

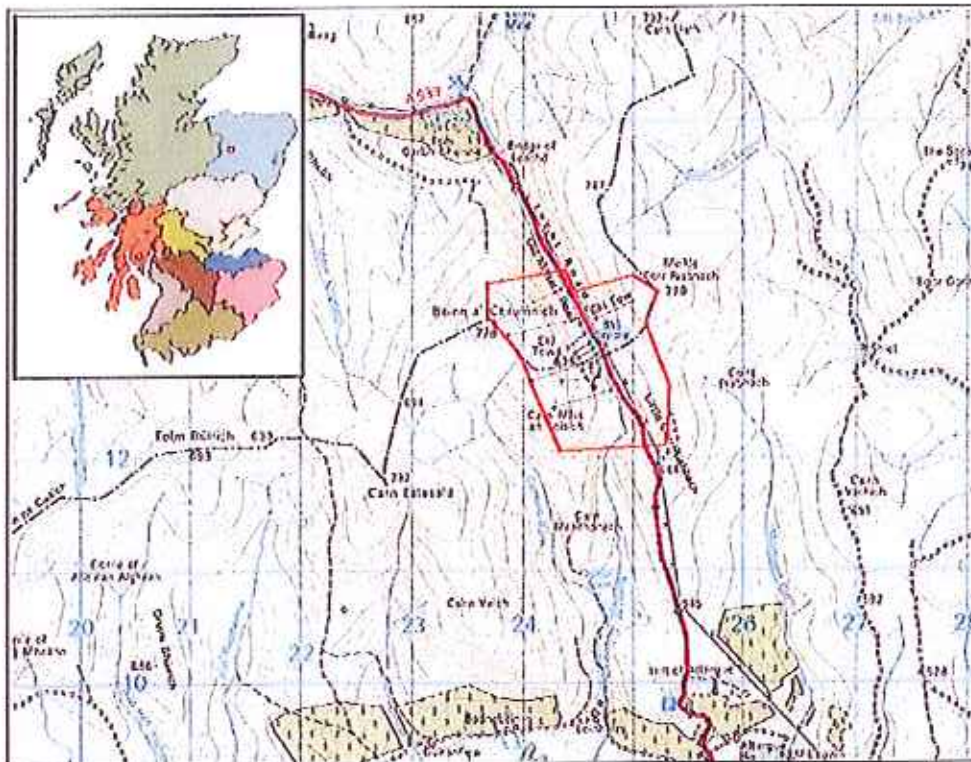
**Wind Turbine Development Overview
For Single Medium Size Turbine at
The Lecht Ski Centre
Aberdeenshire**



February 2011.

Structure

This document explains the issues involved with the planning application for installing a single medium scale wind turbine at the Lecht Ski Company (LSC) located in Strathdon within the current national grid limitations for connection. The Lecht ski Area site is shown below with site boundaries marked in red.



Lecht Ski Centre Location

The aim of this study is to provide stakeholders with an understanding of the potential for medium scale wind energy development on the site which is mainly to offset the Lecht Ski Company's own energy consumption and provide a small additional source of revenue outside the winter season. The requirement for development is primarily led by recent poor winter seasons that have put LSC under significant financial pressures. With a current annual electricity demand in excess of 460 MWh per annum the aim of this development would be to offset a proportion of grid consumption, reduce energy costs and lower energy related carbon emissions.

The project aims to preserve a valued regional facility, through the use of renewable energy, while also contributing to national and international aims of reducing CO2 emissions.

This document provides an overview of the work undertaken to date to assess the

development of wind energy at the Lecht site. This includes an environmental feasibility of a small-medium scale wind turbine.

The report will consist of the following sections:

2. Site overview – provides a brief description of the site and discusses its current and future operation and electricity demand
3. Proposed development – outlines the proposed development at the site before assessing scope of works to install the options and the associated costs
4. Planning and environmental – This summarises the main findings of the environmental section and addresses the key concerns.
5. Wind resource and turbine yield – summarises the estimated available wind resource at the site and the likely energy generation of the turbine options.

