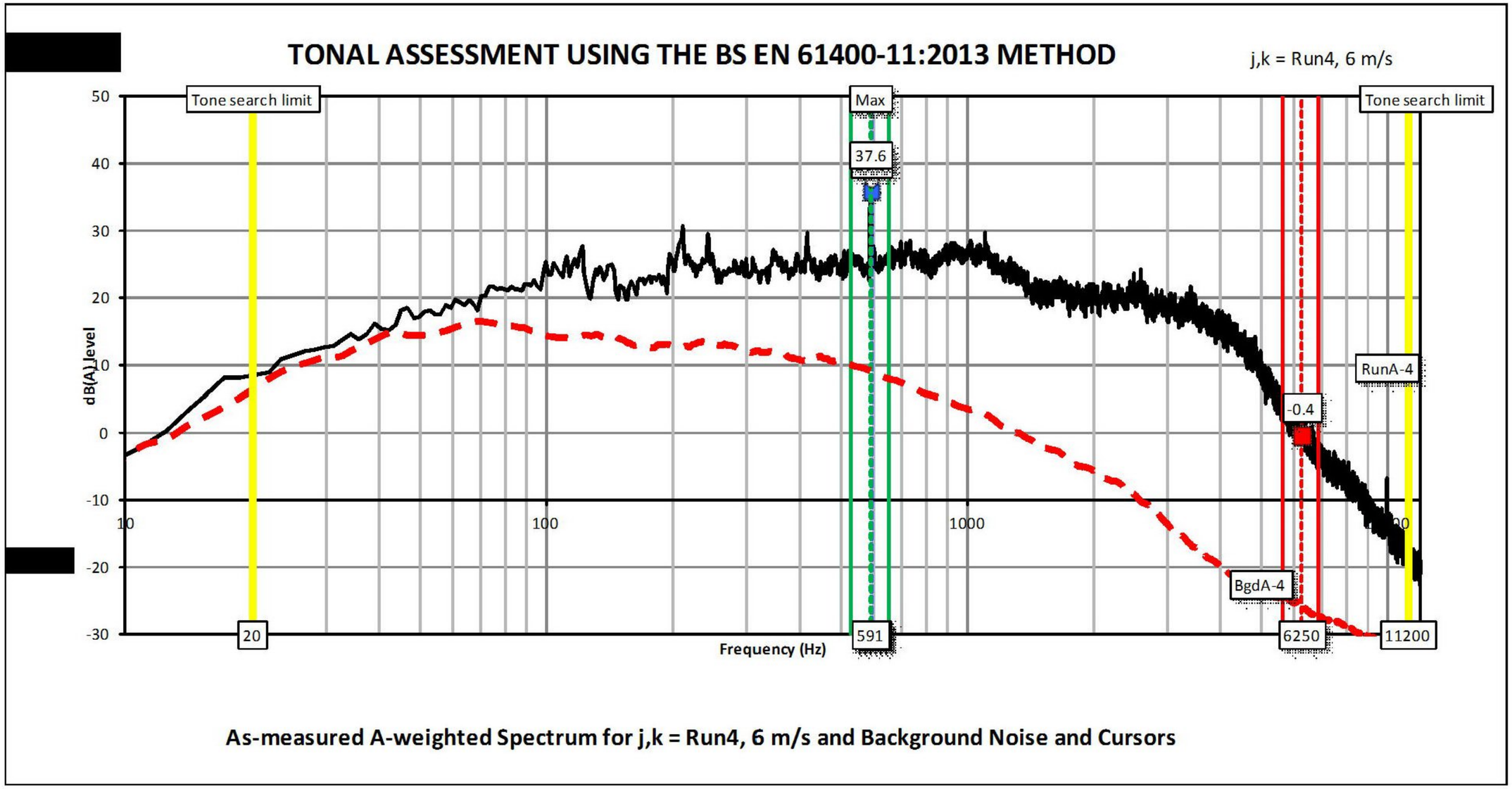


FIGURE 15c CRITICAL BAND WITH 2nd HIGHEST TONALITY SHOWING TONES AND MASKING NOISE FOR 5 m/s WIND SPEED BIN. (Tonality -13 dB)



As-measured A-weighted Spectrum for j,k = Run4, 6 m/s and Background Noise and Cursors

FIGURE 16a TONAL ASSESSMENT USING THE IEC 61400-11:2012 METHOD FOR THE 6 m/s HUB-HEIGHT WIND SPEED BIN

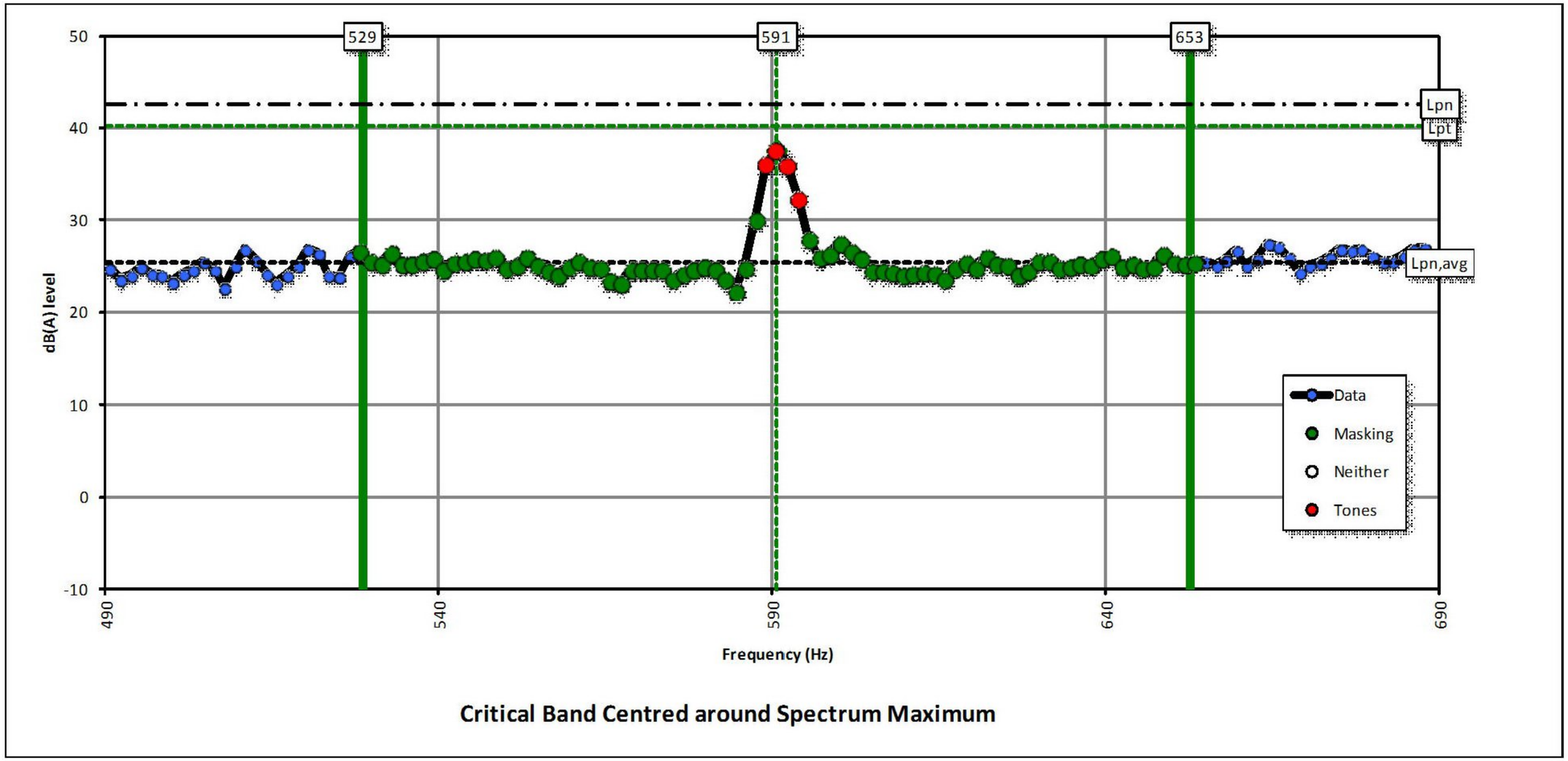


FIGURE 16b CRITICAL BAND WITH HIGHEST TONALITY SHOWING TONES AND MASKING NOISE FOR 6 m/s WIND SPEED BIN.
The Highest Tonality and Spectrum Maximum Coincide (Tonality -0.1 dB)

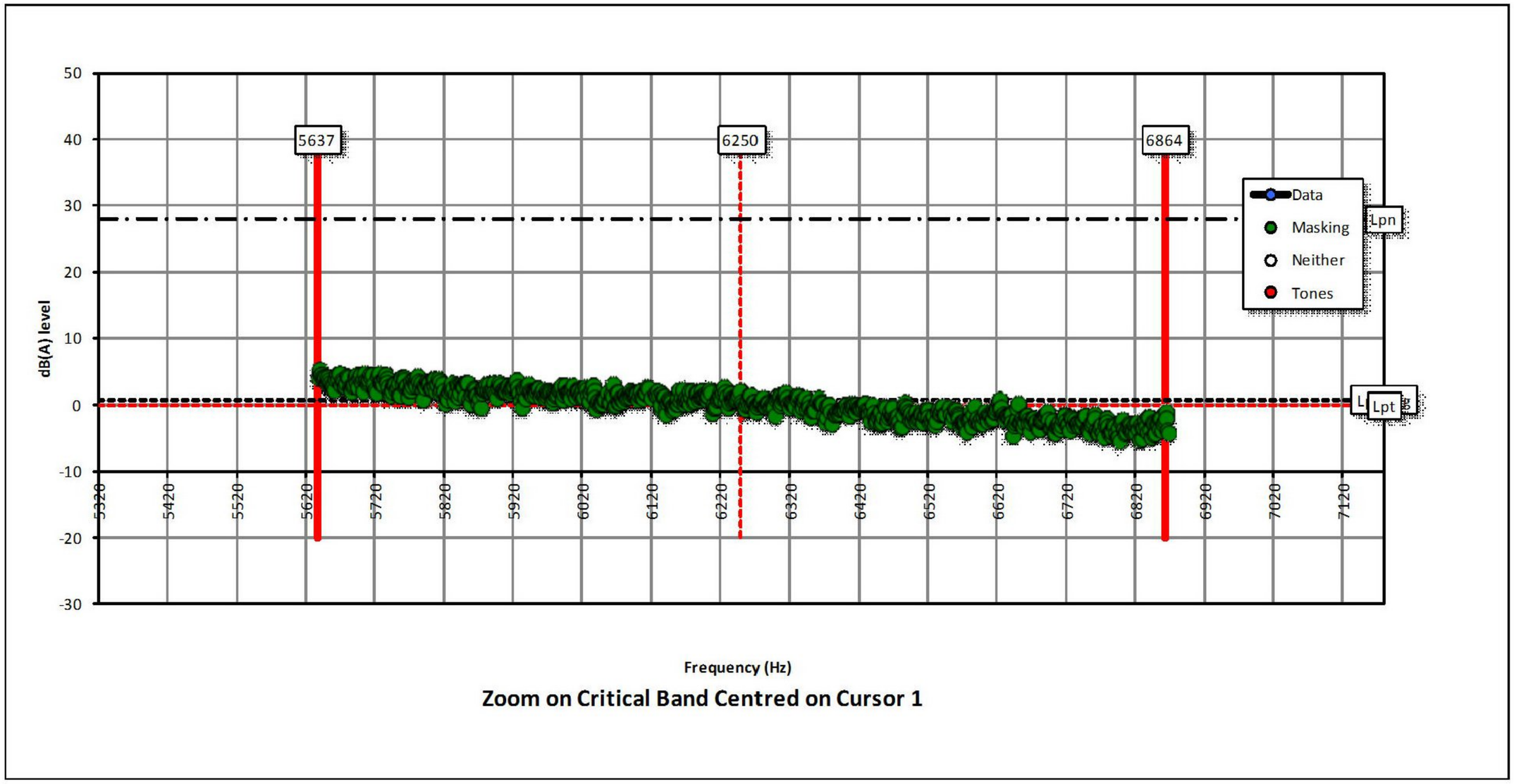
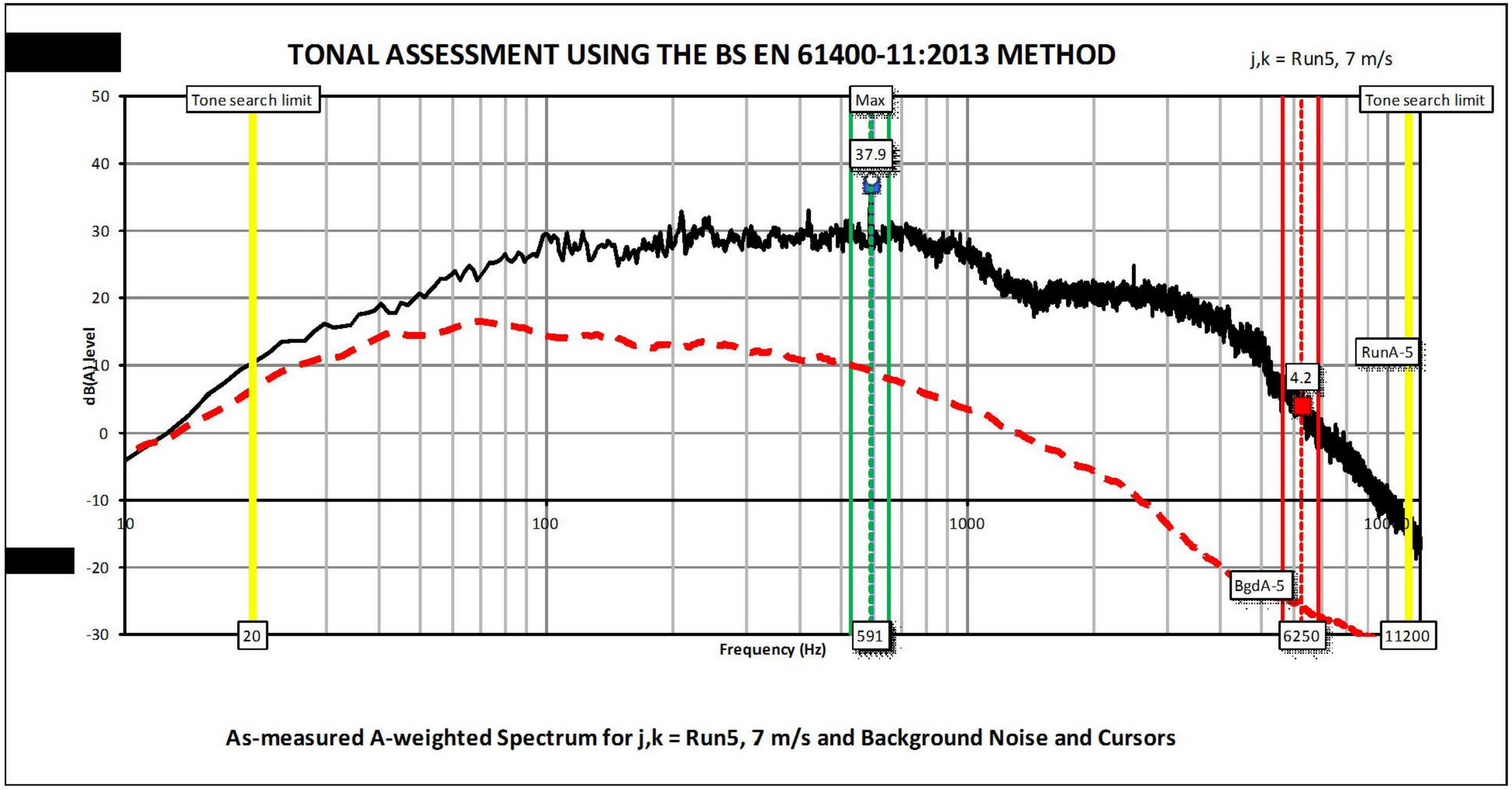


FIGURE 16c CRITICAL BAND WITH 2nd HIGHEST TONALITY SHOWING TONES AND MASKING NOISE FOR 6 m/s WIND SPEED BIN. (Tonality -22 dB)



As-measured A-weighted Spectrum for j,k = Run5, 7 m/s and Background Noise and Cursors

FIGURE 17a TONAL ASSESSMENT USING THE IEC 61400-11:2012 METHOD FOR THE 7 m/s HUB-HEIGHT WIND SPEED BIN

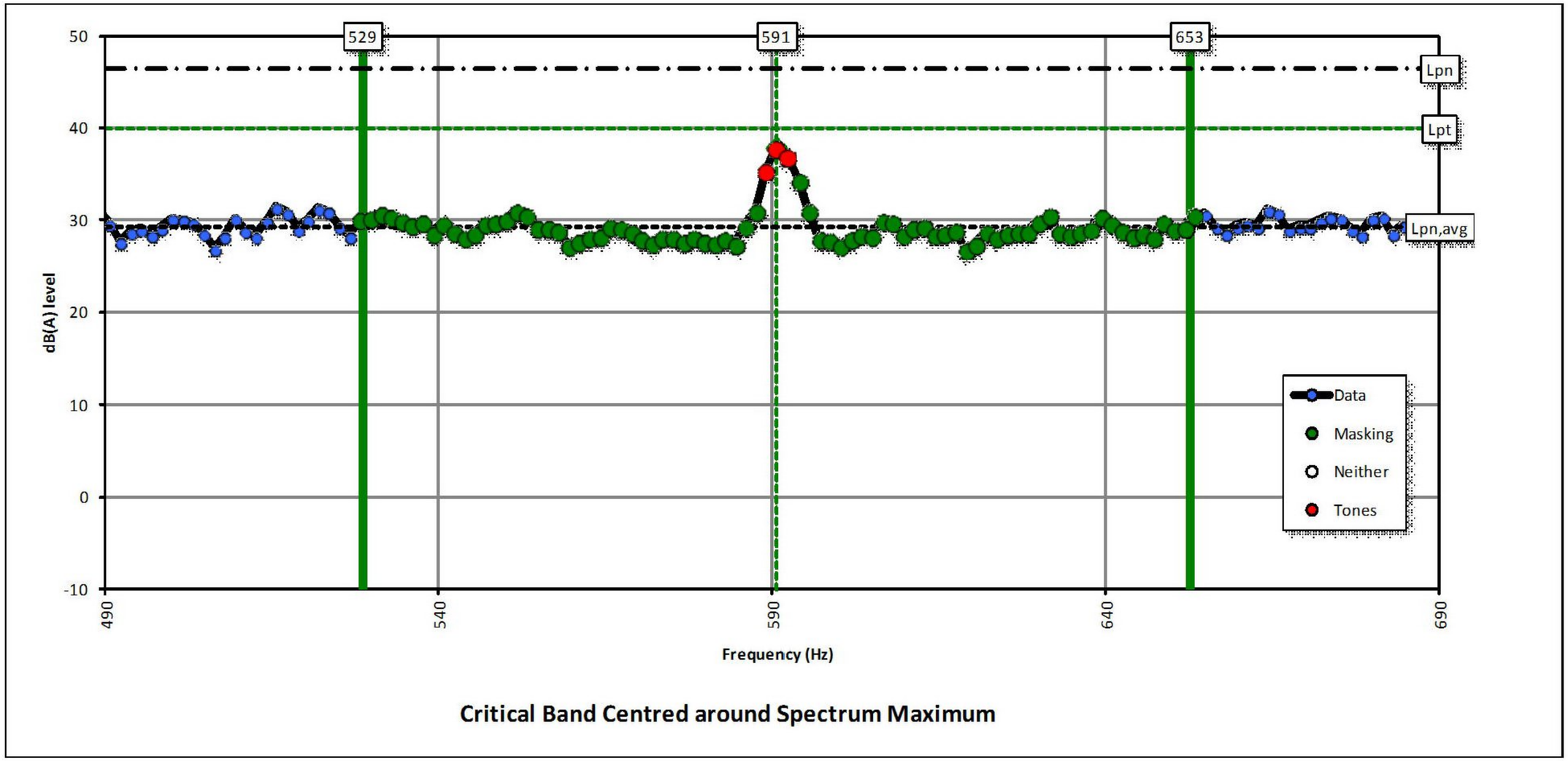
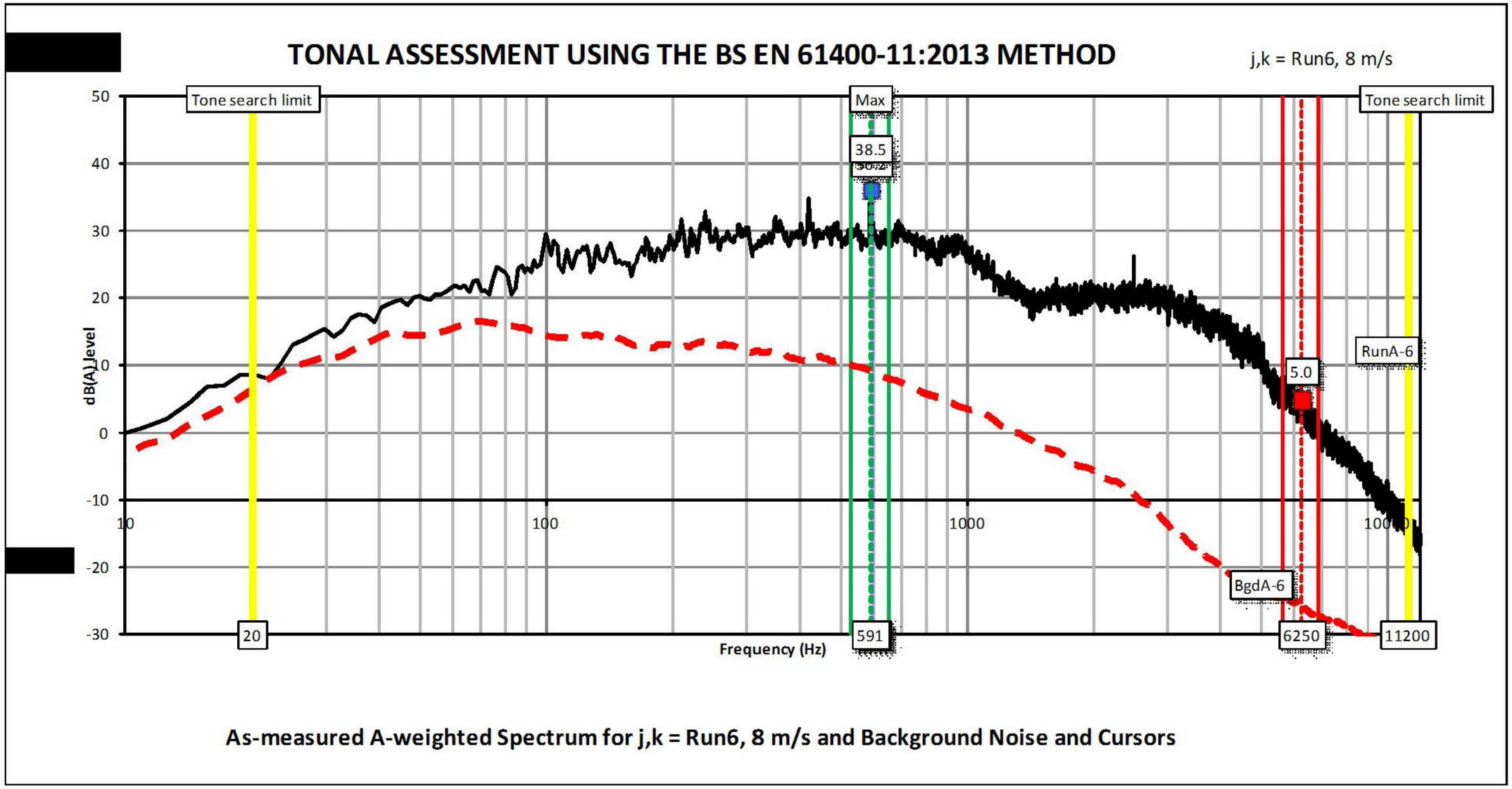


