21 Aviation

21.1 Introduction

21.1.1 Since the submission of the previous application for Beaw Field, the only change to the aviation baseline relates to Saxa Vord where the RAF have re-commissioned the site as a Remote Radar Head with a wind farm friendly radar installed. There are no other changes to the baseline. Given that the infrastructure of the Consented Development is not changing, there would be no aviation effects. The findings of the previous aviation assessment therefore remain valid, and the previous aviation chapter is set out in full below, with a brief update included in relation to planning policy.

21.1.2 Wardell Armstrong LLP has prepared this chapter on behalf of PWFY Ltd. The chapter considers the potential impacts on aviation and associated infrastructure in the vicinity of the Site and is based upon technical appraisals previously conducted by aviation consultant Cyrrus Limited. The Cyrrus technical reports are reproduced in full as Appendices 21.1 and 21.2 respectively.

21.1.3 It is acknowledged that UK Airspace is important for both civilian and military aviation interests and that it is essential that the safety of UK aerodromes, aircraft and airspace is not adversely affected by new wind power infrastructure. Wind turbines can have implications for flight safety due to the height of turbines. Furthermore, depending on the wind turbines size, shape, construction materials and location there may be implications for airport radar and communications systems.

21.1.4 The turbine locations used in the technical appraisals are as defined in Chapter 3, Table 3.1 and the layout of the site and the proposed infrastructure to be deployed is as shown in Figure 3.1.

21.1.5 The final choice of wind turbine has yet to be decided but for the purposes of the aviation assessment a turbine whose maximum dimensions coincide with the planning envelope was considered. This wind turbine has a hub height of 93m and a rotor diameter of 104m, giving an overall tip height of 145m. Other proposed infrastructure to be installed on the site includes the substation, site tracks and crane pads, 90m meteorological mast, telecommunications mast and associated equipment cabin. These additional elements were not considered as part of the technical appraisals conducted by Cyrrus Ltd. as they have no potential to impact aviation interests over and above the impact from the turbines.

21.2 Legislative framework

21.2.1 Scottish Planning Policy (June 2014) at paragraph 169 acknowledges the need for potential impacts on aviation and defence interests to be taken into account during the development management process.

21.2.2 Draft National Planning Framework (NPF) 4 is under preparation and will include all aspects of national planning policy as per the provisions of the Planning (Scotland) Act 2019 and will replace NPF3 once adopted. Draft NPF4 requires that development proposals for renewable energy developments must take into account impacts on impacts on aviation and defence interests including seismological recording.

21.2.3 There are also a number of regulatory and guidance documents specifically relating to aviation which have been adhered to in the design of this wind farm. These include:

- CAP 168 Licensing of Aerodromes;

- CAP 764 CAA Policy and Guidelines on Wind Turbines; and
- CAP 232 2014 Aerodrome Survey Information.

21.3 Methodology

21.3.1 The methodology used for assessing the impacts of the wind farm on the aviation assets is described in detail in Appendix 21.1 and 21.2.

Defining the study area

21.3.2 In general, the Study Area for aviation assessments is multi-layered and incorporates recommended distances around private land strips and unlicensed airfields, physical safeguarding considerations around military and civil airports, civil airport radars, military airfield radars and the long-range National Air Traffic Services and military Air Defence radar network. Thus the largest extent of the Study Area is not determined by the Consented Development or pre-determined boundaries but by the radars which have the range to provide air surveillance over the Consented Development and may be capable of detecting the turbines.

21.3.3 CAP764 states the distances from various types of airfield and circumstances within which consultation should take place. These distances include:

- Officially safeguarded civil aerodromes if turbines are within 30km;
- Officially safeguarded technical sites if turbines are within 10km;
- If proposed turbines are within Line of Sight (LoS) of an air defence, military aerodrome or en-route radar;
- If proposed turbines are within 17km of a licensed aerodrome with a runway length of 1,100m or more;
- If proposed turbines are within 5km of a licensed aerodrome with a runway length of less than 1,100m;
- If proposed turbines are within 4km of an unlicensed aerodrome with a runway length of more than 800m; and
- If proposed turbines are within 3km of an unlicensed aerodrome with a runway length of less than 800m.