2. Site Overview.

2.1. Location

The Lecht Ski Company is located within the Cairngorms National park and provides year round outdoor activities. The site currently consists of a new visitors centre (2003-4), 12 lifts (combination of chair and drag lifts), snow making machinery and a large number of ancillary structures. There is also car parking space for up to 1,000 cars. This area leased by the LSC is highlighted in Figure 2 below. The proposed location of the single turbine has been decided by consultations with CNPA officials with regard to environmental and ornithological advice, as well as considering the practicalities of construction.



Figure 2: Land Leased by the Lecht Ski Company

2.2 Current electricity consumption

Directly offsetting a site's demand significantly improves the financial feasibility of wind energy projects due to the increased value achieved for the electricity generated. An assessment of the consumption at the Lecht shows there to be a significant seasonal demand but limited availability for exporting to the national grid during periods of excess generation. This section explains the site's current infrastructure, consumption and the availability to export generation onto the grid.

2.3 Infrastructure

The site is supplied from the grid by a single 11 kV 3-phase line which runs from Strathdon, >15km to the South (mainly overhead but with short section (3km of underground). Voltage is taken down to 3-Phase 415V by an on-site transformer. The most significant loads on the site are for the ski lifts, all run by electric motors and the snowmaking equipment when the conditions are right. 3-Phase power is fed to the 12 lifts at 415V. After line losses, power arrives at the lifts at the required 380V, therefore no further transformers are required. The lifts are fitted with soft start systems to reduce spikes in power draw during start up.

The maximum authorised capacity for the site is currently 300 kVA during the winter and 276 kVA during the summer. The site intake substation is rated at 350MVA.

2.4 Consumption

The electricity usage at the Lecht can vary considerably, depending on conditions. At full operation during the ski season, the maximum draw is approximately 300kVA. When conditions permit, the ski lifts operate during the day and the snow making equipment operates at night.

During the summer months the daytime demand is associated with the visitors centre. The night time demand is negligible,-accounting for one residential building and some freezers. Peak demands during summer months are typically 80kVA.

Electricity bills for a typical winter month show a monthly consumption of 64,650 kWh. This equates to an average load of 90kVA. A bill from a typical summer month shows a consumption of 20,370 kWh. This equates to an average load of 27kVA. The total annual consumption is approximately 466,000 kWh. This equates to an average draw of 53.2 kVA.

2.5 Export

The Distribution Network Operator (DNO) was initially contacted to gauge their opinion on the site's export potential. Preliminary discussions indicate that the network could support a generator up to 900kW with no major upgrading work requirements. Further work and modeling undertaken after the initial assessment has concluded that without upgrades the maximum capacity for export would be in the region of 140kW. The main reason for the greatly reduced low export allowance is the length of the line from the Strathdon substation to the Lecht and the voltage rise that would occur if larger export occurred. SSE have a requirement to ensure the voltage fluctuations for other consumers on the line do not exceed the allowable limits and in a worst case model (minimum demand by consumers on line) any level of export over 140kW would lead to an unacceptable voltage rise.

2.6. Electrical summary

An initial examination of The Lecht's electricity infrastructure and consumption shows that the network and demand is currently only suited for small to medium scale wind energy integration. The site's seasonal variation in demand will match the windier winter months and this means that a significant proportion of the current demand can be offset. During the summer the site demand is relatively low and a reasonable amount of electricity generated could be exported.

3. Turbine Location

3.1 Turbine site and Mitigation.

The primary criteria required to allow for the feasible installation of a small to medium scale wind turbine on this land are:

1. Wind resource – The wind resource for the Lecht area has been assessed in Section 5. Although the optimal areas were seen to be on the higher terrain on Corr Rlabhach, this was discounted primarily for ornithological reasons.
2. Minimising turbulence – This is a particular issue when buildings, woodland or steep terrain are in the way of the prevailing wind direction. The position is a compromise for these aspects.
3. Distance from residential buildings – At the Lecht site the occupant of the only domestic building also has a direct financial interest in the project.
4. Access to site – The civil work required to provide adequate access conditions is minimized with the access from the car park for construction only 40m away.
5. Avoidance of key environmental areas – The site is within the locality of the Lecht ski area. The surrounding area outside of the Lecht ski area has been given designated status including a Site of Special Scientific Interest (SSSI), Special Area of Conservation (SAC) and potential Special Protection Area (SPA), this land is highlighted in orange below in Figure 3

capacity of up to 180 kW.