FIGURE 17b CRITICAL BAND WITH SPECTRUM MAXIMUM SHOWING TONES AND MASKING NOISE FOR 7 m/s WIND SPEED BIN. (Tonality -4.1 dB)



As-measured A-weighted Spectrum for j,k = Run6, 8 m/s and Background Noise and Cursors

FIGURE 18a TONAL ASSESSMENT USING THE IEC 61400-11:2012 METHOD FOR THE 8 m/s HUB-HEIGHT WIND SPEED BIN

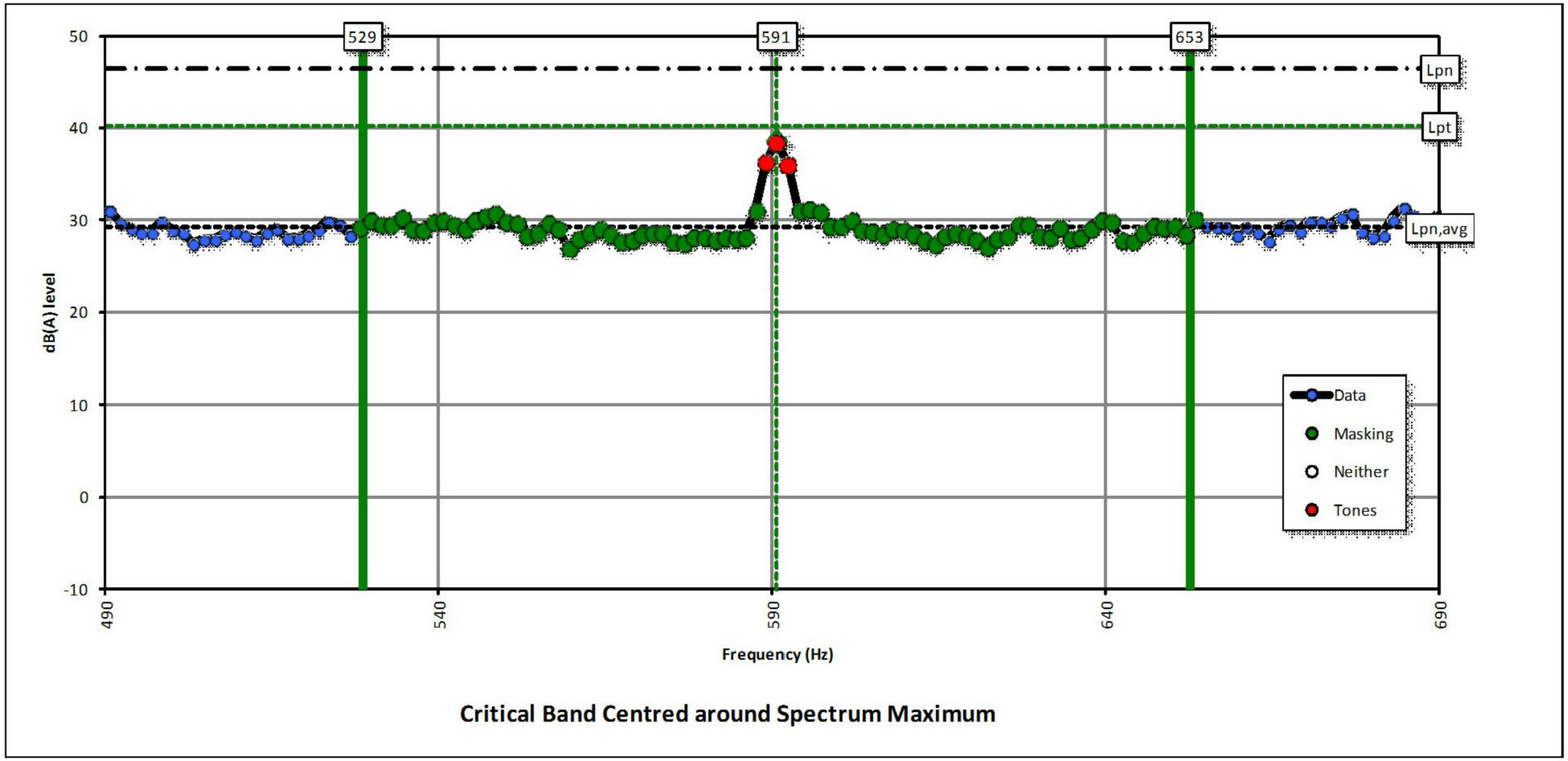
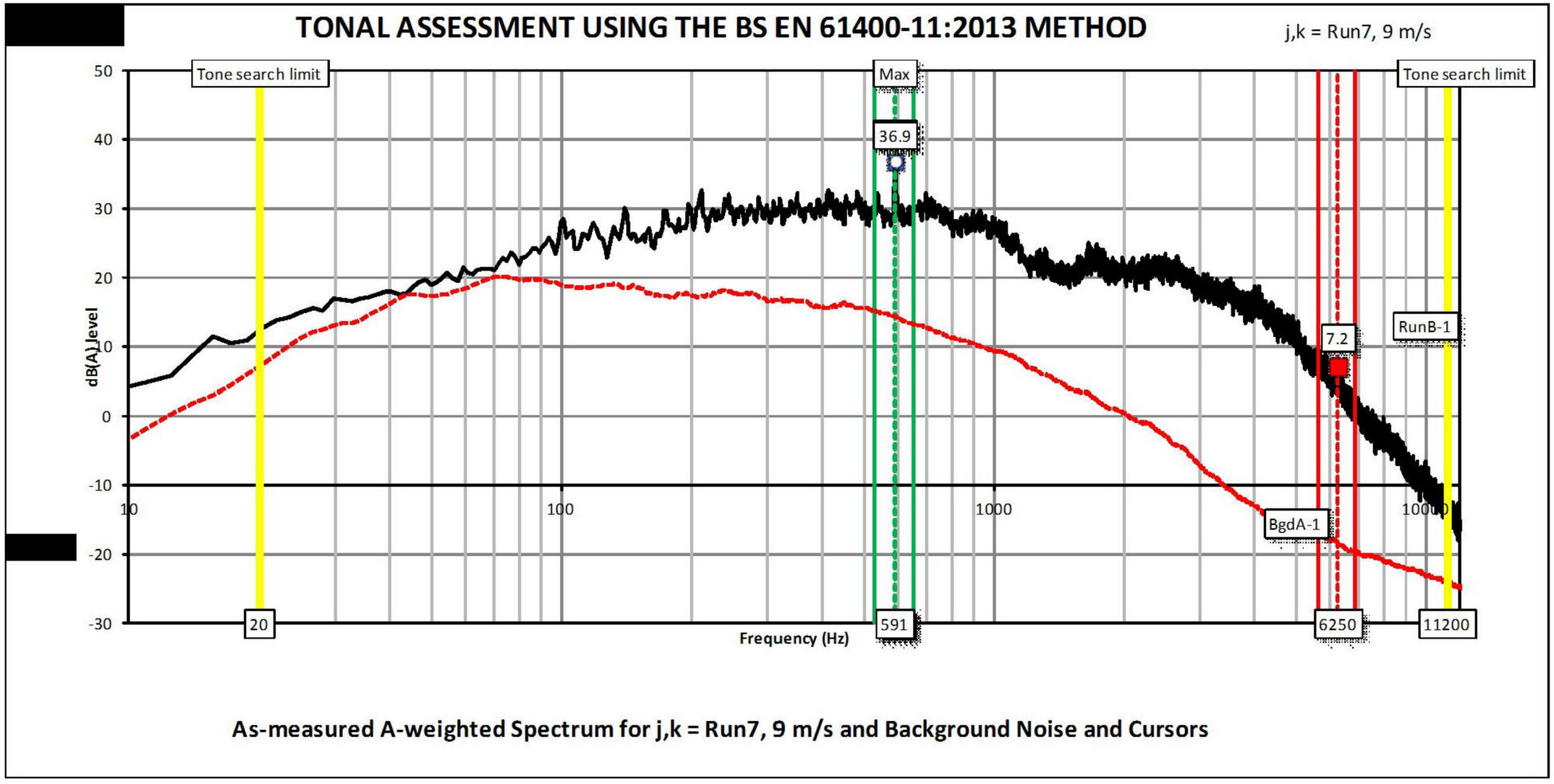


FIGURE 18b CRITICAL BAND WITH SPECTRUM MAXIMUM SHOWING TONES AND MASKING NOISE FOR 8 m/s WIND SPEED BIN. (Tonality -6.2 dB)



As-measured A-weighted Spectrum for j,k = Run7, 9 m/s and Background Noise and Cursors

FIGURE 19a TONAL ASSESSMENT USING THE IEC 61400-11:2012 METHOD FOR THE 9 m/s HUB-HEIGHT WIND SPEED BIN

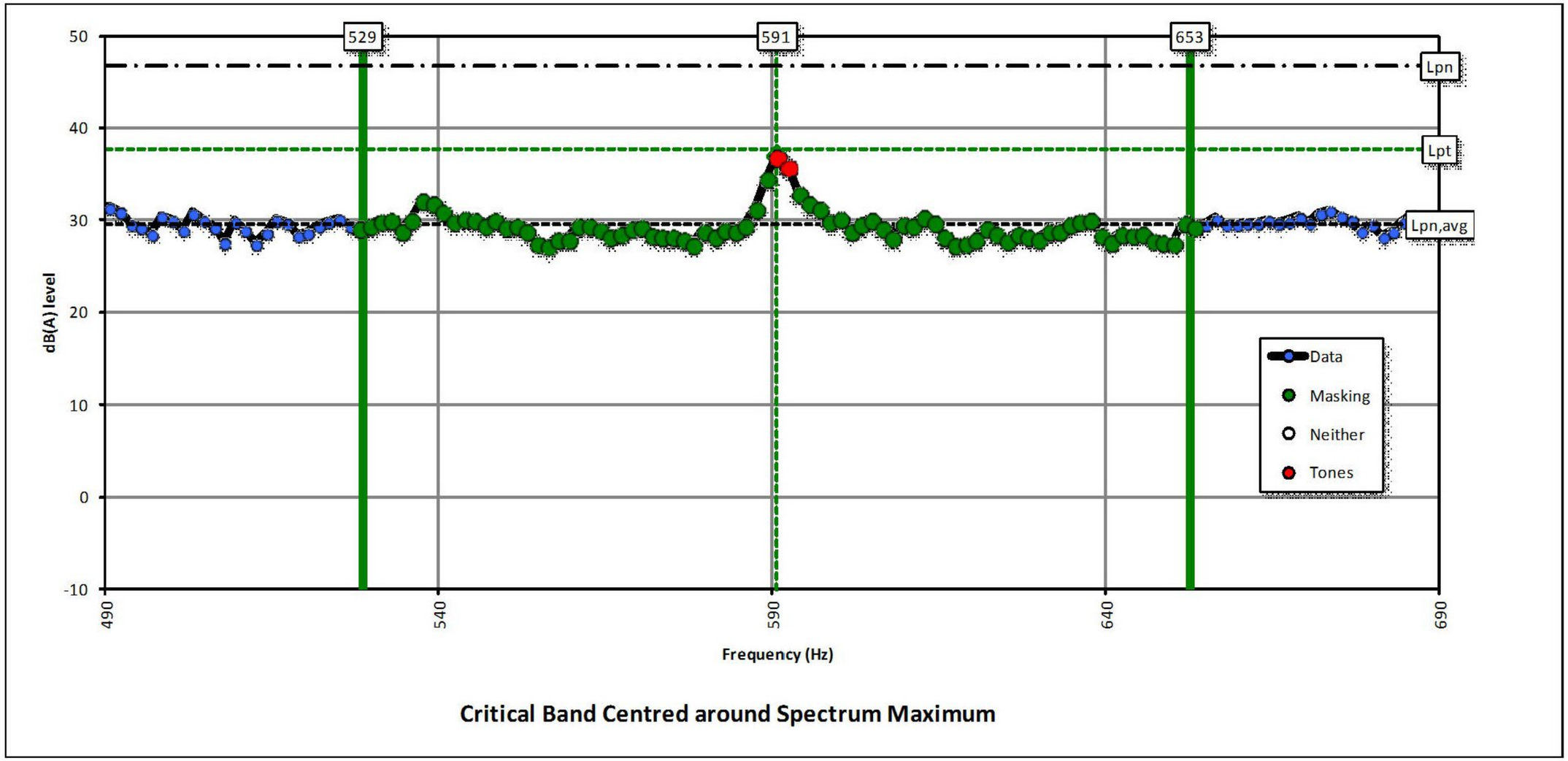
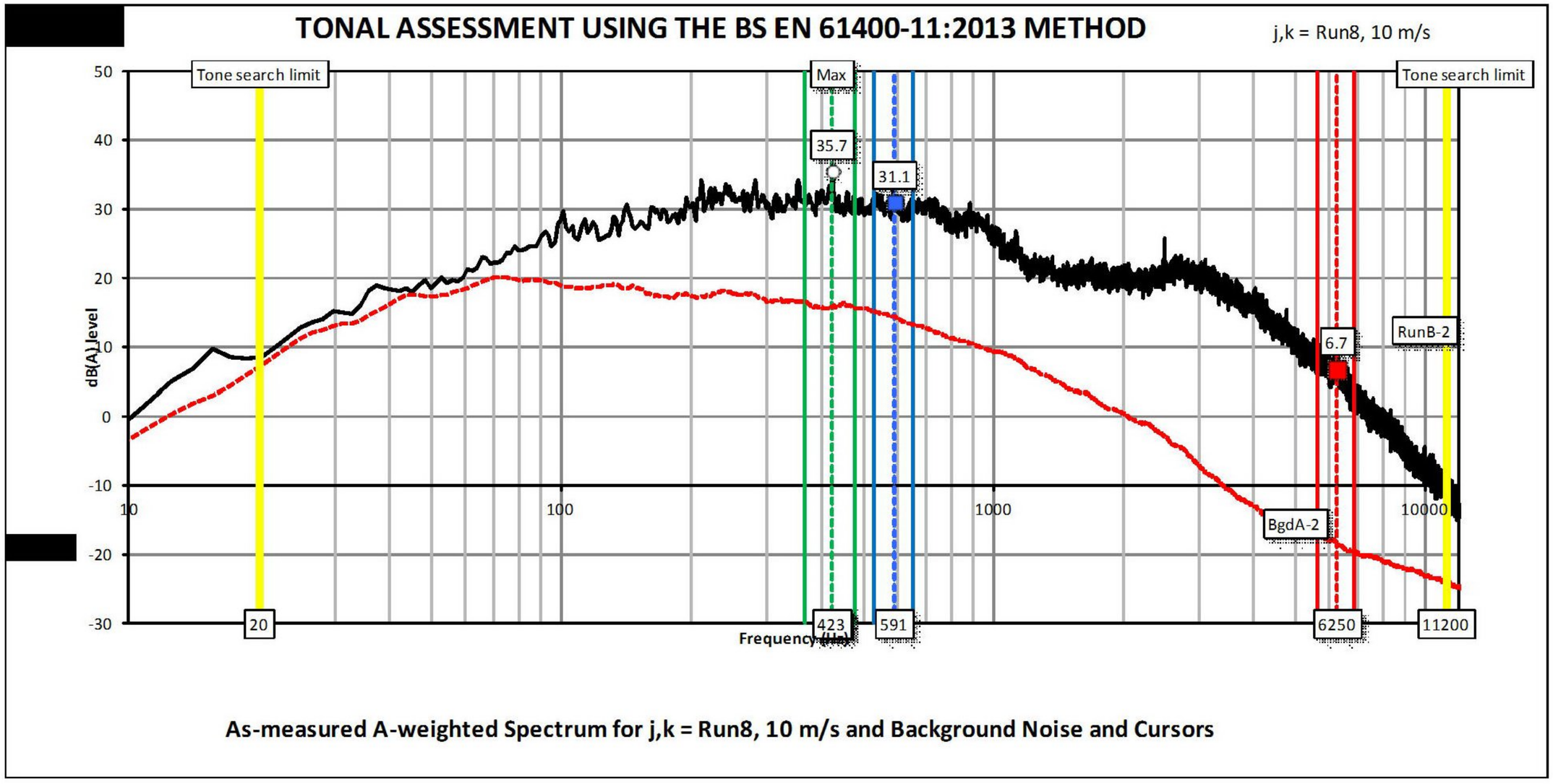


FIGURE 19b CRITICAL BAND WITH SPECTRUM MAXIMUM SHOWING TONES AND MASKING NOISE FOR 9 m/s WIND SPEED BIN. (Tonality -6.7 dB)



As-measured A-weighted Spectrum for j,k = Run8, 10 m/s and Background Noise and Cursors

FIGURE 20a TONAL ASSESSMENT USING THE IEC 61400-11:2012 METHOD FOR THE 10 m/s HUB-HEIGHT WIND SPEED BIN

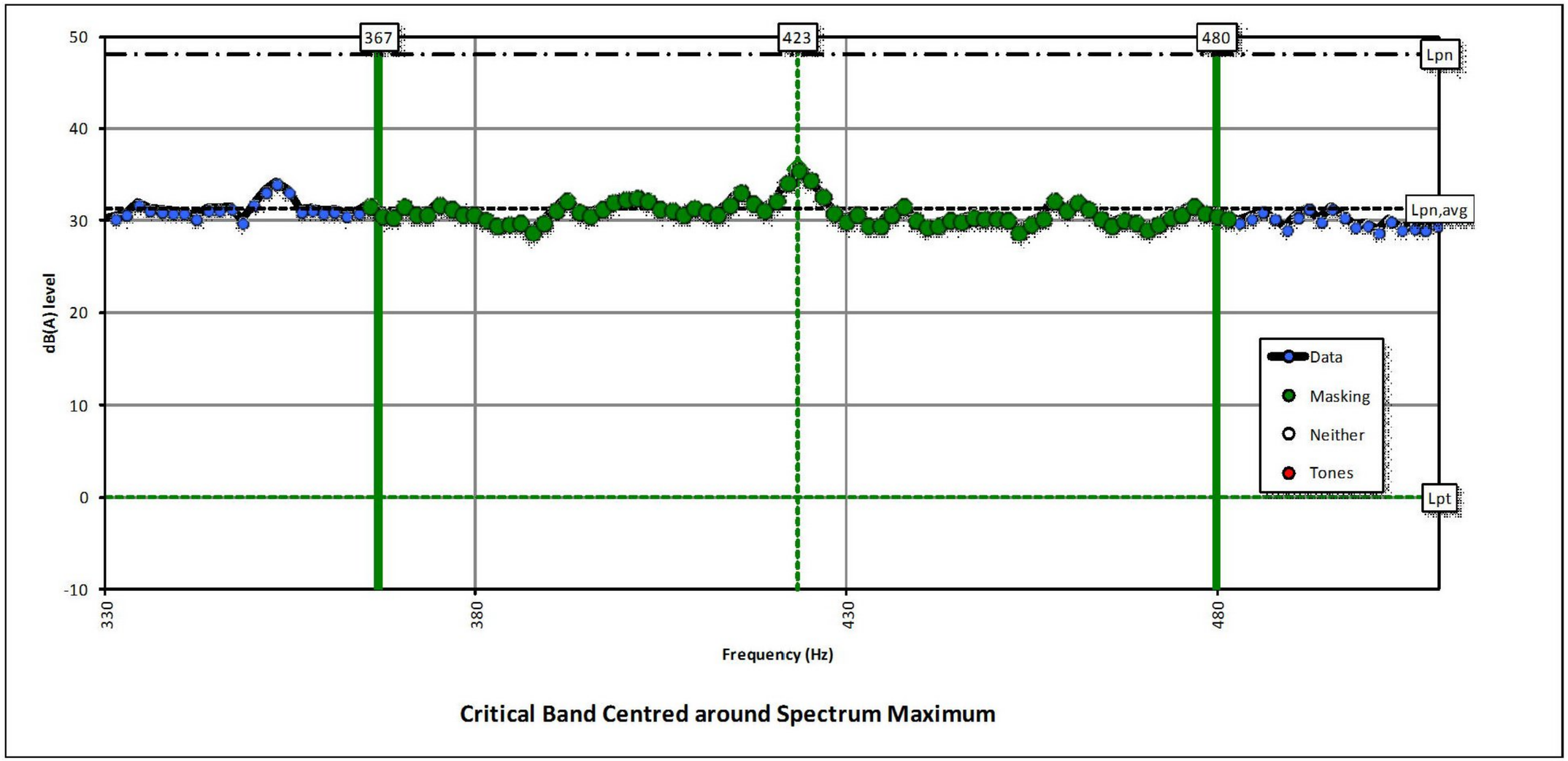


FIGURE 20b CRITICAL BAND WITH SPECTRUM MAXIMUM SHOWING TONES AND MASKING NOISE FOR 10 m/s WIND SPEED BIN. (Tonality -15 dB)

