CHAPTER 14: OTHER ISSUES

14. OTHER ISSUES

14.1 Introduction

14.1.1 This Chapter considers the potential significant effects on the following issues of relevance to the Proposed Varied Development that are not covered within the other environmental chapters, namely:

- Telecommunications, Television / Radio;
- Aviation (Civil and Military);
- Shadow Flicker;
- Ice Throw;
- Air Quality;
- Climate Change and Carbon Balance;
- Population and Human Health; and
- Risk of Major Accidents and Disasters.

14.1.2 Due to the lack of similarity between these issues they are considered separately in Sections 15.3 to 15.8, with methods of assessment and structure of reporting varying accordingly.

14.1.3 This Chapter has been prepared by ASH, with inputs by SSE and SLR.

14.2 Consented Development

Summary of Effects of Consented Development

Telecommunications, Television / Radio

14.2.1 No disruption to telecommunications, such as television and radio reception, were predicted as a result of the Consented Development, and no objections were raised by telecommunication providers in response to the application for consent.

Aviation (Civil and Military)

14.2.2 The Consented Development was not within line of sight to the HIAL Inverness Airport or the RAF Lossiemouth Primary Surveillance Radars (PSRs) and no effects to these were anticipated.

14.2.3 Assessment showed that no radar line of sight exists between the Consented Development and the Perwinnes and Allanshill PSRs or NATS air to ground communications facilities. This indicated that there would be no technical impact on NATS operated aviation navigational facilities. As such, there were no anticipated effects predicted on aviation navigational equipment.

Shadow Flicker

14.2.4 There were no potential impacts of shadow flicker predicted as a result of the Consented Development.

Ice Throw

14.2.5 Following the implementation of proposed mitigation measures, such as making operation crews and members of the public aware of the risks of ice throw, it was considered that the risk of ice throw would be very low.

Air Quality

14.2.6 With the implementation of mitigation measures to control dust, no significant effects on air quality were predicted.

Relevant Mitigation Measures and Conditions of Consent

14.2.7 The following Conditions of the existing consent are relevant for the matters discussed above.

Condition 16: Aviation Lighting

No turbine can be erected until a scheme of aviation lighting is submitted to, and approved in writing by, the Planning Authority after consultation with the Ministry of Defence. Thereafter the approved scheme of aviation lighting shall be fully implemented on site. The Company shall provide both the Ministry of Defence and the Defence Geographic Centre (AIS Information Centre) with a statement, copied to the Planning Authority and Highland and Islands Airports Limited, containing the following information:

- *The date of Commencement of the Development;*
- *The exact position of the wind turbine towers in latitude and longitude;*
- *A description of all structures over 300 feet high;*
- *The maximum extension height of all construction equipment;*
- *The height above ground level of the tallest structure; and*
- *Finalised details of an aviation lighting scheme, unless otherwise required, as agreed with the MOD and other aviation interests and the Planning Authority. This is expected to provide for all perimeter turbines being fitted with infra-red lighting with an optimised flash pattern of 60 flashes per minute of 200ms to 500ms duration at the highest practicable point; and 25 Candela red lighting on all of the cardinal wind turbines at the highest practicable point.*

Reason: To ensure that the erected turbines present no air safety risk.

14.2.8 No changes are proposed to this Condition of Consent.

Condition 23: Construction and Environmental Management Plan

There shall be no Commencement of Development unless a Construction Environmental Management Plan ("CEMP") outlining the specific details of all on-site construction works, post-construction reinstatement, drainage and mitigation, together with details of the timetabling, has been submitted to and approved in writing by the Planning Authority in consultation with SNH and SEPA.