4. Planning and Environmental

Of greatest concern are the landscape and visual impacts alongside potential ornithological impacts due to the proximity of habitat known to be used by protected species. The smaller scale of development now proposed reduces these concerns but is still valid to a lesser extent especially with respect to the landscape and visual impacts. This section briefly outlines these considerations.

4.1. Primary considerations

Wind turbines have a number of potential environmental and social impacts that need to be assessed. The primary concerns related to a wind development are outlined in the Table below.

Impact	Level of Impact	Potential mitigation measures
Landscape and visual	High	Reduced by being surrounded by higher hill tops
Noise	Low	Turbine selection (low noise turbines available) Turn off turbine at sensitive periods (worst case)
Ecology	Medium	Site completely within Lecht ski area
Ornithological	High	Site re-positioned away from hill tops and from sensitive areas.
Aviation	Low	Within the glen.
Television	None	
Cumulative	Low	
Soils and hydrology	Low	Site completely within Lecht ski area
Telecommunication	None	Provide re-networking of impacted links
Shadow Flicker	None	Provide screening Shut down turbine during sensitive periods
Proximity to road	None	

4.2 Landscape and Visual

Below are photos and montages of the site. The landscape photos were taken in January 2011. They show the views from the West and East sides of the valley at a height of around 680 m, the equivalent to the top tip of the turbine.



Montage of proposed turbine and the area around the turbine showing that it is not close to any ski runs.

Zone of Visual influence.

These have been done for the new location and are attached in the annex I. They show the worst case scenario as it does not take into account built structures or vegetation that may partially / completely block the view of the turbine from certain positions.

The pictures show the ZVI from both the hub height and from the blade tip height. Both are with a 5km range as well as a 5,10 and 15km ranges.

The key visual concern will be loss of visual amenity within the ski area, which is already influenced with existing ski lifts and hydro pylons.

Landscape photos are below. These are taken from the East and West of the proposed position at the same height as the tip of the turbine.