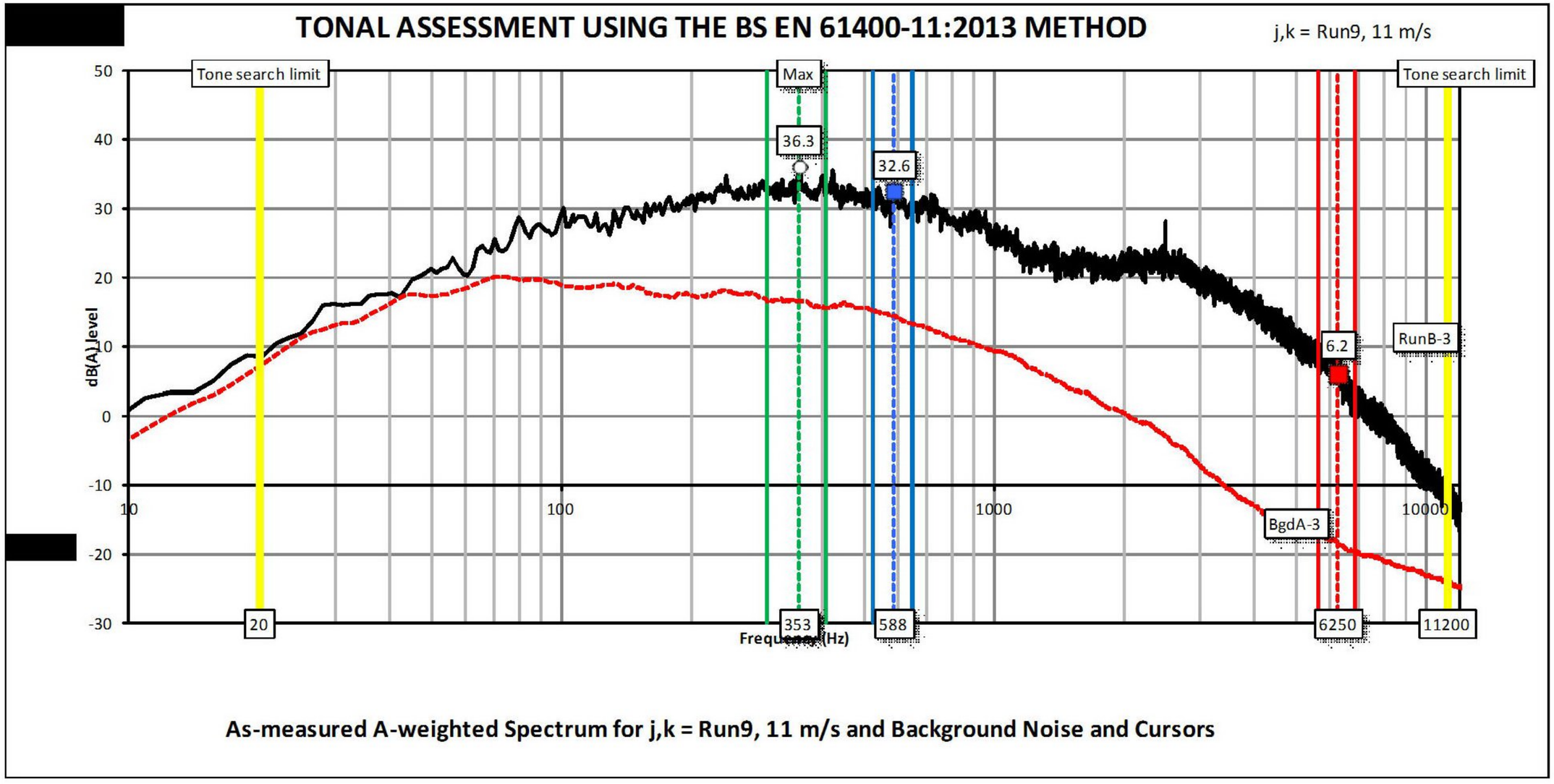


FIGURE 21a TONAL ASSESSMENT USING THE IEC 61400-11:2012 METHOD FOR THE 11 m/s HUB-HEIGHT WIND SPEED BIN

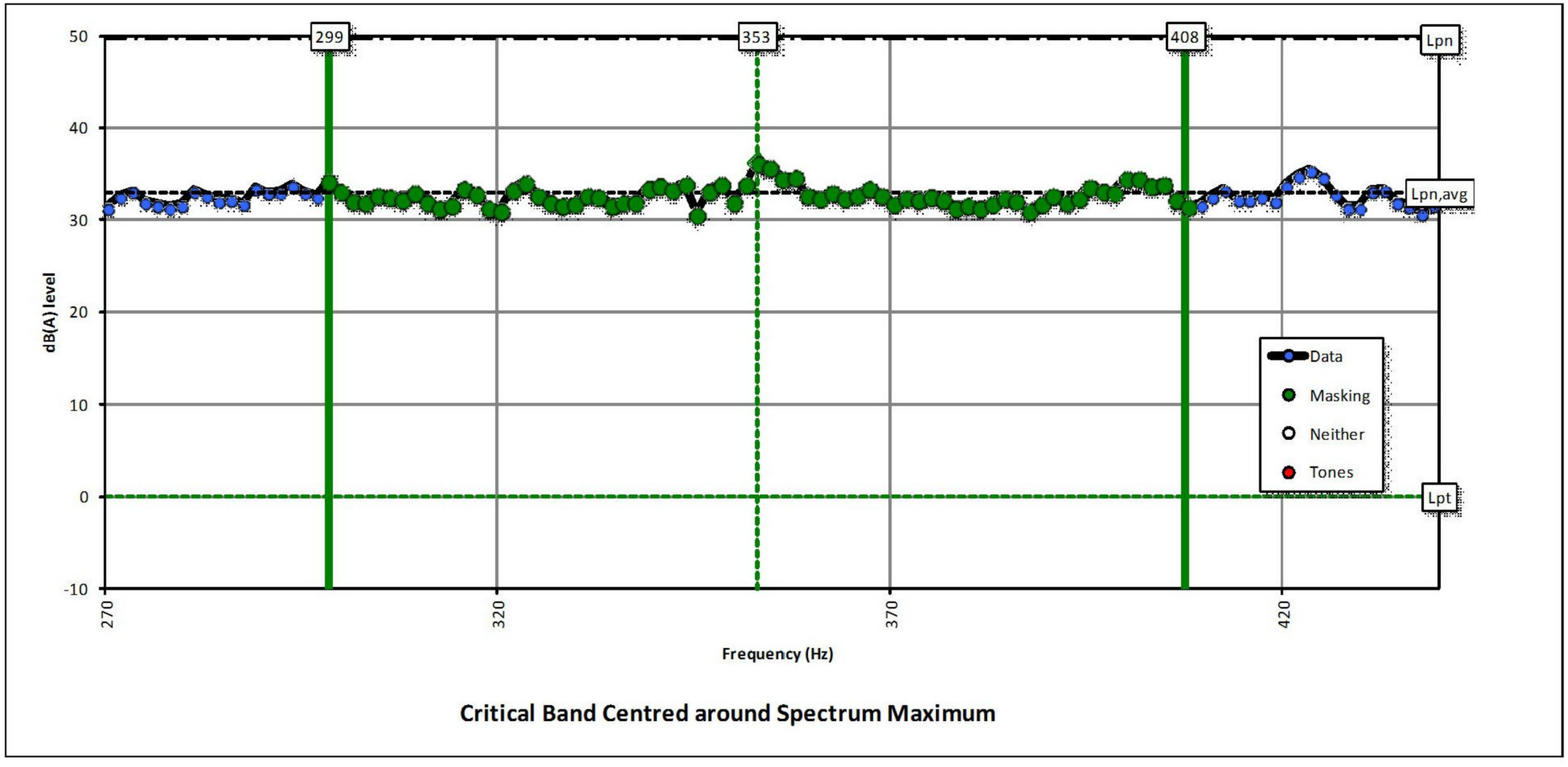
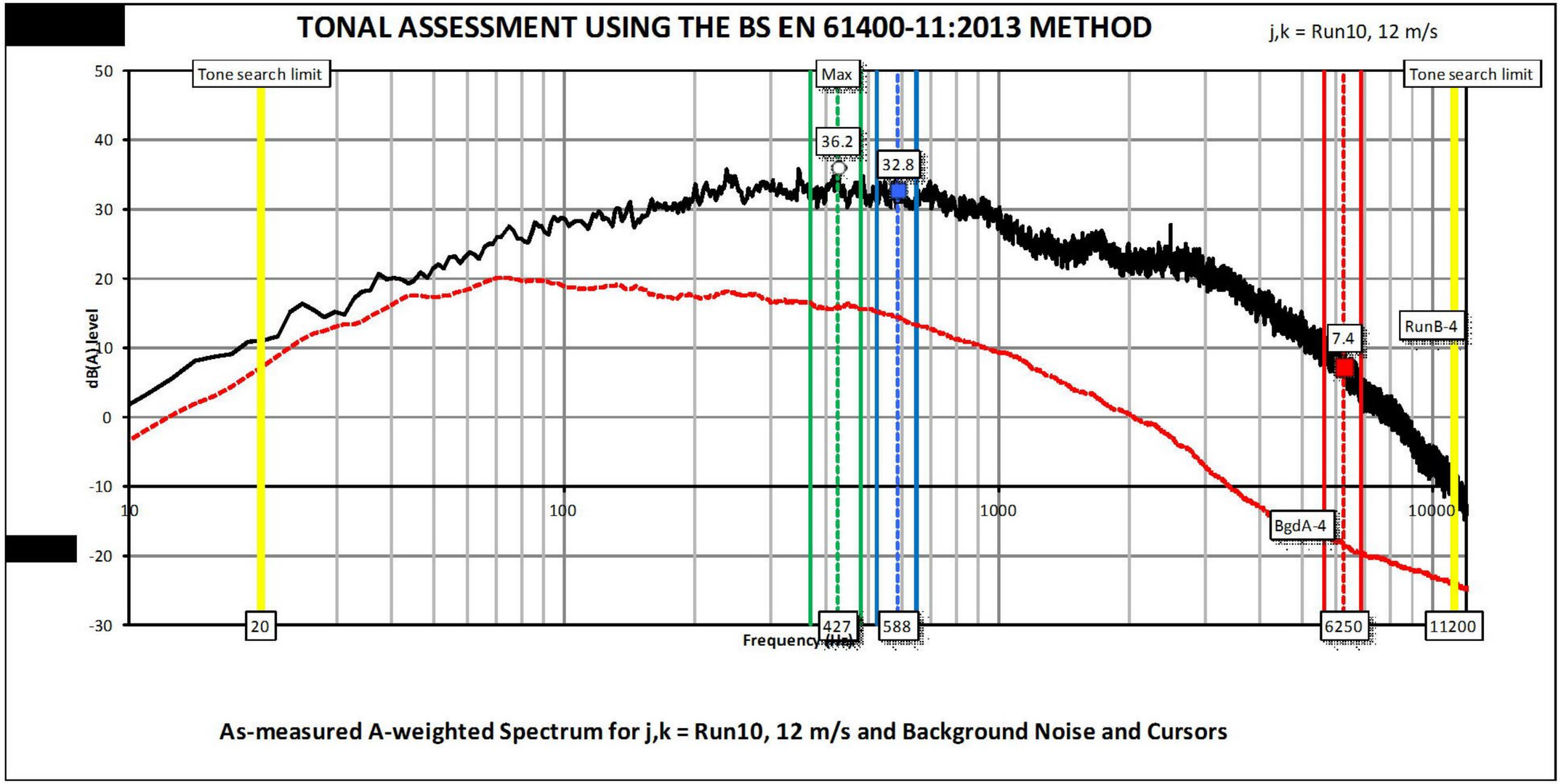


FIGURE 21b CRITICAL BAND WITH SPECTRUM MAXIMUM SHOWING TONES AND MASKING NOISE FOR 11 m/s WIND SPEED BIN. (Tonality -15 dB)



As-measured A-weighted Spectrum for j,k = Run10, 12 m/s and Background Noise and Cursors

FIGURE 22a TONAL ASSESSMENT USING THE IEC 61400-11:2012 METHOD FOR THE 12 m/s HUB-HEIGHT WIND SPEED BIN

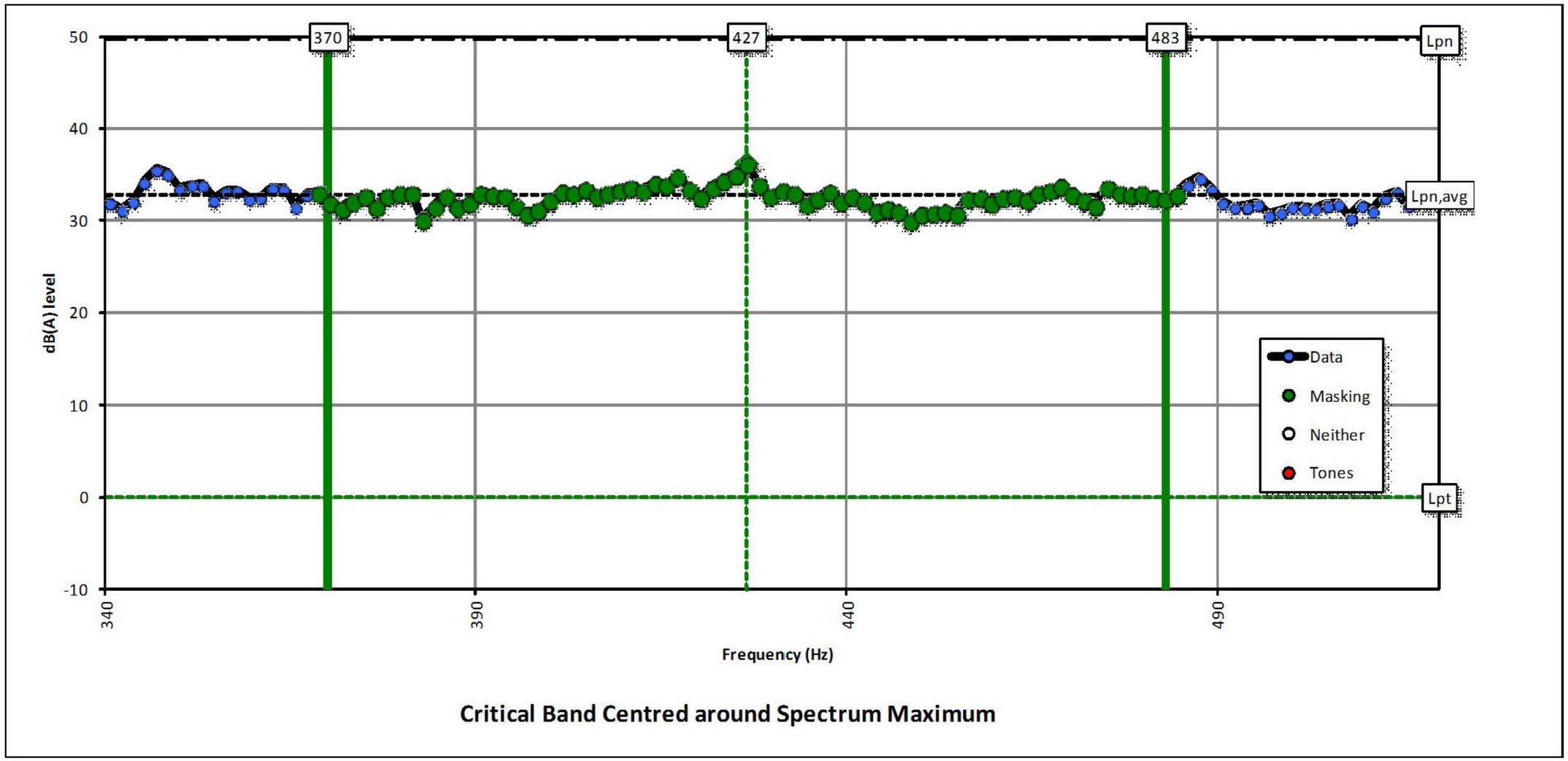


FIGURE 22b CRITICAL BAND WITH SPECTRUM MAXIMUM SHOWING TONES AND MASKING NOISE FOR 12 m/s WIND SPEED BIN. (Tonality -15 dB)

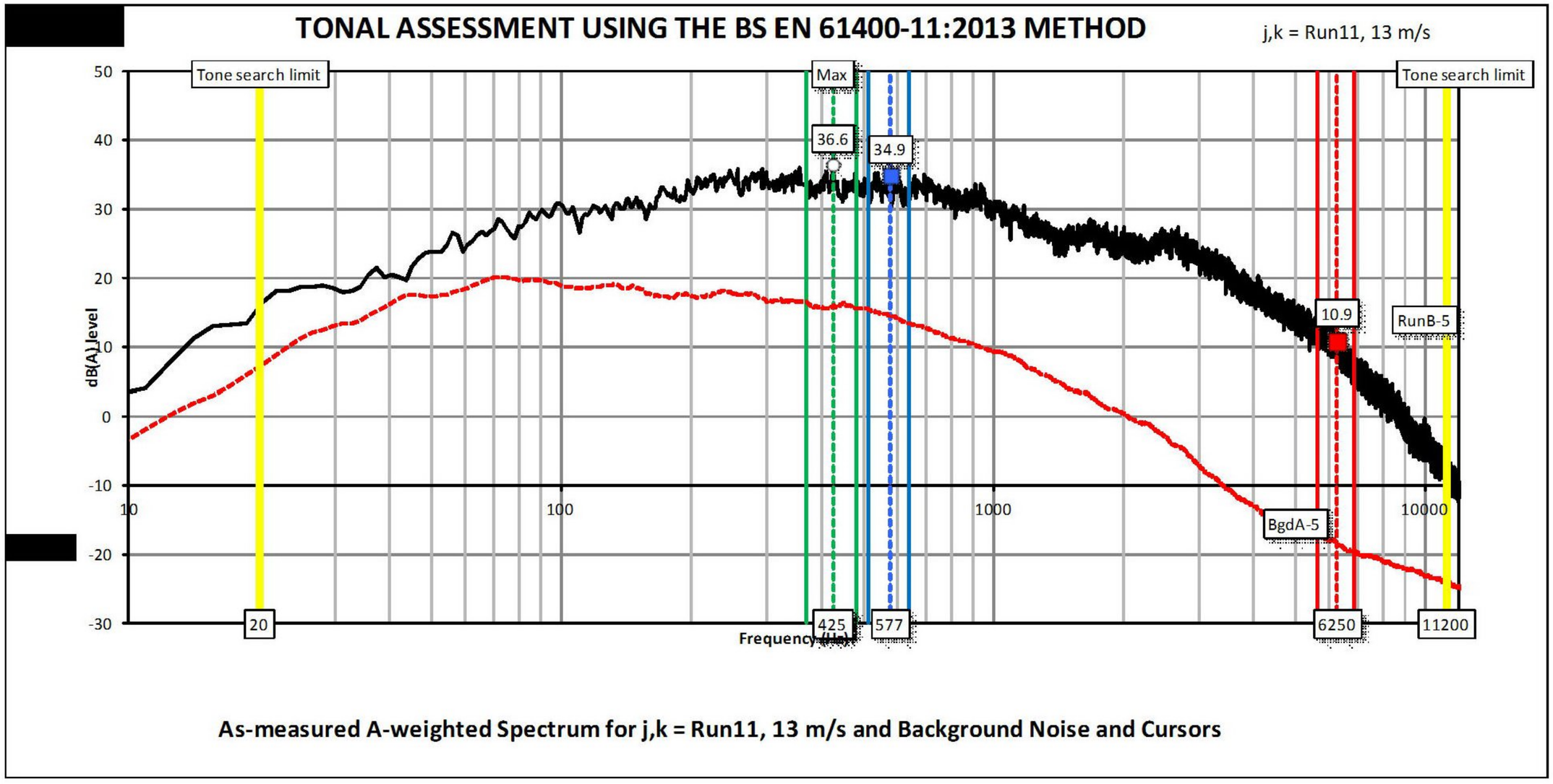


FIGURE 23a TONAL ASSESSMENT USING THE IEC 61400-11:2012 METHOD FOR THE 13 m/s HUB-HEIGHT WIND SPEED BIN

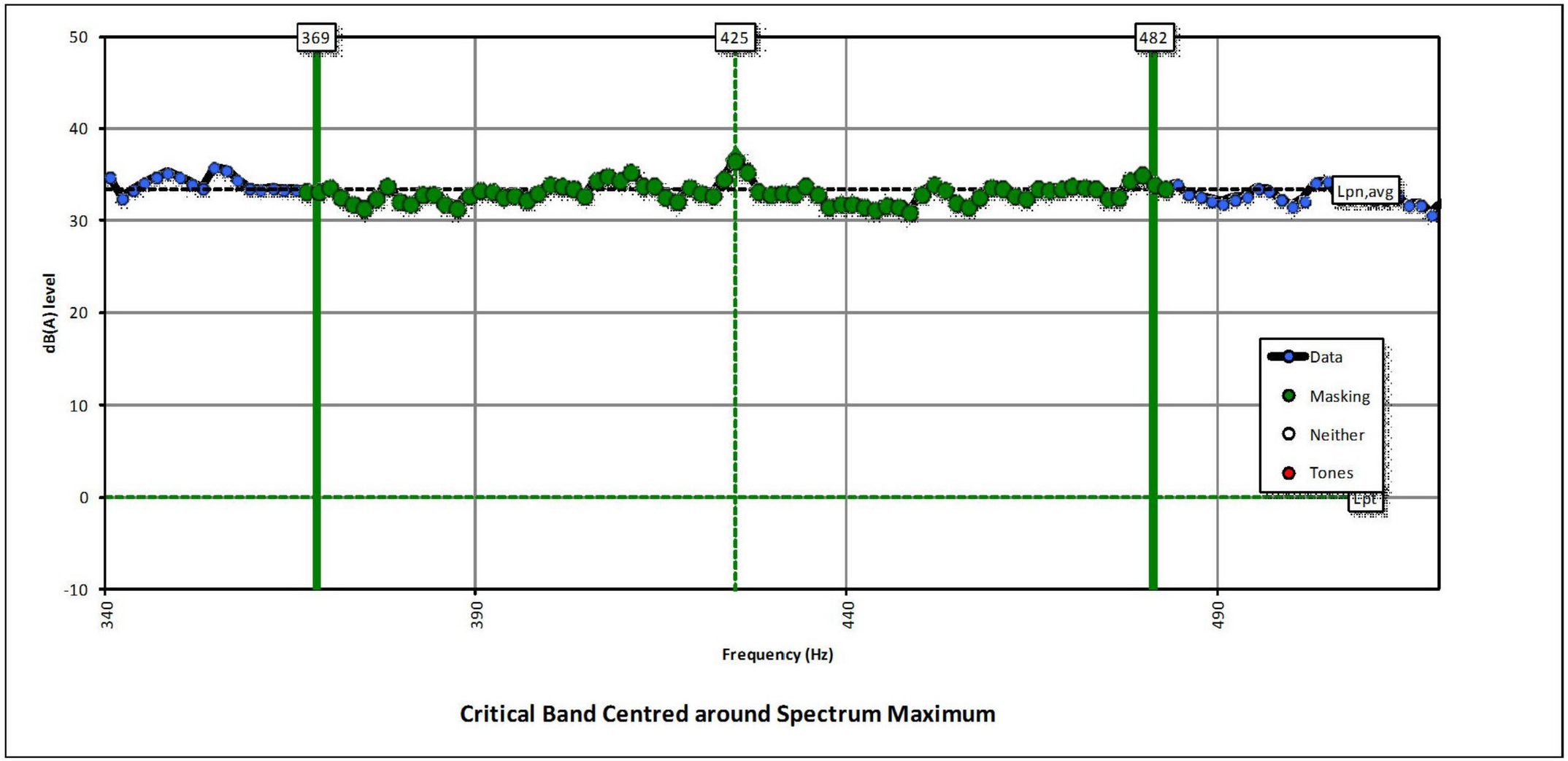
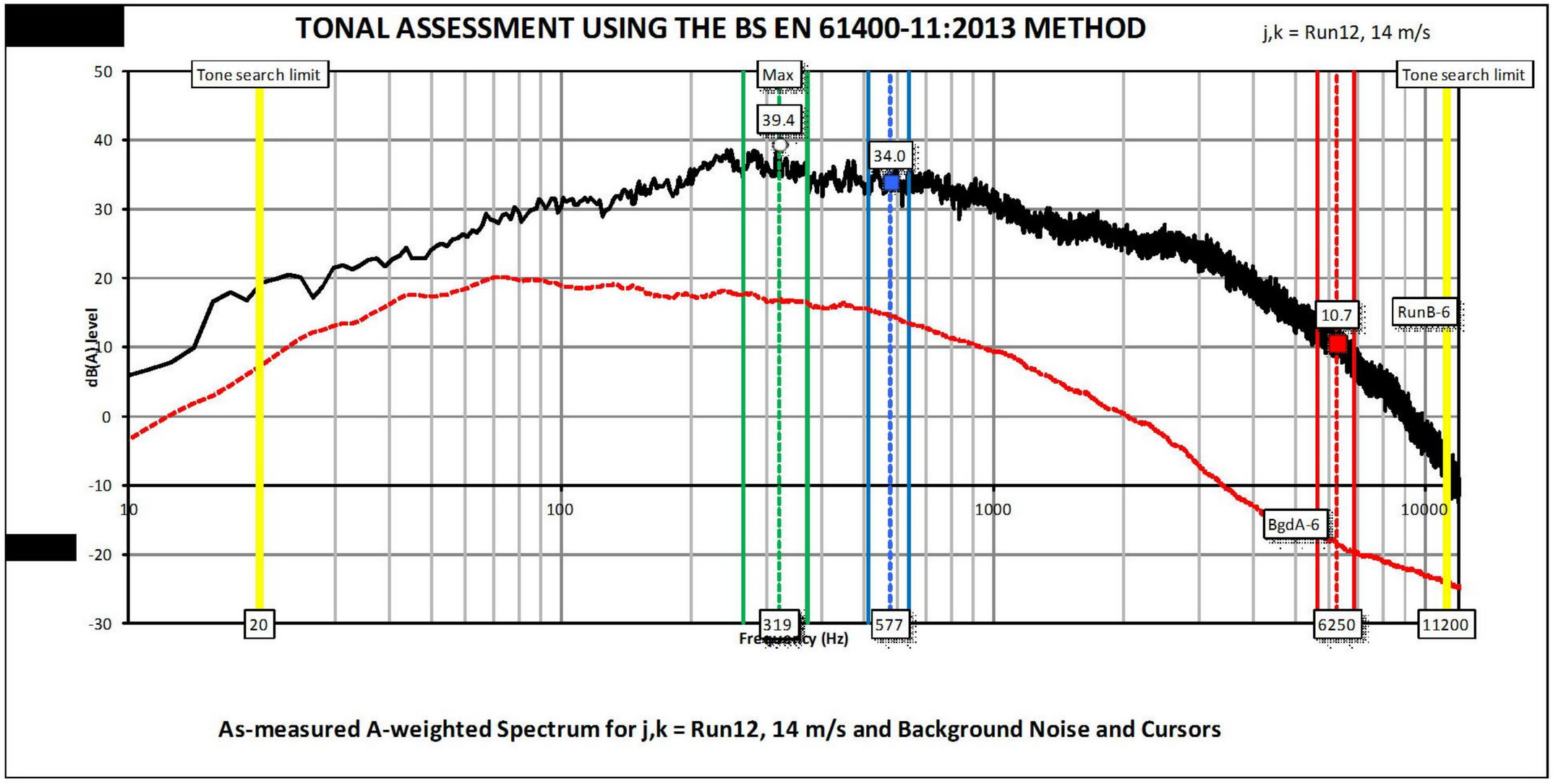