The CEMP shall include (but shall not be limited to):

a) A site waste management plan (dealing with all aspects of waste produced during the construction period (other than peat), including details of contingency planning in the event of accidental release of materials which could cause harm to the environment;

b) Details of the formation of the construction compound, welfare facilities, any areas of hardstanding, turning areas, internal access tracks, car parking, materials stockpiles, oil storage, lighting columns, and any construction compound boundary fencing;

c) A dust management plan;

d) Site specific details for management and operation of any concrete batching plant (including disposal of pH rich waste water and substances);

e) Details of measures to be taken to prevent loose or deleterious materials being deposited on the local road network including wheel cleaning and lorry sheeting facilities, and measures to clean the site entrances and the adjacent location road network;

f) A pollution prevention and control method statement, including arrangements for the storage and management of oil and fuel on the site;

g) Soil storage and management;

h) A peat management plan, to include details of vegetated turf stripping and storage, peat excavation (including volumes), handling, storage and re-use;

i) A drainage management strategy, demonstrating how all surface and waste water arising during and after development will be managed and prevented from polluting any watercourses or sources;

j) A surface water and groundwater management and treatment plan, including details of the separation of clean and dirty water drains, and locations of settlement lagoons for silt laden water;

k) Sewage treatment and disposal;

l) Temporary site illumination;

m) The construction of the access into the site and the creation and maintenance of associated visibility splays;

n) The methods of construction of crane pads;

o) The methods of construction of turbine foundations;

p) The methods of working cable trenches;

q) The methods of construction and erection of the wind turbines and meteorological masts;

r) Details of watercourse crossings;

Post construction restoration / reinstatement of the working areas not required during the operation of the Development, including construction access tracks, borrow pits construction compound, storage areas, laydown areas, access tracks, passing places and other construction areas.The development shall be implemented thereafter in accordance with the approved CEMP unless otherwise approved in advance in writing by the Planning Authority in consultation with SNH and SEPA.

Reason: To ensure that all construction operations are carried out in a manner that minimises their impact on road safety, amenity and the environment, and that the mitigation measures contained in the Environmental Statement accompanying the application, or as otherwise agreed, are fully implemented.

14.2.9 Minor variations to the wording of this Condition are proposed to clarify wording in relation to specific requirements of the CEMP. The proposed variations are reflected below and in Appendix 1.2.

There shall be no Commencement of Development unless a Construction Environmental Management Plan ("CEMP") outlining the specific details of all on-site construction works, post-construction reinstatement, drainage and mitigation, together with details of the timetabling, has been submitted to and approved in writing by the Planning Authority in consultation with SNH and SEPA.

The CEMP shall include (but shall not be limited to):

a) A site waste management plan (dealing with all aspects of waste produced during the construction period (other than peat)~~, including details of contingency planning in the event of accidental release of materials which could cause harm to the environment~~;

b) Details of the formation of the construction compound, welfare facilities, any areas of hardstanding, turning areas, internal access tracks, car parking, materials stockpiles, oil storage, lighting columns, and any construction compound boundary fencing;

c) A dust management plan;

d) Site specific details for management and operation of any concrete batching plant (including disposal of pH rich waste water and substances);

e) Details of measures to be taken to prevent loose or deleterious materials being deposited on the local road network including wheel cleaning and lorry sheeting facilities, and measures to clean the site entrances and the adjacent location road network;

f) A pollution prevention and control method statement, including arrangements for the storage and management of oil and fuel on the site;

g) Soil storage and management;

h) A peat management plan, to include details of vegetated turf stripping and storage, peat excavation (including volumes), handling, storage and re-use;

i) A drainage management strategy, demonstrating how all surface and waste water arising during and after development will be managed and prevented from polluting any watercourses or sources;

j) A surface water and groundwater management and treatment plan, including details of the separation of clean and dirty water drains, and locations of settlement lagoons for silt laden water;

k) Sewage treatment and disposal;

l) Temporary site illumination;

m) The construction of the access into the site and the creation and maintenance of associated visibility splays;

n) The methods of construction of crane pads;

o) The methods of construction of turbine foundations;

p) The methods of working cable trenches;

q) The methods of construction and erection of the wind turbines and meteorological masts;

r) Details of watercourse crossings;

s) Post construction restoration / reinstatement of the working areas not required during the operation of the Development, including ~~construction access tracks,~~ borrow pits construction compound, storage areas and ~~,~~ laydown areas ~~, access tracks, passing places and other construction areas.~~

t) Environmental Incident and Emergency Plan including details of contingency planning in the event of accidental release of materials which could cause harm to the environment.

u) Details of species and habitat protection measures to be implemented for the construction period and details of appropriate relevant reporting and monitoring programmes.