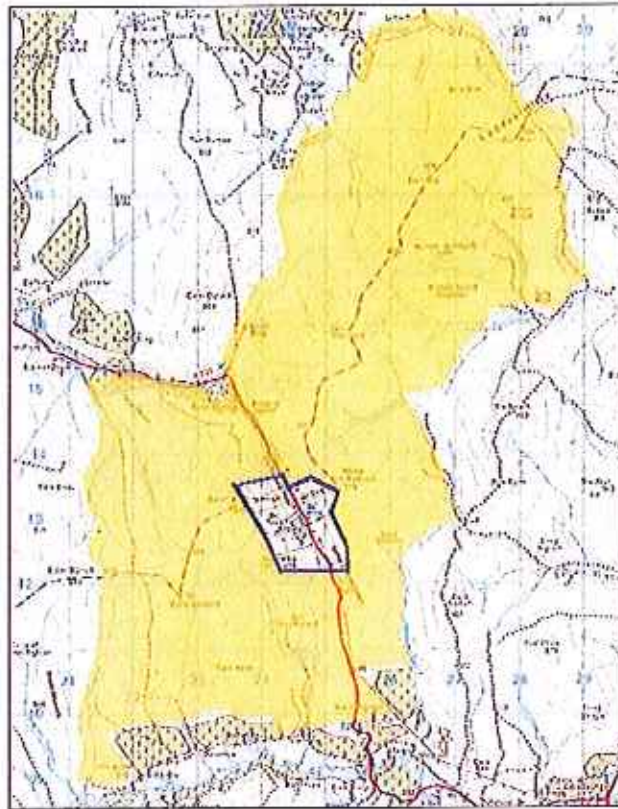


Figure 3: Lecht surrounding environmentally designated areas

6. Proximity to a grid connection point -- The electrical work required to connect from the site to the grid network, next to the existing garage, is minimized and within the ski area.
7. Avoidance of sensitive areas -- There is no disturbance of archaeological or historical sites, including stone walls and ruins of interest with this development.
8. Clearance from roads -- The required clearance distance for the turbine from the public road is well beyond the limits required by the Local Planning Authority (LPA) and the Aberdeenshire Council guidelines. This suggested a minimum distance from the road of HBT (Height to Blade Tip).
9. Suitable ground conditions -- Much of the area consists of wet heath and upland bog. There is a requirement to construct a turbine foundation, temporary suitable hard standing for the crane with a temporary access road between the car park and the site of approximately 40m.
10. Sufficient space to install turbine(s) -- The location close to the car park will give plenty of space for the assembling process of the turbine. This would include space for crane assembly (100-300t mobile crane required) and movement as well as an additional area to assemble the rotor.

3.2 Location

Details of the proposed site are below.

Position. 57 11.928N 003 14.860 W. Base at 639.78 m

Factors	
Access	Relatively simple given proximity to car park and the main public road
Connection to grid	<500m to preferred connection point
Environmental	The site is within the non-designated land Lecht 'window' so it is not directly within the Ladder hill's SSSI and SAC
Wind resource	Not as good an average as on top of the hill but will avoid the excessive winds which will stop the generation.
Visual Impact	Position within the Glen means that the ZTV will be considerably reduced through obstruction by areas of higher terrain, apart from a narrow corridor to the North and South.

3.3 Scale of development

The most suitable scale of turbine for development at the proposed site is principally dictated by the following factors:

- **Available resource** – The available wind resource at the site is explained in more detail in Section 5 but it is expected that small to medium scale turbines will not be limited by the resource at any proposed tower height. In fact the high wind speeds limit tower heights to smaller of the available options
- **Current Demand** – From section 2 the current on-site demand is seen to be seasonal with a baseload of around 40kW and a peak load of 300kW. Without upgrades the current maximum level of export will be in the region of 140kW. This would limit the likely maximum turbine output (without upgrade) to 180kW
- **Available space** – The site is away from the ski runs, close to the car park and considered to be optimal for development of a single turbine.
- **Environmental factors** – The close proximity to designated areas would reduce the likelihood of larger developments achieving planning consent

From an examination of the core limitations to development (primarily capacity for export from site) the optimal scale of development is considered to be a single turbine with a

Looking From North – East from the west side of the valley, at height of turbine tip.



Looking East – South



Above looking from South – West and West to North below.



4.3 Aviation.

There were no objections to the original application at the top of the hill and none are foreseen at the new site in the valley. The Company has had detailed discussions with the manager NATs at Aberdeen as well as NATS en-route.

NATS Aberdeen will have no objections as *' Since the turbine isn't within 30km of Aberdeen Airport then you'll not need to consult with BAA (who would then consult with me to agree if we would recommend them to accept/object. With your description of the site I'd be pretty certain that it'll be terrain shaded from all of the NERL assets so therefore wouldn't be objected to.*

Discussions with NATS en-route also highlighted that they will make a formal decision when planning is put through by LPA. There were no objections to the original and through telephone conversations with them it seemed this would be very unlikely to change. The self assessment maps provided by NATS en route are attached in the annex. These maps are to indicate the areas of possible conflict. This shows the Lecht site to be in a clear area, especially as it is now well below the hill tops.

4.4 Ecology.

An approach has been made to Dr. Adam Watson to complete a study of the proposed site. (This is still to be confirmed by him).

The site of the proposed development consists of open heath and is within the current ski lift operated area. The Lecht Ski area is bordered by an area designated as a SSSI and SAC and the Lecht ski area is excluded due to damage to vegetation from recreational activities.

There will be a short period of disturbance during the construction phase. Assembly will take place mainly on the nearby car park. A temporary access road will be required to be built from the car park to the turbine site, approx 40m to hold machinery for installing the foundations and a crane for construction. This will cause direct disturbance to flora and fauna in the limited area and noise disturbance to fauna. In the event that particularly sensitive species are found to inhabit the area then this stage can be timed to minimise key periods of concern (e.g. mating periods).