FIGURE 23b CRITICAL BAND WITH SPECTRUM MAXIMUM SHOWING TONES AND MASKING NOISE FOR 13 m/s WIND SPEED BIN. (Tonality -15 dB)



As-measured A-weighted Spectrum for j,k = Run12, 14 m/s and Background Noise and Cursors

FIGURE 24a TONAL ASSESSMENT USING THE IEC 61400-11:2012 METHOD FOR THE 14 m/s HUB-HEIGHT WIND SPEED BIN

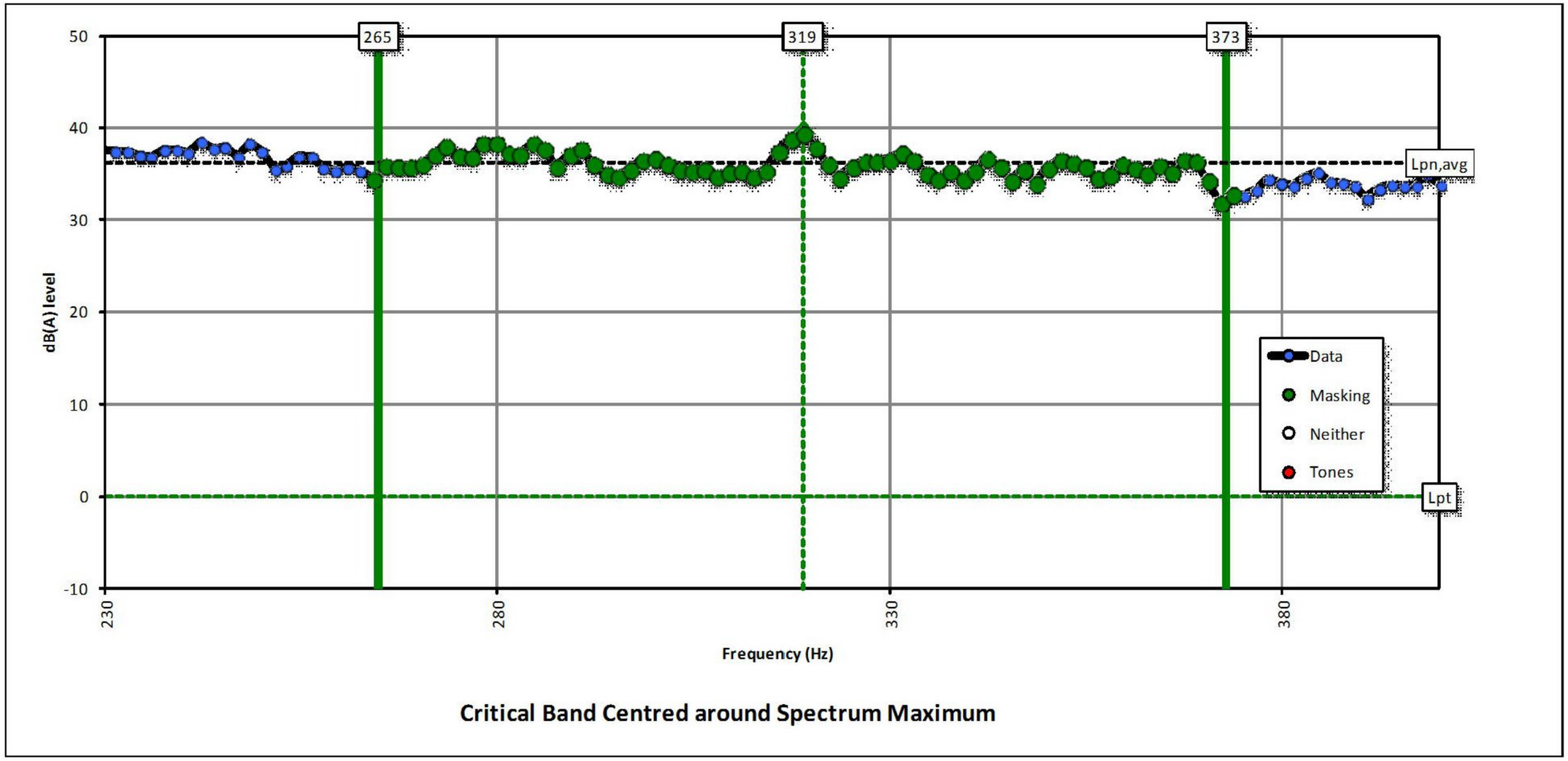


FIGURE 24b CRITICAL BAND WITH SPECTRUM MAXIMUM SHOWING TONES AND MASKING NOISE FOR 14 m/s WIND SPEED BIN. (Tonality -15 dB)

APPENDIX 1

CALIBRATION CERTIFICATES

Certificate of Calibration

Issued by University of Salford (Acoustics Calibration Laboratory)
UKAS ACCREDITED CALIBRATION LABORATORY NO. 0801

APPROVED SIGNATORIES
Claire Lomax [x] Andy Moorhouse [ ]
Gary Phillips [ ] Danny McCaul [ ]

[redacted]

acoustic calibration laboratory
The University of Salford, Salford, Greater Manchester, M5 4WT, UK
http://www.acoustics.salford.ac.uk
t 0161 295 3030/0161 295 3319 f 0161 295 4456 e c.lomax1@salford.ac.uk

UKAS CALIBRATION
0801

University of Salford MANCHESTER

Certificate Number: 02399/2 Date of Issue: 13 May 2016

PERIODIC TEST OF A SOUND LEVEL METER to IEC 61672-3:2006

FOR:	TUV SUD Octagon House Concorde Way, Segensworth North, Fareham Hampshire
FOR THE ATTENTION OF:	Patrick Jones
PERIODIC TEST DATE:	16/03/2016
TEST PROCEDURE:	CTP12 (Laboratory Manual)

Sound Level Meter Details

Manufacturer	Bruel & Kjaer		
Model	2250		
Serial number	2653893		
Class	1		
Hardware version	3.0	Software version	BZ7222 Version 4.5.2

Associated Items	Microphone	Preamplifier	Calibrator
Manu	Bruel & Kjaer	Bruel & Kjaer	Bruel & Kjaer
Model	4189	ZC 0032	4231
Serial Number	2643613	18847	2651818
Calibrator Adaptor	-	-	UC0210

Test Engineer (initial): [redacted] Name: Gary Phillips

This certificate is issued in accordance with the laboratory accreditation requirements of the United Kingdom Accreditation Service. It provides traceability of measurement to the SI system of units and/or to the units of measurement realised at the National Physical Laboratory or other recognised national metrology institutes. This certificate may not be reproduced other than in full except with the prior written approval of the issuing laboratory.

Certificate of Calibration

Issued by University of Salford (Acoustics Calibration Laboratory)
UKAS ACCREDITED CALIBRATION LABORATORY NO. 0801

Certificate Number: 02399/2 Date of Issue: 13 May 2016

Procedures from IEC 61672-3: 2006 and TPS 49 Edition 2 June 2009 were used to perform the periodic tests.

The manufacturer's instruction manual was marked as follows: B&K 2250 BE 1712-15 April 2007 from hardware version 1.1.

Adjustment data used to adjust the sound levels indicated in response to the application of a multi-frequency sound calibrator to sound levels equivalent to those that would be indicated in response to plane, progressive sound waves were obtained from the manufacturer's instruction manual referred to in this certificate.

The sound level meter calibration check frequency is 1000 Hz, the reference sound pressure level is 94 dB. As this instrument only has a single range, this range is the reference level range.

The environmental conditions in the laboratory at the start of the test were:
Static pressure 102.899 kPa ± 0.015 kPa, air temperature 22.8 °C ± 0.3 °C, relative humidity 37.3 % ± 1.7%.

The initial response of the instrument to application of the associated sound calibrator was 93.9 dB (C). No adjustment of the instrument was required. This indication was obtained from the calibration certificate of the calibrator, 02399/1, and information in the manufacturer's instruction manual specified in this certificate, when the instrument is configured for use with the supplied microphone extension cable and the following instrument settings; Input: Top Socket, Transducer: 4189, Sound Field Correction: Free-field, Windscreen Auto Detect: Off, Windscreen Correction: None. The instrument was calibrated without a windshield. Consult manufacturer's instructions if using a windshield.

With the microphone replaced by the electrical input device specified in the manufacturer's instruction manual, the levels of self-generated noise were:

A:	**12.9 dB***
B:	**11.9 dB***
C:	**13.0 dB***
$Z_{LF\text{-}Normal}$:	**18.1 dB***
$Z_{LF\text{-}Extended}$:	**23.0 dB***

* Under-range indicated on instrument display.

The environmental conditions in the laboratory at the end of the test were:
Static pressure 102.888 kPa ± 0.015 kPa, air temperature 23.3 °C ± 0.3 °C, relative humidity 38.9 % ± 1.7%.

Certificate of Calibration

Issued by University of Salford (Acoustics Calibration Laboratory)
UKAS ACCREDITED CALIBRATION LABORATORY NO. 0801

Certificate Number: 02399/2 Date of Issue: 13 May 2016

The sound level meter submitted for testing has successfully completed the class 1 periodic tests of IEC 61672-3:2006, for the environmental conditions under which the tests were performed. As public evidence was available, from an independent testing organization responsible for approving the results of pattern evaluation tests performed in accordance with IEC 61672-2:2003, to demonstrate that the model of sound level meter fully conformed to the requirements in IEC 61672-1:2002, the sound level meter submitted for testing conforms to the class 1 requirements of IEC 61672-1:2002.

The microphone corrections applied as specified in 12.6 of IEC 61672-3:2006 were obtained from a frequency response measured by this Laboratory using the electrostatic actuator method. This response in isolation is not covered by our UKAS accreditation.

Instruments used in the verification procedure were traceable to *National Standards*. The multi-frequency calibrator method was employed in the acoustical tests of a frequency weighting.

The uncertainty evaluation has been carried out in accordance with UKAS requirements. All measurement results are retained at the acoustic calibration laboratory for at least four years.

Certificate of Calibration

Issued by University of Salford (Acoustics Calibration Laboratory)
UKAS ACCREDITED CALIBRATION LABORATORY NO. 0801

0801

Page 1 of 2

APPROVED SIGNATORIES

Claire Lomax [ ] Andy Moorhouse [ ]
Gary Phillips [x] Danny McCaul [ ]

acoustic calibration laboratory
The University of Salford, Salford, Greater Manchester, M5 4WT, UK
http://www.acoustics.salford.ac.uk
t 0161 295 3030/0161 295 3319 f 0161 295 4456 e c.lomax1@salford.ac.uk

University of Salford MANCHESTER

Certificate Number: 02399/3 Date of Issue: 13 May 2016

VERIFICATION OF A SOUND LEVEL METER / ANALYSER 1/3 OCTAVE FILTER SET MANUFACTURED TO BS EN 61260: 1996 RELATIVE ATTENUATION

FOR: TUV SUD
Octagon House
Concorde Way, Segensworth North,
Fareham
Hampshire

FOR ATTENTION OF: Patrick Jones

DESCRIPTION: Sound level meter with 1/3 octave filter set manufactured to BS EN 61260: 1996 running software BZ 7223 Version 4.5.2.

DATE OF CALIBRATION: 14th and 15th March 2016

TEST PROCEDURE: CTP19 (Laboratory Manual)

Sound Level Meter/Analyser details					
Manu:	Bruel & Kjaer	Model:	2250	Serial No:	2653893
Filter details					
Filter Base: 10			**Filter Class: 0**		

Test Engineer (initial): [redacted] Name: Claire Lomax

This certificate is issued in accordance with the laboratory accreditation requirements of the United Kingdom Accreditation Service. It provides traceability of measurement to the SI system of units and/or to the units of measurement realized at the National Physical Laboratory or other recognised national metrology institutes. This certificate may not be reproduced other than in full except with the prior written approval of the issuing laboratory.

Certificate of Calibration

Issued by University of Salford (Acoustics Calibration Laboratory)
UKAS ACCREDITED CALIBRATION LABORATORY NO. 0801

Certificate Number: 02399/3 Date of Issue: 13 May 2016

INSTRUMENT SET UP

The instrument was adjusted to read 93.9 dB (C) in response to the associated calibrator. This reading was obtained from the calibration certificate of the calibrator, and information in the manufacturer's instruction manual when the instrument is configured as follow: Input: Top Socket, Transd. Used: unknown, Sound Field Correction: Free-field, Windscreen Auto Detect: Off, Windscreen Correction: None. The instrument was calibrated without a windshield. Consult manufacturer's instructions if using a windshield. The instrument was set to measure SPL on the Z-weighting in each of the tested frequency bands. Exact base 10 frequencies have been applied in all of the tests.

All tests were performed on the reference level range. The test signals were applied to the instrument via the ZC 0032 preamplifier, serial number 18847, and an appropriate input adaptor.

RELATIVE ATTENUATION TESTS

The Relative Attenuation of the combination of filter set and sound level meter /analyser was tested over the following frequency ranges:-
1/3 octave filter bands from 20 Hz to 20 kHz.

The tests have been carried out using the method stated in BS EN 61260: 1996 by applying input signals at a level 1 dB below the upper limit of the linear operating range.

RELATIVE ATTENUATION TEST RESULTS

Class 0 tolerances: Table1 of BS EN 61260:1996 **Result: Pass**

Uncertainty of measurement within filter pass-band: 0.20 dB coverage factor k=2
Uncertainty of measurement outside filter pass-band: 0.21 dB coverage factor k=2

NOTE:
These results apply only to the tested filter bands and do not imply that any untested filter bands would also pass the reported test.
The results are only valid for the combination of filter set and sound level meter / analyser tested.

The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor k, providing a coverage probability of approximately 95%. The uncertainty evaluation has been carried out in accordance with UKAS requirements.

All measurement results are retained at the acoustic calibration laboratory for at least four years.

Certificate of Calibration

Issued by University of Salford (Acoustics Calibration Laboratory)
UKAS ACCREDITED CALIBRATION LABORATORY NO. 0801

APPROVED SIGNATORIES

Claire Lomax [X] Andy Moorhouse [ ]
Gary Phillips [ ] Danny McCaul [ ]

[redacted]

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UKAS CALIBRATION
0801

University of Salford MANCHESTER

Certificate Number: 02399/1 Date of Issue: 21 October 2015

CALIBRATION OF A SOUND CALIBRATOR

FOR:	TUV SUD Octagon House Concorde Way, Segensworth North, Fareham Hampshire
FOR THE ATTENTION OF:	Mark McCourt
DESCRIPTION:	Calibrator with housing for one-inch microphones and adaptor type UC 0210 for half-inch microphones.
MANUFACTURER:	Bruel & Kjaer
TYPE:	4231
SERIAL NUMBER:	2651818
DATE OF CALIBRATION:	19/10/2015
TEST PROCEDURE:	CTP06 (Laboratory Manual)

Test Engineer (initial): [redacted] Name: Gary Phillips

Calibrations marked 'Not UKAS Accredited' in this certificate have been included for completeness.

Certificate of Calibration

Issued by University of Salford (Acoustics Calibration Laboratory)
UKAS ACCREDITED CALIBRATION LABORATORY NO. 0801

Certificate Number: 02399/1 Date of Issue: 21 October 2015

MEASUREMENTS

The sound pressure level generated by the calibrator was measured using a calibrated, WS2P condenser microphone as specified in the certificate. The calibration was carried out with the calibrator in the half-inch configuration.

Five determinations of the sound pressure level, frequency and total distortion were made.

The results have been corrected to the reference pressure of 101.325 kPa using manufacturer's data.

RESULTS

Coupler configuration:	Half-inch
Microphone type:	GRAS 40AG
Output level (dB re 20μPa):	94.02 dB ± 0.10 dB
Frequency (Hz):	999.98 Hz ± 0.12 Hz
Total Harmonic Distortion (%):	0.36 % ± 0.15 % (Not UKAS Accredited)

Average environmental conditions at the time of measurement and maximum deviation from the stated average:

Pressure:	102.154 kPa ± 0.003 kPa
Temperature:	22.8 °C ± 0.2 °C
Relative humidity:	46.2 % ± 0.7 %

The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor k=2, providing a level of confidence of approximately 95%. The uncertainty evaluation has been carried out in accordance with UKAS requirements.

All measurement results are retained at the acoustic calibration laboratory for at least four years.

Certificate of Calibration
for System No. 21717 SignalCalc Quattro – 4C1S
Date: November 19th, 2012

Customer:

Data Physics UK / NEL (TUV SUD Ltd)
South Road, Hailsham
East Sussex BN27 3JJ
United Kingdom

Data Physics Corporation certifies that System No. 21717 of the following hardware components:

Model:	Serial No:
DP240D	D48-023
DP240A	A66-023

Has been calibrated complying with MIL-STD-45662A/ANSI/NCSL Z 540-1-1994. The calibration instrument was a Hewlett Packard digital multimeter model 34401A, Serial No.US36062207 with Testwave LLC calibration certificate No. 12N0319.

The recommended calibration interval is 6 months. Based on this interval, the calibration due date is May 19th, 2013.

Calibrated by: [redacted]

Certified by: [redacted]

1741 Technology Drive • Suite 260 • San Jose, CA 95110
TEL: 408.437.0100 • FAX: 408.437.0509 • www.dataphysics.com

Data Physics (UK) Ltd
South Road, Hailsham, East Sussex, BN27 3JJ
www.dataphysics.com sales@dataphysics.com
TEL: 01323 846464 FAX: 01323 847550

TUV SUD NEL Ltd
James Young Building
East Kilbride
Glasgow
G75 0QF

01 February 2016

Data Physics (UK) Ltd. certifies that the system number 21717 consisting of the following hardware components:

Location	Model	Serial Number	Inputs	Outputs
1	DP240	12A66023	4	1

Has been verified to be in current calibration and then re-calibrated complying with MIL-STD-45662A/ANSI/NCSL Z 540-1-1994. The calibration instrument was an Agilent DVM model 34401A serial number MY45018142 with UKAS calibration certificate number 28450 dated 19th May 2015.

Date of calibration 1 February 2016

The recommended calibration interval is 12 months

[redacted]

Calibrated by _____G Murphy

< 0.1 m/s 6 → 12 m/s
Drift < 0.05 m/s
Unc = 0.05 m/s

Deutsche WindGuard
Wind Tunnel Services GmbH, Varel

DEUTSCHE WINDGUARD

accredited by the / *akkreditiert durch die*

Deutsche Akkreditierungsstelle GmbH

as calibration laboratory in the / *als Kalibrierlaboratorium im*

Deutschen Kalibrierdienst

DKD

DAkkS Deutsche Akkreditierungsstelle D-K-15140-01-00

Calibration mark *Kalibrierzeichen*
1612813
D-K-15140-01-00
06/2016

Calibration certificate
Kalibrierschein

Acceptable

Object *Gegenstand*	Cup Anemometer
Manufacturer *Hersteller*	Windspeed LTD Denbighshire LL18 2AB
Type *Typ*	A100R
Serial number *Fabrikat/Serien-Nr.*	11778 E88F
Customer *Auftraggeber*	TUV NEL Ltd UK Glasgow G75 0QU
Order No. *Auftragsnummer*	2600001270
Project No. *Projektnummer*	VT160556
Number of pages *Anzahl der Seiten*	4
Date of Calibration *Datum der Kalibrierung*	02.06.2016

This calibration certificate documents the traceability to national standards, which realize the units of measurement according to the International System of Units (SI).
The DAkkS is signatory to the multilateral agreements of the European co-operation for Accreditation (EA) and of the International Laboratory Accreditation Cooperation (ILAC) for the mutual recognition of calibration certificates.
The user is obliged to have the object recalibrated at appropriate intervals.
Dieser Kalibrierschein dokumentiert die Rückführung auf nationale Normale zur Darstellung der Einheiten in Übereinstimmung mit dem Internationalen Einheitensystem (SI).
Die DAkkS ist Unterzeichner der multilateralen Übereinkommen der European co-operation for Accreditation (EA) und der International Laboratory Accreditation Cooperation (ILAC) zur gegenseitigen Anerkennung der Kalibrierscheine.
Für die Einhaltung einer angemessenen Frist zur Wiederholung der Kalibrierung ist der Benutzer verantwortlich.

Date *Datum*	Head of the calibration laboratory *Leiter des Kalibrierlaboratoriums*	Person in charge *Bearbeiter*
02.06.2016	[redacted] Dipl. Phys. Dieter Westermann	[redacted] Techniker Dirk Henninges

Anhang
Annex

14901

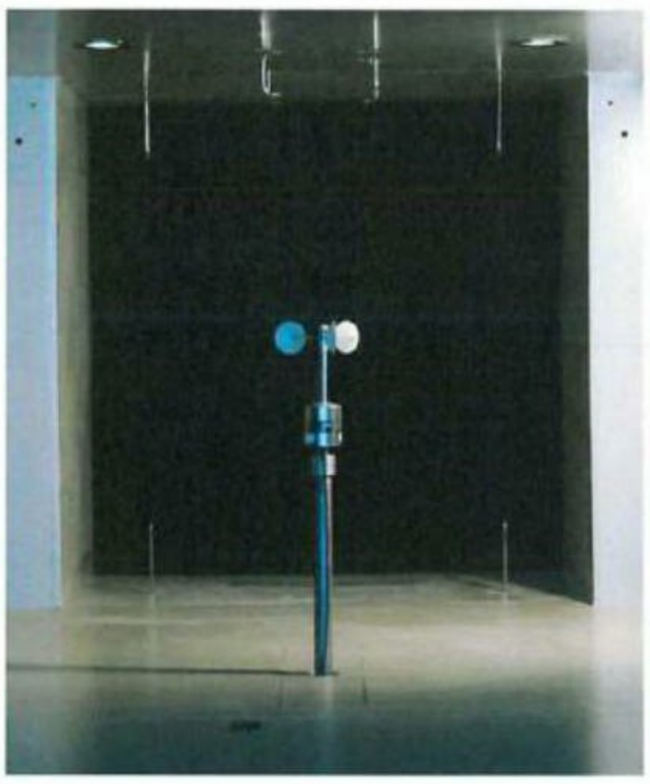
2 Instrumentation

Pos.	Sensor	Manufa.	Identification	Year
1	Pitot static tube	Airflow	483/8 Nr. 000142	02
2	Pitot static tube	Airflow	483/8 Nr. 000143	02
3	Pitot static tube	Airflow	483/8 Nr. 000144	02
4	Pitot static tube	Airflow	483/8 Nr. 000145	02
5	Pressure transducer	Setra	C 239 Nr. 1688081	02
6	Pressure transducer	Setra	C 239 Nr. 1688082	02
7	Pressure transducer	Setra	C 239 Nr. 1688083	02
8	Pressure transducer	Setra	C 239 Nr. 1688084	02
9	El. Barometer	Vaisala	100 A Nr. X2010004	02
10	El. Thermometer	Galltec	KPK 1/6-ME	02
11	El. Humidity sensor	Galltec	KPK 1/6-ME	02
12	Wind tunnel control	-	-	-
13	CAN-BUS / PC	esd	-	04
14	Anemometer		-	
15	Universal Isolator	Knick	P2700 - 98430	05

Table 1 Description of the data acquisition system

Remark: Last Re-accreditation see page 2

3 Photo of the calibration set-up



Calibration set-up of the anemometer calibration in the wind tunnel of Deutsche WindGuard, Varel. The anemometer shown is of the same type as the calibrated one.