The development shall be implemented thereafter in accordance with the approved CEMP unless otherwise approved in advance in writing by the Planning Authority in consultation with SNH and SEPA.

Reason: To ensure that all construction operations are carried out in a manner that minimises their impact on road safety, amenity and the environment, and that the mitigation measures contained in the Environmental Statement accompanying the application, or as otherwise agreed, are fully implemented.

14.3 Assessment of Effects for Proposed Varied Development

14.3.1 The following section provides an assessment of each of the issues covered in this Chapter.

Telecommunications, Television / Radio

Introduction

14.3.2 This section considers the potential effects of the Proposed Varied Development on telecommunications, television and radio. The information provided in this section is based on the assessment contained within the 2015 ES and is intended to provide telecommunication consultees with sufficient information to provide, if required, updated consultation responses in relation to the Proposed Varied Development.

Methodology

14.3.3 A desk-based assessment and site survey was carried out as part of the 2015 ES to collect baseline data and identify television and telecommunications fixed link signal transmissions in proximity to the site.

14.3.4 In the absence of guidelines for determining significance of effects on telecommunications, television and radio, the methodology used in this assessment is based on establishing whether or not there would be any effect.

14.3.5 Where there is a potential effect, appropriate mitigation measures have been identified to avoid or reduce effects. Significance is not attributed and therefore effects predicted are considered qualitatively using professional judgement.

Baseline

14.3.6 A comprehensive desk study was undertaken as part of the 2015 ES to identify potential effects on telecommunications.

14.3.7 The desk study identified one television transmitter that provides a service to the area surrounding the Proposed Varied Development, which was identified as Rosemarkie. It is situated approximately 48.8km due south from the site, at approximate grid reference E276207 N862271.

14.3.8 A television signal strength survey of the most populated areas served by Rosemarkie was undertaken, the results of which are summarised in Table 15.2 (see also Appendix 15.1 of 2015 ES).

Table 15.2: TV Signal Strength communities near Proposed Varied Development

Community	TV Signal Strength	Comments
Gordonbush	Good signal strength	All aerials point south towards the transmitter, which has gone through digital switchover and is in the opposite direction from the wind farm.
Balnacoil	Poor signal strength	The area receives its signal from the Rosemarkie transmitter which is located to the south and is in the opposite direction from the wind farm. The majority of properties have satellite dishes.
Brora	Good signal strength	The area receives its signal from the Rosemarkie transmitter which is located to the south and is in the opposite direction from the wind farm.
Helmsdale	Poor signal strength	Helmsdale is a village to the north-east of the site and receives a signal from the Rosemarkie transmitter which is in the opposite direction from the wind farm. If the aerials were elevated then the signal would be improved.

Potential Effects

Telecommunications

14.3.9 Turbines have the potential to cause interference to telecommunication links, and exclusion zones for wind farms are often required to ensure the link interference does not occur. Ofcom publishes a method for calculating the size of the exclusion zone around a microwave link beyond which is accepted that a turbine would not interfere with the link. Link operators normally also calculate their own exclusion zone criteria, which may be more onerous. This exclusion zone is known as the Fresnel zone.

Television/Radio

14.3.10 The introduction of a wind farm may cause impairment to television reception in the surrounding areas. This impairment is similar to the impairment caused by other built structures. Even natural features such as trees can have a negative effect.