Significance criteria

21.3.4 Broadly the potential effects of a wind farm on either civil or military aviation interests fall into two categories:

- Effects on the aerodrome itself and those protected surfaces which surround it i.e., the presence of structures and obstacles that could potentially cause physical harm through risk of collision; and
- Effects on the radar systems and other navigational aids which the aerodrome or aviation network operator uses in order to track and support aircraft on approach, departure or en-route.

21.3.5 The general approach to wind farm development is to avoid effects on aviation interests wherever possible, and to find appropriate technical and/or operational mitigation solutions where this cannot be achieved. These solutions should be agreed between the developer and the aviation interest holder.

Upon agreement and implementation of mitigation, wind farm developments should have at worst, a negligible effect on operations of the aviation asset.

21.3.6 To determine the potential impacts of the Consented Development on aviation interests, the sensitivity of a receptor was considered in relation to the magnitude of effect (see Table 21.2).

Table 21.1 Sensitivity of aviation receptors with respect to aerodromes and protected surfaces

Sensitivity	***Criteria***
High	Affected facility or airspace user has very limited capacity to accommodate the proposed form of change
Medium	Affected facility or airspace user has some capacity to accommodate the proposed form of change
Low	Affected facility or airspace user has a good capacity to accommodate the proposed form of change
Very Low	Affected facility or airspace user has a high capacity to accommodate the proposed form of change

21.3.7 For the purpose of this assessment the sensitivity of all aviation receptors, be that navigational radars or protected surfaces around aerodromes, is adjudged to be high. This is based on the safety critical function that these receptors perform. Non-aviation receptors dealt with in this chapter, such as Met Office assets, will be awarded a sensitivity based on professional judgement using the sensitivity criteria described in Table 21.1.

21.3.8 The 'magnitude of impact' for the Consented Development is based on potential radar and operational impacts. These are categorised according to the criteria in Table 21.2.

Table 21.2 Aviation magnitude of impact

Magnitude	***Criteria***
High	Significant compromise to receptors ability to continue safe operations or safe provision of air navigation services (radar)
Moderate	Some restriction on receptors ability to continue safe operations or safe provision of air navigation services (radar)
Minor	Minor restriction on receptors ability to continue safe operations or safe provision of air navigation services (radar)
Negligible	Very minor or no restriction on receptors ability to continue safe operations or safe provision of air navigation services (radar)

21.3.9 The overall significance of an impact is determined by combining the site-specific sensitivity and magnitude of effect, as illustrated in Table 21.3. It must be noted that professional judgement is used to determine the level of impact significance, following the definitions given in Tables 21.1 and 21.2

respectively. Where impact significance is assessed as negligible or minor, the overall effect is not significant and conversely, where the impact significance is assessed as moderate or major, the overall effect is significant.

Table 21.3 Overall significance of effect matrix

Sensitivity of receptor		***High***	***Medium***	***Low***	***Very Low***
Magnitude of effect	***High***	Major	Moderate	Minor	Negligible
	Moderate	Moderate	Moderate	Minor	Negligible
	Minor	Minor	Minor	Minor	Negligible
	Negligible	Negligible	Negligible	Negligible	Negligible

21.3.10 In relation to the above:

- Major**:** a restriction/curtailment on the ability of the Air Navigation Service Provider to continue to ensure safety and/or provide unrestricted air traffic services;
- Moderate**:** there would be a possible restriction/curtailment on the ability of the Air Navigation Service Provider to continue to ensure safety and/or provide unrestricted air traffic services but which might be mitigated by changes to operating procedures;
- Minor**:** there would be a possible restriction/curtailment on the ability of the Air Navigation Service Provider to continue to provide unrestricted air traffic services, but which is manageable with little change to existing operating procedures; and
- Negligible**:** any effect should be completely manageable within current operating practices and without any requirement for change thereto.