Remark: The proportion of the set-up are not true to scale due to imaging geometry.

4 Deviation to MEASNET procedure

The calibration procedure is in all aspects in accordance with the IEC 61400-12-1 Procedure

5 References

[1] D. Westermann, 2009 - Verfahrensanweisung DKD-Kalibrierung von Windgeschwindigkeitssensoren
[2] IEC 61400-12-1 12/2005 - Wind Turbine Power Performance Testing
[3] ISO 3966 1977 - Measurement of fluid flow in closed conduits
[4] MEASNET 09 1997 - Cup Anemometer Calibration Procedure

Deutsche WindGuard Wind Tunnel Services GmbH
Oldenburger Str. 65
26316 Varel ; Tel. ++49 (0)4451 9515 0

1612813
D-K-15140-01-00
06/2016

Calibration result
Kalibrierergebnis

Sensor out Hz	Tunnel speed m/s	Uncertainty (k=2) m/s
3.055	4.009	0.050
4.545	5.945	0.051
6.164	7.975	0.051
7.764	10.014	0.052
9.355	12.038	0.052
10.893	13.980	0.054
12.464	15.984	0.053
11.673	14.962	0.053
10.115	13.032	0.052
8.540	11.006	0.051
6.940	8.968	0.051
5.388	7.015	0.051
3.777	4.970	0.050

File: 1612813

Statistical analysis

Slope	1.26951 (m/s)/(Hz) ±0.00156 (m/s)/(Hz)
Offset	0.1608 m/s ±0.013 m/s
Standard error (Y)	0.013 m/s
Correlation coefficient	0.999992

Remarks

The calibrated sensor complies with the demanded linearity of MEASNET

Deutsche WindGuard
Wind Tunnel Services GmbH, Varel

1612813
D-K-15140-01-00
06/2016

Graphical representation of the result
Grafische Darstellung des Ergebnisses

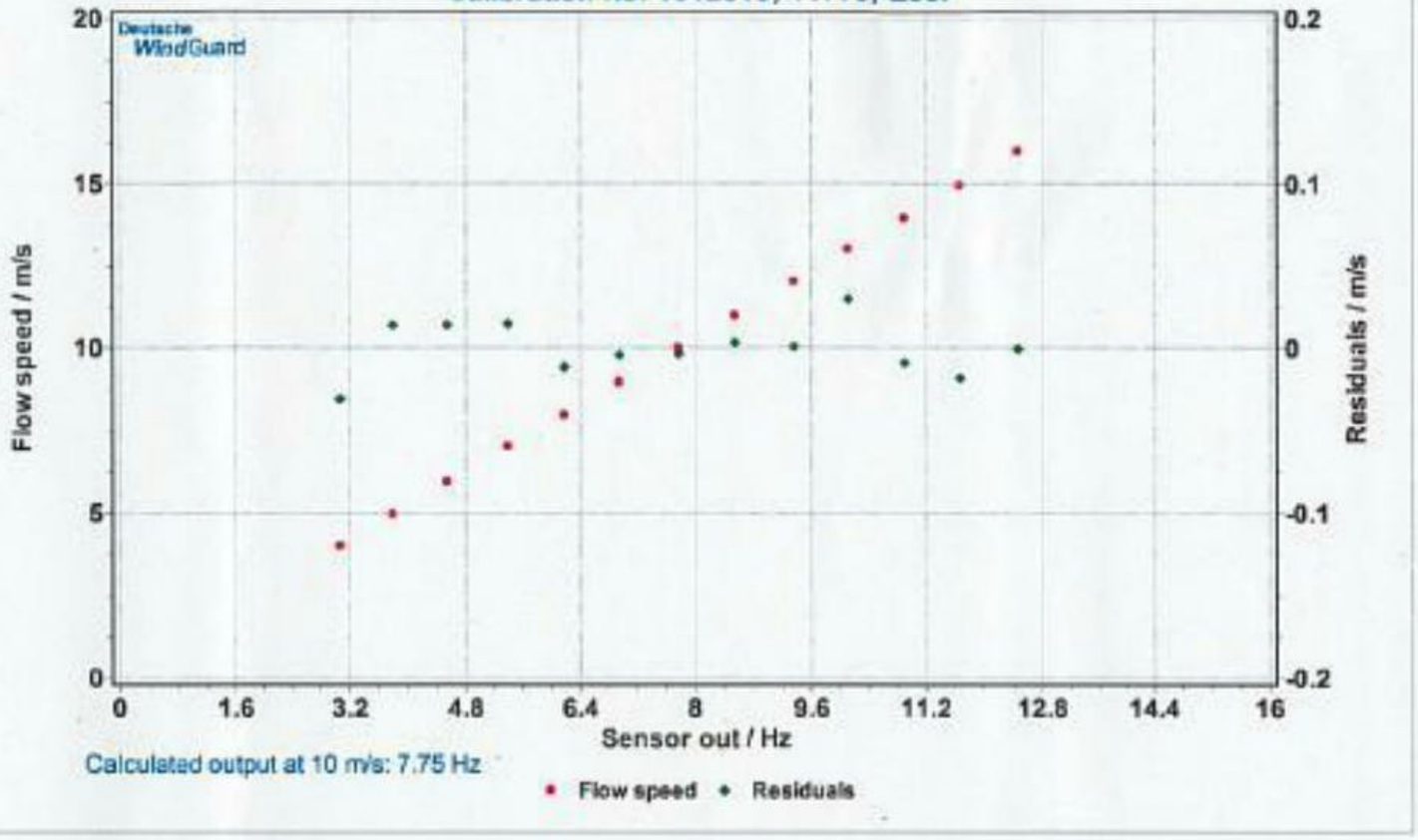
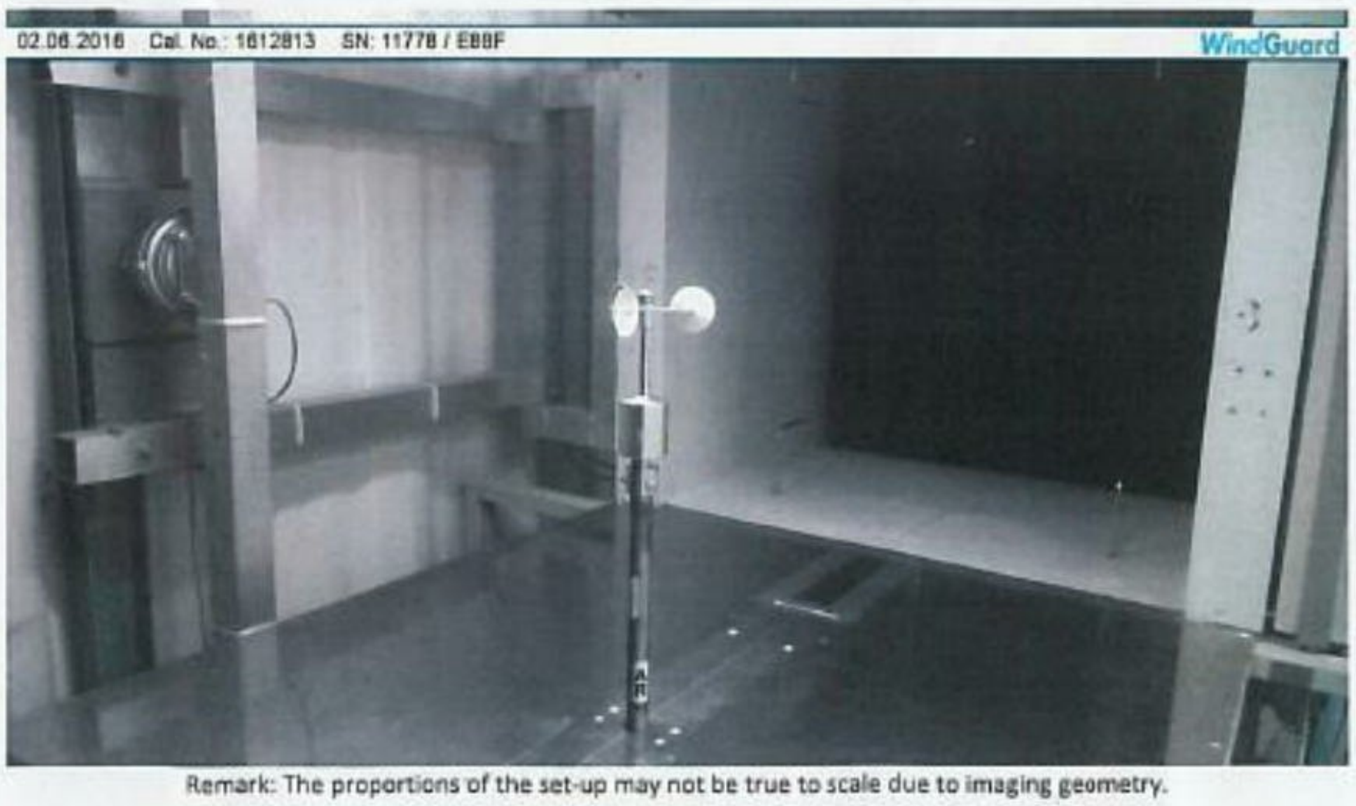


Photo of the measurement setup
Foto des Messaufbaus



Remark: The proportions of the set-up may not be true to scale due to imaging geometry.

Deutsche WindGuard
Wind Tunnel Services GmbH, Varel

DEUTSCHE WINDGUARD

CERTIFICATE OF CALIBRATION

ISSUED BY ANTECH

DATE OF ISSUE 03 June 2016 CERTIFICATE NUMBER: U80137-16

UKAS CALIBRATION
0439

Antech Calibration Services
Hewett Road
Gapton Hall Industrial Estate
Great Yarmouth
Norfolk NR31 0NN
Telephone: +44 (0) 1493 440600 Facsimile: +44 (0) 1493 440606
e-mail: sales@antech.org.uk

APPROVED SIGNATORY [redacted]

CUSTOMER DETAILS **ANTECH REF: 12395.1-16-A**

Company	:	TUV SUD UK Ltd
Address	:	James Young Goods Receiving Store Scottish Technology Park East Kilbride G75 0QF
Order Number	:	2600001286

INSTRUMENT CALIBRATED

Manufacturer	:	Setra
Model	:	278
Serial No.	:	4288972
Date Inst. Received	:	02 June 2016
Date Calibrated	:	03 June 2016

LABORATORY CONDITIONS : 20 °C ± 1 °C

CALIBRATION PROCEDURE : 10206

The instrument to be calibrated is an absolute mode pressure transmitter. The instrument was not adjusted.

Approved Signatory : D. Highton ( ) S.J. Hagg ( )

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CERTIFICATE OF CALIBRATION

ANTECH

UKAS ACCREDITED CALIBRATION LABORATORY No. 0489

CERTIFICATE NUMBER
U89137-16

Instrument Details

Calibrated Range — **900 mbar to 1100 mbar absolute mode**

Calibration Configuration — The instrument was calibrated in a horizontal position. The pressure reference was taken as the horizontal axis through the input pressure connection.

The pressure medium was dry, filtered nitrogen.

Calibration Sequence — The instrument was energised in the laboratory for 30 minutes prior to commencing calibration with a 24 volt dc stabilized power supply. The instrument was cycled to its maximum range three times before commencing the calibration.

Measurement Results — Results recorded were read from a digital multimeter provided by Antech Calibration Services.

[redacted]

CALIBRATION RESULTS

Applied Pressure mbar	Instrument Output V	Expected Output V	Error % FS	Measurement Uncertainty ± mbar	Measurement Uncertainty ± V
900.00	1.5025	1.5000	0.1002	0.101	0.00004
950.00	1.7527	1.7500	0.1072	0.101	0.00005
1000.00	2.0029	2.0000	0.1176	0.101	0.00005
1050.00	2.2534	2.2500	0.1364	0.101	0.00006
1100.00	2.5042	2.5000	0.1675	0.101	0.00006
1050.00	2.2534	2.2500	0.1365	0.101	0.00006
1000.00	2.0030	2.0000	0.1182	0.101	0.00005
950.00	1.7527	1.7500	0.1070	0.101	0.00005
900.00	1.5025	1.5000	0.0997	0.101	0.00004

The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor $k = 2$, providing a level of confidence of approximately 95 %. The uncertainty evaluation has been carried out in accordance with UKAS requirements.

END OF CERTIFICATE

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CERTIFICATE OF CALIBRATION

ISSUED BY ANTECH

DATE OF ISSUE 3 June 2016 CERTIFICATE NUMBER : U80150-16

UKAS CALIBRATION
0489

Antech Calibration Services
Hewett Road
Gapton Hall Industrial Estate
Great Yarmouth
Norfolk NR31 0NN
Telephone: +44 (0) 1493 440600 Facsimile: +44 (0) 1493 440606
e-mail: sales@antech.org.uk

APPROVED SIGNATORY [redacted]

CUSTOMER DETAILS **ANTECH REF: 12395-2.16/A**

Company	:	TUV SUD UK Ltd
Address	:	James Young Goods Receiving Store Scottish Technology Park East Kilbride G75 0QF
Order Number	:	2600001286

UNIT CALIBRATED

Manufacturer	:	Vaisala (Campbell Scientific)
Model	:	HMP45 AC Temperature and Humidity probe.
Serial No.	:	E3350007
Plant No.	:	- -
Date Inst. Received	:	2 June 2016
Date Calibrated	:	3 June 2016

AMBIENT TEMPERATURE : 20°C ± 5°C

CALIBRATION PROCEDURE : PROC30800

Approved Signatory : J.L.Gunn ( ) A Oxborough ( )

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CERTIFICATE OF CALIBRATION

ANTECH

UKAS ACCREDITED CALIBRATION LABORATORY No. 0489

CERTIFICATE NUMBER
U80150-16

Calibration details:

The UUT was calibrated by inter-comparison with working standard PRT's in an environmental test chamber.

At each generated condition a time of not less than 90 minutes was allowed for temperature to equilibrate. A set of 10 readings recorded at 1-minute intervals was then taken from the instrument under test, and the value recorded as the average of these 10 measurements.

During the calibration all instruments were maintained at laboratory conditions of 20 °C ± 5 °C, <70% rh.

The transmitter range is -39.2°C to +60 °C / 0.008 to 1 Vdc output.

The transmitter supply voltage was 12 volts dc.

The transmitter analogue output was measured using a six and a half digit multimeter.

No adjustment was made to the instrument.

The uncertainties of measurement quoted are true at the time of calibration and are not indicative of the UUT to maintain its calibration with time.

TEMPERATURE MEASUREMENT RESULTS

Standard Mean Temperature °C	UUT Output Vdc	Equivalent Temperature °C
-10.03	0.3016	-9.84
20.00	0.5996	19.96
40.07	0.7988	39.88

Uncertainty of measurement ± 0.30°C

Accepted 20-9°C

The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor k=2, providing a level of confidence of approximately 95%. The uncertainty evaluation has been carried out in accordance with UKAS requirements.

END OF CERTIFICATE

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APPENDIX 2

DESCRIPTION OF TYBE ‘B’ UNCERTAINTIES

Type B uncertainties

For these measurements all the type B measurement uncertainty components as specified in IEC 61400-11:2012 are given in Table 6. For all of the Type B uncertainties mentioned here, a rectangular distribution of possible values is assumed for simplicity with a range described as "±a". The standard deviation for such a distribution is:

$$U = \frac{a}{\sqrt{3}}$$

Table 6 - Type B measurement uncertainty components

Parameter	Value
Calibration, U_{bc}	0.2 dB
Instrument, U_{bi}	0.1 dB
Ground Board, U_{bg}	0.3 dB
Wind screen insertion loss, U_{bw}	N/A – primary screen with no secondary windscreen
Distance and direction of microphone, U_{bs}	0.1 dB
Air absorption (impedence), U_{ba}	0.2 dB
Weather, U_{bz}	0.5 dB
Wind speed (measured), U_{bm}	0.2 m/s
Wind speed (derived), U_{bd}	N/A for small wind turbines tested according to testing option as per Annex F of IEC 61400-11:2012 standard
Wind speed from power curve, U_{bp}	N/A for small wind turbines tested according to testing option as per Annex F of IEC 61400-11:2012 standard

Before calculating the sound power level uncertainty the average wind speed and uncertainty per bin needs to be considered. Specifications are given in IEC 61400-11:2012
The values per bin shall be averaged arithmetically as:

$$\overline{V}_k = \frac{1}{N} \cdot \sum_{j=1}^{N} V_{j,k}$$

where

N is the number of measurements in wind speed bin k;
$V_{j,k}$ is the average value of wind speed at measurement period j in wind speed bin k.

The Type A uncertainty of the average wind speed per bin k is calculated as:

$$s_{V,k} = \sqrt{\frac{\sum_{j=1}^{N} \left(V_{j,k} - \overline{V}_k\right)^2}{N \cdot (N-1)}}$$

where

$V_{j,k}$ is the average value of wind speed at measurement period j;
$\overline{V}_k$ is the average wind speed in wind speed k.

The Type B uncertainty on the wind speed for each measurement period j, u_{Bj} is calculated as:

$$u_{Bj} = \sqrt{\sum_{q=1}^{q} u_{Bj,q}^2}$$

where

$u_{Bj,q}$ is the Type B uncertainty from source q on the average wind speed for each measurement

Information about the sources are given in Table 6.

The Type B uncertainty on average wind speed in bin k, u_{Bk} is calculated as:

$$u_{Bk} = \sqrt{\frac{1}{N} \cdot \sum_{j=1}^{N} u_{Bj}^2}$$

The combined uncertainty $u_{comb,k}$ can be expressed as:

$$u_{comb,k} = \sqrt{s^2_{k} + u^2_{Bk}}$$

Uncertainty of average sound spectra

For each 1/3-octave band i the average sound pressure level is averaged energetically as:

$$\overline{L}_{i,k} = 10 \cdot \log\left[\frac{1}{N} \cdot \sum_{j=1}^{N} 10^{\left(\frac{L_{ij,k}}{10}\right)}\right]$$

where

N is the number of measurements in wind speed bin k;
$L_{ij,k}$ is the und pressure level of 1/3-octave band I measurement period j, in wind speed bin k.

The Type A standard uncertainty of the average wind speed per bin k is calculated as:

$$s_{L,i,k} = \sqrt{\frac{\sum_{j=1}^{N} \left(L_{ij,k} - \overline{L}_{i,k}\right)^2}{N \cdot (N-1)}}$$

Where

$\overline{L}_{i,k}$ is the average sound pressure spectrum in wind speed bin k

The Type B uncertainty on the energy averaged sound pressure level of 1/3-octave band i, for each measurement period j is calculated as:

$$u_{Lij} = \sqrt{\sum_{q=1}^{7} u_{Lijq}^2}$$

where

u_{Lijq} is the Type B uncertainty from source q on the average sound pressure level of 1/3-octave band for each measurement period j.

The Type B uncertainty on the average sound pressure level of 1/3-octave band I in wind speed bin k is calculated as:

$$u_{Li,k} = \sqrt{\left[\frac{1}{N} \cdot \sum_{j=1}^{N} u^2_{Lij,k}\right]} = u_{Lij,k}$$

The combined uncertainty can be expressed as:

$$u_{com,Li,k} = \sqrt{s^2_{Li,k} + u^2_{Li,k}}$$

Uncertainty of noise levels at bin centres

The sound pressure level for both total noise and background noise at bin centre has to be calculated. This has to be done at each 1/3- octave band i and at every bin centre of wind speeds. Using linear interpolation the estimated sound pressure level at wind speed v is given as:

$$L_i(t) = (1-t) \cdot \bar{L}_k + t \cdot \bar{L}_{k+1}$$

where

$$\bar{v}_k \leq v < \bar{v}_{k+1}$$

The t value at a certain wind speed v is given as:

$$t = \frac{(v - \bar{v}_k)}{(\bar{v}_{k+1} - \bar{v}_k)}$$

To fulfil an entire statistical evaluation according to IEC 61400-11:2012 a corresponding covariance is calculated as:

$$cov_{Li\,v\,k} = \frac{1}{N-1} \cdot \sum_{j=1}^{N} (v_{j,k} - \bar{v}_k) \cdot (L_{i,j,k} - \bar{L}_{i,k})$$

The corresponding covariance is used to calculate the uncertainty on the sound pressure level at bin centre wind speed v using:

$$U_{C,L_v}(l) = \sqrt{U_L^2(l) - \frac{cov_{LV}^2(l)}{U_v^2(l)}}$$

where

$$U_L^2(l) = (1-l)^2 \cdot U_{C,L,k}^2 + l^2 \cdot U_{C,L,k+1}^2$$

$$cov_{LV}(l) = (1-l)^2 \cdot \frac{cov_{LV,k}}{N_k} + l^2 \cdot \frac{cov_{LV,k+1}}{N_{k+1}}$$

$$U_v^2(l) = (1-l)^2 \cdot U_{C,v,k}^2 + l^2 \cdot U_{C,v,k+1}^2$$

and

N_k is the number of measurements in wind speed bin k

APPENDIX 3

TONALITY AUDIBILITY SUMMARY
FOR EACH INTEGER WIND SPEED BIN

BS EN 61400-11:2013 - Tonal Audibility Calculation Summary - For Windspeed Bins 3.0 through 8.0 m/s

Speed, k (m/s)	Running, 3 m/s to 8 m/s bins							
Spectrum, j	CB Centre	Lpn,avg	Lpt	Lpn	ΔLtn	ΔL_a	Report?	ΔL_a Energy
1__3 m/s	98.4	23.3	35.0	39.6	-4.6	-2.6	YES	0.55
2__4 m/s	*100.0*	*24.3*	*35.6*	*40.7*	*-5.1*	*-3.0*	*NO*	*0.50*
3__5 m/s	100.0	23.3	None	39.6	-16.3	-14.2	NO	
4__6 m/s	121.9	23.0	None	39.4	-16.4	-14.3	NO	
5__7 m/s	121.9	27.2	None	43.6	-16.4	-14.3	NO	
6__8 m/s	100.0	25.1	None	41.5	-16.3	-14.2	NO	
7__3 m/s	*193.8*	*21.7*	*31.7*	*38.2*	*-6.5*	*-4.4*	*NO*	*0.36*
8__etc	*196.9*	*22.9*	*30.5*	*39.3*	*-8.9*	*-6.8*	*NO*	*0.21*
9__	210.9	24.0	None	40.5	-16.5	-14.3	NO	
10__	*210.9*	*24.5*	*30.7*	*41.0*	*-10.3*	*-8.1*	*NO*	*0.15*
11__	209.4	29.0	None	45.5	-16.5	-14.3	NO	
12__8 m/s	209.4	28.4	None	44.8	-16.5	-14.3	NO	
13	390.6	16.9	None	33.7	-16.8	-14.4	NO	
14	393.8	17.9	None	34.6	-16.8	-14.4	NO	
15	393.8	22.1	None	38.9	-16.8	-14.4	NO	
16	415.6	24.8	None	41.7	-16.8	-14.5	NO	
17	418.8	29.0	None	45.9	-16.8	-14.5	NO	
18	418.8	29.8	None	46.6	-16.8	-14.5	NO	
19	590.6	16.9	33.3	34.1	-0.8	1.6	AUD	1.4
20	592.2	17.7	35.3	35.0	0.3	2.7	AUD	1.9
21	592.2	22.5	37.8	39.7	-1.9	0.5	AUD	1.1
22	590.6	25.4	40.2	42.7	-2.5	-0.1	YES	1.0
23	*590.6*	*29.2*	*39.9*	*46.5*	*-6.5*	*-4.1*	*NO*	*0.39*
24	*590.6*	*29.2*	*40.2*	*46.4*	*-6.2*	*-3.8*	*NO*	*0.42*
25	6250	-21.8	1.9	5.4	-3.4	1.3	AUD	1.3
26	6250	-20.8	4.0	6.4	-2.4	2.3	AUD	1.7
27	*6250*	*-7.5*	*1.9*	*19.7*	*-17.7*	*-12.9*	*NO*	*0.05*
28	6250	0.8	None	28.0	-27.2	-22.3	NO	
29	6250	4.0	None	31.2	-27.2	-22.3	NO	
30	6250	3.9	None	31.1	-27.2	-22.3	NO	
Mode & Average	6250	21.7		4000	Avg. $\Delta L_{a,k}$	-1.0		

Speed, k (m/s)							
Spectrum, j	CB Centre	Lpn,avg	Lpt	Lpn	ΔLtn	ΔL_a	Report?
1							
2							
3							
4							
5							
6							
7							
8							
9							
10							
11							
12							
13							
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27							
28							
29							
30							

BS EN 61400-11:2013 Tonal Audibility Summary - General method									
Wind speed bin, k (m/s)	Condition	Spectra examined	No of Spectra with Identified Tones			Background proximity ?	Average $\Delta L_{a,k}$	Report Tonal Audibility as	
			Identified	Percentage	AUDible				
3 - 8	Running	30	14	47%	5		-1.0	$\Delta L_{a,k}$ (dB)	-1.0
	Background	0						Centre (Hz)	6250
								CBW (Hz)	1227
								Background ?	