14.3.11 Turbines have the potential to cause interference to television signals resulting from:

- Physical blocking – this has the potential to significantly affect televisions where aerials are located within 500m of a turbine, as at greater distances signals can propagate around turbines. Any loss of television signals at greater distances are unlikely to affect signal quality and are masked by closer objects blocking the aerial, such as trees.
- Signal reflection – this is the most common cause of turbine television interference. This occurs when a radio signal is reflected off the turbine structure. At most locations, turbines would not affect television signals because any reflected signals are dominated by the principle television signal. However, at certain terrain-shielded locations, the existing principle television signal could be poor, so that any reflected signal from a turbine may start to dominate.

14.3.12 It should be noted that analogue television in the area of the Proposed Varied Development ceased to be transmitted in October 2010 as part of the 'digital switchover'.

14.3.13 Digital television signals are generally more robust and less prone to signal reflection. However, a minimum signal level is required for digital television to operate correctly. If a property already receiving a weak digital signal experiences additional blocking or reflections from turbines, the signal level may drop, causing the television screen to pixilate or cut out intermittently. Reflections and blocking from other objects (such as trees) close to the aerial can cause similar effects.

14.3.14 Turbines have the potential to cause disruption to medium and long wave radio broadcasts only in the immediate vicinity of the turbines. FM and DAB digital radio signals are less prone to interference than television signals, and therefore it is likely that no impairments to radio signal quality would be experienced.

14.3.15 A Television Impact Report was prepared for the 2015 ES (Appendix 15.1 of the 2015 ES), which outlined the findings of a comprehensive survey undertaken to determine the potential effects on TV signal on areas surrounding the development at that time.

14.3.16 The 2015 ES and 2016 FEI Report concluded that the Consented Development would have no effect on television or radio signals within the study area. The Proposed Varied Development is not anticipated to result in any change to these assessment findings.

Aviation (Civil and Military)

Introduction

14.3.17 This section considers the potential effects of the Proposed Varied Development on Aviation, including aviation navigational equipment and aviation operations. The information provided in

this section is based on the assessment contained within the 2015 ES and is intended to provide aviation consultees with sufficient information to provide, if required, updated consultation responses in relation to the Proposed Varied Development.

Methodology

14.3.18 A desk-based assessment and consultation was carried out for the 2015 ES to collect baseline data including:

- Radar line of sight (LOS) analysis of civil and military primary surveillance radars (PSR);
- Proximity of civil and military airfields, Helicopter Landing Sites, para-dropping and microlight sites;
- Location of air to ground communications facilities; and
- Consultation with aviation operators and stakeholders.

14.3.19 Since the 2015 ES and 2016 FEI Report were published, the Civil Aviation Authority (CAA) has released the sixth edition of ' CAA Policy and Guidelines on Wind Turbines – CAP 764[1]

14.3.20 There are also a number of documents which provide guidance on aviation considerations, including:

- CAP 764 CAA Policy and Guidelines on Wind Turbines (The Stationery Office June 2013) provides guidance on the analysis of potential effects of wind development on aviation navigational equipment;
- United Kingdom Helicopter Landing Sites (UKHLS) booklet (September 2014);
- UK Minor Aerodromes Book (January 2015); and
- NATS online wind farm planning self-assessment mapping.

14.3.21 The study area for the assessment of potential effects on aviation navigational equipment and aviation operations are as follows:

- 10km from air to ground communications facilities;
- 10km from para-dropping sites, microlight sites, gliding sites, helicopter landing sites and minor aerodromes;
- 40 nautical miles (nm) from MOD primary surveillance radar (PSR) facilities;
- 30km of civilian airports and associated PSR facilities; and
- 200km from NATS En-route (NERL) PSR facilities.

14.3.22 In the absence of guidelines for determining significance of effects aviation navigational equipment and aviation operations, the methodology used in this assessment is based on establishing whether or not there would be any effect.

14.3.23 Where there is a potential effect, appropriate mitigation measures have been identified to avoid or reduce effects. Significance is not attributed and therefore effects predicted are considered qualitatively using professional judgement.