Due to the development being within the Lecht ski area it is likely that those species that would be sensitive to this operation will be at least partly habituated to the built

environment and associated noise issues. The decommissioning stage will have a similar impact to that associated with construction due to the short time period and requirement for heavy on-site machinery.

Overall the issue of disturbance is unlikely to be severe due to short period of serious disturbance (construction, decommissioning) and the expected habituation during operation.

During the construction phase there is likely to be displacement of a significant area of heather and lichen moorland. The majority of this area will be re-instated and in time return to current form. The only areas that will be displaced throughout the operation will be the visible tower footprint as soil will be backfilled over the majority of the foundation work.

4.5 Ornithology

The swept area of the turbine options are 40-50% of the original turbine proposal put forward and therefore this would significantly reduce the issue of bird strike. The proposed turbine has a diameter of 24.6m. There have been on site discussions with Mr Mathew Hawkins, Senior Heritage Officer CNPA, in 2008 as well as discussions with people conducting bird surveys of snow buntings at the Lecht over the last few years. The result has been that the current position would raise the least issues for ornithology. Mr Hawkins is also now looking to see if up to date surveys have been carried out at the Lecht, especially with regard to the current work being done with the hydro electric pylons.

It should however be remembered that the Lecht is a busy recreational area and potentially provides poor habitat for breeding and feeding due to erosion, disturbance and man-made developments (fences etc). The proposed installation of a single turbine will have far less effect with regard to collision compared to larger wind developments where there are several turbines and this should be taken into account. Although it is not possible to predict how significant collision will be with the single turbine and it's relatively small swept area. It is likely to mean that collision will be shown to be a minor issue with few / no likely strikes.

5. Wind Resource and Turbine yield.

This section provides a summary of the expected wind resource at the site and this is then utilised to provide generation figures for the turbine.

For this study the primary source of information available with which to evaluate the site's likely wind resource is the UK wide Department of Trade and Industry's (DTI) NOABL database. This DTI database gives a wind speed for the site and its immediate surroundings at a height of 45m ranging from 6.0 – 11.3 m/s and this data is shown in Figure 7 below. The proposed site is marked in red.