Annex F - Small Wind Turbines (12 spectra per bin)			
Tonality ΔL_k	-9.8	Report Tonal Audibility	
Audibility $\Delta L_{a,k}$	-7.8	$\Delta L_{a,k}$ (dB)	No relevant Tones
		Centre (Hz)	6250
		CBW (Hz)	101

Comment on Method used

Runnning: Auto tone search carried out on all spectra.

Parked: Tonality calculation on all parked spectra based on CB set at mode tone frequency whilst running

Note: although background noise levels may be well below dB(A) totals, background might still be high enough to affect the Masking noise levels in a given Critical Band. The text "BG Too High" indicates this has occurred. Note however: as stated in the Standard's clause 9.5.9, no correction is made for broadband background noise.

BS EN 61400-11:2013_tonality_summary

DWC_tonality_v11_IEC2012.xlsm

BS EN 61400-11:2013 - Tonal Audibility Calculation Summary - For Windspeed Bins 9.0 through 14.0 m/s

Speed, k (m/s)	Running, 9 m/s to 14 m/s bins							
Spectrum, j	CB Centre	Lpn,avg	Lpt	Lpn	ΔLtn	ΔL_a	Report?	ΔL_a Energy
1__9 m/s	210.9	28.9	None	45.4	-16.5	-14.4	NO	
2_10 m/s	210.9	30.9	None	47.4	-16.5	-14.4	NO	
3_11 m/s	210.9	31.5	None	48.0	-16.5	-14.4	NO	
4_12 m/s	201.6	32.0	None	48.5	-16.4	-14.4	NO	
5_13 m/s	196.9	32.9	None	49.3	-16.4	-14.4	NO	
6_14 m/s	200	35.4	None	51.8	-16.4	-14.4	NO	
7__9 m/s	414.1	30.1	None	46.9	-16.8	-14.6	NO	
8__etc	423.4	31.3	None	48.1	-16.8	-14.6	NO	
9__	423.4	32.6	None	49.4	-16.8	-14.6	NO	
10__	426.6	32.8	None	49.6	-16.8	-14.6	NO	
11__	425	33.4	None	50.2	-16.8	-14.6	NO	
12_14 m/s	426.6	34.5	None	51.3	-16.8	-14.6	NO	
13	*590.6*	*29.6*	*37.7*	*46.8*	*-9.1*	*-6.7*	*NO*	*0.2*
14	587.5	30.3	None	47.5	-17.2	-14.8	NO	
15	587.5	30.8	None	48.0	-17.2	-14.8	NO	
16	585.9	31.9	None	49.1	-17.2	-14.8	NO	
17	576.6	33.0	None	50.2	-17.2	-14.8	NO	
18	576.6	34.2	None	51.4	-17.2	-14.8	NO	
19	2500	21.5	None	43.6	-22.2	-18.4	NO	
20	2500	20.7	None	42.9	-22.2	-18.4	NO	
21	2500	22.2	None	44.4	-22.2	-18.4	NO	
22	2500	22.8	None	45.0	-22.2	-18.4	NO	
23	2500	25.2	None	47.4	-22.2	-18.4	NO	
24	2500	25.1	None	47.2	-22.2	-18.4	NO	
25	6250	5.0	None	32.2	-27.2	-22.5	NO	
26	6250	6.4	None	33.6	-27.2	-22.5	NO	
27	6250	6.3	None	33.5	-27.2	-22.5	NO	
28	6250	7.6	None	34.8	-27.2	-22.5	NO	
29	6250	10.1	None	37.3	-27.2	-22.5	NO	
30	6250	10.9	None	38.1	-27.2	-22.5	NO	
Mode & Average	2500	25.3	Spec.Line#	1600	Avg. $\Delta L_{a,k}$	-6.7		

Speed, k (m/s)	Parked, 14 m/s bin						
Spectrum, j	CB Centre	Lpn,avg	Lpt	Lpn	ΔLtn	ΔL_a	Report?
1							
2							
3							
4							
5							
6							
7							
8							
9							
10							
11							
12							
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26							
27							
28							
29							
30							

BS EN 61400-11:2013 Tonal Audibility Summary - General method									
Wind speed bin, k (m/s)	Condition	Spectra examined	No of Spectra with Identified Tones			Background proximity ?	Average $\Delta L_{a,k}$	Report Tonal Audibility as	
			Identified	Percentage	AUDible				
9 - 14	Running	30	1	3%	0		-6.7	$\Delta L_{a,k}$ (dB)	No relevant Tones
	Background	0						Centre (Hz)	
								CBW (Hz)	
								Background ?	

Annex F - Small Wind Turbines (12 spectra per bin)			
Tonality ΔL_k	-16.6	Report Tonal Audibility	
Audibility $\Delta L_{a,k}$	-14.5	$\Delta L_{a,k}$ (dB)	No relevant Tones
		Centre (Hz)	
		CBW (Hz)	

Comment on Method used

Runnning: Auto tone search carried out on all spectra.

Parked: Tonality calculation on all parked spectra based on CB set at mode tone frequency whilst running

Note: although background noise levels may be well below dB(A) totals, background might still be high enough to affect the Masking noise levels in a given Critical Band. The text "BG Too High" indicates this has occurred. Note however: as stated in the Standard's clause 9.5.9, no correction is made for broadband background noise.

(Test data: v7 {Argosy} files 6A thru 8A for running & BG6 thru BG10 for background + some bgd repeats BG8 & BG7)

BS EN 61400-11:2013_tonality_summary

DWC_tonality_v11_IEC2012.xlsm

APPENDIX 4

IMMISSION NOISE MAP FOR WIND SPEEDS
10 m above ground level / 0.1 roughness length

ACOUSTIC NOISE LEVELS

Turbine Make:	Orenda	Model:	Skye (49 kW)

IEC 61400-11:2012 NOISE EMISSION LEVELS

Wind Speed (m/s) at 10 m Height	2	3	4	5	6	7	8	9	10	11	12	13
Apparent Sound Power Level, L_{WA}, dB(A) re 10^{-12}W	-	84.8	87.5	90.2	91.5	91.6	91.8	92.7	93.1	95.6	98.4	-
Combined Uncertainty, U_c, dB	-	1.01	0.72	0.64	0.63	0.62	0.62	0.63	0.63	0.65	0.75	-
Declared Sound Power Level, L_{Wd}, dB(A) re 10^{-12}W	-	86.6	88.9	91.3	92.6	92.7	92.9	93.8	94.2	96.7	99.7	-

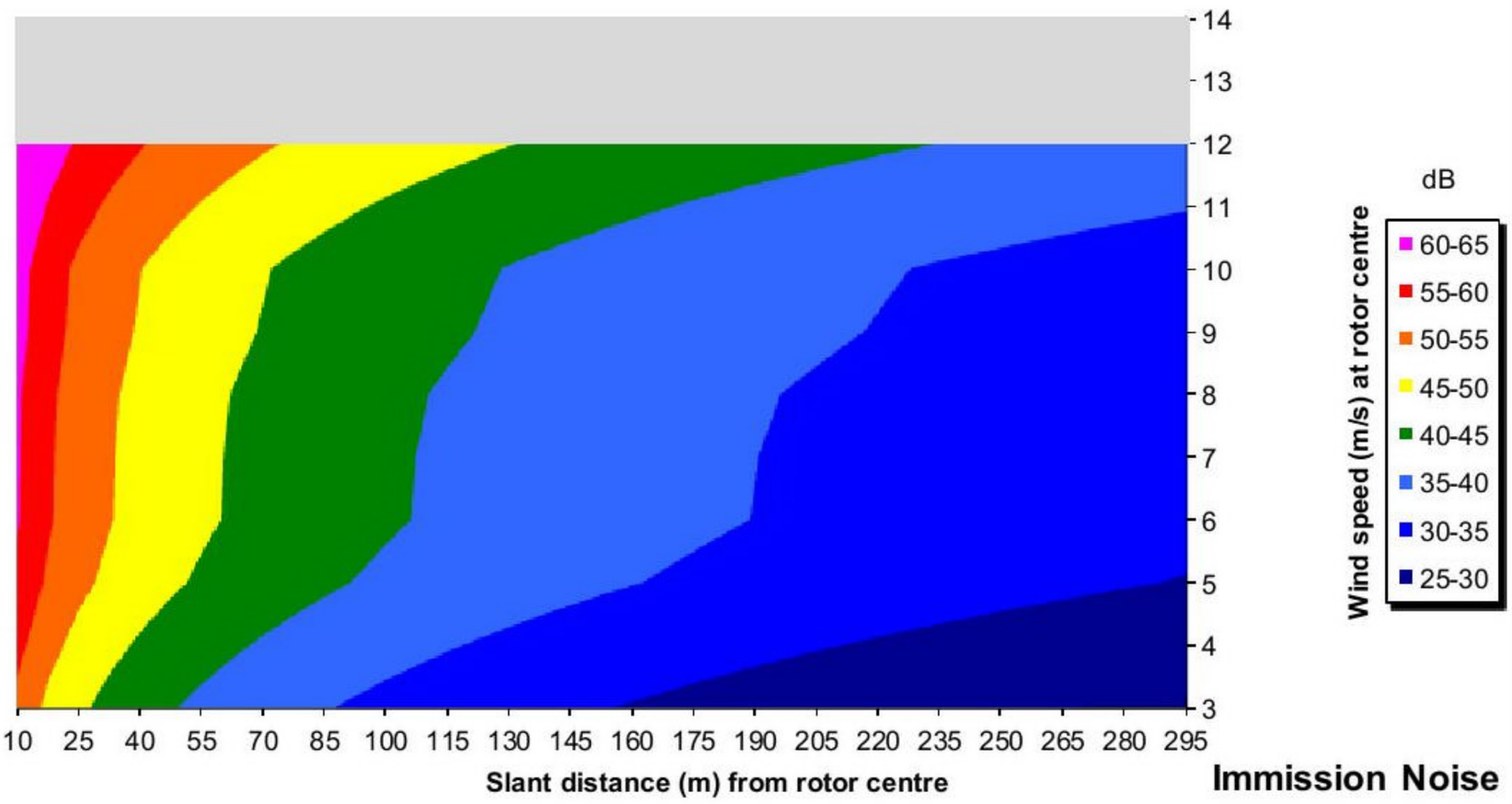
IEC 61400-11:2012 TONALITY

General Comment	0-20 kHz narrow-band analysis using Δf = 1.5625 Hz

Wind Speed (m/s) at 10 m Height	2	3	4	5	6	7	8	9	10	11	12	13
Critical Band Centre Frequency (Hz)	-	591	591	591	-	-	-	-	-	-	-	-
Tonal Audibility, ΔL_a	-	+2.0	+1.5	+0.1	-	-	-	-	-	-	-	-

ESTIMATED NOISE IMMISSION LEVELS (dB(A) at a distant observer location)

Note: based on 'Apparent' Sound Power Level at Hub-height and 'Spherical' propagation.



Immission Noise

www.tuvnel.com

ORE005 - 2016/328

Tested and Issued by:
TUV SUD Ltd.
Feb 2017

IEC 61400-11:2012 TONALITY

General Comment	0-20 kHz narrow-band analysis using Δf = 1.5625 Hz

Wind Speed (m/s) at 10 m Height	2	3	4	5	6	7	8	9	10	11	12	13
Critical Band Centre Frequency (Hz)	-	6250	-	-	-	-	-	-	-	-	-	-
Tonal Audibility, ΔL_a	-	+1.6	-	-	-	-	-	-	-	-	-	-

IEC 61400-11:2012 TONALITY

General Comment	0-20 kHz narrow-band analysis using Δf = 1.5625 Hz

Wind Speed (m/s) at 10 m Height	2	3	4	5	6	7	8	9	10	11	12	13
Critical Band Centre Frequency (Hz)	-	99	-	-	-	-	-	-	-	-	-	-
Tonal Audibility, ΔL_a	-	-2.7	-	-	-	-	-	-	-	-	-	-

A roughness length of 0.1 was used, derived from Eqn. (D2) with historical site data.

Consultation Request Notification

Planning Authority Name	**The Moray Council**
Response Date	**1st November 2017**
Planning Authority Reference	**17/01546/APP**
Nature of Proposal (Description)	**Install a Orenda 49kw wind turbine [33.47m high to blade tip, rotor diameter 18.9m] at**
Site	**Land At Mains Of Pitlurg** **Keith** **Moray** **AB55 5PJ**
Site Postcode	**N/A**
Site Gazetteer UPRN	**000133046358**
Proposal Location Easting	**343229**
Proposal Location Northing	**845608**
Area of application site (Ha)	**1000 m^2**
Additional Comment	
Development Hierarchy Level	**LOCAL**
Supporting Documentation URL	http://public.moray.gov.uk/eplanning/centralDistribution.do?caseType=Application&keyVal=OXC62UBGLRV00
Previous Application	
Date of Consultation	**18th October 2017**
Is this a re-consultation of an existing application?	**No**
Applicant Name	**Orenda Energy Solutions**
Applicant Organisation Name	
Applicant Address	**Per Agent**
Agent Name	**AE Associates**
Agent Organisation Name	
Agent Address	**Cameron House** **26 Cupar Road** **Auchtermuchty** **Fife** **KY14 7DD**
Agent Phone Number	
Agent Email Address	**N/A**
Case Officer	**Richard Smith**
Case Officer Phone number	**01343 563256**
Case Officer email address	**richard.smith@moray.gov.uk**
PA Response To	**consultation.planning@moray.gov.uk**

NOTE:
If you do not respond by the response date, it will be assumed that you have no comment to make.

The statutory period allowed for a consultation response is 14 days. Due to scheduling pressures if a definitive response is not received within 21 days this may well cause the two month determination period to be exceeded.

Please respond using the attached form:-

MORAY COUNCIL

PLANNING CONSULTATION RESPONSE

From: Transportation Manager

Planning Application Ref. No: 17/01546/APP
Install a Orenda 49kw wind turbine [33.47m high to blade tip, rotor diameter 18.9m] at Land At Mains Of Pitlurg Keith Moray AB55 5PJ for Orenda Energy Solutions

I have the following comments to make on the application:-

		Please
(a)	I OBJECT to the application for the reason(s) as stated below	❑
(b)	I have NO OBJECTIONS to the application and have no condition(s) and/or comment(s) to make on the proposal	**x**
(c)	I have NO OBJECTIONS to the application subject to condition(s) and/or comment(s) about the proposal as set out below	❑
(d)	Further information is required in order to consider the application as set out below	❑

Transportation notes that the size of the turbine components would enable delivery via a standard sized Heavy Goods Vehicle – a size of vehicle which would already be accessing the existing farm.

Transportation therefore has no objections to the proposed wind turbine.

Contact: DA/AG **Date 26 October 2017**
email address: transport.develop@moray.gov.uk
Consultee: TRANSPORTATION

Return response to	**consultation.planning@moray.gov.uk**

Consultation Request Notification

Planning Authority Name	**The Moray Council**
Response Date	**1st November 2017**
Planning Authority Reference	**17/01546/APP**
Nature of Proposal (Description)	**Install a Orenda 49kw wind turbine [33.47m high to blade tip, rotor diameter 18.9m] at**
Site	**Land At Mains Of Pitlurg** **Keith** **Moray** **AB55 5PJ**
Site Postcode	**N/A**
Site Gazetteer UPRN	**000133046358**
Proposal Location Easting	**343229**
Proposal Location Northing	**845608**
Area of application site (Ha)	**1000 m^2**
Additional Comment	
Development Hierarchy Level	**LOCAL**
Supporting Documentation URL	http://public.moray.gov.uk/eplanning/centralDistribution.do?caseType=Application&keyVal=OXC62UBGLRV00
Previous Application	
Date of Consultation	**18th October 2017**
Is this a re-consultation of an existing application?	**No**
Applicant Name	**Orenda Energy Solutions**
Applicant Organisation Name	
Applicant Address	**Per Agent**
Agent Name	**AE Associates**
Agent Organisation Name	
Agent Address	**Cameron House** **26 Cupar Road** **Auchtermuchty** **Fife** **KY14 7DD**
Agent Phone Number	
Agent Email Address	**N/A**
Case Officer	**Richard Smith**
Case Officer Phone number	**01343 563256**
Case Officer email address	**richard.smith@moray.gov.uk**
PA Response To	**consultation.planning@moray.gov.uk**

NOTE:
If you do not respond by the response date, it will be assumed that you have no comment to make.

The statutory period allowed for a consultation response is 14 days. Due to scheduling pressures if a definitive response is not received within 21 days this may well cause the two month determination period to be exceeded.

Please respond using the attached form:-

MORAY COUNCIL

PLANNING CONSULTATION RESPONSE

From: Aberdeenshire Council Archaeology Service

Planning Application Ref. No: 17/01546/APP
Install a Orenda 49kw wind turbine [33.47m high to blade tip, rotor diameter 18.9m] at Land At Mains Of Pitlurg Keith Moray AB55 5PJ for Orenda Energy Solutions

I have the following comments to make on the application:-

		Please x
(a)	I OBJECT to the application for the reason(s) as stated below	❑
(b)	I have NO OBJECTIONS to the application and have no condition(s) and/or comment(s) to make on the proposal	❑
(c)	I have NO OBJECTIONS to the application subject to condition(s) and/or comment(s) about the proposal as set out below	**x**
(d)	Further information is required in order to consider the application as set out below	❑

Reason(s) for objection

None

Condition(s)

The proposed site occupies an area in proximity to the archaeology site NJ44NW0001, the remains of the 16th Century Pitlurg Castle. I would ask that the following condition is applied over **all** groundbreaking works (including turbine foundations, cabling trenches, access tracks etc) due to the potential for previously unrecorded archaeology to survive in this area:

"Watching-brief Condition (PAN 2/2011, SPP, HESP)

The developer shall secure the implementation of an archaeological watching brief, to be carried out by an archaeological organisation acceptable to the Aberdeenshire Council Archaeology Service on behalf of the planning authority, during any groundbreaking and development work. The retained archaeological organisation shall be afforded access at all reasonable times and allowed to record and recover items of interest and finds. Terms of Reference for the watching brief will be supplied by the Aberdeenshire Council Archaeology Service.

The name of the archaeological organization retained by the developer shall be given to the planning authority and to the Aberdeenshire Council Archaeology Service in writing not less than 14 days before development commences.

Reason: to record items of archaeological interest."

Further comment(s) to be passed to applicant

Further information required to consider the application

Contact: Claire Herbert **Date…20/10/2017**
email address: **Phone No …01467 537717**
archaeology@aberdeenshire.gov.uk
Consultee: Archaeology service

Return response to	**consultation.planning@moray.gov.uk**

Please note that information about the application including consultation responses and representations (whether in support or objection) received on the proposal will be published on the Council's website at http://public.moray.gov.uk/eplanning/ (You can also use this site to track progress of the application and view details of any consultation responses and representations (whether in support or objection) received on the proposal). In order to comply with the Data Protection Act, personal information including signatures, personal telephone and email details will be removed prior to publication using "redaction" software to avoid (or mask) the display of such information. Where appropriate other "sensitive" information within documents will also be removed prior to publication online.

Consultation Request Notification

Planning Authority Name	**The Moray Council**
Response Date	**1st November 2017**
Planning Authority Reference	**17/01546/APP**
Nature of Proposal (Description)	**Install a Orenda 49kw wind turbine [33.47m high to blade tip, rotor diameter 18.9m] at**
Site	**Land At Mains Of Pitlurg Keith Moray AB55 5PJ**
Site Postcode	**N/A**
Site Gazetteer UPRN	**000133046358**
Proposal Location Easting	**343229**
Proposal Location Northing	**845608**
Area of application site (Ha)	**1000 m^2**
Additional Comment	
Development Hierarchy Level	**LOCAL**
Supporting Documentation URL	http://public.moray.gov.uk/eplanning/centralDistribution.do?caseType=Application&keyVal=OXC62UBGLRV00
Previous Application	
Date of Consultation	**18th October 2017**
Is this a re-consultation of an existing application?	**No**
Applicant Name	**Orenda Energy Solutions**
Applicant Organisation Name	
Applicant Address	**Per Agent**
Agent Name	**AE Associates**
Agent Organisation Name	
Agent Address	**Cameron House 26 Cupar Road Auchtermuchty Fife KY14 7DD**
Agent Phone Number	
Agent Email Address	**N/A**
Case Officer	**Richard Smith**
Case Officer Phone number	**01343 563256**
Case Officer email address	**richard.smith@moray.gov.uk**
PA Response To	**consultation.planning@moray.gov.uk**

NOTE:
If you do not respond by the response date, it will be assumed that you have no comment to make.

The statutory period allowed for a consultation response is 14 days. Due to scheduling pressures if a definitive response is not received within 21 days this may well cause the two month determination period to be exceeded.

Please respond using the attached form:-

MORAY COUNCIL

PLANNING CONSULTATION RESPONSE

From: Contaminated Land

Planning Application Ref. No: 17/01546/APP
Install a Orenda 49kw wind turbine [33.47m high to blade tip, rotor diameter 18.9m] at Land At Mains Of Pitlurg Keith Moray AB55 5PJ for Orenda Energy Solutions

I have the following comments to make on the application:-

		Please x
(a)	I OBJECT to the application for the reason(s) as stated below	❑
(b)	I have NO OBJECTIONS to the application and have no condition(s) and/or comment(s) to make on the proposal	x
(c)	I have NO OBJECTIONS to the application subject to condition(s) and/or comment(s) about the proposal as set out below	❑
(d)	Further information is required in order to consider the application as set out below	❑

Reason(s) for objection

Condition(s)

Further comment(s) to be passed to applicant

Further information required to consider the application

Contact: Adrian Muscutt **Date: 20 October 2017**
email address: **Phone No ……..**
Consultee:

Return response to	**consultation.planning@moray.gov.uk**

Please note that information about the application including consultation responses and representations (whether in support or objection) received on the proposal will be published on the Council's website at http://public.moray.gov.uk/eplanning/ (You can also use this site to track progress of the application and view details of any consultation responses and representations (whether in support or objection) received on the proposal). In order to comply with the Data Protection Act, personal information including signatures, personal telephone and email details will be removed prior to publication using "redaction" software to avoid (or mask) the display of such information. Where appropriate other "sensitive" information within documents will also be removed prior to publication online.