Baseline

14.3.24 The Proposed Varied Development is approximately 33 nautical miles (nm) to the north of Inverness Airport and over 30nm to the south-west of Wick John O'Groats Airport. The local airspace is Class G uncontrolled airspace.

14.3.25 The Proposed Varied Development is also within the MOD's Low Flying Area 14. There is a MOD airfield radar at RAF Lossiemouth approximately 56km (30nm) to the south-east of the Proposed Varied Development. RAF Lossiemouth Air Traffic Control (ATC) will generally provide

[1] The Air Navigation Order 2009 has since been superseded by the Air Navigation

radar services out to 40nm of the radar installation, but may provide services out to the full operational range of 60nm.

14.3.26 There are no MOD air defence units within the study area.

14.3.27 There are two NERL PSR facilities within the study area: Perwinnes (approximately 150km to the south-east of the Proposed Varied Development), and Allanshill (approximately 115km to south-east of the Proposed Varied Development).

14.3.28 There are no met office radars, para-dropping sites, gliding sites, minor aerodromes, microlight sites or Helicopter Landing Sites within the study area, therefore these are not considered further in the assessment.

Potential Effects

14.3.29 Turbines have the potential to act as obstructions to low flying aircraft and can be detected by PSRs, resulting in radar clutter being presented on the controlling systems used by air traffic controllers. This clutter can obscure actual aircraft and/or data pertaining to actual aircraft and cause increased controller workload and decreased aviation safety if unmitigated.

14.3.30 An assessment of radar line of sight using the ATDI ICS Basic modelling tool undertaken as part of the 2015 ES showed that the Proposed Varied Development is not within line of sight to the HIAL Inverness Airport or the RAF Lossiemouth PSR and no effects were anticipated. The Proposed Varied Development is not anticipated to result in any change to these assessment findings.

14.3.31 Assessment using the NATS online self-assessment maps as part of the 2015 ES showed that no radar line of sight exists between the site and the Perwinnes and Allanshill PSRs or NATS air to ground communications facilities. This indicated that there would be no technical impacts on NATS operated aviation navigational facilities, and no anticipated effect on aviation navigational equipment was predicted.

14.3.32 The development lies within an area which is deemed a low flying area by the MOD and by aircraft transiting to and from the Tain Air Weapons Range. It is feasible that pilots of low flying aircraft would require visual cues denoting the location of the Proposed Varied Development.

Mitigation

14.3.33 In accordance with Condition 16, the Applicant will agree a suitable aviation lighting scheme with the MOD given that the Proposed Varied Development is located within an area designated as a low flying area.

Residual Effects

14.3.34 The 2015 ES concluded that there were no residual effects on aviation navigational equipment assuming any mitigation agreed with the MOD is implemented. The Proposed Varied Development is not anticipated to result in any change to these assessment findings.

Shadow Flicker

Introduction

14.3.35 This section considers the potential effects of the Proposed Varied Development on Shadow Flicker.

Baseline and Potential Effects

14.3.36 In the UK, only properties within 130 degrees either side of north, relative to the turbines can be affected by shadow flicker, as turbines do not cast shadows on their southern side (ODPM, 2004). As there are no properties within 130 degrees either side of north from the Proposed

Varied Development, there are no potential impacts on shadow flicker predicted as a result of this Proposed Varied Development.

Ice Throw

Introduction

14.3.37 This section considers the potential effects of the risk of ice throw resulting in injury and/or property damage as a result of the Proposed Varied Development.

Methodology

14.3.38 The study area for ice throw is the maximum potential distance (in metres) of ice falling from turbines. This can be approximated using the formula 1.5 x (blade diameter + hub height) (Tammelin et al., 1997 and BOREAS, 2003). The maximum potential distance for the Proposed Varied Development is therefore 326.85m (1.5 x (136 + 81.9) and the study area for the ice throw assessment is based on a 326.85m buffer around the turbine locations, based on a 149.9m tip height.

Baseline and Potential Effects

14.3.39 Ice can build up on turbine blades, nacelles and towers under certain climatic conditions. Ice may fall or be thrown from the turbine during particular circumstances for example, as a result of turbine movement or vibration, temperature rise or strong winds.