21.4 Baseline

Scatsta Airport

21.4.1 Scatsta Airport is a licenced aerodrome located towards the north of Mainland Shetland. It lies to the southwest of Sella Ness and adjacent to the B9076 road. The airport has a single runway 06/24, which, at a distance of 8 nautical miles (14.82km) is directly aligned with the Consented Development.

Sumburgh Primary Surveillance Radar (PSR)

21.4.2 The Sumburgh PSR is located at Sumburgh Head at the southernmost point of Mainland Shetland. The PSR is 40 nautical miles (74.08km) from the Consented Development.

Fitful Head Secondary Surveillance Radar (SSR)

21.4.3 The Fitful Head SSR is located on the southwest coast of Mainland Shetland, approximately 4 nautical miles to the northwest of Sumburgh Airport. The SSR is more than 37 nautical miles (68.52km) from the closest wind turbine in the Consented Development.

MOD Interests - RAF Saxa Vord

21.4.4 RAF Saxa Vord is located on the northern coast of Unst, to the northwest of Norwick and the northeast of Burrafirth. At the time of the original EIA it was decommissioned with the MOD retaining a strategic interest in the site and safeguarding the radar position for possible future re-installation. Since Beaw Field Wind Farm gained consent, the RAF have re-commissioned the site as a Remote Radar Head (RRH) and re-located a 'wind farm friendly' TPS-77 Air Defence Radar there.

Met Office - Weather Radar

21.4.5 The Met Office operate a network of radars across the UK to aid in forecasting weather patterns. The closest weather radars to the Consented Development are at the Hill of Dudwick, near Ellon, Aberdeenshire (348km) and Druim a'Starraig, near Stornaway, on the Isle of Lewis (388km). The Met Office Weather Radar Network supports forecast services and warnings of severe/hazardous weather conditions delivered to the public, partners, government agencies and departments (including the MoD), aviation stakeholders, emergency responders and the Environment Agency. The existing network is in the process of being upgraded although this is not expected to have any impact on the Consented Development as no upgrades are proposed within the Shetland Islands. The negative impact of wind turbines on the operation of weather radars is well documented. In essence the rotating blades can cause clutter, partial beam blocking and inaccuracies in velocity readings.

21.4.6 The Met Office also has other assets with safeguarding protection, these include Radiosondes. There is one Radiosonde on the Shetland Islands, and this is located at Lerwick Radiosonde Station, just to the south of Lerwick. A consultation zone extends out to 20km around the site.

NATS

21.4.7 NATS (formerly the National Air Traffic Service) is the UK's main provider of air traffic control services. NATS has two main service provision companies, NATS En-Route PLC (NERL) and NATS Services Ltd (NSL). NSL operates as a commercial company competing for contracts to supply while NERL is the sole provider of civilian En-Route air traffic control over the UK and is regulated by the CAA.

21.4.8 NATS En-Route operates radars to ensure safe passage of aircraft between civil airports and as such any interference to its radar and communications equipment could pose potential safety concerns.

21.5 Assessment of impacts

Scatsta Airport

21.5.1 Assessment of the CAP168 Obstacle Limitation Surfaces found that no turbines penetrate any surface.

21.5.2 The existing NDB (L) Runway 24 Instrument Approach procedure will be significantly adversely affected by the operation of the wind farm. This impact arises as a consequence of the location of the wind turbines within the primary protection areas for the Initial and Intermediate segments (see Section 7 of

Appendix 21.2). As a result, mitigation is required. Scatsta is assessed as having high sensitivity and the impact of the Consented Development would be high. Consequently, the overall magnitude of effect is assessed as major and thus is 'significant' in EIA terms.

21.5.3 The proposed GNSS LNAV/APV Runway 24 and planned GNSS LNAV/APV Runway 06 would be unaffected by the Consented Development.