Consultation Request Notification – Development Plans

Planning Authority Name	**The Moray Council**
Response Date	**1st November 2017**
Planning Authority Reference	**17/01546/APP**
Nature of Proposal (Description)	**Install a Orenda 49kw wind turbine [33.47m high to blade tip, rotor diameter 18.9m] at**
Site	**Land At Mains Of Pitlurg Keith Moray AB55 5PJ**
Site Postcode	**N/A**
Site Gazetteer UPRN	**000133046358**
Proposal Location Easting	**343229**
Proposal Location Northing	**845608**
Area of application site (Ha)	**1000 m2**
Additional Comments	
Development Hierarchy Level	**LOCAL**
Supporting Documentation URL	http://public.moray.gov.uk/eplanning/centralDistribution.do?caseType=Application&keyVal=OXC62UBGLRV00
Previous Application	
Date of Consultation	**18th October 2017**
Is this a re-consultation of an existing application?	**No**
Applicant Name	**Orenda Energy Solutions**
Applicant Organisation Name	
Applicant Address	**Per Agent**
Agent Name	**AE Associates**
Agent Organisation Name	
Agent Address	**Cameron House 26 Cupar Road Auchtermuchty Fife KY14 7DD**
Agent Phone Number	
Agent Email Address	**N/A**
Case Officer	**Richard Smith**
Case Officer Phone number	**01343 563256**
Case Officer email address	**richard.smith@moray.gov.uk**
PA Response To	**consultation.planning@moray.gov.uk**

NOTE:
If you do not respond by the response date, it will be assumed that you have no comment to make.

The statutory period allowed for a consultation response is 14 days. Due to scheduling pressures if a definitive response is not received within 21 days this may well cause the two month determination period to be exceeded.

Please respond using the attached form:-

PLEASE COMPLETE AND RETURN WITHIN 48 HOURS
to consultation.planning@moray .gov.uk

MORAY COUNCIL
PLANNING CONSULTATION RESPONSE

From: Development Plans

Planning Application Ref. No: 17/01546/APP
Install a Orenda 49kw wind turbine [33.47m high to blade tip, rotor diameter 18.9m] at Land At Mains Of Pitlurg Keith Moray AB55 5PJ for Orenda Energy Solutions

Ward: 02_17 Keith And Cullen

DETERMINATION - DEPARTURE FROM DEVELOPMENT PLAN

(For Structure/Local Plan Comment)

		Page No	Policy No(s)	Yes	No
1	**Departure from Moray Local Development Plan 2015**		E1 *Natura 2000 Sites and National Nature Conservation Sites*		X
			ER1 *Renewable Energy Proposals*	X	
			BE1 *Scheduled Monuments and National Designations*		X
			Moray Onshore Wind Energy Guidance 2017	X	
			Moray Wind Energy Landscape Capacity Study 2017	X	
2	**Further Discussion Required**				

REASONING FOR THIS DECISION:

The proposal is to install an Orenda 49kw wind turbine [33.47m high to blade tip, rotor diameter 18.9m] at Land at Mains of Pitlurg, Keith.

Policy ER1 *Renewable Energy Proposals*

The proposal is subject to Policy ER1 *Renewable Energy Proposals* which states that the policy should be read in conjunction with the Moray Onshore Wind Energy Policy Guidance 2013 and the Moray Wind Energy Landscape Capacity Study 2012. Both documents have been revised and adopted as of 1 November 2017.

With reference to the Spatial Framework within the Moray Local Development Plan 2015 and Moray Onshore Wind Energy Policy Guidance 2017, this identifies potential for wind farm development under the terms of paragraph 161 of the Scottish Planning Policy (SPP). The proposed site is within an area likely to be most appropriate for onshore windfarms. However, this framework only applies to proposals over 35 metres to tip.

Policy ER1 further states that additional detail on the assessment process will be addressed through Supplementary Guidance to include detailed mapping of constraints and guidance on areas with the greatest potential for small-medium, medium and large scale wind farms.

The Moray Onshore Wind Energy Policy Guidance and Landscape Capacity Study 2017 were prepared to identify areas with the greatest potential for wind turbine development however there is no mapping for small scale turbines (20-35m high).

Landscape Capacity

The site is located within Landscape Character Type (LCT) 8 ‘Upland Farmland’ as identified in the Moray Wind Energy Landscape Capacity Study 2017. This landscape has a simple land cover of large fields of pasture and some arable land. Small geometric coniferous shelterbelts and woods pattern the farmland although it generally has an open and simple pattern.

Within this LCT, there is medium-low sensitivity for small typology turbines (20-35m high). Whilst this size of turbine would have less of an impact on the scale of small farms and houses, the position of the turbine is located in the middle of an open agricultural field, unrelated to other turbines, relatively high on a sloping ridgeline, with no features - such as woodland and buildings - to reduce the scale of the proposed turbine on the landscape.

Cumulative Impact

The Moray Wind Energy Landscape Capacity Study 2017 states that turbines of the size proposed should avoid being sited close to operational/consented wind farms and large turbines. The constructed Edintore Wind Farm, which consists of 6 turbines each at height of 125m, is the closest wind farm to the proposed site at a distance of approximately 1km.

Appendix D of the Landscape Capacity Study states that the variety of potential different types of wind turbines within the landscape could lead to clutter with different styles, sizes of structures and speeds of blade movement dotted across the landscape. Along the B9115, there are already a number of consented wind farms and turbines within the vicinity of the proposed site, varying in type and size (heights ranging from 19.25m to 125m). Therefore, the addition of the proposed turbine would have an unacceptable cumulative visual and landscape impact to the detriment of the surrounding area.

In respect of the visual montage, it should be noted that the selected viewpoints can be deemed "conservative" as the impact of the proposal will be significantly different from a nearby position or at different times of the year. For example, from Position A, the proposal is screened by trees; this will not however be the case when the trees have shed their leaves. Position C shows the turbine slightly visible about the trees from a relatively low part of the B9115. Had the picture been taken slightly further west on the B9115, the proposal would be significantly more prominent.

Policy E1 ***Natura 2000 Sites and National Nature Conservation Sites***

The proposal must show that it will not have any adverse effects on any environmental designations, such as sites which are designated due to their national and/or local importance.

Scottish Natural Heritage (SNH) has stated that the proposal will have no impact on the Den of Pitlurg Site of Special Scientific Interest (SSSI) which lies immediately south of the proposed site.

Policy BE1 ***Scheduled Monuments and National Designations***

The proposal must ensure that any development does not take place in a location likely to have a negative impact on a scheduled building or monument, a national or local designation, a listed building or any sites of archaeological importance.

The proposed site occupies an area in proximity to the remains of the 16th Century Pitlurg Castle and Aberdeenshire Council's Archaeology Service has sought a condition for an archaeological watching brief during any groundbreaking and development works due to the potential for previously unrecorded archaeology to survive in this area.

Conclusion

The proposal would be unacceptably prominent in this location, with no features, such as woodland and buildings, present to mitigate the visual impact on the landscape. The addition of this turbine would have an unacceptable cumulative visual and landscape impact with other wind farms/turbines in the vicinity to the detriment of the landscape character of the surrounding area.

Contact: Darren Westmacott **Date: 08 November 2017**
Email Address: darren.westmacott@moray.gov.uk **Phone No: 01343 563358**
Consultee: Development Plans

Return response to	**consultation.planning@moray.gov.uk**

Please note that information about the application including consultation responses and representations (whether in support or objection) received on the proposal will be published on the Council's website at http://public.moray.gov.uk/eplanning/ (You can also use this site to track progress of the application and view details of any consultation responses and representations (whether in support or objection) received on the proposal). In order to comply with the Data Protection Act, personal information including signatures, personal telephone and email details will be removed prior to publication using "redaction" software to avoid (or mask) the display of such information. Where appropriate other "sensitive" information within documents will also be removed prior to publication online.

Consultation Request Notification

Planning Authority Name	**The Moray Council**
Response Date	**1st November 2017**
Planning Authority Reference	**17/01546/APP**
Nature of Proposal (Description)	**Install a Orenda 49kw wind turbine [33.47m high to blade tip, rotor diameter 18.9m] at**
Site	**Land At Mains Of Pitlurg** **Keith** **Moray** **AB55 5PJ**
Site Postcode	**N/A**
Site Gazetteer UPRN	**000133046358**
Proposal Location Easting	**343229**
Proposal Location Northing	**845608**
Area of application site (Ha)	**1000 m^2**
Additional Comment	
Development Hierarchy Level	**LOCAL**
Supporting Documentation URL	http://public.moray.gov.uk/eplanning/centralDistribution.do?caseType=Application&keyVal=OXC62UBGLRV00
Previous Application	
Date of Consultation	**18th October 2017**
Is this a re-consultation of an existing application?	**No**
Applicant Name	**Orenda Energy Solutions**
Applicant Organisation Name	
Applicant Address	**Per Agent**
Agent Name	**AE Associates**
Agent Organisation Name	
Agent Address	**Cameron House** **26 Cupar Road** **Auchtermuchty** **Fife** **KY14 7DD**
Agent Phone Number	
Agent Email Address	**N/A**
Case Officer	**Richard Smith**
Case Officer Phone number	**01343 563256**
Case Officer email address	**richard.smith@moray.gov.uk**
PA Response To	**consultation.planning@moray.gov.uk**

NOTE:
If you do not respond by the response date, it will be assumed that you have no comment to make.

The statutory period allowed for a consultation response is 14 days. Due to scheduling pressures if a definitive response is not received within 21 days this may well cause the two month determination period to be exceeded.

Please respond using the attached form:-

MORAY COUNCIL

PLANNING CONSULTATION RESPONSE

From: Environmental Health Manager

Planning Application Ref. No: 17/01546/APP
Install a Orenda 49kw wind turbine [33.47m high to blade tip, rotor diameter 18.9m] at Land At Mains Of Pitlurg Keith Moray AB55 5PJ for Orenda Energy Solutions

I have the following comments to make on the application:-

		Please x
(a)	I OBJECT to the application for the reason(s) as stated below	❑
(b)	I have NO OBJECTIONS to the application and have no condition(s) and/or comment(s) to make on the proposal	❑
(c)	I have NO OBJECTIONS to the application subject to condition(s) and/or comment(s) about the proposal as set out below	☒
(d)	Further information is required in order to consider the application as set out below	❑

Condition(s)

1. *This permission relates solely to the installation of an Orenda Skye 49 kw wind turbine model, as detailed within the supporting documents accompanying this application, unless otherwise agreed by the Planning Authority.*

2. *The rating level of noise emissions from the turbine (including the application of any tonal and amplitude modulation (AM) penalty), shall not exceed that stated in the table below (see attached).*

Location		**Standardised Wind Speed at 10m height in m/s averaged over 10 minute periods, Sound Pressure Levels in dB, $L_{A90\ 10min}$**						
Property Name	**Map Ref**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Little Pitlurg	Easting 343, 721 Northing 845, 741	29.7	31.6	35	35	35	35	35
Note: for all properties not specified above the predicted noise from the turbine will be calculated using the propagation model in ISO 9613-Part 2 incorporating the recommendations contained in the Institute of Acoustics Good Practice Guide dated May 2013.								

3. *At the reasonable request of the Planning Authority, following a complaint to The Moray Council relating to noise emission from the Wind Turbine, the wind turbine operator shall measure at its own expense the level of noise emissions from the Wind Turbine (inclusive of existing background noise) using an LA90 index over a minimum of 20 periods each of 10 minutes duration. At least 10 of the periods of measurement shall be made at wind speeds between wind speed specified by the Council and a wind speed not less than 2*

metres per second below that specified by the Council. Measurements of noise emissions shall, as far as is practically possible, be made in consecutive 10 minute periods provided that they fall within the wind speed range defined in this condition.

The LA90, 10min noise level from the wind turbine (inclusive of existing background noise) shall be correlated with wind speed and derived using a Best Fit Curve and, where appropriate, allowing for a correction for the influence of the background noise level as described on page 88 of the ETSU-R-97 document, which will necessitate measurement of the background noise level in the absence of the turbine operating. Measured wind turbine noise levels and background noise levels shall be referenced to standardised 10 metre height wind speeds. The measurement procedures, which may include filtering data according to wind direction, shall be agreed with the Planning Authority prior to commencement.

Where considered appropriate by The Planning Authority the wind turbine operator will be required to carry out an assessment for tonal noise in accordance with the procedure recommended in Chapter 6 of the document "The Assessment and Rating of Noise from Wind Farms (ETSU-R-97)" i.e. the procedure based on the Joint Nordic Method. Where the tone level above audibility is greater than 2dB a tonal penalty shall be applied to permitted noise levels, in accordance with figure 16 of the document; so that the permitted levels specified in Condition 2 above will be reduced by the tonal penalty.

Where considered necessary by the Planning Authority, an assessment of amplitude modulation wind turbine noise shall be carried out in accordance with the terms specified by the Planning Authority, and at the expense of the Wind Turbine Operator.

4. *Measurements made in accordance with the provisions of conditions in order to demonstrate compliance with the requirements of Condition 2 shall be correlated with wind speeds. The locations of monitoring shall be determined by or agreed with the Planning Authority.*

5. *At the request of the Planning Authority, following a complaint relating to shadow flicker the Wind Turbine Operator shall investigate and instigate appropriate mitigation measures to minimise the effects of shadow flicker.*

INFORMATIVE

Noise Measurement procedure and Interpretation

"Wind Turbine Noise Level" means the rated noise level due to the wind turbine as detailed in the relevant noise condition associated with this consent, excluding existing background noise level but including any tonal penalty incurred under the methodology described in ETSU-R-9,as well as any penalty for amplitude modulation referred to in conditions 2 and 3 above. Background noise levels and turbine noise levels shall be determined separately for daytime, quiet daytime and night hours.

"Background Noise Level" means the noise level in the absence of wind turbine noise and generated by the regression analysis (linear up to 4 th order polynomials, depending on the nature of the environment) .

"Wind Speeds" means wind speeds standardised to a height of 10 meters above ground level, unless otherwise agreed with the Planning Authority.

"Night Hours" means 23:00 – 07:00 hours on all days.

"Quiet Daytime hours" means 18:00 – 23:00 Monday to Friday, 13:00 – 23:00 Saturday and 07:00 – 23:00 Sunday.

"Daytime Hours" means 07:00 –18:00 Monday to Friday, and 07:00 to 13:00 Saturday.

Measurements shall be made using a measurement system at the complainant's property, using a sound level meter of EN 60651/BS EN 60804 Type 1, or BS EN 61672 Class 1 quality, (or the equivalent UK adopted standard in force at the time of the measurements) set to measure using the fast time weighted response as defined in the above standards. The microphone should be mounted at 1.2 – 1.5 metres above ground level, fitted with a two-layer windshield or suitable equivalent approved in writing by the Planning Authority, and placed outside the complainant's dwelling. Measurements should be made in "free field" conditions. To achieve this, the microphone should be placed at least 3.5 metres away from the building façade or any reflecting surface except the ground at the suitably selected measurement location.

Contact: Douglas Caldwell **Date: 12 December 2017**
email address: douglas.caldwell@moray.gov.uk **Phone No 3355**
Consultee: Environmental Health

Return response to	**consultation.planning@moray.gov.uk**

Please note that information about the application including consultation responses and representations (whether in support or objection) received on the proposal will be published on the Council's website at http://public.moray.gov.uk/eplanning/ (You can also use this site to track progress of the application and view details of any consultation responses and representations (whether in support or objection) received on the proposal). In order to comply with the Data Protection Act, personal information including signatures, personal telephone and email details will be removed prior to publication using "redaction" software to avoid (or mask) the display of such information. Where appropriate other "sensitive" information within documents will also be removed prior to publication online.

MORAY COUNCIL

PLANNING CONSULTATION RESPONSE

From: Ian Douglas

Planning Application Ref. No: 17/01546/APP
Install a Orenda 49kw wind turbine [33.47m high to blade tip, rotor diameter 18.9m] at Land At Mains Of Pitlurg Keith Moray AB55 5PJ for Orenda Energy Solutions

I have the following comments to make on the application:-

		Please x
(a)	I OBJECT to the application for the reason(s) as stated below	❑
(b)	I have NO OBJECTIONS to the application and have no condition(s) and/or comment(s) to make on the proposal	x
(c)	I have NO OBJECTIONS to the application subject to condition(s) and/or comment(s) about the proposal as set out below	
(d)	Further information is required in order to consider the application as set out below	❑

Reason(s) for objection

Condition(s)

Further comment(s) to be passed to applicant

Further information required to consider the application

Contact:Ian M Douglas **Date23/10/17……..**

email address:ian.douglas@moray.gov.uk **Phone No**

7049……..

Defence Infrastructure Organisation

Claire Duddy
Assistant Safeguarding Officer
Ministry of Defence
Safeguarding – Wind Energy
Kingston Road
Sutton Coldfield
West Midlands B75 7RL
United Kingdom

Telephone [MOD]: +44 (0)121 311 2143
Facsimile [MOD]: +44 (0)121 311 2218
E-mail: DIOSEE-EPSSG2a1@mod.uk

Your Reference: 17/01546/APP

Our Reference:
DIO/SUT/43/10/1/10041585

Richard Smith
Planning Officer
The Moray Council

24th October 2017

Dear Mr Smith

Please quote in any correspondence: DIO 10041585

Site Name: Land at Mains of Pitlurg, Keith, Moray AB55 5PJ

Proposal: Erection of 1 Wind Turbine

Planning Application Number: 17/01546/APP

Thank you for consulting the Ministry of Defence (MOD) on the above Planning Application in your communication dated 18th October 2017.

I am writing to tell you that the MOD has no objection to the proposal.

The application is for 1 turbine at 33.45 metres to blade tip. This has been assessed using the grid references below as submitted in the planning application or in the developers' or your pro-forma.

Turbine	Easting	Northing
1	343229	845608

The principal safeguarding concern of the MOD with respect to the development of wind turbines relates to their potential to create a physical obstruction to air traffic movements and cause interference to Air Traffic Control and Air Defence radar installations.

Defence Infrastructure Organisation Safeguarding wishes to be consulted and notified of the progression of planning applications and submissions relating to this proposal to verify that it will not adversely affect defence interests.

If planning permission is granted we would like to be advised of the following prior to commencement of construction;

- the date construction starts and ends;
- the maximum height of construction equipment;
- the latitude and longitude of every turbine.

This information is vital as it will be plotted on flying charts to make sure that military aircraft avoid this area.

If the application is altered in any way we must be consulted again as even the slightest change could unacceptably affect us.

I hope this adequately explains our position on the matter. If you require further information or would like to discuss this matter further please do not hesitate to contact me.

Further information about the effects of wind turbines on MOD interests can be obtained from the following websites:

***MOD*:** https://www.gov.uk/government/publications/wind-farms-ministry-of-defence-safeguarding

Yours sincerely

Claire Duddy
Assistant Safeguarding Officer – Wind Energy
Defence Infrastructure Organisation

SAFEGUARDING SOLUTIONS TO DEFENCE NEEDS

MORAY COUNCIL
PLANNING CONSULTATION RESPONSE
From: The Moray Council, Flood Risk Management
Planning Application Ref. No: 17/01546/APP
Install a Orenda 49kw wind turbine [33.47m high to blade tip, rotor diameter 18.9m] at Land At Mains Of Pitlurg, Keith, Moray, AB55 5PJ by Orenda Energy Solutions

I have the following comments to make on the application:-

		Please x
(a)	I OBJECT to the application for the reason(s) as stated below	☐
(b)	I have NO OBJECTIONS to the application and have no condition(s) and/or comment(s) to make on the proposal	☒
(c)	I have NO OBJECTIONS to the application subject to condition(s) and/or comment(s) about the proposal as set out below	☐
(d)	Further information is required in order to consider the application as set out below	☐

Reason(s) for objection

Conditions(s)

Further comments(s) to be passed to applicant

Further information required to consider the application

Contact: Kenna Warren Date 24 October 2017
email address: Kenna.warren@moray.gov.uk Phone No 01343 563762
Consultee: The Moray Council, Flood Risk Management

Scottish Natural Heritage
Dualchas Nàdair na h-Alba
All of nature for all of Scotland
Nàdar air fad airson Alba air fad

Richard Smith
Planning Officer
Development Services
Environmental Services Department
The Moray Council
High Street
ELGIN
IV30 1BX

Date: 24 October 2017
Our ref: CNS/DC/MOR

Dear Richard,

Planning application consultation
Planning application ref. no. 17/01546/APP
Install a Orenda 49kw wind turbine [33.47m high to blade tip, rotor diameter 18.9m] at land at Mains Of Pitlurg, Keith, Moray AB55 5PJ

I refer to your e-planning consultation received on 18th October 2017 requesting comments from Scottish Natural Heritage (SNH) on the above application.

We advise that the proposal will have no impact on Den of Pitlurg Site of Special Scientific Interest or any other area designated nationally or international for natural heritage interests.

We agree with the findings of the ecological appraisal report and have no further comments to make.

Please let me know if you require any further information.

Yours sincerely

Shirley Reid
Operations Officer
Tayside and Grampian
shirley.reid@snh.gov.uk

Lissa Rowan

From: JRC Windfarm Coordinations <windfarms@jrc.co.uk>
Sent: 18 October 2017 12:50
To: Planning Consultation
Subject: 17/01546/APP [WF453727]

Follow Up Flag: Follow up
Flag Status: Flagged

Dear Consultation,

A Windfarms Team member has replied to your coordination request, reference **WF453727** with the following response:

Dear Sir/Madam,

Planning Ref:

17/01546/APP

Name/Location:

Land at mains of Pitlurg, Moray

Site Centre/Turbine at NGR:

343229 845608

Development Radius:

01.km

Hub Height: *24m* ***Rotor Radius:*** *9.5m*

This proposal ***cleared*** *with respect to radio link infrastructure operated by:*

The Local Utility and Scotia Gas Networks

JRC analyses proposals for wind farms on behalf of the UK Fuel & Power Industry. This is to assess their potential to interfere with radio systems operated by utility companies in support of their regulatory operational requirements.

In the case of this proposed wind energy development, JRC does not foresee any potential problems based on known interference scenarios and the data you have provided. However, if any details of the wind farm change, particularly the disposition or scale of any turbine(s), it will be necessary to re-evaluate the proposal.

In making this judgement, JRC has used its best endeavours with the available data, although we recognise that there may be effects which are as yet unknown or inadequately predicted. JRC cannot therefore be held liable if subsequently problems arise that we have not predicted.

It should be noted that this clearance pertains only to the date of its issue. As the use of the spectrum is

dynamic, the use of the band is changing on an ongoing basis and consequently,developers are advised to seek re-coordination prior to considering any design changes.

Regards

Wind Farm Team

The Joint Radio Company Limited
Dean Bradley House,
52 Horseferry Road,
LONDON SW1P 2AF
United Kingdom

Office: 020 7706 5199

JRC Ltd. is a Joint Venture between the Energy Networks Association (on behalf of the UK Energy Industries) and National Grid.
Registered in England & Wales: 2990041
http://www.jrc.co.uk/about-us

We hope this response has sufficiently answered your query.
If not, please **do not send another email** as you will go back to the end of the mail queue, which is not what you or we need. Instead, **reply to this email keeping the subject line intact or login to your account** for access to your coordination requests and responses.

https://breeze.jrc.co.uk/tickets/view.php?auth=o1xceaqaacafaaaaBvTFgGbvUNMG4w%3D%3D

Lissa Rowan

From: ALLEN, Sarah J <Sarah.ALLEN@nats.co.uk> on behalf of NATS Safeguarding <gmb-bdn-000913@nats.co.uk>
Sent: 24 October 2017 11:18
To: Planning Consultation
Subject: Your Ref: 17/01546/APP (Our Ref: SG25296)

The proposed development has been examined from a technical safeguarding aspect and does not conflict with our safeguarding criteria. Accordingly, NATS (En Route) Public Limited Company ("NERL") has no safeguarding objection to the proposal.