14.3.40 During icing conditions there are two types of risks potentially associated with ice collecting on turbines:

- Fragments thrown off from the operating turbine due to aerodynamic and centrifugal forces; or
- Ice falling down from the turbine when the blades are stationary.

14.3.41 For the Proposed Varied Development, the maximum distance from the turbine where ice could be expected to fall/throw is 326.85m.

14.3.42 Ice throw has been noted as a risk in very cold conditions, for example in the northerly latitudes of Scandinavia or very high altitudes in continental Europe. Ice falls occurs if ice accumulates on the turbine and falls to the ground when it begins to thaw. This would occur when the temperature warms following a period of extreme cold weather conditions.

14.3.43 Due to the more temperate climate of Scotland, icing is likely to be a rare occurrence. The icing map of Europe (WECO, 1999) shows that Scotland is within a light icing area with an annual average of 2-7 icing days per year.

14.3.44 The nearest residential property and public road are approximately 3km from the nearest turbine, and well outside the maximum fall/throw distance. It is predicted that the potential for ice throw affecting members of the public is considered to be extremely low.

Mitigation

14.3.45 The following mitigation measures are proposed to avoid or reduce the risk of ice throw:

- Increase awareness provided to service crews regarding the potential for ice throw and associated risks; and
- Notices placed at access points alerting members of the public accessing the site of the possible risk of ice throw under certain conditions. This will be included as part of the Outdoor Access Plan, required under Condition 21.

Residual Effects

14.3.46 Following the implementation of proposed mitigation measures it is considered that the risk of ice throw affecting members of the public or operational staff will be very low and therefore not signficant. This is consisted with the Consented Development.

Air Quality

Introduction

14.3.47 This section considers the potential effects of the Proposed Varied Development on Air Quality.

Baseline and Potential Effects

Construction

14.3.48 During the construction of the Proposed Varied Development the movement of vehicles and on-site plant would generate exhaust emissions. Given the short term nature of the construction period, and the limited area to be developed within the context of the large-scale nature of the site, effects on local air quality are likely to be negligible.

14.3.49 Construction activities also have the potential to generate dust during dry spells (such as borrow pit quarrying), which may adversely affect local air quality. During construction of Gordonbush Wind Farm, a short stretch of access track close to the entrance from C6 Strath Brora road was tarmacked to minimise dust to adjacent sensitive receptors.

Operation

14.3.50 An operational wind farm produces no notable atmospheric emissions. The operation of the wind farm would therefore have no discernible adverse effects on local or national air quality.

14.3.51 The operation of wind farms contributes to an overall beneficial effect on local and global air quality by contributing to the offsetting of the atmospheric emissions associated with global warming and acid rain, produced by the generation of electricity from the burning of fossil fuels.

Mitigation

14.3.52 Mitigation measures to control dust are included within the draft CEMP (refer to Appendix 4.1), and secured through Condition 23. With mitigation measures in place it is considered that dust from construction is unlikely to cause a nuisance.

Residual Effects

14.3.53 With the implementation of mitigation measures to control dust, no significant effects on air quality are predicted. This is consistent with the Consented Development.

Climate Change and Carbon Balance

Introduction

14.3.54 With regard to climate change, in the context of the EIA process climate change is considered both in relation to the contribution of the Proposed Varied Development to increasing or decreasing gaseous emissions with global warming potential (GWP), and in relation to climate change adaptation.

14.3.55 This section assesses the potential climate change and carbon impact of the Proposed Varied Development.

14.3.56 Reducing carbon dioxide emissions from electricity generation is one of the primary aims of policies which encourage renewable energy generation. The operation of wind farms offset carbon from other forms of energy generation, but there are carbon costs associated with the construction of wind farms, especially where they are located in carbon rich soils such as peatlands. Emissions associated with the Proposed Varied Development would largely be

limited to temporary and short term emissions of exhaust gases from vehicles and construction plant, and the potential for the release of carbon dioxide as a result of dewatering and exposing peat and peat soils during construction. Neither source is considered likely to be significant in terms of GWP.