Sumburgh Primary Surveillance Radar (PSR)

21.5.4 Sumburgh PSR does not have line of sight to the proposed turbines at Beaw Field and it is highly unlikely to detect reflections from these turbines. This PSR is assessed as having high sensitivity to the Consented Development. The magnitude of the effect will be negligible giving an overall significance rating of negligible. This is deemed to be not significant in EIA terms and no mitigation is required.

Fitful Head Secondary Surveillance Radar (SSR)

21.5.5 Fitful Head SSR does have line of sight to the proposed turbines, however aircraft would need to be within 306m of a turbine in order to detect a reflected signal from the radar. The sensitivity of this receptor is graded as high.

21.5.6 Fitful Head is a Mode S SSR which uses selective and predictive tracking to make it relatively immune to multipath effects. SSR track jitter may, however, be experienced in the area shadowed by the turbines. For this reason, the magnitude of effect the Consented Development is assessed as minor rather than negligible. Appendix 21.2 illustrates that in this case, the shadowed area is confined to the sector 013.3° - 015.2° from Fitful Head (relative to True North), extending approximately 1.3NM beyond the turbines, and may theoretically affect aircraft flying at altitudes below 1750ft AMSL within a small portion of the Scatsta Final Approach Vectoring Area. The magnitude of effect is therefore assessed as being minor and not significant in EIA terms. This is further reinforced when one considers that the Site is approximately 38NM (70.38km) from Fitful Head SSR and the Civil Aviation Authority advises that the possibility for effects on SSR only exists for turbines up to 13NM (24.08km) from the radar site.

Ministry of Defence

21.5.7 The MoD was consulted during April 2015 as part of the Scottish Government's scoping process. At that time the Consented Development occupied a slightly larger footprint, comprising 20 rather than 17 turbines, all of which were 10m taller than those that are currently proposed. The MoD was maintaining a strategic interested at Saxa Vord so that it could be reinstated as an air defence radar location at that time and it confirmed in its response (21st May 2015, Ref: DIO/SUT/43/10/1/15761) that it had no objection to the proposal.

21.5.8 In response to a re-consultation with the MoD (16th October 2015, Ref: 23249) it was suggested there may be a possibility of adverse impacts at RAF Saxa Vord. However, subsequent discussions with the MoD confirmed that the scoping assessment response provided previously included a more detailed study and if this had determined that there were not expected to be any impacts then this should take precedence.

21.5.9 Saxa Vord is now an active RRH. The TPS-77 radar there was installed after the Consented Development gained consent and following the MOD having confirmed that it had no objection to the Beaw Field Wind Farm when it was proposed. As no changes to scheme design are now being sought,

it is not anticipated that the MOD will have concerns over the variation entailing an extension to the implementation period and operational lifetime of the Consented Development.

21.5.10 The sensitivity of the asset is considered to be high and, the magnitude of the impact of the Consented Development is assessed as being negligible. This results in a negligible significance which is not significant.

Met Office

21.5.11 Since April 2015 the Met Office has been a statutory consultee for wind farm applications in terms of giving consideration to the impact of Consented developments on Weather Radar.

21.5.12 As part of the service provided by the Met Office a range of maps have been produced to identify zones within which consultation needs to be carried out. WA has reviewed these maps. Only one consultation zone appears on the Shetland Islands and this is centred on Lerwick Radiosonde Station, just to the south of Lerwick. The consultation zone extends out to 20km around the radio site. In this instance the closest turbine in the Consented Development lies 42.2km from the radio site and therefore there are not expected to be any adverse effects as a result of the Consented Development. The sensitivity of the Radiosonde is considered to be medium and the magnitude of the impact of the Consented Development is assessed as being negligible. This results in a negligible significance which is Not Significant in EIA terms.

National Air Traffic Service (NATS)

21.5.13 NATS has produced a series of self-assessment maps[1] for the wind industry to use to establish whether proposed wind developments are likely to impact on their operations. WA has consulted the self-assessment maps and it is evident from these that the Consented Development should not cause any problems. Furthermore, NATS was consulted as part of the scoping process, and it confirmed at that stage that there were no impacts expected. The sensitivity of the NATS network is considered to be high; and the magnitude of the impact is considered to be negligible. Consequently, the significance of the impact of the Consented Development is assessed as being negligible and not significant in EIA terms.