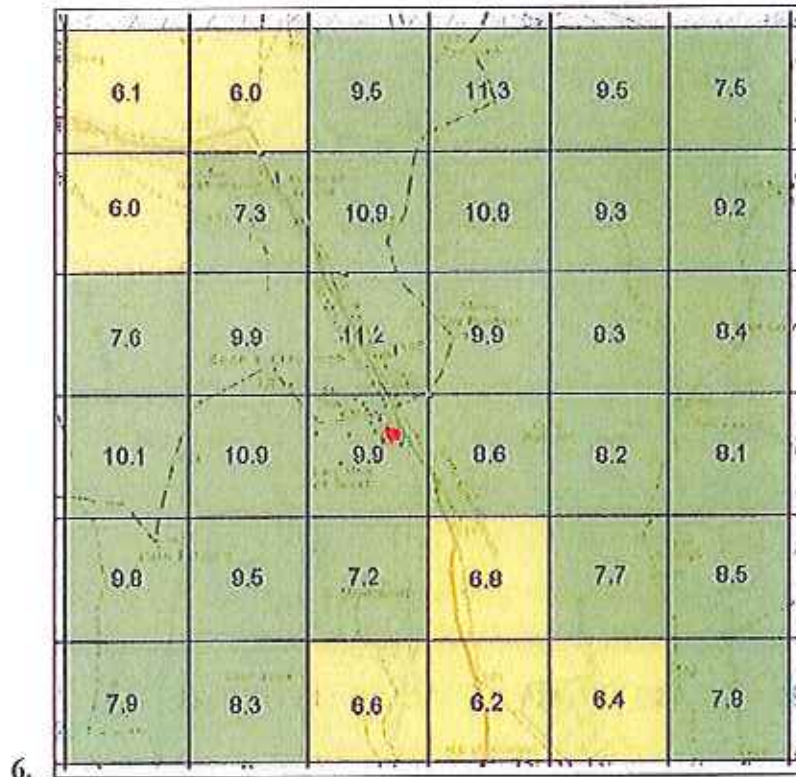


Figure 7: NOABL wind resource map at 45m for the Lecht Site

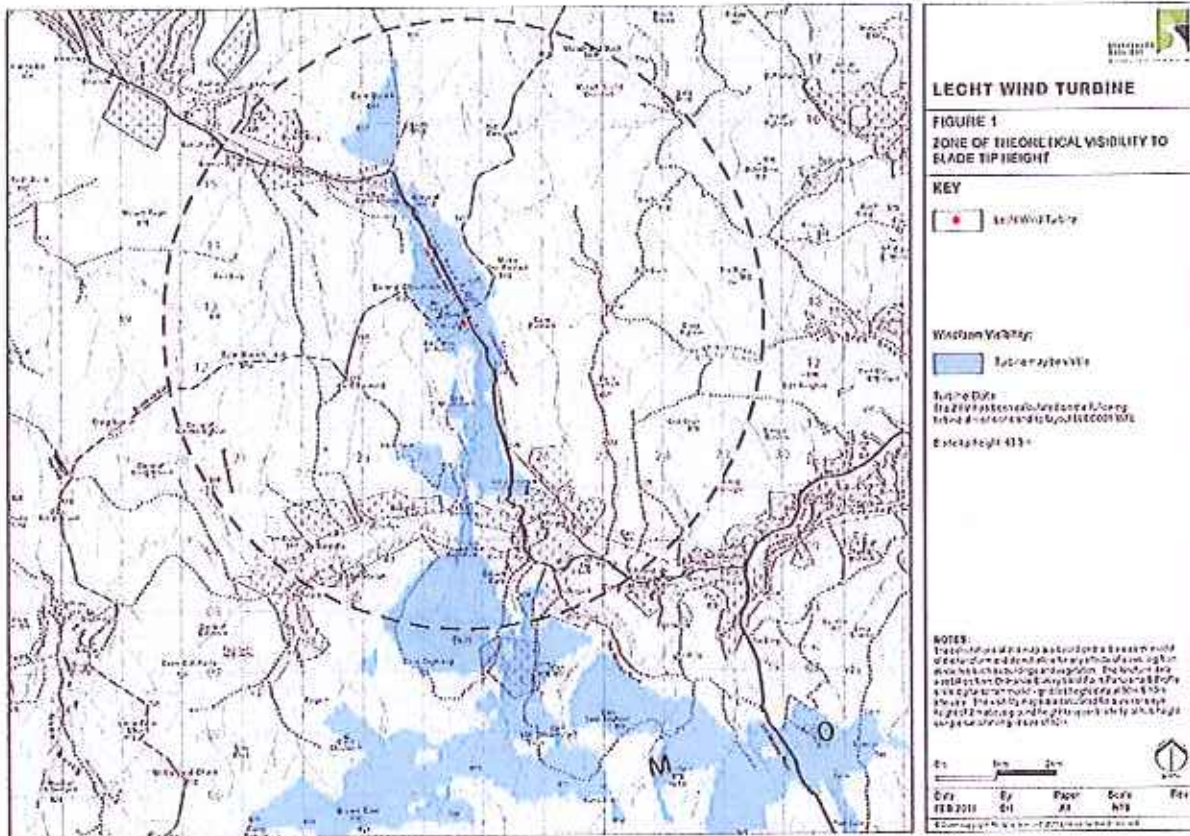
The NOABL database is a high level model (resolution for 1 km² grids) that does not take local wind regimes such as coastal winds into account. Also, although the database model utilises a standard figure for turbulence caused by surface roughness⁵, it does not take account of turbulence from specific micro-topographical obstructions (woodland and site buildings) although this should be of limited concern given the surrounding landscape.

An average wind speed in excess of 7 m/s at hub height is considered suitable for a development of this scale where a large proportion of the generation will be utilised on site. The proposed Nordtank 150 at 7 m /s will produce an average annual power of 345MWh compared to the total Lecht consumption of around 466 MWh.