Methodology

14.3.57 A carbon assessment has been undertaken for the Proposed Varied Development in accordance with Scottish Government recommended methodology 'Calculating Carbon Savings from Wind Farms on Scottish Peatlands – A New Approach' (Nayak et. al., 2010). This methodology has been developed specifically for calculating carbon savings from wind farms on Scottish peat lands. Assessment is undertaken using the calculation spreadsheet v1.5.1.

Carbon Assessment

14.3.58 The carbon calculator has been submitted to the Scottish Government and SEPA using the online tool, the results of which are summarised below.

14.3.59 The potential savings in CO_2 emissions due to the Proposed Varied Development replacing other electricity sources over the 25 year lifetime of the wind farm are approximately:

- 74,305 tonnes of CO_2 per year over coal-fired electricity;
- 22,735 tonnes of CO_2 per year over grid-mix of electricity; or
- 37,234 tonnes of CO_2 per year over a fossil fuel mix of electricity.

14.3.60 The CO_2 'pay back', which is the period of wind farm operation required until there is a net saving of CO_2 can be calculated as the total CO_2 losses associated with the Development divided by the CO_2 saving per year of wind farm operation. Based on the Scottish Government recommended methodology, the Proposed Varied Development has an expected payback time of between 0.9 to 2.9 years (using coal and UK grid supply mix CO2 emission factors, respectively). This is a substantially shorter time period than the 25 year operational period applied for. The estimated CO_2 'pay back' for the Consented Development was between 1.3 to 2.6 years, as stated in the 2016 FEI Report.

Mitigation

Design Stage

14.3.61 As part of the design evolution of the Consented Development, a peat depth survey was undertaken to identify peat depths and to inform a layout which avoids areas of deeper peat and minimises peat slide risk where practicable. Results indicate that the majority of the site comprises of peat <1m in depth; however, pockets of deeper peat (>3m) do exist, and these areas were taken into consideration and avoided during the design process.

Construction Stage

14.3.62 Where appropriate, peat and soil from excavations on site would be utilised for reinstatement. Further details are provided in Appendix 4.1: draft CEMP and Appendix 9.3 of the 2015 ES: Peat Management Plan. These are secured through Condition 23.

Adaptation

14.3.63 In terms of climate adaptation, consideration would be given to the potential implications of climate change on design of turbines (e.g. design for increased flood risk and adverse weather); however, no potential for significant impacts have been identified.

Residual Effects

14.3.64 Given the above, no potential for significant impacts have been identified for Climate Change and Carbon Balance.

Risk of Major Accidents and / or Disasters

14.3.65 Relevant types of accident and / or disasters, given the predominantly rural context of the proposed varied development include:

- Severe weather events, including high winds, high rainfall leading to flooding, or extreme cold leading to heavy snow and ice loading;
- Fire;
- Traffic related accidents; and
- Mass movement associated with ground instability.

14.3.66 Resilience in the event of severe weather and fire is a core component to the wind farm and turbine design. The Applicant uses a remote operational control system (controller and SCADA systems), which allow both automated and remote user shutdown in order to protect assets in the event of extreme conditions including extreme high wind or ice loading. It is noted that the site is not considered to be vulnerable to flooding. While heavy snow is not unlikely, extreme heavy snow is rare. However in the event of an extreme weather event, the Applicant operates to the highest standards for safety and health, with respect to protecting the safety of people. This includes implementing strict protocols for risk assessment which cover consideration of severe weather, and site based 'dynamic' risk assessment which requires staff to stop work in the event that weather conditions become unsafe.