21.6 Cumulative impacts

21.6.1 Since the original EIA the Viking Wind Farm has secured an increase of tip heights to 155m and the Energy Isles Wind Farm (17km to the north of the Consented Development is proposed). In addition, there are several turbines near Lerwick including a single 120m Enercon E82 turbine at Luggie's Knowe and five turbines at Burra Dale; three Vestas V47 turbines and two Vestas V52 turbines.

21.6.2 None of these turbines are expected to cause any cumulative aviation impacts with the Consented Development. There is no line of sight between Beaw Field Farm and the Sumburgh PSR and the Fitful Head SSR, which does have line of site is 38 nautical miles (70.4km) from the Consented Development. This is much greater than the distance referred to in the latest version of CAP 764[2] which states, '*These effects are typically only a consideration when the turbines are located very close to the SSR i.e. less than 10 km'.*

21.6.3 Given the above, and the fact that there are no other wind farms known in the Study Area it is expected that, any cumulative impacts will be negligible and 'not significant.

21.7 Mitigation measures

21.7.1 A significant effect was identified in relation to Scatsta airport and as such mitigation measures will be required. Appendix 21.2 (see sections 10, 11 and 12) sets out the proposed mitigation in detail but in essence the existing NDB (L) Runway 24 Instrument Approach procedure would have to be redesigned.

21.7.2 According to NATS Aeronautical Information Publication (AIP) Scatsta Airport's hours of operation are 06:30 - 18:30 during summer and 07:30 – 19:30 during winter. Outside of these times aircraft would not be expected to be operating in the vicinity and therefore there would be a much lower risk to aviation. It may not be possible to discount it altogether as the airport may still need to be available for emergency landings etc. but the risk would be lower. As the turbines are located just beyond the protected surface it is recommended that specific wind turbines are fitted with aviation lighting to make their presence clear to pilots on approach or take-off.

21.7.3 The Initial segment (base turn) Minimum Obstacle Clearance Altitude (MOCA) would have to be raised from 1,700ft to 2,000ft. The presence of the turbines within the Intermediate segment would require the approach procedure to be redesigned.

21.7.4 All procedures, including those which are not affected from a procedure design perspective, will require re-charting with the proposed wind farm shown as a new obstacle and the new MOCAs where applicable.

21.7.5 Following the introduction of these mitigation measures at Scatsta the impact of the Consented Development on the safe operation of the airport will be minor and thus not significant. The design and implementation of these revised procedures can readily be controlled through imposition of a suspensive planning condition.

21.7.6 No mitigation is recommended or required for either the Sumburgh PSR or the Fitful Head SSR.

21.8 Residual effects

21.8.1 Once the suggested mitigation has been adopted there are not expected to be any residual effects.

21.9 Summary and conclusions

21.9.1 The wind farm has been designed to minimise impacts on the aviation assets in its vicinity. This has been achieved by modifying the layout to ensure it is outside all protected surfaces.

21.9.2 Turbines within the wind farm will be fitted with aviation lighting to assist with visual identification of the turbines in low light levels and hours of darkness.

21.9.3 Some modification of the flight procedures associated with Scatsta Airport will be required in order to maintain safe operation of flights into and out of the Airport during operational hours.

21.9.4 There are not expected to be any adverse impacts on either the Sumburgh PSR or the Fitful Head SSR.

21.9.5 No adverse impacts are expected on the Saxa Vord RRH.

21.9.6 No impacts are expected on Met Office assets such as Lerwick Radiosonde.

21.9.7 No impacts are expected on any facility or service operated by NATS.

[1] http://www.nats.aero/services/information/wind-farms/self-assessment-maps/

[2] CAP 764 "*CAA Policy and Guidelines on Wind Turbines*" (Edition 6, Feb 2016) Safety & Airspace Regulation Group