However, please be aware that this response applies specifically to the above consultation and only reflects the position of NATS (that is responsible for the management of en route air traffic) based on the information supplied at the time of this application. This letter does not provide any indication of the position of any other party, whether they be an airport, airspace user or otherwise. It remains your responsibility to ensure that all the appropriate consultees are properly consulted.

If any changes are proposed to the information supplied to NATS in regard to this application which become the basis of a revised, amended or further application for approval, then as a statutory consultee NERL requires that it be further consulted on any such changes prior to any planning permission or any consent being granted.

Yours Faithfully

NATS

NATS Safeguarding

D: 01489 444687
E: natssafeguarding@nats.co.uk

4000 Parkway, Whiteley,
Fareham, Hants PO15 7FL
www.nats.co.uk

Lissa Rowan

From: Windfarms <windfarms@atkinsglobal.com>
Sent: 19 October 2017 11:00
To: Planning Consultation
Cc: Windfarms-radiotelemetry@scottishwater.co.uk
Subject: WF 32673 - 17/01546/APP - Land At Mains Of Pitlurg, Keith, Moray - NJ 43229 45608

Follow Up Flag: Follow up
Flag Status: Flagged

Dear Sirs,

I am responding to an email of 18/10/2017, regarding the above named proposed development.

The above application has now been examined in relation to UHF Radio Scanning Telemetry communications used by our Client in that region and we are happy to inform you that we have NO OBJECTION to your proposal.

Please note that this is **not** in relation to any Microwave Links operated by Scottish Water

Atkins Limited is responsible for providing Wind Farm/Turbine support services to TAUWI.

Windfarm Support
ATKINS
The official engineering design services provider
for the London 2012 Olympic and Paralympic Games
Web: www.atkinsglobal.com/communications

Aberdeen International Airport

Aberdeen International Airport Limited
Dyce, Aberdeen
AB21 7DU
Scotland

T: +44 (0)870 040 0006
W: aberdeenairport.com

FAO Richard Smith
Moray Council

Via Email

ABZ Ref: ABZ2690

16th November 2017

Dear Richard

Ref: 17/01546/APP Install a Orenda 49kw wind turbine [33.47m high to blade tip, rotor diameter 18.9m] at at Land At Mains Of Pitlurg Keith Moray

I write in relation to the above application. The proposed development has been examined from an aerodrome safeguarding perspective and does not conflict with safeguarding criteria. We, therefore, have no objection to this proposal.

Yours Sincerely

[redacted]

Kirsteen MacDonald

Safeguarding Manager
Aberdeen Airport
07808 115 881
abzsafeguard@aiairport.com

REPORT OF HANDLING

Ref No:	17/01546/APP	**Officer:**	Richard Smith
Proposal Description/ Address	Install a Orenda 49kw wind turbine [33.47m high to blade tip, rotor diameter 18.9m] at Land At Mains Of Pitlurg Keith Moray AB55 5PJ		
Date:	14/12/17	**Typist Initials:**	FJA

RECOMMENDATION		
Approve, without or with condition(s) listed below		
Refuse, subject to reason(s) listed below		**Y**
Legal Agreement required e.g. S,75		
Notification to Scottish Ministers/Historic Scotland		
Hearing requirements	**Departure**	
	Pre-determination	

CONSULTATIONS		
Consultee	**Date Returned**	**Summary of Response**
Development Plans (Environment)	08/12/17	Proposal contrary to policy and supplementary guidance on wind energy.
Environmental Protection Manager	23/10/17	No objection.
Moray Access Manager		No response.
Environmental Health Manager	12/12/17	No objection subject to conditions regarding wind turbine model, noise levels and shadow flicker.
Contaminated Land	20/10/17	No objection.
Moray Flood Risk Management	24/10/17	No objection.
Transportation Manager	26/10/17	No objection
MOD Safeguarding - Wind	24/10/17	No objection.
Atkins Global	19/10/17	No objection.
JRC - Windfarms	18/10/17	No objection.
National Air Traffic Systems Limited	24/10/17	No safeguarding objection.
BAA Aerodrome Safeguarding	16/11/17	No objection.
Ofcom		No response.
Strathisla Community Council		No response.
Aberdeenshire Council Archaeology Service	20/10/17	No objection subject to condition requiring watching brief.
Scottish Natural Heritage	24/10/17	No objection.

DEVELOPMENT PLAN POLICY		
Policies	**Dep**	**Any Comments (or refer to Observations below)**
PP1: Sustainable Economic Growth	Y	
PP2: Climate Change		
ER1: Renewable Energy Proposals	Y	
E1: Natura 2000 and Natural Cons Sites		
E2: Loc Nature Cons Sites & Biodiversity		
E3: Protected Species		
BE1: Sch Monuments and Nat Designations		
BE2: Listed Buildings		
EP6: Waterbodies		
EP8: Pollution		
EP9: Contaminated Land		
EP13: MoD Safeguarding Areas		
T2: Provision of Access		
T5: Parking Standards		
T7: Safe & Promo Walk, Cycling & Equest		
IMP1: Developer Requirements	Y	
IMP2: Development Impact Assessments		

REPRESENTATIONS		
Representations Received		NO
Total number of representations received		
Names/Addresses of parties submitting representations		
Summary and Assessment of main issues raised by representations		
Issue:		
Comments (PO):		

OBSERVATIONS – ASSESSMENT OF PROPOSAL

The Proposal

- This application seeks planning permission for the erection of a single Orenda 49kW wind turbine at land at Mains of Pitlurg, Keith.
- The turbine is a three bladed model, with a rotor diameter of 18.9m and a base to blade tip height of 33.47m.
- Associated works include the construction of concrete foundations for the mast and installation

of underground cabling to transfer power to the grid.

- The turbine model includes a hydraulic tower which is raised from the ground without the need for crane, and therefore there is no requirement for the creation of a permanent access track
- Permission is sought for 20 years from first generation of electricity, after which turbine will be removed and the site restored.

The Site and Surrounding Area

- The turbine would be sited on farmland 490m to the east of Mains of Pitlurg farm, 4.5km to the south of Keith. It would occupy an open position on a sloping ridgeline and would be visible from the surrounding countryside and road network (B9115 to the north/west/east, and an unclassified minor road to the south).
- The operational Edintore wind farm comprising 6 turbines with a height of 125m lies 1km to the north.
- The site is not located within any landscape designation as defined in the Moray Local Development Plan 2015. The Den of Pitlurg SSSI lies approximately 300 to the south of the site.
- The nearest residential properties, with the exception of Mains of Pitlurg (which has a financial involvement), are Little Pitlurg 450m to the west, Rinnes View 450m to the north and Taber-Chalich 560m to the northwest.

History for the Site

None.

History for Wider Area

10/02092/EIA Planning approval (allowed on appeal) for windfarm comprising of 6 wind turbines (125m in height total capacity up to 21mw) at Edintore, Keith. This is operational and lies approximately 1km to the northwest of the current proposal.

11/00463/APP Planning approval for a 20kW wind turbine (27m to tip) at Whitehillock, Keith. This is erected and located 1.1km to the east.

10/01507/APP Planning approval for a 15kW wind turbine (18.8m to tip) at Drumgrain, Keith. This is erected and located 1.9km to the west.

09/01014/FUL Planning approval for a 20kW wind turbine (17m to tip) at Edintore Farm, Keith. Although this was erected following approval and located 900km to the northwest, it has since been removed.

11/00436/APP Planning approval for a 15kW wind turbine (19.25m to tip) at Mill of Towie Farm, Keith. This is erected and lies 1.3km to the northwest.

Appraisal

Section 25 of the 1997 Act as amended requires applications to be determined in accordance with the development plan i.e. the adopted Moray Local Development Plan 2015 (MLDP) unless material considerations indicate otherwise.

The main planning issues are considered below.

Planning Policy Context

The Moray Local Development Plan 2015

The main planning policies and policy guidance to consider the proposal against are;

- Policies ER1 Renewable Energy Proposals, PP1 Sustainable Economic Growth, PP2 Climate Change and IMP1 Developer Requirements;
- The Moray Wind Energy Landscape Capacity Study (MWELCS) 2017, a technical appendix to MOWE, but also approved as a material consideration in its own right;
- The Moray Onshore Wind Energy Policy Guidance (MOWE) 2017, which is statutory supplementary guidance.

Policies PP1 Sustainable Economic Growth and PP2 Climate Change support development which contributes to the delivery of sustainable economic growth and the transition of Moray towards a low carbon economy where the quality of the natural and built environment is safeguarded.

Policy ER1 states that all renewable energy proposals will be considered favourably where they meet set criteria (i.e. safeguard the built and natural environment and avoid or address any unacceptable significant adverse impacts) and accord with the Spatial Framework as defined in the policy, SPP and the Council's Moray Onshore Wind Energy Guidance (MOWE) 2013 and Moray Wind Energy Landscape Capacity Study (MWELCS) 2012. Both the MOWE and MWELCS have been revised and were adopted on 1st November 2017, and are key material considerations in assessing wind turbine proposals. These provide detailed guidance and information requirements for assessing planning applications.

The MWELCS (and MOWE) identify a number of distinct landscape character types and consider the capacity of accommodating each of the identified typologies of wind turbine (based on the overall height of turbine) in each landscape character area using various sensitivity criteria. In this case, the proposed turbine at 33.47m is small typology turbine (of which there are five based on height) and lies within the Landscape Character Type 8 'Upland Farmland', where there are considered to be increased opportunities to accommodate turbines between 20-35m provided these do not give rise to unacceptable landscape, visual, cumulative or other adverse impacts and are not sited close to operational/consented wind farms and large turbines.

The Spatial Framework within the MLDP 2015 and the MOWE Guidance 2017 identifies 'Areas with Potential' for wind farm development under the terms of paragraph 161 of the Scottish Planning Policy (SPP). The current proposal lies within an area likely to be the most appropriate for onshore windfarms (Map 19 of MOWE refers) however this framework only applies to proposals over 35 metres to tip. Policy ER1 further states that additional detail on the assessment process will be addressed through Supplementary Guidance to include detailed mapping of constraints and guidance on areas with the greatest potential for small-medium, medium and large typologies. This is detailed within the new MOWE Policy Guidance and MWELCS 2017, however does not include specific mapping for small typology turbines (20-35m high).

Policy IMP1 Developer Requirements requires new development to be sensitively sited, designed and serviced appropriate to the amenity of the area. The policy requires proposals to have a scale, density and character that reflects the surrounding area and integrates with the surrounding landscape.

Other Policy Considerations

The international, EU, UK and Scottish policy frameworks are all generally supportive of renewable energy developments, including electricity generation from on-shore wind developments, the main

driver being to reduce greenhouse gas emissions and dependence on fossil fuels (to combat climate change) and to fill the resultant energy gap with low carbon alternatives.

National Planning Framework 3 (NPF3) and Scottish Planning Policy (2014) (SPP)
NPF3 identifies the need for a transition towards a low carbon economy, and the need to capitalise on renewable energy resources including onshore wind, whilst SPP 2014 sets out spatial frameworks to guide new wind energy development to appropriate locations.

SPP states a policy presumption in favour of development that contributes to sustainable development and that the planning system should support economically, environmentally and socially sustainable places by enabling development that balances the costs and benefits of a proposal over the longer-term. The aim is to achieve the right development in the right place: it is not to allow development at any cost (para. 28 refers). In this latter respect the relevant (and up-to-date) development plan policies and related guidance are key considerations. Policy PP2 in the Moray Development Plan 2015 is consistent with NPF3, but does not override the landscape impact issues considered below.

Scottish Government's web-based renewables advice on onshore wind turbines (up-dated 2014) highlights the need for a spatial framework and consideration of various criteria to be assessed in the determination of wind turbine proposals including consideration of the ability of the landscape to absorb the development and all other potential impacts.

Landscape, Visual and Cumulative Impacts (ER1, MOWE and MLCS, PP1, PP2 and IMP1)

The proposal site falls within Landscape Character Type (LCT) 8 'Upland Farmland', as defined in the Moray Wind Energy Landscape Capacity Study 2017. This landscape has a simple land cover of large fields of pasture with some arable land predominantly enclosed by post and wire fencing. Small geometric coniferous shelterbelts and woods pattern the farmland although it generally has an open and simple pattern. The rural settlement pattern is one of an even distribution of farms across this extensive area, accessed by a close network of minor roads.

Within this LCT, the MWELCS advises that there is medium-low sensitivity for small typology turbines (20-35m high) and that the simple, gently undulating landform and overall medium scale of the landscape could best relate to the size of smaller typologies. In this case whilst a turbine of the height proposed would normally 'fit' with the scale of the landscape and surrounding farm buildings, the current proposal would appear as an unduly prominent feature in the landscape due to its open position within the central area of a field, unrelated to other turbines, on a sloping ridgeline with no adjacent features (such as woodland and/or buildings) to mitigate its scale and impact. As such the proposal would fail to integrate sensitively with the landscape and would give rise to unacceptable adverse visual and landscape character impacts contrary to policy PP1, ER1, IMP1, MOWE and MWELCS guidance.

With regard to potential cumulative issues the MWELCS outlines a number of constraints which affect this particular LCT when assessing wind turbine proposals; these include amongst others cumulative effects with larger turbines and the potential cumulative landscape and visual effects associated with multiple developments that could exacerbate visual clutter around Keith. In this regard the MWELCS specifically states that small typology turbines should avoid being sited close to operational and consented wind farms and large turbines. The current proposed turbine would be located within close proximity to the operational Edintore Wind Farm of six turbines 125m high situated on Cairds Hill to the north, with the closest turbine being 1km distant and would contrast directly and be seen in close juxtaposition with these larger turbines, causing confusion and visual clutter in the landscape. This would be experienced principally from the nearby B9115 road (in views from the north/southwest/east) and other minor roads and settlement in the surrounding area.

The MWELCS at Appendix D provides further guidance on this matter, highlighting the visual clutter

effects that occur when different types of wind turbine are erected across the landscape with differing styles, sizes of structures and speeds of blade movement. The introduction of the proposed turbine into this area alongside the adjacent wind farm (and other smaller turbines in the area) would result in unacceptable cumulative visual impacts and clutter which would be detrimental to the existing character of the landscape and surrounding area, contrary to policy PP1, ER1, IMP1, MOWE and MWELCS guidance.

Cultural Heritage and Archaeology (ER1, BE1, BE2, IMP1)

The proposed site occupies an area in proximity to the remains of the 16th Century Pitlurg Castle. Aberdeenshire Council's Archaeology Service has requested imposition of a condition requiring implementation of an archaeological watching brief during any groundbreaking and development works due to the potential for previously unrecorded archaeology to survive in this area.

The turbine is sufficiently distant from all other built heritage or cultural features within the wider area.

Ecology (ER1, E1, E2, E3, IMP1)

The works to construct the turbine and cabling would be on agricultural land which has low bio diversity value. An Ecological Appraisal Report submitted with the application provides information in relation to various species within the area, and concludes that the proposal should have no damaging impact upon these species or habitats. Scottish Natural Heritage (SNH) has reviewed this report and is satisfied with its findings and recommendations; had the application been recommended for approval adherence to the various recommendations of the report would have been subject of a planning condition.

The Den of Pitlurg Site of Special Scientific Interest (designated for its biological interest) lies approximately 300m to the south of the proposed turbine. There are no other environmental designations in close proximity. SNH has advised that the proposal will have no impact on this or any other area designated nationally or international for natural heritage interests.

Noise and Shadow flicker (ER1, EP8 and IMP1)

The Environmental Health Manager has been consulted regarding the potential for noise or shadow flicker nuisance from the wind turbine on neighbouring properties, and following assessment of submitted noise data has raised no objection to the application subject to conditions specifying the approved turbine model and controlling noise and shadow flicker impacts.

Guidance contained within the Moray Onshore Wind Energy Policy Guidance 2017 outlines that small/medium turbines should be a minimum of 10 rotor diameters or 200m from neighbouring houses. In this case 10 rotor diameters equates to 189m. The nearest house, Little Pitlurg lies 450m to the west both beyond this and the 200m distance indicating that there would be little or no impact.

Access (T2)

The Transportation Manager notes that the size of the turbine components would enable delivery via a standard sized Heavy Goods Vehicle, a size of vehicle which would already access the existing farm and as such has raised no objection to the proposal.

Tourism/recreation interests:

The turbine will not affect any designated landscapes or recreational areas and as such, it is considered that any effect on tourism or recreation interests will be minimal.

Electromagnetic interference (ER1)

Although Offcom has not responded to this application other relevant bodies including JRC and Atkins Global have confirmed no likely impact on services in terms of electromagnetic interference.

Had the application been recommended for approval, a condition requiring steps to be taken to rectify any interference to services or television reception of neighbouring properties would have been attached to the decision notice in the event of such interference occurring.

Aircraft Activity (ER1, EP13, IMP1)

The National Air Traffic Service (NATS), Aberdeen Airport and Ministry of Defence (MOD) have been consulted on the proposal and have raised no objection on the basis that there will be no safety risks to aircraft (i.e. physical obstruction to air traffic movements or interference to Air Traffic Control/Air Defence Radar). The MOD has requested that it be notified of start and end of works, maximum height of construction equipment and turbine location information if permission is granted.

Recommendation

In light of the above considerations the proposal is considered to represent an unacceptable form of renewable energy development which is contrary to the provisions of the development plan and is therefore recommended for refusal.

OTHER MATERIAL CONSIDERATIONS TAKEN INTO ACCOUNT

HISTORY				
Reference No.	**Description**			
	Decision		**Date Of Decision**	

ADVERT		
Advert Fee paid?	**Yes**	
Local Newspaper	**Reason for Advert**	**Date of expiry**
Banffshire Herald	No PremisesDeparture from development plan	16/11/17
PINS	No PremisesDeparture from development plan	16/11/17

DEVELOPER CONTRIBUTIONS (PGU)	
Status	**N/A**

DOCUMENTS, ASSESSMENTS etc. * ** Includes Environmental Statement, Appropriate Assessment, Design Statement, Design and Access Statement, RIA, TA, NIA, FRA etc*		
Supporting information submitted with application?	YES	
Summary of main issues raised in each statement/assessment/report		
Document Name: Supporting Statement, Visual Montage, ZTV (Zone of Theoretical Visibility) Map, Noise Assessment information, Ecological Appraisal and Designations Map. Main Issues:		

S.75 AGREEMENT		
Application subject to S.75 Agreement		NO
Summary of terms of agreement:		
Location where terms or summary of terms can be inspected:		

DIRECTION(S) MADE BY SCOTTISH MINISTERS (under DMR2008 Regs)			
Section 30	Relating to EIA		NO
Section 31	Requiring planning authority to provide information and restrict grant of planning permission		NO
Section 32	Requiring planning authority to consider the imposition of planning conditions		NO
Summary of Direction(s)			

THE MORAY COUNCIL
TOWN AND COUNTRY PLANNING (SCOTLAND) ACT 1997,
as amended

REFUSAL OF PLANNING PERMISSION

[Keith And Cullen]
Application for Planning Permission

TO Orenda Energy Solutions
c/o AE Associates
Cameron House
26 Cupar Road
Auchtermuchty
Fife
KY14 7DD

With reference to your application for planning permission under the above mentioned Act, the Council in exercise of their powers under the said Act, have decided to **REFUSE** your application for the following development:-

Install a Orenda 49kw wind turbine [33.47m high to blade tip, rotor diameter 18.9m] at Land At Mains Of Pitlurg Keith Moray AB55 5PJ

and for the reason(s) set out in the attached schedule.

Date of Notice: **14 December 2017**

[redacted]

HEAD OF DEVELOPMENT SERVICES
Environmental Services Department
The Moray Council
Council Office
High Street
ELGIN
Moray IV30 1BX

Ref: 17/01546/APP

IMPORTANT
YOUR ATTENTION IS DRAWN TO THE REASONS and NOTES BELOW

SCHEDULE OF REASON(S) FOR REFUSAL

By this Notice, the Moray Council has REFUSED this proposal. The Council's reason(s) for this decision are as follows: -

The proposal is contrary to policies PP1, ER1 and IMP1 of the Moray Local Development Plan 2015 and the Council's Moray Onshore Wind Energy Guidance (MOWE) 2017 and Moray Wind Energy Landscape Capacity Study (MWELCS) 2017 for the following reasons:

1. The proposed turbine by reason of its siting and height would appear as an unduly prominent feature in the landscape due to its position within the central area of a field, unrelated to other turbines, on a sloping ridgeline with no adjacent features (such as woodland and/or buildings) to mitigate its scale and impact. As such the proposal would fail to integrate sensitively with the landscape and would cause unacceptable adverse visual and landscape character impacts to the detriment of the landscape.

2. The proposed wind turbine taken together with the larger wind turbines at the nearby windfarm at Edintore would result in adverse cumulative landscape and visual clutter effects associated with multiple developments, which would be detrimental to the character of the surrounding area. The Moray Wind Energy Landscape Study specifically states that small typology turbines should avoid being sited close to operational/consented wind farms and large turbines. The current proposed turbine would be located within close proximity to the operational Edintore Wind Farm of six turbines 125m high situated on Cairds Hill to the north, with the closest turbine being 1km distant and would contrast directly and be seen in close juxtaposition with these larger turbines, causing confusion and visual clutter in the landscape. This would be experienced principally from the nearby B9115 (in views from the north/southwest/east) and other minor roads and settlement in the surrounding area.

3. The MWELCS (at Appendix D) further highlights the visual clutter effects that occur when different types of wind turbine are erected across the landscape with differing styles, sizes of structures and speeds of blade movement. The introduction of the proposed turbine into this area alongside the adjacent wind farm (and other smaller turbines in the wider area) would result in unacceptable cumulative visual impacts and clutter which would be detrimental to the character of the landscape and surrounding area, contrary to policy PP1, ER1, IMP1, MOWE and MWELCS guidance.

LIST OF PLANS AND DRAWINGS SHOWING THE DEVELOPMENT

The following plans and drawings form part of the decision:-

Reference	Version	Title
		Block plan
EN-404-A	A	Elevations
		Location plan
		Site location plan

DETAILS OF ANY VARIATION MADE TO ORIGINAL PROPOSAL, AS AGREED WITH APPLICANT (S.32A of 1997 ACT)

N/A

NOTICE OF APPEAL
TOWN AND COUNTRY PLANNING (SCOTLAND) ACT 1997

If the applicant is aggrieved by the decision to refuse permission for or approval required by a condition in respect of the proposed development, or to grant permission or approval subject to conditions, the applicant may require the planning authority to review the case under section 43A of the Town and Country Planning (Scotland) Act 1997 within three months from the date of this notice. The notice of review should be addressed to The Clerk, The Moray Council Local Review Body, Legal and Committee Services, Council Offices, High Street, Elgin IV30 1BX. This form is also available and can be submitted online or downloaded from www.eplanning.scotland.gov.uk

If permission to develop land is refused or granted subject to conditions and the owner of the land claims that the land has become incapable of reasonably beneficial use in its existing state and cannot be rendered capable of reasonably beneficial use by the carrying out of any development which has been or would be permitted, the owner of the land may serve on the planning authority a purchase notice requiring the purchase of the owner of the land's interest in the land in accordance with Part 5 of the Town and Country Planning (Scotland) Act 1997.