14.3.67 Wind speeds are constantly measured by the nacelle based ultrasonic anemometers, which are permanently heated. There are typically two anemometers located on the nacelle roof, with redundancy that allows continued operation should one malfunction. The outputs from the anemometers are integrated into the controller and SCADA systems to inform and warn the operator. When wind speeds in excess of the cut-out wind speed are experienced the turbine will enter an idle state by pitching the blades out of the prevailing wind. All turbine subsystems will then run in an auto mode configuration until the wind speed falls below the level to cut back in. The turbine yaw system will keep the turbine pointing upwind with the subsystems in the auto mode. In addition, rotor speed is constantly monitored to ensure that should any overspeed occur, then the turbine will automatically shut down. Siting assessments and analysis of historic wind speed data will have determined the extreme wind speeds likely to be encountered on the site. The turbines proposed by the manufacturers will have been designed to operate within these conditions.

14.3.68 Ice detection is performed by a software application, whereby ice build-up on the turbine blades is determined by comparing the actual performance data with the nominal turbine power curve. When the performance levels drop below the reference thresholds an alarm is generated within the SCADA system to warn the operator. If the turbine is shut down by an icing event, then depending on the system installed it may be possible to carry out remote re-starting of the turbine when climatic conditions allow. Sometimes a manual start will be required. This will necessitate going to the turbine, where a visual assessment of ice build-up can be made. When attempting to re-start the turbine it will be necessary to put an exclusion zone in place in case of any residual ice throw from the blades.

14.3.69 In the event of fire, turbines are located a sufficient distance from settlements and scattered dwellings, such that there would be no significant risk to human health. Wild fire is not considered to have high consequence given the rural nature of the site (with no human population at risk). The turbines are fitted with comprehensive fire detection and warning systems that are integrated to the control and SCADA systems to generate alarms, alert the operator and control the shutdown of the turbine. Depending on supplier the transformer enclosure will be monitored by smoke and heat detection or by arc flash detection for immediate shutdown and removal of electrical energy. The system will also close off air vents and stop all fans to reduce air intake to a potential fire and to prevent smoke and/or gasses

from being circulated within the tower/nacelle. The weather screen and housing around the machinery in the nacelle is made of fibreglass reinforced laminated panels with fire-protecting properties. The design includes fully integrated lightning and EMC protection. Both the nacelle and the steel tower act as a Faraday cage thus preventing fire induced by lightning. The blades are fitted with multiple lightning receptors that conduct to the tower via a slipring arrangement. Any excess grease or spilled oil are gathered in reservoirs to be emptied during scheduled maintenance. The high-speed brake system is shielded around the moving parts to ensure that any sparks generated will not spread into the nacelle. The use of flammable materials has been eliminated wherever possible by design and halogen free (low smoke) cables are deployed.

14.3.70 All construction traffic would be managed in accordance with a detailed traffic management plan, to be agreed with The Highland Council. The Traffic Management Plan will aim to design out risk of accidents using mitigation measures outlined in Chapter 10: Traffic and Transport. The Traffic Management Plan is secured through Condition 17.

14.3.71 The risks associated with peat instability are addressed in Appendix 9.1 of the 2015 ES and therefore no further/separate assessment of mass movement (peat instability) is required.

Residual Effects

14.3.72 With the implementation of mitigation measures discussed above, no other significant effects to human health, cultural heritage or the environment associated with accidents and disasters are anticipated.

14.4 Comparison of Effects between Proposed Varied Development and Consented Development

14.4.1 Table 14.1 summarises the effects that were assessed for the Consented Development and compares these with the effects of the Proposed Varied Development.

Table 14.1: Comparison of Effects

Potential Receptors of Effect	Consented Development	Proposed Varied Development	Change
Telecommunications, Television / Radio	Not Significant	Not Significant	No Change
Aviation (Civil and Military)	Not Significant	Not Significant	No Change
Shadow Flicker	Not Significant	Not Significant	No Change
Ice Throw	Not Significant	Not Significant	No Change
Air Quality	Not Significant	Not Significant	No Change
Climate Change and Carbon Balance	-	Not Significant	N/A
Risk of Major Accidents and Disasters	-	Not Significant	N/A