Appendix I

ZVI for blade tip height

A3 size detailed pictures are attached separately with the planning application.

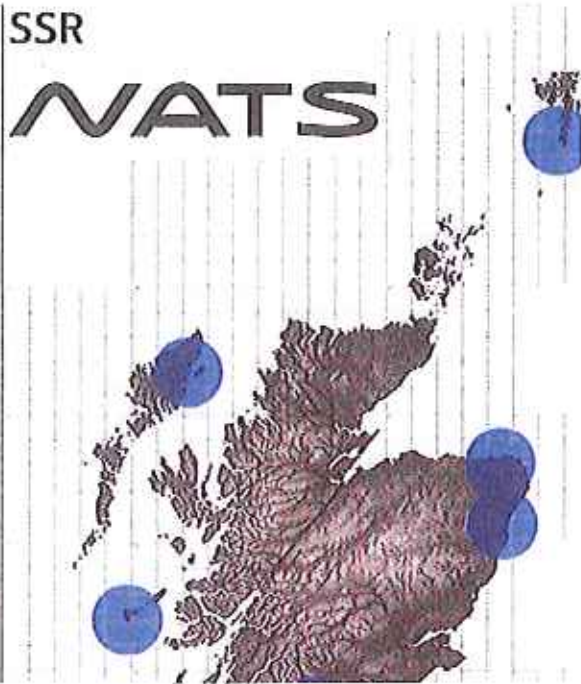


NATS self assessment charts.

Appendix II

SSR

NATS



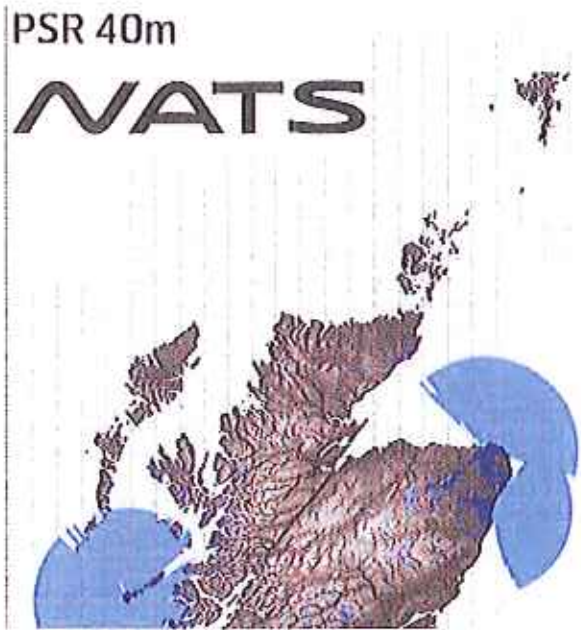
AGA

NATS



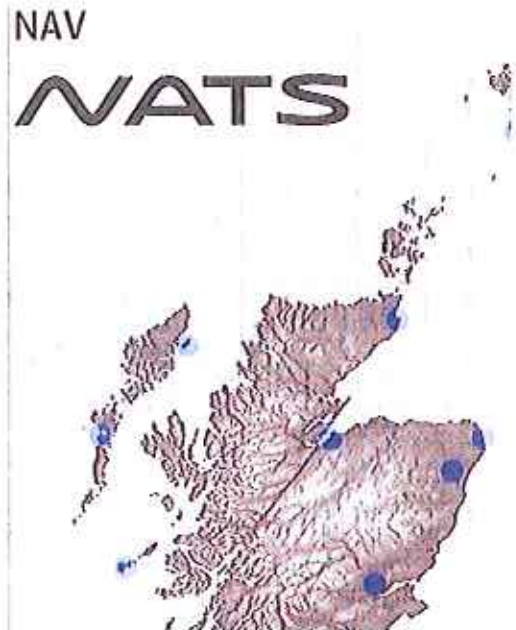
PSR 40m

NATS



NAV

NATS



Detailed NATS self assessment chart for Lecht area.
For view point 40m above ground level.

